

**CITY OF ONTARIO**

**TECHNICAL SPECIFICATIONS**

**VOLUME 2 of 8**

**FOR CONSTRUCTION OF THE**

**ONTARIO SPORTS EMPIRE**

**IN THE CITY OF ONTARIO, CALIFORNIA**

~~February 17, 2025~~  
~~February 28, 2025~~  
~~March 10, 2025~~  
**April 2, 2025**

**PREPARED BY:**

RJM Design Group, Inc.  
31591 Camino Capistrano  
San Juan Capistrano, California 92675  
(949) 493-2600

## ONTARIO SPORTS EMPIRE

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**PROJECT MANUAL  
for the Construction of  
CITY OF ONTARIO**

**ONTARIO SPORTS EMPIRE**

Ontario, CA 91764

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**Owner**

**CITY OF ONTARIO**

303 East B Street  
Ontario, CA 91764

**Landscape Architect**

**RJM DESIGN GROUP INC.**

31591 Camino Capistrano  
San Juan Capistrano, CA 92675

**Architect**

**CRANE ARCHITECTURE GROUP**

110 East Wilshire Ave., Suite 300  
Fullerton, CA 92832

**Civil Engineer**

**civTEC**

999 Corporate Drive, Suite 100  
Ladera Ranch, CA 92694

**Electrical Engineer**

**FBA ENGINEERING**

150 Paularino Avenue, Suite A120  
Costa Mesa, CA 92626

**Irrigation Designer**  
**GLASIR DESIGN**  
424 New Jersey Lane  
Placentia, CA 92870

**Structural Engineering**  
**GMU GEOTECHNICAL INC.**  
30336 Esperanza  
Rancho Santa Margarita CA 92688

**Constructability Review Analysis**  
**MUROW DEVELOPMENT CONSULTANTS**  
16800 Aston St, Ste 200  
Irvine, CA 92606

**Construction Manager**  
**Tilden-Coil Constructors**  
3612 Mission Inn Ave.  
Riverside, CA 92501

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**END OF DOCUMENT**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 10 00****SUMMARY OF THE PROJECT****PART 1 - GENERAL****1.1 THE PROJECT**

- A. Project Title: ONTARIO SPORTS EMPIRE
- B. Project Location: \_\_\_\_\_ as shown approximately on the Vicinity Map in the Drawings.
- C. The Project: The ONTARIO SPORTS EMPIRE is a state-of-the-art development designed to provide a dynamic and engaging recreational space for the community. Spanning approximately 110 acres, the complex will feature a range of high-quality amenities, including synthetic turf soccer and championship football fields, multi-diamond baseball and softball fields, championship baseball fields, batting cages, playgrounds, restroom and concession facilities, and pedestrian friendly concourses with shaded spectator seating and gathering areas. Ample parking flanks the project. Central to the design is the family activity area featuring plaza space, a stage, large LED video board wall, sculptures, shade structures with seating and broadcast viewing opportunities. Walkways throughout the site are enhanced with low-voltage lighting, Wi-Fi connectivity, broadband, and electronic security systems. The project also includes digital reader boards, site monumentation and signage, and carefully planned natural turf areas and sustainable site landscaping with irrigation. Comprehensive site development encompasses finish grading, drainage, utility installation, retaining walls, fencing and a 365-day maintenance program to ensure a smooth and sustainable transition upon completion.
- D. OWNER: City of Ontario (referenced in the Specifications as the "OWNER" or "Client").
- E. This is a City of Ontario public works project. CONTRACTOR to be familiar and comply with procedures, processes, and regulations necessary to complete project.

**1.2 WORK INCLUDED IN THE CONTRACT**

- A. The Project: The overall project is the construction of a new sports complex. The Work under the Contract includes the development of a +/- 110 acre sports complex as described in detail herein. As indicated on the Drawings and in the Specifications, the Work includes:
  - 1. Ontario Sports Empire site development shall include but not be limited to:
    - a. Finish grading and drainage
    - b. Installation of wet and dry utilities
    - c. Installation of footings
    - d. Walkways, plazas, and promenades
    - e. Pedestrian and low voltage lighting
    - f. Wi-Fi Systems
    - g. Electronic security and paging systems
    - h. Project monumentation and signage
    - i. Sculptures
    - j. LED Video board and digital reader boards
    - k. Seating and gathering areas
    - l. Shade structures

- m. Playground areas
  - n. Synthetic Turf Baseball fields
  - o. Batting cages
  - p. Synthetic Turf Soccer fields
  - q. Retaining walls, guardrails and fences
  - r. Surface Parking
  - s. Planting and irrigation
  - t. 365-day maintenance
- 2. Utility system connections and hardscape necessary for park access to all site amenities and adjoining paving.
- 3. The site is large enough to allow for the storage of all construction materials. CONTRACTOR'S construction office shall be on-site and secured with fencing from the surrounding areas. CONSTRUCTION MANAGER'S construction office will be on-site as defined in the specifications herein.
- B. Work Under Separate Contracts: The Work includes coordination of work being performed by others under separate contracts with the OWNER described in Article below titled "CONCURRENT WORK UNDER SEPARATE CONTRACTS."
- C. Environmental Considerations: The project will be designed and shall be constructed in compliance with pre-requisites and credits according to California Code of Regulations (CCR) Title 24, Part 11: Latest California Green Building Standards Code (CALGreen Code)
- D. Additional Information Available to CONTRACTOR: Available in Contract Documents
- E. Additional general information concerning the Project is provided on the Drawings.

### **1.3 CONCURRENT WORK UNDER SEPARATE CONTRACTS**

- A. Work Under Separate Contracts: Work related to the Project may be performed under separate contracts by the OWNER, serving utilities and public agencies, as indicated below. Such work under separate contracts may be indicated on the Drawings and in the Specifications as "Not in Contract", "NIC", "Future" or "Under Separate Contract". Work under separate contract will include:
  - 1.
- B. Relationship to Work Under the Contract: Work under the Contract shall include all provisions necessary to make such concurrent work under separate contracts complete in every respect and fully functional, including field finishing. Provide necessary backing, supports, piping, conduit, conductors and other such provisions from point of service to point of connection, as shown on Drawings and specified herein. Coordinate scheduling and sequencing of work under separate contracts with project scheduler. See Section 01 31 00 - Project Management and Coordination for additional requirements.
- C. Documents for Work Under Separate Contracts: OWNER will make available through, in a timely manner, drawings and specifications of work under separate contracts for coordination and further description of that work.

1. If available, such information will include drawings, specifications, product data, lists and construction schedules for such work.
  2. Information concerning work under separate contracts or directly by OWNER will be provided for convenience only and shall not to be considered Contract Documents.
  3. Such drawings and other data required for the coordination of the work of separate contracts with the Work of the Contract may be included with the Contract Documents. If so, they will be for convenience only and are not to be considered Contract Documents produced by ARCHITECT or ARCHITECT'S consultants.
- D. Permits, Notices and Fees for Work under Separate Contracts: Notices required by and approvals required of, AUTHORITIES HAVING JURISDICTION over work under separate contracts and related fees, will be solely the responsibility of the OWNER.

#### **1.4 CONSTRUCTION SEQUENCE AND SCHEDULING**

- A. Construction Sequence and Scheduling: CONTRACTOR is responsible for the proper scheduling and sequencing of the work. CONTRACTOR shall coordinate on-site and off-site Work to minimize traffic obstruction and interference with continuing activities on adjacent properties and thoroughfares. Sequence and scheduling of grading, paving and utility Work, in particular, shall be coordinated.

#### **1.5 PERMITS, LICENSES AND FEES**

- A. Permits: For Work included in the Contract, CONTRACTOR shall will obtain all permits from AUTHORITY HAVING JURISDICTION (AHJ) and from serving utility companies and agencies.
- B. Permits: OWNER will pay for all permits issued by AUTHORITIES HAVING JURISDICTION, including City of Ontario, County of San Bernardino and San Bernardino County Fire Protection District (SBFPD), Ontario Fire Department (OFD). CONTRACTOR shall obtain and pay for all permits from other authorities and serving utilities having jurisdiction over the Work and submit costs.
- C. Assessments: Costs of assessments and connection fees shall not be included in the Contract Sum. OWNER will pay all assessments and utility service connection fees.
- D. Licenses: CONTRACTOR shall obtain and pay for all licenses associated with construction activities, such as business licenses, CONTRACTORS' licenses and vehicle and equipment licenses. All costs for licenses shall be included in the Contract Sum.
- E. Test and Inspection Fees:
1. CONTRACTOR shall pay all fees charged by County and special district AUTHORITIES HAVING JURISDICTION and from serving utility companies and agencies, for tests and inspections conducted by those authorities, companies and agencies.
  2. CONTRACTOR shall pay for all additional charges by testing and inspection agencies due to the following:
    - a. CONTRACTOR'S failure to properly schedule or notify CONSTRUCTION MANAGER.
    - b. Changes in sources, lots or suppliers of products after original tests or inspections.

- c. Changes in means, methods, techniques, sequences and procedures of construction that necessitate additional testing, inspection and related services.
- d. Changes in mix designs for concrete and mortar after review and acceptance of submitted mix design.
- e. CONTRACTOR submitted requests to change materials or products, which are accepted but require testing and/or re-inspection beyond original design.
- f. Costs of travel and per diem to perform factory testing on sites over 50 miles from the jobsite.
- g. Costs of re-testing, re-inspection of work due to failure of the original test / product being inspected.

## **1.6 CONTRACTOR'S USE OF SITE AND PREMISES**

- A. CONTRACTOR'S Use of Site and Premises: Except as described below, during the construction period the CONTRACTOR shall have full use and responsibility of the premises for construction operations, including use of the site within Project Area.
- 1. All on-site fire hydrants shall be installed, operational, fully-charged, fully-accessible by fire apparatus and approved by local Fire Department prior to loading site with combustible materials, in compliance with California Fire Code (CFC), Article 87.
  - 2. Prior to commencing Work, CONSTRUCTION MANAGER and CONTRACTOR shall tour site together to examine and record existing conditions, including damage to paving, structures and other site improvements.
    - a. CONTRACTOR shall produce video record of existing conditions and provide copy to CONSTRUCTION MANAGER. Video record shall be supplemented by written report describing existing conditions, prepared by the CONTRACTOR.
    - b. At Contract Closeout, paving, structures and other site improvements shall be restored by CONTRACTOR to condition equal to or better than conditions at commencement of Work.
    - c. All cracking, subsidence, soiling, marring, breakage and other defects, other than normal weathering, shall be restored by CONTRACTOR at no change in Contract Time and Contract Sum.
    - d. Basis for determination of satisfactory restoration shall be video recording and written record. Conditions not described on video or in written record shall be restored as.
  - 3. CONTRACTOR shall provide Identification for all workers on site, whether employed by CONTRACTOR, subcontractors or suppliers. Form of identification shall be subject to review and approval of CONSTRUCTION MANAGER. Persons failing to display required identification shall be immediately escorted off the site.
  - 4. Use of Work area by CONTRACTOR shall not limit OWNER'S right to perform construction operations with its own forces or to employ separate CONTRACTORS on portions of the Project, in accordance with the General Provisions of the Contract. CONTRACTOR shall coordinate the Work and make provision for site and building access and for storage and staging areas at the Work site to accommodate work under separate contracts by OWNER.
  - 5. CONTRACTOR shall provide construction fencing and other barriers as necessary to separate the Project Area from existing facilities to remain occupied and accessible to OWNER. Refer to construction fencing requirements specified in Section 01 56 00 - Temporary Barriers and Enclosures.

- B. Work Hours: Refer to General Provisions of the Contract. Work shall be performed during hours in compliance with applicable County noise abatement Ordinance.
- C. Site Access: Access to site shall conform to security and public safety requirements of AUTHORITIES HAVING JURISDICTION. Do not restrict access to adjacent facilities and do not restrict access for those performing work under separate contracts for the OWNER.
- D. Construction Limits: Limit construction activities to areas indicated on Drawings as Project Area. Refer also to Section 01 57 00 - Temporary Controls for additional requirements, including temporary fencing.
- E. Site Access and Egress: CONTRACTOR shall maintain driveways and access/egress routes clear at all times. Use of these areas for parking or storage of materials is prohibited. CONTRACTOR shall sequence and schedule deliveries to minimize necessity for on-site storage of materials. Comply with the requirements of public safety, AUTHORITIES HAVING JURISDICTION and OWNER requirements.
  - 1. Emergency access: CONTRACTOR shall provide pathways, drives, gates, directional signage and other provisions as required by public safety AUTHORITIES HAVING JURISDICTION for emergency access to Work area(s).
  - 2. Emergency egress: CONTRACTOR shall maintain all pathways, drives, gates, and other means of egress during construction as required by public safety AUTHORITIES HAVING JURISDICTION.
- F. Protection of Existing Improvements and Facilities: CONTRACTOR shall protect property adjacent to the Project Area and all existing improvements and facilities within the Project Area, including paving and landscaping indicated to remain.
  - 1. All existing improvements and facilities, except those specifically indicated for removal or reconstruction, shall be protected with temporary barriers, enclosures and passageways. See additional requirements specified in Section 01 57 00 - Temporary Controls.
  - 2. After completion of Work, existing improvements and facilities shall be restored to original condition and location. Project Area shall be cleaned and restored to presentable condition, equivalent to or better than the condition prior to start of Work.
  - 3. Should existing improvements and facilities be damaged or soiled beyond renovation or repair, new products shall be provided by CONTRACTOR equivalent to existing products, as acceptable to OWNER.
  - 4. Site access for Work activities: CONTRACTOR shall obtain approval from the OWNER for site access routes, gate locations and other provisions, such as restriction on times of usage, for personnel and materials.
- G. Utility Outages and Shutdowns:
  - 1. Utility outages and shutdowns shall be subject to approval of the OWNER and AUTHORITY HAVING JURISDICTION.

2. Schedule utility outages and shutdowns to evenings and weekends and at times and dates acceptable to adjacent property OWNERS, unless otherwise directed.
3. Provide minimum 48 hours notice of all utility outages and shutdowns.
4. Duration of outages and shutdowns shall not hinder normal activities of the OWNER and adjacent property OWNERS.

H. Rough Grading:

1. CONTRACTOR will be required to coordinate with rough grading CONTRACTOR for any remaining rough grading items to be completed in order to ensure no conflicts arise with construction under this contract.

## **1.7 OWNER'S USE OF SITE AND PREMISES**

A. OWNER'S Use of Site and Premises: OWNER reserves the right to occupy and to place and install equipment in completed areas of the building, prior to Contract Completion, provided that such occupancy does not interfere with completion of the Work.

1. A Notice of Completion will be executed for each specific portion of the Work to be used by OWNER ("beneficial occupancy") prior to obtaining Certificate of Occupancy from AUTHORITIES HAVING JURISDICTION. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.
2. Prior to use of portions of the Work by OWNER, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Unless otherwise agreed, OWNER will provide operation and maintenance of mechanical and electrical systems in portions of the building used by OWNER. Warranty periods shall not begin until final acceptance of the entire Work.

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**



## SECTION 01 21 00

### ALLOWANCES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for allowances
- B. Related Requirements:
  - 1. Bid Form: The monetary value of scheduled allowance is to be included in bidders Total Cash Purchase Price of the Bid Form.

##### 1.2 REQUIREMENTS

- A. The Base Bid shall include the monetary value of any scheduled allowances to base bid price as set forth below.
- B. Approved Change Order Items which occur during the course of construction shall be deducted from the allowance set forth for each CONTRACTOR/ Category.
- C. Change Items will be processed as described in the General Conditions of the Contract and will be included in a formal Change Order. All Change Orders must be signed by the ARCHITECT, OWNER, and CONTRACTOR prior to fabrication or use.
- D. The allowance may only be used upon written direction from the CONSTRUCTION MANAGER OR OWNER. The allowance shall not be used for CONTRACTOR'S poor workmanship or delays imposed due to CONTRACTOR.
- E. All labor rates and material costs shall be determined in accordance with the general conditions. Mark-up cost, i.e. overhead, profit will be permitted. Bond will not be permitted.
- F. Any portion of the allowance remaining at the end of the project shall be credited to the OWNER via a Change Order. CONTRACTOR shall not deduct any costs including, but not limited to, bond costs, overhead and profit, or other indirect costs when returning any unused allowance amount. The total bond cost is to be adjusted to reflect the final total contract amount and shall be issued as a separate Change Order credit based on actual invoice from the surety.
- G. Allowances shall be listed as a separate line item when submitting the schedule of values.

##### 1.3 SCHEDULE OF ALLOWANCES

BC 01:	Asphalt Paving .....	<b>\$1,000,000</b>
BC 02:	Concrete: Structural .....	\$343,000
BC 03:	Concrete: North Site Concrete .....	\$4,240,000
BC 04:	Concrete: South Site Concrete .....	\$2,827,000
BC 05:	Concrete: East Site Concrete .....	\$582,000
BC 06:	Masonry .....	\$550,000
BC 07:	Structural Steel .....	<b>\$1,500,000</b>
BC 08:	Finish Carpentry .....	\$30,000
BC 09:	Painting .....	\$152,000
BC 10:	Roofing, Waterproofing, Sheet Metal .....	\$271,000
BC 11:	Doors, Frames & Hardware .....	\$64,000
BC 12:	Glazing .....	\$58,000

BC 13:	Metal Stud Framing, Insulation, Drywall & Plaster.....	\$254,000
BC 14:	Rough Carpentry.....	\$231,000
BC 15:	Signage .....	\$861,000
BC 16:	Food Service.....	\$276,000
BC 17:	General Package (A).....	\$2,716,000
BC 18:	General Package (B).....	\$5,778,000
BC 19:	Fire Suppression.....	\$55,000
BC 20:	Plumbing.....	\$126,000
BC 21:	HVAC .....	\$255,000
BC 22:	Electrical & Low Voltage.....	\$4,058,000
BC 23:	Site Utilities.....	\$1,066,000
BC 24:	Chain-link & Ornamental Fencing .....	\$2,256,000
BC 25:	Landscaping & Irrigation.....	\$3,457,000

**PART 2 - PRODUCTS (NOT USED)****PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01 25 00****SUBSTITUTION PROCEDURES****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. General requirements for Substitutions and "OR Equal"

**1.2 RELATED SECTIONS**

- A. Section 01 41 00 - Regulatory Requirements: Codes and standards applicable to product specifications; minimum requirements.
- B. Section 01 42 13 - Reference Standards and Abbreviations: References to various standards, standard specifications, codes, practices and other requirements.
- C. Section 01 33 00 - Submittals Procedures: Requirements applicable to submittals for "or equal" and substitute products.
- D. Section 01 60 00 – Product requirements: General characteristics of products, system completeness, transportation and handling, storage, and installation.

**1.3 SUBSTITUTIONS**

- A. Substitutions: Requests by CONTRACTOR to deviate from specified requirements for products, materials, equipment, and methods, or to provide products other than those specified, shall be considered requests for substitutions except under the following conditions:
  - 1. **Any and all proposed material substitutions presented by the CONTRACTOR shall be submitted to the City during the Bid Period.** These substitution requests must be received by the city no later than 7 days prior to the scheduled bid opening. Substitution request submittals shall be complete as outlined herein including for use of the attached substitution request form. Any substitution requests presented within the 7 days prior to the Bid Opening or beyond the Bid Opening will not be accepted. Acceptance shall be in the form of a written Addendum to the Bidding documents prior to Bidding or revision to the Drawings or Specifications for use as Construction Contract Documents.
  - 2. Changes in products, materials, equipment, and methods of construction are directed by the CONSTRUCTION MANAGER after consultation with the ARCHITECT.
  - 3. CONTRACTOR options for provision of products and construction methods are specifically stated in the Contract Documents.
  - 4. Change in products, materials, equipment, and methods of construction is required for compliance with Codes, ordinances, regulations, orders and standards of AUTHORITIES HAVING JURISDICTION.

- B. Substitution Provisions: Refer to substitution provisions of the General Provisions of the Contract, in addition to the requirements specified herein. Provisions for consideration and acceptance of substitutions shall be as follows:
1. Structural considerations: Substitution requests for products that require structural attachment, or which impose loads on the building structure, shall be accompanied by complete submission of product information, calculations and installation details sufficient for review by the Structural Engineer of Record and review and approval by AUTHORITY HAVING JURISDICTION (AHJ). Submitted information shall include, but not be limited to, the following:
    - a. Sizes and weights of all products, including notations identifying increases or decreases in dimensions and weights.
    - b. Identification of locations of all vertical and lateral loads imposed on the building structure, including notation of increase or decrease in loads and changes in locations of applied loads.
    - c. Structural overturning calculations, structural attachment and anchoring details and calculations, including identification of seismic force criteria used for calculations, prepared and signed by Structural Engineer registered to practice in State of California.
  2. Regulatory approval: Information described above, if acceptable to ARCHITECT and Structural Engineer of Record, shall be submitted to AUTHORITY HAVING JURISDICTION (AHJ) under applicable provisions for deferred approvals. Responsibility for compliance with procedures of AUTHORITY HAVING JURISDICTION (AHJ) shall be on the CONTRACTOR.
    - a. AHJ will review and approve or disapprove the requested substitution.
    - b. Disapproval by AHJ shall render requested substitution to be disapproved.
    - c. Approval by AHJ shall not supersede other conditions for approval under the Contract Documents.
  3. Products identified as "City Standard" are the only products acceptable. No substitutions will be considered for "sole source" products.
  4. Documentation: Substitutions will not be considered if they are indicated or implied on shop drawing, product data or sample submittals. All requests for substitution shall be by separate written request from CONTRACTOR. CONTRACTOR shall utilize Substitution Request form enclosed following this Section OR made directly to the CONSTRUCTION MANAGER.
  5. Cost and Time Considerations: Substitutions will not be considered unless a net reduction in Contract Sum or Contract Time results to the City's benefit, including redesign costs, life cycle costs, plan check and permit fees, changes in related Work and overall performance of building systems.
  6. Design Revision: Substitutions will not be considered if acceptance will require substantial revision of the Contract Documents or will substantially change the intent of the design, in the opinion of the ARCHITECT. The intent of the design shall include both functional performance and visual qualities.
  7. Data: It shall be the responsibility of the CONTRACTOR to provide adequate data demonstrating the merits of the proposed substitution, including cost data and information regarding changes in related Work.

8. Determination by ARCHITECT: ARCHITECT will determine the acceptability of proposed substitutions and the City will notify all potential bidders prior to the Bid Opening of acceptance or rejection. The determination by the ARCHITECT regarding functional performance and visual qualities shall be final.
9. Non-Acceptance: If a proposed substitution is not accepted, CONTRACTOR shall immediately provide the specified product.
10. Substitution Limitation: Only one request for substitution will be considered for each product. Do not order or deliver substitute products until formal approval has been given.
11. Approval of Substitutions by AUTHORITY HAVING JURISDICTION (AHJ): All substitutions shall be considered for changes and shall be governed by the requirements for changes specified in Section 01 26 00 - Contract Modification Procedures. All Change Orders shall be completed in advance of construction, including submission to and approval by AUTHORITY HAVING JURISDICTION (AHJ). Time limit for substitutions in State of California, Public Contract Code Section 3800 shall apply.

C. Request for Substitution Process:

1. CONTRACTOR shall prepare a request for substitution and submit the request to the ARCHITECT for review and acceptance. Submit a minimum of 4 copies. Form and other administrative requirements shall be as directed by the ARCHITECT.
2. Substitution requests shall include complete product data, including drawings and descriptions of products, fabrication details and installation procedures. Include samples where applicable or requested. Where sustainable design attributes are specified, including VOC emissions, formaldehyde content, FSC-accredited certification and compliance to reference standards, indicate in substitution request compliance with specified criteria.
3. Substitution requests shall include appropriate product data for the specified product(s) of the specified manufacturer, suitable for use in comparison of characteristics of products.
  - a. Include a written, point-by-point comparison of characteristics of the proposed substitute product with those of the specified product.
  - b. Include a detailed description, in written or graphic form as appropriate, indicating all changes or modifications needed to other elements of the Work and to construction to be performed by the City and by others under separate contracts with City, that will be necessary if the proposed substitution is accepted.
4. Substitution requests shall include a statement indicating the substitution's effect on the Construction Schedule. Indicate the effect of the proposed substitution on overall Contract Time and, as applicable, on completion of portions of the Work for use by City or for work under separate contracts by City.
5. Except as otherwise specified, substitution requests shall include detailed cost data, including a proposal for the net change, if any, in the Contract Sum.
6. Substitution requests shall include signed certification that the CONTRACTOR has reviewed the proposed substitution and has determined that the substitution is equivalent or superior in every respect to product requirements indicated or specified in the Contract Documents, and that the

substitution is suited for and can perform the purpose or application of the specified product indicated or specified in the Contract Documents.

7. Substitution requests shall include a signed waiver by the CONTRACTOR for change in the Contract Time or Contract Sum because of the following:
  - a. Substitution failed to perform adequately.
  - b. Substitution required changes in on other elements of the Work.
  - c. Substitution caused problems in interfacing with other elements of the Work.
  - d. Substitution was determined to be unacceptable by AUTHORITIES HAVING JURISDICTION.
8. **If, in the opinion of the ARCHITECT, the substitution request is incomplete or has insufficient data to enable a full and thorough review of the intended substitution, the substitution may be summarily refused and determined to be unacceptable.**

D. Contract Document Revisions:

1. Should a CONTRACTOR-proposed substitution or alternative sequence or method of construction require revision of the Contract Drawings or Specifications, including revisions for the purposes of determining feasibility, scope or cost, or revisions for the purpose of obtaining review and approval by AUTHORITY HAVING JURISDICTION (AHJ), revisions will be made by ARCHITECT or other consultant of City who is the responsible design professional, as approved in advance by City through CONSTRUCTION MANAGER.
2. Services of ARCHITECT or other responsible design professional for researching and reporting on proposed substitutions or alternative sequence and method of construction shall be paid by CONTRACTOR when such activities are considered additional services to the design services contracts of the City with ARCHITECT or other responsible design professional.
3. Costs of services by ARCHITECT or other responsible design professional of the City shall be paid on a time and materials basis, based on current hourly fee schedules, with reproduction, long distance telephone and shipping costs reimbursable at cost plus usual and customary mark-up for handling and billing.
4. Such fees shall be paid whether or not the proposed substitution or alternative sequence or method of construction is ultimately accepted by City and a Change Order is executed.
5. Such fees shall be paid from CONTRACTOR'S portion of savings, if a net reduction in Contract Sum results. If fees exceed CONTRACTOR'S portion of net reduction, CONTRACTOR shall pay all remaining fees unless otherwise agreed in advance by City through CONSTRUCTION MANAGER.
6. Such fees owed shall be deducted from the amount owed CONTRACTOR on the Application for Payment next made following completion of revised Contract Drawings and Specifications or completion of research and other services. City will then pay ARCHITECT or other consultant of the City.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 26 10****REQUESTS FOR INFORMATION (RFI)****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for requests for information, including the following.
  - 1. Definitions
  - 2. Electronic Document Submission
  - 3. Request For Information (RFI) Process
  - 4. ARCHITECT Response to RFIs

**1.2 DEFINITIONS**

- A. Request for Information:
  - 1. Written request prepared by CONTRACTOR requesting additional information necessary to clarify an item which CONTRACTOR believes is not clearly shown or called for in the drawings or specifications, or to address problems which have arisen under field conditions, hereinafter referred to as RFI.
  - 2. Properly prepared request for information shall include detailed written statement that indicates specific Drawings or Specification in need of clarification and nature of clarification requested.
    - a. Drawings shall be identified by Drawing number and location on Drawing sheet.
    - b. Specifications shall be identified by Section number, page and paragraph.
  - 3. CONTRACTOR'S documents with similar titles, such as "Request for Interpretation" or "Request for Clarification" shall be considered RFIs.
  - 4. RFIs and ARCHITECT'S responses are not Changes in the Work; if a Change in the Work is required in response to an RFI, separate documents shall be issued in accordance with the General Conditions.
- B. Improper RFIs:
  - 1. RFIs that are not properly prepared or incomplete will be processed by CONSTRUCTION MANAGER or ARCHITECT at CONSTRUCTION MANAGER and/or ARCHITECT'S standard hourly rate, and such costs will be deducted from moneys still due to the CONTRACTOR. CONSTRUCTION MANAGER will notify CONTRACTOR before processing the improper RFI.
- C. Frivolous RFIs:
  - 1. RFIs that request information that is clearly shown on Contract Documents.
  - 2. Frivolous RFIs may be returned unanswered or may be processed by CONSTRUCTION MANAGER or ARCHITECT at CONSTRUCTION MANAGER and/or ARCHITECT'S standard hourly rate, and such costs will be deducted from moneys still due to the CONTRACTOR. CONSTRUCTION MANAGER will notify CONTRACTOR before processing the frivolous RFI.

**1.3 ELECTRONIC DOCUMENT SUBMISSION**

- A. CONTRACTOR to submit RFIs electronically through CONSTRUCTION MANAGER'S web-based project management software CMiC Collaboration.

- B. Refer to Section 01 33 26 – Electronic Document Control for access and use.
- C. In the event there is no section 01 33 26 – Electronic Document Control included or CMiC Collaboration is not functioning, CONTRACTOR to submit RFI via email to CONSTRUCTION MANAGER.

#### **1.4 REQUEST FOR INFORMATION PROCESS**

- A. When the CONTRACTOR is unable to determine from Contract Documents, material, process or system to be installed, ARCHITECT will be requested to make clarification of indeterminate item.
- B. RFIs shall be submitted on form provided herein. Form shall be completely filled in, and if prepared by hand, shall be fully legible after photocopying or transmission by e-mail scan. Each page of attachments to RFIs shall bear RFI number.
- C. RFI's originated by CONTRACTOR:
  - 1. RFIs from subcontractors or material suppliers shall be submitted through, reviewed by, and signed by CONTRACTOR before submittal to CONSTRUCTION MANAGER.
  - 2. RFIs sent by subcontractor or suppliers directly to CONSTRUCTION MANAGER, or ARCHITECT or ARCHITECT'S consultants shall not be accepted and will be returned unanswered.
- D. CONTRACTOR shall carefully study Contract Documents to ensure that requested information is not available therein. RFIs which request information available in Contract Documents will be deemed "improper" or "frivolous" as noted above.
- E. In cases where RFIs are issued to request clarification of coordination issues, for example pipe and duct routing, clearances, specific locations of Work shown diagrammatically, and similar items, CONTRACTOR shall endeavor to provide a suggested solution using drawings or sketches drawn to scale and submit same with RFI.
  - 1. CONTRACTORS are encouraged to utilize photocopies of Contract Documents to completely illustrate their questions, and to provide sketches as required to communicate question, concepts and suggestions.
- F. Do not use RFIs for following purposes:
  - 1. To request approval of submittals or substitutions.
  - 2. To request changes which entail additional cost or credit.
  - 3. To request changes which entail change of time of completion.
  - 4. To request different methods of performing Work than those drawn and specified.
- G. In the event CONTRACTOR believes that clarification by ARCHITECT results in additional cost or time, CONTRACTOR shall not proceed with Work indicated by RFI until Change Order or Construction Change Directive is prepared and approved. RFIs shall not automatically justify cost increase in Work or change in project schedule.
  - 1. Answered RFIs shall not be construed as approval to perform extra Work.
  - 2. Unanswered RFIs will be returned with stamp or notation: Not Reviewed.
- H. CONSTRUCTION MANAGER shall prepare and maintain RFI log.
- I. CONTRACTOR shall allow for a review and response time of up to seven (7) to ten (10) working days during construction for RFIs. ARCHITECT will make every effort to respond to RFIs promptly. RFIs submitted up to ten (10) days before the bid closing will be addressed in the ARCHITECT's response in an addendum. RFIs received within ten (10) days of the bid closing may or may not receive a response.

**1.5 ARCHITECT'S RESPONSE TO RFIS**

- A. ARCHITECT will respond to RFIs on one of following forms:
  - 1. Properly prepared RFIs:
    - a. If no Change in the Work is required, ARCHITECT will respond in space provided on the RFI form.
    - b. If a Change in the Work is required, ARCHITECT will issue change documents in accordance with the Contract.
  - 2. Improper or Frivolous RFIs:
    - a. Notification of Processing Fee(s).
    - b. Unanswered RFIs will be returned with stamp or notation: "Not Reviewed".

**PART 2 - PRODUCTS (NOT USED)****PART 3 - EXECUTION****3.1 ATTACHMENTS**

- A. Use RFI form herein

**END OF SECTION**

# RFI Form

PROJECT NAME:	Ontario Sports Empire		
PROJECT NUMBER:	D&C23-011		
TO:	Jake Albertazzie	EMAIL:	jalbertazzie@tilden-coil.com

DATE:			
FROM:		EMAIL:	
DOCUMENT/DIVISION NUMBER:		DRAWING NUMBER:	

REQUESTED CLARIFICATION:	
RESPONSE TO CLARIFICATION:	

**SECTION 01 30 10****CONSTRUCTION DETAILING ACTIVITY (CDA) 3D-BUILDING INFORMATION MODELING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes:
  - 1. Summary / Administrative Requirements.
  - 2. CONTRACTOR Participation.
  - 3. CONTRACTOR Responsibility.
  - 4. BIM Requirements.

**1.2 SUMMARY / ADMINISTRATIVE REQUIREMENTS**

- A. The Construction Detailing Activity (CDA) is a project coordination program to confirm aspects of the project's design in an orderly and systematic way.
- B. The purpose of the CDA is to expeditiously coordinate the fit, routing and components of the overhead utilities with wall framing and ceiling finishes. Address conflicts during the CDA process in lieu of during installation.
- C. The CDA is to assure that all utilities, architectural, and structural building systems are inter-coordinated and agreed upon by CONTRACTOR, their Subcontractors and related CONTRACTORS, before Work begins in the field.
  - 1. Coordinate the interrelationship of major system assemblies by CONTRACTORS and their relationship with the Work.
  - 2. Coordinate the Work of CONTRACTORS so that portions of the Work are performed in a manner that minimizes interference with the progress of the Work.
  - 3. Do not obstruct spaces and installations that are required to be clear by Applicable Code Requirement.
- D. Components of construction, building lines, building floor elevations, and other details of the Work shall be accurately laid out within the tolerances specified for type of Work and materials indicated. CONTRACTOR shall require use of established lines and elevations for all Work.
- E. Establishes protocols, expected levels of development and authorized uses of Building Information Models on this Project.
- F. The coordination effort will be utilizing 3D Building Information Modeling (BIM)
  - 1. Specific CONTRACTORS are required to produce, submit and coordinate their scope of work utilizing digital/computer based three dimensional models commonly referred to as Building Information Modeling (BIM).
- G. Expeditiously produce fully coordinated shop drawings showing a composite of systems, subsystems, along with architectural and structural elements prior to fabrication of building systems.
- H. At the completion of the CDA, affected CONTRACTORS are required to sign off their acceptance indicating that the Work represented in the BIM and its resulting coordinated shop drawings is constructible and has been reviewed by them and that they are in concurrence with information contained on the drawings.
- I. Level of Development (LOD)
  - 1. The LOD is "LOD 400".

2. The model element is graphically represented within the Model as a specific system, object or assembly in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information. Non-graphic or non-geometric information may also be attached to the Model Element.

### 1.3 CONTRACTOR PARTICIPATION

- A. The following CONTRACTORS are required to participate utilizing 3D BIM are:
  1. CONSTRUCTION MANAGER - Architectural
  2. BC02 – Concrete: Structural
  3. BC07 – Structural Steel
  4. BC13 – Metal Stud Framing, Insulation, Drywall & Plaster
  5. BC16 – Food Service
  6. BC19 – Fire Sprinklers
  7. BC20 – Plumbing
  8. BC21 – HVAC
  9. BC22 – Electrical & Low Voltage
  10. BC23 – Site Utilities
- B. All CONTRACTORS; regardless, if not involved with 3D BIM, are required to coordinate their Work with all other CONTRACTORS. Coordination efforts are required for, but not limited to:
  1. Interior and exterior wall / partition stud framing.
  2. Utility coordination with architectural and structural work.
  3. Underground utility coordination with proposed and existing underground utilities.
  4. Coordination of all building elements.

### 1.4 CONTRACTOR RESPONSIBILITY

- A. Notwithstanding the information shown on the drawings and indicated in the specifications, CONTRACTOR fully recognizes that the contract drawings are only diagrammatic and are not intended to necessarily represent actual fit, tolerances, clearances, routing, or offsets required to achieve final coordination of systems or building components or to otherwise avoid conflicts between such components or systems. CONTRACTOR has adequately reviewed these documents to determine the degree of difficulty required on his part to achieve proper coordination and has allocated sufficient money and personnel (notwithstanding the minimum personnel requirements stipulated in the Contract) to accomplish the necessary coordination, fit and routing of systems or components. The CONSTRUCTION MANAGER and ARCHITECT are not responsible for the quality or content of CONTRACTOR'S work.
  1. Outside Consultants: CONTRACTORS electing to utilize an outside consultant to assist in preparing its 3D model for the coordination process shall not relieve the CONTRACTOR of responsibility for the quality, accuracy and timeliness of its model preparation. Such consultant shall work at the direction of the CONTRACTOR, who shall attend all meetings. CONTRACTOR shall be responsible for all costs resulting from the use of consultants.
- B. Certain portions of the Work may require engineering development or other engineering services by CONTRACTOR. Scope of services and other requirements shall be as indicated in technical specification sections.
  1. For portions of the Work specified for engineering development by CONTRACTOR'S Professional Engineer, shop drawings, calculations, and other data shall be submitted bearing the California registration seal and self-written signature of the CONTRACTOR'S Professional Engineer.

2. CONTRACTOR'S Professional Engineer shall review the material proposed by CONTRACTOR, related to the portions of Work requiring CONTRACTOR'S engineering development, for conformance with the Contract Documents and for compliance with CONTRACTOR'S Professional Engineer's own engineering design.
- C. Should CONTRACTOR not participate or participate timely, any BIM related work will be performed on the CONTRACTOR'S behalf at their expense at a cost of no less than \$200.00 / hour. In the event of a scenario of this kind, monthly reimbursement payment in full shall be made to the CONSTRUCTION MANAGER directly and is a condition of processing CONTRACTOR monthly progress payment.

## 1.5 BIM REQUIREMENTS

- A. General Provisions: The deliverable Model shall be developed to include the systems described below as they would be built and the process of installing them into the new or remodeled facility.
  1. Architectural – Walls (both interior, exterior and soffits), Ceilings, Doors, Roofs, Vertical circulation components (including shaft openings). Permanent (non-movable) casework and furniture as applicable. General ceiling access panels. Trade specific access panels to be provided in the individual trade models as required for service access.
  2. Structural Concrete – Structural concrete walls, foundations, columns, beams, grade beams, slab on grade, and elevated decks. All floors and decks shall be modeled complete with edge of slab condition and slab depressions. Foundations shall include all stepped footings, slab edge conditions and continuous perimeter footings where applicable. Structural concrete openings for MEPF trades shall be included.
  3. Structural & Misc. Steel – All steel columns, primary and secondary framing members and steel bracing for the roof and floor systems (including decks). Structural connections and plates shall be included. Supplemental steel to support MEP trade systems shall be modeled according to layout information provided by responsible trade. Steel stair assemblies and supporting members shall be included.
  4. HVAC – All heating, ventilating, air-conditioning and specialty equipment, including air distribution ducts for all systems. Include control system equipment, registers, diffusers, grilles, access doors and all mechanical piping (including refrigerant piping) larger than 1/2" diameter. Support systems for ductwork and equipment are required to be modeled and shall be reviewed for coordination including hangers, seismic bracing at specified or code required locations and intervals. Any and all equipment or code required service/access clearances and support components for such equipment shall be modeled as a 3D element for use during clash detection.
  5. Electrical and Low Voltage systems – All necessary electrical components, lighting fixtures, panel boards, distribution equipment, control boards and systems. Cable tray, and conduit rack systems shall be modeled. Individual conduits 1-1/2 inch diameter and larger shall be modeled. When specific specialty equipment requires detailed electrical points of connection, all necessary receptacles, junction boxes and any conduit shall be modeled for the purpose of coordination with the equipment manufacturer and other trades. Support systems for conduit, cable tray and equipment are required to be modeled and shall be reviewed for coordination including, hangers, seismic bracing at specified or code required locations and intervals. Pendant mounted fixtures shall include specific support and sway bracing elements. Any and all equipment or code required service/access clearances shall be modeled as a 3D element for use during:
    - a. Other Communication and Notification systems – Communication, Audio/Visual and Notification (alarm) systems shall be provided with device locations at a minimum to allow coordination of ceiling and wall layouts with other trades.
  6. Plumbing – For building plumbing, all plumbing fixtures, equipment, piping, floor and area drains and related equipment. For site utilities from each Point Of Connection (POC) to

all underground site utility systems. When specific equipment requires detailed plumbing points of connection, all necessary piping and connections shall be modeled for the purpose of coordination with the equipment manufacturer and other trades. Support systems for piping and equipment are required to be modeled and shall be reviewed for coordination including hangers, seismic bracing at specified or code required locations and intervals. Any and all equipment or code required service/access clearances and support components for such equipment shall be modeled as a 3D element for use during clash detection.

7. Fire Sprinkler – All relevant fire protection components, branch piping, sprinkler heads, fittings, drains, pumps, tanks, sensors and control panels. Support systems for piping and equipment are required to be modeled and shall be reviewed for coordination including hangers, seismic bracing at specified or code required locations and intervals. Any and all equipment or code required service/access clearances shall be modeled as a 3D element for use during clash detection.
8. Metal Stud Framing – All interior and exterior wall framing including kickers, bracing, soffits, ceilings, and shaft enclosure framing. Critically important are the placement of all king & jamb studs, headers & top track for spatial coordination and clash detection with other trades. In addition, provide a backside of stud shop drawing with dimensions from building gridlines is to be provided from all perimeter framed walls based on plans and coordinated model with steel structure bent plate and concrete curbs.
9. Food Service Equipment – All equipment identified as requiring coordination with other trades for points of connection, services or spatial coordination shall be modeled for clash detection and layout purposes. Exhaust hoods, rooftop equipment, refrigerant lines shall include support systems such as hangers and seismic bracing at specified or code required locations and intervals.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 MEETINGS**

- A. Orientation Meetings
  1. Prior to the start of the BIM CDA, meet with CONSTRUCTION MANAGER and ARCHITECT to discuss the coordination effort. The purpose of this meeting is to develop a mutual understanding of the administration of the CDA and the scope of the required BIM submittals and drawings. The Orientation Meeting must be attended by all affected CONTRACTORS.
- B. Coordination Meetings
  1. BIM CDA meetings will be held weekly up to 100% completion of the CDA process.
    - a. During the BIM CDA meetings, spatial coordination software will be used for assembling the various trade models, providing a report and 3D views of trade coordination issues. The team will discuss and coordinate problems of fit, trade interfaces, and constructability.
    - b. CONSTRUCTION MANAGER and ARCHITECT will review and evaluate the routings and placements of the coordinated utilities for compliance with the original design intent only.
  2. Upon 100% completion, there will be a 100% Complete meeting. The purpose of the 100% completion meeting is for all CONTRACTORS to sign the fully coordinated drawings indicating their full approval and that each Subcontractor has fully coordinated his work with the work of all CONTRACTORS.



3. CONTRACTOR may be required to attend additional coordination meetings as required at no additional expense to OWNER. CONTRACTOR'S Subcontractors may be required to attend CDA meetings as necessary.
- C. The provisions of this section do not lessen CONTRACTOR'S responsibility for providing adequate coordination, including attendance at work site meetings as required by CONSTRUCTION MANAGER for any and all work including work not indicated above.
- D. The coordination will be weekly until such time the CDA process is not impacting shop drawing preparation, material procurement, and the Project Schedule.

### **3.2 CONSTRUCTION DETAILING ACTIVITY (CDA) SEQUENCE**

- A. Review Contract Documents and prepare 3D BIM shop drawings in the sequence in which they are envisioned to be erected.
  1. Coordination effort will include review of all construction documents for their completeness, constructability and code compliance. Failure to perform this satisfactorily will not be the basis for additional compensation after signing the coordination drawings.
- B. CONTRACTORS required to participate shall make available, digital formats of their coordination progress drawings or BIM throughout the CDA process.
  1. The formats shall include 3D BIM and/or 2D CAD along with printable drawings (PDF) as agreed upon in the orientation meeting for clash detection.
- C. Review of the clash model(s) will take place during Coordination Meetings.
  1. Team members will agree upon solutions to resolve conflicts and retain design intent of the contract documents.
  2. CONTRACTORS will implement these changes in the BIM prior to the next weekly meeting. CONTRACTORS who are responsible for multiple scopes of work are expected to coordinate with their subcontractor clashes between those scopes within their model prior to the project coordination meetings.
  3. This process will be repeated until all coordination issues have been resolved.
- D. All conflicts will be resolved through the CDA process rather than at the installation stage. Conflicts occurring at the installation stage will not be the basis for additional costs or time extensions. Issues shall be resolved via the CDA process and documented on the coordination drawings.
- E. Sign drawings indicating full coordination and fit of all new building systems: The end product of this effort will be a fully coordinated digital BIM and set of drawings, consistent with the design intent and applicable building codes, for the new work of the project. Upon the completion of the BIM and coordination drawings, CONTRACTORS will indicate they have coordinated their work by signing the coordination drawings. Upon completion of the CDA, shop Drawings and fabrication can proceed.

END OF SECTION

## ONTARIO SPORTS EMPIRE

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**SECTION 01 30 55****CHANGE ORDER PROCEDURE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes:
  - 1. Labor Rate Break-Down per Worker Classification.
  - 2. Change Order Procedure and Form.
  - 3. Time and Material Procedure.
- B. Related Requirements:
  - 1. General Conditions.
  - 2. Supplementary General Conditions

**1.2 LABOR RATE BREAK-DOWN PER WORKER CLASSIFICATION**

- A. CONTRACTOR shall provide a labor rate breakdown for each worker classification for review. This will be required prior to any change order review. The labor rate breakdown shall fall the form provided herein.

**1.3 CHANGE ORDER PROCEDURE**

- A. The OWNER, through the CONSTRUCTION MANAGER may from time to time direct the CONTRACTOR to make changes in the work within the general scope of the Contract. All changes to the Contract will be implemented through written orders or directives prepared by the A/E and issued by the CONSTRUCTION MANAGER.
- B. When the CONSTRUCTION MANAGER believes a change order to the construction documents is required that may involve a change in time or cost, CONSTRUCTION MANAGER will request the A/E to prepare a written change as described in Division 00 – General Conditions and issue it to CONSTRUCTION MANAGER. The A/E will sequentially number and date each Construction Change Directive. The CONSTRUCTION MANAGER will request a Change Order Request (COR) to the written change requesting the CONTRACTOR to submit a proposal. The proposal will fully describe the proposed change(s) to the Contract Documents, including sketches, new drawings, or revised specifications as required. The CONSTRUCTION MANAGER will maintain a log of all CORs issued. The CONSTRUCTION MANAGER shall number each COR. CONTRACTOR to use the Change Order form provided herein.
- C. Should the CONTRACTOR believe that conditions have changed or CONTRACTOR has been directed to do additional work requiring a change in time or cost, CONTRACTOR may request the CONSTRUCTION MANAGER to prepare a COR delineating the changed condition along with the cost and/or time impact. If the CONTRACTOR intends to make claim for a change in the contract time or cost, CONTRACTOR must give the CONSTRUCTION MANAGER written notice per contract documents after the occurrence of the event giving rise to the claim, or lose his rights to the cost recovery of the extra work arising from the claim.
- D. Refer to Division 00 – General Conditions for additional information.

**1.4 TIME AND MATERIAL PROCEDURE**

- A. If the Work is directed to be performed on a “time and material” (T&M) basis, the T&M form shall be signed daily by the CONSTRUCTION MANAGER. CONTRACTOR to use the T&M form provided herein.
- B. CONTRACTOR MUST notify CONSTRUCTION MANAGER and the Inspector of Record (IOR) daily, prior to the commencement of the time and material (T&M) work and when CONTRACTOR stops T&M same day. This process to continue until all T&M work is completed. If the CONTRACTOR or their Subcontractor has not properly notified CONSTRUCTION MANAGER and/or IOR, as stated above, CONTRACTOR concedes to cost as determined by the CONSTRUCTION MANAGER.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 CHANGE ORDER REQUEST REVIEW**

- A. Upon receipt of the COR, CONSTRUCTION MANAGER will evaluate the CONTRACTOR'S quotation for the work, using an estimate of time and cost impact prepared by the A/E or CONSTRUCTION MANAGER. If the quotation is acceptable to the CONSTRUCTION MANAGER, the proposal will be forwarded to the DISTRICT and the A/E.
- B. If the quotation is judged by CONSTRUCTION MANAGER to be not acceptable, CONSTRUCTION MANAGER will begin negotiations with the CONTRACTOR to come to an agreement as to the time and cost impact.
- C. The CONSTRUCTION MANAGER reserves the sole right to notify the CONTRACTOR when there will be no further negotiations, and when an impasse exists between CONTRACTOR and CONSTRUCTION MANAGER and the work is declared to be in dispute.

### **3.2 FORMS**

- A. Labor Rate Break-Down Sheet.
- B. Changes and Extra Form.
- C. Time and Material (T&M) Work Item Ticket Form.

**END OF SECTION**

## Labor Rate Break-Down

**CONTRACTOR Name:** \_\_\_\_\_

**Prevailing Base Wage Rate** \_\_\_\_\_

\$0.00

*Classification*

**Base Wage Rate**

**Burden Rate**

FICA (Social Security)	6.20%	x Base Wage Rate =	0.00
FICA (Medicare)	1.45%	x Base Wage Rate =	0.00
FUTA (Federal Unemployment)*	0.60%	x Base Wage Rate =	0.00
SUI (State Unemployment Ins)*	6.20%	x Base Wage Rate =	0.00
Worker's Compensation *		x Base Wage Rate =	0.00
General Liability Insurance *		x Base Wage Rate =	0.00
Union Related Fees / Dues *		x Base Wage Rate =	0.00
Union Related Fees / Dues *		x Base Wage Rate =	0.00
Union Related Fees / Dues *		x Base Wage Rate =	0.00
Union Related Fees / Dues *		x Base Wage Rate =	0.00

Total Burden Cost

\$0.00

**Fringe Benefits**

Pension	0.00
Health & Welfare	0.00
Training / Certification	0.00
Vacation	0.00

Total Fringe Benefits

\$0.00

**Total Hourly Rate:**

**\$0.00**

**Footnotes:**

- \* Note FUTA: Tax only applies to employee wages up to \$7,000.00
- \* Note SUI: Tax only applies to employee wages up to \$7,000.00, rate varies by Company
- \* Note SDI (State Disability Insurance) is paid by Employee & is not part of the Employer's burden rate
- \* Note: Rates may require backup/verifications to be submitted

### CHANGES AND EXTRAS FORM

	<u>EXTRA</u>	<u>CREDIT</u>
(a) Material (attach itemized quantity and unit cost plus sales tax)	_____	_____
(b) Labor Not to Exceed Applicable Prevailing Wage Rates (attach itemized hours and rates)	_____	_____
(c) Equipment (attach invoices)	_____	_____
(d) <b>Subtotal</b>	_____	_____
(e) If Subcontractor performed Work, add Subcontractor's overhead and profit to portions performed by Sub-CONTRACTOR, not to exceed ten percent (10%) of item (d).	_____	_____
(f) <b>Subtotal</b>	_____	_____
(g) CONTRACTOR'S Overhead and Profit: Not to exceed fifteen percent (15%) of Item (d) if CONTRACTOR performed the work. No more than five percent (5%) of Item (f) if Subcontractor performed the work. If work was performed by CONTRACTOR and Subcontractors, portions performed by CONTRACTOR shall not exceed fifteen percent (15%) if Item (d), and portions performed by Subcontractor shall not exceed ten percent (10%) of Item (f)	_____	_____
*For CM directed supplemental work, the allowable mark ups shall be 10% for sub CONTRACTOR 15% for prime		
(h) <b>Subtotal</b>	_____	_____

	<u>EXTRA</u>	<u>CREDIT</u>
(i) Bond not to exceed one percent (1%) of Item (d)	_____	_____
(j) <b>TOTAL</b>	_____	_____
(k) Date / Time	_____	_____

It is expressly understood the undersigned CONTRACTOR approves the foregoing as to the changes, if any, and the contract price specified for each item and as to the extension of time allowed, and agrees to furnish all labor, materials and service and perform all work necessary to complete any additional work specified therein, for the consideration stated herein.

It is expressly understood that the value of such extra Work or changes, as determined by any of the aforementioned methods, expressly includes any and all of the CONTRACTOR'S costs and expenses, both direct and indirect, resulting from additional time required on the Project or resulting from delay to the Project. Any costs, expenses, damages or time extensions not included are deemed waived.

The CONTRACTOR expressly acknowledges and agrees that any change in the Work performed shall not be deemed to constitute a delay or other basis for claiming additional compensation based on theories including, but not limited to, acceleration, suspension or disruption to the Project.

## TIME AND MATERIAL WORK ITEM TICKET

Project Name: \_\_\_\_\_ PCO# \_\_\_\_\_ BC# \_\_\_\_\_  
 CONTRACTOR: \_\_\_\_\_ Sheet # \_\_\_\_\_ of \_\_\_\_\_

Reference Document: \_\_\_\_\_ Submitted for work on: \_\_\_\_\_

Schedule Activity Code Number: \_\_\_\_\_

Original Work Date for this Item: \_\_\_\_\_ Is Work Completed today? \_\_\_\_\_

Date of Last Work Activity: \_\_\_\_\_ Date Submitted to CM \_\_\_\_\_

### WORK COMPLETED TODAY:

**Location:** \_\_\_\_\_

**Description of Work:** \_\_\_\_\_

EMPLOYEE NAME	CLASSIFICATION	Hours Noted	REMARKS
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____

ITEM DESCRIPTION	QTY / UNITS	Hours Noted	REMARKS
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____

EQUIPMENT	MAKE & MODEL	Hours Noted	REMARKS	Rented / Owned
1. _____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____

**CONTRACTOR CERTIFICATION:** Signature by CONTRACTOR certifies all information on this sheet is true and accurate. CONTRACTOR also certifies only the listed labor, material, and equipment listed were used for this item and that no other items are part of this work.

### SIGNATURES

**CONSTRUCTION MANAGER:** Verifies hours worked as identified on this sheet only, not acceptance of any cost or schedule impact on behalf of the OWNER.





## ONTARIO SPORTS EMPIRE

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**SECTION 01 31 19****COORDINATION AND MEETINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes:
  - 1. Post-bid interview.
  - 2. Kick-Off Meeting.
  - 3. Coordination Meetings
  - 4. Preparatory Meetings.
  - 5. Progress meetings – OWNER and ARCHITECT.
  - 6. Pre-installation Conferences.
  - 7. Contactor Coordination Meetings (“Foreman Meetings”)
    - a. Three week look ahead / Pull Planning

**1.2 POST BID INTERVIEW**

- A. Each apparent low Bidder shall attend and participate in a post bid interview with CONSTRUCTION MANAGER, prior to award of any contract by the OWNER. The post bid interview will be scheduled by CONSTRUCTION MANAGER within three (3) calendar days after the date of bid. The Conditions of the Contract and all other Sections of the Contract apply to this Section as fully as if repeated herein.
- B. A duly authorized representative of the apparent low Bidder is required to attend the post bid interview, in person.
- C. The apparent low bidder's authorized representative must have a clear understanding of the project requirements and have signatory authority on behalf of the apparent low Bidder.
- D. The CONSTRUCTION MANAGER will review the project requirements with the attendees, including but not limited to:
  - 1. The Contract ,Plans, Specifications.
  - 2. Addenda.
  - 3. Scope of Work.
  - 4. Alternates.
  - 5. Allowances.
  - 6. Value Engineering.
  - 7. The Construction Schedule, Milestones, and Award Dates.
  - 8. Critical Material Identification and Requirements.
- E. POST BID INTERVIEW DOCUMENTATION
  - 1. The CONSTRUCTION MANAGER will document the post bid interview on the form attached to this section. Both the apparent low bidder and the CONSTRUCTION MANAGER are required to sign the post bid interview documentation. Post bid interview will be conducted either at the OWNER'S or CONSTRUCTION MANAGER'S office.

**1.3 KICK-OFF MEETING**

- A. Each CONTRACTOR is required to attend the Kick-Off meeting as scheduled by the CONSTRUCTION MANAGER. This meeting will be scheduled shortly after the issuance of CONTRACTOR'S Notice to Proceed (NTP).

- B. Those required to attend from the CONTRACTOR are: Project Manager and Administrative Professional that will be working on the project.
- C. The purpose of the meeting is to ensure CONTRACTOR is aligned with Project obligations and expectations. The following topics to be discussed:
  - 1. Project Administration
    - a. Contract and insurance status
    - b. Certified payroll, billing, and As-built procedures
    - c. Labor Compliance Program (LCP) procedures (If applicable)
      - 1) The LCP as administered by the DIR, will be discussed, including the federal and state labor law requirements applicable to the contract, prevailing wage requirements, the respective recordkeeping responsibilities, the requirement for the submittal of certified payroll records to the DIR and CONSTRUCTION MANAGER and the prohibition against discrimination in employment.
      - 2) A Labor Law Requirements checklist may be provided to the CONTRACTOR and must be signed and returned to the CONSTRUCTION MANAGER.
    - d. OWNER Controlled Insurance Program procedures (OCIP) (If applicable)
      - 1) The OCIP as administered by the OWNER'S consultant will discuss all CONTRACTOR'S requirements and record keeping responsibilities necessary to comply with the program.
    - e. Project Labor Agreement (PLA) or similar program procedures (If applicable)
      - 1) The PLA as administered by the OWNER'S consultant will discuss all CONTRACTOR'S requirements and record keeping responsibilities necessary to comply with the program.
    - f. Daily Work Reports Procedures.
- D. The LCP, OCIP, and/or PLA may require separate meetings as these topics maybe conducted by different OWNER consultants.
- E. CONSTRUCTION MANAGER to take notes and publish meeting meetings for record.

#### 1.4 COORDINATION MEETINGS

- A. Coordinate scheduling, submittals, and work of the various sections of the specifications to assure efficient and orderly sequence of installation of interdependent construction elements with provisions for accommodating items installed later.
- B. Prior to commencement of a particular type or kind of work, examine relevant information, Contract Documents and subsequent data issued to the project.
- C. Verify that utility requirement characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to and placing in service, such equipment.
- D. Coordinate space requirements and installation of mechanical and electrical work, which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.
- E. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. In locations where several elements of mechanical and electrical work must be sequenced and positioned with precision in order to fit into available space, prepare coordination drawings

showing the actual conditions required for the installation. Prepare coordination drawings prior to purchasing, fabricating or installing of the elements required to be coordinated.

- G. Closing up of walls, partitions or furred spaces, backfilling and other covering up operations shall not proceed until all enclosed or covered work and inspections have been completed. Verify before proceeding.
- H. Coordinate completion and cleanup of work of separate sections in preparation for substantial completion (and for portions of work designated for OWNER'S full and/or partial occupancy).
- I. After OWNER occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents to minimize disruption of OWNER'S activities.
- J. Coordinate all utility company work in accordance with the General Conditions.

### **1.5 PREPARATORY MEETINGS**

- A. Each CONTRACTOR is required to attend a Preparatory meeting as scheduled by the CONSTRUCTION MANAGER. Ideally this meeting is scheduled and conducted 3 – 4 months in advance of the CONTRACTOR'S start of construction.
- B. Those required to attend from the CONTRACTOR are: Project Manager, General Superintendent, Foreman, and Administrative Professional.
- C. The purpose of the meeting is to ensure CONTRACTOR is aligned with Project obligations and expectations. The following topics to be discussed:
  - 1. Safety
    - a. Required documentation
    - b. Permits
    - c. Competent Person
    - d. Safety Meeting
  - 2. Division 01 – General Requirements
    - a. Review all sections
    - b. SWPPP procedures and obligations
  - 3. Scope of Work & Schedule
    - a. Confirm submittal status and review submittal for clarity
    - b. Review applicable RFIs
    - c. Review all addendums, Bulletins, and CCDs
    - d. Review schedule activities for durations, required manpower, and productive rate
    - e. Review scope of work obligations
    - f. Mock-up requirements
- D. CONSTRUCTION MANAGER to take notes and publish meeting minutes for record.

### **1.6 PROGRESS MEETINGS – OWNER AND ARCHITECT**

- A. CONSTRUCTION MANAGER will schedule and administer meetings throughout progress of the work at semi-weekly intervals or more frequently if needed.
- B. CONSTRUCTION MANAGER will make arrangements for meetings, prepare agenda, and preside at meetings. CONSTRUCTION MANAGER will record minutes and distribute copies.
- C. Attendance required: OWNER, ARCHITECT, INSPECTOR, and CONSTRUCTION MANAGER.
- D. Agenda:
  - 1. Review minutes of previous meetings (Field Reports).

2. Review work progress.
3. Field observations, problems and decisions.
4. Identification of problems which impede planned progress.
5. Review submittals, schedule and status of submittals.
6. Review off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordinate projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to work.

#### **1.7 PRE-INSTALLATION CONFERENCE**

- A. When required in individual specification section, convene a pre-installation conference prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. CONTRACTOR to notify CONSTRUCTION MANAGER at least ten (10) work days in advance of meeting date.
- D. CONSTRUCTION MANAGER to prepare agenda, preside at conference, record minutes and distribute copies within two (2) days after conference to participants
- E. Review conditions of installation, preparation and installation procedures, and coordination with related work.

#### **1.8 CONTRACTOR COORDINATION MEETINGS – (“FOREMAN MEETING”)**

- A. CONSTRUCTION MANAGER will schedule and administer weekly CONTRACTOR coordination meetings to review and facilitate coordination of the work.
- B. CONSTRUCTION MANAGER will make arrangements for meetings, prepare agenda, look-ahead schedules, areas where additional CONTRACTOR focus is required, and record minutes as required.
- C. Mandatory Attendees Required: CONSTRUCTION MANAGER, Inspector, and CONTRACTOR'S Foreman.
- D. Foreman are further required to participate and coordinate work per the three week look ahead schedule provided by the CONSTRUCTION MANAGER in a weekly foreman's meeting.
- E. Three-Week Look Ahead Schedule / Pull Planning:
  1. CONTRACTOR'S foreman is required to breakdown schedule activities into more specific component operations in coordination with the CONSTRUCTION MANAGER and other trade foremen to meet the activity durations identified in the construction schedule.
    - a. This work product will be communicated through the three week look ahead schedule produced by the CONSTRUCTION MANAGER.
    - b. As requested from the CONSTRUCTION MANAGER, each CONTRACTOR is required to participate in schedule coordination exercises using a pull planning board. Pull planning is a collaborative process requiring each CONTRACTOR to share how activities can advance faster and more efficiently. Through this collaboration, CONTRACTOR commits to date(s) with tags placed on the pull planning board that are added, adjusted, and coordinated with other trades to honor activity and milestones commitment dates.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 ATTACHMENTS:**

- A. Post Bid Interview Form

**POST BID INTERVIEW FORM**

CONSTRUCTION MANAGER: Tilden-Coil Constructors, Inc.

CONTRACTOR/BIDDER: \_\_\_\_\_

DATE: \_\_\_\_\_ TIME: \_\_\_\_\_ PHONE: \_\_\_\_\_

**I. INTRODUCTIONS: (SIGN BELOW)**

**CONSTRUCTION MANAGER**

PRINT NAME	SIGNATURE	TITLE

**CONTRACTOR**

PRINT NAME	SIGNATURE	TITLE

**II. PURPOSE OF INTERVIEWS IS TO ASSURE:**

- A. CONTRACTOR acknowledgement of complete and accurate bid.
- B. CONTRACTOR acknowledgement of and understanding of the schedule requirements.
- C. CONTRACTOR acknowledgement of his scope of work assignments.

**III. THE CONTRACT PLANS, SPECIFICATIONS:**

\_\_\_\_\_

\_\_\_\_\_

---

**IV. ADDENDA:**

---

**V. SCOPE OF WORK:**

**Review work scope with CONTRACTOR**

A. Category Assignments:

---

B. General Notes Applicable To All CONTRACTORS:

---

C. Deferred Approvals & Submittals:

---

D. Logistics Plans:

---

E. Phasing Plans:

---

F. SWPPP Requirements:

---

G. Hazmat, Soils & Hydrology Report:

---

H. EIR Report:

---

I. BIM:

---

J. Mitigation Measures:

---



**VI. ALTERNATES:**

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

**VII. ALLOWANCES:**

- A. \_\_\_\_\_

**VIII. Liquidated Damages:**

- A. \_\_\_\_\_

**IX. VALUE ENGINEERING:**

- A. The OWNER may be interested in Value Engineering, do you have any obvious value engineering items that you would like to propose?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**X. THE CONSTRUCTION SCHEDULE, MILESTONES & AWARD DATES:**

- A. Do you have any comments or concerns about the Preliminary Baseline Schedule we should consider?

\_\_\_\_\_

**XI. CRITICAL MATERIAL IDENTIFICATION & REQUIREMENTS:**

- A. Please identify critical materials, deliveries and dependencies, including OWNER furnished items that could affect the completion of your work.

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

**XII. CONTRACTOR COMMENTS/SUGGESTIONS:**

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

**XIII. PROJECT CONTACT LIST (PM, Foreman, Admin):**

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

Initials: \_\_\_\_\_  
**CONTRACTOR                      CONSTRUCTION MANAGER**

**SECTION 01 32 00****CONSTRUCTION SCHEDULE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Administrative and procedural requirements for successful execution of the Work, as well as documenting the progress of construction during performance of the Work.
- B. Section includes:
  - 1. Summary.
  - 2. Notice to Proceed.
  - 3. Construction Schedule.
  - 4. Submittals.
  - 5. Procurement and Fabrication Schedule.
  - 6. Three week look ahead schedule.
  - 7. CONTRACTOR Daily Work Journal.

**1.2 NOTICE TO PROCEED (NTP)**

- A. NTP begins the start of administrative, early planning / coordination, submittals, procurement, fabrication, delivery, and/or the start of construction. Refer to the issued NTP for details.

**1.3 CONSTRUCTION SCHEDULE**

- A. The Project Construction Schedule, Exhibit "A" is composed of tentative starting dates and fixed durations for major activities of work on the project. Not all activities have been shown. This DOES NOT relieve the CONTRACTOR from complying with the requirements of the schedule or initiating and coordinating their respective work as necessary in the proper sequencing of the Work.
  - 1. If a CONTRACTOR'S scheduled activity involves incidental work of other CONTRACTOR'S, it shall be assumed to all be completed within the activity duration scheduled.
  - 2. These unidentified activities shall be coordinated by the CONSTRUCTION MANAGER'S project Superintendent. The Superintendent shall have exclusive discretion in establishing start dates and durations and the CONTRACTOR shall incorporate these requirements as if stated herein.
- B. Double Shift / Weekend / After Hour Work or Modified Hours
  - 1. The project working hours are as follows:
    - a. 6am until 11pm Monday through Friday.
    - b. 7am until 8pm on Saturdays.
    - c. 8am until 5pm on Sundays.
  - 2. CONTRACTOR is responsible to meet each completion date for each activity on the schedule, which in turn, may or may not specifically identify required double shift, weekend, after-hours, or modified working hours.
    - a. All Critical Path Activities are assumed to be double shift work. For example:
      - 1) CONTRACTOR'S critical path activity has a five-day duration and CONTRACTOR is requiring seven days to perform their work. CONTRACTOR to include in base bid performing two double shifts as to complete their activity in the five-day duration as noted in the schedule.

3. Extended work shifts and/or working on Saturdays will be required for CONTRACTOR to meet the construction schedule. Refer to the general conditions for additional information.
  4. When the facility operation will or may be impacted, CONTRACTOR MUST performed their respective work on the weekend, after hours or during modified working hours to complete scheduled activities at NO additional expense to the OWNER.
    - a. These provisions shall also apply, but not be limited to utility tie-ins, system related tie-ins, switchovers, site need considerations, and CONTRACTOR delay.
- C. The CONSTRUCTION MANAGER will prepare and provide updates to the Project Construction Schedule and 3 week look ahead short interval schedule.
- D. Each CONTRACTOR will be required to provide the following details to the CONSTRUCTION MANAGER no later than 5 days after the Notice to Proceed:
1. Proposed manpower loading of each scheduled field activity.
  2. Establish submittal lead times which will allow for the proper review time by the ARCHITECT without delaying the timely scheduled procurement of products, materials and/or assemblies.
  3. Establish fabrication and/or procurement lead times which will maintain that no operation will be delayed from its scheduled starting date.
  4. Other requirements noted in General Conditions regarding the schedule.
- E. CONTRACTOR must coordinate all work with all other CONTRACTORS on the project through the CONSTRUCTION MANAGER'S Project Superintendent in order to complete each activity of their work within the fixed durations as shown on the "Baseline Schedule".
- F. When the official start date has been established by the Notice to Proceed letter, inserted into the "Baseline Schedule", start dates as shown on the "Baseline Schedule" shall be referred to as "tentative" only to the extent that dates will be continually adjusted either forward or backward by the CONSTRUCTION MANAGER as the project progresses.
- G. CONTRACTOR is expected to continually monitor all phases of the project field construction progress in order to ensure that CONTRACTOR'S work is properly implemented into the overall project improvements.
- H. CONTRACTOR must properly man and perform the work of activity and complete same within the noted number of consecutive working days or less assigned to activity in the Baseline Schedule.
- I. CONSTRUCTION MANAGER may change the starting date of any activity.
- J. CONTRACTORS must be prepared to provide properly trained and skilled labor with adequate manpower and equipment to perform simultaneous functions as reflected in the progress schedule.
1. Scheduled activities are tentative only and will adjust with job progress and weather conditions at CONSTRUCTION MANAGER'S direction.
  2. It is the CONTRACTOR'S sole responsibility to verify scheduling with jobsite Superintendent with sufficient lead time to ensure CONTRACTOR can coordinate all requirements of future activities regarding labor and materials.
  3. Should CONSTRUCTION MANAGER have reason to believe at any time that CONTRACTOR is not providing an adequate workforce armed with the proper materials and/or equipment, CONSTRUCTION MANAGER shall give CONTRACTOR written notice per General Conditions – "CITY'S RIGHT TO CARRY OUT THE WORK...." and CONTRACTOR shall comply.
    - a. Written notice may require CONTRACTOR to work double shift and/or weekends to cure lost time.

- b. Activity Manpower loading submitted shall in no way limit the responsibility of the CONTRACTOR to perform to the fixed duration requirements of the Final Baseline Schedule.
  - 4. Weekly meetings will be held to determine CONTRACTOR'S work schedules, including shifts and potential double shifts. The CONSTRUCTION MANAGER will review, finalize and approve the schedule each week to ensure it aligns with project milestones
  - 5. In weekly meetings, the CONSTRUCTION MANAGER will communicate the required manpower shifts to the CONTRACTOR. These shift requirements will be determined as the project progresses.
- K. CONTRACTORS that are mobilized / on-site, construction progress may be impacted from time to time. CONSTRUCTION MANAGER may redirect an activity or activities or advance a new activity sooner as to maintain schedule progress. CONSTRUCTION MANAGER upon (2) business day notice to CONTRACTOR, CONTRACTOR must prepare and proceed with identified activity.
- L. CONTRACTOR may accelerate an activity and shall communicate status of acceleration prior to starting to the CONSTRUCTION MANAGER.
- M. Scheduled activities are established to indicate project completion prior to contract completion date. "Float" between activities and to the end of the project shall be owned by the CONSTRUCTION MANAGER.
- N. Recovery Plan
  - 1. If CONTRACTOR is behind schedule by more than two (2) calendar days for any stage of Work, based on the updated "Baseline Schedule" after incorporating all approved time extensions, CONTRACTOR shall submit to the CONSTRUCTION MANAGER within five (2) days of notification of such delay, a "Recovery Plan". The recovery plan shall be based on proposed revisions to the updated "Baseline Schedule" for the next fifteen (15) day period and shall show how CONTRACTOR intends to bring the Work back on schedule. Recovery Plan shall also include a written description of how the measures that CONTRACTOR intends to take without additional cost to the OWNER will regain schedule compliance. The recovery plan activities shall be identified according to their relationship to activities on the accepted schedule. If the revisions include sequence changes, the CONTRACTOR shall provide a schedule diagram comparing the original sequence to the revised sequence of Work.
  - 2. Should CONTRACTOR fail to submit and execute such recovery plan, the CONSTRUCTION MANAGER shall have the option to direct CONTRACTOR to employ any or all measures that the CONSTRUCTION MANAGER may deem fit to regain schedule compliance without additional cost to the OWNER.
  - 3. The revisions shall not be incorporated into any schedule update until the revisions have been reviewed and accepted by OWNER. Upon acceptance by the CONSTRUCTION MANAGER, the Recovery Plan shall be incorporated into the updated "Baseline Schedule" during the next update.
  - 4. CONTRACTOR will be required to submit a Recovery Plan for each update that indicates that the Work progress is more than two (2) calendar days behind schedule.
  - 5. Should CONTRACTOR dispute the determination by CONSTRUCTION MANAGER regarding the status on contract delay, such dispute shall not relieve CONTRACTOR of the responsibility to comply with the requirements of this section and other related sections until the dispute is resolved per Contract terms.
  - 6. Failure to provide a Recovery Plan to the CONSTRUCTION MANAGER may result in holding liquidated damages or damages as defined in the contract for each day of delay from the payment application and notifying CONTRACTOR'S bond company.
- O. Inclement Weather and Governmental Delay

1. The agreement between the OWNER and CONTRACTOR indicates the number of calendar days of Contract time for the Work. Within the stipulated Contract Time, the Project Construction Schedule, included in the bid documents, includes weather and governmental days in the project duration.
  2. The number of weather related and governmental days have been built into the critical path. The project owns the allowable days. As the number of approved inclement weather and governmental days increases, the duration of this allowance or activity will decrease the corresponding number of days. No other activities may be concurrent with this activity.
  3. Delays in construction due to inclement weather will be construed as excusable delay only for the days in which the inclement weather substantially caused delay in overall progress of the Project by affecting Critical Work Activities.
  4. CONTRACTOR shall submit a written request on Company letterhead for each delay due to inclement weather within two (2) calendar days from the day of inclement weather. CONTRACTOR shall document the date and the nature of the inclement weather, the specific activity in which the inclement weather caused delay, and the task or operation in each trade that was delayed and its relation to the Critical Path.
  5. The CONSTRUCTION MANAGER will review the request and the written documentation submitted by CONTRACTOR and compare with the "Baseline Schedule". If CONSTRUCTION MANAGER finds the inclement weather did substantially cause delay in the overall progress of the Project, the delay will be deemed an excusable delay.
  6. Non-Compensable but excusable delays shall be first deducted from the allowance of excusable delays shown on the "Baseline Schedule". When the total number of days for excusable delays due to inclement weather exceeds the allowance, the excess will be granted through extension of the Contract Time by Change Order to impacted CONTRACTOR only in accordance with the provisions of the General Conditions. Extension to the Contract Time due to inclement weather will be granted only for excusable delay in excess of the allowance.
  7. If the CONTRACTOR fails to submit a claim and documentation within the stipulated time, the inclement weather shall be construed to have caused no delay in the construction.
- P. Weekend / After Hour Work or Modified Hours
1. CONTRACTOR is responsible to meet each completion date for each activity on the schedule, which in turn, may or may not specifically identify required weekend, after-hour work, or modified working hours. These provisions shall also apply, but not be limited to utility tie-ins, system related tie-ins, switchovers, site need considerations, and CONTRACTOR delay.
  2. When the facility operation will or may be impacted, CONTRACTOR MUST performed their respective work on the weekend, after hours or during modified working hours to complete scheduled activities at NO additional expense to the OWNER.
  3. Extended work shifts and/or working on Saturdays will be required for specific trades to meet the construction schedule. Refer to the general conditions for additional information.

#### **1.4 SUBMITTALS**

- A. CONTRACTOR shall comply with Division 00 and 01 for the compliance and procedure of submittal submission.
- B. All submittals regardless of when the respective scope of work is scheduled to be installed shall be completely submitted within the time frames as established in Division 00 and 01.

#### **1.5 PROCUREMENT & FABRICATION SCHEDULE**

- A. CONTRACTORS shall provide dates as to when material must be ordered / fabricated and delivered to the project site. Materials shall be onsite as required as not to impact the schedule or dependent trades.
- B. CONTRACTOR shall provide written confirmation of ordered / fabricated material and delivery.
- C. CONTRACTOR shall use tools necessary for taking field measurements where required before fabrication.
  - 1. CONTRACTOR understands that field measurements may require multiple visits to the site to accommodate phasing and project progress.
  - 2. CONTRACTORS using devices such as a scanner or other similar devices to obtain measurements, understand that CONTRACTOR may need to set-up multiple times same day to accommodate existing or temporary conditions such as scaffold and other similar appurtenances to obtain all the necessary dimensions.
  - 3. All cost and delay associated with demands to remove and replace temporary measures or completed construction are the responsibility of the CONTRACTOR obtaining dimensions.

#### **1.6 THREE WEEK LOOK AHEAD SCHEDULE**

- A. CONSTRUCTION MANAGER will produce and publish a three-week look ahead weekly during the foreman meeting. Refer to 01 31 19 - Coordination and Meetings for additional information and requirements.

#### **1.7 CONTRACTOR DAILY WORK JOURNAL**

- A. CONTRACTOR'S daily shall be sent electronically. Refer to 01 33 26 – Electronic Document Control for additional information and requirements.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 33 00****SUBMITTALS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes:
  - 1. Electronic Document Submission.
  - 2. Submittal Procedures.
  - 3. Shop Drawings.
  - 4. Product Data.
  - 5. Samples.
  - 6. Manufacturers' Instructions.
  - 7. Manufacturers' Certificates.
  - 8. Coordinated Drawings.

**1.2 ELECTRONIC DOCUMENT SUBMISSION**

- A. CONTRACTOR to submit all submittals, minus samples electronically.
- B. Submittals are to be uploaded into the CONSTRUCTION MANAGER'S web-based software – CMiC Collaboration.
  - 1. Refer to specification section 01 33 26 – Electronic Document Control for access and use.
- C. In the event there is no section 01 33 26 – Electronic Document Control included or CMiC Collaboration is not functioning, CONTRACTOR to submit Submittals via email to CONSTRUCTION MANAGER.

**1.3 SUBMITTAL PROCEDURES**

- A. Transmit separate request for each submittal directly to the CONSTRUCTION MANAGER.
  - 1. Collate submittal neatly with label identification.
  - 2. Include state agency application or approval number.
- B. Use Submittal Form cover sheet provided herein.
- C. Sequentially number the transmittal forms. Re-submittals are to have original number with an alphabetic suffix.
- D. Identify Project, CONTRACTOR, subcontractor or supplier; pertinent drawing sheet and detail number(s) and specification section number, as appropriate.
  - 1. Provide name and telephone number of individuals who may be contacted for further information.
- E. Apply CONTRACTOR'S date stamp with CONTRACTOR'S original signature or initials affixed thereto, certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Stamped signatures or initials are not acceptable.
- F. Schedule submittals to expedite the Project. Coordinate submission of related items.
  - 1. Make all submittals in accordance with the progress schedule and far enough in advance of scheduled dates of installation to provide required time for reviews for securing

necessary approvals for possible revision and re-submittal and for placing orders and securing delivery.

- G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- H. State effect of substitution on construction schedule and changes required in other work or products.
- I. Provide space for CONTRACTOR and ARCHITECT review stamps.
- J. Revise and re-submit submittals as required, identify all changes made since previous submittal. Re-submittals shall be prepared and re-submitted within ten (10) calendar days of CONTRACTOR'S receipt of returned submittals; within five (5) days if submittal affects schedule critical path.
- K. Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
- L. Coordinate as required with all trades and all public agencies involved.
- M. Unless otherwise specifically authorized by ARCHITECT, make all submittals in groups containing all associated items. ARCHITECT may reject partial submittals as not complying with the provisions of this section.

#### 1.4 SHOP DRAWINGS

- A. Submit a schedule of the shop drawings, listing their required submission and review dates to the CONSTRUCTION MANAGER for review and acceptance. The schedule shall allow sufficient time for checking by the CONSTRUCTION MANAGER and ARCHITECT. In addition, the shop drawing submission and review dates shall be incorporated into the progress schedule required in the General Conditions.
- B. Submit newly prepared information, drawn to accurate scale. Highlight, encircle or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project will not be approved as Shop Drawings.
- C. Submit documents in PDF format. An electronically marked up file will be returned. Create PDFs at native size and right side up. Illegible files will be rejected. Submit in the following quantities:
  - 1. Shop Drawings: One (1) electronic copy, black line drawings. No color.
  - 2. Product Data/Equipment Data: One (1) electronic copy, indexed documents with table of contents and page numbers.
  - 3. Samples: Five (5) - labeled - plus additional quantity to be returned to CONTRACTOR (each type and color being used in project).
  - 4. Deferred Approvals: One (1) electronic copy of drawings, data, and calculations. Additional quantities may be required by City agency. CONTRACTOR is responsible to issue all deferred submittals to the approving agency after they are approved by the ARCHITECT. CONTRACTOR to include all coordination meetings, fees, and request made by the approving agency until the submittal is approved.
- D. Shop Drawings shall include fabrications and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:
  - 1. Dimensions.
  - 2. Identification of products and materials included.
  - 3. Compliance with specified standards.
  - 4. Notation of coordination requirements.

5. Notation of dimensions established by field measurement.
- E. Safety Data Sheets (SDS): Submit safety data sheets and chemical inventory list for materials brought to site with product submittals.
  - F. Sheet Size: Native size as appropriate for information conveyed. Where feasible, submit Shop Drawings on sheets at least 8½ inch x 11 inch, but not larger than 30 inch x 42 inch.
  - G. The CONTRACTOR shall review, stamp with his approval as herein required, and submit with reasonable promptness and in orderly sequence, in accordance with the submittal schedule, all shop drawings required by the Contract Documents or subsequently by the ARCHITECT as covered by modifications. Shop drawings shall be properly identified. At the time of submission, the CONTRACTOR shall inform the ARCHITECT in writing of any deviation in the shop drawings from the requirements of the Contract Documents.
  - H. Stamp: Each page of shop drawings shall bear the CONTRACTOR'S stamp, which shall signify the CONTRACTOR'S representation that he has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained in the shop drawings. Each stamp shall be accompanied by a wet signature or initial of an employee of the CONTRACTOR who may be contacted for information. Stamped signatures or initials are not acceptable.
  - I. The ARCHITECT will review shop drawings with reasonable promptness so as not to cause any delay, but only for conformance with the design concept of the project and with the information given in the Contract Documents. The ARCHITECT'S favorable review of a separate item shall not indicate acceptance of an assembly in which the item functions.
  - J. Submittal of shop drawings to the CONSTRUCTION MANAGER shall be made by the CONTRACTOR with a dated transmittal form or letter and not by subcontractors or suppliers.
  - K. The ARCHITECT'S review of shop drawings shall not relieve the CONTRACTOR of responsibility for any deviation from the requirements of the Contract Documents unless the CONTRACTOR has informed the ARCHITECT in writing of such deviation at the time of submission and the ARCHITECT has given written acceptance to the specific deviation, nor shall the ARCHITECT'S favorable review relieve the CONTRACTOR from responsibility for errors or omissions in the shop drawings.
  - L. No portion of work requiring shop drawings shall be commenced until the shop drawings have been returned with a favorable review by the ARCHITECT.

## **1.5 PRODUCT DATA**

- A. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information unique to this Project.

## **1.6 SAMPLES**

- A. Submit samples to illustrate functional and aesthetic characteristics of the Product with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for ARCHITECT selection or in custom colors selected.
- C. Include identification on each sample with full Project information.
- D. Submit a minimum of five (5) samples, or as specified in individual sections of the specifications, four (4) of which will be retained by the ARCHITECT.

- E. Reviewed samples which may be used in the Work are indicated in individual specification sections.
- F. Selection or rejection of samples will be made by the ARCHITECT in writing.

### **1.7 MANUFACTURER'S INSTRUCTIONS**

- A. When specified in individual specification sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing in quantities specified for Product Data.
- B. Identify conflicts between manufacturers' instructions and Contract Documents.

### **1.8 MANUFACTURER'S CERTIFICATES**

- A. When specified in individual specification sections, submit manufacturers' certificate to ARCHITECT for review in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product, but must be acceptable to ARCHITECT.

### **1.9 COORDINATED DRAWINGS**

- A. Submit drawings, which indicate routing, locations, sizes, types, and numbers of components in concealed spaces where potential conflict may occur between structures, mechanical, electrical, fire sprinklers, communications, and ceiling suspension systems.
- B. Indicate locations of all ceiling penetrations and surface-mounted items. Provide cross sections at all areas to indicate proper support of ceilings and non-interference with work of other sections of the specifications. Cross sections shall indicate coordination required and proposed solutions for routing of elements where potential conflict exists. Reproduction of ARCHITECT'S reflected ceiling plan is not acceptable.
- C. Drawings shall be based on field measurements, shop drawings and product data.
- D. Conflicts shall be brought to CONSTRUCTION MANAGER'S and ARCHITECT'S attention immediately.
- E. Submit to the CONSTRUCTION MANAGER, in writing, requests for clarification or interpretations that will affect the intent of the Contract Documents.
- F. The coordinated drawings shall indicate each class of work in the affected area. The drawing or written submittal shall include CONTRACTOR'S recommendations for the solution of any potential conflicts as well as recommendations tendered by any work of any section of the specifications which may be affected thereby.
- G. Submit the coordinated drawings in a scale of not less than 1/8" = 1'-0" with necessary sections and profiles at an appropriate, clearly readable enlarged scale.
- H. The ARCHITECT will review the submittals, make appropriate notations and comments to ensure the solution meets the intent of the Contract Documents and then return to CONTRACTOR for implementation.
- I. The CONTRACTOR shall be responsible for the proper coordination of the work of all sections of the specifications in the execution of coordinated drawing. Any installation of materials, components or equipment under one section of the specifications without full and complete,

agreement, knowledge, and consent by fabricators of adjacent or otherwise related or affected work will not be approved.

- J. It shall be incumbent upon the CONTRACTOR that all fabricators of work involved in the execution of coordinated drawings be informed, consulted and advised in sufficient advance time to arrive at solutions where no extension of contract time or extra cost to the OWNER will be approved due to CONTRACTOR'S negligence in the expeditious, timely submittal of coordinated drawings.
- K. Refer to Scope Summaries for other electronic file requirements.

#### **1.10 DSA DEFERRED APPROVALS AND MUNICIPALITY APPROVALS**

- A. Prepare all necessary shop drawings and product data. Submit one (1) electronic copy.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this Project.
- C. Where required by local municipalities submit to and obtain necessary approvals directly to municipality with copy submitted to CONSTRUCTION MANAGER.
- D. Upon DSA and/or municipality approval and review and final corrections, one (1) electronic copy for Record Documents/use by the CONSTRUCTION MANAGER.

#### **1.11 SUBMITTALS / SHOP DRAWINGS**

- A. Contractor to submit samples per above herein and per plans and details. Submittals to include but are not limited to the following:
  - 1. Fencing (All types, posts, fabric, fastners),
  - 2. Metalizing
  - 3. Backstops Complete (including netting, cables, powder coated posts, vinyl coated posts, galvanized posts, molded synthetic wood with fiber and oval pre-drilled oblong holes including hardware).
  - 4. Shade Structure Complete (fabric, thread, metal coatings and hardware).
  - 5. Paint Coatings 12" x 12" and as noted all colors, all textures (including powder coating samples)
  - 6. Resilient surfacing size as noted all colors
  - 7. Precast concrete materials, all shapes, trims, colors.
  - 8. Ballfield netting
  - 9. Furnishings all types, models and materials
  - 10. Drinking fountains
  - 11. Misters
  - 12. seat walls all conditions
  - 13. Scoreboards
  - 14. Planting
  - 15. Irrigation
  - 16. Lighting (complete system)
  - 17. Security / Wifi (complete System)
  - 18. Shade Canopy Structures (Fields, Family Activity Area, Stage)
  - 19. Family Activity Area Partitions
  - 20. All signage and wayfinding
  - 21. Flagpole
  - 22. Banquette seating
  - 23. Playground equipment
  - 24. Bleachers

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 ATTACHMENTS**

A. SUBMITTAL FORM

**END OF SECTION**

**SUBMITTAL FORM****CM #** \_\_\_\_\_ (For CM Use Only)**PROJECT NAME:** \_\_\_\_\_**CONTRACTOR NAME:** \_\_\_\_\_**SUBMITTAL****BC #** \_\_\_\_\_ **SUBMITTAL #** \_\_\_\_\_**DATE:** \_\_\_\_ / \_\_\_\_ / \_\_\_\_ **Title / Description:** \_\_\_\_\_**SPECIFICATION SECTION or DRWG. # :** \_\_\_\_\_ **NO. COPIES SUBMITTED:** \_\_\_\_**NO. COPIES RETURNED:** \_\_\_\_

TO: Tilden-Coil Constructors, Inc.

ATTN.: \_\_\_\_\_

**CONTRACTOR CERTIFIES:**

1. We have reviewed the attached submittal verifying products in this submittal, dimensions, adjacent work, and coordination of information is in accordance with the requirements of the work and contract documents and
2. We have reviewed and approved the field dimensions, the construction criteria, and has also made written notation regarding any information in the Shop Drawings and Submittals that does not conform to the Contract Documents. This Submittal has been coordinated with all other Shop Drawings and Submittals received to date by me as the CONTRACTOR and this duty of coordination has not been delegated to Subcontractors, material suppliers, the CONSTRUCTION MANAGER, ARCHITECT or the Engineers on this Project.

**BY:** \_\_\_\_\_ **DATE:** \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
CONTRACTOR'S Representative**FOR USE BY ENGINEER:****ENGINEER'S STAMP:**

\_\_\_\_\_ **NO EXCEPTIONS TAKEN**  
\_\_\_\_\_ **MAKE CORRECTIONS NOTED**  
\_\_\_\_\_ **REVISE & RESUBMIT**  
\_\_\_\_\_ **REJECTED**

**REMARKS:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





**SECTION 01 33 26****ELECTRONIC DOCUMENT CONTROL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for Electronic document management through CONSTRUCTION MANAGER'S CMiC software system – "CMiC Collaboration" including the following:
  - 1. Requirements for processing:
    - a. RFIs
    - b. Submittals
    - c. Pay Applications
    - d. Manpower / Daily Work Journal
    - e. Incident Reports
    - f. Punchlist
  - 2. Plan Sheet Access.
  - 3. Access, Permission and Tutorial.
  - 4. Hardware Requirements.

**1.2 ELECTRONIC DOCUMENT MANAGEMENT**

- A. This project will utilize a web-based project management software called CMiC Collaboration and the CONTRACTOR is required to use. This web-based software is a collaborative tool which allows CONTRACTOR designated personnel continuous access through the internet to project data.
- B. No additional software is required. CONSTRUCTION MANAGER provides instruction and video.
- C. CONTRACTOR is responsible to visit the website as often as necessary to be kept fully appraised.

**1.3 REQUIREMENTS FOR PROCESSING:**

- A. RFIs:
  - 1. CONTRACTOR shall upload RFIs through CMiC Collaboration.
  - 2. Any RFI from CONTRACTOR'S subcontractor must be submitted by CONTRACTOR.
  - 3. CONSTRUCTION MANAGER will receive an automatic e-mail notification when RFI has been submitted. CONSTRUCTION MANAGER reviews RFI for completeness and clarity. CONSTRUCTION MANAGER forwards to ARCHITECT for review and response.
    - a. Only complete RFIs as defined in Section "01 26 10 Request For Information" are forwarded to ARCHITECT for review.
  - 4. Once CONSTRUCTION MANAGER receives RFI response, CONSTRUCTION MANAGER will forward to CONTRACTOR. CONTRACTOR receives an automatic e-mail notification.
  - 5. In the event CMiC Collaboration is not functioning, CONTRACTOR to email RFI to CONSTRUCTION MANAGER.
- B. Submittals
  - 1. CONTRACTOR shall upload submittal(s) through CMiC Collaboration.

2. CONSTRUCTION MANAGER receives an automatic e-mail notification when submittal(s) has been submitted. CONSTRUCTION MANAGER reviews for completeness and compliance before sending to the ARCHITECT for their approval.
    - a. Only complete submittals as defined in Section "01 33 23 Submittals" are forwarded to ARCHITECT for review.
  3. Once CONSTRUCTION MANAGER receives submittal from ARCHITECT, CONSTRUCTION MANAGER will forward to CONTRACTOR. CONTRACTOR will receive an automatic e-mail notification.
  4. Resubmittals shall follow the same procedure as mentioned above.
  5. In the event CMiC Collaboration is not functioning, CONTRACTOR to email submittal to CONSTRUCTION MANAGER.
- C. Pay Applications
1. CONTRACTOR'S monthly progress payments is processed through CMiC Collaboration and GC Pay.
  2. The draft billing shall be in accordance with Division 00-General Conditions or the Supplemental General Conditions.
  3. In the event CMiC Collaboration is not functioning, the billing process shall be in accordance with Division 00-General Conditions or the Supplemental General Conditions.
- D. Manpower and Daily Work Journal
1. CONTRACTOR shall submit their Daily Work Journal in CMiC Collaboration via "Veriwolf Mobile" mobile using a job specific QR code.
  2. CONTRACTOR to initiate each daily work journal by 8am by identifying their manpower.
  3. CONTRACTOR to complete daily work journal, pre-shift, and safety tool box meetings before leaving the project site.
  4. All workers must register on the "Veriwolf Mobile" site using the project specific QR code, and complete the safety video and quiz.
  5. All workers on-site must check-in daily using the "Veriwolf Mobile" either individually using the QR code or by their foreman.
  6. In the event CMiC Collaboration is not functioning, CONTRACTOR shall:
    - a. Report manpower by 8am to CONSTRUCTION MANGER Superintendent.
    - b. Use the Daily Work Journal form provided herein and submit before leaving the site.
- E. Incident Reports
1. CONTRACTOR is required to upload incident reports in CMiC Collaboration the day of the incident.
  2. In the event CMiC Collaboration is not functioning, CONTRACTOR to provide a copy of the incident report to CONSTRUCTION MANAGER the day of the incident.
- F. Punchlist
1. CONTRACTOR'S punchlist is published in CMiC Collaboration.
  2. CONTRACTOR to access CMiC Collaboration to obtain.
  3. In the event CMiC Collaboration is not functioning, CONSTRUCTION MANAGER will provide an electronic copy of CONTRACTOR'S punchlist to CONTRACTOR for their use and resolve.

#### 1.4 PLAN SHEET ACCESS

- A. Access to all plan sheets is provided to CONTRACTOR.

#### 1.5 ACCESS, PERMISSION AND TUTORIAL

- A. Access rights to CMiC Collaboration is initiated by the CONSTRUCTION MANAGER.
- B. CONTRACTOR to identify designated personnel such as project manager and field personnel as well as, provide the following information noted herein and forward to CONSTRUCTION MANAGER.
  - 1. Contact Name
  - 2. Position
  - 3. Email address
- C. Upon receipt of designed personnel information, CONSTRUCTION MANAGER sends email invite to designated personnel. The email will be from [invites@cmic.ca](mailto:invites@cmic.ca). This email is the link to register and provide access into the CMiC system.
  - 1. Please note, this email may potentially be marked as spam, check the junk/spam folder as not to miss the email.
- D. Registration and Access Steps
  - 1. Open [invites@cmic.ca](mailto:invites@cmic.ca) email.
  - 2. Click on "Join Team".
    - a. This will redirect to a self-enrollment website. Follow the prompts to enter in your email address and choose your password. A confirmation email will be sent.
  - 3. Once this process is finished, open your preferred browser, and go to the following website: <https://cmiccollaborate.com/>. Enter in your email address and newly created password.
  - 4. When successfully logged in, the CMiC Project Gateway homepage will appear. This is the central location to access the project. Locate and click on the project.
    - a. Access to RFIs, submittals, and plan sheets will be available.
- E. Tutorial Video
  - 1. A tutorial video has been created to assist becoming more familiar with CMiC.
    - a. Go to link to access video: <https://youtu.be/i8kwNEenwTA>

## **1.6 HARDWARE REQUIREMENTS**

- A. CONTRACTOR shall equip designated personnel with a portable computer device or phone to enable designated personnel access to CMiC Collaboration.
- B. CONTRACTOR to ensure that designated personnel are equipped with portable computer device or phone for the duration of the project.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 CONTRACTOR DAILY WORK JOURNAL**

- A. CONTRACTOR'S report must identify each of the following:
  - 1. List the schedule activity number(s) under construction that day.
  - 2. Total number of personnel on the project that day.
  - 3. Estimated 100% completion date of each activity or activities currently under construction that day.
  - 4. Specific problems, if any, with the actions and/or inactions of other CONTRACTORS, the OWNER, CONSTRUCTION MANAGER, ARCHITECT, consulting engineers, or the contract documents, which are preventing CONTRACTOR'S work from being properly completed per the schedule.

- B. Any delay shall be communicated in accordance with General Conditions - Notice by CONTRACTOR.
  - 1. In NO case, will CONTRACTOR'S Daily Work Journal be used as a "Notice by CONTRACTOR".

### **3.2 ATTACHMENTS**

- A. Form: CONTRACTOR'S Daily Work Report (DWR)

CONTRACTOR'S DAILY WORK REPORT							
Project Name:							
Contractor:							
By:							
Date:							
MANPOWER ON THE PROJECT:							
TRADE	CLASS	NAME	HRS.	TRADE	CLASS	NAME	HRS.
EQUIPMENT ON THE PROJECT:				MATERIALS RECEIVED TODAY			
TYPE	OWNED BY		HRS.	TYPE	SUPPLIER'S NAME		HRS.
DESCRIPTION OF WORK PERFORMED (Example: Building #, Locations, Linear Footage, Cubic Yard, Etc.)							
Activity #:							
Building:							
Location:							
Further Information:							
Daily Safety Inspection of Work Area Made?		Yes	<input type="checkbox"/>	No	<input type="checkbox"/>		
Employee Injury Reported?		Yes	<input type="checkbox"/>	No	<input type="checkbox"/>	If yes, attach injury report.	

END OF SECTION

**SECTION 01 35 00****SAFETY PROGRAM****PART 1 - INTRODUCTION AND BASIC ELEMENTS****1.1 RELATED DOCUMENTS AND PROVISIONS**

- A. All Contract Documents should be reviewed for applicable provisions related to the provisions in this section, including without limitations:
1. Drawings and Specifications.
  2. General Conditions, Special Conditions and Supplementary Conditions.
  3. Summary of Work.
  4. Other General Requirements.
  5. Local, State and Governing Agencies.
  6. Applicable Cal/OSHA Standards (Title 8).
  7. Referenced consensus standards, including ANSI, NFPA, (where applicable).

**1.2 DEFINITIONS**

- A. Competent Person – One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous and is knowledgeable of applicable regulations and who has authorization to take prompt corrective measures to eliminate risks or prevent personnel exposure to hazardous conditions.
- B. Globally Harmonized System Program (GHS) – Federal required program which includes providing and maintaining project related Safety Data Sheets (SDS), providing chemicals to be used and inventory protocol, and providing a list of hazardous substances and their use.
- C. Hazardous Communication Program (HCP) – CAL OSHA required program which includes providing and maintaining project related Safety Data Sheets (SDS), providing chemicals to be used and inventory protocol, and providing a list of hazardous substances and their use.
- D. Incident – An unexpected happening causing a “near miss”, loss, or injury, including without limitation, accidental or unanticipated events involving personal injury, illness or property damage.
- E. Job Hazard Analysis (JHA) – A task-driven planning document used to help ensure every task receives proper safety assessment and planning.
- F. Personnel – Any person employed by Prime CONTRACTOR and/or business, firm, person, including but not limited to deliveries, suppliers, and vendors that has an agreement with Prime CONTRACTOR, in which Prime CONTRACTOR has a contract agreement with OWNER that is providing services to the project site.
- G. Qualified Person – A designated person who by possession of a recognized degree, certificate, or professional standing, or who, by extensive knowledge, training and experience, has successfully demonstrated his/her ability to solve and resolve problems with the ability to safely perform all assigned duties and, when required, is properly licensed in accordance with federal, state, or local laws and regulations.
- H. Site Specific Safety Plan (SSSP) – A written plan communicating how the work will be done safely taking into consideration personnel, others on the project site, inspectors, visitors, and the general public.
- I. Prime CONTRACTOR – A business, firm, person that has a contract agreement with OWNER.

- J. Subcontractor - A business, firm, person that has a contract agreement with Prime CONTRACTOR, in which Prime CONTRACTOR has a contract agreement with OWNER.
- K. Supervisor - One who is trained and certified to identify existing and predictable hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.

### 1.3 GENERAL SAFETY UNDERSTANDING

- A. Prime CONTRACTORS are responsible for their means, methods, techniques, sequences or procedures for safety in connection with their work. CONSTRUCTION MANAGER shall not have control over, charge of, or responsibility for Prime CONTRACTOR'S or their Subcontractor's means, methods, techniques, sequences or procedures for safety, nor shall the CONSTRUCTION MANAGER be responsible for acts of omission by Prime CONTRACTORS, their Subcontractors, agents, employees, or any other persons performing portions on behalf of Prime CONTRACTORS.
- B. Safety requirements are the responsibility of the Prime CONTRACTOR and their subcontractors.
- C. Any sub-tier to a Prime CONTRACTOR is responsible to comply with the safety requirements.
- D. Prime CONTRACTOR is responsible to ensure their sub-tier complies with these responsibilities.
- E. Prime CONTRACTOR retains sole responsibility for regulatory compliance and the means and methods employed to implement the contents of their Program.
- F. The requirements set forth in this Section are complementary to, and do not supersede, the requirements of the General Conditions, General Requirements, Governing Agencies or other provisions of the Contract Documents pertaining to safety. In the event of a conflict between or among provisions relating to safety or protection, the provision that requires **the greater degree and higher level of action, care, caution or protection shall govern.**
- G. Prime CONTRACTOR shall comply fully with all Federal, State and/or local safety related laws, orders, citations, rules, regulations, standards and statutes.
- H. Prime CONTRACTOR shall comply with safety, health, and environmental laws and regulations of safe work practices. This section is **NOT** intended as a complete safety program.
- I. Prime CONTRACTOR shall comply with Site Specific Safety Plan (SSSP) requirements. These requirements are to be followed in addition to the Prime CONTRACTOR'S Injury and Illness Prevention Program (IIPP).
- J. Any information or submittals provided to CONSTRUCTION MANAGER shall be reviewed solely to verify the content of the Prime CONTRACTOR'S submittal(s) and for record.

### 1.4 GENERAL REQUIREMENTS

- A. The Prime CONTRACTOR has sole responsibility, on a twenty-four (24) hour day, seven (7) day week basis, for initiating, maintaining, supervising and enforcing all safety precautions and programs in connection with the performance of the Contract for the safety of their personnel, their subcontractors, the public, and the project site. This includes responsibilities for vendors, delivery and transportation services, and service providers at the project site. No actions, inspection or approvals by the OWNER, OWNER'S Program Manager, CONSTRUCTION MANAGER, or other person acting on behalf of the OWNER shall diminish such Prime CONTRACTOR responsibility.
- B. Prime CONTRACTOR shall make CONSTRUCTION MANAGER immediately aware of:



1. Any unique safety, health, or environmental concerns related to their work and make timely efforts to notify other affected prime CONTRACTORS working on project site and protect the public from hazards.
  2. Any safety or health inspections or other actions by Cal/OSHA, EPA, AQMD, Water Control Board, Health Department, or other Governmental Authorities.
- C. If Prime CONTRACTOR or their subcontractor employs non-English speaking personnel, the Prime CONTRACTOR and/or subcontractor shall have a supervisor (superintendent or foreman) proficient in English and the foreign language(s).
- D. Prime CONTRACTOR shall be responsible to secure and comply with all permits, such as, but not limited to: excavations, tower cranes, temporary elevators, asbestos abatement, lead abatement, air permits, water permits, and hazardous waste generation. All permits are to be forwarded to the CONSTRUCTION MANAGER.
- E. Prime CONTRACTOR is responsible for maintaining all postings required by applicable laws and the contract documents, such as, but not limited to, the Cal/OSHA poster, Cal/OSHA 300 & 301 logs, first aid register, accident reports, equipment inspection records, and health and safety training records for personnel.
- F. Prime CONTRACTOR shall provide first aid kit/supplies in accordance with Cal/OSHA for their personnel and comply with governing regulations.
- G. Prime CONTRACTOR shall provide fire extinguishers of the appropriate size and type to be used and in accordance with NFPA recommendations for the type of exposure and the Site Specific Safety Plan.
- H. Prime CONTRACTOR shall ensure that no alcohol, firearms, weapons, animals, or controlled substances enter or are at the project site. Prime CONTRACTOR shall immediately and permanently remove from the project site any personnel found in violation of this provision.
- I. No radios, headphones, earbuds, ipods, MP3 players, music devices of any type or speakers are permitted on the project site.
- J. No glass bottles are permitted.
- K. Loose or frayed clothing, dangling ties, finger rings, etc. shall not be worn around moving machinery or other sources of entanglement.
- L. Machinery shall not be repaired or adjusted while in operation, nor shall oiling of moving parts be attempted, except on equipment that is designed or fitted with safeguards to protect the person performing the work.
- M. Do not work under vehicles or equipment or machinery supported by jacks or chain hoists without protective blocking that will prevent injury if jacks or hoists should fail.
- N. Do not operate any motorized equipment, tractors, skip-loaders, forklifts, heavy equipment, and carryalls on surfaces, terrain, and slopes not permitted by the manufacture.
- O. Pickup and/or delivery of supplies or equipment shall be limited to normal working hours (7:00 a.m. - 3:30 p.m.) unless previously arranged with CONSTRUCTION MANAGER.
- P. CONSTRUCTION MANAGER shall designate a construction entry to the project site.
- Q. CONSTRUCTION MANAGER shall designate a staging area so as not to interfere with the normal function of the OWNER'S operation.
1. If Prime CONTRACTOR requests additional staging and space permits, location and ingress/egress shall be coordinated in advance with CONSTRUCTION MANAGER. Additional fencing is at Prime CONTRACTOR'S expense.

- R. Parking areas shall be reviewed and coordinated with CONSTRUCTION MANAGER in advance. No parking or material storage is to occur under the drip line of trees or in areas that could otherwise be damaged.
- S. When working in or around occupied areas; tenants, users, and the public have the right-of-way.
  - 1. All project sites have been declared “drug-free zones”. No drugs, alcohol and/or smoking are allowed at any time in any buildings and/or grounds or adjacent OWNER property.
  - 2. Smoking, E-cigarettes and the use of any tobacco products is prohibited on the project site or adjacent property.
  - 3. Foul language, unacceptable and/or loud language is prohibited. “Cat calls” or other derogatory language is prohibited.
  - 4. No clothing exhibiting profanity is permitted.
  - 5. No interaction with tenants, users and the public is permitted.
  - 6. Prime CONTRACTOR shall observe the noise ordinance and mitigate at all times including, without limitation, all applicable local, city, and/or state laws, ordinances, and/or regulations.
  - 7. If portable lights are used after dark, all light must not be directed into neighboring property.
  - 8. All paths of travel for deliveries, including without limitation, material, equipment, and supply deliveries, shall be reviewed and coordinated with CONSTRUCTION MANAGER in advance. Any damage will be repaired to the pre-damaged condition by the Prime CONTRACTOR.
  - 9. When on an active campus:
    - a. No interaction with students, staff or faculty is permitted.
    - b. Driving on the premises shall be limited to periods when students and public are not present. If driving or deliveries must be made during the school hours, two (2) or more ground guides shall lead the vehicle across the area of travel. In no case shall driving take place across playgrounds or other pedestrian paths during recess, lunch, and/or class period changes. The speed limit on-the premises shall be five (5) miles per hour (maximum) or less if conditions require.
- T. Failure to follow these directives could result in individual(s) being suspended or removed from the project site at the discretion of CONSTRUCTION MANAGER. The same rules and regulations shall apply equally to delivery personnel, inspectors, consultants, and other visitors to the project site.
- U. News Media
  - 1. Project site incidents resulting in news media coverage shall be immediately reported to the CONSTRUCTION MANAGER.
  - 2. Any questions from news media personnel (radio, television, and newspaper) must be referred to the CONSTRUCTION MANAGER.

## **PART 2 - PRIME CONTRACTOR AND SUBCONTRACTOR RESPONSIBILITIES**

### **2.1 GENERAL RESPONSIBILITIES**

- A. Shall have all applicable Cal/OSHA regulations available for use and reference at the project site.
- B. Responsible to design and implement Site Specific Safety Plan (SSSP) and submit to CONSTRUCTION MANAGER for review.

- C. Shall ensure their personnel are properly trained and instructed for all work that require specific training and/or competency to meet all applicable Cal/OSHA regulations, state and federal law, and the requirements herein.
- D. Responsible for disposal on a daily basis, all rubbish and debris generated by its work.
- E. Responsible for ensuring that prompt corrective action is taken when they are made aware of any safety issues and/or concerns.
- F. Forward to CONSTRUCTION MANAGER a copy of any citation or warning for record.
- G. "Competent Person", "Qualified Person" or "Supervisor" shall be readily available at the project site during activities requiring same.

## 2.2 PRE-CONSTRUCTION / PREPARATORY MEETING(S)

- A. Prior to the start of work, Prime CONTRACTOR shall submit to CONSTRUCTION MANAGER a copy of the items listed herein. If not applicable at the time of the meeting, Prime CONTRACTOR shall submit a copy no later than 7 calendar days before the activity commences:
  - 1. Code of Safe Practices.
  - 2. Project specific Injury and Illness Prevention Plan (IIPP).
  - 3. Heat Illness Prevention Plan (HIPP).
  - 4. Hazard Communication/Globally Harmonized System (GHS) Program which includes:
    - a. Safety Data Sheets (SDS).
    - b. Chemical inventory list.
    - c. Hazardous substance list.
    - d. Refer to section 3.23 for additional information.
  - 5. First Aid/CPR trained personnel on the project site and their expiration dates.
  - 6. Operator's certification and documented training:
    - a. Required certification.
      - 1) Forklift (expires 3 yrs).
      - 2) Crane (expires 3 yrs).
    - b. Documented training on safe operations.
      - 1) Boom-lift.
      - 2) Scissor lift.
      - 3) All other equipment.
  - 7. List of Prime CONTRACTOR'S: "Competent Person(s)", "Qualified Person(s)", "Licensed", or "Supervisor(s)" as defined by OSHA for the activities noted below. Refer to Exhibit "C.1" for the Competent Person Designation form. Prime CONTRACTOR to fill this out and submit to the CONSTRUCTION MANAGER.
 

a. Asbestos Abatement (Refer to section 3.2) .....	Competent
b. Burning, Welding and Hot Work (Refer to section 3.4) .....	Competent
c. Confined Space (Refer to section 3.8) .....	Competent
d. Crane Picks & Critical Lifts (Refer to section 3.10 & 3.11) .....	Qualified
e. Demolition (Refer to section 3.12) .....	Qualified
f. Electrician (live circuits) (Refer to section 3.13) .....	Qualified
g. Explosives (Refer to section 3.17) .....	Licensed
h. Fall Protection (Refer to section 3.18) .....	Competent and Qualified
i. Ladders (Refer to section 3.30) .....	Qualified
j. Lead Abatement (Refer to section 3.31) .....	Supervisor
k. Pile Driving (Refer to section 3.36) .....	Competent
l. Powder Actuated Tools (Refer to section 3.37) .....	Qualified
m. Scaffold (Refer to section 3.40) .....	Competent
n. Silica and Dust Exposure Protection (Refer to section 3.41) .....	Competent
o. Steel Erection (Refer to section 3.42) .....	Competent
  - 8. Site Specific Safety Plan (SSSP) (Refer to section 2.1.B)

- a. Communicates how the work will be done safely taking into consideration personnel, inspectors, visitors, and the general public (e.g. students, faculty, and pedestrians). This plan shall include, but not necessarily be limited to:
  - i. Confined Space .....(Refer to section 3.8)
  - ii. Crane Picks and Critical Lifts.....(Refer to section 3.10 & 3.11)
  - iii. Demolition..... Refer to section 3.12)
  - iv. Explosives ..... (Refer to section 3.17)
  - v. Fall Protection..... (Refer to section 3.18)
  - vi. Job Hazard Analysis (JHA).....(Refer to section 2.4)
  - vii. Lead Abatement ..... (Refer to section 3.31)
  - viii. Lockout/Tagout (LOTO)..... (Refer to section 3.33)
  - ix. Precast, Pre-fabricated Concrete, Tilt-up Panels.....(Refer to section 3.38)
  - x. Respirator Protection ..... (Refer to section 3.39)
  - xi. Scaffold..... (Refer to section 3.40)
  - xii. Silica and Dust Exposure Protection.....(Refer to section 3.41)
  - xiii. Traffic Control, Flagging, Operations and Plate Bridging.....(Refer to section 3.44)

## 2.3 PROJECT SAFETY ORIENTATION AND TRAINING

- A. Personnel must attend a project site safety orientation conducted by the CONSTRUCTION MANAGER before personnel starts.
  1. During the orientation, Prime CONTRACTOR shall provide a copy of the appropriate required equipment certification and/or documented training as noted in 2.2.A.6.
- B. Prime CONTRACTOR is responsible to advise the CONSTRUCTION MANAGER of new personnel on the project site and coordinate project site safety orientation prior to the starting work.

## 2.4 JOB HAZARD ANALYSIS (JHA)

- A. Developed by the Prime CONTRACTOR and/or its Subcontractor for critical activities identified by Prime CONTRACTOR, Subcontractor, CONSTRUCTION MANAGER, and/or OWNER. This would include, but not limited to:

Personal fall arrest systems	Crane picks (74% or less of crane capacity)	Lead abatement
Live electrical work	Crane picks (75% or greater of crane capacity)	Use of explosives
Trench/Excavations (5ft or deeper)	Tilt-up	Work on or adjacent to road ways
Confined space	Asbestos abatement	Helicopter picks

- B. The JHA's are to be completed by the Prime CONTRACTOR'S supervisor familiar with the work activity to be performed.
  1. The JHA will break down the work activity into key steps, identify the hazards associated with each step, and the controls to either eliminate, avoid and/or protect against potential accident.
  2. Prior to commencing the work activity, the Prime CONTRACTOR'S supervisor will review the completed JHA with personnel performing the work activity.
  3. Refer to Exhibit "C.2" for the form.
- C. The JHA's will be kept by the Prime CONTRACTOR for future reference and a copy of the JHA will be submitted to CONSTRUCTION MANAGER.

## 2.5 PRE-SHIFT MEETING

- A. A pre-shift production and safety meeting shall be conducted at the start of each shift.
  1. Refer to Exhibit "C.3" for the form.

- B. These meetings shall:
  - 1. Review production activities for the shift.
  - 2. Review safety activities that are a component of the production activities.
- C. The meeting at a minimum to focus on the following:
  - 1. Tasks for the shift.
    - a. Applicable Job Hazard Analysis' (JHA's).
  - 2. Tools and equipment needed for those tasks.
  - 3. Materials needed for those tasks.
  - 4. Proper material handling techniques.
  - 5. Safe work procedures to perform those tasks.
  - 6. PPE needed to safely perform those tasks.
  - 7. Other pertinent information.
  - 8. Questions from personnel.

## 2.6 INJURY AND INCIDENT REPORTING

- A. In the event of an Injury or incident, notify CONSTRUCTION MANAGER'S Project Superintendent immediately. This includes any member of the general public, third party, and/or property damage.
  - 1. A detailed written report is to be furnished within **twenty-four (24) hours** of the injury or incident and shall include the following:
    - a. Copies of all reports of any injury or incident involving other people (e.g. general public) or property damage caused by their actions.
    - b. Signed statements from witnesses of their observations. Witness statements shall contain the name and permanent address of the witness.
    - c. Recommendations to prevent recurrence of the injury or incident.
    - d. How the report will be communicated to all personnel (e.g. tailgate meeting).
      - 1) Submit to CONSTRUCTION MANAGER, sign-in sheet, the same day they are conducted.
- B. Notify CONSTRUCTION MANAGER'S Project Superintendent the same day of any "near-miss" incidents.

## 2.7 SAFETY MEETINGS

- A. Weekly safety meetings are to be conducted in compliance with Cal/OSHA standards, which address the specific hazards associated with their trade. Provide a copy of attendees with their signature along with the meeting minutes to CONSTRUCTION MANAGER weekly.
- B. A Superintendent and/or Foreman shall be present at all CONSTRUCTION MANAGER scheduled safety/coordination meetings.
- C. All prime CONTRACTORS will attend any meeting, such as an "all hands safety meeting", scheduled by CONSTRUCTION MANAGER related to safety.

## 2.8 SAFETY INSPECTIONS

- A. Prime CONTRACTOR shall designate a project site safety representative (e.g. Superintendent, Foreman), who shall conduct and document a **safety inspection** of their work areas and submit a copy to CONSTRUCTION MANAGER the same day the inspection was performed. Safety inspections are to be conducted daily and more frequently if necessary. Any conditions that may affect the safety of persons or property will be noted in writing for correction by the creating prime CONTRACTOR.

## 2.9 DISCIPLINARY POLICY AND ENFORCEMENT

- A. A plan for disciplinary action for violations of known safety requirements shall be part of the Prime CONTRACTOR'S IIPP.
- B. This program is the minimum safety standards established for this project site and is not intended to take the place of a Prime CONTRACTOR'S Disciplinary Policy.
- C. CONSTRUCTION MANAGER reserves the right to stop Prime CONTRACTOR'S work if CONSTRUCTION MANAGER believes Prime CONTRACTOR is not performing their work in compliance with any applicable safety laws or regulations or agreed upon safety action plan/program (e.g. JHA, Crane pick plan). The work activity will cease until corrective action is taken by the Prime CONTRACTOR. If Prime CONTRACTOR fails to take corrective action, CONSTRUCTION MANAGER, in its discretion, shall have the right, but not the obligation, to take corrective action and to charge the cost and/or expense thereof against Prime CONTRACTOR.
- D. The Prime CONTRACTOR agrees to enforce compliance with the following disciplinary actions as a result of committing a safety violation:
  1. Action Level One (1) – If CONSTRUCTION MANAGER observes that Prime CONTRACTOR has failed to comply with any safety requirements applicable to the work, CONSTRUCTION MANAGER will have the right, but not the obligation, to issue a written Safety Notice to the Prime CONTRACTOR.
  2. Action Level Two (2) – If an observed non-compliance with safety requirements is not corrected by Action Level One, or if the Prime CONTRACTOR repeatedly fails to comply with the safety requirements applicable to the project site, CONSTRUCTION MANAGER shall have the right, but not the obligation, to issue a second written Safety Notice to the Prime CONTRACTOR and its surety.
    - a. The Prime CONTRACTOR may not resume work until CONSTRUCTION MANAGER and the Prime CONTRACTOR'S reputed Executive in charge, such as its President or Operations Manager, have met and the Prime CONTRACTOR has demonstrated that it is prepared and able to take specific and adequate corrective actions.
    - b. CONSTRUCTION MANAGER may, in the exercise of its sole discretion, require of Prime CONTRACTOR to include in their corrective actions, but are not limited to, the following:
      - 1) Removal of certain Prime CONTRACTOR or subcontractor personnel from the project site.
      - 2) Alteration of the Prime CONTRACTOR'S or subcontractor's job procedures.
      - 3) The Prime CONTRACTOR shall not resume work until proposed corrective actions are reviewed by CONSTRUCTION MANAGER and has agreed to the work proceeding. CONSTRUCTION MANAGER will document the meeting results in the form of meeting minutes, a copy of which will be provided to the Prime CONTRACTOR and maintained at the project site.
  3. Action Level Three (3) – If Action Levels One and/or Two do not result in the Prime CONTRACTOR'S performance being brought into compliance with applicable safety requirements, then other actions, including, without limitation, contract termination may result.
  4. Nothing stated under 2.9 (above) shall be interpreted as creating or implying any obligation on the part of the OWNER or CONSTRUCTION MANAGER to issue any notices, whether formal or informal, to Prime CONTRACTOR in the event of an incident or of circumstances involving the risk of an incident. Notices issued to Prime CONTRACTOR, whether or not in the forms suggested above, shall be complied with by Prime CONTRACTOR. Nothing stated herein shall be interpreted as limiting any right's or remedies to the exercise of procedures set forth in this section.

5. **IMMINENT DANGER** (any conditions or practices in any place of employment which are such that a danger exists which could reasonably be expected to cause death or serious physical harm) – Any imminent danger type safety violations shall result in **immediate suspension** and/or permanent removal. Any personal removed is not permitted on any CONSTRUCTION MANAGER'S projects.

### PART 3 - SAFETY STANDARDS

#### 3.1 AIR MONITORING EQUIPMENT (SEE CONFINED SPACE ENTRY FOR ADDITIONAL REQUIREMENTS)

- A. Appropriate multi gas air monitoring equipment shall be used to test confined spaces, utility holes, cable vaults, pits, and similar spaces for flammable, toxic, or oxygen deficient atmospheres. The exposing prime CONTRACTOR(s) is (are) responsible for the provision, maintenance, calibration and testing of equipment.
- B. Air monitoring equipment must be tested and calibrated as required by the manufacturer before each use.
- C. Prior to use, personnel must be trained per manufacturer requirements on the use, limitations and alarm modes of each air-testing device that is (are) used.
- D. Personnel must immediately leave work area whenever an equipment alarm sounds due to:
  1. Low or high oxygen level (acceptable range is 19.5% - 23% oxygen).
  2. Combustible gas above 10% lower explosive limit (LEL).
  3. Hydrogen Sulfide reaches permissible exposure limit of 10 ppm, or other toxic gas level reading.
  4. Sensor failure.
  5. Low battery alarm.

#### 3.2 ASBESTOS

- A. Abatement Prime CONTRACTOR must be licensed in accordance with applicable State, Federal, and Local requirements to perform removal and disposal of asbestos containing material and encapsulation.
- B. The Prime CONTRACTOR shall ensure personnel are trained in asbestos awareness to identify ACM and PACM.
- C. Upon discovery of any asbestos containing materials (ACM) or presumed asbestos containing materials (PACM), Prime CONTRACTOR shall stop work in such areas and notify CONSTRUCTION MANAGER.
- D. All asbestos abatement and removal work must follow all regulations of Cal/OSHA, the Environmental Protection Agency (EPA), and the applicable Air Quality Management District (AQMD).
- E. Abatement Prime CONTRACTOR'S Competent Person shall:
  1. Conduct an exposure assessment immediately before or at the initiation of the operation to ascertain expected exposures during that operation or workplace.
  2. Shall make frequent and regular inspections:
    - a. Class I jobs, project site inspections shall be made at least once during each work shift, and at any time when requested by personnel.
    - b. Class II, III and IV jobs, project site inspections shall be made at intervals sufficient to assess whether conditions have changed and at any time when requested by personnel.

3. For Class I or II asbestos work, perform or supervise the following duties, as applicable:
  - a. Set-up regulated area, enclosures, or other containments; ensure integrity of containments, control entry/exit from enclosure or area.
  - b. Supervise personnel exposure monitoring.
  - c. Personnel must wear respirators and protective clothing.
  - d. Ensure personnel set up, use and remove engineering controls, including personal protective equipment, hygiene facilities, decontamination procedures, proper work practices, and notification requirements.

### 3.3 BARRICADES AND SIGNAGE

- A. Temporary perimeter fencing may be provided by the CONSTRUCTION MANAGER. Prime CONTRACTOR to refer to logistics plan, subcontract agreement or any other contract document that may communicate the limits of perimeter fencing being provided by the CONSTRUCTION MANAGER. Prime CONTRACTOR to provide the following as a minimum:
  1. Barricades are required around excavations, holes or openings in floor or roof areas, edges of roofs and elevated platforms, overhead work and overhead utilities, and wherever necessary to warn or protect against falling in, through or off. Barricades must be suitable for the area of use.
  2. To ensure the safety of the general public, Prime CONTRACTOR shall provide and maintain adequate protection, such as chain-link fences, gates and barricades, to separate work areas from areas outside project site limits. Barricades must be suitable for the area of use.
  3. Barricades may also be used to isolate people from work activities as required by the activity, potential hazards created by the activity, or the location of the activity. Barricades must be suitable for the area of use.
- B. Chain-link Fencing:
  1. Shall be free from barbs, excessive galvanizing material that may form sharp projections (icicles), or other projections that may cause injury.
  2. Must be in good repair and installed to ensure stability of the fencing from being knocked over.
  3. Must be installed/braced to prevent being blown over during windy conditions.
  4. Base supports shall be installed/placed to eliminate tripping hazards when fencing is placed adjacent to sidewalks and walkways.
- C. Prime CONTRACTOR shall notify CONSTRUCTION MANAGER and obtain approval to remove any barricade (e.g. guardrails), and other perimeter protection (e.g. fencing) and/or floor opening covers.
- D. Prime CONTRACTOR shall notify those affected by the removal of any barricade, perimeter protection and/or floor opening cover, and will be solely responsible, including providing additional temporary safety measures for area and those in the area during the period of temporary removal.
- E. Prime CONTRACTOR shall immediately return to proper condition and maintenance, any barricade, perimeter protection and/or floor opening cover removed because of their work.
- F. Prime CONTRACTOR shall provide appropriate signs (e.g. Powder Actuated Tool in Use).

### 3.4 BURNING, WELDING AND HOT WORK

- A. Hot work includes, but is not limited to, the following activities: grinding, cutting, welding, burning, brazing or soldering, heating, hot air welding or other operations that generate heat, flames, arcs, sparks or other source of ignition.



- B. Prime CONTRACTOR shall have a written Hot Work Program for fire prevention during hot work activities.
- C. Prime CONTRACTOR shall procure and post all permits necessary for hot work as required by the Fire Marshal or Fire Code having jurisdiction over the project site. The Prime CONTRACTOR shall attain a copy of all permits before starting any work.
- D. Prior to performing hot work, evaluate the following: type of hot work to be performed, project site preparation, atmospheric conditions, use of appropriate personal protective equipment, and firefighting equipment.
- E. Project site preparation should include a survey for the following: combustible materials; hazards posed by heat transfer; flammable, corrosive, or toxic residues; equipment linings, appropriate lockout/tagout applications, and housekeeping.
- F. Prime CONTRACTOR'S Competent Person shall:
  - 1. Notify CONSTRUCTION MANAGER of hot work activity.
  - 2. Inspect the work area(s) for safety factors and assure fire extinguishers or other firefighting equipment are present.
  - 3. Attach the hot work permit to the fire extinguisher or other fire fighting equipment that will be present during the activity.
- G. Fire extinguishers rated at least 10B:C, and/or other fire protection equipment are to be provided by the Prime CONTRACTOR for each hot work operation in accordance to Cal/OSHA and local Fire Marshal / Fire Code requirements.
  - 1. This equipment shall be located on the same elevation(s) of the work and within 25 feet of the hot work activity.

### 3.5 CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT (PPE)

- A. Without limitations to any other requirements of applicable laws or the contract documents, Prime CONTRACTOR and subcontractor are responsible for providing all Personal Protective Equipment (PPE) for their personnel (e.g. hard hats, safety glasses, face shield, harness, lanyard, N-95 particulate mask, respirator, high visibility vest, and hearing protection).
- B. PPE must be properly fitted and suitable for protection from existing hazards.
- C. Provide adequate training for the use of PPE that personnel will wear and/or use as required by applicable Cal/OSHA standards.
- D. The minimum PPE requirements of the project:
  - 1. **Hard hats** (ANSI Z89.1 or equivalent) shall be worn at all times (100%) while on the construction project site, except in the break areas and construction offices.
    - a. Welders must wear a hard hat when using welding hoods.
    - b. No metal hard hats, "cowboy" style hard hats, or bump caps allowed.
  - 2. **Safety glasses** (ANSI Z87.1 or equivalent) that meet Cal/OSHA standards for the exposure shall be worn at all times (100%) while on the construction project site, except in the designated break areas and construction offices. This includes those with prescription eye wear.
  - 3. **High visibility vests** (Class 2 vest) required; safety orange, green or yellow, shall be worn at all times (100%) and must be the outermost garment while on the construction project site, except in the break areas and construction offices.
    - a. ANSI 107-2010 Class 3 vests are required for personnel with high task loads in a wide range of weather conditions and where traffic exceeds 50 mph. These work activities could include but not limited to all personnel, vehicle operators, utility personnel, survey crews, emergency responders, and railway.

4. **Construction work boots** (ANSI Z41.1 or equivalent) shall be worn at all times during the course of all construction activities. They must be substantial leather boots with good rubber soles.
  - a. Additional foot protection (e.g. metatarsal guards, steel toe) may be required if there is a danger of foot injury due to falling objects, rolling objects, or chemical exposure (e.g. chemical resistant type rubber boot). Metatarsal guards are required when operating a wacker, jack hammer, and jumping jack tamper.
  - b. Loafers, sandals, tennis shoes, running shoes, or open-toed shoes are not proper work shoes and are not permitted.
5. **Long Pants** are required at all times. No sweat pants.
6. **Shirts** must have a minimum four (4) inch sleeve length over shoulders and shall be worn at all times.
  - a. Tank tops, cut-offs, net shirts, sleeveless shirts are prohibited.
  - b. No questionable, profanity and/or vulgar images, words or logos are allowed on shirts or other visible clothing apparel.
7. **Hand Protection** may be required if there is a danger to hand injury due to cuts, burns, electrical current, or harmful physical or chemical agents. Protective gloves are required when working with wet concrete.
8. **Hearing Protection** devices shall be used to protect from noise levels which exceed 90dBA.
9. **Face Protection** may be required when:
  - a. There is an inherent risk from flying particles or injurious chemicals.
  - b. Cutting, grinding or sanding of finished concrete or metals.
10. **Respiratory Protection** may be required if engineering or operational controls are not feasible for limiting harmful exposure to airborne contaminants.

### 3.6 COMPRESSED GAS CYLINDERS, GAS CUTTING AND WELDING

- A. All cylinders must be secured and transported in an upright position at all times.
- B. Oxygen and fuel gas cylinders must be separated at least 20 feet, or enclosed with a 5 foot high barrier with a ½ hour fire rating when in storage and placed away from potential contact that may rupture the tanks.
- C. Cylinder valves shall be turned to the off position if left inactive for 30 minutes or longer.
- D. Cylinders designed for valve protection caps must have the valve protection cap installed when in storage or when being transported.
- E. Cylinders, hoses, and fittings shall be checked for leaks and damage on a regular basis.
- F. Cylinders must be labeled as to the nature of their contents per NFPA requirements and the OSHA Hazard Communication Standards.
- G. Cylinders shall not be taken into confined spaces.
- H. Cylinder storage areas shall have appropriate warning signage posted.
- I. Appropriate fire-fighting equipment must be provided for each cylinder storage area.
- J. Torches and hoses shall not be left connected to cylinders overnight.
- K. Torches and hoses shall not be stored in unventilated gang boxes or storage containers.
- L. Flashback arrestors and check valves shall be installed in accordance with manufacturer's instruction on all oxygen-fuel torch sets.

### 3.7 CONCRETE AND MASONRY CONSTRUCTION

- A. The creating prime CONTRACTOR must guard all protruding reinforcing steel to eliminate impalement hazards.
- B. Protective gloves are required when there is skin contact with wet concrete.
- C. Concrete – Structural Concrete
  - 1. Do not remove any forms or shoring until a determination has been made by the testing lab that the concrete has gained sufficient strength to support its own weight and that of superimposed loads.
  - 2. Loads shall not be placed on newly constructed concrete structures or fill on decks until the concrete has reached its specified compression strength unless otherwise accepted by the structural engineer of record. Prime CONTRACTOR shall be the point of contact for information regarding this requirement.
  - 3. Where concrete shoring/reshoring is employed, a shoring/reshoring plan specific shall be available for review at the project site.
    - a. Deviations from the shoring/reshoring plan will require the issuance of a new shoring/reshoring plan.
    - b. The addition of superimposed loads on the floor (such as equipment and/or materials) that are not listed in the reshoring plan shall be construed as a deviation from the plan.
- D. Concrete – Pouring and Pumping Operations
  - 1. Permanent and temporary power lines shall be identified prior to the start of a concrete pour. Appropriate safeguards shall be implemented for the pumping, pouring and finishing operations.
  - 2. A project site traffic control plan shall be established for concrete truck traffic. Trained Spotters and Flaggers shall be used as necessary for public and personnel safety.
  - 3. Those involved in pouring and finishing activities shall have appropriate personal protection equipment (PPE), including gloves, mud boots, over boots, rubber boots, and eye protection.
  - 4. Concrete truck washout receptacles shall be in an area acceptable to CONSTRUCTION MANAGER and located out of vehicular and pedestrian travel areas.
  - 5. Diapers or equivalent shall be provided for the pump and concrete trucks when the truck to pump transfer occurs in a public street or other public area.
  - 6. Provide a project site logistics plan for each pump location that includes provisions for concrete truck traffic routing and control, as well as pedestrian traffic routing and control (if applicable).
- E. Coring, Cutting, Chipping, Drilling, Grinding, Profiling, and Sanding
  - 1. All areas of work are to be reviewed for possible impact to any existing conditions.
    - a. Consider what is or may be on the other side of concrete that is being cored, cut or chipped (occupied area, system piping, embedded anchors, structural member, and soil).
    - b. Consider what is or may be embedded in the concrete (conduit, reinforcing steel).
  - 2. If it is determined, there is any potential of embedded items in the concrete, a sub-surface investigation must be performed by the Prime CONTRACTOR (e.g. pacometer, ferro-scan, x-ray, and ground-penetrating radar). A twelve foot (12 ft) area on either side of the planned area shall be scanned.
  - 3. ANSI-Approved face shield and eye protection and the appropriate respiratory protection is required.
  - 4. Dry cutting, coring, chipping, drilling, grinding, profiling, and profiling of concrete or masonry is prohibited.
  - 5. Wet method or local exhaust ventilation is required to control respirable crystalline silica, dust and airborne particulates. Additional requirements can be found in section 3.38 – Silica and Dust Exposure Protection.

- F. Masonry Construction
  - 1. Masonry walls shall be braced and/or supported as required by Cal/OSHA and/or local requirements.
  - 2. Clear Zone - Unauthorized personnel shall be prohibited from entering the work area.

### 3.8 CONFINED SPACE (SEE AIR MONITORING FOR ADDITIONAL REQUIREMENTS)

- A. Prime CONTRACTOR shall submit a written Program addressing confined space entry and rescue procedure.
  - 1. Must abide by the applicable Cal/OSHA standards for all confined space entry operations and furnish all appropriate personnel, equipment, and support.
  - 2. Obtain permits required for confined space entry programs. Submit a copy to CONSTRUCTION MANAGER for record.
- B. Prime CONTRACTOR shall ensure that a Competent Person identifies all confined spaces in which their personnel may enter.
- C. All confined spaces will be treated as permit required confined space until proven otherwise by the Competent Person.
- D. Those entering must be trained in the hazards of confined space work, including operating and rescue procedures, the use of respiratory equipment, and instructions as to the hazards they may encounter.
- E. Provide all necessary entry-rescue equipment required for all entries into confined spaces (e.g. tripod, full body harness and lifeline or equivalent) as required by the applicable Standard. Wrist straps may be used in designated areas instead of full body harness.
- F. Prior to entry into a confined space, ensure all lines that may convey flammable, injurious, or incapacitating substances into the space are disconnected, blinded, or blocked off by other positive means in accordance with Lockout/Tagout (LOTO) regulations.
- G. Prior to entry into confined space, test the air with an appropriate device or method for: (1) Oxygen content, (2) Flammable gases and vapors, and (3) Potential toxic air contaminants. A written record shall be made and kept at the project site.
- H. The confined space shall be emptied, flushed, or otherwise purged of flammable or injurious substances to the extent feasible. Proper ventilation equipment is required.
- I. Whenever an atmosphere free of dangerous air contamination and/or oxygen deficiency cannot be ensured, the Prime CONTRACTOR shall provide NIOSH approved respiratory equipment to personnel who are involved in a comprehensive respiratory protection program in accordance with applicable Cal/OSHA standards.
- J. Where standby personnel are required, they must have a valid certificate in First Aid and CPR training from the American Red Cross, or equivalent training verified by documentary evidence.
- K. Visual contact or two-way radio communication must be available at all times.
- L. Must establish a means of communication with outside emergency services.
  - 1. Provide a 2-way form of communication:
    - a. from inside to outside and
    - b. outside to 911.
  - 2. This procedure must be made available to all those that enter and/or those on standby.

### 3.9 CONNECTIONS TO UTILITIES

- A. The Prime CONTRACTOR shall not, nor allow any subcontractor to make any temporary service connections to electrical, water, air or steam utilities without prior approval of CONSTRUCTION MANAGER.
- B. Temporary connections shall comply with all applicable Federal, State, and local regulations.
- C. Temporary connections shall be inspected on a regular basis.

### **3.10 CRANE PICK (CRANES, BOOM TRUCKS AND RIGGING)**

- A. A written "Lift Pick" plan for all crane picks regardless of the capacity must be submitted to CONSTRUCTION MANAGER. The following documents must be included:
  - 1. Copies of the Crane Certifications (annual and quadrennial).
  - 2. Copy of the Crane Operator's Certification.
  - 3. The name and supporting documents for qualified riggers and signal persons, which will be provided by the Prime CONTRACTOR.
  - 4. Refer to Exhibit "C.4" – "Lift Pick & Critical Lift Pick" for the form.
- B. Cranes and derricks exceeding three (3) tons rated capacity, and their accessory gear shall not be used until the employer has ascertained that such equipment has been certified as evidence by current and valid documents attesting to compliance with the following:
  - 1. Test and examinations shall be conducted annually by a currently licensed certifying agency or designee in the certifying agency license, and a certificate shall be issued by the certifying agency.
  - 2. Current annual and quadrennial inspection certificates shall be maintained on each crane.
- C. A licensed certifying agency or designee in the certifying agency license shall re-inspect any crane that is involved in any incident or is damaged during set-up or operation, and a new certificate of inspection issued prior to being returned to service.
- D. Only operators authorized by the Prime CONTRACTOR that are trained and certified in the safe operation of cranes or hoisting apparatus shall be permitted to operate such equipment.
  - 1. Operators shall have valid evidence of current Licensing or Certification in accordance with State and Local requirements.
  - 2. Operators not having such evidence shall not be permitted to operate applicable machinery.
- E. Outriggers shall be fully extended during all lifts. If geometry factors prevent fully extending the outriggers, they need to be extended as far as possible and "off the rubber" load charts limits shall be used.
- F. Picks "off the rubber" will not be permitted, regardless of load.
- G. When required by the manufacturer's or certifying agent's instructions, outriggers shall be set so that wheels or crawler tracks within the boundary of the outriggers shall be relieved of all weight by the outrigger jacks or blocking.
- H. Plates, pads or mats shall be used under the outriggers or crawlers of all cranes and shall be of suitable material and size to support the crane on the surface that it is set upon. The assembly of the plates, pads or mats shall be assembled with no air gaps.
- I. All mobile cranes having either a maximum rated boom length exceeding 200 feet or a maximum rated capacity exceeding 50 tons shall be equipped with a load indicating device or a load movement device.
- J. Any crane that meets the following, must file a Notice of Proposed Construction or Alteration (Form 7460-2) with the FAA for approval:
  - 1. Greater than 200 feet in height.

2. Within 20,000 feet of a public and/or military airport and exceeds 100:1 (H:V) in surface elevation.
- K. Cranes shall be equipped with a boom angle or a boom radius indicator and clearly legible load chart in clear view from the Operator's position.
- L. An effective, audible warning and operating signal device (such as a horn) shall be provided on the outside of the crane. The controls shall be in easy reach of the Operator.
- M. The Qualified Person shall:
1. Visually inspects the crane, derrick or hoist's controls, rigging and operating mechanism prior to the first operation of any work shift.
  2. Records daily inspections by the operator or other Qualified Person shall be maintained on the crane and must be available for review upon request.
  3. Adjustments and repairs to the crane.
  4. Where the weight of the load being handled is unknown and may approach the rated capacity, shall determine the magnitude of the load unless the crane is equipped with a load-indicating device.
- N. The Prime CONTRACTOR responsible for the hosting activity shall provide a Qualified Person to direct the lift. The Qualified Person shall see that:
1. The crane is properly leveled for the work being performed and blocked where necessary.
  2. The load is well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches.
- O. A designated person shall monitor the clearance between crane booms, load lines, and loads, and power lines and alert the Operator when necessary.
1. For power lines rated 50kV or less, minimum clearance between the lines and any part of the crane or load is 10 feet.
  2. Power lines rated over 50kV, minimum clearance between the lines and any part of the crane or load shall be at least 20 feet. If 20 feet is not achievable, the Prime CONTRACTOR shall schedule a formal meeting with CONSTRUCTION MANAGER to review clearance tables, de-energize power, and alternatives.
- P. A qualified signal person shall be provided when the point of operation is not in full and in direct view of the operator unless a signaling or control device is provided. Only one person shall be permitted to give signals to the operator.
- Q. A fire extinguisher of not less than 10-B:C rating shall be kept in serviceable condition and readily accessible to the Operator.
- R. Operations shall be conducted and the job controlled in a manner to prevent loads from being passed directly over anyone, occupied workspaces, or occupied passageways.
- S. Any personnel involved in the operation may give a "stop" signal if such a signal is warranted.
- T. A legible chart depicting and explaining the system of crane signals used shall be conspicuously posted in the vicinity of the hoisting operation.
- U. No one shall be permitted to ride on loads, hooks, or slings of any derrick, hoist, or crane.
- V. Swing radius protection shall be provided where a rotating crane is positioned to operate in areas where people may be caught between rotating parts and fixed objects or non-rotating crane components.
- W. Tag lines, restrain lines, or guide ropes shall be used on all loads except where their use presents a greater hazard. Such lines or ropes should be insulated to prevent shock, and shall not contain knots or splices that may snag on an object.

- X. Cranes, hoists, or derricks shall not be left unattended while the load is suspended.
- Y. Before leaving the crane unattended, the Operator shall:
  - 1. Land or properly secure any attached load.
  - 2. Disengage clutch (if applicable).
  - 3. Set travel, swing, boom brakes, and other locking devices unless otherwise specified by the certifying agents.
  - 4. Put controls in the "off" position.
  - 5. Stop the engine.
  - 6. Secure the crane against accidental travel.
- Z. Rigging, Slings, and Hooks
  - 1. Hoisting hooks shall be of the safety latch-type.
  - 2. Crane hooks with cracks or with deformation of throat opening more than 15% in excess of the normal opening, or more than 10-degrees twist from plane of unbent hook, shall be removed from service.
  - 3. Ropes shall be inspected for proper lubrication, excessive wear, broken strands, and proper weaving.
  - 4. Each day before use, slings and all fastening and attachments shall be inspected for damage or defects by a Qualified Person. Any wears showing deformation or damage will be permanently removed.
  - 5. "Free Rigging" (lifting from forks of forklift without manufacturers engineering attachment) will not be permitted for any reason.
  - 6. In order to determine proper time for replacement, a continuing inspection record shall be maintained for hoisting ropes. Conditions such as the following shall be reason for replacement:
    - a. In running ropes, 6 randomly distributed broken wire in one rope lay, or 3 broken wires in one strand in one lay.
    - b. Wear of 1/3 the diameter of the outside individual wires.
    - c. Kinking, crushing, bird caging, or other damage resulting in distortion of the rope structure.
    - d. In stranding ropes, more than 2 broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.
    - e. Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.
  - 7. Fixtures are usually attached to wire rope by the use of wire rope clips. The clips must be attached with the inside curve of the U-bolt against the dead, or short end of the wire rope, and flat clip (saddle) against the live, or long end of the wire rope.
  - 8. Slings shall have permanently affixed tags stating the:
    - a. Manufacturer's name or trademark.
    - b. Rated capacity.
- AA. Multiple lift shall only be performed if the following criteria are met:
  - 1. A multiple lift rigging assembly is used.
  - 2. A maximum of five members are hoisted per lift.
  - 3. Rigging procedures shall prevent hazardous contact between the structural steel members being hoisted, adjacent structures or anyone.
  - 4. Only beams and similar structural members are lifted.
  - 5. Anyone engaged in the multiple lift have been trained in these procedures in accordance with Cal/OSHA.
  - 6. No crane is permitted to be used for a multiple lift where such use is contrary to the manufacturer's specifications and limitations.
  - 7. Components of the multiple lift rigging assembly shall be specifically designed and assembled to support the maximum capacity for the total assembly and for each

individual attachment point. This capacity, certified by the manufacturer, shall be based on the manufacturer's specifications with a 5 to 1 safety factor for all components.

8. Multiple lift rigging assembly shall be rigged with members:
  - a. Attached at their center of gravity and maintained reasonably level.
  - b. Rigged from top down.
  - c. Rigged at least 7 feet apart.
  - d. The members on the multiple lift rigging assembly shall be set from the bottom up.

### 3.11 CRITICAL LIFT

- A. Lifts that exceed 75% of the rated capacity of the crane or derrick, or requires the use of more than one crane, derrick, or lifting device; or is deemed a critical lift by the OWNER or CONSTRUCTION MANAGER by reason of potential negative consequences to safety, structure, or schedule; in addition to the above requires the following:
  1. A Critical Lift Plan shall be prepared by a Qualified Person. The Qualified Person preparing the plan may be the crane operator, lift supervisor, or rigger and a copy provided to the prime CONTRACTOR(s) and CONSTRUCTION MANAGER.
    - a. The crane operator, lift supervisor, and rigger shall participate in the preparation of the plan.
    - b. The plan shall be reviewed by, and signed by, all personnel involved with the lift.
    - c. The plan shall specify the exact size and weight of the load to be lifted and all crane and rigging components that add to the weight. The manufacturer's maximum load limits for the entire range of the lift as listed in the load charts shall also be specified.
    - d. The plan shall specify the lift geometry and procedures, including the crane position, height of the lift, the load radius, and the boom length and angle, for the entire range of the lift.
    - e. The plan shall designate the crane operator, lift supervisor, and rigger, and state their qualifications.
    - f. The plan will include a rigging plan that shows the lift points and describes rigging procedures and hardware requirements.
    - g. The plan will describe the ground conditions, outrigger or crawler track requirements, and, if necessary, the design of mats necessary to achieve a level, stable foundation of sufficient bearing and capacity for the lift.
    - h. The plan will list environmental conditions under which lift operations are to be stopped.
    - i. The plan will specify coordination and communication requirements for the lift operation.
    - j. For tandem or tailing crane lifts, the plan will specify the make and model of the cranes, the line, boom and swing speeds, and requirements for an equalizer beam.
  2. Refer to Exhibit "C.4" – "Lift Pick & Critical Lift Pick" for the form.
  3. Critical lift plans shall be submitted to the CONSTRUCTION MANAGER.

### 3.12 DEMOLITION

- A. Demolition work shall at all times be under the immediate supervision of a Qualified Person with the authority to secure maximum safety for personnel engaged in demolition work.
- B. Obtain AQMD permit and forward a copy to CONSTRUCTION MANAGER.
- C. Prior to permitting and the start of demolition operations, the Qualified Person shall make a survey of the structure to determine the condition of the framing, floors, and walls, and the possibility of an unplanned collapse of any portion of the structure. Any adjacent structure where personnel may be exposed shall also be similarly checked.



1. The survey shall be in written form, kept on the project site and submitted to CONSTRUCTION MANAGER.
- D. Utility companies shall be notified and all utility services shut off, capped, or otherwise controlled, at the building or curb line before starting demolition. The Prime CONTRACTOR is responsible to verify that these actions have been taken.
1. The Prime CONTRACTOR shall develop an Emergency Call List for all known utility OWNERS prior to the start of demolition activities.
  2. A project site plan shall be marked up to show the locations of known utilities, and the nearest identified shut-off valves/controls. CONSTRUCTION MANAGER shall be provided a copy. Verify that the shut-off valves/controls are working properly prior to work beginning.
- E. Confirm existing alarm systems have been identified and taken out of service prior to commencing demolition operations. Alarm services shall be notified that the alarm will be taken out of service before taking the system out of service.
- F. Determine any type of hazardous chemicals, gases, explosives, flammable materials, or similarly dangerous substances have been used in any pipes, tanks, or other equipment on the property.
- G. When the presence of hazardous substances is apparent or suspected, Prime CONTRACTOR shall stop work and notify CONSTRUCTION MANAGER. Material such as but not limited to:
1. Pipe-covering insulation, steel beam and column fire protection, HVAC duct, VCT, plaster, acoustical tile and flooring adhesive shall be surveyed for asbestos.
  2. Paint and ceramic tile shall be surveyed for lead.
- H. During demolition, continuing inspections shall be made as the work progresses to detect hazards resulting from weakened, load burdened, or deteriorated floors or walls or loosened materials.
1. Ensure that floor load limits are not exceeded during demolition operations.
  2. Disperse demolition equipment throughout the structure and remove demolished materials to prevent excessive loads on supporting walls, floors or framing.
- I. Adequate dust control measures shall be provided during demolition, stockpiling and loading operations.
- J. Walking across exposed floor joists, steel beams, or girders is prohibited.
- K. Provide passage for others around the area of demolition. Conduct operations to prevent damage to adjacent buildings, structures, other facilities, and people.
- L. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and to adjacent facilities.
- M. Demolish concrete and masonry in sections. Use bracing and shoring to prevent collapse.

### **3.13 ELECTRICAL**

- A. Electrical work on live circuits will be only permitted by a qualified electrician. NFPA 70E arc flash requirements must be followed.
- B. All temporary power panels shall have covers installed at all times by the Prime CONTRACTOR. All circuits must be clearly labeled.
- C. Supply ground fault circuit interrupters (GFCI) for all temporary electrical wiring cords and equipment.
  1. GFCI shall be tested in accordance with manufacturer's requirements. Logs shall be maintained of all such testing.

2. GFCI with an automatic reset feature are not permitted on the project site.
  3. Assured grounding may be used in conjunction with GFCI protection but is not permitted as an alternative to GFCI protection.
  4. Provide monthly inspections.
- D. Temporary lighting shall not be suspended by its' extension/power cord.
  - E. Temporary lighting must be equipped with guards to prevent contact with the bulb.
  - F. Romex cable will not be permitted to be used as electrical cord.
  - G. Prime CONTRACTOR shall ensure that all temporary power cords are at least 12awg heavy-duty construction grade, are in good condition, and have correct voltage and amperage rating.
  - H. When feasible, all temporary power cords shall be secured above the floor to avoid trip hazards in walking and working surface areas.
  - I. Outdoor cables must be protected from damage from pedestrian and vehicle traffic.
  - J. Ground pins shall not be removed from electrical cords.
  - K. Damaged or defective tools and cords shall be removed from service.
  - L. Power tools must be double insulated or grounded properly and inspected prior to use.
  - M. Properly Lockout /Tagout (LOTO) any equipment within the Prime CONTRACTOR'S responsibility. Control of the Lockout/Tagout is also the Prime CONTRACTOR'S responsibility.
  - N. The Prime CONTRACTOR shall coordinate instances that require multi- prime CONTRACTOR Lockout/Tagout activities.

### **3.14 ELEVATING WORK PLATFORMS AND AERIAL DEVICES (E.G. BOOM-LIFT, SCISSOR-LIFT)**

- A. Only authorized and trained personnel shall operate an aerial device or elevating work platform. Training records shall be maintained on the project site for review.
- B. All aerial devices or elevating work platforms will be subject to a comprehensive inspection. Aerial or elevating work platforms will need to be inspected daily before use. Noncompliant equipment will not be permitted.
- C. Boom, basket, platform load limits specified by the manufacturer shall not be exceeded.
- D. No one shall sit or climb on the edge of the basket or platform or use planks, ladders, guardrails or other devices to gain greater height.
- E. No one shall work off of elevated work platforms or aerial devices when exposed to winds 30mph or greater.
- F. Elevating Work Platforms:
  1. An elevated work platform is a device designated to elevate a platform in a substantially vertical axis (vertical tower, Scissor Lift).
  2. The railing protection shall be 42 inches high, plus or minus 3 inches, with a mid-rail at the half-way height point. Where the guardrail is less than 39 inches high, an approved personal ANSI certified fall protection system shall be used.
  3. Powered elevating work platforms shall have both upper and lower control devices. Controls shall be plainly marked as to their function and guarded to prevent accidental operation.
  4. An emergency stopping device shall be provided at the upper controls of elevating work platforms.
- G. Aerial Device

1. An aerial device is any vehicle-mounted or self-propelled device, telescoping extendible or articulating, or both, which is primarily designed to position personnel.
2. Belting off to an adjacent pole, structure, or equipment while working from an aerial device is not permitted.
3. Lift controls shall be tested in accordance with the manufacturer's recommendations or instructions prior to use to determine that such controls are in safe working condition.
4. Aerial baskets or platforms shall not be supported by adjacent structures when personnel is on the platform or in the baskets while in an elevated position.
5. While in an elevated aerial device, personnel shall be secured to the identified anchorage point through the use of a full body harness and lanyard for fall protection.

### **3.15 EMERGENCY ACTION / EVACUATION**

- A. Prime CONTRACTOR is obligated to notify the CONSTRUCTION MANAGER and the other prime CONTRACTORS if their work activities will have an impact on the project site emergency action plan.

### **3.16 EQUIPMENT / TOOLS**

- A. Prime CONTRACTOR equipment and tools must be in proper working condition and routinely (e.g. daily or prior to use) inspected for defects and removed from use if found to be defective.
- B. Any equipment or tool found to be damaged or defective must be removed from service and repaired before it can be returned to service.
- C. Manufacturer's instructions shall be followed with respect to equipment/tool operation and training requirements.
- D. Equipment is not to be used with loads that exceed the recommended rated capacity.
- E. Prime CONTRACTOR is to use only their equipment and tools, and not those of other prime CONTRACTORS, unless they are properly trained and authorized.
- F. Tools and equipment are to be used for their designated purpose.
- G. Tools and equipment are to be used only by trained and authorized personnel.
- H. Proper guards or shields must be installed on all power tools before use. All guards must be manufactured by and/or approved by the manufacturer for that particular piece of equipment.
- I. "Wedging" or "Pegging" guards on circular saws or other equipment, rendering them non-functional, is not permitted.
- J. No internal combustion vehicle or machinery is to be operated inside a structure unless proper controls have been implemented to minimize carbon monoxide levels.
- K. Tools and equipment must be properly stored, secured and located away from unauthorized access.
- L. For pneumatic power tools, all air hoses exceeding ½ inch inside diameter shall have a safety device (commonly known as "OSHA valve" or "safety check valve") at the source of air supply or branch line origin (such as a manifold) to reduce pressure in case of hose failure.
- M. Do not lift or lower portable electric tools by means of the power cord. Use a rope or handle.

### **3.17 EXPLOSIVES**

- A. Blasting activities will be done in accordance with state, and local regulatory requirements.

- B. Blaster must have all required federal, state, and local permits. A copy of the permits shall be forwarded to the CONSTRUCTION MANAGER. The actual permit shall be present on the jobsite during blasting operations.
- C. Blaster must have a current valid California "Blaster's License" issued by Cal/OSHA. The license shall be physically present on the project site to accomplish the blasting operation and/or direct and supervise others in such operations.
- D. Prime CONTRACTOR to submit a written "Evaluation of potential rock blasting impacts and recommended practices" to CONSTRUCTION MANAGER.
- E. Prime CONTRACTOR to submit a written "Blasting plan" to CONSTRUCTION MANAGER, which would include, but may not be limited to, procedures for:
  - 1. Storage, handling, transportation, loading, and firing of explosives.
  - 2. Communication with authorities and landowners.
  - 3. Pre- and post- blast inspections.
  - 4. Mitigation controls for flying rocks, noise reduction, and misfires.
  - 5. Safety procedures (e.g. fire prevention, signs and flagmen, and warning signals).
  - 6. Mitigation of environmental impacts.
  - 7. Disposal of waste blast material.
  - 8. Blasting adjacent to existing overhead or underground utilities, roadways or trails, environmentally sensitive areas, farmlands, or areas with potential geologic hazards.
- F. No smoking, open flames or other sources of ignition within 50 feet of any area where explosive materials are being handled, except devices necessary to ignite the fuses of set charges.
- G. Empty boxes, paper and fiber packing materials which have previously contained high explosives shall not be used again for any other purpose. They shall be destroyed by burning at an isolated location outdoors, and no person shall be nearer than 100 feet after the burning has started.
- H. Tamping poles or devices shall be made of wood or plastic materials manufactured for tamping explosives.
- I. Loading shall not commence until all drilling is completed and drill holes are cleaned or blown out. When conditions justify simultaneous loading and drilling in the same area, such operations shall be separated as widely as practicable and in no case shall a drilling operation be closer than 50 feet to a hole being loaded.
- J. All drill holes shall be sufficiently large to freely admit the insertion of the explosive materials.
- K. No holes shall be loaded except those to be fired in the next round of blasting.
- L. Use only lights specifically designated to be used within 50 feet of the loading area.
- M. Loading operations shall be carried on with the smallest practical number of persons and explosive materials loading equipment present and no one but the loading crew, inspection personnel, and authorized supervisory personnel shall be allowed within 50 feet of the loading area.
- N. Holes to be blasted shall be charged as near to blasting time as practical and such holes shall be blasted as soon as possible after charging has been completed.
- O. Areas in which charged holes are awaiting firing shall be guarded or barricaded and posted or flagged against unauthorized entry.
- P. When blasting under, or near overhead power lines, all loaded holes shall be covered with a nonconductive blasting mat anchored to prevent the mat or other material from being blown into the overhead lines.

- Q. Drilling shall not be started until all remaining butts of old holes are examined for unexploded charges and if any are found, they shall be detonated or properly disposed of before other work proceeds.
- R. The licensed blaster-in-charge shall fix the time of blasting.
- S. Blasts are not to be fired until the licensed blaster-in-charge verifies the following:
1. All surplus explosive materials are in a safe place,
  2. All security personnel at the blast area are in the proper location, and
  3. All personnel are either outside of the blast area or under sufficient cover.
- T. Before adopting any system of electrical firing, the licensed blaster shall conduct a thorough survey for extraneous currents, and all dangerous currents shall be eliminated before any holes are loaded.
- U. Blasts are not to be fired without a warning signal/procedure. The signals, which may be given by a siren, air horn, whistle or other device, shall be loud enough to be heard clearly in areas that could possibly be affected by the blast or flying rock from the blast.
- V. Warning signals shall be given by the use of a compressed air whistle, a horn, lights or equivalent means, such as flaggers or voice warning and shall be clearly audible at the most distant point in the blast area. Where other than flagger or other visible method or voice warning is used, the following signals are recommended:

WARNING SIGNAL	5 minutes prior to the blast	A 1-minute series of long audible signals
BLASTING SIGNAL	1 minute prior to the blast	A series of short audible signals
ALL-CLEAR SIGNAL	Following inspection of the blast area	A prolonged audible signal

- W. The "ALL CLEAR" signal shall not be given until the licensed blaster has made a thorough, visual inspection of the blast area for misfires.
- X. Whenever blasting is being conducted in the area immediately adjacent to gas pipelines, flammable liquid gas pipelines, electric, water, fire alarm, telephone, telegraph, and steam utilities, the licensed blaster shall notify the appropriate representatives of such pipelines or utilities at least 24 hours in advance of blasting, specifying the location and intended time of such blasting. Verbal notice shall be confirmed with written notice before the blast.
- Y. After blasting, the blasting crew shall wait at least 5 minutes before returning to the point of blasting.
- Z. If any misfires are found, or suspected to exist, they shall be reported to the person in charge. Steps shall be taken to eliminate all undetonated explosive materials.
- AA. In case of a detonator misfire, the shot area shall be made safe under competent supervision by one of the following means after a 30-minute wait following electric or non-electric shock tube blasting, or a 60-minute wait following fuse cap blasting.
- BB. No other work shall be performed in the danger area except that necessary to remove the hazard of the misfire. No other personnel except the licensed blaster and the necessary crew shall be in the danger area when a misfire hazard is being removed.

### 3.18 FALL PROTECTION

- A. 100% Fall Protection shall be implemented for all fall exposures of six (6) feet or more whether moving or stationary in an unprotected elevation, and anytime where a fall could occur from a

surface that is not protected by handrails, hole-covers, guardrails or other appropriate fall elimination device.

1. The exception apply only to framers and wood frame activities:
  - a. When installing or “rolling” the joists. Cal/OSHA fall protection requirements shall govern.
  - b. When framers are walking /working on securely braced joists, rafters, or roof trusses that do not exceed 24 inches OC, and there is no more than 6ft from an unprotected side or edge.
- B. Where a fall hazard exists, efforts must be made to eliminate the hazard; provide protection against the hazard; or establish alternative methods to control/monitor the hazard.
- C. Any personnel approaching within six (6) feet of any skylight shall be protected from falling through the skylight or skylight opening.
- D. Toeboards, debris netting (e.g. snow fence), or equivalent type material, shall be used at the perimeter of structures where other operations, facilities or people could be impacted by falling debris.
- E. Rescue shall be addressed in the fall protection policies and fall protection training.
- F. Methods of fall protection include:
  1. Guardrails and toeboards.
  2. Covers for floor and roof openings, pits, trap-doors, and temporary floor openings.
  3. Personal Fall Arrest System (PFAS).
  4. Personal Fall Restraint System (PFRS).
  5. Positioning Device System.
  6. Safety Nets.
  7. Scaffold Platforms.
  8. Roof Warning Lines.
- G. The implementation of the fall protection plan shall be under the supervision of a Competent Person.
- H. Prime CONTRACTOR shall submit to CONSTRUCTION MANAGER a project site specific written fall protection plan prepared by a Qualified Person and developed specifically for work activities exceeding six (6) feet in elevation requiring fall protection. The fall protection plan must be signed by the Prime CONTRACTOR’S:
  1. Qualified Person who created the plan
  2. Competent Person supervising operations covered by the plan
  3. Prime CONTRACTOR’S Project Manager
  4. Prime CONTRACTOR’S Project Foreman/Supervisor
- I. Submit to CONSTRUCTION MANAGER documentation of training on Personal Fall Arrest System (e.g. harness, lanyard, anchor point) if anyone will be utilizing a body harness.
- J. Each personal fall arrest system shall be inspected by a Competent Person in accordance with the manufacturer’s recommendations. The date of each inspection shall be documented.
- K. Personal Fall Arrest Systems (PFAS) shall limit the fall distances to a maximum of six (6) feet and prohibit personnel from contacting a lower level or structure element.
- L. The only type of body restraint system allowed is full body harness with a lifeline, lanyard, and deceleration device. Safety belts or body belts are not permitted for fall arrest.
- M. All personal fall arrest, personal fall restraint and positioning device systems shall be labeled as meeting the requirements contained in ANSI A10.14-1991.
- N. Where practical, the anchor end of the lanyard shall be secured at a level not lower than personnel’s waist.

- O. Lifeline and anchorages shall be capable of supporting a minimum dead weight of 5,000 pounds.
- P. Lanyards and vertical lifelines shall have a minimum breaking strength of 5,000 pounds.
- Q. Anchorages used for attachment of personal fall arrest equipment:
  - 1. Shall be independent of any anchorage being used to support or suspend platforms.
  - 2. Capable of supporting at least 5,000 pounds per person or part of a complete personal fall protection system used under the supervision of a Qualified Person that maintains a safety factor of at least two (2).
- R. The use of non-locking snap hooks is prohibited.

### **3.19 FIRE PROTECTION AND PREVENTION**

- A. Each Prime CONTRACTOR is responsible for conducting a monthly inspection of their fire extinguishers to ensure they have not been damaged, discharged or gone missing.
- B. Portable fire extinguishers.
  - 1. Shall be fully charged, inspected monthly, serviced annually and have inspection tag.
  - 2. Fire extinguishers rated not less than 10B (e.g. 2A:10BC), shall be provided within 50 feet of any area where more than 5 gallons of flammable or combustible liquids are stored.
  - 3. Fire extinguisher rated at least 10-B:C, shall be kept near operations where fuel gas cylinders/bottles are being used.
  - 4. Fire extinguishers shall be readily available for use where temporary heating devices are used.
- C. Storage of more than 25 gallons of flammable liquids or 60 gallons of combustible liquids shall be in a NFPA approved storage cabinet. Not more than 120 gallons of Class I, II, or IIIA liquids may be stored in a storage cabinet.
- D. "No Smoking" signs shall be posted as required by operations or material exposures.

### **3.20 FLAMMABLES AND COMBUSTIBLES**

- A. Prime CONTRACTOR is required to supply fire extinguishers, fire blankets, and other sufficient fire protection devices for the immediate work area where flammable and combustible material is stored or used. All fire extinguishers must be provided by each Prime CONTRACTOR and rated at least a minimum of 2A:20B-C. (For additional information, refer to Fire Protection and Prevention section).
- B. Any supplied flammable liquids must be stored in FM approved or UL listed safety containers.
  - 1. All containers must be properly labeled and stored when not in use.
  - 2. Only FM approved or UL listed, or DOT metal safety cans will be allowed for flammable storage. (NO PLASTIC FUEL CANS).
- C. Prime CONTRACTOR shall identify non-compatible materials in advance and provide for separate storage as required.
- D. All outside storage areas must be at least 20 feet from any building.
- E. For roof work:
  - 1. No more than a one-day supply of flammables may be placed on the roof during working hours.
  - 2. All flammables must be removed from the roof at the end of each workday by the Prime CONTRACTOR.

- 3. At least two (2) fire extinguishers appropriate for the type and quantity of flammable materials present must be provided if flammables are present.
- F. Any supplied flammable and combustible materials must be kept away from sparks, heaters, and any other heat source.
- G. Empty containers of flammable and hazardous materials shall be removed from the project site as soon as possible.
- H. No smoking signs shall be posted at flammable and/or combustible storage cabinets and/or area.

### **3.21 FLOOR, ROOF, AND WALL OPENINGS**

- A. Prime CONTRACTOR shall be responsible for covering floor, roof and wall openings it has created.
  - 1. Covers must be able to support at least 400 pounds or twice the weight of the anticipated load.
  - 2. Cover must be secured to prevent accidental removal or displacement. Cover must extend no less than 12 inches from the sides of the opening.
  - 3. Must be labeled "Hole" or "Cover".

### **3.22 FORKLIFTS (INDUSTRIAL TRUCKS AND TRACTORS)**

- A. Only drivers authorized by the Prime CONTRACTOR and trained in the safe operations of industrial trucks shall be permitted to operate forklifts.
- B. Operator training and posting of information regarding forklift operations shall be in accordance with applicable Cal/OSHA Standards.
- C. Prime CONTRACTOR shall certify that each Operator has been trained and evaluated. Training records (Operator cards) must be available for review at all times for the piece of equipment they are operating.
- D. All forklifts and industrial trucks and tractors shall be equipped with an audible back-up alarm which can be clearly heard from a distance of 200 feet. In congested areas or areas with high ambient noise which obscures the audible alarm, a signal person in clear view of the operator shall direct the backing operation.
- E. Every industrial truck and tractor shall be equipped with operable brakes, a parking brake, and a horn.
- F. The rated capacity of all industrial trucks and industrial tractors shall be displayed at all times on the vehicle in such a manner that it is readily visible to the Operator.
- G. Forklifts (Industrial Trucks and Tractors) shall not be loaded in excess of their rated capacity.
- H. Seat belts shall be provided and worn on industrial trucks and tractors where rollover protection is installed and Operator shall be instructed in their use.
- I. No riders shall be permitted on vehicles unless the vehicles are equipped with adequate riding facilities.
- J. No one shall ride on or be elevated on the forks of lift trucks.
- K. Industrial trucks may be used to elevate personnel in accordance with applicable Cal/OSHA Standards and manufacturer's recommendations using appropriate personnel platforms.
- L. No one shall be allowed to stand, pass, or work under the elevated portion of an industrial truck, loaded or empty.



- M. Operators shall check the vehicle at least once per shift. Attention shall be given to tires, horn, lights, battery, controller, brakes, steering mechanism, cooling system, and the lift system (forks, chains, cable and limit switches).
- N. Operators shall not exceed the authorized or safe speed, always maintain a safe distance from other vehicles, keeping the truck under positive control at all times.
- O. Operators shall slow down and sound the horn at cross aisles and other locations where vision is obstructed.
- P. Grades shall be ascended or descended slowly.
- Q. The forks shall always be carried as low as possible, consistent with safe operation.
- R. When leaving a vehicle unattended, the power shall be shut off, brakes set, the mast brought to the vertical position, and forks left in the down position.
- S. "Free Rigging" is not permitted. If loads are to be suspended from the forklift, it must be with the appropriate manufacturers approved attachment.

### **3.23 HAZARD COMMUNICATION/GLOBALLY HARMONIZED SYSTEM (GHS) PROGRAM**

- A. Prime CONTRACTOR shall maintain a copy of all Safety Data Sheets (SDS), chemical inventory list for all hazardous substances used at the project site by their firm, as well as all hazardous substances used at the project site by all subcontractors.
- B. In accordance with the provisions of the Hazard Communication / GHS standard, Prime CONTRACTOR must have a comprehensive written Hazard Communication Program which includes:
  - 1. A list of hazardous substances known to be on the project site.
  - 2. Methods the Prime CONTRACTOR will use to inform personnel of the hazards of non-routine tasks.
  - 3. The program shall include methods the Prime CONTRACTOR will use to inform other prime CONTRACTOR(s) of any precautionary measures.
  - 4. The methods used to provide other prime CONTRACTOR(s) with access to Safety Data Sheets (SDS).
  - 5. The methods the Prime CONTRACTOR will use to inform the other prime CONTRACTOR(s) of the labeling system in use.
- C. Prime CONTRACTOR must submit a copy to CONSTRUCTION MANAGER prior to work starting:
  - 1. The Hazard Communication / GHS Program.
  - 2. Safety Data Sheets (SDS) for any hazardous substances that will be used on the job site.
- D. Prime CONTRACTOR must have a binder which contains the following items:
  - 1. A comprehensive written Hazard Communication / GHS Policy.
  - 2. A chemical inventory listing all hazardous materials brought onto or used on the project site by the Prime CONTRACTOR.
  - 3. Safety Data Sheets (SDS) for all hazardous materials used on the project site.
- E. Prime CONTRACTOR shall ensure their personnel have received training in the safe use of hazardous materials; and are able to read and understand the information on Safety Data Sheets (SDS). The training shall include at least:
  - 1. Methods and observations that may be used to detect the presence or release of a hazardous chemical.
  - 2. The physical and health hazards of the chemicals used in the work area.
  - 3. Measures personnel can take to protect themselves from the hazards.

4. Details of the Hazard Communication Program, including the labeling systems and the use of SDS.
- F. Prime CONTRACTOR shall ensure that all containers used on the project site are properly labeled as to their contents, including gas and diesel containers.

### **3.24 HAZARDOUS MATERIALS, TOXIC SUBSTANCES AND ENVIRONMENTAL CONTROLS**

- A. Prime CONTRACTOR is responsible for the generation, management, and proper disposal of any hazardous material, toxic substances, or any related materials or substances, as defined or included in the definition of "hazardous material" under any applicable Federal, State, or Local Law, Regulation or Ordinance.
- B. Prime CONTRACTOR agrees to notify CONSTRUCTION MANAGER within 72 hours for approval:
  1. Delivery of any large quantities (more than 55 gallons) of gasoline, diesel fuels and any solvent onto the project site.
  2. Approval to bring hazardous wastes on the project site or generate hazardous waste.
  3. Using any chemical or material creating noxious or toxic fumes.
  4. Such request may or may not be granted.
- C. Prime CONTRACTOR using any hazardous material or toxic substance shall notify all other prime CONTRACTORS on the project site of their use, and what measures should be taken to prevent exposure.
- D. All incidents involving exposures to or releases of potentially hazardous substances must be reported immediately, verbally, and followed in writing within 24 hours to CONSTRUCTION MANAGER.
- E. Spills of hazardous materials (including cutting oil, fuel, solvents, and antifreeze) must be reported immediately to the appropriate regulatory agencies and to CONSTRUCTION MANAGER. The creating prime CONTRACTOR responsible for the spill is responsible for cleanup costs.
- F. The creating prime CONTRACTOR is responsible for proper disposal of its hazardous wastes. A copy of the completed Uniform Hazardous Waste Manifest must be provided to CONSTRUCTION MANAGER.
- G. Cutting equipment must have secondary containment (e.g. drip pans, sandboxes).
- H. All containers:
  1. Drums, jugs and other containers must have secondary containment.
  2. Must be maintained in good condition and must be appropriate for the materials to be stored in them.
  3. All containers must be labeled with their contents and precautions for use.
  4. Hazardous waste containers must be labeled "Hazardous Waste" in addition to listing their contents on the label.
- I. Weekly inspection of the project site must be performed by each prime CONTRACTOR to assure compliance with this section.
- J. Gasoline shall not be used for cleaning purposes.

### **3.25 HEATERS – PORTABLE HEATERS**

- A. All heaters must be Factory Mutual and/or Underwriters Laboratory approved.
- B. The Prime CONTRACTOR must notify CONSTRUCTION MANAGER when liquid/gas fueled heaters brought onto the project site prior to use.

- C. Tent heater use requirements:
  - 1. Use only in tents made of fire resistant material.
  - 2. Avoid contact with heating elements or other hot parts.
  - 3. Keep flammable materials and clothing away from hot equipment.
  - 4. Never use heaters in a utility hole or in a tent that covers a utility hole.
  - 5. Ensure adequate ventilation is provided when using a tent.
  - 6. Secure a fire extinguisher within the tent in an accessible location.

### **3.26 HEAVY EQUIPMENT / MATERIAL HANDLING AND EARTHMOVING EQUIPMENT**

- A. Equipment shall be maintained in good working order. All vital parts such as motors, chassis, blades, blade holders, tracks, drivers, hydraulic and pneumatic mechanisms, and transmissions must be inspected each day.
- B. Drivers must be specifically trained to operate the mobile equipment they intend to use. All Operators must follow manufacturers' operating and safety instructions. Training records must be available at the project site for review.
- C. Whenever visibility conditions warrant additional light, all vehicles, or combination of vehicles, in use shall be equipped with at least two (2) headlights and two (2) taillights in operable condition.
- D. All vehicles, or combination of vehicles, shall have brake lights in operable condition.
- E. All vehicles shall be equipped with an adequate audible warning device (horn) at the Operator's station.
- F. All vehicles and equipment must have a back-up alarm that is normally audible for a distance of 200 feet.
  - 1. In congested areas or areas with high ambient noise which obscures the audible alarm, a signal person in clear view of the operator shall direct the backing operation.
- G. All vehicles with cabs shall be equipped with windshields and powered wipers.
- H. Vehicles operating in areas or conditions that cause fogging or frosting of windshields shall be equipped with operable defogging or defrosting devices.
- I. Cracked or broken windshields shall be promptly replaced.
- J. Windshields and mirrors shall be kept clean such that vision is not compromised or obstructed.
- K. Seatbelts shall be provided and worn with the approved proper anchorage points.
- L. Trucks with dump bodies shall be equipped with positive means of support, permanently attached, to prevent accidental lowering of the body while maintenance or inspection work is being done.
- M. Operating levers controlling hoisting or dumping devices on haulage bodies shall be equipped with a latch or other device that will prevent accidental starting or tripping of the mechanism.
- N. Trip handles for tailgates of dump trucks shall be so arranged that, in dumping, the Operator will be in the clear.
- O. All rubber-tired motor vehicle equipment shall be equipped with fenders.
  - 1. All vehicles in use shall be checked at the beginning of each shift for defects in:
  - 2. Service brakes, trailer brake connections, parking brake system, and emergency stopping systems (brakes).
  - 3. Tires, horn, steering mechanism, seat belts, operating controls and safety devices.
- P. Lights, reflectors, windshield wipers, defrosters, and fire extinguishers.
- Q. Before starting a job, the Operator shall be given instructions regarding the work to be done.

- R. Before starting the motor, the Operator shall check to make sure that all operating controls are in the neutral position.
- S. Before starting the equipment, or moving the equipment after re-entering the cab, the Operator shall walk entirely around the equipment to make sure no other personnel, equipment or material will be struck.
- T. Prime CONTRACTOR shall ensure that Operators of heavy equipment wear appropriate hearing protection devices when exposed to noise over 90dB.
- U. At no time shall a piece of equipment be left unattended while the motor is running, especially if the machine is on an inclined surface or on loose material.
- V. Block or chock wheels when parking on inclines.
- W. Machines shall be operated at speeds and in a manner consistent with conditions on the project site.
- X. No one other than the Operator shall ride on equipment.
- Y. During refueling operations equipment motors shall be turned off. Smoking is prohibited during refueling.
- Z. If possible, equipment shall be driven entirely off the roadway at night.
- AA. Unattended equipment must be left in a secure area not accessible to members of the public or unauthorized third parties. Keys shall be removed from unattended equipment.
- BB. Spotters and/or Flaggers must be used when equipment Operator's view is obstructed whether moving forward or backward.

### **3.27 HORIZONTAL BORING / PIPE JACKING**

- A. Prior to boring/jacking operations the Prime CONTRACTOR must contact DIG ALERT to ensure all OWNERS of underground facilities in the area are notified to mark their utility locations.
- B. The Prime CONTRACTOR shall locate all buried utilities (Pot hole) before commencing boring/jacking operations. No mechanical devices may be used to Pot hole. Hand dig only.
- C. Open a guide hole (bore slot) over any existing utility that is in line with the bore shot.
- D. Excavate bore slot, bell hole and guide holes as necessary.
- E. If resistance is encountered during the boring/jacking operation, cease the boring operation immediately and excavate at the point of resistance to determine necessary action.
- F. The Operator must be trained in the use of the boring/jacking machine.
- G. At least two people must operate the bore motor at all times.
- H. Stay clear of rotating bore pipe and the rotating head of boring machine. Loose clothing, long hair, or gloves can cause injury if caught in rotating bore pipe.
- I. Only one person shall transmit signals to the Operator.
- J. Do not hold rotating bore pipe with hands or feet.
- K. Operate the boring machine only at slow RPM's when connecting or disconnecting bore pipe.

### **3.28 HOUSEKEEPING**

- A. Prime CONTRACTOR shall perform their work so as to maintain the project site in a clean, safe and orderly condition.

- B. Prime CONTRACTOR is responsible for clean-up and removal of their debris, excess material, trash, waste, and tools on a daily basis. All work areas shall be kept clean at all times. If Prime CONTRACTOR fails to perform this function, CONSTRUCTION MANAGER reserves the right to charge the Prime CONTRACTOR for clean-up performed on their behalf by others.
- C. All construction materials must be stored in an orderly manner.
- D. All exits and access ways must be kept unobstructed.
- E. Emergency exits must be available. Panic hardware, where present, must remain unobstructed.
- F. All work areas must be cleaned and free of debris.
- G. Puncture hazards (e.g. nails, staples, and fasteners) created by stripped formwork, scrap lumber, pallets, and shipping materials shall be eliminated or controlled.
- H. Metal containers with covers must be provided for disposal of oily and paint soaked rags.
- I. Walkways and sidewalks must be kept free of construction materials, debris, dirt, tools and extension cords.
- J. Where steel plates are used to bridge excavations or other similar type of construction activities in walkways or sidewalks, the leading edges of the steel plates must be tapered or feathered with temporary asphalt or other suitable materials to prevent trip hazards.
- K. Rubbish and construction debris bins must be structurally sound and designed for lifting. Bins should not be filled above their top edge and should be covered during lifting to prevent material falling out.
- L. Empty containers of flammable and hazardous materials shall be removed from the project site as soon as possible.
- M. Dry sweeping or dry brushing where such activities could contribute to exposure to respirable crystalline silica is not permitted. Wet sweeping, HEPA-filtered vacuuming or other method(s) to minimize exposure are required.

### **3.29 IMPALEMENT PROTECTION**

- A. Prime CONTRACTOR shall be responsible for protecting all impalement hazards (e.g. form stakes, rebar, and EMT) it has created by complying with Cal/OSHA standards for protecting impalement hazards (e.g. approved Cal/OSHA cap).
- B. Personnel exposed to protruding reinforcing steel or other similar projections, shall be protected against impalement hazard by guarding all exposed ends that extend up to six (6) feet with protective covers, or troughs.

### **3.30 LADDERS**

- A. Type II (Medium-Duty – 225 lbs. working load) and Type III (Light-Duty – 200 lbs. working load) ladders are prohibited.
- B. The Prime CONTRACTOR shall provide a training program for ladder use and stairways, as necessary. The program shall enable personnel to recognize hazards related to ladders and stairways, and the procedures to be followed to minimize these hazards.
- C. A Qualified Person shall inspect as frequently and after any occurrence that could affect their safe use.
- D. Broken or defective ladders must be immediately removed from service.

- E. Personnel must maintain 3-point contact while ascending or descending a ladder.
- F. Job-made ladders shall not be permitted unless they meet the requirements of the Cal/OSHA Standards.
- G. All types of ladders must be inspected at least daily for:
  - 1. Cracks, splits, splinters, and decay.
  - 2. Protruding nails and loose rivets.
  - 3. Loose, bent or broken braces, tie rods, guide irons, locks, pulleys and strand hooks.
  - 4. Broken, worn or defective spurs and pads.
- H. Extension Ladders.
  - 1. Portable ladder feet shall be placed on a substantial base.
  - 2. Straight and extension ladders must be tied-off or secured to prevent displacement.
  - 3. No metal ladders are permitted.
  - 4. No more than one person is allowed on a ladder.
  - 5. Ladders are not to be used for skids, braces, workbenches, or any other purpose other than climbing.
  - 6. All straight and extension ladders must be equipped with nonskid safety feet.
  - 7. Ladders must extend no less than 36 inches above the landing.
  - 8. Ladders shall be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is about one-quarter of the working length of the ladder (4:1).
- I. Step Ladders.
  - 1. Step ladders must be fully open and the spreader set in the open and locked position.
  - 2. Do not climb, stand or sit on the top two rungs.
  - 3. Do not lean a step ladder against a wall or other object in the unopened position.
  - 4. Always ascend and descend facing the ladder.
  - 5. Do not exceed the designated weight capacity.

### **3.31 LEAD ABATEMENT**

- A. The OWNER shall identify any Lead Based Paint (LBP) within the proposed scope of work prior to any construction, remodeling, or demolition activities.
- B. The OWNER shall identify any sheet lead, such as in laboratories and x-ray facilities prior to commencing demolition or construction activities.
- C. The OWNER shall arrange for disposal of the hazardous waste stream (e.g. paint chips), through a waste disposal facility with a current California TSDF permit and obtain the EPA Hazardous Waste Generator Identification number.
- D. Personnel who performs lead abatement work shall have a current training certification by a California accredited lead trainer. The overseer of the work is the "Supervisor" as required by Cal/OSHA.
- E. All lead abatement and removal work must follow applicable regulations of Cal/OSHA, the Environmental Protection Agency (EPA), state, federal and local requirements.
- F. Prime CONTRACTOR must submit a copy of the "Lead-work pre-job notification" to Cal/OSHA and CONSTRUCTION MANAGER at least 24 hours before conducting lead-related work.
- G. Supervisor must conduct frequent and regular inspections of the project site, regulated areas, materials, and equipment.

### **3.32 LIQUIDS – CORROSIVE ACIDS AND CAUSTICS**

- A. Prime CONTRACTOR shall not store, handle, apply or use acids or caustics until a proper procedure, per OSHA standards, has been established.
- B. Never add water to acid – if dilution is needed, add acid to water.
- C. Prime CONTRACTOR using acids or caustic materials shall have an emergency eyewash and/or shower facility immediately available to personnel working with these types of materials.
- D. Proper personal protection must include a face shield, apron, and gloves as well as any other equipment deemed necessary by the SDS or manufacturer's usage instruction.

### **3.33 LOCKOUT/TAGOUT (LOTO)**

- A. The Prime CONTRACTOR must have a written Lockout/Tagout (LOTO) program for the control of hazardous energy that meets or exceeds the Cal/OSHA Standards and a copy submitted to the CONSTRUCTION MANAGER.
- B. Equipment, energized systems, and pressurized systems shall be completely de-energized before beginning the Lockout/Tagout procedure and subsequent cleaning, servicing, or adjusting.
- C. Moveable parts shall be mechanically blocked or locked out prior to cleaning, servicing, or adjusting operations.
- D. Equipment that has lockable controls or that is readily adaptable to lockable controls shall be locked out or positively sealed in the "off" position.
- E. Accident prevention signs or tags shall be placed on the controls of equipment, machines, and prime movers during repair work.
- F. All prime CONTRACTORS must affix their own lock/tag.
- G. Locks and tags must be removed at the end of the job by the originator. Never remove another person's tag or lock to operate a switch, valve, or device.

### **3.34 MOTOR VEHICLES**

- A. Those driving project site motor vehicles shall have a valid driver's license for the state in which he or she resides and for the class vehicle driven.
- B. Drivers of vehicles over 26,000 pounds GVW are required by Federal and State Departments of Transportation regulations to possess a Commercial Driver's License (CDL).
- C. Drivers must be specifically trained to operate the mobile equipment they intend to use. Training records must be available at the project site for review.
- D. Drivers on the project site shall obey all street and highway speed and traffic laws.
- E. Drivers shall check the mechanical condition of their vehicles at least daily.
- F. Only if necessary, will a motor vehicle be left running and operator must maintain constant visual contact within 25 feet of the vehicle.
- G. Drivers are required to observe the "right-of-way" rule. Yield to other drivers whose driving actions demand the right-of-way.
- H. Drive defensively. Anticipate what the other driver may do. Leave yourself an out.
- I. Drivers shall keep a distance of AT LEAST one vehicle length for each 10 miles of speed between their vehicle and the vehicle in front of them.
- J. Seat belts shall be worn anytime when driving or riding in project vehicle.

- K. Block or chock vehicle wheels when parking on inclines.
- L. All passengers in motor vehicles must be seated and within the confines of the vehicle.
- M. No one is permitted to ride in the open bed of a pick-up truck.
- N. Unauthorized passengers shall not be transported in any vehicle or on any equipment at any time.
- O. The project site speed limit is 5 mph. Obey all traffic signs.
- P. Pedestrians have the right-of-way.
- Q. Parking shall be in specified areas only. Do not block entrances and do not park in reserved spaces.
- R. The Prime CONTRACTOR is responsible for the stability of any material being hauled.

### **3.35 OVERHEAD UTILITIES**

- A. Prime CONTRACTOR shall identify all overhead utilities prior to the start of any work.
- B. For power lines rated 50kV or less, minimum clearance around the lines is 10 feet.
- C. For power lines rated over 50kV, minimum clearance around the lines shall be at least 20 feet. If 20 feet is not achievable, the Prime CONTRACTOR will schedule a formal meeting with CONSTRUCTION MANAGER to review clearance tables, de-energize power, and other alternatives.

### **3.36 PILE DRIVING**

- A. Prime CONTRACTOR will designate a danger zone that will clearly delineate around the operating hammer where personnel involved in cutting, chipping or welding operations shall be prohibited so as to protect them from the hazards of falling objects.
- B. The danger zone shall be maintained under the supervision of a Competent Person.
- C. A blocking device or other effective means capable of safely supporting the weight of the hammer shall be provided to secure the hammer in the leads and shall be used at all times when any personnel is working under the hammer.
- D. Access to Pile Leads
  - 1. Leads shall be provided with a continuous ladder or horizontal bracing that is uniformly spaced at intervals no greater than 18 inches and the leads shall be equipped with adequate anchorages, so that personnel may engage a personal fall protection system to the leads.
  - 2. The operator of the equipment will apply all brakes and necessary safety switches to prevent uncontrolled motion of the equipment before personnel may access the leads.
- E. Sheet pile access
  - 1. If personnel are required to go aloft on sheet piling, personnel shall use an aerial device or ladder.
  - 2. Sheet piling shall be firmly stabilized before personnel are permitted to work on them.
  - 3. Stirrups shall be provided for use by personnel who must take a position on sheet piles.
- F. Where work is to be performed, walkways at least 20 inches in width shall be provided across piles or other open work with the exception of those piles on which the driver is standing.
- G. Before any type of pile is placed in position for driving, the pile head must be cut square to the driving head and free of concrete spall, steel fragments, or other debris.



- H. Pile hammer requirements
  - 1. The pile hammer, clamp, power unit and supply hoses shall be inspected in accordance with their manufacturer's recommendations. Associated equipment such as the couplings, support and lifting equipment, rigging and retaining bolts shall be inspected before each shift and periodically during use.
  - 2. Driving heads shall be kept aligned with the pile and pile hammer as a pile is driven
- I. Vibratory pile hammer
  - 1. When driving with a crane-suspended vibratory pile hammer, the person operating the remote on/off clamp switch shall be in direct visual contact with the signal person.
- J. Pile Driving Rig Stability.
  - 1. Guys, outriggers, thrustouts, or counter-balances shall be provided as necessary to maintain stability of pile driver rigs.
  - 2. Hammers shall be lowered to the bottom of the leads while the pile driver is being moved (traveling).
  - 3. All personnel shall be kept clear when piling is being hoisted into the leads.
- K. When driving jacked piles, all access pits shall be provided with ladders and bulk-headed curbs to prevent material from falling into the pit.
- L. Hoisting of piling shall be done by hooks provided with a means to prevent accidental disengagement or a shackle shall be used in place of a hook.
- M. Taglines shall be used for controlling unguided piles and free hanging (flying) hammers.

### **3.37 POWDER-ACTUATED TOOLS**

- A. Only trained and Qualified personnel holding a valid operator's card can use a powder-actuated tool.
- B. Powder-actuated tools must meet or exceed the requirements of ANSI A10-3.1977.
- C. Containers for powder-actuated tools must be lockable and bear the label 'Powder-Actuated Tool' on the outside. The container must be kept under lock and key storage.
- D. The following must be provided with each tool:
  - 1. Operating and service manuals.
  - 2. Power load chart.
  - 3. Inspection-Service record.
  - 4. Repair and servicing tools.
- E. Eye and/or face protection is required for Operators and assistants.
- F. Tools must be inspected prior to use. Defective tools must not be used.
- G. Powder-actuated tools must be unloaded if work is interrupted. Tools must not be loaded until ready for use.
- H. Powder-actuated tools must not be left unattended.
- I. On misfire, the tool must be held in place for 30 seconds.
- J. Misfire shall be placed in a designated can of water. Used and misfired cartridges shall be properly disposed.
- K. Different power loads must be kept in separate compartments.
- L. Warning signs must be posted bearing the words: "Powder-Actuated tools in use" within 50 feet of the point of use.

### **3.38 PRECAST, PRE-FABRICATED CONCRETE CONSTRUCTION, TILT-UP, PANELS**

- A. An erection plan, addenda, and procedure shall be prepared by or under the direction of a professional engineer registered in California.
- B. The erection plan, addenda, and procedures shall be available at the jobsite and submitted to the CONSTRUCTION MANAGER.
- C. Inspections shall be made by the professional engineer, or authorized representative, during the course of erection.
- D. Proposed field modifications shall be approved by the professional engineer.
- E. No personnel shall be directly under the load
- F. Only personnel essential to the operation are permitted in the fall zone (but not directly under the load).
- G. Wall panels shall be supported to prevent overturning, toppling and/or collapse until permanent connections are completed as specified in the erection plan
- H. Panels shall be properly braced to resist wind and lateral forces.

### **3.39 RESPIRATORY PROTECTION**

- A. Prime CONTRACTOR shall prepare a written Respiratory Protection Program for protection of those who will be wearing a respirator and submit a copy to the CONSTRUCTION MANAGER.

### **3.40 SCAFFOLD**

- A. Prime CONTRACTOR shall have a written program addressing scaffold procedures for safe erection, use and dismantling of scaffold system.
- B. Scaffolds shall be erected, moved, or dismantled or altered only under the supervision and direction of a Competent Person qualified in scaffold erection, moving, dismantling or alteration.
- C. Prime CONTRACTOR'S designated Competent Person shall:
  - 1. Determine the feasibility and safety of providing fall protection for personnel erecting or dismantling supported scaffolds. Fall protection is required for personnel erecting or dismantling supported scaffolds where the installation and use of such protection is feasible and does not create a greater hazard.
  - 2. Inspect their scaffold prior to use each day.
  - 3. Have at each access point (e.g. ladder, stair tower), a "green" inspection tag. This tag shall also be signed by the Competent Person daily, prior to use, as verification of their inspection.
- D. Personnel involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold shall be trained by a Qualified Person to recognize any hazards associated with the work in question. The training shall include the following topics, as applicable:
  - 1. The nature of any electrical hazards, fall hazards, and falling object hazards in the work area.
  - 2. The correct procedures for dealing with electrical hazards.
  - 3. The correct procedures for erecting, maintaining, and dismantling the fall protection and falling object protection systems being used.
  - 4. The proper use of the scaffold, including the proper handling of materials on the scaffold.
  - 5. The maximum intended load and the load-carrying capacities of the scaffold.
  - 6. Any other pertinent procedures or safety requirements.

