KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

HAVERFORD COLLEGE, 370 LANCASTER AVENUE

HAVERFORD, PA 19041-1392

ABBREVIATIONS

ACOUSTIC	ACOUS.
ABOVE FINISHED FLOOR	AFF
ALUMINUM	AL OR ALUM
ARCHITECT, ARCHITECTURAL	ARCH
BOARD	BD
BOTTOM OF	B.O.
BUILDING	BLDG
CABINET	CAB
CARPET	CPT
CEILING	CLG
CEILING JOIST	C.J.
CENTER LINE	CL
CERAMIC TILE	CT
CLEAR	CLR
COLD WATER	CW
COLUMN	COL
CONCRETE	CONC
CONCRETE MASONRY UNIT	CMU
CONSTRUCTION	CONST
CONTINUOUS	CONT
DEMOLITION	DEMO
DETAIL	DTL
DIAMETER	DIA
DIMENSION	DIM
DOOR	DR
DOWN	DN
DRAWING	DWG
EACH	EA
ELECTRIC	ELEC
EQUIPMENT	EQUIP
ESTIMATE	EST
EXISTING	EXST
FEET, FOOT	' OR FT
FINISH	FIN
FINISH FLOOR	F.F.
FIRE EXTINGUISHER	F.E.
FIRE EXTINGUISHER CABINET	F.E.C.
FIRE-RESISTANCE TREATED	F.R.T.
FLUORESCENT	FLUOR
FRAME	FR
FURNITURE	FURN
GAUGE	GA
GENERAL CONTRACTOR	G.C.
GLASS	GL
GYPSUM WALL BOARD	GWB
HARDWARE	HDWR
HEIGHT	HT
HORIZONTAL	HORIZ
HOT WATER	HW
INCH	" OR IN
INSULATION	INSUL
INTERIOR	INT
JUNCTION BOX	JB
LAVATORY	LAV
MANUFACTURE	MFR
MASONRY OPENING	M.O.
MAXIMUM	MAX
MECHANICAL	MECH
METAL	MTL
MINIMUM	MIN
MISCELLANEOUS	MISC
NOMINAL	NOM
NOT IN CONTRACT	N.I.C.
NOT TO SCALE	NTS
OPPOSITE	OPP
PAINT, PAINTED	PT, PTD
PARTITION	PTN
PLASTIC LAMINATE	PLAM
PLYWOOD	PLYWD
QUANTITY	QTY
RADIUS	R
RAINWATER CONDUCTOR	RWC
REFERENCE	REF
REINFORCE	REINF
REQUIRED	REQD
REVISION	REV
ROOM	RM
ROUGH OPENING	R.O.
SIMILAR	SIM
SOLID CORE	SC
SPECIFICATIONS	SPECS
SQUARE FEET	SF OR SQ. FT.
SQUARE INCHES	SQ. IN.
STAINLESS STEEL	S.STL.
STANDARD	STD
STEEL	ST
SUSPENDED	SUSP
SYSTEM	SYS
TELEPHONE	TEL
TOP OF	T.O.
TYPICAL	TYP
UNLESS NOTED OTHERWISE	UNO
VERIFY IN FIELD	VIF
VERTICAL	VERT
VINYL COMPOSITION TILE	VCT
WATER CLOSET	WC
WEIGHT	WT
WELDED WIRE REINFORCING	WWF
WITH	W/
WITHOUT	W/O
WOOD	W, WD
YARD	YD

MATERIALS LEGEND

- EARTH, COMPACTED FILL
- EARTH, UNDISTURBED
- CRUSHED ROCK GRAVEL
- CONCRETE, CAST STONE
- CONCRETE MASONRY
- BRICK
- RIGID INSULATION
- WOOD BLOCKING OR SHIM
- WOOD FRAMING, CONTINUOUS
- PLYWOOD
- WOOD - FINISHED
- PLASTER OR GYPSUM BOARD
- SOLID SURFACE

ARCHITECTURAL LEGEND

- ROOM NAME / XXX — ROOM IDENTIFICATION
- 1 / A-X.X — ENLARGED PLAN OR DETAIL MARK
- 6 / 3 XXX 4 / 2 — MULTIPLE ELEVATION REFERENCE
- 1 / A-X.X — ELEVATION REFERENCE
- 1 / A-X.X — SECTION REFERENCE
- WP — WORKING POINT OR DATUM
- 1A — PARTITION TYPE
- XX / XX — COLUMN GRID
- 100.5" — SPOT ELEVATION TAG
- XX-XX — DOOR TAG IDENTIFICATION
- 1 — WINDOW TAG
- X | X | 1 — INTERIOR FINISH IDENTIFICATION (WALL / WALL BASE / FLOOR)
- CLEAR DIMENSION BETWEEN ELEMENTS
- DIMENSION TO EDGE
- DIMENSION TO CENTERLINE
- FLOOR CORE, COORD. LOCATION W/MPE DOCUMENTS
- PARTITION CORE, COORD. LOCATION & SIZE W/MPE DOCUMENTS
- WALL OR PARTITION W/1-HOUR FIRE-RESISTANCE RATING
- WALL OR PARTITION W/2-HOUR FIRE-RESISTANCE RATING
- SURFACE-MOUNTED RACEWAY, COORD. W/ELECTRICAL DOCUMENTS
- ES/EW — EMERGENCY SHOWER/ EYEWASH STATION, COORD. W/MPE DOCUMENTS
- 0CS — CUP SINK
- A — SURFACE-MOUNTED LABORATORY SERVICE
- DI — BENCH-MOUNTED LABORATORY SERVICE
- FE — FIRE EXTINGUISHER
- FEC — FIRE EXTINGUISHER CABINET

OUTLINE SPECIFICATIONS

DIVISION 04 – MASONRY

1. UNIT MASONRY:
   a. MATCH SIZE & TEXTURE OF EXISTING.
   b. MORTAR TO MATCH EXISTING.
   c. TOOL JOINTS TO MATCH EXISTING PROFILE.
   d. CONCRETE MASONRY UNITS:
      i. PROVIDE SPECIAL SHAPES AT NEW OPENINGS.
      ii. LINTELS AT NEW PENETRATIONS WIDER THAN 8 INCHES:
         – HEIGHT: 8 INCHES (NOM.)
         – MATCH WALL THICKNESS.
         – TOP & BOTTOM REINFORCING BARS.
         – MIN. 8 INCHES OF BEARING AT EACH JAMB.
      iii. GROUND-FACE UNITS TO MATCH COLOR OF EXISTING WHERE INDICATED
      iv. JAMB BLOCKS WITH ROUNDED CORNERS AT OUTSIDE CORNERS
   e. REINFORCING: GALVANIZED.
   f. HORIZONTAL REINFORCING @16" O.C.
   g. VERTICAL REINFORCING @ 32" O.C.
   h. SALVAGE EXISTING MASONRY UNITS WHERE INDICATED:
      i. OUTSIDE CORNER UNITS WITH ROUNDED CORNERS.
      ii. FILL MASONRY UNITS AS NEEDED TO TOOTH INTO EXISTING PARTITION TO REMAIN.
      iii. REMOVE MORTAR FROM SALVAGED UNITS AND CLEAN FOR RE-INSTALLATION.

DIVISION 06 – WOOD AND PLASTICS

1. MISCELLANEOUS CARPENTRY: PROVIDE FIRE-RETARDANT TREATED WOOD BLOCKING WHERE INDICATED AND AS REQUIRED TO COMPLETE THE WORK OF THIS PROJECT.

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

1. PENETRATION FIRESTOPPING: PROVIDE FIRESTOPPING WHERE NEW CONSTRUCTION OR EQUIPMENT PENETRATES EXISTING FIRE-RESISTANCE RATED CONSTRUCTION, INCLUDING DUCTWORK, PIPES, AND CONDUIT. RATING OF FIRESTOPPING ASSEMBLY SHALL MATCH THAT OF THE EXISTING CONSTRUCTION. FIRESTOPPING SHALL BE MANUFACTURED BY 3M.

2. JOINT SEALANTS:
   a. SEAL JOINTS BETWEEN DISSIMILAR MATERIALS USING PRODUCTS MANUFACTURED BY DOW, PECORA, TREMCO, OR OTHER MANUFACTURER.
   b. SILICONE SEALANT: BETWEEN PLUMBING FIXTURES & ADJACENT CONSTRUCTION, & WITHIN CERAMIC TILE.
      i. COLOR: AS SELECTED BY ARCHITECT FROM FULL RANGE OF AVAILABLE COLORS.
   c. LATEX, PAINTABLE SEALANT: BETWEEN HOLLOW METAL FRAMES AND GYPSUM BOARD.

DIVISION 08 – DOORS AND WINDOWS

1. HOLLOW METAL FRAMES:
   a. MATERIAL: STEEL.
   b. THICKNESS: 16 GAUGE.
   c. FINISH: FACTORY PRIMED FOR FIELD PAINTING.
   d. STYLE: DOUBLE RABBET.
   e. THROAT DEPTH VARIES TO MATCH PARTITION CONSTRUCTION.
   f. FRAME CONSTRUCTION: KNOCK-DOWN.
      i. FILL AND FINISH JOINTS WITHIN HOLLOW METAL TO MATCH APPEARANCE OF WELDED

2. GLAZING
   a. SAFETY GLAZING (FULLY TEMPERED).
      i. THICKNESS 1/4-INCH, MINIMUM.

DIVISION 09 – FINISHES

1. NON-STRUCTURAL STEEL FRAMING:
   a. 20-GAUGE STUD THICKNESS (ACTUAL).
   b. STUD DEPTH:
      i. 3 5/8-INCH STUD DEPTH UNLESS NOTED OTHERWISE.
      ii. 6-INCHES WHERE INDICATED.
   c. PROVIDE (2) ROWS OF SHEET METAL BLOCKING WITHIN PARTITIONS:
      i. HEIGHT: 10 INCHES, MINIMUM.
      ii. THICKNESS: 20 GAGE.
      iii. HEIGHTS: 30 INCHES AND 66 INCHES A.F.F.
   d. PROVIDE ACOUSTICAL BATT INSULATION BETWEEN STUDS.

OUTLINE SPECIFICATIONS

2. RUBBER COVE BASE AND ACCESSORIES
   a. MANUFACTURERS: JOHNSONITE, ROPPE.
   b. HEIGHT: MATCH EXISTING
   c. THICKNESS: 1/8"
   d. COLORS: AS SELECTED BY ARCHITECT FROM FULL RANGE OF AVAILABLE COLORS.
      i. COLOR 1: LAB H103A.
      ii. COLOR 2: CORRIDORS (MATCH EXISTING).

INTERIOR PARTITION SCHEDULE

1. 3-5/8" MTL STUD FRAMING FROM FLOOR TO 8 INCHES ABOVE CEILING. SOUND-ATTENUATION INSULATION BETWEEN FRAMING MEMBERS, FULL HEIGHT. 5/8-INCH GWB ON EXPOSED SIDE OF FRAMING, FULL HEIGHT. (2) ROWS OF SHEET METAL BLOCKING.
2. 6" MTL STUD FRAMING FROM FLOOR TO UNDERSIDE OF STRUCTURE ABOVE. SOUND-ATTENUATION INSULATION BETWEEN FRAMING MEMBERS, FULL HEIGHT. 5/8-INCH GWB ON EACH SIDE OF FRAMING, FULL HEIGHT.
2A. 6" MTL STUD FRAMING FROM FLOOR TO UNDERSIDE OF STRUCTURE ABOVE. SOUND-ATTENUATION INSULATION BETWEEN FRAMING MEMBERS, FULL HEIGHT. 5/8-INCH GWB ON EXPOSED SIDE OF FRAMING, FULL HEIGHT.
3. INFILL CMU PARTITION TO MATCH EXIST. DEPTH. REINFORCE MASONRY & TIE INTO EXIST CMU TOOTH CMU INTO EXIST.

CODE SUMMARY

2018 INTERNATIONAL BUILDING CODE
WITH 2015 ACCESSIBILITY REQUIREMENTS
2018 INTERNATIONAL CODE SERIES

BUILDING GROSS AREA: 188,000 S.F.
PROJECT AREA: 720 S.F. (FIRST FLOOR)

CONSTRUCTION TYPE: IB
CONCRETE FLOOR SLABS, COLUMNS, & BEAMS.
MASONRY EXTERIOR WALLS.
MASONRY AND FRAMED INTERIOR PARTITIONS.

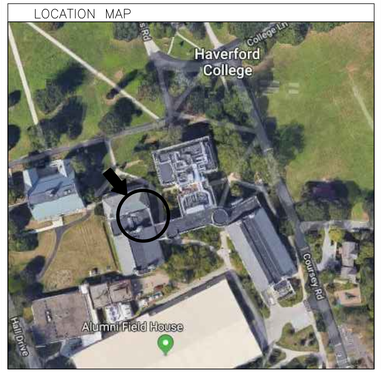
OCCUPANCY GROUP: B, BUSINESS

BUILDING IS FULLY SPRINKLERED.