- E. Handrails, midrails and toe boards are required on all scaffold over six (6) feet high. If the guardrail system is incomplete or missing, personal fall protection is required.
- F. Untagged scaffolds shall not be used.
- G. Scaffolding material must not be damaged and planks must be free of defects, damage or debris. Painted planks will not be permitted.
- H. Scaffold planks must be laid tight and secured to prevent movement. Planks must overlap between 6 and 12 inches over the scaffold supports.
- I. Scaffolds must be erected level on a firm base. When the scaffold is resting on earth or other such material, the uprights shall rest on and be secured to the equivalent of a 2-inch by 10-inch by 10-inch (2" x 10" x 10") wood base. Base plate shall be nailed in accordance with CAL/OSHA standards.
- J. Ties should provide tension, as well as compression and sway support
  - 1. Use no less than #12 wire, double looped or #10 wire, single wrapped.
- K. A screw jack must extend at least 1/3 of its length into the leg tube, and the exposed thread must not exceed 12 inches on any rolling scaffold.
- L. Use horizontal diagonal bracing as close to the bottom as possible and at 20-ft intervals from the rolling surface.
- M. A stair-tower or built-in stair/ladder system shall be provided for access to all scaffolds four (4) frames or more in height.
- N. Personnel may ride on rolling scaffold moved by others below if the following exist:
  - 1. The floor or surface is within 3 degrees of level, and free from pits holes, or obstructions.
  - 2. The minimum dimensions of the scaffold base, when ready for rolling, is at least ½ of the height. Outriggers, if used, shall be installed on both sides of staging.
  - 3. The wheels are equipped with rubber or similar resilient tires.
  - 4. The manual force used to move the scaffold shall be applied as close to the base as practical, but not more than 5 feet (1.5 meters) above the supporting surface of the scaffold.
  - 5. Before a scaffold is moved, personnel on the scaffold shall be made aware of the move.
  - 6. No one shall be on any part of the scaffold which extends outward beyond the wheels, casters, or other support.
- O. No surfing or self-propelling mobile scaffolding will be permitted without a submitted Prime CONTRACTOR'S "surfing scaffold" program.
- P. Wheels must be locked on rolling scaffolds before use.
- Q. All connections, including casters, on rolling scaffolds shall be pinned.
- R. The Prime CONTRACTOR must keep the platform load within the safe platform work load limit.
- S. In the event the height-to-base ratio exceeds 3:1, the system must be secured to the structure. The system shall be tied at the ends and inside of the system at 26ft vertical intervals and 30ft horizontal intervals. The top work level shall be tied.
  - 1. Exception: When the frame width is 3ft wide, tie off is at 20ft vertical intervals.
- T. Suspended scaffolds that are in service shall be inspected by a Competent Person daily and tested as frequently as is necessary in order to provide proper maintenance.
- U. Suspended scaffolds must have adequate anchorage points. Those on the scaffold shall have a full body harness, lifeline and deceleration device that must be attached to a separate anchorage point other than that of the scaffold before stepping out onto any suspended scaffold.

**3.41 SILICA AND DUST EXPOSURE PROTECTION**

- A. Prime CONTRACTOR shall submit to CONSTRUCTION MANAGER a written Respirable Crystalline Silica Program.
- B. Prime CONTRACTOR shall fully and properly implement the engineering controls (e.g. integrated water delivery system that supplies water to cutting surface, or commercially available shroud or cowl with HEPA-filter dust collection system), work practices, and respiratory protection to reduce and maintain exposure to respirable crystalline silica and/or dust to or below the PEL.
- C. During operations in which hand tools, powered tools or equipment are used to cut, core, chip, drill, grind, profile, or sand and creates respirable crystalline silica and/or dust; a dust reduction system shall be applied to effectively reduce those particulates.
- D. Procedures shall be implemented to ensure that dust reduction systems maintain their effectiveness for dust reduction throughout the work shift.
- E. Dust reduction systems shall be installed, operated, and maintained in accordance with manufacturer's recommendations.
- F. Dry sweeping or dry brushing where such activities could contribute to exposure to respirable crystalline silica is not permitted. Wet sweeping, HEPA-filtered vacuuming or other method(s) to minimize exposure are required.
- G. The Competent Person must make frequent and regular inspections of the project site, materials, and equipment to implement the written exposure control plan.

**3.42 STEEL ERECTION**

- A. No building, structure, or part thereof, or any temporary support shall be loaded in excess of its design capacity.
- B. Trusses and beams shall be braced laterally and progressively during construction to prevent buckling or overturning.
- C. During placing of structural members, the load shall not be released from the hoisting line until the members are secured with not less than two bolts drawn up wrench tight.
- D. During the installation of decking, the exposed edges of all temporary planked and metal decked floors at the periphery of the building, or at interior openings, such as stairways and elevator shafts shall be protected by a single 3/8-inch minimum diameter wire rope located between 42 and 45 inches above design finish floor height. Mid-rail protection shall be installed at the completion of the installation of decking.
  - 1. Other guardrail protection may be used if equal fall protection is provided.
  - 2. Periphery fall protection intended to be used as a catenary line can be used if it meets Cal/OSHA requirements for fall protection.
- E. Where skeleton steel is being erected, a tightly planked and substantial floor shall be maintained with two (2) stories or 30 feet, whichever is less, below and directly under the portion of each tier of beams on which any work is being performed.
- F. When connecting beams at the periphery or interior of a building or structure where the fall distance is greater than six (6) feet, the Connector shall be provided with and use appropriate personal fall protection equipment in accordance with Cal/OSHA requirements.
  - 1. Connector means a person who, working with hoisting equipment, is placing and connecting beams or other structural members.

- G. When performing work other than connecting, personnel shall be provided and use personal fall protection equipment in accordance with Cal/OSHA requirements where the fall distance is greater than six (6) feet.
- H. Open web steel joists shall not be placed on any structural steel framework unless such framework is safely bolted or welded.
- I. Containers shall be provided for storing or carrying rivets, bolts, and drift pins, and secured against accidental displacement when aloft.
- J. When bolts or drift pins are being knocked out, means shall be provided to keep them from falling.
- K. Impact wrenches shall be provided with a locking device for retaining the socket.
- L. Connections of equipment used in plumbing-up shall be properly secured.
- M. Turnbuckles shall be secured to prevent unwinding while under stress.
- N. Plumbing-up guys shall be removed only under supervision of a Competent Person.
- O. Work taking place above grade or any surface exposed to protruding reinforcing steel, or other similar objects, shall be protected against the hazard of impalement by the use of guardrails, or approved ANSI certified fall protection system, or protective covers (e.g. rebar caps).

### **3.43 TAR AND MELTING POTS**

- A. Any melting chamber must be vented and must have a working thermometer.
- B. No melting pots or tar kettles may be located on roof structures. All melting pots must be on the ground outside, and at least 25 feet from any building.
- C. Pipelines shall be adequately braced or supported to prevent collapse.
- D. Pumper pipelines shall be securely fastened at rooftop and shall not be supported by ladders used for access.
- E. Barricades must be provided when hot liquids are present overhead on a roof or upper floor.
- F. Buckets containing hot asphalt or pitch shall not be carried on ladders.
- G. A fire extinguisher shall be kept near each kettle in use. Extinguisher capacity shall be at least:
  - 1. Less than 150 gallon kettle – 8:BC.
  - 2. 150 – 300 gallon kettle – 16:BC.
  - 3. Larger than 350 gallon kettle – 20:BC.
- H. Kettle and tanker pumps shall be provided with a means of stopping the flow of hot asphalt or pitch manually from the rooftop in emergencies.

### **3.44 TRAFFIC CONTROL, FLAGGING OPERATIONS AND PLATE BRIDGING**

- A. Prime CONTRACTOR may be required to submit a traffic control plan to the agency having jurisdiction. Plans requiring approval, must be submitted timely as not to impact the schedule. Any plan requiring agency approval or not, shall be forwarded to CONSTRUCTION MANAGER one (1) week prior to the work activity.
- B. Traffic Control
  - 1. Prime CONTRACTOR shall establish work area protection zones necessary to protect personnel and the public when work is performed in areas where pedestrians or vehicles have access.

2. All personnel in work zones shall wear at a minimum Class II reflectorized vest (or jacket) in accordance with the requirements of Cal/MUTCD. Class III vests may be required, refer to Cal/MUTCD.
  3. Traffic control shall be established in compliance with California Manual on Uniform Traffic Control Devices (Cal/MUTCD), local traffic control regulations, WATCH Handbook, or other contract-referenced documents/standards.
  4. Prime CONTRACTOR shall establish Work Area Protection in consideration of the location of the project site, pedestrians and traffic conditions, and the time of day (daylight or dark).
  5. Prime CONTRACTOR shall ensure adequate protection to passing vehicles on a roadway by providing a Flagger when barricades, signs and signals may be insufficient.
  6. When placing or removing Work Area Protection, the Prime CONTRACTOR shall:
    - a. Be consistently alert to traffic conditions.
    - b. Face oncoming traffic.
    - c. Wear proper personal protection (e.g. Class II or III reflective vest, hard hat, and safety glasses).
  7. Place the initial warning signs (e.g. Construction ahead) first and remove last.
  8. Work zone site must be made safe for pedestrians by using:
    - a. Rope or vinyl warning tape.
    - b. Fencing or other barricades.
    - c. Cones and signs.
    - d. Pedestrian crossings (designated and painted).
    - e. Other appropriate means, methods and devices.
  9. All night work requires adequate illumination to light the work area and warn the public vehicular traffic.
  10. For night work, the illumination used to light the work area shall be aimed such that it does not create glare for, or blind, the public driving through the work zone.
- C. Flagging Operations
1. Shall be conducted in accordance with the following unless a more specific standard applies.
    - a. Flaggers shall be trained in the proper fundamentals of flagging (signaling) traffic before being assigned as Flaggers.
    - b. The Flagger must be protected and the motorist forewarned by use of advance warning signs and cones.
    - c. Use cones before the Flaggers position to mark the traffic lane.
    - d. The use of reflective vests (minimum Class II) shall be required for all Flaggers.
    - e. During the hours of darkness, the Flagger's position shall be illuminated.
    - f. To 'Stop' traffic – The Flagger shall face traffic and hold the stop paddle in a vertical position at arm's length.
    - g. When it is safe for traffic to proceed – The Flagger shall stand parallel to the traffic movement, and with the slow paddle held in a vertical position at arm length.
- D. Plate Bridging
1. Trenches, excavations, or other surface openings or significant depressions must be covered with a bridge plate to permit safe and unobstructed flow of traffic.
  2. Bridging plates must be secured from movement by a holding device(s) such as cleats, angles, bolts, and tack welding.
  3. Bridging plates should be installed to produce a minimum amount of noise.
  4. Bridging plates must extend a minimum of one foot beyond the edges, with pavement materials feathering the edges for a reasonably smooth transition.
  5. Advance warning signs shall be posted when steel plates are used in a travel path.

**3.45 TRENCH AND EXCAVATION (SEE BARRICADES AND SIGNS FOR ADDITIONAL INFORMATION)**

- A. Prime CONTRACTOR must identify all shut-off valves or control points for known utilities and ensure they work prior to digging.
- B. Each Prime CONTRACTOR shall call AUTHORITY HAVING JURISDICTION (e.g. DIGALERT) to mark utilities.
  - 1. Areas to be excavated are to be scanned and/or traced with equipment that locates underground utilities (e.g. pacometer, magnetometer, x-ray, and ground penetrating radar).
  - 2. Underground locating company shall scan and locate all known below grade utilities by reviewing as-built and onsite utility monuments (e.g. gas and water meters, and electrical sub-stations) that may run within the limits of the project site.
  - 3. Underground locating company shall, at a minimum, sweep 12 feet to either side of the new construction prior to any excavation/trench.
- C. Prime CONTRACTOR shall pothole to locate existing utilities and provide as-builts for horizontal and vertical location.
  - 1. Visual verification by means of pot-holing by hand-digging, air excavation or water jet excavation shall occur at approximately 12 foot increments along existing utilities.
  - 2. Prime CONTRACTOR must hand expose to the point of no conflict 24" on either side of the underground facility, so you know its exact location before using power equipment.
  - 3. Any damage to existing utilities shall be the responsibility of the Prime CONTRACTOR to repair or reroute as necessary to maintain the operation of the system(s).
- D. Prime CONTRACTOR shall be responsible for protecting and maintaining all trenches and/or excavations it has created by complying with Cal/OSHA standards.
- E. Prime CONTRACTOR shall support and protect all existing site and offsite, above and/or below grade, utilities, improvements, and structures.
- F. Prime CONTRACTOR shall provide and maintain appropriate barricades to protect people, vehicles, and equipment from falling into the trench/excavation. Lighted barricades must be provided at night.
  - 1. Any trench/excavation that will remain open overnight will require either one or a combination of the following barriers: railings, temporary fencing around perimeter, delineators and "danger" tape, walkway, bridge, and steel plate, and must be reviewed by CONSTRUCTION MANAGER prior to the Prime CONTRACTOR leaving.
    - a. Barriers must be installed a minimum of 6 feet from the face of the trench or excavation.
  - 2. Any steel plate (Bridge Plate) or other cover shall be installed in a manner so as to eliminate tripping hazards.
- G. Prime CONTRACTOR'S Competent Person shall:
  - 1. Determine the soil classification (Type A, B, or C) to determine the appropriate type of protective system required for the excavation.
  - 2. Supervise trenching or excavating operations.
  - 3. Inspect their trench and/or excavation prior to use each day, regardless of the depth.
    - a. Prime CONTRACTOR shall have written documentation of their inspection and submit to CONSTRUCTION MANAGER upon completion of the inspection.
  - 4. Be available at the project site during period of access into all trenches/excavations regardless of the protective systems.
- H. The Prime CONTRACTOR'S materials for the protection of personnel (e.g. bracing, shoring, shielding, and trench boxes) must be in good condition and of proper dimensions/materials.

- I. Excavation greater than 20 feet in depth must have a professional excavation plan approved by a Registered Professional Engineer (RPE). Reports of engineered excavations by professional engineers shall be submitted to CONSTRUCTION MANAGER.
- J. Excavated soils, material or equipment are to be kept at least two (2) feet from the edge of the excavation.
- K. Ladders or other safe means of access and egress must be provided by the Prime CONTRACTOR when the depth of the trench or excavation are 4 feet or more in depth and spaced within 25 feet of lateral travel.
- L. Walkways or bridges with standard guardrails shall be provided where personnel or equipment are required or permitted to cross over excavations over six (6) feet in depth and wider than 30 inches.
- M. Structural ramps:
  - 1. That are used by personnel as a means of access or egress from excavations shall be designed by a Competent Person.
  - 2. Structural ramps used for access or egress of equipment shall be designed by a Competent Person qualified in structural design and shall be constructed in accordance with the design.
- N. Where pedestrian traffic must be accommodated over excavations, suitable non-skid plates or other suitable material capable of withstanding at least twice the maximum intended load must be provided to serve as a pedestrian runway for safe passage.
  - 1. The edges of the runway shall be tapered to minimize trip hazards. Alternatively, the approach to the runway shall be tapered with a suitable and durable material, or the runway set into the surface, to minimize trip hazards.
- O. Rescue equipment must be provided by the Prime CONTRACTOR (e.g. full body harness and lifeline, breathing apparatus, and basket stretcher) when hazardous atmospheric conditions are expected to exist in a trench or excavation. (See Confined Space Entry for additional requirements).

### 3.46 FORMS

- A. Competent Person Designation Form: .....Reference Exhibit "C.1"
- B. Job Hazard Analysis (JHA) Form: .....Reference Exhibit "C.2"
- C. Pre-Shift Crew Meeting Form:.....Reference Exhibit "C.3"
- D. Lift Pick & Critical Lift Plan Form: ..... Reference Exhibit "C.4"

END OF SECTION



## Exhibit "C.1 – Competent Persons Designation Form

**COMPETENT PERSON DESIGNATION**

An evaluation has determined that the person named below has knowledge of the systems, equipment, conditions and procedures, proper use, inspection, manufacturer's recommendations and instructions, and maintenance for the activities designated below. Consequently, this person has been designated as a: "C" = Competent Person(s), "Q" = Qualified Person(s), "L" = licensed, "S" = Supervisor per Cal/OSHA guidelines and delegated the responsibility and authority for coordinating activities and operations covered by the designation(s).

<b>COMPANY:</b> _____	
<b>Name of Designated Competent Person:</b> _____	
<b>Title of Designated Competent Person:</b> _____	
<b>COMPETENT PERSON DESIGNATION(S):</b> Check all that apply <small>C = "Competent Person(s)", Q = "Qualified Person(s)", L = "Licensed or S = "Supervisor(s)"</small>	
<input type="checkbox"/> Asbestos Abatement (C)	<input type="checkbox"/> Demolition (Q)
<input type="checkbox"/> Burning, Welding & Hot-work (C)	<input type="checkbox"/> Electrician (Live Circuit) (Q)
<input type="checkbox"/> Confined Space (C)	<input type="checkbox"/> Explosives (L)
<input type="checkbox"/> Cranes & Rigging (Q)	<input type="checkbox"/> Fall Protection (C & Q)
<input type="checkbox"/> Ladders (Q)	<input type="checkbox"/> Lead Abatement (S)
<input type="checkbox"/> Scaffold (C)	<input type="checkbox"/> Silica & Dust (C)
<input type="checkbox"/> Pile Driving (C)	<input type="checkbox"/> Steel Erection (C)
<input type="checkbox"/> Powder Actuated Tool (Q)	<input type="checkbox"/> Trench/Excavation (C)
<b>REVIEW AND VERIFY THE CREDENTIALS FOR DESIGNATED COMPETENT PERSON – Check all that apply</b> <b>(Company Authorized Representative to complete):</b>	
<input type="checkbox"/> Formal Training (describe the training received and attach copy of training certificate(s), and the year training was completed): _____ _____	
<input type="checkbox"/> Union Apprenticeship (describe the training received and attach copy of training certificate(s), and the year training was completed): _____ _____	
<input type="checkbox"/> Years of Experience (describe how this experience has enabled this person to be considered "Competent Person", and provide the number of years): _____ _____	
<input type="checkbox"/> Informal Training (describe the training, and when this training was conducted): _____ _____	
<input type="checkbox"/> On-The-Job Performance (OJT): (describe how OJT has enabled this person to be considered "Competent Person", and provide the number of years): _____ _____	
<b>SIGNATURES:</b> <b>Competent Person:</b> _____ <b>Date:</b> _____ <b>Company Authorized Representative:</b> _____ <b>Date:</b> _____ <b>Title of Company Authorized Representative:</b> _____	

Exhibit "C.2" – JHA Form

## Job Hazard Analysis (JHA)

Job/Operation Title: <span style="background-color: #cccccc; display: inline-block; width: 100px; height: 1.2em;"></span>				JHA #: <span style="background-color: #cccccc; display: inline-block; width: 50px; height: 1.2em;"></span>		Date: <span style="background-color: #cccccc; display: inline-block; width: 100px; height: 1.2em;"></span>	
Job Site Location: <span style="background-color: #cccccc; display: inline-block; width: 100px; height: 1.2em;"></span>				Analysis By: <span style="background-color: #cccccc; display: inline-block; width: 100px; height: 1.2em;"></span>		Approved By: <span style="background-color: #cccccc; display: inline-block; width: 100px; height: 1.2em;"></span>	
Contractor: <span style="background-color: #cccccc; display: inline-block; width: 100px; height: 1.2em;"></span>				Special Hazard(s): <span style="background-color: #cccccc; display: inline-block; width: 150px; height: 1.2em;"></span>			
<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <b>Safety Equipment Required for this task:</b>  <input type="checkbox"/> Hard Hats  <input type="checkbox"/> Safety Glasses  <input type="checkbox"/> Face Shield  <input type="checkbox"/> Work Vests             </div> <div style="width: 50%;"> <input type="checkbox"/> Gloves  <input type="checkbox"/> Steel Toe Boots  <input type="checkbox"/> Respirator  <input type="checkbox"/> Hearing Protection             </div> <div style="width: 50%;"> <input type="checkbox"/> Hot Work Permit  <input type="checkbox"/> Confined Space Permit  <input type="checkbox"/> Lockout/Tagout  <input type="checkbox"/> Fire Extinguisher             </div> <div style="width: 50%;"> <input type="checkbox"/> Caution Tape  <input type="checkbox"/> Danger Tape  <input type="checkbox"/> Barricades             </div> <div style="width: 50%;"> <input type="checkbox"/> Other: <span style="background-color: #cccccc; display: inline-block; width: 50px; height: 1.2em;"></span> </div> </div>							
SEQUENCE OF BASIC JOB STEPS				POTENTIAL HAZARDS/ACCIDENTS		RECOMMENDED SAFE JOB PROCEDURES	
Step No.				Step No.			

The Job Safety & Hazard Analysis (JSHA) is intended to assist in planning work. It is a guideline and not a definitive study of the hazards that may be present or may impact the job. Prime Contractor Supervisor is expected to complete their own independent Job Safety & Hazard Analysis (JSHA) prior to work beginning. Files of completed forms should be maintained at the jobsite.

## Exhibit "C.3" – Pre-Shift Crew Meeting Form

[illegible]

Exhibit "C.4" – Lift Pick & Critical Lift Plan Form  
1 of 3



## Lift Pick & Critical Lift Plan

GENERAL INFORMATION		
Date of lift:	Project Name:	Lift Location:
Contractor Name:		
Crane Company Name:		
Person responsible for plan & contact info:		
Crane Operator:	Signal Person:	
Crane Rigger:	Crane inspected by:	
Crane Oiler:	Rigging inspected by:	
Designated Lift Leader:	Other:	
CRANE INFORMATION		
Make:	Model:	S/N:
Date of Manufacture:	Size (Capacity in tons):	
Type of crane:		
<input type="checkbox"/> Hydraulic <input type="checkbox"/> Friction <input type="checkbox"/> Lattice <input type="checkbox"/> Truck <input type="checkbox"/> Rough Terrain <input type="checkbox"/> Crawler		
LOAD		
Description of load(s):		
Weight of max load (provide manufacturers product data sheets and/or calculations):		
Location of load center of gravity (provide manufacturers product data sheet and/or sketch):		
How will the load center of gravity be <u>determined</u> :		
Will any load be upended? If so, provide stability evaluation from manufacturer or professional engineer:		
RIGGING INFORMATION		
List rigging components – be specific: manufacturer, description, size, length, capacity, and weight:		
CRANE LOCATION & CLEARANCE		
Provide a to-scale plot plan showing crane location, adjacent buildings, pipe racks, and other significant obstructions within load swing radius. Indicate direction and span of swing.		
Provide a to-scale elevation depicting crane, adjacent structures, and load.		
What is the horizontal distance from the crane center pin to the nearest structure?		
What is the minimum clearance from boom to highest point of structure during a pick?		

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Exhibit "C.4" – Lift Pick & Critical Lift Plan Form  
2 of 3

### Lift Pick & Critical Lift Plan

What is the minimum clearance from load to highest point of structure during a pick?		
What is the minimum distance from boom to load during a pick?		
Will the load or any part of the crane be over any active piping, tanking, or equipment during a pick? Please explain:		
Have underground site utilities been identified and located?		
<b>SET-UP</b>		
Boom angle (degrees):	Distance from Pin (in feet):	
Crane Capacity at set-up configuration (pounds or tons):	Load including rigging is what percentage (%) of rated crane capacity:	
Maximum vertical boom elevation (including erected jib) in feet:	If vertical boom elevation exceeds 200' above existing site elevation, provide FAA permit number:	
<b>EQUIPMENT and LIFT RELATIONSHIP</b>		
Maximum operating radius (feet):	Planned operating radius (feet):	
Allowable load per load chart (in pounds or tons):	Ratio of lift to allowable load (%):	
Clearance between boom and load (feet and inches):	Clearance to existing facilities (feet):	Clearance to energized power lines (feet):
<b>GROUND STABILITY</b>		
Surface Type: <input type="checkbox"/> Bare ground <input type="checkbox"/> Asphalt <input type="checkbox"/> Concrete		Additional Comments:
Type of support used: <input type="checkbox"/> Mat <input type="checkbox"/> Cribbing		<i>Note: Mats or cribbing will be used on all surfaces</i>
Will outriggers be located over underground utilities? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, explain protective measures to be taken:		
How will outriggers be configured? <input type="checkbox"/> Fully extended <input type="checkbox"/> Intermediate and Pinned <input type="checkbox"/> Fully retracted		
<b>WEATHER</b>		
Lift will not proceed if wind exceeds (MPH):	Precipitation type: <input type="checkbox"/> Rain <input type="checkbox"/> Snow <input type="checkbox"/> Ice <input type="checkbox"/> None	
Cloud type: <input type="checkbox"/> Overcast <input type="checkbox"/> Clear	Lift conducted: <input type="checkbox"/> During daylight <input type="checkbox"/> With artificial light	
<b>LIFT AREA RESTRICTIONS</b>		
Area Barricaded: <input type="checkbox"/> Yes <input type="checkbox"/> No	Equipment swing radius barricaded: <input type="checkbox"/> Yes <input type="checkbox"/> No	
Warning signs required: <input type="checkbox"/> Yes <input type="checkbox"/> No	Unnecessary personnel removed from area: <input type="checkbox"/> Yes <input type="checkbox"/> No	
Will max working radius of boom be within 20' of an overhead power line: <input type="checkbox"/> Yes <input type="checkbox"/> No	If yes, attach JHA outlining how contact hazard will be mitigated.	

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Exhibit "C.4" – Lift Pick & Critical Lift Plan Form

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**Lift Pick & Critical Lift Plan**

COMMUNICATION	
Operator view is unobstructed (pick to set): <input type="checkbox"/> Yes <input type="checkbox"/> No	Communication used: <input type="checkbox"/> Hand signals <input type="checkbox"/> Radio <input type="checkbox"/> Other: Explain other:
PRE-LIFT SAFETY MEETING	
Type of lift: <input type="checkbox"/> Load exceeds 75% of load chart capacity for lifting equipment (Critical Pick) <input type="checkbox"/> Two or more cranes / booms required to lift <input type="checkbox"/> Specialized hoisting rigging equipment used <input type="checkbox"/> Load suspended or moved over loaded lined <input type="checkbox"/> Other (Specify)	
Items discussed:	
Non-compliance with any part of this Crane Lift Plan will be grounds for immediate cessation of work along with corrective action which could lead to permanent removal from the site.	
Contractor, Rigger and Crane Operator are responsible for the accuracy of all calculations and inspections. Any review conducted by Tilden-Coil is to ensure completion of form only.	

**SIGNATURES**

Crane Company

Responsible Person:

Print Name

Signature

Date

Contractor

Responsible Person:

Print Name

Signature

Date



**SECTION 01 35 43****ENVIRONMENTAL PROCEDURES****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Section includes:
  - 1. Special requirements for environmental management during construction operations.
  - 2. Monitoring requirements.

**1.2 RELATED SECTIONS**

- A. Section 01 31 00 - Project Management and Coordination: Environmental Manager and CONTRACTOR training requirements.
- B. Section 01 45 00 - Quality Control: Meetings and project coordination regarding quality.
- C. Section 01 74 19 - Construction Waste Management and Disposal: Accumulation and disposal of waste materials, including recycling requirements.
- D. Section 01 56 00 - Temporary Barriers and Enclosures: Protection of existing landscaping
- E. Section 31 00 00 - Earthwork: Dust control.

**1.3 DEFINITIONS**

- A. Definitions pertaining to sustainable development: As defined in ASTM E 2114.
- B. Environmental pollution and damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.

**1.4 PRECONSTRUCTION MEETING**

- A. Preconstruction Meeting: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting attended by OWNER'S REPRESENTATIVE, CONSTRUCTION MANAGER, and CONTRACTOR to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Coordinate with Section 01 31 00 - Project Management and Coordination.
  - 1. Schedule meeting in conjunction with preconstruction meeting for Environmental Regulatory Requirements.
  - 2. Verify procedures and requirements necessary to ensure implementation of Environmental Protection Plan is coordinated with applicable environmental regulatory requirements.

## 1.5 SUBMITTALS

- A. Environmental Protection Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit an Environmental Protection Plan.
1. Format: At a minimum, address the following elements:
    - a. Identification of Project.
    - b. Identification and contact information for Environmental Manager.
    - c. General site information.
    - d. Summary of Plan.
    - e. Procedures to address water resources.
    - f. Procedures to address land resources.
    - g. Procedures to address air resources.
    - h. Procedures to address fish and wildlife resources.
    - i. Monitoring procedures.
  2. Revise and resubmit Plan as required by CONSTRUCTION MANAGER.
    - a. Approval of CONTRACTOR'S Plan will not relieve the CONTRACTOR of responsibility for compliance with applicable environmental regulations.
- B. Reports for Field Quality Control.

## PART 2 - PRODUCTS

Not Applicable to this Section.

## PART 3 - EXECUTION

### 3.1 ENVIRONMENTAL PROTECTION

- A. Protection of Natural Resources: Comply with applicable regulations and these specifications. Preserve the natural resources within the Project boundaries and outside the limits of permanent Work performed under this Contract in their existing condition or restore to an equivalent or improved condition as approved by CONSTRUCTION MANAGER.
1. Demolition: Confine demolition and construction activities to work area limits indicated on the Drawings or, if not indicated, maximum 40 feet beyond the building perimeter, 10 feet beyond solid paving, and 25 feet beyond pervious paving. Dispose of demolished and waste materials that are not identified to be salvaged, recycled, or reused in accordance with Section 01 74 19 - Construction Waste Management and Disposal and the following:
    - a. Remove debris, rubbish, and other waste materials resulting from demolition and construction operations, from site.
    - b. Do not burn construction and demolition waste.
    - c. Transport materials with appropriate vehicles and dispose off-site to areas that are approved for disposal by governing AUTHORITIES HAVING JURISDICTION.
    - d. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways. Remove spillage and sweep, wash, or otherwise clean project site, streets, or highways.

2. Water resources: Protect groundwater resources from contaminants.
  - a. Comply with requirements of the National Pollutant Discharge Elimination System (NPDES) and the State Pollutant Discharge Elimination System (SPDES).
  - b. Oily substances: Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water.
    - 1) Store and service construction equipment at areas designated for collection of oil wastes.
  - c. Mosquito abatement: Prevent ponding of stagnant water conducive to mosquito breeding habitat.
  - d. Prevent run-off from site during demolition and construction operations.
3. Land resources: Prior to construction, identify land resources to be preserved within the Work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and landforms without permission from CONSTRUCTION MANAGER.
  - a. Conserve distinctive geological features and character.
  - b. Earthwork: As specified in Section 31 00 00 - Earthwork and as follows:
    - 1) Erodible soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils, except where the constructed feature obscures borrow areas, quarries, and waste material areas. Clear areas in reasonably sized increments only as needed to use the areas developed. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
    - 2) Delineate work zones so as to restrict compaction of soil elsewhere.
    - 3) Delineate buffer zones around naturally moist areas.
    - 4) Erosion and sedimentation control devices: Construct or install temporary and permanent erosion and sedimentation control features as required.
  - c. Tree and plant protection: Refer to Section 01 56 00 – Temporary Barriers and Enclosures
    - 1) Prior to start of construction, tag each tree and plant scheduled to remain with value as approved by CONSTRUCTION MANAGER. In the event of damage to tree or plant, CONSTRUCTION MANAGER may at OWNER'S REPRESENTATIVE'S discretion, deduct the indicated value of the damaged tree or plant from the Contract Sum.
4. Air Resources: Comply with IAQ Management Plan and as follows:
  - a. Prevent creation of dust, air pollution, and odors.
  - b. Sequence construction to avoid disturbance to site to the greatest extent possible.
  - c. Use mulch, water sprinkling, temporary enclosures, and other appropriate methods to limit dust and dirt rising and scattering in air to lowest practical level.
    - 1) Do not use water when it may create hazardous or other adverse conditions such as flooding and pollution.
  - d. Store volatile liquids, including fuels and solvents, in closed containers.
  - e. Properly maintain equipment to reduce gaseous pollutant emissions.
5. Fish and Wildlife Resources: Manage and control construction activities to minimize interference with, disturbance of, and damage to fish and wildlife.
  - a. Do not disturb fish and wildlife.
  - b. Do not alter water flows or otherwise significantly disturb the native habitat related to the project and critical to the survival of fish and wildlife, except as indicated or specified.

- c. Identify and conserve wildlife corridors that intersect the site.

### **3.2 FIELD QUALITY CONTROL**

#### **A. Field Quality Control, General:**

- 1. Comply with the requirements of agencies having jurisdiction and as specified herein.
- 2. Provide field practices, shipping, and handling of samples in accordance with ASTM D 4840.

#### **B. Field Quality Control Reports: Provide in accordance with approved Environmental Protection Plan.**

**END OF SECTION**

**SECTION 01 41 00****REGULATORY REQUIREMENTS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Codes, ordinances, laws, and regulations applicable to Work under the Contract.

**1.2 AUTHORITY AND PRECEDENCE OF CODES, ORDINANCES AND STANDARDS**

- A. Authority: All codes, ordinances and standards referenced in the Drawings and Specifications shall have the full force and effect as though printed in their entirety in the Specifications.
- B. Precedence:
  - 1. Where specified requirements differ from the requirements of applicable codes, ordinances and standards, the more stringent requirements shall take precedence.
  - 2. Where the Drawings or Specifications require or describe products or execution of better quality, higher standard or greater size than required by applicable codes, ordinances and standards, the Drawings and Specifications shall take precedence so long as such increase is legal.
  - 3. Where no requirements are identified in the Drawings or Specifications, comply with all requirements of applicable codes, ordinances and standards of AUTHORITIES HAVING JURISDICTION.

**1.3 APPLICABLE CODES, LAWS, AND ORDINANCES**

- A. Applicable Codes, Laws, and Ordinances: As listed below. Refer also to Section 01 10 00 - Summary of the Project regarding permits and licenses.
- B. Building Codes:
  - 1. Performance of the Work shall meet or exceed the minimum requirements (to be in compliance with the latest version-in-effect of):of California Code of Regulations (CCR), Title 24, including the following:
    - a. CCR Title 24, Part 1: California Building Standards Administrative Code.
    - b. CCR Title 24, Part 2: California Building Code (CBC), consisting of International Building Code (IBC) Volumes 1 through 3, with State of California Amendments.
    - c. CCR Title 24, Part 3: California Electrical Code (CEC); consisting of National Fire Protection Association (NFPA) 70 - National Electrical Code (NEC), with State of California Amendments.
    - d. CCR Title 24, Part 4: California Mechanical Code (CMC); consisting of Uniform Mechanical Code (UMC) with State of California Amendments.
    - e. CCR Title 24, Part 5: California Plumbing Code (CPC); consisting of Uniform Plumbing Code (UPC) with State of California Amendments.
    - f. CCR Title 24, Part 6: California Energy Code.
    - g. CCR Title 24, Part 9: California Fire Code (CFC); consisting of International Fire Code (IFC) with State of California Amendments.

- h. CCR Title 24, Part 11: California Green Building Standards Code (CALGreen Code).
      - i. CCR Title 24, Part 12: California Referenced Standards Code.
  - 2. Performance of the Work shall also comply with applicable requirements of current editions of California Code of Regulations (CCR) as follows:
    - a. CCR Title 8 - Industrial Relations.
    - b. CCR Title 19 - Public Safety.
    - c. CCR Title 22 - Social Security.
  - 3. As applicable, performance of the Work shall comply with requirements of the following standards, in compliance with California Building Code (CBC) Section 3504.1:
    - a. NFPA 72 - National Fire Alarm Code, with State of California Amendments. Note: See UL Standard 1971 for "Visual Device."
    - b. NFPA 253 - Critical Radiant Flux of Floor Covering Systems.
    - c. NFPA 13 - Standard for the Installation of Sprinkler Systems.
  - 4. References on the Drawings or in the Specifications to "code", "Code" or "building code" similar terms, not otherwise identified, shall mean the codes specified above, together with all additions, amendments, changes, and interpretations adopted by code authorities of the jurisdiction having authority over the Project.
  - 5. The applicable edition of all codes shall be that adopted at the time of issuance of permits by the AUTHORITY HAVING JURISDICTION (AHJ).
- C. Date of Laws and Ordinances: The applicable date of laws and ordinances shall be that of the date of performance of the Work.
- 1. Work shall be accomplished in conformance with all applicable laws, ordinances, rules, and regulations of Federal, State, County, City, and special district agencies and jurisdictions having authority over the project.
  - 2. Performance of the Work shall be accomplished in conformance with all rules and regulations of public utilities, utility districts and other agencies serving the facility.
  - 3. Where such laws, ordinances, rules, and regulations require more care or greater time to accomplish Work, or require better quality, higher standards or greater size of products, Work shall be accomplished in conformance to such requirements with no change to the Contract Time and Contract Sum, except where changes in laws, ordinances, rules, and regulations occur subsequent to the execution date of the Agreement.

**PART 2 – PRODUCTS (NOT USED)****PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 42 13****ABBREVIATIONS AND ACRONYMS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Use of references in Drawings and Specifications, including requirements for copies of reference standards at Project site.
- B. Definitions of terms used in Specifications and Drawings, including abbreviations, acronyms, names, and terms which may be used in Specifications.

**1.2 RELATED SECTIONS**

- A. Section 01 41 00 - Regulatory Requirements: Identification of applicable building Code and other codes, ordinances, and regulations applicable to performance of the Work.

**1.3 USE OF REFERENCES**

- A. References: The Drawings and Specifications contain references to various standards, standard specifications, codes, practices and requirements for products, execution, tests, and inspections. These reference standards are published and issued by the agencies, associations, organizations, and societies listed in this Section or identified in individual product specification Sections.
  - 1. Wherever term "Agency" occurs in referenced Standard Specifications, it shall be understood to mean Master Builder / OWNER for purposes of the Contract.
  - 2. Wherever term "Engineer" occurs in referenced Standard Specifications, it shall be understood to mean ARCHITECT for purposes of the Contract.
  - 3. Wherever term "ARCHITECT" occurs in referenced Standard Specifications, it shall be understood to mean ARCHITECT, Landscape ARCHITECT, and their related subconsultants for purposes of the Contract.
  - 4. Standard Specifications shall be as amended and adopted by the jurisdiction in which the Project is located.
  - 5. Where reference is made to Standard Details, such reference shall be to the Standard Details accompanying the Standard Specifications, as amended and adopted by the jurisdiction in which the Project is located.
- B. Relationship to Drawings and Specifications: Such references are incorporated into and made a part of the Drawings and Specifications to the extent applicable.
- C. Referenced Grades Classes and Types: Where an alternative or optional grade, class or type of product or execution is included in a reference but is not identified on the Drawings or in the Specifications, provide the highest, best, and greatest of the alternatives or options for the intended use and prevailing conditions.

- D. Copies of Reference Standards: Reference standards are not furnished with the Drawings and Specifications because it is presumed that the CONTRACTOR, subcontractors, manufacturers, suppliers, trades, and crafts are familiar with these generally recognized standards of the construction industry.
- E. Job Site Copies:
1. CONTRACTOR shall obtain and maintain at the Project site copies of reference standards identified on the Drawings and in the Specifications in order to properly execute the Work.
  2. At a minimum, the following shall be readily available at the site, as applicable to the Work:
    - a. Local and State Building Codes: As referenced in Section 01 41 00 - Regulatory Requirements.
    - b. Safety Codes: Occupational Safety and Health Act (OSHA) regulations and State of California, California Administrative Code, California Code of Regulations (CCR), Title 8 - Industrial Relations, Chapter 4, Subchapter 7, General Industry Safety Orders (Cal-OSHA), to extent applicable to the Work.
    - c. General Standards: California Reference Standards Code, as amended and adopted by AUTHORITIES HAVING JURISDICTION for use with California Building Code (CBC), Underwriters Laboratories, Inc. (UL) Building Products Listing, Factory Mutual Research Organization (FM) Approval Guide and American Society for Testing and Materials (ASTM) Standards in Building Codes, and American National Standards Institute (ANSI) standards.
    - d. Fire and Life Safety Standards: All referenced standards pertaining to fire rated construction and exiting.
    - e. Common Materials Standards: American Concrete Institute (ACI), American Institute of Steel Construction (AISC), American Welding Society (AWS), Gypsum Association (GA), National Fire Protection Association (NFPA), Tile Council of America (TCA) and Woodwork Institute of California (WIC) standards to the extent referenced within the Contract Specifications.
    - f. Research Reports: ICC Evaluation Service, Inc. (ICC ES) Research and Evaluation Reports, for products not in conformance to prescribed requirements stated in Building Code.
    - g. Product Listings: Approval documentation, indicating approval of AUTHORITIES HAVING JURISDICTION for use of product within the applicable jurisdiction.
    - h. Standard Specifications: Standard Specifications for Public Works Construction (SSPWC), commonly known as "The Greenbook".
- F. Edition Date of References:
1. When an edition or effective date of a reference is not given, it shall be understood to be the current edition or latest revision published as of the date indicated on the Drawings and Specifications.
  2. All amendments, changes, errata, and supplements as of the effective date shall be included.
- G. ASTM and ANSI References: Specifications and Standards of the ASTM International (formerly American Society for Testing and Materials) (ASTM) and the American National Standards Institute (ANSI) are identified in the Drawings and Specifications by abbreviation and number only and may not be further identified by title, date, revision, or amendment. It is presumed that the CONTRACTOR is familiar with and has access to these nationally- and industry-recognized specifications and standards.



## 1.4 DEFINITIONS OF TERMS

- A. Basic Contract Definitions: Words and terms governing the Work are defined in the General Provisions of the Contract.
- B. Words and Terms Used on Drawings and in Specifications: Additional words and terms may be used in the Drawings and Specifications and are defined as follows:
1. "Allowances:" The allocation of funds for items in the bid schedule for the purpose of identification and budgeting of work where quantities and/or costs are unknown at the time of bidding. If the allowance is either greater or less than the allowance, the contract price shall be increased or decreased accordingly upon proof of the amount expended by the CONTRACTOR. Allowances shall include all of the costs of materials, fixtures, or equipment and all costs of delivery, handling, and installations. CONTRACTOR shall make no claim for additional compensation because of any increase, decrease or elimination of any allowance item.
  2. "Applicable:" As appropriate for the particular condition, circumstance or situation.
  3. "Approve(d):" Approval action shall be limited to the duties and responsibilities of the party giving approval, as stated in the General Provisions of the Contract. Approvals shall be valid only if obtained in writing and shall not apply to matters regarding the means, methods, techniques, sequences, and procedures of construction. Approval shall not relieve the CONTRACTOR from responsibility to fulfill Contract requirements.
  4. "And/or:" If used, shall mean that either or both of the items so joined are required.
  5. "Deletable:" The Bid Schedule consists of deletable bid items. Deletable bid items are considered part of the Bidder's Base bid but are items of work that may or may not be deleted from the total Contract amount awarded as progression of the work proceeds for the project. No allowance for any costs will be considered for work deleted in its entirety.
  6. "Directed:" Limited to duties and responsibilities of the CONSTRUCTION MANAGER or OWNER'S REPRESENTATIVE as stated in the General Provisions of the Contract, meaning "as instructed by CONSTRUCTION MANAGER or OWNER'S REPRESENTATIVE, in writing, regarding matters other than the means, methods, techniques, sequences and procedures of construction. Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by CONSTRUCTION MANAGER or OWNER'S REPRESENTATIVE", "requested by the CONSTRUCTION MANAGER or OWNER'S REPRESENTATIVE", and similar phrases. No implied meaning shall be interpreted to extend the responsibility of the CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, or other responsible design professional into the CONTRACTOR'S supervision of construction.
  7. "Equal" or "Equivalent:" As determined by OWNER'S REPRESENTATIVE or other responsible design professional as being equivalent, considering such attributes as durability, finish, function, suitability, quality, utility, performance and aesthetic features.
  8. "Furnish:" Means "supply and deliver, to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

9. "Indicated:" The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown", "noted", "scheduled", and "specified" are used to help the reader locate the reference. There is no limitation on location.
10. "Install:" Describes operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations.
11. "Installer:"
  - a. "Installer" refers to the CONTRACTOR or an entity engaged by the CONTRACTOR, as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
  - b. "Experienced Installer:" The term "experienced," when used with "installer" means having a minimum of 5 previous Projects similar in size to this Project, knowing the precautions necessary to perform the Work, and being familiar with requirements of AUTHORITIES HAVING JURISDICTION over the Work.
12. "Job Site:" Same as site.
13. "Necessary:" With due considerations of the conditions of the Project and as determined in the professional judgment of the OWNER'S REPRESENTATIVE or other responsible design professional as being necessary for performance of the Work in conformance with the requirements of the Contract Documents, but excluding matters regarding the means, methods, techniques, sequences, and procedures of construction.
14. "Noted:" Same as "Indicated."
15. "Per:" Same as "in accordance with," "according to" or "in compliance with."
16. "Products:" Material, system, or equipment.
17. "Project Site:" Same as "Site."
18. "Proper:" As determined by the OWNER'S REPRESENTATIVE or other responsible design professional as being proper for the Work, excluding matters regarding the means, methods, techniques, sequences, and procedures of construction, which are solely the CONTRACTOR'S responsibility to determine.
19. "Provide:" Means "furnish and install, complete and ready for the intended use."
20. "Regulation:" Includes laws, ordinances, statutes and lawful orders issued by AUTHORITIES HAVING JURISDICTION, as well as and rules, conventions and agreements within the construction industry that control performance of the Work.
21. "Required:" Necessary for performance of the Work in conformance with the requirements of the Contract Documents, excluding matters regarding the means, methods, techniques, sequences and procedures of construction, such as:

- a. Regulatory requirements of AUTHORITIES HAVING JURISDICTION.
  - b. Requirements of referenced standards.
  - c. Requirements generally recognized as accepted construction practices of the locale.
  - d. Notes, schedules, and graphic representations on the Drawings.
  - e. Requirements specified or referenced in the Specifications.
  - f. Duties and responsibilities stated in the Bidding and Contract Requirements.
22. "Scheduled:" Same as "Indicated."
23. "Selected:" As selected by CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, or other responsible design professional from the full selection of the manufacturer's products, unless specifically limited in the Contract Documents to a particular quality, color, texture or price range.
24. "Shown:" Same as "Indicated."
25. "Site:" Same as "Site of the Work" or "Project Site;" the area or areas or spaces occupied by the Project and including adjacent areas and other related areas occupied or used by the CONTRACTOR for construction activities, either exclusively or with others performing other construction on the Project. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land upon which the Project is to be built.
26. "Supply:" See "Furnish."
27. "Testing Laboratory" or "Testing Laboratories:" Same as "Testing and Inspection Agency."
28. "Testing and Inspection Agency:" An independent entity engaged to perform specific inspections or tests, at the Project Site or elsewhere, and to report on, and, if required, to interpret, results of those inspections or tests.

## 1.5 ABBREVIATIONS, ACRONYMS, NAMES AND TERMS, GENERAL

- A. Abbreviations, Acronyms, Names and Terms: Where acronyms, abbreviations, names, and terms are used in the Drawings, Specifications, or other Contract Documents, they shall mean the recognized name of the trade association, standards generating organization, AUTHORITY HAVING JURISDICTION or other entity applicable.
- B. Abbreviations, General: The following are commonly used abbreviations which may be found on the Drawings or in the Specifications:

AC or ac	Alternating current, air conditioning or asphaltic concrete (depending upon context)
AMP or amp	Ampere
C	Celsius
CFM or cfm	Cubic feet per minute
CM or cm	Centimeter
CY or cy	Cubic yard
DC or dc	Direct current
DEG or deg	Degrees
F	Fahrenheit
FPM or fpm	Feet per minute

FPS or fps	Feet per second
FT or ft	Foot or feet
Gal or gal	Gallons
GPM or gpm	Gallons per minute
IN or in	Inch or inches
Kip or kip	Thousand pounds
KSI or ksi	Thousand pounds per square inch
KSF or ksf	Thousand pounds per square foot
KV or kv	Kilovolt
KVA or kva	Kilovolt amperes
KW or kw	Kilowatt
KWH or kwh	Kilowatt hour
LBF or lbf	Pounds force
LF or lf	Lineal foot
M or m	Meter
MPH or mph	Miles per hour
MM or mm	Millimeter
PCF or pcf	Pounds per cubic foot
PSF or psf	Pounds per square foot
PSI or psi	Pounds per square inch
PSY or psy	Per square yard
SF or sf	Square foot
SY or sy	Square yard
V or v	Volts

- C. Abbreviations and Acronyms for Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- D. Undefined Abbreviations, Acronyms, Names and Terms: Words and terms not otherwise specifically defined in this Section, in the Instructions to Bidders, in the General Provisions of the Contract, on the Drawings or elsewhere in the Specifications, shall be as customarily defined by trade or industry practice, by reference standard and by specialty dictionaries such as the following:
1. Dictionary of Architecture and Construction, Fourth Edition (To be in compliance with the latest version-in-effect) Cyril M. Harris, McGraw-Hill Book Company
  2. Encyclopedia of Associations Edition (To be in compliance with the latest version-in-effect), published by Gale Research Co.,

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 43 39****MOCK-UPS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Mock-ups shall be independent structures that represent components of a portion of the building or site construction, as indicated, for the following purposes:
  - 1. Examination of visual qualities and demonstration of interfacing of various products, including selection acceptable colors, sheen, patterns, and textures.
  - 2. Performance testing of building elements.
- B. Specific mock-ups are specified on plans and in product Sections in Divisions 1 through 16 and are described at the end of PART 3 - EXECUTION, herein.
- C. CONTRACTOR shall provide engineering design services as necessary to construct supporting substrates for visual mock-ups, to ensure structural stability of mock-ups.
- D. Responsible testing agency will provide engineering services as necessary to construct supporting elements for performance mock-ups.

**1.2 RELATED SECTIONS**

- A. Section 10 14 00 Signage
- B. Section 32 13 13 Concrete Paving
- C. Section 32 15 00 Decomposed Granite Paving
- D. Section 03 10 00 - Concrete Forms and Accessories
- E. Section 03 20 00 - Concrete Reinforcing
- F. Section 03 30 00.01 - Cast-in-Place Concrete
- G. Section 07 90 00 - Joint Sealers: Joint sealers in interior and exterior walls, paving and floors to be incorporated into mock-ups.
- H. Section 09 24 00 - Portland Cement Plaster: Wall finish to be incorporated into exterior wall mock-up.

**1.3 DEFINITIONS**

- A. Mock-Ups: Full-size, physical example assemblies to illustrate finishes and materials.

1. Mock-ups will be used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples.
2. Mock-ups shall establish the standard by which permanent Work will be judged.
3. The required mock-ups may be provided at locations that if acceptable / approved may be left in place as part of the final installation. If the mock-up is approved, it shall remain in place and serve as a comparison example for all subsequent like installations. If the mock-up is deemed unacceptable it shall be immediately removed and another mock-up provided. This process will continue until the mock-up is deemed acceptable / approved by the landscape architect.

#### **1.4 SUBMITTALS**

- A. Product Data and Samples: Submit in accordance with the requirements of each respective product Section.
- B. Schedule: Time schedule for the construction of mock-ups shall be prepared and submitted to the CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE for review prior to construction.
- C. Quality Control Submittals: In accordance with the provisions of Section 01 33 00, the following:
  1. Design Data: When and as directed by the OWNER'S REPRESENTATIVE, engineering design calculations confirming the structural stability of the mock-ups.

#### **1.5 QUALITY ASSURANCE**

- A. Fabricators' and Installers' Qualifications: In accordance with the provisions of product Sections of the Specifications, for products and materials incorporated into mock-ups.
- B. Field Representation: Where noted, during construction of mock-up, representative of product manufacturer shall be present to inspect and coordinate installation of products represented in the mock-up.
- C. Mock-Ups: Before installing portions of the Work requiring mock-ups, build mock-ups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  1. Build mock-ups in location and of size indicated or, if not indicated, where acceptable to CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE.
  2. Notify CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE of the scheduled start and completion dates of construction of mock-ups, with minimum of 7 calendar days' notice.
  3. Submit progress reports, including photographs, to allow CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE to monitor construction of mock-ups and to schedule field visits to examine mock-ups.
- D. Visual Quality Mock-Ups:

1. Mock-ups shall demonstrate the proposed range of aesthetic effects and workmanship. Visual examination of the mock-ups will be made by the ARCHITECT, OWNER'S REPRESENTATIVE and other related parties during construction of mock-ups and after completion of mock-ups.
    - a. Incorporate changes or variations directed by ARCHITECT, CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE into mock-ups during their construction and prior to their completion, insofar as possible.
    - b. Obtain acceptance of visual qualities of mock-ups by ARCHITECT, CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE before commencing the corresponding work for the Project, revise the updated Construction Schedule to reflect required revisions to mock-ups.
  2. Obtain review and acceptance of mock-ups by ARCHITECT, CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE before starting Work, including fabrication and installation.
  3. Should mock-ups fail to be acceptable to ARCHITECT, CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE, mock-ups shall be taken down or dismantled, and reconstructed to the extent necessary until acceptance has been obtained.
    - a. Additional mock-ups shall be provided at no change in Contract Sum and Contract Time.
    - b. Adjust Construction Progress Schedule as necessary to accommodate reworking of mock-ups if necessary, to avoid delay in the Work. Rejection of mock-ups will not be sufficient cause to extend construction schedule.
  4. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed Work. Do not alter, remove, or destroy mock-ups until their removal has been authorized by the ARCHITECT, CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE.
  5. Demolish and remove mock-ups when directed, unless otherwise indicated.
- E. Performance Mock-Ups: Provide mock-ups at locations specified in applicable product Sections of the Specifications. Construct performance mock-ups in compliance with requirements specified in applicable product Section of the Specifications and requirements of AUTHORITY HAVING JURISDICTION.
1. Performance mock-ups will be reviewed by AUTHORITY HAVING JURISDICTION, when required by that authority. Approval of the AUTHORITY HAVING JURISDICTION shall be secured prior to start of fabrication and field installation.
  2. Submit reports of testing of performance mock-ups to OWNER'S REPRESENTATIVE, responsible design professional if in addition to or other than CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, and AUTHORITY HAVING JURISDICTION (AHJ). Number of copies shall be as directed.
- F. Scheduling of Mock-Ups: Construct mock-ups and perform required observations, inspections, and tests sufficiently in advance of permanent construction to avoid delay of the Work.
1. Coordinate mock-ups with other submittals specified in applicable product Sections of the Specifications, including product data, shop drawings, samples for selection and certificates.

2. Include sufficient time for notification and review of mock-ups by ARCHITECT, CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, and other responsible parties.
3. Include mock-ups in Construction Progress Schedule.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS AND COMPONENTS**

- A. Products for Mock-Ups: Identical to products proposed for Materials and finishes shall comply with the requirements specified in the various applicable Sections of the Specifications, and shall match previously submitted and approved samples.
- B. Mock-Up Assemblies: Mock-ups shall incorporate all related construction materials and finishes having a visual or performance effect upon the completed Work.

## **PART 3 - EXECUTION**

### **3.1 MOCK-UPS CONSTRUCTION**

- A. Visual Mock-Ups Construction: Using identical methods and products to those proposed for permanent Work.
  1. Locate mock-ups where indicated or directed. Mock-ups are not intended to be built into permanent construction, **unless such locations are accepted in advance, in writing, by CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE.**
  2. Construct mock-ups in safe and structurally sound manner, to accommodate all loads imposed by environmental factors and examination activities.
  3. Construct mock-ups in compliance with reviewed submittals.
  4. Construct mock-ups using same construction personnel, means and methods as intended for permanent Work.
  5. Completed appearance of mock-ups shall match that of permanent Work.

### **3.2 MAINTENANCE OF MOCK-UPS**

- A. Maintenance of Visual Mock-Ups:
  1. Maintain mock-ups during course of construction or until removal is directed. Maintain mock-ups and surrounding site in a safe and clean condition, easily accessible, protected from soiling, damage, and deterioration.
  2. Immediately restore damage to mock-ups subject to damage, soiling or deterioration.

### **3.3 REMOVAL OF MOCK-UPS**



A. Removal of Visual Mock-Ups: Remove mock-ups at the completion of the Work.

1. Unless otherwise directed, maintain mock-ups until after Substantial Completion review.
2. Remove mock-ups and restore finishes in a manner to make previous presence of mock-up invisible. Complete construction of site Work at location of mock-up in accordance with the Contract Drawings.

### 3.4 MOCK-UPS

The following Mockups will be constructed at a minimum. Additional mockups may be identified on the plans, appendixes, and OR may be requested by the CONSTRUCTION MANAGER, ARCHITECT, OWNER'S REPRESENTATIVE, and or AUTHORITY HAVING JURISDICTION (AHJ).

A. Mock-up No. 1 - Site Paving (Including but not limited to Concrete Paving, Banding, Joints, Mow Curbs, Ramps, and all other Site Paving including textures, aggregate seeding, and finishes).

1. Description: For each type of Portland cement concrete paving, demonstrating range of colors and textures. Include each type of finish, decorative scoring, and expansion joint, with joint and concrete sealers.
2. Size: 12' x12' most cases and as directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR.

B. Mock-up No. 2 - Damage/Repair Mock-Ups

1. Description: Provide a "damage / repair" sample directly adjacent to **each required mock-up** for each paving type specified on project. Purpose of "damage / repair" sample are to clearly indicate CONTRACTOR'S ability to repair damaged concrete to match existing, should damage occur during course of construction.
2. Size: 2'x2' most cases and as directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR.

C. Mock-up No. 3 - Seat wall

1. Description: Provide a 5' long Seat wall all types and conditions per plans and details. Mock-up should reflect all finishes, colors, grouts, etc.
2. Size: As directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR.

D. Mock-up No. 4 - Pavers

1. Description: Install a paver area of each style, pattern and color of pavers being used. Mock-up should reflect all finishes, colors, grouts, etc.
  2. Size: 6'x6' and as directed on plans, details, specifications, and Landscape Architect direction.
  3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR.
- E. Mock-up No. 5 – Decomposed Granite Paving (DG)
1. Description: Install a DG paving area of each style, pattern and color of pavers being used. Mock-up should reflect all finishes, colors, etc.
  2. Size: 10'x10' and as directed on plans, details, specifications, and Landscape Architect direction.
  3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR.
- F. Mock-up No. 6 – Fencing (Including but not limited to Tubular Steel Fencing, chain-link fencing, backstop fencing, decorative fencing) Mock-up to include all finishes textures including metalizing, galvanization, and coatings).
1. Description: Install a Fencing paving area of each style, pattern and color of pavers being used. Mock-up should reflect all finishes, colors, etc.
  2. Size: 10'x10' and as directed on plans, details, specifications, and Landscape Architect direction.
  3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR.
- G. Mock-up No. 7 – Concrete Stairs
1. Description: Concrete stairs including risers, treads, cheek walls, railings, etc.
  2. Size: Stairs to have a minimum 4 risers, and be at least 3' in length and as directed on plans, details, specifications, and Landscape Architect direction.
  3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR.
- H. Mock-up No. 8 – Guardrails / railings
1. Description: Provide complete mock-up of all guardrail conditions per plans and details. Guardrails to represent all welds, metalizing, and finish painting.
  2. Size: Construct 8' section of each guardrail condition and as directed on plans, details, specifications, and Landscape Architect direction.
  3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR.

I. Mock-up No. 9 – Scorer's Table

1. Description: Scorer's table at baseball fields and soccer fields
2. Size: Size as directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR.

J. Mock-up No. 10 – Gates

1. Description: Entry / Exit Gates including but not limited to tubular steel and chain-link, including all hardware associated (complete system).
2. Size: Size as directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR

K. Mock-up No. 11 – Exterior block walls

1. Description: Exterior CMU block wall including texture grout, color, joints, sealants, and anti-graffiti coatings.
2. Size: Size as directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR

L. Mock-up No. 12 – Concrete Stencils

1. Description: Concrete stencil lettering and impressions as directed on plans, details, specifications, and Landscape Architect direction.
2. Size: Size as directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR

M. Mock-up No. 13 – Terraced Concrete Seating

1. Description: Terraced Concrete Seating including surface mounted aluminum bleachers and stairs.
2. Size: Minimum 8' in length and as directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR

N. Mock-up No. 14 – Concrete Banding

1. Description: Concrete banding reflection all conditions, textures, colors and joints,
2. Size: 2' long minimum and as directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR

O. Mock-up No. 15 – Synthetic Turf Base

1. Description: Synthetic Turf Base (not including the turf rug)
2. Size: 30'x30' and as directed on plans, details, specifications, and Landscape Architect direction.
3. Location: On project site at location mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR

**END OF SECTION**

**SECTION 01 45 00****QUALITY CONTROL****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Regulatory requirements for testing and inspection.
- B. Quality of the Work.
- C. CONTRACTOR'S quality control – Review / Inspection of construction.
- D. Inspections and tests, including those by AUTHORITIES HAVING JURISDICTION, independent testing and inspection agency or agencies, serving utilities and product manufacturers.
- E. CONTRACTOR'S responsibilities for observations, inspections, and tests.

**1.2 RELATED SECTIONS**

- A. Section 01 31 00 - Project Management and Coordination: Coordination of Work under Contract.
- B. Section 01 41 00 - Regulatory Requirements: Compliance with applicable codes, ordinances, and standards.
- C. Section 01 33 00 - Submittal Procedures: Administrative requirements for submission of results of tests and inspections.
- D. Section 01 60 00 - Product Requirements: Product options, substitutions, transportation and handling requirements, storage and protection requirements, and system completeness requirements.

**1.3 REGULATORY REQUIREMENTS FOR TESTING AND INSPECTION**

- A. Regulatory Requirements (To be in compliance with the latest version-in-effect of): for Testing and Inspection: Inspections, testing and approvals required by the AUTHORITY HAVING JURISDICTION (AHJ). Refer also to Section 01 41 00 - Regulatory Requirements.
  - 1. Title 24, California Code of Regulations (CCR), Part 1, California Building Code (CBC).
  - 2. Title 24, California Code of Regulations (CCR), Part 2 - California Building Code (CBC).

**1.4 QUALITY OF THE WORK**

- A. Quality of Products: Unless otherwise indicated or specified, all products shall be new, free of defects and fit for the intended use.
- B. Quality of Installation: All Work shall be produced plumb, level, square and true, or true to indicated angle, and with proper alignment and relationship between the various elements.

- C. Protection of Existing and Completed Work: CONTRACTOR shall take all measures necessary to preserve and protect existing and completed Work free from damage, deterioration, soiling and staining, until acceptance of the Work by OWNER through CONSTRUCTION MANAGER.
- D. Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Unless more stringent requirements are indicated or specified, comply with manufacturer's instructions and recommendations, reference standards and building code research report requirements in preparing, fabricating, erecting, installing, applying, connecting, and finishing Work.
- E. Deviations from Standards and Code Compliance and Manufacturer's Instructions and Recommendations: Document and explain all deviations from reference standards and building code research report requirements and manufacturer's product installation instructions and recommendations, including acknowledgement by the manufacturer that such deviations are acceptable and appropriate for the Project.

## 1.5 CONTRACTOR'S QUALITY CONTROL

- A. CONTRACTOR'S Qualifications: CONTRACTOR and all subcontractors shall be licensed by State of California, CONTRACTORS License Board, to perform Work required by the Contract Documents. In addition, current specialty certifications, approvals and licenses of building product manufacturers shall be held by those performing the Work, as applicable.
  - 1. CONTRACTOR shall employ highly skilled and trained craftpersons together with such other employees as required by applicable laws, rules, and ordinances.
  - 2. Each craft shall be under constant supervision by qualified foreman or other designated supervisor to ensure that Work performed is of highest quality.
- B. CONTRACTOR'S Quality Control: CONTRACTOR shall ensure that products, services, workmanship, and site conditions comply with requirements of the Drawings and Specifications by coordinating, supervising, testing, and inspecting the Work and by utilizing only suitably qualified personnel.
- C. Quality Requirements:
  - 1. Work shall be accomplished in accordance with quality requirements of the Contract Drawings and Contract Specifications, including, by reference, all Codes, laws, rules, regulations, and standards.
  - 2. When no quality basis is prescribed, the quality shall be in accordance with the best accepted practices of the construction industry for the locale of the Project, for similar projects and in compliance with applicable Codes, laws, rules, and regulations of AUTHORITIES HAVING JURISDICTION.
- D. Quality Control Personnel: CONTRACTOR shall employ and assign knowledgeable and skilled personnel as necessary to perform quality control functions to ensure that the Work is provided as required.
- E. Coordination of Field Quality Control: CONTRACTOR shall coordinate and schedule with CONSTRUCTION MANAGER quality assurance activities of Testing Laboratory and inspectors from AUTHORITIES HAVING JURISDICTION.

- F. Verification of Quality: Work shall be subject to Review and Approval by Design Team Members (i.e. OWNER'S REPRESENTATIVE, Engineers, CONSTRUCTION MANAGER, and other responsible design professionals, Testing Laboratory, AUTHORITY HAVING JURISDICTION (AHJ), serving utilities and product manufacturers, in accordance with provisions of the General Provisions of the Contract and requirements of product manufacturers.
1. CONTRACTOR shall cooperate by making Work available for observation, inspection and testing by designated representatives of OWNER'S REPRESENTATIVE, AUTHORITY HAVING JURISDICTION (AHJ), serving utilities and product manufacturers.
  2. Such verification may include observation, inspection and testing at mill, plant, shop, or project site locations where products for the Work are manufactured, fabricated, or assembled.
  3. CONTRACTOR shall provide access and facilities for verification of quality by CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, AUTHORITY HAVING JURISDICTION (AHJ), serving utilities and product manufacturers. See additional requirements specified herein in Article 1.12 titled "CONTRACTOR'S RESPONSIBILITIES FOR OBSERVATIONS, INSPECTIONS AND TESTS."
  4. CONTRACTOR shall provide all information and assistance necessary for verification of quality, including that by and from subcontractors, fabricators, materials suppliers, manufacturers, installers, applicators, and others performing Work.
  5. Contract modifications, if any, resulting from such verification activities shall be governed by applicable provisions in the General Provisions of the Contract.
  6. CONTRACTOR shall notify CONSTRUCTION MANAGER in writing within 10 days of completion of work installed by OWNER under separate contract of any defects or discrepancies that will cause delay or cost to the Contract. Failure to notify the CONSTRUCTION MANAGER in writing shall constitute acceptance of the work as complying with the Contract and coordinated with CONTRACTOR'S interface and work to be completed.
  7. Prior to expiration of guaranty period provided under the Contract, OWNER may exercise its right to reinspection.
    - a. If a determination is made to hold such an inspection, CONSTRUCTION MANAGER will schedule inspection in conjunction with CONTRACTOR.
    - b. At a minimum, CONTRACTOR'S authorized representative and CONSTRUCTION MANAGER shall participate in reinspection.
    - c. Discrepancies noted during reinspection, except normal wear and tear, normal weathering, and abuse shall be corrected by CONTRACTOR at no cost to OWNER. Such repairs shall be made promptly and to satisfaction of CONSTRUCTION MANAGER.
  8. **All reviews (re-inspections) required of Design Team members due to CONTRACTOR or his subcontractors that are found to be deficient as the result of not being fully prepared or in non-conformance with the Construction Documents shall be back charged to the CONTRACTOR. The back charge amount shall include all associated fees based on time, material, and travel expenses of those Design Team members involved with deficient or non-conforming reviews. This back charge shall be processed by CONSTRUCTION MANAGER or ARCHITECT at CONSTRUCTION MANAGER and/or ARCHITECT'S standard hourly rate, and such costs will be deducted from moneys still due to the CONTRACTOR, prior to Design Team member's attendance at any future reviews (re-inspections).**

- G. Observations by CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE and OWNER'S REPRESENTATIVE'S Consultants:
1. Periodic and occasional observations of Work in progress will be made by CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, and OWNER'S REPRESENTATIVE'S consultants as determined necessary to review progress of Work and general conformance with design intent.
  2. Continuous inspection will be made by Project Inspector and the independent Testing Laboratory engaged by OWNER.
- H. Limitations on Inspection, Test and Observations: Employment of Project Inspector, independent Testing Laboratory and observations by CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE and other responsible design consultants shall in no way relieve CONTRACTOR of duties and responsibilities to perform Work in full conformance to all requirements of Contract Documents and applicable Building Code and other regulatory requirements.
- I. Non-Conforming Work:
1. Correction of Non-Conforming Work: Non-conforming Work shall be modified, replaced, repaired, or redone by the CONTRACTOR at no change in Contract Sum or Contract Time.
  2. Rejection of Non-Conforming Work: OWNER through CONSTRUCTION MANAGER reserves the right to reject all Work not in conformance to the requirements of the Drawings and Specifications.
  3. Acceptance of Non-Conforming Work: Acceptance of non-conforming Work, without specific written acknowledgement and approval of the CONSTRUCTION MANAGER and, as applicable, AUTHORITIES HAVING JURISDICTION, shall not relieve the CONTRACTOR of the obligation to correct such Work.
  4. Contract Adjustment for Non-conforming Work: Should OWNER'S REPRESENTATIVE through CONSTRUCTION MANAGER determine that it is not feasible or in OWNER'S REPRESENTATIVE'S interest to require non-conforming Work to be repaired or replaced, and should non-conforming Work not be in conflict with the requirements of AUTHORITIES HAVING JURISDICTION, an equitable reduction in Contract Sum shall be made by agreement between OWNER and CONTRACTOR. If equitable amount cannot be agreed upon, a Construction Change Directive will be issued and the amount in dispute resolved in accordance with applicable provisions of the General Provisions of the Contract.
  5. Non-Responsibility for Non-Conforming Work: OWNER'S REPRESENTATIVE and OWNER'S REPRESENTATIVE'S consultants disclaim any and all responsibility for Work not produced in full conformance with the Contract Documents and the requirements of AUTHORITY HAVING JURISDICTION (AHJ).

## **1.6 INSPECTIONS AND TESTS BY AUTHORITIES HAVING JURISDICTION**

- A. CONTRACTOR'S Assistance: CONTRACTOR shall assist in all tests and inspections required by AUTHORITIES HAVING JURISDICTION over the Work under this Contract, including those required by AUTHORITY HAVING JURISDICTION (AHJ), including OWNER, Fire Authority, County Health Department, California Department of Fish & Game, Water Quality Control Board (WQCB) where



applicable. Such assistance shall include notification of the CONSTRUCTION MANAGER and Project Inspector when the Work is ready for inspection or re-inspection.

## **1.7 INSPECTIONS BY OWNER**

- A. Access to the Work: On behalf of the OWNER'S REPRESENTATIVE, CONSTRUCTION MANAGER and Project Inspector shall have access at all times for the purpose of inspection of the Work, including access to offsite shops and other fabrication and mixing facilities where the Work is in preparation. CONTRACTOR shall at all times maintain proper facilities and provide safe access for such inspection.
1. Should it be considered necessary or advisable by the CONSTRUCTION MANAGER, at any time before final acceptance of the entire Work, to make an examination of the Work already completed, by removing or tearing out the same, the CONTRACTOR shall on request promptly furnish all necessary facilities, labor, and materials.
  2. If such Work is found to be defective, in any respect, due to the fault of the CONTRACTOR or CONTRACTOR'S subcontractor, CONTRACTOR shall defray all expenses of such examinations and of satisfactory reconstruction. If, however, such Work is found to meet the requirements of the Contract, the additional cost of labor and material necessarily involved in the examination and replacement shall be allowed the CONTRACTOR.
- B. Rejection of Work by OWNER'S REPRESENTATIVE: OWNER'S REPRESENTATIVE, through CONSTRUCTION MANAGER, shall have the right to reject materials and workmanship which are defective or non-conforming, or to require their correction.
1. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the OWNER'S REPRESENTATIVE.
  2. If the CONTRACTOR does not correct such rejected Work within a reasonable time, fixed by written notice, the OWNER'S REPRESENTATIVE may repair or replace defective and non-conforming Work and charge the expense to the CONTRACTOR.

## **1.8 INSPECTIONS BY OWNER'S PROJECT INSPECTOR / REPRESENTATIVE**

- A. Inspections by OWNER'S REPRESENTATIVE'S Project Inspector: OWNER'S REPRESENTATIVE will employ a fulltime Project Inspector. Project Inspector shall be certified and approved by AUTHORITY HAVING JURISDICTION (AHJ).
1. The Work of construction in all stages of progress shall be subject to the personal, continuous observation of the Project Inspector. CONTRACTOR shall provide free and safe access to any and all parts of the Work at all times.
  2. CONTRACTOR shall furnish to the Project Inspector reasonable facilities for obtaining such information as may be necessary to keep the Project Inspector fully informed respecting progress and manner of the Work and the character of the materials.
  3. Inspection of the Work by the Project Inspector shall not relieve the CONTRACTOR of any obligation to fulfill the Contract.

## **1.9 INSPECTIONS BY INDEPENDENT TESTING LABORATORY**

A. Inspections by Independent Testing Laboratory:

1. OWNER'S REPRESENTATIVE will select, employ, and pay for an independent Testing Laboratory, licensed, certified, and approved by AUTHORITY HAVING JURISDICTION (AHJ). Testing Laboratory will conduct tests and inspections as indicated on Drawings, in Specifications and as required by AUTHORITY HAVING JURISDICTION (AHJ).
2. Testing Laboratory shall be licensed to conduct testing and inspection operations and services in the State of California. Testing Laboratory services for this project shall be supervised by Civil Engineer licensed to practice in the State of California, who shall certify and sign all reports.

B. Responsibilities of Independent Testing and Inspection Agency (Testing Laboratory):

1. Testing Laboratory shall provide qualified personnel at the project site and other locations where Work of the Contract is performed.
2. Testing Laboratory shall cooperate with CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, and CONTRACTOR when performing testing and inspection services.
3. Testing Laboratory shall perform observations, inspections, sampling and testing of products in compliance with requirements of the Contract Documents and AUTHORITY HAVING JURISDICTION (AHJ).
4. Testing Laboratory shall determine whether materials, mixes, products, application and installation procedures, characteristics of completed Work comply with requirements of the Contract Documents.
5. CONTRACTOR shall pay for the following:
  - a. Mileage and travel time for quality control services by Testing Laboratory when travel of more than 50 miles from the project site is required.
  - b. Overtime pay for personnel of Testing Laboratory when observations, inspections or tests are required after normal, established working hours.
  - c. All costs for repeated observations, reinspection or retesting by Testing Laboratory due to non-conforming Work.
  - d. OWNER'S REPRESENTATIVE will deduct such costs from the final payment (or funds due and payable) under the Contract. Contract Sum will be adjusted accordingly by Change Order.
6. CONTRACTOR shall make the Work in all stages of progress available for personal and continuous observation by the Testing Laboratory.
  - a. Testing Laboratory shall have free access to any and all parts of the Work at all times.
  - b. CONTRACTOR shall provide the Testing Laboratory with reasonable facilities for Testing Laboratory to obtain such information as Testing Laboratory determines is necessary for Testing Laboratory to be kept fully informed of the progress and manner of performance of the Work and character of products, according to Testing Laboratory's duties and responsibilities.
  - c. Observation and inspection of the Work by Testing Laboratory shall not relieve CONTRACTOR from any obligation to fulfill the requirements of the Contract.

- C. Inspections and Tests by AUTHORITIES HAVING JURISDICTION: CONSTRUCTION MANAGER through Project Inspector and Testing Laboratory will cause all tests and inspections required by AUTHORITY HAVING JURISDICTION (AHJ) to be made for Work under this Contract.
1. CONTRACTOR shall notify CONSTRUCTION MANAGER and Project Inspector in writing of required schedule and shall coordinate the conducting of required tests and inspections.
  2. All time required for inspections and tests by AUTHORITIES HAVING JURISDICTION shall be included in the Contract Time.
  3. Costs for inspections and tests by AUTHORITY HAVING JURISDICTION (AHJ) will be paid by OWNER'S REPRESENTATIVE.
- D. Submission of Reports: Testing Laboratory will promptly submit one copy of each report of observations, inspections, sampling and testing to the following:
1. CONSTRUCTION MANAGER.
  2. CONTRACTOR.
  3. Project Inspector.
  4. OWNER'S REPRESENTATIVE.
  5. OWNER'S REPRESENTATIVE'S consultant (design professional of record), as appropriate to the Work: Structural engineer, mechanical engineer, and electrical engineer.
  6. AUTHORITY HAVING JURISDICTION (AHJ).

#### **1.10 INSPECTIONS AND TESTS BY SERVING UTILITIES**

- A. Inspections and Tests by Serving Utilities:
1. CONTRACTOR shall cause all tests and inspections required by serving utilities to be made for Work under this Contract.
  2. Except as specifically noted, scheduling, coordinating, conducting, and paying for such inspections shall be solely the CONTRACTOR'S responsibility.
  3. Unless otherwise specified, inspections and tests by AUTHORITIES HAVING JURISDICTION shall be included in Contract Time and Contract Sum.

#### **1.11 INSPECTIONS AND TESTS BY PRODUCT MANUFACTURERS**

- A. Inspections and Tests by Product Manufacturers:
1. CONTRACTOR shall cause all tests and inspections specified or required to be conducted by product manufacturers or authorized representatives of product manufacturers to be made.
  2. Additionally, CONTRACTOR shall cause all tests and inspections required by product manufacturers or installer/applicator as conditions of guarantee, warranty, or certification of Work to be made, the cost of which shall be included in the Contract Sum. Provide reports in

format and with content comparable to that specified under Article titled "INSPECTIONS BY INDEPENDENT TESTING LABORATORY."

- B. Reports of Inspections and Tests by Product Manufacturers: CONTRACTOR shall provide reports in format and with content comparable to that specified under Article titled "INSPECTIONS BY INDEPENDENT TESTING LABORATORY."

#### **1.12 CONTRACTOR'S RESPONSIBILITIES FOR OBSERVATIONS, INSPECTIONS AND TESTS**

- A. CONTRACTOR'S Responsibilities for Observations, Inspections and Tests:
1. CONTRACTOR shall notify Testing Laboratory, Project Inspector, and product manufacturer, as applicable, 48 hours in advance of expected time for operations requiring inspection and testing services.
  2. CONTRACTOR shall deliver to Testing Laboratory or designated location, adequate samples of materials proposed to be used which require advance testing, together with proposed mix designs.
  3. CONTRACTOR shall cooperate with CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, and OWNER'S REPRESENTATIVE'S consultants, as applicable, Testing Laboratory, Project Inspector, and product manufacturer in the conduct of inspections and tests. CONTRACTOR shall provide access to Work areas and off-site fabrication and assembly locations, including during weekends and after normal work hours.
  4. CONTRACTOR shall provide incidental labor and facilities as necessary to ensure safe access to Work to be tested and inspected, to obtain and handle samples at the Project site or at source of products to be tested, and to store and cure test samples.
  5. CONTRACTOR shall provide, at least 15 days in advance of first test or inspection of each type, a schedule of tests or inspections indicating types of tests or inspections and their scheduled dates.
- B. Additional Tests: Costs for additional tests, inspections, and related services, due to the following, shall be reimbursed to OWNER'S REPRESENTATIVE by CONTRACTOR and no change in Contract Time shall result.
1. Failure to properly schedule or notify Testing Laboratory, Project Inspector or other responsible testing and inspection agency, manufacturer and AUTHORITIES HAVING JURISDICTION.
  2. Changes in sources, lots, or suppliers of products after original tests or inspections.
  3. Changes in means, methods, techniques, sequences, and procedures of construction which necessitate additional observation, inspection, testing, sampling, and related services.
  4. Changes in mix designs, such as those for concrete, mortar, and plaster, after review and acceptance of submitted mix design.
  5. Re-testing caused by a failed test or inspection.

#### **PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 50 00**  
**CONSTRUCTION FACILITIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Temporary facilities as indicated or specified as required for proper performance of the contract.

**1.2 REGULATORY REQUIREMENTS**

- A. Comply with governing regulations and utility company regulations and recommendations.
- B. Comply with pollution and environmental protection regulations for use of water and energy, for discharge of wastes and storm drainage from Project Site and for control of dust, air pollution, and noise.
- C. Temporary construction shall conform to requirements of State, County and Local authorities and underwriters which pertain to operation, health, safety and fire hazard. CONTRACTOR shall furnish and install items necessary for conformance with such requirements, whether or not called for under the separate divisions of these specifications.

**1.3 TEMPORARY WATER**

- A. BC#23 Site Utilities shall provide construction water at the closest existing fire hydrant as approved by the local jurisdiction and the CONSTRUCTION MANAGER.
  - 1. This shall include temporary meter and backflow devices.
  - 2. CONTRACTORS requiring construction water shall provide all labor and materials to distribute.

**1.4 TEMPORARY SANITARY FACILITIES**

- A. CONSTRUCTION MANAGER shall provide chemical toilets and wash stations for the duration of the project.
- B. Existing facilities shall not be used.

**1.5 TEMPORARY FENCES AND BARRICADES**

- A. The CONSTRUCTION MANAGER shall provide six (6) foot high temporary chain link fence with locked entrance gates to substantially enclose the entire project site. Any activities schedule to commence prior to the installation of fencing will be temporarily fenced by CONTRACTOR requiring same.
- B. The applicable CONTRACTOR requiring same shall construct and maintain planking, barricades, lights and warning signs as indicated as required by Local authorities and State safety ordinances and as necessary for the protection of the public.
- C. Refer to Exhibit B for Logistics Plan.

**1.6 TEMPORARY TELEPHONE SERVICE**

- A. No temporary phone will be provided.

**1.7 CONSTRUCTION EQUIPMENT**

- A. CONTRACTOR shall erect, equip, and maintain construction equipment in strict accordance with applicable statutes, laws, ordinances, and regulations of AUTHORITY HAVING JURISDICTION.
- B. CONTRACTOR shall provide, maintain and move upon completion of the Work all temporary rigging, scaffolding, hoisting equipment, rubbish chutes, ramps, stairs, runways, platforms, ladders, railings, and other temporary construction as required for all work hereunder.
- C. CONTRACTOR shall provide, maintain, and move upon completion all required equipment, lifts, and hoists as required for all the work.

**1.8 STORAGE**

- A. Operations of the CONTRACTOR, including storage of materials, shall be confined to areas approved by CONSTRUCTION MANAGER. CONTRACTOR shall be liable for damage caused by him during such use of property of the OWNER or other parties. CONTRACTOR shall save the OWNER and CONSTRUCTION MANAGER along with their respective officers, employees and agents, and the ARCHITECT and his employees, free and harmless from liability of any nature or kind arising from any use, trespass or damage occasioned by his operations on premises of third persons. Storage facilities shall provide protection of products from excessive cold, heat, moisture, humidity or physical abuse as specified in the respective sections for the products stored. Each CONTRACTOR requiring same shall provide their own temporary storage and security for same.
- B. Staging areas will be under the supervision of the CONSTRUCTION MANAGER. Materials shall be placed and relocated as necessary for the progress of the project.

**1.9 TEMPORARY JOB OFFICE**

- A. CONSTRUCTION MANAGER shall have a temporary site job office for the CONSTRUCTION MANAGER'S and Inspector's use only. Should any CONTRACTOR require office space, the CONTRACTOR requiring office space shall provide same.

**1.10 TEMPORARY ELECTRICAL**

- A. BC #22 Electrical shall provide temporary power as follows:
  - 1. Refer to BC #22 scope for specifics.
- B. Any temporary power requirements beyond these provided will be the responsibility of the CONTRACTOR requiring the same.
- C. All welding will be done with self-contained gas powered units.

**1.11 TEMPORARY LIGHTING**

- A. BC#22 Electrical shall provide temporary power as follows:
  - 1. Refer to BC #22 Scope for specifics.

**1.12 TEMPORARY HEAT**

- A. Temporary heat will be provided and maintained by the CONTRACTOR requiring same.



- B. Do not use permanent equipment for temporary heating purposes unless specifically noted otherwise in the contract documents.
- C. When schedule indicates casework installation before permanent power and HVAC systems are complete, Casework CONTRACTOR shall provide temporary heat/dehumidifier as required.

#### **1.13 TEMPORARY VENTILATION**

- A. All CONTRACTORS shall ventilate enclosed areas to assist cure of materials, dissipate humidity and to prevent accumulation of dust, fumes, vapors, or gases as the above may be generated by them.

#### **1.14 BARRIERS**

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Provided protection for plant life and trees designated to remain and for soft and hardscape areas adjacent to work, replace damaged materials as directed by the CONSTRUCTION MANAGER.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.
- E. Construction workers shall not interact or communicate with students or staff except in emergency or safety related situations.

#### **1.15 NOISE CONTROL**

- A. CONTRACTORS shall ensure that all construction equipment utilized include noise-reduction features (e.g., mufflers and engine shrouds) that are no less effective than those originally installed by the manufacturer of such equipment.
- B. CONTRACTORS shall review and be knowledgeable of any CEQA documentation for this project restricting or limiting noise, and implement any and all scheduling or mitigation methods necessary to conform with the CEQA documents. This includes any Mitigated Negative or Negative Declaration instrument the OWNER has produced.
- C. CONTRACTORS shall review and be knowledgeable of any federal, state or local agency requirements for noise restrictions and adhere to the policies outlined by the applicable laws and codes.

#### **1.16 POLLUTION CONTROL**

- A. Provide methods, means and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.

#### **1.17 EXTERIOR ENCLOSURES**

- A. Provide temporary weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for materials, to allow for temporary heating and maintenance or required ambient temperatures identified in individual specification Sections and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

**1.18 ACCESS ROADS**

- A. Provide and maintain access to fire hydrants, free of obstructions.
- B. Existing on-site roads may be used for construction traffic.
- C. CONTRACTORS may not park or drive on concrete walks or in the new buildings at any time.

**1.19 PROGRESS CLEANING**

- A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.
- B. Each CONTRACTOR shall remove their debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces prior to the space being enclosed.
- C. Each CONTRACTOR shall broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
- D. Remove waste materials, debris, and rubbish from site regularly and per requirements of the General Conditions.

**1.20 FIRE PROTECTION**

- A. Fire protection during construction shall be provided in accordance with CFC, Article 87.

**PART 2 - PRODUCTS (NOT USED)****PART 3 - EXECUTION****3.1 TEMPORARY FACILITIES**

- A. Locate and install where directed by the CONSTRUCTION MANAGER and maintain in a safe and sanitary condition at all times until completion of the contract.

END OF SECTION

**SECTION 01 54 00**  
**CONSTRUCTION AIDS**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Construction aids, including:
  - 1. Temporary lifts and hoists.
  - 2. Debris chutes.
  - 3. Temporary stairs.
  - 4. Scaffolding.

**1.2 RELATED SECTIONS**

- A. Section 01 10 00 - Summary of the Project: CONTRACTOR'S use of site and premises.
- B. Section 01 56 00 - Temporary Barriers and Enclosures: Temporary construction barriers, enclosures, and passageways.

**1.3 CODES AND REGULATIONS**

- A. Safety Regulations: Comply with Regulatory Requirements (To be in compliance with the latest version-in-effect of) of all applicable Federal, State, and local safety rules and regulations. CONTRACTOR shall be solely responsible for jobsite safety.
  - 1. CONTRACTOR shall apply and pay for scaffolding permit.

**1.4 TEMPORARY LIFTS AND HOISTS**

- A. Temporary Lifts and Hoists: Provide facilities for hoisting materials and personnel. Mobile lifts and truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

**1.5 DEBRIS CHUTES**

- A. Debris Chutes: Provide chutes as necessary for debris removal.
  - 1. Construct debris chutes of substantial materials. Use cylindrical, laminated fiber forms (Sonotube® or equal) to minimize noise of debris removal.
  - 2. Provide controls at debris chutes to minimize the spread of dust and debris.
  - 3. Limit use of debris chutes to times to minimize disruption of activities in adjacent spaces.

## **1.6 TEMPORARY STAIRS AND SCAFFOLDING**

- A. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of Contract Completion review.
- B. Permanent Stair Usage: Use of permanent stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to CONSTRUCTION MANAGER.
  - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress.
  - 2. If, despite such protection, stairs become damaged, restore damaged areas as acceptable to CONSTRUCTION MANAGER.
  - 3. Coordinate usage of existing stairs at occupied facilities with CONSTRUCTION MANAGER.
- C. Scaffolding: Provide scaffolding as necessary for access and proper performance of the Work. Design and installation of scaffolding shall be solely CONTRACTOR'S responsibility.

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.1 MAINTENANCE OF CONSTRUCTION AIDS**

- A. Maintenance: Use all means necessary to maintain construction aids in proper and safe condition throughout progress of the Work.
- B. Replacement: In the event of loss or damage, promptly restore construction aids by repair or replacement at no change in the Contract Sum or Contract Time.

### **3.2 REMOVAL OF CONSTRUCTION AIDS**

- A. Removal of Construction Aids: Unless otherwise mutually agreed by CONSTRUCTION MANAGER and CONTRACTOR, remove construction aids prior to Contract Completion review. Coordinate removal with requirements specified in Section 01 51 00 - Temporary Utilities, Section 01 50 00 - Construction Facilities, Section 01 55 00 - Vehicular Access and Parking and Section 01 56 00 - Temporary Barriers and Enclosures.
- B. Cleaning and Repairs: Clean and repair damage caused by installation or use of construction aids.

**END OF SECTION**

**SECTION 01 55 00****VEHICULAR ACCESS AND PARKING****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Requirements for vehicular access to Work areas.
- B. Requirements for construction parking.

**1.2 RELATED SECTIONS**

- A. Section 01 10 00 - Summary of the Project: CONTRACTOR'S use of site and premises.
- B. Section 01 50 00 - Construction Facilities: Coordination of access to field offices and sheds.
- C. Section 01 55 29 - Construction Staging Areas: Layout of construction staging area, including locations for vehicular access and construction parking.
- D. Section 01 56 00 - Temporary Barriers and Enclosures: Requirements for temporary construction barriers, enclosures, and passageways, applicable to construction parking areas.
- E. Section 01 58 00 - Project Identification: Directional and informational signage.
- F. Section 01 57 00 - Temporary Controls: Storm water pollution prevention measures; video record of existing conditions to be used to determine restoration Work.
- G. Section 01 74 00 - Cleaning and Waste Management: Cleaning during construction and final cleaning.

**1.3 PROTECTION OF EXISTING CONDITIONS**

- A. Protection of Adjacent Facilities: CONTRACTOR shall restrict Work to limits indicated on the Drawings and as specified in Section 01 10 00 - Summary of the Project. Protect existing, adjacent facilities from damage, including soiling and debris accumulation.

**1.4 SITE ACCESS**

- A. Site Access: Use of designated existing streets and driveways for construction traffic is permitted. CONTRACTOR shall prepare a haul route plan and obtain approval from OWNER'S REPRESENTATIVE prior to site mobilization. Review access routes with CONSTRUCTION MANAGER and comply with directions.
  - 1. Tracked vehicles shall not use paved areas.
  - 2. Provide unimpeded access for emergency vehicles. Maintain 20 foot (6 m) width driveways with turning space between and around combustible materials.
  - 3. Provide and maintain access to fire hydrants free of obstructions.

4. Clean and restore paving and other site features after construction use.

**B. Traffic Control:**

1. CONTRACTOR shall comply with all traffic regulations, including speed limits. CONTRACTOR shall pay all parking and traffic fines.
2. Employ trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on vehicular and pedestrian traffic lanes. Comply with regulations of AUTHORITIES HAVING JURISDICTION.
3. Provide signage, cones, and other suitable devices to direct traffic. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

**1.5 TRAFFIC SIGNS AND SIGNALS**

- A. Traffic Signs and Signals: Provide temporary signs and signals as required by AUTHORITIES HAVING JURISDICTION. Relocate signs and signals as necessary during construction.

**1.6 CONSTRUCTION PARKING**

- A. Construction Parking: CONTRACTOR shall prepare a parking plan and obtain approval from OWNER'S REPRESENTATIVE prior to site mobilization. Review construction parking with CONSTRUCTION MANAGER and comply with directions of CONSTRUCTION MANAGER.
1. Provide parking in designated locations for construction purposes.
  2. Do not park on public roadways unless approved by local police and fire authorities. Do not park on streets of adjoining residential community. Overnight parking is prohibited.
  3. Maintain clear access ways and parking for emergency vehicles, as required by local police and fire authorities.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.1 MAINTENANCE OF PARKING AND ACCESS ROADS**

- A. Maintenance: Maintain traffic and parking areas in a sound condition. Repair breaks, potholes, low areas, standing water and other deficiencies, to maintain paving and drainage in original or specified condition.
- B. Cleaning of Roadways and Parking Areas: Keep public and private rights-of-way and parking areas clear of construction-caused soiling, dust, and debris, especially debris hazardous to vehicle tires. Perform cleaning as frequently as necessary. Coordinate with requirements specified in Section 01 57 00 - Temporary Controls and Section 01 74 00 - Cleaning and Waste Management.

**END OF SECTION**

**SECTION 01 56 00****TEMPORARY BARRIERS AND ENCLOSURES****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Temporary construction barriers, enclosures, and passageways.
  - 1. Dust and debris barriers.
  - 2. Security barriers.
  - 3. Temporary chainlink fencing.
  - 4. Covered passageways.
- B. Protection of completed Work.
- C. Removal of construction facilities and temporary controls.

**1.2 RELATED SECTIONS**

- A. Section 01 10 00 - Summary of the Project: CONTRACTOR'S use of site and premises.
- B. Section 01 55 00 - Vehicular Access and Parking: Construction parking restrictions.
- C. Section 01 57 00 - Temporary Controls: General requirements for protection of existing conditions and run-off control.
- D. Section 01 58 00 - Project Identification: Directional and informational signage.
- E. Section 01 50 00 – Construction Facilities: Temporary facilities as indicated or specified as required for proper performance of the contract.

**1.3 CODES AND REGULATIONS**

- A. California Building Code (CBC): Comply with California Building Code (CBC) (To be in compliance with the latest version-in-effect of): Chapter 33, Section 3303 - Protection of Pedestrians During Construction or Demolition.
- B. Fire Regulations: Comply with requirements of fire AUTHORITIES HAVING JURISDICTION, including California Fire Code (CFC) (To be in compliance with the latest version-in-effect of): Article 87 during performance of the Work.
- C. Safety Regulations: Comply with requirements of all applicable Federal, State, and local safety rules and regulations. CONTRACTOR shall be solely responsible for jobsite safety.

- D. Barricades and Barriers: As required by governing AUTHORITIES HAVING JURISDICTION, provide substantial barriers, guardrails, and enclosures around Work areas and adjacent to embankments and excavations for protection of workers and the public.

#### **1.4 PROTECTION OF EXISTING CONDITIONS**

- A. Protection of Adjacent Facilities: CONTRACTOR shall restrict Work to limits indicated on the Drawings and as specified in Section 01 10 00 - Summary of the Project: Protect existing, adjacent facilities from damage, including soiling and debris accumulation.
- B. Protection of Existing Furniture, Fixtures and Equipment: As applicable, provide temporary enclosures, barriers and covers to protect existing furniture, fixtures, and equipment remaining in Project area during construction.

#### **1.5 MAINTENANCE OF CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

- A. Maintenance: Use all means necessary to maintain temporary barriers and enclosures in proper and safe condition throughout progress of the Work.
- B. Replacement: In the event of loss or damage, promptly restore temporary barriers and enclosures by repair or replacement at no change in the Contract Sum or Contract Time.

#### **1.6 TEMPORARY BARRIERS, ENCLOSURES AND PASSAGEWAYS**

- A. Temporary Barriers, General: Provide temporary fencing, safety netting, screening, barriers, and guardrails as necessary to provide for public safety, to prevent unauthorized entry to construction areas and to protect existing facilities, environmentally sensitive areas, and adjacent properties from damage from construction operations.
  - 1. Refer to temporary fencing and phasing plan in the Drawings. Comply with requirements indicated. If no drawings are provided CONTRACTOR to develop a fencing plan and submit to CONSTRUCTION MANAGER for review prior to fabrication and installation.
  - 2. Note requirements for continued occupancy and use of existing buildings and site areas during construction.
  - 3. Comply with applicable requirements of California Building Code (CBC) and of AUTHORITIES HAVING JURISDICTION, including industrial safety regulations. Review requirements with CONSTRUCTION MANAGER.
  - 4. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting.
  - 5. Paint temporary barriers and enclosures with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard.
  - 6. Where appropriate and necessary, provide warning lighting, including flashing red or amber lights.
- B. Temporary Chainlink Fencing: Provide temporary portable chain-link fencing with windscreen. See Section 01 55 29 - Construction Staging Area for requirements and layout of fencing.



1. Inground Chain-Link Fencing: Minimum 2-inch (50-mm) 11-gauge, galvanized steel, chain-link fabric fencing; minimum 6 feet (2.4 m) high (above surface) with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails.
  - a. Provide concrete or galvanized steel bases for supporting posts for portable connections if necessary.
  - b. Provide protective barriers at bases to prevent tripping by pedestrians and to protect finish surface.
2. **Windscreen on Chain-Link Fencing: For screening of construction activities from view, equivalent to the following:**
  1. Windscreen for standard construction fencing application:
    - a. Specified manufacturer: Collins Company, Fullerton, CA (714-870-9779).
    - b. Acceptable manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01 60 00 - Product Requirements.
    - c. Windscreen fabric: Closed mesh weave of 30 warp by 16 fills per square inch.
      - 1) Fiber: 5.6 ounce per square yard polypropylene fiber.
      - 2) Shade factor: 78 percent.
      - 3) Tensile strength: 360 pounds for warp and 190 pounds for fill, when tested according to ASTM D1682, grab method.
      - 4) Tear strength: 110 pounds for warp and 70 pounds for fill, when tested according to ASTM D2263, trapezoidal method.
    - d. Fabric fabrication:
      - 1) Reinforce hems and seams with 2-3/4 inch black polypropylene folded binding tape, with tensile strength of 300 pounds.
      - 2) Provide center reinforcing tape in addition to reinforced perimeter hems and panel seams.
      - 3) Sew hems and seams with UV light resistant polyester thread.
      - 4) Provide 9/32-inch brass grommets spaced at 12-inches on center in perimeter hems and center reinforcing tape.
    - e. Secure windscreen to fence at all grommets.
    - f. Locate windscreen on outside of fence.
  2. **Enhanced Windscreen for key entrance areas: Contractor to provide in six (6) locations / intersections a 400 LF Custom Printed Mesh Fence Wrap Plus (200 LF each side).**
    - g. Specified manufacturer: Fence Screen Rancho Santa Margarita, CA (888) 313 6313. Alternate Manufacturer JB3D, 731 N. Main Street Orange, CA (174) 744 2300.
    - h. Acceptable manufacturers: None identified. Equivalent products of other manufacturers will be considered in accordance with the "or equal" provision specified in Section 01 60 00 - Product Requirements.
    - i. Windscreen fabric: Mesh PLUS Fence Wrap - 351 Series
      - 1) Material: PVC Tight MAXFlex Mesh™ with No Fillers
      - 2) Blockage: 90% Privacy & the Highest Level of UV Inhibitors
      - 3) Weight: 330 g/m2
      - 4) Grab Tensile: 230 / 200 lbs.

- 5) Base Fabric: 9x18 1000 Denier
  - 6) Strip Tensile 200/140 lbs.
  - 7) Flame Resistance: Not consumed within 2 mins
  - 8) Ink Composition: Ultra High-Def. CMYK MAXFLEX UV-INK, 300% INK Stretch
  - 3) UV: Moderate UV inhibitors
- j. Fabric fabrication:
- 1) Reinforce hems and seams with welded edge.
  - 2) Sew hems and seams with UV light resistant polyester thread.
  - 3) Provide Black Military Grade Coated Brass Grommets spaced 24-inches on center in perimeter hems and center reinforcing tape.
  - 4) Landscape Architect to provide contractor with artwork.
- k. Secure windscreen to fence at all grommets.
- l. Locate windscreen on outside of fence.
- C. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- D. Temporary Wood Fencing: Erect a structurally adequate, protective wood fencing in compliance with California Building Code (CBC) Chapter 33, Section 3303.7 - Pedestrian Protection. Wood fencing shall be provided as required by Table 33-A.
1. Materials: As required by CBC Section 3303.7.
  2. Finishes: As acceptable to OWNER'S REPRESENTATIVE. Fence where exposed to public view shall receive minimum of one coat wood primer and one coat semi-gloss paint, color(s) as directed by CONSTRUCTION MANAGER.
- E. Temporary Closures: Provide temporary closures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate closures with ventilating and material drying or curing requirements to avoid dangerous conditions and effects such as mold.
  2. Vertical openings: Close openings of 25 sq. ft. (2.3 sq. m) or less with plywood or similar materials.
  3. Horizontal openings: Close openings in floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
  4. Install tarpaulins securely using wood framing and other suitable materials.
  5. Where temporary wood or plywood enclosure exceeds 100 sq. ft. (9.2 sq. m) in area, use fire-retardant-treated material for framing and main sheathing.
- F. Temporary Partitions: Erect and maintain temporary partitions and temporary closures to limit dust and dirt migration, including migration into existing facilities, to separate areas from fumes and noise and to maintain fire-rated separations. Coordinate with provisions to control pollutants specified in Section 01 81 19 - Indoor Air Quality Requirements.

1. Dust barriers: Construct dustproof, floor-to-ceiling partitions of not less than nominal 4-inch (100-mm) studs, 2 layers of 3-mil (0.07-mm) polyethylene sheets, inside and outside temporary enclosure.
    - a. Overlap and tape full length of joints.
    - b. Include 5/8-inch thick gypsum board at temporary partitions serving as noise barrier.
    - c. Insulate partitions to minimize noise transmission to adjacent occupied areas.
    - d. Seal joints and perimeter of temporary partitions.
  2. Dust barrier passages: Where passage through dust barrier is necessary, provide gasketed doors or heavy plastic sheets that effectively prevent air passage.
    - a. Construct a vestibule and airlock at each entrance to temporary enclosure with not less than 48 inches (1219 mm) between doors.
    - b. Maintain water-dampened foot mats in vestibule where passage leads to existing occupied spaces.
    - c. Equip doors with security locks.
  3. Fire-rated temporary partitions: Maintain fire-rated separations, including corridor walls and occupancy separations, by construction of stud partitions with gypsum board faces.
    - a. Construction details shall comply with recognized time-rated fire-resistive construction. Typically, 1-hour rated partitions shall be 2x4 wood studs at 16-inches on center or 3-1/2 inch metal studs at 16-inches on center, with 5/8-inch thick Type X gypsum board at both faces, with joints filled, taped and topped.
    - b. Seal partition perimeters with acceptable fire stopping and smoke seal materials.
    - c. Construct fire-rated temporary partitions whenever existing time-rate fire-resistive construction is removed for 12 hours or more.
- G. HVAC Protection: Provide dust barriers at HVAC return grilles and air inlets to prevent spread of dust and clogging of filters.
- H. Temporary Floor Protection: Protect existing floors from soiling and damage. Coordinate with pollution controls specified in Section 01 81 19 - Indoor Air Quality Requirements.
1. Cover floor with 2 layers of 3-mil (0.07-mm) polyethylene sheets, extending sheets 18 inches (460 mm) up the side walls.
  2. Cover polyethylene sheets with 3/4-inch (19-mm) fire-retardant plywood.
  3. Provide floor mats to clean dust from shoes.
- I. Landscape Barriers: Provide barriers around trees and plants and environmentally sensitive areas designated to remain.
1. Locate barriers as directed outside of drip lines of trees and plants.
  2. Protect entire area under trees against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water.
  3. CONTRACTOR shall pay all costs to restore trees and plants within barriers that are damaged by construction activities. Restoration shall include replacement with plant materials of equal

quality and size. Costs shall include all fines, if any, levied by AUTHORITIES HAVING JURISDICTION.

- J. Barricades, Warning Signs and Lights, General: Comply with standards and Code requirements for erection of structurally adequate barricades. Paint barricades with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.
- K. Guard Rails: Provide guard rails along tops of embankments and excavations. Along public walkways and areas accessible by the public, adjoining excavations, provide guardrails in addition to fencing.
  - 1. Guardrails shall be substantially and durably constructed of lumber, firmly anchored by posts embedded in concrete, and complying with Code requirements for temporary barriers.
  - 2. Guardrails shall comply with dimensional requirements and accommodate loads as prescribed by California Building Code (CBC) for permanent guardrails.
- L. Security Closures and Lockup: Provide substantial temporary closures of openings in exterior surfaces and interior areas as appropriate to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Provide doors with self-closing hardware and locks.
  - 1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- M. Weather Closures: Provide temporary weather-tight closures at exterior openings to prevent intrusion of water, to create acceptable working conditions, to protect completed Work and to maintain temporary heating, cooling, and ventilation. Provide access doors with self-closing hardware and locks.
- N. Temporary Access, Passage, and Exit Ways: Construct temporary stairs, ramps, and covered walkways, with related doors, gates, closures, guardrails, handrails, lighting, and protective devices, to maintain access and exit ways to existing facilities to remain operational.
  - 1. Design and location of temporary construction shall be by CONTRACTOR, subject to review by CONSTRUCTION MANAGER and AUTHORITIES HAVING JURISDICTION.
  - 2. Provide temporary lighting, illuminated interior exit signage, non-illuminated directional and instructional signage, and temporary security alarms for temporary exits and exit passageways.
  - 3. Temporary measures shall suit and connect to existing building systems, and shall be approved by CONSTRUCTION MANAGER and AUTHORITIES HAVING JURISDICTION.

## **1.7 PROTECTION OF INSTALLED WORK**

- A. Protection of Installed Work, General: Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.

- B. Protective Coverings: Provide protective coverings at walls, projections, jambs, sills, and soffits of openings as necessary to prevent damage from construction activities, such as coatings applications, and as necessary to prevent other than normal atmospheric soiling.
- C. Traffic Protection:
  - 1. Protect finished floors, stairs and other surfaces from traffic, soiling, wear, and marring.
  - 2. Provide temporary covers of plywood, reinforced kraft paper or temporary rugs and mats, as necessary. Temporary covers shall not slip or tear under normal use.
  - 3. Prohibit traffic and storage on waterproofed and roofed surfaces and on landscaped areas.
  - 4. Protect newly fine graded, seeded, and planted areas with barriers and flags to designate such areas as closed to pedestrian and vehicular traffic.

## **1.8 REMOVAL OF TEMPORARY BARRIERS AND ENCLOSURES**

- A. Removal of Temporary Barriers and Enclosures: Unless otherwise mutually agreed by CONSTRUCTION MANAGER and CONTRACTOR, remove temporary materials, equipment, services, and construction prior to Contract Completion review. Coordinate removal with requirements specified in Section 01 51 00 - Temporary Utilities, Section 01 50 00 - Construction Facilities, Section 01 55 00 - Vehicular Access and Parking and Section 01 56 00 - Temporary Barriers and Enclosures.
- B. Cleaning and Repairs: Clean and repair damage, soiling and marring caused by installation or use of temporary barriers and enclosures.

## **PART 2 – PRODUCTS (NOT USED)**

## **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 56 33****TEMPORARY SECURITY BARRIERS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Work site security.
- B. Security/pass requirements, including pass-type identification badges.
- C. Fire protection during construction.

**1.2 RELATED SECTIONS**

- A. Section 01 10 00 - Summary of the Project: CONTRACTOR'S use of site and premises.
- B. Section 01 52 00 - Construction Facilities: Storage sheds at Work site.
- C. Section 01 81 19 - Indoor Air Quality Requirements: Control of dust and other pollutants at building interior.
- D. Section 01 56 00 - Temporary Barriers and Enclosures
- E. Section 01 50 00 - Construction Facilities: Field offices and sheds.
- F. Section 01 54 00 - Construction Aids: Temporary lifts and hoists; temporary stairs and scaffolding.
- G. Section 01 55 00 - Vehicular Access and Parking: Vehicle access and parking control at Work areas.
- H. Section 01 56 00 - Temporary Barriers and Enclosures: Requirements for dust and debris barriers.
- I. Section 01 57 23 - Temporary Storm Water Pollution Control: Prevention of discharge of pollutants from the construction site into receiving waters.
- J. Section 01 74 00 - Construction Waste Management and Disposal: Control of construction and demolition waste.

**1.3 CODES AND REGULATIONS**

- A. Fire Regulations: Comply with requirements of fire AUTHORITIES HAVING JURISDICTION, including California Fire Code (CFC) (To be in compliance with the latest version-in-effect of): Article 87 during performance of the Work.
- B. Safety Regulations: CONTRACTOR shall be solely responsible for jobsite safety. Minimum requirements shall include the following.
  - 1. Comply with requirements of all applicable Federal, State, and local safety rules and regulations.

- C. Barricades and Barriers: Provide substantial barriers, guardrails, fencing and enclosures as necessary to secure and control access to Work areas. See Section 01 56 00 - Temporary Barriers and Controls for specific requirements.

#### **1.4 WORK SITE SECURITY**

- A. Security Responsibility: Security of the Work site, including various locations within existing facilities, shall be solely the CONTRACTOR'S responsibility until completion of the Work.
- B. CONTRACTOR'S Security Program:
  - 1. CONTRACTOR shall protect Work site, including existing premises and OWNER'S REPRESENTATIVE'S operations, from theft, vandalism, and unauthorized entry. CONTRACTOR shall be responsible for restoration and replacement of loss or damage to property at no change in Contract Sum and Contract Time.
    - a. Damaged and deteriorated products shall not be incorporated into the Work.
    - b. Damaged and deteriorated products shall be immediately removed from the site.
    - c. Damage to completed Work and to existing facilities shall be immediately corrected.
  - 2. CONTRACTOR shall initiate and maintain Security Program in coordination with local police and fire authorities. Program shall commence upon site mobilization.
  - 3. Termination of or reduction in Security Program as Work is completed may occur only with approval of CONSTRUCTION MANAGER.
  - 4. CONTRACTOR shall provide enclosures and sheds to protect materials and equipment from damage, theft and misuse at no change in Contract Sum and Contract Time. Refer to Section 01 52 00 - Construction Facilities and insurance requirements in General Provisions of the Contract.
  - 5. Project Inspector's Access: Provide the Project Inspector with keys necessary to gain access to locked areas of the Work. Project Inspector will be responsible for such keys and will return them to the CONTRACTOR at acceptance of the project or area is complete.
- C. Guard Service: At CONTRACTOR'S discretion, employ guards to protect the site after working hours. Costs of guard service shall be included in the Contract Sum.
- D. Work Site Entry Control:
  - 1. CONTRACTOR shall restrict entry of unauthorized persons and vehicles to Work site and existing facilities. Comply with requirements specified in Section 01 55 00 - Vehicular Access and Parking.
  - 2. CONTRACTOR shall permit and accommodate site access by CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE'S staff, inspectors, and construction personnel performing concurrent work for OWNER'S REPRESENTATIVE.
  - 3. Coordinate Work site entry control with requirements specified in Section 01 55 00 - Vehicular Access and Parking, including restrictions on obstructing roadways and walkways.



- E. Supplements to Site Security: OWNER, at OWNER'S expense, may supplement construction site security.

## **1.5 PERMANENT KEYS CONTROL**

- A. Permanent Keys Control: Immediately upon receipt of permanent keys for whatever purpose (finish hardware, mechanical equipment, casework, dispensers, lockers, switches, equipment items, etc.), tag or otherwise clearly identify keys according to one approved system and turn them over to the CONSTRUCTION MANAGER prior to any opportunity of access to keys by parties other than those authorized by OWNER.

## **1.6 PROTECTION OF EXISTING CONDITIONS**

- A. Protection of Adjacent Facilities: CONTRACTOR shall restrict Work to limits indicated on the Drawings and as specified in Section 01 10 00 - Summary of the Project. Protect existing, adjacent facilities from damage, including soiling and debris accumulation.
- B. Video Record of Existing Conditions: CONTRACTOR shall produce video record of all existing conditions within and adjacent to Project area.
  - 1. Video record shall made with sound to record comments to identify locations and describe conditions.
  - 2. CONSTRUCTION MANAGER will accompany CONTRACTOR during recording of existing conditions but will not direct recording process.
  - 3. Video shall record state of existing features, including but not limited to:
    - a. Paving.
    - b. Landscaping.
    - c. Building surfaces.
    - d. Utilities.
    - e. Lighting standards, fencing, signage, and other site appurtenances.
  - 4. CONTRACTOR shall retain one copy and deliver one copy of video record to CONSTRUCTION MANAGER.
  - 5. Video record shall be used to verify restoration of existing conditions after completion of construction activities.
  - 6. Existing feature not recorded shall be restored as directed by CONSTRUCTION MANAGER, including reconstruction, and refinishing as determined necessary by CONSTRUCTION MANAGER.

## **1.7 FIRE PROTECTION**

- A. Fire Protection Responsibility: Protection of Project from fire shall be solely CONTRACTOR'S responsibility.

- B. Fire Protection Provisions, General: Maintain, at a minimum, the Work in conditions to minimize fire hazards and provide adequate fire protection devices, such as suitable fire extinguishers, blankets, warning signs and storage containers.
  - 7. Store combustible materials in containers in fire-safe locations.
  - 8. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
  - 9. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
- C. Special Fire Protection Provisions: During hazardous construction activities, maintain adequate fire protection devices immediately available for use at the location of such activities.
- D. Fire Protection Equipment: Until fire protection is provided by permanent fire protection systems and equipment, install, and maintain temporary fire protection equipment as necessary to protect against ignition and spread of fires. Comply with NFPA 10 "Standard for Portable Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alteration and Demolition Operations."
- E. Temporary Fire Sprinkler Provisions: Where existing fire sprinkler system is affected by demolition and re-construction activities, provide either temporary fire protection measures acceptable to AUTHORITIES HAVING JURISDICTION or modify existing system as necessary to maintain fire protection. Include extensions and additions to standpipe system, for Fire Department connections. Comply with California Fire Code (CFC) Article 87 during all phases of the Work.
- F. Fire Extinguishers for Protection During Construction: Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.
  - 1. Provide hand carried, portable UL-rated, Class "A" fire extinguishers for temporary offices and similar spaces.
  - 2. In other locations, provide hand-carried, portable, UL-rated, Class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
- G. Installation of Fire Extinguishers for Protection During Construction: Locate fire extinguishers in field offices, storage sheds, tool houses, other temporary buildings and throughout the Work site. Comply with directions of Fire Marshal having jurisdiction.
  - 1. In the area under construction, provide at least one fire extinguisher for each 5,000 square feet of building floor area.
  - 2. Locate fire extinguishers no greater than 100 feet travel distance apart.

## **1.8 EROSION AND SEDIMENTATION CONTROL**

- A. Pavement Clearing and Cleaning: Keep site accessways, parking areas and building access and exit facilities clear of mud.

3. Remove mud, soil and debris and dispose in a manner which will not be injurious to persons, property, plant materials and site.
4. Comply with runoff control requirements specified in Section 01 57 23 – Temporary Storm Water Pollution Control.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 60 00****PRODUCT REQUIREMENTS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. General requirements for products used for the Work, including:
  - 1. General characteristics of products.
  - 2. Product options.
  - 3. System completeness.
  - 4. Transportation and handling requirements.
  - 5. Storage and protection of products.
  - 6. Installation of products.

**1.2 RELATED SECTIONS**

- A. Section 01 41 00 - Regulatory Requirements: Codes and standards applicable to product specifications; minimum requirements.
- B. Section 01 42 13 - Reference Standards and Abbreviations: References to various standards, standard specifications, codes, practices, and other requirements.
- C. Section 01 33 00 - Submittal Procedures: Requirements applicable to submittals for "or equal" and substitute products.
- D. Section 01 25 00 – Substitution procedures: Substitution requirements and procedures.

**1.3 GENERAL PRODUCT REQUIREMENTS**

- A. Products, General: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock, and include materials, equipment, assemblies, fabrications, and systems.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model designations indicated in the manufacturer's published product data.
  - 2. Materials: Products that are shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the Work.
  - 3. Equipment: A product with operating parts, whether motorized or manually operated, that requires connections such as wiring or piping.
- B. Specific Product Requirements: Refer to requirements of Section 01 45 00 - Quality Control and individual product Specifications Sections in Divisions 2 through 33 for specific requirements for products.

- C. Minimum Requirements: Specified requirements for products are minimum requirements. Refer to general requirements for quality of the Work specified in Section 01 45 00 - Quality Control and elsewhere herein.
- D. Product Selection: Provide products that fully comply with the Contract Documents, are undamaged and unused at installation. Comply with additional requirements specified herein in Article titled "PRODUCT OPTIONS".
- E. Standard Products: Where specific products are not specified, provide standard products of types and kinds that are suitable for the intended purposes and that are usually and customarily used on similar projects under similar conditions. Products shall be as selected by CONTRACTOR and subject to review and acceptance by OWNER'S REPRESENTATIVE.
- F. Product Completeness: Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect. Comply with additional requirements specified herein in Article titled "SYSTEM COMPLETENESS".
- G. Code Compliance: All products, other than commodity products prescribed by Code, shall have a current ICC Evaluation Service, Inc. (ICC ES) Research Report or Evaluation Report, as applicable. Refer to additional requirements specified in Section 01 41 00 - Regulatory Requirements.
- H. Interchangeability: To the fullest extent possible, provide products of the same kind from a single source. Products required to be supplied in quantity shall be the same product and interchangeable throughout the Work. When options are specified for the selection of any of two or more products, the product selected shall be compatible with products previously selected.
- I. Product Nameplates and Instructions:
1. Except for required Code-compliance labels and operating and safety instructions, locate nameplates on inconspicuous, accessible surfaces. Do not attach manufacturer's identifying nameplates or trademarks on surfaces exposed to view in occupied spaces or to the exterior.
  2. Provide a permanent nameplate on each item of service-connected or power-operated equipment. Nameplates shall contain identifying information and essential operating data such as the following example:  
  
Name of manufacturer  
Name of product  
Model and serial number  
Capacity  
Operating and Power Characteristics  
Labels of Tested Compliance with Codes and Standards
  3. For each item of service-connected or power-operated equipment, provide operating and safety instructions, permanently affixed and of durable construction, with legible machine lettering. Comply with all applicable requirements of AUTHORITIES HAVING JURISDICTION and listing agencies.
- J. Electrical Product Requirements: Comply with requirements specified in Division 26, 27, 28 as required.

## 1.4 PRODUCT OPTIONS

- A. Products Specified by Description: Where Specifications describe a product, listing characteristics required, with or without use of a brand name, provide a product that has the specified attributes and otherwise complies with specified requirements.
3. Comply with specified attributes related to sustainable design criteria. Refer to Section 01 81 13 - Sustainable Design Requirements and requirements specified in individual product Sections in Divisions 2 through 32.
- B. Products Specified by Performance Requirements Where Specifications require compliance with performance requirements, provide product(s) that comply and are recommended by the manufacturer for the intended application. Verification of manufacturer's recommendations may be by product literature or by certification of performance from manufacturer.
1. Comply with specified sustainable design performance requirements. Refer to Section 01 81 13 - Sustainable Design Requirements and requirements specified in individual product Sections in Divisions 2 through 33.
- C. Products Specified by Reference to Standards: Where Specifications require compliance with a standard, provided product shall fully comply with the standard specified. Refer to general requirements specified in Section 01 42 13 - Reference Standards and Abbreviations regarding compliance with referenced standards, standard specifications, codes, practices, and requirements for products.
1. Comply with specified standards related sustainable design. Refer to Section 01 81 13 - Sustainable Design Requirements and requirements specified in individual product Sections in Divisions 2 through 33.
- D. Products Specified by Identification of Manufacturer and Product Name or Number:
1. "Specified Manufacturer": Provide the specified product(s) of the specified manufacturer.
- a. If only one manufacturer is specified, without "acceptable manufacturers" being identified, provide only the specified product(s) of the specified manufacturer.
- b. If the phrase "or equal" is stated or reference is made to the "or equal provision," products of other manufacturers may be provided if such products are equivalent to the specified product(s) of the specified manufacturer. Equivalence shall be demonstrated by submission of complete information in compliance with requirements specified herein, and in compliance with section 01 25 00 substitution procedures.
- c. Products identified as "OWNER Standard" are only products acceptable. No substitutions will be considered.
2. "Acceptable Manufacturers": Product(s) of the named manufacturers, if equivalent to the specified product(s) of the specified manufacturer, will be acceptable in accordance with the requirements specified herein and in compliance with section 01 25 00 substitution procedures, except considerations regarding changes in Contract Time and Contract Sum will be waived if no increase in Contract Time or Contract Sum results from use of such equivalent products.
3. Unnamed manufacturers: Products of unnamed manufacturers will be acceptable only as follows:

- a. Unless specifically stated that substitutions will not be accepted or considered or that products are "OWNER Standard," the phrase "or equal" shall be assumed to be included in the description of specified product(s). Equivalent products of unnamed manufacturers will be considered in accordance with the "or equal" provision specified herein, below.
  - b. If provided, products of unnamed manufacturers shall be subject to the requirements specified herein and in compliance with section 01 25 00 substitution procedures.
4. Quality basis: Specified product(s) of the specified manufacturer shall serve as the basis by which products by named acceptable manufacturers and products of unnamed manufacturers will be evaluated. Where characteristics of the specified product are described, where performance characteristics are identified or where reference is made to industry standards, such characteristics are specified to facilitate evaluation of products by identifying attributes of the specified product(s) which must be met by proposed products.
- E. Products Specified by Combination of Methods: Where products are specified by a combination of attributes, including manufacturer's name, product brand name, product catalog or identification number, industry reference standard, or description of product characteristics, provide products conforming to all specified attributes.
- F. "Or Equal" Provision: Where the phrase "or equal" or the phrase "or approved equal" is included, product(s) of unnamed manufacturer(s) may be provided as specified above in subparagraph titled "Unnamed manufacturers."
  1. Products identified as "OWNER Standard" are the only products acceptable. No substitutions will be considered for "OWNER Standard" products.
  2. The requirements specified herein and in compliance with section 01 25 00 substitution procedures shall apply to products provided under the "or equal" provision except, if the proposed product(s) are determined to be equivalent to the specified product(s) of the specified manufacturer, the requirement specified for substitutions to result in a net reduction in Contract Time or Contract Sum will be waived.
  3. Use of product(s) under the "or equal" provision shall not result in any delay in completion of the Work, including completion of portions of the Work for use by OWNER'S REPRESENTATIVE or for work under separate contract by OWNER'S REPRESENTATIVE.
  4. Use of product(s) under the "or equal" provision shall not result in change in Contract Sum and Contract Time. Should additional costs be incurred, including costs for re-design and for fees for plancheck review and permit, costs shall be paid by CONTRACTOR with no change in Contract Sum and Contract Time.
  5. Use of product(s) under the "or equal" provision shall not require substantial change in the intent of the design, in the opinion of the OWNER'S REPRESENTATIVE. The intent of the design shall include functional performance and aesthetic qualities.
    - a. Should changes in dimensions, configurations, locations, and interfaces between products be necessary due to use of other than the specified products of the specified manufacturer, such changes shall be made by the CONTRACTOR, subject to review by the OWNER'S REPRESENTATIVE and, if applicable, approval by the Division of the State ARCHITECT (DSA), at no change in Contract Sum and Contract Time.
    - b. Refer to Section 01 26 00 - Contract Modification Procedures for requirements for approval of changes by AUTHORITY HAVING JURISDICTION (AHJ).



6. The determination of equivalence will be made by the OWNER'S REPRESENTATIVE and such determination shall be final.
- G. Visual Matching: Where Specifications require matching a sample, the decision by the OWNER'S REPRESENTATIVE on whether a proposed product matches shall be final. Where no product visually matches but the product complies with other requirements, comply with provisions for substitutions for selection of a matching product in another category.
- H. Selection of Products: Where requirements include the phrase "as selected from manufacturer's standard colors, patterns and textures", or a similar phrase, selections of products will be made by indicated party or, if not indicated, by the OWNER'S REPRESENTATIVE. The OWNER'S REPRESENTATIVE will select color, pattern, and texture from the product line of submitted manufacturer, if all other specified provisions are met.
- I. Contract Document Revisions:
  1. Should a CONTRACTOR-proposed substitution or alternative sequence or method of construction require revision of the Contract Drawings or Specifications, including revisions for the purposes of determining feasibility, scope or cost, or revisions for the purpose of obtaining review and approval by AUTHORITY HAVING JURISDICTION (AHJ), revisions will be made by OWNER'S REPRESENTATIVE or other consultant of OWNER'S REPRESENTATIVE who is the responsible design professional, as approved in advance by OWNER'S REPRESENTATIVE through CONSTRUCTION MANAGER. Design revisions may be processed by CONSTRUCTION MANAGER or ARCHITECT at CONSTRUCTION MANAGER and/or ARCHITECT'S standard hourly rate, and such costs will be deducted from moneys still due to the CONTRACTOR.
  2. Services of OWNER'S REPRESENTATIVE or other responsible **design professional for researching and reporting on proposed substitutions or alternative sequence and method of construction shall be paid by CONTRACTOR** when such activities are considered additional services to the design services contracts of the OWNER'S REPRESENTATIVE or other responsible design professional.
  3. Costs of services by OWNER'S REPRESENTATIVE or other responsible design professional of the OWNER'S REPRESENTATIVE shall be paid on a time and materials basis, based on current hourly fee schedules, with reproduction, long distance telephone and shipping costs reimbursable at cost plus usual and customary mark-up for handling and billing.
  4. Such fees shall be paid whether or not the proposed substitution or alternative sequence or method of construction is ultimately accepted by OWNER'S REPRESENTATIVE and a Change Order is executed.
  5. Such fees shall be paid from CONTRACTOR'S portion of savings if a net reduction in Contract Sum results. If fees exceed CONTRACTOR'S portion of net reduction, CONTRACTOR shall pay all remaining fees unless otherwise agreed in advance by OWNER'S REPRESENTATIVE through CONSTRUCTION MANAGER.
  6. Such fees owed shall be deducted from the amount owed CONTRACTOR on the Application for Payment next made following completion of revised Contract Drawings and Specifications or

completion of research and other services. OWNER will then pay the OWNER'S REPRESENTATIVE.

## 1.5 SYSTEM COMPLETENESS

### A. System Completeness:

1. The Contract Drawings and Specifications are not intended to be comprehensive directions on how to produce the Work. Rather, the Drawings and Specifications are instruments of service prepared to describe the design intent for the completed Work.
2. It is intended that all equipment, systems, and assemblies be complete and fully functional even though not fully described. Provide all products and operations necessary to achieve the design intent described in the Contract Documents.
3. Refer to related general requirements specified in Section 01 41 00 - Regulatory Requirements regarding compliance with minimum requirements of applicable codes, ordinances, and standards.

### B. Omissions and Misdescriptions: CONTRACTOR shall report to ARCHITECT immediately when elements essential to proper execution of the Work are discovered to be missing or misdescribed in the Drawings and Specifications or if the design intent is unclear.

1. Should an essential element be discovered as missing or misdescribed prior to receipt of Bids, an Addendum will be issued so that all costs may be accounted for in the Contract Sum.
2. Should an obvious omission or misdescription of a necessary element be discovered and reported after execution of the Agreement, CONTRACTOR shall provide the element as though fully and correctly described, and a no-cost Change Order shall be executed.
3. Refer to related general requirements specified in Section 01 31 00 - Project Management and Coordination, regarding construction interfacing and coordination.

## 1.6 TRANSPORTATION, DELIVERY AND HANDLING

### A. Transportation, Delivery and Handling, General: Comply with manufacturer's instructions and recommendations for transportation, delivery, and handling, in addition to the following.

### B. Transportation: Transport products by methods to avoid product damage.

### C. Delivery:

1. Schedule delivery to minimize long-term storage and prevent overcrowding construction spaces. Coordinate with installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
2. Deliver products in undamaged condition in manufacturer's original sealed container or packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

D. Handling:

1. Provide equipment and personnel to handle products by methods to prevent soiling, marring or other damage.
2. Promptly inspect products on delivery to ensure that products comply with contract documents, quantities are correct, and to ensure that products are undamaged and properly protected.

**1.7 STORAGE AND PROTECTION**

A. Storage and Protection, General: Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible.

1. Periodically inspect to ensure products are undamaged and are maintained under required conditions.
2. Products damaged by improper storage or protection shall be removed and replaced with new products at no change in Contract Sum or Contract Time.
3. Store sensitive products in weather tight enclosures.

B. Inspection Provisions: Arrange storage to provide access for inspection and measurement of quantity or counting of units.

C. Structural Considerations: Store heavy materials away from the structure in a manner that will not endanger supporting construction.

D. Weather-Resistant Storage:

1. Store moisture-sensitive products above ground, under cover in a weathertight enclosure or covered with an impervious sheet covering. Provide adequate ventilation to avoid condensation.
2. Maintain storage within temperature and humidity ranges required by manufacturer's instructions.
3. For exterior storage of fabricated products, place products on raised blocks, pallets or other supports, above ground and in a manner to not create ponding or misdirection of runoff. place on sloped supports above ground.
4. Store loose granular materials on solid surfaces in a well-drained area. Prevent mixing with foreign matter.

E. Protection of Completed Work:

1. Provide barriers, substantial coverings, and notices to protect installed Work from traffic and subsequent construction operations.
2. Remove protective measures when no longer required and prior to Substantial Completion review of the Work.
3. Comply with additional requirements specified in Section 01 56 00 - Temporary Barriers and Enclosures

**PART 2 – PRODUCTS (NOT USED)****PART 3 - EXECUTION****3.1 INSTALLATION OF PRODUCTS****A. Installation of Products:**

1. Comply with manufacturer's instructions and recommendations for installation of products, except where more stringent requirements are specified, are necessary due to Project conditions or are required by AUTHORITIES HAVING JURISDICTION.
2. Anchor each product securely in place, accurately located and aligned with other Work.
3. Clean exposed surfaces and provide protection to ensure freedom from damage and deterioration at time of Substantial Completion review. Refer to additional requirements specified in Section 01 74 00 - Cleaning and Waste Management and Section 01 50 00 - Construction Facilities.

**END OF SECTION**

**SECTION 01 64 00****STORM WATER POLLUTION PREVENTION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Installation of Storm Water Pollution Prevention Plan ("SWPPP") measures per plans and specifications for the purpose of preventing the discharge of pollutants from the construction site into the receiving waters.
- B. Compliance with local, state and federal regulations.

**1.2 REFERENCES**

- A. California Storm Water Best Management Practice ("BMP") Handbook for Construction Activity (California Stormwater Quality Association), latest Edition.
- B. Storm Water Resource Control Board ("SWRCB").
- C. National Pollutant Discharge Elimination System ("NPDES").
- D. Storm Water Pollution Prevention Plan ("SWPPP").

**1.3 SUBMITTAL REQUIREMENTS**

- A. All construction phases greater than one (1) acre:
  - 1. OWNER'S REPRESENTATIVE will or have submit Notice of Intent ("NOI") to the SWRCB to acquire a Waste Discharge Identification Number ("WDID#") prior to starting construction activities.
  - 2. OWNER'S REPRESENTATIVE Qualified SWPPP Developer (QSD), will or have submit applicable phases of site specific Storm Water Pollution Prevention Plan outlining the complete guidelines per Local, State and Federal regulations based upon the "New State Wide General Construction Permit, effective July 1, 2010, Order No. 2009-0009-DWQ" (including but not limited to all revisions to date), will be written and signed by a QSD.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Use materials of a class, grade and type needed to meet the performance described in the BMP Handbook.

**PART 3 - EXECUTION****3.1 IMPLEMENTATION**

- A. BC#01 Earthwork CONTRACTOR will be the Qualified SWPPP Practitioner (QSP) for the project.
- B. CONTRACTOR Responsibility

1. To have a Qualified SWPPP Practitioner (QSP), as certified by the State, on their company's staff (company as a whole).
  - a. The QSP cannot be a hired consultant; the QSP must be an employee of the CONTRACTOR'S staff. This requirement is to further ensure the responsibilities of storm water pollution prevention are fully understood by the CONTRACTOR.
  - b. CONTRACTOR'S QSP is required to attend the construction preparatory conference, coordinated by the CONSTRUCTION MANAGER at the start of the Project, and be available during the duration of the Project.
2. Contain on-site storm water at the jobsite. Do not drain on-site water directly into the storm drain.
3. Bid Category #01 (CONTRACTOR) identified herein is responsible to implement the QSD's plan, as well as maintenance, inspect, report, and monitor the Storm Water Pollution Prevention Plan (SWPPP) for their respective construction phase(s) for the purpose of preventing and eliminating the discharge of pollutants from the construction site throughout the duration of this phase of work. This includes but not limited to:
  - a. Dust control, street sweeping, stabilized entrances, sandbags, gravel bags, hay bales, wattles, swales, silt fence, plastic sheeting, cleaning of catch basins and piping
4. All CONTRACTORS are responsible for maintaining (unless specifically noted otherwise herein) all necessary SWPPP measures applicable to the performance of their bid category scope of work, including but not limited to the following:
  - a. Dust control
    - 1) Provide general dust control except during demolition and mass grading operations, during which time the CONTRACTOR performing demolition and grading operations will be responsible for dust control.
  - b. Trash and debris management
    - 1) All trash and debris is to be contained (in containers, cans, bins, etc.) at all times.
    - 2) All containers are to be covered daily as to prevent wind removal of trash and debris thus preventing storm water pollution.
    - 3) All containers are to be covered by a waterproof, non-porous, cover and sealed to protect from leakage and storm water pollution at the end of each day and in accordance with the new SWRCB regulations.
  - c. Construction material management and storage
    - 1) All materials must be stored in a manner as to prevent storm water pollution, including but not limited to the following
      - a) Materials shall not have direct contact with the ground.
      - b) Materials shall be covered completely with waterproof covering when not in use.
  - d. Equipment management and storage
    - 1) All equipment shall be properly stored, contained and protected while on Site.
    - 2) Heavy machinery and equipment shall be equipped to prevent any dripping, spillage and/or leakage of fluids onsite. Properly store and protect equipment at all times.
    - 3) Use drip pans or absorbent pads for vehicles and equipment maintenance activities involving fueling, grease, oil, solvents, or other vehicle fluids.
  - e. Spill Kit
    - 1) Each CONTRACTOR to have a spill kit when CONTRACTOR has equipment or hazardous substances on site.
    - 2) Spill kit shall have adequate quantities of absorbent spill cleanup material.
    - 3) Spill kit shall be located at:
      - a) Designated refueling areas.
      - b) Chemical or hazardous substances storage areas.

- f. Stockpile management
  - 1) All stockpiled materials must be protected and covered by water proof covering when not in use.
  - 2) Stockpiles are not to be placed directly on (e) hardscape to remain without expressed written consent from the CONSTRUCTION MANAGER.
- g. Repair and/or replace any SWPPP measures relocated, removed, and/or damaged by the performance of the respective CONTRACTOR'S scope of work. Repair and replacement is to be done immediately.
- h. Revisions, additions and maintenance as required specific to the performance of the respective CONTRACTOR'S scope of work.
- i. Maintenance and cleaning of construction entrance and vehicles as to ensure no soil whatsoever is tracked outside the limits of SWPPP measures in place as approved by the QSP and QSD.
- 5. Earthwork Installation: (Bid Category #01)
  - a. Shall provide rumble plates and gravel at all entrances.
  - b. All perimeter control, such as silt fence, sand/gravel bags, straw wattle
  - c. All other SWPPP measures as shown
  - d. During this phase, provide site watering as often as required daily for dust control.
    - 1) Include in base bid an additional [40] hours of dust control to be used at the discretion of the CONSTRUCTION MANAGER
  - e. Street sweep site and off-site as often as required.
  - f. Turnover to take place after site rough grading and building pad certification are complete.
- 6. Site Plumbing Utility Installation: (Bid Category #23)
  - a. During installation, modify BMPs as required to ensure SWPPP is being maintained.
  - b. Provide grave/sand bags at storm drain inlets. Maintain BMPs until structures have been installed and the adjacent finish work as completed.
  - c. During this phase, provide site watering as often as required daily for dust control.
    - 1) Include in base bid an additional [40] hours of dust control to be used at the discretion of the CONSTRUCTION MANAGER.
- 7. Site Electrical Installation: (Bid Category #22)
  - a. Maintain BMPs until installation is complete.
  - b. During installation, modify BMPs as required to ensure SWPPP is being maintained.
  - c. During this phase, provide site watering as often as required daily for dust control.
    - 1) Include in base bid an additional [40] hours of dust control to be used at the discretion of the CONSTRUCTION MANAGER.
- 8. Building Structure Phase (Bid Category #02)
  - a. Upon rough grading and building pad certification is complete, maintain all SWPPP measures identified on the SWPPP plan(s).
  - b. Maintain until finish grading has been scheduled to commence at each respective area.
  - c. During this phase, modify BMPs as required to ensure SWPPP is being maintained.
  - d. Site water as often as required daily for dust control.
    - 1) Include in base bid an additional [40] hours of dust control to be used at the discretion of the CONSTRUCTION MANAGER.
  - e. Street sweep site and off-site no less than weekly.
    - 1) Include in base bid an additional [40] hours of street sweep to be used at the discretion of the CONSTRUCTION MANAGER.
  - f. Turnover to take place when the start of finish grading to commence at each respective area.
- 9. Site Work Finish Grading: (Bid Category #01)

- a. Upon commencement of finish grading, maintain all SWPPP measures identified on the SWPPP plan(s) until finish grading is complete.
  - b. During this phase, modify BMPs as required to ensure SWPPP is being maintained.
  - c. Site water as often as required daily for dust control.
  - d. Street sweep site and off-site no less than weekly.
  - e. Turnover to take place upon completion of the finish grading of each respective area.
- 10. Site Hardscape – Concrete Phase: (Bid Category #03, #04 & #05)
  - a. Upon commencement of site hardscape – concrete, maintain all SWPPP measures identified on the SWPPP plan(s) until complete.
  - b. Remove SWPPP BMPs in the areas of hardscape – concrete locations.
  - c. Site water as often as required daily for dust control.
- 11. Site Hardscape – Asphalt Phase: (Bid Category #01)
  - a. Upon commencement of site hardscape–asphalt, maintain all SWPPP measures identified on the SWPPP plan(s) until complete.
  - b. Remove SWPPP BMPs in the areas of hardscape – asphalt locations.
  - c. Site water as often as required daily for dust control.
- 12. Site Landscape Phase: (Bid Category #25)
  - a. Upon commencement of landscaping, maintain all SWPPP measures identified on the SWPPP plan(s) until complete.
  - b. Remove SWPPP BMPs in the areas in landscape areas.
  - c. Site water as often as required daily for dust control.
- C. Additional increased SWPPP measures, not identified upon the SWPPP and required solely by Excessive Rain Events greater than the historical monthly averages, shall be provided immediately as requested by the CONSTRUCTION MANAGER. The additional measures shall be performed on a Time and Material basis with the tickets acknowledged and verified on a daily basis by the CONSTRUCTION MANAGER.
  - 1. This does not apply to additional measures and revisions required for the performance of a bid categories scope of work, which may not be performed on a time and material basis as they are not to be an additional cost to the OWNER.
- D. If SWPPP design work or changes are to be performed during each specific phase of the project; the Qualified SWPPP (QSP) must review the changes, and the Qualified SWPPP Designer (QSD) must certify the design work or changes and the respective CONTRACTOR responsible shall implement and maintain such changes.
- E. All CONTRACTORS are required to submit a written SWPPP Report to the QSP (separate from the CONTRACTOR'S Daily Work Report) each day SWPPP measures are installed, revised, maintained, and or inspected. This report is to identify the location and quantities of work SWPPP measures provided, including materials, labor and equipment utilized.
- F. Failure to comply with the requirements of the SWPPP will result in damages being assessed against the CONTRACTOR(S) responsible, in the amount of a minimum \$5,000.00 per day fine.
- G. Responsible CONTRACTOR(S) shall have the QSP coordinate the QSD making any and all revisions made in the field, revising the SWPPP to suit changing site conditions and also when properly installed systems are ineffective. Maintain a current SWPPP drawing onsite in the CONSTRUCTION MANAGER'S site office at all times.
- H. Responsible CONTRACTOR(S) shall provide updates, amendments, and annual reporting information as needed. Information is to be provided to the QSP

### 3.2 TURN OVER OF PHASES



- A. Prior to acceptance of each SWPPP Phase, each respective CONTRACTOR shall schedule a site inspection walk with CONSTRUCTION MANAGER /QSP and verify existing SWPPP conditions. Site walks and verification of SWPPP implementation shall be performed by the responsible SWPPP Phase CONTRACTOR and the next subsequent SWPPP Phase responsible CONTRACTOR prior to turnover of each said SWPPP Phase. Any corrections and repairs prior to turn over of phase shall be the responsibility of the active responsible CONTRACTOR.

### **3.3 MONITORING**

- A. The CONSTRUCTION MANAGER / QSP will provide the monitoring of the SWPPP implementation and maintenance, unless noted otherwise in this specification section which includes information to be provided by the CONTRACTOR(S) to the QSP.
- B. CONTRACTOR(S) must provide inspection logs and/or supporting documents monthly with the progress payment request.

### **3.4 LIABILITIES AND PENALTIES**

- A. Review of the SWPPP and inspection log by CONSTRUCTION MANAGER shall not relieve the CONTRACTOR from liabilities arising from non-compliance of storm water pollution regulations.
- B. Compliance with the Clean Water Act pertaining to construction activity is the sole responsibility of the applicable CONTRACTOR(S). Failure to comply with the regulations of the Regional Water Quality Control Board (RWQCB) or other prosecuting authority may result in significant fines and possible imprisonment. Fines may be assessed up to \$32,500 (if not more) per day for each violation. Any fines, penalties levied and any related costs against the OWNER due to non-compliance by the responsible CONTRACTOR shall be the sole responsibility of the said CONTRACTOR and will NOT be reimbursed by the OWNER.

### **3.5 PROJECT COMPLETION**

- A. CONTRACTOR will be required to do a final Project closeout walk through as part of punchlist items.
- B. A Notice of Termination ("NOT") to the OWNER for the SWRCB, upon completion of the Project. Reference guidelines within the "New State Wide General Construction Permit, effective July 1, 2010, Order No. 2009-0009-DWQ" and all amendments thereto. The NOT is not complete until the SWCRB has accepted and clears application of any further requirements. The CONTRACTOR is responsible for maintaining the project site until final completion/acceptance of the NOT by the SWCRB.
- C. CONTRACTOR is responsible to remove and legally disposal any remaining SWPPP temporary measures and equipment upon receipt of the Notice of Termination.

### **3.6 ATTACHMENTS**

- A. Storm Water Pollution Prevention Site Monitoring Report
  - 1. Use Storm Water Pollution Prevention Site Monitoring Report herein
  - 2. Use General Construction Activity Storm Water Permit herein for:
    - a. Annual Certification
    - b. Final Completion Certification

END OF SECTION

<b>OWNER Project Number</b>	<b>Storm Water Pollution Prevention Site Monitoring Report Activity Storm Water Permit</b>	<b>State of California State Water Re- sources Control Board</b>
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School Name: \_\_\_\_\_  
 Project Description: \_\_\_\_\_

**I. Type of Examination:** (Use one form for each type of examination)

☐ Prior to Anticipated Storm Event    ☐ After Actual Storm Event    ☐ Weekly

Date Examined: \_\_\_\_\_

**II. Check the response for each SWPPP question below**

- A. Do you have an approved Storm Water Pollution Prevention Plan ("SWPPP") and a BMP Handbook on the Project site? Yes \_\_\_\_\_ No \_\_\_\_\_
- B. Does your SWPPP incorporate an up-to-date erosion control plan? Yes \_\_\_\_\_ No \_\_\_\_\_
- C. Is the erosion control installed per plan? Yes \_\_\_\_\_ No \_\_\_\_\_
- D. If the work is at a stage where the erosion control plan cannot be constructed, is the erosion control at the Maximum Extent Practicable for the stage you are in?  
 Yes \_\_\_\_\_ No \_\_\_\_\_
- E. Did you observe the presence of any floating materials such as oil, grease, pieces of wood, paper, etc., odor, toxics, and/or sediments? Yes \_\_\_\_\_ No \_\_\_\_\_
- F. If yes, what is it that you observed? \_\_\_\_\_

**III. Check the status of the following items as observed:**

SWPPP Items	Acceptable	Not Acceptable	Repairs Required	Date Repairs Completed
A. Project Entrance/Rumble Plates/ Gravel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
B. De-silting Basins (cleaned)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
C. Water Quality Basin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____

D. Silt Fences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
SWPPP Items	Acceptable	Not Acceptable	Repairs Required	Date Repairs Completed
E. Hay bales/check dams/sandbags	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
F. Berms and Dikes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
G. Sand/Gravel Inlet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
H. Slope Protection - Polymer and Mulch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
I. Vegetation/Re-vegetation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
J. Dust Control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
K. Surface Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
L. Slope Instability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
M. Storage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
N. Disposal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
O. Spills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____
P. Clean up	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	_____

IV. Describe any problems or required repairs checked above and the necessary actions needed:

Item	Description of Problem or Required Repair	Action Needed
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Examination Performed by CONTRACTOR: \_\_\_\_\_

Print Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

<b>OWNER Project Number</b>	<b>General Construction Activity Storm Water Permit</b>  <b>Annual Certification and Final Completion Certification</b>	<b>State of California State Water Board WDID No. _____</b>
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**COMPLIANCE**

School Name: _____ Project Description: _____
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**ANNUAL CERTIFICATION**

I certify the Project has met the following conditions: All elements of the Storm Water Pollution Prevention Plan are in place; construction materials and equipment maintenance waste have been disposed of properly; and the Project site is in compliance with all local storm water management requirements including erosion/sediment control requirements and the appropriate use permits have been obtained.

CONTRACTOR \_\_\_\_\_

Print Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**FINAL COMPLETION CERTIFICATION**

I certify the Project has been completed and the following conditions have been met: All elements of the Storm Water Pollution Plan have been completed; construction materials and equipment maintenance waste have been disposed of properly; the Project site is in compliance with all local storm water management requirements including erosion/sediment control requirements and the appropriate use permits have been obtained; and a post construction storm water operation and management plan is in place.

CONTRACTOR: \_\_\_\_\_

Print Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## ONTARIO SPORTS EMPIRE

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**SECTION 01 71 00****EXAMINATION AND PREPARATION****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Requirements for preparation prior to installing, applying, and placing products to determine acceptable conditions for the Work.
- B. Layout of the Work and other engineering services necessary to accomplish the Work.

**1.2 RELATED SECTIONS**

- A. Section 01 31 00 - Project Management and Coordination: Requirements for proper sequencing and interfacing of the Work; general requirements for pre-installation conferences.
- B. Section 01 32 00 - Construction Progress Documentation: Requirements for scheduling and sequencing of the Work.
- C. Section 01 73 29 - Cutting and Patching: Work performed to provide access for performing the Work.
- D. Section 01 77 00 - Contract Closeout Procedures: Project record documents, including layout data.
- E. Section 01 32 23 - Survey and Layout Data: Requirements for survey and layout data submittals.
- G. Individual Division 2 through 33 Product Specification Sections: Specific requirements for preparation prior to performance of the Work.

**1.3 LAYOUT OF WORK**

- A. Surveyor: CONTRACTOR shall select and pay for services of a land surveyor, registered in the State of California, for proper performance of the Work.
  - 1. Services of surveyor shall be suitable for layout and verification of location of buildings and site elements.
  - 2. For the Project record, submit the name, address, and telephone number of land surveyor before starting survey Work.

**PART 2 – PRODUCTS (NOT USED)****PART 3 - EXECUTION****3.1 PREPARATION**

- A. Manufacturer's Requirements: Determine product manufacturer's requirements and recommendations prior to commencing Work.

- B. Preparations: Perform preparation actions according to manufacturer's instructions and recommendations and according to specified procedures.
  - 1. Perform surface preparation as necessary to create suitable substrates for application, installation, and placement of products.
  - 2. Notify CONSTRUCTION MANAGER in writing of unsuitable conditions preventing proper performance of the Work.
- C. Existing Utility Information: Furnish information to serving utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Verify depth of existing utility lines prior to excavation. Coordinate with CONSTRUCTION MANAGER and with AUTHORITY HAVING JURISDICTION (AHJ).
- D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by OWNER'S REPRESENTATIVE or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify OWNER'S REPRESENTATIVE through CONSTRUCTION MANAGER not less than seven calendar days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without written permission from OWNER'S REPRESENTATIVE through CONSTRUCTION MANAGER.
- E. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- F. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- G. Review of Contract Documents and Field Conditions: Immediately upon discovery of the need for clarification of the Contract Documents, submit a Request for Information (RFI) to OWNER'S REPRESENTATIVE. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests in accordance with requirements specified in Section 01 26 10 - Requests for Information (RFI), using form provide or as directed by CONSTRUCTION MANAGER.
- H. Verification of Construction Layout: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks, and locate survey reference points. If discrepancies are discovered, promptly notify CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE and Project Inspector.

### **3.2 FIELD ENGINEERING**

- A. Examination: Verify locations of survey control and reference points prior to starting Work. Promptly notify CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE and Project Inspector if discrepancies are discovered.



- B. Survey Control and Reference Points: CONTRACTOR shall locate and protect survey control and reference points. Control datum for survey shall be as indicated on Civil Drawings.
1. Effective January 1, 1995, AB 1414 "Preservation of Survey Monumentation Compliance with Section 8771 of the Business and Professions Code" provides for the preservation of Survey Monuments in construction projects. This legislation mandates that, prior to construction, monuments shall be referenced in the field and "Corner Records" shall be prepared for filing in the Office of the County Surveyor. These shall be performed prior to Contract Completion of the Work.
  2. Comply with requirements of AUTHORITIES HAVING JURISDICTION for survey monumentation preservation on capital improvement projects where monumentation points are present.
  3. CONTRACTOR shall be responsible for preparing and submitting proper documentation to the Office of the County Surveyor in compliance with AB 1414.
  4. Contract Completion and release of retainage shall be contingent upon obtaining documentation from CONTRACTOR'S project surveyor or engineer that monuments have been set or restored and that Corner Records have been filed with and to the satisfaction of the County Surveyor.
  5. All costs and actions necessary for compliance with AB 1414 shall be included in the Contract Sum and Contract Time.

### 3.3 SURVEYING AND FIELD ENGINEERING SERVICES

- A. Refer to Section 01 32 23 - Survey and Layout Data.
1. CONTRACTOR shall be responsible for the accuracy and adequacy of surveying and field engineering services.
  2. CONTRACTOR shall utilize recognized engineering practices.
  3. CONTRACTOR shall check the location, level and plumb, of every major element as the Work progresses.
  4. Preserve construction survey stakes and marks for the duration of their usefulness.
  5. If construction survey stakes are lost or disturbed, and require replacement, CONTRACTOR shall pay for replacement at no change in Contract Time.
  6. CONTRACTOR shall excavate all holes necessary for line and grade stakes.
- B. Surveying for Layout and Control of the Work: Establish elevations, lines, and levels for all Work under the Contract. Locate and lay out by instrumentation and similar appropriate means:
1. Site improvements, including pavements, curbs, headers, sewers, storm drains, structures, and paving. Note on Project record drawings utility locations, slopes, and invert elevations.
  2. Stakes for cutting, filling, grading and topsoil placement, to establish finished grade or flow line indicated on Contract Drawings.

- a. Preserve construction survey stakes and marks for the duration of their usefulness.
  - b. If construction survey stakes are lost or disturbed, and require replacement, CONTRACTOR shall perform replacement at no change in Contract Sum and Contract Time.
  - c. CONTRACTOR shall excavate all holes necessary for line and grade stakes.
3. Grid or axis for structures, building foundation, column locations and ground floor elevations.
  4. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  5. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  6. Inform installers of lines and levels to which they must comply.
  7. Notify CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE and Project Inspector when deviations from required lines and levels exceed allowable tolerances.
  8. Close site surveys with an error of closure equal to or less than the standard established by AUTHORITIES HAVING JURISDICTION.
- C. Monuments: Establish a minimum of two permanent monuments on site, referenced to established control points. Record locations, with horizontal and vertical data, on Project Record Drawings.
1. In accordance with Professional Land Surveyor Act, Section 8772, any monument set by a licensed land surveyor or registered civil engineer to mark or reference a point on a property or land line shall be permanently and visibly marked or tagged with the certificate number of the surveyor or civil engineer setting it, each number preceded by the letters "L.S." or "R.C.E." respectively, as the case may be, or, if the monument is set by a public agency, it shall be marked with the name of the agency and the political subdivision it serves.
  2. Nothing in this Section shall prevent the inclusion of other information on the tag which will assist in the tracing or location of survey records which relate to the tagged monument.
  3. Centerline ties filed with the County Surveyor will be checked for compliance with this law.
- D. Site Grading Verification: Upon completion of grading, survey graded areas and establish that elevations are correct and within acceptable tolerances for paving and finish grading. Civil Engineer will provide certifications for building pad and finish grading to OWNER'S REPRESENTATIVE.
- E. Verification of Work: Periodically verify layout and completed conditions of the Work by same means.

#### END OF SECTION

**SECTION 01 71 23  
FIELD ENGINEERING (PRIME)**

**PART 1 GENERAL**

**1.01 REQUIREMENTS INCLUDE**

- A. Quality Control.
- B. Survey Reference Points.
- C. Field Engineering and Staking by Bid Category #01 CONTRACTOR.
- D. Field Engineering and Staking Paid by Other Bid Category CONTRACTORS.
- E. Staking Requests and Procedures.

**1.02 QUALITY CONTROL**

- A. Each Bid Category CONTRACTOR requiring survey, survey request shall be coordinated through the CONSTRUCTION MANAGER.
- B. It is the requesting Bid Category CONTRACTOR'S responsibility to understand, double check, and verify the placement of the survey stakes prior to beginning work and notify the CONSTRUCTION MANAGER of any discrepancies, questions, and/or problems before proceeding with the work.

**1.03 SURVEY REFERENCE POINTS**

- A. Control datum for survey will be established by Bid Category #01 CONTRACTOR.
- B. Each CONTRACTOR shall locate and protect survey control and reference points.
- C. The applicable Bid Category CONTRACTOR shall protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to the CONSTRUCTION MANAGER'S jobsite superintendent the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice from the ARCHITECT through the CONSTRUCTION MANAGER.

**1.04 FIELD ENGINEERING & STAKING**

- A. ROUGH GRADE STAKING FURNISHED BY BID CATEGORY #01 CONTRACTOR
  - 1. Establish temporary bench control at three locations. Locations determined in the field.
  - 2. Perimeter of site at +/- 100'.
  - 3. Site at +/- 50 ft. grid.
  - 4. Grade breaks, angle points, B.C.'s and E.C.'s.

5. Building pad corners (establish pad finish and/or subgrade elevations).
  6. Swales.
  7. Ridge lines.
  8. Post rough grade survey.
    - a. Establish and record 25 topo points for contour confirmation.
- B. FOUNDATION CONSTRUCTION FURNISHED BY BID CATEGORY #02 CONTRACTOR
1. Establish horizontal and vertical control.
  2. Building pad certification and As-built.
  3. Layout of building - perimeter and major grid lines for line only, and all radius points.
  4. Layout of all depressions for floor finishes.
  5. Major grid lines at 1st floor and 2nd floor as is applicable.
- C. SITE UTILITIES FURNISHED BY BID CATEGORY #23 CONTRACTOR
1. STORM DRAIN SYSTEM
    - a. Staked at +/- 25' intervals. (Line & Grade)
    - b. Catch basins.
    - c. Manholes including rim & invert elevations.
    - d. Drainage structures.
    - e. Angle points, grade breaks, transitions, and inlets.
    - f. Invert elevations at all grade breaks and POCs.
  2. SEWER SYSTEM
    - a. Sewer main at +/- 25' intervals. (Line & Grade)
    - b. Manholes including rim & invert elevations.
    - c. Sewer manholes and cleanouts.
    - d. Angle points, grade breaks transitions and inlets.
    - e. Invert elevations at all grade breaks and POCs.
  3. DOMESTIC WATER, FIRE WATER & GAS LINES SYSTEMS
    - a. Staked at +/- 50' intervals. (Line & Grade).
    - b. Angle points, laterals, appurtenance, and devices.
  4. SITE ELECTRICAL SYSTEM
    - a. Switchgear enclosures.
    - b. Manholes and vaults.
- D. SITE IMPROVEMENTS FURNISHED BY BID CATEGORY #03, #04, #05 & BC#22 CONTRACTORS AS IT RELATES TO THE SPECIFIED SCOPE OF WORK PER THE SITE CONCRETE EXHIBIT AND FOR THE ELECTRICAL PACKAGE FOR CONCRETE LIGHT STANDARDS
1. CURB, CURB & GUTTER, "V" GUTTER, SWALES, DRIVE APPROACHES
    - a. Staked at +/- 50' intervals.
    - b. Beginning of curve and /or radius. End of curve and/or radius.
    - c. B.C.'s and E.C.'s.
    - d. Grade breaks, angle points, and radius points.
  2. RETAINING / PLANTER / SEAT WALL STAKING
    - a. Staked at +/- 50' intervals.
    - b. Curved walls staked at 25' intervals.
    - c. Angle points and radius points.
    - d. Top of wall.

- e. Top of footing.
- 3. SITE WORK STAKES
  - a. Redwood header and edge of pavement at 25 ft. intervals.
  - b. Light standards - two (2) stakes each.
  - c. Subgrade staking for site concrete, asphalt paving, playground areas.
    - i. Staked at +/- 50' intervals.
    - ii. Grade breaks and angle points.
  - d. Ramps and stairs
  - e. Chain-link / ornamental fencing and gates:
    - i. Staked at +/- 50 intervals. (Line & Grade).
    - ii. Angle points, end points and transition points.

#### **1.05 FIELD ENGINEERING & STAKING PAID BY OTHERS BID CATEGORY CONTRACTORS**

- A. Any and all required field engineering and staking which is not specifically noted as being furnished above, must be done by the Bid Category CONTRACTOR'S Surveyor and paid for by the applicable Bid Category CONTRACTOR requiring and/or requesting same. Bid Category CONTRACTOR may have additional surveying done by the Bid Category #01 CONTRACTOR Surveyor, a Licensed Land Surveyor or a registered Civil Engineer at Bid Category CONTRACTOR'S expense.
- B. The requesting Bid Category CONTRACTOR requiring additional survey, shall contract directly with the Bid Category #01 CONTRACTOR.

### **Part 2 PRODUCTS**

#### **NOT USED**

### **PART 3 EXECUTION**

#### **3.01 STAKING REQUESTS AND PROCEDURES**

- A. Staking request shall consider continuity of survey work (example):
  - 1. Survey staking of a complete area of site.
  - 2. Survey staking of total sewer/storm drain line or large segment of continuous work.
- B. All staking requests shall be made in writing, on the form provided herein, through the CONSTRUCTION MANAGER'S Project Superintendent a MINIMUM of 48 hours prior to need of staking.
  - 1. Should the area to be staked be found not ready for or clear for staking, or the requested staking date changed, the Surveyor shall have up to 48 hours additional time to begin work.
  - 2. Staking requests shall be made for a minimum of eight (8) hours of survey time per request unless Surveyor and CONTRACTOR mutually agree to shorter requested time per request.
- C. After the stakes are set, it shall be the requesting Bid Category CONTRACTOR'S sole responsibility to protect the stakes from any damage. Any re-staking shall be charged to the Bid Category CONTRACTOR which ordered the initial staking.
- D. Should a discrepancy occur and the Surveyor's stakes are missing, then the

Surveyor's field notes shall be relied on as to how the object was staked.

- E. A set of field notes will be provided to the CONSTRUCTION MANAGER and the requesting Bid Category CONTRACTOR related to the specific staking after the staking is complete. The field notes and the marking stakes shall be used together and any differences shall be immediately brought to the attention of the CONSTRUCTION MANAGER.
- F. The requesting Bid Category CONTRACTOR responsible for the building foundations shall measure between the Surveyor's staking for building layout and immediately notify the CONSTRUCTION MANAGER of any discrepancies found. The CONSTRUCTION MANAGER will then take the appropriate action. Should said CONTRACTOR fail to make the above measurement, he shall assume responsibility for the accuracy of the layout.
- G. Bid Category #01, #02, #03, #04, #05, #22 & #23 CONTRACTOR Surveyor shall provide any as-built points in CAD format to CONSTRUCTION MANAGER'S field office in within twenty-four (24) hours of completed work.
- H. Bid Category #01, #02, #03, #04, #05, #22 & #23 CONTRACTOR Surveyor shall also provide all cut sheets to the Project superintendent via email within twenty-four (24) hours of completed work.

## **Part 4 FORMS**

### **4.01 SURVEY REQUEST FORM**

- A. Use form provided herein

**END OF SECTION**

## SURVEY REQUEST FORM

### Ontario Sports Empire

Date Required: \_\_\_\_\_ Specification: \_\_\_\_\_

Survey Requested:

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Specific Location: \_\_\_\_\_  
(Offsite, Site, Building Name, Etc.)

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NOTE: According to Specifications, CONTRACTOR is to notify the CONSTRUCTION MANAGER, a minimum of 48 hours prior to inspections or testing being required.

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Request made by:    Print: \_\_\_\_\_

Signature: \_\_\_\_\_

Firm: \_\_\_\_\_

Date Received: \_\_\_\_\_ By: \_\_\_\_\_

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**SECTION 01 71 23.10****ROUGH GRADE CONFORMANCE SURVEYING****PART 1 - GENERAL****1.1 SUMMARY**

- A. The City shall obtain an Independent Testing Agency (ITA) – to confirm that compaction has been attained prior to conformance survey.
- B. Conformance Surveying work shall be completed by the City's obtained Surveyor and shall be based on established site bench marks, monuments, lines, and levels necessary for the work covered by this Contract.

**1.2 SUMMARY OF WORK**

- A. Conformance surveying required for proper completion of the work may include, but may not be limited to:
  - 1. Synthetic turf rough grade subgrade.
  - 2. Coordination with project Independent Testing Agency (ITA) – to confirm that compaction rates have been attained prior to conformance survey.
  - 3. Other applicable project components.

**1.3 RELATED SECTIONS**

- A. Section 07 71 23.10 - Conformance Surveying
- B. Section 32 11 16 – Synthetic Turf Base Course
- C. Section 32 12 93.10 – Artificial Grass

**1.4 SUBMITTALS**

- A. CONTRACTOR'S Surveyor will submit one (1) electronic copy of all conformance surveys for the project to the OWNER, Project Landscape ARCHITECT, and base/turf installer.

**PART 2 - PRODUCTS (NOT USED)****PART 3 - EXECUTION****3.1 LAYING OUT THE WORK**

- A. The City shall employ a Registered California Licensed Land Surveyor (hereafter referred to as Surveyor) to perform any conformance surveying work required. The conformance survey and necessary work involved to perform the below identified tasks are the sole responsibility of the CONTRACTOR, at no extra cost to the OWNER.

- B. The surveyor shall compare the as-constructed spot elevations to those on the contract design documents for the same location. Conformance survey shall show both of these numbers and provide the difference between these two numbers. **The survey shall not be performed until the ITA (Independent Testing Agency) has verified that the specified compaction has been attained.**
- C. All surveys provided in this section shall be accurate to 0.01' feet minimum.

### 3.2 SYNTHETIC TURF SUBGRADE CONFORMANCE SURVEYING

**Note: The survey shall not be performed until the ITA (Independent Testing Agency) has verified that the specified compaction and has been attained.**

- A. The City shall verify that subgrade has been prepared according to specifications with regard to compaction, grade tolerances and is free of debris, non-compactable material, topsoil, or organics prior to beginning work.
- B. Top of subgrade elevations shall be verified on a 25-foot grid using laser-operation survey instruments. Grades must be within 1/2" -inch plus or minus from the designed subgrade elevations per plans. In addition, no point within the 25-foot grid deviates more than 1/2"-inch from any other adjacent point within the 25-foot grid.
- C. Overall grade elevations shall balance across each individual field with no import/export required based on the designed 7.25" subgrade depth from final field elevations.
- D. Prior to acceptance of the subgrade, a conformance survey will be prepared by the City obtained Surveyor. The survey shall be based on a 25 foot grid showing the field sheet flow, the center of the subgrade elevation of the subdrain trench edges, and the perimeter of the field. The conformance survey shall show both design grades and subgrade elevations and the difference between the two. Upon completion the rough grade CONTRACTOR shall be provided 5 working days to review and respond to the Conformance Survey. Any portion of the survey that does not conform to the requirements identified above in item 3.02-B will be corrected by the rough grade CONTRACTOR. Areas out of conformance will be resurveyed (following the identical procedure stated above) by the Surveyor, and these revised points shall be added to the original digital file for review and acceptance by the OWNER and Project Landscape ARCHITECT. Any and all delays and costs incurred due to grades out of conformance are the sole responsibility of the rough grade CONTRACTOR. At any point during construction following acceptance of the subgrade by the OWNER, the OWNER reserves the right to recheck the subgrade to verify it is still in conformance. It is the rough grade CONTRACTOR'S responsibility to protect the grading and compaction tolerances of the subgrade after conformance survey is complete and prior to installation of composite material.

**END OF SECTION**

**SECTION 01 73 00****EXECUTION****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. General requirements for installing, applying, and placing products.
- B. General requirements for correction of defective Work.

**1.2 RELATED SECTIONS**

- A. Section 01 31 00 - Project Management and Coordination: Pre-installation and coordination conferences where procedures for installing, applying, and placing products are reviewed prior to performance of the Work.
- B. Individual Division 2 through 33 Product Specification Sections: Specific requirements for installing, applying, and placing products.

**1.3 EXECUTION**

- A. Manufacturer's Requirements: Determine product manufacturer's requirements and recommendations prior to commencing Work.
- B. Execution: Perform installation, application, and placement actions according to manufacturer's instructions and recommendations and according to specified procedures.
  - 1. Perform surface preparation as necessary to create suitable substrates for application, installation, and placement of products.
  - 2. Notify CONSTRUCTION MANAGER in writing of unsuitable conditions preventing proper performance of the Work.

**PART 2 - PRODUCTS**

Not Applicable to this Section.

**PART 3 - EXECUTION****3.1 INSTALLATION, APPLICATION AND PLACEMENT OF PRODUCTS**

- A. Manufacturer's Instructions: Comply with manufacturer's written instructions and recommendations for installing, applying, placing, and finishing products.
- B. Installation, Application and Placement, General: Locate the Work and components of the Work accurately, in correct alignment, orientation and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
  4. Maintain minimum headroom clearance of 8 feet (2.4 m) in spaces without a suspended ceiling, unless otherwise directed.
  5. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until acceptance of the Work.
  6. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- C. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- D. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by OWNER'S REPRESENTATIVE.
  2. Allow for building movement, including thermal expansion and contraction.
- E. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- F. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.
- G. Cleaning: Comply with requirements specified in Section 01 74 00 - Cleaning Requirements. See individual product Specifications Sections for specific cleaning procedures to be performed.
- H. Protection: Provide barriers, covers and other protective devices as recommended by manufacturer and complying with general requirements specified in Section 01 56 00 - Temporary Barriers and Enclosures.
1. Comply with manufacturer's written instructions for temperature and relative humidity.
  2. See individual product Specifications Sections for specific protective measures to be provided.
- I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### **3.2 OWNER'S REPRESENTATIVE-INSTALLED PRODUCTS**

- A. Site Access: Provide access to Project site for OWNER'S REPRESENTATIVE'S construction forces and those performing work for OWNER'S REPRESENTATIVE under separate contracts. Coordinate with requirements specified in Section 01 55 00 - Vehicular Access and Parking.

- B. Coordination: Coordinate construction and operations of the Work with work performed by OWNER'S REPRESENTATIVE by separate contract or with OWNER'S REPRESENTATIVE'S construction forces.
1. Construction schedule: Inform CONSTRUCTION MANAGER of CONTRACTOR'S preferred construction schedule for OWNER'S REPRESENTATIVE-installed work. Adjust construction schedule based on a mutually agreeable timetable. Notify CONSTRUCTION MANAGER if changes to schedule are required due to differences in actual construction progress.
  2. Pre-installation and coordination conferences: Include OWNER'S REPRESENTATIVE'S construction forces at pre-installation and coordination conferences covering portions of the Work that are to receive OWNER'S REPRESENTATIVE-installed work. Attend preinstallation conferences conducted by OWNER'S REPRESENTATIVE'S construction forces if portions of the Work depend on OWNER'S REPRESENTATIVE-installed products.

### **3.3 CORRECTION OF THE WORK**

- A. Correction of the Work, General: Repair or remove and replace defective construction. Restore damaged substrates and finishes to match original and new surrounding construction.
1. Comply with requirements in Section 01 73 29 - Cutting and Patching.
  2. Repairing shall include replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
  3. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
  4. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
  5. Remove and replace chipped, scratched, and broken glass.
- B. Restoration of Existing Conditions: Restore permanent facilities used during construction to their original condition or to match new construction.

### **END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 73 29****CUTTING AND PATCHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Requirements and limitations for cutting and patching of work.

**1.2 SCOPE**

- A. Where the work requires that a particular existing building element such as a partition, wall, paving, window, or similar element of existing building construction be removed, it is the intention of this specification that such work be a part of the demolition section and not a part of cutting and patching. Refer to individual category scope of work sheets to determine the limits of demolition work for each CONTRACTOR.
- B. New work required to replace such removals is considered as a part of the separate sections of the specifications covering similar new construction.
- C. Where incidental cutting and patching is required for the installation of a specific item or piece of equipment (including piping, ductwork, conduit, etc.), all such cutting and patching is considered to be specified as a part of the section requiring the cutting and patching.
- D. CONTRACTOR shall verify and check all areas to be cut and patched and shall coordinate the work of the various trades involved.
- E. Where doubt exists as to the size, location or method of cutting concrete or any other structural element, CONTRACTOR shall contact the ARCHITECT before proceeding.
- F. Where doubt exists, CONTRACTOR shall distinguish between "cutting" and "demolition".
- G. Unless specifically designated otherwise, existing work cut, altered, or revised to accommodate new work shall be patched to duplicate undisturbed adjacent finishes, colors, textures and profiles; concrete flatwork shall be removed to the nearest panel joint; new work in existing portions shall also be finished to match adjacent existing work unless noted otherwise.

**1.3 SUBMITTALS**

- A. Submit written request in advance of cutting or alteration which affects:
  - 1. Structural integrity of any element of Project.
  - 2. Integrity of weather-exposed or moisture-resistant element.
  - 3. Efficiency, maintenance or safety of any operational element.
  - 4. Visual qualities of sight exposed elements.
  - 5. Work of OWNER or separate CONTRACTOR.
- B. Include in request:
  - 1. Identification of Project.
  - 2. Location and description of affected work.
  - 3. Necessity for cutting or alteration.
  - 4. Description of proposed work and products to be used.
  - 5. Alternatives to cutting and patching.
  - 6. Effect on work of OWNER or separate CONTRACTOR.
  - 7. Written permission of affected separate CONTRACTOR.

8. Date and time work will be executed.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Patching Materials, General: As required for original installation and to match surrounding construction.
  - 1. Paving: Per Appendix D-Geotechnical Report
  - 2. Lawns and grasses: Restore areas trenched, disturbed, or damaged. Provide sod or seeded planting mix, to match existing lawn or grass area
  - 3. Building finish materials: Match existing products and finishes. Confirm colors, patterns, and textures with OWNER'S REPRESENTATIVE. Custom cut new materials to fit and to match joint patterns with existing materials.
- B. Product Substitution: For each proposed change in materials, submit request for substitution under provisions of Section 01 60 00 - Product Requirements.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Inspect existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. Confirm status and current warranties and guarantees.
- B. After uncovering existing work, inspect conditions affecting performance of work.
  - 1. Prior to cutting, boring or drilling through new or existing structural members or elements including reinforcing bars, CONTRACTOR shall prepare detailed drawings for review by the ARCHITECT and approval by ENGINEER OF RECORD. Agency approvals shall be obtained by the ARCHITECT, not CONTRACTOR.
- C. Beginning of cutting or patching means acceptance of existing conditions.

### **3.2 PREPARATION**

- A. Provide temporary support to ensure structural integrity of the work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering work.
- C. Maintain excavations free of water.
- D. Review limits of cutting with CONSTRUCTION MANAGER, prior to starting work.
- E. Mark limits of removal prior to cutting.

### **3.3 CUTTING AND PATCHING**

- A. Execute cutting, fitting, and patching to complete work.
- B. Fit products together, to integrate with other work.
- C. Uncover work to install ill-timed work.
- D. Remove and replace defective or non-conforming work.
- E. Provide openings in the work for penetration of mechanical and electrical work.



**3.4 PERFORMANCE**

- A. Execute work by methods to avoid damage to other work and which will provide appropriate surfaces to receive patching and finishing.
- B. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- C. Restore work with new products in accordance with requirements of Contract Documents.
- D. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- E. At penetrations of fire-rated walls, partitions, ceiling, or floor construction, completely seal voids with fire-rated devices or material in accordance with project specifications, to full thickness of the penetrated element.
- F. Re-finish surfaces to match adjacent finish. For continuous surfaces, re-finish to nearest intersection, or natural break. For an assembly, re-finish entire unit.

**3.5 SLEEVES AND HANGERS**

- A. Provide conduit, outlets, piping sleeves, boxes, inserts or other materials or equipment necessary to be built into work. Promptly furnish same and set such sleeves or other materials as construction program required.
- B. In the event delays occur in delivery of sleeves or other materials, arrange to have boxes or other forms set at locations where piping or other material is to pass through or into slabs or other work.
- C. Upon subsequent installation of sleeves or other material, install fill materials as required. Necessary expenditures incurred for boxing out or filling shall be without extra cost to the OWNER.

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 73 99****ROOF OPENING AND UTILITY SHUTDOWN****PART 1 - GENERAL****1.1 SUMMARY**

- A. Protecting OWNER'S property from inclement weather during roof opening procedures and subsequent proposed improvements.
- B. Ensuring OWNER'S daily operations are not compromised during utility shutdown and/or tie-ins.
- C. Section Includes:
  - 1. Requirements and limitations for roof openings.
  - 2. Requirements and limitations for utility shutdowns.
- D. Related Sections
  - 1. Safety Program, Section 01 35 00.

**1.2 ROOF OPENINGS**

- A. Any CONTRACTOR who will be opening a roof shall assess with CONSTRUCTION MANAGER, the existing conditions of the roof. CONTRACTOR to coordinate walk no less than three (3) weeks in advance of commencement of work. CONTRACTOR shall:
  - 1. Conduct a flood test to identify any existing ponding and leaks.
  - 2. Identify any poor conditions that require attention.
  - 3. Verify downspouts and roof receptors are un-obstructed.
  - 4. Assessment shall not only be within the limits of Work, but shall extend beyond Work limits to consider: skylights, conduits, doghouses and other areas outside.
  - 5. Provide assessment documentation to CONSTRUCTION MANAGER. CONSTRUCTION MANAGER to address any areas of concern with OWNER.
  - 6. These requirements may be performed jointly with all CONTRACTORS who will disturb the weather tightness of the building.
- B. CONTRACTOR to complete and submit "Roof Opening" form, provided herein, within two (2) weeks of the scheduled roof opening to CONSTRUCTION MANAGER.
- C. CONTRACTOR to schedule a meeting with CONSTRUCTION MANAGER. The agenda:
  - 1. Review "Roof Opening" request form.
  - 2. Confirm start and completion dates / timelines.
  - 3. Agree on existing conditions based on roof assessment.
  - 4. Confirm CONTRACTOR'S daily communication plan with CONSTRUCTION MANAGER.
  - 5. Review Scope of Work, coordinate between interfacing trades, discuss and resolve any scope gaps that will prevent continuous weather protection and restoration of a weather tight roof.
  - 6. Review CONTRACTOR'S Job Hazard Analysis and safety strategy. Refer to the Safety Program section 01 35 00 for additional information.
  - 7. Confirm CONTRACTOR'S protection strategy and continued daily maintenance.
  - 8. Confirm CONTRACTOR'S contingency plan. Clarify and agree on cure procedures in the event of failure to perform or protection failure.
  - 9. This meeting may be performed jointly with all CONTRACTORS who will disturb the weather tightness of the building.

10. This meeting may be held as part of the pre-roof meeting with the roofing material manufacturer.
- D. CONTRACTOR understands:
  1. The "Roof Opening" request form is a tool to assist in planning and mitigating water intrusion.
  2. Submission of the "Roof Opening" form and approval to commence with the opening does not in any way authorize or approve additional project costs associated with these activities and/or minimize CONTRACTOR's obligation to provide a weather tight assembly.
  3. The responsibility to ensure roof opening(s) and/or penetration(s) are water-tight to prevent any water intrusion; regardless of, the day of week and/or time of day to ensure their proposed protection is preventing water intrusion and/or making modifications as necessary. CONTRACTOR may need to be onsite prior to, during and after inclement weather.
  4. The financial responsibility for repairs for any damage sustained.
- E. CONTRACTOR is not authorized to perform any roof opening / penetration(s) without submitting this form and obtaining approval to commence.

### 1.3 UTILITY SHUTDOWN

- A. Electrical shutdown and/or tie-in, CONTRACTOR shall assess existing circuitry to identify all buildings and equipment affected.
- B. Plumbing shutdown and/or tie-in, CONTRACTOR shall assess existing pipe routing to identify buildings and equipment affected.
- C. Hydronic shutdown and/or tie-in, CONTRACTOR shall assess existing pipe routing to identify buildings and equipment affected.
- D. Assessment shall be conducted no less than four (4) weeks in advance of commencement of work.
- E. CONTRACTOR to complete and submit "Utility Shutdown / Tie-In" request form within three (3) weeks of scheduled utility shut down and/or utility tie-in to CONSTRUCTION MANAGER.
- F. CONTRACTOR to schedule a meeting within two (2) weeks with CONSTRUCTION MANAGER. The agenda:
  1. Review "Utility Shutdown / Tie-In" request form.
  2. Confirm all buildings, equipment, and utilities affected by shutdown.
  3. Confirm start and completion dates / timelines.
  4. Confirm CONTRACTOR'S daily communication plan with CONSTRUCTION MANAGER.
  5. Review CONTRACTOR'S Job Hazard Analysis and safety strategy. Refer to the Safety Program, Section 01 35 00 for additional information.
  6. Confirm CONTRACTOR'S contingency plan.
  7. Confirm OWNER'S approval of shutdown or tie-in.
- G. CONTRACTOR understands:
  1. The "Utility Shutdown / Tie-In" request form is a tool to assist in planning and mitigating disruption to normal OWNER activities and/or daily operations.
  2. Submission of the "Utility Shutdown / Tie-In" request form and approval to commence does not in any way authorize or approve additional project costs associated with these activities and/or minimize CONTRACTOR's obligation.
- H. CONTRACTOR is not authorized to perform any shut down or tie-in without submitting this form and obtaining authorization to proceed.

**PART 2 - PRODUCTS (NOT USED)****PART 3 - EXECUTION****3.1 ROOF OPENINGS**

- A. Upon "Roof Opening" request form submission and meeting, CONTRACTOR shall:
  - 1. Continually review the weather and adapt accordingly.
    - a. CONTRACTOR may need to postpone exposing work when a significant rain event is forecasted within five (5) work days.
  - 2. Conduct a pre-shift meeting. Refer to the Safety Program, Section 01 35 00 for additional information.
- B. CONTRACTOR shall have sufficient protection materials physically on the roof irrespective of the weather forecast prior to starting any work.
- C. Once the Work has commenced:
  - 1. Ensure daily weather protection is in place before the crews leave the roof, that roof drains are clear, and the hatches are closed.
  - 2. Ensure weather protection is performing well during any rain activity 24 hours per day and (7) days a week.
  - 3. Assure roof openings are temporarily covered until all penetrations are 100% sealed.
  - 4. CONTRACTOR may need to provide the necessary lighting should roof protection take place during the evening.
  - 5. Temporary weather protection shall be capable of withstanding extreme atmospheric conditions such as sun rot, high winds, and rain-water accumulation as well as, puncture and tear. Divert water around openings and take measures to drain water outside the building.
- D. Should the CONTRACTOR fail to properly protect the weather tightness of the building as described herein:
  - 1. The OWNER has the right to carry out the necessary work to mitigate and remedy the situation. The CONTRACTOR shall be responsible for all cost incurred by the OWNER.
  - 2. Any damage sustained to the building requiring remediation, the CONTRACTOR shall be responsible for all cost incurred by the OWNER.
  - 3. All cost shall be deducted from the CONTRACTOR'S contract sum.

**3.2 UTILITY SHUTDOWN / TIE-IN**

- A. Upon "Utility Shutdown / Tie-In" request form submission and meeting, CONTRACTOR shall:
  - 1. The day before and day of confirm all parties are in agreement with time lines.
  - 2. Conduct a pre-shift meeting. Refer to the Safety Program, Section 01 35 00 for additional information.

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 75 00****STARTING AND ADJUSTING****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Starting systems.
- B. Demonstration and instructions.
- C. Testing, adjusting, and balancing.

**1.2 RELATED SECTIONS**

- A. Section 01 45 00 - Quality Control: Project Inspector; independent testing and inspection agency (Testing Laboratory); manufacturer's field reports.
- B. Section 01 78 23 - Operation and Maintenance Data: System operation and maintenance data and extra materials.
- C. Section 01 91 00 - Commissioning: General requirements for comprehensive and systematic process to verify building systems performance need spec.
- D. Section 01 79 00 - Demonstration and Training: Administrative and procedural requirements for instructing OWNER'S personnel in use and maintenance of systems, subsystems, and equipment installed under the Contract.

**1.3 STARTING SYSTEMS**

- A. Starting of Systems:
  - 1. Coordinate schedule for start-up of various equipment and systems.
  - 2. Notify CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE and Testing Laboratory seven days prior to start-up of each item. Also notify Commissioning Agent (CxA) for coordination with commissioning specified in Section 01 91 13 - General Commissioning Requirements.
  - 3. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
  - 4. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
  - 5. Verify that wiring and support components for equipment are complete and tested.
  - 6. Execute start-up under supervision of applicable manufacturer's representative and installer's personnel in accordance with manufacturers' instructions.

7. When specified in individual specification Sections, require manufacturer to provide OWNER'S REPRESENTATIVE to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

- B. Start-Up Reports: Submit written reports in accordance with Section 01 33 00 - Submittals Procedures that equipment or system has been properly installed and is functioning correctly.

#### **1.4 DEMONSTRATION AND INSTRUCTIONS**

- A. Demonstration and Training: As specified in Section 01 79 00 - Demonstration and Training.

#### **1.5 TESTING, ADJUSTING, AND BALANCING**

- A. Testing, Adjusting and Balancing, General: Refer to Section 01 91 00 – General Commissioning Requirements.

- B. Testing, Adjusting and Balancing by CONTRACTOR: CONTRACTOR shall perform start-up and adjusting procedures specified in various Sections of the Specifications. Coordinate with demonstration requirements specified in Section 01 79 00 - Demonstration and Training.

1. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
2. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
3. Verify that wiring and support components for equipment are complete and tested.
4. Adjust operating components to ensure smooth and unhindered operation.
5. Execute start-up under supervision of applicable CONTRACTOR personnel and manufacturer's representative in accordance with manufacturers' instructions.
6. When specified in individual specification Sections, require manufacturer to provide OWNER'S REPRESENTATIVE to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

- C. Testing, Adjusting and Balancing by Commissioning Agent (CxA): CxA will perform testing and balancing services as specified in Section 01 91 00 – General Commissioning Requirements.

1. Reports will be submitted by CxA to CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, Project Inspector and CONTRACTOR, indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.
2. CxA will make minor adjustments of operating components and controls to achieve performance within design parameters.
3. CxA will submit a written report stating whether equipment or system has been properly installed and is functioning correctly. If not, CONTRACTOR shall make adjustments and replacements as necessary to achieve proper installation and function.



**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 77 00**  
**CLOSEOUT PROCEDURES**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Contract closeout procedures.

**1.2 RELATED SECTIONS**

- A. Section 01 33 00 - Submittals Procedures: General requirements for submittals.
- B. Section 01 74 00 – Cleaning and Waste Management: Cleaning and debris removal during construction
- C. Section 01 74 00 - Cleaning and Waste Management: Cleaning as part of Contract closeout.
- D. Section 01 78 33 – Project Warranties and Bonds: Documents to be submitted as part of Contract closeout.
- E. Section 01 78 39 - Project Record Documents: Project record drawings and specifications to be submitted as part of Contract closeout; operation and maintenance data to be submitted as part of Contract closeout.

**1.3 FINAL COMPLETION ACTIONS**

- A. Final Application for Payment: In the Application for Payment that coincides with the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed substantially complete.
- B. Warranties, Bonds and Certificates: Submit specific warranties, guarantees, workmanship bonds, maintenance agreements, final certifications, and similar documents.
- C. Locks and Keys: Change temporary lock cylinders over to permanent keying and transmit keys to OWNER'S REPRESENTATIVE, as directed by CONSTRUCTION MANAGER, unless otherwise directed or specified.
- D. Tests and Instructions: Complete start-up testing of systems, and instruction of OWNER'S REPRESENTATIVE'S personnel. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- E. Sustainable Design Submittals: Prepare and submit information validating compliance with California Building Standards Code (CALGreen) as specified in individual product Sections in Divisions 2 through 33.

**1.4 SUBSTANTIAL COMPLETION REVIEW**

- A. CONTRACTOR'S Notification for Substantial Completion Review: When CONTRACTOR determines that the Work is complete in accordance with the Contract Documents, CONTRACTOR shall submit to CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE, and Project Inspector written

certification that the Contract Documents have been reviewed, the Work has been inspected by the CONTRACTOR and by AUTHORITIES HAVING JURISDICTION, and the facility is ready for Completion review.

- B. Preliminary Contract Closeout Review Meeting: As authorized by CONSTRUCTION MANAGER, OWNER'S REPRESENTATIVE and OWNER'S REPRESENTATIVE'S consultants and other responsible design professionals, as appropriate, will attend a meeting at the Project site to review Contract closeout procedures and to review the list of items to be completed and corrected (punch list) to make the Work ready for acceptance by the CONSTRUCTION MANAGER. This meeting shall be scheduled not earlier than 14 days prior to the date anticipated for the Substantial Completion review.
- C. Correction (Punch) List: CONTRACTOR shall prepare and distribute at the preliminary Contract closeout review meeting, a typewritten, comprehensive list of items to be completed and corrected (punch list) to make the Work ready for acceptance by CONSTRUCTION MANAGER.
1. The punch list shall include all items to be completed or corrected prior to the CONTRACTOR'S application for final payment.
  2. The punch list shall identify items by location (room number or name) and consecutive number. For example, 307-5 would identify item 5 in Room 307, Roof-4 would identify item 4 on Roof.
  3. CONTRACTOR shall prepare separate lists according to categories used for Drawings. For example, provide lists for Architectural, Structural, Mechanical, Plumbing, Electrical, Civil, Landscape, and Equipment. Provide a list also for the Fire Protection (sprinkler) system.
  4. ARCHITECT, ARCHITECT'S consultants, and other design professionals under separate contracts with OWNER, if in attendance, shall conduct a brief walk-through of Project with the CONTRACTOR to review scope and adequacy of the punch list.
  5. Verbal comments will be made to the CONTRACTOR by the ARCHITECT, ARCHITECT'S consultants, and other design professionals under separate contracts with OWNER, if in attendance, during the walk-through. These comments will indicate generally the additions and corrections to be made to the punch list. Such comments shall not be considered to be comprehensive; CONTRACTOR shall use the comments as guidance in preparing the punch list for the Substantial Completion review.
- D. Substantial Completion Meeting: On a date mutually agreed by CONSTRUCTION MANAGER, ARCHITECT and CONTRACTOR, a meeting shall be conducted at the Project site to determine whether the Work is satisfactory and complete for filing a Notice of Completion (Substantial Completion).
1. CONTRACTOR shall provide three working days notice to ARCHITECT for requested date of Substantial Completion meeting.
  2. ARCHITECT and consultants of ARCHITECT and OWNER, as authorized by CONSTRUCTION MANAGER, will attend the Substantial Completion meeting.
  3. In addition to conducting a walk-through of the facility and reviewing the punch list, the purpose of the meeting shall include submission of warranties, guarantees and bonds to CONSTRUCTION MANAGER, submission of operation and maintenance data (manuals),

provision of specified extra materials to OWNER, and submission of other Contract closeout documents and materials as required and if not already submitted.

4. ARCHITECT, ARCHITECT'S consultants, as appropriate, and other design professionals under separate contracts with OWNER, if applicable, will conduct a walk-through of the facility with the CONTRACTOR and review the punch list.
  5. CONTRACTOR shall correct the punch list and record additional items as may identified during the walk-through, including notations of corrective actions to be taken.
  6. CONTRACTOR shall retype the punch list and distribute it within three working days to those attending the meeting.
  7. If additional site visits are required by the ARCHITECT, ARCHITECT'S consultants, and other design professionals under separate contracts with OWNER, to review completion and correction of the Work, the costs of additional visits shall be reimbursed to OWNER by the CONTRACTOR by deducting such costs from the Final Payment.
- E. Uncorrected Work: Refer to requirements specified in Section 01 45 00 - Quality Control regarding Contract adjustments for non-conforming Work.
- F. Clearing and Cleaning: Prior to the Substantial Completion review, CONTRACTOR shall conduct a thorough cleaning and clearing of the Project area, including removal of construction facilities and temporary controls. Refer to Section 01 74 00 - Cleaning and Waste Management.
- G. Inspection and Testing: Prior to the Substantial Completion review, complete inspection and testing required for the Work, including securing of approvals by AUTHORITIES HAVING JURISDICTION.
1. Complete all inspections, tests, balancing, sterilization and cleaning of plumbing and HVAC systems.
  2. Complete inspections and tests of electrical power and signal systems.
- H. ARCHITECT'S Certification of Substantial Completion: When ARCHITECT determines that list of items to be completed and corrected (Punch List) is sufficiently complete for OWNER to occupy Project for the use to which it is intended, ARCHITECT will complete and issue to CONSTRUCTION MANAGER and CONTRACTOR a Certificate of Substantial Completion using The American Institute of ARCHITECTS Form G704 - CERTIFICATE OF SUBSTANTIAL COMPLETION or other form or correspondence as directed by CONSTRUCTION MANAGER.
- I. Notice of Completion: After OWNER has determined that the Work is complete, a Notice of Completion resolution will be scheduled for review.

## **1.5 FINAL COMPLETION SUBMITTALS**

- A. Final Completion Submittals: Prior to Completion review meeting and submission of final Application for Payment, CONTRACTOR shall complete and submit the following. Final payment will not be made by OWNER until all submittals have been made and determined by CONSTRUCTION MANAGER and ARCHITECT to be acceptable.
- B. Agency Document Submittals: Submit to CONSTRUCTION MANAGER all documents required by AUTHORITY HAVING JURISDICTION (AHJ), including serving utilities and other agencies. Submit

- original versions of all permit cards, with final sign-off by inspectors. Submit all certifications of inspections and tests.
- C. Final Specifications Submittals: Submit to CONSTRUCTION MANAGER all documents and products required by Specifications to be submitted, including the following:
1. Project record drawings and specifications. Refer to Section 01 78 39 - Project Record Documents.
  2. Operating and maintenance data. Refer to Section 01 78 23 - Operation and Maintenance Data.
  3. Guarantees, warranties and bonds. Refer to Section 01 78 33-Product Warranties and Bonds
  4. Spare parts and extra stock.
  5. Test reports and certificates of compliance.
- D. Certificates of Compliance and Test Report Submittals: Submit to OWNER through CONSTRUCTION MANAGER certificates and reports as specified and as required by AUTHORITY HAVING JURISDICTION (AHJ), including the following as applicable:
1. Sterilization of water systems.
  2. Sanitary sewer system tests.
  3. Gas system tests.
  4. Lighting, power, and signal system tests.
  5. Ventilation equipment and air balance tests.
  6. Fire sprinkler system tests.
  7. Roofing inspections and tests.
- E. Lien and Bonding Company Releases: Submit to OWNER through CONSTRUCTION MANAGER, with copy to ARCHITECT, evidence of satisfaction of encumbrances on Project by completion and submission of The American Institute of ARCHITECTS Forms G706 - CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS, G706A - CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS, and (if applicable) G707 - CONSENT OF SURETY, or other form as directed by CONSTRUCTION MANAGER. Comply also with other requirements of OWNER, as directed through CONSTRUCTION MANAGER. Signatures shall be notarized.
- F. Subcontractor List: Submit two copies to OWNER, through CONSTRUCTION MANAGER, and two copies to ARCHITECT of updated Subcontractor and Materials Supplier List.
- G. Warranty Documents: Prepare and submit to OWNER through CONSTRUCTION MANAGER all warranties and bonds as specified in Section 01 78 33 - Product Warranties and Bonds.
- H. Sustainable Design Documentation: Complete proper documentation for Submittals according to California Green Building Standards Code (CALGreen). Refer to individual product Sections in Divisions 2 through 33.

## 1.6 FINAL PAYMENT

- A. Final Payment: After completion of all items listed for completion and correction, after submission of all documents and products and after final cleaning, submit final Application for Payment, identifying total adjusted Contract Sum, previous payments and sum remaining due. Payment will not be made until the following are accomplished:
1. All Project Record Documents have been transferred and accepted by OWNER, through CONSTRUCTION MANAGER.
  2. All extra materials and maintenance stock have been transferred and received by OWNER, as verified by CONSTRUCTION MANAGER.
  3. All warranty documents and operation and maintenance data have been received and accepted by OWNER, as verified by CONSTRUCTION MANAGER.
  4. All liens have been released or bonded by CONTRACTOR, as accepted by OWNER through CONSTRUCTION MANAGER.
  5. CONTRACTOR'S surety has consented to Final Payment.

## 1.7 POST-CONSTRUCTION INSPECTION

- A. Post-Construction Inspection: In accepting final payment, CONTRACTOR shall agree to perform a post-construction inspection with representatives of OWNER and, if authorized by OWNER, the responsible design professionals, to review performance of the completed Work and to determine what, if any, corrections shall be performed by CONTRACTOR in compliance with the CONTRACTOR'S Warranty, as described in the General Provisions of the Contract.
- B. Scheduled Date and Time of Post-Construction Inspection: No later than 300 days after the date of Substantial Completion, after occupancy and use of the facility by OWNER, at days and times as directed by OWNER.
- C. Inspection Activities:
1. CONTRACTOR shall inspect, test and adjust the Work, noting defects and corrective actions to be taken.
  2. CONTRACTOR shall instruct OWNER'S operating personnel in operational requirements needed to maintain correct appearance and function of the facility. Refer to Section 01 79 00 - Demonstration and Training.
- D. Post-Construction Inspection Report: CONTRACTOR shall prepare and submit to OWNER through CONSTRUCTION MANAGER a typewritten report, comparable to the Correction (Punch) List prepared for Completion Review.
1. Post-Construction Inspection Report shall identify deficiencies and corrective actions taken.

2. Post-Construction Inspection Report shall note when corrective actions are unable to restore defects in the Work to compliance with the requirements of the Drawings, Specifications, and manufacturer's criteria.
- E. Correction of Defects: Corrections shall be governed by provisions of the General Provisions of the Contract and requirements specified in Section 01 78 33 - Product Warranties and Bonds.

**PART 2 – PRODUCTS (NOT USED)**

Not Applicable to this Section.

**PART 3 – EXECUTION (NOT USED)**

Not Applicable to this Section.

**END OF SECTION**



**SECTION 01 78 23****OPERATION AND MAINTENANCE DATA****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Format and content of operation and maintenance manuals.
  - 1. Data requirements for materials and finishes.
  - 2. Data requirements for equipment and operating systems.
- B. Submission of operation and maintenance manuals.

**1.2 RELATED SECTIONS**

- A. Section 01 31 00 - Project Management and Coordination: Coordination documents and models prepared for performance of the Work, to be incorporated into operation and maintenance data submitted to CONSTRUCTION MANAGER at Contract closeout.
- B. Section 01 45 00 - Quality Control: Manufacturer's instructions; test and balance reports.
- C. Section 01 60 00 - Product Requirements: Systems demonstration.
- D. Section 01 77 00 - Contract Closeout Procedures: Contract closeout procedures.
- E. Section 01 78 39 - Project Record Documents: Submission of Project record documents.
- F. Section 01 78 33 – Product Warranties and Bonds: Requirements for warranties and bonds
- G. Section 01 91 00 – General Commissioning Requirements: Reports and other data from commissioning.
- H. Section 01 79 00 - Demonstration and Training: Administrative and procedural requirements for instructing OWNER'S personnel in operation and maintenance of systems, subsystems, and equipment installed under the Contract.
- I. Product Specifications Sections in Divisions 2 through 33: Specific requirements for operation and maintenance data.

**1.3 QUALITY ASSURANCE**

- A. Documentation: Preparation of operation and maintenance data shall be done by persons:
  - 1. Trained and experienced in maintenance and operation of the described products.
  - 2. Familiar with requirements of this Section.
  - 3. Skilled in technical writing to the extent required to communicate essential data.
  - 4. Skilled as drafters competent to prepare required drawings.

#### 1.4 FORMAT AND CONTENT OF OPERATION AND MAINTENANCE MANUALS

- A. Format for Operation and Maintenance Data Manuals: Prepare data in the form of an instructional manual. Comply with the general requirements specified below and comply with specific requirements for types of products in Articles following. See Article titled "SUBMISSION OF OPERATION AND MAINTENANCE MANUALS" for number of copies of manuals.
- B. Operation and Maintenance Data Organization: Organize operation and maintenance data in 3-ring binders and organize the contents of each binder following the organization of the Contract Specifications.
  - 1. Organize the group of binders and the contents of individual binders in sequence according to the Section numbers and titles as listed in the Table of Contents of the Project Manual. Number the binders consecutively; coordinate with Paragraph below titled "Tables of Contents."
  - 2. Organize each binder with color-coded tabbed dividers for each distinct product and system, with typed inserts in tabs identifying the product or system.
  - 3. Organize the contents of each tabbed division according to the Article headings in PART 2 - PRODUCTS in each product Specification Section.
    - a. Within each tabbed division, organize the information according to major component parts of equipment and systems, as applicable, and to facilitate locating information.
    - b. Separate operation and maintenance data for each product under separate tabbed divisions, where feasible.
    - c. Within each tabbed division, include a cover sheet identifying the specific products and component parts included in the tabbed division.
  - 4. If the products of more than one Specification Section are included in the binder, provide separate, heavy cover stock dividers to separate information for each Section.
- C. Binders: 8-1/2 x 11 inch, standard three-ring binders with heavy duty vinyl covers with hard cardboard backing, black color, with provision on binder spine for inserting identification card; Maximum binder ring size shall be 3-inches. Use multiple binders as necessary to avoid overfilling. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed card inserted on binder spine, stating OPERATION AND MAINTENANCE DATA, the Project name and the general subject matter of the contents of the binder.
- E. Title Page: In each volume (binder) of operation and maintenance data, include a title page with the following:
  - 1. Name of the Project.
  - 2. Names, addresses and telephone numbers of the responsible design professionals (ARCHITECT and consultant of ARCHITECT or OWNER, as applicable).
  - 3. Name, address, and telephone numbers of CONTRACTOR, including names of contact persons.

- F. Table of Contents: In each volume (binder) of operation and maintenance data, include a listing of the contents of the volume. In a separate, first binder, provide a master Table of Contents of operation and maintenance data, identifying the product and systems, the applicable Specification Section number and title, and the operation and maintenance data binder number.
- G. Schedule of Products and Systems: In the first volume of the set of operation and maintenance data, include a schedule of products and systems, indexed to the Table of Contents of the volumes (binders), and cross-referenced to the Contract Drawings and Specifications.
- H. Operation and Maintenance Data: In each tabbed division of operation and maintenance data for each product or system, provide the following:
  - 1. On a cover page for each tabbed division, provide the following:
    - a. Identify by name, address and telephone number, the manufacturer, supplier, and installer. Include names of contact persons, if known.
    - b. Identify by name, address and telephone number, local sources of supplies, replacement parts and factory-authorized service.
  - 2. Within each tabbed division, include complete operation and maintenance data as published by the product manufacturer where feasible. Otherwise, present all data neatly typewritten on 20 pound, correspondence quality bond paper. Strike-through information on printed literature where not applicable.
  - 3. Supplement the manufacturer's printed data with neatly typewritten text and professionally drafted diagrams as necessary to suit the particular installation for the Project and to fully explain operation and maintenance procedures. Provide logical sequence of instructions for each procedure.
- I. Drawings: Supplement operation and maintenance data to illustrate configurations and relationships of component parts of equipment and systems, and to show control and flow diagrams, as applicable.
  - 1. Do not use Project Record Documents as maintenance drawings.
  - 2. Neatly fold drawings to size of text pages and provide reinforced, punched binding edge. Add binding strip as necessary to avoid punching through drawing content.
- J. Additional Data: As specified in individual product Specification Sections.
- K. Warranty and Guaranty: Include copy of each warranty, guaranty, bond, and service contract issued. Provide information sheet identifying:
  - 1. Proper procedures in event of failure.
  - 2. Instances that might affect validity of warranties or bonds.
- L. Material Safety Data Sheet (MSDS): For products requiring MSDS, according to CCR Title 8, include copy of each applicable Material Safety Data Sheet (MSDS) for products delivered to the site and incorporated into the completed construction.

**1.5 DATA REQUIREMENTS FOR MATERIALS AND FINISHES**

- A. Data for Building Products, Applied Materials and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured Products.
- B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- C. Data for Moisture Protection and Weather-Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional Requirements: As specified in individual product Specification Sections.

**1.6 DATA REQUIREMENTS FOR EQUIPMENT AND OPERATING SYSTEMS**

- A. Data for Equipment and Operating Systems: Include description of each unit or system, and component parts.
  - 1. Include manufacturer's printed operation and maintenance instructions.
  - 2. Identify function, normal operating characteristics and limiting conditions.
  - 3. Include performance curves, with engineering data and tests.
  - 4. Include sequence of operation by controls manufacturer, as applicable.
  - 5. Provide diagrams by controls manufacturer for control systems, as applicable and as installed.
- B. Piping Data: Provide CONTRACTOR'S coordination drawings, with piping diagrams as installed. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams. Color code diagrams as necessary for clarity.
- C. Reports: Include test and balancing reports, as applicable and as specified in individual product Specification Sections.
- D. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.
- E. Wiring Diagrams: Include diagrams of wiring as installed, with color coding as necessary for clarity.
- F. Operating Procedures: Include:
  - 1. Start-up, break-in, and routine normal operating instructions and sequences.
  - 2. Regulation, control, stopping, shut-down, and emergency instructions.
  - 3. Summer and winter operating instructions.
  - 4. Special operating instructions.

G. Maintenance Requirements: Include:

1. Routine maintenance procedures and guide for trouble-shooting.
2. Disassembly, repair, and reassembly instructions.
3. Alignment, adjusting, balancing, and checking instructions.

H. Servicing and Lubrication: Provide servicing and lubrication schedule, and list of lubricants required.

I. Parts Data: Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams as necessary for service and maintenance.

1. Include complete nomenclature and catalog numbers for consumable and replacement parts.
2. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in stock by OWNER'S REPRESENTATIVE.

J. Software: All programming codes, access codes and other data necessary for operation, maintenance, future functioning, and modifications of microprocessor-controlled products, independent of Original Equipment Manufacturer (OEM).

K. Additional Requirements: As specified in individual product Specification Sections.

## **1.7 DATA REQUIREMENTS FOR ELECTRIC AND ELECTRONIC SYSTEMS**

A. Data Requirements for Electrical and Electronic Systems: Description of each system and component parts, including:

1. Function, normal operating characteristics and limiting conditions.
2. Performance curves, engineering data and tests.
3. Complete nomenclature and commercial number of replaceable parts.

B. Circuit Directories of Panel Boards: Include:

1. Electrical service.
2. Controls.
3. Communications.

C. Wiring Diagrams: As-installed, color-coded wiring diagrams.

D. Operating procedures:

1. Routine and normal operating instructions.
2. Sequences required.

3. Special operating instructions.
- E. Maintenance procedures:
1. Routine operations.
  2. Guide to "trouble-shooting."
  3. Disassembly, repair, and reassembly.
  4. Adjustment and checking.
- F. Manufacturer's printed operating and maintenance instructions.
- G. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
- H. Prepare and include additional data when the need for such data becomes apparent during instruction of OWNER'S personnel. Refer to Section 01 79 00 - Demonstration and Training.
- I. Additional requirements for operating and maintenance data: Respective sections of specifications.

#### **1.8 INSTRUCTION OF OWNER'S PERSONNEL**

- A. Instruction of OWNER'S Personnel: As specified in Section 01 79 00 - Demonstration and Training.
- B. Basis for Instruction: Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- C. Instructional Material: Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

#### **1.9 SUBMISSION OF OPERATION AND MAINTENANCE MANUALS**

- A. Submittal: Submit three hard copies and one (1) PDF scan of entire document to OWNER through CONSTRUCTION MANAGER prior to submission of final Application for Payment.

### **PART 2 – PRODUCTS (NOT USED)**

### **PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 78 36****WARRANTIES****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 through 50 apply to this Section.

**1.2 SUMMARY**

- A. This Section including administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
  - 1. Refer to Article 53, Warranty and Guarantee of the General Conditions for terms of the CONTRACTOR'S period for correction of the Work.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 01 70 00: "Execution and Closeout Requirements" specifies contract closeout procedures.
  - 2. Divisions 2 through 50 Sections for specific requirements for warranties on products and installations specified to be warranted.
  - 3. Certifications and other commitments and agreements for continuing services to City are specified elsewhere in the Contract Documents.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the CONTRACTOR of the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the CONTRACTOR.

**1.3 DEFINITIONS**

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the City.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the City.

**1.4 WARRANTY REQUIREMENTS**

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty.

- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The CONTRACTOR is responsible for cost of replacing or rebuilding defective Work regardless of whether the City has benefited from use of the Work through a portion of its anticipated useful service life.
- D. City's Recourse: Expressed warranties made to the City are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the City can enforce such other duties, obligations, rights, or remedies.
  - 1. Rejection of Warranties: The City reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the City reserves the right to refuse to accept the Work, until the CONTRACTOR presents evidence that entities required to countersign such commitments are willing to do so.

## 1.5 SUBMITTALS

- A. Submit written warranties to the City prior to the date for Final completion.
- B. When the Contract Documents require the CONTRACTOR, or the CONTRACTOR and a subcontractor, supplier, or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the City, for approval prior to final acceptance.
  - 1. Refer to Divisions 2 through 50 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the CONTRACTOR, or by the CONTRACTOR, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11inch (115-by-280-mm) paper.
  - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
  - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES" Project title or name, and name of the CONTRACTOR.
  - 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.



**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 78 39****PROJECT RECORD DOCUMENTS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Requirements for Project record documents to be submitted for Contract closeout.

**1.2 RELATED SECTIONS**

- A. Section 01 33 00 - Submittals Procedures: General requirements for submission for shop drawings, product data, samples, and quality control reports.

**1.3 PROJECT RECORD DOCUMENTS**

- A. Project Record Documents, General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the reference by CONSTRUCTION MANAGER and OWNER'S REPRESENTATIVE during normal working hours.
- B. Record Drawings: Record information continuously as Work progresses. Do not conceal Work permanently until all required information is recorded.
  - 1. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately.
  - 2. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
  - 3. Legibly and to scale, mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the work.
  - 4. Mark new information that is important to the OWNER'S REPRESENTATIVE'S operation and maintenance of the Work but was not shown on Contract Drawings or Shop Drawings. Record actual construction, including:
    - a. Measured depths of foundations and footings encountered, measured in relation to finish First Floor datum.
    - b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent ground improvements.
    - c. Field changes of dimension and detail.
    - d. Details not on original Contract Drawings. Application of copies of details produced and provided by OWNER'S REPRESENTATIVE during construction will be accepted.
    - e. Permanent Room names and Room numbers.
  - 5. Note related Change Order numbers where applicable.

6. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on the cover of each set.
  7. Store Record Documents separate from documents used for construction.
- C. Record Specifications: Record changes made by Addenda and Change Orders. In PART 2 - PRODUCTS in each Section, legibly mark and record in red ink actual Products installed or used, including:
1. Manufacturer's name and product model or catalog number.
  2. Product substitutions or alternates utilized.
- D. Submission:
1. Project Record Documents shall be kept current and will be reviewed for completeness by CONSTRUCTION MANAGER as condition for certification of each Progress Payment Application.
  2. Submit marked record documents to CONSTRUCTION MANAGER prior to final Application for Payment, for approval. Submit 2 sets of documents xerographically reproduced on white bond paper.
  3. Submit 'As-Built Certification' on a monthly basis by inspector Must accompany progress payment form provided in specifications.

**PART 2 – PRODUCTS (NOT USED)****PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 79 00****DEMONSTRATION AND TRAINING****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Administrative and procedural requirements for instructing OWNER'S personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment installed under the Contract.
  - 3. Demonstration and training visual presentation media and notes.

**1.2 RELATED SECTIONS**

- A. Section 01 31 00 - Project Management and Coordination: Requirements for pre instruction conferences.
- B. Section 01 75 00 - Starting and Adjusting Procedures: Coordination of start-up and adjusting of systems, subsystems and equipment with demonstration and training of OWNER'S personnel.
- C. Section 01 78 23 - Operation and Maintenance Data: Operating and maintenance instructions to be used during training and demonstration.
- D. Divisions 2 through 33 Sections for specific requirements for demonstration and training for Work specified in those Sections.

**1.3 SUBMITTALS**

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. Receipt, review, and acceptance of instruction program by OWNER, through CONSTRUCTION MANAGER (CM), shall be condition precedent to approval of CONTRACTOR'S application for payment in excess of 50 percent of the Contract Sum.
  - 2. Submission of instruction program shall be scheduled to allow sufficient time for receipt, review, and acceptance of instruction program by OWNER, through CONSTRUCTION MANAGER (CM), and shall be not less than 3 weeks prior to proposed date of first training session.
  - 3. At completion of training, submit two complete training manual(s) to OWNER, through CONSTRUCTION MANAGER, for OWNER'S use.
- B. Qualification Data: For persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses,

- names, and addresses of ARCHITECTS and OWNERS, and other information specified.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
  - D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
  - E. Demonstration and Training Video Presentations: Submit two DVD copies within seven days of end of each training module.
    - 1. Identification: On each copy, provide an applied label with the following information:
      - a. Name of Project.
      - b. Name and address of videographer.
      - c. Name of OWNER'S REPRESENTATIVE.
      - d. Name of CONTRACTOR.
      - e. Date video was recorded.
      - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - 2. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

#### 1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: Factory-authorized service representative and other qualified instructors, complying with requirements in Section 01 45 00 - Quality Control, experienced in operation and maintenance procedures and training.
- C. Photographer/Videographer Qualifications: A professional photographer who is experienced photographing construction projects.
- D. Pre instruction Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 - Project Management and Coordination. Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## 1.5 COORDINATION

- A. Coordination of Instruction Schedule: Coordinate instruction schedule with OWNER'S operations. Adjust schedule as required to minimize disrupting OWNER'S operations. Coordinate with OWNER through CONSTRUCTION MANAGER (CM).
- B. Coordination of Instructors: Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content. Allow for 30 days notice to OWNER through CONSTRUCTION MANAGER (CM).
- C. Coordination with Operation and Maintenance Data: Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by OWNER'S REPRESENTATIVE.
  - 1. Do not submit instruction program until operation and maintenance data have been reviewed by OWNER'S REPRESENTATIVE or other responsible design professional and accepted by OWNER through CONSTRUCTION MANAGER (CM).
  - 2. Coordinate review of operation and maintenance data to make operation and maintenance data available at least 30 days prior to date scheduled for initial training session.

## PART 2 - PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Motorized doors, including overhead coiling doors.
  - 2. Equipment, including athletic, audio-visual, food service and laboratory equipment as applicable.
  - 3. Fire-protection systems, including fire alarm and fire-extinguishing systems.
  - 4. Intrusion detection systems, if applicable.
  - 5. Conveying systems, including elevators and wheelchair lifts, as applicable.
  - 6. Heat generation, including boilers, pumps, and water distribution piping, as applicable.
  - 7. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping, as applicable.
  - 8. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices, as applicable.
  - 9. HVAC instrumentation and controls, as applicable.

10. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies and motor controls, as applicable.
  11. Lighting equipment and controls, as applicable.
  12. Communication systems, including voice and data systems and video equipment, as applicable.
  13. Motorized window coverings.
- B. Schedule of Training Sessions: Arrange to have training conducted on consecutive days, with no more than 6 hours of training scheduled for any one day. Concurrent classes will not be acceptable.
- C. Training Modules, General: Develop a learning objective and teaching outline for each module. Develop an instruction program that includes individual training sessions for each system and operating products not part of a system, as required by Division 2 through 16 Specification Sections. Include a description of specific skills and knowledge that participant is expected to master.
- D. Training Module Content: Training modules shall progress logically. Each training module shall be comprised of time spent both in the classroom and at specific location of subject equipment or system. As a minimum, cover the following subjects for each item of equipment and system:
1. Familiarization:
    - a. Review catalog, parts lists, drawings, etc., which have been previously provided for the plant files and operation and maintenance manuals.
    - b. Check out the installation of the specific equipment items.
    - c. Demonstrate the unit and indicate how all parts of the specifications are met.
    - d. Answer questions.
  2. Safety:
    - a. Using material previously provided, review safety references.
    - b. Discuss proper precautions around equipment.
  3. Operation:
    - a. Using material previously provided, review reference literature.
    - b. Explain all modes of operation (including emergency).
    - c. Check out OWNER'S personnel on proper use of equipment and controls.
  4. Preventive Maintenance:
    - a. Using material previously provided, review preventive maintenance (PM) lists including:
      - 1) Reference material.
      - 2) Daily, weekly, monthly, quarterly, semiannual, and annual jobs.
    - b. Demonstrate how to perform Preventative Maintenance tasks.
    - c. Demonstrate to OWNER'S personnel what to look for as indicators of equipment problems.
  5. Corrective Maintenance:
    - a. List possible problems.



- b. Discuss repairs--point out special problems.
  - c. Open up equipment and demonstrate procedures, where practical.
- 6. Parts:
  - a. Show how to use previously provided parts list and order parts.
  - b. Check over spare parts on hand. Make recommendations regarding additional parts that should be available.
- 7. Local Representatives:
  - a. Where to order parts: Name, address, telephone.
  - b. Service problems:
    - 1) Who to call.
    - 2) How to get emergency help.
- 8. Operation and Maintenance Manuals:
  - a. Review any other material submitted.
  - b. Update material, as required.
- E. Classroom Training for Operations Personnel:
  - 1. Using projected drawings and photographs, describe and discuss equipment locations in plant and present operational overview of systems. Thoroughly discuss operating and maintenance manuals.
  - 2. Describe purpose and plant function of equipment and systems.
  - 3. Describe operating theory of equipment.
  - 4. Describe start-up, shutdown, normal operation and emergency operating procedures, including discussion of system integration and electrical interlocks, if any.
  - 5. Identify and discuss safety items and procedures.
  - 6. Describe routine preventative maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.
  - 7. Describe operator detection, without test instruments, of specific equipment trouble symptoms.
  - 8. Describe required equipment performance test procedures and intervals.
  - 9. Describe routine disassembly and assembly of equipment if applicable (as determined by OWNER on case-by-case basis) for purposes such as operator inspection of equipment.
- F. Classroom Training for Maintenance and Repair Personnel:
  - 1. Theory of operation.
  - 2. Description and function of equipment.

3. Start-up and shutdown procedures.
  4. Normal and major repair procedures.
  5. Equipment inspection and troubleshooting procedures including the use of applicable test instruments and the "pass" and "no pass" test instrument readings.
  6. Routine and long-term calibration procedures.
  7. Safety procedures.
  8. Preventative maintenance such as lubrication; normal maintenance such as belt, seal, and bearing replacement; and up to major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.
- G. Field Training for Operations Personnel:
1. Identify locations of equipment components and controls.
  2. Review of component functions and theory of operation.
  3. Identifying piping and flow options.
  4. Identifying valves and explain their functions at various settings.
  5. Identifying instrumentation:
    - a. Location of primary element.
    - b. Location of instrument readout.
    - c. Discuss purpose, basic operation, and information interpretation.
  6. Discuss, demonstrate, and perform standard operating procedures and round checks, including system start-up and shutdown procedures.
  7. Review and perform safety procedures.
  8. Perform the required equipment exercise procedures.
  9. Discuss and perform preventative maintenance activities.
  10. Identify and review safety items and perform safety procedures, if feasible.
- H. Field Training for Maintenance and Repair Personnel: In addition to field training specified above for operations personnel, include the following:
1. Describe normal repair procedures.
  2. Perform routine disassembly and assembly of equipment, if applicable, for inspections and tests.
  3. Perform routine maintenance and repair tasks, including mechanical and electrical operations for

troubleshooting, adjustments, and calibration.

I. Presentation Media:

1. Presentations shall utilize computer-generated, projected graphics utilizing Microsoft PowerPoint software, including animation as appropriate to enhanced presentation and viewer interest. Graphics shall include text and still and moving images. PowerPoint presentation shall be suitable for incorporation into video record of instruction.
2. Each session shall include mock-ups, samples, and other visual aids as appropriate.
3. Each session shall include printed handouts and notes for each participant.
4. Produce sufficient printed materials to provide minimum of 5 unused copies for OWNER'S use in subsequent training programs.

J. Video Record: Each training session shall be recorded and reproduced on digital video disc (DVD). Video media shall be labeled with legible, permanent computer-printed labels.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

A. Preparation:

1. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
2. Set up instructional equipment at instruction location.

#### **3.2 INSTRUCTION**

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between CONTRACTOR and OWNER'S REPRESENTATIVES (through CONSTRUCTION MANAGER) for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct OWNER'S personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
1. CONTRACTOR will furnish a qualified instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  2. OWNER' will furnish through CONSTRUCTION MANAGER (CM) to CONTRACTOR names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
1. Schedule training with OWNER through CONSTRUCTION MANAGER (CM), with at least ten working days advance notice.

- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.
- E. Cleanup: Collect used and leftover educational materials and deliver to OWNER through CONSTRUCTION MANAGER (CM). Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

**END OF SECTION**

**SECTION 01 81 13****SUSTAINABLE DESIGN REQUIREMENTS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. General requirements and procedures for compliance during construction with requirements of CCR Title 24, Part 11: California Green Building Standards Code (CALGreen Code), including Amendments and or latest version.
- B. CONTRACTOR shall be responsible for completion and transmission to OWNER'S REPRESENTATIVE through CONSTRUCTION MANAGER documents developed during construction (submittals) necessary for completion and verification of the Application Checklist for Building Standards Code (BCS), in compliance with CALGreen Code, including Amendments and or latest version.

**1.2 RELATED SECTIONS**

- A. Section 01 81 19 - Indoor Air Quality Management: Indoor Air Quality (IAQ) management procedures and requirements.
- B. Section 01 35 43 - Environmental Management: Special requirements for noise and acoustics management during demolition and new construction operations.
- C. Section 01 74 19 - Construction Waste Management and Disposal: Waste management controls and systems
- D. Section 01 60 00 - Product Requirements: Environmental requirements for construction products, including packaging.
- E. Section 01 74 00 - Cleaning and Waste Management: Requirements for cleaning agents and procedures.
- F. Section 01 91 00 - Commissioning: Requirements for CALGreen Code commissioning activities.
- G. Section 01 79 00 - Demonstration and Training: Requirements for instructing OWNER'S personnel in use and maintenance of facilities.
- H. Divisions 2 through 33 Sections: Specific requirements for submittals demonstrating compliance with CALGreen requirements specific to the Work specified in each of these Sections.

**1.3 DEFINITIONS**

- A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

- B. **Rapidly Renewable Materials:** Materials made from agricultural products that are typically harvested within a ten-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.
- C. **Regionally Manufactured Materials:** Materials that are manufactured within a radius of 500 miles from the Project location. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.
- D. **Regionally Extracted, Harvested, or Recovered Materials:** Materials that are extracted, harvested, or recovered and manufactured within a radius of 500 miles from the Project site.
- E. **Recycled Content:** The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
  - 1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
  - 2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

#### **1.4 SUBMITTALS**

- A. **CALGreen Compliance Submittals:** Make sustainable design-related submittals as specified in Division 2 through 33 Sections.
  - 1. Comply with general requirements for submittals specified in Section 01 33 00 - Submittal Procedures.
  - 2. Prepare and submit Checklist for California Green Building Standards Code (CALGreen) including specific items specified in Article 3.1, below.
  - 3. Sustainable design (CALGreen) submittals are in addition to submittals specified in other Sections.
  - 4. Make submittals as Adobe Acrobat Portable Document Format (PDF) electronic files.

#### **1.5 CONFERENCES**

- A. **Coordination Meetings:** Comply with general requirements for project meetings specified in Section 01 31 00 - Project Management and Coordination. Conduct two onsite CALGreen Coordination Meetings.
  - 1. **Initial Coordination Meeting:** Conduct pre-construction meeting to review CALGreen Implementation Plan. This includes mandatory participation by critical subcontractors.
  - 2. **Second CALGreen Coordination Meeting:** Conduct Contract Closeout meeting to exchange outstanding documentation and to confirm final performance data.

**PART 2 - PRODUCTS**

Not Applicable to this Section

**PART 3 - EXECUTION****3.1 CHECKLIST FOR CALIFORNIA GREEN BUILDING STANDARDS CODE (CALGREEN)**

- A. Completion of Checklist for California Green Building Standards Code (CALGreen): CONTRACTOR shall complete this checklist for materials and equipment, with additional input from OWNER'S REPRESENTATIVE for design-related requirements.
- B. Construction Waste Reduction, Disposal and Recycling: In compliance with CALGreen 5.408.1, as specified in Section 01 74 19 - Construction Waste Management and Disposal.
- C. Finish Materials Pollutant Control:
  - 1. Indoor Air Quality (IAQ) Control: In compliance with CALGreen A5.405.1 and as specified in Section 01 81 19 - Indoor Air Quality Requirements.
  - 2. Adhesives, sealants, and caulks: Comply with CALGreen 5.504.4.1, including South Coast Air Quality Management District (SCAQMD) Rule 1168 for VOC limits and CALGreen Tables 5.504.4.1 and 5.504.4.2.
  - 3. Paints and coatings: Comply with CALGreen 5.504.4.3, including South Coast Air Quality Management District (SCAQMD) Rule 1116 for VOC limits, unless more stringent requirements are specified.
  - 4. Carpet system: Comply with CALGreen 5.504.4.4, including testing and product requirements of CALGreen 5.504.4.4
    - a. If used, carpet cushion shall comply with Carpet and Rug Institute Green Label Program.
    - b. Adhesives used for carpet installation shall comply with requirements of CALGreen Table 804.4.1.
  - 5. Composite wood products: Comply with CALGreen 5.504.4.5, including limitations on formaldehyde content in CALGreen Table 5.504.4 and in compliance with California Air Resources Board (CARB) Air Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products.
  - 6. Resilient flooring system: Comply with CALGreen 5.504.4.6, including compliance with material list or product registry under 2009 Edition, California CHPS (Collaborative for High Performance Schools) (CA-CHPS) or certification under Floor Score Program of the Resilient Floor Covering Institute, for Tier 1.

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 81 19****INDOOR AIR QUALITY REQUIREMENTS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. This Section specifies Indoor Air Quality (IAQ) management procedures during construction, in compliance with CCR Title 24, Part 11: 2010 California Green Building Standards Code (CALGreen Code), including July 2012 Amendments and or latest version.
- B. CONTRACTOR shall develop procedures and maintain the project site to eliminate and mitigate potential sources of indoor air pollutants to enhance the indoor air quality of the project site and the finished, occupiable building.

**1.2 RELATED SECTIONS**

- A. Section 01 31 00 - Project Management and Coordination: Meetings and project documentation.
- B. Section 01 81 13 - Sustainable Design Requirements: General requirements and procedures for compliance with 2010 California Green Building Standards Code (CALGreen Code), including July 2012 Amendments.
- C. Section 01 56 00 - Temporary Barriers and Enclosures: Requirements for dust and debris barriers.
- D. Section 01 74 00 - Cleaning and Waste Management: Progress and final cleaning, including removal of dust and debris from building interior.
- E. Section 01 91 00 - Commissioning: Commissioning activities in compliance with 2010 California Green Building Standards Code (CALGreen Code), including July 2012 Amendments.

**1.3 DEFINITIONS**

- A. Definitions: Pertaining to sustainable development, as defined in ASTM E 2114.
- B. Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.
- C. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.
  - 1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

- D. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity, and air speed.
- E. Interior Final Finishes: Materials and products that will be exposed at interior, occupied spaces; including flooring, wallcovering, finish carpentry, and ceilings.
- F. Packaged Dry Products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.
- G. Wet Products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

#### **1.4 SUBMITTALS**

- A. Indoor Air Quality (IAQ) Management Plans: Prepare and submit IAQ Management Plans demonstrating compliance with CCR Title 24, Part 11: 2010 California Green Building Standards Code (CALGreen Code).
  - 1. Confirm whether permanently installed air handling equipment was used during construction
  - 2. Submit product data for temporary filtration media and filtration media used during occupancy (include manufacturer, model #, MERV rating, and location of installed filter)

### **PART 2 - PRODUCTS**

Not applicable to this Section

### **PART 3 - EXECUTION**

#### **3.1 INDOOR AIR QUALITY (IAQ) MANAGEMENT**

- A. Indoor Air Quality (IAQ) Management: CONTRACTOR shall manage and protect indoor air quality, including performance of the following:
  - 1. During construction meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning CONTRACTORS National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 1995, Chapter 3.
    - a. Minimize accumulation of dust and debris which may become airborne and infiltrate the heating, ventilating and air conditioning system.
    - b. Conduct thorough progress and final completion cleaning to remove dust from interior surfaces. Refer to Section 01 74 00 – Cleaning and Waste Management.
  - 2. Protect stored on-site or installed absorptive materials from moisture damage, including materials such as insulation, carpeting, ceiling tile and gypsum wallboard. Coordinate with requirements for temporary dust and debris barriers specified in Section 01 50 00 - Temporary Facilities and Controls.

3. Protect from intrusion by dust, water, and debris all heating, ventilating and air conditioning equipment, ductwork, and other related air distribution component openings by closing all openings with tape, durable plastic sheeting, sheet metal or other methods as acceptable to AUTHORITY HAVING JURISDICTION (AHJ). Provide protection during shipping and handling, storage on the construction site, installation and operational adjustments and testing, until final startup.
4. If permanently installed air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 shall be used at each return air grille, as determined by ASHRAE 52.2-1999.
5. Replace all filtration media immediately prior to Completion review.
6. Prohibit smoking inside the building and within 25 feet of building entrances once the building is closed-in.

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 01 91 00****COMMISSIONING (CALGREEN)****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. This Section specifies building systems commissioning process for building systems, including detailed administrative and procedural requirements covering individual responsibilities, submittals, meetings, documentation, equipment inspections, startup and testing procedures, training, operating and maintenance manuals, and any related work during the Warranty Period.
- B. Commissioning shall comply with requirements of 2010 edition, California Code of Regulations (CCR), Title 24, Part 11, California Green Building Standards Code (CALGreen).
- C. This Section is applicable to the following systems and equipment to be commissioned for this project:
  - 1. All equipment and controls of the heating, ventilating and air conditioning systems.
  - 2. Building automation system (and any integration to OWNER Controls System).
  - 3. Lighting controls.
  - 4. Domestic hot water systems.

**1.2 COMMISSIONING OVERVIEW**

- A. Commissioning: Systematic process of ensuring that building systems are installed and perform functionally and interactively as intended according to the OWNER'S (OWNER'S) Project Requirements (OPR), Basis of Design (BoD), and requirements of the Contract Documents.
  - 1. Commissioning during project design phase, including delegated design during the Construction Contract, is intended to achieve the following specific objectives in development of the Contract Documents:
    - a. Review the OPR and BoD for clarity and completeness. Design team shall update the OPR and BoD as required.
    - b. Review Design Documents, prior to mid-phase construction documents completion, for adherence to the OPR and BoD.
    - c. Incorporate commissioning requirements into Contract Documents.
    - d. Verify Commissioning Authority's (CxA) design review comments are incorporated into subsequent design documents.
  - 2. Commissioning during project construction phase is intended to achieve the following specific objectives according to the Contract Documents:
    - a. Finalize the Commissioning Plan (CxP).

- b. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry-accepted minimum standards and that they receive adequate operational checkout and testing by the Installing CONTRACTORS.
  - c. Verify and document proper performance of equipment and systems..
  - d. Verify that operation and maintenance documentation is provided and is complete.
  - e. Develop systems manual that provides future operating staff the information necessary to optimally operate the commissioned systems.
  - f. Verify that OWNER'S facilities and operations personnel are trained according to Contract requirements.
3. Commissioning during warranty phase is intended to achieve the following specific objectives according to the Contract Documents:
  - a. Perform off-season deferred testing.
  - b. Review operational issues prior to end of warranty period so that warranty items are identified and corrected.
4. Commissioning process shall not take away from or reduce responsibilities of CONTRACTOR to provide finished and fully functioning product. CONTRACTOR shall have overall responsibility to ensure that all systems are properly tested and commissioned, and that all required commissioning documents are completed and submitted to OWNER through CONSTRUCTION MANAGER.

### **1.3 RELATED SECTIONS**

- A. Section 01 78 23 - Operation and Maintenance Data: General requirements for preparation and submission of operation and maintenance data.
- B. Section 01 78 39 - Project Record Documents: As-built information regarding systems included in commissioning scope.
- C. Section 01 79 00 - Demonstration and Training: Instruction of OWNER'S facility operations and maintenance personnel.
- D. Division 26 - Electrical: Sections that specify commissioning of building automation (and any integration of OWNER Controls System) and lighting control system.

### **1.4 REFERENCES**

- A. California Code of Regulations (CCR), Title 24, Part 11, California Green Building Standards Code (CALGreen), latest version.
- B. California Code of Regulations (CCR), Title 24, Part 6, California Energy Efficiency Standards, latest version.

### **1.5 DEFINITIONS**

- A. Acceptance Phase: Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review, and training occur.

- B. Approval: Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.
- C. ARCHITECT / Engineer (A/E): Prime consultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.
- D. OWNER'S Project Requirements (OPR): Documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. OPR describes systems, components, conditions, and methods chosen to meet the intent. Some reiterating of design intent may be included.
- E. Commissioning Authority (CxA): Party identified by OWNER (OWNER) who leads, plans, schedules, and coordinates commissioning team to implement commissioning process.
- F. Commissioning Coordinator (CxC): Independent testing and inspection agency, not otherwise associated with A/E team members or the CONTRACTOR, although CxC may be hired as subcontractor to CxA. CxC shall assist CxA and direct and coordinate day-to-day commissioning activities. CxC does not take an oversight role.
- G. Commissioning Plan (CxP): Overall plan, developed before or after bidding that provides the structure, schedule, and coordination planning for the commissioning process.
- H. Construction Checklist: List of system verification checklists (SVCs) to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by CxC to the Installing CONTRACTOR.
  - 1. Term "construction" refers to completed Work before functional testing.
  - 2. Construction checklists or SVCs are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension correct, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some construction checklist items entail simple testing of the function of a component, a piece of equipment, or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system).
  - 3. Construction checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, CONTRACTORS typically perform some, if not many, of the construction checklist items a commissioning authority will recommend. However, few CONTRACTORS document in writing the execution of these checklist items. Therefore, for most equipment, the CONTRACTORS execute the checklists on their own.
  - 4. Commissioning Authority (CxA) only requires that the procedures be documented in writing and does not witness much of the completion of construction checklists, except for larger or more critical pieces of equipment.
- I. Contract Documents (CDs): Documents binding on parties involved in the construction of this Project (drawings, specifications, change orders, amendments, contracts, Cx Plan, etc.).
- J. CONTRACTOR: General CONTRACTOR or authorized representative.
- K. Data Logging: Monitoring flows, currents, status, pressures, etc. of equipment using stand-alone data loggers separate from the control system.

- L. Deferred Functional Tests: Functional Performance Test (FPTs) that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that prevent the test from being performed.
- M. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents.
- N. Design Intent: A dynamic document that provides the explanation of the ideas, concepts, and criteria that are considered to be very important to the OWNER. It is initially the outcome of the programming and conceptual design phases.
- O. Factory Testing: Testing of equipment on-site or at the factory by factory personnel with a Project Manager present.
- P. Functional Performance Test (FPT): Test of dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods.
  - 1. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
  - 2. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
  - 3. The systems are run through all the control system's sequences of operation, and components are verified to be responding as the sequences state.
  - 4. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the term. TAB's primary work is setting up system flows and pressures as specified, while functional testing is verifying that which has already been set up.
  - 5. Commissioning Authority will develop functional test procedures, in sequential written form, and coordinate, oversee and document actual testing, which is usually performed by installing CONTRACTOR or vendor.
  - 6. FPTs are performed after construction checklists and startup is complete.
- Q. General CONTRACTOR (GC): CONTRACTOR for entire project and party identified as "CONTRACTOR" in OWNER-CONTRACTOR Agreement. Term refers as well to all subcontractors and material suppliers engaged by CONTRACTOR. Party is also referred to "General CONTRACTOR" and "Prime CONTRACTOR" in some contexts.
- R. Indirect Indicators: Indicators of response or condition, such as reading from control system screen reporting damper to be 100 percent closed.
- S. Installing CONTRACTOR: Party engaged by CONTRACTOR to installs specific equipment or systems. Party is also referred to as "Applicator" in some contexts.



- T. Manual Test: Using hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- U. Monitoring: Recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.
- V. Non-Compliance: See Deficiency.
- W. Non-Conformance: See Deficiency.
- X. Over-Written Value: Writing over sensor value in control system to see response of a system (e.g., changing outside air temperature value from 50 deg F to 75 deg F to verify economizer operation). See also "Simulated Signal."
- Y. OWNER-Contracted Tests: Tests performed by others directly engaged and paid by OWNER outside the Construction Contract and which CxA does not oversee. These tests will not be repeated during functional tests if properly documented.
- Z. Phased Commissioning: Commissioning that is completed in phases (by floors, for example) due to size and complexity of facility or due to construction scheduling issues, in order minimize total construction time.
- AA. Functionally testing only a fraction of the total number of identical or near-identical pieces of equipment.
- BB. Seasonal Performance Tests: FPTs that are deferred until the system(s) will experience conditions closer to their design conditions.
- CC. Simulated Condition: Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).
- DD. Simulated Signal: Disconnecting a sensor and using a signal generator to send an amperage, resistance, or pressure to the transducer and DDC system to simulate a sensor value.
- EE. Specifications: The construction specifications portion of the Contract Documents.
- FF. Startup: Initial starting or activating of dynamic equipment, including execution of construction checklists.
- GG. Subs: Subcontractors engaged by Prime CONTRACTOR who provide and install building components and systems.
- HH. Test Procedures: Step-by-step process that must be executed to fulfill the test requirements. CxA shall develop the test procedures and CxC shall implement their execution.
- II. Test Requirements: Requirements specifying modes, functions, and other parameter to be tested. Test requirements are not detailed test procedures. Test requirements for each system is specified in respective product section of the Specifications, in the Project Manual portion of the Contract Documents.
- JJ. Trending: Monitoring using building control system.

KK. Vendor: Supplier of equipment.

LL. Warranty Period: Warranty period for entire project, including equipment components. Warranty shall begin on date of completion established in Notice of Completion filed with AUTHORITY HAVING JURISDICTION (AHJ). Warranty period is at least one year, unless extended warranty or guaranteed is specifically noted in the Contract Documents. For purposes of the Contract, the terms "warranty" and "guarantee" shall be interchangeable.

## **1.6 COMMISSIONING PROCESS OVERVIEW**

A. Commissioning Process Overview: The following narrative provides an overview of the typical commissioning tasks during construction and the general order in which they occur:

1. The Commissioning Authority (CxA) prepares a Preliminary Cx Plan during the project final design phase. The Cx Plan provides guidance in the execution of the commissioning process.
2. Commissioning during construction begins with a kickoff meeting conducted by the CxA where the commissioning process and systems to be commissioned are reviewed with the commissioning team members, including (General) CONTRACTOR and Installing CONTRACTORS. The Preliminary Commissioning Plan (CxP) shall be presented and reviewed, and specific requirements shall be discussed. CxA shall designate CxC at or before this meeting.
3. The CxA shall review CONTRACTOR submittals applicable to systems being commissioned for conformance to the BoD and OPR. This review shall run concurrent with DP design reviews and submitted to the Design team and the OWNER.
4. As part of normal submittal, the (General) CONTRACTOR shall submit to CxA additional equipment documents and forms including manufacturer installation checklists, detailed startup procedures, proposed Pre-Functional Checks and Tests procedures, and equipment warranty information. CxA shall review these submittal documents and forms for completeness, and may request additional data, and use these documents to develop specific check-lists and test procedures for the equipment and systems to be commissioned.
5. CxA shall update Commissioning Plan (CxP) with equipment specific documentation, check-lists, and test forms.
6. Additional meetings shall be conducted throughout construction with Commissioning Team members, as required, to plan, scope, coordinate, and schedule commissioning activities, review documentation, and resolve Commissioning Issues and Deficiencies.
7. The CxA develops System Readiness Checklist (SRC) forms which summarize and track the Installation Verifications, Startup, and Pre-Functional Checks & Tests required for each system and equipment to be commissioned. (General) CONTRACTOR (GC) shall complete the SRC forms, and include completed Installation Verification, Startup, and Pre-functional Checks and Test forms to document that systems and equipment are ready for operation. CxC shall submit the completed SRCs and associated documents to CxA and CONSTRUCTION MANAGER (CM) for approval before proceeding to Functional Performance Testing.

8. CxA will perform various inspections and back-checks of the completed Installation Verification forms submitted by the CxC as part of the SRC.
9. Installing CONTRACTORS, as directed by the CxC, shall perform Startup, and Pre-Functional Checks & Tests. The CxC shall document completion of the Installation Verification, Startup and Pre-Functional Checks & Tests on the System Readiness Checklists. The CxA will witness select Start-up and Pre-Functional Checks & Tests, and perform a sample number of inspections and back-checks where determined to be necessary.
10. The CxA will develop final equipment and system Functional Performance Test (FPT) procedures and forms. These test procedures shall be submitted to (General) CONTRACTOR and Installing CONTRACTORS for review and comment.
11. Once systems to be commissioned are verified ready for FPTs by the completion of the SRCs, FPTs are executed by the Installing CONTRACTORS under direction of the CxC, and witnessed by the CxA. The FPTs may be achieved by, or any combination of: Manual Testing; Monitoring via the Building Management System (BMS) trending capabilities (if applicable to project) or by stand-alone Data Loggers. Include analysis of results.
12. During Installation Verification, Startup, Pre-Functional Checks & Tests, and Functional Performance Testing, all Deficiencies and Commissioning Issues are recorded by the CxA on the Commissioning Issues Log. (General) CONTRACTOR and its Installing CONTRACTORS shall correct Commissioning Issues and retest the system(s) without delay at no additional cost to the OWNER.
13. (General) CONTRACTOR shall compile and complete Operations and Maintenance Manuals in compliance with requirements of the Contract Documents. CxA will review Operation and Maintenance Manuals (O&M Data) for completeness and provide comments to OWNER regarding the documentation.
  - a. Coordinate with requirements specified in Section 01 78 23 - Operation and Maintenance Data.
  - b. Provide separate report on systems under commissioning scope for use in demonstration of compliance with CALGreen Code to AUTHORITY HAVING JURISDICTION (AHJ).
14. The CxA will review and provide comment to CONSTRUCTION MANAGER (CM) and to (General) CONTRACTOR (GC) for specified training provided by Installing CONTRACTORS, and shall verify that training has been completed.
15. The CxA will review and ensure that test data and Operation and Maintenance Manuals (O&M Data) demonstrate compliance with commissioning requirements of California Green Building Standards Code (CALGreen). CxC shall provide assistance to CxA in preparation of this document.
16. The CxA will complete the Final Construction Phase Commissioning Report for project record for the OWNER and for submission as required to AUTHORITY HAVING JURISDICTION (AHJ).

## **1.7 COMMISSIONING TEAM**

- A. Members Appointed by CONTRACTOR: Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through

coordinated action. Commissioning Team shall consist of, but not be limited to, representatives of CONTRACTOR, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by OWNER (OWNER):

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. OWNER will engage the CxA under a separate contract.
2. Representatives of OWNER (OWNER) responsible for facility operation and maintenance.
3. ARCHITECT and engineering design professionals of record.

## 1.8 RESPONSIBILITIES FOR COMMISSIONING

A. OWNER'S (OWNER'S) Responsibilities:

1. OWNER'S Project Requirements (OPR) Documentation: Through CONSTRUCTION MANAGER, OWNER will provide OWNER'S Project Requirements (OPR) documentation to CONSTRUCTION MANAGER (CM), Commissioning Agent (CxA) and (General) CONTRACTOR for information and use.
2. OWNER'S Personnel: OWNER will assign operation and maintenance personnel and schedule them to participate in commissioning team activities. Coordinate also with requirements specified in Section 01 79 00 - Demonstration and Training.
3. Basis of Design (BoD) Documentation: OWNER will provide, through CONSTRUCTION MANAGER (CM) to CxA and (General) CONTRACTOR, Basis of Design (BoD) documentation, prepared by ARCHITECT and approved by OWNER, for use in developing Commissioning Plan (CxP), Operation and Maintenance Manuals (O&M Data), and operation and maintenance training plan.

B. CONSTRUCTION MANAGER'S (CM's) Responsibilities: CM will function as OWNER'S (OWNER'S) Representative. All communication to OWNER and responsible design professionals shall be through CM.

C. Commissioning Authority's (CxA's) Responsibilities:

1. The primary role of the CxA is to organize and lead the commissioning team, to develop the Commissioning Plan (CxP), and assist CxC and (General) CONTRACTOR (GC) in coordination and execution of the commissioning process.
2. Prepare Commissioning Plan (CxP) and work with CONSTRUCTION MANAGER (CM) and (General) CONTRACTOR (GC) to schedule commissioning activities.
3. Review submittals for compliance with the Commissioning Plan (CxP) and the need for developing commissioning forms.
4. Convene commissioning team meetings, prepare meeting agendas, and distribute meeting minutes.

5. Observe and inspect system and equipment installation, start-up, checkout, and testing for compliance with the OPR, BoD, and Contract Documents, review completion of commissioning documentation, and record any Deficiencies and Commissioning Issues in Commissioning Issues Log.
6. Witness systems, assemblies, equipment, and component startup.
7. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.
8. Prepare and maintain Commissioning Issues Log. Submit completed Commissioning Issues Log with Final Construction Phase Commissioning Report, demonstrating correction of all deficiencies.
9. Coordinate instruction and training of OWNER'S personnel for systems included in commissioning with general requirements for instruction and training specified in Section 01 79 00 - Demonstration and Training.
10. Perform inspections and back-checks of (General) CONTRACTOR-completed Installation Verification documents.
  - a. Verify the execution of commissioning process activities using random sampling. Sampling rate may vary from 1 to 100 percent.
  - b. Verification shall include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OWNER'S Project Requirements (OPR).
  - c. When random sample does not meet requirements, CxA will report failure in Commissioning Issues Log
11. Review and comment on Operation and Maintenance documentation and training plans. Coordinate with requirements specified in Section 01 79 00 - Demonstration and Training.
12. Assist CxC in preparing report on systems under commissioning scope for use in demonstration of compliance with CALGreen Code to AUTHORITY HAVING JURISDICTION (AHJ).
13. Assist CxC in assembling commissioning documents to include in Commissioning Report prepared by CxA.
14. The CxA is not responsible for:
  - a. Design concept or design criteria.
  - b. Review for code compliance.
  - c. Design and construction scheduling.
  - d. Cost estimating.
  - e. Construction management.
  - f. Providing tools and test equipment used for commissioning and data collection.
  - g. Scheduling Startup or Functional Performance Testing.
  - h. Coordinating the work of Installing CONTRACTORS, vendors, and any special testing agents.
  - i. Performing Pre-functional checks and tests, Startup and Functional Performance Tests.

D. (General) CONTRACTOR'S Responsibilities:

1. (General) CONTRACTOR (GC) shall be responsible for all commissioning tasks to be performed, including tasks assigned to Installing CONTRACTORS. GC shall ensure that all commissioning responsibilities are assigned to and completed by competent personnel.
2. Include cost for GC and Installing CONTRACTOR'S support of commissioning process in Contract Sum.
3. Schedule and coordinate commissioning kickoff meeting and other selected meetings with CxA to facilitate commissioning process.
4. Plan, schedule, coordinate and facilitate the commissioning work performed by GC and Installing CONTRACTORS. Provide sufficient lead-time and notify CxA well in advance of commissioning activities. Update the master construction schedule periodically with commissioning progress and required activities.
5. GC shall review, comment, and accept Commissioning Plan (CxP) prepared by CxA.
6. GC shall furnish copy to CxA of all relevant construction documents, addenda, change orders, approved submittals and shop drawings related to commissioned systems in Commissioning Plan (CxP).
7. GC shall ensure that all Installing CONTRACTORS execute commissioning responsibilities according to the Contract Documents, Commissioning Plan (CxP) and schedule.
8. Using SRC forms, GC shall document and certify that all work is complete and systems are installed and operational according to Contract Documents, including calibration of instrumentation and controls.
9. GC shall evaluate installation and performance deficiencies identified on the Commissioning Issues Log and in inspection and test reports. GC shall collaborate with Installing CONTRACTORS responsible for system and equipment installation and recommend corrective action for Deficiencies. GC shall ensure that all Deficiencies and Commissioning Issues are resolved.
10. For commission systems, GC shall prepare training plan and submit plan to CxA and OWNER for review and acceptance. GC shall execute training of OWNER'S personnel according to approved training plan. Coordinate with requirements specified in Section 01 79 00 - Demonstration and Training.
11. GC shall manage preparation of Operation and Maintenance Manuals (O&M Data) by CxA, in accordance with Contract Documents.
12. GC shall manage preparation by CxA and CxC of report on systems under commissioning scope, for use in demonstration of compliance with CALGreen Code to AUTHORITY HAVING JURISDICTION (AHJ).
13. For all systems commissioned, GC shall document Warranty Issues for the OWNER.

14. GC shall manage payment of additional costs and back-charges by CONTRACTOR for additional CxA and CxC services resulting from excessive retests.
- E. (General) CONTRACTOR'S (GC's) Responsibilities: GC shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
  3. Attend commissioning team meetings scheduled by CxA.
  4. Integrate and coordinate commissioning process activities with construction schedule.
  5. Review and accept construction checklists provided by the CxA.
  6. Complete paper and electronic construction checklists as Work is completed and provide to CxA on at least weekly basis.
  7. Review and accept commissioning process test procedures provided by the CxA.
  8. Complete commissioning process test procedures.
  9. Coordinate with instruction and training specified in Section 01 79 00 - Demonstration and Training.
- F. Installing CONTRACTORS' Responsibilities: Refer to product Sections in the Construction Contract Specifications for responsibilities relating to specific products and systems. Installing CONTRACTORS' responsibilities may be re-assigned as determined by (General) CONTRACTOR (GC).
1. Include and itemize all cost for Installing CONTRACTOR'S commissioning tasks.
  2. Provide additional submittal data, installation manuals, manufacturer's detailed installation checks and startup procedures Operation and Maintenance data, required warranty procedures, and any other requested documentation for equipment and systems to be commissioned.
  3. Attend commissioning meetings as directed by the CxC to facilitate the commissioning process.
  4. Assign personnel with expertise and authority to act on behalf of the Installing CONTRACTOR and schedule them to participate in and perform assigned commissioning tasks.
  5. Assist CxA in preparing the Functional Performance Test Procedures, clarifying the operation and control of commissioned equipment where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures. Review the Functional Performance Test procedures to ensure feasibility, safety, and equipment protection, and provide necessary written alarm limits to be used during the tests.
  6. Provide instruction and training for OWNER'S personnel, for systems commissioned. Submit training plan to CONSTRUCTION MANAGER (CM) for CxA and OWNER review and approval.

7. Perform and document Startup and checkout. Complete all Installation Verification and Pre-Functional Checks & Testing documentation clearly and legibly. Provide a copy of all forms to the CxC and CxA as part of completing the System Readiness Checklists.
  8. Address Installing CONTRACTOR applicable Commissioning Issues Log items and Deficiencies promptly. All installation and Startup and Pre-Functional issues must be resolved before Function Performance Testing can proceed.
  9. Coordinate with CxA and perform Functional Performance Testing. Execution of tests shall be witnessed by the CxC and CxA.
  10. Assist the CxA in collecting all requested Monitoring / Trending data associated with FPTs.
  11. Prepare Operation and Maintenance Manuals (O&M Data) according to the Contract Documents, including all additional documentation required by these specifications.
  12. Assist CxC in preparation of report on systems under commissioning scope, for use in demonstration of compliance with CALGreen Code to AUTHORITY HAVING JURISDICTION (AHJ).
  13. During construction, maintain project record documents make available for use by CxA review during commissioning process. Refer to requirements specified in Section 01 78 39 - Project Record Documents.
- G. Testing and Balancing (TAB) CONTRACTOR'S Responsibilities: TAB CONTRACTOR shall be responsible for conducting and reporting tests of systems included in commissioning, in addition to tests performed by Installing CONTRACTORS:
1. Submit the outline of the TAB plan and approach for each system and component to CONSTRUCTION MANAGER (CM) and CxA prior to beginning TAB. This plan shall be developed after TAB CONTRACTOR is familiar with all control systems.
  2. Immediately report Deficiencies discovered which may affect or delay commissioning process.
  3. Provide draft TAB report to CONSTRUCTION MANAGER (CM), CxA, CxC, (General) CONTRACTOR (GC) and Installing CONTRACTOR for review.
- H. Equipment Suppliers's Responsibilities:
1. Provide all requested submittal data, including detailed installation checks, startup and checkout procedures and forms.
  2. Assist in equipment testing according to agreements with Installing CONTRACTORS.
  3. Include in the commissioning contract sum all special tools and instruments specific for a piece of equipment which are only available from equipment supplier, and required for testing the equipment according to Contract Documents.
  4. Provide information and support requested by the CxA regarding equipment sequences of operation and testing procedures.



## 1.9 SUBMITTAL REQUIREMENTS FOR COMMISSIONING

- A. Normal Submittals: CxA shall receive from (General) CONTRACTOR (GC) on copy of each reviewed submittals for equipment and systems to be commissioned. Coordinate with general requirements for submittals specified in Section 01 33 00 - Submittal Procedures.
- B. Commissioning Submittals: Additional submittal data required for Commissioning shall be submitted to CxA for use in developing the Commissioning Plan (CxP) and all commissioning forms:
  - 1. Detailed manufacturer installation and startup manuals with checklists, troubleshooting procedures, operating and maintenance procedures.
  - 2. Installation and checkout materials actually shipped with equipment, including actual field checkout forms to be used by factory or field technicians.
  - 3. Shop drawings including detailed sequences of operation.
  - 4. Warranty information.

## 1.10 OPERATING AND MAINTENANCE MANUALS

- A. Operation and Maintenance Manuals (O&M Data): Refer to Section 01 78 23 - Operation and Maintenance Data. (General) CONTRACTOR (GC) shall compile O&M Data as specified in product Sections of the Contract Specifications. O&M Data shall be clearly marked to highlight actual equipment and features installed. In addition, the following shall be included for all systems and equipment commissioned:
  - 1. Contract Specification Sections copied from the design documents including revisions according to all Addenda, Construction Change Directives and Change Orders.
  - 2. Reviewed submittal data, cut sheets and appropriate shop drawings.
  - 3. Manufacturer's Operation and Maintenance Instructions which shall include:
    - a. Installation, startup, and break-in instructions.
    - b. All starting, normal shutdown, emergency shutdown, manual operation, seasonal changeover, and normal operating instructions.
    - c. Operation, Maintenance, and Installation instructions originally shipped with the unit.
    - d. Detailed preventative maintenance and service procedures including a schedule matrix checklist (checked as weekly, monthly, quarterly, etc.).
    - e. Troubleshooting procedures.
    - f. Parts list, edited to omit reference to items which do not apply.
    - g. Lists of special tools required to service or maintain the equipment.
    - h. Performance data, ratings, and curves, etc.
    - i. Warranty documents clearly identifying conditions required to maintained warranty, and specific conditions which may void the warranty.
    - j. Any service contracts issued.
  - 4. The BMS installing CONTRACTOR shall include control drawings and detailed sequences of operation for each piece of equipment and its components.

- B. CxA's Review of Operation and Maintenance Manuals (O&M Data): For all systems and equipment commissioned, CxA will review for required content inclusion and completeness, and approve O&M manuals.
- C. Systems Manual: For all systems and equipment commissioned, provide separate "Systems Manual" which focuses on operating rather than maintaining equipment, particularly the interaction between equipment to include the following;
  - 1. The final version of the BoD.
  - 2. System single line diagrams.
  - 3. As-built "Sequences of Operation", control drawings and original set points.
  - 4. Operating instructions for integrated building systems.
  - 5. Recommended schedule of maintenance requirements and frequency if not already included in the project O&M manuals.
  - 6. Recommended schedule for retesting of commissioned systems with blank test forms from the original Commissioning Plan (CxP).
  - 7. Recommended schedule for calibrating sensors and actuators.
- D. Report to AUTHORITY HAVING JURISDICTION (AHJ): Assist CxC in preparing report on systems under commissioning scope for use in demonstration of compliance with CALGreen Code to AUTHORITY HAVING JURISDICTION (AHJ).

## **PART 2 - PRODUCTS**

### **2.1 TEST EQUIPMENT**

- A. All standard testing equipment required to perform Startup, Pre-Functional Checks & Tests and Functional Performance Testing shall be furnished by the Installing CONTRACTOR responsible for the equipment and systems being commissioned.
- B. Special equipment, tools and instruments (only available from the vendor, specific to a piece of equipment) required for testing equipment shall be included in the base bid price, and turned over to the OWNER at project completion.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerance specified in the Contract Documents. If not otherwise specified, the following minimum requirements apply:
  - 1. Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5 degree F and a resolution to + or - 0.1 degree F.
  - 2. Pressure sensors shall have an accuracy of + or - 2.0 percent of the value range being measured (not full range of meter) and have been calibrated within the last year.

3. All equipment shall be calibrated according to the manufacturer's recommended intervals and recalibrated when dropped or damaged.
4. Calibration tags shall be affixed or certificates readily available for all test equipment.

## 2.2 COMMISSIONING FORMS

### A. Installation Verification Form:

1. Forms will be developed by the CxA referencing the contract documents and manufacturer provided documentation provided during submittal.

### B. Startup and Pre-Functional Checks and Tests forms.

1. Forms shall primarily consist of overall start-up and checkout lists and specific checklists provided by manufacturers and Installing CONTRACTORS, and shall be used where required and appropriate. CxA will review all forms to ensure manufacturer-recommended procedures and tests are fully included. Forms shall include:
  - a. Manufacturer's standard written installation and startup checkout procedures.
  - b. Check boxes by each procedure.
  - c. Signatures and date block at the end of the form.
  - d. If applicable, controls point to point checks, sensor calibrations, and actuator testing.
2. Installing CONTRACTOR for equipment and system controls or controls manufacturer shall provide point-to-point checkout, sensor calibration and actuator test forms. Checklists and forms shall be used where required or appropriate.

### C. System Readiness Checklist: SRCs shall be developed by CxA with input from CxC, (General) CONTRACTOR (GC) and Installing CONTRACTORS.

### D. Functional Performance Test (FPT) forms:

1. The CxA will develop FPT forms with procedures to verify and document proper operation of each piece of equipment and system. FPT forms may contain:
  - a. System and equipment or component name(s), location, and identification number.
  - b. Reference to system readiness checklist and start-up documentation.
  - c. Date of testing and list of participating parties.
  - d. Excerpt of the specification section describing the test requirements.
  - e. A copy of the specific sequence of operations or other specified parameters being verified.
  - f. Points list.
  - g. Formulas used in any calculations.
  - h. Required pre-test field measurements.
  - i. Instructions for setting up the test.
  - j. Special cautions, alarm limits, etc.
  - k. Specific step-by-step procedures to execute the test in a clear, sequential, and repeatable format, including any control system point value or setpoint overrides required to simulate a test condition or sequence mode.
  - l. Definitions of control system trend data to be collected and provided to the CxA in electronic format for analysis and review.

- m. The expected system response and acceptance criteria of proper performance with a Yes/No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
  - n. A section for recoding actual system response, notes, and comments.
  - o. Signatures and date block for the CxA approval.
- 2. (General) CONTRACTOR (GC) and Installing CONTRACTORS shall use Functional Performance Test forms provided by CxA.
- 3. CxC, GC and Installing CONTRACTORS shall review all Functional Performance Tests (FPT) documents provided by CxA prior to including them in final Commissioning Plan.

## **PART 3 - EXECUTION**

### **3.1 SCHEDULING AND COORDINATION**

- A. Commissioning Schedule: CxA develop and distribute an initial schedule of commissioning events to CONSTRUCTION MANAGER (CM), CxC, (General) CONTRACTOR (GC) and Installing CONTRACTORS at commissioning kickoff meeting.
  - 1. GC shall develop detailed Start-up Schedule for all systems to be commissioned and coordinate schedule with CxA to include commissioning milestones. CxA will integrate all commissioning activities into master commissioning schedule.
  - 2. The CxC shall provide sufficient notice to the CxA and OWNER for scheduling and coordinating commissioning activities. A minimum two-week's notice shall be provided to the CxA for witnessing equipment Start-ups, Pre-Functional Checks & Tests, and Functional Performance Testing.
  - 3. The Commissioning Team shall address scheduling problems and make necessary notification in a timely manner in order to expedite the commissioning process.
- B. Commissioning Meetings: When commissioning team member attendance is required, as determined by CxA and CxC, team members shall be punctual and attentive during meeting.
  - 1. CxA will conduct commissioning kick-off meeting, usually within 60 days of commencement of construction. All team members involved in commissioning process shall attend kick-off meeting.
  - 2. CxA will plan other commissioning meetings as CxA determines is necessary, as construction progresses. These meetings will cover planning and coordination, and Commissioning Issues resolution.
  - 3. Frequency of meetings will vary through construction but generally increase during start-up and commissioning activities.
- C. Meeting Minutes: CxA will write and distribute meeting minutes documenting meeting discussion, conclusions, and actions for each team member.

### **3.2 SYSTEM READINESS**

- A. System Installation Verification, Startup, Pre-Functional Checks and Tests: Assisted by CxA, (General) CONTRACTOR (GC) shall inspect systems to be commissioned by completing System Readiness Checklists (SRC) to ensure that equipment and systems are complete, operational, and ready for Functional Performance Testing.
1. SRCs shall be checklists which summarize and track completion of Installation Verification, Startup, and Pre-Functional Checks and Tests.
  2. SRCs shall be developed by CxA, with input from CxC and Installing CONTRACTORS, to suit specific systems of this Project.
  3. (General) CONTRACTOR (GC) shall document to CONSTRUCTION MANAGER (CM) progress and completion of Installation Verification, Startup, and Pre-Functional Checks and Tests on the SRC. Upon completion, GC shall attach all associated Installation Verification, Startup and Pre-Functional Checkout and Tests forms to SRCs and submit to CxA for inclusion in commissioning documentation to be submitted through CONSTRUCTION MANAGER (CM) to OWNER (OWNER).
  4. Approval of completed SRC by CxA is required prior to Functional Performance Testing of equipment and system.
  5. Each SRC may have more than one Installing CONTRACTOR responsible for its execution.
- B. (General) CONTRACTOR (GC) shall provide completed Installation Verification, Startup and Pre-Functional Checkout & Testing forms for each commissioned system.
1. Each piece of equipment and system shall receive a full Installation Verification, Startup, and Pre-Functional Checks & Tests.
  2. GC shall complete all Installation Verification forms. GC shall be responsible for completion of all Startup and Pre-Functional Check & Tests and associated forms.
  3. CxA will perform inspections and back-checks of completed Installation Verification and Pre-Functional Checks and Test forms, and associated witnessing of Startup and Pre-Functional Checks.
  4. All completed forms shall be attached to the SRC and submitted for CxA and approval before proceeding with Functional Performance Testing.
  5. At discretion of CxA and according to approved Commissioning Plan (CxP), Percent Sampling may be used for multiple identical pieces of non-life-safety or non-critical equipment (example: VAV boxes).
  6. (General) CONTRACTOR (GC) shall clearly identify and list all deficiencies resulting from Installation Verification, Start-up and Pre-Functional Checks and Tests on SRC forms and immediately notify CxA. Once Deficiencies are corrected and verified or tested, update and resubmit SRC and associated forms.

### 3.3 FUNCTIONAL PERFORMANCE TESTING (FPT)

- A. Functional Performance Testing (FPT): CxA will develop test procedures and Function Performance Test (FPT) forms for each piece of equipment and system to be commissioned.
  - 1. (General) CONTRACTOR (GC) shall assist the CxA in development of FPT forms by providing required submittal data and updates, and providing additional equipment and system operation information when requested by CxA.
  - 2. Prior to execution, the CxA will provide a copy of the test procedures to (General) CONTRACTOR (GC) and Installing CONTRACTORS. (General) CONTRACTOR (GC) and Installing CONTRACTORS shall review and approve the tests procedures for feasibility, safety, equipment, and warranty protection.
  - 3. Project (General) CONTRACTOR shall engage Installing CONTRACTOR to execute all Functional Performance Tests according to approved test procedures on FPT forms. All testing results shall be documented on FPT forms. Forms shall be signed and dated by parties performing tests.
- B. Witnessing of Tests: CxA shall witness all Functional Performance Testing (FPT) procedures according to Commissioning Plan (CxP). CxC may witness tests under supervision by CxA.
  - 1. CxA shall coordinate all Functional Performance Tests with (General) CONTRACTOR (GC) and Installing CONTRACTORS, and provide minimum of 10 working days notice prior to conducting each system test.
  - 2. FPT for each system shall be completed and compliance with Basis of Design (BoD) and California Code of Regulations (CCR), Title 24, Part 11, California Green Building Standards Code (CALGreen) shall be validated.
    - a. FPT for each system shall be completed prior to formal Approval of system commissioned.
    - b. Signature by CxA and CxC shall certify compliance.
- C. Functional Performance Tests (FPTs) may be conducted using these approved test methods:
  - 1. Manually manipulating equipment settings and observe performance and/or monitoring performance by analyzing results using the control system's trending capabilities and/or stand-alone Data Loggers.
  - 2. Overwriting control system sensor values to simulate a condition, such as overwriting the outside air temperature to be something other than it actually is.
  - 3. Altering setpoints to force equipment into a mode of operation to verify a sequence. For example, to see the AC compressor lockout work at an outside air temperature below 55 degrees F, when the outside air temperature is above 55 degrees F, temporarily change the lockout setpoint to be 2 degrees F below the current outside air temperature.
  - 4. Using Indirect Indicators for testing responses will be allowed only after the actual conditions represented by the Indirect Indicators have been visually and directly verified, calibrated and documented on the SRC.
- D. Setup of Functional Performance Tests (FPTs):

1. Each FPT shall be performed under conditions which simulate actual conditions as close as is practically possible.
  2. Party executing test shall provide all necessary materials, system modifications, etc. to produce necessary flows, pressures, temperatures, etc. to execute test and demonstrate compliance with Basis of Design (BoD).
  3. At completion of the test, party executing test shall return all affected components and systems to pre-test normal condition.
- E. Alternative Test Method: At discretion of CxA, and according to Commissioning Plan (CxP) and OWNER'S (OWNER'S) approval, a Percent Sampling approach may be used to functionally test multiple identical pieces of non-life-safety or non-critical equipment, if acceptable to AUTHORITY HAVING JURISDICTION (AHJ). If, after two attempts at testing specified sample percentages, failures are still present, then 100 percent of remaining units shall be tested at Installing CONTRACTOR'S expense.
- F. Trending: Where CxA requires BMS trending, CxA will provide with FPT form a points list that may include both hardware (inputs, outputs) and virtual / software points, and appropriate trending intervals.
1. (General) CONTRACTOR (GC) shall provide trend data to CxA in electronic format. As OWNER- (OWNER-) approved alternative, GC may provide CxA remote access to control system and provide training that will allow CxA to directly download trend data.

### **3.4 DEFICIENCIES AND COMMISSIONING ISSUES**

- A. Discovery of Deficiencies: During Installation Verification, Startup, and Pre-Functional Checks and Tests, all Deficiencies and Commissioning Issues shall be documented on inspection and test forms in use, and shall be documented additionally by CxA in Commissioning Issues Log.
- B. Correction of Deficiencies and Commissioning Issues:
1. Immediate correction of minor Deficiencies identified during testing may be allowed at discretion of CxA. In such cases, deficiency and identified resolution shall still be documented on commissioning form in use and reported in Commissioning Issues Log.
  2. When Commissioning Issues are identified during Functional Performance Testing, CxA shall discuss with executing Installing CONTRACTOR and/or CxC and determine whether testing can proceed or should be suspended. Commissioning Issue and any identified resolution shall be documented on commissioning test form in use in addition to in Commissioning Issues Log.
- C. Commissioning Issues Log: CxA shall maintain and update Commissioning Issues Log, and document the issues resolution process. Copies shall be distributed to CONSTRUCTION MANAGER (CM), (General) CONTRACTOR (GC) and Installing CONTRACTORS as appropriate.
1. All deficiencies and commissioning issues shall be corrected promptly.
  2. Responsible party shall correct the issue and inform CxA in writing of resolution and completion date.

3. CxC shall reschedule testing with CxA and Installing CONTRACTOR. Testing shall be repeated until passing performance is achieved or OWNER (OWNER) accepts noted issue.
  4. CxA shall validate correction and record resolution in Commissioning Issues Log.
- D. Dispute Resolution: When there is dispute regarding deficiency or Commissioning Issue, regardless of validity or responsibility, additional parties may be brought into discussion as appropriate for resolution.
1. CxA may recommend solutions to Deficiencies and Commissioning Issues. However, burden of responsibility to solve, correct and perform required retests shall be with (General) CONTRACTOR, Installing CONTRACTORS and, where Basis of Design (BoD) is unachievable, responsible Design Professional(s).
  2. CxA shall have the final interpretive authority and the OWNER (OWNER) through CONSTRUCTION MANAGER (CM) will have final approval authority.
- E. Retesting:
1. For all Commissioning Issues identified during Functional Performance Testing (FPT), retesting is required to verify resolution of issue and to complete the FPT.
  2. Time necessary for CxA and OWNER (OWNER) to direct and witness retesting will be back-charged to (General) CONTRACTOR and Installing CONTRACTOR responsible for Commissioning Issue as follows:
    - a. If Commissioning Issue is not related to previous SRC inspection, Start-up or checklist deficiency, no cost will be assessed by CxA or OWNER (OWNER) for first retest. Cost for additional required retests after first retest will be back-charged.
    - b. If Commissioning Issue is related to previously reported SRC inspection, Start-up or checklist Deficiency and reported resolved, and determined during subsequent Functional Performance Testing (FPT) to be faulty, additional costs will be assessed for all required retests.
  3. Required retesting shall not be considered justification for claim of delay or for time extension to Contract.

### **3.5 INSTRUCTION AND TRAINING OF OWNER'S (OWNER'S) PERSONNEL**

- A. Instruction and Training of OWNER'S (OWNER'S) Personnel: CxC shall coordinate and schedule the training for OWNER'S personnel, for all systems and products included in commissioning. CxC shall ensure that training is completed according to requirements of the Contract Documents, including Section 01 79 00 - Demonstration and Training.
- B. Training Plan: Coordinate with requirements specified in Section 01 79 00 - Demonstration and Training.
1. Not less than 30 days prior to start of training, Installing CONTRACTORS responsible for specific equipment and system training shall submit written training plans to CxA for all equipment and systems to be commissioned.



2. CxA shall submit training plan(s) through CONSTRUCTION MANAGER (CM) to OWNER for review and approval. Training plan(s) shall cover the following elements:
  - a. Equipment and/or systems included in training.
  - b. Intended audience.
  - c. Location of training.
  - d. Subjects covered (description, duration of discussion, presentation methods, etc.).
  - e. Instructor's name and qualifications.
3. CxA shall review training plans to verify compliance with specified requirements.
4. Upon completion of training, instructor shall submit CxA "sign-in" attendance sheets for each training session conducted, verifying attendance of required personnel.

### **3.6 DEFERRED AND SEASONAL TESTING**

- A. Deferred and Seasonal Training: Before or during Warranty Period, all Seasonal Testing or Deferred Testing shall be completed as part of commissioning. Tests shall be conducted by Installing CONTRACTOR responsible for equipment and systems, completed in same manner as all other commissioning tests, and shall be witnessed by CxA.
- B. CxA shall coordinate with OWNER'S Representative through CONSTRUCTION MANAGER (CM) to schedule Deferred and Seasonal Testing.
- C. CxA shall make final adjustments to Operation and Maintenance Manuals (O&M Data) and project record documents as needed for modifications made during Deferred or Seasonal Testing.

### **3.7 PROJECT CLOSEOUT**

- A. Final Commissioning Report: Upon completion of all commissioning activities, CxA shall prepare and submit to CONSTRUCTION MANAGER, for forwarding to OWNER, a Final Commissioning Report detailing the Commissioning Plan (CxP) and all commissioning activities. The CxC shall support this effort by providing all CxA coordinated commissioning documentation.

### **3.8 NEAR-WARRANTY-END REVIEW**

- A. Near-Warranty-End Review: Within three months of termination of Warranty Period, OWNER will schedule through CONSTRUCTION MANAGER (CM) and participate in review of commissioned systems with Commissioning Agent (CxA), OWNER'S operation and maintenance personnel, responsible design professionals, (General) CONTRACTOR (GC) and appropriate Installing CONTRACTORS to identify all Warranty Issues.
  1. List of Warranty Issues will be developed jointly by CONSTRUCTION MANAGER (CM), OWNER'S operation and maintenance personnel, and CxA.
  2. CxA shall be responsible for and ensure cooperation of appropriate Installing CONTRACTORS to resolve Warranty Issues prior to the end of the Warranty Period(s).
  3. After correcting noted Warranty Issues, CxA shall notify OWNER'S REPRESENTATIVE in writing, through CONSTRUCTION MANAGER (CM) for scheduling back-checking and verification of resolution of Warranty Issues.

4. Issues identified during Warranty Period will remain Warranty Issues until satisfactory completion as determined by OWNER through CONSTRUCTION MANAGER (CM), including back-check verification by CxA, even if Warranty Period expires during correction and back-check periods.

**END OF SECTION**

**SECTION 02 00 00**  
**EXISTING CONDITIONS**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Description
- B. Protection of Existing Structures and Utilities

**1.2 RELATED REQUIREMENTS**

- A. Article 5, Existence of Utilities at the Work Site, of the General Conditions
- B. Section 7-9 Protection and Restoration of Existing Improvements of the Standard Specifications
- C. Section 01 50 00 - Construction Facilities

**1.3 INCLUDED**

- A. Description
  - 1. Work included: Administrative requirements for cut over of utilities to adjacent facilities.
- B. Protection of Existing Structures and Utilities
  - 1. The Drawings show existing above and below grade structures, drainage lines, storm drains, sewers, water, gas, electrical, hot water, and other utilities which are known to the City.
  - 2. Locate all existing installations before proceeding with construction operations which may cause damage to such installations. Existing installations which are to remain in place and in service shall be kept in service and damage to them shall be repaired with no adjustment of Contract Sum.
  - 3. If any other structure or utilities are encountered, request Engineer to provide direction on how to proceed with the Work.
  - 4. If any structure or utility is damaged, take appropriate action to ensure the safety of persons and property.
  - 5. Locate drainage, sewer lines, water, gas, and other utility service lines or piping in the way of new work. Properly cap or plug, and make tight at the property line, such services which are not to be removed.
  - 6. Public Utilities:
    - a. Send notices, make all necessary arrangements, and perform all other services required in care and maintenance of all public utilities. Assume all responsibility concerning same for which the City may be liable. Provide enclosing or boxing-in for protection of any public utilities equipment. Upon completion of Work, remove all

- enclosures, fill in all openings in concrete, grout same watertight, and leave in finished condition.
- b. In case it should be necessary to move or temporarily maintain the property of any public utility or of any other property OWNER, the cost of which is not required to be borne by the City thereof, the CONTRACTOR shall bear all expenses incidental to the removal or temporary maintenance of such property in a manner satisfactory to the City thereof.
  - c. The right is reserved to the controlling governmental agencies and to the OWNERS of public utilities and franchises to enter at any time upon any street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the work and for the purpose of maintaining and making repairs to their property.
  - d. When the proper completion of the Work requires their temporary or permanent removal, the CONTRACTOR shall, at his own expense, remove and, without unreasonable delay, temporarily or permanently replace or relocate, in a workman-like manner and to the satisfaction of the OWNER'S REPRESENTATIVE, all water pipe, pipelines, conduits, culverts, roads, driveways, fences, wires, poles, retaining walls, curbs, gutters, concrete walks and all other improvements of whatever character, not required by law to be removed by the City thereof; and all such improvements temporarily removed shall be maintained until permanently replaced, all at the CONTRACTOR'S expense.

**END OF SECTION**

**SECTION 03 10 00****CONCRETE FORMING AND ACCESSORIES****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Formwork for cast in place concrete, with shoring, bracing and anchorage.
- B. Forming of openings in concrete for Work specified in other Sections.
- C. Form accessories.
- D. Placement in forms of inserts and embedded products furnished under other Sections.

**1.2 RELATED SECTIONS**

- A. Section 03 20 00 - Concrete Reinforcing: Reinforcement for concrete construction.
- B. Section 03 30 00 - Cast in Place Concrete: General requirements for concrete construction, including finish qualities.

**1.3 REFERENCES**

- A. American Concrete Institute (ACI):
  - 1. ACI 117 - Standard Tolerances for Concrete Construction and Materials.
  - 2. ACI 318 - Building Code Requirements for Reinforced Concrete.
  - 3. ACI 301 - Specifications for Structural Concrete for Buildings.
  - 4. ACI 347 - Guide to Formwork for Concrete.
- B. U.S. Department of Commerce/National Bureau of Standards (NBS): NBS PS 1 - Construction and Industrial Plywood.

**1.4 DEFINITIONS**

- A. Unexposed Finish: A general-use finish, with no appearance criteria, applicable to all formed concrete concealed from view after completion of construction.
- B. Exposed Finish: A general-use finish applicable to all formed concrete exposed to view and including surfaces which may receive a paint coating (if any).

**1.5 SYSTEM REQUIREMENTS**

- A. Formwork Design Requirements: Formwork products and execution specified herein are for finish surface quality only.

1. Design, layout, and construction of formwork shall be solely the responsibility of the CONTRACTOR.
2. Design and construct formwork, shoring and bracing to conform to California Building Code (CBC) requirements and ACI 318.
3. Resulting concrete shall conform to shapes, lines and dimensions indicated and required.
4. Tolerances for concrete shall be as specified in ACI 117, ACI 301, ACI 318 and ACI 347, unless otherwise specified or indicated.

## **1.6 SUBMITTALS**

- A. Materials List: Forming materials in contact with concrete.
- B. Product Data: Form release agent.

## **1.7 QUALITY ASSURANCE**

- A. Industry Standard: Formwork design and construction shall be in accordance with ACI 301 and ACI 318.
- B. Formwork Designer's Qualifications: When required by AUTHORITIES HAVING JURISDICTION, designer of formwork shall be a Civil or Structural Engineer registered to practice in the State of California.
- C. Sample Panels: Before casting exposed concrete indicated on Drawings, produce sample panels to demonstrate finish. Produce a minimum of 3 sets of full-scale sample panels, cast vertically, approximately 48 by 48 by 4 inches (1200 by 1200 by 150 mm) minimum, to demonstrate the expected range of finish and texture variations.
  1. Locate panels as indicated or, if not indicated, as directed by OWNER'S REPRESENTATIVE.
  2. Demonstrate methods of curing aggregate exposure, sealers, and coatings, as applicable.
  3. In presence of OWNER'S REPRESENTATIVE, damage part of an exposed-face surface for each finish and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
  4. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
  5. Demolish and remove sample panels when directed.
  6. If mutually agreed between CONSTRUCTION MANAGER and CONTRACTOR, as alternative to producing sample panels, construct, and finish one exposed concrete element. This element will serve as mock-up and, if acceptable to OWNER'S REPRESENTATIVE, may be may become part of the completed Work. If not acceptable, wall shall be demolished and reconstructed, incorporating review comments of OWNER'S REPRESENTATIVE, until determined by OWNER'S REPRESENTATIVE to be acceptable.

## 1.8 REGULATORY REQUIREMENTS

- A. Regulatory Requirements: Conform to formwork construction requirements of the California Building Code (CBC), Section 1906.
- B. Coordination: Coordinate Work specified in this Section with other Sections which require placement of embedded products and provision of openings and recesses. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from the OWNER'S REPRESENTATIVE before proceeding.

## PART 2 - PRODUCTS

### 2.1 FORMING MATERIALS

- A. Forming Materials: Conform to ACI 301. Provide materials for contact with concrete which will impart suitable surface quality to completed concrete, including the following.
  - 1. Forming materials for concrete unexposed in finished construction: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit. When unexposed concrete is intended to receive waterproofing, provide form as for exposed finish concrete.
  - 2. Forming materials for concrete exposed in finished construction: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish forms in largest practicable sizes, to minimize number of joints and to conform to joint configuration indicated on the Drawings.
- B. Plywood for Formed Surfaces:
  - 1. Plywood for Concealed Surfaces: PS 1, undamaged face, minimum APA C-C Plugged EXT or APA Structural I Sheathing.
  - 2. Plywood, for Exposed Surfaces: PS 1, smooth-faced, undamaged, APA B-B High Density Overlaid Concrete Form, Class I. Plywood for exposed surfaces shall be minimum 5/8-inch thick.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Sonoco Products Co., Hartsville, SC (803/383-7000), Sonotube Plus Fibre Form, or equal, spirally wound, laminated fiber forms with special liner to eliminate spiral seam marks on finished concrete. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
- D. Hardboard: For curved surfaces, tempered hardboard, Masonite Corp., or equal.
- E. Lumber: Douglas fir or douglas fir-larch, grade appropriate for intended use, sound and undamaged straight edges, solid knots.
- F. Fillets for Chamfered Corners: Wood molding at plywood or lumber forms; rigid plastic at steel, fiberglass, and plastic forms.
- G. Embedded Nailers: Clear all heart redwood or pressure preservative-treated (PPT) douglas fir, edges reverse beveled to key into concrete.

- H. Fillets for Chamfered Corners: Wood molding at plywood or lumber forms; rigid plastic at steel, fiberglass, and plastic forms.
- I. Embedded Nailers: Clear all heart redwood or pressure preservative-treated (PPT) douglas fir, edges reverse beveled to key into concrete.

## **2.2 FORMWORK MATERIALS**

- A. Formwork Materials, General: Conform to ACI 301. Provide materials to construct formwork to support forming materials in contact with concrete, of sufficient capacity to withstand pressures of concrete placement and to support concrete in place until cured, without distortion.

## **2.3 FORMWORK ACCESSORIES**

- A. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal.
  - 1. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.
  - 2. Provide units that will leave no hole larger than 1-inch diameter.
- B. Form Release Agent: Commercial formulation form release agent, colorless product with the following characteristics:
  - 1. Will not bond with, stain concrete, absorb moisture or adversely affect concrete surfaces.
  - 2. Will not impair subsequent treatments of concrete surfaces or bond of applied coatings.
  - 3. Complies with applicable air quality regulations for volatile organic compounds (VOCs).

## **PART 3 - EXECUTION**

### **3.1 EARTH FORMS**

- A. Earth (Soil) Forms, General: Comply with the following, except as otherwise indicated on Drawings.
  - 1. Except as otherwise indicated on Drawings, conform to ACI 301, ACI 347 and California Building Code (CBC) Section 1906.
  - 2. Direct contact of concrete with soil (casting "neat") is acceptable only as noted on Structural Drawings.
- B. Soil Forms and Trenches: Hand trim sides and bottom of soil forms and trenches. Remove loose soil prior to placing concrete.

### **3.2 CONSTRUCTED FORMWORK**

- A. Constructed Formwork, General: Construct and erect formwork, shoring and bracing to achieve design requirements, in conformance to ACI 301, ACI 347 and California Building Code (CBC)



Section 1906 - Formwork, Embedded Pipes and Construction Joints. Refer also notes on Structural Drawings.

- B. Constructed Formwork, Exposed Concrete Elements: In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place architectural concrete surface irregularities, designated by ACI 347R as abrupt or gradual, to Class A, 1/8 inch (3.2 mm).
1. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
  2. Chamfer exterior corners and edges of cast-in-place architectural concrete only as indicated on Drawings.
- C. Constructed Formwork Design:
1. Design and fabricate formwork for easy removal, without impact, shock, or damage to concrete surfaces or other portions of the Work.
  2. Design formwork to support all applied loads until concrete is adequately cured and has attained sufficient strength, within allowable tolerances and deflection limits.
- D. Constructed Formwork Construction: Construct and brace formwork to accurately achieve end results required by contract documents, with all elements properly located and free of distortion. Provide for necessary openings, inserts, anchorages, and other features shown or otherwise required.
1. Formwork Segments: Arrange and assemble formwork to permit dismantling and stripping without damage to concrete.
  2. Joints: Minimize form joints and make forms watertight to prevent leakage of concrete mortar. Locate form joints, at exposed concrete, to be symmetrical about center of panel, unless otherwise noted. Align joints symmetrically at exposed conditions.
  3. Chamfers: Provide 3/4-inch chamfered edges and corners at all exposed locations, unless specifically indicated otherwise on the Drawings.
  4. Permanent openings: Provide openings to accommodate Work specified in other Sections. Size and locate openings accurately. Securely support items built into forms; provide additional bracing at openings and discontinuities in formwork.
  5. Temporary openings: Provide temporary openings for cleaning and inspection. Provide drain openings at bottoms of formwork to allow water to drain. Locate temporary openings in most inconspicuous locations at base of forms, closed with tight-fitting panels designed to minimize appearance of joints in finished concrete Work.
- E. Formwork Bracing and Shoring: Provide bracing and shores to ensure stability of formwork and accommodate all construction loads. Use form ties of sufficient strength and sufficient quantities to prevent formwork spreading. Maintain principal shores to support concrete until minimum required strength is achieved.

### **3.3 INSERTS, EMBEDDED PRODUCTS AND OPENINGS**

- A. Embedded Products: Provide formed openings where required for items to be embedded in or pass through concrete. Install accessories in accordance with manufacturer's instructions and referenced standards, level, straight and plumb.
- B. Openings: Size and locate formed openings, depressions, recesses, and chases to accommodate products to be applied to, built into and pass-through concrete Work. Coordinate size, location and placement of inserts, embedded products, openings, and recesses with Work specified in other Sections.
- C. Anchors and Other Devices: Set and build into concrete formwork anchorage devices and other embedded products required for Work to be attached to or supported by concrete elements.
- D. Locating Embedded Products and Openings: Use setting drawings, diagrams, instructions, and templates to set embedded products.
- E. Screeds: Set screeds and establish level for tops of concrete slabs and leveling for finish surfaces. Shape surfaces as indicated on the Drawings. Provide cradle, pad or base type screed supports for concrete over waterproof membranes and vapor retarders.

### **3.4 FORM RELEASE AGENT**

- A. Form Release Agent: Provide either form materials with factory-applied non-absorptive liner or field-applied form coating. If field-applied coating is employed, thoroughly clean and recondition formwork and reapply coating before each use. Rust on form surfaces will not be acceptable.
- B. Form Release Agent Application: Comply with manufacturer's instructions and recommendations.
- C. Restrictions: Do not apply release agent where concrete will receive applied finish which might be affected by agent. Do not apply release agent where decorative wood graining is intended for concrete surface. Leave form face dry.

### **3.5 FORM CLEANING**

- A. Form Cleaning, General: Clean and remove foreign matter within forms as erection and placement proceeds. Clean formed cavities of debris prior to concrete placement.
- B. Formwork Reuse: Do not reuse wood and plywood forming materials which contact concrete, except as follows:
  - 1. High density plywood may be cleaned and reused for exposed concrete.
  - 2. Unfaced plywood may be reused for concealed concrete.
  - 3. Steel and fiberglass forming materials may be cleaned and reused.
- C. Patching and Repairs: Patch tie holes with sheet metal patches and restore forms to like new condition prior to reuse.

### 3.6 FORMWORK REMOVAL

- A. Removal of Non-Load-Bearing Formwork: Provided that concrete has hardened sufficiently that it will not be damaged and has achieved sufficient strength to support its own weight and all imposed construction and design loads, forms not actually supporting weight of concrete or weight of soffit forms may be removed after concrete has cured at not less than 50 degrees F for 24 hours.
  - 1. Comply with notes on Structural Drawings and California Building Code (CBC) requirements.
  - 2. Maintain curing and protection operations after form removal.
- B. Removal of Load-Bearing Formwork: Do not remove shoring and forms supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, until concrete has attained 90 percent of specified compressive strength. In addition, the CONTRACTOR shall have determined that the actual compressive strength attained is adequate to support the weight of the concrete and superimposed loads.
  - 1. Comply with notes on Structural Drawings and California Building Code (CBC) requirements.
  - 2. Maintain curing and protection operations after form removal.
- C. Formwork Removal:
  - 1. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against concrete surfaces to be exposed to view.
  - 2. Remove formwork progressively so no unbalanced loads are imposed on structure. Remove formwork without damaging concrete surfaces.
  - 3. Remove or snap off metal spreader ties inside wall surface. Cut nails and form ties off flush and leave surfaces level and clean.

### 3.7 PATCHING

- A. Schedule: Patch forming and tie holes immediately after form removal.
- B. Cleaning: Clean surface of all loose materials and soiling.
- C. Patching: Patch all holes and depressions with grouting gun and grout mix of one part cement and 2-1/2 parts mortar sand.

### 3.8 EXPOSED CONCRETE FINISHES

- A. Exposed Concrete Finishes: Match accepted mock-up, to satisfaction of OWNER'S REPRESENTATIVE. See Section 03 30 00 - Cast in Place Concrete for finishing of concrete surface after removal of formwork.

### 3.9 FORMWORK SCHEDULE

- A. Footings and Walls, Not Exposed to View: Site fabricated plywood or lumber, coated with form release agent.

- B. Footings and Walls, Exposed to View: Site-fabricated, high density overlaid (HDO) plywood, coated with form release agent compatible with applied finish coatings.
- C. Cylindrical Columns, Pedestals, and Supports: Formed by spirally wound, laminated fiber forms with special liner to eliminate spiral seam marks on finished concrete.
- D. Curved Surfaces: Site-fabricated with sealed, tempered hardboard.

**END OF SECTION**

**SECTION 03 20 00**  
**CONCRETE REINFORCING**

**PART 1-GENERAL**

**1.1 SECTION INCLUDES**

- A. Reinforcing steel bars, welded steel wire fabric fabricated steel bar or rod mats for cast-in-place concrete.
- B. Support chairs, bolsters, bar supports, and spacers, for supporting reinforcement.

**1.2 REFERENCES**

- A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 19 (ACI 318).
- B. ACI 301 - Specifications for Structural Concrete for Buildings.
- C. ACI 315 (SP-66) - Details and Detailing of Concrete Reinforcement.
- D. ACI 318 - Building Code Requirements for Structural Concrete.
- E. ASTM A1064 - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- F. ASTM A615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
- G. ASTM A706 - Standard Specification for Low Alloy Steel Deformed Bars for Concrete Reinforcement.
- H. ASTM C1116 - Specification for Fiber-Reinforced Concrete and Shotcrete.
- I. AWS D1.4 - Structural Welding Code Reinforcing Steel.
- J. CRSI - Manual of Practice.
- K. CRSI - Placing Reinforcing Bars.

**1.3 QUALITY ASSURANCE**

- A. Perform concrete reinforcement work in accordance with CRSI Manual of Standard Practice.
- B. Conform to ACI 301 and ACI 315 (SP-66).
- C. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.

**1.4 CERTIFICATES**

- A. Submit mill test certificates of supplied concrete reinforcing, indicating physical and chemical analysis.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Reinforcing Steel: ASTM A615, Grade 40 for No. 4 bars and smaller, Grade 60 for No. 5 bars and larger. Billet-steel deformed bars, uncoated finish.
- B. Welded Reinforcement: ASTM A706, Grade 60, deformed bars, unfinished.
- C. Welded Steel Wire Fabric: ASTM A1064 plain type; coiled rolls; uncoated finish.
- D. Steel Wire: ASTM A1064, plain, cold drawn steel.

### **2.2 ACCESSORY MATERIALS**

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete including load bearing pad on bottom to prevent vapor barrier puncture.
- C. Chairs, Bolsters, Bar Supports, Spacers Adjacent to Architectural Concrete Surfaces: Plastic coated sized and shaped as required.

### **2.3 FABRICATION**

- A. Fabricate in accordance with ACI 315 (SP-66), providing concrete cover specified in Section 03 30 00.
- B. Locate reinforcing splices not indicated on Drawings at points of minimum stress.
- C. Weld reinforcing bars in accordance with AWS D1.4.

## **PART 3--EXECUTION**

### **3.1 INSTALLATION**

- A. Before placing concrete, clean reinforcement of foreign particles or coatings.
- B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.
- C. Do not displace or damage vapor barrier required by Section 03 30 00.

### **3.2 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed under provisions of Section 01 45 00.

**END OF SECTION**

**SECTION 03 21 00****REINFORCING STEEL****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Reinforcing steel bars for cast in place concrete.
- B. Reinforcing steel bars for reinforced concrete unit masonry.
- C. Reinforcement accessories.

**1.2 RELATED SECTIONS**

- A. Section 03 30 00 - Site Concrete: Reinforcing steel bars for concrete.
- B. Section 32 13 13 - Concrete Paving: Reinforcing steel bars for Portland cement concrete paving.
- C. Section 03 10 00 - Concrete Formwork: Formwork for cast-in-place concrete; provisions for access for reinforcement Work.
- D. Section 03 30 00 - Cast in Place Concrete: Provisions for protection of reinforcement during concrete placement.
- E. Section 04 22 00 - Concrete Unit Masonry: Requirements for reinforcement for unit masonry, specified in Section 03 20 00-Concrete Reinforcing.

**1.3 REFERENCES**

- A. American Concrete Institute (ACI):
  - 1. ACI 301 - Specifications for Structural Concrete for Buildings.
  - 2. ACI 318 - Building Code Requirements for Reinforced Concrete.
- B. American Welding Society (AWS):
  - 1. AWS D1.4 - Structural Welding Code--Reinforcing Steel.
  - 2. AWS D12.1 - Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
- C. Concrete Reinforcing Steel Institute (CRSI):
  - 1. CRSI MSP-1 - Manual of Practice.
  - 2. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
  - 3. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

## 1.4 SUBMITTALS

### A. Product Data:

1. Reinforcement supporting and spacing devices at exposed concrete only, to demonstrate non-corroding and non-staining characteristics.
2. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

### B. Quality Control Submittals:

1. Certifications: Mill test certificates for all reinforcing steel, showing physical and chemical analysis. If steel is to be welded, include in chemical analysis welded the percentages of carbon, manganese, copper, nickel, and chromium, and optionally the percentages of molybdenum and vanadium.
2. Certifications: If steel is to be welded, submit certifications signed by AWS Certified Welding Inspector (CWI) of prequalified welding procedures, qualifications of welding procedures unless prequalified, qualification of welding operators, and qualification of welders.

### C. Sustainable Design Submittals: Comply with requirements specified in Section 01 81 13 - Sustainable Design Requirements.

1. Product Data: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
  - a. Include statement indicating costs for each product having recycled content.
  - b. Include name, address, and telephone number of manufacturer.

## 1.5 QUALITY ASSURANCE

### A. Industry Standards, Reinforcement: Provide concrete reinforcement in accordance with ACI 301, ACI 318, CRSI Manual of Practice, CRSI 63 and CRSI 65.

### B. Regulatory Requirements: Conform to California Building Code (CBC), Section 1907 - Details of Reinforcement.

### C. Qualification of Welds, Welding Operators, and Welders: Comply with UBC Standard 19-2. Perform welding procedure qualification, except for prequalified procedures, as required by AWS D1.4, prior to executing any welding of reinforcing steel.

1. Only AWS Certified Welding Inspectors shall be used for tests and qualifications associated with welding of reinforcing steel.
2. Only AWS qualified welders or welding operators shall perform welding of reinforcing steel.

### D. Coordination: Coordinate Work specified in this Section with other Sections which require placement of embedded products and provision of openings and recesses. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request direction from



CONSTRUCTION MANAGER before proceeding. CONSTRUCTION MANAGER will consult with OWNER'S REPRESENTATIVE (structural engineer) and provide direction to CONTRACTOR.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Delivery: Deliver reinforcement in bundles marked with durable identification tags.
- B. Storage: Store reinforcement to avoid excessive rusting or fouling with grease, oil, dirt, or other bond-weakening coatings.
- C. Handling: Take precautions to maintain reinforcement identification after bundles are broken.

## **PART 2 - PRODUCTS**

### **2.1 STEEL BAR REINFORCEMENT**

- A. Steel Reinforcing Bars: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.
  - 1. Deformed steel reinforcing bars: ASTM A 615, type, and grade as indicated in Structural Drawings.
  - 2. Stirrup bars: ASTM A 615, type, and grade as indicated on Structural Drawings.
  - 3. Reinforcing steel bars to be welded: ASTM A 706, type, and grade as indicated on Structural Drawings.
- B. Welded Wire Fabric (WWF): Type as indicated on Structural Drawings.
  - 1. WWF with deformed-steel wire: ASTM A 497, Grade 80, flat sheets only.
  - 2. WWF with smooth steel wire: ASTM A 185, flat sheets only.

### **2.2 REINFORCEMENT ACCESSORY MATERIALS**

- A. Tie Wire: Minimum 16 gage annealed type, black or galvanized finish.
- B. Chairs, Bolsters, Bar Supports and Spacers: Wire-bar-type devices, complying with CRSI Manual of Standard Practice for spacing, supporting and fastening reinforcing bars in place. Provide size and shape as required for strength and support of reinforcement during reinforcement installation and concrete placement.
  - 1. Supports at Slab on Grade: Provide devices with load-bearing pads or horizontal runners where base material will not support chair legs, to prevent puncture of vapor retarder or provide precast concrete block bar supports of equal or greater strength to specified concrete.
  - 2. Corrosion Resistance:
    - a. Provide plastic coated, plastic-tipped (CRSI, Class 1) or stainless steel types at exposed-to-view concrete surfaces.
    - b. Provide only stainless steel (CRSI Class 2) at exterior exposed surfaces to be painted.

## **2.3 REINFORCEMENT FABRICATION**

- A. Reinforcement Fabrication, General: Conform to CRSI Manual of Practice, providing required concrete cover as indicated on Structural Drawings.
- B. Splices: See Structural Drawings.
  - 1. Do not splice bars unless specifically shown on the Structural Drawings.
  - 2. Where splices are not indicated on Drawings, locate splices at point of minimum stress and review locations with OWNER'S REPRESENTATIVE (Structural Engineer) before fabrication and placement. Submit mechanical splice data to OWNER'S REPRESENTATIVE (Structural Engineer) for review prior to use.
  - 3. Splices shall be staggered so that not more than one-third of the reinforcing bars are spliced at any one location.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Cleaning: Clean reinforcement to remove loose rust and mill scale, soil, frost, and other materials which may reduce or destroy bond with concrete.
- B. Adjustment and Inspection: Do not bend or straighten reinforcement in a manner injurious to material. Do not use bars with kinks or bends not shown on Drawings and reviewed shop drawings, or bars with reduced cross-section due to corrosion or other cause.

### **3.2 REINFORCEMENT PLACEMENT**

- A. Reinforcement Placement, General: Place and secure reinforcement as specified herein, as indicated and noted on Drawings and in compliance with recommended details and methods of reinforcement placement and support specified in CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
  - 1. Place, support, and secure reinforcement to prevent displacement. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
  - 2. Locate reinforcement to provide required cover by concrete. If not otherwise indicated on Drawings or specified herein, provide concrete cover in compliance with ACI 318.
- B. Reinforcement Spacing: Space reinforcement as indicated on Drawings. If not indicated, maintain clear spacing of the bar diameter but not less than 1 inch nor less than 1-1/3 times maximum size aggregate.
- C. Coordination: Locate reinforcement to accommodate embedded products and formed openings and recesses.
- D. Slab on Grade Reinforcement: Provide load bearing pads under supports or provide precast concrete block bar supports. Do not displace or damage vapor retarder at slab on grade.

- E. Dowels: Secure tie dowels in place before depositing concrete. Provide No. 3 bars for securing dowels where no other reinforcement is provided.

### **3.3 CONCRETE COVER**

- A. Concrete Cover: As indicated on the Structural Drawings.

### **3.4 REINFORCEMENT SUPPORTS**

- A. Reinforcement Supports: Support reinforcement on metal chairs, spacers, or metal hangers to provide required coverage and to properly locate reinforcement. Do not use wood. Avoid cutting or puncturing vapor retarder during reinforcement placement and concreting operations. Repair damage before placing concrete.
- B. Support Spacing: Space chairs and accessories in conformance with CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature.

### **3.5 REINFORCEMENT SPLICES**

- A. Reinforcement Splices, General: Provide standard reinforcement splices by lapping ends, placing bars in contact and tightly wire tying. Comply with details and requirements of ACI 318 for minimum lap of spliced bars and criteria indicated on Drawings.
- B. Clearances for Splices: Wherever possible, provide minimum 1-1/2 inch clearance between sets of splices. Stagger horizontal bars so that adjacent splices will be minimum 48-inches apart.

### **3.6 WELDING OF REINFORCEMENT STEEL**

- A. Welding: Perform welding under continuous inspection and supervision of a qualified Registered Deputy Inspector employed by testing and inspection agency. Weld reinforcement as indicated on Drawings or as directed by CONSTRUCTION MANAGER. CONSTRUCTION MANAGER will consult with OWNER'S REPRESENTATIVE (structural engineer) and provide direction to CONTRACTOR.
- B. Carbon Equivalent (CE): CE of reinforcing bars or splice materials shall be calculated from chemical composition as indicated in mill report by following formula:

$$CE = \% C + \% Mn/6 + \% Cu/40 + \% Ni/20 + \% CR/10 - \% Mo/50 - \% V/10$$

If mill test report is not available, make chemical analysis of bars representative of bars to be welded. Bars with CE above 0.75 shall not be welded. No welds shall be made at bends in reinforcing bars.

### **3.7 CORRECTIONS DURING CONCRETE PLACEMENT**

- A. Corrections During Concrete Placement: Caution workers to not walk on bars. Maintain reinforcing steel during placement of concrete; reset reinforcement in the event that it is displaced by runways, workers and other causes.

### **3.8 DEFECTIVE WORK**

A. Defective Reinforcement Work: The following shall be considered defective and shall be ordered to be removed and reconstructed at no change in Contract Time and Contract Sum.

1. Bars with kinks or bends not shown on Drawings.
2. Bars injured due to bending or straightening.
3. Bars heated and field bent.
4. Reinforcement not placed in accordance with Drawings and Specifications.
5. Rusty or oily bars.
6. Bars exposed in surface of concrete.

**END OF SECTION**

**SECTION 03 30 00.01****CAST-IN-PLACE CONCRETE****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Cast-in-place concrete foundation walls, and footings.
- B. Floors and slabs on vapor barrier.
- C. Control, expansion, and contraction joint devices associated with concrete work.
- D. Curing and sealing compound.
- E. Building walls.
- F. Retaining walls, utility slabs.
- G. Equipment pads, Thrust blocks, Light pole bases, Flag pole bases.

**1.2 REFERENCES**

- A. 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design.
- B. CBC - California Building Code, (CCR) California Code of Regulations Title 24, Part 2, Chapter 19.
- C. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
- D. ACI 301 - Specifications for Structural Concrete for Buildings.
- E. ACI 302.1R - Guide for Concrete Floor and Slab Construction.
- F. ACI 305R - Hot Weather Concreting.
- G. ACI 306R - Standard Specification for Cold Weather Concreting.
- H. ACI 318 - Building Code Requirements for Structural Concrete.
- I. ASTM C33 - Concrete Aggregates.
- J. ASTM C94 - Ready-Mixed Concrete.
- K. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
- L. ASTM C150 - Portland Cement.
- M. ASTM C289 - Potential Reactivity of Aggregate.

- N. ASTM C309 - Liquid Membrane Forming Compound.
- O. ASTM C494 - Standard Specifications for Chemical Admixtures for Concrete.
- P. ASTM C618- Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture for Concrete.
- Q. ASTM C932 - Surface-Applied Bonding Agents.
- R. ASTM C1315 - Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- S. ASTM C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
- T. ASTM D226 - Asphalt Saturated Organic Felt used in Roofing and Waterproofing.
- U. ASTM D1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction.
- V. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
- W. ASTM E154 - Standard Test Methods for Water Vapor Retardants used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
- X. ASTM E1643 - Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slab.
- Y. ASTM E1155 - Determining Floor Flatness and Levelness Using the F-Number System.
- Z. ASTM E1745 - Standard Specifications for Plastic Water Vapor Retarders Used in Contact with Soil Or Granular Fill Under Concrete Slabs.
- AA. ASTM F1249 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
- BB. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- CC. National Ready Mix Concrete Association - Plant Certification Program.
- DD. Stormwater Best Management Practice Handbook (BMP Handbook), Construction Edition, as published by the California Storm Water Quality Association.

### 1.3 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain materials from same source throughout the Work.

**1.4 QUALIFICATIONS**

- A. Manufacturer: Manufacturer of ready-mix concrete products complying with ASTM C94 requirements for production facilities and equipment. Certified according to National Ready Mix Concrete Associates Plant Certification Program.

**1.5 DESIGN MIX**

- A. Submit design mix for each class of concrete, prepared by a California Registered Civil Engineer, to Testing Laboratory and OWNER'S REPRESENTATIVE for review.

**1.6 REGULATORY REQUIREMENTS**

- A. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.
- B. Conform to CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, and the 2010 ADA Standards for Accessible Design for access requirements for individuals with disabilities.

**1.7 SUBMITTALS**

- A. Submit product data and manufacturer's instructions under provisions of Section 01 33 00.

**1.8 FIELD SAMPLE**

- A. Provide field sample of rough form/board form finish under provisions of Section 01 45 00.
- B. Provide a minimum 6'-0" x 6'-0" sample wall panel to be reviewed by OWNER'S REPRESENTATIVE.
- C. Accepted sample may not remain as part of work.
- D. Field sample will demonstrate minimum standard for the work.

**1.9 PRE-INSTALLATION CONFERENCE**

- A. Convene a conference two weeks prior to commencing placement of floor slab work of this section, under provisions of Section 01 31 00.
- B. Require attendance of parties directly affecting the work of this Section.
- C. Agenda:
  - 1. Placement of subgrade beneath floor slab.
  - 2. Testing of subgrade beneath floor slab.
  - 3. Delivery and placement of concrete.
  - 4. Testing and inspection procedures for concrete.

5. Submittal of mix design for concrete.
6. Hot and cold weather concreting procedures.
7. Vapor barrier location and installation.
8. Placement of control and expansion joints.
9. Steel reinforcement installation.
10. Installation of inserts and embedded items.
11. Finishes and finishing.
12. Forming and form removal limitations.
13. Floor slab flatness and levelness requirements.
14. Curing process and procedures.
15. Protection of finished floor slabs.
16. Floor slab joint and crack repair.
17. Moisture vapor transmission testing.

#### **1.10 WARRANTY**

- A. Provide fifteen-year warranty from curing, hardening and vapor barrier compound manufacturer under provisions of Section 01 77 00.
- B. Warranty: Include coverage for removal and replacement of finish floor materials that delaminate from interior floor slabs due to moisture migration and excessive vapor emissions or due to presence of efflorescence and alkali contaminates.
  1. Subfloor Moisture Conditions: Moisture emission rate of no more than 3 lb/1000 sq. ft./24 hours when tested by Quantitative Anhydrous Calcium Chloride Test, ASTM F1869, with subfloor temperature not less than 65 degrees F.
  2. Subfloor Alkalinity Conditions: A pH range of between 5 to 9 when subfloor is wetted with potable water and pHdrion paper is applied.
  3. December 17, 2012 Warranty to be supported by \$1,000,000.00 product liability insurance policy issued directly to the OWNER'S REPRESENTATIVE.
- C. Provide ten year warranty from waterproofing admixture manufacturer that surfaces treated with crystalline waterproofing admixture will remain free from water leakage.

#### **1.11 ENVIRONMENTAL REQUIREMENTS**

- A. Provide concrete curing, finishing, and waste management techniques as defined in Section 4 of



the Storm Water Best Management Practice Handbook, (BMP Handbook) Construction Edition.

## **PART 2 - PRODUCTS**

### **2.1 FORMWORK**

- A. As specified in Section 03 10 00.

### **2.2 REINFORCEMENT**

- A. Reinforcing steel as specified in Section 03 20 00.

### **2.3 CONCRETE MATERIALS**

- A. Cement: ASTM C150, Type II-V Portland type; low alkali; grey color.
- B. Fine and Coarse Aggregates Normal Weight Concrete: ASTM C33, non reactive when tested in accordance with ASTM C289 and Appendix X-1 of ASTM C33.
- C. Water: ASTM C1602, clean and not detrimental to concrete.

### **2.4 ADMIXTURES**

- A. Fly Ash: ASTM C618, Class F.
- B. Water Reducing Admixture: ASTM C494, Type A.
- C. Crystalline Waterproofing Admixture: Xypex Admix C-1000 as manufactured by Xypex Chemical Corporation, [www.xypex.com](http://www.xypex.com).
- D. Calcium chloride, or any other admixtures not allowable.

### **2.5 VAPOR BARRIER**

- A. Material: 15 mil thick polyethylene film meeting the requirements of ASTM E1745, Class A, with a maximum permeance of 0.01 perms in accordance with ASTM E96/E154, Section 7, and a water vapor transmission rate (WVTR) of less than 0.0037 when tested according to ASTM F1249.
- B. Accessories:
  - 1. Minimum 4 inch wide polyethylene tape with pressure sensitive adhesive.
  - 2. PVC termination bar with pre-drilled holes.
  - 3. All accessories provided by vapor barrier manufacturer.
- C. Manufacturers:
  - 1. Fortifiber Building Products, [www.fortifiber.com](http://www.fortifiber.com).

2. Poly-America, [www.yellowguard.com](http://www.yellowguard.com).
3. Reef Industries, [www.reefindustries.com](http://www.reefindustries.com).
4. Stego Industries, [www.stegoindustries.com](http://www.stegoindustries.com).
5. Substitutions: Under Provisions of Product Requirements: Section 01 60 00.

## 2.6 ACCESSORIES

- A. Underlayment: ASTM D226, Type I (No. 15) asphalt saturated roofing felt.
- B. Bonding Agent: ASTM C932; Weld-Crete as manufactured by Larsen Products Corp., [www.larsenproducts.com](http://www.larsenproducts.com).
- C. Non-shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 7000 psi in 28 days.
- D. Joint Filler: ASTM D1751, 1/2 inch thick.
- E. Sand Fill: Manufactured "crusher run" sand free of silt, clay, loam, friable or soluble materials or organic matters, all passing the No. 4 sieve and only 5 percent passing the No. 200 sieve.
- F. Curing, Hardening and Vapor Barrier Compound: ASTM C1315, Type I, Class A and ASTM C309, Type 1, Class A, with maximum volatile organic compound (VOC) content rating as required to suit regulatory requirements. Material to have no less than 34 percent penetrating solids, have no visible sheen and be compatible with floor finish materials and overlays. Provide the following:
  1. PMC 3300 Penetrating Sealer manufactured by Curranseal, [www.curranseal.com](http://www.curranseal.com).
- G. Sealing Compound: Ashford Formula manufactured by Curecrete Distribution, Inc., [www.ashfordformula.com](http://www.ashfordformula.com).
- H. Chemical Concrete Stain: Penetrating reactive concrete stain and clear sealer of color selected by OWNER'S REPRESENTATIVE. Subject to compliance with requirements provide one of the following:
  1. Blush-Tone Acid Stain as manufactured by Rafco Products Co., [www.brickform.com](http://www.brickform.com).
  2. Lithochrome Chemstain as manufactured by L.M. Scofield Co., [www.scofield.com](http://www.scofield.com).
  3. ChlorStain as manufactured by Super Stone, Inc., [www.superstone.com](http://www.superstone.com).
  4. Patina Stain System as manufactured by the Symons Corporation, [www.symons.com](http://www.symons.com).
  5. SGS Concrete Stain as manufactured by Solomon Grind Chemical Services, [www.solomoncolors.com](http://www.solomoncolors.com).

- I. Concrete Floor Slab, Saw Cut, Joint, Crack, Repair Material: Cement-based, polymer-modified product that can be feathered at edges to match adjacent floor elevations. Compressive strength not less than 4,200 psi at 28 days when tested according to ASTM C109. Equivalent to ARDEX SD-F Feather Finish, [www.ardex.com](http://www.ardex.com). Epoxy base to be equivalent to W.R. Meadows Rezi-Weld Flex semi-rigid epoxy, [www.wrmeadows.com](http://www.wrmeadows.com).
- J. Substitutions: Under provisions of Section 01 60 00.

## 2.7 CONCRETE MIX

- A. Mix concrete in accordance with ASTM C94 and ACI 318, Section 5.3.
- B. Footings: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4,000 psi at 28 days.
  - 2. Maximum Water-Cement Materials Ratio: 0.60.
  - 3. Aggregate Size: 1-1/2 inch maximum.
  - 4. Slump Limit: 4 inch minimum, 6 inch maximum.
  - 5. Fly Ash: Maximum 25 percent by weight.
- C. Foundation Walls: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4,000 psi at 28 days.
  - 2. Maximum Water-Cement Materials Ratio: 0.60.
  - 3. Aggregate Size: 1-1/2 inch maximum.
  - 4. Slump Limit: 4 inch minimum, 6 inch maximum.
  - 5. Fly Ash: Maximum 25 percent by weight.
- D. Slabs-On-Grade: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4,000 psi at 28 days.
  - 2. Minimum Cement Materials Content: 540 lb./cu. yd.
  - 3. Maximum Water-Cement Materials Ratio: 0.45.
  - 4. Aggregate Size: 1 inch maximum.
  - 5. Slump Limit: 3 inch minimum, 5 inch maximum.
  - 6. Fly Ash: Maximum 25 percent by weight.
- E. Building Walls: Proportion normal weight concrete mixture as follows:

1. Minimum Compressive Strength: 4,000 psi at 28 days.
2. Maximum Water-Cement Materials Ratio: 0.60.
3. Aggregate Size: 1-1/2 inch maximum.
4. Slump Limit: 4 inch minimum, 6 inch maximum.
5. Fly Ash: Maximum 25 percent by weight.
6. Waterproofing Admixture: 3 percent by weight of cement.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION**

- A. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause difficulty in placing concrete.

### **3.2 PREPARATION**

- A. At locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.
- B. Place 2 inch thick sand fill over subgrade.
- C. Compact sand fill as specified in Section 31 20 00-Earth Moving.
- D. Install underlayment over wood subfloor. Lap joints 6 inches. Fasten in place.

### **3.3 VAPOR BARRIER**

- A. Install vapor barrier in compliance with ASTM E1643 under interior slabs over sand subgrade.
- B. Install vapor barrier to exterior surface of below grade building foundation walls and grade beams. Seal to vertical surface of foundation wall with pressure sensitive tape and termination bar at an elevation consistent with the top of the adjacent finish grade.
- C. Lay vapor barrier with long dimension parallel with long dimension of space.
- D. Lap vapor barrier over footing and seal to vertical surface of interior foundation wall with pressure sensitive tape and termination bar at an elevation consistent with the top of the slab.
- E. Overlap all joints in vapor barrier 6 inches and seal with tape.
- F. Seal all pipe penetrations of vapor barrier with pipe boot fabricated from vapor barrier material and tape.
- G. Repair damaged areas with vapor barrier, overlapping damaged area by 6 inches and taping all four sides.

### **3.4 PLACING CONCRETE**

- A. Notify OWNER'S REPRESENTATIVE minimum 24 hours prior to commencement of concreting operations.
- B. Place concrete in accordance with ACI 301.
- C. Hot Weather Placement: ACI 305R.
  - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete in hot weather. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
- D. Cold Weather Placement: ACI 306R.
  - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 306R.
- E. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
- F. Do not disturb or damage vapor barrier while placing concrete. Repair damage as required to maintain integrity of barrier.
- G. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.
- H. Place interior floor slabs on fill in a strip sequence pattern.
- I. Excessive honeycomb or embedded debris in concrete is not acceptable.

### **3.5 JOINTS**

- A. Saw cut control joints at an optimum time after finishing. Use 3/16 inch thick blade, cutting 1/3 into depth of slab thickness.
- B. Provide control joints at 15 feet on center unless otherwise indicated in geotechnical reports.
- C. Where indicated on the drawings, separate slabs from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface.

### **3.6 FLOOR SLAB JOINT FILLING AND CRACK REPAIR**

- A. Prepare, clean, and install joint repair material according to manufacturer's written instructions.
- B. Defer joint filling and crack repair until concrete has aged a minimum of 60 days.

- C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- D. Mechanically V-groove as necessary all saw cuts, joints, and cracks, to a minimum width of 1/4 inch and a minimum depth of 5/8 inch.
- E. Fill bottom of joint to a depth of at least 3/16 inch with semi-rigid epoxy.
- F. Place silica sand over epoxy filler.
- G. Fill all saw cuts, joints, and cracks with cement based joint repair material to top of concrete surface.
- H. Steel trowel edges of joint repair material to a feather edge to match adjacent floor elevation.
- I. Apply curing, hardening and vapor barrier compound over repaired joints, saw cuts and cracks.

### **3.7 FINISHING OF FORMED SURFACES**

A. Rough form finish:

- 1. Leave surfaces with the texture imparted by forms, except patch tie holes and defects.
- 2. Remove fins exceeding 1/4 inch in height. Keep fins where board formed concrete walls are indicated.
- 3. Use for below grade foundation walls, concealed spaces, and building wall exterior shown as board form finish.

B. Smooth form finish:

- 1. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.
- 2. Patch tie holes and defects.
- 3. Remove fins completely.
- 4. Use for exposed finish surfaces to receive paint and surfaces to receive tile finish.

C. Smooth rubbed finish:

- 1. Produce on newly hardened concrete no later than the day following form removal.
- 2. Wet the surfaces and rub with carborundum brick or other abrasive until uniform color and texture are produced.
- 3. Do not use a cement grout other than the cement paste drawn from the concrete itself by the rubbing process.
- 4. Use for exposed finish surfaces to receive clear sealer.

### **3.8 FINISHING SLABS**

- A. Uniformly spread, screed, and consolidate concrete. Do not spread concrete by vibration.
- B. Float Finish: Float with hand float or with a powered disc float. High spots to be cut down and low spots to be filled. Use as preparation for further finishing.
- C. Scratched Finish: Mechanically float surfaces. Roughen with stiff brushes before final set. Use for tile with full bed setting systems and where indicated.
- D. Troweled Finish: After floating, steel trowel to smooth, mark free surface. Use for exposed floors and slabs to receive carpeting, resilient flooring, and where indicated.
- E. Fine Broom Finish: After floating and while the surface is still plastic, provide a fine textured finish by drawing a fine fiber bristle broom uniformly over the surface in one direction only. Use for floors and slabs to receive tile using the thin set setting method and where indicated.

### **3.9 CHEMICALLY STAINED CONCRETE FINISH**

- A. Concrete surfaces shall have cured a minimum of 28 days prior to stain application.
- B. Apply chemical stain to concrete surfaces as indicated on the drawings.
- C. Apply stain evenly over surface in quantities according to manufacturer's recommendations.
- D. Do not apply stain when temperature is above 85 degrees F.
- E. Maintain a wet edge on surfaces during application.
- F. Remoisten concrete to blend hard edges or lap marks caused by application.
- G. Flush area of stain application with mixture of water and baking soda after stain has dried.
- H. Prevent water rinse runoff to planted areas or other surfaces that may be damaged by stain residue.
- I. Apply manufacturer's recommended sealer to stained surfaces. Apply in accordance with manufacturer's recommendations.

### **3.10 SLAB TOLERANCES**

- A. Maintain slab tolerance as defined in ACI 302.1R of (SOV) FF35 and FL25 and (MLV) FF24 and FL17 as measured by ASTM E1155 for slabs on grade.
- B. Correct the slab surface if the actual FF/FL number for the floor installation measures less than required.
- C. After correction of slab surface to specified tolerance, apply curing, hardening and vapor barrier over corrected surface.
- D. In areas of floor drains, maintain floor levels at the walls and slope surface uniformly to drains at 1/8 inch per foot.

**3.11 CURING**

- A. Apply curing, hardening and vapor barrier compound on all floor slabs that are not exposed and indicated to be sealed.
- B. Cure concrete surfaces in accordance with ACI 301.
- C. Spray apply curing, hardening and vapor barrier compound on finished slab surfaces located below grade, at grade, and above grade in two "wet on wet" flood coats at the total rate of 200 sq. ft./gallon in accordance with manufacturer's instructions.
- D. Application of compound shall be by a trained applicator acceptable to compound manufacturer.
- E. After application of curing, hardening, and vapor barrier compound, moist cure concrete using the following method:
  - 1. Spraying: Fog spray clean, potable water over floor slab areas and maintain moist for 10 days.
  - 2. Polyethylene Film: Spread over floor slab areas, lap edges and sides, maintain in place for 10 days.

**3.12 SEALING**

- A. Apply sealing compound on finished floor slab surfaces that are not to receive a finished floor covering and are indicated to be exposed and sealed.
- B. Apply sealing compound immediately following finishing operation.
- C. Apply sealing compound in sufficient quantities to keep entire surface wet for a minimum of 30 minutes.
- D. Lightly mist surface with water as compound is absorbed into surface.
- E. Flush surface with water and squeegee surface free of excess compound.
- F. Burnish final concrete surface with propane burnisher.

**3.13 PATCHING**

- A. Notify OWNER'S REPRESENTATIVE immediately upon removal of forms to determine areas that will require patching.
- B. Surface defects shall include color and texture irregularities, stains, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections and discolorations in the surface that cannot be removed by cleaning.
- C. Patch imperfections in accordance with ACI 301.

**3.14 DEFECTIVE CONCRETE**



- A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.
- B. Repair or replace concrete not properly placed or of the specified type.

### **3.15 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed under provisions of Section 01 45 00.
- B. OWNER'S Inspector will take cylinders and perform slump and air entrainment tests in accordance with ACI 301 and will arrange for pick-up by Testing Laboratory.
- C. Three cylinders will be taken for every 50 yards, or fraction thereof, for each class of concrete for each day.
- D. Tests of cement and aggregates will be performed by Testing Laboratory to ensure conformance with requirements stated herein.
- E. Slab tolerance as measured by ASTM E1155 shall be performed within 72 hours of floor slab installation.
- F. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

### **3.16 PROTECTION**

- A. Protect finished work under provisions of Section 01 60 00.
- B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 03 45 00.01****ARCHITECTURAL PRECAST CONCRETE****PART 1 - GENERAL****1.1 SCOPE:**

- A. The work performed under this section of the specifications shall include all labor, material, equipment, services, and supervision required for the manufacture of the architectural precast concrete units shown on the drawings.
- B. Related work specified elsewhere:
  - 1. All anchors, inserts and other hardware or attachments cast into poured-in-place concrete or welded to supporting structural framework
  - 2. Inserts, embedment, sleeves, holes, or other attachments required by other trades.
  - 3. Joint fillers, sealants, and caulking

**1.2 REFERENCES**

- A. American Concrete Institute (ACI)
  - 1. ACI318 - Building Code Requirements for Reinforced Concrete
- B. American Society for Testing and Materials (ASTM)
  - 1. ASTM A615 - Spec for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
  - 2. ASTM A767/A767M - Spec for Zinc Coating (Galvanized) Steel Bars for Concrete Reinforcement.
  - 3. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - 4. ASTM C33 - Spec for Concrete Aggregates.
  - 5. ASTM C150 – Spec for Portland Cement.
  - 6. ASTM C26 – Spec for Air-Entraining Admixtures for Concrete.
- C. Precast Concrete Institute (PCI)
  - 1. PCI Design Handbook for Precast and Pre-stressed Concrete.
  - 2. PCI MNL-117 – Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

**1.3 QUALITY ASSURANCE:**

- A. Production of architectural precast concrete units shall comply with the provisions of Precast Concrete Institute (PCI) MNL 117, "Manual for Quality Control for Production of Architectural Precast Concrete Products"
- B. A minimum of 5 years production experience in architectural precast concrete work of quality and scope for a specified project is required.

- C. Manufacturer shall be by a company specializing in providing architectural concrete products and services
- D. Manufacture of architectural precast concrete units shall meet the allowable tolerances as set forth in PCI MNL 117.
- E. A competent Erection CONTRACTOR having experience in the erection of this type of material shall perform installation of architectural precast concrete units.

#### **1.4 ACCEPTABLE FABRICATORS**

- A. Acceptable fabricators per CDI plans and specifications and per architectural specifications in the appendix section 03 45 00.

#### **1.5 SUBMITTALS:**

- A. The Manufacturer shall submit for approval, prior to production of precast units, FIVE samples representative of the actual elements as to quality and type of finish. The sample shall be at least 12" x 12" x 2" in size.
- B. Upon request of the OWNER'S REPRESENTATIVE, test cylinders and product data shall be available for review.
- C. The Manufacturer shall submit shop drawings for approval prior to undertaking any work. These drawings shall show all finishes, dimensions, connection, and related details.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS:**

- A. All concrete and steel shall be outlined in ACI 318 AISC Manual of Steel Construction and confirm to the latest ASTM standards

#### **2.2 STRUCTURAL DESIGN:**

- A. Concrete shall confirm to the requirements for 28-day minimum compressive strength as shown on the structural drawings or in approved design calculations.

#### **2.3 FABRICATION**

- A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and following dimensional tolerances, unless otherwise indicated.
- B. Molds: Accurately construct molds mortar-tight and of sufficient strength to withstand pressures due to concrete placing operations and temperature changes. Maintain mold work to provide completed precast concrete units of shapes, lines and dimensions indicated, within specified fabrication tolerances.
- C. Dimensional Tolerances of Finished Units: Ornamental architectural precast concrete, being tapered by design, is measured for length, width and thickness at the surface from which the mold is loaded maintaining plus or minus 1/16 of an inch tolerance. Overall

height and width measured at face adjacent to mold at time of casting:

1. Surface Finish Match Architectural Specifications available in the appendix:  
Fabricate precast units and provide exposed surface finished as follows:
  - a. Modern – Smooth, relatively void free texture
  - b. Color: Select from CDI color chart to minimize variations in color.

## **2.4 DAMAGE AND REPAIR:**

- A. Patching WILL NOT BE ACCEPTED. Any precast units that are damaged, cracked, spalled or have blemishes or defects as determined by the City of Ontario project manager shall be replaced at no expense to the City of Ontario

## **2.5 STORAGE:**

- A. Products shall be stored and handled in such a manner that prevents damage and protects the product. Any precast concrete units damaged on the jobsite, in transit, during installation or anytime prior to acceptance of this project by the City of Ontario shall be replaced at no expense to the City of Ontario.

## **PART 3 - EXECUTION**

- A. Care shall be used in the delivery and handling of architectural precast concrete units and in their storage at the jobsite. Members shall be handled in such a manner so as to prevent physical damage.

## **3.1 ERECTION:**

- A. A Competent Erection CONTRACTOR having experience in the erection of this type of material shall perform installation of architectural precast concrete units. If required, members shall be lifted by means of suitable lifting devices at points provided by the Manufacturer.
- B. The erector shall execute a final clean down to remove dirt and stains that are direct result of the erection process.
- C. Any damage that occurs during the erection will be the responsibility of the erector. These repairs will be deemed acceptable if the structural adequacy and/or aesthetic appearance is not impaired, subject to the approval of the OWNER'S REPRESENTATIVE.
- D. After completion, any further soiling or damage to architectural precast concrete units is the responsibility of the General CONTRACTOR.
- E. Refer to RECOMMENDED EXECUTION OF THE INSTALLATION in architectural specifications in appendix section 03 45 00 for further requirements.

**END OF SECTION**



**SECTION 04 05 13****MASONRY MORTARING AND GROUTING****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Mortar and grout for masonry.

**1.2 REFERENCES**

- A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.
- B. ASTM C144 - Aggregate for Masonry Mortar.
- C. ASTM C150 - Portland Cement.
- D. ASTM C207 - Hydrated Lime for Masonry Purposes.
- E. ASTM C270 - Mortar for Unit Masonry.
- F. ASTM C404 - Aggregates for Masonry Grout.
- G. ASTM C476 - Grout for Masonry.
- H. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture for Concrete.
- I. All masonry work shall be in accordance with The Masonry Society publication TMS 602 – "Specification for Masonry Structures".

**1.3 SUBMITTALS**

- A. Submit product data under provisions of Section 01 33 00.

**1.4 STORAGE AND HANDLING**

- A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

**1.5 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain materials and surrounding air temperatures to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

**1.6 MIX DESIGN**

- A. Submit design mix prepared by a California Registered Civil Engineer to testing laboratory and OWNER'S REPRESENTATIVE for review.

**PART 2 - PRODUCTS**

## 2.1 MATERIALS

- A. Portland Cement: ASTM C150, Type I, low alkali, gray color.
- B. Mortar Aggregate: ASTM C144, standard masonry type, non-reactive.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Grout Aggregate: ASTM C404.
- E. Fly Ash: ASTM C618, Class F.
- F. Water: Clean and potable.

### Acceptable Product Manufacturers:

- 1. Angelus Block Co., Inc.  
Sun Valley Plant  
11374 Tuxford St., Sun Valley, Ca. 91352/ (818)767-8576
- 2. Orco Block Co.,  
Orange/Los Angeles  
11100 Beach Blvd., Stanton, Ca. 90680/ (714) 527-2239
- 3. Exterior Wainscots: 8x8x16 Shot-Blast CMU, Harvest (or as noted on the plans)  
Exposed Exterior Walls: 8x4x16 Shot-Blast CMU, Harvest (or as noted on the plans)  
Interior Walls: 8x8x16 Precision CMU, Natural Gray.  
Refer to the drawings for CMU type, sizes, and colors.

### B. Product Requirements:

- 1. Reinforcing Bars: ASTM A615, grade 60, unless otherwise shown on the drawings, using deformed bars for number 3 and larger.
- 2. Bending: ACI 318.
- 3. Wire Reinforcement: ASTM A82.

## 2.2 MORTAR COLOR

- A. Color: Match Architectural specifications see appendix section 04 20 00

## 2.3 ADMIXTURES

- A. Sika Grout Aid as manufactured by Sika Corp., [www.sikausa.com](http://www.sikausa.com).
- B. Substitutions: Under provisions of Section 01 60 00

## 2.4 MORTAR MIXES

- A. Comply with ASTM C270, Proportion Specification. Limit fly ash content to 15 percent maximum.
  - 1. Mortar for masonry below grade and in contact with earth: Type M.



2. Mortar for reinforced masonry: Type S.
  3. Pointing Mortar: Type N, with maximum 2 percent ammonium stearate or calcium stearate per cement weight.
  4. Mortar for glass unit masonry: Type S.
- B. Acceptable Alternative: Mix Preblended Masonry Mortars as manufactured by E-Z Mix, Inc., or Amerimix.

## **2.5 MORTAR MIXING**

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use.
- B. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.
- C. Do not use anti-freeze compounds to lower the freezing point of mortar.
- D. If water is lost by evaporation, retemper only within 2 hours of mixing.
- E. Use mortar within two hours after mixing at temperatures of 80 degrees F, or 2-1/2 hours at temperatures under 40 degrees F.
- F. Mortar which has hardened or stiffened due to hydration of cement shall not be used.

## **2.6 GROUT MIXES**

- A. Comply with ASTM C 476 for grout in reinforced and non-reinforced unit masonry: 2000 psi strength at 28 days.
  1. Fine Grout: spaces less than 2 inches in horizontal dimension.
  2. Coarse Grout: spaces 2 inches or more in least horizontal dimension.
  3. Mix 1 lb of grout aid per 100 lbs of cementitious materials.
  4. Limit fly ash content to 25 percent maximum.

## **2.7 GROUT MIXING**

- A. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.
- B. Do not use anti-freeze compounds to lower the freezing point of grout.

# **PART 3 - EXECUTION**

## **3.1 PREPARATION**

- A. Plug cleanout holes with masonry units to prevent leakage of grout materials. Brace masonry for wet grout pressure.

**3.2 INSTALLATION**

- A. Install mortar and grout to requirements of the specific masonry Section.
- B. Work grout into masonry cores and cavities to eliminate voids.
- C. Do not displace reinforcement while placing grout.
- D. Remove grout spaces of excess mortar.

**3.3 FIELD QUALITY CONTROL**

- A. Testing and analysis of mortar and grout will be performed under provisions of Section 01 45 00.

**END OF SECTION**

**SECTION 04 22 00****CONCRETE MASONRY UNIT****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Concrete masonry unit.
- B. Mortar and grout.
- C. Reinforcement for masonry.

**1.2 RELATED SECTIONS**

- A. Section 03 21 00 – Reinforcing Steel
- B. Section 05 05 23 – Metal Fastenings: Non-shrink grout for baseplate and equipment anchoring.
- C. Section 07 19 00 - Water Repellents: Penetrating, protective product applied to exposed exterior concrete unit masonry.
- D. Section 07 90 00 - Joint Sealers: Control joint backing and sealants.
- E. Appendix B: Architectural Specifications Section 04 20 00

**1.3 REFERENCES**

- A. American Concrete Institute (ACI): ACI 530 - Building Code Requirements for Masonry Structures.
- B. Concrete Masonry Association of California and Nevada (CMACN) - Typical Details for Concrete Masonry.

**1.4 DEFINITIONS**

- A. High-Lift Grouting: Grouting method as developed for use in reinforced concrete unit masonry is intended for use on wall construction where openings, block pattern arrangements, special reinforcing steel, or embedded structural steel details do not prevent the free flow of grout or inhibit the use of mechanical vibration to properly consolidate the grout fill in all cells or horizontal grout spaces. Horizontal reinforcing should be positioned in a single vertical plane at each curtain of steel to allow maximum accessibility to the cell spaces.
- B. Pour: "Pour" is considered as the entire height of grout fill placed in one day and is composed of a number of successively placed grout lifts.
- C. Lift: A "lift" is the layer of grout placed in a single continuous operation.

**1.5 SUBMITTALS**

- A. Product Data: List of materials and manufacturer's catalog data for proprietary products.

- B. Shop Drawings: Large scale wall elevations with reinforcing layout.
  - 1. Include composite masonry wall penetration drawings, indicating size and location of each wall penetration and opening as necessary by all affected trades.
  - 2. Submit penetration elevations along with corresponding reinforcing steel shop drawings and steel embedment drawings.
  - 3. Include proposed control joint locations. Provide control joints per geotechnical report.
- C. Manufacturer's Instructions: Cleaning of masonry containing liquid polymeric admixture.
- D. Certificates of Conformance: Submit manufacturer's certificates for concrete unit masonry and cement.
- E. California Green Building Standards Code (CALGreen) Compliance Submittals: Indicate source, address, quantity, and recycled content of all concrete masonry components, including masonry units, mortar, and grout.

## **1.6 QUALITY ASSURANCE**

- A. Regulatory Requirements: Comply with applicable requirements of California Building Code (CBC) Section 2105 - Quality Assurance, including Section 2105.2 or latest version.
- B. Sample Panel: Construct sample panel to verify selections made under sample submittals and to demonstrate compatibility of materials and effects of the materials and construction procedures on the final appearance of wall. Construct sample panels for each type of exposed unit masonry construction in sizes approximately 60-inches (1500 mm) wide by 48-inches (1200 mm) high by full thickness
  - 1. Use specified materials.
  - 2. CMU sample panels erected shall represent range of texture and color permitted for the project.
  - 3. Prepare more than one sample batch of mortar, especially when coloring pigments are added to the mortar, to establish desired aesthetics and performance.
  - 4. Perform all construction procedures on sample panel, including cleaning and application of coatings and sealants.
  - 5. Retain sample panel during construction as standard for judging completed masonry work. Acceptance of sample panel does not constitute approval of deviations from materials contained in sample panel, unless such deviations are specifically approved in writing by CONSTRUCTION MANAGER.
- C. Field Inspection: Placement of reinforcement, laying of masonry units and grouting of masonry shall be continuously inspected by a special masonry inspector. Refer to requirements specified in Section 01 45 00 - Quality Control and in PART 3 herein, in Article titled FIELD QUALITY CONTROL.

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- B. Storage:
  - 1. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
  - 2. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
  - 3. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
  - 4. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.8 PROJECT CONDITIONS

- A. Hot Weather Conditions: Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 90 degrees F or greater in the shade and when relative humidity is less than 50 percent.
- B. Cold Weather Conditions: Do not lay or grout masonry when ambient temperature in the shade is less than 40 degrees F, unless approved methods are used during construction to heat Work area and to maintain minimum required temperature for mortar and grout curing.
  - 1. Maintain minimum 40 degrees temperature for a period of at least 96 hours after mortar and grout are placed and prevent masonry from freezing for minimum of 7 days after placement and grouting.
  - 2. All materials used shall be free from frost and masonry shall not be place on frozen substrate.

## **PART 2 - PRODUCTS**

### 2.1 CONCRETE MASONRY UNITS

- A. Acceptable Manufacturers: Equivalent products of other manufacturers, including Angelus Block, Sun Valley, CA (818/767-8576), will be acceptable in accordance with the "or equal" provision specified in Section 01 60 00 - Product Requirements.
- B. Hollow Load-Bearing Concrete Masonry Units: Complying with California Building Code (CBC) Table 2103.1 and ASTM C 73, two-core type, modular sizes as indicated on Drawings.
  - 1. Grade and Type: Grade N, Type I, moisture-controlled units, open end bond-beam design, except provide closed ends at corner and wall end conditions. Provide bond-beam units at all locations with horizontal reinforcing steel bars, to provide minimum vertical opening at all cross

webs 3-inches high by 3-inches wide. See Structural Drawing for unit types to be used at stack bond.

2. Weight Classification: Match Appendix B: Architectural Specifications Section 04 20 00
  3. Strength: As specified on Structural Drawings.
  4. Recycled content block: Match Appendix B: Architectural Specifications Section 04 20 00
  5. Face designs and colors: Match Appendix B: Architectural Specifications Section 04 20 00
  6. Finish: Match Appendix B: Architectural Specifications Section 04 20 00
  7. Sealer: Sinak HLQ-125 to match concrete paving, or approved equal. Seal all CMU after installation. See Concrete Paving 32 13 13 for Sealer application.
- C. Solid Concrete Masonry Units: Modular size, color, and finish to match hollow core units, conforming to California Building Code (CBC) Section 2103.1, Grade N, Type II. Provide solid units for exposed tops of walls, window sills, veneer and other conditions as indicated on the Drawings.
1. Special Shapes:
    - a. Provide end, corner, pilaster, and cap units as necessary.
    - b. Provide deep cut type bond beam block.
    - c. Include abrasive burnished surface finish on exposed exterior surfaces.

## **2.2 REINFORCEMENT AND ANCHORAGES**

- A. Reinforcing Steel: ASTM A 615, yield grade as indicated on Drawings; deformed billet steel bars; plain finish. Comply with requirements specified in Section 03 20 00 - Reinforcing Steel.

## **2.3 MORTAR AND GROUT MATERIALS**

- A. Mortar and Grout Materials, General: Comply with California Building Code (CBC), Section 2102.
- B. Portland Cement: ASTM C 150, Type as indicated on (Structural) Drawings, from one manufacturer only.
- C. Color: Match Appendix B: Architectural Specifications Section 04 20 00
- C. Grout Materials:
1. Grout Aggregate, General: Comply with ASTM C 476 - Standard Specification for Grout for Masonry and complying with California Building Code (CBC), Section 2103.12., except when other gradations are specifically approved by OWNER'S REPRESENTATIVE (Structural Engineer) and AUTHORITY HAVING JURISDICTION (AHJ).
  2. Grout Coarse Aggregate: Match Appendix B: Architectural Specifications Section 04 20 00
  3. Grout fine aggregate: Match Appendix B: Architectural Specifications Section 04 20 00

4. Grout Admixture:
  - a. Specified manufacturer: Sika Corporation, Lyndhurst, NJ (regional office, Santa Fe Springs, CA; 562/903-3650).
  - b. Acceptable manufacturers: None. No substitutions will be accepted without approval of AUTHORITY HAVING JURISDICTION (AHJ).
  - c. Admixture: Sika® Grout Aid, blend of expanding, retarding and water-reducing agents for Portland Cement grout, to provide slow, controlled expansion prior to grout hardening. Provide dosage according to manufacturer's recommendations and reviewed grout mix.
- D. Grout Mix: In compliance with California Building Code (CBC), Table 2103.12 and ASTM C 476.
  1. Grout shall be high-slump workable mix, preferably placed by pumping to permit continuous pouring.
  2. Grout shall be worked into all voids. Mechanical vibrators shall be used for consolidation. Where job conditions preclude such use, other methods may be employed if approved in advance by AUTHORITY HAVING JURISDICTION (AHJ).
  3. Because of high water/cement ratio used in this type of grout, it is essential that grout be reconsolidated after it has taken on plastic consistency but prior to taking initial set. Reconsolidate grout to overcome settlement shrinkage, separation from reinforcing steel and promote bond to concrete masonry unit walls.
  4. Sufficient water may be added to make workable mix that will flow into all voids of masonry without separation or segregation. When grout is placed in masonry units with typical rates of absorption, slump of grout shall be approximately nine to ten inches (9-inches to 10-inches) depending on temperature and humidity conditions.
  5. Where least lateral dimension of cells to be filled exceeds five inches, coarser aggregate may be used in grout fill if mix is designed in accordance with California Building Code (CBC), Section 1905. The maximum size of aggregate shall not exceed 1-inch. Water per sack of cement may be greater than is shown in California Building Code (CBC), Table 19-A-8 to allow for absorption by masonry units and with sufficient workability to meet requirements stated in paragraph above.
  6. Incorporate admixtures in grout mixes in accordance with manufacturer's instructions and recommendations.
  7. Plasticizer: Water-reducing type which reduces porosity and absorption to increase bond strength; if used, only as reviewed and approved by OWNER'S REPRESENTATIVE (Structural Engineer) and AUTHORITY HAVING JURISDICTION (AHJ).
- E. Water: Clean, fresh, potable, and free of mineral or organic matter detrimental to mortar and grout, in quantity only as necessary to produce mortar of specified strengths according to reference standards.

## 2.4 MORTAR AND GROUT MIXES

- A. Mortar and Grout Mixes, General: Comply with California Building Code (CBC), Table 2103.8(1), Table 2103.8(2), Table 2103.12 and ASTM C 476. Shovel measures shall not be allowed. Lime

shall be last material added to mixes. Admixtures shall be acceptable on if included in reviewed mix designs. Admixtures shall be approved by AUTHORITY HAVING JURISDICTION (AHJ).

- B. Mortar Mix: Comply with requirements of California Building Code (CBC), Section 2103.
- C. Admixtures: Admixtures shall be acceptable only if included in reviewed mix designs. Dosages shall be according to manufacturer's recommendations and reviewed grout mix. Admixtures shall be approved by OWNER'S REPRESENTATIVE (Structural Engineer) and AUTHORITY HAVING JURISDICTION (AHJ).
- D. Design Strengths: Include admixtures in mix designs.
  - 1. Combined compressive strength, masonry unit and mortar assembly: As specified on Structural Drawings.
    - a. For  $F'_m$ , strength shall be verified by unit strength method or masonry prism tests in compliance with California Building Code (CBC), Section 2105.
    - b. For  $F'_m = 2500$  psi, strength shall be verified by masonry prism tests in compliance with California Building Code (CBC) Section 2106.
  - 2. Mortar compressive strength: As noted on Structural Drawings.
  - 3. Grout compressive strength: As noted on Structural Drawings.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Preparation: Contact surfaces of all foundations and floors that are to receive masonry Work shall be thoroughly cleaned and roughened in accordance with California Building Code (CBC), Section 1906.4 before start of laying of masonry. Protect roughened surface during construction to ensure good bond between grout fill and concrete surface.

#### **3.2 REINFORCING STEEL**

- A. Reinforcing Steel Condition: Verify that reinforcement is clean, free of scale, dirt, or other foreign coatings which would reduce bond to grout.
- B. Reinforcing Steel Placement: Place steel reinforcement in concrete masonry walls as indicated on (Structural) Drawings and in accordance with ACI 531, precisely located and supported and secured against displacement. Vertical reinforcing shall be tied to horizontal reinforcing at spacing not to exceed 4'-0".
  - 1. All reinforcing bars shall be straight. Do not "dog leg" bars at splices and do not use bent bars unless specifically indicated on Structural Drawings.
  - 2. Lapped reinforcement shall have same clearance as bars being lapped.
  - 3. Maintain 1/2-inch minimum clearance from interior face of masonry unit.



4. Maintain position of reinforcing within 1/4-inch of indicated dimension, while also maintaining minimum clearances.
- C. Clearances for Reinforcing Steel:
1. Where vertical reinforcing is indicated at both faces of wall, ensure that 1/2-inch minimum clearance is maintained to inside faces of masonry cell at all sizes of masonry.
  2. Where clearances of 2-inches and 2-1/2 inches are indicated (respectively) in nominal 8-inch and 10-inch thick masonry, carefully maintain clearance dimensions within placement tolerance indicated above, including lapped bars.
  3. Provide steel spacers to secure vertical reinforcing in required and proper position before, during and after grouting operations.

### 3.3 MASONRY UNIT PLACING AND BONDING

- A. Placing and Bonding, General:
1. Lay masonry to lines and levels indicated, plumb and true, using only dry masonry units.
  2. Fill head and bed joints for full thickness of the faceshells to provide the greatest resistance to water penetration.
  3. Low-lift construction shall comply with CBC Section 2104.6.1.2.2.
  4. High-lift construction shall comply with CBC Section 2104.6.1.2.3.
- B. Cutting: Make jobsite cuts with proper tools to provide straight unchipped edges and to fit masonry construction to final form. Take care to prevent breaking masonry unit corners or edges.
- C. Laying: Concrete masonry units need not be wetted before laying except in dry areas where contact surfaces of units shall be moistened immediately before laying to prevent excessive drying of mortar.
1. Lay masonry for proper jointing with other Work.
  2. Fill all head and bed joints solidly with mortar for distance in from face of unit not less than thickness of face shell. Take care in placing mortar to minimize droppings into block cells. Arrange open-end concrete masonry units in stacked bond so closed ends are not abutting.
  3. Buttering corners of joints, or excessive furrowing of mortar joints will not be accepted.
  4. Remove excess mortar as Work progresses.
  5. Do not shift or tap masonry units after mortar has taken initial set.
  6. Where adjustment is necessary, remove mortar and replace.
- D. Pattern: Lay masonry in running and stacked bonds, as indicated on the Drawings. Align vertical cells for continuity of reinforcement and grout. Course one block unit and one mortar joint to equal 8-inches. Make vertical and horizontal joints equal and of uniform thickness.

E. Horizontal and Vertical Face Joints:

1. Nominal thickness: 3/8-inch, uniform.
2. Tooling: Tool joints when thumb-print hard with joint tools to compress mortar to ensure full contact with block surfaces and to provide greatest resistance to water-penetration.
3. Joint shapes: As indicated on the Drawings and as follows.
  - a. Masonry exposed in completed construction: Concave.
  - b. Masonry concealed under tile mortar bed, Portland Cement plaster or applied paneling: Flush.
  - c. Veneer masonry exposed in completed construction: Raked joint at exposed exterior and interior conditions.

F. Cavity Protection: Cover the top of ungrouted masonry to protect it from the weather and to prevent accumulation of water in cores of CMU.

G. Internal Cavity Cleaning: Remove mortar protruding into cells of cavities to be reinforced or filled.

H. Intersections and Corners: Fully bond intersections, external and internal corners.

I. Joining Masonry Work: Provide expansion joints in accordance with reference standards. When joining fresh masonry to set or partially set masonry construction, clean exposed surface of set masonry and remove loose mortar prior to laying fresh masonry.

J. Construction (Cold) Joints: If necessary to stop off a horizontal run of masonry, rack back one-half block length in each course.

1. Do not use toothing to join new masonry to set or partially set masonry when continuing a horizontal run.
2. In high-lift grouting method, intermediate horizontal construction joints shall not be permitted.
3. Plan the Work for one continuous pour of grout to top of wall in 4-foot layers or lifts during same working day.
4. Section of wall to be grouted in any one pour shall be limited to length in which successive lifts can be placed within one hour of preceding lifts.
5. Vertical control barriers shall be placed between pour sections in locations approved by OWNER'S REPRESENTATIVE (Structural Engineer) and AUTHORITY HAVING JURISDICTION (AHJ).
6. Should blow-out, breakdown in equipment or any other emergency occur, cease grouting operation.
7. Alternate procedure may be used with approval of OWNER'S REPRESENTATIVE (Structural Engineer) and AUTHORITY HAVING JURISDICTION (AHJ).

- K. Cleanouts: Provide cleanout openings for all walls, at bottom of each pour, in accordance with California Building Code (CBC), Section 2104A.6.1.2.3.
1. Cleanout openings shall be made prior to start of laying of masonry and be of sufficient size and location to allow thorough flushing away of all mortar droppings and debris.
  2. After laying of masonry units is completed, cells shall be cleaned, reinforcing positioned and inspection completed.
    - a. Thoroughly remove all mortar droppings and overhangs from foundation or bearing surface, cell walls and reinforcing.
    - b. An acceptable method shall be provision of 2- to 3-inch blanket of dry sand over exposed surface of foundation, dislodging any hardened mortar from cell walls and reinforcing with pole or rod and removing mortar debris with sand cover prior to clean up and grouting.
  3. Close cleanouts by inserting face shells of masonry units or covering openings with forms.
  4. Face shell plugs shall have two-day minimum curing time and shall be adequately braced to resist pressure of fluid grout.
- L. Initial Cleaning: Remove excess mortar before mortar sets. Clean surfaces at exposed masonry to present even surface texture and color.
1. Remove "primary" efflorescence from masonry walls exposed in the finished construction in accordance with manufacturer's recommendations and NCMA TEK Bulletin #8-3A.
  2. Remove soiling or stains from masonry walls exposed in the finished construction in accordance with manufacturer's recommendations and NCMA TEK Bulletin #8-2A.
  3. Promptly remove excess wet mortar from the face of the masonry as work progresses. Do not use strong acids, overaggressive abrasive blasting, or high-pressure cleaning methods.
  4. Dispose of residues in compliance with applicable environmental regulations.

### **3.4 BUILT-IN WORK**

- A. Built-In Work: As Work progresses, install hollow metal door frames and other items to be built into the Work and specified in other Sections.
1. Avoid cutting and patching. Coordinate placement of built-in products specified in other Sections so built-in products are placed as masonry is laid.
  2. Install bolts, anchors, nailing blocks, sleeves, inserts, frames, vent flashings, conduit and other built-in products as masonry Work progresses.
  3. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
  4. Do not build into masonry construction organic materials that are subject to deterioration.
  5. Solidly grout spaces around built-in products.

### 3.5 PARGING

- A. Parging: At masonry to receive tile mortar setting bed or Portland Cement plaster finish.
  - 1. Dampen masonry walls prior to parging.
  - 2. Scarify each parging coat to ensure full bond to subsequent coat.
  - 3. Parge masonry walls in two uniform coats of mortar to a total thickness of 3/4 inch (19 mm).
  - 4. Steel trowel surface smooth and flat with a maximum surface variation of 1/8 inch per foot (1 mm/m).
  - 5. Strike top edge of parging at 45 degrees.

### 3.6 GROUTING

- A. Grout Mixing:
  - 1. Comply with requirements of California Building Code (CBC), Section 2103A.4.
  - 2. Mixing of grout shall comply with requirements for mixing of concrete, according to California Building Code (CBC), Section 1905A.8. When possible, mix and deliver grout in accordance with requirements for transit-mixed concrete.
  - 3. Time admixture addition in strict accordance with manufacturer's instructions and recommendations. Procedure used for adding admixture to grout mix shall provide for good dispersion.
- B. Inspection Holes: Provide inspection and cleanout holes at base of vertical cell grout lifts in excess of 4 feet. Clean concrete grout spaces of excess mortar and debris before grouting.
- C. Grouting, General: Grout all cells of units with coarse grout unless otherwise indicated. Work grout into cores and cavities to eliminate voids. Do not displace reinforcing steel when placing grout.
- D. Low-Lift Grouting:
  - 1. Limit height of pours to 12-inches (300 mm).
  - 2. Limit height of masonry to 16-inches (400 mm) above each pour.
  - 3. Pour grout only after vertical reinforcing is in place; place and tie horizontal reinforcing before grout is poured. Prevent displacement of bars as grout is poured.
  - 4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

E. High-Lift Grouting: Comply with California Building Code (CBC) Chapter 21.

1. To prevent "blow-outs," pour no grout until the mortar has been set and cured. However, grout the walls as soon as possible after mortar has cured to reduce shrinkage and cracking of the vertical joints. All cleanout closures, reinforcing, bolts and embedded connection items are to be secured in position before grouting is started.
2. Handle grout from the mixer to the point of deposit in the grout space as rapidly as practical by pumping and placing methods which will prevent segregation of the mix and cause a minimum of grout splatter on reinforcing and masonry unit surfaces not being immediately encased in the grout lift.
3. Depending upon weather conditions and absorption rates of the masonry units, the lift heights and waiting periods may be varied. Under normal weather conditions, with typical masonry units, the individual lifts of grout are limited to four feet in height with a waiting period between lifts of 30 to 60 minutes.
4. Place the first lift of grout to a uniform height within the pour section and mechanically vibrate thoroughly to fill all voids. The grouting team should be organized to enable the vibration to follow closely behind and at the same pace as the pouring operation.
5. After a waiting period sufficient to permit the grout to become plastic, but before it has taken any set, the succeeding lift shall be poured and alternate cells vibrated 12-inches to 18-inches into the preceding lift. Do this in such a manner as to reconsolidate the preceding lift and close any plastic shrinkage cracks or separations from the cell walls.
6. If, because of unavoidable job conditions, the placing of the succeeding lift is going to be delayed beyond the period of workability of the preceding lift, reconsolidate each lift by reworking with the mechanical vibrator as soon as the grout has taken its settlement shrinkage.
7. Repeat the waiting, pouring and reconsolidation steps until the top of the pour is reached.
8. Reconsolidate the top lift after the required waiting period to fill any space left by settlement shrinkage.

F. Cleaning after Grouting: Immediately after the wall has been fully grouted, hose off with water under pressure through a jet nozzle, to remove all the scum and stains which have percolated through masonry units and joints.

G. Grout Curing: Coordinate proper curing of mortar joints and grout pour. Concrete masonry faces and top of grout pour shall be kept damp to prevent too rapid drying during hot or dry weather, and drying winds.

H. Construction Joints: When grouting is halted for one hour or longer, horizontal construction joints shall be formed by stopping the pour of the grout 1-1/2 inches below top of uppermost unit.

I. Inspection Hole Filling: After inspection of concrete grout spaces, plug cleanout holes with masonry units. Brace against wet grout pressure.

### 3.7 FIELD QUALITY CONTROL

- A. Field Quality Control, General: All masonry work shall be continuously inspected during laying and grouting by Testing Laboratory, employing inspector specially approved for such purpose by AUTHORITY HAVING JURISDICTION (AHJ).
  - 1. Testing Laboratory will take test samples and perform such tests as required by California Building Code (CBC), Sections 2105A.3, 2105A.4, 2105A.5 and 2105A.6.
  - 2. Testing Laboratory will check materials, details of construction and construction procedures.
  - 3. Testing Laboratory will submit verified report that the Work covered by the report has been performed and materials use and installed in every particular in accordance with and in conformance to the approved Contract Drawings and Contract Specifications.
- B. Field Testing Mortar and Grout: Comply with requirements of California Building Code (CBC), Section 2105A.5.
- C. Core Tests: Testing Laboratory will make core tests of completed masonry construction in accordance with California Building Code (CBC), Section 2105A.4.
  - 1. Testing Laboratory will inspect coring of masonry walls and prepare report of coring operations.
    - a. In this report, the number, the location, and the condition of all cores cut on the project will be stated.
    - b. Particular attention will be paid to description of bond between grout fill and cell walls of masonry unit.
    - c. Report will also include description of difficulties encountered in coring operation which might impair strength of sample.
  - 2. One-half of cores will be tested for bond strength of joint between masonry units and grout. This test will determine the unit force required to shear masonry unit face shells from grout core for each face.
- D. Mortar and Grout Testing: Comply with requirements of California Building Code (CBC), Section 2105A.5.

### 3.8 TOLERANCES

- A. Maximum Variation from Unit to Adjacent Unit: 1/16-inch (1.6 mm).
- B. Maximum Variation from Plane of Wall: 1/4-inch in 10 ft (6 mm/3 m) and 1/2-inch in 20 ft (13 mm/6 m) or more.
- C. Maximum Variation from Plumb: 1/4-inch (6 mm) per story non-cumulative; 1/2-inch (13 mm) in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8-inch in 3 ft (3 mm/m) and 1/4-inch in 10 ft (6 mm/3 m); 1/2-inch in 30 ft (13 mm/9 m).
- E. Maximum Variation of Joint Thickness: 1/8-inch in 3 ft (3 mm/m).

### 3.9 POINTING, CLEANING AND PROTECTION

A. Pointing:

1. At final completion of unit masonry Work, fill holes in joints and tool.
2. Cut out and repoint defective joints.
3. Dry brush masonry surface after mortar has set, at end of each day's Work and after final pointing.
4. Leave Work and surrounding surfaces clean and free of mortar spots and droppings.

B. Progress Cleaning:

1. Clean masonry as Work progresses by dry brushing surface after mortar has set.
2. Clean surfaces again at end of each day's Work and after final pointing.
3. Leave masonry and surrounding surfaces clean and free of mortar spots and droppings.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry.

1. Dry brush masonry surface. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain OWNER'S REPRESENTATIVE'S review of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.
5. Prepare joints for application of sealants.

D. Protection: Without damaging completed Work, provide protective boards at exposed external corners which are subject to damage by construction activities.

1. Protect sills, ledges and off-sets from mortar drippings or other damage during construction. Remove misplaced mortar or grout immediately.
2. Cover top of walls with non-staining waterproof coverings when Work is not in progress.

E. Repairing Masonry: Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units.

1. Install new units to match adjoining units.

2. Install new units in fresh mortar and grout, pointed to eliminate evidence of replacement.

**END OF SECTION**



**SECTION 05 05 13****SHOP-APPLIED COATINGS FOR METAL (TNEMEC AND ZINC PRIMING)****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Ornamental Metal, fabrication and construction for all ornamental metal fencing, gates, guard rails, and handrails
- B. General. The materials for ornamental metal items.
- C. SSPC Surface Preparation Standards

**PART 2 - PRODUCTS**

- A. Polyamidoamine Epoxy/Aliphatic Acrylic Polyurethane, as provided by **Tnemec Company** Incorporated, or approved equal, 417 East Weber Avenue, Compton, CA 90222. Phone 310-639-9810. Fax 310-637-4161.
- B. ~~Dynaflux 309-16 Spray Galv Zinc Galvanizing Spray. As provided by Dynaflux, Inc. 241 Brown Farm Road, Cartersville, GA 30120. Phone: 770.382.8843. Fax: 770.382.9034 [www.dynaflux.com](http://www.dynaflux.com)~~
- C. All site metal fencing, guardrails, handrails, gates as indicated on plans.

**PART 3 – EXECUTION****3.1 FABRICATION:**

- 1. Miscellaneous metal work which will be exposed to view shall only be fabricated with materials that are smooth and free of surface blemishes, including, but not limited to, pitting, seam marks, trade names, and roughness. Remove such blemishes by grinding or by welding and grinding prior to cleaning, treating or applying surface finishes.
- 2. Shop Assembly: Work shall be fitted, shop assembled, and ready for erection when identified on construction schedule.
- 3. Workmanship: Form metals to shape and size with sharp lines and angles, and with smooth surfaces and faces free from distortion. Mill fastening to a close fit. Do all fitting true to line. Bend or form all tubing, pipe, and other members to continuous and true curves with all joints flush and neatly fastened together. All fabrications shall be square, plumb, straight, and true.
- 4. Jointing and Connections: Jointing and intersections shall be accurately made in true planes and tightly fitted to hairline joints. Connections shall be welded. Do not use screws

unless specifically shown or required - if used, screws shall be countersunk with a metal compatible with the members being joined.

5. Welding: Welding shall conform to the requirements of the "Structural Welding Code" ASW D1.1. Where welds are exposed to views, bevel members prior to welding and weld full. Grind welds flush, smooth, level with the adjacent surfaces. Grind welds at intersecting members to sharp lines.
6. Holes: Accurately space to centers such that holes are not poorly or carelessly seamed.
7. Anchorage: Fabricate and space anchoring devices to provide adequate support for intended use.
8. Insulation of metals from contact with masonry and different metals from contact with each other shall be provided where necessary to prevent corrosion.
9. Debur and grind smooth all welds and rough spots.
10. All ornamental metal fabrications shall be abrasive blasted per SSPC-SP6 Commercial blast cleaning prior to the application of the zinc thermal spray. Surface must be free of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter.
11. Shop Applied – High Performance Coating System:
  - a. Primer: All ornamental metal fabrications shall receive 2 to 4 mil. zinc thermal sprayed metalized primer per ANSI/AWS C218.93, ASTM C633, ASTM B833-93, and SSPC-CS Guide 23.00, June 1, 1991. Contact: Zinc Nation, Inc. Contact: Whitney Blakeslee. Phone: 714-239-6190. CONTRACTOR shall submit sample of metalizing for review and approval prior to metalizing ornamental metal items. Sample shall be prepared by Zinc Nation or approved equal. Following metalizing, CONTRACTOR shall provide "Certification of Metalizing" by Zinc Nation to city prior to delivery of metal works to site. Certification shall note specific project name, location, OWNER'S REPRESENTATIVE and a list of elements which were metalized (gates, fencing, handrails, guardrails, etc.) Failure to provide certification will require CONTRACTOR to return subject project elements to **Zinc Nation** for sand blasting, metalizing and subsequent application of specified coating (Tnemec Coating, See Sections 210 and 304) at no cost to OWNER'S REPRESENTATIVE.
  - b. Intermediate & Finish Coats: Polyamidoamine Epoxy/Aliphatic Acrylic Polyurethane, as provided by **Tnemec Company** Incorporated, or approved equal, 417 East Weber Avenue, Compton, CA 90222. Phone 310-637-2363. Fax 310-637-4161.
    1. Local Tnemec Representative – TPC Consultants, Chris Hille, (720)278-4817, [chille@tnemec.com](mailto:chille@tnemec.com)
    2. Web Site [www.tnemec.com/tpc](http://www.tnemec.com/tpc). Equivalent materials of other manufacturers may be substituted only by approval of the OWNER'S REPRESENTATIVE. Requests for substitution shall include manufacturer's literature for each product giving the name, generic type, descriptive information, solids by volume, recommended film thicknesses, performance criteria and a list of five projects where each product has been used and rendered satisfactory service. No

request for substitution shall be considered that would decrease the film thickness or offer a change in the generic type of the coating.

- c. Intermediate: Tnemec Series L69 Hi-Build Epoxoline DFT 4.0 to 6.0 mils.
- d. Finish Coat: Tnemec Series 1095 Endura-Shield, (Semi-Gloss) DFT 3.0 to 5.0 mils.
- e. Total DFT: 9.0 to 15.0 mils. (Including zinc metalizing)
- f. Color: ALL colors to be approved prior to fabrication. Color selections shall match Architectural Plans, Details, and Specifications. **The contractor shall submit a sample panel for approval of the custom color prior to manufacturing.**

1. **Motion Graphic Screen Wall**
  - a. **Frame Mathews Pumpnickle MP06179 LRV11.5**
  - b. **Printed Colors Background, Mathews Sterling Silver, MP18071 LRV60.8**
  - c. **Printed Graphic Overlay Mathews, Color Garbo Silver MP02650 LRV66.5**
2. **Moveable Screen Wall**
  - a. **Frame Mathews Pumpnickle, MP06179 LRV11.5**
  - b. **Printed Colors Background, Mathews Sterling Silver, MP18071 LRV60.8**
  - c. **Printed Graphic Overlay Mathews, Color Garbo Silver MP02650 LRV66.5**
3. **Monitor Walls**
  - a. **Frame and Metal Skirt, Frame Mathews Color Pumpnickle, MP06179 LRV11.5**
  - b. **PEE CHEE graphics on either side of monitor walls to match the colors of the onsite graphics. Monitor walls panels graphics should be opposite of the other side. "There are 3 monitor walls per activity area. Gold/Maroon/Gold and the other side is Marron/Gold/Marron, Wayfinding end panels shall be the project site Maroon facing the internal Common walkway.**
4. **Omega Fence – Architectural Series**
  - a. **Either Bronze PM311Asso **Signal Black RAL 9004** Fence and post color shall be a custom color to match the Dunn Edwards color Black Russian DE6391.**
  - b. **Chocolate Brown RAL 8017**
5. **FAM ACT Canopy **Stage and Family Activity Area Canopy****
  - a. **Tnemec Semi – Gloss Color **Medium Bronze 85BR** – Custom **Black Russian\*****
6. **Sports Canopy**
  - a. **Tnemec Semi-Gloss Color Montana 80BR**
7. **Tubular Steel **Fencing** and Entry Gates**
  - a. **Tnemec Semi – Gloss Color **Medium Bronze 85BR** Custom **Black Russian\*****
8. **Handrails**
  - a. **Tnemec Semi-Gloss Color Montana 80BR**
9. **Guard Rails**
  - a. **Tnemec Semi-Gloss Color Montana 80BR**
10. **LED Video Wall (All structural members, frames, catwalk (excluding LED panels)**

- a. Tnemec Semi – Gloss Color ~~Medium Bronze 85BR~~ Custom Black Russian\*
- 11. ~~Backstop~~ Chainlink Fencing (Posts, fabric, gates, frames, bands, caps, latches, tension bars, brace bands, hinges, all hardware)
  - a. ~~Satin Black per H&M Welding and Powder Coating~~
  - b. Permafused II color "Midnight Black"
- 12. 30' and 40' Netting Poles, Backstop Poles & All Associated Backstop Hardware (Bolts, brackets, hardware, fasteners, shouldered eyebolts, washers, molded synthetic wood fasteners and connections)
  - a. ~~Alesta Powder Coating number PFB652S6 "Vulcan Black"~~
  - b. Semi Gloss per H&M Welding and Powder Coating
- 13. 20' Netting Poles, & All Associated Hardware (Bolts, brackets, hardware, fasteners, shouldered eyebolts, washers, molded synthetic wood fasteners and connections)
  - a. Permafused II color "Midnight Black"

\*Tnemec Custom Color Black Russian to match Dunn Edwards DE6391 Contact Adam Hobbs (310) 804-3605 (Tnemec Sales Rep) for Custom Color

### 3.2 PERFORMANCE CRITERIA:

1. System Type: Aromatic Urethane, Zinc-Rich / Polyamidoamine Epoxy / Aliphatic Acrylic Polyurethane.
2. Surface Preparation (Field): SSPC-SP2, SSPC-SP3 or SSPC-SP11
3. Primer (Field Touch-Up of Metalizing): Apply ~~Dynaflux 309-16 Spray Galv Zinc Galvanizing Spray. DFT 2.5-3.5 mils.~~ Series 94-H2O Hydro-Zinc 2-4 mils DFT
4. Intermediate: Series L69 Hi-Build Epoxoline II, DFT 3.0 to 5.0 mils
  - a. Volatile Organic Compounds: 98 grams/Litre
  - b. HAPs Content: 0.00 lbs/gallon solids
  - c. ASTM D 4541 Adhesion: Not less than 1.943 psi
  - d. ASTM B 117 Salt Spray (Fog): Not more than 3/16" rust creepage at scribe after 20,000 hours exposure
5. Finish Coat: Aliphatic Acrylic Polyurethane. (Tnemec Series 1095 Endura-Shield) **COLOR PER 3.1-11-F:COLOR (THIS SECTION)**
6. Description: A user friendly, low VOC, aliphatic polyurethane coating that provides excellent color and gloss retention for exterior applications to steel, concrete and other miscellaneous substrates.
7. Properties:
  - a. Solids by Volume: 66%
  - b. VOC:
    - i. Unthinned: 0.73 lbs/gallon (88 grams/litre)
    - ii. Thinned 15% (No. 46 Thinner: 0.81 lbs/gallon (97 grams/litre)
8. Curing Time: At 75 degrees F (24 degrees C) (curing time varies with surface temperature, air movement, humidity, and film thickness.)

- a. To Touch: 1-2 hours
  - b. To Handle: 9 hours
  - c. To Re-coat: 10-12 hours
5. Performance Criteria:
- a. Adhesion: ASTM D4541 (Elcometer): No less than 1,469 psi (10.13 MPa) pull; average of three trials.
  - b. Impact: ASTM D2794, No visible cracking or delamination of film after 25 inch-pounds (2.82 J) direct impact, average of four tests..
  - c. Hardness: ASTM D3363: No gouging or scratching with an 3H or less pencil.
  - d. QUV: ASTM D4387, UVA-340 Bulbs: No blistering, cracking, or chalking. Less than 58% gloss retention and no more than 15.2 unit gloss loss and 1.4 DE<sub>00</sub> color change after 4,000 hours exposure.
  - e. Humidity: ASTM D4585: No blistering cracking rusting or delamination of film after 5,000 hours exposure.

### 3.3 INSTALLATION:

1. Ornamental metal items and fencing shall be erected in accordance with the plans. All work shall be erected square, plumb, straight, and true. Perform all required cutting, drilling, and filling. Accurately set and properly secure. Attach work in true planes, in alignment, properly reinforced and stiffened.
2. Embedded Items: Provide miscellaneous metal items to be embedded or installed in concrete.
3. Coordination with Related Work: Provide all anchors, sleeves, bolts, and connecting members necessary for securing metal work to other adjacent or adjoining work. Provide and install angles and other reinforcement. Do all cutting, puncturing, drilling, tapping, or modifying of adjacent or adjoining work where necessary for proper installation. Furnish all sockets, bolts, anchors, and other portions of this work to the various trades where needed that are to be built into the structure and be responsible for their accurate spacing and setting.
4. Expansion and Contraction: Assemble and install work with adequate provisions to prevent objectionable distortion and overstressing from expansion and contraction. Construct to be weather-tight where exposed to the weather.
5. Touch-up Painting: Immediately after erection of Ornamental metal items and fencing, all bare steel areas including welds shall be thoroughly cleaned per SSPC-SP11 Power-Tool cleaning to white metal and spot primed with—~~Dynaflux 309-16 Spray Galv Zinc~~ **Galvanizing Spray at 2.5 to 3.5 mils DFT** ~~Series 94-H2O Hydro-Zinc 2-4 mils DFT~~. All other areas that the shop applied coating system has been damaged, abraded, or needs repair, shall be re-coated with the intermediate polyamidoamine epoxy and aliphatic acrylic polyurethane finish coat to match all existing surfaces. If the ornamental metal includes nuts and bolts, these will need to be prepared prior to field painting by power tool cleaning per SSPC-SP3 and coating with the polyamidoamine epoxy & aliphatic acrylic polyurethane coating to match existing structure.
6. Miscellaneous Steel Items: Provide all necessary steel items required which are not specified elsewhere. All necessary supports, guides, brackets, etc., shown or required shall be provided.

7. Provide a minimum 2 gallons of the epoxy and 1 gallon of the polycarbamide for field touch up paint to City for their on-going use.

**END OF SECTION**

**SECTION 05 12 00.01**  
**STRUCTURAL STEEL FRAMING**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Structural steel framing members and support members.
- B. Baseplates, and anchor bolts.
- C. Grouting under baseplates.

**1.2 REFERENCES**

- A. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2.
- B. ASTM A36 - Carbon Structural Steel.
- C. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
- D. ASTM A108 - Steel Bars, Carbon, Cold-Finished, Standard Quality.
- E. ASTM A307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- F. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- G. ASTM A992 - Standard Specification for Steel for Structural Shapes for Use in Building Framing.
- H. ASTM C1107 - Packaged Dry, Hydraulic Cement Grout (non shrink).
- I. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 KSI Yield Strength.
- J. AWS A2.4 - Standard Welding Symbols.
- K. AWS D1.1 - Structural Welding Code - Steel.
- L. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- M. SSPC - The Society for Protective Coatings.

**1.3 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings:
  - 1. Indicate profiles, sizes, spacing, and locations of structural members, connections, cambers, and loads.

- 2. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Submit under provisions of Section 01 33 00 certifying that products meet or exceed specified requirements.
- D. Mill Test Reports: Submit under provisions of Section 01 33 00 Manufacturer's Certificates, indicating structural strength and destructive and non-destructive test analysis.
- E. Welders' Certificates: Submit under provisions of Section 01 33 00, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

#### **1.4 QUALITY ASSURANCE**

- A. Fabricate structural steel members in accordance with AISC-Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

#### **1.5 QUALIFICATIONS**

- A. Design connections not detailed on the Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of California.
- B. Design connections in accordance with CBC California Building Code, (CCR) California Code of Regulations, Title 24, Part 2, Chapter 22.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- A. Provide structural steel with a minimum post consumer recycled content of 75 percent.
- B. Structural Steel Members: ASTM A36. W and WT shapes, ASTM A992.
- C. Structural Tubing: ASTM A500, Grade B.
- D. Steel Pipe: ASTM A53, Grade B.
- E. Shear Stud Connectors: ASTM A108, Grade 1015, forged steel, headed, unfinished.
- F. Anchor Bolts: ASTM A307. ASTM F1554 if over 9-1/2 inches long.
- G. Welding Materials: AWS D1.1; type required for materials being welded.
- H. Grout: ASTM C1107, non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.

#### **2.2 FABRICATION**

- A. Fabricate structural steel members in accordance with AISC Specification.
- B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.



**2.3 FINISH**

- A. Prepare structural component surfaces in accordance with SSPC SP-2.
- B. Shop and Touch-Up Primer: SSPC 15, Type 1, Red Oxide.
- C. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded or in contact with concrete or masonry.
- D. Finish: Site paint exposed to view structural steel members under provisions of Section 09 90 00 AND section 09 94 00 POWDER COATING AND section 09 97 13 – STEEL COATINGS AND 05 05 13 SHOP-APPLIED COATINGS FOR METAL (TNEMEC AND ZINC PRIMING)

**2.4 SOURCE QUALITY CONTROL AND TESTS**

- A. Testing and analysis of components will be performed under provisions of Section 01 45 00.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

**3.2 ERECTION**

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- B. Field weld components indicated on Drawings.
- C. Field connect members with threaded fasteners indicated; torque to required resistance.
- D. Do not field cut or alter structural members without approval of OWNER'S REPRESENTATIVE.
- E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

**3.3 GROUTING**

- A. Clean concrete on masonry bearing surfaces.
- B. Roughen bearing surface prior to setting base and bearing plates.
- C. Set base and bearing plates on wedges, shims, or setting nuts.
- D. Tighten anchor bolts after members are positioned and plumb.
- E. Cut off protruding wedges or shims flush with edge of base or bearing plate.
- F. Pack grout solidly between bearing surfaces and plates so no voids remain.
- G. Finish exposed surfaces, protect installed materials, and allow to cure.

**3.4 ERECTION TOLERANCES**

- A. Erect structural steel members in accordance with AISC Specification.

**3.5 RECYCLING CONSTRUCTION WASTE**

- A. Recycle excess materials waste under the provisions of Section 01 74 00.

**3.6 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed under provisions of Section 01 45 00.

**END OF SECTION**

**SECTION 05 50 00.01****MISCELLANIOUS METALS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Shop fabricated ferrous metal items, galvanized, metalized, and primed and coated.
- B. Schedule of metal fabrications.
- C. Omega II Fence System, Style "Omega Architectural Welded Wire Fence"

**1.2 REFERENCES**

- A. ASTM A36 - Structural Steel.
- B. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- F. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- G. ASTM A780 - Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- H. AWS A2.4 - Standard Welding Symbols.
- I. AWS D1.1 - Structural Welding Code - Steel.
- J. SSPC - The Society for Protective Coatings.
- K. Section 05 05 13 – SHOP-APPLIED COATINGS FOR METAL (TNEMEC AND ZINC PRIMING)
- L. Section 09 94 00 – POWDER COATING

**1.3 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- C. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

**1.4 QUALIFICATIONS**

- A. Welders' Certificates: Submit under provisions of Section 01 33 00, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

## 1.5 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Drawings.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Steel Sections: ASTM A36.
- B. Steel Tubing: ASTM A500, Grade B.
- C. Plates: ASTM A36.
- D. Pipe: ASTM A53, Grade B, Schedule 40.
- E. Bolts, Nuts, and Washers: ASTM A307 galvanized to ASTM A153 for galvanized components.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Shop and Touch Up Primer: SSPC 15, Type 1, red oxide.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC 20.
- I. A minimum of 50 percent of the materials of this section shall be manufactured within 500 miles of the project site. **Exceptions will be made for the Omega Fence System only.**
- J. A minimum of 20 percent of the materials manufactured within 500 miles of the project site must have raw materials extracted/harvested within 500 miles of the project site.

### 2.2 FABRICATION, GENERAL

- A. Fit and shop assemble in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds unless indicated otherwise.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

- G. Omega II Architectural Series Shall be welded wire 6GA (4.88mm) Inline fence post shall be 2"x2" square. End post & Post flanking gate shall be 3"x3" square per plans and details. Contractor to submit shop drawings prior to fabrication.

## 2.3 FINISHES

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime paint items with one coat.
- D. Galvanize assembled items to minimum 1.25 oz/sq ft zinc coating in accordance with ASTM A123.
- E. Repair damaged galvanized surfaces in accordance with ASTM A780 Method A2.
- F. Finish: Site paint exposed to view prime painted and galvanized items under provisions of Section 09 90 00 AND 09 94 00 – POWDER COATING AND 09 97 13 – STEEL COATINGS AND 05 05 13 SHOP-APPLIED COATINGS FOR METAL (TNEMEC AND ZINC PRIMING)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

### 3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

### 3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated on Drawings.
- D. Perform field welding in accordance with AWS D1.1.
- E. Obtain OWNER'S REPRESENTATIVE approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

**END OF SECTION**

**SECTION 07 19 00**  
**WATER REPELLENTS**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Water repellent coating.
- B. Application schedule.

**1.2 QUALITY ASSURANCE**

- A. Perform work in accordance with manufacturer's printed instructions.
- B. Maintain one copy of document on site.

**1.3 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacture of water repellent coatings with five years minimum experience.
- B. Applicator: Acceptable to manufacturer.

**1.4 SUBMITTALS**

- A. Submit product data under provisions of Section 01 33 00.
- B. Include details of product description, tests performed, limitations to coating, cautionary procedures required during application, and chemical properties, including percentage of solids.
- C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.
- D. Submit manufacturer's certificate under provisions of Section 01 33 00 that products meet or exceed specified requirements and that their application was according to manufacturer's recommendation.
- E. Submit manufacturer's certificate that products supplied comply with local regulations controlling the use of volatile organic compounds (VOC).
- F. Submit manufacturer's test and inspection reports under provisions of Section 01 33 00.

**1.5 PRE-INSTALLATION CONFERENCE**

- A. Convene a pre-installation conference two weeks prior to commencing work of this Section, under provisions of Section 01 31 00.
- B. Review installation procedures and coordination required with related work.

**1.6 FIELD SAMPLE**

- A. Apply coating to 24 sf area of each surface to be waterproofed where directed by OWNER'S REPRESENTATIVE.
- B. Apply number of coats specified. Color change or surface sheen is cause for rejection of product.

**1.7 WARRANTY**

- A. Provide manufacturer's 5-year warranty for materials and their installation.
- B. Warranty: Maintain treated surface free from penetration of moisture. Repair damage to interior surface of walls that moisture has penetrated.

**1.8 REGULATORY REQUIREMENTS**

- A. Comply with all current federal, state, and local volatile organic compound (VOC) regulations.

**1.9 ENVIRONMENTAL REQUIREMENTS**

- A. Do not apply coating when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

**PART 2 PRODUCTS****2.1 ACCEPTABLE MANUFACTURERS**

- A. Degussa, [www.protectosil.com](http://www.protectosil.com).
- B. Hydrozo, Inc., [www.chemrex.com](http://www.chemrex.com).
- C. Monopole International, Inc., [www.monopoleinc.com](http://www.monopoleinc.com).
- D. Okon, Inc., [www.okoninc.com](http://www.okoninc.com).
- E. Pecora Corp., [www.pecora.com](http://www.pecora.com).
- F. Pro So Co., Inc. [www.prosoco.com](http://www.prosoco.com).
- G. Substitutions: Under provisions of Section 01 60 00.
- H. Carlisle Coatings & Waterproofing [www.carlisleccw.com/](http://www.carlisleccw.com/)
- I. Rain Guard Pro [www.rainguardpro.com](http://www.rainguardpro.com)

**2.2 MATERIALS**

- A. Coatings: Clear, non-yellowing formulations containing no silicones.
- B. Degussa, Aqua-trete Concentrate.



- C. Hydrozo, Inc., Enviroseal Double 7HD.
- D. Monopole International, Inc., Aquaseal Micro Emulsion.
- E. Okon, Inc., Block Plugger/W2 Sealer.
- F. Pecora Corp., Klere-Seal 920-W Silane/Siloxane.
- G. Pro So Co., Sure Kleen Weather Seal Siloxane WB.

## **PART 3 EXECUTION**

### **3.1 INSPECTION**

- A. Verify joint sealants are installed and cured.
- B. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of coating.
- C. Beginning of installation means acceptance of substrate.

### **3.2 PREPARATION**

- A. Remove loose particles and foreign matter.
- B. Remove oil or foreign substance with a chemical solvent which will not affect coating.
- C. Protect adjacent surfaces not scheduled to receive coating.
- D. If applied on unscheduled surfaces, remove immediately, by approved method.

### **3.3 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed under provisions of Section 01 45 00.
- B. Manufacturer of water repellant coating shall provide the following inspection services:
  - 1. Application start-up inspection.
  - 2. Periodic inspections during application.
  - 3. Certification of materials and application.

### **3.4 APPLICATION**

- A. Delay work until substrate is cured a minimum of 30 days.
- B. Apply coating in two continuous successive wet-on-wet applications in accordance with manufacturer's instructions, using airless spray with coverage, recommended by manufacturer for substrate being coated.

**3.5 PROTECTION AND CLEANING**

- A. Protect adjacent surfaces from damages and stains.
- B. Clean materials from surfaces where inadvertently applied.
- C. Protect finished installation under provisions of Section 01 60 00.

**3.6 SCHEDULE**

- A. Exposed surfaces of exterior concrete walls.

**END OF SECTION**

**SECTION 07 90 00**  
**JOINT PROTECTION**

**PART 1 - GENERAL**

**1.1 SECTION INCLUDES**

- A. Preparing sealant substrate surfaces.
- B. Sealant and backing.

**1.2 SUMMARY OF SEALANT LOCATIONS**

- A. Joints in horizontal surfaces.
  - 1. Expansion and isolation joints in cast-in-place concrete slabs.
  - 2. Expansion and isolation joints in masonry paving.
  - 3. Joints in precast concrete paving units.
  - 4. Joints in stone paving units.
  - 5. Control and expansion joints in ceramic and quarry tile.
  - 6. Control and expansion joints in soffits, ceilings, and overhead surfaces.
  - 7. Joints on underside of precast beams and planks.
  - 8. Other joints as indicated.
- B. Joints in vertical surfaces:
  - 1. Expansion and isolation joints in cast-in-place concrete.
  - 2. Expansion and isolation joints in masonry.
  - 3. Joints in precast concrete.
  - 4. Expansion and isolation joints in stonework.
  - 5. Control and expansion joints in ceramic and quarry tile.
  - 6. Other joints as indicated.

**1.3 REFERENCES**

- A. ASTM C834 - Latex Sealing Compounds.
- B. ASTM C919 - Practices for Use of Sealants in Acoustical Applications.
- C. ASTM C920 - Elastomeric Joint Sealants.

- D. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- E. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- F. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, Solvent Release Type.
- G. SWRI - (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

#### **1.4 SUBMITTALS**

- A. Submit product data under provisions of Section 01 33 00.
- B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, and color availability.
- C. Submit samples under provisions of Section 01 33 00.
- D. Submit two samples 4 inches long in size illustrating colors selected per plans.

#### **1.5 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.
- B. Applicator: Company specializing in applying the Work of this Section with minimum three years documented experience, approved by sealant manufacturer.
- C. Conform to Sealant, Waterproofing, and Restoration Institute (SWRI) requirements for materials and installation.
- D. Perform Work in accordance with ASTM C1193.
- E. Perform acoustical sealant application work to provide maximum STC values in accordance with ASTM C919.

#### **1.6 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install solvent curing sealants in enclosed building spaces.
- B. Do not install sealant when temperature is less than 40 degrees F.
- C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

#### **1.7 OPERATION AND MAINTENANCE DATA**

- A. Submit maintenance data under the provisions of Section 01 77 00.
- B. Submit recommended inspection intervals for sealant joints.
- C. Submit instructions for repairing and replacing failed sealant joints.

#### **1.8 WARRANTY**

- A. Provide 5-year warranty under provisions of Section 01 77 00.
- B. Include coverage for installed sealants and accessories which fail to achieve air and water seal and exhibit loss of adhesion or cohesion or do not cure.

## **PART2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content limits when calculated according to South Coast Air Quality Management (SCAQMD) Rule 1168, and must meet or exceed the requirements of the Bay Area Quality Management District Regulation 8, Rule 5.
  - 1. Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.

### **2.2 MANUFACTURERS**

- A. Manufacturers and their products are listed for each type of sealant. Acceptable manufacturers include the following:
  - 1. Dow Corning Corp., [www.dowcorning.com](http://www.dowcorning.com).
  - 2. General Electric Co., [www.gesealants.com](http://www.gesealants.com).
  - 3. Pecora Corp., [www.pecora.com](http://www.pecora.com).
  - 4. Sika Corp., [www.sikausa.com](http://www.sikausa.com).
  - 5. Sonneborn/ChemRex, [www.chemrex.com](http://www.chemrex.com).
  - 6. Tremco, Inc., [www.tremcosealants.com](http://www.tremcosealants.com).
  - 7. United States Gypsum Co., [www.usg.com](http://www.usg.com).
  - 8. W.R. Meadows, Inc., [www.wrmeadows.com](http://www.wrmeadows.com).

### **2.3 SEALANTS**

- A. Type A - Acrylic Latex: One-part, non-sag, mildew resistant acrylic emulsion compound complying with ASTM C834, Type S, Grade NS, formulated to be paintable.
  - 1. Tremco, Inc., Acrylic Latex Caulk.
  - 2. Pecora Corporation, AC-20.

3. Sonneborn, Chemrex, Sonolac.
- B. Type B - Butyl Sealant: One-part, non-sag solvent-release-curing sealant complying with FS TT-S-001657 for Type 1 and formulated with a minimum of 75 percent solids.
1. Tremco, Inc., Tremco Butyl Sealant.
  2. Pecora Corporation, BC-158.
  3. Sonneborn, Chemrex, Multi-Purpose Sealant.
- C. Type C - Silicone Sealant: One-part nonacid-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.
1. Dow Corning Corp., Dow Corning 790.
  2. General Electric Co., Silpruf.
  3. Tremco, Inc., Spectrum 1.
  4. Pecora Corp., 864 or 890.
  5. Sonneborn/Chemrex, Omniseal.
- D. Type E - Neutral-Curing Silicone Sealant: One part medium modulus neutral-curing silicone sealant complying with ASTM C920, Type S, Grade NS, Class 25.
1. Dow Corning Corp., Dow Corning 795.
  2. General Electric Co., Ultraglaze 4000.
  3. Tremco, Inc., Spectrem 3.
  4. Pecora Corp., 895.
- E. Type F - One-Part Mildew-Resistant Silicone Sealant: Complying with ASTM C920, Type S, Grade NS, Class 25.
1. Dow Corning Corp., Dow Corning 786.
  2. General Electric Co., Sanitary 1700.
  3. Tremco, Inc., Tremsil 200.
  4. Pecora Corp., 863 or 898 White.
- F. Type G - Multi-Part Pourable Sealant: Complying with ASTM C920, Type M, Grade P, Class 25. Shore A hardness +40.
1. Tremco, Inc., THC900/901.
  2. Pecora Corp., Dynatred or Urexpan NR-200.
  3. Sika Corporation, Sikaflex 2c NS TG.

4. W.R. Meadows, Pourthane NS/SL.
- G. Type H - Acoustical Sealant: Nondrying, nonhardening permanently flexible conforming to ASTM C834.
  1. Pecora Corp., AIS-919 Acoustical Sealant.
  2. Tremco, Inc., Tremco Acoustical Sealant.
  3. United States Gypsum Co., Sheetrock Acoustical Sealant.

## **2.4 ACCESSORIES**

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## **PART3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that joint openings are ready to receive Work and field measurements are as shown on Drawings and recommended by the manufacturer.
- B. Beginning of installation means installer accepts existing substrate.

### **3.2 PREPARATION**

- A. Clean and prime joints in accordance with manufacturer's instructions. Prime if recommended by manufacturer.
- B. Remove loose materials and foreign matter which might impair adhesion of sealant.
- C. Verify that joint backing and release tapes are compatible with sealant.
- D. Perform preparation in accordance with ASTM C1193.
- E. Protect elements surrounding the Work of this Section from damage or disfiguration.

### **3.3 INSTALLATION**

- A. Install sealant in accordance with manufacturer's instructions.
- B. Measure joint dimensions and size materials to achieve required width/depth ratios.
- C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.

- D. Install bond breaker where joint backing is not used.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Tool joints concave unless otherwise detailed.

### **3.4 CLEANING AND REPAIRING**

- A. Clean work under provisions of Section 01 77 00.
- B. Clean adjacent soiled surfaces.
- C. Repair or replace defaced or disfigured finishes caused by Work of this Section.

### **3.5 PROTECTION OF FINISHED WORK**

- A. Protect sealants until cured.

### **3.6 SCHEDULE**

As noted on plans.

**END OF SECTION**



**SECTION 09 90 00**  
**PAINTING AND COATING**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Surface preparation.
- B. Products and application.
- C. Surface finish schedule.

**1.2 SUMMARY OF PAINTED SUBSTRATES**

- A. Section includes the application of paint systems on the following interior substrates:
  - 1. Primed or unprimed steel.
  - 2. Galvanized metal.
  - 3. Steel handrails, guardrails, and fittings.
  - 4. Bollards.
  - 5. Fencing
  - 6. Lighting
  - 7. Wood.
- B. Section includes the application of paint systems on the following exterior substrates:
  - 1. Primed or unprimed steel.
  - 2. Galvanized metal.
  - 3. Steel handrails, guardrails, and fittings.
  - 4. Bollards.
  - 5. Fencing
  - 6. Lighting
  - 7. Wood.
- C. Substrate listings are for principal surfaces only. Refer to drawings, details and individual specification sections for items, surfaces, and substrates not specifically listed.

### 1.3 REFERENCES

- A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
- B. SSPC - The Society for Protective Coatings.

### 1.4 SYSTEM DESCRIPTION

- A. Preparation of all surfaces to receive final finish.
- B. Painting and finishing work of this section using coating systems of materials including primers, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.
- C. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.
- D. Painting and finishing all exterior and interior surfaces of materials including structural, mechanical, and electrical work on site, in building spaces, and above or on the roof.
- E. Paint exposed surfaces except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces.

### 1.5 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this Section.

### 1.6 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with five years experience.
- B. Applicator: Company specializing in commercial painting and finishing with five years documented experience.
- C. Coats: The number of coats specified is the minimum number acceptable. If full coverage is not obtained with the specified number of coats, apply such additional coats as are necessary to produce the required finish.
- D. Employ coats and undercoats for all types of finishes in strict accordance with the recommendations of the paint manufacturer.
- E. Provide primers and undercoat paint produced by the same manufacturer as the finish coat.
- F. The minimum dry film thickness of each coat of paint shall comply with the manufacturer's recommendations for each type of paint used.

### 1.7 REGULATORY REQUIREMENTS

- A. Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this specification, comply with the more stringent provisions.
- B. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).
- C. Comply with South Coast Air Quality Management District (SCAQMD) Rule 1113. A copy of this regulation can be obtained from <http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1113.pdf?sfvrsn=28>
- D. In the South Coast Air Quality Management District (SCAQMD), where lower VOC contents are specified for a number of categories, certain products maybe covered under the manufacturer's SCAQMD - approved Averaging Program. As a result, certain products may be fully compliant with SCAQMD Rule 1113, despite having VOC contents higher than specified limits.

## 1.8 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00.
- B. Provide manufacturer's technical information and instructions for application of each material proposed for use by catalog number.
- C. List each material by catalog number and cross-reference specific coating with specified finish system.
- D. Provide manufacturer's certificate that products proposed meet or exceed specified materials.
- E. Submit samples under provisions of Section 01 33 00.
- F. Submit two samples 8-1/2 x 11 inch in size of each paint color and texture applied to cardboard. Resubmit samples until acceptable color, sheen and texture is obtained.
- G. On same species and quality of wood to be installed, submit two 4 x 8 inch samples showing system to be used.

## 1.9 FIELD SAMPLES

- A. Provide field samples under provisions of Section 01 33 00.
- B. On wall surfaces and other exterior and interior components, duplicate specified finishes on at least 100 sq.ft. of surface area.
- C. Provide full-coat finishes until required coverage, sheen, color, and texture are obtained.
- D. Simulate finished lighting conditions for review of field samples.

- E. After finishes are accepted, the accepted surface may remain as part of the work and will be used to evaluate subsequent coating systems applications of a similar nature.