REQUIRED FIRE-RESISTANCE RATINGS FOR BUILDING COMPONENTS:

STRUCTURAL MEMBERS	2 HOURS
BEARING WALLS	2 HOURS
NON-LOADBEARING PARTITIONS	0 HOURS
SHAFTS	
CONNECTING LESS THAN 4 STORIES	1 HOUR
CONNECTING 4 STORIES OR MORE	2 HOURS
FLOOR CONSTRUCTION	2 HOURS
ROOF CONSTRUCTION	1 HOUR
EXIT ACCESS CORRIDORS	0 HOURS
FIRE ENCLOSURE OF EXITS	2 HOURS

LOCATION MAP



DRAWING LIST

GENERAL

CS-001	COVER SHEET- ABBREVIATIONS, ARCHITECTURAL LEGEND, OUTLINE SPECIFICATIONS, CODE SUMMARY, LOCATION MAP, KEY PLAN, PARTITION SCHEDULE, FINISH SCHEDULE, DOOR SCHEDULE, DRAWING LIST

ARCHITECTURAL DRAWINGS

A-200	DEMOLITION & FLOOR PLANS
A-600	REFLECTED CEILING PLANS, FURNITURE PLAN & DETAILS
A-900	EXTERIOR ELEVATION & DETAIL

MECHANICAL DRAWINGS

M-000	LEGENDS, ABBREVIATIONS & GENERAL PROJECT NOTES
M-101	PARTIAL DEMOLITION, NEW WORK & RCP PLAN
M-500	DETAILS AND SCHEDULES

MECHANICAL & PLUMBING DRAWINGS

MP-700	MECHANICAL & PLUMBING SPECIFICATIONS
MP-701	MECHANICAL & PLUMBING SPECIFICATIONS
MP-702	MECHANICAL & PLUMBING SPECIFICATIONS

PLUMBING DRAWINGS

P-100	PLUMBING PARTIAL FIRST FLOOR DEMOLITION PLANS
P-101	PLUMBING PARTIAL NEW WORK PLANS TEMPLATE
P-600	PLUMBING DEMOLITION RISER DIAGRAMS
P-601	PLUMBING NEW WORK RISER DIAGRAMS

FIRE PROTECTION DRAWINGS

FP-000	FIRE PROTECTION COVER SHEET
FP-101	FIRE PROTECTION PARTIAL DEMOLITION & NEW WORK PLANS

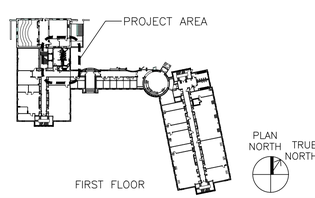
ELECTRICAL DRAWINGS

E-000	LEGENDS & ABBREVIATIONS
E-100	PARTIAL DEMOLITION AND NEW WORK POWER PLANS
E-101	PARTIAL DEMOLITION AND NEW WORK LIGHTING PLANS
E-500	DETAILS
E-600	SCHEDULES
E-700	SPECIFICATIONS

FINISH SCHEDULE

ROOM	FLOOR	BASE	WALLS
H115	EXST, RES. TILE TYPE 1	RUBBER COVE	CMU & GWB, PTD.
H101B	EXST	EXST	EXST
H103A	RES. TILE TYPE 2	RUBBER COVE	CMU, PTD. & GWB, PTD.

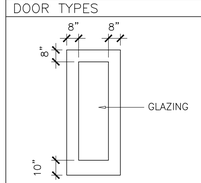
KEY PLAN



DOOR SCHEDULE

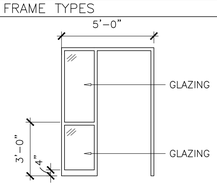
DOOR NO.	DOOR TYPE	DOOR SIZE W	DOOR SIZE H	DOOR SIZE THK	DOOR MATL	DOOR FINISH	FRAME TYPE	FRAME MATL	FRAME FINISH	HDWR SET	NOTES
H103A-1	1	3'-0"	7'-2"	1¾"	WD/GL	NAT	1	HM	PTD	1	SEE 4/A-200, CARD READER

DOOR TYPES



TYPE 1

FRAME TYPES



TYPE 1

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Project:

KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

Revision No.	Description/ Date
	BID DOCUMENTS 07/11/24

Project No:	2413
Scale:	AS NOTED
Plot Scale:	1"=1"

Sheet Title:
COVER SHEET

Sheet No.
CS-001

GENERAL DEMOLITION NOTES:

A. VERIFY EXISTING CONDITIONS PRIOR TO START OF REMOVAL ACTIVITIES. COORDINATE REMOVALS WITH SCOPE OF NEW CONSTRUCTION.

B. MAINTAIN THE STRUCTURAL INTEGRITY OF THE KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) AT ALL TIMES.

C. EXISTING CONSTRUCTION AND FINISHES TO REMAIN IN PLACE UNLESS OTHERWISE NOTED. PROTECT EXISTING MATERIALS FROM DAMAGE DURING CONSTRUCTION AND REPLACE OR RESTORE DAMAGED ELEMENTS TO PRE-CONSTRUCTION CONDITION.

D. PROTECT EXISTING EQUIPMENT DURING CONSTRUCTION ACTIVITIES. PROTECTION TO INCLUDE PLASTIC SHEETING, TEMPORARY PARTITIONS, OR OTHER MEASURES DETERMINED BY OWNER.

E. MATERIALS REMOVED DURING DEMOLITION ARE TO BE RECYCLED TO GREATEST EXTENT POSSIBLE.

F. WHERE GENERAL CONSTRUCTION IS INDICATED FOR DEMOLITION, REMOVE ASSOCIATED MPE EQUIPMENT BACK TO NEAREST TRUNK DUCT, MAIN PIPE, OR JUNCTION BOX. COMPLY WITH REQUIREMENTS OF APPLICABLE CODES. COORDINATE WITH MPE DOCUMENTS.

G. WHERE MATERIAL IS TO BE REMOVED FROM EXISTING CONSTRUCTION TO REMAIN, REMOVE ANCHORING DEVICES IN THEIR ENTIRETY AND INFILL CONSTRUCTION TO MATCH EXISTING. DO NOT CUT ANCHORING DEVICES AND LEAVE PORTIONS EMBEDDED IN EXISTING CONSTRUCTION TO REMAIN.

H. WHEN REMOVING EXISTING FINISH FLOOR ASSEMBLY, REMOVE ALL COMPONENTS TO CONCRETE FLOOR SLAB. REMOVE LOOSE MATERIALS, INCLUDING ADHESIVE, AND RENDER SUBSTRATE SUITABLE FOR INSTALLATION OF FINISH FLOOR SPECIFIED.

ⓧKEYED DEMOLITION NOTES

1. REMOVE MASONRY PARTITION TO EXTENT INDICATED. SAW-CUT MASONRY AT EXISTING MASONRY TO REMAIN. SALVAGE MASONRY CORNER UNITS FOR RE-INSTALLATION; REMOVE MORTAR FROM SALVAGED UNITS AND CLEAN.
2. REMOVE MASONRY PARTITION AS REQUIRED FOR ACCESS TO SUPPLY & DRAIN PIPING & VENT RISERS. SAW-CUT MASONRY AT EACH FIXTURE & PROVIDE TEMPORARY SUPPORT.

2A. SAW-CUT AND REMOVE MASONRY WALL TO EXTENT INDICATED FOR NEW MPE EQUIPMENT. REFER TO MPE DOCUMENTS FOR COORDINATION WITH MPE FIXTURE AND SERVICE REMOVAL.

3. REMOVE FRAMED PARTITION.
4. REMOVE DOOR, FRAME AND HARDWARE.
5. REMOVE ACCESS DOOR ASSEMBLY
6. REMOVE MASONRY LINTEL AND UNITS UP TO UNDERSIDE OF STRUCTURE ABOVE. PROVIDE SUPPORT FOR PIPES AND CONDUIT THAT PENETRATE EXISTING MASONRY.
7. REMOVE EXISTING GWB SOFFIT TO UNDERSIDE OF STRUCTURE ABOVE. REMOVE GWB AND JOINT COMPOUND FROM MASONRY AND CONCRETE SURFACES TO REMAIN.
8. REMOVE RESILIENT TILE FLOORING FROM EXIST. CONCRETE FLOOR STRUCTURE TO REMAIN.
9. SCARIFY EXISTING EPOXY FLOORING IN PREPARATION FOR SPECIFIED FINISH FLOOR.
10. REMOVE COUNTERTOP ASSEMBLY IN ITS ENTIRETY.
11. REMOVE PLUMBING FIXTURE.

11A. REMOVE PLUMBING FIXTURE AND MTL ACCESS PANEL, SALVAGE FOR RE-INSTALLATION.

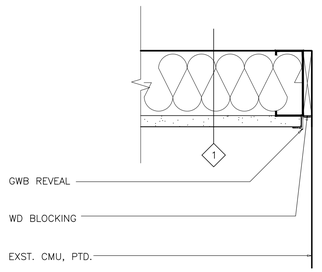
12. REMOVE TOILET ACCESSORY.
13. REMOVE TOILET PARTITION ASSEMBLY INCLUDING DOORS AND ACCESSORIES.
14. REMOVE WALL-MOUNTED SHELF.
15. REMOVE FLOOR DRAIN AND CAP PIPING IN CEILING OF BASEMENT FLOOR. SEE MPE DOC.S.
16. REMOVE ELECTRICAL DEVICE.
17. NOT USED
18. REMOVE TOILET ACCESSORY, SALVAGE FOR RE-INSTALLATION.
19. REMOVE TOILET PARTITION ASSEMBLY INCLUDING DOORS, HARDWARE, AND ANCHORING DEVICES. SALVAGE FOR MODIFICATION AND RE-INSTALLATION IN TOILET ROOM H101B AS INDICATED.
20. REMOVE SUSPENDED CEILING ASSEMBLY. SALVAGE LIGHT FIXTURES, GRILLES & DIFFUSERS. RETURN TO OWNER.

20A. REMOVE EXISTING SUSPENDED CEILING ASSEMBLY, INCLUDING LIGHT FIXTURES, DIFFUSERS, AND OTHER CEILING MOUNTED EQUIPMENT, AS REQUIRED FOR DEMOLITION OR INSTALLATION OF ABOVE CEILING CONSTRUCTION. SALVAGE ALL COMPONENTS FOR RE-INSTALLATION. REFER TO MPE DOCUMENTS.

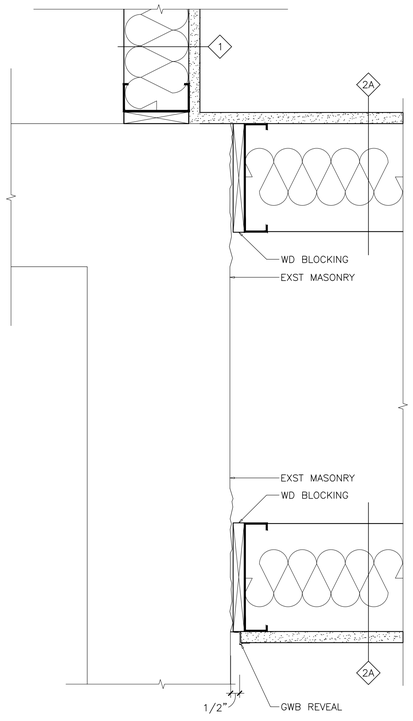
21. SAW-CUT STUCCO AND REMOVE (2) WYTHES OF MASONRY FOR INSTALLATION OF MECHANICAL EQUIPMENT. REMOVE INTERIOR MASONRY IN FULL MODULES. SAW-CUT EXISTING MASONRY. PROVIDE TEMPORARY SUPPORT DURING CONSTRUCTION.

POWER AND COMM. LEGEND

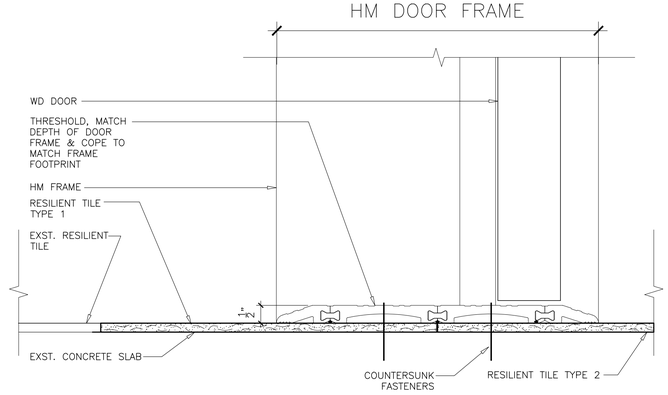
⇒	DUPLEX POWER RECEPTACLE
◀	WALL MOUNTED DATA FACEPLATE
HS	WALL MOUNTED STROBE



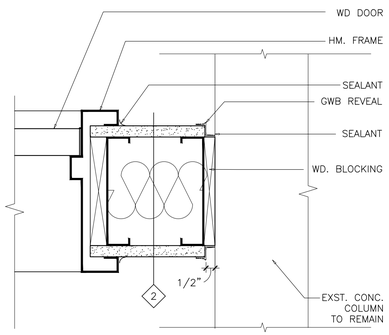
5 A-200 PLAN DETAIL 3"=1'-0"



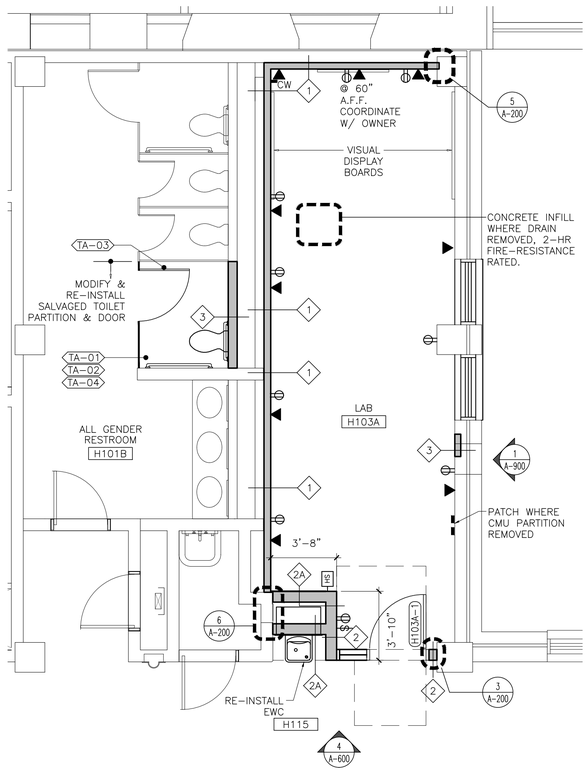
6 A-200 PLAN DETAIL 3"=1'-0"



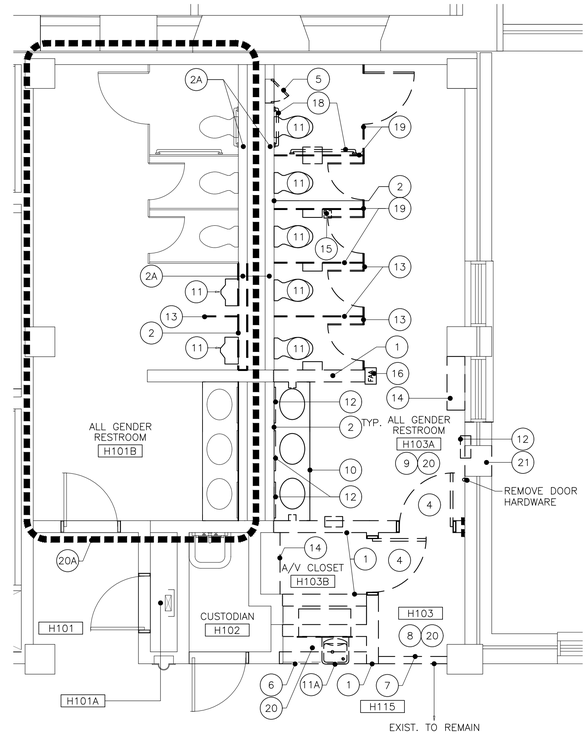
4 A-200 THRESHOLD DETAIL - H103A 6"=1'-0"



3 A-200 JAMB DETAIL 3"=1'-0"

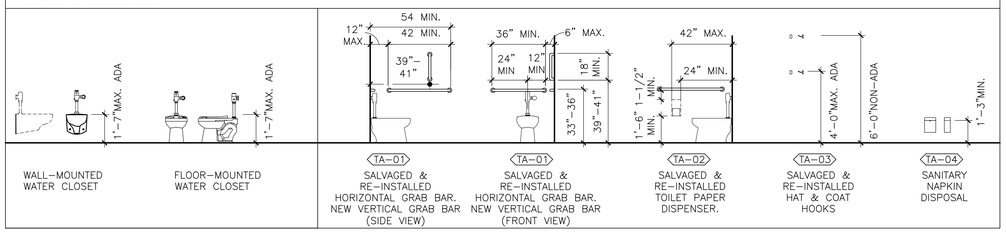


2 A-2.0 FLOOR PLAN 1/4"=1'-0"



1 A-2.0 DEMOLITION PLAN 1/4"=1'-0"

FIXTURES AND ACCESSORIES LEGEND: MOUNT PER MANUFACTURER'S INSTRUCTIONS FOR ACCESSIBILITY, DIMENSIONS ARE TO HIGHEST OPERABLE POINT. G.C. TO PROVIDE & INSTALL FIXTURES & ACCESSORIES.



WALL-MOUNTED WATER CLOSET	FLOOR-MOUNTED WATER CLOSET	TA-01 SALVAGED & RE-INSTALLED HORIZONTAL GRAB BAR. NEW VERTICAL GRAB BAR (SIDE VIEW)	TA-01 SALVAGED & RE-INSTALLED HORIZONTAL GRAB BAR. NEW VERTICAL GRAB BAR (FRONT VIEW)	TA-02 SALVAGED & RE-INSTALLED TOILET PAPER DISPENSER.	TA-03 SALVAGED & RE-INSTALLED HAT & COAT HOOKS	TA-04 SANITARY NAPKIN DISPOSAL

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Sheet Title:

DEMOLITION & FLOOR PLANS

Sheet No.

A-200

PLAN NORTH TRUE NORTH

CEILING LEGEND

- RCP–1: SUSPENSION GRID & ACOUSTIC CEILING PANELS.
- GWB SOFFIT OR CEILING
- 1X4 FLUORESCENT LIGHT FIXTURE
- RECESSED DOWNLIGHT
- RETURN AIR DIFFUSER
- DIRECTIONAL SUPPLY AIR DIFFUSER
- SPRINKLER HEAD

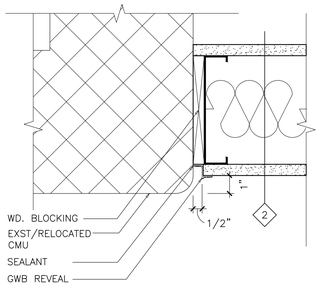
CONSTRUCTION NOTES (CN–X)

CN–1 SAW–CUT MASONRY FOR DUCT PENETRATION. PROVIDE MASONRY LINTEL @ TOP OF OPENING. TOOTH MASONRY INTO EXISTING @ JAMBS. INFILL MASONRY BELOW DUCT.

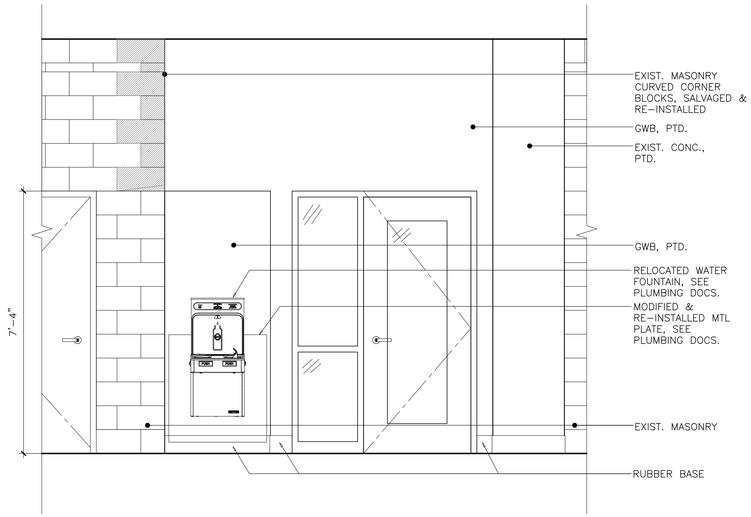
CN–2 INFILL OPENING LEFT BY DUCT DEMOLITION. MASONRY TO MATCH EXISTING PARTITION.

CN–3 RE–INSTALL SUSPENDED CEILING ASSEMBLY, LIGHT FIXTURES, DIFFUSERS, AND OTHER EQUIPMENT AT COMPLETION OF CONSTRUCTION. REPLACE DAMAGED OR MISSING ELEMENTS. CLEAN PANELS AND GRID. CLEAN LIGHT FIXTURES AND DIFFUSERS. REFER TO MPE DOCUMENTS.

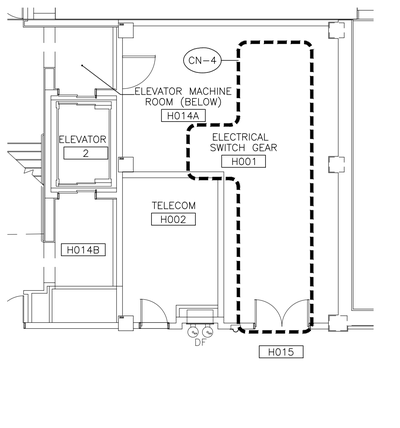
CN–4 COORDINATE PLUMBING DEMOLITION WITH EXISTING CONDITIONS.



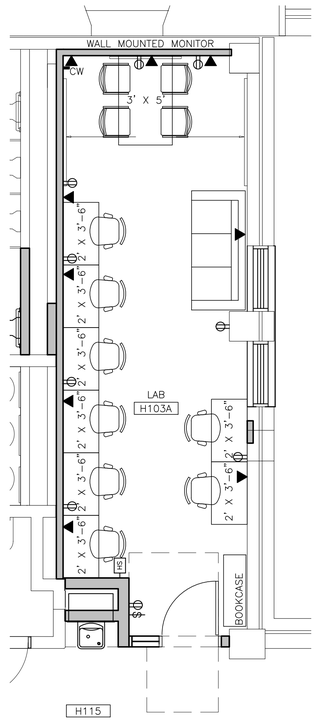
5 A–600 SOFFIT DETAIL @ EXIST. MASONRY
3"=1'–0"



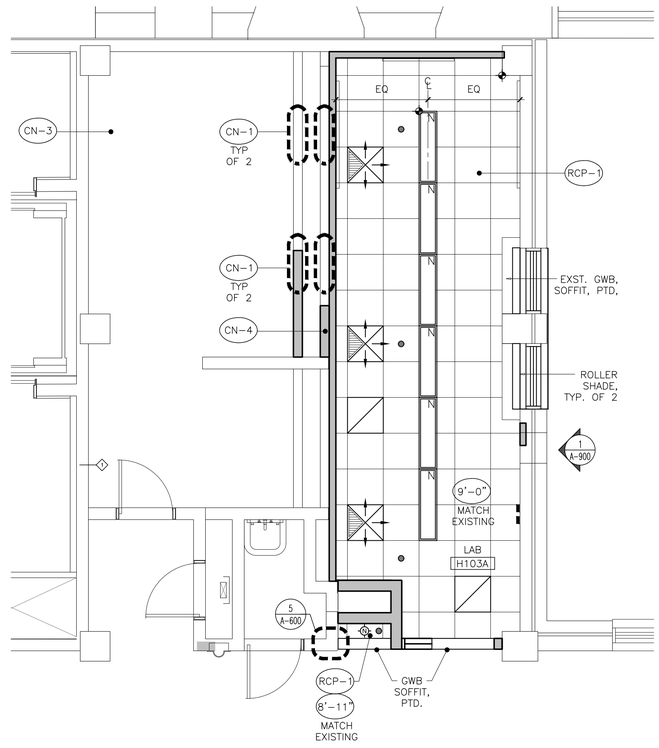
4 A–600 CORRIDOR H115 NORTH ELEVATION
1/4"=1'–0"



3 A–600 BASEMENT LEVEL LOGISTICS PLAN
1/8"=1'–0"



2 A–600 FURNITURE PLAN – FOR REFERENCE ONLY
1/4"=1'–0"



1 A–600 REFLECTED CEILING PLAN
1/4"=1'–0"

PLAN NORTH TRUE NORTH

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Project:

KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

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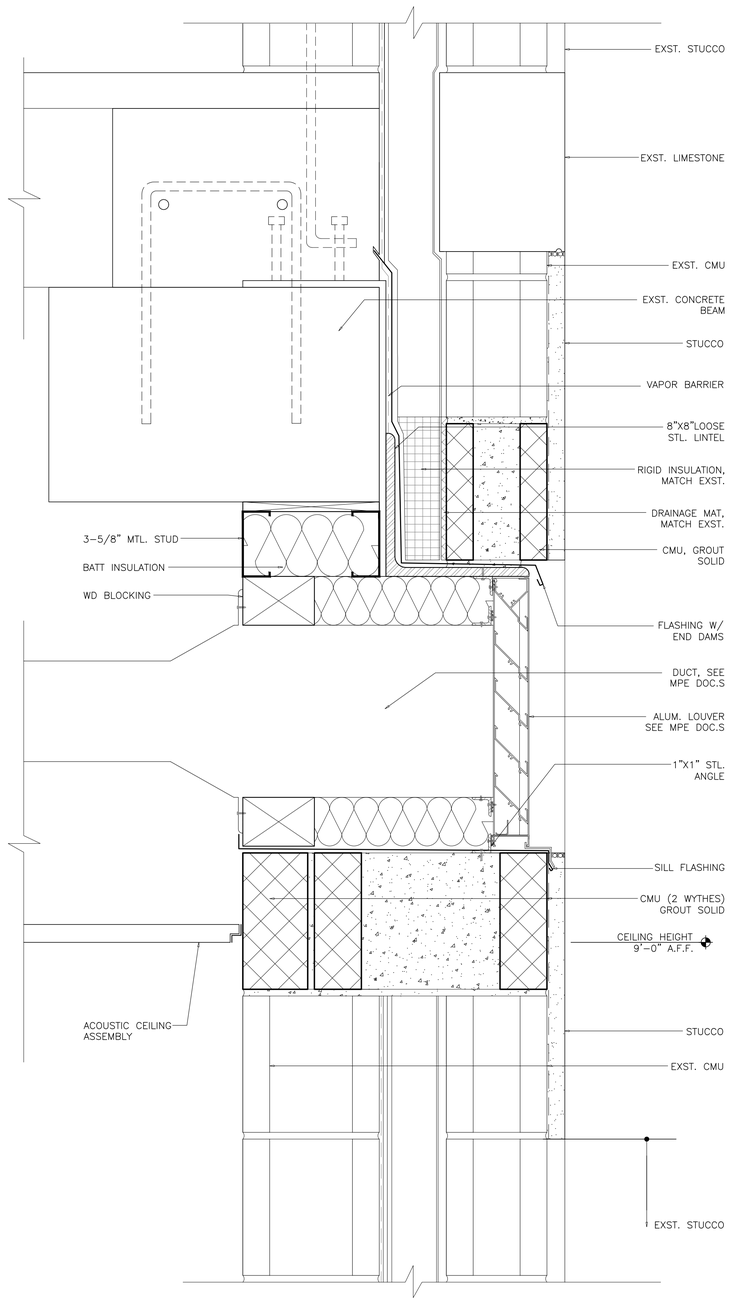
Project No:	2413
Scale:	AS NOTED
Plot Scale:	1"=1"

Sheet Title:

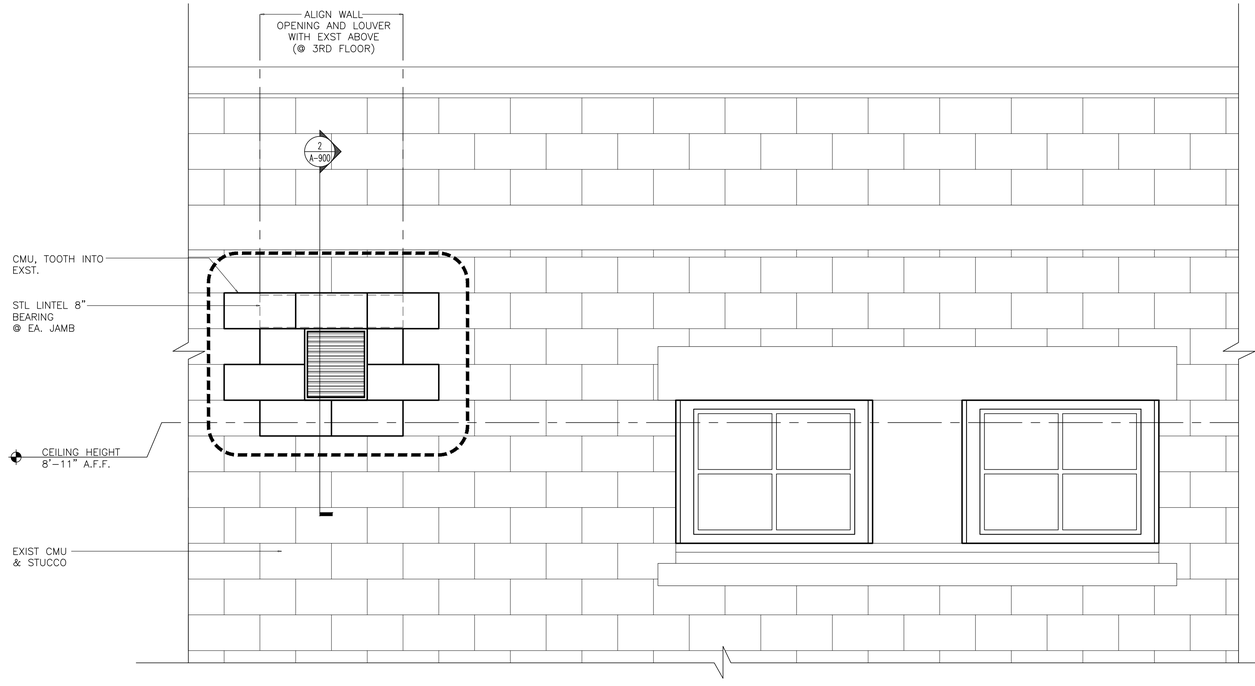
REFLECTED CEILING PLAN, FURNITURE PLAN & DETAILS

Sheet No.