#### **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site and store and protect under provisions of Section 01 60 00.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.
- C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing. Paint containers not displaying product identification will not be acceptable.
- D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.
- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

#### **1.11 ENVIRONMENTAL REQUIREMENTS**

- A. Provide continuous ventilation and heating facilities to maintain interior surface and ambient temperatures above 50 degrees F with a maximum humidity level of 50 percent for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperatures for Latex Paints: 50 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- D. Minimum Application Temperature for Varnish and Urethane Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

#### **1.12 EXTRA MATERIAL**

- A. Provide a five gallon unopened container of each color to OWNER'S REPRESENTATIVE.
- B. Label each container with color, texture, and locations in addition to the manufacturer's label.

### **PART 2 PRODUCTS**

#### **2.1 ACCEPTABLE MANUFACTURERS - PAINT**

- A. Unless specifically identified otherwise, product designations included in this section are

those of the Dunn-Edwards Corporation, [www.dunnedwards.com](http://www.dunnedwards.com) and shall serve as the basis of design standard for kind, quality, performance and function.

- B. Subject to full compliance with specified requirements, other manufacturers and their affiliate companies offering equivalent products are:
1. Behr Process Corp., [www.behrpaint.com](http://www.behrpaint.com).
  2. Benjamin Moore Paints, [www.benjaminmoore.com](http://www.benjaminmoore.com).
  3. Glidden Professional, [www.gliddenprofessional.com](http://www.gliddenprofessional.com).
  4. Kelly-Moore Paint Company, [www.kellymoore.com](http://www.kellymoore.com).
  5. Pittsburgh Paints, [www.ppg.com](http://www.ppg.com).
  6. Sherwin Williams, [www.sherwin-williams.com](http://www.sherwin-williams.com).
  7. Tnemec Company, Inc., [www.tnemec.com](http://www.tnemec.com).
  8. Vista Paint Corporation, [www.vistapaint.com](http://www.vistapaint.com).
  9. Dynaflux, [www.dynaflux.com](http://www.dynaflux.com)
- C. Substitutions: Under provisions of Section 01 60 00.

## 2.2 MATERIALS

- A. Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
- B. Good flow and brushing properties; capable of drying or curing free of streaks or sags.
- C. "Deep Tone" colors to be composed of 100 percent acrylic pigments with a colored base.
- D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- E. Chemical Components of Interior Paints and Coatings: Shall not exceed the limitations of Green Seal's Standard GS-11 and SCAQMD Rule 1113 averaging method for VOC content and the following restrictions:
1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
  2. Non-Flat Paints and Coatings: VOC content of not more than 50 g/L.
  3. Anticorrosive Coatings: VOC content of not more than 100 g/L.
  4. Varnishes and Sanding Sealers: VOC content of not more than 275 g/L.
  5. Stains: VOC content of not more than 250 g/L.

6. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
7. Restricted Components: Paints and coatings shall not contain any of the following:
  - (a) Acrolein.
  - (b) Acrylonitrile.
  - (c) Antimony.
  - (d) Benzene.
  - (e) Butyl benzyl phthalate.
  - (f) Cadmium.
  - (g) Di (2-ethylhexyl) phthalate.
  - (h) Di-n-butyl phthalate.
  - (i) Di-n-octyl phthalate.
  - (j) 1,2-dichlorobenzene.
  - (k) Diethyl phthalate.
  - (l) Dimethyl phthalate.
  - (m) Ethylbenzene.
  - (n) Ethylene Glycol.
  - (o) Formaldehyde.
  - (p) Hexavalent chromium.
  - (q) Isophorone.
  - (r) Lead.
  - (s) Mercury.
  - (t) Methyl ethyl ketone.
  - (u) Methyl isobutyl ketone.
  - (v) Methylene chloride.

- (w) Naphthalene.
- (x) Toluene (methylbenzene)
- (y) 1,1,1-trichloroethane.
- (z) Vinyl chloride.

### **2.3 FINISHES**

- A. Refer to schedule at end of Section for surface finish schedule.

## **PART 3 EXECUTION**

### **3.1 INSPECTION**

- A. Beginning of installation means acceptance of existing surfaces.

### **3.2 SURFACE PREPARATION - GENERAL**

- A. Galvanized Surfaces: Refer to 09 94 00 – POWDER COATING AND 09 97 13 – STEEL COATINGS AND 05 05 13 – SHOP-APPLIED COATINGS FOR METAL (TNEMEC AND ZINC PRIMING)
- B. Shop Primed Steel: Refer to 09 94 00 – POWDER COATING AND 09 97 13 – STEEL COATINGS AND 05 05 13 – SHOP-APPLIED COATINGS FOR METAL (TNEMEC AND ZINC PRIMING)

### **3.3 PROTECTION OF ADJACENT WORK**

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

### **3.4 APPLICATION**

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply prime coat to surfaces which are to be painted or finished.

- D. Apply each coat to uniform finish.

### **3.5 CLEANING**

- A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

### **3.6 PROTECTION OF COMPLETED WORK**

- A. Protect finished installation under provisions of Section 01 60 00.
- B. Erect barriers and post warning signs. Maintain in place until coatings are fully dry.
- C. Confirm that no dust generating activities will occur following application of coatings.

### **3.7 PATCHING**

- A. After completion of painting in any one room or area, repair surfaces damaged by other trades.
- B. Touch-up or re-finish as required to produce intended appearance.

### **3.8 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed under provisions of Section 01 45 00.
- B. The OWNER'S REPRESENTATIVE reserves the right to invoke the following test procedure at any time and as often as the OWNER'S REPRESENTATIVE deems necessary.
- C. The OWNER'S REPRESENTATIVE will engage the services of an independent testing agency to sample paint material being used.
- D. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the CONTRACTOR.
- E. The testing agency will perform appropriate quantitative materials analysis and other characteristic testing of materials as required by the OWNER'S REPRESENTATIVE.
- F. If test results show materials being used and their installation do not comply with specified requirements or manufacturer's recommendations, the CONTRACTOR may be directed to stop painting, remove noncomplying paint, pay for testing, and repaint surfaces to acceptable condition.

### **3.9 COLOR SCHEDULE**



- A. Paint and finish colors shall be selected by the OWNER'S REPRESENTATIVE from manufacturer's entire range of standard and custom color selections and special colors selected to match or compliment the colors of other materials, equipment, or components which comprise the work.
- B. Color: ALL colors to be approved prior to fabrication. Color selections shall match Architectural Plans, Details, and Specifications. **The contractor shall submit a sample panel for approval of the custom color prior to manufacturing.**

1. ~~Motion Graphic Screen Wall~~
  - a. ~~Frame Mathews Pumpnickle MP06179 LRV11.5~~
  - b. ~~Printed Colors Background, Mathews Sterling Silver, MP18071 LRV60.8~~
  - c. ~~Printed Graphic Overlay Mathews, Color Garbo Silver MP02650 LRV66.5~~
2. ~~Moveable Screen Wall~~
  - a. ~~Frame Mathews Pumpnickle, MP06179 LRV11.5~~
  - b. ~~Printed Colors Background, Mathews Sterling Silver, MP18071 LRV60.8~~
  - c. ~~Printed Graphic Overlay Mathews, Color Garbo Silver MP02650 LRV66.5~~
3. ~~Monitor Walls~~
  - a. ~~Frame and Metal Skirt, Frame Mathews Color Pumpnickle, MP06179 LRV11.5~~
  - b. ~~PEE CHEE graphics on either side of monitor walls to match the colors of the onsite graphics. Monitor walls panels graphics should be opposite of the other side. "There are 3 monitor walls per activity area. Gold/Maroon/Gold and the other side is Marron/Gold/Marron, Wayfinding end panels shall be the project site Maroon facing the internal Common walkway.~~
4. Omega Fence – Architectural Series
  - a. ~~Either Bronze PM311Asso~~ **Signal Black RAL 9004** Fence and post color shall be a custom color to match the Dunn Edwards color Black Russian DE6391.
  - b. ~~Chocolate Brown RAL 8017~~
5. ~~FAM ACT Canopy~~ **Stage and Family Activity Area Canopy**
  - a. Tnemec Semi – Gloss Color ~~Medium Bronze 85BR~~ **Custom Black Russian\***
6. Sports Canopy
  - a. Tnemec Semi-Gloss Color Montana 80BR
7. Tubular Steel **Fencing** and Entry Gates
  - a. Tnemec Semi – Gloss Color ~~Medium Bronze 85BR~~ **Custom Black Russian\***
8. Handrails
  - a. Tnemec Semi-Gloss Color Montana 80BR
9. Guard Rails
  - a. Tnemec Semi-Gloss Color Montana 80BR
10. **LED Video Wall (All structural members, frames, catwalk (excluding LED panels)**
  - a. Tnemec Semi – Gloss Color ~~Medium Bronze 85BR~~ **Custom Black Russian\***

11. **Backstop** Chainlink Fencing (Posts, fabric, gates, frames, bands, caps, latches, tension bars, brace bands, hinges, all hardware)
  - a. **Satin Black per H&M Welding and Powder Coating**
  - b. Permafused II color "Midnight Black"
12. 30' and 40' Netting Poles, Backstop Poles & All Associated Backstop Hardware (Bolts, brackets, hardware, fasteners, shouldered eyebolts, washers, molded synthetic wood fasteners and connections)
  - a. **Alesta Powder Coating number PFB652S6 "Vulcan Black"**
  - b. Semi Gloss per H&M Welding and Powder Coating
13. 20' Netting Poles, & All Associated Hardware (Bolts, brackets, hardware, fasteners, shouldered eyebolts, washers, molded synthetic wood fasteners and connections)
  - a. Permafused II color "Midnight Black"

\*Tnemec Custom Color Black Russian to match Dunn Edwards DE6391 Contact Adam Hobbs (310) 804-3605 (Tnemec Sales Rep) for Custom Color

#### END OF SECTION

**SECTION 09 94 00****POWDER COATING****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Powder coating applied to metal surfaces.

**1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM)
1. ASTM B117 – Practice for Operating Salt Spray (Fog) Apparatus.
  2. ASTM D522 – Test Methods for Mandrel Bend Test of Attached Organic Coatings.
  3. ASTM D523 – Test Method for Specular Gloss.
  4. ASTM D714 – Test Method for Evaluating Degree of Blistering of Paints.
  5. ASTM D968 – Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
  6. ASTM D1400 – Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base.
  7. ASTM D1654 – Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
  8. ASTM D1730 – Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.
  9. ASTM D2247 – Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
  10. ASTM D2794 – Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
  11. ASTM D3359 – Test Methods for Measuring Adhesion by Tape Test.
  12. ASTM D3363 – Test Method for Film Hardness by Pencil Test.
  13. ASTM D3451 – Practices for Testing Polymeric Powders and Powder Coatings.
  14. ASTM D4214 – Test Method for Evaluating Degree of Chalking of Exterior Paint Films

15. ASTM D4242 - 07: Standard Test Method for Inclined Plate Flow for Thermosetting Coating Powders.
  16. ASTM D5382 – A Guide to Evaluation of Optical Properties of Powder Coatings.
  17. ASTM D5861 – Guide to Significance or Particle Size Measurements of Coating Powders.
  18. ASTM D5965-96, C– *Specific Gravity*
  19. ASTM D3451-92, 13– *Mass Loss During Cure*
  20. ASTM D6441 – Test Methods for Measuring the Hiding Power of Powder Coatings
  21. ASTM D7378 - 10: Standard Practice for Measurement of Thickness of Applied Coating Powders to Predict Cured Thickness
- B. American Architectural Manufacturer's Association (AAMA)
1. AAMA 2604-05 – Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
- C. International Organization for Standardization (ISO)
1. ISO 1519 - Paints and varnishes - Bend test (cylindrical mandrel).
  2. ISO 1520 - Paints and varnishes - Cupping test.
  3. ISO 2409 - Paints and varnishes - Cross-cut test.
  4. ISO 2815 - Paints and varnishes - Buchholz indentation test.

### 1.3 SUBMITTALS

- A. Submit product data and colors to the OWNER'S REPRESENTATIVE for review and approval.
- B. Submit full records of all products used. List each product in relation to finish formula and include the following:
  1. Product type and use.
  2. Manufacturer's product number.
  3. Color numbers or descriptions.
  4. Manufacturer's Material Safety Data Sheets (MSDS).
- C. Submit manufacturer's application instructions for each product specified.

- D. Submit certification that all materials have been applied in accordance with the coating manufacturer's recommendations.

#### **1.4 SAMPLES**

- A. Submit 6 samples (8 1/2 x 11 size) of the color and finish of all powder coated products to the OWNER'S REPRESENTATIVE for review and approval.
- B. Submit full range of available colors where color availability is restricted.
- C. Use 1.5 mm (14 gage) aluminum or steel q-panels for sample finish.

#### **1.5 QUALITY ASSURANCE**

- A. Standard of Acceptance:
  - 1. Final coat to exhibit uniformity of color and uniformity of gloss across full surface area.
  - 2. Quality of coated products to conform to specified requirements.
  - 3. H&M Welding & Powder Coating (HMWPC) shall warranty its work for a period of 2 years. HMWPC warrants that the process of pretreatment, powder application, and cure of all coated parts meet or exceed the industry standards set forth by the powder manufacturers.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store, handle and protect coated materials in accordance with Section 01 60 00 - Product Requirements.
- B. Deliver and store materials in original packaging, sealed, with labels intact. (see Product Descriptions).
- C. Indicate on containers or wrappings:
  - 1. Manufacturer's name and address.
  - 2. Type of coating.
  - 3. Color number in accordance with established color schedule.
  - 4. Batch number.
- D. Provide and maintain dry, temperature controlled, secure storage.

#### **1.7 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain substrate and ambient temperature limits required by coating manufacturer.
- B. Apply coating only when surface to be coated is dry and adequately pre-treated.

**1.8 SCHEDULING**

- A. Submit work schedule for various stages of coating application.
- B. Submit schedule minimum 48 hours in advance of operations.

**PART 2 PRODUCTS****2.1 MANUFACTURER**

- A. Alesta Powder Coatings, 9800 Genard Rd. Houston, TX 77041-7624, T 1-800-247-3886, fax: 713-939-4027.
- B. H&M Welding & Powder Coating 935 W. Brooks St. Ontario CA 91762, T: 909-983-0306

**2.2 MATERIALS**

- A. Powder Coating: Alesta Powder Coating **Number PFB652S6 "Vulcan Black HP" COLOR PER SECTION 09 90 00 PAINTINGS AND COATING.**  
File Thickness 2.0 – 2.5 Mils, ALESTA AR300\*

**2.3 COLORS**

- A. See architectural drawings for specific colors and locations
- B. **COLOR PER SECTION 09 90 00 PAINTINGS AND COATING.**

**2.4 COATING FINISHES****POWDER PROPERTIES**

ASTM D5965-96, C	Specific Gravity	1.63 ± 0.05
	Theoretical Coverage	118 ft <sup>2</sup> /lb/mil
ASTM D3451-92, 13	Mass Loss During Cure	< 1%
	Recommended Shelf Life:	12 Months @ 75 °F

**COATING PROPERTIES**

ASTM D523-89	Gloss at 60°	58-68
DPC TM 10.219	PCI Powder Smoothness	6
ASTM D2454-95	Overbake Resistance, Time	100%
ASTM D3363-92a	Pencil Hardness	H-2H
ASTM D2794-93	Dir / Rev Impact, Gardner	160 / 160 in/lbs
ASTM D3359-97	Adhesion, Cross Hatch	5B Pass
ASTM D522-93a	Flexibility, Mandrel	1/8 in. dia., no fracture
ASTM B117-97	Salt Spray	1,000 hrs
UL DTOV2 Organic Coating	Steel Enclosures, Elect. Eq.	Recognized

**PART 3 EXECUTION**

### 3.1 PREPARATION

- A. Grind fabrication welds smooth.
- B. Clean surfaces prior to pretreatment coating.
- C. Surfaces to Receive Finishes: Dry and free of debris, oils, dust, or other deleterious materials.

### 3.2 PROCESS FOR BARE METAL:

- A. Cleaning: Clean the metal using a solvent-based cleaner to remove oils, grease, and contaminants.
- B. Sandblasting: Blast the metal with Garnet grade 8 abrasive to remove rust, old paint, and impurities, providing a textured surface for better adhesion.
- C. QC Inspection: Inspect the surface for any remaining impurities or oils. Repeat cleaning if necessary or blow off dust if needed.
- D. Sanding: Lightly scuff the surface to enhance powder coating adhesion.
- E. Powder Application: Apply the powder coat using electrostatic spray guns, ensuring an even coat and inspecting visually for uniformity.
- F. Curing: Cure the coated metal at the manufacturer's specified temperature and duration.
- G. Final Inspection: Inspect the cured coating for consistency, coverage, and defects. Apply additional coats if necessary.

### 3.3 PROCESS FOR GALVANIZED MATERIAL:

- A. Cleaning: Use a mild alkaline cleaner or degreaser to remove oils and contaminants without damaging the zinc coating.
- B. Surface Preparation: Avoid aggressive sandblasting; use light abrasive blasting with Garnet grade 8 to create a suitable surface profile.
- C. QC Inspection: Check for cleanliness and the proper surface texture for coating adhesion. Repeat cleaning if necessary or blow off dust if needed.
- D. Sanding: Lightly scuff the surface to enhance powder coating adhesion.
- E. Baking: Pre-bake the metal to outgas contaminants and promote adhesion.
- F. Powder Application: Apply the powder coat using electrostatic spray, ensuring a uniform application and adjusting settings to avoid uneven coverage.

- G. Curing: Cure at the appropriate temperature and time to prevent damage to the zinc coating.
- H. Final Inspection: Inspect for coating uniformity, coverage, and adhesion. Reapply or touch up as necessary.

### 3.4 CLEANING

- A. Clean surfaces to be coated as follows: Remove all dust, dirt, and other surface debris by vacuuming, wiping dry with clean cloths or compressed air.
- B. Rinse scrubbed surfaces with clean water until foreign matter is flushed from S Surface.
- C. Allow surfaces to drain completely and allow to thoroughly dry.
- D. If the above procedures do not clean the substrate surfaces, clean the surfaces with high pressure water washing.
- E. Apply pretreatment as soon as possible after cleaning and before surface deterioration occurs.
- F. Pre-treat iron phosphate for steel, zinc phosphate for galvanized or steel structures and yellow green chromating, or approved chrome-free for aluminum substrates.

### 3.3 APPLICATION

- A. Apply coating to requirements of coating manufacturer's written application instructions.
- B. Method of Application: As identified above and in plans and details and per manufacturer recommendations.
- C. Spray application: *Electrostatic Spray, Cold, Substrate: 0.032 in. CRS, Pretreatment: Bonderite® 1000, Parcolene® 60.*
  - 1. Provide and maintain equipment that is suitable for intended purpose, capable of properly fluidizing powder coating to be applied.
  - 2. Apply coating materials to clean surfaces to minimum 2.5 - 3.5 mil dry film thickness or as specified by manufacturer.
  - 3. Ensure coating adheres to internal corners and recessed areas.
- D. Allow surfaces to cure for minimum time period as required by manufacturer.
- E. Cure in accordance with manufacturer's cure curves, 10 minutes 400 degrees Fahrenheit.

**END OF SECTION**



**SECTION 09 96 23****GRAFFITI RESISTANT COATINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes:  
Permanent anti-graffiti coating system.

**1.2 QUALITY ASSURANCE**

- A. **CONTRACTOR Qualifications:** Installer shall be a firm with not less than three years of successful experience in application of coatings of type required on substrates similar to those of this project. The firm shall be approved by the manufacturer of the coating for installation of their product.
- B. Manufacturer's representative shall inspect substrate conditions including alkalinity and moisture content. Obtain written approval from representative before proceeding with work.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 00.
- B. **Instructions:** Provide instructions bearing manufacturer's name, coating type, and recommended installation procedures. Provide methods and material instruction for graffiti removal. Include adhesive-backed graffiti removal instruction label suitable for application to interior surface.
- C. Submit proof of purchase (Invoice of materials purchased) and proof of delivery of coating materials.
- D. **Manufacturer's Warranty:** Submit one copy of manufacturer's warranty for specified materials.
- E. **Field Sample:** Apply graffiti resistant coating to field mock-up sample representing exterior surfaces to be coated. Apply coating system over a minimum 3 ft. x 3 ft. test area and test removal of applied spray paint in presence of CONSTRUCTION MANAGER for approval using removal methods recommended by the manufacturer.

**1.4 EXTRA MATERIALS**

- A. Furnish the following to OWNER'S REPRESENTATIVE upon completion of the Project.
  - 1. Provide four containers of removal products as recommended by the manufacturer accompanied by removal instructions.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Coating orders to the manufacturer or supplier shall identify the store number, location, and address of project. CONTRACTOR shall require a record keeping account be established and maintained by the coating supplier which records graffiti resistant coating type, brand, and quantity purchased, for the specific project.
- B. Deliver coating materials in sealed original labeled containers, bearing manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and/or reducing.
- C. Store materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F in ventilated area and as required by manufacturer's instructions.
- D. Prevent fire hazards and spontaneous combustion.

## 1.6 WARRANTY

- A. Provide manufacturer's written warranty guaranteeing effective graffiti removal for not less than 5 years and warrant that treated surfaces can be effectively and repeatedly cleaned of graffiti without damage or loss of effectiveness of the graffiti resistant coating. Manufacturer shall, for the duration of the warranty period, guarantee replacement of product and labor to remove graffiti and replace graffiti resistant coating where graffiti removal has shown to be ineffective.

## 1.7 PROJECT CONDITIONS

- A. Environmental Requirements: Follow manufacturer's recommendations for temperature range in which coating may be applied.

## PART 2 - PRODUCTS

### 2.1 GRAFFITI RESISTANT COATING

- A. Graffiti resistant coating shall be a clear, sacrificial graffiti resistant coating which provides protection for exterior surfaces from permanent graffiti staining and damage caused by spray paint and marking pens. Coating shall be suitable for application to painted and unpainted surfaces including masonry, concrete, and metals. Product shall be a coating that dries clear, non-yellowing, with a low luster.  
Manufacturer: ~~"Graffiti Melt" anti-graffiti coating system, flat finish, by Genesis Coatings. 2780 La Mirada Drive, #D, Vista, CA 92081. T-(760)599-6011~~ Rain Guard Pro "VandIGuard" Original Anti-Graffiti Coating, 6061 Dale St. Unit K, Buena Park, CA 90621
- B. Graffiti Remover: Eaze Away or Gold Remover or other product as recommended by the manufacturer.
- C. Conditions with unpainted surfaces shall be primed with one coat of Micro-Seal® HD Silane / Siloxane Water Repellent by Rain Guard Pro. 6061 Dale St. Unit K, Buena Park, CA 90621

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verify all surfaces are ready to receive coating in accordance with manufacturer's printed requirements. Beginning of installation indicates acceptance of substrate.

**3.2 PREPARATION**

- A. Surface shall be free of dirt, dust, contaminants such as curing compounds, hardeners, bond breakers, and form release. Allow painted surfaces to cure properly. Do not water blast painted surfaces. Assure surfaces are clean and dry.
- B. Mask or otherwise protect adjacent surfaces not scheduled to receive coating. If applied on unscheduled surfaces such as glass, remove immediately, by approved method.
- C. Protect landscaping, property, and vehicles from over spray and drift.

**3.3 APPLICATION**

- A. Apply coating in accordance with manufacturer's published instructions.
- B. Application Rate: Apply each coat at the manufacturer's published application rate.

**3.4 SURFACES TO BE COATED**

- A. Apply graffiti resistant coating to all exterior exposed building surfaces visible from the ground level, including concrete, masonry, metal work, powder coated items where anti-graffiti powder coating has not been applied, and metal railing. Apply coating to painted and unpainted surfaces. Exclude horizontal surfaces subject to wheel or foot traffic. Apply per as noted on plans and at the direction of LANDSCAPE ARCHITECT.

**3.5 MAINTENANCE**

- A. Deliver cleaning projects to OWNER'S REPRESENTATIVE for storage and subsequent use for graffiti removal.

**3.6 FIELD QUALITY CONTROL**

- A. Verify application rate by periodic on-site inspection and calculation of area covered compared to consumption of coating material used. Document inspections showing total area covered and number and volume of coating containers used

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 09 97 13****STEEL COATINGS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Coating system of urethane zinc rich primer two-component epoxy primer and intermediate coats and two-component hybrid polyurethane finish coating, for shop- and field-finishing of:
  - 1. Exposed exterior structural steel.
  - 2. Miscellaneous steel fabrications.
  - 3. Exterior formed steel (hollow metal) gate and fence frames.

**1.2 RELATED SECTIONS**

- A. Section 05 50 00.01 - MISCELLANIOUS METALS: Coordination of shop priming requirements, for exterior metal fabrications to receive field-applied hybrid polyurethane coating system.

**1.3 SUBMITTALS**

- A. Product Data:
  - 1. Provide the manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material proposed for use.
  - 2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
  - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- B. Samples: For verification purposes, provide samples of each color and material to be applied with texture to simulate actual conditions on representative samples of the actual substrate.
  - 1. Provide stepped samples, defining each separate coat, including primers, intermediate coats and finish coats. Use representative colors when preparing samples for review. Resubmit until the required sheen, color, and texture are achieved.
  - 2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
  - 3. Sample (draw-down) of finish coating indicating match to specified color.

#### **1.4 QUALITY ASSURANCE**

- A. Applicator Qualifications: Engage an experienced applicator who has successfully completed coating system applications similar in material and extent to those indicated for the Project.
- B. Single-Source Responsibility: Provide primers and undercoat material produced by the same manufacturer as the finish coats for each type of coating. Use only thinners recommended by the manufacturer and only within recommended limits.
- C. Coordination: Coordinate shop application of special primers for steel products with Work specified in Section 05 12 00 - Structural Steel Framing, Section 05 50 00 - Metal Fabrications. Shop- or field-applied primers and paints shall be compatible with field-applied coatings on steel products.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery: Deliver materials to the job site in the manufacturer's original, new, unopened packages, and containers bearing manufacturer's name and label, and the following information:
  - 1. Name or title of material.
  - 2. Product description (generic classification or binder type).
  - 3. Manufacturer's name, stock number and date of manufacture.
  - 4. Contents by volume, for major pigment and vehicle constituents.
  - 5. Thinning instructions.
  - 6. Application instructions.
  - 7. Color name and number.
  - 8. Handling instructions and precautions.
- B. Storage: Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

#### **1.6 PROJECT CONDITIONS**

- A. Project Conditions: Comply with coating manufacturer's requirements for ambient temperature, surface temperature and humidity conditions.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Specified Manufacturer: Themec Company, Inc., North Kansas City, MO (816/474-3400; regional representative, TPC Consultants, Inc., Compton, CA, 310/637-2363; local representative, Jody Cochran, 909/241-7230).
- B. Dynaflux 309-16 Spray Galv Zinc Galvanizing Spray. As provided by Dynaflux, Inc. 241 Brown Farm Road, Cartersville, GA 30120. **Phone:** 770.382.8843. **Fax:** 770.382.9034  
www.dynaflux.com
- C. Acceptable Manufacturers: Equivalent products of other manufacturers, including those listed below, will be acceptable in accordance with the "or equal" provision specified in Section 01 60 00 - Product Requirements.
  - 1. Carboline Company, St. Louis, MO (314/644-1000 or 800/849-4645).
  - 2. International Protective Coatings Corp., San Diego, CA (858/547-8810).

### 2.2 POLYURETHANE COATING SYSTEM FOR STEEL, SOLID COLOR FINISH

- A. Polyurethane Coating System of Steel, Solid Color Finish: For application to exterior steel products indicated on the Drawings to receive field-applied solid color finish coating. Steel shall be ungalvanized plain steel or, if galvanized steel is used, zinc coating shall be removed or treated in compliance with coating manufacturer's instructions and recommendations.
- B. Primer Coatings: Coordinate with shop priming requirements specified in Section 05 50 00 - Miscellaneous Metal Fabrications
  - 1. Primer for shop application, upon completion of fabrication of steel products, two-component Zinc Rich Urethane coating: Themec Series 94 H2O Tneme-Zinc.
  - 2. Spot Primer Coating: For field application where shop-applied primer coating is damaged due to erection, cutting, welding and installation of steel products, two-component Zinc Rich Urethane coating: Themec Series 94 H2O Tneme-Zinc.
- C. Intermediate Coating: For field application over all surfaces of steel products after erection, cutting, welding and installation, Themec Series L69 Epoxoline, two-component catalyzed epoxy coating.
- D. Finish Coating, Solid Color: Themec Series 750 UVX, solid color pigment, Hybrid polyurethane coating, semi-gloss sheen.
- E. Finish Colors: As indicated on the Drawings or, if not indicated, as directed by the LANDSCAPE ARCHITECT.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Cleaning: Before applying coatings or other surface treatments, clean the substrates of substances that could impair bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and coating application so dust and other contaminants from the cleaning process will not fall on wet, newly coated surfaces.
- B. Surface Preparation, General: Clean and prepare surfaces to be coated according to the manufacturer's instructions for each particular substrate condition and as specified. Provide barrier coats over incompatible primers, or remove and reprime. Notify the LANDSCAPE ARCHITECT in writing of problems anticipated when using the specified finish-coat material with substrates primed by others.
- C. Ferrous Metal Surface Preparation: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale and other foreign substances. Use solvent or mechanical cleaning methods that comply with the recommendations of the Steel Structures Painting Council.
1. Blast-clean steel surfaces as recommended by the coating system manufacturer and according to the requirements of SSPC Specification SSPC-SP 6.
  2. Prior to priming, treat bare and sandblasted or pickled-clean metal with a metal-treatment wash coat in accordance with coating manufacturer's instructions and recommendations.
  3. Field touch-up shop-applied prime coats that have been damaged and bare areas. Prepare surface in accordance with SSPC SP-11 Power Tool Clean to bare metal, solvent clean, and touch-up with specified spot primer, at 2-3 mils DFT.
- D. Passivated Galvanized Steel Surface Preparation and Coating system Recommendation: Prepare galvanized surfaces in accordance with ASTM D 6386 and according to the manufacturer's instructions for the type of service, metal substrate, and application required. Remove all soluble and insoluble contaminants and corrosion. Sweep (Abrasive) Blasting per ASTM D 6386 to achieve a uniform anchor profile (1.0 - 2.0 mils).
- Prime Coat: Tnemec Series L69 @ 2.5-3.5 mils DFT.  
Solid Finish Coat: Tnemec Series 1095 Endura-Shield, (Semi-Gloss) DFT 3.0 to 5.0 mils
- E. Previously-Painted Steel Preparation: Determine whether existing paint is suitable substrate for application of primer and finish coats of polyurethane coating system, according to manufacturer's instructions and recommendations. Clean and prepare surfaces according to coating manufacturer's instructions and recommendations.
1. If existing paint is not suitable, remove all paint to bare metal, prepare steel surface and apply primer and finish coats as for unpainted steel.
  2. If existing paint is suitable, prepare surface according to manufacturer's instructions and recommendations and apply primer and finish coats as for unpainted steel.
  3. Remove all corrosion (rust). Media blast as necessary.
  4. Fill all depressions and voids with epoxy-type automotive body filler and sand smooth.



- F. Material Preparation: Carefully mix and prepare materials according to the coating manufacturer's directions.
1. Maintain containers used in mixing and application of coatings according to the manufacturer's directions.
  2. Stir materials before applying to produce a mixture of uniform density; stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain the coating material before using.
  3. Use only the type of thinners approved by the manufacturer and only within recommended limits.
- G. Tinting: Tint each primer and intermediate coat to facilitate identifying each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

### 3.2 APPLICATION

- A. Application, General: Apply special coatings by brush, roller, spray, squeegee, or other applicators according to the manufacturer's directions. Use brushes best suited for the material being applied. Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
1. Do not apply coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
  2. Coating colors, surface treatments, and finishes are indicated in the Schedules.
  3. Provide finish coats compatible with the primers used.
  4. The number of coats and film thickness required shall be the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Where sanding is required, according to the manufacturer's directions, sand between applications to produce a smooth, even surface.
  5. When undercoats or other conditions show through the final coat, apply additional coats until the cured film has a uniform coating finish, color, and appearance. Give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive minimum dry film thickness (DFT) equivalent to that of flat surfaces.
  6. The term "exposed surfaces" refers to exposure to exterior moisture and interior swimming pool conditions. Coatings shall extend behind applied components, such as lighting fixtures and piping and conduit, as necessary to maintain coating system integrity and to provide desired corrosion protection.
    - a. Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces.
    - b. Coat the back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
    - c. Omit field primer coat on metal surfaces that have been factory- or shop-primed with specified primer for coating system. Otherwise, remove non-conforming primer and

prepare steel using solvent or mechanical cleaning methods that comply with the recommendations of the Steel Structures Painting Council and requirements of coating system manufacturer.

- B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient drying time between successive coats.
  2. Do not recoat until the coating has dried so it feels firm and does not deform or feel sticky under moderate thumb pressure and where applying another coat does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
1. Brushes: Use brushes best suited for the material applied.
  2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
  3. Spray Equipment: Use spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Field Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to the material required to be coated or finished that has not been shop primed. Recoat primed and sealed substrates where there is evidence of suction spots or unsealed areas in the first coat to ensure a finish coat with no burn-through or other defects caused by insufficient sealing.
- E. Coating Application, General: Comply with manufacturer's instructions and recommendations for application of primer, intermediate and finish coats. Finish shall be free from cloudiness, spotting, holidays, laps, runs, sags, ropiness and other surface imperfections.
1. Primer and Finish Coating, Solid Color Finish: Brush, roller or spray application using procedures as necessary to achieve consistent, smooth finish free of brush and roller marks.
  2. Should recoating be necessary, comply with manufacturer's instructions and recommendations for surface preparation and recoat procedures.
- F. Minimum Coating Thicknesses: Apply each material no thinner than the manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system not less than as recommended by the manufacturer. Minimum dry film thickness (DFT) shall be:
1. Primer coating: 2.5 to 3.5 mils DFT.
  2. Spot primer coating: 3 mils DFT minimum over prepared metal.
  3. Intermediate coating: 4 to 6 mils DFT.

4. Finish coating, solid color: 3 mils DFT minimum.
- G. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish, or recoat Work not complying with specified requirements.

### **3.3 CLEANING AND PROTECTION**

- A. Cleanup: After completing coating application, clean surrounding surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- B. Protection: Protect surrounding surfaces, whether being coated or not, against damage from coating operations. Correct damage by cleaning, repairing, replacing, and recoating, as acceptable to the LANDSCAPE ARCHITECT. Leave surfaces in undamaged condition.
  1. Provide "Wet Paint" signs to protect newly coated finishes. Remove temporary protective wrappings provided by others to protect their work after completing coating operations.
  2. At completion of Work specified in other Sections, touch up and restore damaged or defaced coated surfaces.

#### **END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 10 14 00****SIGNAGE****PART 1 - GENERAL**

## 1.01

- A. Drawings and general provisions of the Contract, including General Requirements, apply to this Section.

## 1.02 SUMMARY OF WORK INCLUDED

- A. Permits: Obtain all sign permits, including payment of fees, required by the City of Ontario for the installation of all exterior and interior signage and graphics for the Project.
- B. Sign Fabrication: Types of signs, messages, and graphics are indicated in the Drawings and herein, and require various materials, finishes, Illumination and fabrication and installation techniques.
- C. Shop drawings, layouts, samples, and mock-ups for the OWNER'S approval.
- D. Structural design and calculations for all ground-mounted, exterior building-mounted, interior wall-mounted and ceiling-suspended signs to confirm structural integrity of the designed support connection. All structural connections will require certification by an Engineer licensed in the State of California.
- E. Installation of all fabricated signs, including all fasteners, fastenings and related electrical and data connections unless noted otherwise on Drawings.
- F. Coordination with all trades of this Contract required for the fabrication and installation of the signage, including the approvals by the OWNER required in this Section. Fabrication and installation of the Work in accordance with the latest edition-in-effect of: 1. National Electrical Code (NEC), 2. Underwriters Laboratory (UL), 3. National Fire Protection Agency (NFPA), 4. National Electrical Manufacturers Association Standards.
- G. Coordination and verification of all messages with the OWNER. OWNER is to provide a complete set of sign location plans with sample numbering system and electronic message schedule template for fabricator to complete sign message schedule for submission to and approval by the OWNER.
- H. Verification of all conditions and sign dimensions in the field. Sign Fabricator is to coordinate all signage requirements with the architectural, structural, mechanical, lighting, electrical, and telecommunications drawings to ensure that all proposed signs can be installed, with power and required data connections and structurally supported. Verification of conditions and sign dimensions must be completed prior to sign fabrication and approval of all required submittals.

- I. Sign Types and Quantities  
The Sign Fabricator is responsible for verifying quantities with the OWNER and DESIGNER.

### 1.03 DESIGN CRITERIA

- A. Structural design: Details in the Drawings indicate a design approach for sign fabrication but do not necessarily include all fabricating details required for the complete structural integrity of the signs, including consideration for static, dynamic, and erection loads during handling, erecting, and service at the installed locations, nor do they necessarily consider the preferred shop practices of the individual sign CONTRACTORS. Perform complete structural design of the signs and to incorporate all safety factors necessary to protect the OWNER and their representatives, against public liability. Designs which meet rational engineering analysis will be acceptable, provided that shop drawings; including structural design, are approved by ARCHITECT. Connection details and structural calculations to be verified prior to any fabrication. Signs must meet all applicable local, State, and national codes, as well as testing laboratory listings where required.

### 1.04 SHOP DRAWINGS

- A. The Drawings presented for pricing are not fabrication drawings. Provide all details necessary to effectively explain and specify the fabrication process and the expected performance of the installed product. Demonstrate through details and specifications complete understanding of the desired final product and the method/process by which they are producing said product. Obtain field measurements prior to creating and submitting Shop Drawings. Repackaging the supplied Drawings with new title blocks and delivering, as submittals, will not be accepted. Although art may be supplied electronically, all graphic content to be created by the fabricator unless noted on the Drawings that the artwork will be provided.
- B. The Drawings represent the design intent for the signs required for the Project. Obtain proper engineering of all elements of the Work and where applicable, to include a set of wet stamped, signed engineering calculations by a licensed California Structural Engineer. The internal structure, dimensions, and specifications for all items shall be indicated in the Shop Drawings.
- C. Provide shop drawings for all items including, but not limited to the following:
  - 1. Complete fabrication and installation drawings for each sign type. Indicate dimensions, materials, finishes, fastening, anchorage, joining, sealing, backing, utility requirements, rough-in, and adjacent related site conditions.
  - 2. Each sign type with all graphic elements.
  - 3. Evacuation Map final graphics. The Drawings documentation will provide a template to be used for developing specific area plans and routes as coordinated with the DFS representative and Emergency Egress plans.
  - 4. All letter styles shall be accurately reproduced.
  - 5. Connections and routing for all power and data cabling.

### 1.05 SUBMITTALS

- A. Procedure:
  - 1. Define any actions requiring review by the OWNER.

2. First article of production-run items, both large and small, will be reviewed by the OWNER before production-run is commenced. Quantity and selection of first article items to be determined by OWNER, ARCHITECT, Selbert Perkins Design (SPD) and General CONTRACTOR prior to production.
- B. Submit physical samples of sufficient size and quantity to illustrate materials, finishes, equipment or workmanship, and to establish standards by which completed work will be judged. Samples shall represent the functional characteristics of the product or material, with integrally related parts and attachment devices, colors, and finishes.
- C. All samples to have a place for stamp approval.
- D. Required samples for review:
  1. Full 6" x 6" set of all specified paint colors and finishes.
  2. Complete, full-size message in each typeface to demonstrate proper spacing (black text on white background: outline not accepted).
  3. Each type of exposed metal used for major elements of work with the specified finishes in the Drawings.
  4. Mock-ups as scheduled in this Section. Mock-ups shall become the property of the OWNER and are not to be part of the completed work unless otherwise stated by the OWNER.
  5. Other items as may be required by the OWNER, as noted in the Drawings, or herein.
- E. Extra Materials/Spares: Deliver to the appropriate OWNER'S REPRESENTATIVE contact person, in manufacturer's original packaging and store at the Project as directed:
  1. Furnish (1) gallon of each finish paint color for touch-up purposes.
  2. Furnish (6) lamps of each type and size used in the signage (as applicable).
  3. Furnish spare keys to master keyed elements and access panels.
- F. Supplementary Product Literature: Submit for information. Furnish within seven (7) days of request, manufacturer's literature describing the general properties of each product to be used in the Work.
- G. Message Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
  1. When room numbers to appear on signs differ from those in the Drawings, include the drawing room number on schedule.
  2. When content of signs is indicated as "placeholder" or "to be determined", request such information from the OWNER and/or General CONTRACTOR at least 2 months prior to start of fabrication.
  3. Each sign must bear the latest confirmed copy by the OWNER prior to fabrication and installation.

## 1.06 QUALITY ASSURANCE

### Mock-ups and Prototypes:

1. Provide a mock-up (partial for large Signs; complete for smaller Signs) of each sign type at the fabrication facility or on-site for review.
2. Utilize the same materials and installation methods in the mock-up as intended for the final Work. Schedule the installation so that the mock-up may be examined, and any necessary adjustments made, prior to commencing fabrication of the final Work. Replace unsatisfactory items as directed.

3. When accepted, mock-up shall serve as the standard for materials, workmanship, and appearance for the Work throughout the project.
- B. Work-In-Progress Approvals:
1. Provide work-in-progress sign elements reviews. Scheduled or unscheduled reviews at the Fabrication Facility may be initiated by the OWNER to ensure continued quality control and make adjustments required during fabrication. Correct unsatisfactory items as directed by the OWNER.
- C. Regulatory Requirements:
1. Comply with all applicable Regulatory Requirements. Obtain necessary approvals and permits from all governing authorities as required.
- D. Markings and Labels:
1. Locate markings, labels, manufacturer names and other identifications so as to be concealed from public view and as acceptable by the OWNER.
  2. No trade name or other identification shall appear on any item, visible to the public the public except as specifically approved by the OWNER in advance
- E. Final Location of Signs:
1. The location of signs as shown on the Location Plans is for general reference only and in some cases is not representative of the exact final location. Final locations of all signs and wall graphics shall be field-located in coordination with the OWNER.
  2. Sign Fabricator shall arrange for meetings at the Project site to accommodate direction of final locations according to Project Construction Schedule.
- F. Lettering:
1. Sign Fabricator shall be responsible for the quality control of all lettering. All letterforms shall be crisp, sharp, free of nicks, ragged edges and discontinuous curves. All lettering shall conform to approved typeface, stroke weight, letter spacing and kerning. No substitutions of typeface foundry, brand or version or implementation technique will be accepted without a prior written approval.
  2. Vinyl Graphics: All artwork shall be derived from electronic computer artwork for cutting on a Gerber Sign Maker II or approved equal.
  3. All cutting and routing shall be executed in such a manner that all edges and corners of finished letterforms are true and clean. Letterforms with rounded positive or negative corners, nicked, cut, or ragged edges, etc., will not be accepted. All letterforms shall be so aligned as to maintain a baseline parallel to the sign format. Margins must be maintained as specified in the Drawings.
  4. All Work under the Agreement shall be performed by skilled craftsmen under supervision of trained foremen, experienced in the trade of craft required to accomplish the Work and produce a product of high quality.
- G. Tactile Sign Messages
1. All tactile sign messages must comply with ADAAG 2010; Sections 703.2-703.4
  2. Character spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8 inch (3.2 mm) minimum and 4 times the raised character stroke width maximum. Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch (1.6 mm) minimum and 4 times the raised character stroke width maximum at the base of the cross sections, and 1/8 inch (3.2 mm) minimum and 4 times the raised



- character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch (9.5 mm) minimum.
  3. Per California (Title 24) Braille, braille dots within cells must be .10 inch apart, measured from the centers. Horizontal cell spacing must be .30 inch, measured between corresponding braille dots in adjacent cells. Vertical cell spacing must be between .395" and .40", measured between corresponding braille dots in stacked lines of braille. Braille dots themselves must be between .025 and .037 inches high with a base diameter between .059" and .063". Dots must be rounded or domed, be in a horizontal format, and be located below the corresponding text. The space between the raised text and the braille must be between 3/8 inch minimum and 1/2 inch maximum.
  4. Proof-reading of Braille messages is to be performed by the Sign Fabricator prior to fabrication and installation.
- H. High Quality of Workmanship:
1. Sign Fabricator shall be responsible for the high quality of all materials and workmanship required for the execution of the Project including materials and workmanship of any firm or individual who acts as Sign Fabricator's Sub-CONTRACTOR.
  2. Sign Fabricator shall be responsible for providing up-to-date drawings, specifications, sign location plans, signage schedule (message schedule), etc., to all sub-CONTRACTORS.
- I. Dimensions and Discrepancies
1. Sign Fabricator shall verify and be responsible for all dimensions and conditions shown in the Drawings. The shop drawings shall be approved by the OWNER prior to fabrication.
  2. Sign Fabricator shall notify the OWNER of any discrepancies in the Drawings (including discrepancies between written dimensions and scaled dimensions), in Sign Location Plans and/or Sign Message Schedule, in field-dimensions or conditions and/or changes required in construction details.
- J. Regulatory Requirements (To be in compliance with the latest version-in-effect of):
1. ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1
  2. California Building Code (CBC) and California Fire Code - Title 24
  3. California Public Safety Code - Title 19
  4. California Environmental Protection – Title 27
  5. National Association of Architectural Metal Manufacturers (NAAMM) "Metal Finishes Manual."
  6. American Welding Society (AWS) – AWS D1.1 "Structural Welding Code, Steel," and AWS D1.2 "Structural Welding Code, Aluminum."
  7. Underwriters Laboratories Inc. (UL) – Standards for Safety, UL Publication 48 "Electric Signs."
  8. United States Green Building Council (USGBC)
    - a. Leadership in Energy and Environmental Design (LEED): Green Building Rating System

## 1.07 GRAPHICS/ARTWORK

- A. OWNER to provide artwork templates in Adobe Illustrator (Mac-based) via electronic file transfer.
- B. Prepare final artwork for each and every sign, including all code-required evacuation maps. Maps are to be coordinated with the building emergency egress plans and approved by the Fire Inspector in charge of the Project and/or a DBS representative in charge of the project prior to fabrication.

## 1.08 MAINTENANCE

- A. Maintenance and Operating Manuals
  - 1. Submit four (4) copies of Maintenance and Operating Manuals to OWNER'S REPRESENTATIVE and 1 copy to the ARCHITECT.
  - 2. Furnish complete manuals describing the materials, devices and procedures to be followed in operating, cleaning and maintaining the Work. Include manufacturers' brochures and parts lists describing the actual materials used in the Work, including metal alloys, finishes, electrical components and other major components.
  - 3. Assemble manuals for component parts into single binders identified for each system.
- B. Instruction
  - 1. Prior to acceptance, establish with OWNER'S REPRESENTATIVE an instruction and training program for OWNER'S REPRESENTATIVE'S personnel.
  - 2. Notify OWNER'S REPRESENTATIVE in writing at least 7 days prior to commencement of the program providing an outline of topics indexed to the Maintenance and Operating Manual.
  - 3. Provide a trained instructor. Provide three (3) consecutive 4-hour periods of training scheduled during the normal 8-hour working day. Instruction and training shall include, but shall not be limited to, procedures to be followed in the normal day-to-day maintenance and operation of the Work.

## 1.09 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Signage to be delivered to the job-site in a timely manner with complete protective coverings in place.
- B. Storage: Store signage and equipment at the job-site or other location as directed by the General CONTRACTOR.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Metals
  - 1. Aluminum
    - a. Aluminum shall be suitable for ornamental, architectural work. Surface finish shall be smooth, free of extrusion marks or imperfections. Alloy shall be selected to meet the structural requirements of the specific application.
  - 2. Steel
    - a. Stainless Steel and Steel shall be suitable for ornamental and architectural work. Surface finish shall be smooth, free of all extrusion marks or imperfections. Alloy

shall be selected to meet the structural requirements of specific application. Structural metal for concealed framing shall be of galvanized rolled steel or equal as required to satisfy structural requirements.

- B. Aluminum interior plaques shall be constructed from 0.125 inch aluminum, #4 horizontal brushed finish with semi-gloss linear polyurethane clear coat, unless otherwise specified on the Drawings.
- C. Aluminum exterior cabinets, spacers, backplates and frames shall be constructed from 0.25 inch aluminum, #4 horizontal brushed and clear anodized finish unless otherwise specified on Drawings.
- D. Aluminum interior fabricated components shall be constructed from 0.125 inch thickness aluminum sheet.
- E. Adhesive used for installing Signs shall be manufactured by Dow Corning or equal. VHB, Polyfoam, or "Isotac" contact adhesive tape manufactured by 3M shall be used in conjunction with silicone adhesives for installation of wall signs, in minimum thicknesses available.
- F. Extruded aluminum shapes shall utilize 6063-T6 aluminum alloys, unless otherwise specified on the Drawings.
- G. Concrete installation of anchoring devices into concrete slab shall be adjusted to avoid penetrating existing reinforcing conduit, etc. contained in the concrete slab. Coordinate with the ARCHITECT, General CONTRACTOR and licensed Structural Engineer.
- H. Applied Vinyl: Electrocut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing, suitable for exterior applications. Applied vinyl shall be 3M Scotchlite Reflective Graphic Film Series, 3M Scotchcal Translucent and Opaque Graphic Films unless otherwise specified on the Drawings.
- I. Acrylic intended for non-illuminated use shall be 0.25 inch cast acrylic sheet with non-glare finish, unless otherwise specified on the Drawings. Acrylic intended for edge-illuminated use shall be .375 inch extruded acrylic sheet with embedded diffuser particles designed specifically for edge-lighting, unless otherwise specified on the Drawings.
- J. Use Plexiglas II as manufactured by Rohm and Haas Co., or as approved equal. Thickness shall be as indicated on the Drawings or not less than 1/8" thick. Signage Fabricator shall provide color and finish samples of all plastics for approval prior to fabrication; no substitution in color, thickness, or finish of plastics will be accepted without written approval from the OWNER. All plastics shall be of uniform color, translucence and illumination, as supplied by the manufacturer. Any exposed edges of acrylic shall be flame-polished or sanded smooth so as no saw-tooth marks are visible.
- K. Decal or Transfer: Provide special printed paper or vinyl suitable for reproducing the design onto material indicated, as required. Submit sample to ARCHITECT.
- L. Aluminum posts shall be constructed from 2-inch square T52 tubes, 0.1875 inch wall thickness and #4 brushed and clear anodized finish with capped ends, unless otherwise specified on the Drawings.

- M. Hardware / Hinges: Provide and install all incidental hardware necessary for the proper functioning of the all signs, including, but not restricted to, materials and products covered in this section. Provide stainless steel hinges for all hinged access panels. Provide pin tumbler locks for all access panels requiring locks. Provide stainless steel fasteners for assembling ferrous and non-ferrous metals.
- N. Bolts, nuts, screws, washers, anchors and other devices required to complete the Work. Signage Fabricator shall use the same basic metal or alloy as the metal being fastened to, and finish to match in color and texture. Use stainless steel 300 series alloy where used to join dissimilar materials.
- O. All exposed fasteners to be 0.125 inch tamper-resistant flathead stainless steel screws painted to match adjoining surfaces unless otherwise specified on the Drawings.
- P. Pin-mount supports shall be 3/16 inch to 1 inch diameter painted threaded rods.
- Q. Insulation/Material Isolation: Separate all ferrous and non-ferrous metals with non-conductive gaskets to prevent electrolysis. In addition to gaskets, provide stainless steel fasteners for some cases as required. Where metal surfaces will be in contact with dissimilar materials, coat the surfaces with epoxy paint or plate with zinc chromate, or provide other means of dielectric separation as recommended by the manufacturer to prevent galvanic corrosion (e.g., Neoprene gasket as an isolation membrane).
- R. Welding Electrodes and Filler Metal: Provide the alloy and type of welding electrodes and filler metal required for strength, workability, compatibility and color-match after grinding smooth and finishing the fabricated product.
- S. Additional Materials and Processes: For materials or processes described in the preceding list, the material and/or process as detailed on the Drawings shall be used if they meet or exceed equivalent.

## 2.02 ELECTRICAL COMPONENTS

- A. Electrical components shall conform to the applicable Electrical Codes in effect and the following:
  - 1. All materials shall be approved and listed by Underwriters Laboratories, Inc.
  - 2. Light Emitting Diode (LED) general lighting requirements:
    - a. Provide sufficient LED wattage, quantities and spacing to ensure continuous, maximum illumination.
    - b. Provide LED lighting prototypes in mock-ups to verify brightness and uniformity of lighting.
  - 3. LED lighting component, color and power requirements:
    - a. Edge-lighting – fabricated linear white LEDs 24 VAC
    - b. Back- lighting – fabricated matrix white LEDs 24 VAC
  - 4. Heavy-duty, non-keyed, flush-mounted, fused or un-fused disconnects. Provide NEMA 1 for dry locations and proper enclosure for others.
  - 5. Digital Screens:
    - a. Make/Model, or approved equal.
  - 6. Media Player:
    - a. Make/Model, or approved equal.
- B. Electrical Wiring and Equipment: Provide and install electrical materials such as ballasts, transformers, lamps, sockets, neon units, connectors, and all other equipment which shall

be new and shall be approved by Underwriters Laboratories, Inc. The assembly of all components within the illuminated signs shall conform to all standards of Underwriters Laboratories, Inc. as published in the latest edition of "Standards for Sign Safety" and all illuminated signs shall bear the U.L. label. All wiring and equipment shall be concealed within the Sign structure.

- C. Conduit and Devices: Provide rigid steel conduit, junction boxes and associated devices in accordance with applicable codes as required.
- D. Wiring: Minimum #12 AWG copper shall be used. High-tension wiring shall not be less than GTO 15 wire as manufactured by Carol Cable Company, or approved equal. All wiring shall be AWM 90 0 centigrade 1000 volt TW/MTW U.L. file no. 18971. Wiring connectors for wire splicing shall be U.L. approved 1000 volt capacity and shall be Scotch Lock type Y or R or equal. All splices should be easily accessible for inspection and should be shown on Shop Drawings.
- E. Ballasts shall be used as required for internally illuminated cabinet signs, in quantity and arrangement as recommended by ballast manufacturer and accessible for maintenance and shown on Shop Drawings.
- F. Disconnect Switch: All Signs or Sign components with electrical service shall be equipped with an approved external disconnect switch, flush mounted on the cabinet / Sign, with circuits and capacity to control all primary wiring within the Sign. Location of switch shall be shown on Shop Drawings and is subject to approval.
- G. Illumination: All Signs with fluorescent fixtures shall utilize minimum 800 milliamp T8 output cool white fluorescent lamps at the length and placement necessary to provide even illumination without light leaks, unless otherwise specified on the Drawings. All Signs with LED light sources shall be built to perform as specified on the Drawings. Provide specification information required to verify performance. Provide lamps, ballasts, waterproof flush access panel(s), and conceal wherever possible. Provide conduit wiring and electrical equipment from the field electrical connection to any part of the sign and within the sign.
- H. Ventilation: While maintaining a proper weather seal, provide for sufficient ventilation of sign components to prevent overheating or warping; allowing for color of sign, mounting surface, climate conditions, etc. In providing for ventilation, protect sign from elements (rain, wind, debris, etc.) that may cause operational or cleaning problems. Signs/cabinets with light leaks will not be accepted. Utilize stainless steel bug mesh screen for integration with weep holes or vent / louvers on the Signs to prevent insect migration into illuminated Signs.

## 2.03 FINISHING MATERIALS

- A. Linear Polyurethane Coatings: Provide the following, or other products as acceptable.
  - 1. Acrylic Linear Polyurethane enamel: Two components, acrylic aliphatic isocyanate / acrylic polyurethane having ultraviolet (UV) inhibitors and engineered for exterior application by Matthews Paint Company or approved equal.
  - 2. Primer for Aluminum: Two part component primer: One-coat Matthews 74-734 and 74-735 Metal Pretreat at .25 mils dry film thickness or one-coat Matthews 74-793 Spray Bond at .15 to .25 mils dry film thickness or Wyandotte / AKZO Grip-Guard Wash Primer (2Afy-31284) with Grip-Guard Wash Primer Hardener (10AFK-31285) combined and applied per manufacturer's specifications or approved equal (primer) for the application of the pre-approved and pre-formulated paint system.

3. Primer for Steel: Two part component primer: One-coat Matthews 74-734 and 74-735 Metal Pretreat at .25 mils dry film thickness or Wyandotte / AKZO Grip-Guard Wash Primer (2Afy-31284) with Grip-Guard Wash Primer Hardener (10AFK-31285) combined and applied per manufacturer's specifications or approved equal (primer) for the application of the pre- approved and pre-formulated paint system.
  4. Clear Sealers: Matthews Acrylic Polyurethane (MAP) Clearcoats By Matthews Paint Co. or approved equal and applied per manufacturer's specifications. Clear coats are to be graffiti-resistant and protect the signs from the elements and provide an additional barrier against impacts, abrasion, hail, sand, salt, grit and chemicals.
- B. Anodized Aluminum Components / Panels: If required, Signage CONTRACTOR shall provide anodized (application of aluminum oxide film coating in clear or colored dye finish) aluminum panels or parts to match Executive ARCHITECT'S color, grain, finish and specifications.
  - C. Silk Screening Materials: Provide photo-processed screening, arranged to furnish sharp and solid images without edge build-up or bleeding of the coating. Pattern-cut screens may be used for non-repeat copy, provided that final image copy is equal to photo-screen quality. Provide only weather-resistant coating materials, compatible with the intended substrates. All silk-screened graphics are to be done with the finest screen size feasible for sharp, even reproduction.
  - D. Acid-etched Graphics and Typography: Acid-etched typography and graphic imagery must be no more than 1/16" deep (unless otherwise noted on the Drawings), with clean, crisp, sharp edges; ragged or soft (polished out) edges will be rejected. Acid baths used for etching should be fresh and used in an environment and temperature that will provide the highest quality etched images.
  - E. Vinyl Die-Cut and Pattern Cut-out Graphics: Use Scotchcal Opaque and Translucent film and Scotchcal Diamond Grade VIP Reflective film manufactured by 3M where specified. Use pressure-sensitive, non-yellowing, non-peeling and weather resistant vinyl as specified. Use approved fonts and equipment as specified.

### **PART 3 - EXECUTION**

#### **3.01 FABRICATION**

- A. Signage shall be complete for proper installation as described on the Drawings.
- B. Finished work shall be firm, well-anchored, in true alignment, properly squared, with smooth, clean and uniform appearance, without holes, cracks, discoloration, distortion, stains, or marks.
- C. Construct all work to eliminate burrs, dents, cutting edges, and sharp corners; ease all exposed metal edges.
- D. Finish welds on exposed surfaces to be imperceptible in the finished Work.
- E. Except as indicated on the Drawings or directed otherwise, finish all surfaces smooth.
- F. Surfaces, which are intended to be flat, shall be without dents, bulges, oil canning, gaps, or other physical deformities.

- G. Surfaces, which are intended to be curved, shall be smoothly free flowing to required shapes.
- H. Except where approved otherwise by the OWNER, conceal all fasteners.
- I. Make access panels tight-fitting, light-proof, and flush with adjacent surfaces.
- J. Conceal all identification labels and Underwriters Laboratories (UL) labels to conform to Underwriters Laboratories Codes.
- K. Follow manufacturer's recommended fabricating procedures regarding expansion or contraction, fastening, and restraining of acrylic and/or plastic.
- L. Exercise care to ensure that painted, polished, and plated surfaces are unblemished in the finished Work.
- M. Isolate dissimilar materials. Exercise particular care to isolate nonferrous metals from ferrous metals.
- N. All illumination shall be even and without hot / dark spots.
- O. Provide miscellaneous metal items required for completion of the Work even if they are not shown or specified on the Drawings.
- P. Refer to the Drawings for sign color specifications.
- Q. Paint finishes shall be Matthews Acrylic Polyurethane with Matthews Primers and Metal Pre-Treatments or OWNER-approved equal.

### 3.02 SIGNS AND SUPPORTS

- A. General: Provide custom manufactured Sign assemblies, components completely fabricated and finished at the fabrication shop before delivery to the Project site. Construct to accurate detail and dimensions as shown on the Drawings and as reviewed on approved Shop Drawings. Fit and assemble the Work at the shop and mark the components as required to facilitate assembly during installation. Exposed fasteners on finished faces will not be allowed, unless specifically indicated on the Drawings. Waviness and oil canning of surfaces is not acceptable. Minimum material thickness is to be 0.090 inches. Conceal wiring, conduit and other electrical components within sign enclosures; any exposed conduit and electrical components shall be finished to match adjacent surfaces upon request by the OWNER at no additional charge.
- B. Lettering: Cut and rout in a manner to produce true and clean edges and corners of finished letterforms. Letterforms having rounded positive or negative corners, nicked, cut, or ragged edges are not acceptable. Align letterforms to maintain a baseline parallel to the sign format. Maintain margins as indicated on the Drawings.
- C. Seams and Joints: Cut walls and floors carefully, and neatly repair them in an acceptable manner. Consult the ARCHITECT and General CONTRACTOR in cases where cutting into a structural portion of the building is required so that satisfactory reinforcement may be provided. Added joints shall be ground-filled and finished flush and smooth with the adjacent work; such seams shall be invisible after final finish has been applied. Spot-welded joints shall not be visible on exterior of signs after final finish has been applied. No gaps, light

leaks, waves, or oil canning will be permitted in the Work. If any of these are evident, correct the Work or construct a new Sign.

- D. Metal Signs and Supports: Fabricate exposed surfaces uniformly flat and smooth, without distortion, pitting, or other blemishes. Form exposed metal edges to a smooth radius. Permanently bond the laminated metal components and honeycomb core with adhesive or sealant in accordance with product manufacturer's recommendations. Grind exposed welds and rough areas to make flush with adjacent smooth surfaces.
- E. Welding: Make welds continuous. Comply with American Welding Society, Aluminum Association, and Copper Development Association standards for the type of metals used.
- F. Fasteners: Use exposed fasteners only if shown on the Drawings. Perform drilling and tapping at the Shop, and countersink adjoining surfaces for tamper-resistant flathead stainless steel machine screws; paint and finish all exposed surfaces same as background.
- G. Castings: Exposed surfaces shall be uniformly free from porosity and roughness. Edges shall be filled and ground smooth. Faces shall be chemically etched and mechanically polished for the finishes as specified on the Drawings.
- H. Galvanizing: Steel components in exterior construction and where noted on the Drawings shall be galvanized. Complete the shop fabrication prior to application of the zinc coating. Remove mill scale and rust, clean and pickle the units as required for proper pretreatment of the surfaces.
- I. Hardware: Provide all incidental hardware necessary for the proper functioning of signs. External hardware shall conform to the external appearance of the Sign.
- J. Supports and Backing in Walls: Provide engineered Sign supports anchored to building structure where required and to meet requirements of applicable building codes. Support or backing-requiring installation within the building wall construction shall be immediately relayed to and reviewed by the ARCHITECT and/or General CONTRACTOR for field coordination.
- K. Access Doors and Frames: Access doors and frames shall be flush with the material in which they occur, unless otherwise specified. Access doors and frames shall be provided upon prior written approval of the ARCHITECT. Each trade providing access doors and frames shall verify the need for fire rated doors on the Construction Drawings. Access doors in walls, partitions or ceilings shall bear UL fire rated labels of same fire rating. If access doors and frames are required to be exposed to view, they shall be chrome, brass, stainless steel, or other finish to match other finishes in the spaces in which they are to be installed, unless otherwise specified. Obtain ARCHITECT'S approval for location of each access door prior to placement.

### 3.03 SHOP APPLICATION OF SIGN FINISHES

- A. Sign Graphics: Provide the letters, numerals, symbols, and other graphics markings, using the finish materials shown. Apply the graphics neatly, uniformly proportioned and spaced, and accurate within the dimensions indicated. Prepare the substrate surfaces and apply finish materials in accordance with manufacturers' instructions.



- B. Metal Finishes: Remove scratches, abrasions, dents and other blemishes before applying finish. Apply the following to the fabricated Work, with texture and reflectivity as required to match the ARCHITECT'S sample. Non-glare finish on all sign faces.
- C. Linear Polyurethane Finishes: Clean the surfaces as required for proper adhesion of coatings. Use 3M "Scotch Brite" pads with cleanser and water, and/or chemically treat as recommended by paint manufacturer to remove deleterious film or residue.
- D. Linear Polyurethane Paint: Provide pretreatment and primer in accordance with manufacturer's recommendation. Add ultra violet inhibitors to paint subject to sunlight exposure.
- E. Clear Linear Polyurethane Finish: Provide pretreatment, primer, and matte or semi-gloss finish coatings in accordance with manufacturer's recommendations. Apply 1.5 to 2.0 mils (0.0375 to 0.050 mm) dry film thickness.

### 3.04 GRAPHIC APPLICATION

- A. Preparation: Surfaces to receive the graphic markings shall be clean, dry, and otherwise made ready for application of the materials. Accurately measure and lay out the required marking configurations as indicated on drawings.
- B. Vinyl Die-cut and Pattern-cut Graphics: Use pressure sensitive, non-yellowing, non-peeling and weather resistant vinyl adhesive letters or images, custom flood coated as required, die cut from ScotchCal or ScotchLite as manufactured by 3M Company. Apply in strict accordance with manufacturer's instructions. Make uniformly smooth and free from bubbles, wrinkles, stretching and blemishes.
- C. Painted or Silk-screened Graphics: All graphics shall be applied using photo processed screens from camera ready art, arranged to furnish sharp and solid images without build-up or bleeding of the coating. Comply with coating manufacturer's application instructions. Provide proper type of primer to suit each substrate and obtain a permanent bond. Verify compatibility of each substrate with the coatings to be used in the Work. Apply the markings with neat edges, minimum 3 mils (0.075 mm) dry film thickness and as required to obtain solid markings without voids.
- D. Acid-Etched Graphics and Typography: Acid-etched typography and graphic imagery must be a minimum of 1/16" deep, with clean, crisp, sharp edges; ragged or soft (polished out) edges will be rejected. Acid baths used for etching should be fresh and used in an environment and temperature that will provide the highest quality etched images. Colorfill as indicated by the color and finish schedule, keeping inks and fills true to the edges of letterforms / graphics.

### 3.05 VERIFICATION OF CONDITIONS

- A. Inspect all surfaces to receive signage and report all defects which would interfere with signage installation.
- B. Starting Work implies acceptance of surfaces as satisfactory
- C. Verify all conditions and sign dimensions in field. Review and study architectural, landscape, lighting, electrical and related plans to ensure that all proposed signs can be installed and

supported. Verification of conditions and sign dimensions to be completed prior to sign fabrication and reviewed with the ARCHITECT.

### 3.06 INSTALLATIONS

- A. Install signage upon acceptance by the OWNER of material and completion of job site area to receive such materials.
- B. Special Precautions: Guard against damaging existing wall surfaces, pavements and planting where signage is to be installed.
- C. Footings beneath topping surface shall be installed and located prior to top surface installation.
- D. Prior to installation, check all components, nuts, bolts, and other connections for proper alignment, fit and any damage. Replace damaged or defective components.
- E. Prior to installation, confirm all electrical locations and requirements with ARCHITECT.

### 3.07 CLEAN UP

- A. Keep areas of work clean, neat and orderly at all times. Clean surfaces, inside and out. Use approved cleaners if necessary to remove dirt.
- B. Protective coverings and strippable films shall be removed at a time that will afford the greatest protection of the signage. Surfaces shall be cleaned to remove excess glazing and sealant compounds, dirt, and other substances.
- C. Upon completion of work and before final acceptance, remove tools, surplus materials, apparatus, and debris from the site. Leave the site in a neat, clean condition. Wash, clean, and leave paved areas without stains.

### 3.08 FINAL INSPECTION AND ACCEPTANCE

- A. Upon completion of work, a final inspection for acceptance will be performed by ARCHITECT.
- B. All mock-ups and unused submittals shall be removed from site prior to final acceptance.

Submit operation manuals, tools, and keys as specified in this Section.

**End of Section**

**SECTION 10 75 01****FLAGPOLES****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Aluminum ground set flagpoles, quantity as indicated on the Drawings.
- B. Flagpole fittings and accessories.
- C. Setting sleeves.

**1.2 RELATED SECTIONS**

- A. Section 03300 - Cast in Place Concrete: Concrete for flagpole foundations.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Design Criteria: Provide flagpoles and installations constructed in compliance with California Building Code (CBC), Chapter 16, and NAAMM FP 1001, "Guide Specifications for Design of Metal Flagpoles." Provide flagpole and anchorage system to comply with the following requirements:
  - 1. Base flagpole design on nylon or cotton flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent. Submit samples to Landscape Architect prior to fabrication.
  - 2. Basic Wind Speed: Meet or exceed structural calculations.
- B. Pole Construction: Construct pole and ship to site in one piece if possible. If more than one piece is necessary, provide snug-fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight hairline field joints.

**1.4 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical data and installation instructions for each type of flagpole required. Include data for fittings and accessories.
- B. Shop Drawings: Show general layout of flagpoles and bases. Detail jointing, anchorage, and support systems. Show finishes, and flagpole fittings and accessories.
- C. Structural Calculations: Submit calculations prepared, signed and sealed by qualified professional engineer licensed in State of California demonstrating compliance with applicable design loadings specified above and in compliance with required criteria of California Building Code (CBC) Chapter 16.
- D. Maintenance Data: Submit for each product specified in this section. Include cleaning and preventive maintenance instructions.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firm regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 5 years.
- B. Installer's Qualifications: Firm regularly engaged, for the preceding five years, in the installation of flagpoles of equivalent type and physical characteristics to those required. If requested by ARCHITECT, submit verifiable list of not less than five projects of equivalent type successfully completed within the preceding two years.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Conform to product manufacturer's special instructions to prevent damage to products.
  - 1. Deliver flagpoles and accessories properly labeled and in original wrappings.
  - 2. Provide suitable protection for each flagpole before shipment.
  - 3. Spiral-wrap pole with heavy kraft paper or polyethylene material and place pole in hard protective tube.
- B. Storage: Store and handle materials in a manner which will prevent damage prior to installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Specified Manufacturer: iPi Interstate Pole Industries, 525 Maple Ave, Carpinteria CA 93013  
Ph: 805.566.1998, [jz@ipipoles.com](mailto:jz@ipipoles.com), [www.iPipoles.com](http://www.iPipoles.com)
- B. Flagpole Mounting: Per structural plans and details.
- C. 80' Tall Flagpole (12" wide flagpole + 20'x30' flag)
- D. 100' Tall Flagpole (12" wide flagpole + 44" filial (eagle) + 25' x 40' flag)

### 2.2 ACCESSORY MATERIALS

- A. Pole Base Reinforcement: As indicated on the Drawings and as specified in Section 03 20 00 - Reinforcing Steel.
- B. Concrete for Pole Foundations: As specified in Section 03 30 00 - Cast in Place Concrete, with minimum 3000 psi compressive strength at 28 days and per structural calculations, plans and details.
- C. Curing Materials: Use products and procedures as specified in Section 03 30 00 - Cast in Place Concrete and per structural calculations, plans and details.

- D. Joint Sealant: As recommended by flagpole manufacturer, elastomeric joint sealant, complying with requirements specified in Section 07900 - Joint Sealers for Use NT (nontraffic) and for Use M, G, A and, as applicable to joint substrates indicated, for Use O.

## **2.3 FLAGS**

- A. Flags for Flagpoles: Nylon, provide one each, size 25' x 40', 20' x 30' for United States and State of California. Submit Samples for approval prior to fabrications.

## **2.4 FABRICATION**

- A. Fabrication, General: Provide each flagpole as a complete unit fabricated by a single manufacturer, including base, anchorage devices, fittings, and accessories as necessary for proper installation.

# **PART 3 - EXECUTION**

## **3.1 PREPARATION**

- A. Protection and Coordination: Protect surrounding completed Work during excavation of flagpole foundation and placing concrete. Coordinate flagpole location with underground utilities and landscape irrigation system.
- B. Embedded Ground-Set Poles:
  - 1. Excavation: Provide accurately cut and neatly dimensioned cavity suitable to receive embedding concrete and flagpole foundation sleeve.
    - a. Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.
    - b. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms and foundation tube, sleeve, or anchor bolts in position, to prevent displacement during concreting.
  - 2. Concrete:
    - c. Place concrete immediately after mixing. Use methods which prevent segregation of mix.
    - d. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness.
    - e. Consolidate concrete using internal vibrator.
    - f. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.
    - g. Moist-cure exposed concrete for not less than 7 days. Cure concrete for a period of at least 14 days before installation of flagpole.

## **3.2 FLAGPOLE INSTALLATION**

- A. Flagpole Installation, General: Install flagpoles in accordance with manufacturer's instructions and recommendations and as necessary to comply with requirements of California Building Code (CBC) Chapter 16.
- B. Alignment: Align flagpoles to a vertical tolerance of one in 100.
- C. Embedded Ground-Set Poles:
  - 1. Install flagpole in foundation tube, seated on bottom plate between steel centering wedges.
  - 2. Plumb flagpole and install hardwood wedges to secure flagpole in place.
  - 3. Place and compact sand in foundation tube and remove hardwood wedges. Tamp each layer before adding next layer.
  - 4. After last sand layer is placed, provide moisture seal over sand by applying sealant of proper thickness.
- D. Electrical Grounding: Provide positive lightning ground suitable for flagpole and installation conditions.
- E. Tolerances: Maximum variation from plumb position (90 degrees from horizontal plane) of 1-inch at top of flagpole.

### **3.3 ADJUSTING AND CLEANING**

- A. Operational Check: Verify smooth and proper operation of all installed fittings.
- B. Adjustments: Adjust halyard mechanisms for ease of required operation, as necessary.
- C. Cleaning: Clean all surfaces of soil, grease, oil and other contaminants.

**END OF SECTION**

**SECTION 11 68 13****PLAYGROUND EQUIPMENT****PART 1- GENERAL****1.1 SCOPE**

- A. Furnish labor, material, and equipment necessary for the furnishing and installation of the playground equipment, structure or modular unit as shown on the drawings and specified herein.
- B. Work shall include but not limited to the following: excavation, layout, and the furnishing and installing of playground equipment in accordance with the manufacturer's installation specifications, certification including all appurtenances and accessories as required for a full and complete installation.

**1.2 RELATED WORK IN OTHER SECTIONS**

- A. Section 33 40 30: Stormwater Utilities
- B. Section 02 41 00: Demolition
- C. Section 32 13 00: Rigid Paving
- D. Section 32 18 00: Athletic and Recreational Surfacing

**1.3 LICENSES**

CONTRACTOR shall have a California State CONTRACTOR'S License C61 (D34). Limited Specialty, Prefabricated Equipment.

**1.4 CONTRACTOR'S RESPONSIBILITIES**

The CONTRACTOR shall obtain the manufacturer's instructions and procedures for the installation, including a complete parts list. Installer shall be certified by the National Playground Safety Institute. Install per manufacturer's specifications.

**1.5 FIELD TECHNICIAN ON-SITE VISIT**

The CONTRACTOR shall arrange with the playground equipment manufacturer to provide an on-site visit by a factory technician during the playground equipment installations. The factory technician shall make any necessary recommendations for proper and safe playground equipment installation. This service shall be considered as included in the lump sum bid for furnishing and installing new playground equipment, and no additional payment will be made therefore.

**1.6 SUBMITTALS**

- A. Product Data: The CONTRACTOR shall submit the material and equipment submittals, including:
  - 1. Play Equipment Manufacturer and Manufacturer's Representative's name(s) and address(s);

2. Plan view drawings with model numbers; descriptive labels (including component names,) deck heights, and notations of compliance with CPSC, ASTM F1487-01 and ADA;
  3. Detailed component list with model numbers and catalog descriptions;
  4. Color Chart;
  5. Written material specifications for all components;
  6. IPEMA certification certificate from the IPEMA Website;
  7. Copy of Manufacturer Warranty in Certificate format;
  8. Copy of Manufacturer's ISO 9001 Certification.
- B. Approval of the submittals shall be the CONTRACTOR'S authorization to order the required material and equipment. There will be no deviation from the approved submittals without the written authorization of the City Representative.

## 1.7 PRODUCTS

- A. Products: The layout shown in the plan views are based upon equipment and measurements from the play equipment manufacturer and/or their sales representative responsible for the project. See "Manufacturers" below, item D.
- B. Design and Fabrication: Playground equipment, structure and modular units submitted for consideration shall be equivalent in design, layout, deck size, post size, clamping/fastening system, deck/slide/climber height, ADA accessibility, appearance, color and construction detail of the playground equipment, structure or modular unit, specified in the drawings. Reasonable variations in size/height (no more than +/- 5%) and manufacturer's standard colors may be allowed at the OWNER'S REPRESENTATIVE'S discretion. Color schemes are to match as closely as possible to the original specified colors. Play value and safety features of components must be equal or superior to specified design as judged by the OWNER'S REPRESENTATIVE.
- C. Modification: Any expense of modification, adjustment or revision required to ensure compliance of furnished equipment to specified equipment and playground design shall be the sole expense and responsibility of the CONTRACTOR.
- D. Manufacturers:
- i. Kompan: Playground equipment, playground shade sails. CONTRACTOR to install per manufacturer details and specifications. CONTRACTOR to provide footings and reinforcement. See landscape construction details.

## 1.8 PLAYGROUND SAFETY STANDARDS AND QUALITY ASSURANCE

- A. All public playground equipment supplied shall meet all applicable provisions of the current "Handbook for Public Playground Safety" published by the Consumer Product Safety Commission (CPSC) latest Edition, and ASTM F1487-01 "Standard Consumer Safety Performance Specification for Playground Equipment for Public Use," published by the American Society for Testing and Materials (ASTM). All products shall bear the certification seal of the International Play Equipment Manufacturers Association (IPEMA). All designs



shall meet or exceed the Americans with Disabilities Act (ADA) "Final Accessibility Guidelines for Play Areas" regulations latest edition. All manufacturers must be ISO 9001 certified.

## **1.9 REFERENCES AND STANDARDS**

- A. ASTM: as defined in Section 31 10 00 - Site Clearing
- B. CPSC: Consumer Product Safety Commission
- C. IPEMA: International Playground Equipment Manufacturers Association
- D. ADA: Americans with Disabilities Act
- E. ISO: International Organization for Standardization
- F. CPSI: Certified Playground Safety Inspector
- G. General Liability Insurance coverage
- H. The equipment manufacturer shall provide General Liability Insurance coverage in the following manner.
  - 1. \$1,000,000 in General Liability coverage
  - 2. \$1,000,000 per occurrence
  - 3. \$2,000,000 in the aggregate
  - 4. 50,000,000 in Excess Coverage

## **1.10 WARRANTY/GUARANTY**

- A. The equipment manufacturer shall warrant material and workmanship against defects, from the date of manufacturer's invoice, for the period of time as follows:
  - 1. 100-Year Limited Warranty for all stainless steel fasteners, aluminum posts, clamps, beams and caps, against structural failure due to corrosion/natural deterioration or manufacturing defects. This warranty does not include any cosmetic issues or wear and tear from normal use.
  - 2. The warranty stated above is valid only if the structures and/or equipment are erected in conformance with Manufacturer's installation instructions and maintained according to the maintenance procedures furnished by manufacturer for a full text of the warranty, contact your local sales representative.
- B. The CONTRACTOR shall guarantee installation workmanship for a period of one year from the date of Substantial Completion of the Project. The CONTRACTOR shall be responsible for coordinating manufacturer material warranty items with the manufacturer/distributor and for the installation of replacement material(s) at no additional cost to the OWNER.
- C. Provide copy of CONTRACTOR'S installation warranty on company letterhead.

- D. A written guarantee from the playground equipment manufacturer of the availability of replacement parts or components for a period of 25 years from the date of acceptance of the work.
- E. Certificate of compliance that all playground equipment meets or exceeds the U.S. Consumer Product Safety Commission Standards and the Standard Consumer Performance Specification for Playground Equipment for Public Use.
- F. The CONTRACTOR shall also supply to the OWNER'S REPRESENTATIVE a letter from the playground manufacturer stating that all installed equipment has been installed in accordance with the manufacturer's specifications and complies with ADA and CPSC Guidelines and Standards.
- G. Certificates and warranties shall be submitted prior to release of final payment.

## **PART 2- MATERIALS**

### **2.1 EQUIPMENT**

See drawings for type, style, configuration, size and height of playground equipment, structure, modular units, and components of the playground equipment to be provided and installed.

### **2.2 COLOR SCHEDULES**

See drawings for the color schedules of the various elements of the playground equipment to be provided.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF PLAY EQUIPMENT**

- A. Instructions: Explicit installation instructions shall be provided by the manufacturer, which shall include detailed, scaled plan views; elevations, footing drawings and details; as well as, sequential instructions to assure proper installation of the playground and fitness equipment, structure or modular unit.
- B. Playground equipment must be installed by a manufacturer certified installer and shall be installed in accordance with the manufacturer's installation specifications. Installation crew leader must be CPSI certified. A Manufacturer's Representative must inspect the final installation prior to acceptance. Manufacturer's representative must not be employed by the installer and will provide a letter certifying proper installation.
- C. Close Out: CONTRACTOR shall provide the OWNER'S REPRESENTATIVE with one copy of complete manufacturer's installation instructions and maintenance kit. Submit three sets of installation manuals with each order. It is the CONTRACTOR'S responsibility to secure the installation instructions from the installer.
- D. Clean up: The site shall be kept clean and free of tools, trash, debris, and installation materials on a daily basis. Material may be stored on site during installation with appropriate protective measures and approval by the OWNER'S REPRESENTATIVE.

**END OF SECTION**

**SECTION 11 68 33****ATHLETIC FIELD EQUIPMENT****PART 1- GENERAL****1.1 SCOPE**

- A. Furnish labor, material, and equipment necessary for the furnishing and installation of the sport court and athletic field equipment as shown on the drawings and specified herein.
- B. Work shall include but not limited to the following: layout, furnishing and installing of athletic field equipment in accordance with the manufacturer's installation specifications, certification including all appurtenances and accessories as required for a full and complete installation.

**1.2 RELATED WORK IN OTHER SECTIONS**

- A. Section 32 18 00: Athletic and Recreational Surfacing
- B. Section 32 12 93.10 – FAMILY ACTIVITY CENTER – BULLPENS & TRANSITIONAL SLOPED AREAS ARTIFICIAL GRASS SLIT-FILM AND THATCH
- C. Section 32 18 13 – SYNTHETIC GRASS SURFACING - BATTING CAGES
- D. Section 32 18 00 – ARTIFICIAL GRASS SPORTS FIELDS
- E. Section 32 33 00 – SITE FURNISHINGS

**1.3 CONTRACTOR'S RESPONSIBILITIES**

The CONTRACTOR shall obtain the manufacturer's instructions and procedures for the installation, including a complete parts list.

**1.4 SUBMITTALS**

- A. Product Data: The CONTRACTOR shall submit the material and equipment submittals, including:
  - 1. Manufacturer and Manufacturer's Representative's name(s) and address(s);
  - 2. Detailed component list with model numbers and catalog descriptions;
  - 3. Color Chart;
  - 4. Written material specifications for all components;

**1.5 PRODUCTS**

- A. Soccer Goals

**PART 2- MATERIALS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

**END OF SECTION**

**SECTION 11 68 43****EXTERIOR ~~SCOREBOARDS~~ SPORTS MONITORS****PART 1- GENERAL****1.1 SCOPE**

- A. Furnish labor, material, and equipment necessary for the furnishing and installation of the electronic scoreboards, TV's, LED Video Wall including electrical connections as shown on the drawings and specified herein.
- B. Work shall include but not limited to the following: layout, furnishing and installing of scoreboard TV's, LED Video Wall in accordance with the manufacturer's installation specifications, certification including all appurtenances and accessories as required for a full and complete installation.

**1.2 RELATED WORK IN OTHER SECTIONS**

- A. Section 32 18 00: Athletic and Recreational Surfacing
- B. Section 32 12 93.10 – FAMILY ACTIVITY CENTER – BULLPENS & TRANSITIONAL SLOPED AREAS ARTIFICIAL GRASS SLIT-FILM AND THATCH
- C. Section 32 18 13 – SYNTHETIC GRASS SURFACING - BATTING CAGES
- D. Section 32 18 00 – ARTIFICIAL GRASS SPORTS FIELDS
- E. Section 32 33 00 – SITE FURNISHINGS

**1.3 CONTRACTOR'S RESPONSIBILITIES**

The CONTRACTOR shall obtain the manufacturer's instructions and procedures for the installation, including a complete parts list.

**1.4 SUBMITTALS**

- A. Product Data: The CONTRACTOR shall submit the material and equipment submittals, including:
  - 1. Manufacturer and Manufacturer's Representative's name(s) and address(s);
  - 2. Detailed component list with model numbers and catalog descriptions;
  - 3. Color Chart;
  - 4. Artwork / Branding
  - 5. Written material specifications for all components;

## 1.5 PRODUCTS

1. **Basis of design;** All scoreboards are available from Daktronics. 201 Daktronics Dr. | Brookings, SD 57006-5128 T. 1-800-325-8766 **Direct Contact LEIE SUALUA "EA" Mobile: 949.312.0903 | Email: [leie.sualua@daktronics.com](mailto:leie.sualua@daktronics.com)** All electronic team names and captions.
  - A. Soccer Tournament Scoreboards: **SO-2008 FB-2018**
  - B. Soccer Championship Scoreboards: **SO-2024 FB-2018**
  - C. Ballfield Tournament Scoreboards: BA-2030
  - D. Baseball Championship Scoreboards: BA-2026
2. Alternate scoreboard substitution may include Nevco scoreboards; available from Nevco 1-800-325-8766 Nevco US Sales Representative 1 (800) 851-4040 <https://nevco.com/> Direct Contact: John Sidlowski, Email: [jsidlowski@csmsales.net](mailto:jsidlowski@csmsales.net), Phone: (619) 807-1904 All electronic team names and captions.
  - A. Soccer Tournament Scoreboards: Model 3680
  - B. Soccer Championship Scoreboards: Model 3680
  - C. Ballfield Tournament Scoreboards: Model 3680
  - D. Baseball Championship Scoreboards: Model 1604-PC-ETN
3. LED Video Wall and Outdoor Display Monitors from **Key Code Media, Inc. – California 270 S. Flower Street, Burbank, CA 91502, Contact: Brian Boring @ 818-303-3900 [www.keycodemedia.com](http://www.keycodemedia.com)**
  - A. LED Video Wall Quote #237857
    - i. Product: A0621 (6.66 mm) Primary Data Runs Required: 23
    - ii. Dimension (WxH): 44.800 m x 12.480 m = 559.10 sqm Max Panels of Data Cascade: 20
    - iii. 146.98 ft x 40.94 ft = 6017.36 sqft Max Power Requirement: 369008 W
    - iv. Diagonal: 46.51 m / 1,830.94 in / 152.58 ft Heat Load: 881341 BTU/hr
    - v. Aspect Ratio (WxH): 3.590 : 1 AC Main Power Cables Required: 114 @208V/16A
    - vi. Weight: 14105 kg / 31096 lbs OR 228 @120V/16A
    - vii. Resolution (WxH): 6720 x 1872 AC Circuit Single Outlet Required: 114 @208V/20A Circuits
    - viii. Panels Matrix (WxH): 35 x 13(1280mm x 960mm) OR 228 @120V/20A Circuits
    - ix. Panels Per Screen: 455 Max Panels Of Power Cascade: 4 @208V OR 2 @120V
  - B. Outdoor Display Monitors 12"
  - C. Outdoor Display Monitors 64"

**PART 2- MATERIALS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 11 82 00****FACILITY SOLID WASTE HANDLING EQUIPMENT****PART 1- GENERAL****1.1 SCOPE**

- A. Furnish labor, material, and equipment necessary for the furnishing and installation of the trash compactor at the main maintenance yard and the satellite maintenance yard including electrical connections, vehicle clearances, concrete surfacing, as shown on the drawings and specified herein and in accordance with the manufacturers' recommendations.
- B. Work shall include but not limited to the following: layout, furnishing and installing of trash compactor in accordance with the manufacturer's installation specifications, certification including all appurtenances and accessories as required for a full and complete installation.

**1.2 RELATED WORK IN OTHER SECTIONS**

- A. Section 03 20 00 – CONCRETE REINFORCING
- B. Section 03 30 00.01 – CAST IN PLACE CONCRETE
- C. 09 96 23 – GRAFFITI RESISTANT COATINGS
- D. 32 12 16 – ASPHALT PAVING
- E. DIVISION 26 ELECTRICAL

**1.3 CONTRACTOR'S RESPONSIBILITIES**

The CONTRACTOR shall obtain the manufacturer's instructions and procedures for the installation, including a complete parts list.

**1.4 SUBMITTALS**

- A. Product Data: The CONTRACTOR shall submit the material and equipment submittals, including:
  - 1. Manufacturer and Manufacturer's Representative's name(s) and address(s);
  - 2. Detailed component list with model numbers and catalog descriptions;

3. Color Chart;
4. Written material specifications for all components;

## **1.5 PRODUCTS**

- A. The main maintenance yard will have (2) 30 yd self-contained compactors
  1. Marathon RJ250SC-30 (Right side access door and enclosed hopper), and remote power pack (10 HP-230/460V 3-Phase)
  2. Marathon RJ250SC-30 (Left side access door and enclosed hopper), and remote power pack (10 HP-230/460V 3-Phase)
  3. (4) 6 yd bins w/covers
- B. The satellite yard will have (1) 30 yd self-contained compactor.
  1. The satellite yard will have (1) 30 yd self-contained compactor
  2. Marathon RJ250SC-30 (Right side access door and enclosed hopper), and remote power pack (10 HP-230/460V 3-Phase)
  3. (2) 6 yd bins w/covers

## **PART 2- MATERIALS (Not Used)**

## **PART 3 – EXECUTION (Not Used)**

**END OF SECTION**

SECTION 13 31 23  
TENSILE MEMBRANE STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to the Work of this Section.

1.2 SUMMARY

- A. This Section includes an exterior architectural tensile membrane canopy structure system.
- B. The tensile membrane structure CONTRACTOR (hereafter referred to as "Subcontractor") shall be responsible for the detailing, fabrication, supply, and installation of the Work specified herein, some or all of which may be subcontracted by Subcontractor to others meeting the qualification requirements of Section 1.5. The intent of this specification is to establish in the first instance an undivided, single-source responsibility of the Subcontractor for all of the foregoing functions.
- C. Subcontractor's Work shall include, but not necessarily be limited to, the supply, fabrication, shipment, and erection of the following principal items:
  - 1. The architectural membrane as indicated on the drawings and in these specifications.
    - a. Stage and Family Canopies will be waterproof PTFE fabric.
    - b. Soccer and Baseball Canopies will be porous mesh PTFE fabric.
  - 2. Perimeter, catenary, and sectionalized aluminum clamping system.
  - 3. Structural steel, including masts, trusses, struts, beams, and/or weldments, as indicated on the drawings. Basis of design is field assembled bolted frame connections. No field welding is required.
  - 4. Gutters and internal drains on the Family Activity Canopies and Stage Canopy.
  - 5. Flags (20' x 10'), flag cables and internal hoisting system for the Family Activity Canopies.
  - 6. Mounting plates and electrical accommodations for lights, televisions, fans and access per lighting and electrical requirements. All canopies will have internal conduit up the columns. All conduit beyond the columns will be external. All canopies will have one (1) hand hole at the bottom of the column (18" above finish floor) and threaded couplings (or nipples) at the column near the fabric elevation for electrical wiring.
  - 7. Fasteners and gasketing.
  - 8. A 2" diameter standoff clamp bar is required at the front edge of the Stage Canopy for performance accessories to clamp onto.
- D. The architectural membrane used in these structures shall be PTFE (polytetrafluoroethylene) coated woven fiberglass fabric. All references to "membrane" in this Section 13000, without exception, and whether singular, plural, or capitalized or not, are to such architectural membrane.
- E. Related Sections: The following Construction Specification Institute (CSI) MasterFormat™ divisions contain requirements relating to this section:
  - 1. Division 1: General Requirements.
  - 2. Division 3: Concrete, for cast-in-place foundations.
  - 3. Division 5: Metals, for structural metal framing, metal fabrications, expansion control systems, and shop-applied metal coatings.

4. Division 8: Doors and Windows, for skylights, clerestories, and/or glazed curtain wall systems.
5. Division 9: Finishes, for paints and coatings.
6. Division 11: Roof Hatch

### 1.3 REFERENCES

- A. General: Except as otherwise shown or noted, all Work shall comply with the requirements of the following codes and standards:
  1. Building Code of CA, [Insert year.] edition.
  2. American Institute of Steel Construction (AISC).
    - a. AISC/ANSI 360 Specification for Structural Steel Buildings
    - b. AISC 303 Code of Standard Practice for Steel Buildings and Bridges
    - c. AISC/ANSI 341 Seismic Provisions for Structural Steel Buildings
  3. American Society of Civil Engineers (ASCE).
    - a. ASCE 19: Structural Applications of Steel Cables for Buildings
  4. American Society for Testing and Materials (ASTM).
    - a. ASTM A586: Standard Specification for Zinc-Coated Steel Structural Strand
    - b. ASTM A603: Standard Specification for Zinc-Coated Steel Structural Wire Rope
    - c. ASTM D4851-88: Standard Test Methods for Coated and Laminated Fabrics for Architectural Use
    - d. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials
    - e. ASTM E108: Standard Test Methods for Fire Tests of Roof Coverings
    - f. ASTM E136: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
    - g. ASTM C423: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
    - h. ASTM E424: Standard Test Method for Solar Energy Transmittance and Reflectance of Sheet Materials
  5. American Welding Society (AWS).
    - a. AWS D1.1: Structural Welding Code
    - b. AWS 2.4: Symbols for Welding and Nondestructive Testing
  6. Aluminum Association.
    - a. Specifications for Aluminum Structures
  7. National Fire Protection Association (NFPA).
    - a. NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
  8. Society for Protective Coatings (SSPC).
    - a. Steel Structures Painting Manual, Volumes 1 and 2

### 1.4 SYSTEM REQUIREMENTS

- A. General: Provide a structural tensile membrane system that complies with requirements specified herein by testing the Subcontractor's corresponding membrane system in accordance with the indicated test methods.
- B. Building Code Criteria: The tensile membrane structure shall comply with the State of California Building Code, 2022 edition. Controlling code and design criteria insertions below to be provided and verified by the Project Engineer of Record. Reference structural drawings general notes.
  1. Ground Snow Load: 0 psf

2.	Snow Load Importance Factor:	0	
3.	Roof Live Load	12	psf
4.	Basic Wind Speed:	110	mph
5.	Wind Load Importance Factor:	1.1	
6.	Wind Exposure Category:	C	
7.	Design Mean Roof Height(s):	12	feet

- C. Life Safety: All tensile membrane structures shall be detailed so that no life safety issue is created in the event of the loss of a part of the membrane. The tensile membrane structure shall not rely on the membrane for structural stability.
- D. Fire Performance: Range of characteristics required of membranes:
1. Burning Characteristics (ASTM E84).
    - a. Flame Spread 5 max.
    - b. Smoke Generation (Tunnel Test) 20 max.
  2. Fire Resistance of Roof Coverings (ASTM E108).
    - a. Burning Brand Class A
  3. Incombustibility of Substrates (ASTM E136).
    - a. Substrate Noncombustible Pass
  4. Flame Resistance (NFPA 701 Small Scale, UL 94).
    - a. Flame Out 1 second after
    - b. Char Length 0.25-inch max.

#### 1.5 QUALITY ASSURANCE

- A. Subcontractor Qualifications: Fabrication and erection of the tensile membrane structure is limited to firms with proven experience in fabrication and construction of complex tensile membrane structures. Such firms, through their own experience and/or that of their qualified subcontractors, shall meet the following minimum requirements:
1. The Subcontractor shall have at least fifteen (15) years' experience in the successful fabrication and erection of permanent, custom tensile membrane structures.
  2. The Subcontractor shall have fabricated and erected at least fifty (50) PTFE coated fiberglass tensile membrane structures, with at least five (5) structures of similar size and complexity as this project.
  3. The Subcontractor shall be licensed in the state of California.
  4. The Subcontractor shall design, procure, fabricate and erect PTFE coated fiberglass tensile membrane as a tensile membrane structure.
  5. The Subcontractor shall demonstrate it owns and operates a fabrication facility of adequate capacity and will maintain a staff experienced in the fabrication of PTFE coated fiberglass tensile membrane structures that will undertake the fabrication of this project.
  6. The Subcontractor shall maintain an in-house Warranty and Service department to assist in repair and service calls.
  7. The Subcontractor shall submit a Corporate Quality Control Manual describing the company's complete quality assurance program.
- B. Qualified Subcontractor (pre-approved).
1. **Birdair, Inc.**
  2. 5500 Main Street, Ste 206, Williamsville, New York 14221 USA  
Attn: Erik Jarvie  
Phone (626) 610-5029  
[EJarvie@Birdair.com](mailto:EJarvie@Birdair.com) Web Site [www.birdair.com](http://www.birdair.com)
  3. Or approved equal. Applicant must meet all minimum requirements as outlined in section 1.5.A above and show written proof for each item listed to become an approved subcontractor.

Substitution requests must be submitted by a Prime Bidder, minimum of (10) days prior to the bid date. Any approved equal shall be issued by addendum only, prior to the bid date.

4. Applicant for approved equal must submit engineering analysis along with request for approved equal. Analysis must include:
  - a. Finite Element Analysis.
  - b. Fabric form finding.
  - c. Proof of adequate membrane gradient under load displacement to allow water drainage.
  - d. Frame member sizing.
  - e. Canopy reaction loads at foundations.

## 1.6 SUBMITTALS

- A. General: Notwithstanding any provisions of these specifications that may appear to be to the contrary, any and all submittals by the Subcontractor shall be subject to review, approval, and adoption by the Project Engineer as part of the overall project design and engineering and shall not create a contractual or other professional design relationship between the Subcontractor and either the Project Engineer or the OWNER.
- B. Product Data: Include manufacturer's specifications for materials, fabrication, installation, and recommendations for maintenance. Include test reports showing compliance with project requirements where test method is indicated.
  1. Samples: Submit selection and verification samples.
- C. Submittals With Bid: The General CONTRACTOR shall submit with its bid the following materials from the Subcontractor:
  1. Schedule indicating key milestone dates during the project.
  2. Pre-qualification package including:
    - a. Company background and years of experience
    - b. Organizational chart and staff C.V.
    - c. List of past project references
    - d. Client recommendations
    - e. Fabrication facility documentation:
      - i) Background, including proof of ownership and years of operation
      - ii) Physical address
- D. Shop Drawings: Subcontractor shall submit tensile membrane structure drawings defining the completed structure, anchorage and connection details, interfaces with building construction, and general membrane seam arrangements.
- E. Quality Assurance Submittals.
  1. Test Reports: Provide test reports from a qualified testing laboratory that show compliance of the Subcontractor's PTFE coated fiberglass tensile membrane system with specification requirements, as follows:
    - a. Physical test data of the actual fabric roll goods to be used in the project confirming conformance with specifications for the membrane.
  2. Certificates: Product certificates signed by the Subcontractor certifying materials comply with specified characteristics, criteria, and physical requirements.
- F. Closeout Submittals.
  1. Warranty: Project Warranty documents as described herein.
  2. Record Documents: Project record documents for installed materials in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
  3. Maintenance Manual: Submit two (2) copies of a maintenance manual for the tensile membrane structure to the OWNER. The manual shall include a schedule for routine

inspection, an inspection checklist, instructions for emergency repair and use of emergency repair materials, and warranty. During the system erection period, the OWNER shall provide maintenance personnel to be trained in the use of the repair materials.

#### 1.7 PRODUCT DELIVERY, HANDLING, AND STORAGE

- A. General: Refer to the Conditions of the Contract for product handling provisions.
- B. Materials shall be packed, loaded, shipped, unloaded, stored, and protected in a manner that will avoid abuse, damage, and defacement.

#### 1.8 WARRANTY

- A. General: Refer to the Conditions of the Contract for project warranty provisions.
- B. After final payment, the Subcontractor shall furnish the OWNER with a written Warranty, which warrants that the membrane, its perimeter attachment system, and the structural support system as supplied by the Subcontractor have been installed in accordance with the project specifications and will be free from defects in materials and workmanship that will impair their normal use or service. The Warranty shall start from the date of Substantial Completion of the tensile membrane structure, which shall be the first date on which the entire tensile membrane structure is subject to design prestress conditions and continue for a period of one (1) year thereafter.

### PART 2 - MATERIALS

#### 2.1 ARCHITECTURAL MEMBRANE

- A. General: The membrane used in these structures shall be polytetrafluoroethylene ("PTFE," such as Teflon®) coated woven fiberglass. All references to "membrane" in this Section 13000, without exception, and whether singular, plural, or capitalized or not, are to such architectural membrane.
- B. The membrane shall meet the following general requirements:
  - 1. Source Quality Control: The primary materials shall be obtained from a single manufacturer. Secondary materials shall be those recommended by the primary manufacturer.
  - 2. Physical Characteristics: The following indicates a range of physical properties typical of PTFE Architectural Membranes. The determination of specific characteristics and selection of a membrane shall be derived from project engineering by the Project Engineer.
    - a. Coated Fabric Weight (oz./sq. yd.): 24 min. to 45.5 nom. (ASTM 4851)
    - b. Thickness (mils): 18 min. to 36 nom. (ASTM 4851)
    - c. Strip Tensile (lbs./in., avg.):
      - 1. Dry, Warp 520 min. to 975 min. avg. (ASTM 4851)
      - 2. Dry, Fill 380 min. to 900 min. avg. (ASTM 4851)
    - d. Strip Tensile, After Crease Fold (lbs./in., avg.):
      - 1. Dry, Warp 375 min. to 760 min. avg. (ASTM 4851)
      - 2. Dry, Fill 350 min. to 735 min. avg. (ASTM 4851)
    - e. Trapezoidal Tear (lbs./in., avg.):
      - 1. Warp 35 min. to 95 min. avg. (ASTM 4851)

	2. Fill	35 min. to 120 min. avg. (ASTM 4851)
f.	Solar Transmission (%):	7 to 22 nom. (ASTM E424)
g.	Solar Reflectance (%):	70 to 73 nom. (ASTM E424)

C. Materials.

1. Base Fabric: The yarns used shall be of the highest commercial quality, essentially free of broken fibers and fully suitable for coating. The fabric shall be woven with uniform tension and crimp in the warp and fill yarns and free of defects deleterious to the coating process.
2. Fluorocarbon Coatings: The coating materials shall be fluorocarbon resins formulated specifically for architectural applications. These materials shall be applied to form a weatherized barrier between the fiberglass yarns and the environment. The bulk of the coating shall be formulated dispersions of PTFE fluoropolymer resin and additives to enhance abrasion and tear resistance, impart pigmentation, or modify solar transmission. The additives shall not constitute more than 20% by weight of the total coating or 25% by weight of any individual layer. The surface shall be totally a fluoroethylenepropylene ("FEP") resin to facilitate heat welding.
3. After weaving, the base fabric shall be cleaned and primed to achieve optimum mechanical properties of the coated membrane. The coating, described above, shall be virtually free of mud cracks and pinholes. The coating shall be applied evenly to both sides of the fabric and the FEP fluorocarbon resin topcoat shall be of sufficient thickness to permit proper heat fusion of joints with the recommended die pressure and temperature.
4. Fabric manufacturer will offer ten (10) year pass-through warranty on material against UV degradation.

## 2.2 CABLES AND END FITTINGS

A. Materials.

1. All structural wire rope cables shall conform to the latest revision of ASTM A603.
2. All structural strand cables shall conform to the latest revision of ASTM A586.
3. All cables shall be coated to "Class A" zinc coating throughout.
4. All cables in contact with the membrane shall be white PVC coated. All other cables may be galvanized only.

B. Fabrication.

1. Cable fabricator shall provide effective quality control over all fabrication activities. Inspection of the place of fabrication may occur at any time to verify proper quality control. This inspection does not relieve the fabricator from meeting the requirements of this specification.
2. Cables that are designated to be prestretched shall be prestretched per ASTM A603 for wire rope and ASTM A586 for structural strand. Cables of the same type shall have the same modulus of elasticity.
3. All cables shall be manufactured to the following length tolerances at 70 degrees Fahrenheit (23 degrees Celsius):
  - a. Length < 70 feet (21.3 meters) ¼ inch (6.4 mm)
  - b. Length 70 to 270 feet (21.3 to 82.3 meters) 0.03% of length
  - c. Length > 270 feet (82.3 meters) 1 inch (25.4 mm)
4. Cables shall have a continuous longitudinal paint stripe (¼ inch wide max.) along their top surface unless noted otherwise.
5. Index markings shown shall be a circumferential paint stripe (¼ inch wide max.).
6. All cables and end fittings shall be delivered clean and dry.
7. All swaged and speltered fittings shall be designed and attached to develop the full breaking strength of the cable. Thimble end fittings shall develop a minimum of 90% of the cable breaking strength.



8. Swaged end fittings, pins, nuts, and washers shall be hot dip galvanized per ASTM A153. Any damage to the zinc coating shall be cleaned and painted with a gray zinc-rich paint per ASTM A780.
9. Speltered end fittings shall be hot dip galvanized per ASTM A153. Any damage to the zinc coating shall be cleaned and painted with a gray zinc-rich paint per ASTM A780.

### 2.3 ALUMINUM CLAMPING SYSTEM

- A. Materials.
  1. All structural aluminum clamping systems shall be ASTM alloy 6061-T6.
  2. Bent plates shall be formed from ASTM alloy 6061 and then heat-treated to T6.
  3. All structural "U straps" shall be stainless steel, Type 316.
  4. All structural aluminum clamping shall have the following finish:
    - a. Polyester thermosetting powder coating with a tri-glycidyl isocyanurate (i.e. TGIC) curing agent/hardener per American Architectural Manufacturers Association (AAMA) 2603 to a thickness of 3 mils, white in color.
  5. Structural sheet aluminum shall be ASTM alloy 5052-H32.
  6. Non-structural sheet aluminum shall be ASTM alloy 1100 series.
- B. Fabrication.
  1. Aluminum fabricator shall provide effective quality control over all fabrication activities. Inspection of the place of fabrication may occur at any time to verify proper quality control. This inspection does not relieve the fabricator from meeting the requirements of this specification.
  2. Fabricated aluminum shall have no sharp edges.
  3. Stamp all parts with the appropriate mark number.
  4. All fabricated aluminum shall be free of oil, grease, and machining chips.
  5. Tolerances shall be as follows:
    - a. Cross sectional dimensions                    +/- 10%, 0.03-inch (0.8 mm) max.
    - b. Bolt hole locations                               +/- 1/32 inch (0.8 mm)
    - c. Overall length                                       +/- 1/16 inch (1.6 mm)
  6. All welded joints shall conform to AWS D1.2.

### 2.4 STRUCTURAL STEEL

- A. General: The structural steel fabrication shall comply with the latest revision of all applicable codes, standards, and regulations including the following:
  1. ASTM (as referenced) **or equivalent.**
  2. AISC: "Specification for Structural Steel Buildings" and "Code of Standard Practice for Steel Buildings and Bridges."
  3. SSPC: "Steel Structures Painting Manual, Volumes 1 and 2."
  4. Research Council on Riveted and Bolted Structural Joints: "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
  5. AWS D1.1 and AWS A2.4.
- B. In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards or these specifications, the provisions of the more stringent shall govern.
- C. Submittals.
  1. General: Submit the following in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
  2. Shop Drawings.
    - a. The structural steel fabricator shall submit shop drawings to the Subcontractor for approval.

- b. The drawings shall show all shop and erection details including cuts, copes, connection holes, threaded fasteners, bolts, studs and spacing, etc.
- c. The drawings shall show all welds, both shop and field, by the currently recommended symbols of the AWS.
- d. A welding procedure must be submitted to the Subcontractor for approval of welds that are not prequalified.
- e. Shop drawings shall be carefully checked before being submitted for approval, and shall be submitted in the order in which they are needed for the execution of the work, well in advance and not all at one time. Submitted drawings shall show all structural steel required for the work, whether or not indicated on the drawings.
- f. The fabricator shall not fabricate any material until after receipt of approved drawings.
- g. The fabricator shall immediately make all corrections to his drawings as required by the Subcontractor and shall keep a satisfactory history of all changes by separately numbered and dated revision block on a convenient portion of each drawing affected.
- h. Certification of material conformance that includes chemical and physical properties for all structural elements shall be submitted to the Subcontractor.

D. Materials.

- 1. Structural steel for plates and bars shall conform to the requirements of ASTM A36 or ASTM A572, Grade 50, or equivalent material in yield strength, tensile strength, elongation and weldability.
- 2. Structural pipe shall conform to ASTM A53, Types E or S, Grade B or equivalent material in yield strength, tensile strength, elongation and weldability.
- 3. Structural tubing shall conform to ASTM A500 Grade B or equivalent material in yield strength, tensile strength, elongation and weldability.
- 4. Structural bolts.
  - a. High strength bolts: ASTM A325, unless noted otherwise.
  - b. Common bolts and nuts: ASTM A307.
  - c. Threaded rods: ASTM A36, unless noted otherwise.
- 5. Other materials: All other materials, not specifically described but required for a complete and proper installation of structural steel, shall be provided and shall be new, free from rust, first quality of their respective kinds, and subject to the approval of the Subcontractor.

E. Accessories.

- 1. Base Plates and Anchor Bolts.
  - a. Base plates supported on concrete, whether shop attached or shipped loose, shall be furnished and set on shims, leveling plates or leveling nuts. Grouting shall be by the General CONTRACTOR.
  - b. Anchor bolt locations shall be furnished by the Subcontractor and used by the General CONTRACTOR to set the bolts. The General CONTRACTOR is to check carefully the setting of the bolts to their proper position prior to placing of concrete. Anchor bolts, provided by the General CONTRACTOR, shall have two (2) nuts and washers. Damaged threads shall be repaired or be cut to permit full tightening of nuts.

F. Fabrication.

- 1. Workmanship: All members, when finished, shall be true and free of twists, bends, and open joints between the component parts. Members shall be thoroughly straightened in the shop by methods that will not injure them, before being worked on in any way.
  - a. Properly mark materials, and match-mark when directed by the Subcontractor, for field assembly.

- b. Grind all edges and corners that could contact membrane to a minimum 1/16" (1.6mm) radius.
  2. Connections.
    - a. Connections shall be as indicated on the drawings. When details are not shown the connections shall conform to the requirements of the AISC.
    - b. Provide high-strength threaded fasteners for all structural steel bolted connections, unless noted otherwise.
    - c. Combination of bolts and welds in the same connection are not permitted, unless otherwise detailed.
    - d. Welded Connections.
      1. Definitions: All terms herein relating to the welds, welding and oxygen cutting shall be construed in accordance with the latest revision of "Standard Definitions of Welding Terms and Master Chart of Welding Processes" of the AWS.
      2. Operators: Welds shall be made only by operators who have been previously qualified by tests, as prescribed in AWS D1.1 to perform the type of work required.
      3. Welding equipment shall be of sufficient capacity and maintained in good working condition, capable of adjustment in full range of current settings. Welding cables shall be adequate size for the currents involved and grounding methods shall be such as to insure proper machine operation.
      4. No welding shall begin until joint elements are clamped in proper alignment and adjusted to dimensions shown on the drawings with allowance for any weld shrinkage that is expected. No members are to be spliced without prior approval.
      5. All welding shall be done in accordance with the reference specifications, with the following modifications and additions:
        - a. All field welding shall be done by manual shielded metal-arc welding.
        - b. All groove welds shall have complete penetration, unless otherwise specified on the drawings.
        - c. The minimum preheat and interpass temperature requirements shall be as required per AWS D1.1.
      6. Welding Sequence: Heavy sections and those having a high degree of restraint must be welded in a sequence with the proper preheat and post-weld heat treatment such that no permanent distortion occurs. Submit a welding sequence for approval for these types of connections.
      7. Oxygen Cutting: Manual oxygen cutting shall be done only with a mechanically guided torch. Alternatively, an unguided torch may be used provided the cut is not within 1/2 inch of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal edges. The use of oxygen-cut holes for bolted connections or pin connections will under no circumstances be permitted, and violation of this clause will be sufficient cause for the rejection of any pieces in which oxygen-cut holes exist.
3. Tolerances: All tolerances shall be as per the AISC "Code of Standard Practice for Steel Buildings and Bridges" unless otherwise indicated. Limit variation in straightness to (member length)/960 measured in any direction for all members.

4. Paint System, ~~Three Coat; Epoxy Polyurethane~~: See specification 05 05 13 for **SHOP-APPLIED COATINGS FOR METAL (TNE MEC AND ZINC PRIMING)**.
  - a. Color: Stage Canopy and Family Canopies will be Tnemec Semi-Gloss Color Medium Bronze 85BR.
  - b. Color: Sports canopies will be Tnemec Semi-Gloss Color Montana 80BR.
  - a. ~~Source Quality Control: Primary materials shall be obtained from a single manufacturer. Secondary materials shall be those recommended by the primary manufacturer.~~
  - b. ~~Surface Preparation and Prime Coat:~~
    1. ~~Surface preparation shall be near white blast cleaning SSPC SP 10, after all fabrication operations such as machining and welding are complete. There shall be a maximum of eight hours elapsed time between surface preparation and application of the prime coat.~~
    2. ~~Protect all drilled and tapped holes and/or threaded studs prior to painting such that all bolted connections can be made by subcontractor or membrane structure erector without first cleaning threads.~~
    3. ~~Primer shall be International Paint Interzinc 315 or approved equal, and shall comply with the composition and performance requirements of SSPC paint specification No. 20.~~
    4. ~~Primer shall be mixed and applied in accordance with manufacturer's instructions and technical product datasheets. The dry film thickness shall be 2.5-3 mils.~~
  - c. ~~Intermediate Coat:~~
    1. ~~Intermediate coat shall be International Paint Intergard 475HS or approved equal.~~
    2. ~~The intermediate coat shall be mixed and applied in accordance with the manufacturer's instructions technical product datasheets. The dry film thickness shall be 4-6 mils.~~
  - d. ~~Finish Coat:~~
    1. ~~The finish coat shall be International Paint Interthane 870 series or approved equal, and shall comply with the composition and performance requirements of SSPC paint specification No. 36.~~
    2. ~~The finish coat shall be mixed and applied in accordance with the manufacturer's instructions and technical product datasheets. The dry film thickness shall be 4-5 mils.~~
    3. ~~Total system dry film thickness shall be 10.5-14 mils.~~
  - f. ~~Color: The paint color shall be as specified on the drawings or selected by the ARCHITECT.~~
  - g. ~~Quality: The dry paint shall be uniform and continuous with no voids or puddles and shall not be broken by scratches or nicks. Although Birdair or the Steel Fabricator may witness the painting operation, this does not relieve the Painting Subcontractor of the responsibility for meeting the quality and workmanship requirements of these specifications.~~
  - h. ~~Care and Handling: The Painting Subcontractor shall make every reasonable effort to ensure that the painted steel is thoroughly dry and that is handled carefully to prevent damage to the paint and to reduce field repairs. Nylon slings should be used when handling the painted steel.~~
  - i. ~~Certification: The Painting Subcontractor shall be required to certify the paint manufacturer's name, paint identification, conformance with manufacturer's written instructions, and the paint dry mil thickness.~~

- G. Source Quality Control.
  1. Testing.

- a. An independent testing laboratory paid for by the OWNER shall perform testing and inspection of the structural steel and welding. All welds shall be tested by visual, dye penetrant, magnetic particle methods, or ultrasonic methods in accordance with instructions from the Subcontractor.
  - b. The Subcontractor and the testing laboratory inspector shall be permitted to inspect the work in the shop or field throughout fabrication and erection.
  - c. The inspector shall check for workmanship of steel, both in the shop and field, and check general compliance with the Contract Documents and steel shop drawings. The inspector shall record types and locations of all defects found in the work and measures required and performed to correct such defects.
  - d. The steel fabricator shall make all repairs to defective work to the satisfaction of the inspector and at no additional cost to the Subcontractor.
  - e. The inspector shall submit reports of his inspection and test findings to the Subcontractor. He shall record all defects found with subsequent repair operations and submit reports to the Subcontractor.
  - f. The work of the independent inspector shall in no way relieve the steel fabricator of his responsibility to comply with all requirements of the Contract Documents.
- H. Product Handling and Protection: Use all means necessary to protect structural steel before, during, and after installation and to protect the installed work and materials of all other trades.
- I. Rejection and Replacement.
- 1. In the event of damage to the steel, immediately make all repairs and replacements necessary to the approval of and at no additional cost to the Subcontractor.
  - 2. Any materials or welding rejected through inspection either in the shop, mill or field must be promptly replaced to the satisfaction of, and at no additional cost to, the Subcontractor.
- J. Qualifications of Steel Fabricator: The steel fabricator shall have not less than five (5) years' continuous experience in the fabrication of structural steel.

## 2.5 FASTENERS

- A. General: Provide fasteners used to secure clamp systems to curbs and cables, assemblage of clamp systems, and other fasteners as required to complete the work specified herein.
- B. Materials.
- 1. All work shall comply with the latest edition of ASTM standards and American Iron and Steel Institute (AISI), as referenced herein.
  - 2. Fasteners used in membrane clamping systems shall be stainless steel. Bolts and studs shall conform to ASTM F593, Type 304. Nuts shall conform to ASTM F594, Type 316. Washers shall be plain, narrow, and conform to AISI Type 18-8.
  - 3. All clamping systems subjected to relative movement between clamping and curb shall receive a split-ring lock washer conforming to AISI Type 18-8.
  - 4. Unless otherwise specified on the drawings, all other bolts and nuts shall conform to ASTM A307-76B, zinc plated to conform to ASTM B633 Class Fe/Zn 8 type III.
- C. Source Quality Control: The manufacturer shall certify that all fasteners comply with the above referenced specifications.

## 2.6 GASKETING

- A. General: All work shall comply with the latest edition of ASTM standards, as referenced herein.
- B. Sponge Neoprene Gasketing:

1. Material.
  - a. All sponge neoprene shall be of a cellular elastomeric compound of a firm grade, which has been manufactured in pre-formed shapes for use as gasket and sealing material, as specified in ASTM specification C509.
  - b. Cellular elastomeric materials furnished to this specification shall be manufactured from natural or synthetic rubber, or mixtures of these, with added compounds of such nature and quality that, with proper curing, the finished product will comply with this specification.
  - c. The cured compounds shall be suitable for use where resistance to sunlight, weathering oxidation, and permanent deformation under load are of prime importance.
  - d. The manufacturing process shall be such as will ensure a homogeneous cellular material free of defects that may affect serviceability.
  - e. The physical characteristics of the neoprene must meet or exceed ASTM C509, "Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Materials."
  - f. Certification of material shall be provided that conforms to ASTM C509.
  
- C. Dense Neoprene Gasketing:
  1. All neoprene material shall conform to ASTM D 2000M hardness Grade 60. The material shall be homogenous, free from defects and shall be compounded and cured to meet the requirements specified herein.
  2. All neoprene shall be non-staining formulation and shall consist of at least 50% by weight of basic rubber hydrocarbon. Material shall not contain crude or reclaimed rubber.
  3. The physical characteristics of the neoprene must meet or exceed the following physical test requirements when tested using the standard ASTM test slab can compression set plug (or approved equal):
 

	PROPERTY	ASTM TEST METHOD	UNITS
a.	Shore A Durometer	D 2240	55 – 65
b.	Tensile Strength (Min.)	D 412	1,100 PSI
c.	Percent Elongation (Min.)	D 412	300%
d.	Percent Compression Set (Max.)	D 395, Method B, 22 hrs at 212°F	35%
e.	Heat Aging, Change from Original Properties:	D 573, 70 hrs @ 212°F	
	1. Hardness Change (Max.)		+15 Points Shore A
	2. Tensile Strength (Max.)		-15%
	3. Elongation Change (Max.)		-40%
f.	Flame Resistance		Must Not Propagate Flame
g.	Temperature Range		-30°C to 100°C
h.	Ozone Resistance	D 1171, Method A, 72 hrs @ 38°C and 50 mPa Ozone	
i.	Resistance to Oil Aging:	D 471, 70 hrs @ 212°F Immersion in ASTM Oil No. 3	
	1. Tensile Strength (Max.)		-70%
	2. Elongation (Max.)		-55%
	3. Volume Change (Max.)		+120%

## 2.7 MAINTENANCE KIT

- A. Architectural Membrane Maintenance Kit: The OWNER shall be supplied with the following materials for emergency repair or maintenance. The materials shall be neatly packaged into a maintenance kit for storage by the OWNER.

B.	QUANTITY	DESCRIPTION
1.	6	12-inch diameter patch
2.	12	5-inch diameter patch
3.	12	4 inch x 8 inch rectangular patch
4.	6 sq yds	Membrane
5.	1	Hot air gun
6.	1	Tacking roller
7.	2	Insulating bearing blocks
8.	1	5/8 in. hole punch
9.	1	Utility knife
10.	50	Repair clips
11.	1	Spool of No. 36 nylon twine
12.	36 yds	Cormar B29/4 x 15 Kevlar® thread
13.	1	Hand awl
14.	1 pkg	C-29 needles
15.	1	Repair manual

### PART 3 - FABRICATION AND ERECTION

#### 3.1 FABRICATION OF MEMBRANE PANELS

- A. General.
1. Membrane assembly shop drawings shall include all information necessary for the fabrication by the Subcontractor of the tensile membrane structure. They shall include size and shape of envelope, type and location of shop and field connections, size, type, and extent of all heat-welded seams.
  2. The Subcontractor shall take necessary care to plan and assemble the fabricated sections such that the assembly has no shop patches. Splices, if any, shall be patterned into a symmetrical and repetitive geometric arrangement within the assembly, shown on the shop drawings and, where feasible, hidden by structural members.
  3. All fabricated joints shall have a minimum of 90% of the total strength of the coated membrane in strip tensile testing. All structural joints shall be fused in accordance with industry standards and shall maintain the integrity of the coating.
  4. Biaxial Test: At least one (1) representative sample of the outer membrane shall be biaxially test loaded. Membrane compensation in patterning shall be based upon the results of the biaxial test loading.

#### 3.2 ERECTION OF MEMBRANE ASSEMBLIES

- A. Prior to installation of the membrane assemblies, the Subcontractor shall meet with the General CONTRACTOR to review the erection procedure and scheduling. The Subcontractor shall coordinate all work with other trades.
- B. No trade shall have access to, or work from the membrane, unless authorized by the Subcontractor in writing.
- C. Weather conditions: The Subcontractor shall proceed with installation of the tensioned membrane and associated Work only when existing and forecast weather conditions permit Work to be



performed in accordance with established procedures and an appropriate degree of safety. The Subcontractor shall proceed only when willing to guarantee the Work as required without additional reservations or restrictions. All mutual decisions or agreements to proceed with the Work under unfavorable weather conditions must be recorded in writing stating the reasons for proceeding and the name of the person or persons involved in the decision. Under no condition will the Subcontractor be required to erect in weather conditions not approved by them.

D. Patching and repairs:

1. Installation of the canopy fabric shall be made with due care and appropriate protection to limit abrasion, cuts and tears.
2. Small damaged areas, maximum dimension in any direction 4 in., in the roof fabric shall be patched. No more than one field patch in 2000 sq. ft. shall be allowed, and no more than one field patch per panel, and no more than 5 field patches in the entire Work shall be allowed.
3. All field patches shall be executed to achieve 100% of the virgin coated membrane's strength properties.
4. All patches shall be circular.

E. Erection of Structural Steel (or other structural supporting elements).

1. The Subcontractor shall employ a competent foreman to supervise all work of steel erection. This foreman shall be present at all times during the Subcontractor's scope of work.
2. All precautions shall be taken to ensure an accurately located and completely safe and stable structure at all times. Adequate guy cables shall be used throughout the work and all erection bolts shall be drawn up tight.
3. All steel shall be accurately aligned before permanent connections are made.
4. Temporary bracing shall be left in place as long as may be required for safety. The bracing shall be located so it does not interfere with the erection of the tensile membrane structure, and can be removed as required during construction.
  - a. The structure is to be self-supporting and stable after the building is fully completed. It is the Subcontractor's sole responsibility to determine the erection procedure and sequence and to ensure the safety of the building and its component parts during erection. This includes the addition of whatever temporary bracing, guys or tie-downs that may be necessary. Such materials shall be removed by the Subcontractor and remain his property after completion of the project.
5. Erection tolerances shall be specified in the AISC "Code of Standard Practice for Steel Buildings and Bridges," including those related to placement of anchor bolts, unless otherwise indicated.
  - a. Tensile membrane structures (including individual membrane panels) are pre-engineered and pre-fabricated to fit a specific theoretical dimension. For those primary and secondary structural elements to which the membrane structure (including an individual membrane panel) is connected, the erected position of member working points, including those of cantilevered members, shall not vary from the theoretical model by more than 1" (25mm) in any direction, either individually, *or cumulatively* across a shipping piece. This includes but is not limited to: cable connection points, membrane panel edges, membrane bearing locations, intermediate splice points of field-spliced members, hardware connections, weldments and their anchorages. For arched members, include the three-dimensional location of the member midpoint as a working point for tolerance measurement.
  - b. The *cumulative* effect of dimensional steel discrepancies shall be such that the distance between membrane panel support points does not vary more than 1" (25mm) from the theoretical dimension within each membrane panel.



- c. All steel structures that support tensioned membrane must maintain an uninterrupted drainage path and a minimum constant slope of 5 degrees from all points of the membrane.
- d. In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards *or* these specifications, the provisions of the more stringent shall govern.

### 3.3 PROTECTION AND CLEANING

- A. Protect work from damage and deterioration during installation.
- B. Upon completion of tensile membrane structure installation:
  - 1. The Subcontractor shall clean all surfaces of the system's components in conformance with the membrane manufacturer's recommendations.
  - 2. Inspect the system and repair membrane panels that have become damaged. Repairs shall be executed in such a way that they are visually acceptable.
- C. Further protection of the work and final cleaning, if necessary, shall be the responsibility of the General CONTRACTOR.

END OF SECTION 133100

## ONTARIO SPORTS EMPIRE

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**SECTION 13 31 23.1****TENSILE MEMBRANE STRUCTURES – MODERN SHADE****PART 1 GENERAL****1.1 Summary**

The shade structure manufacturer shall be responsible for the design, engineering, fabrication and supply of the work specified herein.

**1.2 Submittals**

- A. Provide proof of installed reference sites with structures for similar scope of a project and installation that are engineered to the latest IBC specifications. Include in reference; list of structure dimensions with install dates and project locations.
- B. Provide fabric samples to demonstrate fabric color range and paint color selections.
- C. Provide wet sealed structural engineering drawings and calculations as deferred submittal for approval by Construction Manager

**1.3 Project Conditions**

Field Measurements: Verify layout information for shade structures shown on the drawings in relation to the property survey and existing structures including all utilities and easements. Verify locations by field measurements prior to construction.

**1.4 Warranty**

- A. The manufacturer shall provide a 10-year non-prorated warranty on the shade fabric and Teflon stitching against cracks, tears, material breakdown or significant fading as a direct result of ultraviolet exposure with the exception of Red, which carries a 3-year limited warranty. Shade fabrics over 40' in length carry a limited 5-year non-prorated warranty.
- B. The manufacturer shall provide a 20-year non-prorated warranty against failure due to rust-through corrosion on steel frames.
- C. The manufacturer shall provide a 1-year warranty on all moving parts, surface coat finish, or any other product or part not covered by the above warranties.

**PART 2 PRODUCTS****2.1 Related Documents**

Pre-Engineered Package: the proposed structure(s) by manufacturer or approved equal shall be modular and prefabricated, and include the structural steel frame, fabric roof, steel cables, all fasteners, and detailed installation instructions of structure(s) including foundations. The proposed structure(s) also need to include engineering drawings and calculations.

- A. Acceptable Manufacturer: Modern Shade LLC,  
4213 Felter Lane, Austin, TX. 78744  
Contact: **Barbara Brosch**  
[barbro@kompan.com](mailto:barbro@kompan.com)  
Toll Free: 1.877.385.3444  
Main: 512.385.4100  
Fax: 512.385.4103  
Email: [sales@modernshadellc.com](mailto:sales@modernshadellc.com)
- B. The shade structure shall conform to the current adopted version of the International Building Code including local agency amendments and additions to the code.

- C. All shade structures shall be engineered and designed to meet a minimum.
- 90 mph nominal wind load (or 115 mph ultimate wind speed) with fabric attached
  - 150 mph nominal wind load without fabric (steel frame only)
  - 5 psf snow load

## 2.2 Materials Framing

- A. Utilized per manufacturer's specifications and sealed engineering drawings
- B. Rolled steel plates, shapes, and bars shall be structural quality carbon steel complying with ASTM A-36, except where engineer drawings specify otherwise.
- C. Structural steel tubular products shall be cold-formed structural quality carbon steel complying with ASTM A-500, Grade B except where engineer drawings specify otherwise.
- D. Galvanized tubing material shall be corrosion resistant using patented Flo-Coat TM with polymer coating applied to seal and protect.
- E. Reinforcement steel as required or designed per detailed specifications excepted by Structural Engineer.
- F. All structural steel shall be fabricated and erected in accordance by and as recommended by the AISC Manual of Steel Construction.

## 2.3 Powder Coat Finish

- A. All Structural Steel shall be blasted and treated with de-greaser to remove any unwanted substances.
- B. Pre-heated to remove any welding gas impurities and moisture.
- C. All Structural Steel (galvanized and non-galvanized) including welds to be primed with Zinc rich primer.
- D. Powder coated in the approved color by electro-statically applying and backing at 400 degrees Fahrenheit to a minimum thickness between 4.0 – 6.0 mil for a consistent glossy finish.
- E. TGIC polyester powder shall meet or exceed ASTM standards for adhesion, hardness, impact, flexibility, over bake resistance, and sea spray resistance.

## 2.4 Hot-Dip Galvanized Finish

- A. All HDG work shall be carried out according to this procedure and the following references: ASTM A123, ASTM B6, ASTM A780, ASTM A142/A143M, ASTM A153/A153M, ASTM A384/A384M, ASTM A385/A385M
- B. Fabricated steel shall be dipped in a Sodium Hydroxide bath to remove organic contaminants, heated (approx 160F) at approximately 10-14% concentration. Water immersion rinse to remove loose particles, oils, and residual caustic solution.
- C. Hydrochloric acid immersion cleaning to remove rust and mill scales. Water immersion rinse to remove residual acid solution.
- D. Material to air dry after flux treatment prior to entering the kettle
- E. Material dipped in Zinc bath at approximately 840F containing Special High Grade Zinc meeting ASTM B6 spec to prevent corrosion. Surface is skimmed prior to material being slowly immersed into bath, temperature equalizes for proper reaction, material slowly removed at an incline for draining purposes. Dipping time varies depending on material type and size. Zinc coating weight varies depending on material type, size, and steel chemistry meeting minimum requirement of ASTM A123 specification.
- F. Material is hand cleaned removing drips, projections, and other impurities per requirements of ASTM A123 specification.
- G. Coating thickness inspection taken with calibrated millage gauge per ASTM A123 specification requirement.
- H. Areas subject to renovation shall be repaired per the ASTM A780 specification. If an area is repairable per the spec, the steel surface is prepped with power tools sanding away oxidized areas to bare metal. ZRC Galviline Galvanizing Repair Compound (paint containing zinc dust) is then brushed on to the bare metal.

## 2.5 Shade Fabric and Thread

- A. High-density polyethylene woven architectural fabric, 85% - 98.8% Ultraviolet Resistant.
- B. ALL fabric seams shall be sewn with minimum 2000 Denier PTFE thread utilizing the lock stitch sewing method. PTFE Thread will not lose any significant strength due to UV or chemical exposure. Chain stitching of any kind shall not be used.
- C. Water runoff: Runoff Roof Angle 75% - 14 degrees
- D. Provides an average of 85% or greater shade covered area.
- E. Temperature stability at a maximum +176degrees/-13degrees minimum.
- F. Utilized in accordance to manufacturer's shade cloth specifications product data, installation instructions use limitations and recommendations for the entire structure, including both published data and specified data prepared for this project.
- G. Approved Fire Rating as a result of the ASTM E-84 (Class A). Also available upon request substitute fabric with extra fire retardant to pass California Fire Marshall and NFPA 701 Test Method 1 & 2.
- H. Fabric shall be lead free.
- I. Fabric cable pockets are double folded to provide extra reinforcement.
- J. Fabric corners shall be reinforced with minimum 3" internal seat belt webbing that connects each cable pocket opening in semi-arc pattern with cross section of webbing connecting to corner attachment. Standard and Super Structure Hips shall have a stainless-steel plate sewn into internal webbing pockets at each corner to prevent fabric from ripping out.

## 2.6 Welding

- A. All welds performed by AWS certified welder.
- B. Welding performed in accordance with the latest edition of the American Welding Society Structural Welding Code AWS D1.1
- C. Steel shall be welded as to develop the maximum strength at connections.
- D. According to selection, Engineer drawings shall specify particular sizes and types of welds.
- E. Welds shall be visually inspected for soundness, smooth, even contour and freedom from undercutting and arc strikes. Minimum fillet welds 3/16" on small upper frames and 1/4" everywhere else. Welds shall be continuous.
- F. Standard practice welding performed using 71A75 Dual Shielded Flux Core .045 wire.

## 2.7 Foundations

- A. The foundation design shall be based on previous knowledge of soil conditions in the vicinity or existing surfaces and building codes and structural load requirements in accordance with American Concrete Institute, ACI 318-05.
- B. Existing foundation conditions shall be examined and surveyed to assure support for the structure.

## 2.8 Concrete Piers

- A. Concrete work shall be performed when outdoor temperatures are above 32 degrees Fahrenheit and conditions are relatively dry.
- B. Utilizing a minimum concrete strength of 2500 psi high strength Ready Mix concrete with an approximate finished weight of 145 Lbs. per Cu. Ft.
- C. Reinforcing steel shall be detailed, fabricated, and placed in accordance with the latest ACI Detailing Manual and Manual of Standard Practice.
- D. Concrete shall be formed as to direct drainage from the site to prevent corrosion or rust in embedded post.

## 2.9 Base Plate and Anchors

- A. Steel plates shall be continually welded at the base of the post and bolted to the foundations.
- B. All steel plates shall be carbon steel connections shall conform to ASTM A-325.
- C. All anchor bolts and threaded rod shall be ASTM F-1554 unless otherwise specified by the engineer of record.
- D. Installation, design, and structural specifications shall be in accordance with ASTM Structural Specifications for Bolted Connections.

- E. Anchoring methods shall be in conjunction with all related selections of this specification.

#### 2.10 Fasteners Bolted Connections

- A. All nuts, bolts, anchor bolts, lock washers, cable locks, and threaded rods shall be medium carbon steel, stainless steel, or galvanized corrosion resistant: size and type to suit applications and meet requirements.
- B. Carbon steel connections shall conform to ASTM A-325 steel.
- C. Bolted connections shall be in conjunction with all related selections of this specification.
- D. All bolted connections shall be installed in accordance with Structural Specifications for Bolted Connections utilizing ASTM A-325 or ASTM A-490 Bolts.

#### 2.11 Steel Aircraft Cables and Tensioning

- A. Standard min. 1/4" galvanized steel aircraft cable shall be utilized with a minimum tensile strength of 7,000 lbs. on standard structures and min. 3/8" galvanized steel cable with a minimum tensile strength of 14,400 lbs. on super structure sizes unless otherwise specified by the engineer of record.
- B. **MaxTension™**, our proprietary pulley system, is designed to keep the top fabric tight and firm.
- C. Smaller Structures under 30 ft. will have a single cable pass through the **MaxTension™** pulley system at each corner in order to achieve required tension.
- D. Structures over 30 ft. require an independent cable on each side of the structure that passes through the **MaxTension™** pulley system in order to achieve required tension.
- E. Sail Structures require an independent cable on each side of the fabric membrane sail which terminate into a delta. Cables must arrive from the factory with only one end terminated and the opposite "live" end open for required tensioning adjustments in the field. Unlike single point tension systems, our multi-point tension system allows each side to achieve maximum tension specific to the length of each span. Deltas shall be sewn into each attachment point using 3" minimum internal seat belt webbing for added strength. Fabric corners sandwiched between steel connector plates and squeezed together with bolts are not acceptable. Deltas attach to shackles and turnbuckles in order to achieve required tension and for easy removal and reattachment of the fabric. Turnbuckles may not be required on small sails.

### PART 3 EXECUTION

#### 3.1 Preparation

- A. Prepare surfaces according to the manufacturers' guidelines.
- B. Locate piers according to the plans provided by manufacturer.

#### 3.2 Installation

- A. Install in accordance with manufacturer's guidelines.
- B. Place on prepared concrete foundations or footings as specified.
- C. Anchor securely in place.
- D. Must apply silicone to all slip fit connections to avoid rust.

#### 3.3 Protection

- A. Protect installed products until project is completed.
- B. Touch-up, repair or replace any products that might have been damaged during installation before substantial completion.

**SECTION 26 05 00****ELECTRICAL GENERAL PROVISIONS****PART 1 - GENERAL****1.01 SCOPE**

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with furnishing, delivery, and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to, the following:
1. Examine all other Sections for work related to those other Contract Document Sections and required to be included as work under this Section and this Division.
  2. Electrical General Provisions and Requirements for electrical work.
  3. Division-1; General Requirements; General Conditions.
- B. Organization of the Specifications into Divisions, Sections and Articles, and arrangement of Drawings shall not control the Contractor in dividing the Contract Work among Sub-Contractors or in establishing the extent of work to be performed by any trade.

**1.02 GENERAL SUMMARY OF ELECTRICAL WORK**

- A. The Specifications and Drawings are intended to cover the complete installation of systems. The omission of expressed reference to any item of labor or material for the proper execution of the work in accordance with present practice of the trade shall not relieve the Contractor from providing such additional labor and materials.
1. The Contract Document terms "Provide", "Provided", "Providing", are each defined to mean individually and collectively: Contractor shall furnish, and Contractor shall install, and Contractor shall connect.
- B. Refer to the Drawings and Shop Drawings of other trades for additional details, which affect the proper installation of this work. Diagrams and symbols showing electrical connections are diagrammatic only. Wiring diagrams do not necessarily show the exact physical arrangement of the equipment.
- C. Before submitting a bid, Become familiar with all features of the Building Drawings and Site Drawings, which may affect the execution of the work. No extra payment will be allowed for failure to obtain this information.
- D. If there are omissions or conflicts between the Drawings and Specifications, clarify these points with the Owner's Representative before submitting bid and before commencing work.
- E. Provide work and material in conformance with the Manufacturer's published recommendations for respective equipment and systems.

**1.03 LOCATIONS OF EQUIPMENT**

- A. The Drawings indicate diagrammatically the desired locations or arrangements of conduit runs, outlets, equipment, etc., and are to be followed as closely as possible. Proper judgment shall be exercised in executing the work to secure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structure conditions encountered.

- B. Where outlets are placed on a wall, locate symmetrically with respect to each other, furniture, cabinets, and other features or finishes on the wall.
- C. In the event changes in the indicated locations or arrangements are necessary, due to developed conditions in the building construction or rearrangement of furnishings or equipment, such changes shall be made without cost to the Contract, providing the change is ordered before the conduit runs, etc., and work directly connected to same is installed and no extra materials are required.
- D. Lighting fixtures in mechanical spaces are shown in their approximate location only. Do not install light outlets or fixtures until mechanical piping and ductwork is installed; then install lights in a location to provide best lighting.
- E. Coordinate and cooperate in every way with other trades to avoid interference and ensure a satisfactory job.
- F. The location of the existing utilities, building, equipment, and conduit shown on the Drawings is approximate. Verify exact locations and routing of existing systems during pre-construction.
  - 1. Pothole all trench routes prior to digging the trench. Pothole at least 100 feet ahead of the actual trenching to allow space to alter the new conduit routing to accommodate existing conditions.
  - 2. In-buildings employ raceway/circuit tracers, x-ray visual detection, RF/ ultrasound, electromagnetic circuit detection to avoid damaging existing hidden conditions.
  - 3. Repair/replace, without additional cost to the Contract, and to the satisfaction of the Owner any existing work damaged that was identified in the Record Drawings provided; Identified by the Owner's Representative; Identified by In-Building Investigation; Identified by the Underground Detection Services performed; or any existing work damaged as a result of failure to comply with all the Referenced Requirements.
- G. Underground Detection Services Existing Utility Structures
  - 1. Detection/location services shall be provided utilizing the latest detection equipment available. Services shall be performed by a company regularly engaged in the business of existing Underground Utility Structure Detection for the past 5-years.
  - 2. Prior to excavation and prior to directional boring the following work shall be performed:
    - a. Contractor to mark excavation, trenching and directional boring locations and indicate width and depth.
    - b. Locate, by way of vertical and horizontal control dimensions, existing subgrade petroleum product pipes, process piping, conduits, sewer, water, gas, storm drain, electrical, telephone, and irrigation lines in the affected areas of Contract construction work.
    - c. Arrange and meet with the Owner's Representative to review existing underground conditions.
    - d. The proposed location and route of each excavation shall be continuously surveyed along the entire excavation path using Ground-Penetrating Radar (GPR) operating from the surface grade. The GPR shall detect and map existing underground metal and non-metal, both private and public utility lines, pipes, conduits, conductors, etc. The GPR shall identify the horizontal and vertical location of existing underground conditions located at a depth of up to 3-meters below finish grade and located with a vertical and horizontal accuracy within  $\pm 12$ -inches of actual condition. The Contractor shall add this information to the existing Conditions Site Plan.



3. Exercise extreme caution in directional boring, excavating and trenching on this site to avoid existing underground utilities and structures, and to prevent hazard to Personnel and/or damage to existing underground utilities or structures. The Contract Documents, Drawings and Specifications do not include necessary components for construction safety, which is the responsibility of the Contractor.
  4. The Contractor shall contact Common Ground Alliance (CGA) telephone #811 "Know What's Below-Call Before You Dig" and Underground Service Alert (USA), not less than 72-hours prior to excavation. Contractor shall not excavate until verification has been received from CGA and USA that existing underground utilities serving the site have been located, identified, and marked.
- H. The locations of existing in-building or underground utilities, where shown on Drawings, are shown diagrammatically and have not been independently verified by the Owner, the Owner's Representative, Architect/Engineer. The Owner, Owner's Representative, and the Owner's Architect/ Engineer are not responsible for the location of existing utilities or structures, whether or not shown or detailed and installed under this or any other Contracts. The Contractor shall identify each existing utility line prior to cutting on excavation and mark the locations on the building's surfaces and ground surfaces of each existing circuit and utility line.
- 1.04 HVAC-AIR CONDITIONING, HEATING, PLUMBING EQUIPMENT WIRING
- Provide electrical work, materials, and control components required for proper operation of the air conditioning, heating and plumbing systems as indicated on the Electrical, Mechanical, and Plumbing Contract Documents and specified herein.
- 1.05 ELECTRICAL POWER SERVICE
- A. Electrical power service and metering facilities shall conform to the Requirements of the serving Utility Companies. Contractor shall verify Service Locations and Requirements and shall pay all costs levied by the serving Utility Companies for rendering utility services to the Contract without additional cost to the Owner. Service information will be furnished by the serving utilities.
- B. Conform to All Requirements of the serving Utility Company. Location of transformer pad and or manholes and pull boxes and routing of service conduits indicated on the Drawings are approximate and shall be verified with the serving Utility Company prior to installation. Installation of service shall not begin until approved Drawings have been received from the serving Utility Company.
- C. Within 30-calendar days of receipt of notice that the Contract award has been made, the Contractor shall notify the New Business Departments of the District Office of the serving Utility Company concerning the project Contract and shall provide information as to the total Lighting, and Power Requirements of the Contract. The Contractor shall furnish at the same time information as to the estimated completion date of job or the date when the respective Utility Company circuits, will be ready for installation, energizing and activation of the respective services.
- D. Contractor shall submit Electrical Utility Metering and Electrical Service Entrance Equipment Shop Drawings to the Electric Utility Company supplying the project for review and approval by the serving Utility Company. The submittal and acceptance by the Utility shall occur prior to submitting of Shop Drawings to the Owner's Representative or A/E for review. Copies of the serving Electrical Utility approval of the service entrance equipment shall be included in the Shop Drawings submittals to the Owner's Representative and A/E.
- 1.06 PERMITS
- Take out and pay for all required permits, inspections, and examinations without additional cost to the Owner.

1.07 QUALITY ASSURANCE

- A. Work and Materials shall be in full accordance with the latest recommendations, Rules, and Regulations. The publications shall be included in the Contract Documents as Contract Requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the Requirements describing the more restrictive provisions shall become the applicable Contract Definition and Requirement:
1. American National Standards Institute – ANSI.
  2. California Code of Regulations Title 24.
  3. California Part 3 "California Electrical Code" CEC, Title 24 and Title 8 "Division of Industrial Safety".
  4. California Building Code - CBC.
  5. California Fire Code – CFC
  6. The National Electrical Code – NEC/NFPA 70.
  7. The Life Safety Code – NFPA 101.
  8. Illuminating engineering Society of North America. IES and IESNA.
  9. International Building Code – IBC.
  10. National Fire Protection Agency - NFPA.
  11. National Fire Alarm Code – NFAC/NFPA 72.
  12. Underwriter's Laboratory – UL.
  13. Other applicable State and Local Government Agencies Laws and Regulations.
  14. Electrical Installation Standards National Electrical Contractors Association (NECA) and National Electrical Installation Standards (NEIS):
    - a. NECA/NEIS-1: Standard of Practices for Good Workmanship in Electrical Construction.
    - b. NECA/NEIS-90: Standard for Commissioning Building Electrical Systems
    - c. NECA/NEIS-101: Standard for Installing Steel Conduit (Rigid, IMC, EMT) (ANSI)
    - d. NECA/AA-104: Recommended Practice for Installing Aluminum Building Wire and Cable (ANSI)
    - e. NECA -111: Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) (ANSI)
    - f. NECA/NEIS-169: Standard for Installing and Maintaining Arc-Fault Circuit Interrupters.
    - g. NECA/NEIS-230: Standard for Installing and Maintaining Electric Motors and Motor Controllers
    - h. NECA/NEIS-305: Standard for Fire Alarm System Job Practice
    - i. NECA/NEIS–331: Standards for Installing Building and Service Entrance Grounding
    - j. NECA/NEIS-400: Standard for Installing and Maintaining Switchboards
    - k. NECA/NEIS-407: Recommended Practice for Installing Panelboards
    - l. NECA/NEIS-409: Standard for Installing and Maintaining Dry-Type Transformers
    - m. NECA/NEIS-413: Standard for Installing and Maintaining Electrical Vehicle Supply Equipment
    - n. NECA/NEIS-420: Standard for Fuse Applications.

- o. NEIS/NECA and IESNA-500: Standard for Installing Indoor Lighting Systems
  - p. NEIS/NECA and IESNA-501: Standard for Installing Exterior Lighting Systems
  - q. NECA/NEMA-605: Recommended Practice for Installing Underground Nonmetallic Utility Duct
  - r. NECA/NEIS and BICSI-607: Standard for Telecommunications Bonding and Grounding, Planning, and Installation Methods
  - s. NECA/NEIS-700: Standard for Installing Overcurrent Protection to Achieve Selective Coordination
  - t. NECA/NEMA-701: Standard for Energy Management, Demand Response and Energy Solutions.
- B. All material and equipment shall be new and shall be delivered to the site in unbroken packages. All material and equipment shall be listed and labeled by Underwriters Laboratories or other recognized Testing Laboratories, where such listings are available. Comply with all Installation Requirements and restrictions pertaining to such listings.
- C. Work and material shown on the Drawings and in the Specifications are new and included in the Contract unless specifically indicated as existing or N.I.C. (not in Contract).
- D. Keep a copy of all applicable Codes and Standards available at the job site at all times for reference while performing work under this Contract. Nothing in Plans or Specifications shall be construed to permit work not conforming to the most stringent of Building Codes.
- E. Where a conflict or variation occurs between applicable Codes, Standards and/or the Contract Documents, the provisions of the most restrictive provision shall become the Requirement of the Contract Documents.

#### 1.08 SUBMITTALS (ADDITIONAL REQUIREMENTS)

##### A. General

1. Review of Contractor's submittals is for general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents. Any action shown is subject to the Requirements of the Plans and Specifications. Contractor is responsible for quantities; dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of work with that of all other trades and satisfactory performance of their work.
2. The Contractor shall review each submittal in detail for compliance with the Requirements of the Contract Documents prior to submittal. The Contractor shall "Stamp" and sign each item of the submittal with a statement "CERTIFYING THE SUBMITTAL HAS BEEN REVIEWED BY THE CONTRACTOR AND COMPLIES WITH ALL THE REQUIREMENTS OF THE CONTRACT DOCUMENTS". The Contractor shall clearly and specifically identify each individual proposed substitution, substitution of equal or proposed deviation from the Requirements of the Contract Documents with a statement "THIS ITEM IS A SUBSTITUTION".  
  
The burden of research, preparation of calculations and the furnishing of adequate and complete Shop Drawings information to demonstrate the suitability of Contractor's proposed substitutions and suitability of proposed deviations from the Contract Documents is the responsibility of the Contractor.
3. Departure from the submittal procedure will result in resubmittals and delays. Failure of the Contractor to comply with the Submittal Requirements shall render void any acceptance or any approval of the proposed variation. The Contractor shall then be required to provide the equipment or method without variation from the Contract Documents and without additional cost to the Contract.

4. The Contractor at no additional cost or delays to the Contract shall remove any work, material and correct any deficiencies resulting from deviations from the Requirements of the Contract Documents not approved in advance by the Owner prior to commencement of work.
5. Shop Drawings submitted by the Contractor, which are not specifically required for submittal by the Contract Documents, or Contractor Shop Drawings previously reviewed and resubmitted without a written resubmittal request to the Contractor, will not be reviewed, considered, or commented on. The respective Shop Drawing submittal/resubmittal will not be returned to the Contractor and will be destroyed without comment or response to the Contractor. The respective submittal shall be considered null and void as being not in compliance with the Requirements of the Contract Documents.
6. Refer to Division-1 for Additional Requirements.

**B. Material Lists and Shop Drawings**

1. Submit material list and Equipment Manufacturers for review within 35 days of Award of Contract. Give name of Manufacturer and where applicable, brand name, type and/or catalog number of each item. Listing more than one Manufacturer for any one item of equipment, or listing items "as specified", without both make and model or type designation, is not acceptable. Shop Drawings shall not be submitted before review completion of Manufacturers list. The right is reserved to require submission of samples of any material whether or not particularly mentioned herein.
2. After completion of review of the Material and Equipment Manufacturers list, submit Shop Drawings for review. Shop Drawings shall be submitted in completed bound groups of materials (i.e., all lighting fixtures or all switchgear, etc.). The Contractor shall verify dimensions of equipment and be satisfied as to fit and that they comply with all Code Requirements relating to clear working space about electrical equipment prior to submitting Shop Drawings for review. Submittals, which are intended to be reviewed as substitution or departure from the Contract Documents, must be specifically noted as such. The Requirements of the Contract Documents shall prevail regardless of the acceptance of the submittal.
3. Shop Drawings shall include catalog data sheets, instruction manuals, Dimensioned Plans, elevations, details, wiring diagrams, and descriptive literature of component parts where applicable. Structural calculations and mounting details, signed by a Structural Engineer registered in good standing by the State of California, shall be submitted for all equipment weighing over 400-pounds, and shall be in compliance with Title 21 and Title 24 of the California Code of Regulations (CCR).
4. Each Shop Drawing item shall be identified with the Specification Section, applicable paragraph number(s), lighting fixture/equipment types and Drawing sheet numbers; the specific Shop Drawing is intended to represent. Shop Drawing pages/sheets submittals shall be sequentially numbered with unique alphanumeric numbering system to facilitate correspondence referencing identification of individual sheets.
5. The time required to review and comment on the Contractor's submittals will not be less than 14 calendar days, or more than 21-calendar days after receipt of the submittals at the office of FBA Engineering. The review of Contractor submittals and return to Contractor of submittals with review comments will occur in a timely manner conditioned upon the Contractor complying with all the following:
  - a. The submittals contain complete and accurate information, complying with the Requirements of the Contract Documents.
  - b. Contractor's submittals are each marked with Contractor's approval "Stamp", and with Contractor signatures.

- c. The submittals are received in accordance with a written, Shop Drawing submittal schedule for each submittal. The Contractor distributes the schedule not less than 35-calendar days in advance of the Shop Drawing Submittals, and the schedule identifies the calendar dates, the Contractor will deliver the various submittals for review.
6. Shop Drawings shall include the Manufacturers' projected days for shipment from the factory of completed equipment, after the Contractor releases the equipment for production. It shall be the responsibility of the Contractor to ensure that all material and equipment is ordered in time to provide an orderly progression of the work. The Contractor shall notify the Owner's Representative of any changes in delivery, which would affect the project completion date.
7. Submittal Identification
  - a. Each submittal shall be dated: with submittal transmission date; sequentially numbered and titled with submittal contents identification and applicable Specification/Drawing references (*i.e., Submittal dated: 05/12/19 Submittal #4 Contents: Branch Circuit Panelboards Sheet #E5.1 and Transformers Specification Section 260500 Paragraph 2.11, etc.*).
  - b. Each resubmittal shall be dated: with original submittal date and resubmittal transmission dates; sequentially numbered with original submittal number and sequential resubmittal revision number and titled with submittal contents identification and applicable Specifications/Drawing references (*i.e., Original Submittal Date: 05/12/19 Resubmittal Date: 10/09/19 Original Submittal #4 Resubmittal Revision R2 Contents: Transformer Resubmittal Specification Section - 260500 Paragraph 2.11, etc.*).
  - c. Contractor shall provide a written response narrative with each resubmittal. Describe each response action, resubmittal addition, change and deletion. Correspond to each response to A/E specific review comment.
- C. The Contractor shall be responsible for incidental, direct and indirect costs resulting from the Contractor's substitution of; or changes to; the specified Contract Materials and Work.
- D. The Contractor shall pay, upon request by the Owner's Representative, a fee for the Owner's Representative time involved in the review of substitution submittals and design changes resulting from the Contractor's requested substitutions. The fee shall be not less than \$135.00 per hour but, in no case, less than stated in Division-1, whichever is greater.
- E. Maintenance and Operating Manuals
  1. The Contractor shall furnish three copies of type-written maintenance and operating manuals and electronic digital copy for all electrical equipment, fire alarm equipment, sound system equipment, etc., to the Owner.
  2. Instruct Owner's Personnel in correct operation of all equipment at completion of Project.
  3. Maintenance and operating manuals shall be bound in three-ring, hard-cover, plastic binders with table of contents. Manuals shall be delivered to the Owner's Representative, with an itemized receipt.
- F. Portable or Detachable Parts: The Contractor shall retain in his possession and shall be responsible for all port-able and detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until final completion of Contract work. These parts shall then be delivered to the Owner's Representative with an itemized receipt.

G. Record Drawings (Additional Requirements)

1. Provide and maintain in good order a complete set of Electrical Contract "Record" prints. Changes to the Contract to be clearly recorded on this set of prints. At the end of the Project, transfer all changes to one set of transparencies to be delivered unfolded to the Owner's Representative.
2. The actual location and elevation of all buried lines, boxes, monuments, vaults, stub-outs and other provisions for future connections shall be referenced to the building lines or other clearly established base lines and to approved benchmarks. If any necessary dimensions are omitted from the Record Drawings, the Contractor shall, at the Contractor's own expense, do all excavation required to expose the buried work and to establish the correct locations.
3. The Contractor shall keep the "Record" prints up to date and current with all work performed.
4. Refer to Division-1 for Additional Requirements.

1.09 CLEANING EQUIPMENT, MATERIALS, PREMISES

All Parts of the Equipment shall be thoroughly cleaned of dirt, rust, cement, plaster, etc., and all cracks and corners scraped out clean. Surfaces to be painted shall be carefully cleaned of grease and oil spots and left smooth, clean and in proper condition to receive paint finish.

1.10 JOB CONDITIONS - PROTECTION

Protect all work, materials and equipment from damage from any cause whatever and provide adequate and proper storage facilities during the progress of the work. Provide for the safety and good condition of all the work until final acceptance of the work by the Owner and replace all damaged or defective work, materials and equipment before requesting final acceptance.

1.11 EXCAVATION, CUTTING, BACKFILL AND PATCHING ADDITIONAL REQUIREMENTS

A. General

1. Perform excavation, cutting, backfill, core drilling, directional boring, and patching of the construction work required for the proper installation of the electrical work.
2. Patching shall be of the same material, thickness, workmanship, and finish as existing and accurately match-surrounding work to the satisfaction of the Owner's Representative.
3. Prior to penetrating, coring, drilling or cutting existing building elements, concrete and/or masonry, provide imaging equipment examinations of each specific location. The imaging process shall identify existing internal embedded components and locations, including structural elements/anchors, conduit, and piping that are present. Do not penetrate or damage the existing internal embedded elements. Imaging shall employ one of the following, with GPR methodology preferred:
  - a. Non-invasive imaging employing high frequency, Ground Penetrating Radar (GPR), single side echo reflection technology.
  - b. Non-invasive imaging employing x-ray radiography, through-and-through imaging technology.

B. Excavation Temporary Cover

1. Excavations for Contract Work occurring in streets, vehicular drive areas, parking lots, sidewalks; any paved surface; or any area accessible to the public; provide temporary steel

plating and shoring support for the plates, to completely cover the excavations under one or more of the following conditions:

- a. Excavation shall not remain "open" for more than 4-calendar days; provide temporary plating.
  - b. Excavation shall not be "open" over weekends (Saturday, Sunday) or Holidays; provide temporary plating.
2. The temporary plating shall be a minimum of 0.75-inch thickness steel, but in no case shall the thickness be less than required to support AASHTO-H20 traffic loading.
  3. Provide a minimum of two 100% open lane(s) (12 feet lane width) for vehicular traffic at all times during construction, for vehicle access to all areas.

## 1.12 IDENTIFICATION

### A. Equipment Nameplates

1. Panelboards, terminal cabinets, circuit breakers, disconnect switches, starters, relays, time switches, contactors, push-button control stations, and other apparatus used for the operation or control of feeders, circuits, appliances, or equipment shall be properly identified by means of descriptive nameplates or tags permanently attached to the apparatus and wiring.
2. Provide nameplate label on electrical service entrance equipment describing available short circuit information and Arc-Flash information calculated by the Contractor, including:
  - a. Calculation date, month-day-year.
  - b. Calculate maximum available short circuit fault current and Arc-Flash intensities.
  - c. Description of parameters and changes affecting the Requirements for recalculation of the fault current information and Arc-Flash information.
3. Electrical equipment including switchgear, switchboards, electric panels and control panels, motor control centers, combination motor starters, transformers, disconnects, etc., shall each be labeled by the Manufacturer with "Electric-Arc-Flash" warning signs. The signs shall explain a hazard to personnel may exist if the equipment is worked on while energized or operated by personnel while energized. The sign shall instruct personnel to wear the correct Protective Equipment/clothing (PPE) when working "Live" or operating "Live" electrical equipment and circuits.
4. Nameplates shall be engraved laminated phenolic, rated UV-resistant for wet locations and outdoor locations, fade resistant. Shop Drawings with dimensions and format shall be submitted before installation. Attachment to equipment shall be with escutcheon pins, rivets, self-tapping screws or machine screws. Self-adhering or adhesive backed nameplates shall not be used.
5. Provide black-on-white laminated plastic nameplates for normal power and white-on-red nameplates for emergency power, engraved in minimum 1/4-inch high letters sized as required, to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
  - a. Switchboards:
    - 1) Equipment designations as shown on Drawings.
    - 2) Identify ampere rating.
    - 3) Identify voltage and phase.
    - 4) Identify power source and circuit number. Include location when not within sight of equipment.

- 5) Use identification nameplate to identify load(s) served for each branch device.
- b. Motor Control Centers:
- 1) Equipment designations as shown on Drawings.
  - 2) Identify ampere rating.
  - 3) Identify voltage and phase.
  - 4) Use identification nameplate to identify main overcurrent protective device.
  - 5) Use identification nameplate to identify load(s) served for each branch device.
- c. Panelboards:
- 1) Equipment designations as shown on Drawings.
  - 2) Identify ampere rating.
  - 3) Identify voltage and phase.
  - 4) Identify power source and circuit number. Include location when not within sight of equipment.
  - 5) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
  - 6) Use typewritten circuit directory to identify load(s) served for panelboards with a door.
  - 7) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device.
- d. Transformers:
- 1) Equipment designations as shown on Drawings.
  - 2) Identify kVA rating.
  - 3) Identify voltage and phase for primary and secondary.
- e. Enclosed switches, circuit breakers, and motor controllers:
- 1) Equipment designations as shown on Drawings.
  - 2) Identify voltage and phase.
  - 3) Identify power source and circuit number. Include location when not within sight of equipment.
- f. Time Switches:
- 1) Equipment designations as shown on Drawings.
  - 2) Identify load(s) served and associated circuits controlled. Include location.
- g. Enclosed Contactors:
- 1) Equipment designations as shown on Drawings.
  - 2) Identify ampere rating.
  - 3) Identify voltage and phase.
  - 4) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
- h. Transfer Switches:
- 1) Identify voltage and phase.



- 2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
  - 3) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
2. Service Equipment:
  - a. Use identification nameplate to identify each service dis-connecting means.
  - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Emergency System Equipment:
  - a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
  - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
- B. Plates: All cover and device plates shall be furnished with engraved or etched designations under any one of the following conditions (minimum character size not less than 0.188 inch. Engraving shall indicate circuits and equipment controlled or connected):
  1. More than two devices under a common coverplate.
  2. Lock switches.
  3. Pilot switches.
  4. Switches in locations from which the equipment or circuits controlled cannot be readily seen.
  5. Manual motor starting switches.
  6. Where so indicated on the Drawings.
  7. As required on all control circuit switches, such as heater controls, motor controls, etc.
  8. Receptacles other than standard 15-amp 120-volt duplex receptacles; shall indicate circuit voltage, ampere, phase and source circuit number.
  9. Where outlets or switches are connected to emergency power circuit; provide panelboard and circuit number engraved on plate.
  10. Low voltage and signal system outlets.
- C. For equipment and access doors or gates to equipment containing or operating on circuits of more than 100 volts AC or DC nominal. Provide red-on-white laminated warning signs engraved in ½-inch high letters to read: "DANGER - 480 (or applicable voltage) VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY".
- D. Conduit Identification.
  1. Adhesive Marking Labels for Raceway and Metal Clad Cable: Preprinted flexible, self-adhesive labels with legend indicating voltage and service (Emergency, Power, Lighting,

Air-Conditioning, Control, Voice and data Communications, Fire Alarm and Detection, Public Address (Paging) Electronic Security). Manufacturer: Brady, Ideal, Waytech.

2. Label size as follows:

- a. Raceways 1-inch and Smaller: ½-inch high by minimum 2¼-inch long.
- b. Raceways Larger than 1-inch: 1⅝-inch high by minimum 4¼-inch long.

E. Wire and Cable Identification

- 1. Provide identification on individual wire and cable including signal systems, fire alarm, electrical power systems (each individual phase, neutral and ground), empty conduit pull ropes, and controls circuit.
- 2. Permanent identification shall be provided at each termination location, splice location, pullbox, junction box and equipment enclosure.
  - a. Individual wire and cable larger than #6AWG or 0.25-inch diameter, shall be provided with polypropylene identification tag holders, with yellow polypropylene tags interchangeable black alphanumeric characters, character height 0.25 inch. Attach identification tags with plastic "tie" wraps, minimum of two for each tag. As manufactured by Almetek Industries- "EZTAG" Series; or TECH Products - "EVERLAST" Series.
  - b. Individual wire and cable #6AWG and smaller or smaller than 0.25-inch diameter, shall be provided with water and oil resistant, flexible, self-laminating pressure sensitive machine embossed plastic tags that wrap a minimum of 360 degrees around the wire/cable diameter. The entire tag shall then be covered with a clear flexible waterproof plastic cover wrapped a minimum of 540 degrees around the wire/cable diameter and completely covering the identification. As manufactured by: Brady Identification; or 3M; or Panduit.
  - c. Each identification tag location shall indicate the following information: circuit number, circuit phase, source termination and destination termination equipment name (or outlet number as applicable).
- 3. Install permanent identification after installation/pulling of wire/cable is complete, to prevent loss or damage to the identification.

F. Cardholders and Cards shall be provided for circuit identification in panelboards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the inside of panel door. List of circuits shall be type-written on card. Circuit description shall include name or number of circuits, area, and connected load.

G. Junction and Pullboxes shall have covers stenciled with box number when shown on the Drawings, or circuit numbers according to panel schedule. Data shall be lettered in a conspicuous manner with a color contrasting to finish.

1.13 TESTING

A. The Contractor shall obtain an independent Testing Laboratory, provide all instrumentation and perform tests on the electrical system and equipment as hereinafter described and further directed by the Owner's Representative. The test shall be performed after the completion of all electrical systems included in the Contract Scope of Work. All tests shall be recorded and documented and submitted to the Owner's Representative for review, six copies.

- 1. All equipment and personnel required for set-up and testing shall be provided by the Contractor.

2. Return all equipment and circuits to corrected operational condition when test-and-pass is successfully completed.
- B. Test for Phase to Ground and Neutral Condition:
1. Open main service disconnects.
  2. Isolate the system neutral from ground by removing the neutral disconnects link located in the service switchboard.
  3. Close all submain disconnects.
  4. Close all branch feeder circuit breakers.
  5. Turn all switches to "on" position, unplug all portable equipment from outlet receptacles.
  6. Measure the resistance of each non-energized phase-to-phase, phase-to-ground and phase-to-neutral. A properly calibrated "megger" type test instrument shall be used. The test voltage shall be a nominal 500 volts.
  7. Record all readings after one minute duration and document into a complete report.
  8. Isolating Grounds and Phases: If low resistance phase and/or ground neutral connections are found in the system, they shall be isolated and located by testing each circuit individually as outlined above. Make proper corrections to restore the resistance values to an acceptable value.
- C. Method of obtaining ground resistance shall be in accordance with the latest edition of the James G. Biddle (Plymouth Meeting, Pennsylvania) manual published on this subject.
1. Perform "fall-of-potential" three-point tests on the main grounding electrode of system per IEEE Standard No. 81, Section 8.2.1.5. when suitable locations for test rods are not available, a low resistance dead earth or reference ground shall be utilized.
  2. Perform the two-point method test per IEEE Standard No. 81, Section 8.2.1.1, to determine the ground resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.
- D. The testing, calibrating and setting of all ground and ground fault equipment, circuit breakers, circuit device protection relays, and meters adjustable settings shall be by an independent Testing Laboratory. Set as recommended by the respective Manufacturer and coordination and arc-flash studies, to be coordinated with other protection devices within the electrical design. Bound and tabulated copies of the test and settings shall be sent to the Owner's Representative.
- E. Ampere and Voltage Measurements
1. Measure and record ampere and line voltage measurements under full load on all panel feeders, switchboard, and switchgear feeders, motor control centers and motor circuits provided in the Contract. Record measurements at the equipment tested and submit to the Owner's Representative for review.
  2. Ampere and voltage measurements shall be:
    - a. Phase A-B, A-C, and B-C.
    - b. Phase A-Neutral, B-Neutral and C-Neutral.
  3. The ampere and voltage readings shall be not less than 20-minutes duration for each test. Record and submit the measured minimum, maximum and 20-minute average for each ampere and voltage value and test location. Voltage and ampere measurements shall

occur at the connected load end of each respective feeder, not at the source of supply end of each feeder.

4. Test equipment shall be accurate within plus or minus 1%.
5. Branch circuit devices 40-amp or less and motor loads ten horsepower or smaller are excluded from individual Ampere and Voltage Testing Requirement.
6. If, in the opinion of the Owner's Representative, the voltages and regulations are not met within acceptable limits, make arrangements with the serving utility for proper electrical service. Retest feeder line voltages, and submit to Owner's Representative for review, after the utility company has completed corrective actions. Reset "voltage taps" on transformers provided or modified as part of the Contract Work, to adjust line voltages to within acceptable values, as directed by the Owner's Representative.

F. State of California Title-24 Compliance Testing

1. Mandatory California Title-24 Building Energy Code, Part-6 acceptance testing. Shall ensure those respective systems properly installed and functioning, all in conformance with Title-24.
2. Refer to Process Guide to Acceptance Testing, published by the State of California, complete the testing and documentation.
3. Perform California Title-24 Testing and Certification. Submit the completed Certification of Acceptance documentation to the AHJ and Owner's Representative.

G. Complete the following work before any electrical equipment is energized.

1. All equipment shall be permanently anchored.
2. All bus connections and conductor/wire connections shall be tightened per Manufacturer's instructions and witnessed by the Owner's Representative.
3. All ground connections shall be completed and identified. Perform and successfully complete all required megger and ground resistance tests.
4. Low voltage/signal circuits, line voltage branch circuits and feeders shall be connected, tested and identified.
5. The interiors of all electrical enclosures including busbars and wiring terminals shall be cleaned of all loose material and debris, paint, plaster, cleaners or other abrasive's overspray removed, and equipment vacuumed clean. The Owner's Representative shall observe all interiors before covers are installed.
6. All wall, ceiling, and floor work and painting shall be completed within areas containing electrical equipment prior to installation of equipment. The equipment indoor rooms and spaces shall be weathertight, and weather protected from environmental incursions.
7. All doors for line voltage and low voltage/signal electrical equipment rooms shall be provided with locks to restrict access to energized equipment.
8. Electrical spaces and rooms shall not be used as storage rooms after power is energized.
9. Outdoor electrical equipment enclosures and housings shall be weather protected.
10. The electrical system time current coordination and Arc-Flash studies shall be complete for circuit breakers, ground relays set, and circuit relay sets, fuses; set-up, tested and calibrated accordingly. Protection settings for all devices shall be completed and tested.

1.14 COMMISSIONING - CX

A. General

1. The Commissioning shall verify the electrical systems for the term of the Contract, by observation; and by calibration; and by testing. The Commissioning shall ensure the electrical systems perform interactively and correctly, according to the Contract and Operational Requirements.
2. Commissioning shall provide startup, testing and documented confirmation of the Contract constructed systems, materials and work, functions in compliance within the criteria set forth in the Contract Documents to the satisfaction of the Owner's needs. The Commissioning Scope shall encompass each system identified as requiring "Commissioning" by the Contract Documents, including but not limited to:
  - a. Electrical circuits' protection, short circuit, overcurrent, ground fault devices and electrical grounding.
  - b. Electrical circuits monitoring and metering.
  - c. Light fixtures, lamps and ballasts.
  - d. Lighting control devices, equipment and lighting control systems.
  - e. Standby and emergency electric power supply equipment and systems.
  - f. Motor Control Equipment.
  - g. Fire alarm, equipment, devices, and fire alarm systems.
  - h. Communications, low voltage and signal devices and systems.
  - i. Additional systems described in the Contract Documents.
3. Commissioning process shall review all the Shop Drawing submittals, including:
  - a. Controls, Operation and Maintenance Requirements.
  - b. Facility performance testing compliance.
  - c. Project Contract Requirements compliance.
  - d. Compliance with basis for design and operational descriptions provided in the Contract.
4. Commissioning shall be the process of ensuring all the systems described in the Contract Documents comply with the Contract Document design; all systems are installed properly; all systems are functional, tested and capable of being operated and maintained to perform within the Contract Requirements and design intent.
5. Functional setup, recalibration, correcting deficiencies, retesting and the associated costs, for system(s) that fail Commissioning, shall be the responsibility of the Contractor. The Contractor shall include all Commissioning costs in the Contract Scope of Work.
6. Complete all Commissioning functions prior to the occupancy of the facility by the Owner, unless directed otherwise by the Owner's Representative.
7. Submit six copies of Commissioning Documentation to Owner's Representative.

B. Commissioning Procedures

1. Prepare a Commissioning Matrix identifying components and systems included in the Commissioning Scope; the status; actions completed and actions to be completed.
2. Verify Contractor compliance with Contract Document Requirements Manufacturer's recommendations and approved Shop Drawings.
3. Perform startup, functional tests, reports, and document results.

4. Evaluate and document the setup parameters, software, operating condition and performance of each system at the time of functional test completion. Document and record each performance parameter and condition, in the Commissioning Report.
5. Schedule testing and prepare descriptions of testing.
6. Describe measures taken to correct deficiencies.
7. Verify that instructions to Owner's Representatives, operations and maintenance manuals comply with Contract Documents.
8. Prepare warranty matrix identifying the start dates, expiration dates, routine preventative maintenance dates and the Owner's responsibility for performing preventative maintenance and keeping logs for each maintenance function and warranty claims.
9. Confirm completion of all punch list items that have been acceptably accomplished and a list of what has not been acceptably completed.
10. Describe uncorrected deficiencies accepted by the Owner.

C. Commissioning Phasing

The Commissioning Phases of work shall include the following activities:

1. SDQ - Shop Drawing Qualification shall verify complete and correct Shop Drawings have been submitted.
2. IQ – The Installation Qualification of Contract Work shall verify systems are correctly and properly installed.
3. OQ - Verify systems interfaces and software is correctly and properly operational.
4. ITM - Verify the Contract Inspection, Testing and procedures for Maintenance are complete.
5. PQ - Performance Qualification complete the functional performance testing to validate each building system.

1.15 POWER AND FIRE ALARM OUTAGES

- A. All Electrical Services (line voltage, low voltage/signal and fire alarm) in all occupied facilities of the Contract work are to remain operational during the entire Contract period. Any interruption of the electrical services for the performance of this work shall be at the convenience of the Owner and performed only after consultation with the Owner's Representative. Work involving circuit outages shall be only at such a time and of such a duration as approved in writing. Work involving circuit outages for the work required to connect new equipment and disconnect existing equipment shall be performed at the convenience of the Owner.
- B. Contract Work involving outages or disruption of normal function in electrical power systems, telephone/communication systems, fire alarms, shall be performed during the following time periods. The Contract Work shall be phased to limit outages in the respective systems to the stated periods:
  1. 11:30 p.m. Friday to 11:30 p.m. Sunday of the same weekend. Work shall occur on multiple weekend periods if a single weekend is not sufficient time to complete the work.
  2. The Contract Work involving outages shall be phased in multiple work time units, to comply with the permitted outage limitations.

- C. Work involving system outages to the building fire alarm system shall be performed only after consultation with the Owner and shall be only at such a time and of such duration as approved in writing. Contractor shall provide continuous "Fire-Watch" during fire alarm system outages and comply with AHJ "Fire-Watch" Requirements.
- D. Provide overtime work; double shift work; nighttime work; Saturday, Sunday, and holiday work to meet outages schedule.
- E. Provide temporary electrical power to meet the Requirements of this Article.
- F. Any added costs to Contractor due to necessity of complying with this Article shall be included in the Contract Scope of Work.
- G. When electrical work involving power disruptions to existing areas is initiated, the work shall proceed on a continuous basis without stopping until electric system power is restored to the affected areas.
- H. Request in writing to the Owner's Representative a minimum of 3-weeks in advance, for scheduling proposed electrical systems outage.

#### 1.16 TEMPORARY ELECTRICAL POWER

Provide temporary electrical power if work requiring power outages cannot be completed in time permitted and approved by the Owner's Representative.

#### 1.17 ASBESTOS, POLYCHLORINATED BIPHENYL (PCB) OR HAZARDOUS WASTE:

- A. It is understood and agreed that this Contract does not contemplate the handling of asbestos, PCB or any hazardous waste material. If asbestos, PCB or any hazardous waste material is encountered, notify the Owner's Representative immediately. Do not disturb, handle or attempt to remove.
- B. Lighting Fixture Demolition Hazardous Materials
  - 1. The removal of existing lighting fixtures will generate Hazardous Material Waste Disposal Contract Documents.
    - a. The existing lighting fixture ballast contains PCB material.
    - b. The existing lighting fixture lamps contain mercury.
    - c. The existing lighting fixture internal wire insulation may contain asbestos.
  - 2. Remove, handle, store, contain, dispose of and document the hazardous materials resulting from existing lighting fixtures work, as part of the Contract Requirements.

#### 1.18 TIME/CURRENT COORDINATION, SHORT CIRCUIT, ARC-FLASH AND SERIES RATED EQUIPMENT

- A. Series Rated Equipment.
  - 1. Circuit Protective Devices identified as "Series Rated" or "Current Limiting" (i.e., SR – Series Rated; CLCB - Current Limiting Circuit Breaker; CLF - current limiting fuse, etc.) shall be series rated and tested (UL 489, UL 67, and CSA5) by the Manufacturer with all equipment and circuit protective devices installed downstream of the identified series rated or current limiting device.
  - 2. Provide nameplates on all equipment located downstream, including the CLCB and CLF devices, to comply with CEC/NEC paragraphs 110-22 and 240-83 "CAUTION SERIES

RATED SYSTEM - NEW DEVICE INSTALLATIONS AND REPLACEMENTS SHALL BE THE SAME MANUFACTURER AND MODELS".

B. Short Circuit, Coordination and Arc-Flash

1. Perform Engineering Analysis and submit engineered settings for each equipment location, fuse and circuit breaker device, showing the correct time and current settings to provide selective coordination within the limits of the specified equipment. Shall comply with the latest application Standards of IEEE and ANSI. Provide electrical system short circuit worst case bolted-fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash calculations as part of the Coordination Analysis recommendations. Obtain the necessary information including the maximum fault current from the secondary side of the Utility Company transformer to complete the calculations from the serving Electrical Utility Company.
2. Obtain the short-circuit current ratings (SCCR) for all equipment with control panels or controllers (elevators, HVAC, plumbing equipment, etc.). Incorporate these items into the short circuit analysis and determine that the available fault current does not exceed the SCCR of the equipment.
3. The information shall be submitted in both tabular form and on time current log-log graph paper with an engineering narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.
4. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract equipment. Shall comply with, but not limited to:
  - a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
  - b. IEEE-399, Recommended Practices for Industrial and Commercial Power System Analysis.
  - c. IEEE-1584, Guide for Performing Arc-Flash Hazard Calculations Working Calculation.
  - d. CEC/NEC
5. Provide permanent warning labels on each equipment location. The labels shall describe Arc-Flash, Short-Circuit and Time/Current Coordination, including safety precautions and protective clothing. Also describe actions to be taken if any circuit changes or equipment modifications occur.
6. The analysis shall be submitted with the Shop Drawing submittals for the respective equipment.
7. The Contractor shall independently contact the serving utility company to obtain the current system short circuit amps or available fault current.
8. The Contractor shall independently obtain As-Built Drawings for the existing infrastructure to establish lengths. If As-Built Drawings are not available, the Contractor shall research existing conditions and make reasonable but conservative estimates of conductor length. Where existing conductors have been re-used, the Contractor shall confirm conductor quantity, size, and conduit type.



1.19 INDEPENDENT TESTING LABORATORY

A. Testing Laboratories Definition

1. The Testing Laboratory shall meet Federal OSHA Criteria for accreditation of Nationally Recognized Testing Laboratories (NRTL) Title 29 Part 1907 and 29 CFR-1910.
2. Membership in the National Electrical Testing Association (NETA) shall also constitute acceptance of meeting said criteria, for testing of electrical systems.

1.20 EQUIPMENT SEISMIC AND WIND LOAD REQUIREMENTS (ADDITIONAL REQUIREMENTS)

A. General

1. Equipment supports and anchorages provided as part of the Contract shall be designed, constructed and installed in accordance with the Earthquake Regulations of the California Building Code (CBC), International Building Code (IBC).
2. Provide equipment anchorage details, coordinated with the equipment mounting provision, prepared, signed and "stamped" with PE registration in good standing, by a Civil or Structural Engineer Licensed as a Professional Engineer (PE) in the State of California.
3. Mounting recommendations shall be provided by the Manufacturer based upon approved shake-table tests used to verify the seismic design of that type of equipment.
4. The Equipment Manufacturer shall document the details necessary for proper wind-load and seismic mounting, anchorage, and bracing of the equipment for floor, ceiling, and wall/back installation location.
5. Seismic performance shall be based on actual installation location of the respective equipment in the building and height above or below grade.
6. The Seismic Requirements are typical for each equipment item exceeding 100-pounds, including but not limited to the following:
  - a. Switchgear, switchboards, and motor control equipment
  - b. Transformers
  - c. Equipment racks and terminal cabinets
  - d. Panels
  - e. Conduits with floor, ceiling or wall attachment support and conduits with suspension attachments.
  - f. Busway, wire way and cable tray
  - g. Uninterruptable power supplies (UPS)
  - h. Inverters
  - i. Generators and related equipment
  - j. Lighting equipment
  - k. Fire alarm equipment

C. Wall Mounted Electrical Equipment

1. Surface Mounted Equipment

- a. Provide multiple horizontal sections of metal "C" channels for support and attaching wall mounted equipment to walls. Channels shall provide "turned lips" at longitudinal edges to hold "lock-in" fasteners and shall comply with ANSI-1008 and ASTM-A569 latest revision. The channels shall be steel hot dip zinc galvanized. As manufactured by Unistrut or Kindorf.
- b. The "C" channels shall be positioned horizontally within 3-inches of the top and bottom of each equipment section cabinet and located behind each equipment

vertical section. Provide additional intermediate “C” channels at not less than 36-inches on center between the “top” and “bottom” “C” channel positions, located behind each equipment vertical section.

- c. The “C” channels shall be of sufficient length to provide connection to not less than two vertical structural wall framing elements separated by not less than 16-inches; but in no case shall the “C” channel length be less than the width of the respective equipment section.
- d. Attach the “C” channels to the wall structural elements after the wall, finish surface, installation (including painting) is complete.
- e. Attach the “C” channels with fasteners to the building wall framing structural elements as follows: welded to steel framing; bolted to wood framing; cast in place concrete inserts for masonry and concrete construction; drilled “afterset” expansion anchors for existing masonry and concrete construction.
- f. Attach the equipment to the “C” channels with threaded and bolted fasteners to “pre-locate” and lock into the channel “turned lips” and channel walls.

2. Flush mount equipment

- a. Provide anchor attachment of equipment into adjacent wall structural elements.

D. Housekeeping Pad

- 1. Provide cast-in-place, steel re-enforced concrete raised “housekeeping” pads under all floor standing electrical equipment (except data network equipment racks).
- 2. Pad sizes
  - a. The raised housekeeping pad height shall extend 4-inches above the surrounding finished floor elevation for interior building locations.
  - b. The pad shall extend 8-inches below finish grade plus 4-inches above finish grade for outdoor equipment location on grade.
  - c. The pads shall extend 7-inches past the “footprint” edge of the respective floor standing equipment.
- 3. Anchor equipment to pads. Anchor pads to the building structural floor. Equipment pad, equipment re-enforcing and equipment anchoring shall comply with Seismic Earthquake Requirements and Wind Load Requirements.
- 4. Unless shown otherwise on Drawings. The equipment housekeeping pad steel re-enforcing shall consist of two layers of number 4-size steel-rebar laid horizontally and uniformly spaced 6-inches on center. Position rebar in two directions (90-degrees opposed) and centered inside the concrete house-keeping pad. Horizontal rebar shall extend to within 3-inches of the edge of the concrete pad in all directions. Metal wire “tie-wrap” shall be provided at each rebar crossing.
- 5. Equipment anchor attachments shall extend through the housekeeping pad and into the structural concrete below the pad a minimum of not less than 2-inches.

1.21 ELECTRICAL WORK CLOSEOUT

A. Prepare the following items and submit to the Owner’s Representative before final acceptance.

- 1. Two copies of all test results as required under this Section.
- 2. Two copies of Local and/or State Code Enforcing Authority’s Final Inspection Certificates.
- 3. Copies of Record Drawings as required under the General Conditions, pertinent Division One Sections and Electrical General Provisions.

4. Two copies of all receipts transferring portable or detachable parts to the Owner's Representative when requested.
5. Notify the Owner's Representative in writing when installation is complete and that a final inspection of this work can be performed. In the event any defect or deficiencies are found during this final inspection they shall be corrected to the satisfaction of the Owner's Representative before final acceptance can be issued.
6. Prior to energizing, retighten to the proper torque, each circuit conductor lug landing, each bus bar (phases, neutral and ground) and circuit protection device threaded connections in all switchboards, switchgear, motor control centers, transformers, busways, disconnect switches, motor starters, motor terminals and panelboards, after the equipment is installed/connected and prior to energizing the equipment. The torque values shall comply with Manufacturer's recommendations.

**END OF SECTION 26 05 00**

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## ONTARIO SPORTS EMPIRE

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**SECTION 26 05 01****BASIC ELECTRICAL MATERIALS AND METHODS****PART 1 - GENERAL****1.01 SCOPE**

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with furnishing, delivery, and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
  2. General Provisions and Requirements for electrical work.

**1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)**

- A. Submit product data sheets for all outlet boxes, floor boxes, wiring devices, device plates, relays, contactors, timeswitches, and disconnects fuses.
- B. Submit detailed Shop Drawings including Dimensioned Plans, elevations, details, schematic and point-to-point wiring diagrams and descriptive literature for all component parts for transformers, relays, time clocks and photocells.
- C. Submit Transformer Test Reports.
- D. Submit Material List for Outlet Boxes.

**PART 2 - PRODUCTS****2.01 OUTLET AND JUNCTION BOXES**

- A. General:
1. Flush or concealed outlet boxes and junction boxes.
    - a. Non-masonry and/or non-concrete locations provide pressed steel boxes. Steel thickness not less than 0.062-inch, hot-dip galvanized. Knockout (KO) type with conduit entrances and quantities size to match conduits shown connecting to respective junction box and outlet box.
    - b. UL-514 listed and labeled.
    - c. Minimum required box depth is exclusive of extension-ring depth.
    - d. Provide all boxes with matching cover plates. Cover plates shall be gasketed water-tight in wet and outdoor locations.
    - e. Boxes installed in masonry or concrete shall be UL "concrete-tight" approved for installation in concrete and shall allow the placing of conduit without displacing reinforcing bars.
  2. Provide outlet boxes of proper Code size for the number of wiring devices, connecting conduits, and conductors/cables or conduits passing through or terminating therein. In no case shall outlet box be less than 4.0-inches square by 2.125-inches deep. Unless specified elsewhere or noted otherwise on the Drawings, 2.5-inches minimum depth for box width's exceeding 2-gang.

3. Increase the minimum outlet box size to 4.69-inches square by not less than 2.125-inches deep, where one or more of the following conditions occurs:
  - a. More than two conduits connect to the outlet box.
  - b. Circuit "Homerun" or Conduit "Homerun" connects to outlet box.
4. Signal, Communication and Low Voltage Outlet Boxes:
  - a. Individual or duplex audio/visual, telephone, computer or data outlets: 4.69-inches square by 2.125-inches deep minimum with single gang wide extension ring.
  - b. Combination AV/signal/telephone/data or computer outlets: 4.69-inches square by 2.125-inches deep minimum with 2-gang wide extension ring.
5. Junction boxes shall be sized to comply with the following:
  - a. Code Requirements size based on the conduit quantities, conduit sizes and wire-fill connected to the junction box.
  - b. Junction box minimum size shall not be less than 4.69-inches square by 2.5-inches deep, but not less than size indicated on the Drawings or required by Code.
6. Provide extension rings on flush outlet boxes and flush junction boxes, to finish face of extension ring flush to (within  $\pm 0.63$ -inches) of finished building surfaces. Extension ring shall match outlet box materials/construction and contain "attachment mounting-tabs" for wiring devices. Extension rings shall be "screw-attached" to respective box and maintain "ground" bonding continuity.
7. Outlet boxes installed in outdoor locations, or in wet locations, or in concrete/masonry, shall be cast-iron or cast-bronze, with threaded conduit hubs. UL rated for wet locations.
  - a. Aluminum boxes shall NOT be in contact with concrete or masonry. Die-cast aluminum or cast aluminum water-tight electrical outlet boxes with threaded hubs may be provided as an alternate to cast-iron or cast-bronze outlet boxes, only where one or more of the following conditions occur:
    - 1) Outdoor locations above finish grade.
    - 2) Indoor wet locations surface or flush in walls or ceilings.
    - 3) Not in contact with concrete or masonry.
8. Provide fixture-supporting device in outlet boxes for surface mounted fixtures as required.
9. Provide solid gang boxes for three or more devices, typically for line and low voltage switches, receptacles, low voltage/signal outlets, etc. for mounting devices behind a common device plate.
10. Provide isolation barriers in outlet boxes:
  - a. Between line voltage and low voltage devices.
  - b. Where more than one device is installed in an outlet box, between and separating each device.
  - c. Between 277-volt and 120-volt devices.
  - d. Between devices connected to emergency and non-emergency circuits of all voltages.
11. Outlet boxes installed penetrating into fire rated walls, fire rated floors, fire rated ceilings and all fire rated construction. The outlet boxes shall be UL listed, classified and labeled, for fire rated and temperature rated penetration of the respective fire rated surface and fire rated construction. The outlet box fire rating and temperature rating shall equal or exceed the fire/temperature rating of the surface/construction being penetrated. Provide UL listed and labeled supplemental fire and temperature protection to maintain ratings:

- a. Wall and ceiling penetrations, supplemental tumescent fire wrap (external or internal of outlet box).
    - b. Floors provide subfloor supplemental fireproofing below floor box.
  12. Outlet boxes installed in floors. The floor outlet boxes shall be UL listed and labeled for scrub water exclusion Requirements, including but not limited to tiles, carpeting and exposed wood and concrete floor fishes.
  13. Outdoor flush in wall device outlet boxes:
    - a. Flush in wall outlet box with corrosion resistant gasketed watertight, hinged, key locking cast metal, self-closing cover. Tamper resistant and vandal resistant.
    - b. UL-listed and labeled for installation in masonry, cast-in-place concrete, hollow-framed walls, and wet locations.
    - c. Flush cast-iron or cast-bronze or brass, device back-box, nominal 4.68-inch square by 2.25-inches deep.
    - d. Internal metal adapter plate for wiring device types, in the box as indicated on the Drawings.
    - e. As manufactured by Legrand/Pass and Seymour #4600 Series: or C.W. Cole #310 Series.
  14. Refer to Architectural and Structural Contract Documents and Details for additional Box and Install Requirements.
- B. Surface Outlet Boxes
  1. Surface mounted outlet boxes, cast iron Type FS or FD, with threaded hubs as required. Box interior dimensions and interior volume capacity not less than required for “press steel boxes”, and “sheet steel boxes”. Provide plugs in all unused openings. Provide weatherproof gaskets for all exterior boxes.
- C. Floor Boxes
  1. General:
    - a. Outlet boxes installed in floors. The floor outlet boxes shall be UL listed and labeled for Scrub Water Exclusion Requirements, including but not limited to floor tiles, carpeting and exposed wood and concrete floor fishes.
    - b. Electrical power receptacles in a floor box; shall be industrial grade wet location heavy-duty, high abuse rated devices; tamper resistant. Grounding type, 125 volts, 60Hz AC, 20-amp, NEMA 5-20R (duplex), or other NEMA configurations noted on the Drawings. Standard length receptacle mounting strap as required by the Manufacturer of floor box being furnished.
    - c. Tested, listed and labeled to comply with UL-514A and/or UL514C.
  2. Pedestal Type Floor Outlets (Non-Poke-Thru Type)
    - a. Power (high potential) floor outlets pedestal shall be nominal 3-inches by 3-inches high by 4.5-inches long, die cast aluminum brushed finish with duplex grounding type convenience receptacles. Pedestal shall be mounted on 3-inches nominal depth metal, electrical flush in floor box, complete with proper adapter and nipple for mounting to floor box and attachment of conduits.
      - 1) Back-to-back, two 20-amp 120 volt, 60Hz AC grounding duplex convenience receptacles.
    - b. Low voltage-signal (low potential) floor outlets pedestal shall be nominal 3-inches by 3-inches high by 4.5-inches long, die cast aluminum brushed finish. Pedestal shall be mounted on flush in floor 3-inches nominal depth metal, electrical floor

- box, complete with proper nipple and adapter for mounting to floor box and attachment of conduits. The Contractor shall provide the type of outlet(s) at each floor box location as required by the Low Voltage-Signal Contract Documents.
        - c. The pedestal shall provide 0.25-inch or greater protective top-over-hang (drip-lip) shading the wiring device coverplates. Provide stainless steel device coverplates.
        - d. Metal electrical floor boxes for pedestals shall be cast-iron, concrete pour rated or open framing rated as applicable. Not less than two 0.75-inch and two 1.0-inch conduit entrances. "Box Leveling" adjustable supports.
        - e. Pedestal as manufactured by Hubbell LO-CON/SC Series pedestal with matching cast-iron floor boxes; or Wiremold/Legrand series pedestal with matching cast-iron floor boxes.
3. Poke-Thru floor boxes for "After-Set" Floor Outlets.
  - a. Through floor wiring for power and communication shall be UL listed with a fire and temperature rating of not less than 2-hours. The units shall include an internally divided floor fitting; a divided through-floor conduit/raceway, and a divided under floor junction "split-box" not less than 4.7-inches by 4.7-inches by 2.125-inches in size. Junction box shall be installed concealed in ceiling space of the floor below. The length of the floor "through-raceway" shall match the thickness of the finish floor and as recommended by the Manufacturer. Unit shall be self-supporting without the attachment of an above floor fitting. Internal isolation barriers between high potential and low potential circuits and sections. The integral fire barrier shall incorporate a cold smoke barrier to prevent the passage of smoke when heat is not present.
  - b. Poke-Thru Floor boxes shall contain dual services for high potential and low potential devices and circuits.
  - c. Poke-Thru Floor pedestal type; (internally divided high potential and low potential sections) service fittings die cast, brushed aluminum, single piece device housing, with stainless steel device cover plates front and rear of the housing as follows:
    - 1) Front side (high potential) one 20-amp, 120 volt, 60Hz, AC, grounding duplex convenience outlet plugs.
    - 2) Rear side (low potential) shall contain "knockouts" or "keystones" as follows at locations shown on the Drawings:
      - a) Knockouts for signal cables one 1-inch diameter and two 0.5-inch diameter with rubber bushing grommets for each knockout.
      - b) Four RJ-45 keystone, snap-in retainers for low potential plug-in signal connections.
      - c) The Contractor shall provide the type of outlet(s) at each poke-thru location as required by the low voltage-signal Contract Documents.
    - 3) Alternately where specifically indicated on the Drawings, the front and rear cover plates shall be supplied with knockouts for 1.0-inch flexible conduit "Furniture" connection, one per cover plate.
    - 4) The pedestal shall provide 0.25-inch or greater protective over-hang (drip-lip) of the device coverplates. Provide stainless steel device coverplates.
  - d. Non-Pedestal Poke-Thru flush in floor type; (internal divided high potential and low potential sections) die cast, flush with finish floor, metal cover flip-open, locking, hinged access covers. Open-close die cast aluminum port-covers for plug-in portable cable connections. ADA compliant, wide trim matching flange.
    - 1) Two 20-amp, 120-volt, 60Hz, AC, grounding duplex convenience receptacles for high potential power connections.



- 2) Four RJ-45 keystone, snap-in retainers for low potential plug-in signal connections. The Contractor shall provide the type of outlet(s) at each poke-thru location as required by the Low Voltage-Signal Contract Documents.
    - 3) Cover shall close and lock after portable plug-in cables have been inserted into respective connections, under the cover.
    - 4) UL wet mop, scrub water rated for carpeted and non-carpeted floors.
  - e. Die cast aluminum cover, nominal 8-inch diameter metal housing flush in "core-hole", outlet metal body size.
  - f. Flush with floor or pedestal type as indicated on Drawings. As manufactured by Wiremold/Legrand# Evolution Poke-Thru 8AT Series, Smoke and Fire Rated Poke-Through fittings; no known equal.
4. Floor Boxes for Flush Floor Outlets (non-pedestal) recessed concealed inside outlet box, plug-in receptacles.
  - a. Provide cast-in-floor with concrete pour pan, rated for on grade to prevent direct earth contact, cast-in-place concrete floors on-grade and above-grade; adjustable "leveling-feet" for box.
  - b. UL wet mop, scrub water rated for carpeted and non-carpeted floors. UL-File E171211 installation fire rating and/or UL-Fire Resistance Classified.
  - c. Floor boxes shall contain dual services:
    - 1) High potential with not less than two 120-volt 60Hz AC 20-amp grounding duplex convenience receptacles.
    - 2) Low potential for low voltage system outlets and signal circuits with up to and including eight RJ-45 plug-in keystone snap-in retainer receptacles. The Contractor shall provide the type of outlet(s) at each poke-thru location as required by the Low Voltage-Signal Contract Documents.
    - 3) Internal isolating barrier between high and low potential circuits and sections of box.
    - 4) Also refer to Drawings for Additional Outlet Requirements.
  - d. Conduit knockouts in bottom of box and in each side walls of box. Not less than one 1.25-inch and one 0.75-inch knockouts for both low potential and high potential conduits connections on each opposing box sides. Include the same configuration of knockouts on the bottom of the box, for high potential section and low potential sections.
  - e. Floor box cover:
    - 1) Flush tamper resistant "lock-down" removable main cover. Independent hinged "flip-out" port in the removable cover, to allow main box cover to be in a fully closed position with "plug-in" cords connected into box when the lock-down cover is closed. Main cover "lock-down" to prevent non-authorized access into box interior.
    - 2) Brass, removable recessed main cover, rated for carpet, or tile for floor finish, brass overlapping trim cover finish. Cover recess depth 0.25-inch, 0.5-inch or 0.75-inch as required to match respective floor covering thickness and type. ADA compliant, wide trim matching flange.
  - f. Floor box with metal body, nominal box size 10-inches by 12-inches by depth to match floor, but not less than 3.0-inches deep box.
  - g. Floor box as manufactured by FSR #FL-500P Series; no known equal.

## 2.02 PULLBOXES

### A. General

1. Sizes as indicated on the Drawings and in no case of less size or material thickness than required by the Governing Code and AHJ.
2. Exercise care in locating pullboxes to avoid installation in drain water flow areas and to clear existing condition interferences.
3. UL listed and labeled for electrical circuits.

### B. General Purpose Sheet Metal Pullbox

1. General purpose sheet steel pullboxes: Install only in dry protected locations with removable screw attached covers. Manufacturer's standard rust proofing and baked enamel finishes.
2. Weatherproof sheet steel pull boxes: Fabricate of Code gauge steel. All surfaces interior and exterior hot dip galvanized steel. Gasketed weather-tight cover of same material.

### C. Concrete Pullboxes and Hand-Holes for Electrical

1. AASHTO H-20 traffic loading rated box and cover, pre-cast concrete, steel reinforced pullboxes and hand-holes. Provide complete with pulling irons, hot-dip galvanized metal traffic cover with hot-dip galvanized metal cover frame, pullbox concrete base with sump. Four cable full height wall racks with porcelain cable support blocks.
2. Boxes shall be "Intercept" type with multiple box sections. Extension cable-intercepts at both ends of box. Refer to Drawings for box size.
3. Covers shall be flush bolt down. Covers weighing more than 40-pounds shall be split cover type "Torsion-Spring" assist, hinged open-close.
4. Box covers shall comply with Federal ADA, UL, State and Local AHJ for slip resistance. Provide cast-or-bead weld on cover of pullbox to indicate services within pullbox (i.e., "480/277-VOLT, 3-PHASE, 4-WIRE ELECTRICAL" OR "SIGNAL/TEL/P.A./CLOCK/FIRE ALARM" etc.).
5. Shall be set on a machine-compacted pea gravel base 12-inches thick with gravel base extend 6-inches beyond box base on all sides. Provide a 0.75-inch by 10-foot copper clad ground rod through the box bottom with 9-inch projection into box, for grounding all metal parts and frames with continuous #10AWG copper bond wire.
6. Seal all box joints and seal box between cover and frame with a mastic compound similar to Parmagum or Dukseal. After cables have been pulled, connected, tested and inspected, seal box cover and bolt-close cover.
7. As manufactured by Jensen Precast, or Oldcastle Precast.

## 2.03 SWITCHES, WIRING DEVICES

### A. General

1. Provide wiring device circuit switches totally enclosed, electrical insulating Bakelite or electrical insulating composition base, manual operator type with 277-volt 60Hz AC rating for full capacity contacts rated for incandescent lamp loads, fluorescent lamp loads and motor loads. Switch mounting-ears for screw attachment to outlet box. Switches shall be UL listed and labeled; conform to NEMA-WD1 and WD6.

2. Switch controlling (on-off) rated for all lighting loads and all non-lighting loads; switch ratings shall be 20-amp, unless indicated otherwise on Drawings.
3. Color as selected by Owner's Representative. Switches and wiring devices controlling circuits connected to emergency power shall be red.
4. All switches shall be of the same Manufacturer.
5. Where switches are mounted in multiple gang assembly and are operating at 277 volts and/or 277 volts and 120 volts or emergency/non-emergency and mounted in same outlet box, there shall be an insulating barrier installed between each switch.
6. Devices shall additionally be listed and labeled as UL-All Weather-Resistant wet-location for the following install locations:
  - a. Devices indicated on Drawings as Weather-Proof (W.P.).
  - b. Devices installed in outdoor locations
  - c. Installed in classified wet or damp area locations both indoor and outdoor.
7. Wiring devices shall be listed and labeled for connection of both "solid" and "stranded" copper circuit conductors.
8. Switches with ampere and voltage ratings different than described herein. The different rated switches shall have the same characteristics and performance as the respective described switches, except for differing ampere and voltage characteristics.

B. Switches Heavy Duty (Toggle – Type)

1.	Single Pole Switches – 20-amp at 277V		
	<u>Manufacturer</u>	<u>Toggle Type</u>	<u>Lock Type</u>
	Hubbell	#HBL1221	#HBL1221-L
	Legrand/P&S	#20AC1	#20AC1-L
	Leviton	#1221	#1221-L
2.	Double Pole Switch – 20-amp at 277V		
	<u>Manufacturer</u>	<u>Toggle Type</u>	<u>Lock Type</u>
	Hubbell	#HBL1222	#HBL1222-L
	Legrand/P&S	#20AC2	#20AC2-L
	Leviton	#1222	#1222-L
3.	Three-Way Switches – 20-amp at 277V		
	<u>Manufacturer</u>	<u>Toggle Type</u>	<u>Lock Type</u>
	Hubbell	#HBL1223	#HBL1223
	Legrand/P&S	#20AC3	#20AC3-L
	Leviton	#1223	#1223-L
4.	Four-Way Switches – 20-amp at 277V		
	<u>Manufacturer</u>	<u>Toggle Type</u>	<u>Lock Type</u>
	Hubbell	#HBL1224	#HBL1224-L
	Legrand/P&S	#20AC4	#20AC4-L
	Leviton	#1224	#1224-L
5.	Momentary Contact Switches – 20-amp at 277V		
	<u>Manufacturer</u>	<u>3-Position Regular</u>	<u>3-Position Lock</u>
	Hubbell	#HBL1557	#HBL1557-L

Legrand/P&S	#1251	#1251-L
Leviton	#1251	#1251-L
Cooper-Arrow/Hart	#AH (extra)	#AH (extra)

6. Maintained Contact Switches (Double Throw, Center Off) – 20-amp at 277-volt

<u>Manufacturer</u>	<u>Toggle Type</u>		<u>Lock Type</u>	
	<u>1-Pole</u>	<u>2-Pole</u>	<u>1-Pole</u>	<u>2-Pole</u>
Legrand/P&S	#1225	#1226	#12250L	#1226-L
Hubbell	#HBL1385	#HBL1386-L	#HBL1385-L	#HBLM1386-L
Leviton	#1385	#1386		
Cooper-Arrow/Hart	#AH (extra)	#AH (extra)	#AH (extra)	#AH (extra)

7. Pilot lights used in conjunction with circuit switches shall be LED type with red jewel.

C. Weather-Proof (W.P.) Switches

1. Outdoor switches provide heavy-duty, tamper resistant gasketed weather- proof metal, hinged door cover for each switch.
2. Cover door shall be key locking-type or padlock-type.

D. Other Switches, Receptacles, Devices, and Outlets

1. Special devices outlets and outlet locations shall be as indicated on the Drawings. Modify device and outlet characteristics to accommodate the actual install location conditions for each outlet.

2.04 ELECTRIC RECEPTACLE WIRING DEVICES

A. General

1. All receptacle wiring devices in flush-type outlet boxes shall be installed with a bonding jumper to connect the box to the receptacle ground terminal. Grounding through the receptacle mounting straps is not acceptable. The bonding jumper shall be sized in accordance with the branch circuit protective device as tabulated herein under "Grounding". Bonding jumper shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws 6-32 or larger (except isolated ground receptacles). For receptacles in surface mounted outlet boxes direct metal-to-metal contact between receptacle mounting strap (if it is connected to the grounding contacts) and outlet box may be used. Receptacle mounting ears for screw attachment to outlet box. Receptacle shall be UL listed and labeled; conform to NEMA-WD1 and WD6.
2. All receptacles shall be a product of the same Manufacturer.
3. Receptacle color as selected by Owner's Representative. Receptacles connected to emergency power circuits shall be red.
4. Wiring devices shall be listed and labeled for connection of both "solid" and "stranded" copper circuit conductors.
5. Duplex convenience receptacles and 120-volt single phase branch circuits.
  - a. Duplex (convenience) receptacle, wiring device with two single receptacles with the same electrical rating, integrated into a single assembly by the Manufacturer.
  - b. 20-amp branch circuits with a single duplex convenience receptacle connection on each circuit, receptacles shall be rated for 20-amp.
  - c. 15-amp and 20-amp branch circuits with two or more duplex convenience receptacle connections each circuit, receptacle shall be rated 15-amp or 20-amp.

6. Devices shall additionally be listed and labeled as UL-All Weather-Resistant, provide weather resistant receptacles for the following installation locations. Modify Manufacturer's Catalog number descriptions, shall include all-weather-resistant UL listing and labeling:
  - a. Devices indicated on Drawings as Weather-Proof (W.P.).
  - b. Devices installed in outdoor locations.
  - c. Devices installed in classified as damp or wet locations both indoor and outdoor.
  - d. All GFCI (ground-fault) receptacles at all locations.
7. Receptacles with ampere and voltage ratings different than described for duplex convenience receptacles. The different rated receptacles shall have the same characteristics and performance as the respective duplex convenience receptacles, except for differing ampere and voltage characteristics. Refer to "Floor Boxes" for additional Receptacle Requirements".
8. Receptacles shall be GFCI type for the following locations:
  - a. Located within 84-inches of a sink or hosebib shall be GFCI receptacles.
  - b. Devices installed in outdoor locations.
  - c. Devices installed in classified as damp or wet locations both indoor and outdoor.
  - d. Devices indicated on Drawings as GFCI or Weather-Proof (W.P.).
9. "Split-Wire" duplex convenience receptacles. Each split-wire receptacle plug connects on independent common circuit. Provide nameplate or graphic on face of receptacle describing the receptacle function and control source. Comply with California Title-24 and ASHRAE-90.1, latest revisions.

**B. Duplex Convenience Receptacles.**

1. Shall be grounding type, 120 volt and shall have two current carrying contacts and one grounding contact which are internally connected to the frame. Outlet shall accommodate standard parallel blade cap and shall be side wired. Receptacles shall be tamper-resistant-TR, UL-TR.
2. GFCI receptacles shall be all Weather-Resistant and wet location rated. Duplex rated 120-volt 60Hz AC, 20-amp, unless indicated otherwise on Drawings.
3. Heavy Duty Industrial Grade
 

<u>Manufacturer</u>	<u>NEMA 5-15R</u>	<u>NEMA 5-20R</u>	<u>NEMA 5-20R-GFCI</u>
Legrand/P&S	#5262	#5362	#2095HG
Leviton	#5262	#5362	#W7899
Hubbell	#CR5252	#5362	#GFR8300
Cooper-Arrow/Hart	#AH5262	#AH5362	#WRVGF20

**C. Weatherproof (W.P.) Receptacle**

1. Outdoor receptacles shall be duplex convenience GFCI type rated 20-amp 120-volt 60Hz AC weatherproof, GFCI, unless indicated otherwise on Drawings. Test-reset buttons and visual pilot.
2. GFCI receptacles shall be in a wet location and Weather-Resistant rated weatherproof, gasketed, key locking tamper resistant, wet location.
3. Outdoor, flush mount outlet with hinged, key-locking, weather-proof cover (CEC/NEC – 406.8 compliant). As manufactured by: Pass and Seymour/ Legrand #4600 Series; or C.W. Cole #310 Series.

4. On exposed conduit runs, provide weatherproof ground fault circuit interrupter type GFCI receptacles installed in "FS" conduit watertight cast metal body, with weather-proof spring door type covers, gasket watertight. Door shall be key locking-type or padlock-type.

D. Other Switches, Receptacles, Devices, and Outlets.

1. Special devices, outlets and outlet locations shall be as indicated on the Drawings. Modify device and outlet characteristics to accommodate the actual install location conditions for each outlet.

2.05 PLATES

A. Cover Plates for Devices

1. Provide cover plates for every line voltage and low voltage switch, receptacle, telephone, computer, television, signal and other device out-lets.
  - a. All cover plates shall be nylon or thermoplastic, color as selected by Architect.
2. Plates shall be as manufactured by P&S; or Hubbell; or Leviton; or General Electric.

2.06 STRUCTURAL AND MISCELLANEOUS STEEL

Structural and miscellaneous steel used in connection with electrical work and located out-of-doors or in damp locations, shall be hot dip galvanized unless otherwise specified. Included are underground pullbox covers and similar electrical items. Galvanizing averages 2.0 ounce per square foot and conforms to ASTM A123.

2.07 FLASHING ASSEMBLIES

A. General

1. Flashing shall be compatible with the material being penetrated and with the pipe passing through the flashing. Coordinate with and comply with Manufacturer's recommendations, for both the flashing and the material being penetrated.
2. Provide lead metal flashing assemblies at all roof penetrations, unless recommended otherwise by Manufacturer.
3. Seal the joint between the flashing and pipe passing through the flashing with waterproofing compound.
4. Lead flashing for roof penetrations, as manufactured by: Santa Rosa Lead Products; or Semco; or Flashco.

B. Storm Collars

1. In addition to penetration flashing, provide a storm-collar counterflashing for each roof penetration flashing. Shall attach to the structure of the penetration and form a water-tight "Umbrella" counter flashing over the roof penetration flashing.
2. As manufactured by: STD-Storm collars; or ASI-Storm collars.

2.08 RELAYS, CONTACTORS, AND TIMESWITCHES

A. Individual Control Relays (HVAC Plumbing of the Control Functions)

1. Individual control relays shall have convertible contacts rated a minimum of 10-amp, 600-volt regardless of usage voltage. Coil voltage, number and type of contacts shall be verified

and supplied to suit the specific usage as shown in the wiring diagrams and/or schedules on the Electrical and Mechanical Drawings. Coil control circuit shall be independently fused, sized to protect coil. Relays shall be installed on prefabricated mounting strips. Each relay shall have a surge suppressor to limit coil transient voltages. Furnished in the NEMA Type I enclosure unless indicated otherwise.

2. The following relays are approved:

<u>Manufacturer</u>	<u>Type</u>
Cooper-Arrow/Hart	IMP
General Electric	Class CR 2811
Square D Co.	Class 8501, Type A
Westinghouse	Bul. 16-321, Type NH
Allen Bradley	Approved Equal

B. Contactors and/or Relays

1. Contactors and/or relays for control of lighting shall be 600-volt AC, electrically operated, mechanically held units, open type for panel mounting with number of poles and of size as indicated on the Drawings. Provide auxiliary control relay for operation of each contactor and/or relay with a 2-wire control circuit.
2. Contactors and/or relays shall be mounted in panelboards in barriered section under separate hinged lockable doors or in contactor and/or relay cabinets as called for on the Drawings. Contactors and/or relays shall be installed on Lord sound absorbing rubber mounts.
3. Contactors and/or relays shall be Automatic Switch Co. Bulletin #920 Series for 2-pole and 3-pole, Automatic Switch Co. Bulletin 917 Series with poles as indicated on Drawings. Coil control circuit shall be independently fused, sized to protect coil.
4. Contactors and/or relays shall be equipped with a switch, in the proper configuration, to disconnect the control circuit controlling the coil of the respective device. Control circuit disconnect switch shall be labeled showing function of device.

C. Time-switches

1. All timeswitches shall have synchronous motor drive for operation on 120 or 277-volt, 60Hz, AC and shall be furnished with a 10-hour, spring-driven, reserve-power motor. Contacts shall be rated 40-amp per pole.
  - a. Exterior lighting timeswitches for control of individual circuits or electrically operated relays shall have astronomic dial and shall be Tork 7000ZL Series or approved equal by Paragon or Intermatic.
  - b. Interior lighting timeswitches for control of individual circuits or electrically operated relays shall be Tork 7000 Series or approved equal by Paragon or Intermatic.
  - c. Timeswitches for control of air conditioning or plumbing equipment shall have 7-day dial and shall be Tork WL Series or approved equal by Paragon or Intermatic.
2. All timeswitches shall be mounted in separate section in top of panelboards under separate lockable door unless otherwise indicated on Drawings. Clear opening for time-switch shall be a minimum of 12-inches by 12-inches.

D. Contactors and/or Relays/Time-switch Cabinet

1. Contactors, relays, and/or timeswitches not indicated to be mounted in electrical panels shall be mounted in a cabinet, size as required, with hinged lockable door keyed same as panelboards. Construction of cabinet shall be similar to terminal cabinets.

2. Each contactor, relay or time-switch mounted in the contactor cabinet shall be barriered in its own compartment and shall be installed on Lord sound absorbing mounts.
3. Contactor cabinets shall be of the same Manufacturer as the panelboards.
4. Where relays and/or contactors occupy the same enclosure as time-switches they shall have a clear acrylic shield installed over each relay or contactor to guard line exposed parts from accidental contact by nonauthorized personnel.

## 2.09 DISCONNECTS (SAFETY SWITCHES)

### A. General

1. Disconnect switches shall all be rated:
  - a. 600-volt 60Hz AC for all disconnect safety switches.
  - b. NEMA Type HD, quick-make, quick-break, H.P.-rated.
  - c. Fused Class "R", in NEMA Type I indoor location enclosure. Where enclosure is indicated outdoor or W.P. (Weather-Proof) switches shall be rain tight NEMA 3R enclosure. Lockable access door.
  - d. Number of poles horsepower rating and amperage as indicated on the Drawings.
2. Provide internal neutral bus, ground-lug and conductor landing lugs, size to match conductors shown on Drawings. Switch access door shall be interlocked with switch to prevent access inside switch when switch is "ON" closed position.
3. Maximum voltage, current and horsepower rating clearly marked on the switch enclosure and switches having dual element fuses shall have rating indicated on the nameplate.
4. Disconnect switch and fuses ampere rating shall also comply with Manufacturer's recommendation for the connected load.

## 2.10 TRANSFORMERS (600 VOLTS AND BELOW)

### A. General

1. Provide dry type transformers constructed to meet Underwriters' Laboratories Specification UL 506 and tested in accordance with ANSI and NEMA Standards. Performance on transformers equal to or better than ANSI, NEMA, IEEE and CEC/NEC published criteria.
  - a. 60Hz AC line and load.
2. UL Class 220°C insulation with maximum winding temperature rise of 150°C in 40°C ambient at 100% continuous rated capacity with overload capacity per ANSI C57.12 and C57.96 vacuum impregnated core and coil insulation.
3. Transformers shall be equipped with not less than a total of five 2.5% full capacity voltage taps; two taps above normal voltage; and three taps below normal voltage.
4. Line and load terminals shall be accessible, located behind removable front cover plate. Transformer connects shall terminate in "Conductor-Lugs" to match line side incoming and outgoing secondary side conductors, shall occur on a common (same) side of transformer on insulated supports.
5. Provide wall mount and ceiling mount transformers support brackets, platforms and attachment structures for transformers.



6. Dry type transformers shall meet or exceed NEMA TP-1 (latest revision), Class-1 efficiency levels. Shall be marked as energy efficient for United States Department of Energy and Environmental Protection Agency DOE/EPA "Energy Star" complaint.
7. Transformer windings shall be copper or aluminum.
8. Electrostatic Shield: Provide full width, copper, 100% electrostatic shield (Faraday Shield), between line and load transformer windings, on each transformer phase. Shield shall be low impedance grounded to the transformer metal frame and shall attenuate common mode electrical noise 120dB at 1-500MHz range and transverse mode electrical noise, 30dB at 1-500MHz range. Average effective coupling capacitance of thirty picofarads between line and load sides.
9. Connect transformers by one of the following methods:
  - a. Underfloor conduit resulting in no rigid connections to transformer (provide ground strap for equipment ground).
  - b. Liquid tight flexible metal conduit (provide ground wire for equipment ground).
  - c. Pullbox or wireways from transformer which are isolated from transformer with an approved sound absorbing neoprene gasket (provide ground strap for equipment ground).
10. The physical dimensions of the transformer shall not exceed the size shown on the Drawings.
11. Transformer and transformer mounting shall be designed and tested and comply with install location seismic earthquake resistance seismic loads, typical for floor, wall and ceiling mount/suspended transformers. Bolt floor-mounted transformers to floor and mounting brackets or wall/ceiling brackets as applicable. Provide seismic rated isolation rubber mounts, on each attachment contact location.

B. Test Requirements:

1. The transformers shall be subjected to the following production tests:
  - a. Applied Potential
  - b. Induced Potential
  - c. No Load Loss.
  - d. Voltage Ratio.
  - e. Polarity
  - f. Continuity
2. The Manufacturer shall have performed the following additional tests on transformer units identical to the design type being supplied to this Specification. Proof of performance of these tests in the form of test data sheets shall be provided at the Time Shop Drawings are submitted for approval.
  - a. Sound Levels
  - b. Temperature
  - c. Full Load and 50% Load Losses for linear and nonlinear loads
  - d. Voltage Regulation
  - e. Impedance

C. Transformer Housing

1. Metal, air cooled enclosure
  - a. Removable metal NEMA 1 enclosure, indoor location

- b. Removable NEMA – 3R enclosures, outdoor locations, with vent shields and rodent shields.
    - c. Provide screen protected ventilation for all openings, including bottom of housing, to prevent accidental contact with internal components and prevent rodent/insect entrance.
  - 2. Manufacture's rust inhibitor primer and standard finish paint.
  - 3. Removable lifting and skidding provisions.
  - 4. Provide wall mount and ceiling mount transformers support brackets, platforms and attachment structures for transformers.
- D. Sound Levels: Transformer sound levels, between no load to full load, shall be guaranteed by the Manufacturer not to exceed the following values:
 

9kVA and below	40dBa
10kVA to 50kVA	45dBa
51kVA to 150kVA	50dBa
151kVA to 300kVA	55dBa
301kVA to 500kVA	60dBa

## 2.11 CONCRETE WORK (ADDITIONAL REQUIREMENTS)

### A. Portland Cement

- 1. ASTM C33- (latest revision), Type II, Low Alkali Cement. Composed of Portland cement, coarse aggregate, fine aggregate, and water.
  - a. Concrete for use as electrical equipment footings, lighting pole bases and equipment slabs on grade, concrete shall attain minimum 28-day compressive strength of 4000psi, using not less than 5.75 sacks of cement per cubic yard of wet concrete.
  - b. Concrete for underground duct/conduit encasement, the minimum 28-day compressive strength shall be 2000psi. Provide a minimum of 10-pounds of red oxide concrete coloring per yard of concrete.
  - c. Mix shall obtain a 6-inches slump, measured with standard slump cone per ASTM C143/ C143M (latest revision).
- 2. Coarse Aggregate: Uniformly graded between maximum size not over 1½-inch and not less than 0.75-inch and minimum Size #4, crushed rock or washed gravel. For concrete encased conduit only, maximum aggregate size shall be ½-inch.
- 3. Fine Aggregate: Clean, natural washed sand of hard and durable particles varying from fine to particles passing 3⁄8-inch screen, of which at least 12% shall pass fifty mesh screens.

B. Water: Clean and free from deleterious quantities of acids, alkalis, salts, or organic materials.

### C. Reinforcement

- 1. Bars: Intermediate Grade Steel conforming to ASTM A615/A615M grade 60, with pattern deformations.
- 2. Welded Wire Fabric: ASTM A185/A185M.
- 3. Bending: Conform to Requirements of ACI 318.

- D. Form Material: For exposed work, use PS 1-66 "B-B Concrete Form" plywood forms, or equal. Elsewhere, forms may be plywood, metal, or 1-inch by 6-inch boards. Forms for round lighting pole bases shall be Sono-tube.

## 2.12 WIREWAY

### A. General:

1. Unobstructed lay in type, metal wireway, fittings and connectors UL listed for use as wireway and auxiliary gutter. Length, elbows and "T-S" as shown on Drawings. Minimum cross-section size 4-inches by 4-inches, but not less than shown on the Drawings. Suitable for mounting in any position orientation.

### B. Construction:

1. Minimum metal gauge shall not be less than 14-gage.
2. Cover shall be hinged entire length of cover. Cover shall be held in the closed position with bolts and nuts.
3. Provide spring nuts on all hardware fastener penetrations into the interior of the wireway to protect against wire insulation damage.
4. The inside of 90-degree corners in the wireway shall be a 45-degree bevel.
5. Grounding continuity between wireway sections and fittings shall be continuous the entire length of the wireway.

### C. Finish:

1. Indoor non-raintight, rust inhibitor phosphatizing base coating and baked enamel finish, Manufacturer's standard color.
2. Raintight outdoor-galvanized metal, with corrosion resistant phosphate primer and baked enamel finish, Manufacturer's standard color, NEMA 3R construction.
3. All hardware shall be plated to prevent corrosion.

## PART 3 - EXECUTION

### 3.1 GROUNDING (ADDITIONAL REQUIREMENTS)

- A. Grounding shall be executed in accordance with all applicable Codes and Regulations, both State of California and Local Authorities Having Jurisdiction.
- B. The Neutral of each Transformer and each Uninterruptable Power Supply - UPS and each inverter shall be grounded by individual separate ground conductors in individual conduits as follows:
1. Conductor and conduit shall be grounded to building main ground bus.
  2. Conductor and conduit shall be grounded to respective room/closet ground bus, where occurs.
  3. Conductor and conduit shall be grounded to nearest available effectively grounded building structural steel member or grounded metal cold water pipe.

4. The neutral ground conductors for secondary side of each transformer each, inverter and each UPS unit shall be copper and shall be sized according to the following table:
 

<u>Secondary Total Equivalent Size Copper</u>	<u>Neutral Ground Wire Size Copper</u>
#2 or smaller	#6-1-inch conduit
1 or 1/0	#4-1-inch conduit
2/0 or 3/0	#2-1¼-inch conduit
4/0 thru 350 MCM	#1-1¼-inch conduit
Over 350 MCM thru 600 MCM	2/0-1½-inch conduit
Over 600 MCM thru 1100 MCM	3/0-1½-inch conduit
Over 1100 MCM	4/0-2-inch conduit
  - C. Each pullbox or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.
  - D. The Maximum Resistance to Ground shall not exceed 5 ohms.
- 3.2 OUTLET AND JUNCTION BOXES
- A. General:
1. Accurately place boxes and securely fastens structural members. Where outlets are shown at same location but at different mounting heights, install outlets in one vertical line. Where outlets are shown at same location and mounting height, mount outlets as close together in a horizontal row as possible. Where the outlet boxes for switches and receptacles are shown at the same location and mounting height, mount in common outlet box with barriers between devices. Provide single piece multi-gang cover plate for close mounted outlet boxes. Where switches are shown on wall adjacent to hinge side of doors, box shall be installed to clear door when door is fully opened.
  2. Flush mounted boxes shall be attached to not less than two parallel studs or structure members by means of metal supports. The supports shall span between and attach to the structure members.
  3. Boxes above accessible ceilings shall be attached to structural members. Where boxes are suspended, they shall be supported independently of conduit system by means of hanger rods and/or preformed steel channels. Boxes shall be supported independently of all piping, ductwork, equipment, ceiling hanger wires and suspended ceiling grid system.
  4. Surface mounted outlets shall be attached to concrete or masonry walls by means of expansion shields.
  5. Floor boxes shall be installed level with finish floor and within adjustable limits of floor ring. Where outlets are shown at same or adjacent location, use multi-gang boxes.
    - a. Provide cut-outs in the sub-floor assembly, to accept the recess depth of each electrical floor box. Provide added "fire-proof" applications on the bottom of each floor box location extending through the sub-floor. The "fire-proof" application shall be equal to the floor fire-assembly withstand rating.
    - b. Poke-thru floor outlets, core drill floor for installation of poke-thru. Install "split box" in the ceiling space of the floor below. If the ceiling space of the floor below is not accessible ceiling type (lift-out), then provide 12-inches round removable fire-rated stainless steel access panel and trim-ring in the finish ceiling for hand-access to poke-thru "split-box" above the ceiling.
  6. Outlet Box Horizontal and Vertical Separation: Outlet boxes and device outlet rings installed flush in walls shall be horizontally and vertically separated by not less than 24-

inches (edge of box to edge of box) from device outlet boxes and rings in common wall surfaces located on the opposite (back) side of the same wall.

- a. Where the separation cannot be maintained, provide a solid backing behind and completely enclosing each outlet box.
- b. The backing shall extend the width of the wall cavity (i.e., between "studs" or masonry cells) behind the box and 12-inches above and below the outlet box centerline, completely enclosing the outlet box.
- c. The backing shall consist of the following:
  - 1) 5/8-inch thick gypsum board anchored in place for "Stud" wall construction.
  - 2) Solid "Mortar" to completely fill the outlet box "Cell" behind the box in masonry construction.

7. Provide metal outlet box for each device. Install devices in metal outlet boxes. Typical for all wiring devices including switches, receptacles, line voltage devices, and low voltage/signal system devices.

B. Fire Wrap:

1. In fire rated walls and ceilings provide fire rated "Box-Wrap" around the outside of each outlet box placed in fire rated wall or ceiling. Install the fire wrap on exterior of box inside the wall or ceiling, to maintain the fire rating of wall or ceiling with the installed outlet boxes.

3.03 SWITCHES AND RECEPTACLES-DEVICES

A. General

1. Provide outlet boxes for all devices, switches, receptacles, both line-voltage and low-voltage.
2. Devices installed in wireways shall be installed flush in wireway assembly.
3. Install and screw attach devices into outlet boxes and wireways.
4. Provide ground circuit connections to all devices.
5. Provide branch circuit connections to all devices.
6. Provide testing and commissioning for proper operation and phase/ground connectors.
  - a. Test each GFCI device and Arc-Fault devices after installation and circuit connection is complete.
  - b. Test all devices for correct polarity and proper electrical energization.
  - c. Test On-Off operation of automatically controlled outlets and receptacles.
7. Install and adjust all coverplates to be flush and level, with correct device and circuit identification.
8. Where one or more devices occurring at the proximity with other similar devices, all the devices shall be "Granged" under one common coverplate as follows:
  - a. Duplex convenience receptacles with other proximity (within 18-inches) duplex convenience receptacles.
  - b. Lighting control switches not exceeding 20-amp switch rating with other proximity (within 18-inches) similar switches.

B. Line-Voltage Plug-In Type Receptacle Installation Orientation:

1. The "Ground-Pin" shall face "UP" at the receptacle top location (double duplex) 4-plex, individual and vertically mounted individual duplex receptacles.
2. The "Neutral-Blade" shall face "UP" at the receptacle top location on horizontally mounted duplex receptacles.

3.04 CONCRETE WORK

A. Form:

1. Space forms properly with spreaders and securely tie together. Do not use twisted wire form ties. Keep forms wet to prevent joints from opening up before concrete is placed. Replace improper construction as directed. Do not use wood inside forms.
2. Build in and set all anchors, dowels, bolts, sleeves, iron frames, expansion joints and other materials required for the Electrical Work. Place all items carefully, true, straight, plumb, and even.
3. Carefully remove all exposed forms. Cut nails and tie wires below face of concrete and fill all holes. Rubbish will not be allowed to remain in, under, or around concrete.

B. Mixing: Use batch machine mixer of approved type. After ingredients are in mixer, mix for at least 1½-minutes.

C. Transit Mixing: In lieu of mixing at site, transit mixing may be used if rate of delivery, haul time, mixing time, and hopper capacity is such that concrete delivered will be placed in forms within 90-minutes from time of introduction of cement and water to mixer.

D. Placing of Concrete

1. Before placing concrete, remove wood, rubbish, vegetable matter and loose material from inside forms. Thoroughly wet down wood forms to close joints.
2. Clean reinforcement; remove paint, loose rust, scale and foreign material. Bars with bends not called for will be rejected. Hold securely in place to prevent displacement. Lap bar splices 24-diameters, min; lap fabric one mesh min. Tie intersections, corners, splices with 16-gallon annealed wire, or as otherwise called for.
3. Place concrete immediately after mixing. Do not use concrete that has begun to set; no tempering will be allowed. If chuting is used, avoid segregation. In placing new concrete against existing concrete, use bonding agent per Manufacturer's directions.
4. Give careful and thorough attention to curing of concrete. Keep concrete and forms wet for a minimum of 10-days, after placing concrete.

E. Concrete Finish

1. Finish of Exposed Concrete: Horizontal surfaces, steel troweled monolithic finish; vertical surfaces, smooth and free of fins, holes, projection, etc.
2. Exposed lighting pole bases shall be filled, and sack finished to a smooth finish.
3. Remove concrete pour-forms.

**3.05 WIREWAY INSTALLATION**

Wireway hangers shall provide clamp type, hanger rod type, direct bolted bracket type from ceiling or walls as indicated on the Drawings and required for field installation locations. Support shall be installed a minimum of 5-feet on center.

**END OF SECTION 26 05 01**  
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## ONTARIO SPORTS EMPIRE

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**SECTION 26 05 30****CONDUIT AND WIRE****PART 1 – GENERAL****1.01 SCOPE**

- A. Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with furnishing, delivery, and installation of the work of this Section, complete as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:
1. Examine all other Sections for work related to those other Sections and required to be included as work under this Section.
  2. General Provisions and Requirements for electrical work.

**1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)**

- A. Submit Product Data Sheets for all Wire, Supports, Conduit, Fittings and Splicing Materials.
- B. Submit Material List for all Conduit and Conduit Fittings.

**PART 2 – PRODUCTS****2.01 CONDUIT****A. General**

1. The interior surfaces of conduits and fittings shall be continuous and smooth, with a constant interior diameter. Conduits and conduit fittings shall provide conductor raceways of fully enclosed circular cross section. The interior surfaces of conduits and fittings shall be without ridges, burrs irregularities or obstructions. Conduits and fittings of the same type shall be of the same uniform weight and thickness.
2. Type of conduit, type of conduit fittings and conduit supports shall be suitable for the conditions of use and the conditions of location of installation, based on the Manufacturer's recommendations and based on applicable Codes.
3. All fittings for metal conduit shall be suitable for use as a grounding means, pursuant to the applicable Code Requirements. All metal conduit and metal conduit fittings shall provide 3 second duration ground fault current carrying ratings, when installed and connected to the respective conduit, as follows:
  - a. RMC and EMT conduit fittings.
    - 1) 0.5 inch through 1.5-inch conduit/fitting size, 10,000-amp RMS.
    - 2) 2.0 inch and larger conduit/fitting size, 20,000-amp RMS.
  - b. FMC and LTFMC Conduit Fittings
    - 1) 0.5 inch through 1.25-inch conduit/fitting size, 1,000-amp RMS (without external bonding jumper).
    - 2) 1.5 inch through 4.0-inch fitting size, 10,000-amp RMS with bonding jumper.

4. Protective corrosion resistant finish for metal conduit fabricated from steel and metal conduit fittings fabricated from steel, shall be as follows:
    - a. Clean all metal surfaces (including metal threads) with acid bath "pickle" prior to coating, to remove dirt, oil and prepare surfaces for galvanizing.
    - b. Hot dip galvanized zinc coating on all interior and exterior steel surfaces. Minimum finish zinc coating thickness shall not be less than 0.002 inches.
    - c. Threads shall be hot-dip zinc coated after machine fabrication.
    - d. Exterior metal surfaces shall be finished with clear organic polymer topcoat layer, after galvanizing.
    - e. The inner metal surfaces of conduit fittings shall be finished with a lubricating topcoat after galvanizing, to facilitate conductor pulling through the conduit/ fitting.
  5. Threads for metal conduit and metal conduit fittings shall be taper-pipe-thread, National Pipe Standards (NPS) and shall comply with ANSI-B1.20.1.
  6. Metal conduit termination connector fittings shall be provided with a Manufacturer installed, insulating throat bushing inside the fitting. The bushing shall protect the wire conductor insulation from cutting, nicks and abrasion during conductor installation and electrical load "cycling" after installation is complete. The bushing shall comply with UL 94V-0 flammability.
  7. Provide conduit bonding/grounding jumper from metal enclosures with "concentric ring" knockouts, to positively ground/bond each respective conduit(s) to the metal enclosure.
  8. Metal conduit fittings connecting to PVC coated metal conduit shall be PVC coated to match the conduit.
  9. The conduit and fittings shall be watertight and airtight without cracks and pinholes.
- B. Rigid Metal Conduit (RMC)
1. Rigid metal, round tubing, machine threaded at both ends.
    - a. The conduit and conduit fittings shall comply with the Requirements for an equipment grounding conductor, pursuant to applicable Codes.
  2. RMC Raceway types shall be as follows:
    - a. Rigid Galvanized Steel conduit (RGS), minimum yield strength shall be 35,000 PSI. Shall comply with NEMA Standard 5-19 (latest revision); ANSI C80.1 and ANSI-C80.4 (latest revision); UL 514-B and UL 6 (latest revisions); National Pipe Standard Specification (latest revision).
    - b. Intermediate steel Conduit (IMC). Shall comply with NEMA Standard 5-19 (latest revision) ANSI-C80.6 (latest revision); UL 2142 (latest revision).
  3. RMC Fittings
    - a. Fittings shall be compatible with RGS and IMC.
    - b. Fittings shall be rated "liquid tight".
    - c. Fittings imbedded in concrete shall be rated "liquid tight" and "concrete tight".
    - d. Connectors and couplings for terminating, connecting and coupling to RMC conduit shall be threaded metal.
    - e. Fittings shall comply with ANSI C80.4 and ANSI C33-84 (latest revision); NEMA FB1 (latest revision); UL 514 (latest revision).

4. RMC Fittings as manufactured by:
  - a. For threaded enclosure, termination connection.
    - 1) Thomas & Betts - 106 Series bonding locknut, 5302 Series sealing ring with stainless steel retainer.
  - b. For non-threaded enclosure, termination connector.
    - 1) Thomas & Betts - 370 Series watertight threaded sealing hub, 106 Series threaded bonding lock nut, Sta-Con Series enclosure bonding jumper and 3870 Series threaded ground bushing.
    - 2) OZ/Gedney-CHMT/CHT watertight threaded hub with bonding locknut and GH50G Series enclosure bonding jumper.
  - c. For RMC-to-RMC conduit-to-conduit coupling
    - 1) Erickson - 674 (threaded) Series
    - 2) OZ/Gedney Type 4 (threaded) Series
    - 3) Threaded RMC conduit couplings, product of the same Manufacturer as the RMC conduit.
- C. Rigid Non-Metallic Conduit (RNMC)
  1. General
    - a. Conduit and fittings shall be 90-degree centigrade conductor rated. Fabricated from homogeneous material, free from visible crack holes or foreign inclusions, with integral "end-bell". The conduit and conduit fittings shall be watertight and airtight.
    - b. Conduit, conduit fittings and conduit fitting assembly "solvent cement" shall all be the product of the same Manufacturer. Conduit fittings shall be solvent cement welded watertight.
    - c. Conduit and fittings shall be identified with legible markings showing ratings, size and Manufacturers name.
    - d. RNMC and fitting shall be corrosion resistant, watertight.
    - e. Conduit shall be suitable for conductor operating temperatures from minus 20 degrees centigrade to 90 degrees centigrade.
    - f. RNMC shall comply with NEMA TC-2 (PVC 40 conduit, latest revision) NEMA TC-6 (EB conduit latest revision) and NEMA TC-3 (fittings, latest revision); UL 514 and UL 651 (latest revision).
  2. Polyvinyl Chloride (PVC) – RNMC
    - a. PVC-Schedule 40 heavy wall construction.
    - b. PVC-Schedule 80 extra heavy wall construction.
    - c. PVC-Type EB.
  3. RNMC fittings connecting to metallic raceways shall be provided with a ground/bond jumper connection.
- D. Conduit Bodies Conduit Fitting
  1. Conduit bodies shall provide conductor access with a removable conduit body cover and wiring area enclosed in metal housing. The conduit body shall facilitate pulling conductors.
  2. In-line form "C" conduit bodies shall be prohibited.
  3. The interior space "length" of 90 degree "elbow" conduit bodies shall not be less than 6 times the diameter size of the largest conduit connecting to the conduit body.

4. Conduit body covers shall be removable, gasketed; watertight "domed" metal covers with threaded screw attachment to the conduit body.
5. Lubricated, reusable, wire roller guards inside the conduit body shall protect wire from insulation damage during wire "pulling".
6. Conduit body fittings shall comply with UL 514.
7. Conduit bodies as manufactured by:
  - a. For RMC Conduit
    - OZ/Gedney - LB 6X/Mogul (90-degree elbow) Series - threaded body.
    - Appleton - LB/Mogul (90-degree elbow) Series - threaded body.

## 2.02 PVC COATING

- A. PVC Coatings shall be provided as described for specified metal products.
- B. PVC Coating shall be factory applied, to comply with NEMA-RN1 and 5-19.
- C. The Adhesion of the PVC Coating to the Coated Metal shall exceed the strength of the coating itself, based on 0.5 inch "strip-pull" test.
- D. Uniform Coating Thickness shall be continuous without "breaks" or "pinholes" and shall not be less than the following:
  1. Exterior metal surfaces, 40 mil. coating thickness.
  2. Interior metal surfaces, 10 mil. PVC or urethane coating thickness (i.e., interior of conduits, interior of conduit fittings etc.).

## 2.03 WIRE AND CABLE

- A. All Wire and Cable shall be copper, 600 volt, #12 AWG minimum unless specifically noted otherwise on the Drawings. Conductors #10 AWG and smaller shall be solid. Conductors #8 AWG and larger shall be stranded. Type of insulation as noted on Drawings as follows: Insulation of conductor connected to circuit protection devices required to be "100%" rated, shall be 90-degree rated insulation:
  1. Type THHN/THWN insulation used for #4 AWG and smaller.
  2. Type THW/XHHW or THHN/THWN insulation used for #2 AWG and larger.
  3. Type THWN or XHHW insulation used for all panel feeders' switchboard feeders, motor control center feeders, transformer feeders and service conductors.
  4. Type THHN insulation used for circuit conductors installed in fluorescent lighting fixture raceways, for conductors connected to the secondary of fluorescent or mercury vapor fixture ballast or other hot locations.
  5. Type XHHW or THWN insulation shall be used where conductors are installed in conduit exposed to the outdoor weather.
  6. The following color code for branch circuits:  
Neutral . . . White (Tape feeder neutrals with white tape near connections)

- a. Normal Power
 

<u>120/208 Volt</u> Ground Green Phase A Black Phase B Red Phase C Blue	<u>480/277 Volt</u> Ground Green Phase A Brown Phase B Orange Phase C Yellow
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  - b. Isolated ground insulation shall be green with a longitudinal yellow stripe.
7. Feeders identified as to phase or leg in each panelboard with printed identifying tape.

### PART 3 – EXECUTION

#### 3.01 TRENCHING, FOOTINGS, SLEEVES

- A. Provide Trenching, concrete encasement of conduits, backfilling, and compaction for the underground electrical work, in accordance with applicable Sections of this Specification.
- B. Provide Footings for all post and/or pole-mounted lighting fixtures: concrete shall conform to the applicable Sections of this Specification.

#### 3.02 GROUNDING

- A. Grounding shall be executed in accordance with all applicable Codes and Regulations, both of the State and Local Authorities Having Jurisdiction.
- B. Where Nonmetallic Conduit is used in the Distribution System, the Contractor shall install the proper sized copper ground wire in the conduit with the feeder for use as an equipment ground. The electrical metallic raceway system shall be grounded to this ground wire.
- C. The Maximum Ground/Bond Resistance to the Grounding Electrode shall not exceed 1 ohm from any location in the electrical system. The maximum ground resistance of the grounding electrode to earth shall not exceed 5 ohms.
- D. Ground/Bond Conductors
  - 1. Provide an additional, dedicated, green insulation equipment ground/bond wire inside each conduit type as follows. The metal conduit shall not be permitted to serve (function) as the only (exclusive) electrical ground return path:
    - a. All types of nonmetallic conduit raceways including but not limited to: RNMC - Rigid Nonmetallic Conduit.
    - b. FMC - Flexible Metal Conduit.
    - c. LTFMC - Liquid Tight Flexible Metal Conduit.
    - d. EMT - Electrical Metal Tubing when used to support receptacle power.
  - 2. The equipment ground/bond wire shall be continuous from the electrical circuit source point of origin to the electrical circuit end termination utilization point as follows:
    - a. Every conduit path containing any length of the above identified conduits.
    - b. Every conduit path connected to any length of the above-identified conduits.
  - 3. The equipment ground/bond wire shall be sized as follows, but in no case smaller than indicated on the Drawings. Install equipment ground/bond wire in each conduit/raceway, with the respective phase conductors:

a.	<u>Feeder, Sub-feeders and Branch Circuit Protection</u>	<u>Minimum Equipment Ground Wire Size</u>
	15 amp	#12
	20 amp	#12
	30 to 60 amp	#10
	70 to 100 amp	#8
	101 to 200 amp	#6
	201 to 400 amp	#2
	401 to 600 amp	#1
	801 to 1000 amp	2/0
	1001 to 1200 amp	3/0
	1201 to 1600 amp	4/0
	1601 to 2000 amp	250 MCM
	2001 to 2500 amp	350 MCM
	2501 to 4000 amp	500 MCM

4. Splices in ground/bond wires shall be permitted only at the following locations:
    - a. Ground buses with listed and approved ground lugs.
    - b. Where exothermic welded ground/bond wire splices are provided.
  5. Provide ground/bond wire jumpers for conduit fittings with ground lugs, expansion and deflection conduit fittings at conduit fittings connecting between metallic and non-metallic raceways and to bond metal enclosures to conduit fittings with ground lugs.
- E. Ground Conductors for Branch Circuit Wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger.
- F. Each Panelboard, Switchboard, Pullbox or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

### 3.03 CONDUIT

#### A. General

1. The sizes of the conduits for the various circuits shall be as indicated on the Drawings, but not less than the conduit size required by Code for the size and quantity of conductors to be installed in the conduit.
2. Conduits shall be installed concealed from view.
3. Conduits shall be provided complete with conduit bends, conduit fittings, outlet boxes, pullboxes, junction boxes, conduit anchors/supports, grounding/bonding for a complete and operating conductor/wire raceway system.
4. Metal and nonmetal conduits shall be provided mechanically continuous between termination connection points. Metal conduit shall be provided electrically continuous between termination connection points.
5. Individual conduit paths and home runs shown on the Drawings shall be maintained as separate individual conduits for each homerun and path.
6. Transitions between conduits constructed of different materials and occurring in above grade locations shall be allowed only at outlet boxes, junction boxes, pull boxes and equipment enclosures unless specifically indicated otherwise. Provide outlet boxes and junction boxes.

7. Metal conduit terminating to nonmetal enclosures; terminating into metal enclosures with "concentric ring" knockouts; terminating into metal enclosures with knockout reducing washers, including but not limited to equipment housings, outlet boxes, junction boxes, pull boxes, cable trenches, manholes, shall be provided with a ground/bonding lug integrated with the conduit termination conductor fitting construction, by the Fitting Manufacturer. The lug shall provide for connection of a grounding/bonding conductor (insulated or uninsulated). The grounding lug shall be located on the fitting, inside the termination enclosure.
8. The type of conduit, type of conduit fittings, and type of conduit supports, and method of conduit installation shall be suitable for the conditions of use and conditions of location of installation based on the Manufacturer's recommendations; based on the applicable Codes and based on the Requirements of the Contract Documents.

**B. RMC Installation Locations**

RGS, IMC conduits and RGS, IMC fittings shall be installed in the following locations:

1. Embedded in foundations, and footings constructed with concrete.
2. Embedded in walls and foundations constructed with brick and masonry.
3. Exterior of building for exposed conduit locations.
4. Damp or wet locations exposed or concealed locations.
5. Exposed on roofs.
6. Exposed on utility service poles, for pole risers less than 9 feet above finish grade.

**C. PVC Coated RMC Installation Locations**

PVC coated RMC conduit and PVC coated RMC fittings shall be installed in the following locations:

1. Underground conduit locations for elbows and bends with a radius of less than 36 times the conduit diameter.
2. Underground vertical risers extending above grade.
3. Installed in contact with earth or corrosive materials.
4. Exposed conduit in interior locations.

**D. RNMC Installation Locations**

RNMC conduit and RNMC fittings shall be installed in the following locations containing only "non-hazardous material":

1. Underground, concealed below earth grade, unless specifically noted or specified otherwise.
2. Exposed on utility service poles, for pole risers at 9 feet or higher above finish grade, schedule 80 PVC only.
3. RNMC type "EB" conduit(s) shall be concrete encased along the entire length of the conduits for all installation locations.

E. Conduit Installation

1. Conduit Separation

- a. Conduit installed underground or below building slab without full concrete encasement: Shall be separated from adjacent conduits of identical systems (i.e., signal to signal, data to data, power to power, control to control etc.) by a minimum of 3 inches. Conduits of non-identical systems (i.e., signal to power; data to power; power to control; signal to control, etc.) shall be separated by a minimum of 12 inches.
- b. Conduit installed underground with full concrete encasement; shall be separated from adjacent conduits of similar systems (100 volt and less) by a minimum of 2 inches; conduits for non-power systems (100 volts and less to ground) shall be separated by a minimum of 6 inches from power circuits (over 100 volts to ground); conduits for power circuits shall be separated from adjacent conduits of similar power systems (over 100 volts to ground) by a minimum of 3 inches.
- c. Separation of conduits entering termination points or crossing other conduits may be reduced as required within 60 inches of the termination or crossing points.
- d. Conduits containing Utility Company service circuits (i.e., electrical power, telephone, or cable television) shall be separated a minimum of 12 inches from all other utilities and conduits, with or without concrete encasement; metallic or non-metallic conduit, above grade or underground conduit locations.

2. Conduit stubs

- a. Conduits stubbed underground outside of building line for future use shall be terminated a minimum of 5-feet clear (whichever distance is greater) of building or adjacent concrete walks and AC paving. The stub-out conduit shall be capped. Provide concrete monuments, 6-inches x 6-inches x 15-inches deep, buried flush with grade over the capped ends. The face of monument shall be furnished with 3-inches square brass plates securely mounted and engraved with the number and size of conduits and type of service (i.e., "POWER", "TEL.", etc.).

3. Conduit concrete encasement:

- a. Conduits which are run underground exterior to building slab shall be continuously concrete encased except, 15-amp to 60-amp power branch circuit conduits underground do not require concrete encasement.
- b. PVC rigid-non-metallic-type EB conduit, of any size and any location shall be continuously concrete encased the full length of the conduit installation, including under building slab.
- c. Concrete for encasement of underground conduits shall be 2000 PSI 28 days cures strength with a maximum of  $\frac{3}{4}$ -inch gravel. Concrete encasement of conduits shall be continuous without voids. The encasement shall extend 3-inches past the edges of all conduits on all sides of the circuit. Provide a continuous yellow 12 inches wide flat plastic tracer tape, located 12 inches above the concrete. The tracer tape shall be imprinted with "Warning-Electric Circuits" a minimum of 24 inches on center.
- d. Conduits located below or adjacent to structural foundations shall be separated from the foundation by a minimum of 12 inches. Conduits located below structural foundations shall be fully and continuously concrete backfilled and encased between the bottom of the foundation to the bottom of the conduits. The concrete shall be 4000 PSI 28-day cure strength instead of 2000-PSI concrete.

4. Underground Conduits

- a. Three or more underground conduits larger than 1-inch in size and occupying the same trench shall be separated and supported on factory fabricated, non-metallic,



duct/conduit support spacers. The spacers shall be modular, keyed interlocking type, "built-up" to accommodate quantity, size orientation and spacing of installed conduits. The spacers shall maintain a constant distance between adjacent conduit supports and hold conduits in place during trench backfill operations. Minimum support spacer installation interval along with length of the conduits shall be as follows:

- 1) Concrete encased conduits, not less than 8 feet on center.
  - 2) Non-concrete encased conduits, not less than 5 feet on center.
- b. Provide trenching, excavation, shoring, and Backfilling required for the proper installation of underground conduits. Tops of backfill shall match finish grade.
- c. Bottoms of trenches shall be cut parallel to "finish grade" elevation. Make trenches 12-inches wider than the greatest diameter of the conduit.
- d. Backfilling Trenches for Conduits without Concrete Encasement Requirements
- 1) Conduits which are not required by the Contract Documents to be concrete encased and are located exterior to building slab, shall be set on a 3-inch bed of damp clean sand. Conduit trenches shall be backfilled to within 12-inches of finished grade with damp sand after installation of conduit is completed. Remainder of backfill shall be native soil.
  - 2) Conduits located under a building which are not required by the Contract Documents to be concrete encased, shall be completely backfilled and compacted with clean damp sand to the same level as the building foundation pad.
  - 3) Provide a continuous yellow 12 inches wide flat plastic tracer tape, located 12 inches above the conduits in the trench. The tracer tape shall be imprinted with "Warning-Electric Circuits" a minimum of 24 inches on center.
- e. Backfilling Trenches for Conduits with Concrete Encasement Requirements by the Contract Documents.
- 1) Trenches with all conduits concrete encased shall be backfilled with clean damp sand when located under building pads.
  - 2) Trenches with all conduits concrete encased and not located under a building pad and not located under paved areas shall be backfilled with clean damp sand or native soil.
- f. Backfill Material
- 1) Sand and native soil backfill of trenches shall be machine vibrated in 6-inch lifts to provide not less than 90% compaction of backfill.
  - 2) Concrete and slurry mix shall be machine vibrated during installation to remove "air-voids".
  - 3) Soil shall have no stones, organic matter or aggregate greater than 3 inches.
  - 4) The slurry mix shall consist of concrete, clean sand and clean water mixture. Maximum shrinking of slurry mix shall not exceed 5% wet to dry.
- g. Do not backfill until Owner's Representative has approved installation and As-Built Drawings are up to date. Promptly install conduits after excavation has been done, so as to keep the excavations open as short a time as possible. Excess soil from trenching shall be removed from the site.
- h. Install underground conduit, except under buildings, not less than 36-inches below finished grade in non-traffic areas and 30-inches below finished grade in traffic areas, including roads and parking areas. Not less than 48-inches below finished grade under public/private transit system right of way and railroad right of way. Dimensions shall be measured to the top of the conduit.

- i. Conduit crossing existing underground utilities shall cross below the bottom depth of the existing utilities. If the top portion of the existing utility depth below finish grade exceeds 72 inches and the specified separation and depths are maintained when crossing over the top of the existing underground utility, the conduit may cross above the existing underground utility.
  - j. Provide long radius horizontal bends (minimum radius of 36 times the conduit diameter) in underground conduits where the conduit is in excess of 100 feet long.
  - k. Conduits installed below grade and on grade below buildings, shall not be smaller than 0.75 inches. Conduits for circuits exceeding 600 volts shall not be smaller than 5.0 inches.
  - l. Underground conduits entering a building shall be sloped. The conduit direction of slope shall be away from the building and shall prevent water in the conduit from "gravity draining" towards the building. The conduit slope "high point" shall originate from the building, out to the first exterior pullbox, manhole etc. exterior conduit termination "low point". The minimum slope angle shall be a constant 8 inches (or greater) of fall for each 100 feet of conduit length.
  - m. Dewatering
    - 1) Provide pumping to remove, maintain and dispose of all water entering the excavation during the time the excavation is being prepared, for the conduit laying, during the laying of the conduit, and until the backfill at the conduit zone has been completed. These provisions shall apply on a continuous basis.  
Water shall be disposed of in a manner to prevent damage to adjacent property. Trench water shall not be drained through the construction. Groundwater shall not be allowed to rise around the pipe until joining compound has firmly set.
    - 2) The Owner's Representative shall be notified 48 hours prior to commencement of dewatering.
5. Raceway/Conduits, which are installed at this time and left empty for future use, shall have 0.25-inch diameter polyvinyl rope left in place for future use. The pull rope shall be 500-pound minimum tensile strength. Provide a minimum of 5 feet of slack at each end of pull ropes.
6. Conduit Bends Risers and Offsets
- a. The minimum bend radius of "factory or field" fabricated conduit bends shall not be less than the following. The bend radius shall be measured at the surface, inside radius of the conduit wall.
    - 1) RMC and EMT conduit minimum bend radius - conduit for power circuits over 100 volts and less than 600 volts, 8 times conduit diameter. Conduit for power circuits over 600-volt, 12 times conduit diameter. Conduit for signal and fiber optic circuits, 10 times conduit diameter.
    - 2) RNMC conduit - conduit minimum bend radius 36 times the conduit diameter. Under building reduce minimum bend radius to 10 times the conduit diameter. Conduit bends and offsets in RNMC with less than 36 times conduit diameter bend/offset radius shall be RNMC PVC Schedule 80 or PVC coated RGS.
    - 3) Conduits for Utility Company conductors. Conduit minimum bend radius shall comply with the respective Utility Company Requirements.
  - b. Bends and offsets in conduits shall be kept to an absolute minimum. The total summation of all bends and offsets permitted in a conduit segment, occurring between two conduit termination/ connection end points, shall not exceed the following, including conduit fittings:

- 1) RMC conduit - 360 angular degrees
- 2) RNMC conduit - 270 angular degrees
- c. Each field fabricated conduit offset, bend and elbow which are not the standard product of the Raceway/Conduit Manufacturer shall be mandrel tested. The test shall be conducted after the conduit installation is complete and prior to pulling-in any wire, in the same manner as for underground conduits.
- d. Factory manufactured angle connector conduit fittings shall be installed in exposed conduit locations only. Installation in locations normally concealed from view shall not be permitted. Not more than one factory manufactured angle connector shall be permitted in any length of conduit between conduit termination end points.
- e. RNMC conduit risers from below grade shall be PVC coated RGS. Conduit risers, bends or offsets entering a building shall be PVC coated RGS.
- f. If three or more conduit-bends of the same conduit size and same conduit material type, installed, as part of the Contract Work, fail to comply with the required minimum conduit bend radius or conduit angular degree limits. The following corrective actions shall occur:
  - 1) The Contractor shall remove all the non-complying conduit bends and the respective wire in the conduit from the project site. Provide new conduit and wire, complying with the Contract Documents.
  - 2) Where the conduit bends similar to the non-complying conduit bends are installed concealed in walls, floors, above ceilings or below grade, the Contractor shall expose the conduit bends to allow visual observation.
  - 3) The Contractor shall remove the non-complying conduit bends and dispose of the Project site. The Contractor shall provide new conduit bends and conductors complying with the Contract Documents.
  - 4) All the costs to correct the deficient material and work along with costs to repair the direct, indirect, incidental damages and Contract delays shall be the sole responsibility of the Contractor and shall be included in the bid price.
7. RNMC Conduit
  - a. Joints and fittings shall be solvent welded to RNMC conduit. Joints and fittings shall be watertight and airtight after fabrication.
8. Tighten each conduit fittings and fitting appurtenance, to the "torque" (allowable tolerance  $\pm 5\%$ ) value recommended by the Fitting Manufacturer and applicable Code. If three or more conduit fittings are found to not be in compliance with the Manufacturer's "torque" (tightness) recommendations, the following corrective actions shall occur:
  - a. The Contractor shall tighten "re-torque" the defective fittings and all similar conduit fittings installed as part of the Contract Documents in the presence of the Owner's Representative.
  - b. If the respective conduit fittings similar to the deficient "torque tightness" fittings are installed concealed in walls, floors, above ceilings or below grade, the Contractor shall expose the fitting, to allow retightening each similar conduit fitting to the Manufacturers recommended "torque" values.
  - c. All the cost to repair the direct, indirect, incidental damages and contract delays resulting from complying with these Requirements shall be the sole responsibility of the Contractor and shall be included in the bid price.
- F. Conduit Bodies
  1. Conduit bodies shall be installed in exposed conduit locations only or above accessible ceilings.

2. Conduit bodies shall be accessible for removing body cover and pulling wire through the conduit body.
3. Conduit bodies shall not be installed inside enclosed walls.

### 3.04 WIRE AND CABLE

- A. Branch Circuit and Fixture Joints for #10 AWG and Smaller Wire shall be made with UL-approved connectors listed for 600 volts, approved for use with copper and/or aluminum wire. Connector to consist of a cone-shaped, expandable coil spring insert, insulated with a nylon shell and two wings placed opposite each other to serve as a built-in wrench or shall be molded one-piece as manufactured by 3M-"Scotchlok".
- B. Branch Circuit Joints of #8 AWG and Larger shall be made with screw pressure connectors made of high strength structural aluminum alloy and UL-approved for use with both copper and/or aluminum wire as manufactured by Thomas & Betts. Joints shall be insulated with plastic splicing tape, tapered half-lapped and at least the thickness equivalent to 1.5 times the conductor insulation. Tapes shall be fresh and of quality equal to Scotch.
- C. Use UL Listed Pulling Compound for Installation of Conductors in Conduits.
- D. Correspond each Circuit to the Branch Number Indicated on the Panel Schedule shown on the Drawings except where departures are approved by the Owner's Representative.
- E. Control wiring to conform to the wiring diagrams shown on the Mechanical Drawings and the Manufacturer's Wiring Diagrams.
- F. All Splices in Exterior Pullboxes and Light Poles shall be cast resins encapsulated.
  1. Power conductor splices - 3M Scotchcast Series 82/85/90; Plymouth or equal.
  2. Control and signal circuits 3M Scotchcast Series 8981 thru 8986, Plymouth or equal.
- G. Neatly group and lace all wiring in panelboards, motor control centers and terminal cabinets with plastic ties at 3-inches on centers. Tag all spare conductors.

**END OF SECTION 26 05 30**  
122624/535080

## SECTION 26 24 13

### SWITCHBOARDS

#### PART 1 - GENERAL

##### 1.01 SCOPE

- A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specification Sections and Drawings for related work required to be included as work under Division 26.
2. General Provisions and Requirements for electrical work.

##### 1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)

- A. Provide Manufacturers Catalog Data for switchboards and circuit breakers and all components.
- B. Provide Shop Drawings showing circuit arrangements, size, voltage, ampacity and overcurrent protective devices
- C. Institute of Electrical and Electronics Engineers (IEEE)
1. IEEE/IEC P62271-37-013, "IEEE/IEC Draft International Standard for High-Voltage Switchgear and Control gear -- Part 37-013: Alternating-Current Generator Circuit-Breakers
- D. Provide schematic "ladder type" logic control wiring diagrams and "point-to-point control wiring diagrams showing control and protective systems interlocks.
- E. Provide nameplate engraving schedule.
- F. Short Circuit, Coordination and Arc-Flash
1. Perform Engineering Analysis and submit engineered settings for each equipment location, fuse and circuit breaker device, showing the correct time and current settings to provide selective coordination within the limits of the specified equipment. Shall comply with the latest application Standards of IEEE and ANSI. Provide electrical system short circuit worst case bolted-fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash calculations as part of the Coordination Analysis recommendations. Obtain the necessary information including the maximum fault current from the secondary side of the utility company transformer to complete the calculations from the serving Electrical Utility Company.
  2. Obtain the Short-Circuit Current Ratings (SCCR) for all equipment with control panels or controllers (elevators, HVAC, plumbing equipment, etc.). Incorporate these items into the short circuit analysis and determine that the available fault current does not exceed the SCCR of the equipment.
  3. The information shall be submitted in both tabular form and on time current log-log graph paper with an engineering narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.

4. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract equipment. Shall comply with, but not limited to:
    - a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
    - b. IEEE-399, Recommended Practices for Industrial and Commercial Power System Analysis.
    - c. IEEE-1584, Guide for Performing Arc-Flash Hazard Calculations Working Calculation.
    - d. CEC/NEC
  5. Provide permanent warning labels on each equipment location. The labels shall describe Arc-Flash, Short-Circuit and Time/Current Coordination, including safety precautions and protective clothing. Also describe actions to be taken if any circuit changes or equipment modifications occur.
  6. The analysis shall be submitted with the Shop Drawing submittals for the respective equipment.
  7. The Contractor shall independently contact the serving utility company to obtain the current system short circuit amps or available fault current.
- G. Factory Tests: Equipment Tests - ANSI C37.20. Certified copies of Design Tests, Production Tests, and Conformance Tests of the equipment shall be submitted, and review comments shall be received before delivery of equipment to the Project Site. In lieu of the above tests, a report of these tests previously performed on identical units of each rating will be acceptable.

### 1.03 APPLICABLE STANDARDS

- A. The Switchboard Equipment shall be Designed, Tested and Assembled to comply with ANSI, IEEE, and NEMA and UL.
- B. Seismic Earthquake and Wind Loading Withstand, Testing and Certification (Additional Requirements).
  1. The complete switchboard/switchgear assembly; including circuit protection devices, meter, housings/enclosures, accessories, supports/anchors etc., shall be designed, manufactured and tested.
    - a. Wind loading all outdoor equipment locations.
    - b. Earthquake Seismic Requirements of CBC/IBC Seismic withstand all indoor and all outdoor equipment locations.
  2. Shall withstand, survive and maintain continuous non-interrupted energized operation during seismic event occurrences and wind event occurrences. Continued normal energized operation after the wind event and seismic event occurrences have abated.
  3. Shall include demonstrations of successful operation and run test after completion of seismic event shake-table simulation. Acceptance test seismic qualification of proposed switchboard and/ or switchgear shall employ triple axis shake-table simulation of the Required Response Spectrum (RRS) seismic event motion, certified and approved by the AHJ.
  4. Provide three-dimensional finite element analysis demonstrating anchorage and operational withstand of wind loading not less than as follows and as required by AHJ:
    - a. 110MPH-West Coast USA and Hawaii, per ASCE/SEI 7-16.

5. Seismic Test shall be performed by a third-party independent Test Laboratory. Wind Analysis and Seismic Testing and Reports shall be certified, signed and "Stamped" by PE Professional Engineer licensed and in good standing in the State, Civil Engineer or Structural Engineer.
- C. Equipment Components/Devices, Switchboards, and/or Switchgear shall be manufactured by: General Electric; or Eaton; or Square-D; or Siemens.

## PART 2 - PRODUCTS

### 2.01 BUSSING

- A. Horizontal and vertical busses shall be at full lengths in each equipment Section. Buses shall have a minimum short circuit fault withstand rating equal to available fault current indicated on Drawings, plus a 25% additional capacity (safety margin). However, in no case shall the rating be less than 65,000-amp, symmetrical.
- B. Provide interconnected full capacity neutral bus in each section with the same ratings and construction as the phase busses.
- C. Provide interconnected ground bus in each Section.
- D. Provide space and all hardware and mounting attachments for future devices as indicated on the Drawings.
- E. Main horizontal phase and neutral bussing shall be at full capacity in all equipment sections. The through bus of the end Distribution Section shall be extended and pre-drilled to allow the addition of future Sections.
- F. Vertical riser buss may be tapered, to not less than one third the ampacity rating of the main horizontal buss; but in no case shall the vertical buss be of less capacity than the sum of the frame size ampacities of overcurrent devices mounted in the respective Sections including any indicated spares and spaces.
- G. The equipment bussing shall be of sufficient cross-sectional area to meet UL Standard 891 on temperature rise Bus shall be copper with silver plated bus joints or extruded aluminum with tin plated bus joints. The through bus shall have provisions for the addition of future sections. The through bus supports, connections and joints are to be bolted with grade 5-hex head bolts and Belleville washers to minimize maintenance Requirements.

### 2.02 CIRCUIT BREAKERS

- A. General
  1. Circuit protective devices as indicated on the Drawings. All devices shall have a short circuit interrupting capacity not less than the maximum available fault current at the circuit breaker and as indicated on the Drawings, plus a 25% additional capacity (safety margin). However, in no case shall the circuit breaker interrupting capacity be less than 65,000-amp symmetrical interrupting for 480/277-volt devices and 42,000-amp symmetrical for 240 volt or 208/120-volt devices.
  2. Provide padlock-off devices on each device. Breakers shall provide automatic time over-current and instantaneous circuit protection. Shall be suitable for use as "Main" service disconnect, "Feeder" and "Branch-Circuit" functions.
  3. Circuit breakers shall employ a self-powered stored energy, quick make-quick break, and trip free operating system on each phase, with common trip. Circuit breakers shall not trip

in the event of short term or long-term electrical power failure. Dead front covers accessible close-open controls, monitors and visual indicator flags.

4. Circuit breakers noted as "100%" on the Drawings shall be tested and rated to carry the breaker full rated (100%) ampere load continuously including the assemblies the circuit breakers are installed into.
5. Provide conductor lugs for circuit protection devices to accept conductor temperature rating, sizes and quantities shown on Drawings. Circuit protection devices shall be UL-listed suitable for normal and reverse feed.
6. Provide auxiliary contacts on circuit breakers. Auxiliary "DRY" contacts shall provide supervised remote monitoring of "Open-Close-Trip" circuit breaker status. Typical for circuit breakers supplying the following types of connected electrical loads.
  - a. Fire alarm equipment and devices.
  - b. Mass-evacuation equipment and devices.
  - c. HVAC smoke control and smoke evacuation equipment.
  - d. HVAC fire/smoke electrically operated dampers.
  - e. Intrusion detection and access control equipment and devices.
  - f. Elevators and escalators.
  - g. Fire sprinkler pumps.
7. Plug-in communications port for circuit breaker portable test instrument connects.
8. Circuit breakers shall be [Power Circuit Breaker type,] Insulated Case Circuit Breaker type or Molded Case Circuit Breaker type. Time/current and instantaneous characteristics and selection of circuit breaker type shall comply with the recommendations in the Coordination Study and Insure Optimal Code mandated time/current and instantaneous coordinated sequential tripping throughout the electrical system.

The Contract Document intent requires providing the selection and use of the circuit breaker types and performance characteristics for time/current and instantaneous trip coordination during electrical circuit overload conditions and during electrical short circuit fault conditions. Combined with the specified circuit breaker protection time/current performance characteristics.

- a. Insulated Case Circuit Breaker type-ICCB:
  - 1) NEMA-AB1 and AB3, comply with latest revision.
  - 2) UL-1087, UL-489 and IEC-60.947, comply with latest revision.
  - 3) 5Hz AC closing and 3Hz AC trip and clear.
  - 4) Hybrid combination of Molded Case Circuit Breaker type and Power Circuit Breaker type circuit breakers. ICCB enclosed insulated housing and limited internal maintenance access.
  - 5) Two-step stored energy close mechanism.
  - 6) Extended function on-off instantaneous trip selection.
  - 7) Push-to-trip button.
  - 8) Mechanical operations counter.
- b. Molded Case Circuit Breaker type-MCCB:
  - 1) NEMA-AB1 and AB3, comply with latest revision.
  - 2) UL-1087, UL-489 and IEC-60.947.2 rated devices, comply with latest revision.
  - 3) 5Hz AC closing and 3Hz AC trip and clear.
  - 4) Sealed enclosed housing.



B. Protection Performance Requirements for circuit breakers conforming to one or more of the following applications:

- 600-amp or larger frame size.
  - Larger than 400-amp trip.
  - Service entrance in main switchboard or switchgear.
  - Noted as Main or Main Circuit breakers on the Drawings.
1. Circuit breaker shall employ current sensors and solid-state static digital electronic automatic trip system. Three phase or single-phase operation as noted on the Drawings. Current carrying components shall be completely isolated from the static trip units. The trip unit shall be independent of external power sources. Circuit breakers shall be rated for reverse connection.
  2. Circuit breaker solid state digital trip control functions shall provide the following time/current curve shaping field adjustable features.
    - a. Adjustable ampere setting to vary the long-time continuous current carrying capacity, minimum range of 80% through 100% of full load trip rating.
    - b. Adjustable long-time delay setting to vary the time the breaker will trip under sustained overload conditions. Minimum of three settings, "minimum - intermediate - maximum".
    - c. Adjustable short-time pickup to vary the level of high current the breaker can carry for short periods of time, minimum range of 2-times through 8-times of ampere setting.
    - d. Adjustable short time delay to vary the time of the short-time pickup. Minimum of three settings "minimum-intermediate-maximum".
    - e. Short time "I<sup>2</sup>t" switch to allow a current-squared multiplied by time ramp function in the short-time system. Two positions setting "in-out".
    - f. Adjustable instantaneous pickup to vary the breaker ampere setting for immediate (instantaneous) interruption of severe overloads (short circuits). Adjustable minimum range of 2-times through 9-times of circuit breaker ampere sensor rating. Instantaneous selective override trip setting shall also include "on-off" function. When "off": or "override" is selected, shall then function with the adjustable short time delay and adjustable short time pick-up (Note where the coordination study requires a higher instantaneous setting, change the specified adjustable instantaneous trip to fixed instantaneous trip at 15-times the breaker ampere sensor setting also with on-off function).
    - g. Individual fault trip indicators (flags) shall provide local indication on the breaker for overload and short circuit (and ground fault where applicable) conditions.
    - h. Provide quantity of one, Manufacturer's standard test set for solid state trip circuit breakers.
  3. Arc Energy Reduction
    - a. Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted is 1,200-amp or higher the following shall apply:
      - 1) Documentation. Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s).
      - 2) Method to Reduce Clearing Time. One of the following or approved equivalent means shall be provided:
        - a) Zone-selective interlocking
        - b) Differential relaying
        - c) Energy-reducing maintenance switching with local status indicator
        - d) Energy-reducing active arc flash mitigation system

e) An approved equivalent means

C. Protection Performance Requirements for circuit breakers conforming to one or more of the following applications:

- Smaller than 600-amp frame size.
  - 400-amp and smaller trip.
  - Larger than 100-amp frame size.
  - Larger than 100-amp trip.
1. Circuit breaker shall employ current sensors and solid-state static digital electronic automatic trip system. Time/current curve shaping field adjustable features
  2. Solid state digital trip breakers shall conform to the Requirements described above for solid state breakers larger than 400-amp trip. However, only the following field adjustments are required.
    - a. Long-time ampere setting adjustable minimum range of 80% through 100% of full load trip rating.
    - b. Short time pickup adjustable minimum range of 2-times through 8-times of the ampere setting.
    - c. Fixed or field adjustable instantaneous trip (depending on the results of the coordination study).

D. Performance Requirements for circuit breakers conforming to the following applications:

- 100-amp frame size and smaller.
  - 100-amp and smaller trip.
1. Circuit breaker shall be fixed or adjustable instantaneous current trip with thermal-magnetic trip or with solid-state static digital electronic automatic time/over current automatic trip (depending on the results of the coordination study).

E. Current Limiting Circuit Breakers (CLCB)

1. Protection Performance Requirements for circuit breakers conforming to the following applications:
  - 600-amp and smaller trip and identified as current limiting (CLCB) in the Contract Documents.
  - a. Current limiting circuit breakers shall be supplied in integral fully enclosed insulating housing construction and shall consist of a common trip, thermal-magnetic or solid state static digital trip conventional circuit breaker (Depending on the results of the coordination study), with an independently operating limiter section in series with each pole.
  - b. The conventional breaker section shall have an over center, trip-free, toggle-type mechanism with quick-make, quick-break action and positive handle indication. A button shall be provided on the cover for mechanically tripping the circuit breaker. The current limiting breaker shall have permanent trip units containing solid state static digital trip or individual thermal and magnetic trip elements, in each pole. Calibrated for 40-degrees C ambient temperature. The limiter section shall consist of current limiting elements on each phase, electrically coordinated with the conventional circuit breaker trip elements. The contacts of the limiter section shall be electro-magnetically and electro-dynamically opened and held open until interruption is complete.
  - c. Current and Energy Limitations: On high-level fault currents the limiter portion of the circuit breaker shall operate to limit the rise of fault current. Integral resistance shall be introduced into the faulted circuit to dissipate and limit let-through energy

and to provide a voltage transient-free interruption at near unity power factor. The Let-through short circuit fault current and energy levels shall be less than that permitted by Underwriters Laboratories to a value less than  $I^2t$  of a half cycle wave of the symmetrical prospective current. The CLCB limiter shall limit the asymmetrical short circuit fault current below the equipment symmetrical short circuit fault current.

- d. On fault currents below the threshold of current limitation, the normal non-limiter breaker section shall provide conventional time/current overload and short circuit fault protection.

2. Protection Performance Requirements for circuit breakers conforming to the following applications:

- Trip ratings over 600-amp through 5000-amp or less. Identified as current limiting (CLCB) in the Contract Documents.
  - a. Integrally fused circuit breaker integrated with solid state static digital electronic automatic trip. Combined standard circuit breaker providing overload-short circuit protection within its interrupting capacity and ON-OFF switching function and on each phase current limiters internally mounted on the load side of the circuit breaker, of such ratings that their time current limiting characteristics will coordinate with the time current tripping characteristics of the circuit breaker elements.
  - b. The coordination shall result in the interruption by the circuit breaker alone of fault level currents up to the interrupting capacity of the circuit breaker and interruption by the current limiter in conjunction with the circuit breaker of fault level currents above the interrupting capacity of the circuit breaker.
  - c. A removable cover shall be provided over the current limiter section of the integrally fused circuit breaker. The current limiter housing covers shall be interlocked with the breaker tripping mechanism to ensure the breaker will trip upon removal of the cover. The cover shall be interlocked with the breaker to ensure the circuit breaker cannot be turned to the ON position with the cover removed. Current limiters shall have a spring-loaded plunger which, when the limiter blows, is released to actuate the circuit breaker common trip bar mechanism opening all breaker poles simultaneously.
  - d. The limiters shall be individually interlocked with the breaker element tripping mechanism to ensure the limiter cannot be inserted until the breaker is in the OFF position. The circuit breaker and limiters shall be interlocked to ensure the circuit breaker cannot be closed if a limiter is either missing or has blown.
  - e. Fuse limiters shall be individually removable from the circuit breaker housing.
  - f. The circuit breaker shall be ambient temperature compensating. The circuit breaker shall be provided with thermal magnetic or solid state static digital trip (depending on the coordination study).
  - g. The integrally fused circuit breaker shall be capable of interrupting available short circuit currents up to 200,000 RMS symmetrical amperes at voltage up to 600 VAC.
  - h. Ratings, clearances and performance of the integrally fused circuit breaker shall be in accordance with applicable standards of NEMA, IEEE and UL.

F. Series Rated Circuit Breakers (SR)

1. Performance Requirements for circuit breakers conforming to the following applications:

- a. 400-amp and smaller trip and identified as Series Rated (SR) on the Drawings. Circuit breakers shall be UL listed for series rating with all downstream circuit breakers.

2.03 GROUND FAULT PROTECTIVE SYSTEM AS FOLLOWS:

- A. One control power transformer rated 480/120 volts of suitable capacity for shunt tripping of the main circuit breaker and subfeed circuit breakers as indicated on the Drawings. Fuse transformer on the 480-volt side.
- B. Ground sensor current transformer for each indicated ground fault relay, zero sequence type with integral test winding for each circuit indicated on Drawings (The three phases and neutral conductor shall be brought through the current transformer window per Manufacturer's recommendations). Shall be UL-listed suitable for normal and reverse feed.
- C. One ground break, solid-state relay, and monitor and test panel for each device indicated on the Drawings. Pick-up adjustment shall be continuous 100-amp through 1200-amp; time adjustment shall be continuous from instantaneous through sixty cycles. Monitor panel shall indicate relay operation and provide means for system testing with or without interruption of service and shall not permit system to be inadvertently left in an inactive or off state. Provide resettable trip indicators.
  - 1. Ground fault system shall provide selective trip coordination with other upstream/ down-stream ground fault and phase over current circuit protection devices as determined by the coordination study.
    - a. Ground fault protection devices shall incorporate adjustable time/current trip settings.
    - b. Ground fault protection devices shall incorporate adjustable inverse time and very inverse time adjustable/selective settings.
- D. The ground fault system may be integrated into each circuit breaker with solid state trip units, in lieu of the separate specified ground fault relay and monitor panel system. The solid-state circuit breaker ground fault system shall provide the identical specified operational features of the described separate system.
- E. Each circuit breaker 100-amp and larger, located in the main switchboard(s) and distribution switchboard [or main switchgear] where the main bus is larger than 800-amp and operating above 240-volt phase-to-phase, shall be provided with ground fault system whether or not shown on the Drawings. Provide all interconnecting control power and interlocking wire in switchboards/ switchgear and between switchboards/switchgear for an operational system.

2.04 MAIN SWITCHBOARDS

- A. Switchboard shall be floor-mounted, dead-front, dead-rear type, front and rear aligned, self-supporting, consisting of one or more vertical sections with bussing, circuit protective devices, instrumentation, auxiliary devices and control wiring as indicated on the Drawings and as specified herein.
  - 1. Shall be utility and service entrance rated and approved.
  - 2. Switchboards shall employ mounting configuration for circuit protective devices as follows:
    - a. Group-mount, fixed position, non-drawout switchboards. Front access only, shall not require rear access. Typical for all circuit protective devices, or as indicated on Drawings.
  - 3. Switchboards shall employ circuit breaker types and circuit protection devices as follows:
    - a. All Main circuit breaker of all frame sizes – ICCB type circuit breakers.
    - b. 800-amp and larger frame size Feeder circuit breakers, ICCB type circuit breaker.
    - c. Smaller than 800-amp frame size Feeder circuit breakers, ICCB type; or MCCB type circuit breakers.

- d. CLCB type circuit breakers. CLCB circuit type only where noted on the Drawings.
  - e. CLF with switch and fuse type. CLF with switch and fuse type only where noted on the Drawings.
- 4. Surge Protection Device – SPD
  - a. Provide a 3-phase, 5-wire SPD in the switchboard, with 30-amp 3-pole subfeed circuit breaker.
  - b. See Specifications Section 26 05 01 for SPD Additional Requirements.
- B. Switchboard shall be designed, built and tested in accordance with applicable portion of the latest editions of NEMA PB-2, Underwriters Laboratories No. UL-891 and the National Electrical Code. Rated for service-entrance operation.
- C. Switchboard Sections Configuration
  - 1. Floor standing self-supporting, of the universal frame type using dieformed, 12-gauge steel members bolted and welded together.
  - 2. Provide removable side and rear plates with formed edges all around.
  - 3. Provide ventilation openings required for maintaining nominal operating temperature.
  - 4. Provide removable steel cover plates for all usable device spaces. Provide lifting means and provisions for moving by means of rollers or skids to installation location.
  - 5. Bolt individual Sections together to form a single rigid switchboard assembly.
  - 6. Provide full height, hinged, vertical wireway metal covers, on each vertical wireway, of each Distribution Section of the switchboard.
  - 7. Typical for all switchboards, distribution switchboards and switchgear.
- D. Switchboard shall include, but not be limited to, the following:
  - 1. Underground Pull Section as required by the serving utility incoming service.
  - 2. Metering facilities as required by the serving utility.
  - 3. Current transformer space.
  - 4. Main disconnects devices.
  - 5. Distribution and feeder circuit protective devices.
  - 6. Owner metering (where indicated on Drawings).
  - 7. Bussing, incoming utility compliant and outgoing distribution.

## 2.05 DISTRIBUTION SWITCHBOARDS

- A. Switchboards shall be floor mounted, dead-front, dead-rear type, front and rear aligned, self-supporting, consisting of one or more vertical sections with bussing, group mounted circuit protective devices, instrumentation and control wiring as indicated on the Drawings and as specified herein. Switchboards shall comply with UL Standard #UL-891 and NEMA-PB2.
  - 1. Distribution switchboards shall be service entrance rated and approved, when located in a building separate and remote from the main service entrance switchboard.

2. Distribution Switchboards shall employ circuit breaker types and circuit protection devices as follows:
  - a. All Main circuit breakers of all frame sizes - ICCB type circuit breakers.
  - b. 800-amp and larger frame size Feeder circuit breakers, - ICCB; or MCCB type circuit breakers.
  - c. Smaller than 800-amp frame sizes Feeder circuit breakers - ICCB; or MCCB type circuit breakers.
  - d. CLCB type circuit breakers, only where noted on the Drawings.
  - e. CLF with switch and fuse type. CLF with switch and fuse type only where noted on the Drawings.
- B. Distribution switchboards shall include but not be limited to the following:
  1. Main disconnect device (where indicated on Drawings).
  2. Feeder protective devices.
  3. Owner metering (where indicated on Drawings).
  4. Bussing.
- C. Switchboard Sections
  1. Floor standing, self-supporting, of the universal frame type using die-formed, 12-gauge steel members bolted and welded together.
  2. Provide removable side and rear plates with formed edges all around.
  3. Provide ventilation openings required for maintaining nominal operating temperature.
  4. Provide removable steel cover plates for all usable device spaces. Provide lifting means and provisions for moving by means of rollers or skids to installation location.
  5. Bolt individual Sections together to form a single rigid switchboard assembly.
  6. Provide full height, hinged, vertical wireway metal covers, on each vertical wireway, of each Distribution Section of the switchboard.

## 2.06 MULTI-METER (MULTI-TENANT) UTILITY SERVICE SWITCHBOARD

- A. General
  1. Shall be utility and service entrance rated and approved.
  2. Shall comply with all the same Requirements described for service entrance switchboards and distribution switchboards unless specifically noted otherwise.
  3. Metering Sections shall be group-mount type devices and meters.
  4. Provide utility service meters and service disconnect for each utility service meter. Configuration of service meters and service disconnect shall comply with Utility Company Requirements.
  5. Dead-Front, Dead-Rear constructions, front access only. Rear access shall not be required or permitted. Rear alignment suitable for installing rear of switchboard flat against a wall with no rear access.

6. Pull Sections, Switchboard Sections, associated meter sockets, main protection device, and feeder protection devices shall be factory prewired and tested.
- B. Short circuit fault current rating (Additional Requirements).
1. The maximum peak let-through short circuit fault current of service disconnect shall not exceed the short circuit fault withstand rating of the respective meter and meter socket, in series with each other.
- C. Bus (Additional Requirements)
1. Load capacity of vertical switchboard section bus shall not be less than the sum of all meter/ disconnect full load ampere ratings (including future provisions), contained in the same section. Typical for phase and neutral busses.
  2. Through main-bus connecting between Sections shall extend throughout the line up without "tapering". Typical for phase and neutral busses.
  3. Provisions for main-bus extensions in the future at both ends of switchboard.
- D. Configuration
1. Each Multi-Meter Section shall provide multiple service meters and individual service disconnects for each meter. Not to exceed 30-inches deep. Refer to Drawings for Additional Requirements and dimensions.
    - a. 100-amp, up to 6-meters/disconnects per Section, nominal 38-inches wide Sections.
    - b. 200-amp, up to 4-meters/disconnects per Section, nominal 38-inches wide Sections.
    - c. Larger than 200-amp, 1-meters/ disconnects per Section. Section width not to exceed 48-inches.
  2. Both top exit and bottom exit internal wireway provisions for all service feeders and all distribution feeders. Provide vertical and horizontal internal wireways front accessible. Rear access wireways are not permitted. Provide Auxiliary Sections and Bus Transition Sections. Provide Utility Company underground Pull Sections for utility service entrance connects.
  3. Service meters, meter locations and meter socket configurations shall comply with the serving Utility Company Requirements. Compartments and provisions for utility current transformers, potential transformers, meters, test-blocks, wiring spaces and pull sections shall comply with the Utility Requirements.
- E. Service disconnects (Additional Requirements)
1. Provide a service main circuit breaker (100% rated) disconnect for switchboards exceeding six-utility service meters in the switchboard line-up.
  2. Provide a main disconnect for each utility service meter. Circuit breaker type or switch and fuse type as indicated on the Drawings.

## 2.07 METERING

### A. General

1. The meters shall be microprocessor controlled, digital, multi-function measuring and indicating meters. The meter measurement sensing method shall be true RMS. As

manufactured by Electro Industries Model DMMS300, Square D, General Electric, Westinghouse or equal.

2. Meter face size approximately 4.5-inches by 4.5-inches. Overall depth approximately 8.0-inches. Semi flush mounting, self-contained, dust proof, insulating electrical housing.
3. Ambient temperature operating ranges 0 degrees Centigrade to 55 degrees Centigrade.
4. The meter shall be rated to accommodate single phase and "DELTA" or "WYE" three phases, direct voltage connection up to 600 volts AC.
5. The meter shall accommodate input connection through Potential instrument Transformer (P.T.) for voltages in excess of 600 volts. Meter burden shall not exceed 6.0-volt amperes.
6. The meter shall be rated to accommodate input connection through instrument Current Transformer (C.T.) up to 12,000-amp, with a secondary C.T. current up to 10-amp.
7. The meter scales shall be field programmable for any C.T. and P.T. ratios.
8. Provide a meter on the secondary side of the unit's substation and as indicated on the Drawings.

**B. Meter Indications**

1. Meter indications shall be alpha numeric, LED display type, and 0.56-inch minimum character height. Meter indications shall simultaneously display the numerical value(s) being measured and the name of the measured value (i.e., "1586329 TOT. kWh" etc.). Meter display update time one second.
2. Minimum meter display operating life shall be 100,000 hours.
3. Meter Withstand Ratings:
  - a. Continuous 200% of rating.
  - b. Surge 10 times rating for 3 seconds.

**C. Meter Monitoring and Measurement Range**

1. The meter shall provide multi-function monitoring for all combinations of phase to phase and each phase to neutral of the following parameters in a single self-contained digital meter unit;

	Measurement	Indication	Accuracy	Resolution Range
a.	Kilowatts	0.5%	0.1%	0 to 1,000,000
b.	Kilowatt Hours	0.5%	1kW Hr	0 to 1,000,000,000
c.	Kilowatts Max-Min Demand	0.5%	0.1%	0 to 1,000,000
d.	Kilovolt ampere Hours	0.5%	1kVA Hr	0 to 1,000,000,000
e.	Kilovolt ampere Reactive	0.5%	0.1%	0 to 1,000,000
f.	Kilovolt amperes	0.5%	0.1%	0 to 1,000,000
g.	Power Factor	1.0	1.0%	1.0 to + 0.5
h.	Ampere	0.35%	0.1%	0 to 10,000
i.	Volts	0.35%	0.1%	0 to 100,000
j.	Frequency	0.02Hz	0.01Hz	10Hz to 125Hz
k.	Total Harmonic Distortion Current	0.5%	0.2%	0 to 100%



and Voltage Input to 31<sup>st</sup> Harmonic.

2. The measurement indications shall display continuously in sequence; by individual continuous measurement; or no display (display-off) when programmed from the meter front control panel.
3. The minimum and maximum average time range shall be adjustable from instantaneous through 9999 seconds. The average time range shall be programmable from the meter front control panel to provide an instantaneous and average over time of any meter measurement indication, in any combination of measurement indications.
4. The minimum and maximum for each measurement indication shall be stored in internal memory and displayed on the alphanumeric meter display when requested from the meter control panel by the operator.
5. The meter shall store in non-volatile internal memory the following information, 60-calendar day's accumulation data storage capacity. The stored data shall be retained even during a power failure to the meter. The information shall be recalled to the meter display from the meter front control panel:
  - a. Meter preset program parameters.
  - b. Maximum and minimum measurement indications.
  - c. Total kilowatt-hours.
  - d. Total kilovolt ampere-hours.
  - e. Kilowatt demand.

D. Meter Programming and Control

1. A control panel on the front of the meter shall provide user access to all meter displays, functions and programming features. Password protection entered from the front control panel shall be provided prior to allowing any programming or set point changes to the meter.

E. Communications Ports and Protocols Meter Connection.

1. EIA Serial port RS-485.
2. IEEE-Fast Ethernet RJ-45 port.

2.08 MISCELLANEOUS INSTRUMENTS

- A. Instrument and Control Transformers: ANSI C57.13 and NEMA ST20 as applicable. Transformers shall be specifically designed for use on respective protective relay or metering schemes utilized.
- B. Current Transformers meter/relay grade shall be multi-ratio tap, tap setting as indicated on Drawings, (minimum of three field adjustable tap settings) with 5-amp secondary, insulation class, 600 volt, 60Hz, single ring type, and shall have an Accuracy Classification of 0.3 with the burden of B.01, B.02 and B.03.
- C. Control and transfer switches shall be of the rotary, oil-tight multi-position, cam-operated, multi-stage type, with dust cover and silver-to-silver contacts rated 600 volts, 20-amp and adequate for the duty performed in excess of 10 amp. Equip each switch with engraved plastic escutcheon nameplate identifying its function and position.

2.09 CONTROL WIRING

- A. Terminal blocks with barriered terminals for each connection shall be provided for all control wiring terminator points. Control wiring shall be run in horizontal and vertical, isolated, internal metal

wireways and shall be carried across hinges in laced bundles. Wire terminators shall be crimp-on type spade terminal

- B. Secondary control wiring shall be a minimum of 14 AWG stranded copper type SIS 600-volt insulation.
- C. Control circuits shall have circuit number tags at each termination or break in the wire to match circuit numbers on terminal strips and control wiring diagrams.

#### 2.10 WEATHERPROOF EQUIPMENT

- A. Equipment indicated as Weatherproof (W.P.) or outdoors should be NEMA 3R, non-walk-in, tamper resistant construction. Provide full height hinged doors with provisions for padlocking the doors in the closed position.
- B. Provide a nominal 300-watt sealed, resistance type, anti-condensation heater in each equipment section. Heaters shall be controlled automatically by Thermostats and Humidistats. A circuit breaker shall be provided to supply switchboard buss voltage to the heaters, all prewired by the Manufacturer to fused terminals.
- C. Finish shall be electrostatically applied finish paint over iron oxide rust inhibitor primer. Finish color shall be [Manufacturer's standard color], [olive green Munsel #7GY3.29/1.5]. The bottom side and bottom 6-inches of the equipment shall be coated with 4-mil minimum thickness rust inhibitor undercoating over finish paint, on all interior surfaces. Finish withstand test without face corrosion or blistering:
  - 1. Salt spray withstands - 2000 hours ASTM B117.
  - 2. Humidity withstands - 750-hour ASTM D2247.
- D. Exposed Hardware and Hinges Shall be Stainless Steel Type 302 or 304, Tamper Resistant

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. Install equipment in accordance with Manufacturer's written instructions and applicable portions of NECA's "Standards of Installations" for switchboards, switchgear and motor control centers.
- B. Prior to Energizing and Testing, Manufacturer's Field Engineer shall visually inspect and verify devices are operational and bus connects complete.

#### 3.02 ANCHORING

- A. Bolt equipment to floor and wall where wall exists. Where units are free standing, provide preformed steel channel or angle iron bracing to nearest wall or building structural member.
- B. Equipment anchoring shall be designed for compliance with the earthquake seismic vertical and lateral acceleration of the equipment installation location. Submit structural calculations and details.

#### 3.03 FIELD TESTING INSPECTIONS AND COMMISSIONING (ADDITIONAL REQUIREMENTS)

- A. Test all equipment after the installation has been completed, and the Owner's Representative has been given 10-days' notice of the proposed tests. The Contractor shall provide operating tests demonstrating that all equipment and devices operate in accordance with the Requirements of the documents.

**B. Adjustable Settings**

1. Shall be set and tested after the equipment installation is complete, for proper operation at set points, pickup, and/or drop-out points. Shall be performed by an independent Test Laboratory and Trained Certified Technicians actively engaged in testing and using test instruments designed and manufactured for the purpose.
2. Provide protection device settings and test, to ensure operation and coordination as described in the time/ current coordination final submittal, and in accordance with the Contract Documents.
3. Calibrate and testing shall comply with the Equipment Manufacturer recommendations.
4. Correct deficiencies, non-compliant equipment and retest to demonstrate compliance.
5. Submit reports to Owner's Representative, six copies.

**3.04 IDENTIFICATION (ADDITIONAL REQUIREMENTS)**

- A. Provide a red and white Bakelite nameplate with ½-inch high letters in each section fastened to face of dead-front plate, to read: "DANGER 480 (actual volts) VOLTS, KEEP OUT, AUTHORIZED PERSONNEL ONLY".
- B. Manufacturer shall stencil the equipment name on each device and equipment section to correspond to the identification of the Drawing.
- C. Devices mounted in equipment controlling protective devices shall be provided with nameplates indicating device controlled or monitored.

**END OF SECTION 26 24 13**  
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## ONTARIO SPORTS EMPIRE

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**SECTION 26 24 16****PANELBOARDS AND TERMINAL CABINETS****PART 1 - GENERAL****1.01 SCOPE**

- A. Work Included: All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery, and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specification Sections and Drawings for related work required to be included as work under Division 26.
2. General Provisions and Requirements for electrical work.

**1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)**

- A. Provide Manufacturers catalog data for panels, cabinets, and circuit breakers.
- B. Provide Shop Drawing showing panel circuit arrangements, size, voltage, ampacity, overcurrent protective devices, etc.
- C. Provide nameplate engraving schedule.
- D. Short Circuit, Coordination and Arc-Flash
1. Perform and submit engineered settings for each equipment location, fuse and adjustable circuit breaker device, showing the correct time and settings to provide the selective coordination within the limits of the specified equipment, per the latest applicable Standards of IEEE and ANSI. Provide electrical system short circuit fault analysis, both 3-phase line-to-line and 1-phase line-to-ground calculations as part of the Coordination Analysis recommendations. Provide Electric Arc-Flash calculations as part of the Coordination Analysis recommendations.
  2. The information shall be submitted in both tabular form and on time current log-log graph paper, with an engineering narrative. Written narrative describing data, assumptions, analysis of results and prioritized recommendations, six copies.
  3. The goal is to minimize an unexpected but necessary electrical system outage and personnel exposure to the smallest extent possible within the fault occurrence location, using the specified Contract equipment. Shall comply with, but not limited to:
    - a. IEEE-242, Recommended Practices for Protection and Coordination of Industrial and Commercial Distribution.
    - b. IEEE-399, Recommended Practice for Industrial and Commercial Power System Analysis.
    - c. IEEE-1584, Guide for Performing Arc-Flash Hazard Calculations Working Group
    - d. CEC/NEC
  4. Electrical equipment including switchgear, switchboards, electrical panels, and control panels, transformers, disconnects, etc., shall each be labeled by the Manufacturer with "Electrical-Arc-Flash" warning signs. The signs shall explain a hazard to Personnel may exist if the equipment is worked on while energized or operated by personnel, to wear the correct protective equipment/clothing (PPE) when working "Live" or operating "Live" equipment and circuits.

5. The Contractor shall independently contact the serving Utility Company to obtain the current system short circuit amps or available fault current.
6. The Contractor shall independently obtain As-Built Drawings for the existing infrastructure to establish lengths. If As-Built Drawings are not available, the Contractor shall research existing conditions and make reasonable but conservative estimates of conductor length. Where existing conductors have been re-used, the Contractor shall confirm conductor quantity, size, and conduit type.

## **PART 2 - PRODUCTS**

### **2.01 PANELBOARDS AND DISTRIBUTION PANELS**

- A. Shall be flush, or surface mounting as indicated with group -mount circuit protection devices as shown on panel schedule, hinged lockable doors, index cardholders and proper bussing.
  1. Panelboards shall comply with the latest versions:
    - a. NEMA – PB1.
    - b. UL – 50 and 67.
    - c. CEC/NEC.
    - d. ASTM-B187.
  2. Where indicated on the Drawings shall be furnished with sub-feed breakers and/or additional conductor lugs, split bussing, contactors, time switches, relays, etc., as required.
    - a. Branch circuit panels up through forty-two circuits shall be single section, to accommodate all the circuits and components.
    - b. Distribution panels shall be single section or multi-section, to accommodate all the circuits and components.
  3. Panels shall be “Service-Entrance” equipment rated when the panel main incoming supply feeder originates from one of the following:
    - a. Originates outdoors exterior of the building in which the respective panel is located.
    - b. Originates from an electrical supply source not located in the same building as the respective panel.
- B. Housing and Painting, Panels and Terminal Cabinets
  1. Shall be finished with one coat of rust inhibitor zinc chromate and coat of primer sealer after a thorough cleaning.
  2. Finish color paint as selected by Owner’s Representative where exposed to public view (e.g., corridors, covered passages, offices, etc.). Prime coated panelboard shall be painted to match surroundings after installation in public areas.
  3. Manufacturer’s standard color in electrical rooms /closets, janitor’s, HVAC and storage rooms.
  4. Panel and panel doors shall be fabricated of sheet steel of the following minimum gauges.
    - a. Full height hinged, locking door. Trim and door #12-gauge steel.
    - b. Panel enclosure - Code gauge steel.
    - c. Panels installed in indoor dedicated electrical equipment rooms and dedicated electrical equipment closets, may omit full height hinged locking panel door. Dead front cover behind omitted panel door shall remain.

5. NEMA-1 Metal Housing, for indoor locations.
  6. NEMA-3R Metal Housing, tamper resistant, for outdoor locations.
  7. Furnish all panels and terminal cabinets with the Manufacturers flush locks and keys except where indicated otherwise herein. Keys and locks shall be interchangeable for all panels. Provide two latches and two locks for door heights exceeding 36-inches.
  8. Fasten the trim to panel and terminal cabinets by means of concealed, bolted or screwed fasteners accessible only when the door is open.
- C. Panels 208/120 volt, three phase, 4-wire, S/N or 120/240-volt, single phase, 3-wire, S/N.  
Branch circuit panel as manufactured by:
1. Eaton "Pow-R-Line 1 or 2" Series
  2. General Electric "A" Series
  3. Square D "NF/NQ" Series
  4. Siemens "P1/P2" Series
- D. Branch circuit panels for 480/277 volt, three phase, 4 wire, S/N.  
Panelboard as manufactured by:
1. Eaton "Pow-R-Line 2" Series
  2. General Electric "A" Series
  3. Square D "NF" Series
  4. Siemens "P1/P2" Series
- E. Distribution panels as manufactured by:
1. Eaton "Power-R-Line 4" Series
  2. General Electric "Spectra" Series
  3. Square D "I-Line" Series
  4. Siemens "P4/P5" Series
- F. Top and bottom gutter space shall not be less than 6-inches high. Provide 6-inches additional gutter space in all panels where double lugs are required, or where cable ampere size exceeds bus ampere size. Provide 12-inches additional gutter space in all panels for aluminum feeders where used.
- G. Panel dimensions.
1. Panels with buss sizes 50-amp thru 400-amp
    - a. Shall be 20-inches wide. Surface or flush mounting as indicated.
    - b. Recess mounted type shall have a 20-inches wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.
    - c. Depth shall be 5.75-inches nominal. Height of panel as required for devices and terminations.

2. Panels with buss sizes greater than 400-amp
  - a. Narrow panels 24-inches (maximum) wide by 6.5-inches (maximum) deep units. Wide panels' 25-inches to 44-inches (maximum) wide by 8-inches to 15-inches (maximum) deep units. Nominal 90-inch panel height.
  - b. The wider units shall be used only at locations where the narrow unit is not available with the quantity or size of large-ampere frame branch/sub-feed circuit protective devices shown on the panel schedules, or where the main breaker size exceeds the narrow panel maximum.
  - c. Distribution panels shall be floor standing and supported from behind the panels at walls.
  
- H. Distribution panels and branch circuit panels maximum load rating
  1. Panelboards and Distribution Panels exceeding 800-amp load rating shall not be permitted.
  2. Provide Distribution Switchboards instead of Distribution Panels for bus load and circuit load ratings exceeding 800-amp.
  
- I. Panel Auxiliary Cabinets
  1. Panelboards shown on the Drawings with relays, time clocks or other control devices shall have a separate auxiliary metal barriered compartment mounted above panel.
  2. Panelboards with circuits controlled by low voltage remote control relays shall be provided with separate auxiliary cabinets to contain the relays, adjacent to the panelboard.
  3. Provide auxiliary cabinets with separate hinged locking door to match panelboard.
  4. Provide mounting subbase in cabinet for control devices and wiring terminal strips.
  
- J. Panels shall have a circuit index cardholder removable type, with clear plastic cover. Index card shall have circuit numbers imprinted to match circuit breaker numbers.
  1. The panel identification nameplate shall describe the respective panel name and voltage, corresponding to the Contract Documents.
  2. The electrical power source, name and location of each panel supply-feeder and supply equipment name shall also be identified and described on the respective panel nameplate.

## 2.02 SHORT CIRCUIT RATING

- A. Circuit protective devices and bussing as indicated on the Drawings. All devices and bussing shall have a short circuit fault withstand and interrupting capacity not less than the maximum available fault current at the panel and as indicated on the Drawings, plus a 25% additional capacity (safety margin). However, in no case shall the short circuit fault interrupting and withstand capacity be less than the following symmetrical short circuit.

	<u>C/B and/or Bus Rating</u>	<u>Circuit Voltage</u>	<u>Short Circuit Amp.</u>
1.	400A and less	240V and below	10,000A
2.	400A and less	over 240V and below 600V	14,000A
3.	Over 400A & 800A & below	240V and below	42,000A
4.	Over 400A & 800A & below	over 240V and below 600V	30,000A



B. Panel Short Circuit Fault Rating

1. General

- a. Provide a “fully rated” for short circuit fault interrupt and full load ampere main circuit breaker in each branch circuit panel and/or each distribution panel. Provide the main circuit breaker whether or not a main circuit breaker is shown otherwise on the Drawings, schedules or diagrams. The “utility-source” plus the “motor-load” transient contributions shall be used to establish the available fault duty values, unless indicated otherwise on the Drawings.
- b. The panel main circuit breaker full load ampere capacity rating shall equal the respective panel main bus ampere rating.
- c. The panel assembly, buss and circuit protection devices bolted fault short circuit withstand and bolted fault short circuit interrupt ratings shall not be less than 125% greater (including a 25% safety margin) than the available utility-source symmetrical and asymmetrical bolted fault short circuit current when “Series combined rated” with the panel main circuit breaker.
- d. The main circuit breaker rated “bolted-fault” short circuit fault interrupt and withstand short circuit rating shall not be less than 125% (including a 25% safety margin) of the upstream main service entrance “bolted-fault” available (symmetrical and asymmetrical) short circuit current.

2. Distribution Panelboards

- a. Distribution panel, main circuit breaker, all feeder circuit breakers, and all branch circuit breakers shall be “fully-rated” (plus safety margin) for the available bolted fault short circuit current (including safety margin).
- b. Shall provide time/current-tripping coordination with downstream equipment and upstream equipment.

3. Non-emergency branch circuit panelboards 400-amp buss and smaller; Non-emergency branch circuit panelboards 400-amp trip main circuit breaker and smaller.

- a. The branch circuit panel main circuit breaker shall be “fully-rated” (plus safety margin) Current Limiting Circuit Breaker type (CLCB). Shall provide time/current-tripping coordination with upstream equipment.
- b. The branch circuit panel main circuit breaker shall be “Series-rated” with the panel downstream branch circuit devices and panel bussing. “The series-rating” shall provide short circuit bolted fault current with-stand protection and short circuit bolted fault interrupt rating protection during a downstream 3-phase line-to-line and/or single-phase line-to-ground short circuit bolted faults.
- c. Typical for branch circuit panelboards connected to normal-power (non-emergency) power circuits.

2.03 PANEL CIRCUIT BREAKERS, CIRCUIT PROTECTION DEVICES

A. Circuit Breakers General, for Distribution Panels and Panelboards

1. NEMA-AB1 and AB3, comply with latest revision.
2. UL-1087, UL-489 and IEC-60.947.2 rated devices, comply with latest revision.
3. 5Hz AC closing and 3Hz AC trip and clear.
4. Main circuit breakers for distribution panels exceeding 400-amp and larger.
  - a. Shall be Insulated Case Circuit Breaker type ICCB.

5. Main circuit breakers for branch circuit panelboards 400-amp buss and smaller.
  - a. Shall be Current Limiting Circuit Breaker type-CLCB for non-emergency panelboards.
  - b. Shall be Molded Case Circuit Breaker type-MCCB for emergency panelboards.
6. Branch circuit breakers and feeder circuit breakers smaller than 100-amp trip shall be Molded Case Circuit Breakers type-MCCB and/or Current Limiting Circuit Breakers type-CLCB.
7. All circuit breakers 100-amp and larger trip shall employ sensors and solid state digital electronic automatic trip system. Short-time and long-time. Time/ current curve shaping field adjustable functions and adjustable instantaneous trip. Typical for Molded Case Circuit Breaker type-MCCB, Insulated Case Circuit Breaker type-ICCB and Current Limiting Circuit Breaker type-CLCB.

B. Manufacturer

1. Circuit breakers as manufactured by the following Companies only are acceptable:
  - a. Eaton
  - b. General Electric Co.
  - c. Square D Co.
  - d. Siemens

C. Configuration

1. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the Drawings.
2. Circuit numbers of breakers shall be black-on-white micarta tabs or other previously approved method. Circuit number tabs, which can readily be changed from front of panel, will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.
3. Panelboard circuit protection devices shall be bolt on type for connection to panel bus. Removable and installable without disturbing adjacent devices.
4. Provide conductor wire terminations (lugs) on each circuit protection device for incoming main feeder, branch circuits and outgoing feeder circuits. Dual rated copper/aluminum and compatible with the respective conductor size, type and quantity.
5. Where 2-pole or 3-pole breakers occur in the panels, they shall be common trip units. Single pole breakers with tie-bar between handles will not be accepted.
6. Branch circuit panels shall be field convertible for bottom entry main incoming feeder or top entry main incoming feeder.
7. Each panel section, the feeder and branch circuit protection devices (3-phase and/or 1-phase) shall be "twin-mount", side-by-side double row construction for the following circuit sizes:
  - a. 480/277 volt, 60-amp circuit size and smaller.
  - b. 240 volt – 208/120-volt, 100-amp circuit size and smaller.

D. Lock-Off and Lock-On

1. All circuit breakers shall be pad-lockable in the "off" position.

2. Where branch circuit breakers supply the power to motors and signal systems, the breakers shall also be furnished with lockout clips, mounted in the "on" position. The breakers shall be able to trip automatically with lockout clips in place.
3. Provide lock-on clips on branch circuit breakers supplying fire alarm equipment and fire alarm panels. Provide identification of the dedicated "fire alarm" circuit function and operation. Color-code the circuit breakers to comply with AHJ Requirements.
4. Locking facilities shall be riveted or mechanically attached to the circuit breaker (submit sample for approval. Other means of attachment shall not be accepted without prior written approval of the Owner's Representative.

E. Switch and Fuse Feeder Protective Devices for Distribution Panels

1. Locations where the Drawings show distribution panels employing switch-fuse circuit protection devices.
2. Fusible Switches: Quick-make, quick-break type with rejection clips for use with Class "R" fuses Current Limiting Fuses (CLF). Switches with ratings up to and including 100-amp at 240 volts shall be twins mounted. Switches rated through 60 amp and 480 volts shall be twins mounted. Provisions for padlocking in the "on" and/or "off" positions. Switches shall be removable from front of panel without disturbing adjacent units or panel bus structure.
3. Fuses shall be time delay current limiting types, UL Class RK-1 unless otherwise indicated on the Drawings.  
  
Provide one spare set of fuses of each size and type in each Distribution Panel.
4. Provide auxiliary contact on switch for remote status (on-off) signaling and monitoring. Provide conductor lugs to accept conductor temperature rating, sizes and quantities shown on Drawings.
5. Switch and fuse devices shall be permitted only in distribution panels and only where specifically indicated on the Drawings for feeders.

2.04 PANEL BUSSING

A. Bus Material

1. Bussing shall be rectangular cross section tin-plated copper or alternately silver or tin-plated aluminum.
2. Bussing shall be non-tapered, full length of the enclosure.

B. Ground Bus

1. Each panel shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.
2. Provide additional isolated ground bus in each panel with connecting isolated ground feeders and/or connecting isolated ground branch circuits.

C. Provisions

1. Provide space and all hardware and bus mounting attachments for future devices as indicated on the Drawings.

**D. Neutral Bus**

1. The ampere rating of the neutral bus of panels and distribution panels shall be a minimum of 100% greater ampere capacity than the ampere rating of the corresponding phase bus.
2. Where the panel is indicated to be provided with an “oversize-neutral” or “200%” neutral on the Drawings, provide 200% ampere capacity rated neutral bus.

**2.05 TERMINAL AND AUXILIARY CABINETS****A. Cabinets**

1. Fabricated of Code gauge sheet steel for flush mounting (except where noted as surface) of size indicated on the Drawings, and complete with hinged lock-able doors, provide the quantity of 2-way Feed through conductor terminals required for termination of all conductors, plus 15% spares of each type.
2. Cabinet locks to operate from same key used for panelboards. The trim to cabinets shall be fastened by means of concealed bolted or screwed fasteners accessible behind door into cabinets. All cabinets shall have 5/8-inch plywood backing, finished with fireproof intumescent primer and finish coat paint. Provide equipment ground bus in each cabinet.
3. Cabinets shall be finished with one coat of zinc chromate and one coat of primer sealer after a thorough cleaning. Where exposed to public view (e.g., corridors, covered passages, offices, etc.) finish color paint to match surrounding and Manufacturer's standard gray color in switchboard, janitors, heater and storage rooms.
4. Provide grounded metal barriers inside cabinet to isolate and separate line voltage and low voltage from each other inside the cabinet.

**B. Cabinet Dimensions.**

1. Unless indicated otherwise on Drawings.
  - a. Shall be 20-inches wide. Surface or flush mounting as indicated.
  - b. Recess mounted type shall have a 20-inches wide (maximum) recess metal enclosure with overlapping edge trim plate cover extending 1-inch on all sides of enclosure.
2. Depth shall be 5.75-inches nominal. Height of cabinet as required for devices, plus 25% spare unused interior space for future use, but not less than 36-inches high.

**C. Terminals**

1. Non-digital analog circuits; line and low voltage modular signal systems, 15-amp dual row with isolation barriers, screw-down terminals insulated strips, heavy duty.
  - a. As manufactured by: Molex, or ITT-Cannon, or General Electric.
2. Digital circuits; low voltage signal systems, ANSI/ EIA/TIA Category-6, 110-Block or 66-Block gas-tight punch down style, heavy duty.
  - a. As manufactured by: Leviton, Ortronics, or AMP.

**D. Identification (additional requirements)**

1. Provide engraved nameplate on each cabinet indicating its designation and system (i.e., “Life Safety System - Panel 2LS”, etc.).

2. Identify each terminal landing with unique circuit number and provide corresponding alphanumeric text-index card inside panel access door

### **PART 3 - EXECUTION**

#### **3.01 MOUNTING**

- A. Flush mounted panelboards and terminal cabinets shall be securely fastened to at least two studs or structural members. Trim shall be flush with finished surface.
  1. Panels and cabinets installed flush (recess or semi-recess) into fire rated or smoke rated walls. The wall recess shall be fully wrapped inside the recess with fire/ smoke rated materials. The wrap-materials shall provide the same fire and/or smoke protection rating as the respective wall.
- B. Surface mounted panels and terminal cabinets shall be secured to walls by means of preformed galvanized steel channels securely fastened to at least two studs or structural members.
- C. Panelboards and terminal cabinets shall be installed to ensure the top circuit protective device (including top compartment control devices) are not more than 6-feet-6-inches above finish floor in front of the panel and the bottom device is a minimum of 12-inches above the floor. Manufacturer shall specifically indicate on Shop Drawing submittals each panel where these conditions cannot be met.

#### **3.02 IDENTIFICATION (ADDITIONAL REQUIREMENTS)**

- A. Provide a red and white Bakelite nameplate with ½-inch high letters in each 277/480-volt panel fastened to face of dead-front plate, to read: "DANGER 480 (or as applicable) VOLTS KEEP OUT AUTHORIZED PERSONNEL ONLY".
- B. Manufacturer shall stencil the panel/cabinet number identification on the inside of door to correspond with the designation on the Drawings.
- C. Identification plates and numbers shall be attached with screws or twist lock fasteners. Adhesive attachment of any kind shall not be used.

#### **3.03 SPARE CONDUITS (ADDITIONAL REQUIREMENTS)**

Provide three 1-inch conduit only stubs from each panel and terminal cabinet into accessible ceiling space. Where floor level below panel or terminal cabinet is accessible, also provide an additional three 1-inch conduit only stubs into accessible floor space.

**END OF SECTION 26 24 16**

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## ONTARIO SPORTS EMPIRE

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**SECTION 26 50 05****LIGHTING FIXTURES****PART 1 - GENERAL****1.01 SCOPE****A. Work Included:**

All labor, materials, appliances, tools, equipment necessary for and incidental to performing all operations in connection with furnishing, delivery, and installation of the work of this Section, complete, as shown on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Examine all other Specification Sections and Drawings for related work required to be included as work under Division 26.
2. General Provisions and Requirements for electrical work.

**1.02 SUBMITTALS (ADDITIONAL REQUIREMENTS)****A. General**

1. Provide complete Manufacturers Catalog Data Information for each light fixture (luminaire), driver, lamp, materials, auxiliary equipment/devices, finishes and photometrics.
2. Remote drivers are not allowed without prior written approval by Owner on location and installation details.
3. Provide pricing for all individual light fixture types as a part of the bid. In the event of a light fixture change, Contractor shall price individual light fixture change and shall not be allowed to reprice the entire lighting package.

**1.03 QUALITY ASSURANCE (ADDITIONAL REQUIREMENTS)**

**A. Work and Materials shall be in full accordance with the latest rules and regulations as follows. The following publications shall be included in the Contract Document Requirements. If a conflict occurs between the following publications and any other part of the Contract Documents, the Requirements describing the more restrictive provisions shall become the applicable Contract definition:**

1. UL – Underwriters' Laboratory:
  - a. UL – 8750 and 1598C: Light Emitting Diode – LED Equipment for use in Lighting Products and Replacements
2. NEMA – National Electrical Manufacturers Association:
  - a. NEMA – LE4: Recessed Luminaires Ceiling Compatibility
  - b. NEMA – SSL #1, #3 and #6: Electronic Drivers for LED; LED and Incandescent Lamp Replacement
  - c. NEMA – LSD #44, #45, #49 and #51: SSL-solid state lighting
3. United States Federal Government:
  - a. FCC – Part 18: EMI and RFI emissions limitations.
  - b. EPA: Energy conservation publications and waste disposal regulations.

4. ETL and C.B.M. Certified and Approved.
  5. Electrical installation standards, National Electrical Contractors' Association:
    - a. NEIS/NECA/IESNA – 500: Recommended Practice for installing Indoor Commercial Lighting Systems.
    - b. NEIS/NECA/IESNA – 501: Recommended Practice for installing Exterior Lighting Systems
    - c. NEIS/NECA/IESNA - 502: Recommended Practice for installing Industrial Lighting Systems.
  6. Illuminating Engineering Society – IES (IESNA):
    - a. IES – LM41: Photometric and Reporting.
    - b. IES – 587: Surge Protection.
    - c. IES – LM79: Solid State Lighting (SSL) Testing and Measurement.
    - d. IES – LM80: Testing for Lifetime of LED.
  7. ANSI-American National Standards Institute:
    - a. ANSI – C81
    - b. ANSI – C82
    - c. ANSI – C62.41: Transient Withstand
    - d. ANSI – C78: Lamps
  8. State California Code of Regulations - Title-24: Energy Code
- B. Warranties
1. Lighting fixtures, LED assemblies – 10 years minimum.
  2. Lighting fixtures, drivers – 5 years minimum.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

#### **A. Complete Fixture**

1. Provide light fixtures complete including lamps, drivers, housings, ceiling and wall trim "rings" for each ceiling type, mounting and adapter support brackets, diffusers/ lenses and outlet boxes.

#### **B. Specific Fixture Requirements and Fixture Schedule Information**

1. The catalog numbers included in the description of the various types of lighting fixtures shall be considered to establish the type or class of the fixture with a particular Manufacturer only. The fixture length, lumen outputs, component materials, accessories, mounting type, ceiling, wall and install adapters, operation voltage, and all other components required to fulfill the total description of the fixture based on all Drawing information, branch circuits, voltages, Specification information, and shall be included in the Contract Requirements regardless of whether or not the catalog number specifically includes these components.
2. Lighting fixtures shall be the types as indicated in fixture schedule on the Drawings and as described in the Specifications.



3. All fixtures of the same fixture type shall be the same Manufacturer and of identical finish and appearance, unless indicated otherwise on Drawings.

C. Manufacturer Certification of Operation

1. Lamps and power supplies (drivers) shall be recommended and certified by the respective Manufacturer(s), to be "matched" to operate correctly together, within the published characteristics, for efficacy, lamp starting, operating life hours, lumen output, power factor, power input, operating line ampere, sound intensity, and temperature.

2.02 LIGHT FIXTURES (LUMINARIES)

A. General

1. Lighting fixtures shall have all parts, drivers, sockets, support attachments, trim flanges and fittings necessary to complete and properly install the fixture at the indicated installation locations. All fixtures shall be provided with lamps of size and type specified.
2. Ceiling and/or wall surface mounted lighting fixtures shall not have any exposed chase nipples or conduit knockouts visible to view within fixture housing. Lighting fixtures mounted in continuous rows shall have chase nipples or conduit knockouts between lighting fixture housing but shall not have visible chase nipples/conduit knockouts on the visible ends of the continuous row of lighting fixtures.
3. Where fixture color is indicated to be selected by the Architect and/or Owner's Representative, provide two color chip samples for each color for review.
4. Recessed fixtures with attached junction box shall be provided with a junction box permanently attached to the plaster ring so that the junction box is accessible through the fixture opening when the fixture is removed. Connection between fixture and pull box shall be flexible metal conduit with not less than 16 AWG "AF" or "CF" type fixture rated copper wires, high temperature wire insulation for not less than 600 volts AC. The flexible conduit shall be sufficient length, so that when the fixture is removed, the pullbox is readily accessible.
5. Recessed fixtures shall be Underwriters' Laboratory approved for recessed installation with plaster frame and attached pull box. Lamp enclosure, reflectors and finish wiring shall not be installed until plastering is completed. Exposed finish trim shall not be installed until finished painting of the adjacent surface is completed.
6. The fixture shall bear Underwriters' Laboratory label of approval for the wattage and installation indicated.
7. Light fixtures installed outdoors, in damp or wet locations shall be UL labeled for said location as "damp-location" and "wet-location" for the respective installation location.
8. Fixtures in contact with thermal/building insulation shall be UL listed and rated for direct contact installation in thermal insulation systems.
9. Lighting fixtures installed in masonry and/or concrete construction. The fixture housing shall be rated for "concrete-pour" installation location.

B. Lens and Diffusers

1. Acrylic plastic or Plexiglas for the light fixture diffusers or fixtures lenses shall be 100% virgin material.
2. Diffusers shall be formed from the cast sheet by a vacuum and/or pressure technique.

3. Lighting fixtures containing lamps with dichroic reflectors and light fixtures with non-dichroic lens/diffuser shall be rated for high temperature lamp operations resulting from lamp heat redirected (reflected) back into the fixture.

## 2.03 SOLID STATE LIGHTING (SSL), LIGHT EMITTING DIODES (LED) LAMPS, POWER SUPPLIES, AND LIGHT FIXTURES (ADDITIONAL REQUIREMENTS)

### A. General

1. Solid State LED light source (lamps), related control equipment (driver-power supply), and luminaire (light fixture) optics for light output distribution.
2. Shall comply with the US-DOE Energy Star Program for SSL-LED.
3. Shall comply with the latest revision IESNA LM-79 and LM-80. Submit
4. SSL chromaticity shall comply with the latest revision NEMA and ANSI – C78.377.

### B. LED Lamps

1. Lamp lumen output and overall efficiency shall be based on the LED lamps installed in specified fixture and ambient operating temperature.
2. Lamp Color Rendition Index (CRI) shall equal or exceed CRI – 80, unless noted otherwise on Drawings.
3. CRI and lamp color temperature shall be same for all light fixtures of the same fixture type.

### C. LED Power Supply (driver)

1. Combination of power supply and SSL – lamp shall be tested and certified by respective Manufacturers for performance and proper operation.
2. Provide dimming type driver where indicated on Drawings. Driver and dimming equipment shall be tested and certified by respective Manufactures for performance and proper operation.

## 2.04 LIGHTING STANDARDS (SUPPORT POLES, POLE MOUNTED LIGHTING FIXTURES AND LUMINAIRES)

### A. General

1. Lighting poles, pole bases, pole arms, lighting fixtures (luminaires), supports with all lighting pole attachments and anchors shall be designed and constructed to withstand not less than 110 miles per hour steady horizontal wind loading and 130 miles per hour horizontal wind gust loading, without any damage to the lighting standards.
2. Provide tamper-resistant "hand-hole" and cover on the pole, for access into wiring terminations inside the pole. Provide ground "lug" attachment for equipment bond conductor.
3. Provide factory applied weather protective base undercoat and final finish on all exposed and internal components. Color as indicated or as selected by Owner's Representative.

### B. Base Plate

1. Provide a base plate at the bottom of each pole to attach and secure the pole to the pole anchor bolts. The base plate shall be permanently attached to the bottom of the pole.

C. Anchors

1. Anchor bolts shall be threaded the entire bolt length, not less than four bolts for each pole equally spaced around the pole base. Provide a minimum of two threaded nuts for each anchor bolt. Install a nut on the top and bottom sides of each base plate anchor bolt location. No less than four threads shall be exposed after pole is installed and leveled.

**PART 3 - EXECUTION**

3.01 LIGHT FIXTURE INSTALLATION

A. General

1. The Contractor shall verify actual ceiling and wall construction types as defined on the Architectural Drawings and furnish all lighting fixtures with the correct mounting devices, trim rings, brackets whether or not such variations are indicated by fixture catalog number. The Contractor shall verify depth of all recessed lighting fixtures with Architectural Drawings prior to ordering fixtures. Any discrepancies that would cause recessed lighting fixtures not to fit into ceiling shall be reported to the Owner's Representative prior to release of order to the supplier of the fixtures.
2. On acoustical tile ceilings, fixture outlets shall be accurately located in the center, at the intersection of the four corners or at the center of the joints of two tiles.
3. The Contractor shall aim the exterior adjustable lighting fixtures after dark in the presence of, and at a time convenient to the Owner's Representative.
4. Fixtures shall be ordered and furnished to operate correctly on the branch circuit voltage connected to the respective fixture as shown on the Site Plan and Floor Plan Electrical Drawings. The voltages shown on the fixture schedule are for generic fixture information only.
5. Install and connect lighting fixtures to the circuits and control sequences indicated on the Drawings and to comply with respective Manufacturer's instructions/ recommendations.
6. Lighting fixtures in building interstitial spaces, in mechanical plumbing and electrical spaces / rooms, are shown in their approximate locations. Do not install lighting outlets or light fixtures until the mechanical, plumbing and electrical equipment/pipes/ductwork are installed; then adjust and install lighting in revised clear (non-interfering) locations to provide best even-illumination. Coordinate the locations with all other trades prior to lighting installation.

B. Lighting Fixtures Installed in Ceiling Support Grids - suspended lay-in "T-bar" and concealed spline ceilings.

1. Provide two seismic clips at opposite ends of each recessed light fixture, the clip shall connect to the ceiling grid main runners and the light fixture. The light fixture with seismic clips and ceiling grid runner connections shall resist a horizontal seismic force equal to the total weight of the light fixture assembly.
2. Each light fixture weighing 40-pounds or less and where the respective ceiling grid system is "heavy duty" type, shall be suspended directly from the ceiling grid or shall be suspended independent of the ceiling grid support system as approved by the AHJ. Each light fixture weighing more than 40-pounds or where the ceiling grid system is not a "heavy duty" type shall be supported independent of the ceiling grid and independent of ceiling grid support system.

3. Each light fixture supported independent of the ceiling grid system shall be supported with a minimum of four taut independent support wires, one wire at each fixture corner.
4. Each light fixture supported directly from the ceiling grid or ceiling grid support system shall be additionally connected with a minimum of two independent slack safety support wires. One wire at each opposite diagonal fixture corner. Each 3-foot by 3-foot and larger light fixture shall be supported in the same manner, except provide a minimum of four independent slack safety wires, one at each fixture corner.
5. Light fixtures surface mounted to a suspended ceiling shall be installed with a 1½-inch steel "C" channel which spans across and above a minimum of two parallel main ceiling grid "runners" and concealed above the ceiling. Each channel or angle member shall be provided with a minimum of two threaded studs for attaching to the fixture housing through the lay-in ceiling tile. Two steel "C" channel members shall be installed for each 4-foot (or smaller) fixture. Install the channels within 6-inches of each end of the light fixture to span a minimum of two ceiling grid parallel main runners. Provide two seismic clips connecting the ceiling grid main runners to each steel – "C" channel. Provide not less than two taut independent support wires connecting to each channel. Bolt the light fixtures to the threaded studs on the channels or angles, to support the light fixture tight to the ceiling surface.

C. Fixture Supports

1. The support wires for light fixture support shall be 12-gauge steel (minimum). The wires including their building and light fixture attachments shall provide support capacity of not less than four times the weight of the light fixture assembly. Provide additional light fixture support wires and building anchors to meet these Requirements, as part of the Contract. The support wires shall be anchored to the building structural elements above the ceiling.
2. Pendant mounting fixtures shall be supplied with swivel hangers. Fixtures shall swing in any direction a minimum of 45-degrees of gravity, position. Fixtures shall have special stem lengths to give the mounting height indicated on the Drawings. Stem to be single continuous piece without coupling, and to be finished the same color as the canopy and the fixture, unless otherwise noted. The Contractor shall check all lock nuts and set screws to rigidly secure the swivel socket to the stem, and the stem to the outlet box.
3. Fixtures shall be plumb and vertical. Where obstructions occur restricting 45-degrees free-swing of fixtures, the fixtures shall be "guy" wired to prevent fixtures from striking obstructions. The Owner's Representative shall approve method of guying. Swinging fixtures shall have an additional safety hanger cable attached to the structure and the fixture at each support, with the capacity of supporting four times the vertical weight of the light fixture assembly.
4. Suspended fixtures weighing in excess of 40-pounds shall be supported independently of the fixture outlet box. Provide "aircraft" (minimum 12 gauge) steel hanger cable for suspended fixtures route cable concealed or in pendant where possible. Each cable attachment shall support four times the weight of the fixture assembly. Securely attach the cable to the building structure.
5. Surface mounted fixtures installed on drywall or plaster ceilings and weighing less than 40-pounds may be supported from outlet box. Provide structural supports above drywall or plaster ceilings for installation of fixtures weighing more than 40-pounds and secure fixture to structural supports. The use of toggle bolts is prohibited.

D. Recessed Lighting Fixtures - Fire Rated Building Surfaces

1. Lighting fixtures recessed in ceiling or wall which has a fire resistive rating of 1-hour or more shall be enclosed in a fully enclosed backbox (except over fixture lens/diffuser). The

material used to fabricate the "enclosed backbox" shall have a fire rating equal to that of the respective ceiling or wall.

2. The space from the fixture to the box enclosure shall be a minimum of 3 inches.
3. The back-box shall be concealed behind the fire-rated ceiling and wall finish surface. The light fixture shall be provided with lamp ballast rated for (normal light output) operation in a "high" ambient temperature.

### 3.02 LENS AND DIFFUSERS

Lens, Diffusers, InternalR shall be completely cleaned of all dust, dirt and fingerprints after the installation of the light fixtures and lamps, and after all trades have completed work and prior to occupancy of the facility by the Owner.

### 3.03 TRAINING

Upon completion of the installation the factory-authorized Technician shall provide the proper training to the Owner and/or Owner's Personnel on the servicing and maintenance of the lighting fixtures.

**END OF SECTION 26 50 05**  
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## ONTARIO SPORTS EMPIRE

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**SECTION 26 55 68****EXTERIOR ATHLETIC LIGHTING****Lighting System with LED Light Source****PART 1 – GENERAL****1.1 SUMMARY**

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- B. The purpose of these specifications is to define the lighting system performance and design standards for ONTARIO SPORTS EMPIRE using an LED Lighting source. The manufacturer / CONTRACTOR shall supply lighting equipment to meet or exceed the standards set forth in these specifications.
- C. The sports lighting will be for the following venues:
  - 1. Baseball 1-8
  - 2. Soccer 1-12
- D. The primary goals of this sports lighting project are:
  - 1. **Guaranteed Light Levels:** Selection of appropriate light levels impacts the safety of players and the enjoyment of spectators. Therefore, light levels are guaranteed to not drop below specified target values for a period of 25 years.
  - 2. **Environmental Light Control:** It is the primary goal of this project to minimize spill light to adjoining properties and glare to players, spectators, and neighbors.
  - 3. **Cost of Ownership:** To reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated for the duration of the warranty.
  - 4. **Control and Monitoring** – To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system. Fields should be proactively monitored to detect luminaire outages over a 25-year life cycle. All communication and monitoring costs for 25-year period shall be included in the bid.
    - a. Control and monitoring system shall provide contactor control of all existing circuits. Key switches shall be provided to provide field-level control of existing circuit groups.
    - b. **Entertainment Features:** Incorporation of theatrical light shows enhance the presentation and enjoyment of players and spectators. Control system shall incorporate pre-programmed light shows such as "chase", "wave", "marquee", and "random." Control system shall incorporate the ability to initiate these shows locally. System shall be able to synchronize light shows to customer-supplied music.
    - c. **Accent Lighting:** To allow for custom lighting effects, including team colors, lighting for special occasions, and theatrical effects, all poles should be equipped with RGB accent luminaires to illuminate the structures in various custom colors. Colors should be selectable via an onsite device.

**1.2 ONFIELD LIGHTING PERFORMANCE**

- A. **Illumination Levels and Design Factors:** Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting manufacturers will provide a guarantee

that light levels will be sustained over the life of the warranty period. Lighting calculations shall be developed, and field measurements taken on the grid spacing with the minimum number of grid points specified below.

Manufacturers will provide lumen maintenance data of the LED luminaires used per TM-21-11 and will incorporate the lumen maintenance projections into the lighting designs to ensure target light levels are achieved throughout the guaranteed period of the system. Per IES guidelines, lumen maintenance hours should be reported based on the 6x multiplier of testing hours.

Area of Lighting (per field)	Average Target Illumination Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Baseball 1 & 5	70 fc infield 50 fc outfield	2:1 infield 2.5:1 outfield	25 infield 111 outfield	30'x30'
Baseball 2, 7	50 fc infield 30 fc outfield	2:1 infield 2.5:1 outfield	25 infield 255 outfield	20'x20'
Baseball 2A, 2B, 3A, 3B, 4A, 4B, 6A, 6B, 7A, 7B, 8A, 8B	50 fc infield 30 fc outfield	2:1 infield 2.5:1 outfield	25 infield 98 outfield	20'x20'
Baseball 3, 8	50 fc infield 30 fc outfield	2:1 infield 2.5:1 outfield	25 infield 256 outfield	20'x20'
Baseball 4, 6	50 fc infield 30 fc outfield	2:1 infield 2.5:1 outfield	25 infield 254 outfield	20'x20'
Soccer 1, 2, 3, 4	50 fc	2:1	96	30'x30'
Soccer 5, 6, 7, 8, 9, 10, 11, 12	30 fc	2.5:1	77	30'x30'

- B. Color Temperature: The lighting system shall have a minimum color temperature of 5700K and a CRI of 75.
- C. Playability: Lighting design and luminaire selection should be optimized for playability by reducing glare onfield and providing sufficient uplight.
1. Aiming Angles: To reduce glare, luminaire aiming should ensure the top of the luminaire field angle (based on sample photometric reports) is a minimum of 10 degrees below horizontal.
  2. Glare Control Technology – Luminaires selected should have glare control technology including, but not limited to: external visors, internal shields and louvers. No symmetrical beam patterns are acceptable.
  3. Aerial lighting – Adequate illumination must be provided above the field to see the ball in flight. It is recommended that a lighting analysis be performed above the field of play to evaluate the visibility of the ball over its typical trajectory to ensure the participants will adequately see the ball. Calculation planes should be evaluated up to the maximum anticipated height for the level of play.
  4. Mounting Heights: To ensure proper aiming angles, minimum mountings heights shall be as described below. Higher mounting heights may be necessary for luminaire with lesser glare control to meet field angle requirements of section 1.2.C.1.

# of Poles	Pole Designation	Pole Height
44	A3-A20, A23-A40, S13, S14, S21-S24, S31, S32	70'
48	A1, A2, A21, A22, B1-	80'



	B16, C1-C16, D1-D4, S1, S2, S4, S5, S7, S8, S10, S11	
16	S3, S6, S9, S12, S15- S20, S25-S30	90'

### 1.3 **ENVIRONMENTAL LIGHT CONTROL**

- A. Light Control Luminaires: All luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers, and external shields. No symmetrical beam patterns are accepted. The luminaires shall be painted black.
- B. Spill Scans: Spill scans must be submitted indicating the amount of horizontal and vertical footcandles along the specified lines. Light levels shall be provided in 30-foot intervals along the boundary line at 3 ft above grade.

#### Addendum #2, 3/10/25

Spill Light Data	Maximum
East Riverside Drive Spill Line- Horizontal Footcandles	0.35 FC
East Riverside Drive Spill Line- Max Vertical Footcandles	1.0 FC
East Riverside Drive Spill Line- Max Candela	27500 C
Chino Ave Spill Line- Horizontal Footcandles	0.15 FC
Chino Ave Spill Line- Max Vertical Footcandles	0.25 FC
Chino Ave Spill Line- Max Candela	3500 C

- C. Sample Photometry: The first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the specified performance. Reports shall be certified by a qualified testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.
- D. Field Verification: Lighting manufacturer shall supply field verification of environmental light control using a meter calibrated within the last 12 months:
1. Spill verification: Illumination levels shall be taken in accordance with IESNA RP-6-22. The light sensing surface of the light meter should be held 36 inches above the playing surface with the sensing surface horizontal (for horizontal readings) or vertically pointed at the brightest light bank (for max vertical readings)

### 1.4 **COST OF OWNERSHIP**

- A. Manufacturer shall submit a 25 year Cost of Ownership summary that includes energy consumption, anticipated maintenance costs, and control costs. All costs associated with faulty luminaire replacement - equipment rentals, removal and installation labor, and shipping - are to be included in the maintenance costs.

## **PART 2 – PRODUCT**

### **2.1 SPORTS LIGHTING SYSTEM CONSTRUCTION**

- A. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, drivers and other enclosures shall be factory assembled, aimed, wired and tested.
- B. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the cross-arms, pole, or electrical components enclosure.
- C. System Description: Lighting system shall consist of the following:
  - 1. Galvanized steel poles and cross-arm assembly.
  - 2. Non-approved pole technology:
    - a. Square static cast concrete poles will not be accepted.
    - b. Direct bury steel poles which utilize the extended portion of the steel shaft for their foundation will not be accepted due to potential for internal and external corrosive reaction to the soils and long term performance concerns.
  - 3. Lighting systems shall use concrete foundations. See Section 2.4 for details.
    - a. For a foundation using a pre-stressed concrete base embedded in concrete backfill the concrete shall be air-entrained and have a minimum compressive design strength at 28 days of 3,000 PSI. 3,000 PSI concrete specified for early pole erection, actual required minimum allowable concrete strength is 1,000 PSI. All piers and concrete backfill must bear on and against firm undisturbed soil.
    - b. For anchor bolt foundations or foundations using a pre-stressed concrete base in a suspended pier or re-enforced pier design pole erection may occur after 7 days. Or after a concrete sample from the same batch achieves a certain strength.
  - 4. Manufacturer will supply all drivers and supporting electrical equipment.
    - a. Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure. Integral drivers are not allowed.
    - b. Manufacturer shall provide surge protection at the pole equal to or greater than 40 kA for each line to ground (Common Mode) as recommended by IEEE C62.41.2\_2002.
  - 5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.

6. All luminaires, visors, and cross-arm assemblies shall withstand 150 mi/h winds and maintain luminaire aiming alignment. The luminaires shall be painted black.

Addendum #2, 3/10/25

7. RGBW and RGBU fixtures shall be installed on Soccer 1, Soccer 2, Soccer 3, Soccer 4, Baseball 1, and Baseball 5. Fixture Quantities per Field: Soccer 1- (4) RGBU and (8) RGBW, Soccer 2- (4) RGBU and (8) RGBW, Soccer 3- (4) RGBU and (8) RGBW, Soccer 4- (4) RGBU and (8) RGBW, Baseball 1- (8) RGBU and (16) RGBW, Baseball 5- (8) RGBU and (16) RGBW.

8. Control cabinet to provide remote on-off control, monitoring, and entertainment features of the lighting system. See Section 2.3 for further details.
8. Manufacturer shall provide lightning grounding as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.
  - a. Integrated grounding via concrete encased electrode grounding system.
  - b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

- D. Safety: All system components shall be UL listed for the appropriate application.

## 2.2 **ELECTRICAL**

- A. Electric Power Requirements for the Sports Lighting Equipment:
  1. Electric power: 480 Volt, 3 Phase
  2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.
- B. Energy Consumption: The kW consumption for the field lighting system shall be 1,001.93 kW.

## 2.3 **CONTROL**

- A. Instant On/Off Capabilities: System shall provide for instant on/off of luminaires.
- B. Lighting contactor cabinet(s) constructed of NEMA Type 4 aluminum, designed for easy installation with contactors, labeled to match field diagrams and electrical design. Manual off-on-auto selector switches shall be provided.
- C. Contactor control of lights: To minimize wear on drivers and other electrical components and prevent lights from turning on due to communication loss, circuits must be controlled via contactor switching, not dimming driver output to zero.
- D. Dimming: System shall provide for 3-stage 4-stage dimming (high-medium-low). Dimming will be set via scheduling options (Website, app, phone, email) or via an onsite user interface tablet or device.
- E. Remote Lighting Control System: System shall allow OWNER and users with a security code to schedule on/off system operation via a web site, phone, or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The OWNER may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields to only having permission to execute "early off" commands by phone. Scheduling tool shall be capable of setting curfew limits.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

- F. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The controller shall determine switch position (manual or auto) and contactor status (open or closed).
- G. Management Tools: Manufacturer shall provide a web-based database and dashboard tool of actual field usage and provide reports by facility and user group. Dashboard shall also show current status of luminaire outages, control operation and service. Mobile application will be provided suitable for IOS and Android devices.  
  
Hours of Usage: Manufacturer shall provide a means of tracking actual hours of usage for the field lighting system that is readily accessible to the OWNER.
  - 1. Cumulative hours: shall be tracked to show the total hours used by the facility.
  - 2. Report hours saved by using early off and push buttons by users.
- H. Communication Costs: Manufacturer shall include communication costs for operating the control and monitoring system for a period of 25 years.
- I. Communication with luminaire drivers: Control system shall interface with drivers in electrical components enclosures by means of powerline communication.
- J. Entertainment Features: Control System shall store four (4) standard preprogrammed lighting effects per field with option for two (2) custom preprogrammed lighting scenes or effects. Programming will additionally include four (4) minutes of custom programming with lights synchronized to music supplied by customer. Shows shall be initiated by a manufacturer-provided touchscreen user interface on the control system network. Entertainment Showlight Control System are designed on Soccer 1, 2, 3, 4, and Baseball 1, 5.
- K. Low Voltage Device Brackets mounted to the light poles: Plan for (1) WAP mounting bracket plate, and (1) Security Camera mounting bracket plate on each pole. Provide (1.5") coupling rear facing all poles at 9' for possible low voltage device cabling entry to the light pole.

## 2.4 **STRUCTURAL PARAMETERS**

- A. Wind Loads: Wind loads shall be based on the 2022 California Building Code. Wind loads to be calculated using ASCE 7-16, a design wind speed of 110 mph, exposure category C.
- B. Pole Structural Design: The stress analysis and safety factor of the poles shall conform to AISC 360-16 Specification for Structural Steel Buildings.
- C. Foundation Design: The foundation design shall be based on soil parameters as outlined in the geotechnical report. RMA Group, Report No. 00-232255-01, April 16, 2024
- D. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. These drawings must be submitted at time of bid to allow for accurate pricing.

## **PART 3 – EXECUTION**

**3.1 SOIL QUALITY CONTROL**

- A. It shall be the CONTRACTOR'S responsibility to notify the OWNER if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. CONTRACTOR may issue a change order request / estimate for the OWNER'S approval / payment for additional costs associated with:
1. Providing engineered foundation embedment design by a registered engineer in the State of California for soils other than specified soil conditions;
  2. Additional materials required to achieve alternate foundation;
  3. Excavation and removal of materials other than normal soils, such as rock, caliche, etc.

**3.2 DELIVERY TIMING**

- B. Delivery Timing Equipment On-Site: The equipment must be on-site 8-14 weeks from receipt of approved submittals and receipt of complete order information.

**3.3 FIELD QUALITY CONTROL**

- A. Illumination Measurements: Upon substantial completion of the project and in the presence of the CONTRACTOR, Project Engineer, OWNER'S REPRESENTATIVE, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-22.
- B. Field Light Level Accountability
1. Light levels are guaranteed not to fall below the target maintained light levels for the entire warranty period of 25 years. These levels will be specifically stated as "guaranteed" on the illumination summary provided by the manufacturer.
  2. The CONTRACTOR/manufacturer will be held responsible for any and all changes needed to bring these fields back to compliance for light levels and uniformities. CONTRACTOR/Manufacturer will be held responsible for any damage to the fields during these repairs.
- C. Correcting Non-Conformance: If, in the opinion of the OWNER or his appointed Representative, the actual performance levels including footcandles, uniformity ratios, and uplight for aerial visibility are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be required to make adjustments to meet specifications and satisfy OWNER.

**3.4 WARRANTY AND GUARANTEE**

- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years from the date of shipment. Warranty shall guarantee specified light levels. Manufacturer shall maintain specifically funded financial reserves to assure fulfillment of the warranty for the full term. Warranty does not cover weather conditions events such as lightning or hail damage, improper installation, vandalism or abuse, unauthorized repairs or alterations, or product made by other manufacturers.
- B. Maintenance: Manufacturer shall monitor the performance of the lighting system, including on/off status, hours of usage and luminaire outage for 25 years from the date of equipment shipment. Parts and labor shall be covered such that individual luminaire outages will be repaired when the usage of any field is materially impacted. Manufacturer is responsible for removal and replacement of failed luminaires, including all parts, labor, shipping, and equipment rental associated with maintenance. OWNER agrees to check fuses in the event of a luminaire outage.

**PART 4 – DESIGN APPROVAL****4.1 PRE-BID SUBMITTAL REQUIREMENTS (Non-Musco)**

- A. Design Approval: The OWNER / engineer will review pre-bid submittals per section 4.1.B from all the manufacturers to ensure compliance to the specification 10 days prior to bid. If the design meets the design requirements of the specifications, a letter and/or addendum will be issued to the manufacturer indicating approval for the specific design submitted.
- B. Approved Product: Musco's Light-Structure System™ with TLC for LED® is the approved product. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.
- C. All listed manufacturers not pre-approved shall submit the information at the end of this section at least 10 days prior to bid. An addendum will be issued prior to bid; listing approved lighting manufacturers and the design method to be used.
- D. Bidders are required to bid only products that have been approved by this specification or addendum by the OWNER or OWNER'S REPRESENTATIVE. Bids received that do not utilize an approved system/design, will be rejected.

### REQUIRED SUBMITTAL INFORMATION FOR ALL MANUFACTURERS (NOT PRE-APPROVED) 10 DAYS PRIOR TO BID

*All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements. Complete the Yes/No column to indicate compliance (Y) or noncompliance (N) for each item. **Submit checklist below with submittal.***

Yes / No	Tab	Item	Description
	<b>A</b>	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	<b>B</b>	Equipment Layout	Drawing(s) showing field layouts with pole locations
	<b>C</b>	On Field Lighting Design	Lighting design drawing(s) showing: <ol style="list-style-type: none"> <li>Field Name, date, file number, prepared by</li> <li>Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x &amp; y), Illuminance levels at grid spacing specified</li> <li>Pole height, number of fixtures per pole, horizontal and vertical aiming angles, as well as luminaire information including wattage, lumens and optics</li> <li>Height of light test meter above field surface.</li> <li>Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance (CV), coefficient of utilization (CU) uniformity gradient; number of luminaires, total kilowatts, average tilt factor; light loss factor.</li> </ol>
	<b>D</b>	Off Field Lighting Design	Lighting design drawing showing initial spill light levels along the boundary line (defined on bid drawings) in footcandles. Lighting design showing glare along the boundary line in candela. Light levels shall be taken at 30-foot intervals along the boundary line. Readings shall be taken with the meter orientation at both horizontal and aimed towards the most intense bank of lights.
	<b>E</b>	Photometric Report	Provide first page of photometric report for all luminaire types being proposed showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	<b>F</b>	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the OWNER. Light levels must be guaranteed to not fall below target levels for warranty period.
	<b>G</b>	Structural Calculations	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of California, if required by OWNER. (May be supplied upon award).
	<b>H</b>	Control & Monitoring System	Manufacturer of the control and monitoring system shall provide written definition and schematics for automated control system and entertainment system. They will also provide ten (10) references of customers currently using proposed system in the state of California.
	<b>I</b>	Electrical Distribution Plans	Manufacturer bidding an alternate product must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of California.
	<b>J</b>	Warranty	Provide written warranty information including all terms and conditions. Provide ten (10) references of customers currently under specified warranty in the state of California.

	<b>K</b>	Project References	Manufacturer to provide a list of ten (10) projects where the technology and specific fixture proposed for this project has been installed in the state of California. Reference list will include project name, project city, installation date, and if requested, contact name and contact phone number.
	<b>L</b>	Product Information	Complete bill of material and current brochures/cut sheets for all products being provided.
	<b>M</b>	Delivery	Manufacturer shall supply an expected delivery timeframe from receipt of approved submittals and complete order information.
	<b>N</b>	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications. If in full compliance, tab may be omitted.
	<b>O</b>	Cost of Ownership	Document cost of ownership as defined in the specification. Identify energy costs for operating the luminaires. Maintenance cost for the system must be included. All costs should be based on 25 Years

The information supplied herein shall be used for the purpose of complying with the specifications for ONTARIO SPORTS EMPIRE. By signing below, I agree that all requirements of the specifications have been met and that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in the Non-Compliance section.

**Manufacturer:** \_\_\_\_\_ **Signature:** \_\_\_\_\_

**Contact Name:** \_\_\_\_\_ **Date:** \_\_\_\_/\_\_\_\_/\_\_\_\_

**CONTRACTOR:** \_\_\_\_\_ **Signature:** \_\_\_\_\_



**SECTION 27 00 00****COMMON WORK RESULTS FOR COMMUNICATIONS****PART 1 - GENERAL****1.01 SUMMARY**

- A. This section specifies the basic requirements for Communications installations as indicated or required and includes requirements common to more than one specification section of this Division (such as related documents, related sections, definitions, governing requirements, contractor requirements, warranty requirements, submittal requirements/procedures, and project closeout requirements/procedures, as well as other requirements). This section may expand upon and/or supplement the requirements specified in Division 01.
- B. Examine the contract documents in their entirety (including Drawings and Specification sections in the other divisions) for requirements or work which may affect work under this section, regardless of whether such requirements or work are specifically indicated in this section.
- C. Errors or Omissions in Drawings or Documentation
  - 1. If any errors or omissions appear in Drawings, Specifications, or other documents, the bidding Contractor shall notify the System Designer no later than ten (10) days prior to submitting the bid.
  - 2. Should conflict occur in or between Drawings and Specifications, the bidding Contractor is deemed to have estimated the more expensive way of doing the work, unless the bidding Contractor has asked for and obtained written decision (addendum) before submission of the bid as to which method or materials will be required.
- D. Related Sections:
  - 1. Section 000000 – Procurement and Contracting Requirements
  - 2. Section 010000 – General Requirements
  - 3. Section 270526 – Grounding and Bonding for Communications Systems
  - 4. Section 270528 – Pathways for Communications Systems
  - 5. Section 270553 – Identification for Communications Systems
  - 6. Section 271116 – Communications Room Equipment
  - 7. Section 271323 – Backbone Cabling
  - 8. Section 271513 – Horizontal Cabling
  - 9. Section 271619 – Patch Cords
  - 10. Section 271700 – Testing of Structured Cabling Systems
  - 11. Section 274116 – Audiovisual Systems

- 12. Section 275129 – Two-way Emergency Communications Systems
- 13. Section 280000 – Common Work Results for Security Systems
- 14. Section 281000 – Access Control and Alarm Management Systems
- 15. Section 282000 – Video Surveillance Systems

## 1.02 DEFINITIONS

- A. ANSI – American Northern Standards Institute
- B. AWG – American Wire Gauge
- C. BICSI – Building Industry Consulting Service International
- D. BCT – Bonding Conductor for Telecommunications
- E. EIA – Electronics Industry Alliance
- F. ETL – Intertek Certification Services
- G. IEC – International Electrotechnical Commission
- H. IEEE – Institute of Electrical and Electronic Engineers
- I. IDC – Insulation displacement contact
- J. ISO – International Standards Organization
- K. NECA – National Electrical Contractors Association
- L. NFPA – National Fire Protection Agency
- M. NRTL – Nationally Recognized Testing Laboratory
- N. TIA – Telecommunications Industry Association
- O. UL – Underwriters Laboratory
- P. Provide: Furnish, install, terminate, label, test and certify a complete operating cabling system.
- Q. Contract Documents (CD): Design drawings, specifications, sketches, and schedules provided by the System Designer as they directly relate to this scope of work and this project.
- R. Structured Cabling System (SCS): A SCS is defined as all required cabling including hardware, termination blocks, cross connect wire or cordage, patch panels, patch cords, telecommunication outlets, work area cords, UTP and fiber optic cable installed and configured to provide computer data and voice connectivity from each data or voice device to the network file server or voice network/switch designated as the service point of the local area network.
- S. Point-of-Entry (POE): Unmarked Manholes/Vaults at property line
- T. NET-POP Rooms/MPOE (Main Point of Entry): The area where the outside plant media/carrier services appear in the facility. The NET-POP contains equipment

used by owner or carrier to hand-off/transition cable from outside plant into inside plant type.

- U. Main Distribution Frame (MDF): This technology space houses Layer 2/3 network switching gear and other main network distribution equipment and acts as the mid-connection point between the Core/Network and the TR/IDF/access zones for all connections.
- V. Telecommunications Room (TR)/Intermediate Distribution Frame (IDF): is the location for the termination of backbone cables and for termination of horizontal cables, and for the interconnection of each. The space also hosts access-layer switches and user network connections within each floor.
- W. Active Equipment: electronic equipment used to develop various WAN, LAN, and voice services, e.g., digital multiplexers, RS-232 controllers, Ethernet hubs, switches, routers, PBX, etc.
- X. Campus Backbone: cabling system consisting of media and termination hardware interconnecting POE, Net-Pop's and Future onsite buildings.
- Y. Building Backbone: cabling system consisting of media and termination hardware interconnecting MDFs to IDFs.
- Z. Horizontal Cabling: cabling system consisting of media and termination hardware interconnecting the Telecommunication Outlets (TOs) and the TRs.
- AA. Bonding: permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.
- BB. Basket Cable Tray: A cable support and management system fabricated of continuous, rigid, welded steel wire mesh and available in many sizes with attachment hardware suiting multiple installation methods
- CC. Cable Tray: vertical or horizontal open supports, usually made of aluminum or steel, which are fastened to the building structure. Cables are laid in and fastened to the trays.
- DD. Cabinet: free standing, floor-mounted or wall-mounted modular enclosure designed to house and protect rack-mounted electronic equipment and passive terminations.
- EE. Channel: The end-to-end transmission path between two points at which application specific equipment is connected; encompasses all the elements of the horizontal cabling link, plus the equipment cords in the telecommunications spaces and work area.
- FF. Cross-Connect: equipment used to terminate and tie together communications circuits.
- GG. Cross-Connect Jumper: a cluster of twisted-pair conductors without connectors used to establish a circuit by linking two cross-connect termination points.
- HH. FDE: Fiber distribution enclosure

- II. Grounding: a conducting connection to earth, or to some conducting body that serves in place of earth.
- JJ. Jack: receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight–position/eight–contact modular jacks.
- KK. Ladder Cable Tray: A fabricated structure consisting of two longitudinal side rails connected by individual transverse members (rungs).
- LL. LAN: Local area network.
- MM. Link: Horizontal cabling link encompassing all components of the horizontal cabling (TO, patch panels, blocks, jumpers, and patch cords that join them in the horizontal cross–connect). It is distinguished from a channel because it does not include the equipment cables/cords at the telecom spaces or work area.
- NN. Media: twisted–pair, and fiber optic cable or cables used to provide signal transmission paths.
- OO. Mounting Frame: rectangular steel framework, which can be equipment rack or wall mounted to support wiring blocks, patch panels, and other communications equipment.
- PP. Outside Plant (OSP): generally, any and all portions of the cable system that runs outside of an environmentally enclosed structure and/or building with each end terminated at different buildings. This specifically includes inter–building cables, conduits, manholes, hand–holes, and innerduct.
- QQ. UTP: Unshielded Twisted Pair.
- RR. FO: Fiber Optic
- SS. Passive Equipment: non–electronic hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, patch panels, wiring blocks, fiber optic shelves, etc.
- TT. Patch Cords: a length of wire or fiber cable with connectors on one or both ends used to join communications circuits at a cross–connect.
- UU. Patch Panel: system of terminal blocks or connectors used with patch cords that facilitate administration of cross–connect fields.
- VV. Pathway: facility for the placement of communications cable. A pathway facility can be composed of several components including conduit, wireway, cable tray, surface raceway, under floor systems, overhead systems, raised floor, ceiling support wires, etc.
- WW. Protectors: electrical protection devices used to limit foreign voltages on metallic communications circuits.
- XX. Raceway: an enclosed channel designed expressly for holding wires or cables; may be of metal or insulating material. The term includes conduit, tubing, wire ways, under floor raceways, overhead raceways, and surface raceways. Raceway does not include cable tray.

- YY. Racks: An open, freestanding, floor-mounted structure, typically made of aluminum or steel, used to mount equipment; usually referred to as an equipment rack.
- ZZ. Riser Backbone: The Riser Backbone subsystem links the main cross connect (MDF) in the equipment room to the distribution rooms (TRs).
- AAA. Telecommunication Outlet (TO): Connecting device mounted in a work area used to terminate horizontal cable and interconnect cabling with station equipment.
- BBB. Trough or Ventilated Cable Tray: A fabricated structure consisting of integral or separate longitudinal rails and a bottom having openings sufficient for the passage of air and using 75 percent or less of the plan area of the surface to support cables.
- CCC. Work Area Subsystem: The connection between the telecommunications outlet and the station equipment in the work area is provided by the Work Area Subsystem. It consists of cords, adapters, and other transmission electronics.
- DDD. Wireless Access Point (WAP): Telecom outlet designated for use with wireless network devices. Such outlet shall be mounted above ceiling.
- EEE. Contractor – The successful bidder engaged to provide the work of this Specification

### 1.03 REFERENCES

- A. Most recent revisions, editions, addenda, and bulletins of the following documents:
1. ANSI/TIA 568 series
  2. ANSI/TIA–569 Telecommunications Pathways and Spaces
  3. ANSI/TIA–606 Administration Standard for Telecommunications Infrastructure
  4. ANSI/TIA–607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
  5. ANSI/TIA–862 Structured Cabling Infrastructure Standard for Intelligent Building Systems
  6. TIA–TSB–162 Telecommunications Cabling Guidelines for Wireless Access Points
  7. Telecommunications Distribution Methods Manual
  8. Information Transport Systems Installation Methods Manual (ITSIMM)
- B. California Electrical Code (CEC)
- C. Local Codes and Standards
- D. UL444 – Standard for Safety of Communications Cable
- E. UL 1666 – Standard for Safety of Flame Propagation Height

- F. Local Authority Having Jurisdiction (AHJ)
- G. Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either
- H. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense.

#### 1.04 QUALIFICATIONS

- A. The contractor shall hold a valid State of California C7 and C10 Contractor's license.
- B. Contractor shall have a proven track record in the field of specified cabling and system installations, with at least (3) previous installations of comparable size and complexity undertaken within the last (5) years.
- C. Contractor shall be qualified in the installation and termination of copper and fiber cabling as described in this Division.
- D. Contractor shall have BICSI Registered Communication Distribution Designer (RCDD) to sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.
- E. Contractor shall have onsite at least (1) BICSI Registered Installer for copper and fiber (INSTC and INSTF), or (1) BICSI Technician (TECH) on site to perform scope of work.
- F. Contractor shall be a manufacturer's authorized distributor and warrantee station for the equipment offered, and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.

#### 1.05 SUBMITTALS

- A. Make submittals in accordance with:
  - 1. Section 00 00 00 – Procurement and Contracting Requirements
  - 2. Section 01 33 00 – Submittal Procedures.
- B. Action Submittals:
  - 1. Shop Drawings
    - a) Owner will provide electronic files in CAD or Revit format, containing the contract document drawing files, for use in the preparing of the shop drawings, by the RCDD.
    - b) Drawings will be to scale.
    - c) Submit the following sheets and details:
      - 1) Titlesheet and Cover Page: indicate project name and location; include sheet index
      - 2) Site Plan

- 3) Overall Floor Plans: floor plans showing the locations of devices and cable routing paths with cable types, quantity called out, and device IDs; telecommunications room locations; backbone cable routes; new pathways/conduits/boxes/etc.
  - 4) Enlarged Plans: Communications rooms with equipment types and quantity called out; coordinated wall elevations with space allocated for trades not covered under Division 27; rack elevations with CFCI and OFCI equipment called out.
  - 5) Sheets for the entire structured cabling system and grounding and bonding system, identifying such items as PBB, SBB, TBB, rack fills, cabling pathways and pathway fills, ladder and other cable raceways, coordination with other trades, etc.
  - 6) Rough-in and wiring details.
  - 7) Topology diagrams, indicating Contractor and Owner scopes of work, as well as interconnecting media (i.e. cross-connections between ISP and Owner's network).
2. Product submittal
- a) Contractor shall furnish products for a complete, turnkey system. Submit major components and ancillary accessories required for complete system. Minor accessories like screws and nuts are not required for submission, unless specified in other Specifications sections.
  - b) Product submittal shall be a single complete submittal. Incomplete submittals will be rejected without review.
  - c) Partial submittals will be allowed for short lead items only with documentation on lead time included at the front of the submittal.
  - d) Catalog cut sheets and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication, material finish, and licenses. Clearly indicate on each sheet what is being submitted on.
3. Qualification Data: Submit at least (3) references for telecommunications cabling jobs already completed, involving both fiber optics and twisted pair cabling, similar in scope to the project described herein. Include, for each customer reference, the following information: Company name, address, phone number, name and email address of contact and type of job completed.
- a) Provide copies of the Contractor's certification.
  - b) Provide written guarantees from manufacturers of major equipment, that a service representative has been assigned.

- c) Provide copies of technician training certificates.

#### 1.06 CLOSEOUT DOCUMENTS

- A. Final close out documents including, but not limited to, test results on in digital PDF and physical CD-ROM or USB drive, in native tester format, project manual that includes manufacturer and contractor warranties, product cut sheets, material submittals, etc. Also, include the following:
  - 1. Provide "As-Built" Drawings in AutoCAD or Revit.
    - a) "As-Built" drawings indicating location of all equipment including but not limited to work area outlets, patch panels, cross connect blocks, on each segment and cable routing outlet and identifiers. Indicate labeling for each piece of equipment.
    - b) As-Built drawings will contain all installed cabling and materials. Outlets will be numbered with each cable associated with the work area outlet.
    - c) Red-lined shop drawings submitted as As-built drawings will be rejected without review.
    - d) (1) printed, hard copy of final approved as-built drawings in native sheet size will be provided to Owner. Unapproved sheet sizes will be rejected.
  - 2. Place a laminated full-size, minimum "C" sized, floor plan of these drawings (coordinate with Owner) on the wall of each communications room, showing area covered, data locations, and cable label.
  - 3. Provide network schematics when appropriate.
  - 4. Print (2) printed copies of full-sized as-built drawings, and submit to Owner.
  - 5. Provide printed cable test reports in 3-ring binder and submit to Owner.
  - 6. Provide pricing and contact information for emergency service work not covered by warranty.

#### 1.07 QUALITY ASSURANCE

- A. All equipment shall be mounted with Phillips screws, unless specified in other Specification sections.
- B. Standards for Materials and Equipment
  - 1. The Contractor shall provide all materials, equipment, and installation in compliance with the latest applicable standards from ANSI, FCC, ASTM, EIA/TIA, IEEE, CEC, NFPA, NEMA, OSHA, REA, and UL.
- C. Manufacturer's Warranty
  - 1. Contractor shall provide a lifetime warranty on all copper and fiber links and/or channels.



2. Warranty shall meet the following criteria:
  - a) A guarantee that the installed cabling system will pass the Commercial Building Telecommunications Standards cited in this document.
  - b) This warranty will cover all registered links and/or channels.
  - c) Contractor shall indicate in warranty documentation whether registered links are to be "link" or "channel" type.
    - 1) If links are covered, this warranty may be invoked only if the links are comprised entirely of a single manufacturer's cable and terminations.
    - 2) If channels are covered, this warranty may be invoked only if entire channel links are comprised of single manufacturer's cable, terminations, and patch cords.
  - d) The Contractor will correct any problems and malfunctions that are warranty-related issues without charge for the entire warranty period. Corrections shall start within 48-hours of notification from Owner.
  - e) If the warranty is needed by the Owner within the warranted period and the original installer is no longer in business, System manufacturer shall find a substitute certified contractor and assume costs to fulfill the obligations of the warranty.
  - f) Upon acceptance of the warranty paperwork and test results from the Contractor, System manufacturer will mail a notification letter to the installer and a notification letter with warranty certificate to Owner.
  - g) The warranty period shall commence following the final acceptance of the project by Owner and written confirmation of warranty from System manufacturer.
3. An additional **1-year** written warranty covering workmanship and materials from the date of project completion. All repairs shall be made at no cost to the Owner during the warranty period.

D. Testing and Inspection of Communications Equipment

1. Provide tests specified below, when applicable or required by Owner, and as indicated under individual items of material, equipment, and work specified in this Specification.
  - a) Furnish all test equipment and instruments required for the tests.
  - b) Responsible, qualified employees of the contractor in the presence of the Owner or an authorized representative shall perform the cable testing.

- c) All individuals involved in the testing phase of the project shall not have been involved in the installation phase nor shall have immediate knowledge of the installation task.

- 2. End-to-end performance of all parts and channels will be tested.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. To prevent damage, theft, soiling, and misalignment, protect equipment during transit, storage, and handling.
- B. The Contractor shall coordinate the secure storage of equipment and materials on site, or, if no on-site storage is available, shall provide their own secure storage at the Contractor's expense.
  - 1. Do not store equipment where conditions fall outside the manufacturer's recommendations for environmental conditions.
  - 2. Do not install damaged equipment. Remove environmental conditions from the site and replace damaged equipment with new equipment.
  - 3. If off-site storage of materials is necessary, this shall be at the Contractor's expense.

#### 1.09 PROJECT CONDITIONS

- A. Project Environmental Requirements
  - 1. Hazardous Materials Prohibition
    - a) The Contractor shall ensure that all materials used in the project are asbestos-free, unless specifically authorized in writing by the Owner.
  - 2. Existing Conditions
    - a) Verify that all conditions on the project site are acceptable for the Work specified in this Section. Prior to bid opening, notify the System Designer, in writing, of any discrepancies, conflicts, or omissions. Otherwise, correct these issues at no additional cost to the Owner.
    - b) Continue to monitor the project site. If conditions develop that require a variance from the Specifications or Drawings, then immediately notify the Owner in writing. Otherwise, make recommendations, submit drawings showing how the Work may be installed, and, upon approval, proceed with the necessary changes without additional cost to the Owner.
- B. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings is complete.
- C. Confirmation of Pathway and Cable Manager sizing:
  - 1. Wherever cabling pathways or managers are installed, it is the Contractor's responsibility to confirm pathway or manager sizing to

represent no more than 25% fill upon installation according to manufacturer's fill tables.

2. Pathways deemed overfilled upon installation will not be accepted and shall be remedied at Contractor expense.

#### 1.10 USE OF THE SITE

- A. Where the Owner deems it necessary to place restrictions, use the site as directed by the Owner.
- B. When proceeding with the work, do not interfere with the ordinary use of streets, aisles, passages, exits, or operations of the Owner. During the day, set up cones and barriers in hallways and walkways. Do not string cable down the hallways during normal hours.
- C. Request a hazardous materials worksheet that identifies potentially hazardous locations. Do not proceed with any work in locations where hazardous materials are known to be. Obtain instructions from the Contractor's Project Manager on and when to work in these areas.
- D. Multiple times each day, each contractor shall remove all trash and debris from the site. Before leaving each day:
  1. The Contractor shall replace all ceiling tiles that they have removed.
  2. The Contractor shall place all furniture and equipment that they have moved back into its original location.
  3. The Contractor shall return any equipment that they have disconnected to working order.
  4. The Contractor's Job Foreman shall inspect all work locations to ensure that the rooms are clean and that all of the tasks described above have been done.
  5. It is recommended that the Contractor inspect the site and take pictures to document the condition of the ceilings and walls.

#### 1.11 RESPONSIBILITIES AND COORDINATION

- A. The Contractor shall provide all materials, qualified labor and services required to ensure a complete and operational system, installed in accordance with the intent of the Contract Documents.
- B. The Contractor shall furnish and install all incidental items not actually shown or specified, but which are required by best practices to provide complete functional systems.
- C. The Contractor shall coordinate the details of facility equipment and construction for all specification divisions, which affect the work covered under this Division.
- D. The Contractor shall coordinate all activities with the overall construction schedule.
- E. The Contractor shall coordinate with all other trades. The Contractor will submit a schedule for the installation within 15 days of contract award.

1. The schedule shall include delivery, installation, and testing for conformance to specific job completion dates.
  2. At minimum, the schedule shall provide dates for the start of demolition, the completion of demolition, the installation start date, the completion of copper cabling, the completion of backbone cabling, the completion of testing and labeling, cutover, the completion of the final punch list, final inspection, and acceptance.
- F. The Contractor shall develop a bill of materials, perform material management, and efficiently use the materials whether they are issued by Owner or purchased by the Contractor.
- G. The Contractor shall ensure materials, in excess of, those required to complete the project are kept in their original condition and packaging for restocking.
- H. The Contractor shall maintain a spare set of all major parts for the system at all times.
- I. The Contractor shall maintain existing cables and terminations not determined to be within the demolition scope of work. Cables damaged, removed, or unterminated shall be reinstalled and recertified with the manufacturer's certified installer, and test results provided to the Owner.

#### 1.12 DESIGN CRITERIA

- A. Compliance by the contractor with the provisions of this Specification does not relieve him or she from the responsibilities of providing materials and equipment of proper design, mechanically and electrically suited to meet operating requirements at the specified service conditions.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. This Section includes General Requirements for each section in Division 27 and shall be used in conjunction with specifications, other related Divisions and related Contract Documents to establish the total requirements for the project:
1. Refer to specific sections for Product Part Numbers.
- B. All materials and products shall be:
1. Appropriate for the intended use
  2. Permitted by the Authority Having Jurisdiction (AHJ)
- C. All products shall be new, of the latest version at time of bid, and brought to the job site in original manufacturer's packaging. Used equipment and damaged material will be rejected.
- D. Any modifications to equipment to suit the intent of the Specifications shall be performed in accordance with these requirements.
- E. Take care during installation to prevent scratches, dents, chips, etc. Equipment with significant or disfiguring cosmetic flaws will be rejected.

- F. All components will be approved by the System Designer and shall have the most aesthetic value possible while maintaining specified functionality. Hardware shall:
  - 1. Be in compliance with the Construction Documents.
  - 2. Have fit and finish compatible with the existing surrounding structure.
  - 3. Be unobtrusive.
  - 4. Provide the required functionality.
- G. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of the equipment and its installation.
- H. Provide products that are suitable for the intended use, including, but not limited to environmental, regulatory, and electrical factors.
- I. All fittings, supports, splices, etc. for the system shall be installed to provide a complete assembly- including fasteners, hardware, and other items required to complete the installation as indicated in the Drawings and Specifications.

## 2.02 SUBSTITUTION POLICY

- A. Substitution requests: Substitution requests will be considered only if submitted to Owner's Representative not less than 7 days prior to project bid date. Acceptance or rejection of proposed substitution is at Owner's Representative's sole discretion. Requests for substitutions shall be considered "not approved" unless approval is issued in writing by Owner's Representative.
- B. Rejection: For equipment, cabling, wiring, materials, and all other products indicated or specified as "no substitutions" or "no alternates", Owner does not expect not desire requests for substitutions or alternate products other than those specified. Owner reserves the right for Owner's Representative to reject proposed substitution requests and submissions of alternates without review or justification.
- C. Contractor shall assume all costs for removal and replacement of any product installed in substitution of those specified. Such costs shall include but not be limited to labor, materials as well as any penalties, fees, or costs incurred for late completion.

## PART 3 - EXECUTION

### 3.01 WORKMANSHIP

- A. Manufactured products, materials, equipment, and components shall be provided, conditioned, applied, installed, connected, and tested in accordance with the manufacturer's guidelines and printed instructions.
- B. The installation of all system components shall be carried out under the direction of qualified personnel. Appearance shall be considered as important as mechanical and electrical efficiency. Workmanship shall meet or exceed industry standards.

### 3.02 INTENT OF DRAWINGS

- A. The Drawings show only general locations of equipment, devices, raceways, cable trays, boxes, etc., unless specifically dimensioned.
- B. The Contractor shall be responsible for the proper placement and routing of equipment, cable, raceways, cable runway, and related components, according to the Contract Documents and subject to prior review by the Owner and System Designer.
- C. The Contractor shall refer any conflicts within the Contract Documents to the Construction Manager and/or Owner for resolution.

### 3.03 SERVICE CONTINUITY

- A. Maintain continuity of communications services to all functioning portions of the process or buildings during hours of normal use.
- B. Arrange temporary outages for cutover work with General Contractor. Keep outages to a minimum number and a minimum length of time to minimize operational impact.

### 3.04 LAYOUT AND TOLERANCES

- A. Follow as closely as practicable the design as shown on the Drawings. Make all necessary measurements in the field to verify exact locations and ensure precise location and fit of specified items. Make no substantial alterations without prior approval of the Owner and the System Designer.

### 3.05 TESTING AND INSPECTION OF OWNER-PROVIDED EQUIPMENT

- A. Provide tests specified below, when applicable or required by the Owner, and as indicated under individual items of material, equipment, and work specified in this Specification.
  - 1. Furnish all test equipment and instruments required for the tests.
  - 2. Responsible, qualified employees of the contractor in the presence of the Owner or an authorized representative shall perform the cable testing.
  - 3. All individuals involved in the testing phase of the project shall not have been involved in the installation phase nor shall have immediate knowledge of the installation task.

### 3.06 CONSTRUCTION REVIEW

- A. The System Designer and Owner will review and observe installation work to ensure compliance by the Contractor with Contract Document requirements.
- B. Review, observation, assistance, and actions by the System Designer and Owner shall not be construed as undertaking supervisory control of the work or of methods and means employed by the Contractor. The System Designer's and Owner's review and observation activities shall not relieve the Contractor from the responsibilities of the Contract Documents.
- C. The fact that the System Designer and Owner does not make early discovery of faulty or omitted work shall not bar the Owner from subsequently rejecting this

work and withholding payment until the Contractor makes the necessary corrections.

- D. Regardless of when discovery and rejection are made, and regardless of when the Contractor is ordered to correct such work, the Contractor shall have no claim against the System Designer or Owner for an increase in the contract price, or for any payment on account of increased cost, damage, or loss.

### 3.07 PROJECT RECORD DOCUMENTS

- A. Provide detailed project record documentation for sections listed in Part 1 in addition to the standard requirements, within 30 days after completion of the work.
- B. Maintain separate sets of redlined drawings that show the exact placement and identification of as-built system components. They may be subject to weekly review by the General Contractor or Owner.

### 3.08 ADDITIONAL CONTRACTOR REQUIREMENTS

- A. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job.
- B. All work areas will be cleaned at the conclusion of the project and no tools or materials shall be left in a manner as to pose a safety hazard.
- C. Projects are not considered finished and will not be paid by Owner until all debris, dust, etc. has been cleaned and removed to the Owner's satisfaction.
- D. Contractor shall remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards, and recycling these materials where possible. Removal of orphaned cable is mandatory.
- E. Contractor shall abide by all Owner Security Policies pertaining to access and conduct while on the Owner's property.
- F. Contractor shall obey all posted speed limits and parking regulations at the Owner's facilities where the work is being performed.
- G. Contractor understands that illegally parked vehicles will be towed, and Contractor is responsible for and will assume all costs associated with towing.

### 3.09 FINAL ACCEPTANCE

- A. The Contractor is required to notify the System Designer and Owner of a proposed appointment for Final Inspection at least 72 hours before the appointment.
- B. Owner may visit site during construction to ensure installation is in compliance with their requirements. Punch items discovered by Owner shall be resolved within 10 days of discovery.
- C. System acceptance shall be defined as that point in time when the following requirements have been fulfilled:
  - 1. All submittals and documentation have been submitted, reviewed, and approved.

2. The complete system has successfully completed all testing requirements.
3. All punch list items have been corrected and accepted.

\*\*\*END OF SECTION\*\*\*



**SECTION 27 05 26****GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS****PART 1 - GENERAL****1.01 SUMMARY****A. Section Includes:**

1. Commercial building grounding and bonding requirements for telecommunications infrastructure.
2. Requirements for bonding and communications cabling, equipment, pathways, spaces, and mounting equipment.

**B. Related Sections:**

1. Section 010000 – General Requirements
2. Section 260526 – Grounding and Bonding for Electrical System
3. Section 270000 – Common Work Results for Communications
4. Section 270529 – Pathways for Communications Systems
5. Section 270553 – Identification for Communications Systems
6. Section 271116 – Communications Room Equipment
7. Section 271513 – Horizontal Cabling
8. Section 274116 – Audiovisual Systems
9. Section 281000 – Access Control and Alarm Management System

**1.02 DEFINITIONS**

- A. AWG – American Wire Gauge – The standardized system for gauging the diameter of round, solid, non-ferrous, electrically-conducting wire.
- B. BBC – Bonding Backbone Conductor – A telecommunication bonding connection which interconnects telecommunications bonding backbones. Formerly known as the grounding equalizer.
- C. BN – Bonding Network – A set of interconnected conductive structures that provides a low impedance path for the associated telecommunications infrastructure.
- D. EF – Entrance Facility – An entrance to a building for both public and private network service cables, including wireless, that includes the entrance point of the building and continues to the entrance room or space.
- E. ESD – Electrostatic Discharge – The sudden flow of electricity between two electrically-charged objects caused by contact, an electrical short, or dielectric breakdown.

- F. Mesh–BN – Mesh Bonding Network – A bonding network to which all associated equipment, such as cabinets, frames, racks, trays, and pathways, are connected using a bonding grid that is connected to multiple points on the common bonding network.
- G. PBB – Primary Bonding Busbar – A busbar placed in a convenient and accessible location and bonded, by means of the Telecommunications Bonding Conductor (TBC), to the building's service equipment (power) ground. Formerly known as the Telecommunications Main Grounding Busbar (TMGB).
- H. RBB – Rack Bonding Busbar – A busbar within a cabinet, frame, or rack.
- I. RBC – Rack Bonding Conductor – A bonding conductor from the rack or Rack Bonding Busbar (RBB) to the Telecommunications Equipment Bonding Conductor (TEBC).
- J. SBB – Secondary Bonding Busbar – A common point of connection for telecommunications system and equipment bonding to ground, located in the distributor room. Formerly known as the Telecommunications Grounding Busbar (TGB).
- K. TBB – Telecommunications Bonding Backbone – The conductor that interconnects the Primary Bonding Busbar (PBB) to the Secondary Bonding Busbar (SBB).
- L. TBC – Telecommunications Bonding Conductor – A conductor that interconnects the telecommunications bonding infrastructure to the building's service equipment (power) ground. Formerly known as the bonding conductor for telecommunications.
- M. TEBC – Telecommunications Equipment Bonding Conductor – A conductor that connects the Primary Bonding Busbar (PBB) or Secondary Bonding Busbar (SBB) to equipment racks or cabinets.
- N. TR – Telecommunications Room – An enclosed space for housing telecommunications equipment, cable terminations, and cross–connect cabling. It is the recognized location of the cross–connect between the backbone and horizontal facilities.
- O. UBC – Unit Bonding Conductor – A bonding conductor from equipment or a patch panel to a Rack Bonding Conductor (RBB) or a Rack Bonding Busbar (RBB).

#### 1.03 SUBMITTALS

- A. Refer to 27 0000.

#### 1.04 CLOSEOUT DOCUMENTS

- A. Refer to 27 0000.
- B. As–Built Data: Plans showing as–built locations of grounding and bonding infrastructure, including the following:
  - 1. PBB, RBB, and routing of their bonding conductors

## PART 2 - PRODUCTS

## 2.01 GENERAL

- A. Comply with TIA 607.
- B. Conductors shall comply with UL 486A–486B.

## 2.02 CONDUCTORS

- A. The Telecommunications Bonding Conductor (TBC) shall be a UL-listed, stranded conductor insulated with a green jacket. The TBC shall be equal in size to the TBB specified elsewhere in this Section.
- B. The Equipment Bonding Conductors (EBCs)
  - 1. Shall be #14AWG or larger stranded conductor with a green insulating jacket for all metallic components entering the telecommunications room.
  - 2. Manufacturer:
    - a) General Cable
    - b) Southwire
    - c) Panduit
    - d) Or equal
- C. Bonding Conductor (BC)
  - 1. Shall be #6 insulated (green) stranded copper conductor.
  - 2. Manufacturer:
    - a) General Cable
    - b) Southwire
    - c) Panduit
    - d) Or equal
- D. Rack Bonding Conductor Kits (RBC):
  - 1. Bonds the rack or cabinet to the telecommunications grounding busbar (PBB or SBB).
  - 2. Jumper kits available with both ends factory terminated to provide a bolt-on solution.
  - 3. Jumper kits available with one end factory terminated to attach to the rack or cabinet; free end accommodates unique length requirements.
  - 4. Engineered to comply with US and international grounding requirements.
  - 5. Shall be #6AWG or larger stranded conductor with a green insulating jacket.
  - 6. Manufacturer:
    - a) General Cable

- b) Southwire
- c) Panduit
- d) Or equal

E. Equipment Jumper Kits (Unit Bonding Conductor or "UBC"):

1. Used to ground large, chassis-style rack mounted equipment that have built-in grounding pads or terminals.
2. Bond network equipment to grounding strip or grounding busbar.
3. Jumper kit available with both ends factory terminated to provide a bolt-on solution.
4. Jumper kit available with one end factory terminated to attach to the grounding strip or grounding busbar; free end accommodates unique equipment terminations.
5. Use jumpers with 90° bent lug, on grounding strip side, for high density grounding requirements up to one ground point per RU.
6. Use jumpers with 45° bent lugs on grounding strip side, for improved cable management.
7. Engineered to comply with US and International grounding requirements.
8. Manufacturer:
  - a) General Cable
  - b) Southwire
  - c) Panduit
  - d) Or equal

F. Surge Suppressor Jumper Kit:

1. Bonds power or data line surge suppressor to grounding strip or grounding busbar.
2. Both ends factory terminated to provide a bolt-on solution.
3. Engineered to comply with US and International grounding requirements.
4. Manufacturer:
  - a) General Cable
  - b) Southwire
  - c) Panduit
  - d) Or equal

G. Armored Cable Grounding Kit:

1. Provides a secure bond to the armor sheath on indoor and indoor/outdoor fiber optic cables at both cassette and enclosure ends.
2. Worm–gear design evenly distributes forces across the armor.
3. Made from steel and aluminum material is compatible with common armor for long term reliability.
4. Black insulating cover protects and hides the connection for an aesthetically pleasing work area.
5. Complies with industry requirements ensuring a high level of reliability and safety.
6. Shall be #14AWG or larger stranded conductor with a green insulating jacket.
7. Manufacturer:
  - a) General Cable
  - b) Southwire
  - c) Panduit
  - d) Or equal

## 2.03 CONNECTORS

- A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A–486B.
- B. Compression Wire Connectors: Crimp–and–compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
- C. Code/Flex Conductor H–TAPs
  1. Used as a splice, or to tap smaller (pigtail) conductors into larger continuous conductors.
  2. Each HTAP terminates a wide range of conductor sizes and combinations of code and flex conductors Class G, H, I and Locomotive to suit a variety of applications.
  3. Slotted design allows quick and easy assembly of conductor to HTAP using cable ties.
  4. Tap grooves are separated from one another, allowing them to function independently so HTAP can be used with single or multiple conductors, providing maximum design and installation flexibility.
  5. Color coded and marked with index numbers for proper crimp die selection.

6. UL Listed and CSA Certified, with wide size range of conductor sizes and rated for applications up to 600 V when crimped with tools and dies, or with other specified manufacturers' crimping tool and dies.
  7. Tin plated to inhibit corrosion.
  8. Available with an assortment of clear covers with integrated label fields.
  9. Manufacturer:
    - a) Panduit
    - b) CPI
    - c) Or equal
- D. Code Conductor, Thin Wall, Tin-plated C-TAP (splice)
1. For copper-to-copper splicing or pigtail tap splicing.
  2. Wide wire range-taking capability minimizes inventory requirements.
  3. Color-coded for proper crimp die selection.
  4. Ribbed design provides high strength.
  5. Made from high conductivity wrought copper.
  6. Tin-plated to inhibit corrosion and oxidation.
  7. UL Listed and CSA Certified with AWG conductor to 600 V and temperature rated to 90°C when crimped with Panduit and specified manufacturers' crimping tools and dies.
  8. Manufacturer:
    - a) Panduit
    - b) CPI
    - c) Or equal
- E. Two-hole, Long-Barrel Compression Lugs for Grounding Conductors
1. Meets TIA-607 requirements for network systems grounding applications.
  2. Tested by Telcordia – meets NEBS Level 3 with AWG conductor.
  3. UL Listed and CSA Certified with AWG conductor for use up to 35 KV\*\* and temperature rated 90°C when crimped with manufacturers' crimping tools and dies.
  4. Color-coded barrels marked with specified manufacturers' die index numbers for proper crimp die selection.
  5. Have long barrel to maximize number of crimps and provides premium wire pull-out strength and electrical performance.

6. Have "inspection window" over tongue to visually assure full conductor insertion.
7. Be tin-plated to inhibit corrosion
8. Available with NEMA and BICSI hole-sizes and spacing
9. Manufacturer:
  - a) Panduit
  - b) CPI
  - c) Or equal

#### 2.04 GROUNDING BUS BARS

##### A. The Primary Bonding Busbar (PBB) shall be:

1. A solid, tinned copper bar, 4 inches wide by 20 inches long by 1/4 inch thick.
2. Meet BICSI and TIA-607 requirements for network systems grounding applications.
3. Employ BICSI hole spacing to fit LCC series 2-hole lugs.
4. Be made of high conductivity copper and tin-plated to inhibit corrosion.
5. Come pre-assembled with brackets and insulators attached for quick installation.
6. Provide component labels, sold separately, to identify busbars to meet TIA-606.
7. Manufacturer:
  - a) Panduit
  - b) CPI
  - c) Or equal

##### B. Grounding Busbar for Enclosures

1. With each enclosure and rack, provide a tinned copper busbar to serve as an extension of the PBB for the equipment in the cabinet.
2. Shall be manufactured from copper alloy.
3. Provide horizontal and vertical busbars.
4. Horizontal Busbars shall be at least .75 inches (19 mm) wide, 19 inches (483 mm) long, and 0.1875 inches (5 mm) thick.
5. Have at least 14, factory-provided #12-24 threaded holes.
6. Have pre-punched EIA 310 D mountings, which match that of the vertical rail, for attachment to the mounting rail.

7. Vertical Busbars shall be at least 0.67 inches (17 mm) wide, 78.65 inches (2 m) long, and 0.05 inches (1.27 mm) thick and come in threaded rail and cage nut versions.
8. Include a hardware kit with rack installation hardware and with screws for bonding equipment to the busbar.
9. Manufacturer:
  - a) Panduit
  - b) CPI
  - c) Or equal

## 2.05 OTHER GROUNDING AND BONDING PRODUCTS

- A. Bronze Grounding Clamps for Conduit:
  1. Used to ground copper conductor parallel to, or at a right angle to a rod, tube, or pipe.
  2. Made from high strength, electrolytic cast bronze.
  3. High strength silicon bronze hardware provides long term reliable assembly.
  4. Accommodates a wide range of pipe, tube, rod and conductor sizes – minimizes inventory.
  5. UL 467 Listed for grounding and bonding with AWG conductor and suitable for direct burial in earth or concrete.
  6. Manufacturer:
    - a) Panduit
    - b) CPI
    - c) Or equal
- B. Copper and Aluminum One-Hole Grounding Lay-in Lug for bonding ladder rack
  1. Used for quick installation of a continuous grounding conductor.
  2. UL 467 Listed for grounding and bonding, copper lugs. UL Listed for direct burial in earth or concrete.
  3. UL Listed for use up to 600 V and temperature rated 90°C
  4. Manufacturer:
    - a) Panduit
    - b) CPI
    - c) Or equal
- C. Universal Beam Grounding Clamp



1. Used to for bonding structural steel (ex: I-beams) into bonding network.
2. Universal, fits on a wide range of standard (angled) and wide flange (parallel) structural steel beams.
3. Provide a mounting pad suitable for a two-hole compression lug.
4. Installs quickly and easily with standard 1/4" key hex wrench tooling.
5. UL 467 Listed and CSA 22.2 Certified for grounding and bonding suitable for direct burial in earth or concrete.
6. Comply with vibration tests per MIL-STD-202G (METHOD 201A).
7. Manufacturer for beam grounding clamps:
  - a) Panduit
  - b) CPI
  - c) Or equal

#### 2.06 LABELING

- A. Comply with TIA-606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
- C. Refer to 270553.

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. Examination
  1. Examine the AC grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of the electrical system.
  2. Inspect the test results of the ac grounding system measured at the point of BCT connection.
  3. Prepare written report, endorsed by Installer, and listing conditions detrimental to performance of the Work.
  4. Proceed with connection of the BCT only after unsatisfactory conditions have been corrected.
- B. Installation
  1. This Specification document describes a generic enterprise Communications bonding and grounding system for the construction of a complete and functioning grounding system without prior knowledge of

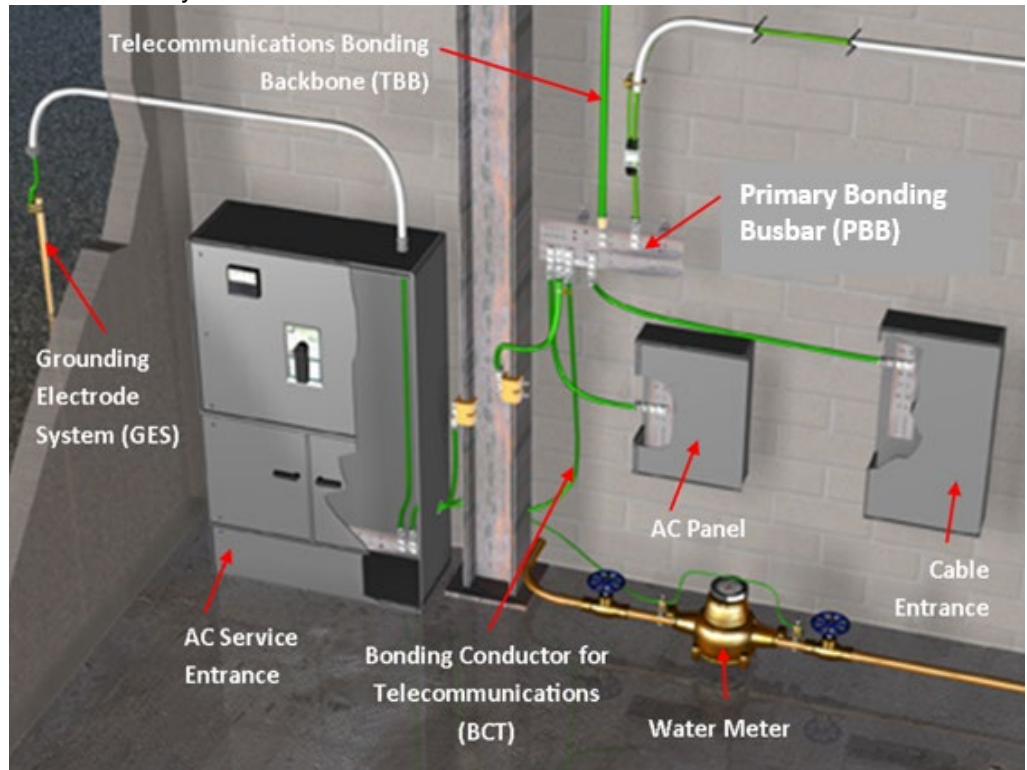
the particular facilities where it will be used. It is the responsibility of the Contractor to adapt these general guidelines and principles to the requirements of the actual environments where the systems are to be implemented.