A-600



2 A-900 WALL PENETRATION DETAIL
3"=1'-0"



1 A-900 WALL PENETRATION ELEVATION
3/4"=1'-0"

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Sheet Title:
EXTERIOR ELEVATION & DETAIL

Sheet No.
A-900

MECHANICAL & PLUMBING LEGEND

- EXTENT OF DEMOLITION
- POINT OF CONNECTION BETWEEN NEW WORK AND EXISTING WORK
- EXISTING WORK TO REMAIN
- NEW WORK OR EXISTING WORK TO BE DEMOLISHED
- DEMOLITION NOTE
- NEW WORK NOTE
- SUPPLY AIR DUCT UP (SECTION)
- SUPPLY AIR DUCT DOWN
- RETURN/EXHAUST AIR DUCT UP (SECTION)
- RETURN/EXHAUST AIR DUCT DOWN
- SUPPLY CEILING DIFFUSER/GRILLE (SIZE INDICATED ON SCHEDULE/DRAWING)
- RETURN/EXHAUST CEILING DIFFUSER/GRILLE (SIZE INDICATED ON SCHEDULE/DRAWING)
- DUCT BREAK/CONTINUATION
- UNION
- REDUCER OR INCREASER
- GATE VALVE
- BALL VALVE
- CAPPED PIPE
- PIPE DOWN
- PIPE DOWN (45°)
- BREAK IN PIPE
- PIPE TAKE-OFF (BOTTOM)
- PIPE OR ROUND DUCT (UP/SECTION)
- VOLUME DAMPER
- 45° WYE DUCT/PIPE TAKEOFF
- WATER HAMMER ARRESTOR

MECHANICAL & PLUMBING ABBREVIATIONS

A.F.F.	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
BFP	BACKFLOW PREVENTER
℄	CENTER LINE ELEVATION OF PIPE ABOVE FINISHED FLOOR
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CO	CLEANOUT
DCW	DOMESTIC COLD WATER
DFU	DRAIN FIXTURE UNITS
DHWS	DOMESTIC HOT WATER SUPPLY
DN.	DOWN
(E)	EXISTING
EA	EXHAUST AIR
EAG	EXHAUST AIR GRILLE
EAR	EXHAUST AIR REGISTER
EL	ELEVATION
E.C.	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
ER	EXISTING TO REMAIN
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN OR FIRE DAMPER
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
HVU	HEATING & VENTILATION UNIT
LAV	LAVATORY
LBS.	POUNDS
MFG	MANUFACTURER
MAX.	MAXIMUM
M.C.	MECHANICAL CONTRACTOR
MIN.	MINIMUM
MOD	MOTOR OPERATED DAMPER
N.C.	NORMALLY CLOSED
N.O.	NORMALLY OPEN
OA	OUTSIDE AIR
P.C.	PLUMBING CONTRACTOR
RA	RETURN AIR
RAR	RETURN AIR REGISTER
RAG	RETURN AIR GRILLE
RHHWR	REHEAT HOT WATER RETURN
RHHWS	REHEAT HOT WATER SUPPLY
SA	SUPPLY AIR
SAF	SUPPLY AIR FAN
SAN.	SANITARY
SAR	SUPPLY AIR REGISTER
SAG	SUPPLY AIR GRILLE
SV	SANITARY VENT
SW	SANITARY WASTE
TYP.	TYPICAL
UR	URINAL
VLV	VALVE
W	WIDE
WC	WATER CLOSET
WCO	WALL CLEANOUT
WHA	WATER HAMMER ARRESTOR
W/	WITH

GENERAL PROJECT NOTES:

1. CONTRACTOR SHALL COORDINATE WITH OWNER REPRESENTATIVE PRIOR TO DOING ANY WORK AFFECTING ANY OPERATIONAL AREA ADJACENT TO THE AREA OF WORK.
2. CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL DEMOLISHED MATERIALS, EQUIPMENT, AND CONSTRUCTION DEBRIS FROM SITE COMPLETELY. DEMOLISHED MATERIALS, EQUIPMENT AND CONSTRUCTION DEBRIS SHALL NOT BE STORED ON SITE.
3. BEFORE LEAVING THE SITE THE CONTRACTOR SHALL ENSURE CONSTRUCTION AREA IS SECURE, ALL MATERIALS AND EQUIPMENT ARE STORED SO NOT TO CREATE A HAZARD, AND ALL CONSTRUCTION DEBRIS IS CLEANED UP. THE CONSTRUCTION AREA SHALL BE SWEPT DAILY.
4. CONTRACTOR SHALL COORDINATE WITH OWNER REPRESENTATIVE TO DETERMINE APPROVED LOCATIONS FOR NEW EQUIPMENT AND MATERIAL LAY-DOWN AREAS PRIOR TO SUBMITTING THEIR BID.
5. ALL DRAWINGS ARE DIAGRAMMATIC AND ARE FOR CONTRACTOR'S REFERENCE ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL DIMENSIONS, EQUIPMENT CONNECTION SIZES, EXISTING FIELD CONDITIONS AND THE SPECIFIED SCOPE OF WORK PRIOR TO SUBMITTING THEIR BID.
6. CONTRACTOR IS RESPONSIBLE FOR COORDINATING AND SCHEDULING ALL SHUTDOWNS REQUIRED TO COMPLETE WORK WITH OWNER. CONTRACTOR SHALL NOT BEGIN WORK UNTIL SCHEDULE IS APPROVED BY OWNER.
7. CONTRACTOR SHALL REFER TO PLANS, SCHEDULES, DETAILS, DIAGRAMS AND SPECIFICATIONS FOR PROJECT INFORMATION AND REQUIREMENTS.
8. CONTRACTOR IS RESPONSIBLE FOR AREA PROTECTION FOR ALL FURNITURE, FLOORS, WALLS, CEILINGS, DOORS, GLASS, AND ALL OTHER ARCHITECTURAL/AESTHETIC ITEMS AS REQUIRED TO FULFILL THE SCOPE OF WORK OUTLINED HEREIN. WHERE ANY DAMAGE OCCURS, THE CONTRACTOR SHALL REPLACE IN KIND AT THEIR OWN COSTS.
9. CONTRACTOR SHALL COORDINATE WITH OTHER TRADES AND PREPARE AND ISSUE CONSTRUCTION COORDINATION DRAWINGS PREPARED IN AUTOCAD PROGRAM FOR REVIEW AND APPROVAL BY ENGINEER AND OWNER PRIOR TO ANY FABRICATION OR PURCHASE OF MATERIALS. COORDINATION DRAWINGS SHALL DEPICT ALL EXISTING AND NEW PIPING ROUTINGS, ELEVATIONS, AND VALVE AND SPECIALTY LOCATIONS.
10. CONTRACTOR SHALL PROVIDE ALL PIPING TIGHT TO UNDERSIDE OF BUILDING STRUCTURE. WHERE EXISTING UTILITIES PREVENT SUCH INSTALLATION, THE CONTRACTOR SHALL OFFSET NEW PIPING AROUND EXISTING UTILITY AND PROVIDE PIPING IMMEDIATELY BELOW SUCH EXISTING UTILITY. NEW INSTALLATIONS SHALL NOT BLOCK SERVICE AND MAINTENANCE CLEARANCES TO EXISTING INSTALL MATERIALS AND EQUIPMENT.
11. CONTRACTOR SHALL PROVIDE ALL VALVES WITH STEM EXTENSIONS TO ACCOMMODATE FOR THE INSULATION THICKNESSES SPECIFIED.
12. CONTRACTOR TO COORDINATE NEW PLUMBING SERVICES AROUND NEW AND EXISTING DUCTWORK AND VENTILATION EQUIPMENT. CONTRACTOR SHALL COORDINATE WITH ALL TRADES PRIOR TO PURCHASING AND INSTALLING ANY MATERIALS.
13. REFER TO PLUMBING SINGLE LINE DIAGRAMS AND SCHEDULES FOR PIPE SIZES AND FIXTURE CONNECTION SIZES.

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Plot Scale:	NONE

Sheet Title:

LEGENDS, ABBREVIATIONS & GENERAL PROJECT NOTES

Sheet No.

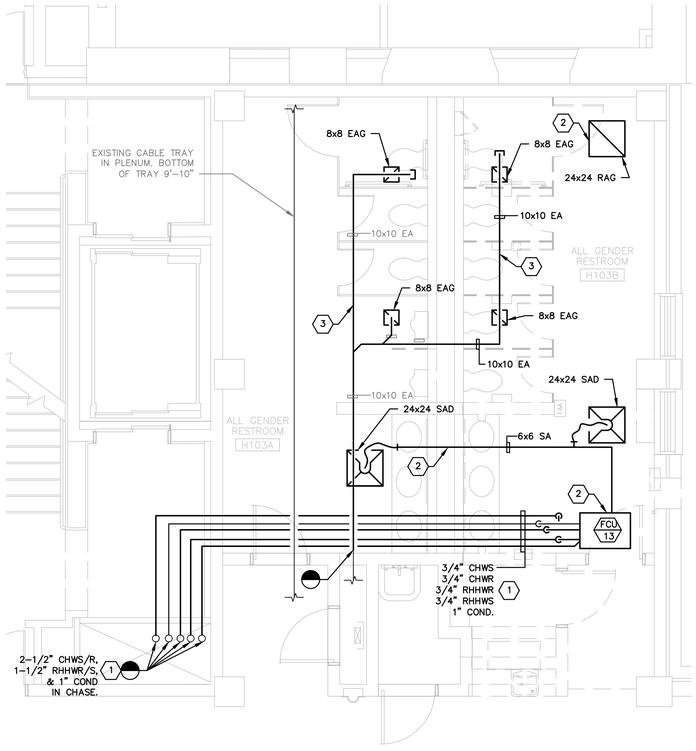
M000

DEMOLITION NOTES:

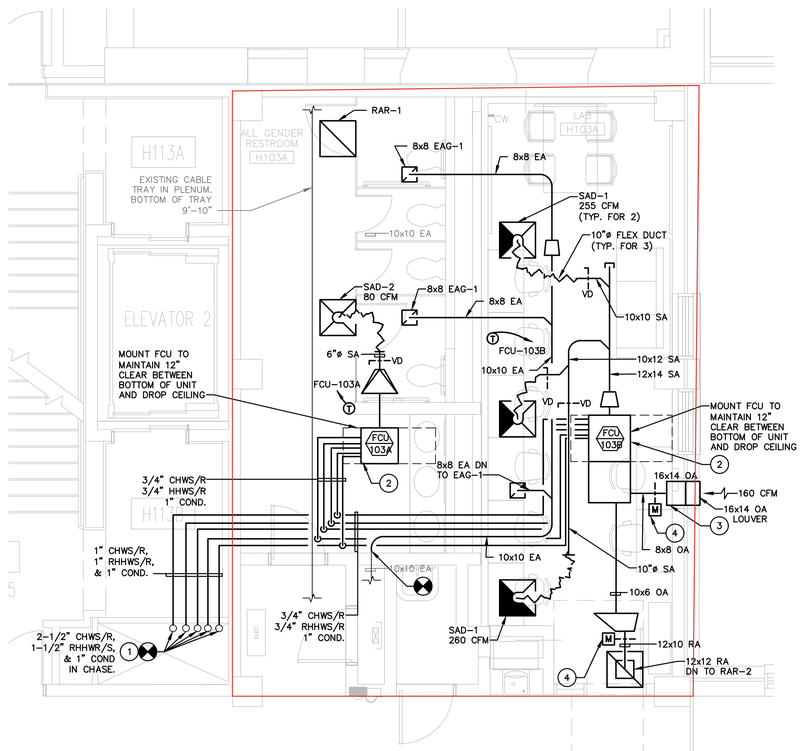
1. DEMOLISH EXISTING REHEAT HOT WATER SUPPLY & RETURN PIPING, AND CHILLED WATER SUPPLY & RETURN PIPING BACK TO 2-1/2" CHW AND 1-1/2" RHHW BRANCH MAINS WITHIN CHASE ON SECOND FLOOR. DEMOLISH EXISTING SUPPORTS, VALVES AND SPECIALTIES BACK TO EXISTING FCU. EXISTING FCU TO BE SALVAGED AND TURNED OVER TO OWNER AFTER DEMOLITION.
2. DEMOLISH EXISTING FAN COIL UNIT, DUCTWORK, DIFFUSERS, THERMOSTAT, AND CONTROL WIRING. REMOVE SYSTEM FROM BUILDING AUTOMATION SYSTEM ENTIRELY.
3. DEMOLISH EXISTING EXHAUST DUCT TO DISCONNECT POINT SHOWN.

NEW WORK NOTES:

1. PROVIDE 1" REHEAT HOT WATER SUPPLY & RETURN, PIPING AND 1" CHILLED WATER SUPPLY & RETURN PIPING FROM NEW FAN COIL UNITS BACK TO EXISTING 2-1/2" CHW AND 1-1/2" RHHW BRANCH MAINS WITHIN CHASE AND CONNECT. PROVIDE ISOLATION VALVES WITHIN CHASE BEFORE REDUCING DOWN TO NEW PIPE SIZES INDICATED.
2. THE TAB CONTRACTOR SHALL COMPLETE TESTING, ADJUSTING AND BALANCING OF THE FCU AIR AND HYDRONIC SYSTEMS. THE CONTRACTOR SHALL COORDINATE THE DEVICE POSITIONS AND FAN SPEEDS WITH CONTROLS CONTRACTOR REQUIRED TO EFFECT THE SPECIFIED SEQUENCE OF OPERATION. THE TAB CONTRACTOR SHALL COORDINATE THE EXTENT OF THIS SCOPE WITH THE CONTROLS CONTRACTOR PRIOR TO SUBMITTING BIDS.
3. PROVIDE 304L STAINLESS STEEL OUTSIDE AIR PLENUM CONNECTED TO OUTSIDE AIR LOUVER. SLOPE FLOOR OF PLENUM TOWARDS LOUVER AT 1/4" PER FOOT.
4. WIRE OA & RA DAMPER TO FCU FIELD CONTROLLER. DAMPER TO CLOSE WHEN UNIT IS NOT IN OPERATION OR IN UNOCCUPIED MODE AND OPEN WHEN THE UNIT IS IN OPERATION AND IN OCCUPIED MODE.