2. System shall provide equipment ground connections (bonds) from the premises entrance facility and outside-plant earthing system to each telecommunication room's ground busbar, and through the racking systems to bond the network equipment.
3. Entire grounding link from equipment to earth should be visually verifiable except where hidden by walls, conduit, or pathways.
4. Installing contractor shall label all elements of the communications bonding network according to guidelines defined in TIA-607-B and ANSI/TIA 606-B.
5. It is the responsibility of the Contractor to be knowledgeable of all previously cited Standards and Codes and to bring to the Owner's attention any conflicts or discrepancies to achieve a fully functioning, standards-compliant earthing system.
6. Contractors working around or adding to existing legacy systems shall bring to the Owner's attention previously installed network elements that may not comply with modern grounding requirements for possible remediation.

C. Primary Bonding Busbar (PBB):

1. PBB shall be located in the entrance facility, near the electrical panel to which it will be bonded but installed to maintain clearances required by applicable electrical codes.
2. PBB shall be sized according to the anticipated number of bonded connections needed.
3. PBB shall have tinned surface to restrain oxidation and be cleaned and antioxidant paste applied prior to fastening conductors.
4. Connectors on TBB which attach to PBB shall be of two-hole, long-barrel compression lugs of the LCC series as specified in the "Materials" section of this document.
5. Building steel within six feet of the Communications grounding system should be bonded into the system with appropriate hardware listed in "Materials" section of this document.
6. All cables containing a metallic shield or armor shall have that shield properly bonded into the Communications grounding system using the appropriately sized Armored Cable Grounding Kit listed in the "Materials" section of this document.

7. The illustration below depicts for reference the general location and layout of the PBB and associated grounding elements in a typical entrance facility.

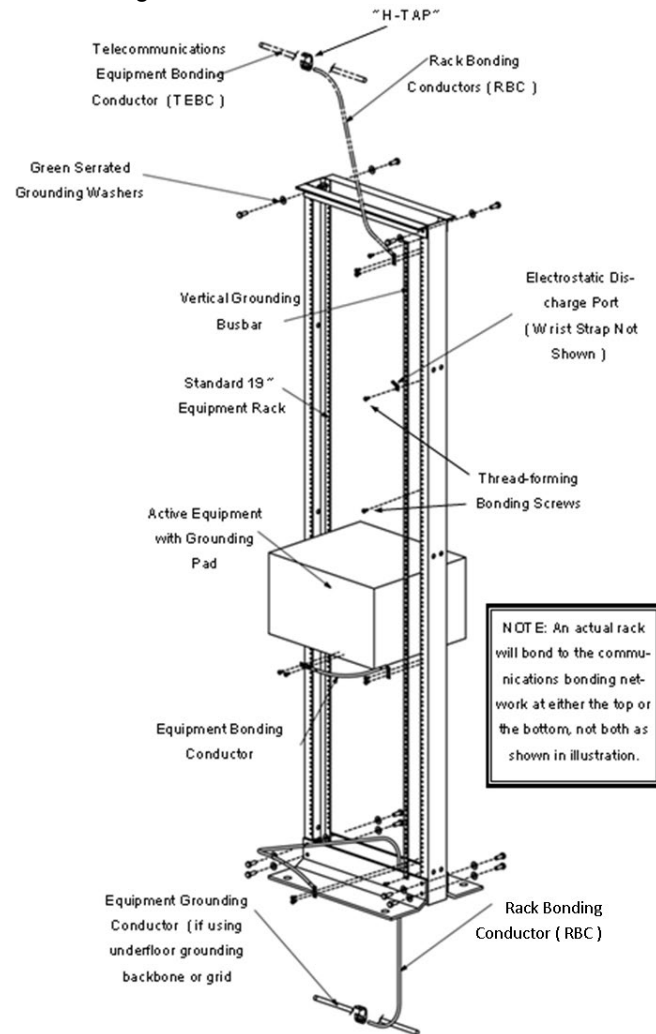


D. Bonding within Cabinets:

1. Racks and Cabinets shall be bonded into the Communications bonding network with conductors of #6 AWG or larger.
2. Racks, cabinets, and similar enclosures shall not be attached serially, (daisy-chained) but must have individual RBC into the grounding system.
3. Newly installed racks and cabinets shall have vertical grounding busbars installed along one rail to provide clean bonding landing point for all rack mount equipment. For part numbers of vertical busbars see "Materials" section of this document. Grounding busbars shall not be isolated from the rack or cabinet.
4. All painted components of racks/cabinets shall be assembled using serrated grounding washers and thread-forming screws to ensure electrical continuity between the different structural components of the rack/cabinet.
5. Larger equipment (chassis switches) with integral grounding terminals or pads shall be bonded to the vertical busbar with equipment grounding kits attached to those terminals and bonding them to the rack-mounted busbars. For kit part numbers see the "Materials" section of this document.

6. Anywhere two metallic surfaces are to be bonded, Contractor shall clean the contact areas of paint or oxidation using abrasive pads and apply film of anti-oxidation compound between surfaces prior to bonding.
7. All cable fittings shall be of two-hole (LCC series) compression-type. Mechanical screw-lugs on racking systems will not be accepted and must be removed and replaced at contractor's expense.
8. All screws used to affix compression lugs to rack-mounted vertical busbars shall be of the thread forming type made specifically for electrical bonding.
9. Smaller equipment (servers, TOR switches) not having integral grounding pads must be bonded to the rack through the equipment mounting flanges using green thread-forming grounding screws with serrations under the head to cut through paint, coatings and oxidation that may be present on the equipment flange. Such equipment shall have minimally one grounding screw per piece of equipment.
10. Existing (installed) racking systems containing live active equipment may be retrofitted for Standards-compliant bonding using rack retrofitting kits listed in the "Materials" section of this document.

11. The following illustration demonstrates how the racks shall be bonded:



### 3.02 FIELD QUALITY CONTROL

- A. On installations confined to a single telecommunications room, the Contractor shall visually verify continuity of Communications bonding system from equipment, through racking systems, to overhead or underfloor backbone to the wall mounted busbar in that telecommunications room.
- B. Contractor shall further verify the use of all appropriate bonding accessories in the racking systems such as grounding washers, thread-forming grounding screws and the presence of electro-static discharge ports and wrist straps within reach of all equipment to be maintained.
- C. On greenfield (new) projects involving installation of a building-wide telecommunications backbone Contractor is further responsible for visually verifying sizing and sound installation of the telecommunications bonding backbone including presence of properly sized and installed grounding equalizer conductors between backbones contained in separate risers.

- D. Contractor shall verify that any conduit longer than 3 feet through which a grounding conductor passes is properly bonded to the grounding conductor as described in this document.
- E. During inspections, Contractor shall verify compliance with all stipulations specified in this document and compliance with all regulatory references (Standards and Codes) cited.
- F. All opens or gaps in the bonding system during final inspections will be recorded in the inspection report and remedied.
- G. During inspections, Contractor shall check all grounding and bonding system conductors and connections for tightness and proper installation, including checking proper dies were used on compression taps and fittings by checking embossed die numbers on those connections.
- H. Owner may request a test of 10% of bonded connections within the grounding system with a volt-ohm meter. Resistance tests taken on either side of a compression or exothermic bond shall be less than 0.2 (2/10) of one ohm in resistance.
- I. Bonded joints to be tested may be random or individually tagged by the Owner.
- J. Contractor shall test system at bonded points indicated and provide results in report form.
- K. Based upon test results, Owner reserves the right to request testing on 100% of exothermic and compression bonds within the installed grounding system.
- L. All bonded connections failing the test described above shall be remedied and retested by the installation contractor at Contractor's expense.

### 3.03 IDENTIFICATION AND ADMINISTRATION

- A. Primary Bonding Busbar (PBB): Label with "PBB".
- B. Bonding Conductor (BC): Label with "WARNING! TELECOMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!" Labels shall be affixed at both ends and at accessible intermediate points.

\*\*\*END OF SECTION\*\*\*

**SECTION 27 05 28****PATHWAYS FOR COMMUNICATIONS SYSTEMS****PART 1 - GENERAL****1.01 SUMMARY****A. Contractor Shall Provide and Install**

1. The materials and labor required for the installation of cable pathway systems include, but are not limited to:
  - a) Conduits and boxes
  - b) Non-continuous cable supports
  - c) Non-metallic cable duct
  - d) Floor boxes
2. Although such work is not specifically mentioned herein or on the Drawings, the Contractor shall furnish and install all miscellaneous items, accessories, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation, without claim for additional payment.

**B. Related Sections:**

1. Section 000000 – Procurement and Contracting Requirements
2. Section 010000 – General Requirements
3. Section 260533.13 – Conduit for Electrical Systems, or similar
4. Section 260533.16 – Boxes for Electrical Systems, or similar
5. Section 270000 – Common Work Results for Communications
6. Section 270526 – Grounding and Bonding for Communications Systems
7. Section 271116 – Communications Room Equipment
8. Section 271323 – Backbone Cabling
9. Section 271513 – Horizontal Cabling
10. Section 271619 – Patch Cords
11. Section 274116 – Audiovisual Systems
12. Section 275113 – Paging System
13. Section 275129 – Two-Way Emergency Communications Systems
14. Section 281000 – Access Control and Alarm Management System
15. Section 282000 – Video Surveillance System

## 1.02 REFERENCES

- A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with latest revision of the NFPA-70 (the National Electrical Code®), state codes, local codes, requirements of Authorities Having Jurisdiction (AHJs), and the following standards, including the most current revisions, addenda, and any Technical Service Bulletins (TSB's) released at the time of bid, including the most recent editions and addenda of the following documents:
1. ANSI/TIA 568 series
  2. ANSI/TIA-569 Telecommunications Pathways and Spaces
  3. ANSI/TIA-606 Administration Standard for Telecommunications Infrastructure
  4. ANSI/TIA-607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
  5. ANSI/TIA-862 Structured Cabling Infrastructure Standard for Intelligent Building Systems
  6. ASTM B 633 – Specification for Electrodeposited Coatings of Zinc on Iron and Steel
  7. ASTM A 653 – Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process
  8. ASTM A 510 – Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
  9. ASTM A 641 – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
  10. IEC 61537 (2006) – Cable Tray Systems and Cable Ladder Systems for Cable Management
  11. ASTM D 3363 - 05 Standard Test Method for Film Hardness by Pencil Test
  12. TIA-TSB-162 Telecommunications Cabling Guidelines for Wireless Access Points
  13. Telecommunications Distribution Methods Manual
  14. Information Transport Systems Installation Methods Manual (ITSIMM)
- B. California Electrical Code (CEC)
- C. OSHA Standards and Regulations
- D. Local Codes and Standards
- E. UL 444 – Standard for Safety of Communications Cable
- F. UL 514C – Standard for Safety for Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers



- G. UL 943 – Ground-Fault Circuit-Interrupters
- H. UL 1449 – Surge Protective Devices
- I. UL 1666 – Standard for Safety of Flame Propagation Height
- J. UL 1682 – Safety Standard for Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type
- K. Local Authority Having Jurisdiction (AHJ)
- L. Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either
- M. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense

#### 1.03 SYSTEM DESCRIPTION

- A. Pathways
  - 1. Pathways are the support system for the infrastructure. All pathways shall conform to the TIA-569-B Commercial Building Standard for Pathways and Spaces. All horizontal and backbone cable shall be properly supported every 48" to 60" inches. Infrastructure Support Systems include, but may not be limited to, the following:
    - a) Conduits, both inside or outside, both above ground or underground, all of which shall be properly supported
    - b) Non-continuous cable supports, which shall be spaced no more than 60" inches apart
    - c) Floor boxes for flexible data and audiovisual inputs

### PART 2 - PRODUCTS

#### 2.01 CONDUITS AND BOXES

- A. Refer to Division 26 Specifications.

#### 2.02 NON-CONTINUOUS CABLE SUPPORTS

- A. Non-continuous cable supports must:
  - 1. Have a cable-bearing surface on the bottom that is at least equal to the full radius of the cable
  - 2. Maintain complete horizontal and vertical bend radius control of 1 inch
  - 3. Have 90° radius edges to prevent damage while installing cables
  - 4. Be designed so that the mounting hardware is recessed to prevent cable damage
  - 5. Have a removable and reusable hook and loop retainer to contain the cables within the hook

- 6. Be factory-assembled for direct attachment to walls, hanger rods, beam flanges, purlins, struts, floor posts, etc. as needed for various on-site conditions
- 7. Be manufactured from a non-conductive material suitable for use in air-handling spaces
- B. Provide separate cabling compartments or where additional capacity is needed, multi-tiered non-continuous cable supports shall be used.
- C. Manufacturer:
  - 1. nVent Caddy
  - 2. Panduit
  - 3. Or equal

#### 2.03 NON-METALLIC CABLE DUCT

- A. Provide pulling grips.
- B. Duct shall:
  - 1. Fit within nominal conduit trade sizes.
  - 2. Be halogen-free.
  - 3. Be resistant to ground chemicals and petroleum products.
  - 4. Be constructed of PET (Polyethylene Terephthalate) and Nylon 6.
  - 5. Number of cells: 3x3
- C. Fabric cable duct:
  - 1. Shall:
    - a) Be fabric construction
  - 2. Manufacturer:
    - a) Maxcell
    - b) Or equal

#### 2.04 FLOOR BOXES

- A. Shall:
  - 1. Be UL-listed and exceed UL water & crush testing requirements.
    - a) Be rated for outdoor environments
  - 2. Have brass, nickel, or aluminum finish.
  - 3. Be made for concrete floors.
  - 4. Have low voltage divider.
  - 5. Have brass, nickel, or aluminum hinged, lockable protective covers

6. Have pre-installed ground wire.
  7. Be recessed/flush style.
- B. Manufacturer:
1. Legrand
  2. Leviton
  3. Or equal

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Provide any necessary screws, anchors, clamps, tie wraps, support hardware, etc. necessary to facilitate the installation of the identification communication system.
- B. Furnish any special installation equipment or tools necessary to properly complete the installation.
- C. Failure to follow the appropriate guidelines may require the installer to provide additional material and labor required to bring the installation back into alignment with the guidelines and to correct, any and all, damage to the cables by the installer during the implementation.
- D. All techniques and fixtures used in the installation must allow for easy maintenance of, and ready access to, all components for test measurements.
- E. No self-tapping screws shall be used.
- F. All parts shall be made of corrosion resistant material, such as plastic, anodized aluminum or brass.
- G. All materials used in installation shall be resistant to fungus growth and moisture deterioration.
- H. All of the pathways shown on the drawings are suggested routes for the Contractor to use as guidelines. Prior to construction, the Contractor shall coordinate in the field with other trades to determine the exact feeder, tie, and riser backbone cabling pathways. In any case where the communication pathway must be removed and re-routed, due to conflicts with other trades with which the Contractor did not previously coordinate, the Contractor is responsible for all costs associated with the removal and relocation.

#### **3.02 NON-CONTINUOUS CABLE SUPPORTS**

- A. The use of non-continuous cable supports as a primary pathway is not permitted.
- B. Non-continuous cable supports shall be used to support horizontal cables from the point of their exit from the main pathway (conduit) to the point of termination.
- C. Follow the manufacturer's recommendations for allowable fill capacity for each size of non-continuous cable support.

- D. Installation and configuration of non-continuous cable supports shall conform to the requirements of the ANSI/EIA/TIA Standards 568-C and 569-B, NFPA 70 (National Electrical Code), and applicable local codes.
- E. Non-continuous cable supports shall be placed straight, following building lines on 48" to 60" (1200 mm to 1500 mm) centers.
- F. Non-continuous cable supports shall be installed every 48" to 60", with a maximum sag of 6".
- G. At no point shall cables rest on acoustic ceiling grids or panels.
- H. Cables shall be supported within 12" of any conduit or raceway entrance.
- I. Non-continuous cable supports shall be attached to walls, purlins, beams, threaded-rod, or other components in strict compliance with all manufacturer Instructions and as directed by the Authority Having Jurisdiction (AHJ).

### 3.03 FLOOR BOXES

- A. Install in accordance with manufacturer's instructions. Test for proper operation. Repair or replace units until satisfactory results are obtained.

\*\*\*END OF SECTION\*\*\*

**SECTION 27 05 36****CABLE TRAY****PART 1 - GENERAL****1.01 SUMMARY**

- A. Contractor Shall Provide and Install
  - 1. Cable tray
  - 2. Cable runway
- B. Related Sections:
  - 1. Section 000000 – Procurement and Contracting Requirements
  - 2. Section 270000 – Common Work Results for Communications
  - 3. Section 270526 – Grounding and Bonding for Communications Systems
  - 4. Section 270528 – Pathways for Communications Systems

**1.02 REFERENCES**

- A. ASTM International:
  - 1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - 2. ASTM A653/A653M - Standard Specification for Steel Sheet, ZincCoated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - 3. ASTM A1011 – Specification for Steel, Sheet and Strip, Hot- Rolled, Carbon, Structural, High-Strength Low-Alloy and High Strength Low Alloy with Improved Formability (Formally ASTM A570 & A607)
  - 4. ASTM A1008 – Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, high-Strength Low-Alloy and high-Strength Low-Alloy with Improved Formability (Formally ASTM A611)
  - 5. ASTM B633 – Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- B. National Electrical Manufacturers Association:
  - 1. NEMA VE 1- - Metal Cable Tray Systems
  - 2. NEMA VE 2- - Cable Tray Installation Guidelines

**1.03 QUALITY ASSURANCE**

- A. All cable and equipment shall be installed in a neat and professional manner. All methods of construction that are not specifically described or indicated in the

contract documents shall be subject to the control and approval of the owner or owner's representative.

- B. Distributors to supply all equipment and accessories new and free from defects.
- C. Distributors to supply all equipment and accessories in compliance with the applicable standards listed in Part 1 of this section and with all applicable national, state, and local codes.
- D. Distributors to supply all items of a given type shall be the products of the same manufacturer.
- E. Manufacturer to comply with NEMA Standards Publication Number VE1, "Cable Tray Systems".
- F. NEC Compliance: Contractor to comply with NEC, as applicable to construction and installation of cable tray and cable channel systems (Article 392 NEC).
- G. UL Compliance: Manufacturer to provide products that are UL-classified and labeled.
- H. NFPA Compliance: Contractor to comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems

#### 1.04 SUBMITTALS

- A. Make submittals in accordance with:
  - 1. Section 00 00 00 – Procurement and Contracting Requirements
  - 2. Section 01 33 00 – Submittal Procedures.
  - 3. Section 27 00 00 – Common Work Results for Communications
- B. Action Submittals:
  - 1. Shop Drawings
    - a) Indicate tray type, dimensions, support points, and finishes.
    - b) Include accessories such as clamps, brackets, hanger rods, splice plate connectors, expansion join assemblies, and fittings.
    - c) Tray routes shall be coordinated with trades prior to submission.
  - 2. Product submittal
    - a) Catalog cut sheets and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication, material finishes, fittings, and accessories. Clearly indicate on each sheet what is being submitted on.

#### 1.05 CLOSEOUT DOCUMENTS

- A. As-built documentation of final routing of cable tray and locations of support structures.

**PART 2 - PRODUCTS****2.01 GENERAL**

- A. Except as otherwise indicated, provide metal cable trays, of types, classes and sizes indicated; with splice plates, bolts, nuts, and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards.
- B. Material and finish specifications for each tray type are as follows:
  - 1. Aluminum: Straight section and fitting side rails and rungs shall be extruded from Aluminum Association Alloy 6063. All fabricated parts shall be made from Aluminum Association Alloy 5052.
  - 2. Pre-galvanized Steel: Straight sections, fitting side rails, rungs, and covers shall be made from steel meeting the minimum mechanical properties and mill galvanized in accordance with ASTM A653 SS, Grade 33, coating designation G90.
  - 3. Hot-dip Galvanized Steel: Straight section and fitting side rails and rungs shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 for 14 gauge and heavier, ASTM A1008, Grade 33, Type 2 for 16 gauge and lighter, and shall be hot-dip galvanized after fabrication in accordance with ASTM A123. All covers and splice plates must also be hot-dip galvanized after fabrication; mill galvanized covers are not acceptable for hot-dipped galvanized cable tray. All hot-dip galvanized after fabrication steel cable trays must be returned to point of manufacture after coating for inspection and removal of all icicles and excess zinc. Failure to do so can cause damage to cables and/or injury to installers.
  - 4. Stainless Steel: Straight section and fitting side rails and rungs shall be made of AISI Type 304 or Type 316 stainless steel.
- C. Cable tray shall be capable of carrying a uniformly distributed load of 75 lbs. /ft. on a 10-foot support span with a safety factor of 1.5 when supported as a simple span and tested per NEMA VE1 Section 5.2.

**2.02 CABLE RUNWAY**

- A. Manufacturer: RXL
  - 1. 1050-BK12
- B. Cable runway system shall be a modular system of ladder, turns, splices, supports, and accessories able to be assembled with couplers.
- C. Powder coat paint in black.
- D. Cable runway shall be nominally sized 12" width.
- E. Provide and install the following components and additional accessories as necessary for a complete system:

1. Overhead mounting equipment (thread-rod, unistrut, nuts, washers, etc.) suitable for the supporting structural elements
2. Cable runway section couplers (splices)
3. Cable runway radius bends
4. Ground strap kits
5. Splice kits
6. End protectors
7. Vertical and horizontal turns
8. Corner brackets
9. Triangular support brackets

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Contractor or approved sub-contractor to remove exposed abandoned cable tray, including abandoned cable tray above accessible ceiling finishes. Remove supports. Cut wire basket cable tray flush with walls and floors, and patch surfaces.

#### **3.02 INSTALLATION**

- A. Cable runway sections shall be bonded together with bonding conductors and the system bonded to the bonding busbar in the space. Abide by manufacturer's specifications.
- B. Install as indicated: Installation shall be in accordance with equipment manufacturer's instructions, and with recognized industry practices to ensure that cable tray equipment comply with requirements of NEC and applicable portions of NFPA 70B. Reference NEMA-VE2 for general cable tray installation guidelines.
- C. Coordinate with other electrical work as necessary to properly integrate installation of cable tray work with other work.
- D. Provide sufficient space encompassing cable trays to permit access for installing and maintaining cables.
- E. Fitting supports shall be located such that they meet the strength requirements of straight sections. Install fitting supports per NEMA VE-2 guidelines, or in accordance with manufacturer's instructions.
- F. In order for a system to be approved as an equipment ground conductor (EGC), all splicing assemblies shall be UL Classified or CSA approved as an EGC. For adjustable splices and expansion areas, copper bonding jumpers must be used when using the system as an EGC.
- G. Support and fasten to structure. Install supports at each connection point, at end of each run, and at other points to maintain spacing between supports of 5 feet maximum. Use manufacturer recommended size for cantilever brackets.



Installation of oversized or undersized cantilever brackets may lead to system failure.

- H. Cable runway shall not be center hung.
- I. Cable runway shall be free of burrs and sharp edges. Polish off edges, so that the cable tray is smooth.
- J. Divided cable runs shall be kept separate with a solid barrier.

### 3.03 CABLE RUNWAY INSTALLATION

- A. Install with side stringers facing down so the runway forms an inverted U-shape and that the hardware between the stringers and cross members face away from cables.
- B. Secure to the structural ceiling, building truss system, wall, floor or tops of equipment racks and/or cabinets using the manufacturer's recommended supports and appropriate hardware, as defined by local code or the authority having jurisdiction (AHJ).
  - 1. Secure to each support with included hardware with a minimum of two fasteners.
  - 2. Support requirements:
    - a) 5 feet (1.5 m) or less in accordance with TIA-569-B.
      - 1) Splices: Within 2 feet (0.6 m)
      - 2) Intersections: Within 2 feet (0.6 m) on all sides of every intersection.
      - 3) Changes in Elevation: Within 2 feet (0.6 m) on both sides.
      - 4) Attached vertically to wall: 2 feet (0.6 m).
  - 3. Splices: Place mid-span, not over a support, with the manufacturer's recommended splice hardware.
  - 4. Overhead installation clearances:
    - a) Above runway: 12 inches (300 mm) minimum.
      - 1) From building or ceiling structure: 12 inches (300 mm) minimum.
      - 2) Between runway and the top of equipment racks and/or cabinets: 3 inches (75 mm).
      - 3) Multiple runway tiers: 12 inches (300 mm) minimum.
      - 4) Above acoustical ceilings: 3 inches (75 mm).
  - 5. Cable fill tolerances:
    - a) Maximum: 6 inches (150 mm) high.

- 1) Over 2-inch (50 mm) outside diameter or non-secured cables: Install 8-inch (200 mm) high cable retaining posts or 6-inch (150 mm) high pathway dividers.
- b) Quantity of cables:
  - 1) Not to exceed a whole number value equal to 50 percent of the interior area of the cable runway, divided by the cross-sectional area of the cable. The interior area of cable runway will be considered to be the width of the cable runway multiplied by a height of 2 inches (50 mm), unless cable retaining posts/pathway dividers are added to the runway. The interior area of cable runway equipped with cable retaining posts/pathway dividers will be considered to be the width of the cable runway multiplied by a height of 6 inch (150 mm). Actual cable fill for cable runway that is not equipped with cable retaining posts/pathway dividers will not exceed 2 inches (50 mm) in height. Actual cable fill for cable runway equipped with cable retaining posts/pathway dividers will not exceed 6 inch (150 mm) in height.
- c) Weight of cables:
  - 1) Not to exceed the stated load capacity of the cable runway as stated in the manufacturer's product specifications or design tables.
6. Secure cables (cable bundles) to the cross members with reusable straps.
7. Cover the exposed ends of the cable runway that do not terminate against a wall, the floor, or the ceiling with fire-retardant black colored end caps made from a rubberized material or an end closing kit consisting of a flat bar of cable runway stringer material factory cut to the width of the cable runway and secured to the cable runway with a junction splice kit.
8. Separate different cable media types within the cable runway using pathway dividers. Treat each type of cable media separately when determining cable fill limits.
9. Where cable exits or enters the end, middle or side of overhead cable runway to access a rack, frame, cabinet or wall-mounted rack, cabinet or termination field, a radius drop shall be used to guide the cable.
10. Maintain a minimum separation of 2 feet (0.6 m) between cable runway used for communications cables and pathways for other utilities or building services.
11. Touch-up paint color-matched to the finish on the component and will correct any minor cosmetic damage (chips, small scratches, etc.) resulting from normal handling during the installation process prior to delivery to the owner. If a component is cosmetically damaged to the

extent that correction in the field is obvious against the factory finish, the component will be replaced with a new component finished from the factory. If a component is physically damaged due to mishandling or modification during the installation process, it shall not be used as part of the cable runway system.

#### 3.04 TESTING

- A. Test cable trays to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. See NFPA 70B for testing and test methods.
- B. Manufacturer shall provide test reports witnessed by an independent testing laboratory of the "worst case" loading conditions outlined in this specification and performed in accordance with the latest revision of NEMA VE-1; including test reports verifying rung load capacity in accordance with NEMA VE-1, Section 5.4.

\*\*\*END OF SECTION\*\*\*

## ONTARIO SPORTS EMPIRE

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**SECTION 27 05 53****IDENTIFICATION FOR COMMUNICATIONS SYSTEMS****PART 1 - GENERAL****1.01 SUMMARY****A. This Section includes:**

1. The supply, delivery, supervision, coordination, and installation of equipment items specified herein and shown on the Drawings.
2. The documentation and instruction for completing the Identification for Communication Systems.

**B. Related Sections:**

1. Section 000000 – Procurement and Contracting Requirements
2. Section 010000 – General Requirements
3. Section 260526 – Grounding and Bonding for Electrical System
4. Section 270000 – Common Work Results for Communications
5. Section 270526 – Grounding and Bonding for Communications Systems
6. Section 270528 – Pathways for Communications Systems
7. Section 271116 – Communications Room Equipment
8. Section 271323 – Backbone Cabling
9. Section 271513 – Horizontal Cabling
10. Section 271619 – Patch Cords

**1.02 SYSTEM DESCRIPTION****A. The Contractor will provide and install identification labeling for the project's communications systems, including all components from the TR to the work outlet and between telecommunications spaces.****B. Identification**

1. In addition to the general requirements above, the Contractor shall submit the following additional data:
  - a) Cable identification numbers scheme for all installed items.
  - b) Cable identification matrix

**PART 2 - PRODUCTS****2.01 LABELING**

- A. Labels shall be compliant with Owner's labeling standards. Devices shall have unique alphanumeric identifiers.
- B. Handwritten labels will be rejected.
- C. Comply with TIA-606 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- D. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
- E. Label shall be black typeface on white tape.
- F. Manufacturer:
  - 1. Brother PT-D400
  - 2. Or equal

## 2.02 TELECOMMUNICATION SPACE LABELING

- A. Refer to Owner's labeling standards.

## 2.03 COMMUNICATIONS ROOM EQUIPMENT

- A. Refer to Owner's labeling standards.
- B. Refer to 27 11 16 for additional requirements.
- C. Label components where they are administrated (i.e. punch down points, panels, wall blocks, faceplates, etc.)
- D. Fiber enclosures shall clearly indicate type of fiber cable terminated: singlemode or multimode.

## 2.04 CABINET LABELING

- A. Refer to Owner's labeling standards.
- B. Label front of rack with unique alphanumeric identifier.

## 2.05 PANEL LABELING

- A. Refer to Owner's labeling standards.
- B. Label front of panel with unique alphanumeric identifier.

## 2.06 CABLE LABELS

- A. Refer to Owner's labeling standards.
- B. Cables labels are identified with information that defines the connection between the near end panel connection and the far end panel connection.
- C. Label cables within 3" from termination on both ends of cable. Label shall match faceplate label.

- D. Label fiber cables 12" from where cable enters enclosure with a label that identifies the cable's origin and destination.
  - 1. Label corresponding fiber strand pairs.
  - 2. Labels shall note the strand's color, origin, and destination. Origin and destination shall include room name.
- E. The near end connection is the connection that is closest to the Main Distribution Area (MDA) in the network topology. A near end connection identifier would consist of the cabinet/rack location, panel location, and port location.
- F. The far end connection identifier would consist of the cabinet/rack location, panel location, and port location.
- G. A typical cable label would have information in the following scheme:
  - 1. This identifier would be decoded to define the cable connects between cabinet AB04 panel 24 port 01 going to cabinet AB07 panel 36 port 13. The far end of the cable would have a label that would have the same information.

#### 2.07 PATCH CORD/EQUIPMENT CORD LABELS

- A. Refer to Owner's labeling standards.
- B. Refer to 27 16 19 for additional requirements.
- C. Patch cord/equipment cord labels are identified with information that defines the connection between the near end patch panel front connections and the far end patch panel front connections or equipment connections.
- D. A near end connection identifier would consist of the cabinet/rack location, panel location, and port location.
- E. The far end connection identifier would consist of the cabinet/rack location, panel location, and port location.

#### 2.08 GROUNDING AND BONDING

- A. Refer to Owner's labeling standards.
- B. Refer to 270526 for additional requirements.
- C. Labeling of the Ground and Bonding system involves the identifications of the Primary Bonding Busbars, Secondary Bonding Busbars, Conductors Connecting Busbars, Conductors Connecting Devices to Busbars and Equalizing Conductors.
- D. The typical scheme for the primary bonding busbar would be:

1-B301-PBB

  - 1. This identifier can be decoded to define that this is the primary bonding busbar located on floor 1 in space B301.
- E. The typical scheme for the busbar connections would be:

## 1-B301-RBB/2-R201-SBB

1. This identifier can be decoded to define that this is the conductor that connects the primary bonding busbar located on floor 1 in space B301 to the secondary bonding busbar on floor 2 in space R201.

**PART 3 - EXECUTION**

## 3.01 GENERAL

- A. Provide any necessary screws, anchors, clamps, tie wraps, support hardware, etc. necessary to facilitate the installation of the identification communication system.
- B. Furnish any special installation equipment or tools necessary to properly complete the installation.
- C. Failure to follow the appropriate guidelines may require the installer to provide additional material and labor required to bring the installation back into alignment with the guidelines and to correct, any and all, damage to the cables by the installer during the implementation.
- D. All techniques and fixtures used in the installation must allow for easy maintenance of, and ready access to, all components for test measurements.
- E. No self-tapping screws shall be used.
- F. All parts shall be made of corrosion resistant material, such as plastic, anodized aluminum or brass.
- G. All materials used in installation shall be resistant to fungus growth and moisture deterioration.

## 3.02 SYSTEM ADMINISTRATION

- A. All components of the installed system shall be uniquely identified by location, function, unit, and sub-unit.
- B. Each location shall be identified by a unique alphanumeric identifier.
- C. Each equipment enclosure in the building shall be assigned a unique alphanumeric identifier.
- D. Each adapter module installed in each distribution or interconnect enclosure shall be identified by an alphanumeric identifier.
- E. All conduits, trays, and pathways shall be identified by a unique alphanumeric identifier.
- F. Optical fiber cables shall be identified by a textual label, which indicates its type, strand count, point of origin, and termination.
- G. Supply all records in compliance with ANSI/TIA 606.
- H. Provide a database, compliant with Open Database Connectivity (ODBC), for administration of the Structured Cabling System described herein.

## 3.03 IDENTIFICATION



- A. Prior to the installation or termination of cabling, confirm all specific labeling requirements with the Owner or the Owner's Engineer.
- B. Cables
  - 1. Mark backbone cables at each endpoint and at all intermediate pull points, access points, and junction boxes. Labels shall indicate the origination and destination identifier, the sheath identifier, and the strand or pair range.
  - 2. Horizontal cables shall be marked at each end, on the sheath indicating the TR, patch panel and panel port to which the cable is wired.
- C. Faceplates, Patch Panels, and Wiring Blocks
  - 1. Mark Fiber Distribution Enclosures (FDEs) with adhesive labels that indicate the range of circuits installed within. Label each port with the origination and destination grid identifier and the individual strand ID.
  - 2. Label patch panels alphabetically or numerically. Individual ports shall come from the factory pre-labeled with a general number designation.
  - 3. Label each faceplate to indicate, for each cable that it houses, the TR, patch panel, and panel port to which the cable is wired.
  - 4. Label each wiring block numerically, beginning at the top left of the termination field. Within each block, identify the individual rows alphabetically, beginning at the top left and proceeding sequentially down and to the right. Label each row with the corresponding cable identifier and label each pair or circuit on each cable.
  - 5. Fit each cable with a self-laminating label, bearing the appropriate cable identifier, that surrounds the outermost jacket. Place the label at each end of the cable, within 3 inches (75 mm) of the end of the sheath.
  - 6. Fit each equipment enclosure with a self-adhesive label bearing its respective identifier, affixed to the top center of the front and rear doors.
  - 7. Fit each FDE with a self-adhesive label, bearing its respective identifier in block characters, affixed at the top center of the front and rear faces.
  - 8. Fit each adapter inside enclosures with a label bearing its identifier, affixed directly adjacent to its shortest side. Rotate characters so that their orientation is kept left to right, top to bottom.
  - 9. Label conduits and pathways within 0.5 m (18 inches) of each end, where exposed and accessible. It is recommended that additional labeling be provided every 3 m (10 feet) of exposed length.
  - 10. Fit network equipment with a label, placed in an accessible area on the front and rear, bearing the appropriate identifier, MAC address, and date of installation. The label shall not interfere with the operation of or interface to the unit, nor shall it obscure manufacturer's labels.

\*\*\*END OF SECTION\*\*\*

## ONTARIO SPORTS EMPIRE

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**SECTION 27 11 16****COMMUNICATIONS ROOM EQUIPMENT****PART 1 - GENERAL****1.01 SUMMARY**

- A. Contractor Shall Provide and Install
  - 1. The Contractor shall furnish and install telecommunications passive equipment, including:
    - a) Cabinets
    - b) Racks
    - c) Fiber Distribution Enclosures
    - d) Copper & Fiber Patch Panels
    - e) Cable Management
    - f) Uninterruptible Power Supplies
- B. Although such work is not specifically mentioned herein or on the Drawings, the Contractor shall furnish and install all miscellaneous items, accessories, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation, without claim for additional payment.
- C. The Contractor shall provide system demonstration, system documentation, and instruction of Owner personnel, without claim for additional payment.
- D. Related Sections:
  - 1. Section 000000 – Procurement and Contracting Requirements
  - 2. Section 000000 – Procurement and Contracting Requirements –
  - 3. Section 010000 – General Requirements
  - 4. Section 260526 – Grounding and Bonding for Electrical Systems
  - 5. Section 270000 – Common Work Results for Communications
  - 6. Section 270526 – Grounding and Bonding for Communications Systems
  - 7. Section 270553 – Identification for Communications Systems
  - 8. Section 271323 – Backbone Cabling
  - 9. Section 271513 – Horizontal Cabling
  - 10. Section 271116 – Patch Cords

## 1.02 SYSTEM DESCRIPTION

- A. This document describes the products and execution requirements relating to furnishing and installing Communications Equipment Room Fittings.

## PART 2 - PRODUCTS

### 2.01 RACKS

- A. Racks shall be used to provide a neat and efficient means for routing and protecting cables, patch cords and power cables in cabinets for server applications.
- B. Racks shall have provisions for routing cables from overhead, and shall accept horizontal cable managers, and cable management accessories used throughout the cabling system.
- C. Racks and accessories shall be provided to support Owner's requirements.
- D. Provide mounting accessories.
- E. Racks shall have the following attributes:
1. Black powder coated and constructed of steel
  2. Adjustable front and rear cage nut equipment rails with rail position markers
  3. Rack unit markers
    - Floor mount brackets
    - 19" loading width
- F. Manufacturer:
1. 4-post racks
    - a) RXL #2410-BK7042T
  2. 2-post racks
    - a) RXL #2200-BK-70-T
  3. Or equal

### 2.02 FLOOR-MOUNT CABINETS

- A. Cabinet shall be used to provide a neat and efficient means for routing and protecting cables, patch cords and power cables in cabinets for server applications.
- B. Cabinets shall have provisions for routing cables from overhead, and shall accept horizontal cable managers, and cable management accessories used throughout the cabling system.

- C. Cabinets shall protect network investment by enclosing cabling and equipment, maintaining system performance, and controlling cable bend radius.
- D. Shelves and accessories shall be provided to support Owner's requirements.
- E. Server and switch cabinets shall have the following attributes:
  - 1. Black powder coated and constructed of steel
  - 2. Adjustable front and rear cage nut equipment rails with rail position markers
  - 3. Rack unit markers
  - 4. 45 Rack units
  - 5. Fan trays at any RU level
  - 6. Single hinge perforated front/rear door with perforated openings
  - 7. Lockable doors
  - 8. PDU Brackets
  - 9. Fully electrically bonded – equipment rails, door, and side panels
  - 10. Single point bonding at top and bottom of cabinet
  - 11. Floor mount brackets
  - 12. Static Load Rating - 3000 lbs.
  - 13. 84"H x 24"W x 32"D
- F. Manufacturer:
  - 1. RXL 5550

## 2.03 WALL-MOUNT CABINETS

- A. Cabinet shall be used to provide a neat and efficient means for routing and protecting cables, patch cords and power cables in cabinets for server applications.
- B. Cabinets shall provide provisions for mounting patch panels and Power Outlet Units (POUs) vertically without blocking the area behind the servers, vertical blanking panels on the outside of the cabinet frame to prevent cold aisle air from bypassing the servers to the hot aisle.
- C. Cabinets shall have provisions for routing cables from overhead, and shall accept horizontal cable managers, and cable management accessories used throughout the cabling system.
- D. Cabinets shall protect network investment by enclosing cabling and equipment, maintaining system performance, and controlling cable bend radius.
- E. Shelves and accessories shall be provided to support Owner's requirements.
- F. Server and switch cabinets shall have the following attributes:

1. Black powder coated and constructed of steel
2. Adjustable front and rear cage nut equipment rails with rail position markers
3. Rack unit markers
4. 18 Rack units
5. Single hinge perforated front/rear door with perforated openings
6. Lockable doors
7. PDU Brackets
8. Fully electrically bonded – equipment rails, door, and side panels
9. Static Load Rating - 300 lbs.

G. Manufacturer:

1. RXL 4500-BK1823GT
2. Or equal

2.04 HORIZONTAL CABLE MANAGEMENT

- A. Horizontal cable management devices will provide containment and concealment of interconnect or equipment cordage in an enclosure or rack, guide patch and equipment cords between the vertical cable manager and individual connections and allow access for cables without blocking the jacks
- B. The horizontal cable manager will be of an appropriate size to accommodate cabling requirements. A single horizontal cable manager may be used to support multiple patch panels, if it can accommodate cable fill requirements.
- C. The horizontal cable manager shall:
  1. Be manufactured of composite materials
  2. Have a color that matches the rack or enclosure
  3. Provide 1 RU of horizontal cable management for every RU of connectivity
  4. Match the rack-mount width of the racks, frames, or cabinets that it serves
  5. Attach to the front or rear of the equipment mounting rail with screws and will be of a size that fits within standard EIA 310 spacing
  6. Fitted with a removable cover, hinged to open up or down, that will snap on to secure the cover in the closed position
  7. Have bend-limiting slots or holes at the rear to facilitate front-to-rear cabling through the horizontal manager

8. Have bend-radius-controlling T-shaped or L-shaped cable guides, along the top and bottom surfaces
9. Have evenly-spaced cable openings, with rounded edges to protect cables, between the cable guides to allow cables to enter and exit the cable manager in a neat and orderly fashion

D. Manufacturer: Leviton

1. 1RU front & rear w/ cover: 491RU-HFR
2. 1RU front only w/ cover: 491RU-HFO
3. 2RU front & rear w/ cover: 492RU-HFR
4. 2RU front only w/ cover: 492RU-HFO
5. 1RU blank panel: 49254-BP1

## 2.05 VERTICAL CABLE MANAGERS

A. Vertical cable managers shall:

1. Be double-sided H-shaped trough with a front door and a rear door.
2. Front and rear sides of the cable manager have T-shaped cable guides separated by openings that align with each U space on the rack.
3. Middle of the manager shall have a vertical support member with an integrated vertical track that shall allow quick attachment and vertical adjustment of cable management accessories inside the manager.
4. Center of the manager will also have openings along both sides of the support to allow easy cable pass-through.
5. Have doors be supported from the tops and bottoms of the cable manager be opened and secured in the closed position with a single lever/latch.
6. Width: 6 inches (150 mm)
7. Depth: 15.5 inches (394 mm)
8. Height: 72 inches (1.8 m)
9. Finishes and colors: Powder coat paint in black. T-shaped cable guides are black.

B. Accessories:

1. Half Spool Kit.
2. Rotating Management Finger Kit.
3. Cable Bundle Swivel Kit.

4. Dual PDU Bracket.
5. Solid Side Panel.
6. Solid Mid Panel for Double-Sided Vision.

C. Manufacturer: Leviton

1. 8980L-VFR
2. 4980L-VFR

## 2.06 MODULAR PATCH PANELS

A. Patch panels for modular field termination of Category 6 or 6A Unshielded Twisted Pair (UTP) cable shall:

1. Be angled modular components with a capacity of 48 connections
2. Made of a steel frame with black powder coat finish
3. Have space on the front for labeling and identification
4. Accept a variety of media and connectivity components, including UTP, optical fiber, and audio/visual components
5. Be made by an ISO 9001 Certified Manufacturer

B. Manufacturer: Leviton

1. 2RU 48-port, angled: 49256-H48
2. Rear cable management bar: 49006-AMB

## 2.07 FIBER DISTRIBUTION ENCLOSURES

A. Fiber distribution enclosures shall:

1. Be 1, 2, or 4RU.
2. Accept a variety of adapter plates, plug-and-play modules.
3. Have sliding trays.
4. Manufacturer: Leviton
  - a) 1RU: 5R1UH-S03
  - b) 2RU: 5R2UH-S06
  - c) 4RU: 5R4UH-12

## 2.08 COPPER PATCH PANELS

A. Patch panels for modular field termination of Category 6 or 6A Unshielded Twisted Pair (UTP) cable shall:



1. Be angled modular components with a maximum capacity of 48 connections per RU
  2. Made of a steel frame with black powder coat finish
  3. Have space on the front for labeling and identification
  4. Accept a variety of media and connectivity components, including UTP, optical fiber, and audio/visual components
  5. Be made by an ISO 9001 Certified Manufacturer
- B. Manufacturer: Leviton
1. 2RU 48-port, angled: 49256-H48
  2. Rear cable management bar: 49006-AMB

## 2.09 UNINTERRUPTIBLE POWER SUPPLY

- A. Refer to Owner's standards.
- B. UPS will provide temporary power in the event of a power outage until emergency is activated or main building power is restored.
- C. UPS will be sized to accommodate power loads of the systems it serves with an 8-hour runtime.
- D. Accessories will be provided for installation.
- E. UPS shall:
1. Be rack-mounted
  2. Be viewable and configurable via web management software
  3. Be minimum 3kVA
  4. Have 3-year warranty
  5. Min 3000 kVA
  6. Be rated for up to 149 degrees Fahrenheit. See temperature rating for outdoor enclosures
  7. Manufacturer:
    - a) Xtreme Power P91-5K
    - b) CPI VD3000A
      - 1) Batteries: CPI VXBP7

## 2.10 POWER DISTRIBUTION UNIT

- A. Power distribution unit shall:

1. Be unmetered 120V, 20A
2. Have a minimum of (10) 5-20R receptacles
3. Have circuit breaker protection
4. Have LED indicators
5. Manufacturer: Leviton
  - a) P1021-12S

## 2.11 OUTDOOR ENCLOSURES

A. Outdoor enclosures shall be the following types:

B. Type 1: CPI RM1065341

1. RMR free-standing enclosure (A54)
2. Type 4X
3. Type 304 stainless steel
4. Height: ~~48" (1219 mm)~~ 52" (1321mm)
5. Width: 36" (914 mm)
6. Depth: 41" (1041mm)
7. Solid single front door with swing handle latch with removable lock core, door switch installed
8. Solid single rear door with swing handle latch with removable lock core, door switch installed
9. Square-punched rails installed 2 pair 25U
10. (2) vertical cable finger managers installed on the front left and right rails
11. Busbar kit, rack, vertical, 1/4 in wx5/8 in hx72 in I installed on the rear left rail (40161-036)
12. Bottom mounted gland plate installed
13. 100mm plinth

C. Type 2: RM1065149

1. RMR free-standing enclosure (A54)
2. Type 4X
3. TYPE 304 STAINLESS STEEL
4. Height: ~~52" (1321mm)~~ 48" (1219mm)
5. Width: 72" (1829 mm)

6. Depth: 41" (1041mm)
7. Solid double front door with 3pt latch and CH751 lock
8. Solid double rear door with 3pt latch and CH751 lock
9. Square-punched rails installed on the left side two pairs 24RMU
10. (4) short finger managers installed in the front left and right rear left and right
11. (2) rear adjustable panels installed on the left side front and rear
12. (2) bottom mounted gland plates installed center of each compartment
13. Provisions on the left side to mount one cooling unit DTS 3185 5000-7000 btu 115vac, stainless steel. Cooling unit sold separately
14. Finish: type 304 ss #4 brushed
15. Door stop kit qty: 4 installed one on each door
16. Grounding kit qty: 4 (uninstalled)
17. Horizontal rack ground bar installed in RMU 24 rear rails (10610-019)
18. Note: cooling unit sold separately (RM1063518)
19. Cool ~1.5kw of heatload with a maximum ambient temperature of ~95 degrees f and an internal maximum temperature of ~95 degrees f

D. Type 3: CPI RM1064082

1. RMR free-standing enclosure (A56)
2. Type 4x
3. Type 304 stainless steel
4. Height: 52" (1321mm)
5. Width: 96" (2438 mm)
6. Depth: 41" (1041mm)
7. Solid double front door with 3pt latch and ch751 lock
8. Solid double rear door with 3pt latch and ch751 lock
9. Solid single side door installed on the right side with 3pt latch
10. Solid divider 12" off-set from the side door
11. Square-punched rails installed on the left side qty: 2 pair 24U
12. (4) short finger managers installed in the front left and right rear left and right

13. (2) rear adjustable panels installed on the left side front and rear
14. (2) bottom mounted gland plates installed center of each compartment
15. Provisions on the left side to mount one cooling unit DTS 3281 7000-8500 btu 115vac, stainless steel.
16. Finish: type 304 ss #4 brushed
17. Door stop kit qty: 4 installed one on each door
18. Grounding kit qty: 4 (uninstalled)
19. Horizontal rack ground bar installed in 24 RMU rear rails (10610-019)
20. 100mm plinth
21. Cooling unit (RM1064082)
22. Cool ~1.5kw of heatload with a maximum ambient temperature of ~95 degrees f and an internal maximum temperature of ~95 degrees f

### **PART 3 - EXECUTION**

#### **3.01 RACKS**

- A. Provide all components of the rack system (racks, front and rear doors, side panels, mounting rails, cable managers, power strips, and accessories) as specified elsewhere in this Section and other referenced sections.
- B. Position the rack so that the front and rear doors and the rack body (as applicable) can be fully opened without being obstructed by other building, storage, or architectural components.
- C. Follow the manufacturer's installation instructions when securing the rack to the floor.
- D. On floor-supported cabinets, the wheeled base must contact the floor. The wheeled base should not be removed or omitted from the installation.
- E. Do not attach the rack to gypsum wall board.
- F. Before installing equipment in the rack:
  1. Install and adjust the position of all accessories, including vertical cable managers, power strips, equipment-mounting rails, fan kits, lights, etc.
  2. Verify that fans, lights, and power strips work prior.
- G. If shelves are used, they may be installed with the equipment.
- H. Provide a telecommunications bond for equipment in the rack.
- I. Attach a vertical busbar to the equipment mounting rails to provide electrical continuity from the equipment to the SBB or Mesh-BN through the enclosure.

- J. The ground shall meet TIA 607-C, local code requirements and shall be approved by the Authority Having Jurisdiction (AHJ).

### 3.02 CABINETS

- A. Provide all components of the cabinet system (cabinet, front and rear doors, side panels, mounting rails, cable managers, power strips, and accessories) as specified elsewhere in this Section and other referenced sections.
- B. Position the cabinet so that the front and rear doors and the cabinet body (as applicable) can be fully opened without being obstructed by other building, storage, or architectural components.
- C. Follow the manufacturer's installation instructions when securing the cabinet to the floor, wall, and backboard.
- D. On floor-supported cabinets, the wheeled base must contact the floor. The wheeled base should not be removed or omitted from the installation.
- E. If the cabinet is not attached to the wall, then the floor, shelf, or tabletop surface on which the cabinet is placed must be able to support the combined weight of the cabinet and the equipment it houses.
- F. Do not attach the cabinet to gypsum wall board. The cabinet must be attached directly into studs through a ¾ inch (19 mm) plywood backboard. The cabinet may be attached to a masonry wall if the installer provides the hardware. Use included hardware, or the appropriate hardware as defined by local code or the authority having jurisdiction. When installed, the top of the cabinet should be no more than 2.1 m (84 inches) above the finished floor.
- G. Cables shall enter and exit the cabinet through conduit knockouts in the top and/or bottom of the cabinet. When cables pass through a conduit knockout but are not enclosed in conduit, use edge-protection grommets on conduit knockouts.
- H. Before installing equipment in the cabinet:
  - 1. Install and adjust the position of all accessories, including vertical cable managers, power strips, equipment-mounting rails, fan kits, lights, etc.
  - 2. Verify that fans, lights, and power strips work prior.
- I. If shelves are used, they may be installed with the equipment.
- J. Evenly and uniformly distribute the equipment load within cabinet enclosures. Place large and heavy equipment towards the bottom of the cabinet enclosure. Secure all equipment to the rack with equipment mounting screws.
- K. Provide a telecommunications bond for equipment in the cabinet.
- L. Attach a vertical busbar to the equipment mounting rails to provide electrical continuity from the equipment to the SBB or Mesh-BN through the enclosure.

- M. The ground shall meet TIA 607-C, local code requirements and shall be approved by the Authority Having Jurisdiction (AHJ).
- N. For additional Grounding and Bonding instructions, refer to Section 270526.

### 3.03 PATCH PANELS

- A. Install patch panels in the equipment racks/cabinets as identified by the Owner. Locate fiber patch panels at the top of the rack/cabinet.
- B. Install patch panels square and plumb and fasten them to the mounting rails in four places using manufacturer-supplied screws, with at least one fastener at each corner.
- C. Install CAT6 patch panels under fiber patch panels, but above CAT6A patch panels. CAT6A patch panels shall be installed after CAT6 patch panels have been installed.
- D. Install horizontal cable support bars at the rear of all patch panels as indicated on the manufacturer's instructions.
- E. Attach all accessories supplied with the panels per the manufacturer's instructions.
- F. Fully load copper patch panels with jacks.
- G. Restore all covers, panels, label holders, and accessories removed during the installation of panels to their original places and states.
- H. On the front and rear of each patch panel, place a machine-generated, self-adhesive white label bearing the panel's identifier, as listed in the submittals, in black ½ inch block letters.

### 3.04 HORIZONTAL AND VERTICAL CABLE MANAGEMENT

- A. Place and install all horizontal and vertical wire and cable management devices and assemblies so as not to impede the efficient use of or connection to adjacent panels, enclosures, or equipment.
- B. Upon completion of the task, replace all covers, doors, and panels that were removed during the installation.
- C. Horizontal Cable Managers
  - 1. When more than one horizontal cable manager is used on a rack, frame, or cabinet, or on a group of racks, frames, or cabinets, use the same make and style cable manager.
  - 2. The color of the cable managers must match the color of the racks or frames.
  - 3. Attach horizontal cable managers to the rack, frame, or cabinet with four screws according to the manufacturer's installation instructions. Each cable manager should be centered in the allocated rack-mount space.

4. Place horizontal managers so that the number of ports (cables) they support will not exceed the cable fill capacity of the cable managers.
5. After cabling is complete, attach the covers to the cable managers in the closed position.
6. Install equipment rack horizontal cable and wire management panels directly adjacent to (above and below) all distribution enclosures, patch panels, and termination hardware in the rack as depicted in the appropriate project Drawings.

D. Vertical Cable Management

1. Attach vertical cable managers to the side of the rack/frame using the manufacturer's installation instructions and included hardware.
2. When a single vertical cable manager is used in between two racks/frames, attach the vertical cable manager to both racks/frames.
3. When more than one cable manager is used on a rack/frame or group of racks/frames, use the same make and style of vertical cable manager on the rack/frame or in between racks/frames.
4. The color of the rack(s)/frame(s) and cable manager(s) must match.
5. Doors should be attached to the cable manager and in the closed position after cabling is complete.

3.05 WIRING PRACTICES

- A. Where specific instructions are not given, perform all wiring in strict adherence to standard industry practices as described in the referenced Telecommunications Distribution Methods Manual (TDMM), and ANSI/TIA-568 standards.
- B. All cables shall originate and terminate at active or passive devices. Cables shall not be spliced. Where several devices are in close proximity, use approved housing to housing connectors and adapters.
- C. All cables terminated in a connection plate mounted in an enclosure shall be dressed to allow cables to be removed from the enclosure and shall be of sufficient cable length to allow for service or re-termination. The plate shall either set on the floor or freely swing clear.

3.06 IDENTIFICATION

- A. Uniquely identify all components of the installed system by location, function, unit, and sub-unit.
- B. Identify each location with a unique alphanumeric identifier.
- C. Assign a unique alphanumeric identifier for each equipment enclosure in the building.

- D. Identify each adapter module in each distribution or interconnect enclosure with an alphanumeric identifier.
- E. Identify optical fiber cables by a textual label that indicates its type, strand count, point of origin, and termination.
- F. Supply all records in compliance with ANSI/TIA 606.

\*\*\*END OF SECTION\*\*\*



**SECTION 27 13 23****BACKBONE CABLING****PART 1 - GENERAL****1.01 SUMMARY**

- A. Contractor Shall Provide and Install
  - 1. The Contractor shall furnish and install telecommunications passive equipment, including:
    - a) Backbone fiber optic cable
- B. Related Sections:
  - 1. Section 000000 – Procurement and Contracting Requirements
  - 2. Section 010000 – General Requirements
  - 3. Section 270000 – Common Work Results for Communications
  - 4. Section 270526 – Grounding and Bonding for Communications Systems
  - 5. Section 270528 – Pathways for Communications Systems
  - 6. Section 270553 – Identification for Communications Systems
  - 7. Section 271619 – Patch Cords
  - 8. Section 271700 – Testing of Structured Cabling Systems

**1.02 SYSTEM DESCRIPTION**

- A. The Contractor will provide, install, and test a complete structured cabling system for the project's voice and data communications systems in between the Telecommunications Room (TR). The Contractor will provide and install all required components as identified below.
  - 1. Fiber optic backbone cabling includes backbone cable, connectors in the Technology rooms or adjacent to active equipment, and patch cords or jumpers.

**PART 2 - PRODUCTS****2.01 OPTICAL FIBER CABLE PERFORMANCE**

- A. Shall comply with Owner's standards.
- B. Where not included in standards, Contractor shall provide as specified below.
- C. Optical Fiber Strands
  - 1. All optical fibers shall:

- a) Be usable and shall meet required specifications.
- b) Be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification.
- c) Consist of a doped silica core surrounded by a concentric glass.
- d) Be proof tested by the fiber manufacturer at a minimum of 100 kpsi (0.7 GN/m<sup>2</sup>).
- e) Be coated with a dual layer acrylate protective coating that is in physical contact with the cladding surface.
- f) Have a maximum attenuation value for each cabled fiber at 23°C ± 5°C on the original shipping reel.

D. Singlemode (8.5/125 µm)

1. Unshifted Single-Mode Optical Fibers with Low Water Peak,” and ITU recommendation TG.652, “Characteristics of Single-Mode Optical Fiber Cable.” The fibers shall have:
  - a) A core/cladding diameter (characterized) of 8.2 µm/125.0 µm ± 0.7 µm.
  - b) Core-to-cladding concentricity of no more than 0.5 µm.
  - c) Cladding non-circularity of no more than 1.0%.
  - d) A coating diameter of 250 µm, plus optional 900 µm buffer.
  - e) Attenuation of 0.34 dB/km at 1310 nm and 0.22 dB/km at 1550 nm.
  - f) Attenuation uniformity with no point discontinuity greater than 0.05 dB at either 1310 nm or 1550 nm.
  - g) Water peak attenuation at 1383 nm ± 3 nm that is no more than 0.31 dB/km.
  - h) A cabled cutoff wavelength: (λ<sub>ccf</sub>) that is no more than 1260 nm.
  - i) IEEE 802.3ae performance that supports laser-based Gigabit Ethernet (GbE) operation in the 10GBASE-LR (1300 nm) operating window at 10,000 m.
  - j) A mode field diameter of 9.20 µm ± 0.40 µm at 1310 nm and 10.4 µm ± 0.8 µm at 1550 nm.
  - k) Macrobend attenuation due to 100 turns of fiber around a 50 mm ± 2 mm diameter mandrel that does not exceed 0.05 dB at 1310 nm and 1550 nm.

- l) A zero dispersion wavelength ( $\lambda_0$ ) of 1301.5 nm that is not more than  $\lambda_0$  at 1321.5 nm or less.
- m) A zero dispersion slope ( $S_0$ ) of no more than 0.086 ps/(nm•km).
- n) Maximum dispersion of no more than 3.2 ps/(nm•km) from 1285 nm through 1330 nm and less than 18 ps/(nm•km) at 1550 nm.
- o) A fiber curl with a curvature radius of no less than 4.0 m.

E. Fiber Optic Cable Fire Ratings

- 1. Listed optical fiber backbone cable is acceptable for use on this project.

F. Fiber Optic Cable Termination

- 1. Where cables are installed, the 900  $\mu$ m buffer, 250  $\mu$ m coated fibers or ribbonized fibers contained in these cables may be terminated either by:
  - a) Fusion splicing of factory-polished splice-on connectors or factory-terminated cable assemblies ("pigtails").
  - b) Cam-style mechanical splice connectors using a tool that provides calculated insertion loss at the point of termination
  - c) Individual fibers secured in a protective covering, such as an aramid-reinforced tube with connectors mated to the resulting assembly

G. Fiber Optic Cable Features

- 1. The size and configuration of fiber optic cables shall be as shown on the Drawings.
- 2. The buffered fibers shall be grouped in subunits of 6 or 12 fibers.
  - a) Subunits shall be stranded around a dielectric central member.
  - b) Layered aramid yarns shall serve as the tensile strength member of the subunit.
  - c) To facilitate jacket removal, a ripcord may be applied between the aramid yarns and the subunit jacket.
  - d) For physical and environmental protection, the subunit jacket shall be extruded over the aramid yarns.
  - e) The jacket shall be continuous and free from pinholes, splits, blisters, or other imperfections have a consistent, uniform thickness and be smooth, as is consistent with the best commercial practice
  - f) The subunits shall be stranded around a dielectric central member, a ripcord shall be inserted beneath the outer jacket to

facilitate jacket removal, an outer jacket shall be extruded around the subunits.

3. An overall helically wound interlocking metallic armor shall be provided, to surround the outer cable jacket, to which a listed outer jacket shall be applied.
4. The individual fibers shall be color-coded for identification and shall meet these requirements:
  - a) The optical fiber color coding shall be in accordance with TIA-598-C, "Optical Fiber Cable Color-Coding."
  - b) The coloring material shall be stable over the temperature range of the cable, shall not be susceptible to migration, and shall not affect the transmission characteristics of the optical fibers.
  - c) Color-coded buffered fibers shall not adhere to one another.
5. The overall jacket for graded index cables as specified herein shall be aqua for distribution cables, or black for indoor-outdoor rated cables.
6. The overall jacket for single-mode cables as specified herein shall be yellow for distribution cables, or black for indoor-outdoor rated cables.

## 2.02 BACKBONE FIBER OPTIC CABLE

- A. Refer to drawings for required cable and strand counts.
- B. Indoor/Outdoor Singlemode OS2
  1. Color: Yellow
  2. Plenum rated, Armored
  3. Water-blocking and UV-resistant
  4. Manufacturer:
    - a) Leviton #PDPK012-I/O-C4C5(YEL)-AB0707
- C. Accessories
  1. LC shuttered molded splice modules
    - a) OS2 duplex: SPLCS-2LL
    - b) OS2 quad: SPLCS-4LL
    - c) OS2 duplex: SF100-S2L
    - d) OM4 quad: SF100-S2M
    - e) OS2 quad: SF100-S4L

- f) OM4 quad: SF100-S4Q
- 2. LC Fusion splice connectors
  - a) Green: 499LC-GN9
  - b) Blue: 499LC-BL9
- 3. Pre-policed LC connectors
  - a) Multimode: 49991-LLC
  - b) Singlemode: 49991-SLC
- 4. Pigtails and fanout kits
  - a) Singlemode Pigtail: UPPLC-KIT
  - b) 12-position fanout kit w/ 24" fanout tubing: 49887-12S
  - c) 12-position fanout kit w/ 36" fanout tubing: 49887-12L
- 5. Splice trays
  - a) 12-fiber: TSPLS-12F
  - b) 24-fiber: TSPLS-24F
  - c) Mounting hardware: SPLMT-HKT

## 2.03 CONNECTORS

~~A. Shall comply with Owner's standards.~~

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Upon completion of work, a Registered Communications Distribution Designer (RCDD) shall submit as-built drawings to the Owner and Engineer.
- B. The Contractor shall input the cabling data into the cable management software.
- C. Install all cables in accordance with project Drawings.
- D. Provide any screws, anchors, clamps, tie wraps, distribution rings, miscellaneous grounding and support hardware, etc. needed to facilitate the installation of the cable plant system.
- E. Furnish any special installation equipment or tools required to properly complete the installation.
- F. Do not roll or store cable reels without an appropriate underlay.
- G. Failure to follow the appropriate guidelines may require the installer to provide the additional material and labor required to bring the installation back into

alignment with the guidelines. This shall also apply to any and all damages caused to the cables by the installer during the implementation.

- H. Provide fire blocking at all fire-rated ceiling, wall, and floor penetrations.
- I. Plug conduits where cabling has been installed in the main equipment room, backbone and other cable entrance locations with re-enterable duct seal of flame-retardant putty.
- J. Provide bushings on all conduit ends.
- K. All wiring, materials, and equipment must be listed and labeled by an NRTL. To certify that performance characteristics, meet ANSI/TIA 568 Standards, provide all Original Equipment Manufacturer (OEM) documentation to the Owner.
- L. All techniques and fixtures used in the installation must minimize complexity must allow for easy maintenance of, and ready access to, all components for test measurements.
- M. No self-tapping screws shall be used.
- N. All parts shall be made of corrosion-resistant material, such as plastic, anodized aluminum, or brass.
- O. All materials used in the installation shall be resistant to fungus growth and moisture deterioration.
- P. To avoid corrosion caused by electrolysis between dissimilar metals under the environmental operating conditions specified, separate dissimilar metals with an inert dielectric material.
- Q. All empty innerduct or conduit shall include a non-corrosive pull-rope.
- R. All of the pathways shown on the drawings are suggested routes for the Contractor to use as guidelines. Prior to construction, the Contractor shall coordinate in the field with other trades to determine the exact feeder, tie, and riser backbone cabling pathways. In any case where the communication pathway must be removed and re-routed, due to conflicts with other trades with which the Contractor did not previously coordinate, the Contractor is responsible for all costs associated with the removal and relocation.

### 3.02 BACKBONE FIBER OPTIC CABLE

- A. Install the optical fiber backbone in a continuous length between the fiber patch panels in each TR.
- B. Throughout its length, run the backbone cable in appropriate, listed raceway.
- C. Leave a 3 m long maintenance loop at each end of the link, neatly contained in the integral management rings and saddles in a "figure 8" loop at the rear of the fiber patch panel.

- D. Throughout the length of the cable, maintain the minimum bend radius and pulling force recommended by the manufacturer and required by industry standards, both during installation and after termination and testing.
- E. On each end, remove all outer jacket and strength member materials to expose the individual fiber strands or ribbons for a length of 0.5 m (18 inches).
- F. On each end, hold the cable ends securely in place with the cable clamping accessories in each fiber patch panel.
- G. Route individual strands in the rear of the fiber patch panel in a neat and orderly fashion and place them so as not to create undue stress or micro bending of the strands.

### 3.03 CABLE BUNDLING MATERIALS

- A. Secure all cable bundles with proper bundling or securing materials so as to ensure that the cable runs are securely held in place both vertically and horizontally.
- B. Do not tighten bundling materials or securing devices so tightly that they deform the inherent cable geometry or construction.
- C. Do not use cable ties or hook-and-loop tape to secure cable runs to other building systems such as electrical conduit, Electric Metallic Tube (EMT), sprinkler pipes, ceiling suspension members.
- D. In environmental air-handling spaces, only use appropriately-listed materials.

\*\*\*END OF SECTION\*\*\*

## ONTARIO SPORTS EMPIRE

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**SECTION 27 15 13****HORIZONTAL CABLING****PART 1 - GENERAL****1.01 SUMMARY**

- A. Contractor Shall Provide and Install
  - 1. The Contractor shall furnish and install telecommunications passive equipment, including:
    - a) Horizontal cable
    - b) Device connections
- B. Related Sections:
  - 1. Section 000000 – Procurement and Contracting Requirements
  - 2. Section 010000 – General Requirements
  - 3. Section 270000 – Common Work Results for Communications
  - 4. Section 270526 – Grounding and Bonding for Communications Systems
  - 5. Section 270528 – Pathways for Communications Systems
  - 6. Section 270553 – Identification for Communications Systems
  - 7. Section 271116 – Communications Room Equipment
  - 8. Section 271700 – Testing of Structured Cabling Systems

**1.02 SYSTEM DESCRIPTION**

- A. The Contractor will provide, install, and test a complete structured cabling system for the project's voice and data communications systems from the Telecommunications Outlet (TO) to the Telecommunications Room (TR), and between telecommunications spaces. The Contractor will provide and install all required components as identified below.
- B. Horizontal Cabling
  - 1. Horizontal cabling includes horizontal cable, telecommunications outlet/connectors in the Work Area (WA), mechanical terminations, and patch cords or jumpers located in a Telecommunications Room (TR).

**PART 2 - PRODUCTS****2.01 HORIZONTAL UTP CABLE**

- A. Jacketing shall be rated for the environment:

1. CMR
  2. CMP
  3. OSP or Direct Burial
  4. Indoor/Outdoor
- B. Where not included in standards, Contractor shall provide as specified below.
- C. Manufacturer:
1. Leviton
- D. Category 6A Unshielded Plenum Twisted Pair Cable
1. Category 6A UTP Copper Cable must meet the following mechanical and performance criteria:
    - a) Exceeds requirements of ANSI/TIA-568.2-D Category 6A and ISO 11801 Class EA channel standards in a 4-connector configuration up to 100 meters
    - b) Exceeds requirements of ANSI/TIA-568.2-D and IEC 61156-5 Category 6A component standards
    - c) Third party tested to comply with ANSI/TIA-568.2-D
    - d) Meets requirements of IEEE 802.3af, IEEE 802.3at and IEEE 802.3bt for PoE applications
    - e) Third party tested to comply with ANSI/TIA-568.2-D.
    - f) Cable diameter: Plenum 0.215 in. (5.2mm) nominal.
    - g) Installation temperature range: 32°F to 140°F (0°C to 60°C).
    - h) Operating temperature range: -4°F to 167°F (-20°C to 75°C).
    - i) Descending length cable markings enable easy identification of remaining cable which reduces installation time and cable usage.
    - j) Tested to meet or exceed 10 Gbps.
- E. Cabling
1. CAT6A
    - a) Blue: Data/Workstations
    - b) Yellow: Wireless Access Points
    - c) White: Security Cameras
    - d) Red: IOT Devices
  2. OSP & Indoor/Outdoor

- a) Black
- F. Jacks
  - 1. CAT6A
    - a) Blue: Data/Workstations
    - b) Yellow: Wireless Access Points
    - c) White: Security Cameras
    - d) Red: IOT Devices
- G. Faceplates
  - 1. Manufacturer: Leviton
  - 2. Faceplates shall have the following attributes:
    - a) Supplied in colors and finishes coordinated with the Architect.
    - b) Have the capability for integral labeling and identification
    - c) Provide capacity for a maximum of:
      - 1) Four individual jacks for single-gang applications
    - d) Provide blank inserts for unused ports.
    - e) Provide ceiling brackets for surface-mount box
    - f) Provide VXC coupler or assembly for MPTL applications.
  - 3. Single and double gang plates
    - a) 42080 series
  - 4. Stainless steel wall plates
    - a) 43080 series
  - 5. Phone wall plates
    - a) 4108W-1SP
  - 6. Surface-mount box
    - a) 41089-XWP series

## 2.02 SURGE PROTECTION DEVICES

- A. Surge protection devices shall have the following attributes:
  - 1. Din-rail mounted
  - 2. Common and differential protection modes
  - 3. Clamping Voltage:

- a) Common mode: 75V
  - b) Differential mode: 7.22V
- 4. Data rate: up to 10GbE
- 5. Operating temperature: -40F – 158F
- 6. Maximum humidity: 95% non-condensing
- 7. UL497B
- 8. EIA/TIA compliance
- 9. 802.3 Types 1, 2, 3, and 4 compatibility
- B. Manufacturer:
  - 1. Ditek DTK-MRJPOES
  - 2. Or equal

## 2.03 CABLE BUNDLING MATERIALS

- A. Hook and loop tape
  - 1. Provide hook and loop tape, that is at least 0.5 inches wide, of a length equal to 150% of the circumference of the cable bundle.
  - 2. Tie wraps are not allowed on this project.
  - 3. When used in areas considered environmental air spaces, all bundling materials must be appropriately listed.
  - 4. Manufacturer:
    - a) Commscope
    - b) Panduit
    - c) Or equal

## 2.04 POWERED FIBER

- A. Power fiber shall consist of:
  - 1. Hybrid fiber/copper cabling within a single cable jacket
  - 2. Rack-mounted fiber distribution and power source
  - 3. Cabling rated for the environment
  - 4. POE input and extension modules, up to 4 POE devices
  - 5. POE extension up to 1 Gbps and an additional 300 feet of category cable distance
  - 6. Up to 100W of POE

**B. Manufacturer:**

1. Leviton/Berk-tek One Reach

**2.05 NEMA ENCLOSURE****A. Nema enclosure shall be:**

1. Sized as shown on drawings, minimum.
2. Have pole-mount attachments
3. Have grounding accessories
4. Fitted with din rails
5. Polycarbonate and rated for the environment/temperature

**B. Manufacturer:**

1. Nvent Hoffman
2. Or equal

**PART 3 - EXECUTION****3.01 GENERAL**

- A. The Contractor shall input the cabling data into the cable management software.
- B. Install required cables, a faceplate/surface box/furniture insert, and a jack at each location designated on the Drawings.
- C. Provide any required screws, anchors, clamps, hook and loop, miscellaneous grounding and support hardware, etc. needed to facilitate the installation of the cable plant system.
- D. Furnish any special installation equipment or tools necessary to properly complete the installation.
- E. Do not roll or store cable reels without an appropriate underlay.
- F. Failure to follow the appropriate guidelines may require the installer to provide additional material and labor required to properly rectify the situation. This shall also apply to any and all damages caused to the cables by the installer during the implementation.
- G. Provide fire blocking at all fire rated penetrations.
- H. Plug conduits where cabling has been installed in the main equipment room, backbone, and other cable entrance locations with re-enterable duct seal of flame retardant putty.
- I. Provide bushings on all conduit ends.

- J. All techniques and fixtures used in the installation must minimize complexity and must allow for easy maintenance of, and ready access to, all components for test measurements.
- K. All materials used in installation shall be resistant to fungus growth and moisture deterioration.
- L. All cable runs must be continuous from patch panel to the outlet location.
- M. All of the pathways shown on the drawings are suggested routes for the Contractor to use as guidelines. Prior to construction, the Contractor shall coordinate in the field with other trades to determine the exact feeder, tie, and riser backbone cabling pathways. In any case where the communication pathway must be removed and re-routed, due to conflicts with other trades with which the Contractor did not previously coordinate, the Contractor is responsible for all costs associated with the removal and relocation.

### 3.02 WIRING PRACTICES

- A. Group and bundle all wiring by power level or signal type.
- B. Wire all cabling to in accordance to ANSI/TIA-568B standards.
- C. Exercise care in wiring to avoid damaging the cables and equipment. Where conduit or chase nipples are not installed around cutouts or knockouts, use grommets.
- D. Where wiring of different classifications shares a common enclosure or junction box, provide metallic isolation barriers to completely electrically separate wiring groups.
- E. Coordinate with tradespeople in the field, and employ proper installation techniques, including earthing and bonding and adequate Electromagnetic Compatibility (EMC). The following table lists the distances that should be maintained between power sources and copper data cabling to avoid Electromagnetic Interference (EMI).

Condition	<2kVA	2-5kVA	>5kVA
Unshielded power lines or electrical equipment in proximity to open or non-metal pathways	6 inches	12 inches	24 inches
Unshielded power lines or electrical equipment in proximity to grounded metal conduit pathway	3 inches	6 inches	12 inches
Power lines enclosed in a grounded metal conduit (or equivalent shielding (in proximity to grounded metal conduit pathway)	2 inches	6 inches	6 inches

Condition	<2kVA	2-5kVA	>5kVA
Transformers and Electric Motors	36 inches	36 inches	47 inches
Fluorescent lighting	12 inches	12 inches	12 inches

1. These guidelines apply to properly earth-bonded tray containing communications circuits in parallel with power circuits for a distance of 45 feet or more.
  2. Communications circuits, contained in properly-bonded, ventilated trough tray, shall not be placed in the same cable tray as power circuits.
- F. All cables shall originate and terminate at active or passive devices. Cables shall not be spliced. Where several devices are in close proximity, use approved housing to housing connectors and adapters.
- G. Strip and terminate cabling utilizing manufacturer's recommended tools. Pins, plugs, and terminals shall not be damaged.
- H. All cables terminated in a connection plate mounted in an enclosure shall be dressed to allow cables to be removed from the enclosure and shall be of sufficient cable length to allow for service or re-termination. The plate shall either set on the floor or freely swing clear.
- I. Cabling shall not be visible when walking through the facility. Cabling shall be in conduits, in cable tray, or in j-hooks above accessible ceiling.
- J. All cables installed in vertical tray or chases shall be supported by means of appropriately-sized vertical cable supports on every third floor. Do not use nylon cable ties.
- K. Cables shall not be pulled across sharp edges. Provide protection where edges exist or manually grind down edges for a smooth, polished surface.
- L. Cables shall not be jammed between assemblies or equipment.
- M. Abide by manufacturer's pulling tension and bend radii.
- N. Cable Installation in Conduit and Duct Banks
1. Through the entire length of all underground conduits, pull mandrel that is one size smaller than the conduit.
  2. When pulling cable, use water-based pulling lubrication. Lubricants that harden after installation are not allowed.
  3. During long or difficult runs, use a dynamometer to measure pulling tension. Place the dynamometer between the cable puller and the pull

line to monitor pulling tension. Do not exceed the manufacturer's maximum pulling tension.

4. Apply pulling grips suitable for use with copper cables to the ends of the cable. Consult the cable manufacturer to determine the appropriate pulling grip and method of attachment. Use breakaway or fuse links at the pulling grip and ensure that the correct "fuse pin" is installed in the fuse link. Channel locks and pliers used for pulling are now allowed.
5. To protect the cable ends until they are terminated, use cable caps (heat-shrinking type) to seal the ends of the cable.
6. Use cable blocks to facilitate the bending of cable. For bends between 5° and 45°, use a 45° cable block. For bends between 45° and 90°, use a 90° cable block.
7. The bend radius for all cables shall conform to manufacturer's specifications.

### 3.03 HORIZONTAL UTP

- A. Install horizontal cable in a continuous length from the point of origin to the point of termination. Group all cables and bundle them in the overhead pathways in a neat and workmanlike manner.
- B. The Contractor shall terminate and test all cables.
- C. The Contractor shall not exceed the manufacturer's maximum pulling tension.
- D. Splices are not allowed.
- E. The Contractor shall make sure that all the materials being installed on this project are of the proper rating (Plenum or Riser) required for the pathways and spaces by local, state, and federal codes.
- F. No horizontal cables, including any required service loops, shall be more than 90 meters or 295 feet long. Prior to installation, the Contractor shall identify any area that cannot be reached within these constraints and shall report them to the Engineer. Do not install any data cable outside of these parameters without written approval from the Engineer.
- G. Install cable paths perpendicular or parallel to the ceiling structure, unless otherwise shown on the Drawings.
- H. Provide 6' service loop in overhead runway in MDF and IDF.
- I. Provide 6' service loop in device backbox, nearest cable tray, or j-hook, wherever is closest to the cable termination.
- J. Do not expose cable to water, paint overspray, paint removal products, or water-based pulling lubricants, as these substances can negatively impact the performance of the cable.



- K. Pulling tension shall not exceed 25 lbs.

#### 3.04 CABLE BUNDLING MATERIALS

- A. Bundles shall not exceed 25 cables.
- B. Use cable bundling and securing materials as required to ensure that cable runs are securely held in place both vertically and horizontally.
- C. Do not tighten bundling materials or securing devices so as to cause deformation of the inherent cable geometry or construction.
- D. Do not use cable ties or hook and latch tape to secure cable runs to other building systems (such as electrical conduit, EMT, sprinkler pipes, ceiling suspension members, etc.). Staples and drive rings are not allowed.
- E. In areas considered environment air-handling spaces, only use appropriately-listed materials.

\*\*\*END OF SECTION\*\*\*

## ONTARIO SPORTS EMPIRE

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**SECTION 27 16 19****PATCH CORDS****PART 1 - GENERAL****1.01 SUMMARY**

- A. Contractor Shall Provide and Install
- B. The Contractor shall furnish and install telecommunications passive equipment, including:
  - 1. Intersystem connections
  - 2. Device connections
- C. Related Sections:
  - 1. Section 000000 – Procurement and Contracting Requirements
  - 2. Section 010000 – General Requirements
  - 3. Section 260526 – Grounding and Bonding for Electrical Systems
  - 4. Section 270000 – Common Work Results for Communications
  - 5. Section 270526 – Grounding and Bonding for Communications Systems
  - 6. Section 270528 – Pathways for Communications Systems
  - 7. Section 270539 – Surface Raceway for Communications Systems
  - 8. Section 270553 – Identification for Communications Systems
  - 9. Section 271116 – Communications Room Equipment
  - 10. Section 271513 – Horizontal Cabling
  - 11. Section 271700 – Testing of Structured Cabling Systems

**1.02 SYSTEM DESCRIPTION**

- A. The Contractor will provide, install, and test a complete structured cabling system for the project's voice and data communications systems from the Telecommunications Outlet (TO) to the Telecommunications Room (TR), and between telecommunications spaces. The Contractor will provide and install all required components as identified below.
  - 1. Copper Patch Cords

## 2. Fiber Patch Cords

### 1.03 SUBMITTALS

#### A. Copper Patch Cords

1. In addition to the general requirements, the Contractor shall submit the following additional data:
  - a) The length of the patch cords
  - b) The connector type for the patch cords

#### B. Fiber Patch Cords

1. In addition to the general requirements, the Contractor shall submit the following additional data:
  - a) The length of the patch cords
  - b) The connector type for the patch cords

#### C. Testing and Test Results

1. Refer to Section 27 17 00.

## PART 2 - PRODUCTS

### 2.01 COPPER PATCH CORDS

- A. Shall comply with Owner's standards.
- B. Where not included in standards, Contractor shall provide as specified below.
- C. Provide (2) patch cords per horizontal cable run.
- D. Category 6A copper **28-AWG** patch cords shall have the following attributes:
  1. Cable diameter not more than 0.235 in. (5.97mm) nominal.
  2. Category 6/Class E channel and component performance.
  3. Exceeds all ANSI/TIA-568.2-D Category 6 and ISO 11801 Class E Edition 2.1 electrical performance requirements for all frequencies from 1 to 250 MHz
  4. FCC and ANSI compliance: Meets ANSI/TIA/EIA-1096-A; contacts plated with 50 micro inches of gold for superior performance.
  5. IEC compliance: Meets IEC 60603-7 c (UL) US listed: UL 1863, CSA standard C22.2.

6. PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications in bundle sizes up to 48 cables.
7. Operating temperature: 14°F to 140F (-10°C to 60°C).
8. Plug housing: UL94V-0 rated clear Polycarbonate.
9. Plug contact plated with 50 microinches of gold and rated to 2500 mating cycles
10. RoHS compliance: Compliant.
11. 26AWG at work area outlets
12. 28AWG at TR panels
13. Color:
  - a) Blue = Data/Workstations
  - b) Yellow = WAPs
  - c) White = Security
  - d) Red = IoT
14. Length:
  - a) Device side: 5'
  - b) Technology room side: 7'

E. Manufacturer

1. Commscope Uniprise
2. Panduit TX6
3. Work Area: 26AWG CMR
  - a) Leviton 6AS10-##\* series
4. Telecom Room: 28AWG shielded Hi-Flex Dual Rated CM/LSZH
  - a) Leviton H6A10-##\* series
5. Telecom Room: 28 AWG Shielded Hi-Flex Dual Rated CM/LSZH
  - a) Leviton H6A1i-## series
6. Above Ceilings: 26AWG, Plenum CMP
  - a) Leviton 6ASP0-## series

## 2.02 CABLE BUNDLING MATERIALS

### A. Hook and loop tape

1. Provide hook and loop tape, that is at least 0.5 inches wide, of a length equal to 150% of the circumference of the cable bundle.
2. Tie wraps are not allowed on this project.
3. When used in areas considered environmental air spaces, all bundling materials must be appropriately listed.
4. Manufacturer:
  - a) Commscope
  - b) Or equal

## 2.03 FIBER PATCH CORDS

- A. Shall comply with Owner's standards.
- B. Where not included in standards, Contractor shall provide as specified below.
- C. Patch cords shall be LC-to-LC ~~or LC-to-SC~~, depending on equipment.
- D. Patch cords shall be 1, 2, ~~or 3~~, 5, or 10 meters long.
- E. Manufacturer:
  1. ~~Commscope~~
  2. ~~Panduit~~
  3. ~~Or equal~~
  4. Leviton UPDLC-SXX series

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. The Contractor shall input the cabling data into the cable management software.
- B. Provide any required screws, anchors, clamps, hook and loop, miscellaneous grounding and support hardware, etc. needed to facilitate the installation of the cable plant system.
- C. Furnish any special installation equipment or tools necessary to properly complete the installation.
- D. Failure to follow the appropriate guidelines may require the installer to provide additional material and labor required to properly rectify the situation. This shall

also apply to any and all damages caused to the cables by the installer during the implementation.

- E. All techniques and fixtures used in the installation must minimize complexity and must allow for easy maintenance of, and ready access to, all components for test measurements.
- F. All materials used in installation shall be resistant to fungus growth and moisture deterioration.
- G. All of the pathways shown on the drawings are suggested routes for the Contractor to use as guidelines. Prior to construction, the Contractor shall coordinate in the field with other trades to determine the exact feeder, tie, and riser backbone cabling pathways. In any case where the communication pathway must be removed and re-routed, due to conflicts with other trades with which the Contractor did not previously coordinate, the Contractor is responsible for all costs associated with the removal and relocation.

### 3.02 WIRING PRACTICES

- A. All cables shall originate and terminate at active or passive devices. Where several devices are in close proximity, use approved housing to housing connectors and adapters.
- B. All cables terminated in a connection plate mounted in an enclosure shall be dressed to allow cables to be removed from the enclosure and shall be of sufficient cable length to allow for service or re-termination. The plate shall either set on the floor or freely swing clear.
- C. Do not use nylon cable ties.

### 3.03 CABLE BUNDLING MATERIALS

- A. Use cable bundling and securing materials as required to ensure that cable runs are securely held in place both vertically and horizontally.
- B. Do not tighten bundling materials or securing devices so as to cause deformation of the inherent cable geometry or construction.
- C. Do not use cable ties or hook and latch tape to secure cable runs to other building systems (such as electrical conduit, EMT, sprinkler pipes, ceiling suspension members, etc.).
- D. In areas considered environment air-handling spaces, only use appropriately listed materials.

### 3.04 IDENTIFICATION

- A. Before installing or terminating cable, confirm all specific labeling requirements with the Owner or the Owner's Engineer.

B. Cables

1. Mark each cable at each endpoint and at all intermediate pull and access points, and junction boxes with labels that indicate the origination and destination identifiers, the sheath identifier, and the strand or pair range.
2. Mark each horizontal cable on the sheath at each end with the TR, patch panel, and panel port to which the cable is wired.

\*\*\*END OF SECTION\*\*\*



**SECTION 27 17 00****TESTING OF STRUCTURED CABLING SYSTEMS****PART 1 - GENERAL****1.01 SUMMARY**

- A. This Section includes the minimum requirements for the test certification, identification, and administration of horizontal balanced twisted pair cabling and optical fiber cabling.
- B. The Contractor provides all labor, materials, tools, field-test instruments and equipment required for the complete testing, identification and administration of the work called for in the Contract Documents.
- C. In order to conform to the overall project event schedule, the cabling Contractor shall survey the work areas and coordinate cabling testing with other applicable trades.
- D. In addition to the tests detailed in this document, the Contractor shall notify the Owner or the Owner's representative of any additional tests deemed necessary to guarantee a fully functional system. The Contractor shall carry out and record any additional measurement results at no additional charge.

**1.02 SCOPE**

- A. This Section includes the minimum requirements for:
  - 1. Identification, including labels and labeling
  - 2. Administration, including:
    - a) Test results documentation
    - b) As-built drawings
  - 3. The testing of copper cabling, including:
    - a) Test instruments
    - b) Test procedures
  - 4. The testing of fiber optic cabling, including:
    - a) Test instruments
    - b) Test procedures
- B. Testing shall be carried out in accordance with this document. The Contractor shall:
  - 1. Test all installed balanced twisted pair cabling permanent links to the applicable performance level.
  - 2. Test the attenuation and polarity of the installed optical fiber cable plant with an Optical Loss Test Set (OLTS)

3. Test the installed condition of the optical fiber cabling system and its components with an Optical Time Domain Reflectometer (OTDR)
4. Verify the condition of the fiber end faces
- C. The Contractor shall document all tests including:
  1. OLTS dual wavelength attenuation measurements
  2. OTDR traces with event tables and OTDR maps – Edit or remove this item as appropriate for the project.
  3. Optical length measurements and pictures of the connector end faces

#### 1.03 RELATED SECTIONS

- A. Section 000000 – Procurement and Contracting Requirements
- B. Section 010000 – General Requirements
- C. Section 270000 – Common Work Results for Communications
- D. Section 270526 – Grounding and Bonding for Communications Systems
- E. Section 270528 – Pathways for Communications Systems
- F. Section 270553 – Identification for Communications Systems
- G. Section 271316 – Communications Room Equipment
- H. Section 271513 – Horizontal Cabling
- I. Section 271619 – Communications Patch Cords

#### 1.04 REFERENCES

- A. Requirements, Codes, and Standards
  1. All testing procedures and field test instruments shall comply with the applicable requirements of the following standards including the most current revisions, addendums, and any Technical Service Bulletins (TSBs) released at the time of bid:
    - a) ANSI Z136.2, ANSI For Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources
    - b) ANSI/EIA/TIA 455 50B, Light Launch Conditions For Long-Length Graded-Index Optical Fiber Spectral Attenuation Measurements
    - c) ANSI/TIA/EIA-455-59A, Measurement of Fiber Point Discontinuities Using an OTDR
    - d) ANSI/TIA/EIA 455 60A, Measurement of Fiber or Cable Length Using an OTDR
    - e) ANSI/TIA/EIA 455 61A, Measurement of Fiber or Cable Attenuation Using an OTDR

- f) ANSI/TIA/EIA 526 7, Optical Power Loss Measurements of Installed Single-mode Fiber Cable Plant
- g) ANSI/TIA-1152, Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling
- h) ANSI/TIA-568-0. D, Generic Telecommunications Cabling for Customer Premises.
- i) ANSI/TIA-568-1. D, Commercial Building Telecommunications Cabling Standard
- j) ANSI/TIA 568.2-D, Balanced Twisted-Pair Telecommunications Cabling and Components Standards.
- k) ANSI/TIA 568 C.3, Optical Fiber Cabling Components Standard
- l) ANSI/TIA-606-C, Administration Standard for Commercial Telecommunications Infrastructure, including the requirements specified by the customer, unless the customer specifies their own labeling requirements.

B. Applicability of Codes, Rules, and Regulations

- 1. Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of the specifications as if herein repeated or hereto attached.
- 2. If the Contractor notes items in the drawings or the specifications, construction of which would be code violations, the Contractor should promptly call them to the attention of the Owner's representative in writing.
- 3. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.
- 4. Balanced Twisted Pair Testing
  - a) Trained technicians, who have successfully attended an appropriate training program and have obtained a certificate as proof thereof, shall execute the tests. Acceptable certificates are ones that have been issued by any of the following organizations or an equivalent organization:
- 5. The manufacturer of the connectors and/or the cable
- 6. The manufacturer of the test equipment used for the field certification
- 7. Training organizations such as Building Industry Consulting Service International (BICSI), the Association of Cabling Professionals™ (ACP), the Cabling Business Institute (CBI)

C. Optical Fiber Testing

- 1. Trained technicians who have successfully attended an appropriate training program, which includes testing with an OLTS and an OTDR and

have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization:

2. The manufacturer of the connectors and/or the cable
3. The manufacturer of the test equipment used for the field certification
4. Training organizations such as Building Industry Consulting Service International (BICSI), the Association of Cabling Professionals™ (ACP), the Cabling Business Institute (CBI)

D. Owner's Participation

1. The Owner or the Owner's representative shall be invited to witness and/or review field testing.
2. Five business days before testing commences, the Owner or the Owner's representative shall be notified of the start date of the testing phase.
3. The Owner or the Owner's representative shall:
  - a) Select a random sample of five percent of the installed links.
  - b) Test these randomly-selected links.
  - c) Store the results in accordance with Part 3 of this document.
4. The Contractor shall compare the results obtained by the Owner to the data provided by the installation Contractor. If more than two percent of the pass/fail determinations in the sample results differ from the data provided by the installation Contractor, the Contractor, under the supervision of the Owner's representative, shall repeat one hundred percent of the testing at no cost to the Owner.

1.05 SUBMITTALS

A. The Contractor shall submit the following:

1. The manufacturer's catalog sheets and specifications for the test equipment.
2. A schedule (list) of all links and channels to be tested.
3. Sample test reports.
4. The test equipment serial number.
5. A graphic diagram documenting the test procedure, including all connectors, the light source (as applicable,) the origin, and the destination of each cable tested.

1.06 CLOSEOUT DOCUMENTS

A. Submit test equipment along with test results.

1.07 TEST RESULTS

- A. Fiber test results shall be submitted in sequential order by telecommunications space they are terminated in.
- B. Category cable test results shall be submitted in sequential order by telecommunications space they are terminated in, and then by unique label identifier.
- C. Balanced Twisted Pair Links
  - 1. Category 6A Balanced Twisted Pair
    - a) Unless otherwise specified by the Owner or the Owners representative, each Category 6A balanced twisted pair cabling link shall be tested for:
      - 1) Wire Map
      - 2) Length
      - 3) Propagation Delay
      - 4) Delay Skew
      - 5) DC Loop Resistance
      - 6) DC Resistance Unbalance within a pair
      - 7) DC Resistance Unbalance between pairs
      - 8) Insertion Loss
      - 9) Near-End Crosstalk (NEXT)
      - 10) Power Sum Near-End Crosstalk (PS NEXT)
      - 11) Attenuation to Crosstalk Ratio Near-End (ACR-N)
      - 12) Power Sum Attenuation to Crosstalk Ratio Near-End (PS ACR-N)
      - 13) Attenuation to Crosstalk Ratio Far-End (ACR-F)
      - 14) Power Sum Attenuation to Crosstalk Ratio Far-End (PS ACR-F)
      - 15) Return Loss
      - 16) Transverse Conversion Loss (TCL)
      - 17) Equal Level Transverse Conversion Transfer Loss (ELTCTL)
      - 18) Power Sum Alien Near-End Crosstalk (PS ANEXT)
      - 19) Average Power Sum Alien Near-End Crosstalk (Average PS ANEXT)
      - 20) Power Sum Alien Attenuation to Crosstalk Ratio Far-End (PS AACR-F)

- 21) Average Power Sum Alien Attenuation to Crosstalk Ratio Far-End (Average PS AACR-F)
2. When a Balanced Twisted Pair Permanent Link Fails
  - a) All installed balanced twisted pair cabling permanent links shall be field-tested and shall pass the test requirements and analysis described in Part 3.
  - b) Any permanent link that fails these requirements shall be diagnosed and corrected.
  - c) Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected permanent link meets performance requirements.
  - d) The final and passing result of the tests for all permanent links shall be provided in the test results documentation, in accordance with Part 3.
- D. Optical Fiber Links
  1. Test Limits – ANSI/TIA-568.3-D Singlemode (STD)
  2. Unless otherwise specified by the Owner or the Owners representative, each optical fiber cabling link shall comply with the following test limits:
    - a) Optical loss testing
    - b) Single-mode links
    - c) Link attenuation calculated by the formulas, as specified in ANSI/TIA 568 C.0:
      - 1)  $\text{Link Attenuation (dB)} = \text{Cable Attn (dB)} + \text{Connector Attn (dB)} + \text{Splice Attn (dB)}$
      - 2)  $\text{Cable Attn (dB)} = \text{Attenuation Coefficient (dB/km)} * \text{Length (Km)}$
      - 3)  $\text{Connector Attn(dB)} = \text{number of connector pairs} * \text{connector loss (dB)}$  Maximum allowable connector loss=0.75 dB
      - 4)  $\text{Splice\_Attn (dB)} = \text{number\_of\_splices} * \text{splice\_loss (dB)}$  Maximum allowable splice\_loss = 0.3 dB
    - d) The values for the Attenuation\_Coefficient (dB/km) are listed in the table below. Where application limits are more stringent, those shall apply.

<i>type of optical fiber</i>	<i>wavelength (nm)</i>	<i>attenuation coefficient (dB/km)</i>	<i>wavelength (nm)</i>	<i>attenuation coefficient (dB/km)</i>
Single-mode (Inside plant)	1310	1.0	1550	1.0
Single-mode (Outside plant)	1310	0.5	1550	0.5

### 3. OTDR Testing

- a) Reflective events (connections) shall not exceed the following limits. Where application limits are more stringent, those shall apply.
  - 1) 0.75 dB in optical loss when bi-directionally averaged
  - 2) -40 dB reflectance for UPC single-mode connections
  - 3) -55 dB reflectance for APC single-mode connections
  - 4) Non-reflective events (splices) shall not exceed 0.3 db

### 4. Magnified End Face Inspection

- a) Fiber connections shall be visually inspected for compliance with IEC 61300 3 35 Edition 1.0 for end face quality.
- b) Scratched, pitted or dirty connectors shall be diagnosed and corrected.

### 5. When an Optical Fiber Link or Channel Fails

- a) All installed optical fiber cabling links and channels shall be field-tested and pass the test requirements and analysis as described in Part 3.
- b) Any link or channel that fails these requirements shall be diagnosed and corrected.
- c) Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link or channel meets performance requirements.
- d) The final and passing result of the tests for all links and channels shall be provided in the test results documentation, in accordance with Part 3.

### E. Acceptance of Test Results

- 1. Once the project is fully completed and tested in accordance with the Contract Documents and to the satisfaction of the Owner, the Owner's acceptance of the test results shall be given in writing to the Engineer.

## 1.08 PROJECT CONDITIONS

### A. Project Environmental Requirements

1. Seismic Safety
  - a) Observe mechanical and electrical support means for all installed equipment as required by all applicable local building codes for this installation's earthquake risk hazard zone and as recommended by Telcordia Specification GR-63.
  - b) All equipment racks should be anchored with suitable anchors that meet safety standards.
  - c) Overhead devices should be mounted with appropriate safety attachments as required.
  - d) Where cabinets and racks are secured directly to the building, this should be done in accordance with guidance provided by the Authority Having Jurisdiction (AHJ) or a structural engineer.
  - e) Equipment and fixtures should have shock and vibration isolation.
2. Fiber Optic Cable Safety
  - a) The following warnings shall be posted on the job site:

WARNING: PERMANENT EYE DAMAGE CAN RESULT FROM LOOKING DIRECTLY INTO A LIGHT BEAM GENERATED BY AN LED OR LASER SOURCE OR INTO THE END OF A CABLE FIBER CONNECTED TO ONE OF THESE SOURCES.

CAUTION: LIGHT GENERATED BY THESE SOURCES MAY NOT BE VISIBLE YET REMAIN HAZARDOUS TO THE EYE. LOOK FOR WARNING LABELS ON SOURCE DEVICES.
  - b) Observe all warning signs on equipment and all written safety precautions in the equipment instruction and technical manuals.
  - c) Always handle cable carefully to avoid personal injury. Care should be taken with individual fibers to prevent injury to the eyes or penetration of the fibers into the skin.

## PART 2 - PRODUCTS

### 2.01 BALANCED TWISTED-PAIR CABLE TESTERS

- A. The field test instrument shall be manufactured by Fluke Networks.
- B. The field test instrument shall have been calibrated within the last twelve months.
- C. There shall be independent verification that the field test instrument meets the following accuracy requirements:
  1. For Category 6A, Level IIIe accuracy in accordance with ANSI/TIA 1152
- D. Permanent Link Adapters



1. The RJ45 plug must meet the requirements for NEXT, FEXT, and Return Loss in accordance with ANSI/TIA 568.2-D.
  2. Twisted pair Category 6A cords are not permitted, as their performance degrades with use and can cause false Return Loss failures.
- E. Results Storage
1. The field test instrument shall be capable of storing more than 10,000 results for all measurements found within this section.
- F. Measurement Capabilities for Category 6A Links
1. On Category 6A links, the field test instrument shall be capable of testing the following parameters:
    - a) Wire Map
    - b) Length
    - c) Propagation Delay
    - d) Delay Skew
    - e) DC Loop Resistance
    - f) DC Resistance Unbalance within a pair
    - g) DC Resistance Unbalance between pairs
    - h) Insertion Loss
    - i) Near-End Crosstalk (NEXT)
    - j) Power Sum Near-End Crosstalk (PS NEXT)
    - k) Attenuation to Crosstalk Ratio Near-End (ACR-N)
    - l) Power Sum Attenuation to Crosstalk Ratio Near-End (PS ACR-N)
    - m) Attenuation to Crosstalk Ratio Far-End (ACR-F)
    - n) Power Sum Attenuation to Crosstalk Ratio Far-End (PS ACR-F)
    - o) Return Loss
    - p) Transverse Conversion Loss (TCL)
    - q) Equal Level Transverse Conversion Transfer Loss (ELTCTL)
    - r) Time Domain Reflectometer
    - s) Time Domain Xtalk Analyzer
    - t) Power Sum Alien Near-End Crosstalk (PS ANEXT)
    - u) Average Power Sum Alien Near-End Crosstalk (Average PS ANEXT)

- v) Power Sum Alien Attenuation to Crosstalk Ratio Far-End (PS AACR-F)
- w) Average Power Sum Alien Attenuation to Crosstalk Ratio Far-End (Average PS AACR-F)

G. PC Software

1. The field test instrument's PC software shall:
  - a) Be Windows® based
  - b) Show when 3 dB and 4 dB rules are applied
  - c) Have re-certification capability where results have "(RC)" added to the end of the Cable IDs
  - d) Have a built-in PDF export capability, as no additional third party software is permitted
  - e) Have built-in statistical analysis

2.02 OPTICAL FIBER CABLE TESTERS

- A. The field test instrument shall have been calibrated within the period recommended by the manufacturer, and a copy of the calibration certificate shall be made available.
- B. Optical Loss Test Set (OLTS)
  1. The single-mode optical fiber light source shall:
    - a) Provide dual laser light sources with central wavelengths of 1310 nm ( $\pm 20$  nm) and 1550 nm ( $\pm 20$  nm).
    - b) Have output power of at least  $-10$  dBm
    - c) Have test reference cords that demonstrate an insertion loss of 0.25 dB when mated against each other
    - d) Be manufactured by Fluke Networks
  2. Power Meter shall:
    - a) Provide test capability at wavelengths of 850 nm, 1300 nm, 1310 nm, and 1550 nm
    - b) Have power measurement uncertainty of  $\pm 0.25$  dB
    - c) Store reference power measurements
    - d) Save at least 10,000 results to internal memory
    - e) Have a USB PC interface
    - f) Be manufactured by Fluke Networks
  3. Optional Length Measurement

- a) An OLTS capable of measuring the optical length of the fiber using time-of-flight techniques is preferable.
- b) For MPO/MTP trunk cables, length shall be calculated using cable jacket length markings.

C. Optical Time Domain Reflectometer (OTDR)

1. The OTDR shall:

- a) Have a color LCD display with backlight
- b) Have rechargeable Li-Ion battery for 8 hours of normal operation
- c) With battery and module, weigh no more than 4.5 pounds and have a volume of no more than 200 in<sup>2</sup>
- d) Have internal non-volatile memory with capacity for storing at least 2,000 OTDR bi-directionally-tested fiber links
- e) Have a USB port to transfer data to a PC or thumb drive/memory stick
- f) Be manufactured by Fluke Networks

2. The single-mode OTDR shall:

- a) Provide test capability at wavelengths of 1310 nm ( $\pm 25$  nm) and 1550 nm ( $\pm 30$  nm)
- b) Have event dead zones that do not exceed 0.6 m at 1310 nm and 1550 nm
- c) Have attenuation dead zones that do not exceed 3.7 m at 1310 nm and 1550 nm
- d) Have distance range of at least 80 km at 1310 nm and 130 km at 1550 nm
- e) Have a dynamic range of at least 32 dB for 1310 nm and 30 dB at 1550 nm
- f) Allow bi-directional testing without moving the OTDR to the far end

D. Fiber Microscope

1. The fiber microscope shall:

- a) Have a field of view of 420  $\mu$ m by 320  $\mu$ m
- b) Have camera probe tips that permit inspection through adapters
- c) Be capable of saving and reporting the end face image to IEC 613003 3 35
- d) Be manufactured by Fluke Networks
- e) Preferably be a video camera system

- E. Integrated OLTS, OTDR, and Fiber Microscope
  - 1. Test equipment that combines an OLTS, an OTDR, and a fiber microscope into one instrument may be used.
  - 2. Any such system shall be manufactured by Fluke Networks.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Prior to field-testing, all outlets, cables, patch panels, and associated components shall be fully assembled and labeled. Any testing performed on incomplete systems shall be redone after the systems are fully assembled and labeled.
- B. The Contractor shall input the cabling data into the cable management software.

#### **3.02 CABLE TERMINATION AND TEST PLANS**

- A. General
  - 1. Provide proof of testing technician(s) certification for operation of the specific units of test equipment, which are proposed for use.
  - 2. The Contractor shall obtain General Contractor approval for each termination and test plan prior to execution of the work.
  - 3. This Section covers work necessary to furnish communications system testing, including the following:
    - a) Outside Plant (OSP) Cabling Infrastructure (Campus LAN/WAN extension)
    - b) Back-Bone Cabling Infrastructure
    - c) Horizontal Cabling Systems
  - 4. Inspection Requirements:
    - a) As part of any performance test, inspect cable, material, and equipment for physical damage, continuity, and proper connection.
    - b) Verify identification and labeling at required locations for visibility, condition, legibility, and accuracy.
  - 5. Test Report Requirements – Each test report shall include the following sections:
    - a) Scope of testing
    - b) List of equipment used in the test with a photocopy of the factory calibration certificate.
    - c) List of technicians performing the tests identified in the scope of testing.

- d) Summary of test results: Hardcopy and electronic copies of the summary forms are to be delivered at conclusion of the project before final payment will be made.
- e) Individual test data sheets: The individual test data sheets shall be developed and completed by the Contractor. Formatted output from cable scanners is typically acceptable provided they contain all of the test parameters including graphs of the information required by this Section.

B. Cable Termination Plans

- 1. Submit detailed termination plans for both fiber optic and twisted pair cables, which describe how each system component will be installed and terminated.

C. Cable Test Plans

- 1. Submit detailed test plans for both fiber optic and twisted-pair cable channels which include at least the following information:
  - a) Describe the tests to be performed.
  - b) Explain when and how each system component will be tested.
  - c) List the test equipment to be used.
  - d) Itemize how theoretical loss budgets and test parameters will be calculated and listed.
  - e) Provide an example of the test reporting documentation for each type of test, which provides a written verification of the results, as required in paragraph 2 below.
- 2. Provide testing documentation which includes:
  - a) Dates and times of test
  - b) Personnel performing tests
  - c) Initial test results
  - d) Description of discrepancies found or failure, if any
  - e) Corrective action, if any
  - f) Date and person performing corrections
  - g) Retest results, if required
  - h) Include space for Owner's sign-off
  - i) Copy of test equipment calibration certificates
  - j) Intrabuilding (Vertical and Horizontal Subsystem) fiber optic segment post-installation test plan

3. Twisted–Pair Cable Tests: Testing shall be performed using a minimum level IIIe tester, approved by the engineer.
4. Twisted–Pair Test Plans: Provide separate post–installation test schemes for the following activities:
  - a) Backbone Subsystem twisted–pair segment test plan.
  - b) Horizontal Subsystem twisted–pair segment test plan.
5. Fiber–Optic Cable Tests: Testing shall be performed using a level IIIe tester, with approved test–heads approved by the engineer.
6. Fiber–Optic Test Plans: Provide separate post–installation test schemes for the following activities:
  - a) Backbone subsystem fiber–optic segment test plan.
  - b) Horizontal subsystem fiber–optic segment test plan.

### 3.03 SYSTEM ADMINISTRATION

#### A. Test Results Documentation

1. At the end of each working day, upload the copper cable permanent link test results, except for alien crosstalk testing, to the associated PC software for inspection by the Owner or the Owner’s representative.
2. Test results uploaded shall allow for the maintenance, inspection, and archiving of the test records.
3. Prior to the Owner accepting the project:
  - a) Store the database of the complete project, including, if applicable, fiber links, in the format native to the software.
  - b) Deliver the database to the Owner on CD, DVD, or thumb-drive.
  - c) To allow the Owner to inspect and print the test reports, include a working and fully-licensed copy of the software.
4. Circuit IDs reported by the test instrument should match the specified label ID.
5. Provide the detailed test results documentation data, in an electronic database, for each tested optical fiber and include the following information:
  - a) The identification of the customer site as specified by the end-user.
  - b) The name of the test limit selected to execute the stored test results.
  - c) The name of the personnel performing the test.
  - d) The date and time that the test results were saved in the memory of the tester.

- e) The manufacturer, model, and serial number of the field test instrument.
  - f) The version of the test software and the version of the test limit database held in the test instrument.
  - g) The fiber identification number.
  - h) The length of each optical fiber.
  - i) The index of refraction used for length calculation when using a length-capable OLTS.
  - j) The backscatter coefficient of the fiber under test when using an OTDR.
  - k) The OLTS attenuation link and channel measurements at the appropriate wavelengths and the margin (the difference between the measured attenuation and the test limit value).
  - l) The OTDR link and channel traces, event tables at the appropriate wavelengths, and a map of the link tested.
  - m) The length of each optical fiber, as calculated by the OTDR.
  - n) The overall pass/fail evaluation of the link-under-test for OLTS and OTDR measurements.
  - o) A picture or image of each fiber end-face.
  - p) A pass/fail status of the end-face using IEC 61300-3-35 Edition 1.0.
6. Testing of Category 6A Permanent Links
- a) For each Category 6A balance twisted-pair permanent link, provide the detailed test results documentation data in the associated PC software including:
  - b) The overall pass/fail evaluation of the link-under-test.
  - c) The date and time the test results were saved in the memory of the tester.
  - d) The identification of the customer site, as specified by the Owner.
  - e) The name of the test limit selected to execute the stored test results.
  - f) The name of the personnel performing the test.
  - g) The version of the test firmware and the version of the test limit database held in the test instrument.
  - h) The manufacturer, model, and serial number of the field test instrument.

- i) The adapters used.
- j) The factory calibration date.
- k) Wire map.
- l) Propagation delay values for all four pairs.
- m) Delay skew values for all four pairs.
- n) DC resistance values for all four pairs.
- o) DC resistance unbalance within a pair values for all four pairs.
- p) DC resistance unbalance between pairs values for all four pairs.
- q) Insertion loss worst case values for all four pairs.
- r) NEXT worst-case margin and worst-case values in both directions.
- s) PS NEXT worst-case margin and worst-case values in both directions.
- t) ACR-N worst-case margin and worst-case values in both directions.
- u) PS ACR-N worst-case margin and worst-case values in both directions.
- v) ACR-F worst-case margin and worst-case values in both directions.
- w) PS ACR-F worst-case margin and worst-case values in both directions.
- x) Return loss worst-case margin and worst-case values in both directions.
- y) TCL worst-case margin and worst-case values in both directions.
- z) ELTCTL worst-case margin and worst-case values in both directions.
- aa) Time domain crosstalk data, if the link is marginal or fails.
- bb) Time domain reflectometer data, if the link is marginal or fails.
- cc) PS ANEXT worst-case margin for all four pairs.
- dd) Average PS ANEXT worst-case margin.
- ee) PS AACR-F worst-case margin for all four pairs.

### 3.04 FIELD QUALITY CONTROL

#### A. General



1. The Owner reserves the right to be present during any or all of the testing.
  2. All cabling not tested in strict accordance with these specifications shall be re-tested at no additional cost to the Owner.
  3. 100% of the installed cabling must be tested. All tests must meet the acceptance criteria defined in the media specific sections of this document.
  4. Prior to each day's testing, fully charge all test equipment and bring an appropriate alternate power source to the job site.
  5. Throughout the testing, have a competent supervisor and supporting technical personnel, acceptable to the Owner, available on site. Changing the supervisor during the testing shall not be acceptable without prior written approval from the Owner.
  6. Upon completion of the testing, it shall be the responsibility of the Contractor to perform the necessary adjustments and other controls to ensure proper system operation. The system shall be physically inspected by the Owner to assure that all equipment is installed in a neat and workmanlike manner as called for by the contract documents.
  7. Verify the performance parameters of the individual systems, following established professional procedures, in addition to those specified herein. Document all acceptance testing, calibration, and correction procedures described herein, taking care to include the following information:
    - a) The date on which each procedure was performed.
    - b) The reason that the procedure was performed.
    - c) The type of and a description of the procedure.
    - d) The parameters measured and their values, including, as applicable, the values measured prior to calibration or correction.
    - e) The parameters associated with calibration or corrective networks, components, or devices.
    - f) The names of the personnel conducting the procedure.
    - g) The equipment used to conduct the procedure.
- B. General Specifications for Testing Balanced Twisted Pair Cable
1. Use field test instruments that have the latest firmware installed.
  2. Upon completion of each test, record the permanent link test results, including the individual frequency measurements from the tester, in the test instrument for subsequent uploading to the associated test equipment software in which the administrative documentation (reports) may be generated.

3. Perform permanent link testing on each cabling segment, connector to connector. Sampling is not acceptable.
4. Perform alien crosstalk testing on all Category 6A links using a sampling plan. For populations of up to 500,000 links, use an Acceptance Quality Level (AQL) of 0.4%, normal inspection, general inspection level I, as defined in ISO 2859 1. The following table lists the sample sizes to be used.

<i>total number of links (N)</i>	<i>sample size (No. of links to test)</i>
3 – 33	3 or 0.1 x N (whichever is greatest)
34 – 3,200	33
3,201 – 35,000	126
35,001 – 150,000	201
150,001 – 500,000	315

5. Choose an equal combination of short, medium, and long disturbed (victim) links for alien crosstalk testing.
6. Permanent link adapters made from twisted pair or Category 6A cords are not permitted.
7. The installer shall build a reference Category 6A link. All components shall be anchored so that it is not possible to disturb them. Each day, the technician is to conduct a Category 6A permanent link test to ensure that there is no degradation of the tester or its permanent link adapters.

### 3.05 TESTING CATEGORY 6A LINKS

- A. Frequency Resolution for all measurements shall be:
  1. 1 – 31.25 MHz: 150 kHz
  2. 31.25 – 100 MHz: 250 kHz
  3. 100 – 250 MHz: 500 kHz
  4. 250 – 500 MHz: 1000 kHz
- B. Wire Map Measurement
  1. Record the length of each balanced twisted pair.
- C. Propagation Delay
  1. Measure the propagation delay, per ANSI/TIA-1152, at 10 MHz.
  2. Record the propagation delay of each balanced twisted pair.
  3. Per ANSI/TIA 568 C.2 Section 6.3.18, the propagation delay shall not exceed 498 ns.
- D. Delay Skew

1. Record the delay skew measurement for each balanced twisted pair.
- E. DC Loop Resistance
  1. Report the DC loop resistance for all four pairs.
  2. Per ANSI/TIA 568 C.2 Section 6.3, DC loop resistance is not to exceed 21  $\Omega$  for all four pairs.
- F. DC Resistance Unbalance within a Pair
  1. Report DC resistance unbalance within a pair for all four pairs.
  2. Per ANSI/TIA 568 C.2 Section 6.2.2, DC resistance unbalance within a pair is not to exceed 200 m $\Omega$  or 3%, whichever is the greatest.
- G. DC Resistance Unbalance between Pairs
  1. Shall be Reported DC resistance unbalance between pairs for the following pairs:

1,2-3,6	1,2-7,8	3,6-7,8
1,2-4,5	3,6-4,5	4,5-7,8
  2. DC resistance unbalance between pairs is not to exceed 200 m $\Omega$  or 7.5%, whichever is the greatest.
- H. Insertion Loss
  1. Report both worst case and worst margins, in one direction, for all four pairs.
  2. Mark reported margins found to be within the accuracy of the field tester with an asterisk (\*).
  3. Insertion loss is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.7.
- I. Near-End Crosstalk (NEXT)
  1. Report both worst case and worst margins in both directions for all pair combinations.
  2. NEXT is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.8.
  3. Mark reported margins found to be within the accuracy of the field tester an asterisk (\*).
  4. Store the time domain Xtalk data for any marginal or failing NEXT results.
- J. Power Sum Near-End Crosstalk (PS NEXT)
  1. Report both worst case and worst margins in both directions for all four pairs.

2. PS NEXT is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.9.
  3. Mark reported margins found to be within the accuracy of the field tester with an asterisk (\*).
  4. Store the time domain Xtalk data for any marginal or failing PS NEXT results.
- K. Attenuation Crosstalk Ratio Near-End (ACR-N)
1. Report both worst case and worst margins in both directions for all pair combinations.
  2. Record ACR-N for all twelve possible combinations.
- L. Power Sum Attenuation Crosstalk Ratio Near-End (PS ACR-N)
1. Report both worst case and worst margins in both directions for all four pairs.
  2. Record PS ACR-N for all eight possible combinations.
- M. Attenuation Crosstalk Ratio Far-End (ACR-F)
1. Report both worst case and worst margins in both directions for all 12 pair combinations.
  2. ACR-F is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.11.
  3. Mark reported margins found to be within the accuracy of the field tester with an asterisk (\*).
- N. Power Sum Attenuation to Crosstalk Ratio Far-End (PS ACR-F)
1. Report both worst case and worst margins in both directions for all four pairs.
  2. PS ACR-F is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.13.
  3. Mark reported margins found to be within the accuracy of the field tester with an asterisk (\*).
- O. Return Loss
1. Report both worst case and worst margins in both directions for all four pairs.
  2. Ignore return loss at all frequencies where the insertion loss is less than 3 dB for that pair.
  3. Return loss is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.6.
  4. Mark reported margins found to be within the accuracy of the field tester with an asterisk (\*).

5. Store the time domain reflectometer data for any marginal or failing return loss results.
- P. Transverse Conversion Loss (TCL)
1. Report both worst case and worst margins in both directions for all four pairs.
  2. TCL is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.2.14.
- Q. Equal Level Transverse Conversion Transfer Loss (ELTCTL)
1. Report both worst case and worst margins in both directions for all four pairs.
  2. ELTCTL is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.2.16.
- R. Power Sum Alien Near-End Crosstalk (PS ANEXT)
1. The disturbed (victim) link shall have disturber links to the left and right of it and, if such links are present, above and below it.
  2. Disturber cables shall include all links within the same bundle as the disturbed (victim) link and adjacent links.
  3. If the link is patch-panel-to-patch-panel, then measure PS ANEXT in both directions. If the link is patch-panel-to-telecommunications-outlet, then measure PS ANEXT from the patch panel end only.
  4. PS ANEXT is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.21.
- S. Power Sum Alien Near-End Crosstalk (Average PS ANEXT)
1. Calculate average PS ANEXT by averaging the individual PS ANEXT loss values, in dB, for all four pairs in the disturbed (victim) link.
  2. PS ANEXT is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.22.
- T. Power Sum Alien Attenuation to Crosstalk Ratio Far-End (PS AACR-F)
1. PS AACR-F shall be the calculated power sum from all external pairs into the disturbed (victim) pair.
  2. The disturbed (victim) link shall have disturber links to the left and right of it and, if such links are present, above and below it.
  3. Disturber cables shall include all links within the same bundle as the disturbed (victim) link and adjacent links. If the link is patch-panel-to-patch-panel, then measure PS AACR-F in both directions. If the link is patch-panel-to-telecommunications-outlet, then measure PS AACR-F from the patch panel end only.

4. PS AACR-F is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.25

U. Power Sum Alien Attenuation to Crosstalk Ratio Far-End (Average PS AACR-F)

1. Calculate Average PS AACR-F by averaging the individual PS AACR-F values, in dB, for all four pairs in the disturbed (victim) link.
2. The disturbed (victim) link shall have disturber links to the left and right of it and, if such links are present, above and below it.
3. Disturber cables shall include all links within the same bundle as the disturbed (victim) link and adjacent links.
4. If the link is patch-panel-to-patch-panel, measure Average PS AACR-F in both directions. If the link is patch-panel-to-telecommunications-outlet, then measure Average PS AACR-F from the patch panel end only.
5. Average PS AACR-F is not to exceed the limits for Category 6A permanent links specified in ANSI/TIA 568 C.2 Section 6.3.26.

3.06 TESTING OPTICAL FIBER CABLE

A. General

1. All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with in accordance with the safety precautions specified in ANSI Z136.2.
2. Prior to field-testing, fully assemble and label all outlets, cables, patch panels, and associated components. Any testing performed on incomplete systems shall be redone after the systems are fully assembled and labeled.
3. Use field test instruments that have the latest software and firmware installed.
4. Upon completion of each test, record the link and channel test results from the OLTS and OTDR in the test instrument for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.
5. Inspect fiber end faces using a video scope with a field of view of no less than 425  $\mu\text{m}$  x 320  $\mu\text{m}$ .
6. Record the end face images in the memory of the test instrument for subsequent uploading to a PC and reporting.
7. Perform testing on each cabling segment, connector to connector. Sampling is not acceptable.
8. Test the cabling using high-quality test reference cords that:
  - a) Are of the same core size as the cabling under test
  - b) Are terminated with reference grade connectors that have a loss of no more than 0.2 dB for single-mode

- c) For OLTS testing, are between 2 m and 5 m long
- d) For single-mode testing, have launch and tail fibers of lengths appropriate for the link under test, as indicated in the following table:

<i>maximum length of link (km)</i>		<i>typical pulse width (ns)</i>	<i>minimum launch and tail cord length (m)</i>
<i>1310 nm</i>	<i>1550 nm only</i>		
0 to 35	0 to 50	= 1,000	130
35 to 45	50 to 65	3,000	400
45 to 50	65 to 75	10,000	1,000
= 50	= 75	20,000	2400

**B. Optical Loss Testing for Horizontal and Backbone Links**

- 1. Single-mode backbone links shall be tested in both directions at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA 526 7, Method A.1 (the one-cord reference method).

**C. Magnified End-Face Inspection**

- 1. Inspect fibers using a video scope with a minimum field of view of 425  $\mu$ m by 320  $\mu$ m per IEC 61300-3-35 Edition 1.0.
- 2. Use the following test limits:
  - a) For single-mode field polished connectors, Table 5 of IEC 61300 3 35 Edition 1.0
  - b) For single-mode factory polished connectors, Table 3 of IEC 61300 3 35 Edition 1.0
  - c) For Angled Physical Contact (APC) connectors, Table 4 of IEC 61300 3 35 Edition 1.0
- 3. Length Measurement
  - a) Record the length of each fiber.
  - b) It is preferable that the optical length be measured using an OLTS or OTDR.
- 4. Polarity Testing
  - a) Verify the polarity of the paired duplex fibers using an OLTS.

**D. Manufacturer's Field Service**

- 1. At the start of the installation, periodically as the Work progresses, and after completion, furnish:
  - a) The services of the manufacturer's technical representative at the job site, as needed, to advise on every phase of the Work

- b) Full-time attendance at least during the first three work days and at least once every week thereafter
- c) Technical assistance to the Installer as required.

### 3.07 FINAL TEST AND ADJUST

- A. The Contractor shall be responsible for post-installation performance testing of all cabling systems specified elsewhere in this Section of the Contract Documents.
  - 1. Testing procedures shall permit recording the length of each link, theoretical loss budget, and tested parameters for each pair and fiber, including space for sign-off by General Contractor and Owner.
  - 2. Any cable links or fiber strands, which fail to meet performance test criteria, shall be re-terminated, re-connectorized, or replaced by the Contractor free of charge.
  - 3. Submit final field test documentation in list form, including the General Contractor signature for Owner's approval.
- B. Unshielded Twisted-Pair Cable System Testing
  - 1. Permanent Link Test Configuration: Perform metered tests on each multi-pair twisted-pair and/or four-pair UTP cable through the wiring block, patch panel, at each end of the cable section and/or telecommunication outlet (T.O.). The permanent link test shall be undertaken as described in ANSI/TIA 568.2-D.
  - 2. Performance Testing:
    - a) Horizontal Cable System:
      - 1) Use a minimum Level IIIe field test instrument capable of the following swept/stepped frequency voltage measurements in accordance with the performance parameters required by ANSI/TIA 568.2-D
      - 2) Test each horizontal link to verify/determine, wire map, length, attenuation, skew, and near-end-crosstalk (NEXT) as described in ANSI/TIA 568.2-D.
    - b) Test Reports: Include field test results for each cable including cable link length in accordance with ANSI/TIA 568.2-D.
    - c) The test summary shall include:
      - 1) Cable Identification as it appears on cable schedule.
      - 2) Cable identification as it appears on the individual test reports.
      - 3) Cable identification as it is labeled in accordance to the Specifications.
      - 4) Pass/Fail Status.



- 5) All test parameters shall appear on each test document including graphics and indicating each test parameter result.
- 6) The individual test data sheet shall include the automated printout produced by the cable scanning equipment.

\*\*\*END OF SECTION\*\*\*

## ONTARIO SPORTS EMPIRE

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**SECTION 27 41 16****AUDIOVISUAL SYSTEMS****PART 1 - GENERAL****1.01 SUMMARY**

- A. This section specifies the basic requirements for communications installations as indicated or required and includes requirements common to more than one specification section of this division (such as related documents, related sections, definitions, governing requirements, contractor requirements, warranty requirements, submittal requirements/procedures, and project closeout requirements/procedures, as well as other requirements). This section may expand upon and/or supplement the requirements specified in Division 01.
- B. Examine the contract documents in their entirety (including drawings and specification sections in the other divisions) for requirements or work which may affect work under this section, regardless of whether such requirements or work are specifically indicated in this section.
- C. Errors or Omissions in Drawings or Documentation
  - 1. If any errors or omissions appear in Drawings, Specifications, or other documents, the bidding Contractor shall notify the Engineer no later than ten (10) days prior to submitting the bid.
  - 2. Should conflict occur in or between Drawings and Specifications, the bidding Contractor is deemed to have estimated the more expensive way of doing the work, unless the bidding Contractor has asked for and obtained written decision (addendum) before submission of the bid as to which method or materials will be required.
- D. System Performance Requirements
  - 1. Audio:
    - a) Audio shall be clear and without distortion and be at an acceptable level to not cause discomfort.
    - b) Program audio system:
      - 1) Frequency Response: 100 Hz to 12,000 Hz. 3 dB per octave roll off below 100Hz and above 12 kHz.
      - 2) Total Acoustical Harmonic Distortion: Less than 2% at 90 dBC (1 kHz reference) at four feet (1,220 mm) above finished floor in the middle of the room.
    - c) Distributed audio system:
      - 1) Frequency Response: 125 Hz to 10,000 Hz. 3 dB per octave roll-off below 125 Hz and above 10 kHz.

- 2) Total Acoustical Harmonic Distortion: Less than 2% at 85 dBC (1 kHz reference) at five feet (1,220 mm) above finished floor.
  - d) Signal to noise ratio (mixer input to amplifier output): min 10 dB from 50 Hz to 15 kHz minimum.
  - e) Frequency response with equalizers bypassed: less than  $\pm 1$  dB from 50 Hz to 12 kHz.
  - f) Distortion: less than 0.5% at 1 kHz at the equipment's rated input signal level.
  - g) Output levels (in audience areas without objectionable distortion, rattles, or buzzes, employing as test signals several different samples of recorded music and microphones applied at each system input):
    - 1) Program audio: not less than 95 dB
    - 2) Speech reinforcement: not less than 85 dB
  - h) Hum and Noise: inaudible (below the background noise level of the space) under normal operation observed in audience areas.
2. Wireless:
- a) Wireless components shall not interfere with other systems.
  - b) Components within a specified room shall not interfere with systems in another room
  - c) Channels shall be coordinated so that wireless devices do not automatically connect to adjacent room/space's components.
3. Control:
- a) System shall not be capable of synchronization conflicts (i.e. alternate action (toggling) on/off without power reset or feedback.
  - b) System shall be synchronized. A single component shall not receive multiple commands simultaneously.
  - c) Volume memory shall be stored in between system ON and OFF. System reboots shall not set volume above 50%.
  - d) Buttons shall be programmed with visible or colored status indicators.
  - e) Physical and virtual buttons shall be operable.
  - f) Configure system so that improper sequencing renders system unusable or with an infinite loop.
  - g) Buttons on GUI shall not lead users to backend configuration or programming without proper permissions (i.e. pincode, or username/password).

- h) System sources shall roll-over in logical manner, and return to pre-programmed default.
- i) System shall be able to completely power cycle all components within room or space.
- j) Rooms with mobile credential control (i.e. smart phone, QR-code) shall not control adjacent rooms or space unless specified in 1.01.E.Room Types.

E. Space Types:

1. In all spaces, assisted listening systems will be provided.
2. Stage
  - a) Speech reinforcement, audio amplification, and source content via microphones, audio inputs, sources, mixers, amplifiers, loudspeakers, and subwoofers
  - b) Inputs and outputs via floorboxes and wall plates
  - c) Audio shall be integrated with paging and mass notification for mute only
3. Family Gathering Area
  - a) Background music via source content and amplifiers
  - b) Digital signage displays shall display content via content player in Green Room MDF
  - c) Shall be integrated with stage audio, paging system, mass notification system, and video wall
4. Championship Fields
  - a) Speech reinforcement via microphones, audio inputs, amplifiers, and loudspeakers
  - b) Shall be integrated with paging and mass notification system

1.02 DEFINITIONS

- A. "AHJ": Authority Having Jurisdiction
- B. "Connect": To install patch cords, equipment cords, crossconnect wire, etc. to complete and electronic or optical signal circuit.
- C. "Cord": a length of cordage having connectors at each end. The term "Cord" is synonymous with the term "Jumper" and "Lead".
- D. "Furnish": To purchase, procure, acquire, and deliver complete with related accessories.
- E. "ISP": Inside Plant
- F. "NEMA": National Electrical Manufacturers Association

- G. "OFCI": Owner-furnished contractor-installed; coordinate the integration of components furnished by the Owner; provide mounting hardware, cable, connectors, etc. to ensure proper integration of OFCI equipment.
- H. "OFE": Owner Furnished Equipment
- I. "OSP": Outside Plant
- J. "Provide": To furnish, transport, install, erect, connect, test and turn over to the Owner, complete and ready for regular operation
- K. "Approved Grounding Point": an approved grounding point is one that satisfies the applicable electrical code and provides a low impedance path to earth. Examples include the following though may manifest in different means: a telecommunications grounding busbar (such as for bonding an equipment rack within a telecom room), the ACEG of the electrical panel serving the equipment requiring bonding to ground (such as for bonding a credenza rack within a conference room), or the ground conductor of a branch circuit (such as for bonding a single piece of equipment).
- L. "Audience Area": the portion of a presentation space intended to be occupied by an audience. An audience area includes the primary seating and standing spaces and may included the adjacent circulation spaces. An audience area generally excludes spaces reserved for presenters.
- M. "Audience Area": the portion of a presentation space intended to be occupied by an audience. An audience area includes the primary seating and standing spaces and may include the adjacent circulation spaces. An audience area generally excludes spaces reserved for presenters.
- N. "Custom" indicates systems or components the Contractor fabricates based on these specifications and drawings
- O. "EDID": Extended display identification data
- P. "HDCP": High-bandwidth digital content protection
- Q. "HDMI": High-definition multimedia interface
- R. "OFE": Owner Furnished Equipment
- S. "RU": rack unit, as defined in EIA/ECA-310
- T. "Shall" denotes a mandatory requirement
- U. "Should" denotes an advisory statement
- V. "SPL": sound pressure level
- W. "THD": total harmonic distortion
- X. "System": The audiovisual components, cabling, and programming incorporated in the descriptions and equipment lists herein

### 1.03 REFERENCES

- A. Most recent editions, revisions, addenda, and bulletins of the following documents:
  - 1. ANSI/TIA–568 series
  - 2. ANSI/TIA–569 Telecommunications Pathways and Spaces
  - 3. ANSI/TIA–606 Administration Standard for Telecommunications Infrastructure
  - 4. ANSI/TIA–607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
  - 5. ANSI/TIA–862 Structured Cabling Infrastructure Standard for Intelligent Building Systems
  - 6. Telecommunications Distribution Methods Manual
  - 7. Information Transport Systems Installation Methods Manual (ITSIMM)
- B. Americans with Disabilities Act
- C. California Electric Codes (CEC)
- D. Local Codes and Standards – all applicable
- E. NFPA 70 – National Electrical Code
- F. NFPA 101 – Life Safety Code
- G. UL 969, “Marking and Labeling Systems”
- H. UL 1419, “Professional Video and Audio Equipment”
- I. UL 60065, “Audio, Video and Similar Electronic Apparatus – Safety Requirements”
- J. InfoComm 1M, “Audio Coverage Uniformity in Enclosed Listener Areas”
- K. InfoComm 2M “Standard Guide for AV Systems Design and Coordination Processes”
- L. InfoComm 3M, “Projected Image System Contrast Ratio”
- M. InfoComm F501 01, “Cable Labeling for Audiovisual Systems”
- N. “Sound Systems Engineering”, 3rd Ed., Davis and Davis
- O. EIA/ECA-310, “Cabinets, Racks, Panels, and Associated Equipment”
- P. Local Authority Having Jurisdiction (AHJ)
- Q. Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either
- R. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor’s expense.

#### 1.04 QUALIFICATIONS

- A. The contractor shall hold a valid State of California C7 and C10 Contractor's license.
- B. Contractor shall have a proven track record in the field of specified cabling and system installations, with at least (3) previous installations of comparable size and complexity undertaken within the last (5) years.
- C. Contractor shall have advanced certifications (i.e. CTS-I, CTS-D).
- D. Contractor shall have manufacturer-specified advanced certifications for critical system components (i.e. DMC-D, XTP, etc.). Refer to Part 2.
- E. Contractor shall be a manufacturer's authorized distributor and warrantee station for the equipment offered, and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.

#### 1.05 SUBMITTALS

- A. Make submittals in accordance with:
  - 1. Section 00 00 00 – Procurement and Contracting Requirements
  - 2. Section 01 33 00 – Submittal Procedures.
- B. Action Submittals:
  - 1. Shop Drawings
    - a) Owner will provide electronic files in CAD or Revit format, containing the contract document drawing files, for use in the preparing of the shop drawings, by the RCDD.
    - b) Drawings will be to scale.
    - c) Submit the following sheets and details:
      - 1) Titlesheet and Cover Page: indicate project name and location; include sheet index
      - 2) Overall Floor Plans: floor plans showing the locations of devices not within enlarged plans; devices and cable routing paths with cable types, quantity called out, and device IDs; rack locations; wall elevations of displays and projector screens; new pathways/conduits/boxes/etc.
      - 3) Enlarged Plans: Floor and reflected ceiling plans showing the locations of devices and cable routing paths with cable types, quantity called out, and device IDs; rack locations; wall elevations of displays and projector screens; loudspeaker power; new pathways/conduits/boxes/etc.
      - 4) Rough-in and wiring details. Include button panel layouts.



- 5) Single line diagrams showing full scope of wiring and cabling between equipment, indicating Contractor and Owner scopes of work.

2. Product submittal

- a) Contractor shall furnish products for a complete, turnkey system. Submit major components and ancillary accessories required for complete system. Minor accessories like screws and nuts are not required for submission, unless specified in Part 2.
- b) Product submittal shall be a single complete submittal. Incomplete submittals will be rejected without review.
- c) Partial submittals will be allowed for short lead items only with documentation on lead time included at the front of the submittal.
- d) Catalog cut sheets and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication, material finish, and licenses. Clearly indicate on each sheet what is being submitted on.
- e) For touchscreen panels, submit separate PDFs per system with a page for each menu, submenu, and pop-up.
- f) Submit Owner logos where required by Owner standards.
- g) Qualification Data: Submit at least three references for projects similar in scope to the project described herein. Include, for each customer reference, the following information: Company name, address, phone number, name and email address of contact and type of job completed.
  - 1) Provide copies of the Contractor's certification.
  - 2) Provide written guarantees from manufacturers of major equipment, that a service representative has been assigned.
  - 3) Provide copies of technician training certificates.
- h) Submit test procedures for each room and standalone device. Group test procedures per room/standalone device. Refer to 1.01.D.System Performance Requirements for minimum requirements.
- i) Cable and channel test documentation utilizing Merideo testing equipment.

1.06 CLOSEOUT DOCUMENTS

- A. Final close out documents including, but not limited to, test results on in digital PDF and physical CD-ROM or USB drive, in native tester format, project manual that includes manufacturer and contractor warranties, product cut sheets, material submittals, etc. Also, include the following:

1. Provide "As-Built" Drawings in AutoCAD or Revit.
  - a) "As-Built" drawings indicating location of all equipment including but not limited to outlets, patch panels, on each segment and cable routing outlet and identifiers. Indicate labeling for each piece of equipment.
  - b) As-Built drawings will contain all installed cabling and materials. Outlets will be labeled with each cable associated with the work area outlet.
  - c) Red-lined shop drawings submitted as As-built drawings will be rejected without review.
  - d) (1) printed, hard copy of final approved as-built drawings in native sheet size will be provided to Owner. Unapproved sheet sizes will be rejected.
2. Provide printed test reports in 3-ring binder and submit to Owner.
3. Owner's written acceptance of installed systems.
4. Print (2) printed copies of full-sized as-built drawings, and submit to Owner.
5. Provide pricing and contact information for emergency service work not covered by warranty.

#### 1.07 QUALITY ASSURANCE

##### A. Standards for Materials and Equipment

1. The Contractor shall provide all materials, equipment, and installation in compliance with the latest applicable standards from AVIXA, ANSI, FCC, ASTM, EIA/TIA, IEEE, CEC, NFPA, NEMA, OSHA, REA, and UL.

##### B. Manufacturer's Warranty

1. Warranty shall meet the following criteria:
  - a) This warranty will cover all cables, terminations, and components provided by the Contractor.
  - b) Minimum 1-year written warranty covering workmanship and materials from the date of project completion. All repairs shall be made at no cost to the Owner during the warranty period.
  - c) Corrections shall start within 48-hours of notification from Owner.
2. If the warranty is needed by the Owner within the warranted period and the original installer is no longer in business, System manufacturer shall find a substitute certified contractor and assume costs to fulfill the obligations of the warranty.
3. Upon acceptance of the warranty paperwork and test results from the Contractor, System manufacturer will mail a notification letter to the installer and a notification letter with warranty certificate to Owner.

4. The warranty period shall commence following the final acceptance of the project by Owner and written confirmation of warranty from System manufacturer.
5. Provide 5-year software service agreement. Include associated licenses and renewal fees for the agreement's duration. Agreement and licenses shall commence following the project's substantial completion, and not the Contract's purchase date.

C. Acceptance Testing

1. Provide tests specified below, when applicable or required by Owner, and as indicated under individual items of material, equipment, and work specified in this Specification.
  - a) Furnish all test equipment and instruments required for the tests.
  - b) Responsible, qualified employees of the contractor in the presence of the Owner or an authorized representative shall perform the cable testing.
  - c) All individuals involved in the testing phase of the project shall not have been involved in the installation phase nor shall have immediate knowledge of the installation task.
2. End-to-end performance and calibration of all parts and channels shall be tested prior to testing in presence of Engineer.
3. Performance testing of typical rooms and 1-of-each-kind of standalone systems shall be performed in presence of Engineer. System shall be accepted by Engineer prior to testing in presence of Owner.
4. Performance testing of all rooms and standalone systems shall be performed in presence of Owner. Owner's written acceptance of system is a requirement of Closeout, and shall not conclude the Closeout Documentation stage.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. To prevent damage, theft, soiling, and misalignment, protect equipment during transit, storage, and handling
- B. The contractor shall coordinate the secure storage of equipment and materials on site, or, if no on-site storage is available, shall provide their own secure storage at the Contractor's expense.
  1. Do not store equipment where conditions fall outside the manufacturer's recommendations for environmental conditions.
  2. Do not install damaged equipment. Remove environmental conditions from the site and replace damaged equipment with new equipment.
  3. If off-site storage of materials is necessary, this shall be at the Contractor's expense.

1.09 PROJECT CONDITIONS

A. Project Environmental Requirements

1. Hazardous Materials Prohibition

- a) The Contractor shall ensure that all materials used in the project are asbestos-free, unless specifically authorized in writing by the Owner.

2. Existing Conditions

- a) Verify that all conditions on the project site are acceptable for the Work specified in this Section. Prior to bid opening, notify the Consulting Engineer, in writing, of any discrepancies, conflicts, or omissions. Otherwise, correct these issues at no additional cost to the Owner.
- b) Continue to monitor the project site. If conditions develop that require a variance from the Specifications or Drawings, then immediately notify the Owner in writing. Otherwise, make recommendations, submit drawings showing how the Work may be installed, and, upon approval, proceed with the necessary changes without additional cost to the Owner.

3. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings is complete.

4. Confirmation of Pathway and Cable Manager sizing:

- a) Wherever cabling pathways or managers are installed, it is the Contractor's responsibility to confirm pathway or manager sizing to represent no more than 25% fill upon installation according to manufacturer's fill tables.
- b) Pathways deemed overfilled upon installation will not be accepted and shall be remedied at Contractor expense.

1.10 USE OF THE SITE

- A. Where the Owner deems it necessary to place restrictions, use the site as directed by the Owner.
- B. When proceeding with the work, do not interfere with the ordinary use of streets, aisles, passages, exits, or operations of the Owner. During the day, set up cones and barriers in hallways and walkways. Do not string cable down the hallways during normal hours.
- C. Request a hazardous materials worksheet that identifies potentially-hazardous locations. Do not proceed with any work in locations where hazardous materials are known to be. Obtain instructions from the Contractor's Project Manager on and when to work in these areas.
- D. Multiple times each day, each contractor shall remove all trash and debris from the site. Before leaving the room each day:
  - 1. The Contractor shall replace all ceiling tiles that they have removed.

2. The Contractor shall place all furniture and equipment that they have moved back into its original location.
3. The Contractor shall return any equipment that they have disconnected to working order.
4. The Contractor's Job Foreman shall inspect all work locations to ensure that the rooms are clean and that all of the tasks described above have been done.
5. It is recommended that the Contractor inspect the site and take pictures to document the condition of the ceilings and walls.

#### 1.11 RESPONSIBILITIES AND COORDINATION

- A. The Contractor shall provide all materials, qualified labor and services required to ensure a complete and operational system, installed in accordance with the intent of the Contract Documents.
- B. The Contractor shall furnish and install all incidental items not actually shown or specified, but which are required by best practices to provide complete functional systems.
- C. The Contractor shall coordinate the details of facility equipment and construction for all specification divisions, which affect the work covered under this Division.
- D. The Contractor shall coordinate with all other trades. The Contractor will submit a schedule for the installation within 15 days of contract award.
  1. The schedule shall include delivery, installation, and testing for conformance to specific job completion dates.
  2. At minimum, the schedule shall provide dates for the start of demolition, the completion of demolition, the installation start date, the completion of copper cabling, the completion of backbone cabling, the completion of testing and labeling, cutover, the completion of the final punch list, final inspection, and acceptance.
- E. The Contractor shall develop a bill of materials, perform material management and efficient use of the materials whether they are issued by Owner or purchased by the Contractor.
- F. The Contractor shall ensure materials, in excess of, those required to complete the project are kept in their original condition and packaging for restocking.
- G. The Contractor shall maintain existing cables and terminations not determined to be within the demolition scope of work. Cables damaged, removed, or unterminated shall be reinstalled and recertified with the manufacturer's certified installer, and test results provided to the Owner.

#### 1.12 DESIGN CRITERIA

- A. Compliance by the contractor with the provisions of this Specification does not relieve him or she from the responsibilities of providing materials and equipment of proper design, mechanically and electrically suited to meet operating requirements at the specified service conditions.

**1.13 LABELING**

- A. Refer to Owner's standards for labeling requirements.
- B. Comply with TIA/EIA-606-A, TIA/EIA-606-A, Addendum 1 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- C. Labeling: Provide labeling for audiovisual system components. The components include, but are not limited to, the following:
  - 1. Equipment racks and equipment enclosures
  - 2. Rack-mounted equipment and devices: Provide a label on the back of each piece of equipment. If a serial number (of a given piece of equipment) is not visible in a final installed condition, provide a label on the equipment on a visible location duplicating the serial number.
  - 3. Wall-mounted equipment and devices: Provide an equipment label on the back of each piece of equipment. If a serial number (of a given piece of equipment) is not visible in a final installed condition, provide a label on the equipment on a visible location duplicating the serial number.
  - 4. Wires and cables: Provide a cable label at each end of each piece of wire, cable, and cord.
  - 5. Terminal blocks, patch panels, and other termination apparatus: Provide a label on each termination block, piece of termination apparatus and termination position on patch panels.
  - 6. Handheld and wireless devices
  - 7. User interfaces, devices, faceplates

**PART 2 - PRODUCTS****2.01 GENERAL**

- A. This Section includes General Requirements for each section in Division 27 and shall be used in conjunction with specifications, other related Divisions and related Contract Documents to establish the total requirements for the project.
- B. All materials and products shall be:
  - 1. Appropriate for the intended use
  - 2. Permitted by the Authority Having Jurisdiction (AHJ)
- C. All products shall be new, of the latest version at time of bid, and brought to the job site in original manufacturer's packaging. Used equipment and damaged material will be rejected.
- D. Provide attachments and accessories necessary for complete installation.
- E. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.

- F. Take care during installation to prevent scratches, dents, chips, etc. Equipment with significant or disfiguring cosmetic flaws will be rejected.
- G. All components will be approved by the Engineer and shall have the most aesthetic value possible while maintaining specified functionality. Hardware shall:
  - 1. Be in compliance with the Construction Documents.
  - 2. Have fit and finish compatible with the existing surrounding structure.
  - 3. Be unobtrusive.
  - 4. Provide the required functionality.
- H. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of the equipment and its installation.
- I. Provide products that are suitable for the intended use, including, but not limited to environmental, regulatory, and electrical factors.

## 2.02 SUBSTITUTION POLICY

- A. Substitution of specified products or systems is not allowed.
- B. Contractor shall assume all costs for removal and replacement of any product installed in substitution of those specified. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

## 2.03 MANUFACTURERS

- A. Refer to drawings for part numbers. Provide newest and current products at the time of procurement. Submit parts within period of longest lead items.
- B. General manufacturers herein are for the basis of design.
- C. Digital Signage Displays:
  - 1. NEC
  - 2. Panasonic
  - 3. Samsung
  - 4. Sharp
  - 5. Or Equal
- D. Content Players
  - 1. The Fugo Nuc
  - 2. Or Equal
- E. Loudspeakers/Subwoofers
  - 1. Biamp
  - 2. Q-Sys

- 3. AtlasIED
  - 4. Or Equal
- F. Audio Amplifiers
  - 1. Biamp
  - 2. Q-Sys
  - 3. AtlasIED
  - 4. Or Equal
- G. Extension Devices:
  - 1. Crestron
  - 2. Or Equal
- H. Audio Processors
  - 1. Biamp
  - 2. Q-Sys
  - 3. AtlasIED
  - 4. Or Equal
- I. Control Panels
  - 1. Crestron
  - 2. Or Equal
- J. Microphones and Receives:
  - 1. Shure
  - 2. Or Equal
- K. Mixers
  - 1. Allen and Heath
  - 2. Or equal
- L. Cabling
  - 1. Windy City Wire
  - 2. Belden
  - 3. Or Equal

### **PART 3 - EXECUTION**

#### **3.01 WORKMANSHIP**



- A. Manufactured products, materials, equipment, and components shall be provided, conditioned, applied, installed, connected, and tested in accordance with the manufacturer's specifications and printed instructions.
- B. The installation of all system components shall be carried out under the direction of qualified personnel. Appearance shall be considered as important as mechanical and electrical efficiency. Workmanship shall meet or exceed industry standards.

### 3.02 INTENT OF DRAWINGS

- A. The Audiovisual drawings show only general locations of equipment, devices, raceways, cable trays, boxes, etc., unless specifically dimensioned.
- B. The Contractor shall be responsible for the proper placement and routing of equipment, cable, raceways, cable runway, and related components, according to the Contract Documents and subject to prior review by the Owner and structured cabling engineer.
- C. The Contractor shall refer any conflicts within the Contract Documents to the Construction Manager and/or Owner for resolution.

### 3.03 GROUNDING

- A. Comply with requirements in both 26 0526 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with ANSI/TIA-607 and the local Electrical Code.

### 3.04 SERVICE CONTINUITY

- A. Maintain continuity of communications services to all functioning portions of the process or buildings during hours of normal use.
- B. Arrange temporary outages for cutover work with General Contractor. Keep outages to a minimum number and a minimum length of time in order to provide minimum impact.

### 3.05 LAYOUT AND TOLERANCES

- A. Follow as closely as practicable the schematic design shown on the drawings. Make all necessary measurements in the field to verify exact locations and ensure precise location and fit of specified items in accordance with the drawings. Make no substantial
- B. Alterations without prior approval of the owner and the engineer.

### 3.06 INSTALLATION

- A. Anchor and brace enclosures and cabinets where seismic bracing is required.
- B. Coordinate cooling for fully enclosed equipment (i.e. fans and vents for racks inside credenzas).
- C. Fully secure ceiling mounted equipment and raceways.

- D. Projection systems shall be aligned and adjusted for no distortion. Utilize physical and optical adjustments.
- E. Loudspeakers in series shall not exceed 75% of rated wattage.
- F. Provide service loops in backbox or nearest J-hook.
- G. Maintain signal and cable separation per Code and ANSI/BICS standards.
- H. Provide strain relief for cables and connectors.
- I. Configure EDID management for audio and video parameters are sent to source devices.
- J. Ensure HDCP is supported and working. HDCP may be disabled in educational institutions only for "fair use" conditions.
- K. Change passwords prior to final acceptance, and enable two-factor authentication.
- L. Ensure most current software is installed on devices and headend equipment.
- M. Coordinate GUI layout with Owner. Ensure button spacing is consistent and even.

### 3.07 CONSTRUCTION REVIEW

- A. The Engineer and Owner will review and observe installation work to ensure compliance by the contractor with requirements of the Contract Documents.
- B. Review, observation, assistance, and actions by the Engineer and Owner shall not be construed as undertaking supervisory control of the work or of methods and means employed by the contractor. The Engineer and Owner review and observation activities shall not relieve the contractor from the responsibilities of these Contract Documents.
- C. The fact that the Engineer and Owner does not make early discovery of faulty or omitted work shall not bar the Owner from subsequently rejecting this work and withholding payment until the contractor makes the necessary corrections.
- D. Regardless of when discovery and rejection are made, and regardless of when the contractor is ordered to correct such work, the contractor shall have no claim against the Engineer or Owner for an increase in the Subcontract price, or for any payment on account of increased cost, damage, or loss.

### 3.08 PROJECT RECORD DOCUMENTS

- A. Provide detailed project record documentation for sections listed in Part 1.
- B. Maintain separate sets of redlined record drawings, which show the exact placement, and identification of as-built system components. These are subject to weekly review by the General Contractor, Owner, or their representative.

### 3.09 ADDITIONAL CONTRACTOR REQUIREMENTS

- A. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job.

- B. All work areas will be cleaned at the conclusion of the project and no tools or materials shall be left in a manner as to pose a safety hazard.
- C. Projects are not considered finished and will not be paid by Owner until all debris, dust, etc. has been cleaned and removed to the Owner's satisfaction.
- D. Contractor shall remove all abandoned cable per Article 800 of the National Electrical Code and per TIA, BICSI, and AVIXA standards, recycling these materials where possible. Removal of orphaned cable is mandatory. Contractors shall consider this when placing bids.

### 3.10 FINAL ACCEPTANCE

- A. The Contractor is required to notify the Engineer/Owner of a proposed appointment for Final Inspection at least 72 hours before the appointment.
- B. Owner may visit site during construction to ensure installation is in compliance with their requirements. Punch items discovered by Owner shall be resolved within 10 days of discovery.
- C. System acceptance shall be defined as that point in time when the following requirements have been fulfilled:
  - 1. All submittals and documentation have been submitted, reviewed, and approved.
  - 2. The complete system has successfully completed all testing requirements.
  - 3. All punch list items have been corrected and accepted.

### 3.11 TRAINING

- A. Provide a minimum of (1) 8-hour training session with a minimum of (4) Owner's staff at the project site (or other location designated by the Owner) by a qualified instructor (presence of equipment manufacturer if needed for additional assistance). Topics shall include system usage, operation and maintenance, and minor modifications.

### 3.12 WARRANTY

- A. Maintenance
  - 1. Contractor shall perform preventative maintenance every (6) months after final completion.
  - 2. Contractor shall perform at a minimum:
    - a) Cleaning of vents, filters, lenses
    - b) Dust removal
    - c) Projector readjustments
    - d) System performance re-validation
    - e) Documentation of equipment requiring replacement (i.e. broken pixels/lenses/lamps, failing motors, etc.)

3. Costs shall be provided for extended services not covered by warranty.

\*\*\*END OF SECTION\*\*\*

**SECTION 27 51 13****PAGING SYSTEM****PART 1 - GENERAL****1.01 SUMMARY****A. Related Sections:**

1. Section 000000 – Procurement and Contracting Requirements
2. Section 010000 – General Requirements
3. Section 260526 – Grounding and Bonding for Electrical Systems
4. Section 270526 – Grounding and Bonding for Communications Systems
5. Section 270528 – Pathways for Communications Systems
6. Section 271116 – Communications Room Equipment
7. Section 274116 – Audiovisual Systems
8. Section 271700 – Testing of Structured Cabling Systems

**1.02 SYSTEM DESCRIPTION**

A. The integrated system provides overhead audio paging and synchronized visual paging. The system shall provide full-function capabilities in paging, messaging, automated flight announcements, and courtesy announcements, monitoring, and automated testing. The Contractor will provide, install, and test a complete paging system. The Contractor will provide and install all required components as identified below.

1. Ethernet Network for connection of all Audio, Visual and Control Computer Devices.
2. Networked Computer-based Control System
3. Multi-Channel Digital Recording and Playback Server
4. Dynamically Routed Audio Network
5. Ethernet Networked Integrated Power Amplifier Systems
6. Parametric Equalization System
7. Ambient Noise Analysis and Control System
8. Gigabit Ethernet Network
9. TCP/IP Networked Microphone Communication Stations
10. Automatic Power Amplifier Backup Switching
11. Automatic Testing and Supervision System

12. Software Selected Monitor System
13. Courtesy Announcement System with Text to Speech Engine (T-CAS®)
14. System Server(s) and Workstations
15. Visual Display Device Controllers
16. Speakers and Cabling
17. Equipment Enclosures and Accessories
18. Uninterrupted Power Systems
19. System Networking, Database, and Control Software
20. High-Powered Speaker Array System

#### 1.03 QUALIFICATIONS

- A. The contractor shall hold a valid State of California C7 and C10 Contractor's license.
- B. Contractor shall have a proven track record in the field of specified cabling and system installations, with at least (3) previous installations of comparable size and complexity undertaken within the last (5) years.
- C. Contractor shall have advanced certifications (i.e. CTS-I, CTS-D).
- D. Contractor shall have manufacturer-specified advanced certifications for critical system components (i.e. DMC-D, XTP, etc.). Refer to Part 2.
- E. AtlasIED certified integrator can be an Enterprise Systems Integrator (ESI) or a Certified Transportation Integrator. The former is the highest tier integrator of AtlasIED.
  1. Or approved equal.
- F. Contractor shall be an Alertus-certified channel partner.
- G. Contractor shall be a manufacturer's authorized distributor and warrantee station for the equipment offered, and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.

#### 1.04 SUBMITTALS

- A. Make submittals in accordance with:
  1. Section 00 00 00 – Procurement and Contracting Requirements
  2. Section 01 33 00 – Submittal Procedures.
- B. Action Submittals:
  1. Shop Drawings
    - a) Owner will provide electronic files in CAD or Revit format, containing the contract document drawing files, for use in the preparing of the shop drawings, by the RCDD.

- b) Drawings will be to scale.
- c) Submit the following sheets:
  - 1) Titlesheet and Cover Page: indicate project name and location; include sheet index
  - 2) Functional Block Diagram – Provide an overall block diagram showing all interconnections between components. Every device shall be identified and every required port shown. Block diagrams or system-generated documentation shall indicate the system configuration and system default settings or conditions.
  - 3) Network Drawing – Provide a system network riser diagram showing the network hierarchy, including all switches and port assignments.
  - 4) Rack Enclosure Layouts – Provide drawings indicating the placement and arrangement of all rack equipment and panels.
  - 5) Floor Plans – Provide scale floor plans indicating pathways, raceways, and conduits used for the system and equipment rooms. Include locations of all field devices including microphone communications stations, ambient sensors, and workstations as well as speaker zone boundaries.
  - 6) Wiring Diagrams – Provide wiring diagrams detailing cabling for network, power, signal and control. Identity terminal numbers and wiring color codes to facilitate installation, operation and maintenance.

2. Product submittal

- a) Contractor shall furnish products for a complete, turnkey system. Submit major components and ancillary accessories required for complete system.
- b) Minor accessories like screws and nuts are not required for submission, unless specified in Part 2.
- c) Product submittal shall be a single complete submittal. Incomplete submittals will be rejected without review.
- d) Partial submittals will be allowed for short lead items only with documentation on lead time included at the front of the submittal.
- e) Catalog cut sheets and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication, material finish, and licenses.
- f) Clearly indicate on each sheet what is being submitted on.

- g) For touchscreen panels, submit separate PDFs per system with a page for each menu, submenu, and pop-up.
  - h) Submit Owner logos where required by Owner standards.
  - i) Qualification Data: Submit at least three references for projects similar in scope to the project described herein.
  - j) Include, for each customer reference, the following information: Company name, address, phone number, name and email address of contact and type of job completed.
    - 1) Provide copies of the Contractor's certification.
    - 2) Provide written guarantees from manufacturers of major equipment, that a service representative has been assigned.
    - 3) Provide copies of technician training certificates.
  - k) Submit test procedures for each room and standalone device. Group test procedures per room/standalone device. Refer to 1.01.D.System Performance Requirements for minimum requirements.
  - l) Cable and channel test documentation utilizing Merideo testing equipment.
3. Warranty Documentation
- a) Refer to 274116.
4. Record Documentation
- a) Refer to 274116.

#### 1.05 QUALITY ASSURANCE

##### A. Standards for Materials and Equipment

- 1. The Contractor shall provide all materials, equipment, and installation in compliance with the latest applicable standards from AVIXA, ANSI, FCC, ASTM, EIA/TIA, IEEE, NEC, NFPA, NEMA, OSHA, REA, and UL.

##### B. Manufacturer's Warranty

- 1. Warranty shall meet the following criteria:
  - a) This warranty will cover all cables, terminations, and components provided by the Contractor.
  - b) Minimum 3-year written warranty covering workmanship and materials from the date of project completion. All repairs shall be made at no cost to the Owner during the warranty period.
- 2. If the warranty is needed by the Owner within the warranted period and the original installer is no longer in business, System manufacturer shall



find a substitute certified contractor and assume costs to fulfill the obligations of the warranty.

- a) Upon acceptance of the warranty paperwork and test results from the Contractor, System manufacturer will mail a notification letter to the installer and a notification letter with warranty certificate to Owner.
- b) The warranty period shall commence following the final acceptance of the project by Owner and written confirmation of warranty from System manufacturer.
- c) Include associated licenses and renewal fees for the agreement's duration. Agreement and licenses shall commence following the project's substantial completion, and not the Contract's purchase date.
- d) Support – The installation contractor shall provide the manufacturer's highest level support plan inclusive of either M-F 8a to 5p ET or 24/7/365 support – Both options with 1 hour response. The contract shall also include software updates and licensing and hardware warranty for three years minimum. The contractor must provide a minimum of one (1) Preventative Factory Health-Check Visit and (2 seats) Factory Training for end user and/or contractor. Optional validation of OS Security Updates.
  - 1) IEDSS ASSURANCE PLAN
  - 2) Or approved equal.

#### C. ACCEPTANCE TESTING

- 1. Provide tests specified below, when applicable or required by Owner, and as indicated under individual items of material, equipment, and work specified in this Specification.
  - a) Furnish all test equipment and instruments required for the tests.
  - b) Responsible, qualified employees of the contractor in the presence of the Owner or an authorized representative shall perform the cable testing.
  - c) All individuals involved in the testing phase of the project shall not have been involved in the installation phase nor shall have immediate knowledge of the installation task.
- 2. End-to-end performance and calibration of all parts and channels shall be tested prior to testing in presence of Engineer.
- 3. Performance testing of typical rooms and 1-of-each-kind of standalone systems shall be performed in presence of Engineer. System shall be accepted by Engineer prior to testing in presence of Owner.
- 4. Performance testing of all rooms and standalone systems shall be performed in presence of Owner. Owner's written acceptance of system

is a requirement of Closeout, and shall not conclude the Closeout Documentation stage.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Refer to 274116.

1.07 PROJECT CONDITIONS

A. Refer to 274116.

1.08 USE OF THE SITE

A. Refer to 274116.

1.09 RESPONSIBILITY AND COORDINATION

A. Refer to 274116.

1.10 DESIGN CRITERIA

A. Refer to 274116.

1.11 LABELING

A. Refer to 274116.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. This Section includes General Requirements for each section in Division 27 and shall be used in conjunction with specifications, other related Divisions and related Contract Documents to establish the total requirements for the project.
- B. All materials and products shall be:
  - 1. Appropriate for the intended use
  - 2. Permitted by the Authority Having Jurisdiction (AHJ)
- C. All products shall be new, of the latest version at time of bid, and brought to the job site in original manufacturer's packaging. Used equipment and damaged material will be rejected.
- D. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.
- E. Take care during installation to prevent scratches, dents, chips, etc. Equipment with significant or disfiguring cosmetic flaws will be rejected.
- F. All components will be approved by the Engineer and shall have the most aesthetic value possible while maintaining specified functionality. Hardware shall:
  - 1. Be in compliance with the Construction Documents.
  - 2. Have fit and finish compatible with the existing surrounding structure.
  - 3. Be unobtrusive.

4. Provide the required functionality.

- G. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of the equipment and its installation.
- H. Provide products that are suitable for the intended use, including, but not limited to environmental, regulatory, and electrical factors.
- I. Provide mounting brackets/attachments, transformers, additional accessories, and licenses for complete turnkey installation.

## 2.02 SUBSTITUTION POLICY

- A. Substitution of specified products or systems is not allowed.
- B. Contractor shall assume all costs for removal and replacement of any product installed in substitution of those specified. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

## 2.03 MANUFACTURERS

- A. AtlasIED GLOBALCOM
- B. Or approved equal

## 2.04 PERFORMANCE

- A. Technology – This system shall utilize the latest in digital audio, video and networking technology. The entire system shall be digital and not utilize combinations of analog and digital circuits. At the first point of connection to the system, microphones and other program sources shall be digitized and remain in the digital domain until the final power amplifiers. Systems that use multiple stages of analog/digital quantization are not acceptable.
  - 1. The system shall be entirely software driven. No analog controls may exist anywhere in the system that could allow unauthorized adjustments or users.
  - 2. Microprocessors shall manage and control all system functions and hardware including microphone communication stations, announcement queuing, telephone interfaces, distribution of emergency announcements, local announcements, terminal announcements, background music distribution, announcement recording, and messaging.
- B. System Architecture – The system shall feature distributed processing, with one or more GCK software controllers. The GCK controller shall provide a network-centric architecture to minimize central head-end equipment. This will eliminate the possibility of complete system failure should catastrophic failure happen in any one room or area. This distributed topology will also allow for local interface terminations with other systems, rather than the need to route connections to a centralized head-end location. Failed or abnormal performance of any active system component shall generate a fault to the fault reporting system.

- C. Ethernet Network – The entire system shall operate on a single Ethernet network. The network shall be designed using a hierarchical star configuration with a Gigabit backbone between all core, intermediate, and edge switches. In shared network environments, the Paging System shall be isolated from other broadcast traffic on a separate VLAN. Multiple VLAN's may be required depending on the ultimate system size and the manufacturer's recommendations. The network shall be designed and installed using recognized industry practice and tested in accordance with ANSI/TIA/EIA 568B-1, 2, and 3.
- D. Software – All system software for every system component shall be integrated into a single enterprise-class application utilizing a common database.
1. The entire system shall be programmed, controlled, and monitored by use of a single software application provided by the manufacturer of the system. Systems that require opening different applications provided by differing manufacturers to setup, control, or monitor system operations are not acceptable.
  2. Set up of announcement control, messaging, signal processing, and amplifier control functions shall utilize an internally hosted web page on the a GCK controller subject to user password and permission Each view shall include the functional setup parameters for each GCK, microphone communications station, integrated digital power amplifier system, and visual display device. These include but are not limited to microphone communications station setup, zone & zone group setup, user and user group setup, permanent digital record and playback (PDRP) configuration, audio monitor and testing setup, zone equalization, ambient analysis setup and power amplifier control.
- E. Password Security – System access to setup workstations, servers, and remote access shall require an authenticated user name and password. Access to microphone communications stations may require an optional user ID and PIN. Each user ID and PIN shall allow for up to 8 characters. The password server shall allow assignment of users to employer user groups for restricted access to appropriate functions and areas.
- F. Announcement Distribution – The system shall provide for distribution of announcements and messages to each zone of the system. A zone is defined as the smallest addressable area of speaker coverage. The system shall prevent a single zone from receiving more than one announcement or message at a time. No announcement or message shall be lost or discarded due to coordination or priority preemption unless configured as such through the business rules programming. For initial programming configure the systems as follows:
1. Program material sent to zones (i.e. Background Music) shall be ducked during any announcement or message.
  2. A local or multi-local zone group announcement shall not delay an emergency or higher priority announcement from playing, but it shall interrupt and override the t announcement in the zones that have been assigned to its use.

3. Multiple emergency announcements may be made at one time if no zone conflicts for that class of announcement exist. Regardless of zone announcements, emergency announcements immediately suspend all other zone activity in the effected zones until completed or cancelled.
- G. Priority Levels – Announcements and messages shall be processed and distributed based on defined levels of priority. A minimum of (256) priority levels shall be available. Initial priority levels shall be assigned as follows:
1. Not Assigned
  2. Emergency Live Announcements
  3. Emergency Messages
  4. Not Assigned
  5. Local Announcements and Messages
  6. Not Assigned
  7. Not Assigned
  8. Not Assigned
  9. Not Assigned
  10. Program Material (Background Music)
- H. Signal Routing – The system shall provide for simultaneous routing of the following traffic.
1. Each GLOBALCOM IP Announcement Control System (GCK) Instance or LAN segment shall route audio to up to 200 end point devices. Routing is limited only by the number of Dante™ channels that are dynamically assigned. No announcements shall be routed through the servers or announcement controllers unless being stored for delayed playback.
  2. The system shall distribute (8) program (BGM) channels assignable to any zone output.
  3. The system shall distribute and monitor audio from any monitor point to the requested monitoring speaker station.
  4. All routing of signals shall be on the digital audio network.
  5. All switching shall be quiet with no audible switching transients, clicks or pops.
  6. The system shall route unlimited visual announcements to the display devices.
- I. Announcement Properties – Each Announcement shall be configurable with announcement properties. These include:
1. Announcement Gain

2. Priority Level
  3. Time to wait in a ready state.
  4. Time to Warn for cutoff.
  5. Maximum Length
  6. Maximum Wait in busy queue
  7. Activate with only partial resources.
  8. Preempt All
  9. Continue with some zones Preempted
  10. Preemption Zone Kill
  11. Recover Zones as available
  12. Ducking
  13. Zone Mute
  14. Emergency
- J. Multi-Local Zone Groups – The system shall have the ability to program multi-local zone groups for each microphone communications station. These zone groups shall be pre-established groups of relational zones that are commonly accessed from those stations. A single number entry (common to every station for that relationship) shall be used to access those zone groups.
- K. User Groups - The system shall provide for editable user group assignments that control user access. User groups are sets of zone assignments within the facility. Zone groups may be selected by user groups based on approved access. User groups shall be available to users at microphone communication stations based on their authenticated membership in a user group and password/PIN.
- L. Logging – When a dedicated system server is included in the system topology, and the server has been loaded with the appropriate software, the Logging System portion of the software shall provide complete logging/archival for the following (4) types of system activity:
1. User Activity Log – This feature shall record all log in and out activity by time and date and record event descriptions for each. This includes all changes made to the system setup configuration.
  2. GCK Announcement Log – This feature shall record all events in the system including all announcements and messages that play. It shall include the user logged in, announcement type, time and date, originating station, destination zone(s) and length.
  3. Communications Station Security Log – This feature logs the status of communications stations. It shall include the user, users company (airline), station name and status

4. Fault Logger – This feature shall log all system faults. It shall include type and location fault, time and date of fault, time and date of restoration, and applicable test data. Faults shall be assignable to fault classifications and configurable for prioritized delivery.
  5. Should the system configuration require only a single GCK controller, log entries and archives will be held in volatile RAM, with all entries being lost upon loss of system power. Periodic external archiving of system logs should be performed if permanent log storage is required.
- M. System Capacity – Each system shall provide for up to (32) GCK nodes. Each GCK node shall provide support up to 200 system end points.
- N. Audio Specifications
1. Frequency Response  $\pm 0.5$  dB 20Hz to 20kHz
  2. Total Harmonic Distortion (THD) < .05% @ Rated Amplifier Output 20Hz to 20kHz
  3. Noise Referenced to Input -120 dBu 20Hz to 20kHz
  4. Signal-to-Noise >90dB
  5. Maximum Latency – From Communications 11.9 ms
  6. Station to Power Amps through (3) Network Switches
- O. Messaging system – The messaging system (Digital Record and Playback (DRP)) shall be integral to the function of the GCK and be integral to a GCK controller or reside on the network as a message server appliance.
1. (8 or 16) Channels of Recording and (8 or 16) Channels of Playback shall be simultaneously available in each controller. Each channel shall provide 130 seconds of recording. Times shall be configurable based on announcement type.
  2. When a communications station or workstation initiates an announcement, the system shall dynamically assign a communications channel (Dante™) and assign it to an open DRP channel. The announcement shall be played if the mic switch is released prior to the end of the record time. If the mic switch is pressed and held during a 5 second (or as programmed) silence period, the announcement shall be cancelled. The announcement will playback automatically, to the selected zone group, in its assigned queue position.
  3. Messages shall be stored in non-volatile memory and have a minimum capacity of 20,000 minutes.
  4. The system shall support minimum of (8) languages.
  5. The system shall support minimum of (3) types of messages. Each message shall have an audio and visual element to provide visual paging that duplicates the audio in the designated zones. The audio and visual elements shall start together and maintain continuous synchronization through the duration of the message.

6. Some messaging may require the use of a dedicated or virtual system database server, and Enterprise software. Contractor shall confirm the necessary hardware required for each type of message to be utilized.
  - a) Standard Messages – These are standard single file (take) messages of following categories. Standard messages may be assigned to any zone or zone group and may be initiated by any assigned communications station or scheduled for play by the system clock.
    - 1) Emergency announcements and instructions.
    - 2) Public service announcements (no parking, no smoking, etc.)
    - 3) Regulatory
    - 4) Other institutional messages.
  - b) Assembled Messages - Assembled messages shall allow audio message “takes” or phrases to be “assembled” in real time to create a complete message. Assembled messages shall allow dynamic information provided by the user or a database to be included within the message to provide for specific information or instructions. The user shall have the ability to “build announcements” using stored takes utilizing the built-in editing system. Takes shall be professionally recorded human voices and edited to allow assembly in any random order. Each message shall be up to 30 takes long.
  - c) Text-to-Speech Messages – Text-to-Speech Messages shall use a high-quality text to speech engine to create audio messages from text. Text-to-Speech messages shall be used only for courtesy announcements where announcements require dynamic messages and real voice takes cannot be anticipated or recorded.

Provide message libraries for English.

- P. Ambient Noise Analysis and Control – The system shall include the capability to automatically adjust the volume levels in each zone based on changes in the ambient noise levels in those zones.

1. Each zone that includes a sensor within its boundaries shall have automatic control.
2. The system shall automatically null announcement or program material for that zone to prevent “run away” or inaccurate volume tracking, and shall provide smooth unobtrusive control.
3. Software shall allow for setup of the following parameters.
  - a) Automatic, slaved to an automatic channel, or fixed modes.
  - b) Configuration of one or two sensors for control of a zone and control of multiple zones from one or more grouped sensors.



- c) Control of threshold, maximum gain allowed and scaling ratio.
  - d) Software shall provide for real time monitoring of sensor levels, program levels, output levels and gain changes.
  - e) System shall provide for automatic setup of zones using the integrated system messaging.
- Q. System Equalization - The system shall provide for frequency response equalization for each speaker zone output.
  - 1. Filter types shall allow notch, high pass, or low pass.
  - 2. Filters shall have a Q range of 0.055 to 33.
  - 3. Provide (9) filters for each zone output.
- R. Automatic Backup Amplifier Switching - The system shall include backup amplifier switching in the event of the failure of a power amplifier.
  - 1. The system shall automatically detect failure or abnormal operation of a power amplifier, and replace it with a spare amplifier without operator initiation.
  - 2. One spare power amplifier shall be installed for each (6) installed amplifiers.
  - 3. The spare amplifiers shall be only be powered up when they are transferred into service. The system shall detect a failure, power up the spare amplifier, and complete the transfer for restored operation within 2 seconds of an amplifier failure.
- S. Monitoring System - Provide the capability for complete integrated aural and signal level monitoring of the system at designated monitor points. This capability shall be available for selection at each system workstation for level monitoring and at each monitor speaker location for aural monitoring. Audio routing shall be automatic from any monitor point to any listening point.
  - 1. Selection shall be instantaneous and not introduce pops or other audio noise.
  - 2. Provide monitor points for each direct digital input, local analog input, ambient channel output, equalizer output, amplifier input, amplifier output, and speaker zone (plus end-of-line).
  - 3. Provide capability to select an announcement or message in progress from the main activity screen and select monitor points for that activity during the announcement or message.
  - 4. Provide a dynamic multi-channel VU monitoring screen selectable for each Amplifier Mainframe. The screen shall include calibrated VU meter bars, channel status, signal presence, and fault status for up to (16) channels. The screen shall also indicate status of the backup amplifier channels if provided.

- T. Testing System – The system shall provide for self-diagnostics that operate in real time under software control.
1. This self-testing shall include testing of any combination of communications stations, direct digital input, local analog input, ambient channel output, equalizer output, amplifier input, amplifier output, and speaker zone (plus end-of-line).
  2. The system shall be capable of testing to a resolution of 0.5 dB.
  3. Manual or programmed audible frequency self-testing shall be available as well as an inaudible (20 kHz) test designed to exceed the requirements of NFPA 72.
  4. All testing must be capable of operating simultaneously with normal system operations including test setup. Systems that disrupt or play audible test tones to more than a single zone at a time are not acceptable.
  5. Each speaker line shall include end of line monitoring to confirm continuity in accordance with NFPA72. Any fault in a speaker line shall be reported within 2 minutes.
  6. Each speaker line shall be tested automatically for ground faults on both sides of the balanced speaker cabling. This testing shall be available without applying power to the amplifier to verify cabling integrity prior to powering.
  7. All test results shall be reported to the fault reporting system.
- U. Courtesy Announcement System (T-CAS) – The system shall include an integrated software module for creation, management and dispatch of courtesy announcements.
1. A common system server and Enterprise software may be required for T-CAS functionality. Contractor is to verify equipment required for each project application.
  2. The module shall be server based to allow any authorized workstation to access it via Microsoft Internet Explorer and the audio system network. Recorded announcements will be created using an adjacent microphone communications station.
  3. The system shall provide for user definable templates and variables to be created for common courtesy announcements. Typical announcement templates will include pick up of a white courtesy phone, meet your party, claim lost items, retrieve messages, ad hoc messages, etc.
  4. The system shall include Batching of similar messages. Messages will “enter” a batch play at the next rotation, and remain in the rotation until the selected number of plays has occurred or until the message is delivered or cancelled.

5. The system shall support Bulletin Board messaging through optional visual displays. Messages shall be added to the bulletin board(s) upon initiation, and display the passengers name and message instructions.
  6. The system will allow for management of announcements within the database for creation, replaying, retrieval, archival, and logging.
  7. The system shall support audio and visual announcements and maintain audio-visual synchronization through the end of announcements. Messages may be played in up to (3) languages.
  8. The T-CAS system will include an optional Text-to-Speech Engine (TTS) if specified. The TTS engine shall be of the highest quality available and include English (optional languages shall include French, Spanish, German, Korean, Japanese, Chinese and others).
- V. Custom Graphical User Interface (IED Director) – The custom Graphical User Interface (GUI) shall allow the end-user the capability to trigger audio-visual messages via on-screen buttons displayed on computer monitors and touch-panels. The custom GUI will be designed using bitmaps or other pictorial representations of the site's building and/or floorplan(s). Functions such as choosing zones and/or zone groups, choosing live or recorded messaging, muting zones and the triggering of digitally recorded A/V messages shall be provided. A meeting between the Contractor and Owner's Representative shall be held to determine the GUI's layout, functionality, and use. This meeting shall take place no less than 100 days prior to the GUI's delivery date.
- W. Time Talker – The system shall include a time-talker feature for automatic playback of current time messages to assigned zone groups. The feature shall be fully configurable by the user and utilize assembled messages with real voice message segments. For example, "The current local time is seven forty-five AM". Time Talker shall have the ability to use preannounce tones and include the following languages; English, French, Spanish, German, Korean, Japanese, and Chinese. Each language shall be assignable at different times of the hour.

## 2.05 PRODUCTS

- A. Announcement Control System (GCK) – The system shall consist of one or more GLOBALCOM IP Announcement Control System controllers. Each GCK shall be designed and distributed to allow continued announcement and standard message operation in the event of failure of the system server, or communication to other GCK nodes.
1. Announcement Controller – The GLOBALCOM IP Announcement Controller shall manage all primary operations of the ACS including paging communication stations, audio routing, message management and Ethernet communications. It shall include an on-board solid state hard drive as well as flash memory for fail safe emergency message playback. The Controller shall accept standard VoIP protocols via two (2) native, simultaneous connections, and shall accommodate eight (8) additional inputs when separate third-party media converters are included. The physical controller shall include GCK3.0 Controller Software

- a) Acceptable Products:
  - 1) GLOBALCOM IP108-D with GCK3.0 Software and 8 Channel Dante™ Sound Card and 8 logic inputs, and 8 relay outputs, 2 analog Inputs and 1 analog output or
  - 2) GLOBALCOM IP216-D with GCK3.0 Software or and 16 Channel Dante™ Sound Card or
  - 3) GCK3.0 Software installed on an AtlasIED approved Workstation or Server with Sound Card.
2. Power Supplies – The GLOBALCOM IP108-D Controller shall be powered with individual 12-volt power supplies. Each power supply module shall be capable of providing 4 amps of power to GLOBALCOM IP Device.
  - a) Acceptable Products:
    - 1) IED1112PSD Modular Power Supply – single unit module (included with unit); or
    - 2) IED1112PS Power Supply Frame with one IED1112PSM Power Supply Module
  3. System Software (Server/Controller) – Each GCK Announcement Controller will be loaded with system software that will enable it to manage up to 200 endpoints.
    - a) System Software will include capability to interface/control other digital system components such as power amplifiers and logic devices.
    - b) Software shall be licensed with an annual license fee which includes support and updates.
      - 1) Acceptable Products:
        - (a) GLOBALCOM IP GCK3.0 Core Software
  - B. System Software (Custom GUI) – Optional Graphical User Interface application supplied in addition to System Software described above. Software application is custom to each project and is subject to server-client access/licensing schedule (as seen below).
    1. Acceptable Products:
      - a) IEDDIRWS Director Workstation Software
  - C. Ambient Analysis Sensor – The Ambient Analysis Sensors shall detect ambient noise levels in respective speaker zones. Noise levels shall be processed using an A-weighted curve and converted to a DC waveform for transmission to an input on the AtlasIED DNA or T112 Series Amplifier with integrated Ambient Analysis System.
    1. Acceptable Products:

- a) IED0540S(-2) Sensor
  - b) or approved equal.
- D. Logic input Module – The Logic input module shall provide (16) ports for interfacing logic signals into the system.
  - 1. Connection to the system shall be via a 100BaseT Ethernet port.
  - 2. The collector shall provide for (16) channels of logic inputs, expandable to 32 logic inputs.
  - 3. The collector shall be powered through the PoE Ethernet Port or with an optional modular power supply.
  - 4. The Collector shall be din rail mounted.
    - a) Acceptable Products:
      - 1) IED1516LI
      - 2) Or approved equal.
- E. Logic Input Expansion Module – The logic input expansion module shall provide (16) ports for interfacing logic signals into the system when used with the Logic Input Collector IED1516LI.
  - 1. The Logic Input Expansion Module shall provide for daisy chain operation with the IED1516LI via ribbon cable.
  - 2. The Collector shall be din rail mounted.
    - a) Acceptable Products:
      - 1) IED1516LI-E or approved equal.
- F. Logic/Relay Module – The Logic/Relay Module is a web-enabled, programmable relay device equipped with two (2) optically-isolated logic inputs, and two electro-mechanical relay outputs. The module receives its power via Power over Ethernet (PoE) and can be used to trigger actions to external devices, or as a monitor point for receiving control closures or registering system faults.
  - 1. Acceptable Products:
    - a) IED1522LR or approved equal.
- G. Audio Input Output Module – The Audio Module is a Dante™ 4-channel, balanced audio Input/output device used for injecting line-level audio signals, such as background music or local audio sources onto the Dante™ digital audio network. It is also capable of converting 4 Dante™ Outputs to Analog Line Level Audio. Each module includes selectable audio Input gain. Inputs and Outputs are via standard quick connectors and is powered via standard PoE.
  - 1. Acceptable Products:
    - a) IED1544AIO-D or approved equal.

- H. Smart Zone Output Processor – The Smart Zone Processor is a Dante™ 4X4-channel, balanced audio Input/output device that provides all the network audio routing and zone digital signal processing functions of an integrated network amplifier. This includes Network audio input, equalization, level control, and ambient analysis. In addition to the four zone outputs, the 1544ZOP has four balanced line-level analog inputs that may be used as automated test inputs associated with the four zone outputs. It also provides (8) logic inputs connections for (2) ambient sensor collectors per input channel. Connectors are quick connect and it is powered via standard PoE.
1. Acceptable Products:
    - a) IED1544ZOP or approved equal.
- I. Integrated Digital Power Amplifier System (IDPAS) – The Integrated Power Amplifier System shall provide DSP processing and power amplification for up to (12) zones in a single modular mainframe.
1. Digital Audio Network Interface – The network interface shall receive (12) dynamic assigned audio channels from the GCK Controller via the Ethernet Network. Control for the IDPAS and monitoring shall be included on the network. The NIC shall provide dual outputs to support a redundant network.
  2. Zone Manager – The IDPAS shall provide zone management for (12) channels as directed by the vACS. Channel management shall be structured to utilize the minimum channels necessary on the network to support paging, messaging and background music activity for any combination of zones.
  3. DSP Processing – The IDPAS shall include digital signal processing for (12) channels of audio. Each channel shall include (9) bands of parametric equalization, time delay, ambient analysis control, (7) monitoring points, and (7) testing points. Complete setup and control software shall be integrated within the GLOBALCOM 3.0 Software and available on the network for configuring, controlling, monitoring, and testing the DSP for each channel.
  4. Ambient Analysis and Control – The Ambient Analysis System shall adjust signal levels in response to either ambient noise levels or computer commands. The system shall operate in real time and shall not be a “sample and hold” system. The system shall include an automatic calibration sequence. All setup, configuration and monitoring controls shall be software based with the ability for multiple sensors averaged to control a single channel(s) or for a single sensor to control multiple channels. The sensors shall utilize control signaling and levels that allow co-locating with the speaker cable for cable routing efficiency. Three modes of operation shall be possible:
    - a) Automatic – Changes attenuation levels in response to noise levels reported by remote sensors.
    - b) Slaved – Changes attenuation levels based on remote sensors of an automatic channel.

- c) Fixed attenuation as set by the computer and user.
    - 1) Acceptable Products:
      - (b) Integrated Amplifier Mainframe – AtlasIED TitanONE T112 or approved equal.
- 5. Power Amplifier Cards – Each IDPAS mainframe shall be designed to accept (7) amplifier cards. Each card shall be removable and replaceable without disabling or interfering with the operation of the DSP or other power amplifier cards. The amplifier cards shall be available as dual line output, 150, 300 or 600-watt cards, and shall be of a high efficiency design to maintain a minimum of 78% efficiency at 100% output. The mainframe shall support simultaneous use of (6) amplifier cards (12) channels) plus the hot spare card. Provide appropriate card models as required.
  - a) Acceptable Products:
    - 1) AtlasIED T2LD-T1 Dual Line output
    - 2) Atlas IED T302-120V-T1 / T302-230V-T1 Dual 150W
    - 3) AtlasIED T602-120V-T1 / T602-230-T1 Dual 300W
    - 4) AtlasIED T1202-120V-T1 / T1202-230-T1 Dual 600W
    - 5) Or approved equal.
- 6. Internal Monitoring – Each IDPAS shall include in internal audio monitoring buss with software selected switching. This monitor shall allow selection of a monitor point from the control software to allow visual and audio monitoring of the channel network input, channel direct input, ambient channel output, EQ output, amplifier input, amplifier output, and speaker load monitor for each of the (12) channels. This feature shall operate simultaneously and independent of the automatic testing.
- 7. Automatic Testing – The automatic testing system shall locally test and process audio test signals through the IDPAS. These tests may be done manually on demand for any single test point as well as globally in the mainframe on a completely automated basis during the day. The test points duplicate those of the monitoring points above with a testing resolution of 0.5 dB.
- 8. Local Inputs – The IDPAS shall include (12) analog inputs for local zone program sources or BGM. One channel shall be configurable as a backup emergency input usable in the event of a network failure.
- J. Digital Network Amplifier – Digital Network Amplifier (DNA) shall be a four (4) channel mainframe power amplifier device with each channel providing 600 watts of amplification. The DNA shall be controlled via network commands to setup and adjust integrated features such as routing configurations, Digital Signal Processing (DSP) settings, delay, output levels, and ambient analysis compensation settings. The mainframe device shall be fully supervised, with any

amplifier failures or environmental condition alerts being reported to the system's fault logger program.

1. Acceptable Products:

- a) AtlasIED DNA2404DL – 70-volt Digital Network Amplifier (Dante™)
- b) AtlasIED DNA2404DH – 100-volt Digital Network Amplifier (Dante™)
- c) Or approved equal

K. Touchscreen Full Function Microphone Communications Stations – Full function communication stations shall have a fully programmable 7" touch screen user interface, a 800 x 480 (480 x 800) LCD color display. The station shall be a network appliance with control and Dante™ audio communicating on the audio network. Connection to the system shall be 100BaseT with power provided by a PoE switch port or PoE mid span power. Microphones shall be provided as handheld models. Each microphone shall utilize a magnetic mount and include a line amplifier in the microphone shell to eliminate microphone signal levels beyond the microphones. Stations shall be provided in horizontal or vertical desktop or wall mount as noted on the drawings and based on the mounting situation required.

1. Acceptable Products:

- a) AtlasIED 571D or approved equal.

L. Touchscreen Full Function Microphone Communications Stations – Full function communication stations shall have a fully programmable 7" touch screen user interface, a 800 x 480 LCD color display. The station shall be a network appliance with control and Dante™ audio communicating on the audio network. Connection to the system shall be 100BaseT with power provided by a PoE switch port or PoE mid span power. Microphones shall be provided as handheld (-H) or gooseneck (-G) as required. Each microphone shall utilize a magnetic mount and include a line amplifier in the microphone shell to eliminate microphone signal levels beyond the microphones. Stations shall be provided in horizontal desktop as noted on the drawings and based on the mounting situation required.

1. Acceptable Products:

- a) AtlasIED 570D-H
- b) AtlasIED IPCSTOUCH-H(G)
- c) Or approved equal.

M. Limited Function Digital Microphone Stations – Limited function microphone stations shall have (4) selection buttons plus PTT (Push to Talk) or No Button Plus PTT. The station shall be a network appliance with control and Dante™ audio communicating on the audio network. Connection to the system shall be 100BaseT with power provided by a PoE switch port or PoE mid span power. Microphones shall be handheld and utilize a magnetic mount. Microphones shall



include a line amplifier in the microphone shell to eliminate microphone signal levels beyond the microphones. Stations shall be provided in surface wall-mounted (1 or 2-gang) or desktop versions as noted on the drawings and based on the mounting situation required.

1. Acceptable Products:

- a) Wall-Mounted Microphone Station – AtlasIED IPCS4 (with handheld microphone); or approved equal.
- b) Wall-Mounted Microphone Station – AtlasIED IPCS1 (with handheld microphone); or approved equal.
- c) Desktop Microphone Station – AtlasIED IPCS4 (with IEDA520DTB desktop base and handheld microphone); or approved equal.
- d) Desktop Microphone Station – AtlasIED IPCS1 (with IEDA520DTB desktop base and handheld microphone); or approved equal.
- e) Mounting adapter plate – AtlasIED IED528SKA (for installations in existing 528 series back box)
- f) Or approved equal.

- N. Rack Mount Communications Station – Rack Communication Stations shall have a full function communication stations with a fully programmable touch screen user interface, a 800 x 480 LCD color display. The station shall be a network appliance with control and Dante™ audio communicating on the audio network. Connection to the system shall be 100BaseT with power provided by a PoE switch port or PoE mid span power. Microphones shall handheld and utilize a magnetic mount. It shall include a line amplifier in the microphone shell to eliminate microphone signal levels beyond the microphones. The station shall include a flush speaker for monitoring selected audio. The speaker shall be powered by an 8-watt power amplifier and include a panel volume control. The station shall use no more than 4 standard rack units.

1. Acceptable Products:

- a) AtlasIED IPCSTOUCH-H with AtlasIED IED5400CS-SRM Rack Mount Kit
- b) Or approved equal.

- O. Digital Audio Bridge - The Digital Audio Bridge (DAB) shall provide a way to route Dante audio across VLAN's to other Dante and/or existing CobraNet controllers. Each network connection of the DAB shall be dual redundant, allowing the maximum possible reliability in network connectivity. The unit be used over existing Ethernet networks, saving money by eliminating additional infrastructure costs. The DAB shall allow up to 8 channels of digital between two networks in each direction (8x8). The device shall be added to the system and configured through the GLOBALCOM® GCK software. By using a network-based bridge, announcement management will be linked and routed resulting in announcement distribution.

1. Acceptable Products:
  - a) AtlasIED IED1100DAB-DD (Dante to Dante)
  - b) AtlasIED IED1100DAB-CD (Dante to CobraNet)
  - c) Or approved equals
  
- P. System Server – The System Server shall support and provide redundancy for all required data files and programs for the Paging System. The server shall include Microsoft Windows 10 IoT and Microsoft SQL Express (2019). It shall provide the most recent configuration as recommended by the system manufacturer with the following minimum specifications:
  1. Rack mount with sliding rack supports
  2. Intel Quad Core Xeon Processor
  3. 16 Gb Memory
  4. SAS/SATA Drive Controllers
  5. RAID 1 Drive Redundancy with (2) Solid State Drives
  6. Dual Gigabit Network Interfaces
  7. Redundant Hot Swap Power Supplies
  8. Locking Drawer Rack Mount 15" LCD Monitor with Keyboard.
  9. For systems designated to include a backup Server, include a second Server identical to the first with site-approved auto-failover software.
    - a) Acceptable Products:
      - 1) IEDSVR Server with IED0590KDS Rack Monitor/Keyboard/Mouse
      - 2) Or approved equal.
  
- Q. User Workstations – The user workstation shall be a rack mount computer to provide the user interface and monitor/test reporting. In smaller single vACS systems this function may be provided by the System Server. See the drawings for clarification. Provide the most recent configuration as recommended by the system manufacturer with the following minimum specifications.
  1. Rack mount with sliding rack supports
  2. Intel i5 Series w/6 Core Processor
  3. 16 Gb Memory
  4. SAS/SATA Drive Controllers
  5. (1) 256GB Solid State Drive
  6. Gigabit Network Interface
  7. Windows 10 Embedded

8. Locking Drawer Rack Mount 15" LCD Monitor with Keyboard and.
  - a) Acceptable Products:
    - 1) IED0591RU-W1 with IED0590KDS Rack Mount Monitor/Keyboard/Mouse
    - 2) Or approved equals.
- R. Uninterruptible Power Supplies (UPS) – All Servers, ACS's, User Workstations and the Core Switch shall be powered by full conversion UPS's.
  1. Acceptable Products:
    - a) APC Smart UPS Series
    - b) Or approved equal.
- S. Loudspeaker Type 1 – The Type 1 loudspeaker system shall include a high performance 4.5" coaxial loudspeaker, ported bass reflex enclosure and press-fit grille for conventional ceiling installation. Frequency response for the system shall be 60Hz – 20kHz. Sensitivity shall be 90dB average. Loudspeaker shall be comprised of a 4.5" coaxial cone type driver. Cone shall be constructed of composite cone with polymer coated cloth surround. The 20mm tweeter shall be a silk dome. Magnet shall be a minimum of 10oz (264g) and the voice coil diameter shall be 1" (25mm). Transformer shall be a 70.7V / 100V type with 2, 4, 8, 16, and 32 watt primary taps (@70.7V) with a front mounted tap selector switch to include transformer bypass setting for 8Ω direct coupled operation. Enclosure shall be a deep drawn steel enclosure design. Internal volume shall be 195.75 in3 . To facilitate connection in conduit systems, enclosure shall be equipped with an access panel covering a recessed terminal cup. This cover shall provide a top access compression fitting / strain relief to facilitate flexible 1 /2" conduit when the compression fitting is removed. External wiring shall be accomplished via a removable lockable wiring connector with screw-down terminals to provide both secure wire termination and pre-wiring capability before loudspeaker installation. The 4 pole locking connector shall facilitate in/out connections and shall be located in the recessed area behind the conduit access panel. Seismic support eye shall be provided on top of enclosure for additional suspension point when used in drop tile ceilings. Construction of enclosure shall be a minimum of 18-gauge deep drawn painted metal. Loudspeaker shall include Safety First Mounting System to eliminate the potential for steel screws to rust and break causing the dogleg to fail, resulting in the loudspeaker falling out of the ceiling. The system shall include a support backing plate to reinforce the ceiling material and tile support rails for use on either 2' x 4' (609mm x 1219mm) or 2' x 2' (609mm x 609mm) suspended ceiling tiles. This assembly can all be installed from beneath the ceiling tile. Overall front face diameter shall not exceed 9.57" (243mm); overall depth from the bottom of the ceiling shall not exceed 7.27" (184.66mm). Grilles shall be press-fit, manufactured from 24-gauge perforated steel mesh and finished in white epoxy. Round grill shall be 7.78" (197.6mm) diameter. Loudspeaker shall be safety listed to both UL1480, UL2043, and CSA C22.2 No. 205 standards.
  1. Acceptable Products:

- a) Atlas Sound FAP43T-W
  - b) Or approved equal.
  
- T. Loudspeaker Type 2 – The Type 2 loudspeaker system shall include a high performance 6.5" coaxial loudspeaker, ported bass reflex enclosure and press-fit grille for conventional ceiling installation. Frequency response for the system shall be 50Hz – 20kHz. Sensitivity shall be 90dB. Loudspeaker shall be comprised of a 6.5" cone type driver. Cone shall be constructed of composite cone with polymer coated cloth surround. Magnet shall be a minimum of 10 oz (264 g) and the voice coil diameter shall be 1" (25 mm). The silk dome tweeter is 20mm and utilizes a Neodymium magnet. Transformer shall be a 70.7V / 100V type with 4, 8, 16, and 32 watt primary taps (@70.7V) with a front mounted tap selector switch to include transformer bypass setting for 8Ω direct coupled operation. Enclosure shall be a deep drawn steel enclosure design. Internal volume shall be 323in<sup>3</sup>. To facilitate connection in conduit systems, enclosure shall be equipped with an access panel covering a recessed terminal cup. This cover shall provide a top access compression fitting / strain relief to facilitate flexible 1 / 2" conduit when the compression fitting is removed. External wiring shall be accomplished via a removable lockable wiring connector with screw-down terminals to provide both secure wire termination and pre-wiring capability before loudspeaker installation. The 4 pole locking connector shall facilitate in/out connections and shall be located in the recessed area behind the conduit access panel. Seismic support eye shall be provided on top of enclosure for additional suspension point when used in drop tile ceilings. Construction of enclosure shall be a minimum of 18-gauge deep drawn painted metal. Loudspeaker shall include Safety First Mounting System to eliminate the potential for steel screws to rust and break causing the dogleg to fail, resulting in the loudspeaker falling out of the ceiling. The system shall include a support backing plate to reinforce the ceiling material and tile support rails for use on either 2' x 4' (609mm x 1219mm) or 2' x 2' (609mm x 609mm) suspended ceiling tiles. This assembly can all be installed from beneath the ceiling tile. Overall front face diameter shall not exceed 10.51" (267 mm); overall depth from the bottom of the ceiling shall not exceed 8.86" (225.1 mm). Grilles shall be press-fit, manufactured from 24-gauge perforated steel mesh and finished in white epoxy. Round grill shall be 8.67" (220mm) diameter. Loudspeaker shall be safety listed to both UL1480, UL2043, and CSA C22.2 No. 205 standards.
  - 1. Acceptable Products:
    - a) Atlas Sound FAP63T-W
    - b) Or approved equal.
  
- U. Loudspeaker Type 3 – The Type 3 loudspeaker System shall include a high performance 8" coaxial loudspeaker, ported bass reflex enclosure and press-fit grille for conventional ceiling installation. Frequency response for the system shall be 55Hz – 20kHz (±5dB). Sensitivity shall be 90dB average. Loudspeaker shall be comprised of an 8" coaxial cone type driver. Cone shall be constructed of polypropylene with a butyl rubber surround. The 19mm tweeter shall be constructed of PEI. Woofer magnet shall be a minimum of 21oz (595g) and the voice coil diameter shall be 1 1 / 2" (38mm). Transformer shall be a 70.7V / 100V type with primary taps at 1.9, 3.8, 7.5, 15, 30, and 60 watts (@ 70.7V) with a front

mounted tap selector switch. This tap selector switch shall also include a transformer bypass setting for instances where the 8Ω FAP82T driver is to be direct coupled with a low impedance amplifier. Enclosure shall be a deep drawn steel enclosure design. Internal volume shall be 937 in<sup>3</sup>. To facilitate connection in conduit systems, enclosure shall be equipped with an access panel covering a recessed terminal cup. This cover shall provide a combination in 3/4" (19mm inside diameter) / 1" (25mm inside diameter) knock-out on the side access and a top access compression fitting / strain relief to facilitate flexible conduit up to 22mm outside diameter or 1" (25mm inside diameter) conduit when the compression fitting is removed. External wiring shall be accomplished via a removable lockable wiring connector with screw-down terminals to provide both secure wire termination and pre-wiring capability before loudspeaker installation. The 4 pole locking connector shall be located in the recessed area behind the conduit access panel. A 1/4"-20 drop forged eyebolt factory installed into an insert on top of enclosure for additional suspension point when used in drop tile ceilings or for pendant mounting. Construction of enclosure shall be a minimum of 18-gauge deep drawn metal finished in white epoxy. The system shall include a support backing plate to reinforce the ceiling material and tile support rails for use on either 2' x 4' (609mm x 1219mm) or 2' x 2' (609mm x 609mm) suspended ceiling tiles. This assembly can all be installed from beneath the ceiling tile. Overall front face diameter shall not exceed 15 3/4" (400mm); overall height shall not exceed 11 1/2" (292 mm), 12 3/4" (324mm) including factory-installed eyebolt. Grilles shall be press-fit, manufactured from 24-gauge perforated steel mesh and finished in white epoxy. Round grille shall be 13.67" (347mm) diameter.

1. Acceptable Products:

- a) Atlas Sound FAP82T-W
- b) Or approved equal.

- V. Loudspeaker Type 4 – The Type 4 indoor/outdoor mini-loudspeaker system shall consist of two-way woofer and tweeter within environment-resistant housings. Enclosure shall be constructed of paintable UV-resistant, talc impregnated, polypropylene injection molded plastic finished in black or white. Each unit shall include a stamped powder coated aluminum grille and removable C-shaped mounting bracket. All hardware inserts shall be brass and threaded 1/4"-20. The 16 Watt RMS system shall have a 4" (102mm) woofer, constructed of reinforced polypropylene, and a 1" (25mm) Ferrofluid tweeter. The dividing network crossover frequency shall be 4kHz. The dividing network shall include protection circuits for the high-frequency component. Each unit shall include an internally mounted 16 Watt 70.7V / 100V line matching transformer for use in distributed sound applications. Wattage taps shall be screwdriver selectable via a sealed switch located near the input section. Wattage taps shall be 3, 4, 8, & 16 Watts @ 70.7V. The loudspeaker system shall meet the following performance criteria: Power handling: 16 Watts RMS. Frequency response: 115Hz – 16kHz (±5dB). Sensitivity shall be 88dB SPL at one watt, 85Hz – 16kHz measured at a distance of one meter on axis. Impedance shall be 8Ω nominal. Input connectors shall include a two-pole barrier strip capable of accepting up to two #14AWG cables. A cover with wire exit hole shall be provided to protect the input connectors. The loudspeaker system shall exhibit no performance or cosmetic degradation after a

100-hour salt spray test per ASTM B117 The unit shall be 7" (178mm) high, 5" (127mm) wide, and 5 15/16" (151mm) deep.

1. Acceptable Products:

- a) Atlas Sound SM42T-B (Black)
- b) Atlas Sound SM42T-W (White)
- c) Or approved equal.

W. Loudspeaker Type 5 – The Type 5 indoor/outdoor loudspeaker system assemblies shall consist of 2-way, woofer and tweeter, within environment-resistant housings. Enclosure shall be constructed of paintable UV-resistant, talc impregnated, polypropylene, injection molded plastic finished in black or white. Each unit shall include a stamped, powder coated, aluminum grille and removable C-shaped mounting bracket. All hardware inserts shall be brass and threaded 1/4"-20. The 75-Watt RMS system shall have a 6-1/2" (165.1mm) woofer, constructed of water resistant, composite cone woofer and a 20mm Ferrofluid cooled tweeter. The dividing network crossover frequency shall be 2.7kHz. The dividing network shall include protection circuits for the high-frequency component. Each unit shall include an internally mounted 32-Watt 70.7V / 100V line matching transformer for use in distributed sound applications wattage taps shall be screwdriver selectable via a sealed switch located near the input section. Wattage taps shall be 4, 8, 16, and 32 @ 70.7V plus transformer bypass setting for direct coupled 8Ω operation. The loudspeaker system shall meet the following performance criteria: Power handling: 75-Watts RMS; Frequency response: 118Hz – 20kHz (±3dB); Pressure sensitivity, 88dB SPL at one watt, 100Hz – 10kHz measured at a distance of one meter on axis. Input connectors shall include a two-pole barrier strip capable of accepting up to two #16AWG cables. A tongue-in-groove cover with rubber wire exit grommet shall be provided to protect the input connectors from corrosion. The unit shall be 10.27" (260.9mm) high, 7.24" (183.9mm) wide, and 6.68" (169.7mm) deep. Weight Shall be 8.45lbs (3.86kg)

1. Acceptable Products:

- a) Atlas Sound SM63T-B (Black)
- b) Atlas Sound SM63T-W (White)
- c) Or approved equal.

X. Loudspeaker Type 6 – The Type 6 loudspeaker system shall be suitable for indoor or outdoor deployment and shall consist of a 2-way, woofer and tweeter design within an environment-resistant housing. Enclosure shall be constructed of paintable UV-resistant, talc impregnated, polypropylene injection molded plastic finished in black or white. Each unit shall include a stamped, powder coated, aluminum grille and removable C-shaped mounting bracket. The 150 Watt RMS system shall have a 8" (133mm) HYCONE™ treated woofer, and a 1" exit compression driver hi-frequency device. Each unit shall include an internally mounted 60 Watt 70.7V/100V line matching transformer with selectable taps of 1.9, 3.8, 7.5, 15, 30, and 60 Watts @ 70.7V. Via a screwdriver selected sealed switch The loudspeaker system shall meet the following minimum performance

criteria: Power handling, 150 Watts RMS (Transformer limited); Frequency response,  $\pm 3\text{dB}$  from 65 Hz to 20 kHz; Pressure sensitivity, 92dB SPL at one watt, 100 Hz to 10 kHz measured at a distance of one meter on axis.

1. Acceptable Products:
  - a) Atlas Sound SM82T-B (Black)
  - b) Atlas Sound SM82T-W (White)
  - c) Or approved equal.

Y. Loudspeaker Type 7 – The Type 7 Loudspeaker System shall be a constant-directivity type equipped with an integral compression driver. Sound-dispersion angle shall be 60 degrees x 40 degrees (+10 degrees) with a constant-dispersion pattern across the controlled frequency band of 1.25-10K (horizontal) and 2-20K (vertical). The tip of the loudspeaker shall loosen to allow bell to be rotated in 15-degree increments. The speaker shall have a power handling capability of 40 watts continuous. Frequency response range shall be 400-7500 Hz (+6dB). APX40TN shall have a SPL of 120dB (40W/1M), 107dB (1W/1M), and 124dB peak at 40 watts. Power taps for 70.7 lines shall be provided at 2.5, 5.0, 10.0, 20.0, 30.0, and 40.0 watts.

- a) Acceptable Products:
  - 1) Atlas Sound APX40TN
  - 2) Or approved equal.

Z. Loudspeaker Type 8 – The Type 8 Loudspeaker shall be a sound projector weatherproof re-entrant reflex type horn with a constant directivity pattern. The horizontal beam width of the horn shall be 60 degrees +/- 10 degrees with a bandwidth of 600Hz to 6 kHz and a vertical beam width of 40 degrees +/- 10 degrees with a bandwidth of 1000Hz to 7 kHz. The sound projector shall be constructed of non-resonant fiberglass and polyester resin with a zinc die cast throat section. Horn size shall not exceed 23.75X 20X16.75 and weigh 14 1/2 lbs. Unit shall have a full range power capacity of 60 watts above the low frequency cutoff of the associated projector horn. Rated frequency response shall be 300-3,000 (+5dB) measured on a plane wave tube at 1 mW and a sound pressure output level of 112.7 (avg) 300-3,000Hz (+5dB). Low frequency limit at full power shall be 300Hz. Driver with enclosed terminal shall be capable of standard Indoor /outdoor use and be fully environment resistant. Unit shall be equipped with a 70.7 volt transformer having power taps of 2.5, 5, 10, 20, 40 and 60 Watts.

1. Acceptable Products:
  - a) Atlas Sound Model CD64
  - b) Atlas Sound CD46 with PD60AT driver
  - c) Or approved equal.

AA. Loudspeakers Type 9 – The Type 9 loudspeaker shall be a self-contained, steerable, column array system, comprised of eight 4-inch NRSC coated cone drivers, eight DSP channels, and eight class D amplifier channels. Audio inputs shall consist of 2 x Dante® / AES67 / 2 x analog line / 2 x AES / EBU. Horizontal

coverage shall be 120°. Vertical coverage shall be variable between 5° and 40° and vertical steering ±40° in 1° increments. Dual beam capability. Performance specifications shall be as follows: frequency response, 100Hz – 18kHz ±3dB; low frequency beam control limit @ 800Hz; maximum SPL, 97dB @ 30m. Onboard processing shall include 24 presets switchable via GPIO UDP, 10 Band IIR filters, FIR Filter, dynamic EQ, limiter, gain, delay, status display surveillance, automatically cascading. Control shall be a configurable IP-based network. External control via UDP commands and 2 x GPIO. The loudspeaker shall provide interoperability with AtlasIED GCK advanced notification application software as part of the AtlasIED GLOBALCOM ecosystem. Power requirements shall be nominal 100, 110, or 230V AC line current at 50 to 60Hz. The UL and CE operating voltage range shall be 94-264V AC. Loudspeaker components shall be mounted in an extruded aluminum enclosure available in white, as well as custom colors. Dimensions shall be H x W x D: 31.7" x 4.7" x 5.9" (805 x 120 x 151mm).

1. Acceptable Products:
  - a) AtlasIED ALX-8D
  - b) Or approved equal

BB. Loudspeakers Type 10 – The Type 10 The loudspeaker shall be a modular, steerable, column array system, comprised of sixteen 4-inch NRSC coated cone drivers, sixteen DSP channels, and sixteen class D amplifier channels. Audio inputs shall consist of 2 x Dante® / AES67 / 2 x analog line / 2 x AES / EBU. Horizontal coverage shall be 120°. Vertical coverage shall be variable between 5° and 40° and vertical steering ±40° in 1° increments. Dual beam capability. Performance specifications shall be as follows: frequency response, 60Hz – 18kHz ±3dB; low frequency beam control limit @ 400Hz; maximum SPL, 100 dB @ 30m. Onboard processing shall include 24 presets switchable via GPIO UDP, 10 Band IIR filters, FIR Filter, dynamic EQ, limiter, gain, delay, status display surveillance, automatically cascading. Control shall be a configurable IP-based network. External control via UDP commands and 2 x GPIO. The loudspeaker shall provide interoperability with AtlasIED GCK advanced notification application software as part of the AtlasIED GLOBALCOM ecosystem. Power requirements shall be nominal 100, 110, or 230V AC line current at 50 to 60Hz. UL and CE operating voltage range shall be 94-264V AC. Loudspeaker components shall be mounted in an extruded aluminum enclosure available in white, as well as custom colors. Dimensions shall be H x W x D: 63.4" x 4.7" x 5.9" (1610 x 120 x 151mm).

1. Acceptable Products:
  - a) AtlasIED ALX-16D
  - b) Or approved equal

CC. Visual Display Device Controller (DDC) – The DDC shall be a Processor Based Media Player equipped to control two Visual Display Devices. Provide the most recent configuration as recommended by the system manufacturer with the following minimum specifications.

1. Intel Celeron® N3060 Processor 1.6-2.48Ghz 2 MB Cache



2. Connectivity: 2xGbE Lan 9 (RJ-45), Wi-Fi Intel Dual Band 802.11ac and Bluetooth 4.0,
3. Memory: Up to 8Gb DDR3L 1600Mhz 2x SODIMM Slots
4. Video: 2 x HDMI v1.4b
5. Monitor Support: Dual Independent monitors 1080p@60 fps
6. Operating Systems: Windows 10 IoT, Linux, Android
7. Media Storage: Up to 500GB
  - a) Acceptable Products:
    - 1) AtlasIED 4WPlayer2
    - 2) Or approved equal.

DD. Mass Notification

1. Features shall include
  - a) Real-time mass notification capabilities
  - b) Multi-channel communication (e.g., mobile, desktop, digital signage, email, text)
    - 1) Desktop shall be version 7.0, installed in the Security Office
  - c) Scalable and flexible for organizations of any size
  - d) Integration with existing IT infrastructure and third-party systems (e.g., fire alarms, security systems)
    - 1) Integrate with paging and audiovisual systems
    - 2) Override digital signage systems
  - e) Cloud and on-premise deployment options
  - f) Customizable alerts (audio, visual, and text-based)
  - g) Secure and encrypted communications

EE. High-Powered Speaker Array System

1. High-power outdoor speaker arrays designed to broadcast emergency alerts across large outdoor areas, such as campuses, industrial sites, and public spaces.
2. Ranges from 150W to 2400W depending on model and coverage area requirements.
3. Pole or wall-mountable, weather-resistant housings designed for outdoor environments.
4. IP65 rated for resistance to dust and water ingress.

5. Designed to provide uniform sound coverage of up to 1,000 meters (depending on model).
6. 100 Hz - 10 kHz for clear audio.
7. Typically supports standard 70V or 100V audio systems, with optional low-impedance connections.
8. Suitable for outdoor, high-noise environments such as stadiums, factories, or campuses.
9. Manufacturer:
  - a) Alertus

FF. Cable

1. Speaker Cable – Provide UL Listed Article 725 (UL 444 for plenum applications) cable. Cable shall be tinned copper with PVC insulation and a PVC jacket. Gauge of cable shall be sized for a maximum of ½ dB loss.
  - a) Acceptable Products:
  - b) Windy City Wire / Smartwire
  - c) Belden
  - d) Or equal

GG. Software – All software provided shall be the latest version available supported by the system manufacturer. Provide properly licensed versions and backup media for all software.

1. Network Operating System – Microsoft Windows Server Standard (2019).
2. GLOBALCOM IP vACS Controller – GLOBALCOM IP108-D or GLOBALCOM IP216-D Controller – Provide end point license applicable to the number of endpoints deployed in the system. See below
3. Workstation and DDC Operating System – Windows 10
4. Database Software – Microsoft SQL Express
5. Announcement Control System Software – IED Enterprise or GCK3.0
6. Courtesy Announcement Software – IED TCASSVR Module
7. Visual Paging DDC Software – IED VISDID
8. Custom GUI Control Interface Software – IED Director
9. GCK3.0 Core Software
  - a) GCK3.0M Core Software Annual License and Maintenance Fee
  - b) HDEPL - GCK Software End Point License for Dante™

- c) HDEPLM - GCK Software End Point Annual License Fee for Dante™
- d) IPSE - GCK Software End Point License for IP devices (non-audio)
- e) IPSEM - GCK Software End Point Annual License Fee for IP devices

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Refer to 274116.

#### **3.02 FINAL ACCEPTANCE**

- A. Refer to 274116.

#### **3.03 TRAINING**

- A. Refer to 274116.

#### **3.04 WARRANTY**

- A. Maintenance
  - 1. Contractor shall perform preventative maintenance every (12) months after final completion.
  - 2. Contractor shall perform at a minimum:
    - a) System performance re-validation
    - b) Documentation of equipment requiring replacement.
- B. Costs shall be provided for extended services not covered by warranty.

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 27 51 26****HEARING ASSISTANCE SYSTEM****PART 1 - GENERAL****1.01 SUMMARY****A. Contractor Shall Provide and Install**

1. The Contractor shall furnish and install telecommunications passive equipment, including:
  - a) Transceivers
  - b) Receivers
  - c) Headsets
  - d) Neck loops
  - e) Chargers
  - f) Cases
  - g) Signage

**B. Related Sections:**

1. Section 000000 – Procurement and Contracting Requirements
2. Section 010000 – General Requirements

**1.02 SYSTEM DESCRIPTION****A. The Contractor will provide, install, and test a complete hearing assistance system. The Contractor will provide and install all required components as identified below.**

1. Transceivers, headsets, neck loops
  - a) Transceivers, headsets, and neck loops will be provided for bidirectional communication between speaker and audience.
2. Receivers, headsets, neck loops
  - a) Receivers, headsets, and neck loops will be provided for one-way listening for audience.
3. Chargers
  - a) Chargers will be provided for portable units.
4. Cases
  - a) Cases will be provided to store equipment.
5. Signage

- a) Signage will be provided to notify audience of system's availability.
- 6. Provide individual user – portable activated controls.
- 7. Connect systems to A/V sound system as directed by the District. Provide comparable sound quality to the main sound system in accordance with Speech Transmission Index (STI).
- 8. Detachable headphones and controls located at designated ADA accessible seating areas. At each accessible location provide one wireless headset with volume control devices for each person.

#### 1.03 SUBMITTALS

- A. Contractor shall provide following submittals and shop drawings for review and approval:
  - 1. A complete list of equipment and materials proposed for system, with catalog cuts, technical data, manufacturers specifications and detail drawings.
  - 2. A complete set of detailed scaled drawings of all devices/components with designations, dimensions, color, operating controls, instrument wiring and schematic diagrams of all circuits.
  - 3. Shop drawings shall show interfaces to existing equipment, identifying numbers of wires, termination requirements, voltages, and other pertinent details. Include front elevations, dimensions, types of mounting, catalog number of locks, and finishes for terminal cabinets.
- B. Operating and Servicing Manuals, Record Drawings:
  - 1. Deliver required number of copies of operating and servicing manual. Each complete manual shall be bound in a flexible binder and all data shall be typewritten or drafted.
  - 2. Each manual shall include all instructions necessary for proper operation and servicing of system and shall include complete 2 wire circuit diagrams of system, a wiring destination schedule for each circuit leaving console and each rack, a schematic diagram of all components, and replacement part numbers. Each manual shall also include as-built cable site plot plan and floor plans indicating all cables with conduit, and as-built coding used on each cable. Programming forms of each system shall be submitted with complete information.
  - 3. Provide shop drawings, indicating location of equipment, conduit, cable runs and other pertinent information.

#### 1.04 QUALITY ASSURANCE

- A. Work shall conform to CCR, Title 24 Part 3, Basic Electrical Regulation and California Electrical Code, latest edition.

- B. Design shall comply with California Building Code (CBC) Chapter 11B and Americans with Disabilities Act – Accessibility Guidelines (ADA-AG). Provide sound reinforcement for hearing impaired occupants as described in ADA-AG.
1. 11B-219.1 General. Assistive listening systems shall be provided in accordance with Section 11B-219 and shall comply with Section 11B-706.
  2. 11B-219.2 Required systems. An assistive listening system shall be provided in assembly areas, including conference and meeting rooms.
  3. 11B-219.3 Receivers. The minimum number of receivers to be provided shall be equal to 4 percent of the total number of seats, but in no case less than two. Twenty-five percent minimum of receivers provided, but no fewer than two, shall be hearing-aid compatible in accordance with Section 11B-706.3.
  4. 11B-219.4 Location. If the assistive-listening system provided is limited to specific areas or seats, then such areas or seats shall be within a 50-foot (15240 mm) viewing distance of the stage or playing area and shall have a complete view of the stage or playing area.
  5. 11B-219.5 Permanent and portable systems. Permanently installed assistive-listening systems are required in areas if (1) they accommodate at least 50 persons or if they have audio-amplification systems, and (2) they have fixed seating. If portable assistive-listening systems are used for conference or meeting rooms, the system may serve more than one room. An adequate number of electrical outlets or other supplementary wiring necessary to support a portable assistive-listening system shall be provided.
  6. 11B-706.1 General. Assistive listening systems required in assembly areas, conference and meeting rooms shall comply with Section 11B-706.
  7. 11B-706.2 Receiver jacks. Receivers required for use with an assistive listening system shall include a 1/8 inch (3.2 mm) standard mono jack.
  8. 11B-706.3 Receiver hearing-aid compatibility. Receivers required to be hearing-aid compatible shall interface with telecoils in hearing aids through the provision of neckloops.
  9. 11B-706.4 Sound pressure level. Assistive listening systems shall be capable of providing a sound pressure level of 110 dB minimum and 118 dB maximum with a dynamic range on the volume control of 50 dB.
  10. 11B-706.5 Signal-to-noise ratio. The signal-to-noise ratio for internally generated noise in assistive listening systems shall be 18 dB minimum.
  11. 11B-706.6 Peak clipping level. Peak clipping shall not exceed 18 dB of clipping relative to the peaks of speech.
- C. Work shall be done by a qualified sound Contractor holding C-10, C-61 and all licenses required by legally constituted authorities having jurisdiction over work. Sound Contractor shall have completed at least 5 school systems of equal scope

to system described herein and shall have been engaged in business of supplying and installing specified type of systems for at least 5 years. Sound Contractor shall maintain a fully equipped service organization capable of furnishing adequate repair service to equipment.

- D. Installation shall be carried out under direction of a qualified Sound Engineer and costs of all such direction shall be included in Contractor's bid. Include name and statement of qualifications with submittals.

#### 1.05 WARRANTY

- A. Warrant system to be free of defects in operation for 5 years, including parts and labor. Warranty for cords, antennas, power supply, and accessories is 90 days.

### PART 2 - PRODUCTS

#### 2.01 HEARING ASSISTANCE SYSTEM

- A. Shall be UL Listed
- B. Hearing Assistance System: Infrared Hearing Assistance System shall be manufactured by Listen Technologies and consist of the following components:
  - 1. Manufacturer:
    - a) ListenTech
    - b) Williams Sound
    - c) Or Equal
  - 2. Transceiver: LKS-8 ListenTALK Portable ADA Kit 2
    - a) The transceiver shall be a digital transceiver operating on the 1.9 GHz unlicensed PCS band utilizing Frequency-Hopping Spread Spectrum (FHSS) techniques allowing interference free full duplex communication. The device shall employ a multiply layer security protocol consisting of a 40-bit (pin free) group subscription, 32-bit authentication and a 64-bit encryption scheme enabling secure conversations. It shall be easy to pair and form groups via Near-field communication (NFC), Docking Station or Software Suite. It shall be simple to operate with a Power, Talk and Volume Up and Down buttons. For North America, it shall support up to 20 simultaneous groups. For Europe, it shall support up to 30 simultaneous groups. It shall be powered via a removable non-proprietary rechargeable lithium-ion battery or via an optional 3 AAA alkaline battery compartment.
    - b) The transceiver shall have a 3.5 mm TRRS CTIA compliant headset connection allowing operation with a standard electret style headset. It shall have a built-in-microphone with auto detect circuitry if users elect to use their personal ear buds. It shall have a 64 x 128 OLED display with auto dimming allowing display of all current status (group name, volume levels, mute, battery status, time remaining, signal strength, unit ID, mode, etc.) The device



shall have a leader clip and when inserted the unit automatically designates itself as a leader and allows the leader/presenter to control pairing/group creation and leader talkback modes (listen only, leader only or group).

- c) The transceiver shall have a signal-to-noise ratio of 70 dB or greater and shall have an audio frequency response of 40 Hz – 15 kHz ( $\pm 3$  dB). The device shall incorporate automatic battery charging circuitry to charge and maintain the lithium-Ion battery either via the micro USB port or via the docking station using the additional charging contacts on the bottom of the device.

3. Receiver: LKR-11 ListenTALK Receiver Pro

- a) The receiver shall be a digital receiver operating on the 1.9 GHz unlicensed PCS band utilizing Frequency-Hopping Spread Spectrum (FHSS) techniques allowing interference free one-way communication. The device shall employ a multiply layer security protocol consisting of a 40-bit (pin free) group subscription, 32-bit authentication and a 64-bit encryption scheme enabling secure conversations. It shall be easy to pair and form groups via Near-field communication (NFC), Docking Station or Software Suite. It shall be simple to operate with a Power and Volume Up and Down buttons. For North America, it shall support up to 20 simultaneous groups. For Europe, it shall support up to 30 simultaneous groups. It shall be powered via a removable non-proprietary rechargeable lithium-ion battery or via an optional 3 AAA alkaline battery compartment.
- b) The receiver shall have a 3.5 mm TRRS CTIA compliant headphone connection allowing operation with a standard style headphones. It shall have a 64 x 128 OLED display with auto dimming allowing display of all current status (group name, volume levels, battery status, time remaining, signal strength, unit ID, etc.)
- c) The receiver shall have a signal-to-noise ratio of 70 dB or greater and shall have an audio frequency response of 40 Hz – 15 kHz ( $\pm 3$  dB). The device shall incorporate automatic battery charging circuitry to charge and maintain the lithium-Ion battery either via the micro USB port or via the docking station using the additional charging contacts on the bottom of the device.

4. 25% of receivers shall be compatible with hearing aids (minimum of 2).

5. Headset: LA-451 Headset 1 (Ear Speaker w/Boom Mic)

6. Neck Loop: LA-438 Advanced Neck Loop (Adult)

7. Charger: LA-423-01 4-Port USB Charger

- a) The 4-Port USB Charger shall be designed for fast and easy simultaneously charging of up to four (4) Listen iDSP products. The device shall have four (4) – 91.5 cm (36 in.) USB to Micro

USB cables. The device shall have an input voltage of 100-240V AC, 50/60Hz with an output voltage of 5V DC @ 4.8, 24.0W. The Listen LA-423 is specified.

8. Case: LA-483 Soft Shell Case 4
  - a) The LA-483 Soft Shell Case holds up to 4 LK-1 Transceivers or iDSP receivers.
9. Signage: LA-304 Assistive Listening Notification Signage Kit
  - a) The Assistive Listening Notification Signage Kit shall be designed for IBC, ADA and CBC compliance displaying the International Symbol of Access for Hearing Loss while stating Assistive Listening Available. The signage kit includes one (1) hard plaque 178mm (7 in.) x 254 mm (10 in.) and one (1) static cling window sticker 178mm (7 in.) x 254 mm (10 in.). The Listen LA-304 is specified.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Mount docking station to flat surface.
- B. If there is no docking station, prepare and charge transceiver and receiver units with USB charger.
- C. Group together portable units and provide unique identifying labels.
- D. Set transceiver to leader and pair receivers to leader.
- E. Pair units to docking station. Utilize NFC pairing where there are no docking stations.
- F. Locate signage at Code-specified height.

#### **3.02 EXAMINATION AND OPERATION**

- A. Contractor shall properly instruct Owner or Owner's representative, in correct operation of system.

#### **3.03 TESTING**

- A. Provide all instruments for testing and demonstrate, in presence of the District Inspector, that all circuits and wiring test free of shorts and grounds.
- B. Furnish all labor, instruments, appliances, equipment and materials necessary to demonstrate to the District that installation performs as required and specified.
- C. The District reserves the right to make independent tests of equipment furnished, to determine whether or not equipment complies with requirements specified, and to accept or reject any or all equipment on basis of results obtained.

\*\*\*END OF SECTION\*\*\*

**SECTION 27 51 29****TWO-WAY EMERGENCY COMMUNICATIONS SYSTEM****PART 1 - GENERAL****1.01 SUMMARY**

- A. Contractor Shall Provide and Install
  - 1. The Contractor shall furnish and install Two-Way Emergency Communications system components, including:
    - a) Remote call stations
    - b) Master call stations
    - c) Cabling
  - 2. Contractor shall design and install Two-Way Emergency Communications system in accordance with referenced Codes noted in Part 1.
- B. Related Sections:
  - 1. Section 000000 – Procurement and Contracting Requirements
  - 2. Section 010000 – General Requirements
  - 3. Section 260526 – Grounding and Bonding for Electrical Systems
  - 4. Section 270000 – Common Work Results for Communications
  - 5. Section 270528 – Pathways for Communications Systems
  - 6. Section 270539 – Surface Raceway for Communications Systems
  - 7. Section 270553 – Identification for Communications Systems
  - 8. Section 271116 – Communications Room Equipment

**1.02 REFERENCES**

- A. NFPA 101: Life Safety Code (Chapter 7.2.12 – Areas of Refuge)
- B. IBC 1009.8: Two-way Communication
- C. California Building Code (Chapter 1009.6 – Areas of Refuge)
- D. California Building Code (Chapter 1009.8 – Two-Way Communication)
- E. Americans with Disabilities Act

**1.03 DEFINITIONS**

- A. Delivered Audio Quality Definitions (DAQ): This is a universal standard often cited in system designs and specifications:
  - 1. DAQ 1: Unusable, speech present but unreadable.

2. DAQ 2: Understandable with considerable effort. Frequent repetition due to noise/distortion.
3. DAQ 3: Speech understandable with slight effort. Occasional repetition required due to noise/distortion.
4. DAQ 3.5: Speech understandable with repetition only rarely required. Some noise/distortion
5. DAQ 4: Speech easily understood. Occasional noise/distortion.
6. DAQ 4.5: Speech easily understood. Infrequent noise/distortion.
7. DAQ 5: Speech easily understood. Coupled Bonding Conductor (CBC) – The term "Coupled Bonding Conductor" shall mean a bonding conductor placed, e.g. strapped, on the outside of any technology cable, used to suppress transient noise.

#### 1.04 SYSTEM DESCRIPTION

- A. The Contractor will provide, install, and test a complete Two-way Emergency Communication Systems (a.k.a. Area of Refuge Systems, Area of Rescue Assistance Systems). The Contractor will provide and install all required components as identified below.
- B. Cabling
  1. Horizontal cabling includes horizontal cable, telecommunications outlet/connectors in the Work Area (WA), mechanical terminations, and patch cords or jumpers located in a Telecommunications Room (TR).
  2. Provide fire-rated cabling and pathways where required by Code.
- C. The system shall support Internal and External calling.
- D. Internal Call System
  1. System shall provide communications between each remote call station location and the Fire Command Center or a Central Control Point location. Visual indicators on the master control station (located at the central control point) will notify rescue personnel which call station(s) require assistance. The Master control station must allow rescue personnel to speak to all remote call stations simultaneously or to individual remote call stations.
- E. External Call System
  1. System shall provide external building calls for assistance to a central monitoring location on the site. Upon activation of the emergency pushbutton at a remote call station, a call will be automatically placed to the master control station. If no one answers at the master control station, the external call system shall dial a secondary location outside the building to activate two-way off-site person-to-person voice communication. The External Call System shall have the ability to be programmed with a minimum of two (2) emergency phone numbers.

## 1.05 SUBMITTALS

A. Submittals shall include, at a minimum, the following information:

### 1. General

- a) Cover Sheet including the submittal date, specification section, contractor name, system vendor name, and the project name.
- b) Equipment list, including quantity, manufacturer, manufacturer part number, and equipment description. A separate equipment list shall be provided for each specification section.
- c) Manufacturer's Data Sheets, wiring diagrams, and installation manuals for each piece of equipment provided. Data sheets shall be bound in the order they occur in the equipment list. If an item occurs more than once in the equipment list, only one data sheet is needed.
- d) Data sheets shall be clearly marked, noting which item or items on that sheet are being provided.
- e) Riser diagrams shall be provided to illustrate communication circuits. Riser and wiring diagrams shall be job specific and show the point of origin for each circuit, areas served by each circuit, circuit type and wire type.

### 2. Sequence of Operation

- a) Provide a Sequence of Operation narrative describing the functions of the system. Sequence of Operation shall include intended preprogrammed phone numbers for the External Call System.
- b) Example Sequence of Operation:
  - 1) Someone requiring assistance in an emergency situation proceeds to a location equipped with a Remote Call Station. The person seeking assistance pushes the "Push for Help" button on the Remote Call Station. A one-shot tone is made at the Remote Call Station and a LED is lit that is steady. The call is displayed digitally on the Master Control Station along with a tone and a display of the call and its location on a multi-character LCD multi-line display. When the alarm signal is answered by the Master Control Station, the Remote Call Station is signaled by the flashing LED that voice communication has been initiated.
  - 2) The Master Control Station operator, upon receiving a Remote Call Station signal, activates a zone button that illuminates both a flashing LED and a green "voice" LED. By depressing and releasing the "talk" button, voice communication is established with the Remote Call Station for as long as required. If more than one Remote

- Call Station is signaling, the Master Control Station accepts the calls in the same manner.
- 3) When the emergency is resolved, the Master Control Station operator pushes a reset button to restore the entire system to standby status.
  - 4) In the event of a wiring fault, each annunciator zone button, equipped with a yellow LED, will illuminate and an alarm that will sound identifying the area requiring service.
  - 5) If there is no answer on the Master Control Station from a Remote Call Station, the Remote Call Station shall be programmed to dial an alternate number to [Identify location] after a preset amount of time (programmable from 10 to 30 seconds).
  - 6) When the call is answered, the Call Progress Lamp shall be illuminated.
  - 7) Each Remote Call Station shall be provided with an automatic "unique caller identifier". In addition, an automatic pre-recorded voice location identifier announcement shall initiate after a pre-programmed amount of time (in case the person calling is incapable of speaking).
  - 8) Basic programming functions are given above. Coordinate additional phone numbers with the User Agency. Coordinate with the User Agency for the proper number of phone circuits for the system.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Provide Two-way Emergency Communication Systems as indicated on the drawings and as specified herein. Catalog numbers are shown for quality and performance requirements only. Two-way Emergency Communication Systems manufactured by others are equally acceptable provided they meet or exceed the performance of the indicated system and meet the intent of the design.
- B. System shall comply with all state and local Electrical Codes.
- C. System must be capable of being programmed and reprogrammed on-site and remotely.
- D. System must have non-volatile memory to protect programming.
- E. System shall have capability to dial to an outside phone number after an adjustable time delay when a Remote Call Station is not acknowledged at the Master Station. Feature shall allow two-way voice communication with an external constantly attended station.

- F. A dry contact for each station shall close when the Remote Call Station is activated.
- G. All low-voltage wiring shall be completely supervised.
- H. Two-way telephone communications conductors shall be monitored for open-circuit and short-circuit fault conditions that would cause the telephone communications circuit to become fully or partially inoperative. Fault conditions shall result in a trouble signal in accordance with NFPA 72.
- I. Failure of either primary or secondary power supply shall result in trouble signal in accordance with section 10.14 of NFPA 72
- J. Manufacturer
  - 1. Code Blue
  - 2. Rath
  - 3. Cornell
  - 4. Alphacom
  - 5. Or equal

#### 2.02 REMOTE CALL STATION

- A. Remote Call Station shall:
  - 1. Be 24VAC.
  - 2. Include a backup power for a minimum of 4 hours of talk time.
  - 3. Be flush mounted.

#### 2.03 MASTER CONTROL STATION

- A. The Master Control Station must allow rescue personnel to speak to all Remote Call Stations simultaneously or to individual Remote Call Stations.
- B. Master Control Station shall:
  - 1. Be 120VAC.
  - 2. Include a rechargeable battery to maintain backup power for a minimum of 4 hours of talk time.
  - 3. Have a stainless steel or powder coated steel housing, red coil cord, and red emergency handset.
  - 4. Be flush or desk mounted.

### PART 3 - EXECUTION

#### 3.01 GENERAL

- A. The Contractor shall input the cabling data into the cable management software.

- B. Install required cables, a faceplate/surface box/furniture insert, and a jack at each location designated on the Drawings.
- C. Provide any required screws, anchors, clamps, hook and loop, miscellaneous grounding and support hardware, etc. needed to facilitate the installation of the cable plant system.
- D. Furnish any special installation equipment or tools necessary to properly complete the installation.
- E. Do not roll or store cable reels without an appropriate underlay.
- F. Failure to follow the appropriate guidelines may require the installer to provide additional material and labor required to properly rectify the situation. This shall also apply to any and all damages caused to the cables by the installer during the implementation.
- G. Provide fire blocking at all fire rated penetrations.
- H. Plug conduits where cabling has been installed in the main equipment room, backbone, and other cable entrance locations with re-enterable duct seal of flame retardant putty.
- I. Provide bushings on all conduit ends.
- J. All techniques and fixtures used in the installation must minimize complexity and must allow for easy maintenance of, and ready access to, all components for test measurements.
- K. All materials used in installation shall be resistant to fungus growth and moisture deterioration.
- L. All cable runs must be continuous from patch panel to the outlet location.
- M. All of the pathways shown on the drawings are suggested routes for the Contractor to use as guidelines. Prior to construction, the Contractor shall coordinate in the field with other trades to determine the exact feeder, tie, and riser backbone cabling pathways. In any case where the communication pathway must be removed and re-routed, due to conflicts with other trades with which the Contractor did not previously coordinate, the Contractor is responsible for all costs associated with the removal and relocation.

### 3.02 MASTER CONTROL STATION

- A. Coordinate the location of the Master Control Station with the local fire marshal. Master Control Stations are typically located in the Fire Command Center, near the main entrance, or at the main reception desk.

\*\*\*END OF SECTION\*\*\*



**SECTION 28 00 00****COMMON WORK RESULTS FOR SECURITY****PART 1 - GENERAL****1.01 SUMMARY**

- A. This section specifies the basic requirements for Communications installations as indicated or required and includes requirements common to more than one specification section of this Division (such as related documents, related sections, definitions, governing requirements, contractor requirements, warranty requirements, submittal requirements/procedures, and project closeout requirements/procedures, as well as other requirements). This section may expand upon and/or supplement the requirements specified in Division 01.
- B. Examine the contract documents in their entirety (including Drawings and Specification sections in the other divisions) for requirements or work which may affect work under this section, regardless of whether such requirements or work are specifically indicated in this section.
- C. Errors or Omissions in Drawings or Documentation
  - 1. If any errors or omissions appear in Drawings, Specifications, or other documents, the bidding Contractor shall notify the System Designer no later than ten (10) days prior to submitting the bid.
  - 2. Should conflict occur in or between Drawings and Specifications, the bidding Contractor is deemed to have estimated the more expensive way of doing the work, unless the bidding Contractor has asked for and obtained written decision (addendum) before submission of the bid as to which method or materials will be required.
- D. Related Sections:
  - 1. Section 000000 – Procurement and Contracting Requirements
  - 2. Section 010000 – General Requirements
  - 3. Section 281000 – Access Control and Alarm Management System
  - 4. Section 282000 – Video Surveillance System

**1.02 DEFINITIONS**

- A. AES – Advanced Encryption Standard. ANSI – American Northern Standards Institute
- B. AWG – American Wire Gauge
- C. BICSI – Building Industry Consulting Service International
- D. BLE – Bluetooth Low Energy
- E. DHCP – Dynamic Host Configuration Protocol

- F. DHS – Department of Homeland Security
- G. DNS – Domain Name System
- H. DPDT – Double Pole Double Throw
- I. EIA – Electronics Industry Alliance
- J. GUI – Graphical User Interface
- K. Hazmat – Hazardous Materials
- L. HTTP – Hypertext Transfer Protocol
- M. IAM – Identity and Access Management
- N. IDM – Identity Management
- O. IEC – International Electrotechnical Commission
- P. IEEE – Institute of Electrical and Electronic Engineers
- Q. IP – Internet Protocol
- R. IPAC – Internet Protocol Access Control
- S. ISO – International Standards Organization
- T. KVM – Keyboard, Video (Monitor), Mouse
- U. LAN – Local Area Network
- V. NECA – National Electrical Contractors Association
- W. NFC – Nearfield Communications
- X. NFPA – National Fire Protection Agency
- Y. NIST – National Institute of Standards and Technology
- Z. NVR – Networked Video Recorder
- AA. PoE – Power over Ethernet
- BB. PTZ – Pan-Tilt-Zoom
- CC. SIA – Security Industry Association
- DD. SMS – Security Management System
- EE. SOC – Security Operations Center
- FF. SSH – Secure Shell
- GG. SSO – Single Sign-on
- HH. TIA – Telecommunications Industry Association
- II. TLS – Transport Layer Security
- JJ. UAS – Unmanned Aerial System

- KK. UL – Underwriters Laboratory
- LL. WAN – Wide Area Network
- MM. Provide: Furnish, install, terminate, label, test and certify a complete system.
- NN. Contract Documents (CD): Design drawings, specifications, sketches and schedules provided by the System Designer as they directly relate to this scope of work and this project.
- OO. NET–POP Rooms/MPOE (Main Point of Entry): The area where the outside plant media/carrier services appear in the facility. The NET–POP contains equipment used by owner or carrier to hand–off/transition cable from outside plant into inside plant type.
- PP. Network Center/Main Distribution Frame (MDF) Areas: This technology space houses Layer 2/3 network switching gear and other main network distribution equipment and acts as the mid–connection point between the Core/Network and the TR/IDF/access zones for all connections.
- QQ. Telecommunications Room (TR)/Intermediate Distribution Frame (IDF): is the location for the termination of backbone cables and for termination of horizontal cables, and for the interconnection of each. The space also hosts access–layer switches and user network connections within each floor.
- RR. Active Equipment: electronic equipment used to develop various WAN, LAN, and voice services, e.g., digital multiplexers, RS–232 controllers, Ethernet hubs, switches, routers, PBX, etc.
- SS. Horizontal: cabling system consisting of media and termination hardware interconnecting the Telecommunication Outlets (TOs) and the TRs.
- TT. Bonding: permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed on it.
- UU. Cable Tray: vertical or horizontal open supports, usually made of aluminum or steel, which are fastened to the building structure. Cables are laid in and fastened to the trays.
- VV. Cabinet: free standing, floor–mounted or wall–mounted modular enclosure designed to house and protect rack–mounted electronic equipment and passive terminations.
- WW. Channel: The end–to–end transmission path between two points at which application specific equipment is connected; encompasses all the elements of the horizontal cabling link, plus the equipment cords in the telecommunications spaces and work area.
- XX. Grounding: a conducting connection to earth, or to some conducting body that serves in place of earth.
- YY. Jack: receptacle used in conjunction with a plug to make electrical contact between communications circuits, e.g., eight–position/eight–contact modular jacks.

- ZZ. Media: twisted-pair/fiber optic cable or cables, or other forms of transmission used to provide signal paths.
- AAA. Outside Plant (OSP): generally, any and all portions of the cable system that runs outside of an environmentally enclosed structure and/or building with each end terminated at different buildings. This specifically includes inter-building cables, conduits, manholes, hand-holes, and innerduct.
- BBB. UTP: Unshielded Twisted Pair.
- CCC. Passive Equipment: non-electronic hardware and apparatus, e.g., equipment racks, cable trays, electrical protection, patch panels, wiring blocks, fiber optic shelves, etc.
- DDD. Patch Cords: a length of wire or fiber cable with connectors on one or both ends used to join communications circuits at a cross-connect.
- EEE. Patch Panel: system of terminal blocks or connectors used with patch cords that facilitate administration of cross-connect fields.
- FFF. Pathway: facility for the placement of communications cable. A pathway facility can be composed of several components including conduit, wireway, cable tray, surface raceway, under floor systems, overhead systems, raised floor, ceiling support wires, etc.
- GGG. Protectors: electrical protection devices used to limit foreign voltages on metallic communications circuits.
- HHH. Raceway: an enclosed channel designed expressly for holding wires or cables; may be of metal or insulating material. The term includes conduit, tubing, wire ways, under floor raceways, overhead raceways and surface raceways; does not include cable tray.
- III. Racks: An open, freestanding, floor-mounted structure, typically made of aluminum or steel, used to mount equipment; usually referred to as an equipment rack.
- JJJ. Wireway: An enclosure with removable lid whose purpose is for routing cable and storing cable slack.
- KKK. Contractor – The successful bidder engaged to provide the work of this specification
- LLL. Access Control and Alarm Management System (ACAMS): System whose primary function is to control access through building via credentials, credential management, and electrified locking hardware. It's secondary function is to provide alarm monitoring and management for various sensors associated with access control breaches throughout the building.
- MMM. Video Surveillance System (VSS): System whose primary function is video recording and storage of select areas in or around the building. The VSS is forensic in nature and is managed by the VMS.
- NNN. Video Management System (VMS): System application that manages viewing and forensic analysis of VSS video feeds.

- OOO. Intrusion Detection System (IDS): System whose primary function is the monitoring and management of alarms associated with breaches through a secured building or perimeter.
- PPP. Perimeter Intrusion Detection System (PIDS): System whose primary function is the detection, tracking, monitoring, and management of alarms associated with breaches from an external perimeter to a secondary or exterior boundary.
- QQQ. Visitor Management System: System whose primary function is to provide temporary access credentials for entry through specified access-controlled portals. This system is integrated with the ACAMS.
- RRR. Antipassback: Antipassback controls are intended to prevent an authorized user from bypassing access control for another individual, by passing back an access credential (card or mobile device) after using it to allow an accompanying individual to present the same credential and gain access.
- SSS. Application Programming Interface (API): Documented set of definitions and protocols for developing integrations between networked software applications, including software running on IoT devices.
- TTT. Availability Zones: Physically separate datacenter locations within each data center geographical region that are tolerant to local failures. Failures can range from software and hardware failures to events such as earthquakes, floods, and fires. Availability zones must be designed so that if one zone is affected, cloud services, capacity, and high availability are fully supported by at least two other zones within the geographical region.
- UUU. Biometric: Unique identifying physical or physiological characteristic of an individual that can be used to identify that individual, such as a facial image or fingerprint.
- VVV. BUS: Short for communication bus, a collection of wires forming a communication system that transfers data between components inside a computer, or between computers.
- WWW. CAN BUS: Controller area network (CAN) communication bus standard designed to allow microcontrollers and devices to communicate with each other's applications without a host computer.
- XXX. Cloud-Native Software: Web application developed specifically for deployment as a cloud service, designed per the NIST five essential characteristics of cloud computing.
- YYY. Container: A discrete computing environment for running software code, typically set up with only those parts of an operating system and other code libraries that are necessary for the software code to run correctly. A container may hold a complete application, a set of software functions, or a single function that performs just one task – such as responding to an access control system event. Each container is autonomous, can be launched in milliseconds, and runs in its own isolated environment, ensuring it does not disrupt other running applications or its underlying system. For example, in a physical access control cloud application supporting tens of millions of users and millions of card reader events

per day, parallel processing using containers is a critical element of high performance.

- ZZZ. Credential: Piece of information, usually digital, which serves as a means of identifying a user to an access control system for the purposes of authenticating the user and determining what that user's permissions are within the system. In a physical access control system, credentials are typically PIN codes, smart card encoded values, biometric data, mobile credentials, etc.
- AAAA. Destination Dispatch: Destination dispatch is an optimization technique used for multi-elevator installations, in which groups of passengers heading to the same destinations use the same elevators, thereby reducing waiting and travel times. Using destination dispatch, passengers request travel to a particular floor using a keypad, touch screen, or electronic credential prior in the lobby and are immediately directed to an appropriate elevator car.
- BBBB. Digital Certificate: Electronic document, issued by a Certificate Authority, for uniquely identifying a party (such as a software application or hardware device) in a networked communication session.
- CCCC. General Data Protection Regulation (GDPR): Regulation in European Union (EU) law on data protection and privacy in the EU and the European Economic Area (EEA). It also addresses the transfer of personal data outside the EU and EEA areas.
- DDDD. IOT-Native Device: Networkable cybersecure device specifically engineered to operate independently and communicate via local network and/or continuous, periodic or ad-hoc Internet connection.
- EEEE. LEAF Consortium: Association of industry manufacturers whose purpose is to foster interoperability in the access control and identity credentials markets.
- FFFF. National Institute of Standards and Technology (NIST): U.S. federal technology agency that works with industries to develop and apply technology, measurements, and standards.
- GGGG. Principle of Least Privilege: Information security concept in which a user is given the minimum levels of access – or permissions – needed to perform the user's job functions.
- HHHH. Representational State Transfer (REST): Set of architectural guidelines for the design and development of HTTP-based communications between computer systems on the web.
- IIII. Reader: One of the several types of devices, mounted at a facility door or gate, or in an elevator cab or elevator lobby, which serves as an input device for credentials such as smartcards, PIN codes, biometrics, mobile credentials, etc.
- JJJJ. RESTful API: API that conforms to the constraints of REST architectural guidelines.
- KKKK. Serverless: Serverless is a cloud-native development model that allows developers to build and run applications without having to manage individual virtual or physical servers directly, which are managed by the cloud service provider, chiefly through highly cost-effective automation. Serverless apps may

be deployed in containers (see definition above) that automatically launch on demand when called.

LLLL. Single Sign-On (SSO): Single Sign-On occurs when a user logs in (signs on) to one application or system, and is then automatically logged in to other applications or systems during the same session, regardless of the application, system, domain or network the user accesses during the session.

MMMM. System Administrator: Individual who has the ability to login to an account and, based on assigned roles, view or change account information and perform manual access control actions.

NNNN. User: Individual to whom a system access credential is provided that the access control system uses to perform authentication of the user and provide authorized access.

OOOO. X.509: Standard for a public key infrastructure (PKI) to manage digital certificates and public-key encryption.

### 1.03 REFERENCES

- A. Most recent editions, revisions, addenda, and bulletins of the following documents:
  - 1. ANSI/TIA-568 series
  - 2. ANSI/TIA-569 Telecommunications Pathways and Spaces
  - 3. ANSI/TIA-606 Administration Standard for Telecommunications Infrastructure
  - 4. ANSI/TIA-607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
  - 5. ANSI/TIA-862 Structured Cabling Infrastructure Standard for Intelligent Building Systems
  - 6. Telecommunications Distribution Methods Manual
  - 7. Information Transport Systems Installation Methods Manual (ITSIMM)
- B. Americans with Disabilities Act
- C. California Electric Codes (CEC)
- D. Local Codes and Standards – all applicable
- E. NFPA 70 – National Electrical Code
- F. NFPA 72 – National Fire Alarm and Signaling Code
- G. NFPA 101 – Life Safety Code
- H. NFPA 730 – Guide for Premises Security
- I. NFPA 731 – Standard for the Installation of Electronic Premises Security Systems

- J. NFPA 780 – Standard for the Installation of Lightning Protection Systems
- K. NFPA 1982 – Standard on Personal Alert Safety Systems
- L. UL444 – Standard for Safety of Communications Cable
- M. UL 96 – Installation Requirements for Lightning Protection Systems
- N. UL 294 – Standard for Access Control System Units
- O. UL 365 – Police Station Connected Burglar Alarm Units and Systems
- P. UL 603 – Standard for Power Supplies for Use with Burglar-Alarm Systems
- Q. UL 681 – Standard for Installation and Classification of Burglar and Holdup Alarm Systems
- R. UL 827 – Standard for Central-Station Alarm Services
- S. UL 1034 – Standard for Burglary-Resistant Electric Locking Mechanisms
- T. UL 1666 – Standard for Safety of Flame Propagation Height
- U. UL 1076 – Standard for Proprietary Burglar Alarm Units and Systems
- V. UL 1610 – Standard for Central-Station Burglar-Alarm Units
- W. UL 2610 – Commercial Premises Security Alarm Units and Systems
- X. Local Authority Having Jurisdiction (AHJ)
- Y. Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the NEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either
- Z. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor's expense

#### 1.04 QUALIFICATIONS

- A. The Contractor shall hold a valid State of California C7 and C10 Contractor's license.
- B. Contractor shall have a proven track record in the field of specified system installations, with at least (3) previous installations of comparable size and complexity undertaken within the last (5) years.
- C. Contractor shall be a manufacturer's authorized distributor and warrantee station for the equipment offered, and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.

#### 1.05 SUBMITTALS

- A. Make submittals in accordance with:
  - 1. Section 00 00 00 – Procurement and Contracting Requirements
  - 2. Section 01 33 00 – Submittal Procedures.



B. Action Submittals:

1. Shop Drawings

- a) Owner will provide electronic files in CAD or Revit format, containing the contract document drawing files, for use in the preparing of the shop drawings.
- b) Drawings will be to scale.
- c) Submit the following sheets:
  - 1) Titlesheet and Cover Page: indicate project name and location; include sheet index
  - 2) Site Plan
  - 3) Overall Floor Plans: floor plans showing the locations of devices and cable routing paths with cable types, quantity called out, and device IDs; headend locations; cable routes; new pathways/conduits/boxes/etc.
  - 4) Alarm zone schedule indicating protected areas.
  - 5) Enlarged Plans: Headend rooms with equipment types and quantity called out; coordinated wall elevations; rack elevations; CFCI and OFCI equipment called out.
  - 6) Panel schedules or risers: Show all devices connected to headend equipment ports; devices IDs; interconnections between all boards, power supplies, batteries, relays, etc.
  - 7) Rough-in and wiring details.
  - 8) Calculations: longest cable voltage drop per headend location; battery storage calculations; video storage calculations; power calculations per circuit per headend location for peak and average power; pixel density calculations for expected camera field of view where specified

2. Product submittal

- a) Contractor shall furnish products for a complete, turnkey system. Submit major components and ancillary accessories required for complete system. Minor accessories like screws and nuts are not required for submission, unless specified in other Specifications sections.
- b) Product submittal shall be a single complete submittal. Incomplete submittals will be rejected without review.
- c) Partial submittals will be allowed for short lead items only with documentation on lead time included at the front of the submittal.

- d) Catalog cut sheets and data sheets containing physical and dimensional information, performance data, electrical characteristics, materials used in fabrication, material finish, and licenses. Clearly indicate on each sheet what is being submitted on.
  - e) Qualification Data: Submit at least three references for projects already completed, similar in scope to the project described herein. Include, for each customer reference, the following information: Company name, address, phone number, name and email address of contact and type of job completed.
    - 1) Provide copies of the Contractor's certification.
    - 2) Provide written guarantees from manufacturers of major equipment, that a service representative has been assigned.
    - 3) Provide copies of technician training certificates.
  - f) Submit test procedures for each door and standalone device.
3. Acceptance testing submittal
- a) Installer shall provide a test plan including system acceptance inspections and test demonstrations to be jointly performed by Installer and Owner. Owner shall designate personnel to observe and/or perform test steps as agreed with Installer.
    - 1) Include the following verifications in the test plan:
      - (a) Security System Operator Permissions: Operator permissions have been established per operator job and task requirements, and that all system operator actions can be performed per assigned duties – for Owner technical and administrative personnel, contracted security officer personnel, and security system services provider technicians – per Owner preferences.
      - (b) User Building Access Permissions: Credential-holder permissions have been defined per user groups. Access is granted and denied at each reader location according to defined user groups.
      - (c) Integrations: All integrations are working fully as expected. Checklists shall include rough-in inspections, installation/quality checks, functional reviews, and configuration inspections.
      - (d) OSDP-shall be enabled where specified.
      - (e) Changed default passwords and logins.

- b) Contractor may use manufacturer's commissioning journals where available to create testing plan.

#### 1.06 CLOSEOUT DOCUMENTS

- A. Final close out documents including, but not limited to, test results on in digital PDF and physical CD-ROM or USB drive, in native tester format, project manual that includes manufacturer and contractor warranties, product cut sheets, material submittals, etc. Also, include the following:
  - 1. Provide "As-Built" Drawings in AutoCAD or Revit.
    - a) "As-Built" drawings indicating location of all equipment including but not limited to devices, headend equipment locations, wall elevations, cable routes, identification/labels, custom wiring, etc.
    - b) Red-lined shop drawings submitted as As-built drawings will be rejected without review.
    - c) (1) printed, hard copy of final approved as-built drawings in native sheet size will be provided to Owner. Unapproved sheet sizes will be rejected.
  - 2. Spreadsheet of the following:
    - a) ACAMS
      - 1) Panel/enclosure identification
      - 2) IP and MAC address(es) for each panel
      - 3) Location of each panel
      - 4) Patch panel and switch ports each panel is connected to
    - b) VSS
      - 1) Camera identification
      - 2) Make and model for each camera
      - 3) IP and MAC address for each camera
      - 4) Location of each camera
      - 5) Patch panel and switch ports each camera is connected to
  - 3. Place a laminated full-size, minimum "C" sized, floor plan of these drawings and panel schedule (coordinate with Owner) on the interior of each headend enclosure, showing area covered, data locations, and identification.
  - 4. Owner's written acceptance of installed systems.
  - 5. Print (2) printed copies acceptance test reports.

6. Print (2) printed copies of full-sized as-built drawings, and submit to Owner.
7. Provide pricing and contact information for emergency service work not covered by warranty.

#### 1.07 QUALITY ASSURANCE

##### A. Standards for Materials and Equipment

1. The Contractor shall provide all materials, equipment, and installation in compliance with the latest applicable standards from ASIS, ANSI, FCC, ASTM, EIA/TIA, IEEE, NEC, NFPA, NEMA, OSHA, REA, and UL.

##### B. Acceptance Testing

1. Verify by inspection and formalize by signed-off inspection documentation that system installation has been performed as specified.
2. Execute test plan and formalize by documentation sign-off that system performance has been demonstrated to the satisfaction of Owner. Owner's Representative retains right to suspend and/or terminate testing at any time upon failure of the system to perform as specified. Owner's written acceptance of system is a requirement of Closeout, and shall not conclude the Closeout Documentation stage.
  - a) Collaborate with Owner's Representative prior to start of testing, to establish criteria pass/fail criteria and classification of test execution problems, such as:
    - 1) Pass/fail: Criteria determining what constitutes a test pass or failure.
    - 2) Suspension and resumption: Criteria determining when testing must be suspended and resulted later.
    - 3) Show Stopper: Stop test, fix problem and restart test from beginning.
    - 4) Major Problem: Fix problem before test can be resumed or concluded.
    - 5) Minor Problem: Add problem to "punch list", complete test.
    - 6) Special Issue: Investigate to determine which problem category above category applies.
3. Provide tests specified below, when applicable or required by Owner, and as indicated under individual items of material, equipment, and work specified in this Specification.
  - a) Furnish all test equipment and instruments required for the tests.
  - b) Responsible, qualified employees of the contractor in the presence of the Owner or an authorized representative shall perform the cable testing.

- c) All individuals involved in the testing phase of the project shall not have been involved in the installation phase nor shall have immediate knowledge of the installation task.
- 4. End-to-end performance and calibration of all parts and channels shall be tested prior to testing in presence of System Designer.
- 5. Performance testing of randomly-selected doors and standalone devices shall be performed in presence of System Designer. System shall be accepted by System Designer prior to testing in presence of Owner.

#### 1.08 WARRANTY & SUPPORT

##### A. Warranty

- 1. Warranty shall meet the following criteria:
  - a) This warranty will cover all cables, terminations, and components provided by the Contractor.
  - b) Minimum 1-year written warranty covering workmanship and materials from the date of project completion. All repairs shall be made at no cost to the Owner during the warranty period.
  - c) Corrections shall start within 48-hours of notification from Owner.
- 2. If the warranty is needed by the Owner within the warranted period and the original installer is no longer in business, System manufacturer shall find a substitute certified contractor and assume costs to fulfill the obligations of the warranty.
- 3. Upon acceptance of the warranty paperwork and test results from the Contractor, System manufacturer will mail a notification letter to the installer and a notification letter with warranty certificate to Owner.
- 4. The warranty period shall commence following the final acceptance of the project by Owner and written confirmation of warranty from System manufacturer.
- 5. Provide 5-year software service agreement. Include associated licenses and renewal fees for the agreement's duration. Agreement and licenses shall commence following the project's substantial completion, and not the Contract's purchase date.

##### B. Manufacturer Support:

- 1. For the duration of the System subscription, automatically provide documented feature and security updates to cloud-based System software and Mobile Apps at no additional charge. Software, Mobile App and firmware updates shall be provided on a continuous basis.
- 2. Provide direct live telephone technical support free of charge both to end users and installing/maintaining security services contractors.
- 3. Provide optional additional-cost professional services for on-site deployment support to installing/maintaining services firm.

- C. Maintenance and Service: Servicing Contractor shall:
1. General Requirements:
    - a) Provide all services required and equipment necessary to maintain the entire integrated electronic security system in an operational state as specified for a period of one year after formal written acceptance of the system. Provide all necessary material required for performing scheduled adjustments or other non-scheduled work. Minimize impacts on facility operations when performing scheduled adjustments or other non-scheduled work.
  2. Description of Work:
    - a) Provide adjustment and repair of the Cloud-Based Physical Access Control System on-site equipment consistent with Manufacturer guidance and instructions.
  3. Personnel:
    - a) Ensure service personnel are certified in the maintenance and repair of the selected type of equipment and qualified to accomplish all work promptly and satisfactorily.
  4. Schedule of Work:
    - a) Perform work during regular working hours, Monday through Friday, excluding federal holidays.
  5. Emergency Service:
    - a) Provide staffed emergency service center service 24 hours a day 365 days a year. Provide emergency service center telephone number for the Owner to request service when system is not functioning properly. Owner has sole authority for determining catastrophic and non-catastrophic system failures within parameters stated in General Project Requirements.
    - b) For catastrophic system failures, provide same day four-hour service response with a defect correction time not to exceed eight hours from notification. Catastrophic system failures are defined as any system failure that Owner determines will place the security of one or more sites at increased risk.
    - c) For non-catastrophic failures, provide eight-hour service response with a defect correction time not to exceed 24 hours from notification.
  6. Operation:
    - a) In performance of scheduled adjustments and repair, at completion of work document the following:
      - 1) For routine maintenance, briefly describe the work done.

- 2) For problem resolution, describe the problem, the troubleshooting work done, root cause discovered, and remedial action taken.
- 3) Verify operation of the system relative to any changes, repairs or part replacements made.

#### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. To prevent damage, theft, soiling, and misalignment, protect equipment during transit, storage, and handling
- B. The contractor shall coordinate the secure storage of equipment and materials on site, or, if no on-site storage is available, shall provide their own secure storage at the Contractor's expense.
  1. Do not store equipment where conditions fall outside the manufacturer's recommendations for environmental conditions.
  2. Do not install damaged equipment. Remove environmental conditions from the site and replace damaged equipment with new equipment.
  3. If off-site storage of materials is necessary, this shall be at the Contractor's expense.

#### 1.10 PROJECT CONDITIONS

- A. Project Environmental Requirements
  1. Hazardous Materials Prohibition
    - a) The Contractor shall ensure that all materials used in the project are asbestos-free, unless specifically authorized in writing by the Owner.
  2. Existing Conditions
    - a) Verify that all conditions on the project site are acceptable for the Work specified in this Section. Prior to bid opening, notify the System Designer, in writing, of any discrepancies, conflicts, or omissions. Otherwise, correct these issues at no additional cost to the Owner.
    - b) Continue to monitor the project site. If conditions develop that require a variance from the Specifications or Drawings, then immediately notify the Owner in writing. Otherwise, make recommendations, submit drawings showing how the Work may be installed, and, upon approval, proceed with the necessary changes without additional cost to the Owner.
  3. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weather-tight, wet work in spaces is complete and dry, and work above ceilings is complete.
  4. Confirmation of Pathway and Cable Manager sizing:

- a) Wherever cabling pathways or managers are installed, it is the Contractor's responsibility to confirm pathway or manager sizing to represent no more than 25% fill upon installation according to manufacturer's fill tables.
- b) Pathways deemed overfilled upon installation will not be accepted and shall be remedied at Contractor expense.

#### 1.11 USE OF THE SITE

- A. Where the Owner deems it necessary to place restrictions, use the site as directed by the Owner.
- B. When proceeding with the work, do not interfere with the ordinary use of streets, aisles, passages, exits, or operations of the Owner. During the day, set up cones and barriers in hallways and walkways. Do not string cable down the hallways during normal hours.
- C. Request a hazardous materials worksheet that identifies potentially-hazardous locations. Do not proceed with any work in locations where hazardous materials are known to be. Obtain instructions from the Contractor's Project Manager on and when to work in these areas.
- D. Multiple times each day, each contractor shall remove all trash and debris from the site. Before leaving the room each day:
  - 1. The Contractor shall replace all ceiling tiles that they have removed.
  - 2. The Contractor shall place all furniture and equipment that they have moved back into its original location.
  - 3. The Contractor shall return any equipment that they have disconnected to working order.
  - 4. The Contractor's Job Foreman shall inspect all work locations to ensure that the rooms are clean and that all of the tasks described above have been done.
  - 5. It is recommended that the Contractor inspect the site and take pictures to document the condition of the ceilings and walls.

#### 1.12 RESPONSIBILITIES AND COORDINATION

- A. The Contractor shall provide all materials, qualified labor and services required to ensure a complete and operational system, installed in accordance with the intent of the Contract Documents.
- B. The Contractor shall furnish and install all incidental items not actually shown or specified, but which are required by best practices to provide complete functional systems.
- C. The Contractor shall coordinate the details of facility equipment and construction for all specification divisions, which affect the work covered under this Division.
- D. The Contractor shall coordinate all activities with the overall construction schedule.



- E. The Contractor shall coordinate with all other trades. The Contractor will submit a schedule for the installation within 15 days of contract award.
  - 1. The schedule shall include delivery, installation, and testing for conformance to specific job completion dates.
  - 2. At minimum, the schedule shall provide dates for the start of demolition, the completion of demolition, the installation start date, the completion of copper cabling, the completion of backbone cabling, the completion of testing and labeling, cutover, the completion of the final punch list, final inspection, and acceptance.
- F. The Contractor shall develop a bill of materials, perform material management and efficient use of the materials whether they are issued by Owner or purchased by the Contractor.
- G. The Contractor shall ensure materials, in excess of, those required to complete the project are kept in their original condition and packaging for restocking.
- H. The Contractor shall maintain existing cables and terminations not determined to be within the demolition scope of work. Cables damaged, removed, or unterminated shall be reinstalled and recertified with the manufacturer's certified installer, and test results provided to the Owner.
- I.

#### 1.13 DESIGN CRITERIA

- A. Compliance by the contractor with the provisions of this Specification does not relieve him or she from the responsibilities of providing materials and equipment of proper design, mechanically and electrically suited to meet operating requirements at the specified service conditions.

#### 1.14 LABELING

- A. Refer to Owner's standards for labeling requirements.
- B. Comply with TIA/EIA-606-A, TIA/EIA-606-A, Addendum 1 and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

- A. This Section includes General Requirements for each section in Division 28 and shall be used in conjunction with specifications, other related Divisions and related Contract Documents to establish the total requirements for the project.
- B. All materials and products shall be:
  - 1. Appropriate for the intended use
  - 2. Permitted by the Authority Having Jurisdiction (AHJ)

- C. All products shall be new, of the latest version at time of bid, and brought to the job site in original manufacturer's packaging. Used equipment and damaged material will be rejected.
- D. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.
- E. Take care during installation to prevent scratches, dents, chips, etc. Equipment with significant or disfiguring cosmetic flaws will be rejected.
- F. All components will be approved by the System Designer and shall have the most aesthetic value possible while maintaining specified functionality. Hardware shall:
  - 1. Be in compliance with the Construction Documents.
  - 2. Have fit and finish compatible with the existing surrounding structure.
  - 3. Be unobtrusive.
  - 4. Provide the required functionality.
- G. Fabricate custom-made equipment with careful consideration given to aesthetic, technical, and functional aspects of the equipment and its installation.
- H. Provide products that are suitable for the intended use, including, but not limited to environmental, regulatory, and electrical factors.
- I. Provide Torx screws for all devices specified in technical sections. Additionally, provide Torx screws for pathways associated with devices specified in technical sections below 10' AFF.

## 2.02 SUBSTITUTION POLICY

- A. Substitution of specified products or systems is not allowed.
- B. Contractor shall assume all costs for removal and replacement of any product installed in substitution of those specified. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

## 2.03 WORKSTATION

- A. Workstation for viewing security systems will be OFCI.

## 2.04 INTEGRATIONS AND INTERFACES

- A. Primary user interface shall be video management system. Integrations shall be provided for seamless control of integrated systems from the primary user interface.
- B. Fire Alarm Integration: Fire alarm system integration is of relay-based interface.
  - 1. Relay-Based Interface: Relay interface to fire alarm system via dry contact to drop power to egress doors during a fire alarm event.
- C. Access Control and Alarm Management System:

1. Refer to 281000 for ACAMS specifications.
- D. Intercom System:
1. Administrators can configure one or more user groups to be downloaded to the touchscreen directory of an intercom.
    - a) Intercom directory list shall automatically be updated as users are added or removed from the associated groups in the access control system.
    - b) Fields downloaded include display name, phone number and other configuration information to dial up to 3 distinct phone numbers per user in the intercom directory.
    - c) No inbound firewall ports shall be necessary for proper operation. The intercom shall initiate an outbound connection to the access control system on an hourly, daily or weekly time interval.
- E. Video Surveillance System:
1. Refer to 282000 for VMS specifications.

### **PART 3 - EXECUTION**

#### **3.01 WORKMANSHIP**

- A. Manufactured products, materials, equipment, and components shall be provided, conditioned, applied, installed, connected, and tested in accordance with the manufacturer's specifications and printed instructions.
- B. The installation of all system components shall be carried out under the direction of qualified personnel. Appearance shall be considered as important as mechanical and electrical efficiency. Workmanship shall meet or exceed industry standards.

#### **3.02 INTENT OF DRAWINGS**

- A. The Security drawings show only general locations of equipment, devices, raceways, cable trays, boxes, etc., unless specifically dimensioned.
- B. The Contractor shall be responsible for the proper placement and routing of equipment, cable, raceways, cable runway, and related components, according to the Contract Documents and subject to prior review by the Owner and System Designer.
- C. The Contractor shall refer any conflicts within the Contract Documents to the Construction Manager and/or Owner for resolution.

#### **3.03 GROUNDING**

- A. Comply with requirements in both 26 0526 "Grounding and Bonding for Electrical Systems" and 28 0526 "Grounding and Bonding for Security Systems" for grounding conductors and connectors.
- B. Comply with ANSI/TIA-607 and the local Electrical Code.

### 3.04 SERVICE CONTINUITY

- A. Maintain continuity of communications services to all functioning portions of the process or buildings during hours of normal use.
- B. Arrange temporary outages for cutover work with General Contractor. Keep outages to a minimum number and a minimum length of time in order to provide minimum impact.

### 3.05 LAYOUT AND TOLERANCES

- A. Follow as closely as practicable the schematic design shown on the drawings. Make all necessary measurements in the field to verify exact locations and ensure precise location and fit of specified items in accordance with the drawings. Make no substantial alterations without prior approval of the Owner and the System Designer.

### 3.06 CONSTRUCTION REVIEW

- A. The System Designer and Owner will review and observe installation work to ensure compliance by the contractor with requirements of the Contract Documents.
- B. Review, observation, assistance, and actions by the System Designer and Owner shall not be construed as undertaking supervisory control of the work or of methods and means employed by the contractor. The System Designer and Owner review and observation activities shall not relieve the contractor from the responsibilities of these Contract Documents.
- C. The fact that the System Designer and Owner does not make early discovery of faulty or omitted work shall not bar the Owner from subsequently rejecting this work and withholding payment until the contractor makes the necessary corrections.
- D. Regardless of when discovery and rejection are made, and regardless of when the contractor is ordered to correct such work, the contractor shall have no claim against the System Designer or Owner for an increase in the Subcontract price, or for any payment on account of increased cost, damage, or loss.

### 3.07 PROJECT RECORD DOCUMENTS

- A. Provide detailed project record documentation for sections listed in Part 1.
- B. Maintain separate sets of redlined record drawings for the communications work, which show the exact placement, and identification of as-built system components. These are subject to weekly review by the General Contractor, Owner, or its representative.

### 3.08 ADDITIONAL CONTRACTOR REQUIREMENTS

- A. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job.
- B. All work areas will be cleaned at the conclusion of the project and no tools or materials shall be left in a manner as to pose a safety hazard.

- C. Projects are not considered finished and will not be paid by Owner until all debris, dust, etc. has been cleaned and removed to the Owner's satisfaction.
- D. Contractor shall remove all abandoned cable per Article 800 of the National Electrical Code and per TIA, BICSI, and ASIS standards, recycling these materials where possible. Removal of orphaned cable is mandatory. Contractors shall consider this when placing bids.

### 3.09 INTEGRATIONS

- A. Coordinate with trades, Owner's staff and/or IT representatives, and other providers where required.

### 3.10 FINAL ACCEPTANCE

- A. The Contractor is required to notify the System Designer and Owner of a proposed appointment for Final Inspection at least 72 hours before the appointment.
- B. Owner may visit site during construction to ensure installation is in compliance with their requirements. Punch items discovered by Owner shall be resolved within 10 days of discovery.
- C. System acceptance shall be defined as that point in time when the following requirements have been fulfilled:
  - 1. All submittals and documentation have been submitted, reviewed, and approved.
  - 2. The complete system has successfully completed all testing requirements.
  - 3. All punch list items have been corrected and accepted.

### 3.11 TRAINING

- A. Provide a minimum of (1) 8 hour training session with a minimum of (4) Owner's staff at the project site (or other location designated by the Owner) by a qualified instructor (presence of equipment manufacturer if needed for additional assistance). Topics shall include system usage, operation and maintenance, and minor modifications.

### 3.12 WARRANTY

- A. Maintenance
  - 1. Contractor shall perform preventative maintenance every (6) months after final completion.
  - 2. Contractor shall perform at a minimum:
    - a) Cleaning of lenses
    - b) Dust removal
    - c) Camera readjustments
    - d) System performance re-validation

- e) Documentation of equipment requiring replacement (i.e. broken lenses/domes, broken locks, loose handles, etc.)
- f) Costs shall be provided for extended services not covered by warranty.

B. Software

1. Contractor shall perform firmware upgrades every (6) months after final completion.
  - a) Contractor shall coordinate firmware upgrades for software applications to remain compatible.
  - b) Coordinate roll-back of software versions with Owner's IT staff.
2. Contractor shall provide licenses as required to maintain software applications.

\*\*\*END OF SECTION\*\*\*

**SECTION 28 10 00****ACCESS CONTROL AND ALARM MANAGEMENT SYSTEM****PART 1 - GENERAL****1.01 SUMMARY****A. Contractor Shall Provide and Install**

1. The materials and labor required for the installation of access control and alarm management systems include, but are not limited to:

- a) Access control system application and servers
- b) Access control panels and enclosures
- c) Power supplies and enclosures
- d) Credentials
- e) Credential readers
- f) Request-to-exit devices
- g) Electrified locksets
- h) Exit buttons
- i) Through-wire electrified transfer hinges
- j) Door contacts
- k) End-of-line resistors
- l) Duress buttons
- m) Motion detectors
- n) Intercoms
- o) Emergency Call Stations
- p) Pedestals
- q) Cabling
- r) **Key Cabinet**

2. Although such work is not specifically mentioned herein or on the Drawings, the Contractor shall furnish and install all miscellaneous items, accessories, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation, without claim for additional payment.

**B. Related Sections:**

1. Section 000000 – Procurement and Contracting Requirements
2. Section 010000 – General Requirements
3. Section 280000 – Common Work Results for Security
4. Section 282000 – Video Surveillance System

## 1.02 SYSTEM DESCRIPTION

### A. Access Control and Alarm Management System (ACAMS)

1. An access control system will be provided to facilitate access through Owner-designed portals via credential readers, electrified locksets, door contacts, and request-to-exit devices. Cabling, control panels, and power supplies will be provided to support devices.
2. System will be tested to ensure failures are remediated, and that the system will be turnkey.
3. Credentials will be provided for proper access through the project boundaries. In addition, access levels/groups, user information, and visitor information will be coordinated.
4. Duress button will be provided to notify Security of an incident or emergency.
5. Motion detectors and door contacts will be provided to alarm buildings.

### B. Intercom System

1. A communication system will be provided for remote communication and access from designated entryways and portals via intercoms and dry contact relays.
2. Communication devices will be provided on stanchion/tower style columns for emergency and assistance calls. Locations and installation will conform with ADA requirements.
3. Cabling will be provided to support devices. Power will be provided in locations requiring fiber media conversion.

## PART 2 - PRODUCTS

### 2.01 ACCESS CONTROL SYSTEM APPLICATION AND SERVERS

#### A. System shall be capable of the following:

1. Customizable GUI with the ability for customizable icons to be placed onto a floor plan.
2. Real-time monitoring of doors, users, controllers, and devices.
  - a) Over 2000 card readers



- b) Over 5000 inputs
  - c) Over 5000 outputs
  - d) Up to 500,000 users
- 3. User permission modifications.
- 4. Scheduled door unlock.
- 5. Scheduled door monitoring.
- 6. Geofencing and location restrictions.
- 7. Export of events in CSV and PDF formats for auditing.
- 8. Remote door lockdown.
- 9. Setting alerts for user behavior.
- 10. Supports active directory.
- 11. Future mobile credentials.
- 12. Native integrations and additional integrations via SDK/API.
- 13. RAID5 or RAID6 configuration.
- B. Provide servers capable of hosting system applications.
  - 1. Refer to manufacturer's recommendations and guidelines for performance requirements.
- C. Provide licenses to support complete installation.
- D. Manufacturer
  - 1. Genetec Synergis

## 2.02 ACCESS CONTROL PANELS AND ENCLOSURES

- A. Panel boards shall be capable of the following:
  - 1. OSDP communications between panel and credential readers.
  - 2. RS-485 communications.
  - 3. Local storage of over 10,000 credentials.
  - 4. Network offline functionality.
- B. Panels shall be:
  - 1. Powered by local power supply in the same or adjacent enclosure.
  - 2. Able to support up to (16) credential readers and doors per panel.
  - 3. Sized or have the ability to support input and output boards.
- C. Control panel shall match Owner's standard manufacturer.

1. Control panels shall consist of:
  - a) Intelligent controllers
  - b) Credential reader boards
  - c) Input boards
  - d) Output boards
- D. Provide 2, 4, or 8-door control panels.
- E. Manufacturer
  1. Genetec Synergis
  2. Mercury LP1502
  3. Mercury LP1501
  4. Mercury MR16IN
  5. Mercury MR16OUT
- F. Enclosures shall house panel boards shall be provided. Provide (1) of the following:
  1. Same as system manufacturer
  2. Lifesafety Power
  3. Altronix
  4. nVent Hoffman

## 2.03 POWER SUPPLIES AND ENCLOSURES

- A. Supply boards shall:
  1. Be able to accept 120VDC at 60 Hz.
  2. Have input protection.
  3. Have independent battery back-up for up to (24) hours of runtime.
  4. Have fault supervision.
  5. Be able to support up to (16) fused or resettable outputs per panel.
  6. Accept fire alarm inputs.
- B. Power supplies shall match Owner's standard manufacturer.
- C. Where standards do not specify a manufacturer, provide (1) of the following:
  1. Separate power supply enclosure from access control enclosure:
    - a) Lifesafety Power

- b) Altronix
- 2. Integrated power supply and access control enclosure
  - a) Lifesafety Power Unified
- 3. Batteries shall be sized for (24) hours of continuous runtime.
  - a) Yuasa
  - b) Or equal

#### 2.04 CREDENTIALS

- A. Credentials shall:
  - 1. Operate at 13.56 MHz.
  - 2. Operate at the same frequency as credential readers.
  - 3. Be formattable with 26, 32, 36, 37, or 48-bits.
- B. Credentials shall match Owner's standard manufacturer.
- C. Provide (500) credentials to Owner.
- D. Where standards do not specify a manufacturer, provide (1) of the following:
  - 1. HID Corporate 1000
  - 2. HID iClass

#### 2.05 CREDENTIAL READERS

- A. Credential readers shall:
  - 1. Operate at both 125 kHz and 13.56 MHz.
  - 2. Operate at the same frequency as credentials.
  - 3. Communicate via OSDP with the access control panel.
  - 4. Have keypad
- B. Manufacturer:
  - 1. HID Signo 20K

#### 2.06 REQUEST-TO-EXIT (REX) DEVICES

- A. REX devices shall be integrated with the door hardware. Refer to Division 8.
- B. For doors without integrated REX, REX devices shall:
  - 1. Operate at 12 or 24V DC.
  - 2. Mount to a single gang mud ring.
  - 3. Have adjustable coverable patterns.

4. Selectable relay triggers.

C. Non-integrated REX shall match Owner's standard manufacturer.

D. Manufacturer:

1. Bosch DS160

## 2.07 ELECTRIFIED LOCKSETS

A. Electrified locksets shall be integrated with the door hardware. Refer to Division 8.

## 2.08 THROUGH-WIRE ELECTRIFIED TRANSFER HINGES

A. Through-wire electrified transfer hinges shall be provided with the door hardware. Refer to Division 8.

## 2.09 EXIT BUTTONS

A. Exit buttons shall:

1. Have the text: PUSH-TO-EXIT
2. Be in English
3. Have an adjustable timer
4. Have stainless steel finish
5. Mount to single gang ring or two-gang backbox
6. Be SPDT or DBDT Form C

B. Credentials shall match Owner's standard manufacturer.

C. Where standards do not specify a manufacturer, provide (1) of the following:

1. SDC 413N
2. Camden CM-30AT
3. Or equal

## 2.10 DOOR CONTACTS

A. Door contacts shall be provided with the door hardware. Refer to Division 8.

B. Where Division 8 does not specify door contacts, contacts devices shall:

1. Be form C dry contact.
2. Be DPDT.
3. Match door frame color or be paintable.

C. Door contacts shall match Owner's standard manufacturer.

1. Manufacturer shall be able to provide the following types of door contacts:
  - a) Recessed Reed Switch
  - b) Surface
  - c) Multiple form factors and environmental conditions.

D. Manufacturer:

1. George Risk Industries
2. Or equal

#### 2.11 END-OF-LINE RESISTORS

- A. End-of-line resistors shall be capable of multiple configurations.
- B. Provide (1) of the following:
1. George Risk Industries
  2. TE Connectivity
  3. Or equal

#### 2.12 DURESS BUTTONS

- A. Duress buttons shall:
1. Be Grade 3 Double Push Panic Button
  2. Have rear / surface removal tamper
  3. Have side push buttons
  4. Have stainless steel fascia
  5. Dimensions : 84mm x 65mm x 26 mm
  6. Environmental Class: 2
  7. Latching
  8. Black ABS, Stainless Steel Fascia
  9. Tamper: TACT Switch
  10. Activation: Microswitch
  11. Be cleanable in food service areas
- B. Manufacturer
1. Knight Fire Safety and Security # PA2SS
  2. Or equal

#### 2.13 MOTION DETECTORS

- A. Motion detectors shall:
  - 1. Be 12VDC
  - 2. Be multi-technology
  - 3. Be wall or ceiling mounted
- B. Manufacturer:
  - 1. DSC
  - 2. Optex
  - 3. Or equal

## 2.14 INTERCOMS

- A. Intercoms shall:
  - 1. Be Full duplex
  - 2. Have PoE power with self-monitoring
  - 3. Have proprietary screws for vandal resistance
  - 4. Have piezoelectric buttons
  - 5. Be flush-mounted
  - 6. Be capable of mounting to pedestals
  - 7. Be capable of integrated with two-way communications system via TCP/IP or SIP
- B. Provide mounts and accessories for turnkey solution.
- C. Manufacturer:
  - 1. Code Blue #IP1500
  - 2. Code Blue #IP2500

## 2.15 EMERGENCY CALL STATIONS

- A. Emergency call stations shall:
  - 1. Be stanchion/tower style
  - 2. Have options for 120V/277V or PoE Power
  - 3. Be capable of wired, cellular, or IP wireless communications
  - 4. Be colored: Blue Gloss black w/ white lettering
  - 5. Text: "Emergency" or "Assistance" in white font
  - 6. Be ADA-compliant

7. Be capable of integrated with two-way communications system via TCP/IP or SIP

B. Manufacturer:

1. Code Blue #CB1-s
- ~~2. Code Blue #CB5-s~~
- ~~3. Code Blue #CB9-s~~
- ~~4. Code Blue #CB9-t~~
- ~~5. Code Blue #CB-RT~~

## 2.16 PEDESTALS

A. Pedestals shall:

1. Have gooseneck for vehicular applications
2. Have sufficient openings in the base for power and data conduits
3. Have mounts and accessories for turnkey solution
4. Have rain hoods and housings with RF buffer plates

B. Pedestrian pedestals shall:

1. Be ADA-compliant
2. Have sufficient mounting surfaces for door actuators and access control devices

C. Single and Dual height pedestals shall:

1. Have housings wide enough for access control devices

D. Manufacturer:

1. Pedestal Pro
2. Or equal

## 2.17 CABLING

A. Cabling shall be listed and rated for the environment.

B. Provide surge protection where cabling enters building with a dedicated path to building ground.

C. Conductor sizes shall fit into device terminals. Minimum conductor size shall be 18 AWG.

D. Provide the following cable types:

1. S1:
  - a) Credential readers

- 1) 24 AWG, 4 conductors, twisted-pair, shielded, RS-485, 120-ohm
  2. S2:
    - a) Door contacts
      - 1) 4 conductors, shielded
    - b) Electrified locksets
      - 1) 4 conductors, shielded
    - c) Request-to-exit devices or exit buttons
      - 1) 4 conductors, shielded
    - d) Miscellaneous devices
      - 1) 4 conductors, shielded
- E. Door cabling shall:
  1. Be provided with 120-ohm termination resistors where card readers are OSDP.
  2. Have multiple components for every door device in an overall composite.
    - a) Credential reader component cable shall be compliant with RS-485/OSDP standards.
    - b) Lock and credential reader gauge shall be sized for maximum 10% voltage drop from panel to device.
  3. Be coordinated with device and hardware conductor gauges.
- F. RS-485 cabling
  1. Shall be compliant with RS-485 standards.
- G. Manufacturers:
  1. Smartwire
  2. Paige Datacom
  3. Belden
  4. Or equal
- H. Refer to Division 27 for network cabling.
  1. Provide fiber media converters where required.

## 2.18 KEY CABINET

### A. Shall:



1. Support up to 96 or 100 keys
2. Have options for 120V or PoE Power
3. Be capable of wired, cellular, or IP wireless communications
4. Manufacturer:
  - a) Torus 100
  - b) Deister Flexx
  - c) Medeco IKC
  - d) Or equal

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. The Contractor shall input the credential data into the access control software.
- B. Provide any required screws, anchors, clamps, hook and loop, miscellaneous grounding and support hardware, etc. needed to facilitate the installation of the cable plant system.
- C. Furnish any special installation equipment or tools necessary to properly complete the installation.
- D. Do not roll or store cable reels without an appropriate support structure.
- E. Failure to follow the appropriate guidelines may require the installer to provide additional material and labor required to properly rectify the situation. This shall also apply to any and all damages caused to the cables by the installer during the implementation.
- F. Provide fire blocking at all fire-rated penetrations.
- G. Plug conduits where cabling has been installed in the main equipment room, backbone, and other cable entrance locations with re-enterable duct seal of flame retardant putty.
- H. All techniques and fixtures used in the installation must minimize complexity and must allow for easy maintenance of, and ready access to, all components for test measurements.
- I. All materials used in installation shall be resistant to fungus growth and moisture deterioration.
- J. All of the pathways shown on the drawings are suggested routes for the Contractor to use as guidelines. Prior to construction, the Contractor shall coordinate in the field with other trades to determine the exact feeder, tie, and riser backbone cabling pathways. In any case where the communication pathway must be removed and re-routed, due to conflicts with other trades with which the Contractor did not previously coordinate, the Contractor is responsible for all costs associated with the removal and relocation.

### 3.02 ACCESS CONTROL SYSTEM APPLICATION

- A. Ensure application is viewable from Owner-selected workstation.
- B. Coordinate access levels and group configurations with Owner.
- C. Coordinate integration of active directory and new users with Owner.
- D. Coordinate door scheduling with Owner.
- E. Coordinate integration with Video Surveillance System and visitor management system.
- F. Coordinate system application, programming, notifications, and GUI configuration with Owner.
- G. Coordinate change of default passwords with Owner.
- H. Ensure the following door statuses are functioning:
  - 1. Access granted
  - 2. Access denied
  - 3. Door forced open
  - 4. Door held open

### 3.03 ACCESS CONTROL PANELS AND ENCLOSURES

- A. Enclosures shall be mounted to plywood.
- B. Patch cords will be provided for connecting to the network.
- C. Coordinate and document board MAC and IP addresses with Owner.
- D. Wire enclosure tamper switches.

### 3.04 POWER SUPPLIES AND ENCLOSURES

- A. Enclosures shall be mounted to plywood.
- B. Circuits shall be dedicated and not shared with other systems.
- C. Input power shall be hardwired.
- D. Provide input surge protection.
- E. Provide lock diodes where not integral to the lock. Coordinate with Division 8.

### 3.05 CREDENTIALS

- A. Coordinate required part numbers and ordering information with Owner.
- B. Ensure facility codes do not exceed that of specified access control panels.

### 3.06 CREDENTIAL READERS

- A. Mount square to device backbox.
- B. Provide spacers where read range is impacted by nearby readers or backplanes.
- C. Terminations shall be pigtailed.
- D. Coordinate LED and sounder programming with Owner.
- E. Ensure rough-in is ADA-compliant, and that junction boxes/pathways are on the secured side of the door.
- F. Remove non-factory paint after walls are finished.

### 3.07 REQUEST-TO-EXIT DEVICES

- A. For integrated REX devices, coordinate terminations and wire handoff with Division 8.
  - 1. Ensure REX is functioning prior to installation.
- B. For non-integrated REX devices:
  - 1. Mount square to device backbox.
  - 2. Aim detection pattern as close as possible to door handle.
  - 3. Detection pattern shall not reflect off of adjacent surfaces or pass through openings to allow accidental device activation.

### 3.08 ELECTRIFIED LOCKSETS

- A. Coordinate terminations and wire handoff with Division 8.
  - 1. Ensure electrified lockset is functioning prior to installation.
- B. Coordinate wiring for doors with automatic push plates and door operators. Under no circumstance shall a push plate activate the door operator without an authorized credential read.
- C. For doors with power supplies above the door, coordinate system configuration with Divisions 26 and 8.
- D. Doors shall be failsecure with mechanical egress.
- E. Provide fire relays at headend locations and at doors with power supplies above the door. Coordinate fire alarm integration with Fire Alarm Contractor.

### 3.09 EXIT BUTTONS

- A. Mount square to device backbox.
- B. Coordinate terminations and wire handoff with Division 8.
- C. Set timer to allow for Code-minimum close times prior to locks re-engaging and for door to fully close.

### 3.10 THROUGH-WIRE ELECTRIFIED TRANSFER HINGES

- A. Coordinate terminations and wire handoff with Division 8.
  - 1. Ensure through-wire electrified transfer hinge is functioning prior to installation.
- B. Measure voltage drop at the lock termination from the power source.

### 3.11 DOOR CONTACTS

- A. Shall be recessed for door frames. Provide surface-mounted contacts where recessing is not possible.
- B. Coordinate door frame drilling and mounting with Division 8.
- C. Contacts shall be secured and flush to mounting surface.
- D. Contact color shall be closely matched with door frame.
- E. In locations where armored loops are required, locate rough-in as close as possible to door for minimal loop length.
- F. No more than (1) contact will be allowed per door leaf. For doors with multiple leaves, normally-open or normally-closed configuration shall be consistent throughout project.

### 3.12 END-OF-LINE RESISTORS

- A. Provide configurations compliant with access control panel manufacturer.
- B. Provide on device side. Resistors at the headend will be rejected.

### 3.13 DURESS BUTTONS

- A. Mount square to device backbox.
- B. Ensure buttons are able to be reset. For key-reset, coordinate handoff of keys with Owner.

### 3.14 CABLING

- A. All cable runs must be continuous from the panel to the device location.
- B. Group and bundle all cabling. Do not bundle with other systems.
  - 1. Division 27 cabling provided for Division 28 cabling are allowed to be bundled together.
- C. Device wiring shall be consistent and documented. Color codes shall be uniform.
- D. All cables shall originate and terminate at active or passive devices. Cables shall not be spliced. Where several devices are in close proximity, use approved housing to housing connectors and adapters.
- E. Strip and terminate cabling utilizing manufacturer's recommended tools. Pins, plugs, and terminals shall not be damaged.

- F. All cables terminated in a connection plate mounted in an enclosure shall be dressed to allow cables to be removed from the enclosure and shall be of sufficient cable length to allow for service or re-termination. The plate shall either set on the floor or freely swing clear.
- G. Cabling shall not be visible when walking through the facility. Cabling shall be in conduits, in cable tray, or in j-hooks above accessible ceiling.
- H. All cables installed in vertical tray or chases shall be supported by means of appropriately-sized vertical cable supports on every third floor. Do not use nylon cable ties.
- I. Cables shall not be pulled across sharp edges. Provide protection where edges exist or manually grind down edges for a smooth, polished surface.
- J. Cables shall not be jammed between assemblies or equipment.
- K. Abide by manufacturer's pulling tension and bend radii.
- L. Cable Installation in Conduit
  - 1. Through the entire length of all underground conduits, pull mandrel that is one size smaller than the conduit.
  - 2. When pulling cable, use water-based pulling lubrication. Lubricants that harden after installation are not allowed.
  - 3. During long or difficult runs, use a dynamometer to measure pulling tension. Place the dynamometer between the cable puller and the pull line to monitor pulling tension. Do not exceed the manufacturer's maximum pulling tension.
  - 4. Apply pulling grips suitable for use with copper cables to the ends of the cable. Consult the cable manufacturer to determine the appropriate pulling grip and method of attachment. Use breakaway or fuse links at the pulling grip and ensure that the correct "fuse pin" is installed in the fuse link. Channel locks and pliers used for pulling are now allowed.
  - 5. To protect the cable ends until they are terminated, use cable caps (heat-shrinking type) to seal the ends of the cable.
  - 6. Use cable blocks to facilitate the bending of cable. For bends between 5° and 45°, use a 45° cable block. For bends between 45° and 90°, use a 90° cable block.
  - 7. The bend radius for all cables shall conform to manufacturer's specifications.
- M. Provide 6' service loop in overhead runway in Technology rooms or at headend location.
- N. Provide 6' service loop in device backbox, nearest cable tray, or j-hook, wherever is closest to the cable termination.

- O. Do not expose cable to water, paint overspray, paint removal products, or water-based pulling lubricants, as these substances can negatively impact the performance of the cable.
- P. Use cable bundling and securing materials as required to ensure that cable runs are securely held in place both vertically and horizontally.
- Q. Do not tighten bundling materials or securing devices so as to cause deformation of the inherent cable geometry or construction.
- R. Cables shall be dressed, bundled, and neatly arranged.
- S. Do not use cable ties or hook and latch tape to secure cable runs to other building systems (such as electrical conduit, EMT, sprinkler pipes, ceiling suspension members, etc.). Staples and drive rings are not allowed.
- T. In areas considered environment air-handling spaces, only use appropriately-listed materials.

### 3.15 INTERCOMS, EMERGENCY CALL STATIONS, AND PEDESTALS

- A. Shall be coordinated for ADA heights and ergonomic activation.
- B. In driveways, face of devices shall be flush with curbs.
- C. Integrations and calls shall be coordinated with Owner.

### 3.16 LABELING

- A. Batteries shall be labeled with installation date.

\*\*\*END OF SECTION\*\*\*

**SECTION 28 20 00****VIDEO SURVEILLANCE SYSTEM****PART 1 - GENERAL****1.01 SUMMARY****A. Contractor Shall Provide and Install**

1. The materials and labor required for the installation of access control and alarm management systems include, but are not limited to:
  - a) Video surveillance system application
  - b) Surveillance cameras
  - c) Cabling
2. Although such work is not specifically mentioned herein or on the Drawings, the Contractor shall furnish and install all miscellaneous items, accessories, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation, without claim for additional payment.

**B. Related Sections:**

1. Section 000000 – Procurement and Contracting Requirements
2. Section 010000 – General Requirements
3. Section 260526 – Grounding and Bonding for Electrical Systems
4. Section 280000 – Common Work Results for Security
5. Section 281000 – Access Control and Alarm Management System

**1.02 SYSTEM DESCRIPTION****A. Video Surveillance System (VSS)**

1. A video surveillance system will be provided for remote viewing of cameras and forensic analysis of recorded video. Cabling, servers, recorders, and uninterrupted power supplies will be provided to support the system.
2. System will be tested to ensure failures are remediated, and that the system will be turnkey.
3. System will be integrated with the Access Control and Alarm Management System (ACAMS) for activations within ACAMS to trigger recording in the VSS.

**PART 2 - PRODUCTS****2.01 VIDEO SURVEILLANCE SYSTEM APPLICATION**

- A. System shall match Owner's standard manufacturer.
- B. System shall be capable of the following:
  - 1. Customizable GUI with the ability for customizable icons to be placed onto a floor plan.
  - 2. Centralized user management.
  - 3. Export of events in CSV and PDF formats for auditing.
  - 4. Flexible rule-based system, driven by schedules and events.
  - 5. Native integrations and additional integrations via SDK/API.
  - 6. Unrestricted number of users, devices, servers, and sites with options for intelligent video walls.
  - 7. Capable of virtual platforms and environments.
  - 8. Federated system architecture.
  - 9. ONVIF compliance.
  - 10. Encryption between servers and clients.
  - 11. Supports active directory.
  - 12. Capable of failover recording.
  - 13. Have gateway for future third party analytics/artificial intelligence applications to access events, cameras, video streams, and meta data.
  - 14. Videowall-capabilities and adaptive streaming.
  - 15. Independent playback for viewing multiple streams and recordings.
  - 16. Capable of privacy masking camera views.
- C. Refer to manufacturer's recommendations and guidelines for additional performance requirements.
- D. Provide licenses to support complete installation.
  - 1.
  - 2. Manufacturer:
    - a) Genetec Omnicast

## 2.02 SURVEILLANCE CAMERAS

- A. Surveillance cameras shall:
  - 1. Be ONVIF-compliant.
  - 2. Have built-in onboard analytics.
  - 3. Have wide dynamic range.
  - 4. Support H.265.



5. Input/output connectivity.
- B. Form factors shall be:
  1. Type 1: 360 degree fixed dome
    - a) Axis #P3735-PLE
  2. Type 2: Indoor 2-sensor multidirectional dome
    - a) Axis #P3265-LV
  3. Type 3: Outdoor 2-sensor multidirectional dome
    - a) Axis #P3265-LVE
  4. PTZ
    - a) Axis #Q6318-LE PTZ
  5. Provide mounts and adaptors as required to meet design intent.

## 2.03 INTERCOMS

- A. Intercoms shall have the following:
  1. 6MP wide-angle camera
  2. Multiple hardware interfaces: audio input/output, relays, HDMI output, RS485
  3. Easy integration with SIP, API and ONVIF
  4. Signed firmware with Secure Boot
  5. Integrated multifrequency reader
  6. Support for HID® iClass®.
  7. Bi-directional communications
- B. Provide pedestal mounting accessories.
- C. Manufacturer:
  1. Axis A8207-VE Mk II
  2. Or equal

## 2.04 PAGING SPEAKERS (TALKDOWN)

- A. Paging speakers shall have the following:
  1. All-in-one speaker system
    - a) Digital signal processing
    - b) Pre-recorded messages
    - c) Live speak

2. VOIP
    3. Simple installation with PoE
    4. Remote health testing
    5. Two input/outputs (GPIO)
  - B. Provide pole mounting accessories.
  - C. Manufacturer:
    1. Axis C1310-E Mk II
    2. Or equal
- 2.05 CABLING
- A. Cabling shall be listed and rated for the environment.
  - B. Provide surge protection where cabling enters building with a dedicated path to building ground.
  - C. Cabling shall be provided by Division 27.
    1. Provide category cabling for channel lengths (patch cables & horizontal cable) below 330 feet.
    2. Provide fiber media transceivers and fiber optic cabling for channel lengths greater than 330 feet.
    3. Provide patch cords.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Provide any required screws, anchors, clamps, hook and loop, miscellaneous grounding and support hardware, etc. needed to facilitate the installation of the cable plant system.
- B. Furnish any special installation equipment or tools necessary to properly complete the installation.
- C. Failure to follow the appropriate guidelines may require the installer to provide additional material and labor required to properly rectify the situation. This shall also apply to any and all damages caused to the cables by the installer during the implementation.
- D. All techniques and fixtures used in the installation must minimize complexity and must allow for easy maintenance of, and ready access to, all components for test measurements.
- E. All materials used in installation shall be resistant to fungus growth and moisture deterioration.

#### **3.02 VIDEO SURVEILLANCE SYSTEM APPLICATION**

- A. Ensure application is viewable from Owner-selected workstation.

- B. Coordinated federated servers with Owner.
- C. Coordinate user permissions with Owner.
- D. Coordinate integration of active directory and new users with Owner.
- E. Coordinate integration with Access Control and Alarm Management System.
- F. Coordinate system application, programming, notifications, and GUI configuration with Owner.
- G. Coordinate change of default passwords with Owner.

### 3.03 SURVEILLANCE CAMERAS

- A. Mount square to device backbox.
- B. Provide varifocal lenses for fixed view cameras.
- C. Camera field-of-view shall be squared with no distortions, discolorations, or glare from other sources.
- D. Cameras shall be set to encode streams at H.265.
- E. Cameras shall output maximum resolution to networked video recorder.
- F. Cameras shall be set to continuous with motion-triggered recording.
  - 1. Continuous recording shall be at 15 fps.
  - 2. Motion-triggered recording shall be at 25 fps.
- G. Door alarms shall notify closest camera or set of cameras to record.
- H. Privacy masks shall be coordinated with Owner.
- I. Built-in analytics shall be coordinated with Owner.
- J. Third party analytic applications shall be coordinated with Owner.
- K. Remove non-factory paint after walls are finished.

### 3.04 CABLING

- A. Cables shall be dressed, bundled, and neatly arranged.

\*\*\*END OF SECTION\*\*\*

## ONTARIO SPORTS EMPIRE

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**SECTION 31 00 00****EARTHWORK****PART 1 - GENERAL**

This Part and all Subparts shall conform to the following related documents:

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. Standard Specifications:
    - a. The "GreenBook": Standard Specifications for Public Works Construction (Latest Edition).
    - b. The Grading Code and Manual of the County of San Bernardino.
    - c. Caltrans-Manual of Traffic Controls for Construction and Maintenance Work Zones (Latest Edition).
  - 2. Standard Drawings shall apply to the work to the extent referenced on the plans:
    - a. Standard Plans, issued by the City of Ontario (Latest Edition)
    - b. Standard Plans, issued by the County of San Bernardino (Latest Edition).
    - c. Standard Plans for Public Works Construction (Latest Edition).
- C. Reference Documents: Geotechnical Investigation Report dated April 16, 2024 and all subsequent supplements. These documents are included in the Specifications as Exhibit "A":

**SUMMARY**

- D. Section Includes:
  - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns and grasses, and exterior plants.
  - 2. Excavating and backfilling for buildings and structures.
  - 3. Drainage courses for concrete slabs-on-grade.
  - 4. Subbase course for concrete pavement.
  - 5. Subbase and base course for asphalt paving.

6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

**1.2 UNIT PRICES****1.3 DEFINITIONS****1.4 SUBMITTALS****1.5 QUALITY ASSURANCE****1.6 PROJECT CONDITIONS (WORK SITE MAINTENANCE)****1.7 SOIL REMOVAL****PART 2 – PRODUCTS**

Products in this Part and all Subparts shall conform to the documents referenced in Part 1 – General. Products include, but are not limited to the following:

**2.1 SOIL MATERIALS****2.2 ACCESSORIES**

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
  1. Red: Electric.
  2. Yellow: Gas, and dangerous materials.
  3. Orange: Telephone and other communications.
  4. Blue: Water systems.
  5. Green: Sewer systems.
  6. Purple: Reclaimed Water System.
- B. Detectable Wire: Tracer wire shall be provided for plastic piping. Insulated No. 12 copper tracer wire shall be buried with the pipe and ends brought to surface.
- C. Drainage Geotextiles
- D. Erosion Control Geotextiles
- E. Separation Geotextiles

**PART 3 – EXECUTION**

Execution of all related work in this Section shall conform to the documents referenced in Part 1 - General. Execution includes, but is not limited to the following:

- 3.1 PREPARATION**
- 3.2 DEWATERING**
- 3.3 EXCAVATION, GENERAL**
- 3.5 EXCAVATION FOR STRUCTURES**
- 3.6 EXCAVATION FOR WALKS AND PAVEMENTS**
- 3.7 EXCAVATION FOR UTILITY TRENCHES**
- 3.8 APPROVAL OF SUBGRADE**
- 3.9 UNAUTHORIZED EXCAVATION**
- 3.10 STORAGE OF SOIL MATERIALS**
- 3.11 BACKFILL**
- 3.12 UTILITY TRENCH BACKFILL**
- 3.13 FILL**
- 3.14 MOISTURE CONTROL**
- 3.15 COMPACTION OF BACKFILLS AND FILLS**
- 3.16 GRADING**
- 3.17 SUBSURFACE DRAINAGE**
- 3.18 BASE COURSES**
- 3.19 DRAINAGE COURSE**
- 3.20 FIELD QUALITY CONTROL**
- 3.21 TOLERANCES**
- 3.22 CLEANING AND PROTECTION**
- 3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 31 22 00****GRADING****PART 1 – GENERAL****1.0 GENERAL REQUIREMENTS:**

- A. Permits: CONTRACTOR shall obtain and pay for all permits and compliance activities associated with Earthwork (e.g., grading, encroachment, and all utility permits).

**1.1 RELATED DOCUMENTS AND REFERENCED STANDARDS**

- A. Project Plans, Specifications and Contract Documents.
- B. Geotechnical Investigation Report dated April 16, 2024 and all subsequent supplements. These documents are included in the Specifications as Exhibit "A."
- C. Related Sections include the following:
  - 1) Section 31 10 00 Site Clearing
  - 2) Section 31 23 00 Excavation and Fill
  - 3) Section 32 13 13 Concrete Paving

**1.2 SUMMARY**

This section includes all earthwork operations associated with rough and precise grading (e.g., overexcavation, subgrade preparation, backfill and compaction), drainage and moisture control, hardscapes (e.g., pavement, slabs on grade and walkways) and trenching and backfilling of all underground facilities and foundations such that all improvements shown on the drawings can be constructed in strict conformance with the geotechnical investigation prepared for this project. All excess material, any excavated material (rock) which has a dimension of 3" or more is unsuitable as well as unsuitable fills as defined in the geotechnical investigation for the project shall be removed and disposed of by the CONTRACTOR at an approved disposal site. All imported fill material shall be approved by the Engineer prior to transportation of the material to the project site. The limits of grading are the entire project site excepting the footprint of the existing structures to remain and as more specifically shown on the grading plan.

**1.3 SUBMITTALS**

- A. Grading placement plan: The CONTRACTOR shall submit a placing plan to the Engineer for approval 10 days prior to beginning any grading operations. The plan shall include, but not be limited to, complete description, details, equipment lists, schedule and supporting calculations showing:
  - 1) Compliance with the Geotechnical Investigation and Project Plans. Sequencing of mass and precise grading operations.
  - 2) Procedures for survey, obtaining final elevations (e.g., pad certification) and record drawings.

- 3) Methods of shoring, and the methods and monitoring (e.g., settlement, survey of foundations, video) of the removal and recompaction next to adjacent structures.
- 4) Methods of shoring and installation of major underground facilities (e.g., water main).
- 5) Disposal site location and contact information.
- 6) Import site location and contact information along with laboratory analysis of properties of the soil to be imported, if any.
- 7) Methods of compaction.
- 8) Method(s) to dry oversaturated soils.
- 9) Excavation stability and safety.

#### **1.4 QUALITY ASSURANCE**

- A. All work shall be in strict conformance with the related documents and referenced standards outlined above. The CONTRACTOR shall attend a pre-grading conference with the appropriate authorities (e.g., City, City Project Engineer, Inspector, Independent Testing Firm) at least three (3) working days prior to starting work.

### **PART 2 – PRODUCTS**

#### **2.1 SOIL MATERIALS**

- A. All materials shall be in strict compliance with the above outlined related documents and referenced standards.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. All operations shall be in accordance with the related documents, referenced standards and NPDES requirements. All work shall meet all Federal, State and Local requirements for safety. All facilities, not to be demolished, shall be protected from damage at all times.
- B. Bring areas to be graded to the approximate finish grades and then scarify, moisten and roll to obtain the required density. Scarify, moisten and roll high areas and low areas to obtain the required finish grades by cutting and filling. Finish grades shall be within 1/4" above or below the finish grade shown, less allowances for subsequent construction. Rough grades shall be within 0.10' of required elevations.

#### **3.2 UTILITIES**

- A. All utilities shall be appropriately permitted, at the CONTRACTOR'S expense, inspected, fabricated, and installed in accordance with the current standards and policies of each utility.

### 3.3 STORAGE OF SOIL MATERIALS

- A. CONTRACTOR shall designate a stockpile area on the grading placement plan submittal for approval.

### 3.4 FIELD QUALITY CONTROL

- A. All work shall be properly inspected, tested for conformance with the Plans, Specifications and Contract Documents. All nonconforming work shall be reworked, as directed by the Engineer, at the sole expense of the CONTRACTOR.
- B. SUBGRADE PREPARATION FOR CONCRETE: Prepare subgrade for concrete items placed directly on earth by cutting, filling, and grading as required and as specified herein, and bring to optimum moisture content. Finish the subgrade within 3/8" tolerance when measured along a 10-foot straightedge in any direction at any location. Compact to the density specified for fills and maintain the moisture content until concrete is placed.
- C. ASPHALTIC CONCRETE PAVING AREAS: Bring areas to required elevations and grades by clearing and preparation, cutting, filling, grading, and compacting as shown and as specified herein. Allow for thickness of subsequent materials. Rough grade to required elevations plus or minus 0.05 foot and proof-roll the areas with a 3-wheel 10-ton roller or approved equivalent. Excavate soft or moving areas revealed by proof-rolling and replace with compacted fill as specified under "Compaction" above. Final fine grading and compaction is specified as a part of the paving operations.
- D. LANDSCAPE AREAS: Bring to nominal 0.10-foot below required grades except where topsoil fill occurs, and finish with smoothly curving contours at grade changes and slopes, as approved. Grade to allow for thickness of topsoil fill. Avoid excessive compaction in all areas.

### 3.5 FINAL CERTIFICATION

- A. Final certification shall be in conformance with the Grading Permit (e.g., Pad Certification and Compaction Reports). Building and other structure pad elevations shall be within a tolerance of  $\pm \frac{1}{4}$  inch and rough grading elevations shall be within 0.10' of required elevations. Furthermore, the CONTRACTOR shall undertake all survey work to establish final grades, elevations, and utility locations and submit this information to the Engineer for approval prior to final acceptance.

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 31 23 00****EXCAVATION AND FILL****PART 1 – GENERAL****1.1 DESCRIPTION:**

- A. All labor, materials, etc. necessary for and incidental to performing all operations of the work for this section, complete as shown on the Drawings or specified herein. Work includes, but is not necessarily limited to, the following:
1. Examine all other sections for work related to those other sections and required to be included as work under this section
  2. Structural excavations for footings, grade beams, etc.
  3. Backfill and compaction
  4. Provide de-watering and site drainage during construction
  5. Remove surplus excavated materials from the site
  6. Preparation of subgrade under slabs
  7. Layout and setting of lines and levels
- B. Related Work in Other Sections:
1. Storm Drainage Utilities - Section 33 40 00
  2. Grading - Section 31 22 00
  3. Concrete Paving - Section 03 00 00
- C. Requirements:
1. All work shall be done in accordance with applicable requirements provided in the "Standard Specifications for Public Works Construction," (current edition)
  2. Permits, fees, and codes: Obtain all permits and pay all fees required in connection with this work. Any fees made necessary by the removal and dumping of debris shall be paid for by the CONTRACTOR.
  3. Layout of the work: The CONTRACTOR shall be responsible for the accuracy of all layout of work and shall retain and pay for the services of a licensed surveyor or civil engineer to set the lines and grades and to stake out all construction.
  4. Soils data: The geotechnical soils report should be reviewed by the CONTRACTOR. Information in report shall not relieve CONTRACTOR of responsibility for the work required. Logs of soil borings included in above-mentioned report do not constitute a guarantee of the uniformity of soil conditions over the entire site nor a guarantee against variations of the ground water level.

5. Sub-grade preparation: The sub-grade shall be that portion of the ground upon which portland cement concrete or building floor slabs are to be constructed. The sub-grade shall be accurately shaped to the required elevations and shall not vary more than .10' above or below the required elevation. Within these limits, the elevations of the finished sub-grade shall conform to the elevations shown on the drawings when allowance is made for pavement and slab thicknesses to bring the area to finished elevation.
  6. During the progress of the work, keep premises free from debris and waste material resulting from the work in this section. Upon completion, remove all surplus material and debris from the site.
- D. Benchmarks:
- Protect against dislocation and damage. Repair or replace any that are disturbed.
- E. Existing Utilities:
1. Carefully protect all conduits, drains, pipes, and wires that are on the property.
  2. Repair any damage to existing utilities resulting from work of this section.

## **PART 2 – PRODUCTS**

- A. Materials for compacted fill and backfill shall consist of material per recommendations of the soils geotechnical evaluation report.
- B. All products, such as imported fill, existing fill to be reused, gravel fill, etc. shall be approved by the Soils Engineer prior to use on this project.
- C. Refer to the soils geotechnical evaluation report for existing materials at the site and for requirements of any products to be used.

## **PART 3 – EXECUTION**

### **3.1 EXCAVATION:**

- A. Excavate to the dimensions and elevations indicated. Remove all materials encountered, regardless of their nature. Adjust angle of slope shown for excavations as required during excavation to suit soil stability conditions encountered, as directed by Soils Engineer. If the excavation for footings is made below the elevations indicated on the drawings, fill the excavated portion with concrete of the strength and weight required for the footings.
- B. Should suitable bearing, as determined by the Soils Engineer, not be encountered at the depth indicated on the drawings for foundations, do not proceed further until instructions are given and the necessary measurements made for the purpose of establishing the additional volume of excavation.
- C. The bottoms of all footings and basement excavation shall be level, free of loose material, and approved by the Soils Engineer.
- D. Remove excavated materials not suitable for backfill from the site and dispose of without any additional cost to the City. Structural excavations for footings shall be done so as to provide ample working space to permit the placing of any required form work, and to

allow the City adjacent areas to be effectively drained and kept free from standing water at all times.

- E. Excavations for footings which are carried below the required depth shall be re-filled to the required level with concrete at the CONTRACTOR'S expense.
- F. Provide any shoring necessary to maintain the banks of excavations and to prevent any sloughing or caving-in, and as necessary to prevent damage of any kind which may occur in connection with this work.

### **3.2 SITE DRAINAGE:**

- A. During the entire period that the excavations are open and the building sub-grades are exposed to the elements, perform corrective and protective grading to divert any surface and rainwater away from the open excavations in a legal manner.
- B. Promptly remove any water occurring in the excavations from any cause and keep the excavations continuously dry by relief trenches, by sumps and pumping, or by other suitable and effective methods.

### **3.3 BACKFILLING:**

- A. After the concrete has been placed, the forms removed, and the concrete work approved, backfill, and compact the excavations to the indicated grades. Before placing backfill, remove all rubbish, wood, and debris from the excavations.
- B. Deposit backfill in loose 6" layers and compact to at least 90% of maximum density at optimum moisture content as determined by ASTM D1557.
- C. Do not backfill against waterproofed surfaces until such surfaces are properly protected and approved.
- D. Under no circumstances will flooding or jetting be permitted when backfilling.

### **3.4 GRADING**

Bring areas to be graded to the approximate finish grades and then scarify, moisten, and roll to obtain the required density. Scarify, moisten, and roll resulting high areas and low areas to obtain the required finish grades by cutting and filling. Finish grades shall be within a tolerance of 1/4" above or below the finish grade shown, less allowances for subsequent construction. Rough grades shall be within 0.10' of required elevations.

#### **A. OBSERVATION AND TESTING:**

- 1. The Soils Engineer will observe the filling and compacting operations so that he can state his opinion whether or not the fill was constructed in accordance with these specifications.
- 2. The Soils Engineer will make field density tests in accordance with Test Method ASTM D1556 for each layer of fill. The Soils Engineer may make field density tests using nuclear density gauge and hand-driven tubes. Density tests may be made by intervals not exceeding 2' of fill height, provided all layers are tested. Density tests shall be made in the compacted materials below the surface where the surface is disturbed. If these tests indicate that the density or moisture

content of any layer of fill or portion thereof does not meet the specified density or moisture content, the particular layer or portions shall be re-worked until the specified density and moisture content have been obtained.

**END OF SECTION**



**SECTION 32 11 16.17****ARTIFICIAL GRASS BASE COURSES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Furnish all labor, materials, tools and equipment necessary to install Crushed Aggregate Permeable Base, Separation Fabric, Flat Drains, HDPE Perimeter Piping, Artificial Grass Fabric Attachment Nailer and Identified Site Furnishings as indicated on the plans and as specified herein; including components and accessories required for a complete installation, including but not limited to:
1. Review and Acceptance of prepared sub-grade, and sub-grade certification.
  2. Coordination with related trades to ensure a complete, integrated, and timely installation: Aggregate base course, sub-base material (tested for permeability), grading and compacting, piping and drain components (when required); as provided under its respective trade section.
- B. Related work specified elsewhere:
1. Earthwork
  2. Concrete (Not per this Bid)
  3. Irrigation (Not per this Bid)
  4. Athletic Grass Sports Fields

**1.2 DESCRIPTION OF WORK:**

- A. The Artificial Grass permeable base and drainage installation CONTRACTOR (base CONTRACTOR) shall provide the Artificial Grass permeable aggregate base system and related appurtenances, including but not limited to HDPE Perimeter Piping, perimeter edge anchorage details, crushed aggregate permeable base, ready to receive the Artificial Grass fabric.
1. It is the intent of this paragraph that all work necessary to provide the specified synthetic sports turf, complete and ready for play, shall be included in the scope of the General Contract.
  2. The base CONTRACTOR will be responsible for installing the base and drainage system for the athletic play fields, batting cages, and family entertainment area plaza areas.
  3. The overall site general CONTRACTOR shall be responsible for providing the storm drain infrastructure tie in's 5' into the field side of the containment curb for each Artificial Grass field areas per the point of connections identified on the plans.
  4. The overall site general CONTRACTOR shall be responsible for providing the irrigation mainline infrastructure tie in's on the field side of the curb to each Artificial Grass field area.
  5. The overall site general CONTRACTOR shall be responsible for protection of any newly installed site flat work and/or scheduling/ coordinating adjacent trades work accordingly to avoid hauling or access over new concrete walkways. The base CONTRACTOR is responsible for providing all protection and access over concrete curbs.

### 1.3 QUALITY ASSURANCE

- A. Permeable base and drainage installation CONTRACTORS (Base CONTRACTOR) qualifications:
1. Installers of the artificial grass base system shall:
    - a. Possess a Class A California Engineering CONTRACTOR'S License and all necessary CONTRACTOR'S Licenses required by the jurisdiction in which the project is located.
    - b. The base CONTRACTOR (company) shall have prior direct experience in the installation of permeable base and drainage infrastructure for Artificial Grass sports fields and must have installed a minimum of 12 such base systems in southern California during the past 3 years, with a minimum size of 65,000 SF per Artificial Grass field. Base CONTRACTOR shall submit a listing of 3 years previous southern California experience, project name, contact references, contact number, email, etc. for each project as part of the Bid submittal.
      - i) Submit base CONTRACTOR'S experience (minimum of 12 such base systems in southern California) as part of the bid. *(See enclosed form for providing required reference material).*
    - c. The base CONTRACTOR'S superintendent shall have a minimum of 5 years experience in the installation of permeable base and drainage infrastructure. Submit base CONTRACTOR superintendent's resume (covering 10 year work experience) with listing of similar projects, name, size, references, contact number, email, etc. as part of the bid. *(See enclosed form for providing required resume/reference material).*
      - 1) *Submit base CONTRACTOR'S superintendent resume (10 year work history) as part of the bid.*
    - d. Base CONTRACTOR shall have a current ASBA certified field builder on staff.
      - 1) *Submit evidence(copy) of current ASBA field builders certification as part of the bid.*
- B. Changes & Substitutions:
1. The base CONTRACTOR shall strictly adhere to the procedures outlined under this Section. Any variance from these requirements shall be submitted to for review and acceptance by the OWNERS REPRESENTATIVE. CONTRACTOR shall submit Substitution change request form for review with all detail information and any variance from specifications one week prior to bid opening.
- C. Artificial Grass Base Planarity and Compaction Requirements:
1. Completed Work of this section shall comply with the following:
    - a. Compaction of sub-grade: 92%-95% ASTM 1557-Modified Proctor density.
    - b. Planarity of sub-grade: tolerance of one quarter inch (1/4") in ten feet (10').
    - c. Compaction of crushed aggregate permeable base: Shall be compacted to a minimum of 90%, and no more than 93%, ASTM 1557- Modified Proctor density.

- d. Surface tolerance of crushed aggregate permeable base: not to exceed 1/4 inch over 10 feet and a maximum of 1/2" from design grade.

D. Permeable Base Mock Up:

- 1. Base CONTRACTOR shall import and install a minimum of a 30' x 30' mock up of the athletic field permeable base for installation, OWNER inspection/testing, review and acceptance by OWNERS REPRESENTATIVE.
  - a. Means and methods to install mockup shall be identical to how the field will be installed.
  - b. Mock up material not meeting project specifications or OWNERS REPRESENTATIVES approval shall be removed and disposed of by and at the cost of the CONTRACTOR.

E. Coordination:

- 1. Coordinate locations of connections to storm drainage system. The overall site general CONTRACTOR shall bring the site area solid storm drain line 5' into the perimeter of the field.
- 2. Coordinate work with installation of underground piping beneath Artificial Grass and with installation of field appurtenances such as concrete curbs, netting, and quick couplers in Artificial Grass and other items required by Contract Documents.
- 3. Coordinate lay down area for each field with OWNER representative as lay down space will change throughout project duration. CONTRACTOR to assume lay down space being provided shall be dirt surface.

#### 1.4 FIELD QUALITY CONTROL & ACCEPTANCE OF WORK

- A. Testing Agency: OWNER will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing. Base CONTRACTOR shall provide project schedule and timeline to recognize, allow for, and coordinate with the geotechnical engineer's specified testing operations.
  - 1. Tests shall include compaction and Proof Roll testing of sub-grade, finish grade and Artificial Grass permeable base, measured at a minimum of 8 locations randomly spaced across the surface of each field.
  - 2. The Independent Testing Agency shall also test the crushed aggregate permeable base material upon delivery to the job site to verify that material meets the specified gradation requirements. Testing shall be provided for every 30,000 SF of Artificial Grass surface.
  - 3. The Independent Testing Agency will also test the crushed aggregate permeable base material for permeability once compaction and planarity requirements have been met. Testing shall be provided for every 30,000 SF of permeable base installed.
  - 4. Drainage Infrastructure

- a. Installed drainage properties to comply with the following
    - 1) Testing Methods:
      - a) ASTM F 2898, "Standard Test Method for Permeability of Artificial Grass Sports Field Base Stone and Surface System by Non-confined Area Flood test Method." –Test results shall exceed 8" hr.
      - b) Methods not specifically listed above shall be submitted for approval.
5. Testing agency will test compaction of soils & base materials in place according to ASTM D1557, ASTM D 6938, as applicable.
6. Base CONTRACTOR shall verify proper elevation of nailer board around entire perimeter of field.
- B. OWNER provided independent testing agency results on installed base material verifying compliance for compaction & permeability by OWNERS REPRESENTATIVE shall be supplied to the Artificial Grass CONTRACTOR prior to the commencement of Artificial Grass installation.
  1. The Artificial Grass CONTRACTOR shall not proceed with the installation of the Artificial Grass surfacing system until compaction and permeability results have been accepted by OWNERS REPRESENTATIVE.
- C. Base CONTRACTOR to provide surface planarity verification using a string line method in presence of Artificial Grass installation CONTRACTOR and OWNER.
  1. A mason's line held taught between two workman separated by a distance of approximately 40 feet, shall be placed directly on the finished surface, parallel to the direction of greatest slope. A third workman shall check for separations between the mason's line and the finished surface that are equal to or greater than the tolerances specified.
  2. Final crushed aggregate permeable base elevations shall conform to the lines and grades shown on the drawings. The measured grades shall not deviate more than (1/2") from the planned grades and not vary more than (1/4") feet in 10 feet in any direction. Laser grading of the finish surface is mandatory.
  3. Base CONTRACTOR'S responsibility shall include correction of any defects in Artificial Grass aggregate base and edge anchorage details identified by the OWNER'S Artificial Grass CONTRACTOR.
  4. Roller marks, tire tracks, footprints or other impressions on the finished surface shall be raked out where they are equal to or greater than the tolerances specified. Following long and short axis checking and corrections, the base CONTRACTOR shall notify the OWNER, that the finished surface is ready for inspection.
  5. The base CONTRACTOR shall perform a final string line check along the long axis of the field in the presence of the Artificial Grass Surfacing Installer. Finished surface planarity shall be approved by the OWNER and Artificial Grass installation CONTRACTOR.
    - a. Please be advised that the visual string line examination and acceptance of the base should not be used as a substitute for independent testing and analysis by a qualified professional engineer. As with all bases, there exists the possibility of hidden, latent or other defects that can only be reliably discovered through inspection, survey or testing by qualified experts in the fields of geology and soils engineering.

6. Damage to the finished surface planarity occurring after approval shall be corrected by the base CONTRACTOR using the method described above.
- D. Materials and Work not conforming to specified requirements shall be promptly removed, replaced and reinstalled as part of the work of this section at no cost to the OWNER.

## **1.5 SUBMITTALS**

- A. General: Submit in accordance with General Provisions.
- B. Product Data: Submittals required:
  1. Permeable aggregate base material (25 lb sample) including sieve size analysis, LA Abrasion testing & source. Testing shall be within last 2 months of submittal date.
  2. Subgrade/Trench Separation Barrier
  3. HDPE pipe & fittings
  4. 1" x 12" Panel Drains
  5. Certification that the submitted products are in compliance with the specification.
- C. Site Furnishings
  1. Goal Posts
  2. Goal Post Access frame Boxes
  3. Quick Coupler boxes and Quick couplers
  4. Baseball and Softball Bases and pegs
  5. Horse Mats

## **PART 2 - PRODUCTS**

### **2.1 SUBGRADE/ PERIMETER DRAINAGE TRENCH SEPARATION BARRIER**

- A. The prepared soil subsurface is to be isolated from the installed field and drainage system above it with a geotextile placed across the entire surface of the field. This insures no mixing of the soil sub surface with the aggregate drainage system.
  1. Separation fabric shall be laid and overlapped in accordance with the manufacturer's and project geotechnical engineer's written recommendations.
- B. Subgrade/Trench Separation Barrier:
  1. Geotechnical Engineer of Record shall review and approve separation barrier selection based on actual site conditions to achieve a firm unyielding base.
    - a. For permeable subgrade applications: Subgrade/Trench separation barrier shall be a 4oz. Non-Woven Geotextile – Mirafi 140N or approved equal

<u>Mechanical Properties</u>	<u>Test Method</u>	<u>Unit</u>	<u>Minimum Ave. Roll Value</u>
Grab tensile strength	ASTM D4632	lbs	120(MD), 120(CD)
Grab tensile elongation	ASTM D4632	%	50(MD), 50(CD)
Trapezoid tear strength	ASTM D4533	lbs	50(MD), 50(MD)
Puncture strength	ASTM D4833	lbs	310
Apparent opening size	ASTM D4751	mm	70
Permittivity	ASTM D4491	sec <sup>-1</sup>	1.7

## 2.2 HDPE PERIMETER SUBDRAIN PIPING

- A. All specific pipes are noted on the Contract Drawings
- B. High-density polyethylene perforated corrugated pipe with an integrally formed smooth waterway. Nominal sizes shall have a full circular cross-section, with an outer corrugated pipe wall and an essentially smooth inner wall (waterway)
- C. 4" through 10" solid wall and perforated drainpipe shall be smooth interior wall conforming to AASHTO M252.
- D. 12" through 36" solid wall and perforated drainpipe shall be smooth interior wall conforming to AASHTO M294 Type S.
- E. Fittings and couplers shall be split couplings or snap couplings manufactured by the same manufacturer as the corrugated polyethylene pipe. The fittings shall not reduce or impair the overall integrity or function of the pipeline. Common corrugated fittings include in-line joint fittings, such as couplers and reducers, and branch or complimentary assembly fittings such as "tees", "wyes", and end caps. These fittings may be installed by various methods, such as snap-on, screw-on, bell and spigot, and wrap around. Couplings shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings supplied or recommended by the pipe manufacturer shall be used. Where designated on the plans and as required by the manufacturer, a neoprene or rubber gasket shall be supplied. Installation of the pipe specified above shall be in accordance with ASTM Recommended Practice D2321 as covered elsewhere in these specifications.
  - a. Corrugated Polyethylene Pipe shall be N-12 drainage pipe as manufactured by Advanced Drainage Systems, Inc. or approved equal.

## 2.3 HDPE ATHLETIC FIELD FLAT DRAINS

- A. Flat Panel Drains shall be a 3-dimensional rigid HDPE (1.5" x 12" flat panel pipe), AdvanEdge with no filter fabric.

## 2.4 CRUSHED AGGREGATE PERMEABLE BASE

- A. Material to be open graded, fractured friction course that provides adequate mechanical stability and compaction for athletic field applications.
- B. Material to be clean with minimal fines as described in gradation table below.
- C. Material to be minimum 100% fractured with at least one mechanical fracture per particle greater than 1/4" sieve size. Crushed Rounded River Rock is not acceptable.

1. Soft lime stones and shale materials are not acceptable.
2. Material shall be tested at the CONTRACTOR'S expense using a sulfate soundness test (ASTM C 88) and LA Abrasion Test (ASTM C 131).

Test Method	Criteria
Sulfate Soundness (ASTM C 88)	Not to exceed 12% Loss
LA Abrasion (ASTM C 131)	Not to exceed 40

D. Stone Base Section Athletic Fields 2-Stone Permeable Base System

1. Base Stone: Base stone shall be from crushed mountain quarry. Comply with the below criteria for ASTM #4 Stone, and the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
2" (50mm)	100
1 1/2" (37.5mm)	90-100
1" (19mm)	20-55
3/4" (19mm)	0-15
3/8 (9.5mm)	0-5

2. Topping Stone: Comply with the below criteria and the following gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
1/2"	100
3/8"	80-100
No. 4	55-75
No. 8	30-50
No. 30	5-25
No. 100	2-10
No. 200	0-3

E. Stone Base Section for Bullpens, Family Entertainment areas and slopes greater than 12% shall use the Modified Permeable Base

1. Comply with the below permeable base gradation:

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
1"	100
3/4"	80-100
3/8"	30-50
No. 4	25-40
No. 8	10-30
No. 30	7-25
No. 40	5-17
No. 50	0-7
No. 200	0-3

- F. Aggregate material for bedding and backfill around the Perforated Perimeter Collector pipe system shall be ASTM #57 Crushed Stone and shall meet criteria C above.
- G. Submit Bills of Lading/Material Delivery Receipts for stone base and topping stone. Bills of lading shall bear the name of the project/delivery address, specific field number delivered to, quantity of materials delivered, quarry source/location of origin of stone materials and/or manufacturer, and date of delivery.

## **2.5 INDEPENDENT CRUSHED AGGREGATE PERMEABLE BASE TESTING**

- A. CONTRACTOR to coordinate schedule as required for OWNERS independent lab to continually monitor and test the crushed aggregate base as follows:
  - 1. Sampling and testing of crushed aggregate permeable base both at the batch plant and on-site will be performed to confirm that the proposed material is in conformance with the project specifications prior to and following deliver of material to the site. Base CONTRACTOR'S representative shall be in attendance at batch plant and at project site at time of material acquisition by the OWNER-provided independent testing agency.
  - 2. Batch plant sampling and testing shall consist of a minimum of two (2) gradation samples per stone type and two (2) permeability samples for the project for initial approval. Base CONTRACTOR shall continuously monitor the requirements in sections 1.4 and 2.4 above throughout placement of the crushed aggregate permeable base material.
  - 3. On-site testing of the installed crushed aggregate permeable base shall be in accordance with section 1.4 above.
  - 4. The OWNERS Testing Agent may choose to periodically inspect and/or obtain samples of aggregate materials at the source and/or as they are delivered or installed on site. Any rock aggregate material that does not conform to the approved submittal samples will be rejected immediately or tested by the base CONTRACTOR Testing Agent to verify compliance with the specifications. Such tests shall imply no warranty of the CONTRACTOR'S work or compliance with the specifications.
    - 1. Costs for initial aggregate material testing by the OWNER'S Testing Agent are the responsibility of the OWNER. Costs for any rock material testing by the OWNER'S Testing Agent on aggregate materials that are a replacement for aggregate materials that were rejected by the OWNER'S Testing Agent due to nonconformance with the specifications, CONTRACTOR'S submittals or quality control test results, will be borne by the CONTRACTOR and may be invoiced to the CONTRACTOR by the OWNER or deducted from the next Progress Payment.

## **2.6 ARTIFICIAL GRASS FABRIC ATTACHMENT NAILER**

- A. Artificial Grass nailer board.
  - a. Composite TREX polymer landscape board, 2 x 4 nominal thickness, or equal
  - b. Attachment anchors shall be Simpson or equal, ss, zinc or galvanized coated wedge anchors 30" O.C. Maximum spacing installed per manufacturer recommendations. First anchor attachment shall be maximum 8" off edge of board.
  - c. Nailer board butt joint shall be spaced 1/2" apart for expansion.



## 2.7 IN GROUND SITE FURNISHINGS

- A. Furnish all labor, equipment and materials, necessary to furnish and install the athletic equipment, as indicated on the drawings and as specified herein. Athletic equipment shall include, but are not limited to:

1. Baseball/Softball Field Bases

- a. Provide and install home plate and bases, including stanchions, ground anchor mounts and base plus at each baseball field.

108- Sportsfield Specialties SHIBL Hollywood impact bases with 6" stanchion

- 1) Provide six (6) sets of bases for a total of 18 total bases per multi-use field, in ground stanchions, ground anchors and base plugs per field for the 6 Multi use Baseball/Softball fields.

- b. 12- Sportsfield Specialties SHIBD Hollywood Double impact bases with 6" stanchion  
c. 24-24 Sportsfield Specialties 8" double ground Anchors

- 1) Provide two (2) sets of bases for a total of 6 total bases, in ground stanchions, ground anchors and base plugs for each of the 2 championship baseball field location.

- d. 12- Sportsfield Specialties 12-Jack Corbett Hollywood bases (2 sets per field) with 6" stanchion and ground Anchor.

- 1) Provide two (2) sets of bases for a total of 6 total bases, in ground stanchions, ground anchors and base plugs for each of the 2 championship baseball field locations.

- e. 96- Sportsfield Specialties SHBBP-44, 8" Ground Anchor Mounts and Hex Base Plugs

- f. 60 total bases or 20 sets Champro Spyder Bases (3 in each set)

- g. 12-Champro Spyder Base orange

2. Baseball/Softball Home Plate areas

- a. 48- Sportsfield Specialties Shutt SHSRHP Hollywood style in ground Home plate

- 1) Provide three (3) in ground home plates for each multi-use Baseball/Softball field.

- 2) Provide one (1) in ground home plate for each Champsioship Baseball field.

- 3) Provide one (1) in ground permanent home plate for each bullpen. Twenty eight (28) total bullpen home plates. Each bullpen mound location to be inlaid in turf for use with a portable mound. Portable Mounds to be provided by City/OWNER.

- 4) Provide and install 7'x4' Baseball/Softball Catchers and Batters box installation with concrete, Horse mats, headers per detail.

3. Football Fields
  - a. 8-Sportsfield Specialties GP820HS Goal posts with Adjustright Technology
    - 1) Stamped Structural footing design from California Licensed structural engineer for goal post is the responsibility of the Artificial Grass CONTRACTOR and goal post manufacturer to provide to OWNERS REPRESENTATIVE prior to installation.
  - b. 8- GPAFIT Sportsfield Specialties Access Frame with Infill Retainer System for Artificial Grass applications.
4. Irrigation Artificial Grass Quick Connect Boxes
  - a. Sportsfield Specialties TCITQCV Artificial Grass Quick Connect Boxes
    - 1) 40 total quick couplers as shown for baseball/ softball fields .
    - 2) CONTRACTOR shall supply and install 1" QC valve with yellow cover, harco ductile iron swing joints and fitting required to install QC assembly per plans to OWNER stubbed mainline.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATORY WORK**

- A. Examination of Site:
  1. Examine site for conditions that will adversely affect execution, permanence, and quality of work.
  2. Verify that underground utility & irrigation piping below sub-grade of Artificial Grass base has been completed and the work of this section can properly proceed.

#### **3.2 EXCAVATION & SUB-GRADE PREPARATION**

- A. Subgrade will be turned over to base/Artificial Grass CONTRACTOR by OWNERS rough earthwork CONTRACTOR to within +/- 1/2" of subgrade design elevations per plans at 90% minimum compaction as verified through a subgrade 25' O.C. conformance survey and geotechnical engineer's compaction testing reports. Its is the intent of the OWNERS rough grading CONTRACTOR to turn over each field individually being capable of being balanced during base CONTRACTORS finish grading operations without any additional import requirements.
- B. Rough grade CONTRACTOR is responsible for hiring a surveyor to verify proper elevation of the subgrade on 25' centers, and submit to the City/Engineer for approval.
- C. Due to the site being an active construction site with construction traffic continuing to use the rough graded Artificial Grass subgrade and disturbing subgrade elevations/ planarity. The base/Artificial Grass base CONTRACTOR shall prepare finished subgrade by scarifying soils to a minimum depth of 12", moisture conditioning soil to a specified variance from optimum moisture content, laser grading the subgrade per slopes and grades identified on the plans and compacting to the specified density.
- D. Spread, disc, farm, or otherwise dry wet soils as required to achieve a uniform moisture content throughout the soils. Moisten soils when too dry to achieve the required moisture content.
- E. Point of connection and cost for onsite water will be provided by OWNERS overall site general CONTRACTOR for base/Artificial Grass CONTRACTOR to use for moisture conditions, dust control etc.

- F. Finished Sub-grade for the Artificial Grass permeable base material shall be sloped as shown on the drawings. The rough grade CONTRACTOR shall hire a surveyor to verify proper elevation of the subgrade on 25' centers, and submit to the City/Engineer for approval.
- G. Trench sub-grade locally as required to achieve design slopes on sub-drain collector pipes.
- H. Compaction:
  - 1. After sub-grade has been properly graded, contoured and sloped as required, compact soil materials as outlined in section Part 1-1.3 above.
- I. Tolerances:
  - 1. Compacted sub-grade shall conform to shall conform to section 1.3 above.

### **3.3 SUBGRADE/TRENCH SEPARATION BARRIER**

- A. The prepared soil subsurface is to be isolated from the installed field and drainage system above it with the specified separation barrier placed across the entire surface of the field.
- B. The subgrade surface shall be free from large stones; 3" or larger, and sharp objects that may puncture or tear the separation barrier.
- C. The separation barrier shall be placed and overlapped in accordance with the Manufacturer's written recommendations. Separation fabric rolls shall be placed along long axis of site parallel with field edge bands and shingled accordingly starting on low side of field.
- D. Separation fabric shall overlap 2'-0" minimum on side and ends of rolls. Separation fabric overlaps are to be in the direction the fill placement will be spread to avoid peeling of Separation fabric at overlaps by advancing the fill.
- E. The Subgrade/Trench separation barrier shall be continuous through the drainage trenches to insure separation of surrounding soil and drainage stone. Trench fabric to have a minimum flap out of the trench onto the subgrade of 2'-0" .

### **3.4 PERFORATED HDPE DRAINAGE PIPE**

- A. Examine the areas and conditions under which the subsurface drainage system work is to be installed. Correct any and all conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been corrected.
- B. EXCAVATION FOR PIPE
  - 1. Excavation shall consist of the removal of all material of every description to the depths and grades designated on the plans and specified herein.

2. If the material at or below the designated grade for which the pipe is to be laid is unsuitable for pipe foundation, then the material shall be removed to such depths and widths as required and replaced with approved foundation material as directed by the geotechnical engineer.
3. Excavation for installation of pipes shall be in trenches to the lines, grades and widths as per the Contract Drawings and in accordance with Safety and Health Regulations (OSHA). In all cases trenches shall be excavated in a manner to ensure the proper and timely completion of the work.
4. Spoils generated from excavation of drainage trenches shall be off-hauled at the cost of the base CONTRACTOR.

#### C. INSTALLATION

1. Once said trench has been excavated to the proper lines, grades and widths, the geotextile fabric shall be installed as per Manufacturer's Specification.
2. Perforated HDPE drainage pipe shall be installed according to recommended installation practices by the pipe manufacturer. Drain lines shall be installed to comply with drain line elevations noted on project plans.
3. Pipe laying work shall commence at the main collector line and shall proceed upgrade. Pipe shall be laid true to line and grade in such a manner as to assure a close concentric joint with the adjoining pipe.
4. Trenches shall be kept free of water and debris. Pipe shall not be laid when the condition of the trench or weather is unsuitable for such work.
  - a. If weather is pending subdrain drain rock shall be burrito wrapped with geotextile flap to keep silt and soil from infiltrating into subdrain trenches.
5. Install Panel Drains as shown on Drawings and anchor with 60d zinc coated nails
6. At the completion of each drainage line installation, place a cap or plug in the up- stream end as to prevent unwanted material and debris from entering the pipe.

#### D. INSPECTION

1. After installation of pipe, inspect to determine whether line displacement or other damage has occurred.
2. Make inspections after lines have been installed prior to backfilling, during the backfilling process, and again at the completion of backfilling. Backfill material shall conform to the material as specified.
3. If inspection indicated poor alignment, debris, displaced pipe, infiltration or other defects, take whatever steps are necessary to correct such defects at no additional cost the OWNER.

**3.5 PERIMETER CURBING AND TURF FABRIC ANCHORAGE NAILER**

- A. A continuous perimeter concrete curb required around the entire perimeter of all Artificial Grass areas will be provided by OWNERS CONTRACTOR for attachment of composite Nailer boards.
- B. Top of 2x4 nailer boards shall be installed per plan details and recessed per the following table and as indicated on design plans:

Pile Height	Nailer Depth
2.5" pile height	1.75"
2.25" pile height	1.5"
1.6" Pile Height	1"

**3.6 INSTALLATION OF PERIMETER HDPE DRAINAGE PIPE AND CRUSHED AGGREGATE PERMEABLE BASE**

- A. Place permeable base materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Minimum nominal compacted thickness of base layer - 4 inches. Minimum nominal compacted to the topping stone layer – 2 inches.
- C. Place materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- D. Compact permeable base materials to the following percentages of maximum dry unit weight according to ASTM D 1557:
  - 1. Crushed aggregate permeable base material shall be placed with adequate moisture content to prevent segregation of the particles during grading. Excess water shall not be applied during installation of rock base and rough grading due to the potential of softening the subgrade and altering the grading.
  - 2. CONTRACTOR to refer to compaction requirements as outlined in Part 1-1.3 above.
  - 3. Care shall be taken during placement and compaction of the crushed aggregate permeable base material in order to insure that the separation barrier is not torn punctured.
  - 4. The crushed stone must be laid without damaging the soil subgrade (and the in-field drainage system as applicable). The specified stone or aggregate supplied must conform to the recommended specifications. The finished crushed stone or aggregate base supplied must be stable, unyielding, and permeable.
  - 5. The crushed stone shall be carefully and evenly spread over the subgrade and up both sides of the subdrain trenches to the depth shown on the plans.
  - 6. Crushed stone shall be smoothed and compacted uniformly to design grades by alternating raking, water settling, and rolling operations. CONTRACTOR shall be advised not to overwork the stone material, thus modifying its gradation characteristics. Minimal rolling is advisable to achieve design grades and compaction. Only static (absolutely no vibratory rolling of the permeable stone is allowed) rolling is allowed on the permeable stone base.)
- E. The finished elevations of the crushed aggregate permeable base shall meet all requirements as outlined in Part 1-1.3 and 1.4 above.

**3.7 FIELD BOXES**

- A. Install field boxes as required for all field appurtenances such as irrigation, quick coupler valves, etc. as specified elsewhere and as detailed.
- B. Backfill around field boxes with crushed aggregate permeable base material in lifts not to exceed 6 inches in loose depth and compact backfill using methods approved by the Geotechnical Engineer.

1. Required compaction percentages around field boxes shall match requirements as outlines in Part 1- 1.3 above.

### **3.8 FIELD QUALITY CONTROL**

- A. Proceed with subsequent work only once test results for previously completed work complies with requirements of section 1.3 and 1.4 above.
- B. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace materials to depth required; re-compact and retest until specified compaction is obtained.
- C. Areas that exhibit segregation of the crushed aggregate permeable base material shall be removed and replaced with properly moisture conditioned crushed aggregate permeable base material, compacted, and graded to the tolerances noted in this specification.

### **3.9 PROTECTION**

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep area free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, contaminated, or where they lose compaction due to subsequent construction operations or weather conditions.

### **3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Disposal: Remove surplus waste material, and soil generated from construction activities, including storm drain spoils, football goal post footing spoils, unsatisfactory soil, trash, and debris, and legally dispose of it off OWNER'S property.

**END OF SECTION**

## **SECTION 32 12 16**

### **ASPHALT PAVING**

#### **PART 1 - GENERAL**

This Part and all Subparts shall conform to the following related documents:

##### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. The "GreenBook": Standard Specifications for Public Works Construction (Latest Edition).
  - 2. State of California, Department of Transportation, (CALTRANS):
    - a. Highway Design Manual (Latest edition).
    - b. Manual of Traffic Controls for Construction and Maintenance Work Zones (Latest Edition).
  - 3. American Society for Testing and Materials (ASTM)
  - 4. American Association of State Highway and Transportation Officials (AASHTO)
  - 5. Asphalt Institute Manual (AIM):
    - a. Construction Specifications for Asphalt Concrete and Other Plant Mix Types.
    - b. MS-10 – Soils Manual for Design of Asphalt Pavement Structures.
  - 6. FS - Federal Specifications
- C. Standard Drawings shall apply to the work to the extent referenced on the plans:
  - 1. Standard Plans for Public Works Construction (Latest Edition).

##### **1.2 SUMMARY**

- A. This Section includes hot-mix asphalt concrete paving.

##### **1.3 SUBMITTALS**

##### **1.4 QUALITY ASSURANCE**

##### **1.5 PROJECT CONDITIONS (WORK SITE MAINTENANCE)**

**PART 2 – PRODUCTS**

Products in this Part and all Subparts shall conform to the documents referenced in Part 1 – General. Products include, but are not limited to the following:

**2.1 AGGREGATES****2.2 ASPHALT MATERIALS****A. Asphalt Concrete****General**

"Asphalt Concrete for base course of roadway and parking structural section shall be B3 PG-64-10 and for surface course of roadway and parking structural section shall be C2- PG 64-10. Both shall comply with Section 203-6, Asphalt Concrete," or Section 400-4, "Asphalt Concrete," of the Standard Specifications.

**2.3 AUXILIARY MATERIALS****A. Herbicide****B. Sand****2.4 MIXES****2.5 BASE MATERIALS****PART 3 – EXECUTION**

Execution of all related work in this Section shall conform to the documents referenced in Part 1 - General. Execution includes, but is not limited to the following:

**3.1 EXAMINATION****3.2 COLD MILLING****3.3 PATCHING AND REPAIRS****3.4 SURFACE PREPARATION****3.5 HOT-MIX ASPHALT PLACING****3.6 JOINTS****3.7 COMPACTION****3.8 INSTALLATION TOLERANCES****3.9 FIELD QUALITY CONTROL**



**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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## SECTION 32 12 93.10

FAMILY ACTIVITY CENTER – BULLPENS & TRANSITIONAL SLOPED AREAS  
ARTIFICIAL GRASS  
SLIT-FILM AND THATCH**PART 1 - GENERAL****1.1 SUMMARY**

- A. Furnish all labor, materials, tools and equipment necessary to install slit-film/thatch artificial grass as indicated on the plans and as specified herein; including components and accessories required for a complete installation including but not limited to
  - 1. Acceptance of prepared sub-base.
  - 2. Coordination with related trades to ensure a complete, integrated, and timely installation: Aggregate base course, sub-base material (tested for permeability), grading and compacting, piping and drain components (when required); as provided under its respective trade section.

**1.2 RELATED SECTIONS**

- A. Section 00 0000 - Site Preparation
- B. Section 31 23 00 – Excavation and Fill
- C. Section 31 23 16 – Excavation
- D. Section Series 31 23 23 - Fill
- E. Section 31 23 23.13 - Backfill
- F. Section Series 32 13 23 - Aggregate Base Courses
- G. Section 12 93 00 - Site Furnishings

**1.3 SUBMITTALS**

- A. Substitutions: Other products are acceptable if in compliance with all requirements of these specifications. Submit alternate products to ARCHITECT for approval prior to bidding in accordance Section 01 25 13, Product Substitution Procedures.
  - 1. Provide substantiation that proposed system does not violate any other manufacturer's patents, patents allowed or patents pending.
  - 2. Provide a sample copy of insured, non-prorated warranty and insurance policy information.
- B. Comply with Section 01 33 00, Submittals Procedures. Submit for approval prior to

fabrication.

- C. Samples: Submit a synthetic turf sample, 12 x 12 inches, representing the turf carpet portion of the product proposed for this project.
- D. Product Certification:
  - 1. Submit manufacturer's certification that products and materials comply with requirements of the specifications.
  - 2. Submit test results indicating compliance with Reference Standards.
- E. Project Record Documents: Record actual locations of seams, drains and other pertinent information in accordance with Specifications, General Requirements.
- F. List of existing installations: Submit list including respective OWNER'S REPRESENTATIVE and telephone number.
- G. Warranties: Submit warranty and ensure that forms have been completed in OWNER'S name and registered with approved manufacturer.
- H. Submit Bills of Lading/Material Delivery Receipts for synthetic turf infill materials. Bills of lading shall bear the name of the project/delivery address, quantity of materials delivered, source/location of origin of infill materials and/or manufacturer, and date of delivery.
- I. Testing Certification: Submit certified copies of independent (third-party) laboratory reports on ASTM testing:
  - 1. Pile Height, Face Weight & Total Fabric Weight, ASTM D5848.
  - 2. Primary & Secondary Backing Weights, ASTM D5848.
  - 3. Tuft Bind, ASTM D1335.
  - 4. Grab Tear Strength, ASTM D1682 or D5034.
  - 5. Water Permeability, ASTM D4491

#### **1.4 WARRANTY AND GUARANTEE**

- A. See Section 01780 - Closeout Submittals, For Additional Warranty Requirements.
- B. The CONTRACTOR shall provide a warranty to the OWNER that covers defects in materials and workmanship of the turf for a period of two (2) years from the date of substantial completion. The turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's requirements. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, and acts of God beyond the control of the OWNER or the manufacturer. The warranty shall be fully third-party insured; pre-paid for the entire 2-year term and be non-prorated. The CONTRACTOR shall provide a warranty to the OWNER that covers defects in the installation workmanship, and further warrant that the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's representative. Prior to final payment for the synthetic turf, the CONTRACTOR shall submit to OWNER

notification in writing that the field is officially added to the annual policy coverage, guaranteeing the warranty to the OWNER. The insurance policy must be underwritten by an “AM Best” A rated carrier and must reflect the following values:

- Pre-Paid 2-year insured warranty from a single source.
- Maximum per claim coverage amount of \$28,000,000.
- Minimum of thirty-three million dollars (\$28,000,000) annual.
- Must cover full 100% replacement value of total square footage installed, minimum of \$7.00 per sq ft. (in case of complete product failure, which will include removal and disposal of the existing surface)
- Provide a sample copy of insured, non-prorated warranty and insurance policy information.
- Policy cannot include any form of deductible to be paid by the OWNER.

## PART 2 - PRODUCTS

### 2.1 MATERIALS AND PRODUCTS

- A. Artificial grass system materials shall consist of the following:
1. Carpet made of slit-film and thatch fiber tufted into a perforated backing.
  2. Infill: Controlled mixture of sand partially covers the carpet.
  3. Glue, thread, paint, seaming fabric and other materials used to install and mark the artificial grass monofilament/slit-film.
- B. The installed artificial grass monofilament/slit-film shall have the following properties:

<u>Standard</u>	<u>Property</u>	<u>Specification</u>
ASTM D1577	Fiber Deniers	10,800/5000
ASTM D5823	Pile Height	1.6”
ASTM D5793	Stitch Gauge	3/8”
ASTM D5848	Pile Weight	50oz/square yard
ASTM D5848	Primary Backing	8+oz/square yard
ASTM D5848	Secondary Backing	20+oz/square yard
ASTM D5848	Total Weight	78oz/square yard
ASTM D1335	Tuft Bind (Without Infill)	8+ lbs
ASTM D5034	Grab Tear (Width)	200 lbs/force
ASTM D5034	Grab Tear (Length)	200 lbs/force
ASTM D4491	Carpet Permeability	>40 inches/hour
	Sand Infill Component	6lbs/square foot

*Variation of +/- 5% on above listed properties is within normal manufacturing tolerances*

- C. Carpet shall consist of monofilament fibers and slit-film tufted into a primary backing with a secondary backing.
- D. Carpet Rolls shall be 15' wide rolls.
  - 1. Rolls shall be long enough to go from field sideline to sideline.
  - 2. Where the playing field is for football, the perimeter white line shall be tufted into the individual sideline rolls.
- E. Backing:
  - 1. Primary backing shall be a multi-layered fabric
  - 2. Secondary backing shall consist of an application of porous, heat-activated urethane to permanently lock the fiber tufts in place.
  - 3. Perforated (with punched holes), backed carpet are acceptable.
- F. The sand infill will comply within the following characteristics:
  - Average Particle size between 20 and 30 mesh [calculated based on summing the midpoint of sieve pan fractions times the % retained on given screen fractions]
  - Average Particle shape > 0.4 on the Krumbein scale
  - Particle structure predominantly single grain
  - Produce < 0.4%, -50M in API crush test at 80psig
- G. Non-tufted or inlaid lines and markings shall be painted with paint approved by the synthetic turf manufacturer.
- H. Glue and seaming fabric for inlaying lines and markings shall be as recommended by the synthetic turf manufacturer.

## **2.2 EXAMINATION**

- A. Verify that all sub-base leveling is complete prior to installation.
- B. Installer shall examine the surface to receive the synthetic turf and accept the sub-base planarity in writing prior to the beginning of installation.
  - 1. Acceptance is dependent upon the OWNER'S test results indicating compaction and planarity are in compliance with manufacturer's specifications.
  - 2. The surface shall be accepted by Installer as "clean" as installation commences and shall be maintained in that condition throughout the process.
- C. Compaction of the aggregate base shall be 95%, in accordance with ASTM D1557 (Modified Proctor procedure); and the surface tolerance shall not exceed 0-1/4 inch over 10

feet and 0-1/2" from design grade.

- D. Correct conditions detrimental to timely and proper completion of Work.
- E. Do not proceed until unsatisfactory conditions are corrected.
- F. Beginning of installation means acceptance of existing conditions.

## **2.3 PREPARATION**

- A. Prior to the beginning of installation, inspect the sub-base for tolerance to grade.
- B. Sub-base acceptance shall be subject to receipt of test results (by others) for compaction and planarity that sub-base is in compliance with manufacturer's specifications and recommendations.
- C. Dimensions of the field and locations for markings shall be measured by a registered surveyor to verify conformity to the specifications and applicable standards. A record of the finished field as-built measurements shall be made.
- D. When requested by ARCHITECT, installed sub-base shall be tested for porosity prior to the installation of the monofilament/slit-film turf. A subbase that drains poorly is an unacceptable substrate

## **2.4 ADJUSTMENT AND CLEANING**

- A. Do not permit traffic over unprotected surface.
- B. CONTRACTOR shall provide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.
- C. All usable remnants of new material shall become the property of the OWNER.
- D. The CONTRACTOR shall keep the area clean throughout the project and clear of debris.
- E. Surfaces, recesses, enclosures, and related spaces shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the OWNER.

## **2.5 PROTECTION**

- A. Protect installation throughout construction process until date of final completion.

## ONTARIO SPORTS EMPIRE

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**SECTION 32 13 13**  
**CONCRETE PAVING**

**PART 1 - GENERAL**

**1.1 GENERAL CONDITIONS**

- A. Requirements of "General Conditions of the Contract" and Division 1, "General Requirements," apply to work in this section with the same force and effect as though repeated in full herein.

**1.2 SCOPE OF WORK**

- A. Furnish materials. Labor, transportation, services, and equipment necessary to install site concrete paving as indicated on drawings and as specified herein. For concrete related to the tower, band shell and entry portals, refer to sheets SN-1 and SN-2.
- B. Work included in this section:
1. Formwork.
  2. Reinforcing steel and dowels.
  3. Concrete placement.
- C. Work related in other Sections:
1. Division 31 22 00 – Grading
  2. Division 31 23 00 – Excavation and Fill
  3. Division 32 – Irrigation System: Coordination of irrigation mainline PVC sleeving and lateral pipe.

**1.3 REFERENCES**

- A. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- B. ACI 301 – Specification for Structural Concrete for Buildings.
- C. ACI 304R – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.
- D. ACI 305R – Hot Weather Concreting.
- E. ACI 306R – Cold Weather Concreting.
- F. ACI 308 – Standard Practice for Curing Concrete.
- G. ACI 309R – Guide for Consolidation of Concrete.
- H. ACI 318 – Building Code Requirements for Reinforced Concrete.
- I. ACI 347 – Recommended Practice for Concrete Formwork
- J. ASTM A 615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.
- K. ADAAG – Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities

- L. ASTM C 31 – Standard Specification for Making and Curing Concrete Test Specimens in the Field.
- M. ASTM C 33 – Standard Specification for Concrete Aggregates.
- N. ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- O. ASTM C 42 – Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- P. ASTM C 94 - Standard Specification for Ready Mix Concrete.
- Q. ASTM C 150 – Standard Specification for Portland Cement.
- R. ASTM C 143 – Test Method for Slump of Hydraulic Cement Concrete.
- S. ASTM C 172 – Standard Practice for Sampling Freshly Mixed Concrete.
- T. ASTM C 231 – Test Method for Sampling Air Content of Freshly Mixed Concrete by Pressure Method.
- U. ASTM C 260 – Specification for Air-Entraining Admixtures for Concrete.
- V. ASTM C 309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- W. ASTM C 494 Standard Specification for Chemical Admixtures for Concrete.
- X. ASTM C 979 – Pigments for Integrally Colored Concrete.
- Y. ASTM D 994 – Specification for Preformed Expansion Joint Filler for Concrete.
- Z. ASTM C 1064 – Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.
- AA. ASTM D 1751 – Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- BB. L.M. Scofield Tech-Data Bulletin D-203 – Application of Surface Retarder (for Retardant finished concrete).
- CC. CCR – California Code of Regulations, Title 24, Part 2, California State Accessibility Standards.
- DD. Southern California Chapter, American Public Works Association – Standard Specifications for Public Works Construction.
- EE. “Standard Specifications of the State of California” Business and Transportation Agency, Department of Transportation, latest edition.
- FF. CRSI – Manual of Standard Practice
- GG. SP-66 – ACI Detailing Manual

## 1.4 SUBMITTALS

- A. In Accordance with Section 01 33 00: Procedures for submittals.
- B. Submit proposed mix design to testing laboratory for review prior to commencement of work.
- C. Paving Mix Designs: Provide documentation for each paving type specified on drawings.
  - 1. Laboratory and Cement Test Reports: Submit six (6) copies of laboratory test reports for concrete materials and a certificate with each concrete mixer truck, stating mix design, PSI rating, slump, water and cement quantity, cement/water ratio, fine aggregate, and color additives.
  - 2. Cement:
    - a. Manufacturer and plant location.
    - b. Cement type; Type II/V per Geotechnical Report – See Appendix
  - 3. Admixtures:
    - a. Manufacturer and plant location.
  - 4. Sand:
    - a. Source and type.
  - 5. Aggregates:
    - a. Source and type.
  - 6. Signed certification from a licensed structural engineer.
- D. Submit manufacturer's instructions under provisions of Section 01 33 00.
- E. Submit concrete delivery tickets with the following:
  - 1. Batch number
  - 2. Mix by class or sack content with maximum size aggregate
  - 3. Admixture
  - 4. Air content
  - 5. Slump
  - 6. Time of loading
  - 7. Total Weight / Cubic Yard / Certification by weigh master
  - 8. Submit concrete test reports.
- F. Submit specification data "Cut Sheets" for integral color, color hardener, retarder, release agent, plastic dowel sleeves, chemical stain, curing agents, clear sealers, patching compounds, joint filler, admixtures, and accessory items.

- G. Submit material certificates for aggregates, reinforcing, and joint fillers.

## 1.5 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301.
- B. Obtain materials from same source throughout.
- C. All material shall comply with the latest editions of the American Concrete Institute (ACI) and Uniform Building Code. Testing of Portland cement concrete shall apply to all site concrete (building, footings, flatwork, etc.) at the discretion of the City inspector.
- D. Mock-Ups:
  - 1. CONTRACTOR Mock-Ups: For each paving finish indicated on Drawings for review and approval by Engineer prior to production. Mock-up shall be provided in area designated by the City. Mock-up shall not be part of the production work. Sample shall be available for review thirty-six (36) hours prior to scheduled production pours and shall indicate specified color, finish, saw cuts and/or tooled control joints and expansion joints with sealant. Mock-up Panels: Prepare one mock-up panel at the project site to demonstrate proficiency of the CONTRACTOR as well as determine the best procedures and degree of aggregate exposure. Mock-up panels shall be a minimum of 12' x 12' or as noted on the construction details. CONTRACTOR shall use the methods and materials proposed for use on the final installation. Uniformity in appearance of each panel shall be the responsibility of the CONTRACTOR. The approved mock-up panel shall serve as a standard of appearance for the final work to be produced.
  - 2. CONTRACTOR Damage/Repair Mock-Ups: Provide a 2 x 2-foot "damage / repair" sample directly adjacent to each required mock-up for each paving type specified on project. Purpose of "damage / repair" sample are to clearly indicate CONTRACTOR'S ability to repair damaged concrete to match existing, should damage occur during course of construction.
- E. Concrete Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- F. Concrete Installer: Provide evidence to indicate successful experience in providing patterned concrete work similar to that specified herein and can demonstrate successful experience through past project documentation and references.
  - 1. Experience: Minimum 5 years experience in the installation of concrete paving.
  - 2. Demonstration of Experience: Minimum 5 projects which have been completed within the past 36 months utilizing similar products, scope, and complexity. Names and phone numbers of clients shall be submitted.
  - 3. Supervision: Perform placement and finishing of concrete work under supervision of a person having a minimum of 5 years of experience in placement and finishing of products specified herein.
  - 4. Submit qualifications to OWNER'S REPRESENTATIVE for information purposes. Submit a resume of Project Manager and Superintendent who will be overseeing the work.

Submit references to include company name, company personnel, telephone number and email addresses.

5. Previous projects shall be located in San Diego, Los Angeles, Orange, Riverside, or San Bernardino Counties. A listing of projects and addresses shall be provided and shall be reviewed and approved by the City prior to any concrete placement and finishing.

- G. Slip Resistance: Provide a finish surface slip resistance coefficient of friction equal or greater than 0.6 for flat surfaces and 0.8 for ramps, when tested in accordance with ASTM F 489.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Store Materials in dry and protected locations protect from damage.
- B. Do not change brand of cement nor source of aggregate during course of work.

## **1.7 SITE CONDITIONS**

- A. Do not replace concrete when subbase surface temperature is less than 40 degrees F, nor when surface is wet.

## **1.8 COORDINATION**

- A. Ensure that irrigation sleeves, electrical conduit, and other utility elements are accommodated and as built located prior to pouring concrete.

## **1.9 INSPECTION OF SITE**

- A. Verify conditions at site that affect Work of this Section, and take field measurements as required. Report major discrepancies between Drawings and field dimensions to OWNER'S REPRESENTATIVE prior to commencing work.

# **PART 2 - PRODUCTS**

## **2.1 BASE MATERIALS**

- A. Aggregate Base: Crushed rock conforming to Section 200- 2.2 of the Standard specifications for Public Works Construction.

## **2.2 FORMS**

- A. Form work to be new, #2 grade Douglas Fir, free of knots, checks, bows, and cracks. Unless otherwise indicated, construct formwork to provide continuous, straight, smooth exposed surfaces.
  1. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bowing or deflection.
  2. Provide forms that comply with US Product Standard PS 1 when applicable
    - a. B-B High Density Overlaid Concrete Form, Class I
    - b. B-B (Concrete Form) Plywood Class I, Exterior Grade or better, edge sealed, with each piece bearing legible inspection trademark.

3. Form Coatings: Provide commercially formulated form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
4. Form Ties: where applicable Provide factory-fabricated, adjustable length, removable or snap off metal form ties, designed to prevent deflection and to prevent spalling concrete surfaces upon removal.
5. All curve to curve tangent lines shall be neat, trim, smooth and uniform. The entirety of the forms shall be installed to maintain a consistent curvature, avoiding any abrupt changes or irregularities at the joints.

B. Conform to ACI 301

C. **Utility Infill Cover** --These are required for “any/all” utility boxes, pull boxes, floor boxes, stage boxes, etc. that are in “paved” public/visible areas that the public is going to see/walk over.

- 1) Designed to support heavy emergency vehicle traffic (Firetruck access).
- 2) Stainless Steel, without visible corner supports, and minimum sized lifting lugs.
- 3) Size as required to facilitate the function of the utility box below (Lid removal, access, maintenance, etc.)
- 4) Installed with “lid in place” so concrete paving/pavers match the surrounding paving.
- 5) Positioned/oriented to align with direction of paving, consistent alignment, align with score joints, etc.
- 6) Submit shop drawings for review/approval prior to placing order.
- 7) Installed per manufacturers recommendations.
- 8) Available from: WunderCovers - 3432 Denmark Ave, STE 214 Eagan, MN 55123  
508) 829-2112 [sales@wundercovers.com](mailto:sales@wundercovers.com)

## 2.3 READY MIXED CONCRETE

- A. Batched, mixed, and transported in accordance with ASTM C94 – “Specifications for Ready Mixed Concrete.”

## 2.4 PORTLAND CEMENT

- A. Cement: ASTM C150 Types I, II and III, “Low Alkali” cement, Portland type, gray color, unless otherwise indicated on plans and details, from single source throughout the project.
- B. Use same brand of cement from single source throughout entire project for each paving type.
- C. Refer to Statement of Mix Design for cement type used.

## 2.5 FINE AGGREGATE

- A. Clean, hard, and durable washed concrete sand, gap-graded, conforming to ASTM C33, non-reactive, dependent on the type, color and etch of exposure desired.
- B. Use same fine aggregate from single source throughout entire project.
- C. Refer to Statement of Mix Design for fine aggregate type used.

## **2.6 COARSE AGGREGATE**

- A. Clean, hard, and durable coarse aggregate, gap-graded, conforming to ASTM C33, non-reactive.
- B. Use same coarse aggregate from single source throughout entire project.
- C. Refer to Statement of Mix Design for coarse aggregate type.

## **2.7 WATER**

- A. Potable, clean, fresh, free from deleterious materials such as oils, acids, and organic matter.

## **2.8 REINFORCING**

- A. Reinforcing Steel: Configuring to ASTM A615, clean and free of rust, dirt, grease, or oils.  
  
#3 reinforcing steel shall be 40 grade  
#4 reinforcing steel shall be 40 grade  
#5 reinforcing steel shall be 60 grade
- B. Tie Wire: 16-gauge plain cold-drawn steel conforming to ASTM A82, lean, and free of rust, dirt, grease, or oils.
- C. Dowels: ASTM A615; 40 ksi yield grade, plain steel, uncoated finish.
- D. Supports for Reinforcement:
  - 1. Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars in place.

## **2.9 CONCRETE MATERIALS**

- A. Portland Cement: ASTM C 150 – Type II/V per Geotechnical Report.
- B. Fly Ash: ASTM C 618 – Type F. The combined weight of fly ash conforming to ASTM C 618 shall not exceed 25% of the total weight of cementitious materials.
- C. Concrete Aggregate: ASTM C 33 – Class 4, non-reactive and as follows. Provide aggregates from single source.
  - 1. Maximum aggregate size:  $\frac{3}{4}$  “.
- D. Water: Clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or reinforcement.

## **2.10 ADMIXTURES**

- A. All admixtures shall be specified in the mix design.
- B. Chloride-containing Admixtures are not permitted
- C. Water-Reducing Admixture: ASTM 494, Type A.
- D. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.
- E. Water-Reducing and Retarding Admixture: ASTM C 494, Type D or E.
- F. Air-Entraining Admixtures: ASTM C 260

#### **2.11 CONCRETE SURFACE RETARDERS/FINISHING AIDS**

- A. Spray Applied, film forming top surface retarder, calibrated for specific sized aggregates and finish requirements without plastic covering. Color coded to allow for ease of application and verification of grade being used as well as even and complete coverage.

Acceptable Materials: Top-Cast Surface Retardant by Dayton Superior

- B. Spray applied protective weather-proofing and temporary water retention agent for Finish Retarders during inclement or extremely hot weather.

Acceptable Materials: Rain-Shield

All products distributed by Architectural Concrete Chemicals, 223 West Hampton Ave., Capital Heights, MD 20743, (800) 638-2672, [www.acchemicals.com](http://www.acchemicals.com)

- C. Manufacturer's Representative:  
Chuck Poole (714) 287-6342  
Dayton Superior Corporation  
1125 Byers Road  
Miamisburg, OH 45342  
800-745-3700  
937-866-0711  
[info@daytonsuperior.com](mailto:info@daytonsuperior.com)

#### **2.14. CURING MATERIALS**

- A. Curing Compound: ASTM C309 or better, concrete cure and sealer – “Clear” by Davis Colors or approved equal.
- B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. Per sq. yd., complying with AASHTO M182, Class 2.
- C. Moisture-Retaining Cover: One of the following complying with ASTM C 171:
  - 1. Waterproof paper.
  - 2. Polyethylene film.
  - 3. White burlap-polyethylene sheeting.

#### **2.16 CONCRETE**



- A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified under ACI 301.
- B. Proportion mixes according to ACI 211.1 and ACI 301 to provide normal-weight concrete with the following properties.
- C. Exposed Sand Finishes: Use “ Ready Mixed “ concrete unless otherwise approved or specified; in accordance with ASTM C 94. Exposed Sand Finishes should meet or exceed the following criteria.
  - 1. Compressive Strength: Per geotechnical recommendations
- D. Sole Source Cements and Aggregates: All cements and aggregates shall be consistent from batch to batch for the entire project.
- E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by CONTRACTOR when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

## **2.17 CONCRETE MIXING**

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94.
  - 1. Reduce mixing and delivery time when air temperature is between 85 degrees and F and 90 degrees F and reduce mixing and delivery time from 1-1/2 hours to 75 minutes. Batch mixing at site is not acceptable.

## **2.20 EXPANSION JOINT FILLER AND JOINT SEALANTS**

- A. Expansion joint filler and joint sealants.
  - 1. Premolded joint filler shall be a non-bituminous flexible joint material. 1/4" poly-foam expansion joint as manufactured by W.R. Meadows, or approved equal, with pre-scored removable strip to allow for recess below the concrete surface to accept joint sealant. Submit sample to OWNER'S REPRESENTATIVE for approval.
  - 2. Joint sealers shall be two-part urethane sealer per plans. Color shall match paving surface color. Install per manufacturer's recommendations. Install silica sand over “wet” joint sealant (full coverage) to protect sealant until completely cured.

## **2.21 PLANT, EQUIPMENT, MACHINES AND TOOLS**


- A. General: Plant, equipment, machines, and tools used in the workplace shall be subject to approval and shall be maintained in a satisfactory working condition at all times.
  - 1. Provide equipment with capability of producing the required product, meeting or exceeding grade controls, thickness control and smoothness requirements as specified.
  - 2. Use of equipment shall be discontinued if it produces unsatisfactory results.
  - 3. OWNER'S REPRESENTATIVE shall have access to the plant and all equipment to ensure proper operation and compliance with the specifications at all times during construction.

### PART 3 - EXECUTION

#### 3.1 SURFACE PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Verify that paving subgrade extends 1-foot beyond the outside edge of paving or curbing and has a positive outfall for trapped water.
- C. Proof-roll prepared subbase to check for unstable areas and verify need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- D. Remove loose material from compacted subbase surface immediately before placing concrete.
- E. Provide necessary chairs or supports and maintain position of reinforcing bars.
- F. Notify OWNER'S REPRESENTATIVE minimum of 24 hours prior to commencement of concrete operations / placement.
- G. Sequence of work shall be such that all concrete footings below concrete paving shall be installed prior to concrete paving installation above. Core drilling, cutting, or patching of new concrete in order to install footings below new paving shall not be accepted.

#### 3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace and secure edge forms, bulkheads, intermediate screed guides for paving to required lines, dimensions, grades, elevations, and profile.
- B. 
- C. Install forms to allow continuous progress of Work and so that forms can remain in place at least 24 hours after placing concrete.
- C. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- D. Place joint fillers vertical in position, in straight lines. Secure to formwork during concrete placement.
- E. Forms shall be braced to withstand the pressures developed and shall be tight to prevent the loss of mortar. Formed wall surface shall be free of any unevenness greater than 1/4" when checked with a 10' straight edge.
- F. Concrete in walls with side slopes flatter than 3/4:1 shall be placed on suitable material which has been overfilled, compacted and trimmed to true grade. Backforms shall be used where the side slope is 3/4:1 or steeper.
- G. A clear non-staining form release agent which will not discolor nor affect the surface texture of the concrete and does not react with any ingredients of the concrete shall be used.
- H. Use flexible metal, 1" lumber or plywood forms to form radius bends.
- I. Check completed formwork and screeds for grade and alignment to following tolerances:

1. Top of Forms: Maximum 1/8-inch in 10-feet.
  2. Vertical Face Longitudinal Axis: Maximum 1/8-inch in 10-feet.
- J. The CONTRACTOR shall include all fine grading and compaction with regard to setting forms during concrete placement.
- K. Provisions for other trades: Provide openings in concrete formwork and slabs to accommodate other trades, to include placement of underground sleeves.
- L. Placement in forms: Limit horizontal layers to depths with can be properly consolidated, but in no event greater than 24-inches.
1. Consolidate concrete by means of mechanical vibrators, inserted vertically in freshly placed concrete in a systematic pattern at close intervals. Penetrate previously placed concrete to ensure that separate concrete layers are knitted together.
  2. Vibrate concrete sufficiently to achieve consistent consolidation without segregation of coarse aggregates.
  3. Do not use vibrators to move laterally.
  4. Do not vibrate forms.

### 3.3 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar support to hold reinforcement in position during concrete placement. Maintain minimum cover over reinforcement.
- D. Place reinforcement at mid-height of slabs-on-grade.

Aluminum and plastic supports for reinforcement shall not be used.

Bars shall be accurately spaced as shown on the Plans and spacing of first bar immediately adjacent to transverse construction joint shall be one-half the required spacing shown on the Plans. In no case shall the clear distance between parallel bars be less than 2-1/2 diameters of the bar, or a minimum of 2". Unless otherwise shown on Plans, embedment of reinforcing steel (other than stirrups and spacers) shall be 1-1/2 inches clear depth for #8 bars or smaller, and shall be 2-inches clear for #9 bars and larger. Where placement of reinforcing steel requires alternate bars of different size embedment, requirements shall be governed by the larger bar. Stirrups and spacers shall be embedded not less than 1-inch clear depth.

Measurement of embedment shall be from the outside of the bar to the nearest concrete face. Tack welding or butt welding of reinforcing bars will not be permitted.

- E. Lap adjoining pieces of welded wire fabric one full mesh and lace splice with wire. Offset laps of adjoining sheets.

- F. Place fabricated bar mats in lengths as long as practical. Overlap mat minimum of 2 inches.
- G. Interrupt reinforcement at expansion joints.
- H. Place secondary fiber reinforcement in concrete mix in quantities as specified by manufacturer.
- I. Place reinforcement to achieve slab and curb alignment as detailed.
- J. Provide doweled joints at interruption of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.
- K. Splicing

Reinforcing bars may be continuous at locations where splices are shown on the plans, at the option of the CONTRACTOR. The location of splices, except where shown on the Plans, shall be determined by the CONTRACTOR, based upon using available commercial lengths where applicable.

Splices shall consist of placing the reinforcing bars in contact and wiring them together in such a manner as to maintain the alignment of the bars and to provide minimum clearances.

No lapped splices will be permitted at locations where the concrete section is not sufficient to provide a minimum clear distance of 2-inches between the splice and the nearest adjacent bar. The clearances to the surface of the concrete shall not be reduced. Length of lapped splices shall be as noted on drawings.

Splices of tensile reinforcement at points of maximum stress shall be avoided; however, any deviation from splices shown on the Plans shall be approved by the City's Representative.

### 3.4 CONCRETE PLACEMENT

- A. Notify Engineer/City Inspector minimum twenty-four (24) hours prior to commencement of concrete operations.
- B. Before placing concrete, notify Engineer/City to review complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to facilitate installation of their work. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.
- C. Place Ready-Mix concrete within specified time after batching.
  - 1. Below 40 degrees F (4 degrees C) See Cold Weather Placing
  - 2. 40 – 85 degrees F (4-29 degrees C) 90 minutes
  - 3. 86 – 90 degrees F (30-32 degrees C) 75 minutes
  - 4. Above 90 degrees F (32 degrees C) 60 minutes
    - \* Concrete exceeding delivery times may be rejected by the OWNER'S REPRESENTATIVE

- D. Adding Water: Do not add water after initial introduction of mixing water for batch except when slump of concrete is less than specified upon jobsite arrival and the maximum water/cement ratio has not been exceeded.
1. Notify OWNER'S REPRESENTATIVE prior to adding any additional water.
  2. Add only water enough to bring concrete slump within the specified limits. Turn drum at least 30 additional revolutions at maximum mixing speed. Do not add water to batch at any later time.
  3. Ensure that concrete strength meets or exceeds specified requirements, and water does not exceed maximum amount specified in the approved CONCRETE MIX DESIGN.
- E. Remove water from excavations. Before placement, remove wood chips, shavings, and hardened concrete etc. from forms.
1. Clean all equipment.
  2. Wet Forms, except in freezing weather, or oil properly with approved release.
- F. Moisten sub-base to provide a uniform dampened condition at the time concrete is placed. Sprinkling method shall not be such as to form mud or pools of water. Watering sub-grade immediately prior to concrete placement is not sufficient to make the soil uniformly moist.
- G. Do not place concrete around manholes and other utility structures until they are at the required finish elevation and alignment. Coat surfaces of adjacent manholes, catch basins, inlets, and other fixed objects with oil to form isolation joint and prevent bond with paving.
- H. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
1. Place concrete continuously or in layers of such thickness that the concrete will not be placed on a preceding layer which has hardened sufficiently to cause formation of seams or planes of weakness.
  2. If section cannot be placed continuously, provide cold / expansion joints. Deposit concrete as nearly as practicable to its final location to avoid segregation
  3. Deposit and spread concrete in a continuous operation between construction joints and control joints. Do not break or interrupt successive pours such that cold joints occur.
- I. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309 R.
1. Consolidate concrete along face and forms with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand- spreading and consolidation. Do not spread concrete by vibration. Prevent dislocating reinforcing and dowels.
    - a. Do not use vibrators to transport concrete inside forms.
    - b. Insert and withdraw vibrators vertically at uniformly spaced locations not further visible effectiveness of the machines being used. Generally, 16-20" apart.

- c. At each insertion, limit duration of vibration time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- J. Placing Concrete Slabs: Deposit and consolidate concrete slabs in continuous operation, within the limits of construction joints, until placement of panel or section is completed. Maintain reinforcing in proper position during concrete placement operations
- K. Placing Concrete Sidewalks: Place concrete in forms in one (1) layer of such thickness that when consolidated and finished, sidewalks will be of thickness indicated.
- L. Screed paved surfaces with a straightedge and strike off. Use bull floats or derbies to form a smooth surface plane before excess moisture or bleed water appears on surface. Do not further disturb concrete surfaces prior to beginning finishing operations.
- M. Cold Weather Placement: Adhere to ACI 306R – Cold Weather Concreting for installing concrete paving during cold weather.
- N. Hot-Weather Placement: Place concrete complying with ACI 305R when hot weather conditions exist.
  - 1. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
  - 2. Fog-spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, or soft or dry areas.
- O. Place concrete to pattern indicated on plans.

### **3.5 CONCRETE FINISHING**

- A. General:
  - 1. Paving finishes to match approved mock-up finishes.
- B. Broom Finish:
  - 1. Broom finish paving to match approved mock-up.
  - 2. After surface water disappears float surface and trowel to smooth even finish. When concrete is sufficiently hardened, produce a transverse scored texture perpendicular to direction of traffic by drawing a soft fiber bristle broom uniformly across its surface.
  - 3. Use for walkways, mow curbs, ramps, utility slabs, driveways, or otherwise noted on plans or details.
  - 4. Portland cement concrete mowcurbs shall have light broom finish on all surfaces and a medium on all.

5. Protect all curbs, borders and adjacent concrete and masonry surfaces, pavers, stones etc. that are not to receive retarder finish prior to concrete placement and retarder application using Tem-Protect.
6. Place concrete in the manner prescribed previously. Screed or strike off the surface in two (2) directions using a wooden or metal straight edge to achieve the proper elevation in a sawing motion back and forth.
7. Allow the bleed water to evaporate the surface. It can then be floated using a wooden hand float or a bull-float preferably wooden to close the surface and surround the coarse aggregate with cement paste. Float to a uniform appearance. Follow float operations with hand trowels or Fresno steel trowels to create tight dense smooth surface. (This may require two or three passes depending upon mix design and or desired finish to be achieved)

**NOTE: Do not burnish the surface or allow the exposed sand surface to prematurely dry prior to the application of Top-Cast (No5) Finish Retarder.**

8. Spray-applied, film forming top surface retarder, calibrated for specific sized aggregates and finish requirements without plastic covering. Color coded to allow for ease of application and verification of grade being used as well as even and complete coverage.
  - a. Soon after the final seat finish has been completed spray Top-Cast Retarder using a low-pressure sprayer with a 0.5gpm tip at a rate of 200-300 sq./ft. per gallon in a full hiding coat.
 

Once dry Top-Cast Retarder will yield a coating that provides intermittent rain protection. Once completely dry it can be sprayed with Rain-Shield to protect the surface if heavy extended rains are predicted or during extremely hot weather to retain moisture and protect the etch retention.
  - b. *\*Super-Lite grade should be washed in less than 12 hours for best results*
  - c. Rinse water and cement matrix removal shall be in accordance with local codes and should not be allowed to be washed or flow down to arroyos, storm sewers, ponds, streams or sanitary sewers by precipitation or other surface flows.
  - d. Prior to completion of the project, remove wash water residue from the site to location approved by the local agency.

### 3.6 JOINTING

- A. CONTRACTOR shall submit a paving jointing and pour sequence plan indicating the following:
  1. Proposed layout of all joints (cold joint/hidden expansion, expansion joint, sawcut, and tooled joints.)
  2. Concrete pour sequence. Concrete footings beneath concrete paving shall be installed before concrete paving.

- B. Locate cold joint (hidden expansion joint) as indicated. Coordinate cold joints with alternate concrete pours and at all change of pavement types (concrete paving to concrete band). Provide sawcut per detail two days after pour.
- C. Locate expansion joints with caulk sealant at all paving / wall interfaces per plans.
- D. Install joint fillers full-width and depth of joint. Remove perforated portion of joint filler to receive sealants as indicated on the details.
- E. Provide joint fillers in single lengths for the full slab width, whenever possible. Fasten joint filler sections together when multiple lengths are required.
- F. Where intersecting joints occur join top edge and continue any spliced joints without deviation of form line or direction.
- G. Protect the top edge of the joint filler during concrete placement
- H. Place expansion joints per Geotechnical Report to correct elevation and profile. Align curb, gutter, and sidewalk joints.
- I. Place joint filler between paving components and building or other appurtenances.
- J. Control Joints: Provide control joints as indicated in Geotechnical Report, see Appendix, to minimize random surface cracking and as indicated on Drawings. Construct control joints for a depth equal to at least one-fourth of concrete thickness, as follows:
  - 1. Hand-tooled Joints: Form control joints in fresh concrete by grooving and finishing each joint edge with a radiused jointer tool.
  - 2. Machine-Sawn Control Joints: Provide machine-sawn contraction joints as soon as concrete has sufficient strength to support sawing equipment. Cut 1/3 into depth of slab.
  - 3. Do not exceed 1/4-inch in joint width.
- K. Doweled Expansion/Cold Joints: Construct doweled expansion/cold joints at end termination's of paving where paving operations are stopped for more than 1/2 hour, unless paving terminates at an isolation joint and at all edges of different paving types.
  - 1. Steel Dowels:
    - a. Provide steel dowels across expansion/cold joints to reduce differential movement across joint. Utilize steel dowels per plan.
    - b. To assist in correct alignment of steel dowels along expansion/cold joints use Speed Dowel plastic dowel alignment sleeves.
      - 1) Ensure that wood edge forms are true to line and grade prior to installing plastic dowel alignment sleeves.
      - 2) Install plastic dowel sleeves on wood forms at the specified on-center dowel spacing, centered between top and bottom of wood form.
  - 2. Do not continue tie-reinforcement through sides of strip paving.
  - 3. Use a bond breaking agent on cured edges that will be joined with fresh concrete.



4. Immediately before new concrete is placed, wet construction joint and remove standing water.
  5. Tool edges of expansion/cold joints to match decorative field jointing.
  6. Finish each edge of joint with radiused jointer tool.
- L. Isolation Joints: Provide isolation joints to permit horizontal and vertical movement between slab and fixed vertical edges such as building walls, steps, columns, and other vertical restraints.
1. Provide ¼-inch thick polyethylene foam and caulking along edges of isolation joints.
  2. Install isolation joint sealant.

### 3.7 CONCRETE PROTECTION AND CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 305R for hot weather and ACI 306R for cold weather protection during curing.
- B. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture retaining cover curing, curing compound, or combination of the following:
1. Moisture Curing: Keep surfaces continuously moist for not less than 7 days with following materials:
    - a. Water.
    - b. Continuous water fog spray.
    - c. Absorptive cover, water saturated, kept continuously wet.
  2. Cover concrete surfaces and edges with a 12-inch lap over adjacent absorptive covers.
  3. Curing Compound:
    - a. Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions.
    - b. Recoat areas subjected to heavy rainfall within 3 hours after initial application.
    - c. Maintain continuity of coating and repair damage during curing period.

### 3.8 SEALERS

- A. Seal all concrete with concrete sealer. Seal surface of textured concrete pavement surfaces using Prosoco Concrete Protection SB. Apply per manufacturers recommendations.
- B. The application should be a continuous process from start to finish of the project. If for any reason the application is interrupted, mark the place of interruption, and continue at a later time as if no interruption has occurred. Do not apply in temperatures below 50° F, or if the surface temperature is below 50° F.

- C. Remove all coating or substances that may prevent penetration of the sealer (e.g. curing agents, coatings, sealants, dirt, surface oil, efflorescence, paint and standing water). DO NOT use chemicals for removal of these materials.
- D. Protect objects from overspray; especially glass, metals, ceramics, glazed tile and wood. Protect all windows, doorways, lights, etc. with polyethylene film, soap solution, or removable film-forming protection. Should sealer get on exposed glass or aluminum, immediately remove using a damp cloth. If the sealer is allowed to dry, it can be removed from the aluminum using steel wool; or from glass using a razor blade.
- E. Apply sealer in light, even coats with a garden or airless sprayer, or paintbrush. If using a sprayer, before use make sure the selected sprayer is completely clean of solvents and foreign materials. DO NOT apply sealer with a roller or in heavy coats. If sealer is to be applied only to group joints, use a narrow-tip paintbrush.
- F. Concrete Surface Sealer. Aqueous copolymer chemically reactive dispersion that provides a durable, transparent protective barrier, 'Ultrapel' as manufactured by Prosoco or approved equal.

### 3.9 FIELD QUALITY CONTROL TESTING

- A. CONTRACTOR shall employ a qualified independent concrete testing and inspection agency to sample material, perform tests, and submit test reports during concrete placement and construction operations. Sampling and testing for quality control may include the following:
  - 1. Sampling fresh concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    - a. Compression Test Specimens: ASTM C 31. One set of four (4) standard cylinders for each compressive strength test. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
    - b. Compressive-Strength Tests: ASTM C 39. One (1) set for each day's pour of each concrete class exceeding ½ cu.yd. but less than 25 cu. Yd., plus one (1) set for each additional 50 cu. Yd., two (2) specimens tested seven (7) days and three (3) specimens tested twenty-eight (28) days. Test one (1) Specimen in reserve for later testing.
    - c. Slump: ASTM C 143. One (1) test at point of placement for each compressive strength but not less than (1) test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
    - d. Air Content: ASTM C 231, pressure method. One (1) test for each type of air-strength test but no less than one (1) test for each day's pour of each type of air-entrained concrete.
    - e. Concrete Temperature: ASTM C 1064. One (1) test performed hourly when air temperature is 40 degrees F and below and when 80 degrees F and above. One (1) test for each set of compressive strength Specimens.
  - 2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five (5) randomly selected batches or from each batch if fewer than five (5) are used.

3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing concrete.
  4. Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- B. Test results will be reported in writing to OWNER'S REPRESENTATIVE, concrete manufacturer, and CONTRACTOR within 24 hours of testing, Reports of compressive strength tests will contain project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in paving, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7 day and 28 day tests.
- C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but not be used as the sole basis for acceptance or rejection.
- D. Additional Tests: The testing agency will make additional tests of concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42.
- E. CONTRACTOR shall provide adequate notice, cooperate with, provide access to the work, obtain samples, and assist test agency and their representatives in execution of their function.
- F. SCAQMD VOC Compliance: CONTRACTOR to submit documentation that flatwork finish retarders comply with SCAQMD Rule 1113 for VOC compliance in the "Flats" category, not to exceed 50 g/l.

### **3.10 TOLERANCES**

- A. Maximum Variation of Surface Flatness: ¼ inch in 10 feet.
- B. Maximum Variation from True Position: ½ inch.