1 M101 PARTIAL IST FLOOR DEMOLITION PLAN
SCALE: 1/4" = 1'-0"



2 M101 PARTIAL 1ST FLOOR NEW WORK PLAN
SCALE: 1/4" = 1'-0"

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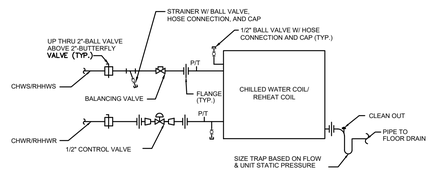
Plot Scale:	AS NOTED

Sheet Title:

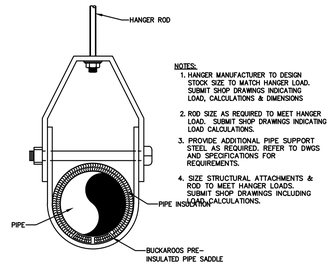
PARTIAL DEMOLITION, NEW WORK, & RCP PLAN

Sheet No.

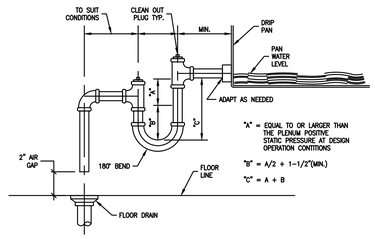
M101



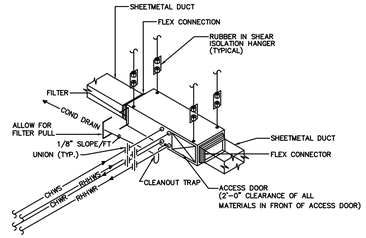
1 M 500 — 2-WAY CHILLED WATER/REHEAT HOT WATER COIL DETAIL
SCALE: NONE



2 M 500 — ADJUSTABLE CLEVIS DETAIL
NTS

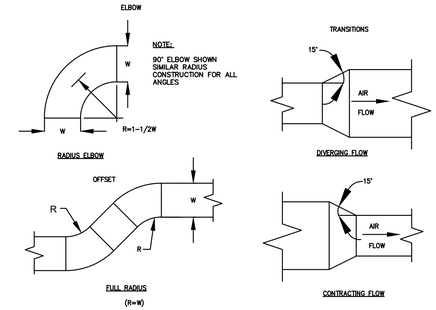


3 M 500 — CONDENSATE TRAP DETAIL
NTS

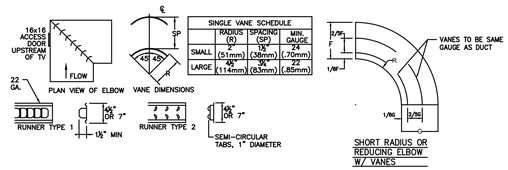


NOTES:
1. MANUAL ELECTRIC DISCONNECT MUST BE WITHIN SIGHT OF EQUIPMENT.

4 M 500 — FAN COIL UNIT DETAIL
SCALE: NONE

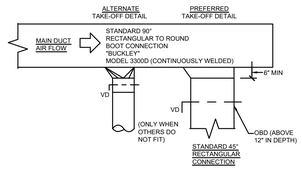


5 M 500 — DUCT TRANSITIONS, OFFSETS, AND ELBOWS DETAILS
3/8"=1'-0"



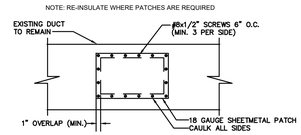
NOTES:
1. THIS LAYOUT PRESUMES AN ELBOW WITH EQUAL INLET & OUTLET SIZES. CHANGE ELBOWS (I.E WITH A SIZE CHANGE) SHALL BE INDIVIDUALLY DETAILED BY SHEET METAL CONTRACTOR, INDICATING MODIFIED OR CUSTOM RUNNER (S&U) & VANE REQUIRED TO ENSURE VANES ARE PERPENDICULAR TO AIRFLOW.
2. MAX UNSUPPORTED VANE LENGTH SHALL NOT EXCEED 36" FOR LARGE OR SMALL SINGLE VANE. INSTALL LONGER LENGTHS IN MULTIPLE SECTIONS OR PROVIDE TIE-RODS.
3. VANES SHALL BE SECURELY FASTENED TO DUCT WITH SCREWS, BOLTS, OR WELDS.
4. RUNNERS SHALL BE SECURELY FASTENED TO DUCT WITH SCREWS, BOLTS, OR WELDS.

6 M 500 — TURNING VANES DETAIL
NTS

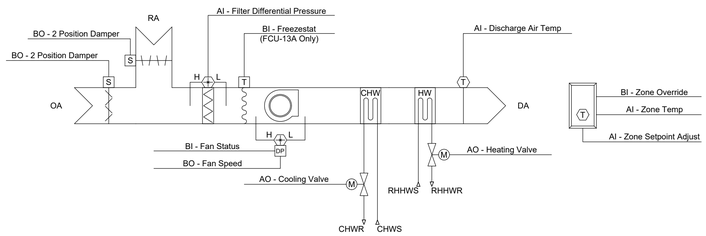


NOTE:
1. ALTERNATE FITTINGS SHALL BE USED WHEN DUCT HEIGHT DOES NOT PERMIT THE USE OF THE PREFERRED FULL SIZE FITTING. SUBMIT FITTINGS FOR REVIEW BY ENGINEER PRIOR TO INSTALLATION
1. THIS APPLIES TO SINGLE TAKEOFFS TO DIFFUSER AS WELL AS BRANCH TAKEOFFS. IT ALSO APPLIES TO TAKEOFFS IN THE HORIZONTAL AS WELL AS VERTICAL DIRECTION.

7 M 500 — DUCT TAKEOFF DETAILS
NTS



8 M 500 — DUCT PATCH DETAIL
NTS



9 M 500 — FAN COIL UNIT CONTROL DIAGRAM
NTS

FAN COIL UNIT SCHEDULE

FCU X	Tag	FCU-103A	FCU-103B
	Location	RESTROOM	COMP. LAB
Fan Section	CFM	80	770
	ESP (in Wc)	0.20	0.42
	V	115	115
	P	1	1
	HZ	60	60
	Motor Quantity (#)	1	1
	Motor (HP)	1/7	1/8
Cooling Coil Section	Rows (#)	1	4
	Fin Spacing (Fins/IN)	12	12
	Total Capacity (BTU/H)	4.1	24.1
	Sens. Capacity (BTU/H)	2.5	17
	EAT DB (°F)	75	79
	EAT WB (°F)	65	67
	LAT DB (°F)	49.7	58.1
	LAT WB (°F)	49.0	56.6
	MEDIUM	WATER	WATER
	EWT (°F)	44.0	44.0
	LWT (°F)	48.1	54.0
	Flow (GPM)	1.5	4.8
	WPD (FT)	11.2	3.0
Reheat Coil Section	Capacity (MBH)	14.4	34.2
	EAT DB (°F)	60	57
	LAT DB (°F)	113	99.1
	Coil Rows	1.0	1.0
	EWT (°F)	180.0	180.0
	LWT (°F)	160.0	160.0
	Flow (GPM)	1.5	3.5
	WPD (FT)	0.3	12.0
Equipment Information	MANUFACTURER & MODEL	CARRIER 42DC02	CARRIER 42DCA10
	L (IN.)	25	32
	W (IN.)	24	29 1/2
	H (IN.)	8-3/4	19
Sound Data	Peak NC	50	60
Notes:		1-7	1-7

NOTES:
1. AHRI CERTIFIED
2. SS DRAIN PAN
3. DISCONNECT SWITCH
4. EC MOTOR / VARIABLE SPEED OPERATION
5. PROVIDE SECONDARY DRAIN PAN.
6. OVERFLOW SWITCH
7. CONDENSATE PUMP

GRD SCHEDULE

	TAG	SAD-1	SAD-2	RAR-1	RAR-2	EAG-1
EQUIPMENT INFORMATION	MANUFACTURER	PRICE	PRICE	PRICE	PRICE	PRICE
	MODEL	SCDA	SCDA	80	80	80
	SIZE	24x24	24x24	24x24	12x12	8x8
	NOISE RATING (NC)	<18	<15	<15	<15	<15
	TSP	0.03	0.023	0.05	0.05	0.031
	NECK	10"Ø	6"Ø	22x22	12x12	6x6
	AIRFLOW	150-225	78-100	80	270-630	50-126
	MOUNTING	LAY IN	LAY IN	LAY IN	LAY IN	LAY IN
	FINISH	WHITE	WHITE	WHITE	WHITE	WHITE
	NOTES	1,2,3,4	1,2,3,4	5,6	3	6

NOTES:
1. PROVIDE SECTORIZING BAFFLES TO EFFECT PATTERN INDICATED ON PLANS.
2. PROVIDE INSULATED BACK PANEL.
3. PROVIDE T-BAR 24x24 LAY-IN TYPE PANEL
4. PROVIDE BEADED INLET NECK
5. PROVIDE INTEGRATED PLENUM WITH BEADED NECK
6. PROVIDE ALL ALUMINUM CONSTRUCTION

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HAVERFORD, PA 19041

Project:

KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

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DETAILS & SCHEDULES

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HAVERFORD COLLEGE – KINSC BUILDING
HILLES WING – COMPUTER SCIENCE LABORATORY
MECHANICAL & PLUMBING PROJECT SPECIFICATIONS

SCOPE OF WORK:

1. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO COMPLETE ALL WORK SHOWN OR INFERRED ON THESE CONTRACT DRAWINGS AND DOCUMENTS. THE WORK SHALL INCLUDE, BUT NOT NECESSARILY BE LIMITED TO THE FOLLOWING PRINCIPLE ITEMS OF WORK:
   A. DEMOLISH EXISTING FAN COIL UNIT, SUPPLY, RETURN, AND EXHAUST DUCTWORK, GRILLES, DIFFUSERS, VOLUME DAMPERS, PIPE AND DUCT HANGERS, PIPE AND DUCT INSULATION, REHEAT HOT WATER PIPING, CHILLED WATER PIPING, WATER CLOSETS, URINALS, LAVATORIES, MOP SINK, WATER COOLER, SANITARY WASTE PIPING, SANITARY VENT PIPING, DOMESTIC COLD & HOT WATER PIPING, FIRE PROTECTION PIPING, SPRINKLER HEADS, VALVES, CONTROLS, SUPPORTS, AND ALL ASSOCIATED APPURTENANCES AS INDICATED ON THE PROJECT DOCUMENTS.
   B. PROVIDE FAN COIL UNIT, SUPPLY, RETURN, AND EXHAUST DUCTWORK, GRILLES, DIFFUSERS, VOLUME DAMPERS, CONTROL SYSTEM, CONTROL WIRING & CONDUIT, PIPING, VALVES, SPECIALTIES, PIPE AND DUCT HANGERS, SUPPORTS, CONTROL VALVES, STRAINERS, PIPE AND DUCT INSULATION, SPRINKLER HEADS, WATER CLOSETS, LAVATORIES, MOP SINK, WATER COOLER, AND ALL OTHER ASSOCIATED APPURTENANCES. EQUIPMENT DEVICES ARE TO BE INSTALLED PER MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS.
   C. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THESE PROJECT SPECIFICATIONS, AND ALL ADOPTED LOCAL CODES, STATE CODES, AND INTERNATIONAL CODES.

GENERAL NOTES:

1. THE HAVERFORD COLLEGE REPRESENTATIVE SHALL BE THE POINT OF CONTACT FOR ALL WORK. WORK IDENTIFIED AS COORDINATED BY OTHER GROUPS OR COMPANIES MUST BE DONE THROUGH THE HAVERFORD COLLEGE REPRESENTATIVE. ANY WORK OR DIRECTION TAKEN BY THE CONTRACTOR WITHOUT THE HAVERFORD COLLEGE REPRESENTATIVES KNOWLEDGE SHALL BE AT THE CONTRACTOR'S RISK. THE PRIME CONTRACTOR IS SOLELY RESPONSIBLE FOR COORDINATING HIS SUBCONTRACTORS.
2. WITHIN THREE DAYS OF A CONTRACT AWARD, THE CONTRACTOR SHALL SUBMIT FINAL DETAILED CONSTRUCTION SCHEDULE.
3. CONTRACTOR SHALL VERIFY SHUTDOWN WORK AND ISOLATION VALVE LOCATIONS IMMEDIATELY AFTER RECEIVING APPROVAL TO PROCEED WITH PROJECT. COORDINATE AND SCHEDULE ALL SHUTDOWN WORK WITH THE HAVERFORD COLLEGE REPRESENTATIVE.
4. ALL LAYOUTS SHALL BE FIELD VERIFIED PRIOR TO FABRICATION. THE CONTRACTOR MAY MODIFY ELEVATIONS AND LOCATIONS AS NECESSARY TO AVOID INTERFERENCES WITH EXISTING AND NEW SERVICES. THE CONTRACTOR SHALL NOT SCALE OFF THESE DRAWINGS FOR THE PURPOSE OF CONSTRUCTION.
5. CONTRACTOR SHALL VISIT THE SITE, BECOME FAMILIAR WITH THE EXISTING FIELD CONDITIONS, AND BID, PLAN, AND EXECUTE THE CONSTRUCTION ACCORDINGLY. NO ADDITIONAL COMPENSATION WILL BE GRANTED TO THE CONTRACTOR BASED ON A CLAIM OF LACK OF KNOWLEDGE OF EXISTING FIELD CONDITIONS.
6. COORDINATE WITH A HAVERFORD COLLEGE REPRESENTATIVE PRIOR TO DOING ANY WORK AFFECTING ANY OPERATIONAL AREA ADJACENT TO THE AREA OF WORK.
7. THE CONTRACTOR SHALL REPORT ALL CHANGES IN THE WORK TO THE HAVERFORD COLLEGE REPRESENTATIVE & ENGINEER PRIOR TO PROCEEDING.
8. THE CONTRACTOR SHALL SUBMIT ELECTRONIC COPIES OF MAINTENANCE AND OPERATING, INSTRUCTION MANUALS & AS–BUILTS TO ENGINEER FOR APPROVAL FOR ALL EQUIPMENT AND SYSTEMS PROVIDED BY THE CONTRACTOR. UPON APPROVAL FURNISH (2) TWO HARD COPY AND (1) ONE ELECTRONIC COPY OF MANUALS IN 3–RING, D–SHAPED BINDERS AND INCLUDE COMPLETE PARTS LISTS AND A SOURCE FOR PURCHASING APPROVED PARTS.
9. IN THIS CONTRACT THE WORD "PROVIDE" SHALL MEAN "FURNISH AND INSTALL."
10. THE CONTRACTOR SHALL CAREFULLY PLAN AND PERFORM ALL WORK TO PREVENT DAMAGE TO EXISTING FACILITIES, EQUIPMENT AND SIMILAR ITEMS. THE CONTRACTOR SHALL PROVIDE PROTECTION DEVICES REQUIRED TO PROTECT EXISTING FACILITIES AND EQUIPMENT DURING THE CONSTRUCTION OF THIS PROJECT. ANY DAMAGE TO EXISTING FACILITIES OR EQUIPMENT RESULTING FROM THE WORK OF THIS CONTRACT SHALL BE REPAIRED OR REPLACED AT THE CONTRACTOR'S EXPENSE TO THE SATISFACTION OF HAVERFORD COLLEGE. THE CONTRACTOR SHALL NOTIFY HAVERFORD COLLEGE IMMEDIATELY OF ANY DAMAGE TO THE NEW EQUIPMENT OR TO EXISTING FACILITIES OR EQUIPMENT.
11. ALL WORK PERFORMED SHALL BE IN ACCORDANCE WITH THE BEST CONSTRUCTION PRACTICES AND AS A MINIMUM SHALL CONFORM TO THE CODES AND STANDARDS OF THE ORGANIZATIONS LISTED BELOW.

    OCCUPATION SAFETY AND HEALTH ADMINISTRATION (OSHA)
    AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
    AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
    AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
    NATIONAL ELECTRIC CODE (NEC)
    FEDERAL, STATE, AND LOCAL CODES AND ORDINANCES
    INTERNATIONAL BUILDING CODE 2009
    INTERNATIONAL MECHANICAL CODE 2009
    INTERNATIONAL EXISTING BUILDING CODE 2009
    NATIONAL FIRE PROTECTION ASSOCIATION
    INTERNATIONAL PLUMBING CODE 2009

PROJECT RECORD DOCUMENTS:

1. SHOP DRAWINGS SHALL BE SUBMITTED BY THE CONTRACTOR FOR ALL NEW EQUIPMENT, MATERIALS, CONTROLS AND INSTRUMENTS.
2. MAINTAIN ON SITE, ONE SET OF THE FOLLOWING:
   CONTRACT DRAWINGS.
   SPECIFICATIONS.
   ADDENDA.
   CHANGE ORDERS AND OTHER MODIFICATIONS TO THE CONTRACT.
   REVIEWED SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
3. RECORD ACTUAL REVISIONS TO THE WORK:
   A. STORE RECORD DOCUMENTS SEPARATE FROM DOCUMENTS USED FOR CONSTRUCTION.
   B. RECORD INFORMATION CONCURRENT WITH CONSTRUCTION PROGRESS.
   C. SPECIFICATIONS: LEGIBLY MARK AND RECORD AT EACH PRODUCT SECTION DESCRIPTION OF ACTUAL PRODUCTS INSTALLED, INCLUDING THE FOLLOWING:
      1. MANUFACTURER'S NAME AND PRODUCT MODEL AND NUMBER.
      2. PRODUCT SUBSTITUTIONS OR ALTERNATES UTILIZED.
      3. CHANGES MADE BY ADDENDA AND MODIFICATIONS.

RECORD DRAWINGS

1. LEGIBLY MARK EACH ITEM TO RECORD ACTUAL CONSTRUCTION INCLUDING:
   A. MEASURED HORIZONTAL AND VERTICAL LOCATIONS OF UNDERGROUND UTILITIES AND APPURTENANCES, REFERENCED TO PERMANENT SURFACE IMPROVEMENTS.
   B. MEASURED LOCATIONS OF INTERNAL UTILITIES TO INCLUDE PIPES, VALVES, EQUIPMENT, CONDUIT, ACCESS DOORS, CONTROLS, DUCTS, ETC.
   C. FIELD CHANGES OF DIMENSION AND DETAIL.
   D. DETAILS NOT ON ORIGINAL CONTRACT DRAWINGS.

PRODUCT SUBSTITUTION PROCEDURES

1. SUBSTITUTIONS MAY BE CONSIDERED WHEN A PRODUCT BECOMES UNAVAILABLE THROUGH NO FAULT OF CONTRACTOR.
2. DOCUMENT EACH REQUEST WITH COMPLETE DATA, SUBSTANTIATING COMPLIANCE OF PROPOSED SUBSTITUTION WITH CONTRACT DOCUMENTS, INCLUDING:
   A. MANUFACTURER'S NAME AND ADDRESS, PRODUCT, TRADE NAME, MODEL, OR CATALOG NUMBER, PERFORMANCE AND TEST DATA, AND REFERENCE STANDARDS.
   B. ITEMIZED POINT-BY-POINT COMPARISON OF PROPOSED SUBSTITUTION WITH SPECIFIED PRODUCT, LISTING VARIATIONS IN QUALITY, PERFORMANCE, AND OTHER PERTINENT CHARACTERISTICS.
   C. COST DATA COMPARING PROPOSED SUBSTITUTION WITH SPECIFIED PRODUCT AND AMOUNT OF NET CHANGE TO CONTRACT SUM.
   D. CHANGES REQUIRED IN OTHER WORK.
   E. AVAILABILITY OF MAINTENANCE SERVICE AND SOURCE OF REPLACEMENT PARTS AS APPLICABLE.
   F. CERTIFIED TEST DATA TO SHOW COMPLIANCE WITH PERFORMANCE CHARACTERISTICS SPECIFIED.
   G. SAMPLES WHEN APPLICABLE OR REQUESTED.
   H. OTHER INFORMATION AS NECESSARY TO ASSIST ARCHITECT/ENGINEER'S EVALUATION.
   I. A REQUEST CONSTITUTES A REPRESENTATION THAT CONTRACTOR:
      I.1. HAS INVESTIGATED PROPOSED PRODUCT AND DETERMINED THAT IT MEETS OR EXCEEDS QUALITY LEVEL OF SPECIFIED PRODUCT.
      I.2. WILL PROVIDE SAME WARRANTY FOR SUBSTITUTION AS FOR SPECIFIED PRODUCT.
      I.3. WILL COORDINATE INSTALLATION AND MAKE CHANGES TO OTHER WORK THAT MAY BE REQUIRED FOR THE WORK TO BE COMPLETE WITH NO ADDITIONAL COST TO OWNER.
      I.4. WAIVES CLAIMS FOR ADDITIONAL COSTS OR TIME EXTENSION THAT MAY SUBSEQUENTLY BECOME APPARENT.
      I.5. WILL COORDINATE INSTALLATION OF THE ACCEPTED SUBSTITUTE, MAKING SUCH CHANGES AS MAY BE REQUIRED FOR THE WORK TO BE COMPLETE IN ALL RESPECTS.
      I.6. WILL REIMBURSE OWNER AND ARCHITECT/ENGINEER FOR REVIEW OR REDESIGN SERVICES ASSOCIATED WITH REAPPROVAL BY AUTHORITIES HAVING JURISDICTION.
   J. SUBSTITUTIONS WILL NOT BE CONSIDERED WHEN ACCEPTANCE WILL REQUIRE REVISION TO CONTRACT DOCUMENTS.
   K. SUBSTITUTION SUBMITTAL PROCEDURE:
      K.1. SUBMIT SHOP DRAWINGS, PRODUCT DATA, AND CERTIFIED TEST RESULTS ATTESTING TO PROPOSED PRODUCT EQUIVALENCE. BURDEN OF PROOF IS ON PROPOSER.

SHOP DRAWING REQUIREMENTS AND DEFINITIONS:

1. SUBMISSION:
   A. SHOP DRAWINGS: SUBMIT TO ARCHITECT/ENGINEER FOR REVIEW FOR LIMITED PURPOSE OF CHECKING FOR CONFORMANCE WITH INFORMATION GIVEN AND DESIGN CONCEPT EXPRESSED IN CONTRACT DOCUMENTS.
   B. INDICATE SPECIAL UTILITY AND ELECTRICAL CHARACTERISTICS, UTILITY CONNECTION REQUIREMENTS, AND LOCATION OF UTILITY OUTLETS FOR SERVICE FOR FUNCTIONAL EQUIPMENT AND APPLIANCES. STRIKEOUT ALL NON-PROJECT RELATED INFORMATION FROM STANDARD SUBMITTALS.
   C. WHEN REQUIRED BY INDIVIDUAL SPECIFICATION SECTIONS, PROVIDE SHOP DRAWINGS SIGNED AND SEALED BY PROFESSIONAL ENGINEER RESPONSIBLE FOR DESIGNING COMPONENTS SHOWN ON SHOP DRAWINGS.
      C.1. INCLUDE SIGNED AND SEALED CALCULATIONS TO SUPPORT DESIGN.
      C.2. SUBMIT DRAWINGS AND CALCULATIONS IN FORM SUITABLE FOR SUBMISSION TO AND APPROVAL BY AUTHORITIES HAVING JURISDICTION.
      C.3. MAKE REVISIONS AND PROVIDE ADDITIONAL INFORMATION WHEN REQUIRED BY AUTHORITIES HAVING JURISDICTION.
   D. SUBMITTALS SHALL BE SUBMITTED ELECTRONICALLY, COMPLETE WITH TRANSMITTAL SHEET, AND PRIME CONTRACTOR'S REVIEW STAMP.
   E. SUBMITTALS SHALL BE ORIGINAL PRODUCT DATA SHEETS. CATALOG AND BROCHURE COPIES WILL BE RETURNED WITHOUT REVIEW.
   F. EACH CONTRACTOR SHALL EXAMINE ALL SUBMITTALS BEFORE SUBMISSION FOR REVIEW. EACH CONTRACTOR SHALL THEN FORWARD ALL SUBMITTALS WITH HIS INITIALED APPROVAL STAMP, AND BY SO DOING THE CONTRACTOR THEREBY REPRESENTS THAT HE HAS DETERMINED AND VERIFIED ALL FIELD MEASUREMENTS, FIELD CONSTRUCTION CRITERIA, MATERIALS, DIMENSIONS, CATALOG NUMBERS, AND SIMILAR DATA, HAS NOTIFIED THE ARCHITECT/ENGINEER OF SITE CONDITIONS VARYING FROM THOSE INDICATED OR SPECIFIED, AND THAT HE HAS CHECKED AND COORDINATED EACH ITEM WITH OTHER APPLICABLE APPROVED SHOP DRAWINGS AND THE CONTRACT REQUIREMENTS. THE CONTRACTOR'S STAMP SHALL PROVIDE WORDING THAT SUCH WORK HAS BEEN COMPLETED. SHOP DRAWINGS AND PRODUCT DATA SUBMITTED WITHOUT THE CONTRACTOR'S STAMP OF APPROVAL WILL BE RETURNED TO THE CONTRACTOR WITHOUT REVIEW.
2. REVIEW
   A. THE A/E WILL REVIEW AND STAMP SUBMITTALS IN ONE OF THE FOLLOWING WAYS:
      A.1. "NO EXCEPTIONS TAKEN": WHICH MEANS SUBMITTALS ARE IN GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND IN GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACTOR DOCUMENTS.
      A.2. "FURNISH AS CORRECTED": WHICH MEANS SUBMITTALS HAVE MINOR CORRECTION. NOTED CORRECTIONS MUST BE MADE IN THE FINAL INSTALLATION. A/E HAS OPTION TO REQUIRE RESUBMISSION FOR RECORD.
      A.3. "REVISE AND RESUBMIT": WHICH MEANS RESUBMISSION IS REQUIRED DUE TO THE NATURE OR NUMBER OF CORRECTIONS.
      A.4. "REJECT": WHICH MEANS SUBMITTALS DO NOT MEET CONTRACTOR REQUIREMENTS. RESUBMISSION IS REQUIRED.
   B. WORK MAY BE EXECUTED UNDER CATEGORIES: "NO EXCEPTIONS TAKEN" OR "FURNISH AS CORRECTED" ONLY.

PIPING INSTALL:

1. CONTRACTOR SHALL PROVIDE ALL REQUIRED PIPE LABELS. LABELS SHALL BE IN ACCORDANCE WITH ANSI A13.1, SHOWING FLOW DIRECTION AND SERVICE.
2. ALL WORK ON THE PIPING SYSTEMS SHALL BE IN ACCORDANCE WITH ESTABLISHED CODES AND STANDARDS FOR THE TYPE OF SYSTEM INVOLVED. IN CASE OF ANY QUESTION AS TO THE SPECIFIC CODE OF STANDARD RELATED TO A SPECIFIC SYSTEM, THE ENGINEER SHALL DETERMINE AND INFORM THE CONTRACTOR OF THE APPROPRIATE REGULATION.
3. PIPING SYSTEMS SHALL BE TESTED AND DEMONSTRATED FREE FROM LEAKS USING METHODS, PROCEDURES AND TEST MEDIA, AS SPECIFIED HEREIN, OR AS DIRECTED BY THE ENGINEER. ANY LEAKS SHALL BE REPAIRED AND THE SYSTEMS RETESTED AND MADE READY FOR OPERATION BEFORE ACCEPTANCE BY OWNER.
4. ALL MATERIALS USED IN THE PIPING SYSTEM COVERED UNDER THIS SECTION SHALL BE NEW, UNUSED, UNDAMAGED, AND OF FIRST QUALITY. PIPING MATERIAL, FITTINGS, AND CONNECTIONS SHALL BE AS DESCRIBED IN THE PIPE SPECIFICATION DESCRIPTION.
5. NATURAL GAS PIPING SHALL COMPLY WITH GAS UTILITY REQUIREMENTS.

PIPE SPECIFICATION

REHEAT HOT WATER SYSTEM (ABOVE GROUND)
CHILLED WATER SYSTEM (ABOVE GROUND)

PIPE/FITTINGS/JOINTS: 2" AND SMALLER

COPPER TUBING: ASTM B88, TYPE L, HARD DRAWN.

FITTINGS: ASME B16.18, CAST BRONZE, OR ASME B16.22, WROUGHT COPPER AND COPPER ALLOY SOLDER JOINT PRESSURE FITTINGS.

JOINTS: ASTM B32, SOLDER, GRADE 95TA, "LEAD FREE".

VALVES

A. UP TO AND INCLUDING 2 INCHES: CLASS 150
   1. MANUFACTURERS
      a. CRANE VALVE, NORTH AMERICA
      b. MILWAUKEE VALVES AND FITTINGS
      c. STOCKHAM VALVES AND FITTINGS
   2. FULL PORTED BRONZE TWO–PIECE BODY, CHROME PLATED BRASS BALL, TEFLON SEATS AND STUFFING BOX RING, LEVER HANDLE WITH BALANCING STOPS, THREADED ENDS.