### **3.11 REPAIRS AND PROTECTION**

- A. Remove and replace concrete paving that is broken, damaged, defective, or does not meet the requirements of this section.
- B. Patching Defective Areas: Immediately cut out honeycomb, rock pockets and voids over ¼ inch (6mm) in any dimension as well as holes left by tie rods, bolts etc. down to solid concrete but, in no case to a depth less than 1 inch (25mm).
1. Cut edges perpendicular to concrete surface.
  2. Thoroughly clean, dampen with water, and brush coat area to be patched with neat cement grout or proprietary bonding agent before placing cement mortar or proprietary patching compound.
- C. Remove and replace concrete with defective surfaces if defects cannot be repaired to the satisfaction of the OWNER'S REPRESENTATIVE.

1. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins, and other projections on the surface as well as stains and other discolorations that cannot be removed by cleaning.
  - a. Dampen concrete surfaces in contact with patching concrete and brush with neat cement grout or apply concrete bonding agent.
  - b. Mix Patching concrete of same materials to provide concrete of same type of class as original concrete.
  - c. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- D. Protect concrete from damage until Final Payment. Exclude traffic from paving for at least 28 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- E. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material until Final Payment.

### **3.12 CLEAN UP**

- A. At completion of Work, remove concrete stains from adjacent work, including but not limited to dissimilar paving types, walls, columns, railing posts, light fixtures, plant materials, to satisfaction of OWNER'S REPRESENTATIVE.

### **3.13 PAVING FINISH SCHEDULE**

- A. Provide paving finishes, as indicated on plans.

**END OF SECTION**

**SECTION 32 14 13.13**  
**INTERLOCKING CONCRETE PAVERS**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
1. Interlocking Concrete Paver Units (manually installed).
  2. Bedding and Joint Sand.
  3. Edge Restraints.
  4. Joint sand stabilizers.
  5. **Penetrating Sealer**
- B. Related Sections: Concrete Paving.

**1.2 REFERENCES**

- A. American Society for Testing and Materials (ASTM):
1. ASTM C 33, Standard Specification for Concrete Aggregates.
  2. C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile, Section 8, Freezing and Thawing.
  3. ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  4. ASTM C 140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
  5. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
  6. ASTM C 936, Standard Specification for Solid Concrete Interlocking Paving Units.
  7. ASTM C 979, Standard Specification for Pigments for Integrally Colored Concrete.
  8. ASTM D 698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  9. ASTM D 1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).

10. ASTM D 2940, Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.

B. Interlocking Concrete Pavement Institute (ICPI):

1. ICPI Tech Spec Technical Bulletins

### 1.3 SUBMITTALS

A. In accordance with General Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Manufacturer's drawings and details: Indicate perimeter conditions, relationship to adjoining materials and assemblies, concrete paver layout, patterns, color arrangement, installation and setting details.

C. Sieve analysis per ASTM C 136 for grading of bedding and joint sand.

D. Concrete pavers:

1. Six (6) representative full-size samples of each paver type, thickness, color, finish that indicate the range of color variation and texture expected in the finished installation.

2. Accepted samples become the standard of acceptance for the work.

3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C 936.

4. Manufacturer's certification of concrete pavers by ICPI as having met applicable ASTM standards.

5. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.

E. Paver Installation Subcontractor:

1. A copy of Subcontractor's current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.

2. Job references from projects of a similar size and complexity. Provide OWNER/Client/General CONTRACTOR names, postal address, phone, fax, and email address.

### 1.4 QUALITY ASSURANCE

A. Paving Subcontractor Qualifications:

1. Utilize an installer specializing in the installation of solid concrete interlocking pavers with three (3) years' experience and having

successfully completed concrete paver installation similar in design, material, and extent indicated on this project.

2. Utilize an installer holding a current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
3. Subcontractor must send copy of ICPI certificate at bid date along with a list of previous paver projects completed.
4. Subcontractor must have held ICPI Certification with that individual company for a minimum of two years, or be an approved manufacturers preferred installers list.

B. Mock-Ups:

1. Install a 6 ft x 6 ft (2 x 2 m) paver area of each style (pedestrian and vehicular), pattern and color of pavers being used. Special Order materials may have a color mock up and a separate shape mock up to show shape and color. Manufacturer may not stock all materials.
2. Use this area to determine surcharge of the bedding sand layer, joint sizes, and lines, laying patterns, colors and texture of the job.
3. This area will be used as the standard by which the work will be judged.
4. Remove and properly dispose of mock-up.
5. Special order materials and mock-ups should be ordered three weeks prior needed ship date. Proper times for ordering shall be managed by CONTRACTOR. Check stock on needed materials to allow for proper cure times.

## 1.5 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Product Requirement Section of the General Conditions.
- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers packaging with identification labels intact.
  1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
  2. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
  3. Unload pavers at job site in such a manner that no damage occurs to the product.

- D. Storage and Protection: Store materials protected such that they are kept free from mud, dirt, and other foreign materials. Store concrete paver cleaners and sealers per manufacturer's instructions.
  - 1. Cover bedding sand and joint sand with waterproof covering if needed to prevent exposure to rainfall or removal by wind. Secure the covering in place.

#### 1.6 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
  - 1. Do not install sand or pavers during heavy rain.
  - 2. Do not install saturated sand.
  - 3. Do not install concrete pavers on saturated sand.
  - 4. Do not install pavers without compacting sub-base and paver base.
- B. Install pavers only under conditions per manufacturer instructions.

#### 1.7 MAINTENANCE

- A. Extra Materials: Provide 2% additional material for use by OWNER for maintenance and repair.
- B. Pavers shall be from the same production run as installed materials. Batches may differ slightly in color due to uncontrollable natural resources.
- C. Contact the paver manufacturer or the Concrete Masonry Hardscape Association for recommendations on cleaning and sealing

#### 1.8 SEQUENCING AND SCHEDULING

- A. Coordinate installation of pavers with work specified in the construction sequencing plans and per the specifications.

#### 1.9 WARRANTY

- A. Installation: Installer shall provide a one (1) year written guarantee.

### PART 2 PRODUCTS

#### 2.1 INTERLOCKING CONCRETE PAVERS

- A. Manufacturer: Ackerstone or Angelus Paving Stones
  - 1. Contact: Adam Wickstrom at Ackerstone 949-382-2690
  - 2. Contact: David M. Quinn at Angelus 714-321-5736



B. Interlocking Concrete Pavers:

1. Paver Type: Ackerstone "Paseo" 4-piece paver collection  
Angelus Courtyard 4-piece paver package
  - a. Material Standard: Comply with material standards set forth in ASTM C936.
  - b. 4 piece- Nominal 6"x6", 6"x9", 9"x9", 9"x12"- 80mm thickness, smooth texture, standard chamfer, color ~~Sandalwood~~ Angelus Tuscan through mix.
  - c. Color Pigment Material Standard: Comply with ASTM C 979

2.2 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted.

2.3 BEDDING AND JOINT SAND

- A. Provide bedding and joint sand as follows:

1. Washed, clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
2. Do not use limestone screenings, stone dust, or sand for the bedding sand material that does not conform to the grading requirements of ASTM C 33.
3. Do not use mason sand or sand conforming to ASTM C 144 for the bedding sand.
4. Do not use Silica sands.
5. Where concrete pavers are subject to vehicular traffic, utilize sands that are as hard as practically available.
6. Sieve according to ASTM C 136.
7. Bedding Sand Material Requirements: Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 1.

Table 1  
Grading Requirements for Bedding Sand  
ASTM C 33

Sieve Size	Percent Passing
3/8 in.(9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 mm)	2 to 10
No. 200 (0.075 mm)	0 to 1

8. Joint Sand Material Requirements: Conform to the grading requirements of ASTM C144 as shown with modifications in Table 2 below:

Table 2 Grading Requirements for Joint Sand		
Sieve Size	ASTM C 144 Natural Sand Percent Passing	ASTM C 144 Manufactured Sand Percent Passing
No. 4 (4.75 mm)	100	100
No. 8 (2.36 mm)	95 to 100	95 to 100
No. 16 (1.18 mm)	70 to 100	70 to 100
No. 30 (0.600 mm)	40 to 75	40 to 100
No. 50 (0.300 mm)	10 to 35	20 to 40
No. 100 (0.150 mm)	2 to 15	10 to 25
No. 200 (0.075 mm)	0 to 1	0 to 10

#### 2.4 VISUAL INSPECTION

- A. All units shall be sound and free of defects that would interfere with the proper placing of unit or impair the strength or permanence of the construction.
- B. Minor cracks incidental to the usual methods of manufacture, or chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.

#### 2.5 SAMPLING AND TESTING

- A. The City or his authorized representative shall be accorded proper facilities to inspect and sample the units at the place of manufacture from lots ready for delivery.
- B. Sample and test units in accordance with ASTM Method C-140.

#### 2.6 REJECTION

- A. In the event the shipment fails to conform to the specified requirements, the manufacturer may sort it, and new test units shall be selected at random by the City from the retained lot and tested at the expenses of the manufacturer. If the second set of test units fails to conform to the specified requirements, the entire lot shall be rejected.

#### 2.7 EXPENSE OF TESTS

- A. The expenses of inspection and testing shall be borne by the CONTRACTOR unless otherwise agreed.

#### 2.8 EDGE RESTRAINTS

- A. Provide edge restraints installed around the perimeter of all interlocking concrete paving unit areas per plan.

#### 2.9 ACCESSORIES

- A. Provide accessory materials as follows:

1. Geotextile Fabric: Per Plans.
2. Joint sand stabilizers

~~Material: Epoxy modified joint stabilizing sealer by BP Pro or approved equal capable of penetrating and sealing the surface of the paver without causing discoloration or reducing the static coefficient of friction to below accepted figures. The sealer shall bond the joint sand in an interlocking paver installation. Test each surface for suitability, and desired results before overall application. Allow surface to dry thoroughly before inspection and approval. Apply per manufacturer's specifications.~~

Material: Water based Silane/Siloxane sealer by SEK Surebond or approved equal capable of penetrating and sealing the surface of the paver without causing discoloration or reducing the static coefficient of friction to below accepted figures. Test each surface for suitability, and desired results before overall application. Allow surface to dry thoroughly before inspection and approval. Apply per manufacturer's specifications.

- B. ~~Stain blocking invisible sealer. Material: SB-5000 stain blocking invisible sealer by BP Pro or approved equal. Water based, penetrating, low VOC sealer that provides an invisible, durable barrier against water, oil and stains on pavers.~~ Stain-resistant invisible penetrating sealer. Material: SB-4000 stain-resistant invisible penetrating sealer by SEK Surebond or approved equal. Water based, penetrating, low VOC sealer that provides an invisible, durable barrier against water born product stains and Salt on pavers.

Contact: Cory Kalteich  
SEK/Surebond  
Hardscape Done Right!  
Sales Director -West  
OR, WA, ID, MT, WY  
CA, NV, AZ, NM, CO, UT  
Cell 630.549.4833

## PART 3 EXECUTION

### 3.01 ACCEPTABLE INSTALLERS

Only use CMHA certified installers who have held certification at specific company for a minimum of two years, or use manufacturer recommended CONTRACTOR list.

### 3.02 EXAMINATION

Notes:

1. *Compaction of the soil subgrade shall be at least 98% modified Proctor density per ASTM D 1557 is to be provided. Subgrade compaction shall be reviewed and approved by the project geotechnical engineer prior to placement of any aggregate base.*
2. *Local aggregate base materials typical to those used for highway flexible pavements are recommended, or those conforming to ASTM D 2940. Compaction of aggregate is recommended to not less than 98% Proctor density in accordance with ASTM D 698 is recommended for pedestrian areas and residential driveways.*

*98% modified Proctor density according to ASTM D 1557 is recommended for vehicular areas. Mechanical tampers are recommended for compaction of soil subgrade and aggregate base in areas not accessible to large compaction equipment. Such areas can include that around lamp standards, utility structures, building edges, curbs, tree wells and other protrusions.*

3. *Prior to screeding the bedding sand, the recommended base surface tolerance shall be  $\pm 3/8$  in. ( $\pm 10$  mm) over a 10 ft. (3 m) straight edge. Per ICPI Tech Spec 2, Construction of Interlocking Concrete Pavements.*
  4. *The paver installation CONTRACTOR shall not correct deficiencies in the base surface with additional bedding sand or by other means. Therefore, the surface elevations of the base should be checked and accepted by a licensed and independent surveyor or designated party, with written certification to the paving subcontractor, prior to placing bedding sand and concrete pavers. Surveyor shall be provided for by the CONTRACTOR. Certification of the subbase grade shall be provided per every 2000 SF of installation.*
- A. Acceptance of Site Verification of Conditions:
1. General CONTRACTOR shall inspect, accept and certify in writing to the paver installation subcontractor that site conditions meet specifications for the following items prior to installation of interlocking concrete pavers.
    - a. Verify that subgrade preparation, compacted density and elevation conform to specified requirements.
    - b. Verify that geotextiles, if applicable, have been placed according to drawings and specifications.
    - c. Verify that aggregate base materials, thickness, compacted density, surface tolerances and elevations conform to specified requirements and soils report.
    - d. Provide written density test results for soil subgrade, aggregate base materials to the City, General CONTRACTOR and paver installation subcontractor.
    - e. Verify location, type, and elevations of edge restraints, concrete collar around utility structures, and drainage inlets.
  2. Do not proceed with installation of bedding sand and interlocking concrete pavers until subgrade soil and base conditions are corrected by the General CONTRACTOR or designated subcontractor.

### 3.03 PREPARATION

- A. Verify base is dry, certified by General CONTRACTOR as meeting material, installation and grade specifications.
- B. Verify that base [and geotextile] is ready to support sand, edge restraints, and, pavers and imposed loads.
- C. Edge Restraint Preparation:
1. Install edge restraints per the drawings at the indicated elevations.

### 3.04 INSTALLATION

A. Spread bedding sand evenly over the base course and screed to a nominal 1 in. (25 mm) thickness, not exceeding 1 1/2 in. (40 mm) thickness. Spread bedding sand evenly over the base course and screed rails, using the rails and/or edge restraints to produce a nominal 1 in. (25 mm) thickness, allowing for specified variation in the base surface. Lay out first row of pavers to get even cuts on either ends or full pieces.

1. Do not disturb screeded sand.
2. Screeded area shall not substantially exceed that which is covered by pavers in one day.
3. Do not use bedding sand to fill depressions in the base surface.

B. Lay pavers in pattern(s) shown on drawings. Place units hand tight without using hammers. Make horizontal adjustments to placement of laid pavers with rubber hammers and pry bars as required.

C. Provide joints between pavers are 1/16 in.

D. Fill gaps at the edges of the paved area with cut pavers or edge units. No cuts shall be smaller than 1/3 units original size.

E. Cut pavers to be placed along the edge with a double blade paver splitter or masonry saw (diamond blade)

F. NO PAVERS SHALL BE CUT LESS THAN 1/3 ITS ORIGINAL SIZE. If required, adjust or slightly deviate from pattern to insure there are no small cuts. Use a masonry paver adhesive standard grade Type II- Basic Bond by Pave Tech Advanced Paving Technology to glue smaller cuts to an adjacent pave making it a solid unit. However, with glue there should be no cut size less than 1/3.

G. reserved

H. Adjust bond pattern at pavement edges such that cutting of edge pavers is minimized. All cut pavers exposed to vehicular tires shall be no smaller than one-third of a whole paver.

I. Keep skid steer and forklift equipment off newly laid pavers that have not received initial compaction and joint sand.

J. Use a low-amplitude plate compactor capable of at least minimum of 4,000 lbf (18 kN) at a frequency of 75 to 100 Hz to vibrate the pavers into the sand. Remove any cracked or damaged pavers and replace with new units.

K. Simultaneously spread, sweep and compact dry joint sand into joints continuously until full. This will require at least 4 to 6 passes with a plate compactor. Do not compact within 6 ft (2 m) of unrestrained edges of paving units.

- L. All work within 6 ft. (2 m) of the laying face must shall be left fully compacted with sandfilled joints at the end of each day or compacted upon acceptance of the work. Cover the laying face or any incomplete areas with plastic sheets overnight if not closed with cut and compacted pavers with joint sand to prevent exposed bedding sand from becoming saturated from rainfall.
- M. Remove excess sand from surface when installation is complete.
- N. Allow excess joint sand to remain on surface to protect pavers from damage from other trades. Remove excess sand when directed by Landscape ARCHITECT.
- O. Surface shall be broom clean after removal of excess joint sand.

### 3.05 FIELD QUALITY CONTROL

- A. The final surface tolerance from grade elevations shall not deviate more than  $\pm 3/8$  in. ( $\pm 10$  mm) under a 10 ft (3 m) straightedge.
- B. Check final surface elevations for conformance to drawings.
- C. The surface elevation of pavers shall be 1/8 in. to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.
- D. Lippage: No greater than 1/8 in. (3 mm) difference in height between adjacent pavers.

### 3.06 JOINT SAND STABILIZATION

- A. ~~Apply joint sand stabilization materials between concrete pavers in accordance with the manufacturer's written recommendations, Prosoco Sure Klean Sealer and Joint Stabilizer or approved equal.~~ Install Angelus Logic Pro Gray polymeric joint sand between concrete pavers in accordance with the manufacturer's written recommendations. Do not install Polymeric Joint Sand if rain is expected within 48 hrs. of installation.
- B. Execution:
  - 1. After the paves have been installed, dry jointing sand as later described herein shall be brushed over the surface and the pavement shall be compacted until all joints are completely filled with sand. Great care shall be taken to ensure that the joints are filled to the top of the bottom of the chamfer or 1/8 inch below the finished elevation of the pavement.
  - 2. The surface shall be clean and free from any staining, oil, dust, and any loose material prior to the application of the joint sand stabilizer. The surface of the paver and the joint sand shall be dry for its full depth prior to commencing work. Turn off any sprinkler systems that may spry onto the pavers.
  - 3. ~~Apply wet-on-wet to a dry and absorbent surface using pressure spray equipment (40 psi maximum) or a pump up sprayer. Do not~~

~~atomize/vaporize the material.~~ Spread sand evenly over the surface of the pavers. Sweep sand into joints using a push/street broom with stiff bristles. Sweep sand over small distances not to exceed 20 feet per bag. Sweep sand from the surface.

- a) ~~Apply a saturating coat of sand joint stabilizer to the entire paved surface.~~
- b) ~~Allow the first application to penetrate for 5-10 minutes and then reapply, concentrating the spray stream along the sand joints to encourage deep penetration.~~
- c) ~~Broom out any pools or puddles that do not completely penetrate the surface within 20 minutes.~~

4. ~~Joints which are not adequately filled and compacted may settle or "wash out" with the initial application. If this occurs, allow the treated surfaces to dry, sweep and vibrate dry sand into any open joint, and reapply sand joint stabilizer.~~ Use a plate compactor or paver roller over the entire sanded surface to densify the sand in the joints. Repeat sweeping and compacting until joints are filled. This may take up to three times for joints to be full depending on paver type. To assure joints are full a putty knife inserted into the joint shall not penetrate deeper than 1/8 inch.
5. ~~Protect from heel and foot traffic for 4 hours. Protect from water for 65 hours. Sand joint stabilizer dries to the touch in 1-3 hours.~~ Remove excess sand from the surface with the broom. Using a leaf blower excess sand and polymers can be blown from the surface prior to activation with water.
6. ~~Clean tools and equipment immediately with soap and water.~~ Starting from bottom of the paver slope shower the sanded section with water to activate the polymers (approx. 10-15 seconds). Do not allow water to puddle. Wait approx. 30 seconds to repeat watering not allowing water to puddle. A leaf blower can be used to remove excess water.
7. 7. ~~Maintenance: Sweep treated surfaces frequently to reduce abrasion from grit and dirt. Remove heavy soiling with Enviro Klean 2010 All Surface Cleaner.~~ Allow to fully dry prior to sealing pavers.

### 3.07 STAIN-BLOCKING INVISIBLE SEALER

#### A. Preparation

To determine the suitability of this product for a specific surface, test on a small, inconspicuous area first. Sweep and remove all soil and other debris from the surface. Clean any stains or efflorescence using ~~Surebond SB-442 General Stain Remover~~ ~~BP Oil Out Degreaser~~ or ~~SB-488 Efflorescence and Rust Remover~~ ~~BP Pro Efflorescence Remover~~, respectively. Make sure all surfaces are dry. Stir before using

#### B. Application

~~Apply SB-5000 Stainblocking Invisible BP Pro Invisible Penetrating SB-4000 Sealer at full strength (never dilute) using a low pressure spray, or a split foam~~

roller, sponge or paint pad. If sprayed, use low pressure and do not exceed 60 PSI. Do not use an airless sprayer. Make sure that the surface is completely covered. Apply second coat at right angles to the first application. Use liberally (but do not allow to puddle) and remove excess immediately. Apply second coat immediately after the first coat, using a wet on wet application. A second coat can be applied for heavy traffic or heavily maintained areas. Tools, applicators, and hands can be cleaned with water. Do not apply during rain, heavy winds or during excessive heat or cold. Apply SEK Surebond Invisible Penetrating Sealer at full strength (never dilute) using a low-pressure spray, roller, sponge or paint pad. If sprayed, use low pressure and do not exceed 60 PSI. Do not use an airless sprayer. A roller can be used to remove pooling and excess material. Make sure that the surface is completely covered. A second coat can be applied for heavy traffic or heavily maintained areas. Apply Second coat to surface before first coat is dry (wet on wet application). Tools, applicators, and hands can be cleaned with water. Do not apply during rain, heavy winds or during excessive heat or cold.

C. Drying Time

The surface should be dry to the touch within approximately 30 minutes of application. Ensure that the pavement is protected from moisture and traffic for at least 24 hours after application and, although initial drying occurs quickly, complete curing will take additional time. Ensure that the pavement is protected from moisture and foot traffic for at least 24 hours after application and, although initial drying occurs quickly, complete curing will take additional time. Allow 72 hours prior to any vehicular traffic.

3.08 PROTECTION

- A. After work in this section is complete, the General CONTRACTOR shall be responsible for protecting work from damage due to subsequent construction activity on the site.

3.09 PAYMENT

Construction of Interlocking Concrete Paver pavements to include but not limited to installation of subgrade preparation, aggregate base, sand layer and interlocking pavers, shall be paid at the contract unit price bid per square foot in place to include all labor, materials, tools, and equipment, and no additional compensation will be made therefore.

Bid price shall include additional allowance for 5 percent material waste for cut pavers and 2 percent for additional overstock material (To be provided to the City) of each type, color and size of paver specified.

END OF SECTION



**SECTION 32 15 00**  
**DECOMPOSED GRANITE PAVING**

**PART 1 – GENERAL**

**1.1 SECTION INCLUDES**

- A. Decomposed Granite Paving

**1.2 RELATED SECTIONS**

- A. Section 31 10 00 – Site Clearing
- B. Section 31 22 00 – Grading
- C. Section 31 23 00 – Excavating and fill

**1.3 SUBMITTALS**

- A. The CONTRACTOR shall provide the City's Representative with copies of all material invoices from the CONTRACTOR'S material supplier, showing material weight and specifications, as verification of all materials supplied for the contract

**1.4 PERFORMANCE REQUIREMENTS**

- A. Standards and references are relevant to the work of this section mention herein;
  - 1. Standard Specifications: Highway Department, Standard Specifications for Highways and Bridges, latest edition.
  - 2. ASTM: American Society for Testing & Materials

**1.5 SAMPLE SUBMITTALS**

- A. Sieve Analysis and Sand Equivalency for specified material
- B. Samples of aggregate for color
- C. Decomposed Granite Paving Mock-up:
  - 1. Install 10-foot by 10-foot by 3.5-inch depth area of Decomposed Granite Paving
  - 2. Install Decomposed Granite Paving over moistened compacted aggregate base or moistened compacted sub grade soil.
  - 3. Install pre approved edging as temporary restraints along the edges.
  - 4. Use equipment to be used on remainder of work in construction the mock-up.
  - 5. Perform initial compaction and final compaction as would be performed for full-scale construction.
  - 6. Make observations during mock-up construction regarding the depth of placement required to achieve finished pavement thickness and elevation after initial and final compaction.

7. Demonstrate compaction procedures during mock-up construction that eliminate roller marks and provide a uniform surface texture without tearing or displacing the pavement mixture, and use lighter weight compaction equipment if required to meet specifications requirements without tearing or displacing the Decomposed Granite Paving.
8. If mock-up fails to meet specification requirements, make necessary adjustments to the construction procedures.
9. Construct as many mock-ups as necessary to achieve and accepted paving depth, surface finish, and surface density over the entire surface of the mock-up at no additional cost to the OWNER
10. Mock-ups which are completely or partially finished incorrectly will be rejected.
11. Remove rejected mock-ups immediately from the site at no additional cost to the OWNER.
12. The Mock-up, when accepted, shall become the project standard for compaction, aggregate consolidation, tolerances and appearance.

## PART 2 – SUMMARY

### 2.1 MANUFACTURES AND SUPPLIERS

- A. Decomposed Granite Paving shall be “Organic-Lock” by Envirobond provided by: Gail Materials, 1256 Magnolia Avenue, Corona CA 92879, Contact: David Dzwilewski Tel: 951.279.1095, Fax 951.279.0956 [www.gailmaterials.net](http://www.gailmaterials.net)

### 2.2 MATERIALS

- A. Gradation: As determined by ASTM C 136 methodology (Caltrans 202)

Sieve Size	Percent Passing
1/2"	100
3/8"	90-100
No. 4	50-100
No. 30	25-55
No. 100	10-20
No. 200	5-18

- B. SAND EQUIVALENT: As Determined by ASTM D 2419 methodology (Caltrans 217)

Shall have a minimum of 30

### 2.3 PREPARATION

- A. The finished sub grade shall be uniform and free of deleterious debris such as organic materials, nails, stones and loose soil.
- B. Make necessary corrections to furnish a firm and stable base as shown and specified on drawings.
- C. Pre-soak base material with water to the correct moisture level prior to installing Decomposed Granite Paving as needed to compact base.

## 2.4 BLENDING

- A. "Organic-Lock" Paving by Envirobond is a manufactures proprietary blend supplied by Gail Materials.

## 2.5 SURVEY REQUIREMENTS

- A. Lines and Levels: Establish lines and levels. Locate and lay out by instrumentation and similar appropriate means for "Organic-Lock" Paving finished surface grades.

## 2.6 CURBING AND EDGING

- A. The use of a curb or edging is not required.
- B. If utilized, compacted "Organic-Lock" Paving should not be more than 1/4-inch below the top of the curbing or edging.

## 2.7 INSTALLATION OF "ORGANIC-LOCK" PAVING

- A. Trail or pathway applications shall have a crown or minimum cross slope of 1.5-percent and shall be compacted to minimum of 90-percent.
- B. Placement:
  - a. Place mix using a continuous self-propelled mechanized spreading and finishing machine designed for that purpose.
  - b. Spread "Organic-Lock" Paving to a loose depth of +/- 4-inches, or a specified on drawing of final grade.
  - c. Compact with a 1 to 3-ton roller to achieve the specified compaction.
  - d. Do not use the vibration mode on the roller drums as this may cause the binder to separate from the aggregate and stick to the roller drum and discolor the "Organic-Lock" Paving.
  - e. If material is sticking to the roller drums, lay sheets of 6-millimeter plastic liner and compact with the roller drum.
  - f. A light misting of water may also aid in the compaction sticking of "Organic-Lock" Paving to the roller.
  - g. Compact material making a minimum of 8 passes and up to 10 passes.
  - h. In small areas that are difficult to access with large equipment use a .5-ton reversible plate compactor making a minimum of 8 passes and up to 10 passes.
  - i. Once compaction of the "Organic-Lock" Paving is completed allow for 24-hours as to allow the "Organic-Lock" Paving to cure. Prevent moisture from coming in contact with the "Organic-Lock" Paving during this the first 24-hours of this stage.

## 2.8 TOLERANCES

- A. Finished "Organic-Lock" Paving Compaction versus Detail Drawing Thickness: +/- 3/16-inch.
- B. Finished surface shall be uniform and solid with +/- 3/16-inch variation from a 10-foot long straight edge laid parallel to the center path except at grade breaks. Loose materials or ruts shall not be present on the surface.

## 2.9 MAINTENANCE

- 
- A. In areas of vehicular use and/or with continued exposure to dirt and debris, surface darkening may occur.
  - B. Scarifying the surface 1/8-inch with a nail drag and roller drum will quickly clean the surface and expose fresh underlying "Organic-Lock" Paving material.
  - C. This procedure will become less frequent over time.

#### 2.10 REPAIRS

- A. In areas of repair, remove the damaged "Organic-Lock" Paving material.
- B. With a shovel, square the corners and edges of the area to be repaired.
- C. Scarify the area to be repaired with a rake or nail drag to prevent a poor interface of existing "Organic-Lock" Paving material and fresh "Organic-Lock" Paving material.
- D. Fill in the area of repair with "Organic-Lock" Paving material and compact as instructed in section 2.7 INSTALLATION OF "ORGANIC-LOCK" PAVING.

END OF SECTION

## SECTION 32 18 00

## ARTIFICIAL GRASS SPORTS FIELDS – DUAL FIBER SLIT-FILM/MONOFILAMENT

**PART 1 - GENERAL**

## 1.1 SUMMARY

- A. Furnish all labor, materials, tools and equipment necessary to install slit-film/monofilament artificial grass as indicated on the plans and as specified herein; including components and accessories required for a complete installation. including but not limited to:
1. Review and Acceptance of prepared sub-base.
  2. Coordination with related trades to ensure a complete, integrated, and timely installation: Aggregate base course, sub-base material (tested for permeability), grading and compacting, piping and drain components (when required); as provided under its respective trade section.
- B. Related work specified elsewhere
1. Excavation/earthwork (Not per this Bid)
  2. Concrete (Not per this Bid)
  3. Irrigation (Not per this Bid)
  4. Athletic Grass Base Courses

## 1.2 REFERENCE STANDARDS

- A. FM Factory Mutual
1. P7825 - Approval Guide; Factory Mutual Research Corporation; current edition
- B. ASTM – American Society for Testing and Materials.
1. D1907 - Standard Test Method for Denier
  2. D5848 - Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Covering
  3. D1338 - Standard Test Method for Tuft Bind of Pile Yarn Floor Covering
  4. D1682 - Standard Method of Test for Breaking Load and Elongation of Textile Fabrics
  5. D5034 - Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
  6. F1551 - Standard Test Method for Water Permeability

7. D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
8. F355 - Standard Test Method for Shock-Absorbing Properties of Playing Surfaces.
9. F1936 - Standard Test Method for Shock-Absorbing Properties of North American Football Field Playing Systems as Measured in the Field

### 1.3 SUBMITTALS

- A. Substitutions: Other products are acceptable if in compliance with all requirements of these specifications. Submit alternate products to City/ARCHITECT for review and approval 1 week (5 working days) prior to bid deadline. Submit complete manufacturers product specifications with request for review/approval of alternative products.
  1. Provide a sample copy of insured, non-prorated Ten Year Warranty and insurance policy information. *Note: Submit as part of the Bid*
- B. Comply with Section 01 33 00, Submittals Procedures. Submit for approval prior to fabrication, delivery, and installation.
- C. Shop Drawings:
  1. Indicate field layout; field marking plan and details for the specified sports; i.e., Soccer, Football, Lacrosse, Softball, Baseball, etc.; roll/seaming layout; methods of attachment, field openings and perimeter conditions.
  2. Show installation methods and construction indicating field verified conditions, clearances, measurements, terminations, drainage.
  3. Provide joint submission with related trades when requested by ARCHITECT.
- D. Product Data:
  1. Submit manufacturer's catalog cuts, material safety data sheets (MSDS), brochures, specifications; preparation and installation instructions and recommendations; storage, handling requirements and recommendations.
  2. Submit fiber manufacturer's name, type of fiber and composition of fiber.
  3. Submit data in sufficient detail to indicate compliance with the contract documents.
  4. Submit manufacturer's instructions for installation.
  5. Submit manufacturer's instructions for maintenance for the proper care and preventative maintenance of the synthetic turf system, including painting and markings.
- E. Samples: Submit a synthetic turf sample, 12 x 12 inches, representing the turf carpet portion of the product proposed for this project.

- F. Product Certification:
  - 1. Submit manufacturer's certification that products and materials comply with requirements of the specifications.
  - 2. Submit test results indicating compliance with Reference Standards.
- G. Project Record Documents: Record actual locations of seams, drains and other pertinent information in accordance with Division 1 Specifications Series, General Requirements.
- H. List of existing installations: Submit list including respective project name, location, current OWNER'S REPRESENTATIVE, telephone number, and email address.
- I. Warranties: Submit warranty and ensure that forms have been completed in OWNER'S name and registered with approved manufacturer.
- J. Testing data to the OWNER to substantiate that the finished field meets the required shock attenuation, as per ASTM F1936.
- K. Submit Bills of Lading/Material Delivery Receipts for synthetic turf infill materials. Bills of lading shall bear the name of the project/delivery address, quantity of materials delivered, source/location of origin of infill materials and/or manufacturer, and date of delivery.
- L. Testing Certification: Submit certified copies of independent (third-party) laboratory reports on ASTM testing:
  - 1. Pile Height, Face Weight & Total Fabric Weight, ASTM D5848.
  - 2. Primary & Secondary Backing Weights, ASTM D5848.
  - 3. Tuft Bind, ASTM D1335.
  - 4. Grab Tear Strength, ASTM D1682 or D5034.
  - 5. Shock Attenuation, ASTM F1936
  - 6. Water Permeability, ASTM F1551

#### 1.4 QUALITY ASSURANCE

- A. Comply with Section 01 43 00, Quality Assurance.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section. The turf CONTRACTOR and/or the turf manufacturer:
  - a. Possess a Class A California Engineering CONTRACTOR'S License.

- b. Company shall specialize in performing the work of this section. The Artificial Grass installation CONTRACTOR shall provide employed, competent workmen skilled in this specific type of synthetic grass installation.
- c. The CONTRACTORS designated Superintendent on the project shall be employed and certified, in writing by the turf manufacturer, as competent in the installation of specified dual fiber slit-film/monofilament material, including sewing seams and proper installation of the infill mixture. *Note: Submit manufacturer certification of the qualifications and competency of the superintendents that are to be assigned throughout the duration of the project as part of the bid.*
- d. The artificial grass installer's Superintendent shall have a minimum of 5 years experience as a Superintendent of synthetic turf installations. Submit Superintendents resume (covering 10 year work experience) with listing of similar artificial grass installation projects: project name, size, location, references, contact number, email, etc. as part of the bid. *Note: (See enclosed form for providing required resume/reference material).*
- e. The installers of the artificial grass shall be employed by the artificial grass manufacturer. Third party "subcontracted" installers are not permitted.
- f. Shall have 1,000 synthetic fields or more in play in the U.S. for at least **3 years**. Fields shall be 65,000 ft<sup>2</sup> or more. Provide a listing of the 10 most recent synthetic turf field projects that meet this criteria. The minimum acceptable experience must include direct responsibility for the synthetic turf installation for at least 10 separate synthetic turf projects (minimum of 65,000 square feet of contiguous base/turf fabric area per project) within the last three years. Five separate soccer field and five separate softball/baseball field projects (10 fields total). Separate projects awarded under one contract qualify as an one individual project. These projects must be listed with most recent project date first, the next most recent project date second, etc. The list must include: project name, installation date, location, total size in square feet of base/synthetic turf installation, type of synthetic product, product manufacturer and type of infill; product installer; OWNER of the project as reference and current telephone number, and email. *Note: This complete project listing must be provided with the bid.* The failure to provide an accurate and complete listing, with viable contact phone and email information may be the cause to deem the entire bid as non-responsive and grounds for rejection. *(See enclosed form for providing required reference material).*
- g. Shall have a minimum of 250 fields that are at least **8 years old**, which is equal to the respective warranty period, with the same infill system. Fields shall be 65,000 ft<sup>2</sup> or more. Provide a listing of 10 synthetic field projects that meet this criterion. The minimum acceptable experience must include direct responsibility for the grading, drainage, base and synthetic turf installation for at least 10 separate synthetic turf projects (minimum of 65,000 square feet of contiguous base/turf fabric area per project) five separate soccer field and five softball/baseball field projects (10 field project total). Separate projects



awarded under one contract qualify as an one individual project. These projects must be listed with most recent project date first, the next most recent project date second, etc. The list must include project name, installation date, location, total size in square feet of base/synthetic turf installation, type of synthetic product, product manufacturer and type of infill; product installer; OWNER of the project as reference and current telephone number, and email. This complete project listing must be provided with the bid. The failure to provide an accurate and complete listing, with viable contact phone and email information may be the cause to deem the entire bid as non-responsive and grounds for rejection. *(See enclosed forms for providing required reference material).*

- h. The manufacturer must be a Preferred Producer by all of the following major international governing bodies: FIFA. Submit certificate as part of the bid.
- i. Shall have a minimum of 500 installations in the State of California.
- j. Shall have a minimum of 1 FIFA Quality Pro recommended field in North America.
- k. Shall have minimum 25 NCAA Division1- game and/or practice fields installed for (football or soccer).
- l. Manufacturer must provide proof that its turf systems have been subject to long-term independent, epidemiological and peer reviewed studies proving its ability to provide for a safe surface. Submit as part of the bid.
- m. Manufacturer must provide third-party lab testing proving the heat reduction qualities of the proposed infill composite topdressing layer. Results must show a minimum of 35F benefit in the laboratory setting.
- n. The manufacturer's cooling composite infill must not need water to provide a cooling benefit

C. Installer: Company shall specialize in performing the work of this section. The CONTRACTOR shall provide competent workmen skilled in this specific type of synthetic grass installation.

- 1. The designated Superintendent on the project shall be certified, in writing by the turf manufacturer, as competent in the installation of specified slit-film/monofilament material, including sewing seams and proper installation of the infill mixture.
- 2. The installer Superintendent shall have a minimum of 5 years' experience as either a CONSTRUCTION MANAGER or a superintendent of synthetic turf installations.

D. Pre-Installation Conference: Conduct conference at project site at time to be determined by ARCHITECT. Review methods and procedures related to installation including, but not limited to, the following:

- 1. Inspect and discuss existing site conditions, access, lay down areas, and preparatory work performed under other contracts.
- 2. In addition to the turf installers, arrange for the attendance of any other trades affected

by the field installations, an OWNER'S REPRESENTATIVE, and the ARCHITECT.

- E. The CONTRACTOR shall verify special conditions required for the installation of the system.
- F. The CONTRACTOR shall notify the ARCHITECT of any discrepancies.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01 60 00, Product Requirements.
- B. Prevent contact with materials that may cause dysfunction.
- C. Deliver and store components with labels intact and legible.
- D. Store materials/components in a safe place, under cover, and elevated above grade.
- E. Protect from damage during delivery, storage, handling and installation. Protect from damage by other trades.
- F. Inspect all delivered materials and products to ensure they are undamaged and in good condition.
- G. Comply with manufacturer's recommendations.

#### 1.6 SEQUENCING AND SCHEDULING

- A. Coordinate the Work with installation of work of related trades as the Work proceeds.
- B. Sequence the Work in order to prevent deterioration of installed system.

#### 1.7 WARRANTY AND GUARANTEE

- A. See Section 01780 - Closeout Submittals, For Additional Warranty Requirements.
- B. The CONTRACTOR shall provide a warranty to the OWNER that covers defects in materials and workmanship of the turf for a period of ten (10) years from the date of substantial completion. The turf manufacturer must verify that their representative has inspected the installation and that the work conforms to the manufacturer's requirements. The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, and acts of God beyond the control of the OWNER or the manufacturer. The warranty shall be fully third-party insured; pre-paid for the entire 10 year term and be non-prorated. The CONTRACTOR shall provide a warranty to the OWNER that covers defects in the

installation workmanship, and further warrant that the installation was done in accordance with both the manufacturer's recommendations and any written directives of the manufacturer's representative. Prior to final payment for the synthetic turf, the CONTRACTOR shall submit to OWNER notification in writing that the field is officially added to the annual policy coverage, guaranteeing the warranty to the OWNER. The insurance policy must be underwritten by an "AM Best" A rated carrier and must reflect the following values:

- Pre-Paid 10-year insured warranty from a single source.
- Maximum per claim coverage amount of \$28,000,000.
- Minimum of twenty-eight million dollars (\$28,000,000) annual.
- Must cover full 100% replacement value of total square footage installed, minimum of \$7.00 per sq ft. (in case of complete product failure, which will include removal and disposal of the existing surface)
- Provide a sample copy of insured, non-prorated warranty and insurance policy information.
- Policy cannot include any form of deductible to be paid by the OWNER.
- Baseball/Softball High Use and Slide Zone Areas will have specific warranty verbiage. Total replacement sets for Home Slide Areas at 1st, 2nd, 3rd base for each Baseball and Softball field: 6 Sets Each Field for multi-use baseball fields and 2 sets for championship baseball fields. Total of 40 replacement sets or 120 total replacements. Each Replacement shall be 5'x8'
- Baseball/Softball batters boxes will have specific warranty verbiage. CONTRACTOR shall provide 6 replacement sets for batters boxes for the multi-use fields and 2 sets for the Baseball fields for a total of 40 replacements sets or 80 total 4'x7' batters boxes.

#### 1.8 MAINTENANCE SERVICE

- A. CONTRACTOR shall train the OWNER'S facility maintenance staff in the use of the turf manufacturer's recommended maintenance equipment.
- B. Manufacturer must provide maintenance guidelines and a maintenance video to the facility maintenance staff.

### **PART 2 - PRODUCTS – SOCCER/LACROSSE FIELDS 5-12 & BASEBALL/SOFTBALL FIELDS 1-8**

#### 2.1 MATERIALS AND PRODUCTS

- A. Artificial grass system materials shall consist of the following:

1. Carpet made of slit-film and dual polymer monofilament polyethylene fibers tufted together into each individual stitch, into a non-perforated backing. Alternating row monofilament and slit-film carpet constructions are not permitted.
2. Infill: Controlled mixture of graded sand and cryogenic rubber crumb that partially covers the carpet. A top infill layer of the extruded composite is mandatory.
3. Glue, thread, paint, seaming fabric and other materials used to install and mark the artificial grass slit-film/monofilament.

B. The installed artificial grass slit-film/monofilament shall have the following properties:

Standard	Property	Specification
ASTM D1907	Pile Yarn Type	UV-resistant polyethylene
	Yarn Structure – A	Slit-Film
	Yarn Denier - A	5,000
	Yarn Structure – B	Ridged Monofilament
	Yarn Denier – B	14,000
ASTM D5823	Pile Height	2"
ASTM D5793	Stitch Gauge	3/4"
ASTM D5848	Pile Weight	39+oz/square yard
ASTM D5848	Primary Backing	7+oz/square yard
ASTM D5848	Secondary Backing	14+oz/square yard
ASTM D5848	Total Weight	60+oz/square yard
ASTM D1335	Tuft Bind (Without Infill)	8+lbs
ASTM D5034	Grab Tear (Width)	200 lbs/force
ASTM D5034	Grab Tear (Length)	200 lbs/force
ASTM F1551	Carpet Permeability	>40 inches/hour
ASTM F1936	Impact Attenuation (Gmax)	<200
	Infill Material Depth	1.25 inches
	Sand Infill Component	3.65lbs/square foot
	Cryogenic Infill Component	2lbs/square foot
	Cooling Composite	0.6lbs/square foot
	Total Product Weight	960oz/square yard

*Variation of +/- 5% on above listed properties is within normal manufacturing tolerances*

- C. Carpet shall consist of dual fiber slit-film/monofilament fibers tufted into a primary backing with a secondary backing.
- D. Carpet Rolls shall be 15' wide rolls.
  1. Rolls shall be long enough to go from field sideline to sideline.
  2. Where the playing field is for football, the perimeter white line shall be tufted into the individual sideline rolls.

**E. Backing:**

1. Primary backing shall be a double-layered polypropylene fabric.
2. Secondary backing shall consist of an application of porous, heat-activated urethane to permanently lock the fiber tufts in place.
3. Perforated (with punched holes), backed carpet are unacceptable.

**F. Monofilament fibers shall be 14,000 denier, slit-film fibers shall be 5000 denier - both fibers shall be low friction, and UV-resistant, measuring not less than 2 inches high. Each monofilament fiber is extruded with two layers of polyethylene polymers. A rigid polyethylene polymer as the inner core of the fiber for superior resilience and a soft yet extremely durable polyethylene polymer as the outer shell of the fiber for a realistic grass-like feel.**

1. Systems with less than 2 inch fibers are unacceptable.

**G. Infill materials shall be approved by the manufacturer.**

1. Infill shall consist of a resilient 3-layered granular system, comprising selected and graded dust-free silica sand and SBR rubber crumb.
2. Artificial Grass products without cryogenic SBR rubber and a top layer of the extruded composite will not be acceptable.
3. Cooling composite must have a bulk density of 0.55 g/cm<sup>3</sup> +/- 15% and a specific gravity of greater than 1.

**H. Non-tufted or inlaid lines and markings shall be painted with paint approved by the synthetic turf manufacturer.****I. Thread for sewing seams of turf shall be as recommended by the synthetic turf manufacturer.****J. Glue and seaming fabric for inlaying lines and markings shall be as recommended by the synthetic turf manufacturer.****PART 3 - PRODUCTS – FOOTBALL/SOCCER FIELDS 1-4****3.1 MATERIALS AND PRODUCTS****A. Artificial grass system materials shall consist of the following:**

1. Carpet made of slit-film and dual polymer monofilament polyethylene fibers tufted together into each individual stitch, into a non-perforated backing. Alternating row monofilament and slit-film carpet constructions are not permitted.

2. Infill: Controlled mixture of graded sand and cryogenic rubber crumb that partially covers the carpet. A top infill layer of the extruded composite is mandatory.
3. Glue, thread, paint, seaming fabric and other materials used to install and mark the artificial grass slit-film/monofilament.

B. The installed artificial grass slit-film/monofilament shall have the following properties:

Standard	Property	Specification
ASTM D1907	Pile Yarn Type	UV-resistant polyethylene
	Yarn Structure – A	Slit-Film
	Yarn Denier - A	5,000
	Yarn Structure – B	Ridged Monofilament
ASTM D5823	Yarn Denier – B	14,000
	Pile Height	2.5"
ASTM D5793	Stitch Gauge	3/4"
ASTM D5848	Pile Weight	47+oz/square yard
ASTM D5848	Primary Backing	7+oz/square yard
ASTM D5848	Secondary Backing	14+oz/square yard
ASTM D5848	Total Weight	68+oz/square yard
ASTM D1335	Tuft Bind (Without Infill)	8+lbs
ASTM D5034	Grab Tear (Width)	200 lbs/force
ASTM D5034	Grab Tear (Length)	200 lbs/force
ASTM F1551	Carpet Permeability	>40 inches/hour
ASTM F1936	Impact Attenuation (Gmax)	<200
	Infill Material Depth	1.75 inches
	Sand Infill Component	6.2lbs/square foot
	Cryogenic Infill Component	2.4lbs/square foot
	Cooling Composite	0.6lbs/square foot

*Variation of +/- 5% on above listed properties is within normal manufacturing tolerances*

- C. Carpet shall consist of slit-film/monofilament fibers tufted into a primary backing with a secondary backing.
- D. Carpet Rolls shall be 15' wide rolls.
  1. Rolls shall be long enough to go from field sideline to sideline.
  2. Where the playing field is for football, the perimeter white line shall be tufted into the individual sideline rolls.
- E. Backing:
  1. Primary backing shall be a double-layered polypropylene fabric.

2. Secondary backing shall consist of an application of porous, heat-activated urethane to permanently lock the fiber tufts in place.
  3. Perforated (with punched holes), backed carpet are unacceptable.
- F. Monofilament fibers shall be 14,000 denier, slit-film fibers shall be 5000 denier - both fibers shall be low friction, and UV-resistant, measuring not less than 2.5 inches high. Each monofilament fiber is extruded with two layers of polyethylene polymers. A rigid polyethylene polymer as the inner core of the fiber for superior resilience and a soft yet extremely durable polyethylene polymer as the outer shell of the fiber for a realistic grass-like feel.
1. Systems with less than 2.5 inch fibers are unacceptable.
- G. Infill materials shall be approved by the manufacturer.
1. Infill shall consist of a resilient 3-layered granular system, comprising selected and graded dust-free silica sand and SBR rubber crumb.
  2. Artificial Grass products without cryogenic SBR rubber and a top layer of the extruded composite will not be acceptable.
  3. Cooling composite must have a bulk density of 0.55 g/cm<sup>3</sup> +/- 15% and a specific gravity of greater than 1.
- H. Non-tufted or inlaid lines and markings shall be painted with paint approved by the synthetic turf manufacturer.
- I. Thread for sewing seams of turf shall be as recommended by the synthetic turf manufacturer.
- J. Glue and seaming fabric for inlaying lines and markings shall be as recommended by the synthetic turf manufacturer.

### 3.2 QUALITY CONTROL IN MANUFACTURING

- A. The manufacturer shall own and operate its own manufacturing plant in North America. Both tufting of the field fibers into the backing materials and coating of the turf system must be done in-house by the turf manufacturer. Outsourcing of either is unacceptable.
- B. The manufacturer shall have full-time certified in-house inspectors at their manufacturing plant that are experts with industry standards.
- C. The manufacturer's full-time in-house certified inspectors shall perform pre-tufting fiber testing on tensile strength, elongation, tenacity, denier, shrinkage, and twist i.e., turns per inch, upon receipt of fiber spools from fiber manufacturer.

- D. Primary backing shall be inspected by the manufacturer's full-time certified in-house inspectors before tufting begins.
- E. The manufacturer's full-time in-house certified inspectors shall verify "pick count", yarn density in relation to the backing, to ensure the accurate amount of face yarn per square inch.
- F. The manufacturer's full-time, in-house, certified inspectors shall perform turf inspections at all levels of production including during the tufting process and at the final stages before the turf is loaded onto the truck for delivery.
- G. The manufacturer shall have its own, in-house laboratory where samples of turf are retained and analyzed, based on standard industry tests, performed by full-time, in-house, certified inspectors.
- H. The manufacturer must have ISO 9001, ISO 14001 and OHSAS 18001 certifications demonstrating its manufacturing efficiency with regards to quality, environment and safety management systems.

### 3.3 FIELD GROOMER & SWEEPER

- A. Supply field groomer as part of the work.
  - 1. Field Groomer shall include a towing attachment compatible with a field utility vehicle.
  - 2. Field Sweeper shall include a towing attachment compatible with a field utility vehicle.

## PART 4 - EXECUTION

### 4.1 EXAMINATION

- A. Verify that all sub-base leveling is complete prior to the turf installation.
- B. Installer shall examine the surface to receive the synthetic turf and accept the sub-base planarity in writing prior to the beginning of installation.
  - 1. Acceptance is dependent upon the OWNER'S test results indicating compaction and planarity are in compliance with manufacturer's specifications.
  - 2. The surface shall be accepted by Installer as "clean" as installation commences and shall be maintained in that condition throughout the process.
- C. Correct conditions detrimental to timely and proper completion of Work.
- D. Do not proceed until unsatisfactory conditions are corrected.



- E. Beginning of installation means acceptance of existing conditions.

#### 4.2 PREPARATION

- A. Prior to the beginning of installation, inspect the sub-base for tolerance to grade.
- B. Sub-base acceptance shall be subject to receipt of test results (by others) for compaction and planarity that sub-base is in compliance with manufacturer's specifications and recommendations.
- C. Dimensions of the field and locations for markings shall be measured by a registered surveyor to verify conformity to the specifications and applicable standards. A record of the finished field as-built measurements shall be made.
- D. When requested by ARCHITECT, installed sub-base shall be tested for porosity prior to the installation of the slit-film/monofilament turf. A subbase that drains poorly is an unacceptable substrate

#### 4.3 INSTALLATION - GENERAL

- A. The installation shall be performed in full compliance with approved Shop Drawings.
- B. Only trained technicians, skilled in the installation of athletic caliber synthetic turf systems working under the direct supervision of the approved installer supervisors, shall undertake any cutting, sewing, gluing, shearing, top-dressing or brushing operations.
- C. The designated Supervisory personnel on the project must be certified, in writing by the turf manufacturer, as competent in the installation of this material, including sewing seams and proper installation of the Infill mixture.
- D. Designs, markings, layouts, and materials shall conform to all currently applicable National Collegiate Athletic Association rules, NFHS rules, and/or other rules or standards that may apply to this type of synthetic grass installation. Designs, markings and layouts shall first be approved by the ARCHITECT or OWNER in the form of final shop drawings. All markings will be in full compliance with final shop drawings.

#### 4.4 INSTALLATION

- A. Install at location(s) indicated, to comply with final shop drawings, manufacturers'/installer's instructions.
- B. The CONTRACTOR shall strictly adhere to specified procedures. Any variance from these requirements shall be provided in writing, by the manufacturer's on-site representative, and submitted to the ARCHITECT and/or OWNER, verifying that the changes do not in any way affect the Warranty. Infill materials shall be approved by the

manufacturer and installed in accordance with the manufacturer's standard procedures.

- C. Carpet rolls shall be installed directly over the properly prepared aggregate base. Extreme care shall be taken to avoid disturbing the aggregate base, both in regard to compaction and planarity.
  - 1. Repair and properly compact any disturbed areas of the aggregate base as recommended by manufacturer
- D. Full width rolls shall be laid out across the field.
  - 1. Turf shall be of sufficient length to permit full cross-field installation from sideline to sideline.
  - 2. Each roll shall be attached to the next roll utilizing standard state-of-the-art sewing procedures.
  - 3. When all of the rolls of the playing surface have been installed, the sideline areas shall be installed at right angles to the playing surface.
- E. Artificial turf panel seams shall be sewn along the selvedge edging flap of the turf roll. Seams secured by other means including gluing are unacceptable. Installation shall be 99% sewn.
  - 1. Minimum gluing will only be permitted to repair problem areas, corner completions, and to cut in any logos or inlaid lines as required by the specifications.
  - 2. Seams shall be flat, tight, and permanent with no separation or fraying.
  - 3. In the case of all lines and logos, field fibers must be sheared to the backing (do not cut the backing) and adhered using hot melt adhesives.
- F. Infill Materials:
  - 1. Infill materials shall be applied in numerous thin lifts. The turf shall be brushed as the mixture is applied. The infill material shall be installed to a depth determined by the manufacturer.
  - 2. Three-layered infill shall be installed in a systematic order.
- G. Non-tufted or inlaid lines and markings shall be painted in accordance with turf and paint manufacturers' recommendations. Number of applications will be dependent upon installation and field conditions.
- H. Synthetic turf shall be attached to the perimeter edge detail in accordance with the manufacturer's standard procedures.
- I. Upon completion of installation, the finished field shall be inspected by the installation

crew and an installation supervisor.

#### 4.5 FIELD MARKINGS

- A. Field markings shall be installed in accordance with approved shop drawings. If football is designated as the primary sport, all five-yard lines will be tufted-in.
- B. Balance of sports markings will be inlaid or painted in accordance with the Drawings.

#### 4.6 ADJUSTMENT AND CLEANING

- A. Do not permit traffic over unprotected surface.
- B. CONTRACTOR shall provide the labor, supplies, and equipment as necessary for final cleaning of surfaces and installed items.
- C. All usable remnants of new material shall become the property of the OWNER.
- D. The CONTRACTOR shall keep the area clean throughout the project and clear of debris.
- E. Surfaces, recesses, enclosures, and related spaces shall be cleaned as necessary to leave the work area in a clean, immaculate condition ready for immediate occupancy and use by the OWNER.

#### 4.7 PROTECTION

- A. Protect installation throughout construction process until date of final completion.

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 32 18 13**  
**SYNTHETIC GRASS SURFACING - BATTING CAGES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Furnish all labor, materials, tools and equipment necessary to install synthetic grass surfacing system as indicated on the plans and as specified herein; including components and accessories required for a complete installation, including but not limited to:
1. Acceptance of prepared sub-base.
  2. Coordination with related trades to ensure a complete, integrated, and timely installation: sub-base material (tested for permeability), grading and compacting, piping and drain components (when required); as provided under its respective trade section.

**1.2 PERFORMANCE REQUIREMENTS**

- A. Completed synthetic grass surfacing system shall be capable of meeting the following performance requirements:
1. ASTM D1338: Tuft bind. Synthetic grass surfacing shall have a tuft bind, without infill material of 8 pounds or more.

**1.3 SUBMITTALS**

- A. Substitutions: Other products are acceptable if in compliance with all requirements of these specifications. Submit alternate products to ARCHITECT for approval prior to bidding.
- B. Product Substitution Procedures.
1. Provide substantiation that proposed system does not violate any other manufacturer's patents, patents allowed or patents pending.
  2. Provide a sample copy of insured, warranty and insurance policy information.
  3. Provide specification sheets showing compliance
- Product Data:
4. Submit manufacturer's catalog cuts, material safety data sheets (MSDS), brochures, specifications; preparation and installation instructions and recommendations.
  5. Submit fiber manufacturer's name, type of fiber and composition of fiber.
  6. Submit data in sufficient detail to indicate compliance with the contract documents.
  7. Submit manufacturer's instructions for installation.
- C. Samples: Submit samples, illustrating details of finished product in amounts as required, or as requested by ARCHITECT.
- D. List of existing installations: Submit list including respective OWNER'S REPRESENTATIVE and telephone number.
- E. Warranties: Submit warranty and ensure that forms have been completed in OWNER'S name and registered with approved manufacturer.

**1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Engaged in manufacturing synthetic grass surfacing products for a minimum of fifteen (15) years.
1. The Manufacturer shall be experienced in the manufacturing and installation of specified type of synthetic grass surfacing system. This includes use of a slit-film fiber, thatch fiber, backing,

- the backing coating, and the installation method.
  - 2. The Manufacturer shall own and operate its own manufacturing plant. Manufacturing the fiber, tufting of the fibers into the backing materials and coating of the synthetic grass system must be done in-house by manufacturer.
- B. Installer/CONTRACTOR Qualifications: Company shall specialize in performing the work of this section.
  - 1. The Company shall provide competent workmen skilled in this specified type of synthetic grass system installation.
  - 2. The designated Supervisory Personnel on the project shall be certified, in writing by the manufacturer, as competent in the installation of specified type of synthetic grass system, including gluing seams.
  - 3. The Company shall be certified by the manufacturer and licensed (if required).
- C. Pre-Installation Conference: Conduct conference at project site at time to be determined by ARCHITECT. Review methods and procedures related to installation including, but not limited to, the following:
  - 1. Inspect and discuss existing conditions and preparatory work performed under other contracts.
  - 2. In addition to the CONTRACTOR and the installer, arrange for the attendance of other Trades affected by the Work, The OWNER'S REPRESENTATIVE, and the ARCHITECT.
- D. The Installer/CONTRACTOR shall verify special conditions required for the installation of the synthetic grass system if required.
- E. The Installer/CONTRACTOR shall notify the ARCHITECT of any discrepancies.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store components with labels intact and legible.
- B. Store materials/components in a secure manner, under cover and elevated above grade.
- C. Protect from damage during storage, handling and installation. Protect from damage by other trades.
- D. Inspect all delivered materials and products to ensure they are undamaged and in good condition.

## **1.6 SEQUENCING AND SCHEDULING**

- A. Coordinate the Work with installation of work of related trades as the Work proceeds.
- B. Sequence the Work in order to prevent deterioration of installed system.

## **1.7 WARRANTY**

- A. The Installer/CONTRACTOR shall provide a warranty to the OWNER that covers defects in materials and workmanship of the synthetic grass product for a period of five (5) years from the date of completion.

# **PART 2 - PRODUCTS**

## **2.1 MATERIALS AND PRODUCTS**

- A. Synthetic grass surfacing system shall consist of the following:
  - 1. Synthetic grass surfacing made with a combination of slit-film fibers and thatch fibers
  - 2. Attached Pad: 5mm urethane pad

3. Infill: No infill required
4. Glue, seaming fabric and other materials used to install and mark the synthetic grass.
5. Transition strip around the perimeter edge shall be SafePath TurfEdge Reducer 200 (0.5" thick)

B. Synthetic grass surfacing system shall have the following properties:

Standard	Property	Specification
ASTM D1577	Fiber Denier	10,000 +
ASTM D1577	Secondary Fiber Denier	5,000
ASTM D5823	Pile Height	0.75"
ASTM D5793	Stitch Gauge	3/16"
ASTM D5848	Pile Weight	40 oz/square yard
ASTM D5848	Primary Backing	8+ oz/square yard
ASTM D5848	Secondary Backing	20+ oz/square yard
N/A	5mm Urethane Pad	61+ oz/square yard
ASTM D5848	Total Weight (including pad)	129+ oz/square yard
ASTM D1338	Tuft Bind (Without Infill)	8lbs
N/A	Infill Component	NA

Variation of +/- 5% on above listed property values is within normal manufacturing tolerances

## 2.2 QUALITY CONTROL IN MANUFACTURING

- A. The manufacturer shall own and operate its own manufacturing plant in North America
- B. The manufacturer shall have full-time certified in-house inspectors at their manufacturing plant that are experts with industry standards.
- C. The manufacturer's full-time in-house certified inspectors shall perform pre-tufting fiber testing on tensile strength, elongation, tenacity, and denier, upon receipt of fiber spools from fiber manufacturer.
- D. Primary backing shall be inspected by the manufacturer's full-time certified in-house inspectors before tufting begins.
- E. The manufacturer's full-time in-house certified inspectors shall verify "pick count", yarn density in relation to the backing, to ensure the accurate amount of face yarn per square inch.
- F. The manufacturer's full-time, in-house, certified inspectors shall perform product inspections at all levels of production including during the tufting process and at the final stages before the synthetic grass is loaded onto the truck for delivery.
- G. The manufacturer shall have its own, in-house laboratory where samples of synthetic grass are retained and analyzed, based on standard industry tests, performed by full-time, in-house, certified inspectors.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that all sub-base leveling is complete prior to installation.
- B. Installer/CONTRACTOR shall examine the surface to receive the synthetic grass and accept the sub-base planarity in writing prior to the beginning of installation.
  1. Acceptance is dependent upon the OWNER'S test results being in compliance with manufacturer's specifications.
  2. The surface shall be accepted by Installer as "clean" as installation commences and shall be

maintained in that condition throughout the process.

- C. Correct conditions detrimental to timely and proper completion of Work.
- D. Do not proceed until unsatisfactory conditions are corrected.
- E. Beginning of installation means acceptance of existing conditions.

### **3.2 PREPARATION**

- A. Prior to the beginning of installation, inspect the sub-base for tolerance to grade.
- B. Sub-base acceptance shall be subject to receipt of test results (by others) that sub-base is in compliance with manufacturer's specifications and recommendations.
- C. When requested by ARCHITECT, installed sub-base shall be tested for drainage prior to the installation of the synthetic grass system.

### **3.3 INSTALLATION**

- A. The installation shall be performed in full compliance with approved Shop Drawings.
- B. Only trained technicians, skilled in the installation of synthetic grass systems working under the direct supervision of the approved installer supervisors, shall undertake any cutting, sewing, gluing and shearing.
- C. The designated Supervisory personnel on the project must be certified, in writing by the manufacturer, as competent in the installation of this material, including gluing seams.
- D. Install at location(s) indicated, to comply with final shop drawings, manufacturers'/installer's instructions.
- E. The Installer/CONTRACTOR shall strictly adhere to specified procedures. Any variance from these requirements shall be provided in writing, by the manufacturer's on-site representative, and submitted to the ARCHITECT and/or OWNER, verifying that the changes do not in any way affect the Warranty.
- F. Synthetic grass system shall be installed directly over the properly prepared concrete floor. Extreme care shall be taken to avoid disturbing the base.
  - 1. Repair and properly compact any disturbed areas of the base as recommended by manufacturer.
  - 2. Seams shall be flat, tight, and permanent with no separation or fraying.

### **3.4 PROTECTION**

Protect completed synthetic grass surfacing system throughout construction process until project completed.

END OF SECTION



**SECTION 32 18 16****SYNTHETIC RESILIENT SURFACING****PART 1 - GENERAL****1.1 DESCRIPTION**

All labor, materials and incidentals necessary to furnish and install complete playground equipment as shown on the Plans and described herein.

**1.2 RELATED WORK IN OTHER SECTIONS:**

- A. Section 33 40 00: Storm Drainage Utilities
- B. Section 31 23 00: Excavation and Fill
- C. Section 32 13 13: Concrete Paving
- D. Section 11 68 13: Playground Equipment

**1.3 LICENSES:**

CONTRACTOR shall have a California State CONTRACTOR'S License C61 (D12). Limited Specialty, Synthetic Materials.

**1.4 References:**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
  - 2. ASTM D624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
  - 3. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
  - 4. ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials.
  - 5. ASTM E303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
  - 6. ASTM F1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment.
  - 7. ASTM F1951 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment.

**1.5 SUBMITTAL OF "APPROVED EQUAL"**

In addition to "Item Equivalency" of the General Requirements, Bidders shall comply with the following requirements:

- A. Bidder shall submit a sample measuring 12 inch x 12 inch x 1/2 inch thick with tapered edge for each color and mixture of colors indicated on the plans and details.
- B. Bidder shall submit the following test results:
  - 1. ASTM F 1292 Impact Attenuation Test Data.
  - 2. ASTM E 108 Flame Test Data. Product shall exhibit a minimum of Class A rating.

3. ASTM E 303 Skid Resistance Test Data.

Above test results shall be certified and submitted on the letterhead of an independent testing laboratory. Test results shall meet or exceed U.S. Consumer Products Safety Commission Standards and the Standard Consumer Performance Specification for Playground Equipment for Public Use.

4. Bidder shall submit verifiable documentation of a minimum of 10 poured-in-place protective surface projects completed in the State of California, dating back 5 years or less, where the proposed "or approved equal" resilient surfacing was used. Include the project name, project cost, completion date, contract person, and telephone numbers.

## 1.6 WARRANTIES AND CERTIFICATION:

Upon completion of the Work, and as a condition for acceptance by the City, the CONTRACTOR shall furnish the Engineer the following:

- A. Written warranty by the protective surface installer as described herein.
- B. Certificate of compliance that all protective playground surfacing has been installed in accordance with the manufacturer's specifications.
- C. Certificate of compliance that all protective playground surfacing meets or exceeds the U.S. Consumer Product Safety Commission Standards and the Standard Consumer Performance Specification for Playground Equipment for Public Use.
- D. The CONTRACTOR shall submit to the City a written 10-year warranty from the installer against all defects in material or workmanship. The warranty shall begin on the date of final acceptance of Work.

## PART 2 - PRODUCTS

### 2.1 POURED-IN-PLACE PROTECTIVE PLAYGROUND SURFACE

- A. Install SpectraPour Supreme poured-in-place rubber playground surfacing or approved equal. Rubber surfacing shall include resilient rubber, wearing course, binder, and all other associated materials as required by the manufacturer. Color per construction details. Telephone: (800) 875-5788. Submit minimum 12" x 12" sample of each color specified in construction details.
- B. The CONTRACTOR shall provide all services and products to ensure a complete installation of resilient playground surfacing.
- C. The resilient surfacing shall conform to ASTM-F-1292-91, ASTM-F-35586 Class A flame spread, ASTM E108.
- D. Thickness of resilient surfacing must match fall heights of proposed play equipment per Consumer Product Safety Commission. CONTRACTOR shall confirm thickness requirements with playground equipment manufacturer prior to installation.
- E. Sub-base preparation and drainage including any necessary excavation will be the sole responsibility of the CONTRACTOR and shall be included in the square footage cost for resilient surfacing.

- F. Concrete curbing must be installed below grade to confine the resilient surfacing and will be installed per Plans and Specifications.
- G. 4" minimum concrete over compacted dirt shall be installed under all resilient surfacing as specified. Confirm thickness with civil engineer's plans and details.
- H. Compaction of sub-base material shall be at 90% minimum, or per geotechnical report.
- I. Compacted sub-base shall be level and uniform.
- J. Compacted sub-grade shall be graded for drainage at a 1-2%. See civil engineering plans and details for specific grades.
- K. Resilient surfacing will be poured in place and its intended use will be for a shock absorbing surface under and around playground equipment.
- L. The resilient surfacing will be porous, seamless, and capable of installing at various thicknesses.
- M. Resilient surfacing is a two-layer system consisting of a base mat cushion layer covered by a weather resistant wearing layer with aliphatic or aromatic binder. Binder type is dependent upon rubber color. See rubber surfacing finish schedules and refer to manufacturer specifications.
- N. Basemat Cushion Course: Per specifications of "SpectraPourSupreme". The resilient surfacing shall be an installed thickness as specified below and ASTM F1292 requirements for critical fall height:

<u>Overall Thickness</u>	<u>Critical Fall Height</u>
2"	4'
2-1/2"	5'
3"	6'
3-3/4"	8'
4-1/2"	10'
5"	12'

- O. Wearing course per Specifications of "SpectraPour Supreme" The wearing course shall be at installed nominal thickness per manufacturer's specifications.

All wearing courses color to be approved by City Representative prior to installation. Color shown on plan for bid purposes. Submit samples for City Representative review prior to installation.

- P. Wearing course shall be hand troweled to produce an even, uniform surface. All edges to be transitioned to a beveled or flush condition.
- Q. A five-year guarantee against defects in materials and workmanship must be provided in writing to the City prior to project completion.

## **PART 3 - EXECUTION**

### **3.1 RESILIENT SURFACING**

- A. Areas where resilient surfacing is to be installed shall be excavated, graded, and compacted as required to meet elevations shown on the Plans.
- B. Portland cement concrete improvements shall be constructed in accordance with the details shown on the Plans.
- C. Cushion Course – Install per manufacturer’s specifications and the Plans.
- D. Wearing Course – Install per manufacturer’s specifications and the Plans.
- E. Finish – The wearing course shall be hand troweled to produce an even, uniform surface. The finish course shall be sloped to drain as indicated on the Plans.

**END OF SECTION**

**SECTION 32 31 13**  
**CHAIN LINK FENCES AND GATES**

**PART 1 – GENERAL**

**1.01 SECTION INCLUDES**

- A. Galvanized (zinc) coated chain link fabric with galvanized steel framework and accessories for site chain link, backstops, ball containment, gates, and hardware.

**1.02 RELATED SECTIONS**

- 01 33 23 Shop drawings, product data
- 01 45 00 Quality control
- 03 30 00 Cast-In-Place Concrete

**1.03 REFERENCES**

- A. ASTM A36 Standard Specification for Carbon Structural Steel
- B. ASTM A121 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
- C. ASTM A392 Standard Specification for Zinc-Coated Steel Chain-Link Fabric
- D. ASTM A780 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-dip Galvanized Coatings
- E. ASTM A817 Standard Specification for Metallic-Coated Steel Wire for Chain Link Fence Fabric and Marcellled Tension Wire
- F. ASTM A824 Standard Specification for Metallic-Coated Steel Marcellled Tension Wire for Use With Chain Link
- G. ASTM B221 Standard Specification for Aluminum and Aluminum Alloy Bars, Rods, Wire Profiles and Tubes
- H. ASTM F552 Standard Terminology Relating to Chain Link Fencing
- I. ASTM F567 Standard Practice for Installation of Chain Link Fence
- J. ASTM F626 Standard Specification for Fence Fittings
- K. ASTM F900 Standard Specification for Industrial and Commercial Swing Gates

- L. ASTM F1043 Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework
- M. ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
- N. ASTM F1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates
- O. UL 325 Door, Drapery, Gate, Louver and Window Operators
- P. WLG2445 Chain Link Fence Manufacturers Institute, Chain Link Fence Wind Load Guide for the Selection of Line Posts and Line Post Spacing

#### **1.04 SUBMITTALS**

- A. Changes in specifications may not be made after the bid date.
- B. Shop drawings: Layout of fences and gates with dimensions, details, and finishes of components, accessories, and post foundations.
- C. Product data: Manufacturer's catalog cuts indicating material compliance and specified options.
- D. Samples: samples of materials (e.g., fabric, wires, and accessories).

#### **1.05 QUALITY ASSURANCE**

- A. Contractors responsible for the chain link fencing shall:
  - 1. Possess a C13 California Engineering Contractor's License and all necessary Contractor's Licenses required by the jurisdiction in which the project is located.
  - 2. The fencing contractor (company) shall have a minimum of 15 years experience in the installation of ballfield fencing projects. Experience shall include (10) Baseball backstop/fencing projects in southern California within the last 3 years that are a minimum of \$1,000,000. in fencing contract. Upon request the fencing contractor shall submit a listing of (10) projects completed in the previous 3 years in southern California and include: project name, location, project owner/contact representative, contact number, email, etc. for each project. Failure to provide this requested information within 3 business days shall be grounds for rejection of bid.
  - 3. Due to the projects compressed construction schedule and the necessary interaction between the ball containment netting contractor and the chain link fencing/backstop contractor, the chain link contractor shall provide a listing of (3) representative southern California Baseball backstop/fencing/netting projects that they have simultaneously worked on in conjunction with the ball containment netting contractor. Projects shall have been completed within the previous 3 years in southern California and include: project name, location, project owner/contact representative, contact number, email, etc. for each project. Failure to provide this requested information within 3 business days shall be grounds for rejection of bid. Note: This listing of projects is intended to demonstrate a proven ability to work in conjunction with the ball containment netting contractor.

B. Contractors responsible for the chain link fencing shall:

1. Possess a Class B California Engineering Contractor's License and all necessary Contractor's Licenses required by the jurisdiction in which the project is located.
2. The netting contractor (company) shall have a minimum of 15 years experience in the installation of ballfield netting projects. Experience shall include (10) Baseball backstop/fencing projects in southern California within the last 3 years that are a minimum of \$250,000. in netting/poles contract. Upon request the netting contractor shall submit a listing of (10) projects completed in the previous 3 years in southern California and include: project name, location, project owner/contact representative, contact number, email, etc. for each project. Failure to provide this requested information within 3 business days shall be grounds for rejection of bid.
3. Due to the projects compressed construction schedule and the necessary interaction between the ball containment netting contractor and the chain link fencing/backstop contractor, the netting contractor shall provide a listing of (3) representative southern California Baseball backstop/fencing/netting projects that they have simultaneously worked on in conjunction with the chain link fencing contractor. Projects shall have been completed within the previous 3 years in southern California and include: project name, location, project owner/contact representative, (if a school project, provide the name of the Director of Facilities, contact number, email, etc. for each project. Failure to provide this requested information within 3 business days of request shall be grounds for rejection of bid. *Note: This listing of projects is intended to demonstrate a proven ability to work in conjunction with the chain link fencing contractor.*

C. Tolerances: ASTM current specification and tolerances apply and supersede any conflicting tolerance.

D. Substitutions: Alternate chain link products may be acceptable by the ARCHITECT as equal if approved in writing ten days prior to bidding provided that the items submitted meet the specifications contained in this document.

E. Single source: To ensure system integrity obtain the chain link system, framework, fabric, fittings, gates and accessories from a single source.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURER

Approved Manufacturer: Master Halco, Inc.

3010 Lyndon B Johnson  
Freeway Dallas, TX. 75234  
Phone (800) 883-8384

[www.masterhalco.com](http://www.masterhalco.com) E-mail: [spec@fenceonline.com](mailto:spec@fenceonline.com)

**2.02 8' and 20' ht chain link/netting fence posts**

- A. 8' Ht chain link post shall be 2 7/8" OD Galvanized steel pipe, with Permafused II, Midnight Black finish (min 10 mil thickness) DQ 40 pipe, Group 1c with a minimum yield strength of 50,000 psi. (4.64 lbs/ft).
- B. 20' Ht chain link/netting post shall be 6-5/8" OD Galvanized steel pipe, with Permafused II, Midnight Black finish (min 10 mil thickness)

**2.03 CHAIN LINK MATERIALS/NETTING FENCE POSTS (POST DIMENSIONS ARE ABOVE GROUND AND DO NOT INCLUDE FOOTING EMBEDMENT)**

- A. "All" chain link materials (posts, fabric, 1 7/8" swing gate frames, hardware, heavy duty hinges, heavy duty fork latches, post caps, tension bars, brace bands, custom brace bands, 6ga core/5ga finish tie wires, etc.) shall be provided by Master Halco and shall be galvanized and coated with Permafused II color "Midnight Black".
- B. "All" chain link fabric shall be 2" mesh, 6 ga Permafused II- polyolefin fused and adhered to zinc-coated steel wire per ASTM F 668 Class 2b- 6ga core/5ga finish
- C. 8' Ht chain link post shall be 2 7/8" OD Galvanized steel pipe, with Permafused II, Midnight Black finish (min 10 mil thickness)
- D. DQ 40 or LG40 pipe, Group 1c with a minimum yield strength of 50,000 psi. (4.64 lbs/ft).
- E. 20' Ht chain link/netting post shall be 6 5/8" OD Galvanized steel pipe, with Permafused II, Midnight Black finish (min 10 mil thickness)
- F. Schedule 40 – ASTM F1083 Intermediate Grade 50,000 psi yield.
- G. 30'Ht netting post shall be 8 5/8" OD steel pipe, schedule per structural plans and details, shall be capped with 1/4" steel plate, galvanized and shall be prepped and powder coated Satin Black per H & M Welding and Powder Coating (909) 559-8732
- H. 40'Ht netting post shall be 16" OD steel pipe, schedule per structural plans and details, shall be capped with 1/4" steel plate, fabricated with extension arm, galvanized and shall be prepped and powder coated Satin Black per H & M Welding and Powder Coating (909) 559-8732
- I. All backstop brackets for supporting and containing the molded synthetic wood shall be fabricated per details, galvanized and shall be prepped and powder coated Satin Black per H & M Welding and Powder Coating (909) 559-8732



- J. All bolts, fasteners, washers, nuts, shouldered eyebolts, etc. shall be galvanized and shall be prepped and powder coated ~~Satin Black per H & M Welding and Powder Coating (909) 559-8732~~ per SECTION 09 90 00 PAINTING AND COATING AND 09 94 00 POWDER COATING

## 2.04 CHAIN LINK SWING GATE

- A. Swing gates: Sizes and dimensions per plans and details. Galvanized steel pipe, with Permafused II, Midnight Black finish (min 10 mil thickness)
- B. Hinges, hot dip galvanized Permafused II, Midnight Black finish (min 10 mil thickness), structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180° (3.14 rad)
- C. Latch: Galvanized Permafused II, Midnight Black finish (min 10 mil thickness) forked type capable of retaining gate in closed position and have provision for padlock. Latch shall permit operation from either side of gate.
- D. Double gates: Provide galvanized drop rod with center gate stop pipe or receiver to secure inactive leaf in the closed position. Provide galvanized Permafused II, Midnight Black finish (min 10 mil thickness) locking latch, requiring one padlock for locking both gate leaves, accessible from either side.
- E. Gate holdback: Provide galvanized Permafused II, Midnight Black finish (min 10 mil thickness) gate hold back keeper for each gate leaf over 5' (1524 mm) wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
- F. Gate posts:

Gate fabric height up to and including 6 ft. (1.2m)

Gate leaf width	Outside Diameter
up to 4 ft. (1.2 m)	2.375 in. (60.3 mm)
over 4 ft. to 10 ft. (1.2 to 3.05 m)	2.875 in. (73.0 mm)
over 10 ft. to 18 ft. (3.05 to 5.5 m)	4.000 in. (101.6 mm)

Gate fabric height over 6 ft. to 12 ft. (1.2 to 2.4m)

Gate leaf width	Outside Diameter
up to 6 ft. (1.8 m)	2.875 in. (73.0 mm)
over 6 ft. to 12 ft. (1.8 to 3.7 m)	4.000 in. (101.6 mm)
over 12 ft. to 18 ft. (2.4 to 5.5 m)	6.625 in. (168.3 mm)
over 18 ft. to 24 ft. (5.5 to 7.3 m)	8.625 in. (219.1 mm)

- G. Single gates shall be supplied with a galvanized PermaFused II, Midnight Black finish (min 10 mil thickness) steel latch mechanism capable of securing the gate with a padlock accessible from either side. Double gates to have galvanized drop rod to hold inactive leaf and a latch mechanism capable of securing the gate with a padlock accessible from either side. Provide drop rod receiver to engage center drop rod.
- H. Cantilever gate posts shall be per plans and details.

## **2.05 POST SETTING MATERIALS**

- A. Concrete: Per geotechnical and structural recommendations

## **PART 3 EXECUTION**

### **3.01 SITE EXAMINATION**

- A. Ensure property lines and legal boundaries of work are clearly established.
- B. Survey of fence location
- C. Verify areas to receive fencing are completed to final grade.

### **3.02 CHAIN LINK FRAMEWORK INSTALLATION**

- A. Install chain link fence system in accordance with ASTM F567 and manufacturer's instructions.
- B. Concrete set posts: Set Posts per geotechnical and structural recommendations.
- C. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
- D. Bracing: Install horizontal brace and truss assembly at mid-height or above for fences 6' (1829 mm) and over at each fabric connection to the terminal post. The diagonal truss rod is installed at the point where the brace rail is attached to the terminal post and diagonally down to the bottom of the adjacent line post. Place the truss rod in tension by adjusting the turnbuckle.
- E. Tension wire: Install tension wires so that it will be located 4" (101.6 mm) up from bottom the fabric. If top rail is not specified, install the tension wire so that it will be located 4" (101.6 mm) down from the top of the fabric. Stretch and install tension wire before installing the chain link fabric and attach it to each post using wire ties.
- F. Top rail: Install in lengths of 21' (6400 mm). Connect ends with sleeves forming a rigid

connection, allow for expansion and contraction.

- G. Center Rails: Install mid rails between line posts and attach to post using rail end or line rail clamps.
- H. Bottom Rails: Install bottom rails between posts and attach to post using rail end or line rail clamps.

### **3.03 CHAIN LINK FABRIC INSTALLATION**

- A. Fabric: Install fabric on security side, pull fabric taut; thread the tension bar through fabric and attach to terminal posts with tension bands spaced maximum of 15" (381 mm) on center and attach so that fabric remains in tension after pulling force is released. Install fabric so that it is 2" (50 mm) +/- 1" (25 mm) above finish grade.
- B. Secure fabric using wire ties to line posts at 15" (381 mm) on center and to rails and braces 24" (610 mm) on center, and to the tension wire using hog rings 24" (610 mm) on center. Tie wire shall be secured to the fabric by wrapping it two 360 degree turns around the chain link wire pickets. Cut off any excess wire and bend back so as not to protrude so as to avoid injury if a pedestrian may come in contact with the fence.

### **3.04 CHAIN LINK GATE INSTALLATION**

- A. Swing gates: Installation of swing gates and gate posts shall be per ASTM F567. Direction of swing shall be as shown on drawings. Gates shall be hung plumb in the closed position with minimal space from grade to bottom of gate leaf. Double gate drop bar receiver shall be set in a minimum concrete footing 6" (152 mm) diameter by 24" (610 mm) deep. Gate leaf holdbacks shall be installed on all double gates and all gate leafs greater than 5' (1524 mm) in width.
- B. Cantilever slide gates: Install cantilever horizontal slide gates and gate posts in accordance with ASTM F567. Cantilever sliding gates shall be plumb in the closed position with minimal ground clearance and slide with an initial force of 40 lbs. (18.14 kg). Double gate drop bar receiver shall be set in a minimum concrete footing 6" (152 mm) diameter by 24" (610 mm) deep.

### **3.05 ELECTRICAL GROUNDING**

- A. Grounding when required shall be the responsibility of a licensed electrical CONTRACTOR.

### **3.06 SITE CLEAN UP**

- A. Clean up area adjacent to fence line from debris and unused material created by fence installation.

END OF SECTION

**SECTION ~~12 93 00~~ 32 33 00****SITE FURNISHINGS****PART 1 - GENERAL****1.1 DESCRIPTION**

All labor, materials equipment necessary for and incidental to performing all operations of work for this Section, complete as shown on the Plans or specified herein. Work includes, but is not necessarily limited to, **purchasing, fabricating, storing, installing, coordinating and shipping** the following:

**Site Furnishing Schedule:**

<b>Item</b>	<b>Key</b>	<b>Description</b>	<b>Purchaser /Fabricator</b>	<b>Installer</b>
1	32	Bike Racks – Park Warehouse Ph: 877-609-1678 Model: 623br630-1	Owner	Contractor
2	33	Drinking fountains - Most Dependable Fountains Ph: 800-552-6331 Model: 10135SM	Owner	Contractor
3	96	Dog waste stations - Doody Calls Direct Ph: 414-581-5409 Commander Roll Station	Contractor	Contractor
4	P1	DEEP SEATED CHAIR - Seaside Casual, DEX Club Chair 143; Frame to be Heathered Teak, Cushion Fabric to be Sunbrella "Trusted Frog", Contact Mike Contrera <a href="mailto:mikecontreras3@yahoo.com">mikecontreras3@yahoo.com</a>	Owner	Owner
5	P2	MAD CHAT CHAIR - Seaside Casual, Mad Chat Chair 289; Frame White, back and seat slate color to be Heathered TEAK, Contact Mike Contrera <a href="mailto:mikecontreras3@yahoo.com">mikecontreras3@yahoo.com</a>	Owner	Owner
6	P3	POOF STOOL - Caluco- Portable round poof/stool; Color White Wicker White 90047, CAL-ST-13 Custom Outdoor Stool. Contact Idali Gochman <a href="mailto:idali@caluco.com">idali@caluco.com</a>  Custom Cushion - Meadow Décor Chino Hills Ca. 19" Dia by 2" thick, Dri-fast foam cushion with chair; attachments, Fabric to be Ultra Fabric UF533-1344 BRISA Rose Red Outdoor Leather Fabric, 13546 Vintage Place Chino, Ca. 91710 ph 909-923-2558. Contact Mike Contrera <a href="mailto:mikecontreras3@yahoo.com">mikecontreras3@yahoo.com</a>	Owner	Owner
7	P4	48" COFFEE TABLE - Innovative Design and Manufacturing (Azusa Ca.); HCT ®4817 Heritage 48" round coffee table, Color to be: RAL Umbra Grey RAL 7022, Contact Lisa Kurkdjian <a href="mailto:lisa@idmifurnishings.com">lisa@idmifurnishings.com</a>	Owner	Owner
8	P5	60" COFFEE TABLE - Innovative Design and Manufacturing (Azusa Ca.), CCT-3020 60" Round Cone table with taper base and laser cut table top, Color to be: RAL Umbra Grey RAL 7022, Contact Lisa Kurkdjian <a href="mailto:lisa@idmifurnishings.com">lisa@idmifurnishings.com</a>	Owner	Owner
9	P6	96" DINING TABLE - Innovative Design and Manufacturing (Azusa Ca.), CBT-226030 Cambridge Solid Top 36" x 96" dining table, With formed tapered legs with mounting tabs Color to be: RAL White, Contact	Owner	Owner

		<a href="mailto:lisa@idmifurnishings.com">Lisa Kurkdjian lisa@idmifurnishings.com</a>		
10	P7	BATTERY DINING CHAIR - Maglin Dining chair, 1800 Series Battery Chair, Frame Color White, Seat/Back to be Chair Red RAL 3003, Contact Jenny Griffin <a href="mailto:Jenny.Griffin@maglin.com">Jenny.Griffin@maglin.com</a>	Owner	Owner
11	P8	96" BAR HEIGHT TABLE - Innovative Design and Manufacturing (Azusa Ca.), CBT-226040 Cambridge Solid Top 36" x 96"x 42" Bar Height dining table With formed tapered legs with mounting tabs Color to be: RAL White, Contact Lisa Kurkdjian <a href="mailto:lisa@idmifurnishings.com">lisa@idmifurnishings.com</a>	Owner	Owner
12	P9	BAR STOOL – DuMor - Aluminum Bar Stool 511-20TX Antique Mahogany wood grain Recycle Plastic, Seat with Deep metal Frame color: Deep Red. Contact Taylor Smith <a href="mailto:TSmith@coastrecreation.net">TSmith@coastrecreation.net</a>	Owner	Owner
13	F4	RED ADIRONDACK CHAIR - Dumor 533 Adirondack Frame Deep Red with Antique Mahogany wood grain Recycle Plastic. Chair to have back seat and arms with the recycled plastic, Mount per manufacturers specifications (redhead into concrete). Contact Taylor Smith <a href="mailto:TSmith@coastrecreation.net">TSmith@coastrecreation.net</a>	Owner	Contractor
14	F9	12' SQUARE UMBRELLA - FRANKFORD G-SERIES 12' Square Umbrella, No Pullies, Lift and Pin Operation Only, MS- Brushed Silver Frame with Vertex Finial with aluminum ribs. Fabric R099-White  Umbrella Base 36G Round Galvanized Steel Plate with ** Use 8" Stem to fit under the F11 60" Coffee Table	Owner	Owner
15	F10	LOOP CHAIR W- WHITE/S-SANDSTONE - Tupelo Goods, High Cloud White-W/ Sandstone-S Contact Emily Sellers <a href="mailto:emily@tupelogoods.com">emily@tupelogoods.com</a>	Owner	Owner
16	F11	60" ROUND WICKER COFFEE TABLE - Caluco- 60" round x 21"high White Wicker Coffee Table with Recycled Plastic Teak Top and 2-1/8" Dia. hole for umbrella, white wicker color white, recycled wood color teak 90047, Contact Idali Gochman <a href="mailto:idali@caluco.com">idali@caluco.com</a>	Owner	Owner
17	PC	36" X 30" POT - Pottery- Tournesol Hand Water/Irrigate, ZCS-3600 36" Dia x 30" high with Pump Out System DR1-4, Pottery Color: GFRC Sandbox, Pottery Texture: Acid Etch Contact Ransom Mayfield <a href="mailto:rmayfield@tournesol.com">rmayfield@tournesol.com</a>	Contractor	Contractor
18	PD	48" X 18" X 24" TROUGH POT - Pottery- Tournesol Hand Water/Irrigate, Urban Collection UR/UCR481824 48" x 18" x 24" Urban Rectangle with Pump Out System DR3-48 Pottery Color: GFRC Shark, Finish Acid Etch, Contact Ransom Mayfield <a href="mailto:rmayfield@tournesol.com">rmayfield@tournesol.com</a>	Contractor	Contractor
19	A	60" X 24" POT - Pottery- Tournesol Hand Water/Irrigate, ZCS 6024 60" Dia x 24" high With Pump Out system DR1-4, Pottery Color: GFRC Sandbox, Pottery Texture: Acid Etch, Contact Ransom Mayfield <a href="mailto:rmayfield@tournesol.com">rmayfield@tournesol.com</a>	Contractor	Contractor
20	B	60" X 42" POT - Pottery- Tournesol Hand Water/Irrigate, 60" ZCS 6000 60" Dia x 42" high with Pump Out system		

		DR1-4, Pottery Color: GFRC Sandbox, Pottery Texture: Acid Etch, Contact Ransom Mayfield <a href="mailto:rmayfield@tournesol.com">rmayfield@tournesol.com</a>		
21	C	48" X 30" POT - Pottery- Tournesol Hand Water/Irrigate, 48" ZCS-4830 48" Dia x 30" high with Pump Out System DR1-4, Pottery Color: GFRC Sandbox, Pottery Texture: Acid Etch Contact Ransom Mayfield <a href="mailto:rmayfield@tournesol.com">rmayfield@tournesol.com</a>	Contractor	Contractor
22	31A	TRASH RECEPTACLE - Forms and Surfaces - Dispatch Receptacle 45 gallon- Hinge Side, Single Stream, Graphic says "litter" Standard Lift Lever Latch, Surface Mount, Body Color – Slate Texture, Lid Finish- Aluminum Texture Contact Kelly McKeown <a href="mailto:Kelly.McKeown@forms-surfaces.com">Kelly.McKeown@forms-surfaces.com</a>	Contractor	Contractor
23	31B	RECYCLED RECEPTACLE - Forms and Surfaces- Dispatch Recycle container 45 gallon- Hinge Side, Single Stream, Graphic says "RECYCLE" Standard Lift Lever Latch, Surface Mount, Body Color – Slate Texture, Lid Finish- Azure Blue, Contact Kelly McKeown <a href="mailto:Kelly.McKeown@forms-surfaces.com">Kelly.McKeown@forms-surfaces.com</a>	Contractor	Contractor
24	31C	FOOD WASTE RECEPTACLE - Forms and Surfaces- Dispatch Receptacle Food Waste 45 gallon- Hinge Side, Single Stream, Graphic says "Food Waste", Standard Lift Lever Latch, Surface Mount, Body Color – Slate Texture, Lid Finish- Lime Texture Contact Kelly McKeown <a href="mailto:Kelly.McKeown@forms-surfaces.com">Kelly.McKeown@forms-surfaces.com</a>	Contractor	Contractor
25	90	SITE BENCH - Dumor 520-6TX 6' steel bench without end arms. Frame color Argento with wood grain recycled plastic seat and back color Antique Mahogany, Contact Taylor Smith <a href="mailto:TSmith@coastrecreation.net">TSmith@coastrecreation.net</a>	Contractor	Contractor
26	3A	GREEN ADIRONDACK CHAIR - Innovative Design and Manufacturing (Azusa Ca.), AAC-323437 Aluminum Adirondack Chair with Mounting Brackets, Color to be: RAL 6018 Yellow Green, Contact Lisa Kurkdjian <a href="mailto:lisa@idmifurnishings.com">lisa@idmifurnishings.com</a>	Owner	Owner
27	3B	ORANGE ADIRONDACK CHAIR - Innovative Design and Manufacturing (Azusa Ca.), AAC-323437 Aluminum Adirondack Chair with mounting brackets, Color to be: RAL 2011 Orange, Contact Lisa Kurkdjian <a href="mailto:lisa@idmifurnishings.com">lisa@idmifurnishings.com</a>	Owner	Owner
28		DINING CHAIR - Landscape Forms- Everyday Dining chair, Armless Mixed Colors, Note Mixed Color see below, EVERYDAY ARMLESS Contact Trinidad Valdez (REP. for Forms and Surfaces) <a href="mailto:trinidad@dsa-lighting.com">trinidad@dsa-lighting.com</a>	Owner	Owner
	F3 D12 D12	1. MAIN PLAZA - loll red, lemon, mango, 2. SOCCER AREAS - white, lemon, loll leaf green 3. BASEBALL AREAS - lemon, white, mango		
29	D11	13' X13' UMBRELLA / BASE - Frankford- NOVA 13'x13' square umbrella, 8110NGU-SQ with crank, aluminum ribs, MS- Brushed Silver Frame, Fabric Colors:	Owner	Contractor

		1. Main Plaza YELLOW R-554 2. Soccer Plaza PISTACHIO R-160 3. Baseball Plaza ORANGE R-567  Umbrella Base NGU-IG (IN GROUND BASE) WITH HINGED SPIGOT STEM Available from <a href="https://www.frankfordumbrellas.com">https://www.frankfordumbrellas.com</a>		
30	D10	16' X16' UMBRELLA / BASE - Frankford Umbrella-Nova 16'x16' square umbrella, 96NGU-SQ with crank, aluminum ribs MS- Brushed Silver Frame Fabric Colors: 1. WHITE R-099-WHITE  Umbrella Base NGU-IG (IN GROUND BASE) WITH HINGED SPIGOT STEM Available from <a href="https://www.frankfordumbrellas.com">https://www.frankfordumbrellas.com</a>	Owner	Contractor
31	D6	36" SQUARE DINING TABLE - Innovative Design and Manufacturing (Azusa Ca.), NPDT-36" square Newport Dining Pedestal Table 3" Square Aluminum Column Radius Corners, Color to be: RAL White, Contact Lisa Kurkdjian <a href="mailto:lisa@idmifurnishings.com">lisa@idmifurnishings.com</a>	Owner	Owner
32	D4	48" SQUARE DINING TABLE - Innovative Design and Manufacturing (Azusa Ca.), NPDT 48" Square Newport Dining Pedestal Table 3" square aluminum column with Radius Corners Color to be: RAL White, Contact Lisa Kurkdjian <a href="mailto:lisa@idmifurnishings.com">lisa@idmifurnishings.com</a>	Owner	Owner
33	D5 F1	42" SQUARE ACCESSIBLE TABLE - Innovative Design and Manufacturing (Azusa Ca.), CDT-424230 42" Square Cambridge Table, With solid aluminum top and laser cut ADA symbol, Tapered legs with mounting tabs, Color to be: RAL White, Contact Lisa Kurkdjian <a href="mailto:lisa@idmifurnishings.com">lisa@idmifurnishings.com</a>	Owner	Owner
34		60" SQUARE DINING TABLE - Innovative Design and Manufacturing (Azusa Ca.), NPDT 60" Square Newport Dining Pedestal Table 3" square aluminum column with Radius Corners Color to be: RAL White, Contact Lisa Kurkdjian <a href="mailto:lisa@idmifurnishings.com">lisa@idmifurnishings.com</a>	Owner	Owner

## 1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 32 13 13 Concrete Paving

## 1.3 GENERAL REQUIREMENTS

A. General

Examine Plans and Specifications and include all miscellaneous metal, which is specified in other Sections. Provide all connections, anchors, bolts, and other fastenings as required. Perform all cutting, punching, drilling, and tapping required for proper assembly of the work. All installations shall be done in accordance with manufacturer's specifications.



**B. Shop Drawings**

Submit shop drawings of all work herein showing layouts, sizes, and methods of construction and installation, including sizes and types of all fastening devices.

**C. Codes**

Materials and work shall conform to the governing Building Code. In case of conflict between these Specifications and the Building Code, the more stringent shall govern.

**D. Delivery**

Ensure that items to be set in concrete or in play areas are delivered at the proper time.

**E. Measurements**

Verify all dimensions by taking field measurements. Proper fit and attachment of all items is required. All required fall zones shall be measured prior to installation of the play elements.

**F. Coordination**

Coordinate with other trades to effect prompt delivery of all materials needed for erection or installation. Identify all bolts or other loose materials.

**G. Storage**

Store materials in dry, protected areas. Protect from rusting, bleaching, and other damage. Remove any damaged items from site and replace at no cost to the City.

**H. Certifications**

Furnish to the City's representative copies of all material certifications.

**I. Trade Names or Equals**

Approval of equipment and materials offered as equivalents to those specified will be as set forth under Section 4, paragraph 4-1.6 of the Standard Specifications.

**J. Submit 6" x 6" color and finish sample for each site furnishing specified, except where noted.****PART 2 - PRODUCTS****2.1 BIKE RACK****A. Bike Rack shall be****PART 3 - EXECUTION****3.1 SURFACE CONDITIONS**

- A. Prior to work of this Section, carefully inspect previously installed work. Verify all such work is complete to the point where this installation may properly commence.
- B. Verify that work of this Section may be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.
- C. In the event of discrepancy, immediately notify the OWNER'S REPRESENTATIVE.
- D. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

### **3.2 INSTALLATION**

- A. Dimensions upon which Work of this Section may be contingent are to be verified by the CONTRACTOR at the work site to ensure proper placement and fit of equipment in the allotted areas.
- B. Set and install site furnishings plumb, level, and true to line with a neat and finished appearance and in accordance with approved submittal and manufacturer's printed instructions.

**END OF SECTION**

## SECTION 32 84 00 – IRRIGATION

## PART 1 GENERAL

## 1.1 SUMMARY

- A. It is the intent of the specifications and drawings that the finished system is complete in every respect and shall be ready for operation satisfactory to the Owner.
- B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as indicated on the drawings, in these specifications, and as necessary to complete the contract.

## 1.2 CONSTRUCTION DRAWINGS

- A. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.
- B. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications. When an item is shown on the plans but not shown on the specifications or vice versa, it shall be deemed to be as shown on both. The Landscape Architect shall have final authority for clarification.
- C. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect as soon as detected. In the event this notification is not performed, the Irrigation Contractor shall assume full responsibility for any revision necessary.

## 1.3 QUALITY ASSURANCE

- A. Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.
- B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the drawings and specifications.
- C. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their

provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.

- D. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately at no additional cost to Owner.
- E. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.
- F. The Contractor shall furnish training documentation related to PVC pipe solvent welding, Ductile Iron Restraint fitting installation, and 2-wire communication cable wire splicing.

#### 1.4 SUBMITTALS

A. Submittals Materials List:

1. After award of contract and before any irrigation system materials are ordered from suppliers or delivered to the job site, submit to the Owner a complete list of all irrigation system materials, or processes proposed to be furnished and installed as part of this contract.
2. The submittals materials list shall include the following information:
  - a. A title sheet with the job name, the contractor's name, contractor's address and telephone number, submittal date and submittal number.
  - b. An index sheet showing the item number (i.e. 1,2,3, etc.); an item description (i.e. sprinkler head); the manufacturer's name (i.e. Hunter Industries); the item model number (i.e. I-40-ADV/36V); and the page(s) in the submittal set that contain the catalog cuts.
  - c. The catalog cuts shall be one or two pages copied from the most recent manufacturer's catalog that indicate the product submitted. Do not submit parts lists, exploded diagrams, price lists or other extra information.
  - d. The catalog cuts shall clearly indicate the manufacturer's name and the item model number. The item model number, all specified options and specified sizes shall be circled on the catalog cuts.
  - e. Submittals for equipment indicated on the legend without manufacturer names, or "as approved", shall contain the manufacturer, Class or Schedule, ASTM numbers and/or other certifications as indicated in these specifications.
3. Submittal materials list format requirements:
  - a. Submittals shall be provided as one complete package for the project. Multiple partial submittals will not be reviewed.
  - b. Submittal package shall be stapled or bound in such a way as to allow for disassembly for review processing. Submittals shall not have tabs, tab sheets, spiral binding, or any other type of binding that will interfere with automated copying of submittals.
  - c. Submittal package shall have all pages numbered in the lower right hand corner. Page numbers shall correspond with submittal index.
  - d. Re-submitted packages must be revised to include only the equipment being re-submitted. Equipment previously reviewed and accepted shall not be re-submitted in the materials list/index sheet or in the catalog cut sheet package.

- B. Substitutions: If the Irrigation Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect or Owner's authorized representative for approval.
  - 1. Provide a written statement indicating the reason for making the substitution.
  - 2. Provide catalog cut sheets, technical data, and performance information for each substitute item.
  - 3. Provide in writing the difference in installed price if the item is accepted.
- C. The Landscape Architect or Owner's authorized representative will allow no substitutions without prior written acceptance.
- D. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.
- E. The Landscape Architect or Owner's authorized representative will not review the submittal package unless provided in the format described above.

#### 1.5 EXISTING CONDITIONS

- A. The Contractor shall verify and be familiar with the locations, size and detail of points of connection provided as the source of water, electrical supply, and telephone line connection to the irrigation system.
- B. Irrigation design is based on the available static water pressure shown on the drawings. Contractor shall verify static water on the project prior to the start of construction. Should a discrepancy exist, notify the Landscape Architect and Owner's authorized representative prior to beginning construction.
- C. Prior to cutting into the soil, the Contractor shall locate all cables, conduits, sewer septic tanks, and other utilities as are commonly encountered underground and he shall take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, the Contractor shall promptly notify the Landscape Architect and Owner who will arrange for relocations. The Contractor will proceed in the same manner if a rock layer or any other such conditions are encountered.
- D. The Contractor shall protect all existing utilities and features to remain on and adjacent to the project site during construction. Contractor shall repair, at his own cost; all damage resulting from his operations or negligence.
- E. The Irrigation Contractor shall coordinate with the General Contractor for installation of required sleeving as shown on the plans prior to paving operations.
- F. The Contractor shall verify and be familiar with the existing irrigation systems in areas adjacent to and within the Project area of work.
- G. The Contractor shall protect all existing irrigation systems, in areas adjacent to and within the project area of work, from damage due to his operations.

- H. Contractor shall notify Owner's Representative if any existing system is temporarily shut off, capped or modified. Provide 48-hour notice, prior to turning off or modifying any existing irrigation system.
- I. The Contractor shall repair or replace all existing irrigation systems, in areas adjacent to and within the project area of work, damaged by the construction of this project. Adjacent irrigation systems shall be made completely operational and provide complete coverage of the existing landscaped areas. All repairs shall be complete to the satisfaction of the Owner's Representative.
- J. The contractor shall provide bore holes under any existing pavement or paving encountered for the required lateral, mainline and low voltage control wire sleeving. Bore holes under 2 inches in diameter and smaller shall be made with a BulletMole® underground boring tool as manufactured by Dimension Tools, LLC (Contact telephone number (888)-650-5554 or at [www.bulletmole.com](http://www.bulletmole.com)). Bore holes larger than 2 inches in diameter shall be made with an approved mechanical boring tool. No air jacking or hydraulic boring of any kind shall be allowed.

#### 1.6 INSPECTIONS

- A. The Contractor shall permit the Landscape Architect and Owner's authorized representative to visit and inspect at all times any part of the work and shall provide safe access for such visits.
- B. Where the specifications require work to be tested by the Contractor, it shall not be covered over until accepted by the Landscape Architect, Owner's authorized representative, and/or governing agencies. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing. Should any work be covered without testing or acceptance, it shall be, if so ordered, uncovered at the Contractor's expense.
- C. Inspections will be required for the following at a minimum:
  - 1. Pre-construction meeting.
  - 2. System layout.
  - 3. Pressure test of irrigation mainline (Four hours at 150 PSI or 120% of static water pressure, whichever is greater.) Mainline pressure loss during test shall not exceed 2 PSI.
  - 4. Coverage test of irrigation system. Test shall be performed prior to any planting.
  - 5. Final inspection prior to start of maintenance period.
  - 6. Final acceptance prior to turnover.
- D. Site observations and testing will not commence without the field record drawings as prepared by the Irrigation Contractor. Record drawings must complete and up to date for each site visit.
- E. Work that fails testing and is not accepted will be retested. Hourly rates and expenses of the Landscape Architect, Owner's authorized representative, and governing agencies for re-inspection or retesting will be paid by the Irrigation Contractor at no additional expense to Owner.

#### 1.7 STORAGE AND HANDLING

- A. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the event of

damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and Owner and at no additional cost to the Owner.

- B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.

#### 1.8 CLEANUP AND DISPOSAL

- A. Dispose of waste, trash, and debris in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Bury no such waste material and debris on the site. Burning of trash and debris will not be permitted. The Contractor shall remove and dispose of rubbish and debris generated by his work and workmen at frequent intervals or when ordered to do so by the Owner's authorized representative.
- B. At the time of completion the entire site will be cleared of tools, equipment, rubbish and debris which shall be disposed of off-site in a legal disposal area.

#### 1.9 TURNOVER ITEMS

- A. Record Drawings:
  1. Record accurately on one set of drawings all changes in the work constituting departures from the original contract drawings and the actual final installed locations of all required components as shown below.
  2. The record drawings shall be prepared to the satisfaction of the Owner. Prior to final inspection of work, submit record drawings to the Landscape Architect or Owner's authorized representative.
  3. All record drawings shall be prepared using AutoCAD 2010 drafting software and the original irrigation drawings as a base. No manual drafted record drawings shall be acceptable. The Contractor may obtain digital base files from the Landscape Architect or Owner's authorized representative.
  4. If the Contractor is unable to provide the AutoCAD drafting necessary for the record drawings the irrigation designer does provide record drawing drafting as a separate service.
  5. Prior to final inspection of work, submit record drawings plotted onto vellum sheets for review by the Landscape Architect or Owner's authorized representative. After acceptance by the Landscape Architect, City Inspector or Owner's authorized representative re-plot the record drawings onto reproducible Mylar sheets. The Contractor shall also provide record drawing information on a digital AutoCAD Release 2010 drawing file. All digital files shall be provided on a compact disc (CD) clearly marked with the project name, file descriptions and date.
    - a. Record drawing information and dimensions shall be collected on a day-to-day basis during the installation of the pressure mainline to fully indicate all routing locations and pipe depths. Locations for all other irrigation equipment shall be collected prior to the final inspection of the work.
    - b. Two dimensions from two permanent points of reference such as buildings, sidewalks, curbs, streetlights, hydrants, etc. shall be shown for each piece of irrigation equipment shown below. Where multiple components are installed with no reasonable reference point between the components, dimensioning may be

made to the irrigation equipment. All irrigation symbols shall be clearly shown matching the irrigation legend for the drawings. All lettering on the record drawings shall be minimum 1/8 inch in size.

6. Show locations and depths of the following items:
  - a. Point of connection (including water POC, backflow devices, master control valves, flow sensors, etc.)
  - b. Routing of sprinkler pressure main lines (dimensions shown at a maximum of 100 feet along routing)
  - c. Isolation valves
  - d. Automatic remote control valves (indicate station number and size)
  - e. Quick coupling valves
  - f. Drip air relief and flush valves
  - g. Routing of control wires where separate from irrigation mainline
  - h. Irrigation controllers (indicate controller number and station count)
  - i. Related equipment (as may be directed)

B. Controller Charts:

1. Provide one controller chart for each automatic controller. Chart shall show the area covered by the particular controller. The areas covered by the individual control valves shall be indicated using colored highlighter pens. A minimum of six individual colors shall be used for the controller chart unless less than six control valves are indicated.
2. Landscape Architect or Owner's authorized representative must approve record drawings before controller charts are prepared.
3. The chart is to be a reduced copy of the actual "record" drawing. In the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a readable size.
4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness.

C. Operation and Maintenance Manuals:

1. Two individually bound copies of operation and maintenance manuals shall be delivered to the Landscape Architect or Owner's authorized representative at least 10 calendar days prior to final inspection. The manuals shall describe the material installed and the proper operation of the system.
2. Each complete, bound manual shall include the following information:
3. Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.
  - a. Operating and maintenance instructions for all equipment.
  - b. Spare parts lists and related manufacturer information for all equipment.

D. Equipment:

1. Supply as a part of this contract the following items:
  - a. Two (2) wrenches for disassembly and adjustment of each type of sprinkler head used in the irrigation system.
  - b. Three 30-inch sprinkler keys for manual operation of control valves.
  - c. Two keys for each automatic controller.
  - d. Four quick coupler keys with a 1" bronze hose bib, bent nose type with hand wheel and two coupler lid keys.
  - e. One valve box cover key or wrench.
  - f. Twenty Five extra sprinkler heads of each size and type.
  - g. One thousand liner feet of dripline specified in the legend.



- h. For specified gate valves: Two (2) 5-foot long valve handle, to fit the specified ball valves.
- 2. The above equipment shall be turned over to Owner's authorized representative at the final inspection.

#### 1.10 COMPLETION

- A. At the time of the pre-maintenance period inspection, the Landscape Architect, Owner's authorized representative, and governing agencies will inspect the work, and if not accepted, will prepare a list of items to be completed by the Contractor. Punch list to be checked off by contractor and submitted to Landscape Architect or Owner's Authorized representative prior to any follow-up meeting. This checked off list to indicate that all punch list items have been completed. At the time of the post-maintenance period or final inspection the work will be re-inspected and final acceptance will be in writing by the Landscape Architect, Owner's authorized representative, and governing agencies.
- B. The Owner's authorized representative shall have final authority on all portions of the work.
- C. After the system has been completed, the Contractor shall instruct Owner's authorized representative in the operation and maintenance of the irrigation system and shall furnish a complete set of operating and maintenance instructions.
- D. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired to the Owner's satisfaction by the Contractor without any additional expense to the Owner. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.

#### 1.11 GUARANTEE

- A. The entire sprinkler system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the filing of the Notice of Completion.
- B. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to Owner within ten (10) calendar days of receipt of written notice from Owner. When the nature of the repairs as determined by the Owner constitute an emergency (i.e. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvement resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be repaired to the satisfaction of the Owner by the Contractor, all at no additional cost to the Owner.
- C. Guarantee shall be submitted on Contractors own letterhead as follows:

##### GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in

accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defective material during the period of one year from date of filing of the Notice of Completion and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 calendar days following written notification by the Owner. In the event of our failure to make such repairs or replacements within the time specified after receipt of written notice from Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT NAME:

PROJECT LOCATION:

CONTRACTOR NAME:

ADDRESS:

TELEPHONE:

SIGNED:

DATE:

## PART 2 MATERIALS

### 2.1 SUMMARY

Use only new materials of the manufacturer, size and type shown on the drawings and specifications. Materials or equipment installed or furnished that do not meet Landscape Architect's, Owner's, or governing agencies standards will be rejected and shall be removed from the site at no expense to the Owner.

### 2.2 PIPE

- A. Pressure supply line between the water meter and the backflow prevention device shall be type K copper, one size larger than backflow device.
- B. Backflow prevention assemblies, and all other above grade assemblies, shall be constructed of threaded brass pipe and threaded brass fittings the same size as the backflow device, unless otherwise directed.
- C. Pressure supply lines 3 inches in diameter and larger shall be Class 200 bell and gasket PVC conforming to ASTM 2672.
- D. Pressure supply lines 2.5 inches in diameter and smaller shall be Class 315 solvent weld PVC with SCH.80 fittings and trustblocks.
- E. Non-pressure lines 3/4 inch in diameter and larger downstream of the remote control valve shall be SCH 40 solvent weld PVC conforming to ASTM D1785.
- F. Recycled water PVC pipe to be color-coded purple in color marked on two sides with recycled water warning statements "Caution-Recycled Water". Recycled water piping must be accepted by the local recycled water governing agencies.

### 2.3 METAL PIPE AND FITTINGS

- A. Brass pipe shall be 85 percent red brass, ANSI, IPS Standard 125 pounds, Schedule 40 screwed pipe.
- B. Fittings shall be medium brass, screwed 125-pound class.
- C. Copper pipe and fittings shall be Type "K" sweat soldered, or brazed as indicated on the drawings.

### 2.4 PLASTIC PIPE AND FITTINGS

- A. Pipe shall be marked continuously with manufacturer's name, nominal pipe size, schedule or class, PVC type and grade, National Sanitation Foundation approval, Commercial Standards designation, and date of extrusion.
- B. All plastic pipe shall be extruded of an improved PVC virgin pipe compound in accordance with ASTM D2672, ASTM D2241 or ASTM D1785.
- C. All solvent weld PVC fittings shall be standard weight Schedule 40 (and Schedule 80 where specified on the irrigation detail sheet, all mainline fittings shall be Schedule 80 PVC) and shall be injection molded of an improved virgin PVC fitting compound. Slip PVC fittings shall be the "deep socket" bracketed type. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated. All fittings shall conform to ASTM D2464 and ASTM D2466.
- D. All threaded nipples shall be standard weight Schedule 80 with molded threads and shall conform to ASTM D1785.
- E. All solvent cementing of plastic pipe and fittings shall be a two-step process, using primer and solvent cement applied per the manufacturer's recommendations. Cement shall be of a fluid consistency, not gel-like or ropy. Solvent cementing shall be in conformance with ASTM D2564 and ASTM D2855.
- F. When connection is plastic to metal, female adapters shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base Teflon paste, tape, or equal.
- G. All pipes 3" and larger shall use self-retraining ductile iron fittings.

### 2.5 VALVES

- A. Ball and Gate Valves:
  - 1. Ball and gate valves shall be of the manufacturer, size, and type indicated on the drawings.
  - 2. All ball and gate valves shall have a minimum working pressure of not less than 150 PSI and shall conform to AWWA standards.
- B. Quick Coupler Valves:
  - 1. Quick coupler valves shall be of the manufacturer, size, and type indicated on the drawings.

2. Quick coupler valves shall be brass with a wall thickness guaranteed to withstand normal working pressure of 150 psi without leakage. Valves shall have 1" female threads opening at base, with two-piece body. Valves to be operated only with a coupler key, designed for that purpose. Coupler key is inserted into valve and a positive, watertight connection shall be made between the coupler key and valve.
3. When used with recycled water, the vinyl quick coupler cover is to be purple in color with the words "Warning-Recycled Water-Do Not Drink" permanently marked on lid.

C. Automatic Control Valves:

1. Automatic control valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Automatic control valves shall be electrically operated.
3. Provide Christy's valve ID tags for each remote-control valve with valve number.

## 2.6 VALVE BOXES

- A. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.
- B. The cover and box shall be capable of sustaining a load of 1,500 pounds.
- C. Valve box extensions shall be by the same manufacturer as the valve box.
- D. The plastic irrigation valve box cover shall be an overlapping type.
- E. Automatic control valve, master valve, flow sensor, and gate/ball valve boxes shall be 17"x11"x12" 'nominal' rectangular size. Valve box covers shall be marked "RCV" with the valve identification number, or "MV", "FS", "GV", "BV" "heat branded" onto the cover in 1-1/4 inch high letters / numbers.
- F. Drip flush valve and Air relief valve boxes shall be 10" circular size. Valve box covers shall be marked with "FV" or "ARV" "heat branded" onto the cover in 1-1/4 inch high letters.
- G. Quick coupler valve boxes shall be 10" circular size. Valve box covers shall be marked with "QCV" "heat branded" onto the cover in 1-1/4 inch high letters.
- H. Valve boxes for Recycled Water shall be purple in color and permanently marked (attached tags are not acceptable) on valve box cover plate with the words "Warning-Recycled Water-Do Not Drink".
- I. Valve boxes for Potable/Domestic Water shall be green in color when installed in turf area and black in color when installed in shrub areas.

## 2.7 AUTOMATIC CONTROLLER AND BOOSTER PUMP

- A. Automatic controller and booster pump shall be of the manufacturer, size, and type indicated on the drawings.
- B. Controller enclosure shall be of the manufacturer, size, and type indicated on the drawings.
- C. Controller and Booster Pump shall be grounded according to local codes using equipment of the manufacturer, size, and type indicated on the drawings; or as required by local codes and ordinances.

## 2.8 ELECTRICAL

- A. All electrical equipment shall be NEMA Type 3, waterproofed for exterior installations.
- B. All electrical work shall conform to local codes and ordinances.

## 2.9 LOW VOLTAGE CONTROL WIRING

- A. Remote control wire shall be direct-burial 2-WIRE AWG-UF type, size as indicated on the drawings, and in no case smaller than 14 gauge.
- B. Connections shall of the manufacturer, size, and type indicated on the drawings.
- C. Remote control 2-WIRE CABLE shall be installed in a 1.25" Conduit.
- D. Ground wires shall be green in color or bare copper and in no case smaller than 6 gauge.

## 2.10 IRRIGATION HEADS AND DRIPLINE

- A. Irrigation heads and dripline shall be of the manufacturer, size, type, with radius of throw, operating pressure, and discharge rate indicated on the drawings.
- B. Irrigation heads and dripline shall be used as indicated on the drawings.
- C. Irrigation heads and dripline shall have purple recycled water warning cover/labels.

## 2.11 MISCELLANEOUS EQUIPMENT

- A. Landscape Fabric:
  - 1. Landscape fabric for valve box assemblies shall be 5.0- oz. weight woven polypropylene weed barrier. Landscape fabric shall have a burst strength of 225 PSI, a puncture strength of 60 lbs. and capable of water flow of 12 gallons per minute per square foot.
  - 2. Type: DeWitt Pro 5 Weed Barrier or approved equal.
- B. Equipment such as backflows, master valves, flow sensors, rain sensors, freeze sensors, flush valves, air relief valves, wye strainers, and master valves shall be of the manufacturer, size and type indicated on the drawings.

## PART 3 EXECUTION

### 3.1 SITE CONDITIONS

- A. Inspections:
  - 1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
  - 2. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.

- B. Discrepancies:
1. In the event of discrepancy, immediately notify the Landscape Architect or Owner's authorized representative.
  2. Do not proceed with installation in areas of discrepancy until all discrepancies have been resolved.
- C. Grades:
1. Before starting work, carefully check all grades to determine that work may safely proceed, keeping within the specified material depths with respect to finish grade.
  2. Final grades shall be accepted by the Engineer before work on this section will be allowed to begin.
- D. Field Measurements:
1. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design. Contractor shall coordinate the installation of all irrigation materials with all other work.
  2. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions prior to proceeding with work under this section.
  3. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities, which are caused by his operations or neglect.
- E. Diagrammatic Intent:
- The drawings are essentially diagrammatic. The size and location of equipment and fixtures are drawn to scale where possible. Provide offsets in piping and changes in equipment locations as necessary to conform with structures and to avoid obstructions or conflicts with other work at no additional expense to Owner.
- F. Layout:
1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads, valves, backflow preventer, and automatic controller.
  2. Layout irrigation system and make minor adjustments required due to differences between site and drawings. Where piping is shown on drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.
- G. Water Supply:
- Connections to, or the installation of, the water supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made at no additional expense to Owner.
- H. Electrical Service:
1. Connections to the electrical supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made at no additional expense to Owner.
  2. Contractor shall make electrical connections to the irrigation controller. Electrical power source to controller locations shall be provided by others.

### 3.2 TRENCHING

- A. Excavations shall be straight with vertical sides, even grade, and support pipe continuously on bottom of trench. Trenching excavation shall follow layout indicated on drawings to the depths below finished grade and as noted. Where lines occur under paved area, these dimensions shall be considered below subgrade.
- B. Provide minimum cover of 18 inches on pressure supply lines 2 ½ inches and smaller.

- C. Provide minimum cover of 24 inches on pressure supply lines 3 inches and larger.
- D. Provide minimum cover of 18 inches for control wires within planters.
- E. Provide minimum cover of 24 inches for control wires within sleeves below paving.
- F. Provide minimum cover of 36 inches on pressure supply lines under vehicular travel ways.
- G. Provide minimum cover of 12 inches for non-pressure lines.
- H. Pipes installed in a common trench shall have a 4-inch minimum space between pipes.

### 3.3 BACKFILLING

- A. Backfill material on all lines shall be the same as adjacent soil free of debris, litter, and rocks over 1/2 inches in diameter.
- B. Backfill shall be tamped in 4-inch layers under the pipe and uniformly on both sides for the full width of the trench and the full length of the pipe. Backfill materials shall be sufficiently damp to permit thorough compaction, free of voids. Backfill shall be compacted to dry density equal to adjacent undisturbed soil and shall conform to adjacent grades.
- C. Flooding in lieu of tamping is not allowed.
- D. Under no circumstances shall truck wheels be used to compact backfill.
- E. Provide sand backfill a minimum of 4 inches over and under all piping under paved areas.

### 3.4 PIPING

- A. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. No hydraulic driving is permitted under asphalt pavement.
- B. Cutting or breaking of existing pavement is not permitted.
- C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, burrs, and reaming. Install pipe with all markings up for visual inspection and verification.
- D. Remove all dented and damaged pipe sections.
- E. All lines shall have a minimum clearance of 4 inches from each other and 12 inches from lines of other trades.
- F. Parallel lines shall not be installed directly over each other.
- G. In solvent welding, use only the specified primer and solvent cement and make all joints in strict accordance with the manufacturer's recommended methods including wiping all excess solvent from each weld. Allow solvent welds at least 15 minutes setup time before moving or handling and 24 hours curing time before filling.

- H. PVC pipe shall be installed in a manner, which will provide for expansion and contraction as recommended by the pipe manufacturer.
- I. Center load all plastic pipe prior to pressure testing.
- J. All threaded plastic-to-plastic connections shall be assembled using Teflon tape or Teflon paste.
- K. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope on all threaded plastic-to-metal connections, except where noted otherwise. All plastic-to-metal connections shall be made with plastic female adapters.

### 3.5 CONTROLLER AND BOOSTER PUMP

- A. The exact location of the controller and the booster pump shall be approved by the Landscape Architect or Owner's authorized representative before installation. The electrical service shall be coordinated with this location.
- B. The Irrigation Contractor shall be responsible for the final electrical hook up to the irrigation controller and booster pump.
- C. The irrigation system shall be programmed to operate during the periods of minimal use of the design area.

### 3.6 CONTROL WIRING

- A. Low voltage control wiring shall occupy the same trench and shall be installed along the same route as the pressure supply lines whenever possible.
- B. All connections shall be of an approved type and shall occur in a valve box. Provide an 18-inch service loop at each connection.
- C. All 2-WIRE communication cable shall be installed in a 1.25" electrical conduit and grounded per manufacturer's recommendations.

### 3.7 VALVES

- A. Automatic control valves, quick coupler, and ball/gate valves are to be installed in the approximate locations indicated on the drawings.
- B. Valve shall be installed in shrub areas whenever possible.
- C. Install all valves as indicated in the detail drawings.
- D. Valves to be installed in valve boxes shall be installed one valve per box.
- E. When connected to Recycled Water, provide purple valve ID tags for each remote-control valve with valve number.

### 3.8 VALVE BOXES

- A. Valve boxes shall be installed in shrub areas whenever possible.



- B. Each valve box shall be installed on a foundation of 3/4 inch gravel backfill, 3 cubic feet minimum. Valve boxes shall be installed with their tops 1/2 inch above the surface of surrounding finish grade in lawn areas and 2 inches above finish grade in ground cover areas.

### 3.9 IRRIGATION HEADS AND DRIPLINE

- A. Irrigation heads and dripline shall be installed as indicated on the drawings.
- B. Spacing of heads and dripline shall not exceed maximum indicated on the drawings.
- C. Riser nipples shall be of the same size as the riser opening in the sprinkler body.

### 3.10 MISCELLANEOUS EQUIPMENT

- A. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practices.
- B. Quick coupler valves shall be set approximately 18 inches from walks, curbs, header boards, or paved areas where applicable.
- C. Install devices such as rain sensors, freeze sensors, flush valves, and air relief valves, master valves and flow sensors as indicated on the drawings and as recommended by the manufacturer.

### 3.11 FLUSHING THE SYSTEM

- A. Prior to installation of irrigation heads, the valves shall be opened and a full head of water used to flush out the lines and risers.
- B. Irrigation heads shall be installed after flushing the system has been completed.

### 3.12 ADJUSTING THE SYSTEM

- A. Contractor shall adjust valves, align heads, and check the coverage of each system prior to coverage test.
- B. If it is determined by the Landscape Architect or Owner's authorized representative that additional adjustments or nozzle changes will be required to provide proper coverage, all necessary changes or adjustments shall be made prior to any planting.
- C. The entire system shall be operating properly before any planting operations commence.
- D. Automatic control valves are to be adjusted so that the irrigation heads, drip emitters and inline drip tubing operate at the pressure recommended by the manufacturer.

### 3.13 TESTING AND OBSERVATION

- A. Do not allow or cause any of the work of this section to be covered up or enclosed until it has been observed, tested and accepted by the Landscape Architect, Owner, and governing agencies.

- B. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing.
- C. When the sprinkler system is completed, the Contractor shall perform a coverage test of each system in its entirety to determine if the water coverage for the planted areas is complete and adequate in the presence of the Landscape Architect.
- D. The Contractor shall furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the plans, or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate, without bringing this to the attention of the Landscape Architect. This test shall be accepted by the Landscape Architect and accomplished before starting any planting.
- E. Areas to be maintained for the formal maintenance period shall start maintenance at the same time, as directed by the Landscape Architect, Owner, and governing agencies. Partial areas will not be released into maintenance prior to completion of items listed in the pre-maintenance review. The maintenance period may not be phased.
- F. If, after the maintenance review, the irrigation systems are not accepted by the Landscape Architect, the contractor shall reimburse the Architect for additional site visits, or additional time required to review work. All additional time will be billed at the Architect's hourly rate and will be paid for by the contractor at no additional cost to the owner.
- G. Final inspection will not commence without record drawings as prepared by the Irrigation Contractor.

#### 3.14 MAINTENANCE

During the maintenance period the Contractor shall adjust and maintain the irrigation system in a fully operational condition providing complete irrigation coverage to all intended plantings.

#### 3.15 COMPLETION CLEANING

Clean up shall be made as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be swept, and any damage sustained on the work of others shall be repaired to original conditions.

### **END OF SECTION**

**SECTION 32 90 00****PLANTING****PART 1 - GENERAL****1.1 INSPECTIONS**

- A. Inspections shall be made by the OWNER'S REPRESENTATIVE. CONTRACTOR shall be on the site when inspections are made. Requests for inspections shall be made at least 48 hours in advance. If the work is not ready for inspection when the inspector arrives, CONTRACTOR shall pay for the OWNER'S REPRESENTATIVE'S visit at current rate.
- B. Inspection as required by the OWNER per inspection job card.
- C. Any work completed without proper inspection by shall be removed and replaced at CONTRACTOR'S expense with no additional cost to the OWNER or increase in schedule.
- D. Quantities and Types. Plant materials shall be furnished in the quantities and/or spacing as shown or noted for each location, and shall be of the species, kinds, sizes, etc., as symbolized, and/or described in the "Plant Legend", as indicated on the drawings. The landscape CONTRACTOR is to verify all sizes and quantities on plans.

**1.2 GUARANTEE**

- A. **All trees (5 gallon and larger) shall be guaranteed for a period of one year.** All shrubs and other plant materials shall be guaranteed for a period of 1 year. All guarantee periods commence from the time of final acceptance by the OWNER at the completion of the 1 year maintenance period.
- B. Replace, as soon as weather permits, all dead plants not in vigorous condition as noted during the maintenance period.
- C. Plants used for replacements shall be same kind and size as originally planted. They shall be furnished, planted, and fertilized as specified and guaranteed within these documents.

**PART 2 - PRODUCTS****2.1 MATERIALS**

**NOTE: These recommendations shall be used for bidding purposes only; soil conditions may change drastically from the time these specifications were developed until the actual soil conditioning takes place.**

- A. Topsoil: Existing soil on the site shall be used as topsoil for planting purposes when possible, and shall be free of debris, oil, weeds, or other foreign matter. Contaminated soil shall be removed and replaced with acceptable existing soil or imported soil.
  - 1. Imported soil shall have a silt and clay content that is equal or less than the underlying subsoil. Silt plus clay content of this soil shall be not greater than 40% by weight and gravel should comprise no more than 15% of the soil by weight. The boron content of this soil shall be not greater than 1 part per million as measured on the saturation

extract. The ECe shall not exceed 3.0 millimhos per centimeter at 25 degrees C. The sodium absorption ratio (SAR) shall not exceed 6.0

2. In order to ensure conformance, samples of the imported soil shall be submitted to an agronomic soils testing laboratory, approved by the OWNER'S REPRESENTATIVE for analysis prior to use. Waypoint Analytics, contact Joe Kiefer (714) 282-8777 or Approved equal. Results of testing shall be delivered to the OWNER'S REPRESENTATIVE for approval. Soil test to include analysis and recommendations.

**B. Recommendations for general soil preparation (per 1,000 sf):**

The following amendments are to be incorporated homogeneously to 6" deep:

- a. Calcium ammonium nitrate (27-0-0) 5 lbs
- b. Potassium sulfate (0-0-50) 10 lbs
- c. Triple superphosphate (0-45-0) 4lbs
- d. Agricultural gypsum 20 lbs
- e. Custom amendment Mix (WCP33) 4 cy, sufficient for 3% to 5% soil organic matter on a dry weight basis. Amendment by Earth Works Soil Amendments, Inc. (951) 782-0260. Contact: Lefo Phororo

**C. Recommendations on a volume basis for plant backfill:**

- a. Dig the plant pit to twice the size of the root ball, and homogeneously blend the following materials into the existing top soil. Rates are expressed per cubic yard:
  - i. Calcium ammonium nitrate (27-0-0) 1/4 lb
  - ii. Potassium sulfate (0-0-50) 1/2 lb
  - iii. Triple superphosphate (0-45-0) 1/4 lb
  - iv. Agricultural gypsum 1 lb
  - v. Custom amendment Mix (WCP33) 30% by volume, sufficient for 3% to 5% soil organic matter on a dry weight basis. Amendment by Earth Works Soil Amendments, Inc. (951) 782-0260. Contact: Lefo Phororo
  - vi. Site Soil 70% by volume.

- D. Irrigate deeply to help lower the SAR to less than 3 where it is elevated. Reduce chloride to less than 150 parts per million in the saturation extract for lower slope for salt-sensitive plants.

1. Plant tablets shall be 7 gram size, Agriform or equal.

**E. Plant Materials:**

1. All plant materials shall be healthy, well-developed representatives of their species of varieties, free from disfigurement with well-developed branch and root systems, and certification of nursery inspection that plants are free from all plant diseases and insect infestation.

2. All trees shall equal or surpass "Devil Mountain Nurseries" standards for size and quality.
3. All shrubs and groundcover shall equal or surpass "Devil Mountain Nurseries" standards for size and quality.
4. Tag plant materials with name and size in accordance with standards of practice recommended by American Association of Nurserymen. See section 2.1.E.16 for requirements.
5. Size of tree and shrub containers shall be as stated on the planting plan. Container stock shall have grown in containers for at least six (6) months, but not over two (2) years. Samples shall be shown to prove that no root-bound conditions prevail. No container plants that have cracked or broken balls of earth, when taken from containers shall be planted, except upon specific approval.
6. Do not prune, prior to delivery, except by specific approval.
7. Plants shall be subject to inspection for size, variety, condition, latent defects, and injuries, at place of growth and at the project site at any time before or during progress of work. Remove rejected plants from the project site immediately and replace it with acceptable material.
8. Protect all plants from damage by sun, wind or rain at all times before planting.
9. Substitutions will not be permitted; except, when proof is submitted that any plant specified is not obtainable. In this case, a proposal will be considered for use of the nearest equivalent in size or variety with an equitable adjustment of contract price. All substitutions will be subject to the OWNER'S REPRESENTATIVE' approval.
10. Plants shall have grown under climatic conditions comparable to those of the project site, unless otherwise specifically approved by the OWNER'S REPRESENTATIVE.
11. All plant material needs to be reviewed and approved by OWNER'S REPRESENTATIVE for size, spread heights, widths, and health to ensure the best material is available and provided for this project. CONTRACTOR to submit photos of nursery questionable stock prior to purchasing and delivery to site.
12. CONTRACTOR to provide tree and plant photo submittal including a matrix of each plant indicating quantity to be provided, quantity available and location of nursery/growing yard. It will be the CONTRACTOR'S responsibility to locate suitable trees.
13. Tree tagging is to be scheduled as soon as possible after photo submittal approval. CONTRACTOR shall coordinate tree tagging scheduling with nurseries which will be attended by the OWNER'S REPRESENTATIVE. See section 2.1.E.16 for requirements.
14. Trees will be inspected by a City approved arborist and/or OWNER'S REPRESENTATIVE when delivered (72 hours advance notice required) and any trees damaged in transport, evidencing health concerns, or not meeting Nursery Tree Stock Standards, will be rejected and sent back at no cost to the OWNER. These trees shall be replaced with no impact to schedule or cost.

15. Trees will be inspected during and at the completion of construction. Any trees evidencing health concern will require treatment onsite as advised by a licensed arborist provided by the CONTRACTOR.

16. *CONTRACTOR shall locate and verify availability of all specified plant material. A complete list of all material and their source nursery/location shall be supplied to the OWNER'S REPRESENTATIVE for review. A representative number of plants shall be reviewed, approved and tagged at the nursery by the OWNER'S REPRESENTATIVE prior to shipment to the planting site. Prior to such visit, CONTRACTOR shall submit 3" x 5" color photographs of all proposed tree and shrub material for OWNER'S REPRESENTATIVE'S review. Photos shall indicate proposed material separate from the surrounding nursery stock in the size and condition of the proposed material to be provided. Photographs of all trees shall include an extended Philadelphia rod with the height increments legible. CONTRACTOR shall submit the following number of photos which shall be a representation of the material to be provided of said planting type at each nursery location:*

- 1) Shrub/ground cover-(1) photo for each type/variety
- 2) Trees- 15 gal-(1) photo for every 40 trees to be provided.
- 3) Trees- 24" through 36" Box -(1) photo for every 30 trees to be provided.
- 4) Trees- 48" Box -(1) photo for every 20 trees to be provided.
- 5) Trees- 60" Box -(1) photo for every 10 trees to be provided.
- 6) Trees- 72" Box -(1) photo for every 10 trees to be provided.
- 7) Trees- 96" & 120" Box- (1) photo for each tree to be provided.
- 8) Palms- (1) photo for every 20 palm trees – These photos shall be provided after they have been located, tagged and approved by the Specified Palm Tree Expert(Gregston Young), see specifications.

*Photos shall be submitted fourteen (14) calendar days prior to specified plant material review at the nursery site. Plants shall be inspected for size and condition of root growth, insects, injuries, and latent defects. Specified shrub, tree, and palm material shall be consistent (height, width, shape, growth pattern, branching height, etc.) by variety and size of container. The OWNER'S REPRESENTATIVE reserves the right to reject entire lots of plants, trees, palms, represented by inconsistent and/or defective samples. Should the CONTRACTOR have the OWNER'S REPRESENTATIVE travel to a nursery to review material that is unavailable, inconsistent, poor form, etc. the cost for the OWNER'S REPRESENTATIVES time/expenses shall be paid for by the CONTRACTOR. Payment for this expense shall be received by the OWNER'S REPRESENTATIVE prior to any subsequent nursery material review.*

*Plant condition shall be in accordance with the California State Department of Agriculture's regulations for nursery inspections, rules, and grading. OWNER'S REPRESENTATIVES maintain the right to reject plant material at the project site due to mechanical damage, pest infestation, material substitution without approval, etc.*

F. Ground Cover:

1. Ground covers will be hand planted in the areas indicated on the planting plans.

2. Ground cover plants shall be grown in flat plants or peat pots as indicated on the plant list. Flat grown plants (rooted cuttings) shall remain in flats until transplanting. The soil in the flat shall contain sufficient moisture so that it will not fall apart when lifting the plants. If plants from peat pots are used, the peat pots shall be protected at all times prior to planting to prevent unnecessary drying of the root ball.
3. Ground covers shall be planted in a triangular pattern evenly spaced unless otherwise noted on the plan. Plant ground covers continuously under all trees and shrubs in the areas designated on the planting plans.
4. Each plant shall be planted with its proportionate amount of soil from the flat or in a peat pot, in a manner that will ensure minimum disturbance of the root system. Hand smooth planting area after planting to provide an even, smooth, final finish grade. To avoid drying out, plantings shall be immediately watered after planting until the entire area is soaked to the full depth of each hole unless otherwise noted on the drawing.

5. A representative number of plants shall be inspected and approved at the nursery by the OWNER'S REPRESENTATIVE prior to shipment to the planting site. Prior to such visit, CONTRACTOR shall submit 3" x 5" color photographs of all proposed tree and shrub material for OWNER'S REPRESENTATIVE'S review. Photos shall indicate proposed material and picture shall indicate material separated from the surrounding nursery stock to size and condition of proposed material to be evaluated. Photographs of all trees shall include a person, with a height of at least 5' 6". Photos shall be submitted seven (7) calendar days prior to specified plant material review at nursery site. Plants shall be inspected for size and condition of root growth, insects, injuries, and latent defects. The OWNER'S REPRESENTATIVE reserves the right to reject entire lots of plants represented by defective samples.

Plant condition shall be in accordance with the California State Department of Agriculture's regulations for nursery inspections, rules, and grading.

- G. Tree ties: V.I.T Twist Brace Ties (T-24) for double staking and triple staking at all lodge pole staked trees, or equal as approved by the OWNER'S REPRESENTATIVE. Secure tree to stake in two places minimum. CONTRACTOR to provide product submittal prior to purchasing and installation.
- H. Tree stakes for each Lophostemon confertus trees shall be 2" two (2), 3" diameter, 12' 18' long schedule 40 galvanized steel poles, painted "dark green" with painted steel caps. Poles shall be staked parallel perpendicular to prevailing winds. Install with 3 cinch ties per tree.
- I. Tree stakes: Two (2) - 2 3" inch diameter x 12 foot long lodgepole stakes for all five gallon, fifteen gallon and 24 inch box trees per the following tree staking schedule. Tree stakes shall be pine and pointed at one end. CONTRACTOR to provide product submittal prior to purchasing and installation.

## Tree Staking Schedule:

Tree Staking / Guying Schedule				
Box Size	Stake / Guy	Size	Material	Comment
24"	Stake	3" x 18'	Steel, Powder Coat, Black	Lophostemon confertus
36"	Stake	3" x 18'	Steel, Powder Coat, Black	Lophostemon confertus
48"	Stake	3" x 12'	Lodgepole	In Turf
48"	Guy	88-DBI	14 oz Anchor ¼" - 7 x 19 GAC	Planter Area
60"	Stake	RF4P 4 Leg	Aluminum Alloy, Galvanized Wire	In Turf
60"	Guy	88-DBI	14 oz Anchor ¼" - 7 x 19 GAC	Planter Area
72"	Stake	RF4P 4 Leg	Aluminum Alloy, Galvanized Wire	In Turf
72"	Guy	138-DBI	2.5 lbs 3/16" 7 x 17 GAC	Planter Area
96"	Guy	138-DBI	2.5 lbs 3/16" 7 x 17 GAC	Planter Area
108"	Guy	4" x 4" x 48" Pressure Treated Deadman	3/8" 6 x 37 GWR Break Strength 15,000 lbs	Planter Area
120"	Guy	4" x 4" x 48" Pressure Treated Deadman	½" 6 x 37 GWR Break Strength 26,600 lbs	Planter Area

**Notes:** All trees in turf / lawn areas shall be staked or anchored per schedule above. All staked trees shall be double staked.

All guyed trees in planting areas shall have 3 guy wires / cables at 120 degree spacing, wire / cable size per chart. Anchors shall be duckbill (size as noted).

Wire / cable shall be covered in 1" SCH 40 PVC (8' length). PVC and cable shall be painted satin black.



All cable ends shall be secured with double loops and fastened with two (2) galvanized drop forged wire rope clips per each termination.

Trees 60" & 72" box sized to be planted in turf to receive Platipus Anchors, model per schedule above.

- J. Trees **not planted in turf areas** and larger than 24 in box sizes utilize (3) Guy wires per planting details and specifications below: (Boxed trees larger than 24" box in size and specified in turf areas shall be installed w/ tree stakes, per Item I above)
- a. Guy Anchors: ~~2" x 4" x 24 Redwood deadman~~ See Tree Staking Schedule
  - b. Wire: pliable 9-gauge galvanized
  - c. Hose: 1/2" diameter new lack rubber hose
  - d. Turnbuckles: galvanized or dip-painted, size as required
  - e. Cable Clamps: galvanized, size as required
  - f. Safety sleeve: 3/8" white PVC (length per drawings), painted black

CONTRACTOR to provide product submittal and quantities prior to purchasing and installation.

- K. Root Barriers: Per plans and where trees are planted within 5' feet of curbs, sidewalks or pavement, install a sub-surface panel barrier 10 feet long centered on the tree trunk Depth 24" ("Deep Root" or approved equal 800-458-7668). CONTRACTOR to provide product submittal prior to purchasing and installation.
- L. Mulch. Mulch material shall be ~~""Forest Blend"~~ "TV400" bark mulch, supplied by Terra Verde Industries (TVI) (949) 551-0363 or approved equal, ground, and screened to manufacturer specification. Composted and nitrogen stabilized. Submit sample for review and approval by the OWNER'S REPRESENTATIVE prior to material delivery on-site.
- M. All trees planted in turf areas shall be planted ~~with continuous, secured Arbogard+ protective sheath at base of trunk. Install per manufacturers specifications. Available from Gemplers (800) 382-8473.~~ 2' diameter mulch ring 3" deep around each trunk.
- N. Pre-emergent weed control: CONTRACTOR to provide pre-emergent weed control Dimension 270G available from Simplot Partners contact ~~Paul Wizikowski at (714) 686-7493~~ Chris Jennings at (714) 388-8965. Install over finish grade & prior to mulch instillation. Install per manufactures recommended specifications and application rates.
- O. Soil Herbicide. A commercially manufactured non-selective herbicide for total control of vegetation products shall meet all federal and state regulations pertaining to the use of such substances. Application and rate of application shall follow manufacturer's recommendations. Application shall not be made until obtaining written approval from the OWNER'S REPRESENTATIVE. Such application shall be performed in consideration of overall construction schedule and operation so as not to disrupt or interfere with the project schedule and timeline. CONTRACTOR to provide product submittal prior to application.
- P. Jute Netting: As provided by "Geojute" or approved equal. Available from: Ben Meadows. (800) 458-7668. CONTRACTOR to provide product sample and specification sheet for approval prior to purchasing and installation.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Site clearance: Clean up and remove from the planting areas weeds and grasses, including roots, and any minor accumulated debris and rubbish before commencing work.

The CONTRACTOR shall be responsible for performing weed killing and landscape maintenance for the entire site throughout the duration of the project. This includes, but is not limited to, maintaining all landscaped areas, removing weeds and debris, and ensuring that the site is kept in a neat and orderly condition.

The CONTRACTOR shall perform landscape maintenance and weed control on a regular basis, as necessary to prevent the growth of weeds and maintain the appearance of the site. This shall include, but is not limited to, mowing, edging, pruning, and fertilizing as needed. The CONTRACTOR shall also protect landscape work and materials from damage due to landscape operations, operations by other CONTRACTORS, and trades and trespassers, as outlined in Part 4: Maintenance 32 90 00 PLANTING.

- B. Storage: Secure permission from the OWNER'S REPRESENTATIVE to store plants on the project site and ensure that they are protected from damage by the sun, wind, and construction work.
- C. Finish grading of all shrub and groundcover planting areas. Grading shall be done as indicated on the grading plans and as follows.
1. Do not work on the soil when moisture content is so great that excessive compaction will occur, or when it is so dry that dust will form or clods will not readily break up.
  2. Remove and dispose of all soil in planting areas that contains any deleterious substance such as oil, plaster, construction waste, concrete, gasoline, paint, solvents, etc., removing the soil to a minimum depth of six (6) inches or to the level of dryness in the affected areas. The affected soil shall be replaced with native or imported soil as required. The CONTRACTOR shall be responsible for any damage to installed plants caused by such substances.
  3. If an area to be landscaped is not acceptable to the CONTRACTOR, the CONTRACTOR shall notify the OWNER'S REPRESENTATIVE, in writing.
  4. Prior to start of finish grading, loosen all planting areas to a depth of six (9) inches. Finish grades shall allow for addition of soil conditioners.
  5. Make minor grade adjustments as directed by the OWNER'S REPRESENTATIVE.
  6. Where designated drainage meets an obstruction, warp grades so that no water collects.

7. Use water trucks and sprinklers as required to control all airborne dust caused by grading operations.
8. Finish grading all planting areas to a smooth and even condition, making certain that no water pockets or **surface** irregularities remain. Remove and dispose of all foreign materials, clods, and rocks over 1 inch in diameter at the surface and sub-surface down to 12 inches depth minimum.
9. Provide a grade which, after conditioning planting and compaction (85%), is 1 inch below the tops of curbs and walks in lawn areas and 2) inch below for shrub areas sloping to drain to adjacent roadway, drain swale or catch basin.

D. Soil Conditioning:

1. Amend all planting areas with a grade of 3:1 or less. Incorporate evenly into the top 9 inches of existing soil (with a rototiller or approved piece of equipment) the following per each 1,000 square feet of planting area.
  - a. 4 cubic yards of Nitrogen fortified organic amendment (compost\* or redwood or fir sawdust).
  - b. 25 lbs. of 06-24-24 XB commercial fertilizer or approved equal.
  - c. 25 lbs gypsum
  - d. 15 lbs soil sulfur
  - e. 4 lbs magnesium sulfate
2. **The above soil conditioning quantities shall be used for bidding purposes only;** soil conditions may change drastically from the time these specifications were developed until the actual soil conditioning takes place. Therefore, the CONTRACTOR shall obtain 12-15 soil samples at locations identified **on the planting plans. by the OWNER'S REPRESENTATIVE**. Cost to be included in the contract sum. These soil tests shall be conducted by an approved agronomic soils testing laboratory approved by the OWNER'S REPRESENTATIVE. For reference, a pre-approved agronomic testing facility is: Waypoint Analytical, (714) 282-8777. Contact Joe Keifer. The CONTRACTOR shall add amendments per soils report recommendations for individual planting areas and as approved by the OWNER'S REPRESENTATIVE.
3. All rocks or unbroken soil clods over 1 inch in diameter brought to the surface shall be removed from the project site. No soil clods or rock over 1" in size shall occur within the top 12" of site soil.

**E. Weed control program:** Upon complete installation of soil amendments, irrigation system, and prior to planting operations, CONTRACTOR shall implement the following weed eradication procedures:

1. Remove all existing weeds and any remaining weed stubble from planting areas by raking, hoeing, and/or hand removal.
2. Apply sulfate of ammonia (21-0-0 24S) at the rate of 5lbs. per 1000 sq. ft. to all planting areas.
3. Water all planting areas per initial establishment period water schedule on the irrigation plans for a period of fourteen (14) days to allow germination of weed seeds. If designated

~~planting areas do not have spray irrigation systems already installed, CONTRACTOR is responsible for providing water to irrigate soil during period of weed abatement. CONTRACTOR shall coordinate water trucks, Rain for Rent, or some other manual method of irrigating soil with OWNER'S REPRESENTATIVE prior to scheduling.~~

- ~~4. Cease watering for five (5) days, to be followed by the spraying of a systemic herbicide application. (Round Up Pro, or approved equal.)~~
- ~~5. Repeat steps 3 and 4 above. Note: If the weed eradication program exceeds two full cycles or 60 days, repeat steps 2, 3 and 4, as required until close of maintenance period.~~

~~Systemic herbicide shall contain the active ingredient glyphosate (Round Up Pro, or approved equal). Spraying rate shall be per the manufacturer's current recommendations and shall be compatible with the eradication rate for the target weed species. CONTRACTOR shall follow herbicide manufacturer's instructions when to resume irrigation after each herbicide application.~~

~~Application of all herbicides shall be performed under the direction of a licensed pest control advisor.~~

~~Any deviation from the above weed eradication procedures shall be approved by the OWNER'S REPRESENTATIVE.~~

~~The CONTRACTOR shall be responsible for keeping all planting areas, appropriately watered and weed-free until release from maintenance responsibility by the OWNER'S REPRESENTATIVE.~~

**F-E.** Planting shall be completed as follows:

1. Determine location of the trees and shrubs by scaling from the planting plan.
2. Place / locate all 5 gallon and smaller containers on finish grade, and obtain approval from the OWNER'S REPRESENTATIVE before excavating planting pits. Provide color-coded 6' high stakes (one color per tree type) secured in finish grade to indicate location of all tree plantings. Location of all tree planting locations, as indicated by 6' color coded stakes shall be reviewed and approved by OWNER'S REPRESENTATIVE prior to planting. Modifications to tree planting may be used to screen adjacent solar panels west of the park site.
3. Excavate planting pits with vertical sides for all plants. Shrub pits shall be twice the diameter and set rootball 2 inches above surrounding grade. Tree pits shall be twice the diameter and set rootball 2 inches above surrounding grade. Tree pits depth shall include the rootball and a transitional zone of compacted, unamended native soil.
4. If planting pits are cut with power auger, vertical sides of pit shall be additionally broken with balling bar or spade to interrupt continuous curve influence on root development.
5. Plant material shall be planted in such a way that after settling, the crown of the plant bears the same relation to finish grade that it did to the surface in the container.

6. Backfill tree and shrub planting pits with uniformly mixed site soil amended with 5 lbs. gypsum and one pound iron sulfate per cubic yard of backfill if specified by soil test (Per D.2 of this specifications section).
7. Form shallow basin around the edge of planting pits. Water should be directed into original rootball until roots grow into surrounding soil.
8. Plant Tablets - 7 gram planting tablets, Provide tablets in the following ratios:
  - a. 1 tablet per ground cover and liners.
  - b. 2 tablets per gallon plant.
  - c. 6 tablets per 5 gallon plant.
  - d. 12 tablets per 15 gallon plant.
  - e. 14 tablets per 24 inch box plant.
  - f. 16 tablets per 30 inch box tree.
  - g. 18 tablets per 36 inch box tree.
  - h. 20 tablets per 48 inch box tree.
9. Grade area around plants to finish grades and dispose of excess soil.
10. Location for trees adjacent to any light standards or utility equipment shall be adjusted to maintain a suitable clearance, to avoid any conflicts as approved by the OWNER'S REPRESENTATIVE.
11. **All landscape areas with a slope gradient of 4:1 and steeper shall be covered with "Geojute" or approved equal; available from:** Ben Meadows (800) 241-6401. Installation shall be per manufacturers specifications. Planting through "Geojute" shall be in accordance with planting recommendations provided by Geojute. **Mulch shall be applied on top of Geojute once planting is completed.**
12. **Prior to application of specified mulch** CONTRACTOR shall broadcast pre-emergent herbicide "Dimension" 270G **Apply per manufacturers recommendations. Contact Simplot, Mr. Chris Jeannings (714) 388-8965 Ultra-40WP** or approved equal to all shrub and groundcover planter areas

**G.F.** Pruning:

1. Prune minimum necessary to remove injured twigs, branches, dead wood, sprouts and suckers.
2. Prune plants according to standard horticultural practices, by qualified personnel.
3. No topping of any trees will be permitted. Trees that have been topped will be replaced at the CONTRACTOR'S expense.

**H.G.** Clean-up:

1. During the course of the work, daily remove surplus materials from the site and leave premises in a neat and clean condition.
2. Prior to acceptance of the project for maintenance, clean up and remove all remaining debris and surplus materials upon completion of work, leaving the premises neat and clean.
3. Remove all tags, labels, nursery container stakes and ties not required per the tree staking schedule from all plant material only after the approval of the OWNER'S REPRESENTATIVE.

## **PART 4 - MAINTENANCE**

### **4.1 GENERAL**

Continuously maintain all work throughout ALL phases until the Final Acceptance of the Work, and then throughout the 1 year warranty after final acceptance.

### **4.2 MAINTENANCE PERIOD**

After all the work indicated on the drawings or herein specified has been completed and inspected and approved by the OWNER'S REPRESENTATIVE; maintain all areas within the project boundary for a period of 1 year. 1 year maintenance period shall not begin until final review and approval by the OWNER'S REPRESENTATIVE has been provided regarding the successful completion of all punch list items

### **4.3 TREE AND SHRUB CARE**

- A. Watering: Maintain a large enough water basin around plants so that enough water can be applied to establish moisture through the major root zone. When hand watering, use a wand to break the water force.
- B. Tree Pruning:
  1. Prune trees to select and develop permanent scaffold branches that are smaller in diameter to the trunk or branch of which they are attached, which have vertical spacing of from 18 to 48 inches and radial orientation so as not to overlay one another; to eliminate narrow V-shaped branch forks that lack thinning out crowns; to maintain growth within space balance crown with roots.
  2. Under no circumstances will stripping of lower branches or "raising up" of young trees be permitted. Retain lower branches in a "tipped back" or pinched condition with as much foliage as possible to promote trunk growth (tapered trunk). Lower branches may be removed only after the tree is able to stand erect without staking or other support.
  3. Thin out and shape evergreen trees when necessary to prevent wind and storm damage. Perform primary pruning to deciduous trees during the dormant season. Prune damaged trees or those that constitute health or safety hazards at any time of the year as directed by the OWNER'S REPRESENTATIVE.

- C. Shrub Pruning:
1. The objectives of shrub pruning are the same as for trees. Do not clip shrubs into balled or boxed forms unless such is required by the design and designated on the planting plans.
  2. Make all pruning cuts of lateral branches or buds, as directed by the OWNER'S REPRESENTATIVE.
  3. Topping is not allowed.
- D. Staking: Remove stakes as soon as they are no longer needed. Inspect stakes to prevent girdling of trunks or branches, and to prevent rubbing that causes bark wounds. The contracting crew at the time of maintenance shall remove the stakes and cut the stakes so they are not protruding into the canopy.
- E. Weed control:
1. Keep all areas ~~basins and areas~~ between plants free of weeds. Apply pre-emergent herbicides recommended by a licensed pest control advisor to all non-seeded landscape areas only. Avoid frequent soil cultivation that destroys shallow roots or disturbs pre-emergent herbicide application.
  2. Eradicate all noxious weeds from site (i.e. nutgrass, bermuda grass, kikuyu grass, crab grass).
- F. Insect and disease control: Maintain control with approved materials. CONTRACTOR shall be responsible for removal of all pests, rodents, slugs, snails, etc. that cause damage to the plant materials and maintain health of plants until project turnover. Any and all damaged plant material caused by such is to be replaced immediately by the CONTRACTOR, at no cost to the OWNER.
- G. Fertilization: Uniformly broadcast sulfur coated urea at the rate of 5 lbs. per 1000 sq.ft. The first application should occur approximately 45-60 days after planting, with repeat applications every ~~60-90 days~~ ~~during the 1 year maintenance period~~ ~~or as growth and color dictate~~. In early fall and spring, substitute a complete fertilizer such as 16-6-8, or equal, for the sulfur coated urea at the rate of 6 lbs. per 1000 sq. ft. to ensure continuing supplies of phosphorus and potassium. Tree and shrub plantings can be maintained with the above fertilizers; however, the frequency between applications should be every 90-~~120~~ days, ~~or as color and growth dictate~~, with the first application 90 days after planting. Follow each fertilization with a thorough irrigation. When plants have become well established, fertilizer applications can be less frequent. (Maintenance progress inspections are required for verification of fertilizer applications)
- Note: Application should be per manufacturer's recommendation per site and OWNER'S REPRESENTATIVE'S approval.
- H. Replacement of plants: Remove dead and dying plants and replace with plants of equal size and variety of original planting plan at no additional cost to the OWNER and as approved by the OWNER'S REPRESENTATIVE. Guarantee period shall re-apply.

- I. Groundcover Care: Apply a pre-emergent herbicide having a life no less than six (6) months to all ground-cover and shrub areas. Herbicide shall be registered for use on the species of plant material specified in planting plans and approved by a licensed pest control advisor.
- J. Watering: Water turf areas at such frequency as weather conditions require, to replenish soil moisture below root zone. Irrigation shall be scheduled between 10 p.m. and 6 a.m. following turf establishment. CONTRACTOR to ensure timing appropriate with current IRWD recycled watering program hours.
- K. General Maintenance:
  - 1. Remove trash from the ground daily and dispose of weekly.
  - 2. Edge ground cover to keep in bounds and trim top growth as necessary to achieve an overall even appearance.
  - 3. Exterminate vertebrate pests, gophers, moles, etc.; and repair damage as required.
  - 4. Test irrigation system weekly and submit reports to OWNER'S REPRESENTATIVE.
  - 5. The site temporary fence shall be maintained to ensure security to the site and to protection of the plant materials to establish growth and promote health.

#### **PART 5 - GUARANTEE**

- 5.1** All trees (5 gallon and larger) shall be guaranteed for a period of one year. All shrubs and plant materials shall be guaranteed for a period of 1 year. All guarantee periods commence from the time of final acceptance by the OWNER'S REPRESENTATIVE at the completion of the 1 year maintenance period.
- 5.2** Replace, as soon as weather permits or as directed by the OWNER'S REPRESENTATIVE, all dead plants and all plants not in vigorous condition as noted during the inspections and maintenance period.
- 5.3** Plants used for replacements shall be the same kind and size as originally planted. Replacement plants shall be approved by the OWNER'S REPRESENTATIVE and shall be furnished, planted, fertilized as specified and guaranteed the same as the original plant materials.

**END OF SECTION**



**SECTION 32 92 23****SODDING****PART 1 - GENERAL****1.1 GENERAL CONDITIONS**

The requirements of the "General Conditions of the Contract" and of Division 1, "General Requirements," shall apply to all work of this Section with the same force and effect as though repeated in full herein.

**1.2 SCOPE OF WORK****A. Work Included:**

All labor, materials, equipment, and services necessary for and incidental to performing all operations of the work for this section, complete as shown on the Drawings or specified herein. Work includes, but is not necessarily limited to, the following:

**1. Clean Up****B. Related Work in Other Sections:****1. Section 32 84 00 - Irrigation System****2. Section 32 90 00 – Planting****C. CONTRACTOR Furnished Labor.** The CONTRACTOR shall furnish all necessary labor to support all aspects of the sodding process. This additional labor is to ensure that all planting occurs at the same time with progression in an organized fashion followed by a uniform application of water within thirty (30) minutes of planting.**1.3 QUALITY ASSURANCE****A. Source Quality Control:**

- 1.** Submit documentation of all lawn and grass material being ordered to City's Representative at least 60 days prior to start of planting. Arrange procedure for inspection of materials with City's Representative at time of submission.
- 2.** Materials shall be subject to inspection and approval by City's Representative at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during the progress of the work.
- 3.** Submit written request for inspection of materials at place of growth and/or availability to City's Representative. Written request shall state the place of growth and/or availability and the harvesting record for the

specified sod. The City's Representative reserves the right to refuse inspection at this time if, in his judgment, an inspection is not warranted.

#### **1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING**

A. Protection and Delivery of Sod:

1. Sod for site planning shall be delivered to planting site within twenty four (24) hours of harvest. Sod shall be refrigerated immediately after harvest prior to transportation. Sod shall remain moist at all times prior to planting.
2. Deliver materials to site in original unopened containers bearing manufacturer's guarantee chemical analysis, name, trademark, purity, germination, and conformance to State law.
3. Deliver materials with legible waterproof identification labels.
4. Protect material during delivery to prevent damage.
5. The CONTRACTOR shall notify the City's Representative seven days prior to delivery of all materials and shall submit an itemized list for each delivery.

B. Storage:

1. Store plant material in shade and protect from weather.
2. Protect material from damage and theft.

C. Handling:

1. Do not drop materials.

#### **1.5 JOB CONDITIONS**

A. Planting:

Perform actual planting only when weather and soil conditions are suitable according to locally accepted practices.

B. Scheduling:

Install trees and container stock plant material before Sodded Lawn and Grass installation.

#### **1.6 SAMPLES AND TESTS**

- A. City reserves the right to take and analyze samples of materials for conformity to Specifications at any time. CONTRACTOR shall furnish samples upon City's request. Rejected materials shall be immediately removed from the site at CONTRACTOR'S expense. Costs of testing materials not meeting Specifications shall be paid by CONTRACTOR.

- B. Laboratory Analysis: Provide laboratory soils analysis conforming to the Landscape Planting Specification.

## 1.7 REPLACEMENTS

- A. Replacement

Any materials found to be dead, discolored, missing, or in poor condition during the maintenance period shall be replaced immediately. The City's Representative shall be the sole judge as to the condition of materials. Materials to be replaced within the guarantee period shall be replaced by the CONTRACTOR within 15 days of written notification by the City.

## 1.8 CONTROL

The selection of herbicides, application rates and methods are to be performed under the control and guidance of a State of California licensed pest control advisor and applicator.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Specific amendments and fertilizer Specifications are to conform to Section 32 90 00 Planting
- B. All materials shall be of standard, approved, and first-rate quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged material shall be delivered to the site in the original unopened container bearing the manufacturer's guaranteed analysis.

### 2.2 STATEMENTS OF CONFIRMATION

Submit at time of delivery invoice statements certifying quantities by bulk and/or weight, for all materials. Submit suppliers' certificates of compliance with these specifications. Random samples may be taken by City's Representative for analysis.

### 2.3 SOD

- A. Sod:
  - 1. Sod Variety: "Tahoma 31 Bermuda Grass" sod supplied by West Coast Turf. Sod shall be 1/2" thick, and delivered in 42-inch rolls. Contact: Anthony Pullizano (760) 834 - 5121

## PART 3 - EXECUTION

### 3.1 INSPECTION

- A. Obtain certification from grading contractor that final grades to 0.1" for sodded areas have been established prior to commencing landscaping operations. Provide for incorporation of all amendments, settling, etc. Be responsible for shaping all planting areas as indicated on Drawings.

### 3.2 PREPARATION

- A. The irrigation system shall be fully operational and approved prior to sodding.

### 3.3 INSTALLATION

- A. General:

- 1. Actual planting shall be performed during those periods when weather and soil conditions are suitable and in accordance with locally accepted practice as approved by West Coast Turf Contact: Anthony Pullizano (760) 834 - 5121.

- B. Preparation of Lawn Areas:

- 1. See Section 32 90 00 for soil preparation of turf.

- C. Final Grades:

- 1. Grade all lawn planting areas to a level of 1 inch below the adjacent pavement surface. Where no grades are shown, grade between existing or fixed controls (such as walks, curbs, catch basins) and elevations shown to provide a smooth and continual plane. Rake and level as necessary to obtain true and even surfaces. Maintain all swales and drainage patterns specified on the site grading plans.
  - 2. Finish grading shall ensure proper drainage of the site.
  - 3. Surface drainage to be as indicated on plans.
  - 4. Re-grade and replant all erosion scars.

- D. Disposal of Excess Soil: Dispose of unacceptable or unused excess soil off site.

- E. Weed Control:

- 1. After soil preparation and establishment of final grades prior to any planting, provide Weed Abatement Program per Section 32 90 00.

- F. Scheduling

The CONTRACTOR shall commence the field turf grass sod installation at the City's direction. CONTRACTOR shall incorporate these dates and the related construction activities in the overall construction schedule. CONTRACTOR shall show due diligence in his performance in meeting this schedule.

- G. Laying Sod:

- 1. Finish grades shall be those indicated on the precise grading plans. Grades not otherwise indicated shall be uniform and straight graded between points where elevations are noted. Minor modeling of the ground surface may be required by the landscape contractor prior to installation of sod. Landscape areas to receive turf shall be rolled with a water drum in a north/south and then east/west direction. Low sports and

high spots in the terrain shall be backfilled and tamped or bladed and spread. The resultant grade shall be smoothly, evenly contoured and compacted to 85%. The gradient shall be as noted on the plans.

12. Soil moisture. All areas to receive planting shall be irrigated prior to planting. Soil shall be maintained in a constant moist condition but well below field capacity. Extreme care must be exercised to prevent over-watering to prevent soil-compaction or creating grade irregularities by heavy equipment.
23. The CONTRACTOR shall provide and install the type and quantity of turf grass sod as shown on the drawings and specified herein. Only long roll sod of the variety specified shall be utilized.
34. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or lightly roll to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess material from sodded areas to prevent smothering.

**NOTE: Mesh backing material shall be removed from sod at the time that sod is laid. The CONTRACTOR shall clean up and dispose, off-site, all mesh material and surplus sod.**

4. Thoroughly water soil with a fine spray immediately after planting to saturate the sodded area to a depth of four inches.
5. After two days of thorough watering, the CONTRACTOR shall curtail watering to permit re-rolling of the sodded area to ensure proper contact with subgrade.
6. After the second rolling of the sod, the CONTRACTOR shall routinely water, fertilize and maintain sodded area until the termination of the specified maintenance period and until acceptance by the OWNER'S REPRESENTATIVE.

H. Maintenance and Observation:

1. Turf type Bermuda shall be no more than 3/4 to 1 inches height at time of the first mowing. All turf areas shall be mowed, removing no more than 1/3 of the turf grass blade, and all bare spots shall be resodded prior to beginning of the maintenance period.
2. Conduct a complete review of all landscape construction items at the end of the landscape construction period to establish the time for beginning of the maintenance period. Notify the City's Representative at least seven days in advance of review.
3. Maintain lawns to watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regarding, and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

a. Mowing

- 1.) Mow throughout maintenance period. At a rate of (2) times weekly.
- 2.) Mow in 3 different directions across entire turf area.
- 3.) Mow height shall be between  $\frac{3}{4}$ " and  $\frac{1}{2}$ " depending on City's Representative.
- 4.) Mower shall be a reel mower with hydraulic reels, 7 blade minimum.
- 5.) Top dress any settling in grade (weekly) throughout maintenance period. Use same material as per Soil Preparation specification.
- 6.) Monitored daily for possible fungus or insect damage. Correct immediately.
- 7.) Submit weekly maintenance schedule to OWNER'S REPRESENTATIVE.
- 8.) Walk entire Turf grass surface with OWNER'S REPRESENTATIVE weekly for performance evaluation and to address any needed adjustments.

b. Fertilization: **FOR BID PURPOSES ONLY. CONTRACTOR TO PREPARE SUBMITTAL FOR AMENDMENT / FERTILIZATION VERIFICATION OF QUANTITIES.**

- 1.) Apply fertilizer every 10 days.  $\frac{1}{2}$  of # pound actual nitrogen per 1000 sq. ft. to turfgrass. 21-0-0 is recommended or approved equal. This is equal to 2.5 lbs. of product per 1000 sq. ft. for the entire 120 day maintenance period.
- 2.) In addition during the 1 year maintenance period, at 45 day intervals apply Gro-Power 3-12-12 at recommended rates.

c. Irrigation should be adjusted from constant daytime syringing to light shallow evening irrigation and daytime irrigation as needed.

d. Weeds shall be mechanically removed daily upon appearance

4. Final Observation will be made at the conclusion of the maintenance period. Submit written notice requesting final observation to the City's Representative at least seven days before anticipated date.
5. When observed turf work does not comply with requirements, replace rejected work and continue specified maintenance until observed by the City's Representative and found to be acceptable. Remove rejected materials promptly from project site.
6. In the event the CONTRACTOR requests observation of incomplete work, without completing previously noted corrections or without preparing for the observation, he will be responsible for reimbursing the City's Representative at the hourly rate in effect at the time of the observation portal to portal (plus transportation costs) for the inconvenience. No further observations will be scheduled until this charge has been paid.

### 3.4 GUARANTEE AND REPLACEMENT

- A. Guarantee until end of maintenance period and acceptance by the City. Replace damaged or dead lawn areas with sod.

### **3.5 CLEAN-UP**

- A. After all planting operations are complete, remove all trash, excess soil, and rubbish from the property. Repair scars, ruts, or other marks in the ground caused by this work and leave the ground in a neat and orderly condition.
- B. Leave the site in broom-clean condition and wash down all paved areas within the project site. Leave walks in clean and safe condition.
- C. Protect landscape work and materials from damage due to landscape operations, operations by other CONTRACTORS, and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

### **3.6 OBSERVATION SCHEDULE**

Normal progress observation shall be requested by the CONTRACTOR from the City Representative at least 40 hours in advance of an anticipated site visit. Advance notification for the below site visits shall be required as follows:

- 1. Final grade review: 48 hours
  - 2. Lawn sod installation: 48 hours
  - 3. Pre-maintenance: 7 days
  - 4. Final acceptance: 7 days
- I. NOTE: Final Acceptance does not remove SOD from part of the 365-day maintenance period until project closeout and turnover. Observation schedule above only for installation.

No site visits shall commence without all items noted in previous observation reports either completed or remedied unless such compliance has been waived by the City. Site visits that are scheduled, but the CONTRACTOR has failed to accomplish punch list tasks or prepare adequately for desired inspections, shall make the CONTRACTOR responsible for reimbursing the City's Representative at his current hourly billing rate plus transportation costs. No further inspections shall be scheduled until this charge has been paid and received by the City's Representative.

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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## SECTION 32 93 44 PALM TREE PLANTING

### PART 1 - GENERAL

#### 1.1 General Conditions:

The requirements of the "General Conditions of this Contract" and the "General Provisions," shall apply to all work of this Section with the same force and effect as though repeated in full herein.

#### 1.2 Scope of Work:

All labor, materials, equipment, and services necessary for and incidental to performing all operations of the work for this section, complete as shown on the Contract Drawings or specified herein. Work includes, but is not necessarily limited to, the following:

- A. Palm Tree Planting
- B. Clean Up

#### 1.3 Quality Assurance

- A. **Contractor shall retain the services of an approved "Certified Arborist / Palm Specialist."** To participate and oversee the acquisition, planting and maintenance of the palms. Obtain source of palms for inspection and approval by **"Certified Arborist / Palm Specialist."** CONTRACTOR to submit qualifications of proposed Certified Arborist to OWNER for review and approval. CONTRACTOR shall submit hourly rates of Certified Arborist, with all hours of his involvement as specified herein to be paid by CONTRACTOR. Certified Arborist shall be involved in all stages of palm tree acquisition, removal, transport, storage, planting, and maintenance. If any discrepancies occur between the Certified Arborist and the plans and specifications, it shall be brought to the immediate attention of the OWNER Inspector and resolved in an acceptable manner prior to the commencement of further work.
- B. **Pre-approved and recommended "Certified Arborist"/"Palm Specialist":** Mr. Gregston D. Young, GDY Consulting; ASCA Registered Consulting Arborist #731 and ISA Board Certified Master Arborist WE-9732B, Tel: 760-250-1229 or GDY@earthlink.net, or approved equal.

- C. Submit documentation and permits (if required) that the source of palm trees is approved. Obtain palms from an approved source.

#### 1.4 Product Delivery, and Storage:

##### A. Delivery

1. Protect plant material during delivery to prevent damage to root ball and fronds.
2. The CONTRACTOR shall notify the OWNER Inspector seven days prior to delivery of all plant materials and shall submit an itemized list of the plants in each delivery.

##### B. Storage

1. Store plant material in shade and protect from weather.
2. Maintain and protect plant material not to be planted within four hours.

#### 1.5 Job Conditions:

Perform actual planting only when weather and soil conditions are suitable according to locally accepted practices.

#### 1.6 Scheduling Work:

- A. Notify the Engineer a minimum of seven (7) days in advance of balling, prepping and transporting.
- D. Palm trees shall be planted at their new locations within 36 hours of removal from original ground.
- E. Schedule palm trees to be balled, transported and planted on days not to exceed 120 degrees Fahrenheit ambient temperature and nights not below 32 degrees Fahrenheit ambient temperature.

## PART 2 - PRODUCTS

### 2.1 General:

- A. Palms shall be inspected by the “Certified Arborist / Palm Specialist”. Inspection shall include but not be limited to overall health and vigor, frond tying, etc. Any palms rendered unsuitable for planting because of this inspection shall not be used. Re-inspection of suitable palms will be at the CONTRACTOR’S expense.
- B. All palms must be tagged, inspected, and approved by the “Certified Arborist / Palm Specialist” for planting prior to shipment and installation. All palms shall be matching in form. All palm trunks shall be straight and true.
- C. All palms shall be obtained at W.D. Young & Sons Palm Nurseries, contact: Charlie Smith, 760-347-7906.

### PART 3 - EXECUTION

#### 3.1 Defronding and Tying:

- A. In preparing palm trees for relocation, all dead fronds shall be removed and the entire trunk “Classic” or “Diamond cut” clean to the height of green fronds. Care shall be taken to prevent injury to the trunk of the tree. Green fronds below “10:30-1:30 o’clock” position shall be neatly cut off leaving a 2 inch stub and all fruit and stalks. Only a drain spade shall be used to trim fronds or trunks. Tools must be sanitized with 50% bleach solution between palms. NO chainsaws shall be used in any of the prepping.
- B. All remaining fronds above “10:30-1:30 o’clock” position (approximately 35 fronds) shall be lifted up and tied together around the crown in an upright position. Due caution shall be taken not to bind or injure the crown. two-ply sisal twine shall be used in tying up the fronds; wire will not be permitted. After tying, the tips of the fronds shall be hedged off above the crown approximately 1/4 of the frond length. Defronding and tying work shall be completed within 30 minutes of digging the rootball and carefully laying the palm down. Submit documentation that palms have been reviewed by the “Certified Arborist / Palm Specialist”. and that they are disease free.

#### 3.2 Digging the Rootball:

- A. When digging out the rootball, no excavation shall be done closer than 12 inches to the trunk at ground level (rootball should be minimum 48-inches wide by 48-inches wide and the excavation shall extend to a minimum depth

of 4 feet. The bottom of the rootball shall be cut off square and perpendicular to the trunk just prior to planting on job site. Under no condition shall the CONTRACTOR cut down the size of the rootball in width or depth, without permission from Arborist

- B. The CONTRACTOR shall not freefall, drag, roll, or abuse the tree or put a strain on the crown at any time. A Soft High Tensile Endless Polyester Lifting Sling with a lifting rating double of the heaviest palm, shall be used around the trunk of the tree while lifting and relocating so as not to scar or skin the trunk in any way. . At no time will trees be balled out and laid on the ground with rootball left exposed to direct sunlight and air. The rootball shall be shaded at all times.
- C Palms shall not be stockpiled for replanting.

### 3.3 Planting of Palms:

- A. Excavation for planting shall include the stripping and staking of all acceptable topsoil encountered within the areas to be excavated for the tree holes.
- B. Excess soil generated from the planting holes and not used as backfill or in establishing the final grades shall be removed from the site.
- C. Protect all areas from excessive compaction when trucking plants or other material to the planting site.
- D. Center palm in pit or trench; align with adjacent palm plantings as indicated on plans. All palms shall be matched specimens (height, size, trunk diameter, character, etc. and shall be installed at matched planted heights).
- E. Set palm plumb and hold rigidly in position until washed concrete sand has filled all voids, water jetting with 3/4-inch by five-foot-long sticker pipe on garden hose, removing all air pockets, then tamping sand firmly around rootball, before releasing palm..
- F. All excavated holes shall have vertical sides with roughened surfaces and shall be of a size that is twice the diameter and 24 inch minimum on all sides. Palm shall be planted at the same depth as was originally grown. The top of the root initiation zone shall be even with the soil surface. Provide bracing as required per the recommendations of the certified arborist.

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- G. Palm back fill mix shall be as recommended by the certified arborist and agronomic soil report. ***The following mix may be used for bidding purposes only.*** Palms shall be backfilled with 100% washed concrete sand. CONTRACTOR shall submit sand sample with sieve analysis for review and approval prior to planting.
- H. Palm root growth stimulant shall be as recommended by the certified arborist and agronomic soil report. ***The following root growth stimulant may be used for bidding purposes only.*** Root-growth stimulant shall be applied when the backfilling is between 1/2 to 2/3 height up the rootball. Application rate shall be per manufacturer's specifications. CONTRACTOR shall submit root growth stimulant product information for OWNER review and approval prior to application.
- I. Palm planting shall be in accordance with planting detail on construction documents.
- J. Palm locations shall be identified from survey of digitized information provided by ARCHITECT, upon request of the CONTRACTOR. Planting shall be done prior to pedestrian hardscape installation. CONTRACTOR shall coordinate as necessary with civil engineering plans to set palms at appropriate vertical height. Location of indicated palm trunk centers as indicated on planting plans and details shall be accurately surveyed and staked on-site prior to planting. Actual palm trunk locations, when planted, shall be as surveyed to allow for installation of adjacent pedestrian hardscape as indicated on plans and details.

### 3.4 Palm Tree Balling, prepping, and Transporting/Transplanting

#### A. General

1. The Work done hereunder consists of balling, prepping, trees and transporting/transporting said trees as described on the Plans.
2. The Certified Arborist shall be involved in all stages of the balling, prepping and transporting.
3. Erect barricades or signs as necessary to prohibit work, heavy vehicles, storage of materials, trenching, or any other activity detrimental to trees from occurring under tree driplines. Notify Engineer of any intention to work within tree driplines and gain approval prior to Work.

4. Obtain the services of a certified arborist (certified by the International Society of Arboriculture) for the duration of the balling, prepping and transporting of the trees. Prior to transplanting preparation, all palms are to be inspected by the Certified Arborist to evaluate the palms health and vigor, and shall provide written certification of findings and recommendations.

B. Submittals

1. Prior to beginning Work, photograph entire profile of all trees from at least two sides.
2. Submit one set of 4 inch x 6 inch color prints to OWNER.

C. Quality Assurance

1. CONTRACTOR shall have or shall hire a subcontractor who has a California State CONTRACTOR'S C-27 License and a minimum of three years' prior experience in balling, prepping and transporting similar sizes and types of trees. A certified arborist provided by the CONTRACTOR shall be present on the site to supervise all tree balling, prepping and transplanting.
2. Examine condition of trees to be balled, prepped. Immediately notify the Engineer of any unsatisfactory conditions detrimental to successful relocation. Beginning balling, prepping and transporting of tree means acceptance of conditions by CONTRACTOR.
3. Comply with all Federal, State, and local codes, ordinances, safety orders, and regulations of all AUTHORITIES HAVING JURISDICTION over this Work.

D. Materials

1. Horticultural Materials:
  - a. Fungicide: "Subdue, Maxx + Cleary's 3336 (2 ounces of Subdue and ½ lb. of Cleary's per 100 gallons of water)" or approved equal. When the palm trees are planted, 7-10 gallons of fungicide 'subdue Maxx + Cleary's 3336', shall be applied to the roots of each palm tree in accordance with the printed instructions of the fungicide manufacturer. A copy of

said printed instructions shall be furnished to the Engineer before applying any fungicide. Fungicide to be used shall be submitted to the Engineer for approval not less than 2 week days prior to its intended use. Fungicide not approved by the Engineer shall not be used.

- b. Fertilizer and Amendments: As specified by certified arborist.

E. Guarantee

Should any tree fail during the balling, prepping and transporting, supply the Engineer with replacement plant material of similar or approved equal quality and size. Engineer is sole judge of need for replacement.

3.5 Cleanup:

Following planting work, all remaining excavation shall be backfilled and compacted in accordance with the requirements of the OWNER Inspector. Burying of debris in holes will not be permitted. All excess soil and debris from the relocation work shall be disposed off the site by the CONTRACTOR. This site shall be left neat and clean to the satisfaction of the OWNER.

3.6 Maintenance:

- A. Be responsible for maintenance and guarantee of all installed new palms to the satisfaction of the OWNER.
  - 1. Maintenance will include spraying to control or prevent disease and weekly water management to include soil probing and observation of soil moisture sensing devices and palm tree pruning.
  - 2. Pruning shall be accomplished with extension ladders or boom trunk. Climbing spikes shall not be used.
  - 3. Pruning shall be done with reciprocal saws (chain saws will not be allowed).
  - 4. Saw blades will be sterilized between each tree with 50 percent household bleach and 50 percent water for five minutes.
  - 5. Pruning will be done to maintain a neat appearance as approved by the OWNER.

6. Proposed pruning schedule is to be submitted to the OWNER for approval.

- B. 90 days after install, cut and fully remove sisal twine around fronds.

3.7 Inspection:

1. Inspection by Certified Arborist, certified by the International Society of Arboriculture. All palms are to be inspected for disease prior to their preparation for removal from the nursery. CONTRACTOR shall contact, schedule, and pay for inspection. The inspection will take place from ground level with field glasses. If disease is suspected, provide manlift for closer inspection of palm crown. Provide the manlift or other equipment as required, at no additional cost to the OWNER.
2. All palms will be observed by the Certified Arborist for height, girth, and overall form in meeting design intent. Said observation and approval does not constitute a review of the palm's health, vigor, and required health-free state, for which the CONTRACTOR is solely responsible.
3. Inspection and approval of new tree locations prior to digging pits.
4. Inspection of prepping and tying prior to loading of trees.
5. Inspection of palm planting operations in place.
6. Inspection for final acceptance and release from maintenance following completion of the maintenance period.



B. Inspection/Observation schedule.

Contact OWNER and Certified Arborist a minimum of 48 hours (2 working days) in advance of scheduled inspections/observations.

Inspection Observation	Contact: Certified Arborist/Palm Specialist	OWNER / Engineer
1.Inspection of palm trees at source.	X	
2.Inspection of defronding, prepping, and tying, as palms are dug in field.	X	
3.Observation of palm tree locations prior to digging planting pits	X	X
4.Observation of typical palm planting.	X	X
5.Pre-maintenance observation	X	X
6.*Inspection of palms at 12 months past 90 day maintenance	X	
7.*Inspection of palms at 20 months past 90 day maintenance.	X	

\*NOTE: items 6 and 7 to be paid by CONTRACTOR.

### 3.8 Guarantee

- A. Newly planted palm trees shall be guaranteed against any and all poor, inadequate, or inferior plant materials, and workmanship for two years following planting and acceptance by OWNER. Transplanted palm trees shall be guaranteed for one year, under the same conditions above, following planting and acceptance by the OWNER.
- B. During the guarantee period, any material found dead or not in a satisfactory growth condition shall be removed from the site.

These trees and disturbed improvements shall be replaced at no added expense to the OWNER, with the same variety and size as originally designated. Palms and all disturbed areas shall be guaranteed for one year from time of planting and replanting to the satisfaction of the OWNER.

**SECTION 33 00 00****UTILITIES****PART 1 - GENERAL**

This Part and all Subparts shall conform to the following related documents:

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. Standard Specifications:
    - a. The "GreenBook": Standard Specifications for Public Works Construction (Latest Edition).
    - b. Water and Sewer Design Development Guidelines and Specifications, issued by the City of Ontario (Latest Edition).
    - c. CalTrans-Manual of Traffic Controls for Construction and Maintenance Work Zones (Latest Edition).
  - 2. Standard Drawings shall apply to the work to the extent referenced on the plans:
    - a. Standard Plans, issued by San Bernardino County (Latest Edition).
    - b. Standard Plans for Public Works Construction (Latest Edition).
    - c. Water and Sewer Design Development Guidelines and Specifications, issued by the City of Ontario (Latest Edition)
    - d. Standard Plans, issued by the State of California Department of Transportation (Caltrans) (Latest Edition).
  - 3. References
    - a. California Fire Code (Latest Edition)
    - b. American Water Works Association (AWWA) Standards

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings.

3. Sleeves.
4. Identification devices.
5. Grout.
6. Piped utility demolition.
7. Equipment installation common requirement.
8. Painting.
9. Concrete bases.
10. Metal supports and anchorages.

### **1.3 DEFINITIONS**

### **1.4 SUBMITTALS**

### **1.5 QUALITY ASSURANCE**

### **1.6 DELIVERY, STORAGE, AND HANDLING**

### **1.7 COORDINATION**

## **PART 2 - PRODUCTS**

Products in this Part and all Subparts shall conform to the documents referenced in Part 1 – General. CONTRACTOR to provide cutsheets for Engineers approval prior to ordering piping. Products include, but are not limited to the following:

### **2.1 MANUFACTURERS**

### **2.2 PIPE, TUBE, AND FITTINGS**

### **2.3 PIPING JOINING MATERIALS**

### **2.4 TRANSITION FITTINGS**

### **2.5 SLEEVES**

### **2.6 IDENTIFICATION DEVICES**

### **2.7 GROUT**

### **2.8 FLOWABLE FILL**

## **PART 3 - EXECUTION**

Execution of all related work in this Section shall conform to the documents referenced in Part 1 - General. Execution includes, but is not limited to the following:

- 3.1      PIPED UTILITY DEMOLITION**
- 3.2      PIPING INSTALLATION**
- 3.3      PIPING JOINT CONSTRUCTION**
- 3.4      PIPING CONNECTIONS**
- 3.5      EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**
- 3.6      PAINTING**
- 3.7      IDENTIFICATION**
- 3.8      CONCRETE BASES**
- 3.9      ERECTION OF METAL SUPPORTS AND ANCHORAGES**
- 3.10     GROUTING**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 33 14 00****WATER DISTRIBUTION****PART 1 – GENERAL**

This Part and all Subparts shall conform to the following related documents:

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. Standard Specifications:
    - a. "Standard Specifications for Public Works Construction", latest Edition, hereafter referred to as "GreenBook", published by Building News Inc., Los Angeles, California.
    - b. Water and Sewer Design Development Guidelines and Specifications, issued by the City of Ontario (Latest Edition). Work Area Traffic Control Handbook (WATCH Manual), Public Works Standards, Inc. (Latest Edition).
  - 2. Standard Drawings:
    - a. Standard Drawings for Water and Sewer Facilities, issued by the City of Ontario (Latest Edition).
  - 3. References
    - a. California Building Code (Latest Edition)
    - b. California Plumbing Code (Latest Edition)
    - c. California Fire Code (Latest Edition)
    - d. National Fire Protection Association (NFPA) codes and standards (Latest Edition)
    - e. American Water Works Association (AWWA) Standards

**1.2 SUMMARY**

- A. This Section includes water-distribution piping and specialties up to five feet outside the building for the following:
  - 1. Domestic Water services.
  - 2. Fire Water services.
  - 3. Combined water service and fire-service mains

**1.3 DEFINITIONS****1.4 SUBMITTALS**

- A. Submittals and Shop Drawings for public water improvements shall be reviewed and approved by the Engineer.

## **1.5 QUALITY ASSURANCE**

## **1.6 DELIVERY, STORAGE, AND HANDLING**

## **1.7 PROJECT CONDITIONS (WORK SITE MAINTENANCE)**

## **1.8 COORDINATION**

# **PART 2 - PRODUCTS**

Products in this Part and all Subparts shall conform to the documents referenced in Part 1 – General. Products include, but are not limited to the following:

## **2.1 MANUFACTURERS**

## **2.2 PIPING MATERIALS**

## **2.3 DUCTILE-IRON PIPE AND FITTINGS**

## **2.4 COPPER TUBE AND FITTINGS**

## **2.5 PVC PIPE AND FITTINGS**

## **2.6 JOINING MATERIALS**

## **2.7 CORROSION-PROTECTION ENCASUREMENT FOR PIPING**

## **2.8 GATE VALVES**

## **2.9 GATE VALVE ACCESSORIES AND SPECIALTIES**

## **2.10 CHECK VALVES**

## **2.11 CORPORATION VALVES AND CURB VALVES**

## **2.12 RELIEF VALVES**

## **2.13 WATER METERS**

- A. Water Meters are to be purchased from the City of Ontario.

## **2.14 BACKFLOW PREVENTION ASSEMBLIES**

- A. Approved manufacturers/models of backflow prevention assemblies are those approved by the State of California Department of Health Services (DOHS), Division of Drinking Water and Environmental, as shown in its latest edition of “Approved Backflow Prevention Assemblies for Service Isolation” and the approved list from the City of Ontario.

## **2.15 FIRE HYDRANTS**



- A. Water District approved Manufacturer(s):

**2.16 FIRE HYDRANT BREAK-OFF CHECK VALVE**

**2.17 FIRE DEPARTMENT CONNECTIONS**

**2.18 TAPPING SLEEVES**

**PART 3 - EXECUTION**

Execution of all related work in this Section shall conform to the documents referenced in Part 1 - General. Execution includes, but is not limited to the following:

**3.1 EARTHWORK**

**3.2 PIPING APPLICATIONS**

**3.3 VALVE APPLICATIONS**

**3.4 JOINT CONSTRUCTION**

**3.5 PIPING INSTALLATION**

**3.6 ANCHORAGE INSTALLATION**

**3.7 VALVE INSTALLATION**

**3.8 DOUBLE CHECK DETECTOR ASSEMBLY INSTALLATION**

**3.9 BACKFLOW-PREVENTER INSTALLATION**

**3.10 WATER-METER INSTALLATION**

**3.11 FIRE HYDRANT INSTALLATION**

**3.12 FIRE DEPARTMENT CONNECTION INSTALLATION**

**3.13 ALARM DEVICE INSTALLATION**

**3.14 CONNECTIONS**

**3.15 FIELD QUALITY CONTROL**

**3.16 IDENTIFICATION**

**3.17 CLEANING**

**END OF SECTION**

## ONTARIO SPORTS EMPIRE

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**SECTION 33 30 00****SANITARY SEWERAGE****PART 1 - GENERAL**

This Part and all Subparts shall conform to the following related documents:

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. Standard Specifications:
    - a. "Standard Specifications for Public Works Construction", latest Edition, hereafter referred to as "GreenBook", published by Building News Inc., Los Angeles, California.
    - b. Water and Sewer Design Development Guidelines and Specifications, issued by the City of Ontario (Latest Edition).Work Area Traffic Control Handbook (WATCH Manual), Public Works Standards, Inc. (Latest Edition).
  - 2. Standard Drawings shall apply to the work to the extent referenced on the plans:
    - a. Standard Plans for Public Works Construction (Latest Edition).
  - 3. Water and Sewer Design Development Guidelines and Specifications, issued by the City of Ontario (Latest Edition).References
    - a. California Building Code (Latest Edition)
    - b. California Plumbing Code (Latest Edition)

**1.2 SUMMARY**

- A. This Section includes sanitary sewerage piping and structures up to five feet outside the building.

**1.3 DEFINITIONS****1.4 PERFORMANCE REQUIREMENTS****1.5 SUBMITTALS****1.6 DELIVERY, STORAGE, AND HANDLING****1.7 PROJECT CONDITIONS (WORK SITE MAINTENANCE)**

**1.8 COORDINATION****PART 2 - PRODUCTS**

Products in this Part and all Subparts shall conform to the documents referenced in Part 1 – General. Products include, but are not limited to the following:

**2.1 PIPING MATERIALS****2.2 PIPES AND FITTINGS****2.3 MANHOLES****2.4 CONCRETE****2.5 PROTECTIVE COATINGS****2.6 CLEANOUTS****PART 3 - EXECUTION**

Execution of all related work in this Section shall conform to the documents referenced in Part 1 – General. Execution includes, but is not limited to the following:

**3.1 EARTHWORK****3.2 IDENTIFICATION****3.3 PIPING APPLICATIONS****3.4 INSTALLATION, GENERAL****3.5 PIPE JOINT CONSTRUCTION AND INSTALLATION****3.6 MANHOLE INSTALLATION****3.7 CONCRETE PLACEMENT****3.8 CLEANOUT INSTALLATION****3.9 TAP CONNECTIONS****3.10 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS****3.11 FIELD QUALITY CONTROL**

**END OF SECTION**

**SECTION 33 40 00**  
**STORMWATER UTILITIES**

**PART 1 – GENERAL**

This Part and all Subparts shall conform to the following related documents:

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. Standard Specifications:
    - a. The “GreenBook”: Standard Specifications for Public Works Construction (Latest Edition).
    - b. Work Area Traffic Control Handbook (WATCH Manual), Public Works Standards, Inc. (Latest Edition).
  - 2. Standard Drawings shall apply to the work to the extent referenced on the plans:
    - a. Standard Plans for Public Works Construction (Latest Edition).
  - 3. References
    - a. California Building Code (Latest Edition)
    - b. California Plumbing Code (Latest Edition)

**1.2 SUMMARY**

- A. This Section includes storm drain piping and structures outside the building.

**1.3 DEFINITIONS**

**1.4 SUBMITTALS**

**1.5 DELIVERY, STORAGE, AND HANDLING**

**1.6 PROJECT CONDITIONS (WORK SITE MAINTENANCE)**

**PART 2 – PRODUCTS**

Products in this Part and all Subparts shall conform to the documents referenced in Part 1 – General. Products include, but are not limited to the following:

- 2.1 PIPES AND FITTINGS**
- 2.2 MANHOLES AND JUNCTION STRUCTURES**
- 2.3 CATCH BASINS**
- 2.5 STORM WATER INLETS**
- 2.6 CONCRETE**
- 2.8 CLEANOUTS**

### **PART 3 – EXECUTION**

Execution of all related work in this Section shall conform to the documents referenced in Part 1 - General. Execution includes, but is not limited to the following:

- 3.1 EARTHWORK**
- 3.2 IDENTIFICATION**
- 3.3 PIPING APPLICATIONS**
- 3.4 INSTALLATION, GENERAL**
- 3.5 MANHOLE AND JUNCTION STRUCTURE INSTALLATION**
- 3.6 CATCH-BASIN INSTALLATION**
- 3.7 CONCRETE PLACEMENT**
- 3.8 TAP CONNECTIONS**
- 3.9 CLOSING ABANDONED STORM DRAINAGE SYSTEMS**
- 3.10 FIELD QUALITY CONTROL**
- 3.11 CLEANING**

**END OF SECTION**