SANITARY WASTE & VENT SYSTEM (ABOVE GRADE)

PIPE/FITTINGS/JOINTS: 2" AND SMALLER

1. PIPE	ASTM B88, TYPE M HARD DRAWN.
2. JOINTS	ASTM B32, SOLDER, GRADE 95TA, "LEAD FREE".
3. FITTINGS	ASME B16.18, CAST BRONZE, OR ASME B16.22, WROUGHT COPPER AND BRONZE.

PIPE/FITTINGS/JOINTS: 2–1/2" AND LARGER

1. PIPE	CAST IRON PIPE: CISPI 301, HUB–LESS SERVICE WEIGHT.
2. JOINTS	CISPI 310, STAINLESS STEEL CLAMP–AND–SHIELD ASSEMBLIES.
3. FITTINGS	CAST IRON: CISPI 301

DOMESTIC HOT AND COLD WATER SYSTEM (ABOVE GROUND)

PIPE/FITTINGS/JOINTS: 2" AND SMALLER

1. PIPE	ASTM B88, TYPE L HARD DRAWN.
2. JOINTS	ASTM B32, SOLDER, GRADE 95TA, "LEAD FREE".
3. FITTINGS	ASME B16.18, CAST BRONZE, OR ASME B16.22, WROUGHT COPPER AND BRONZE.

VALVES

A. MANUFACTURED BY NIBCO INC, FULL PORT BRONZE TWO PIECE BODY, BRONZE BALL, TEFLON SEATS AND STUFFING BOX RING, LEVER HANDLE, AND SOLDER OR THREADED ENDS WITH UNION.

5. **INSPECTION.** PRIOR TO INSTALLATION, ALL PIPE, FITTINGS, VALVES, EQUIPMENT, AND ACCESSORIES SHALL BE CAREFULLY INSPECTED. ANY ITEMS WHICH ARE UNSUITABLE, CRACKED OR OTHERWISE DEFECTIVE SHALL BE REJECTED AND REMOVED FROM THE JOB IMMEDIATELY. ALL PIPE, FITTINGS, VALVES, EQUIPMENT AND ACCESSORIES SHALL HAVE FACTORY APPLIED MARKINGS, STAMPINGS OR NAMEPLATES WITH SUFFICIENT DATA FOR IDENTIFICATION TO DETERMINE THEIR CONFORMANCE WITH SPECIFIED REQUIREMENTS.
6. **PRECAUTIONS TO PREVENT PIPING CONTAMINATION.** PIPE AND FITTINGS SHALL BE DELIVERED TO THE SITE IN A CLEAN, PROTECTED CONDITION. CARE SHALL BE EXERCISED AT EVERY STAGE OF STORAGE, HANDLING, LAYING AND ERECTING TO PREVENT ENTRY OF FOREIGN MATTER INTO PIPING, FITTINGS, VALVES, EQUIPMENT, AND ACCESSORIES. ANY ITEM WHICH IS NOT CLEAN SHALL NOT BE ERECTED OR INSTALLED. DURING CONSTRUCTION, UNTIL SYSTEM IS FULLY OPERATIONAL, ALL OPENINGS IN PIPING AND EQUIPMENT MUST BE KEPT CLOSED AT ALL TIMES EXCEPT WHEN ACTUAL WORK IS BEING PERFORMED ON THAT ITEM OR SYSTEM. CLOSURES SHALL BE PLUGS, CAPS, BLIND FLANGES OR OTHER ITEMS SPECIFICALLY DESIGNED AND INTENDED FOR THIS PURPOSE.
7. **ROUTING OF PIPES.** PIPELINE SHALL BE RUN STRAIGHT AND TRUE, PARALLEL TO BUILDING LINES WITH A MINIMUM USE OF OFFSETS AND COUPLINGS. ONLY SUCH OFFSETS AS MAY BE REQUIRED TO PROVIDE NECESSARY HEADROOM OR CLEARANCE AND TO PROVIDE NECESSARY FLEXIBILITY IN PIPELINES SHALL BE PROVIDED.
8. **USE OF CONNECTIONS.** FLANGES OR UNIONS SHALL BE PROVIDED AT ALL FINAL CONNECTIONS TO EQUIPMENT, TRAPS AND VALVES TO FACILITATE DISMANTLING. PIPING AND PIPING CONNECTIONS SHALL BE ARRANGED SO THAT EQUIPMENT SERVED MAY BE SERVICED OR TOTALLY REMOVED WITHOUT DISTURBING PIPING BEYOND FINAL CONNECTIONS AND ASSOCIATED SHUT–OFF VALVES.
9. **PIPE SIZE.** UNLESS OTHERWISE INDICATED, ALL PIPING SHALL BE INSTALLED AT FULL LINE SIZE WITH REDUCTIONS ONLY WHEREVER REQUIRED BY CONTROL VALVES, PUMPS AND EQUIPMENT CONNECTIONS.
10. **PIPE CUTTING.** ALL PIPE SHALL BE CUT TO EXACT MEASUREMENT AND INSTALLED WITHOUT SPRINGING OR FORCING. PARTICULAR CARE SHALL BE TAKEN TO AVOID CREATING, EVEN TEMPORARILY, UNDUE LOADS, FORCES OR STRAINS ON VALVES, EQUIPMENT OR BUILDING ELEMENTS WITH PIPING CONNECTIONS OR PIPING SUPPORTS. TUBE OR PIPE CUTTERS, MECHANICAL SAWS, OR MECHANIZED OXYGEN CUTTING SHALL BE USED. ALL CUTS SHALL BE REAMED TO REMOVE BURRS. ANY OBJECTIONABLE DEFECTS, INCLUDING SLAG, SHALL BE REMOVED BY MACHINING, CHIPPING, OR GRINDING.
11. **BRANCH TAKEOFFS.** UNLESS OTHERWISE INDICATED IN THESE SPECIFICATIONS OR ON THE DRAWINGS, BRANCH TAKEOFFS SHALL BE FROM TOP OF MAINS OR HEADERS AT EITHER A 45 DEGREE OR 90 DEGREE ANGLE FROM THE HORIZONTAL PLANE. ONLY TEES, SADDLES, WELDOLETS, THREADOLETS OR SOCKOLETS ARE PERMISSIBLE FOR BRANCH CONNECTIONS. NO FISHMOUTH PIPE–TO–PIPE CONNECTIONS ARE ALLOWED.
12. **THREADED JOINTS.** PIPE SCREW THREADS SHALL CONFORM TO ANSI B2.1 "PIPE THREADS." PIPE ENDS SHALL BE REAMED AND ALL BURRS AND CHIPS FORMED IN CUTTING AND THREADING SHALL BE REMOVED. PLATED PIPE AND BRASS VALVE BODIES SHALL BE PROTECTED FROM WRENCH MARKS WHEN MAKING UP JOINTS. THREAD LUBRICANT SHALL BE APPLIED TO MALE THREADS ONLY. THREAD LUBRICANT SHALL BE "NEVER SEEZ" OR EQUAL.

    TEFLON TAPE SHALL BE USED ON ALL THREADED JOINTS. THE TEFLON TAPE SHALL BE APPLIED IN A CLOCKWISE DIRECTION SO AS NOT TO "PEEL–OFF" WHEN MATING JOINT. THREADED JOINTS SHALL NOT BE BACKED OFF TO ALIGN PIPE AND FITTINGS. ANY THREADED JOINT THAT LEAKS SHALL NOT BE SEAL WELDED TO CORRECT LEAKAGE.
13. **DISSIMILAR METAL JOINTS.** DIELECTRIC UNIONS OR INSULATED FLANGE KITS SHALL BE USED WHEN JOINING DISSIMILAR METALS.

PIPE SUPPORTS:

1. PIPE SUPPORTS FOR THE FOLLOWING SYSTEMS SHALL BE FURNISHED AND FABRICATED BY THE CONTRACTOR AS SPECIFIED IN THIS SECTION AND THE CONTRACT DRAWINGS.

PIPE SYSTEM NAME	ABBREVIATION
REHEAT HOT WATER	RHHW
CHILLED WATER	CHW
DOMESTIC COLD WATER	DCW
DOMESTIC HOT WATER	DHW
CONDENSATE	COND.

2. ALL PIPING SUPPORTS SHALL BE FURNISHED IN ACCORDANCE WITH THE CONTRACT DRAWINGS AND THE REQUIREMENTS SPECIFIED HEREIN.

   INDIVIDUAL DETAILS OF PIPING SUPPORTS FOR PIPING 2–INCHES AND SMALLER SHALL NOT BE SUBMITTED TO THE ENGINEER FOR REVIEW, BUT THE CRITERIA USED FOR SELECTION OF THESE PIPE SUPPORT ASSEMBLIES SHALL BE GENERALLY DESCRIBED FOR THE ENGINEER'S REVIEW PRIOR TO ERECTION. THE DESCRIPTION SHALL CONSIST OF TYPE OF PIPE ATTACHMENT, STRUCTURE ATTACHMENT, RODS, TURNBUCKLES, CLEVISES, EYE NUTS AND OTHER MATERIALS WHICH THE CONTRACTOR PROPOSES TO USE IN SELECTION OF COMPONENTS FOR THESE SUPPORTS. THE DESCRIPTION SHALL INCLUDE TYPICAL ASSEMBLY SKETCHES.
3. **CODE REQUIREMENTS.** ALL PIPE SUPPORT MATERIALS, DESIGN AND FABRICATION SHALL BE IN ACCORDANCE WITH THE LATEST APPLICABLE PROVISIONS OF ANSI B31.1, CODE FOR PRESSURE PIPING, UNLESS OTHERWISE SPECIFIED HEREIN; AND IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF THE FEDERAL OCCUPATIONAL SAFETY AND HEALTH STANDARDS.
4. STRUCTURAL STEEL SUPPORT REQUIRED FOR ATTACHING SUPPORTS TO THE BUILDING STRUCTURE SHALL CONFORM TO ASTM A36.

   PIPE SUPPORTS SHALL BE OF FIREPROOF CONSTRUCTION; NO COMBUSTIBLE MATERIAL SHALL BE USED.
5. **SUPPORT FOR PIPES 2 INCHES AND SMALLER**. PIPE SUPPORTS ARE NOT SHOWN OR LISTED ON THE DRAWINGS. THE SELECTION, CONSTRUCTION, MATERIALS, AND INSTALLATION SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS AND PARAGRAPHS OF ANSI B31.1 AND MSS SP–58. DISSIMILAR PIPE/SUPPORT METAL CONTACT SHALL BE AVOIDED.

   IN THE SELECTION OF THE PIPE SUPPORTS, CONSIDERATION SHALL BE GIVEN TO ALL FACTORS, SUCH AS THERMAL EXPANSION, EQUIPMENT VIBRATION, WEIGHT, STRESS, AND SUPPORT REACTIONS. SUPPORTS SHALL NOT INDUCE EXCESSIVE STRAIN IN THE PIPING, CONNECTED EQUIPMENT, OR BUILDING OR SEPARATE PIPE SUPPORTING STRUCTURES. SPECIAL ATTENTION SHALL BE GIVEN TO RIGID FLOORSTANDS, SUCH AS BASE ELBOWS. EACH PIPING SUPPORT FOR PIPING 1/2 INCH NOMINAL DIAMETER AND LARGER SHALL, WHEN INSTALLED COMPLETE WITH PIPING FILLED WITH OPERATING MEDIUM, BE CAPABLE OF WITHSTANDING AN ADDED LOAD OF 250 POUNDS WHEN APPLIED AT THE POINT OF HANGING. THE SELECTION AND APPLICATION OF PIPING SUPPORTS SHALL BE IN ACCORDANCE WITH MSS SP–69, EXCEPT AS STATED OTHERWISE IN THESE SPECIFICATIONS.

   HANGER RODS SHALL BE CONSTRUCTED OF SOLID ROUND STEEL BARS NOT LESS THAN 1/2 INCH DIAMETER FOR 1–1/2 INCH AND LARGER PIPING SIZES AND NOT LESS THAN 3/8 INCH DIAMETER FOR SMALLER PIPING SIZES. EYE RODS SHALL BE FULLY AND NEATLY WELDED. PIPE STRAPS, CHAIN, WIRE, OR OTHER SIMILAR MATERIALS SHALL NOT BE USED IN PLACE OF RODS. SWIVEL CONNECTIONS SHALL BE PROVIDED AT BOTH ENDS OF RODS. MEANS SHALL BE PROVIDED FOR VERTICAL ADJUSTMENT OF RODS, AND ADJUSTMENT COMPONENTS SHALL BE PROVIDED WITH LOCKNUTS.
6. **STRUCTURE ATTACHMENTS**. STRUCTURE ATTACHMENT COMPONENTS SHALL BE FASTENED BY WELDING OR BOLTING. ANCHOR BOLTS FOR ATTACHMENT TO CONCRETE OR MASONRY WILL BE FURNISHED LOOSE WITH ALL SUPPORTS. ANCHOR BOLTS SHALL BE CONE EXPANSION TYPE, CONFORMING TO FEDERAL SPECIFICATION FF–S–325, GROUP II, TYPE 4, CLASS 1 OR 2, UNLESS OTHERWISE INDICATED. EXPANSION ANCHOR DESIGN SHALL MEET THE FOLLOWING CRITERIA.
   MINIMUM SAFETY FACTOR OF FIVE.
   USE IN CEILINGS AND WALLS SHALL BE LIMITED TO NO MORE THAN 1/2–INCH DIAMETER.
   MINIMUM EDGE AND SPACING DISTANCES IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
   USE IN MASONRY SHALL BE SUBJECT TO THE REVIEW OF THE PLANS BY THE ENGINEER.
7. **SUPPLEMENTARY SUPPORT BEAMS**. UNLESS OTHERWISE INDICATED, SUPPLEMENTARY SUPPORT BEAMS, REQUIRED FOR ATTACHMENT OF SUPPORTS TO BUILDING STRUCTURE, WILL BE ATTACHED BY MEANS OF CLIP ANGLES. CLIP ANGLES SHALL BE FURNISHED AND SHALL BE DESIGNED FOR WELDING TO THE WEB OF BUILDING STRUCTURE BEAMS OR COLUMNS.

   CLIP ANGLES SHALL CONFORM TO "FRAMED BEAM CONNECTIONS" AS INDICATED IN THE LATEST AISC MANUAL OF STEEL CONSTRUCTION.

   CLIP ANGLES SHALL BE SIZED TO MATCH SUPPORT BEAM STRENGTH. CLIP ANGLES SHALL BE SECURELY ATTACHED BY BOLTING TO THE SUPPLEMENTARY BEAM FOR SHIPPING AND INSTALLATION EASE. BOLTING SHALL BE THROUGH ELONGATED HOLES IN THE BEAM WEB. PERMANENT ATTACHMENT OF CLIP ANGLES TO BOTH EXISTING STEEL AND SUPPLEMENTARY STEEL WILL BE BY FIELD WELDING.
8. **SPACING CRITERIA**. HORIZONTAL SUPPORT SPACING SHALL NOT EXCEED THE MAXIMUM SPANS AS SHOWN IN THE FOLLOWING TABLE:

MAXIMUM SPAN IN FEET
NOMINAL PIPE SIZE (INCHES)

PIPE MATERIAL	1/2 to 1–1/4	1–1/2	2 to 2–1/2	3	4
SCH. 40 STEEL	7	7	10	12	14
COPPER	5	7	8	10	14

LOCATION CRITERIA. SUPPORTS SHALL BE LOCATED ON BUILDING STRUCTURAL STEEL BEAMS OR COLUMNS WHERE POSSIBLE, NEAR CONCENTRATED PIPING LOADS SUCH AS VALVES, STRAINERS, AND TRAPS, AND NEAR CHANGES IN DIRECTION OF PIPING. ANY SUPPLEMENTARY STRUCTURAL STEEL MEMBERS REQUIRED FOR SUPPORT ATTACHMENTS SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. ANY REINFORCING OF BUILDING OR SEPARATE PIPE SUPPORTING STRUCTURE NECESSARY FOR SUPPORTS SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR. ADJACENT SUPPORT SHALL BE OF THE SAME TYPE AND COMPONENT ASSEMBLY INSOFAR AS PRACTICABLE. CORRESPONDING PARTS OF ADJACENT HANGERS SHALL BE SET AT THE SAME ELEVATION. TWO OR MORE SUPPORTS ATTACHED TO THE SAME PART OF THE BUILDING STRUCTURE SHALL BE LINED UP, RATHER THAN STAGGERED. SUPPORTS SHALL NOT BE ATTACHED TO THE BUILDING STRUCTURAL ANGLES, DIAGONAL BRACING, OR TRUSS MEMBERS. SUPPORTS SHALL BE LOCATED AND ARRANGED SO AS NOT TO INTERFERE WITH OR OBSTRUCT OTHER PIPING, RACEWAYS, LIGHTING, WALKWAYS, STAIRWAYS, HEADROOM, FIRE PROTECTION SYSTEMS, AND EQUIPMENT OPERATION AND MAINTENANCE SPACES.

STRUCTURAL ATTACHMENTS. STRUCTURAL ATTACHMENTS SHALL BE MADE BY USE OF WELDING OR BOLTING. THE USE OF "C" CLAMPS WILL NOT BE PERMITTED.

CEILING AND WALL ATTACHMENTS. CEILING AND WALL, CONCRETE, OR MASONRY ATTACHMENTS SHALL BE USED ONLY WHEN ATTACHMENT TO BUILDING STEEL OR ADDED SUPPLEMENTARY STEEL IS IMPRACTICAL.

9. **PIPE ATTACHMENTS.** WHEREVER POSSIBLE, PIPE ATTACHMENTS FOR HORIZONTAL PIPING SHALL BE PIPE CLAMPS. PIPE ATTACHMENTS SHALL EXTEND SUFFICIENTLY OUTSIDE THE INSULATION, IF ANY, TO PERMIT FREE INSTALLATION AND OPERATION OF OTHER SUPPORT COMPONENTS. PIPE ATTACHMENTS SHALL BE RIGID RELATIVE TO THE PIPING AND INSULATION. CLEVIS TYPE PIPE ATTACHMENTS SHALL BE USED FOR COLD INSULATED LINES AND MAY BE USED FOR UNINSULATED PIPE NOT SUBJECT TO THERMAL MOVEMENT. PIPE CLEVISES SHALL NOT BE USED FOR HOT PIPING. ON COPPER PIPING OR TUBING, THE CLAMP OR CLEVIS SHALL BE OF COPPER OR COPPER–PLATED STEEL. COPPER IN CONTACT WITH DISSIMILAR MATERIAL SHALL BE ISOLATED BY AN APPROVED METHOD.

VALVES AND PIPING SPECIALTIES:

1. THE MATERIALS USED AND THE CONSTRUCTION OF ALL VALVES AND PIPING SPECIALTIES SHALL CONFORM TO APPLICABLE REQUIREMENTS OF ANSI, ASTM AND OTHER NATIONALLY RECOGNIZED STANDARDS.
2. IN ADDITION TO THE REQUIREMENTS FOR SUBMITTALS COVERED ELSEWHERE IN THESE SPECIFICATIONS, THE FOLLOWING ADDITIONAL INFORMATION SHALL BE INCLUDED ON VALVES AND PIPING SPECIALTIES. A LIST OF ALL VALVES TO BE FURNISHED, INCLUDING THE MANUFACTURER, MODEL NUMBER, SERVICE, SIZE RANGES, END CONSTRUCTION,MATERIAL AND ANY SPECIAL FEATURES REQUIRED. THE LIST SHALL IDENTIFY THE VALVES IN ACCORDANCE WITH THE VALVE TYPES DESCRIBED HEREIN. THE SUBMITTAL DATA FOR PIPING SPECIALTIES SHALL INCLUDE, BUT NOT BE LIMITED TO, MANUFACTURER'S MODEL NUMBER, DESIGN CAPACITY, MATERIALS OF CONSTRUCTION, OPERATION AND MAINTENANCE MANUALS, AND VERIFICATION THAT EQUIPMENT IS APPROVED BY ORGANIZATIONS SPECIFIED.
3. DESCRIPTION FOR EACH VALVE AND PIPING SPECIALTY INCLUDES SIZE, RANGE, PRESSURE AND TEMPERATURE LIMITATIONS, MATERIALS AND SPECIAL FEATURES,AND A MANUFACTURER'S REFERENCE. TO ESTABLISH THE OVERALL QUALITY DESIRED AND TO FURTHER CONFIRM THE DESIRED VALVE CONSTRUCTION, THE MODEL NUMBER OF ONE ACCEPTABLE REFERENCE MANUFACTURER IS LISTED. HOWEVER, THE REFERENCE MANUFACTURER DOES NOT REPRESENT THE ONLY ACCEPTABLE MANUFACTURER (UNLESS OTHERWISE STATED). IF THE PRODUCT DESCRIPTION AND REFERENCE MANUFACTURER MODEL NUMBER ARE IN CONFLICT, THEN THE PRODUCT DESCRIPTION SHALL GOVERN. THE CONTRACTOR IS RESPONSIBLE TO PROVIDE EQUIPMENT THAT MEETS THE PRODUCT DESCRIPTION.

PIPING INSULATION AND JACKETS

TYPE P–1 INSULATION

DESCRIPTION	FIBERGLASS PIPE INSULATION FACTORY–APPLIED VAPOR BARRIER CONSISTING OF KRAFT PAPER AND FIBER REINFORCED FOIL.
DENSITY	MINIMUM, 0.75 PCF.
THERMAL CONDUCTIVITY	MAXIMUM, 0.23 BTUIN./(HRFT2F) AT 75°F MEAN TEMPERATURE.
TEMPERATURE LIMITS	MAXIMUM, 850°F. MINIMUM, 0°F.
FIRE HAZARD CLASSIFICATION* (MAXIMUM VALUE)	FLAME SPREAD – 25. SMOKE DEVELOPED – 50.
REFERENCE MANUFACTURER	JOHNS MANVILLE MICRO–LOK

TYPE P–2 INSULATION

MANUFACTURERS: ARMSTRONG AP ARMAFLEX.

INSULATION: ASTM C534; FLEXIBLE, CELLULAR ELASTOMERIC, MOLDED OR SHEET.

'K' VALUE: ASTM C177 OR C518; 0.27 AT 75°F.

MINIMUM SERVICE TEMPERATURE:	_40°F.
MAXIMUM SERVICE TEMPERATURE:	220°F.
MAXIMUM MOISTURE ABSORPTION:	ASTM D1056; 5.0 PERCENT BY WEIGHT.
MOISTURE VAPOR TRANSMISSION:	ASTM E96; 0.20 PERM INCHES.
MAXIMUM FLAME SPREAD:	ASTM E84; 25.
MAXIMUM SMOKE DEVELOPED:	ASTM E84; 50.

SECURE LONGITUDINAL SEAMS AND BUTT JOINTS WITH SELF SEALING, PRESSURE SENSITIVE INSULATION TAPE OR ADHESIVE.

ELASTOMERIC FOAM ADHESIVE
MANUFACTURERS: ARMSTRONG 520 ADHESIVE.
AIR–DRIED, CONTACT ADHESIVE, COMPATIBLE WITH INSULATION.

1. MISCELLANEOUS ACCESSORIES SUCH AS ADHESIVES, TAPES, BANDS, WIRES, CEMENTS, WEATHERPROOF COATINGS, AND OUTER METAL JACKETING SHALL BE THE MANUFACTURER'S STANDARD PRODUCTS OR TYPES RECOMMENDED BY THE MANUFACTURER FOR THE INTENDED USE.
2. THE CONTRACTOR SHALL EXAMINE SURFACES TO BE INSULATED AND WORK AREA WHERE INSULATION IS TO BE APPLIED FOR THE FOLLOWING:

   FABRICATION AND INSTALLATION DEFECTS THAT WOULD AFFECT EXECUTION OF WORK.
   PROPER TEMPERATURE AND HUMIDITY CONDITIONS.
   INSTALLATION OF HANGERS AND SUPPORTS.

   DO NOT COMMENCE WORK UNTIL THE FOLLOWING CONDITIONS HAVE BEEN MET:

   UNSATISFACTORY CONDITIONS ARE CORRECTED.
   APPROVAL OF THE OWNER IS OBTAINED.
3. THE CONTRACTOR SHALL COORDINATE THE INSULATION OF PIPING SYSTEMS WITH OTHER WORK UNDER THIS CONTRACT. DO NOT INSTALL INSULATION BEFORE PIPING AND EQUIPMENT HAVE BEEN TESTED AND APPROVED. LEAVE PIPING JOINTS UNCOVERED UNTIL TESTS HAVE BEEN PERFORMED.

   ENSURE SURFACE TO BE INSULATED IS CLEAN AND DRY PRIOR TO INSTALLATION. ENSURE INSULATION IS DRY BEFORE AND DURING APPLICATION.
4. ALL INSULATION SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS, USING ANY REQUIRED INSTALLATION ACCESSORIES. FINISHES SHALL BE SMOOTH, WITH ALL JOINTS TIGHT AND SEALED. INSULATION SHALL FIT TIGHTLY AGAINST SURFACE TO WHICH IT IS APPLIED WITH ENDS AND EDGES TIGHTLY BUTTED, WITHOUT VOIDS OR GAPS. WHERE DOUBLE–THICKNESS INSULATION IS REQUIRED, ALL JOINTS IN THE INSULATION SHALL BE STAGGERED.

   THE CONTRACTOR SHALL MAKE ANY CONNECTIONS IN THE INSULATION BETWEEN CONTRACTOR–FURNISHED MATERIAL AND MATERIAL INSTALLED BY OTHERS.

   FOR ALL PIPING AND EQUIPMENT, THE INSULATION TYPE AND THICKNESS SHALL BE AS INDICATED ON THE DRAWINGS AND IN THE INSULATION APPLICATION TABLES OF THIS SECTION.

   THE CONTRACTOR SHALL PROVIDE A QUALIFIED PERSON TO SUPERVISE APPLICATION. USE MECHANICS SKILLED IN THE TRADE TO PERFORM THIS PORTION OF WORK.
5. PIPING INSULATION. APPLY PIPING INSULATION TO PIPING ACCORDING TO THE INSULATION APPLICATION TABLE. INSULA SHALL BE CONITNUOUS THROUGH WALLS, PARTITIONS, FLOOR AND SLEEVES. INTERRUPT INSULATION AT CONTROL DEVICES (VALVES, ETC.) SO AS NOT TO INTERFERE WITH THEIR OPER
6. PROTECTION OF INSULATION. SHALL BE PROTECTED AT HANGERS BY PROTECTION SHIELDS MADE FROM ALUMINUM JACKETING.
7. FIELD QUALITY CONTROL. IT IS THE INTENT OF THESE SPECIFICATIONS TO OBTAIN A COMPLETE AND SERVICEABLE INSTALLATION. WHEN THE DUCTWORK, PIPING, AND EQUIPMENT HAVE REACHED OPERATING TEMPERATURES, AND INSPECTION OF THE COMPLETED INSULATION, BY INFRARED PHOTOGRAPHY OR OTHER MEANS, DISCLOSES ANY SIGNIFICANT TEMPERATURE VARIATIONS (I.E., LAGGING INSTALLED OVER UNINSULATED AREAS), THE CONTRACTOR SHALL, AT HIS EXPENSE, REMOVE THE INSULATION FROM THESE AREAS AND APPLY INSULATION CORRECTLY IN ACCORDANCE WITH THESE SPECIFICATIONS.

INSULATION APPLICATION		
SURFACE	INSULATION/ JACKET TYPE	INSULATION THICKNESS (IN)
REHEAT HOT WATER SUPPLY AND RETURN	P–1	1–1/2"
DOMESTIC COLD WATER & HOT WATER SUPPLY	P–1	1"
CONDENSATE	P–2	1/2"

PIPE INSULATED SADDLES

1. MANUFACTURERS:
   A. BUCKAROOS, INC. TRU–BALANCE SLIDING SADDLES
   B. SUBSTITUTIONS: NONE PERMITTED.
2. INSULATED PIPING SADDLES
   C. PRE–ASSEMBLED AND PRE–INSULATED (REFER TO SECTION 20 07 00 FOR REQUIRED THICKNESS)
   D. WATER RESISTANT
   E. INSULATION:
      E.1. MATERIAL: RIGID PHENOLIC FOAM WITH VAPOR RETARDER JACKET AND SELF–SEAL, ACRYLIC. PRESSURE–SENSITIVE, ADHESIVE TAPE.
      E.2. FREE OF NUTRIENTS TO CONTRIBUTE TO MOLD OR FUNGUS.
      E.3. FREE OF CFC AND HCFC COMPOUNDS.
      E.4. LENGTH: BASED ON MANUFACTURERS RECOMMENDATIONS FOR PIPE TYPE AND SIZE.
   F. VAPOR RETARDER JACKET:
      F.1. COMPLIANCE: ASTM C 1136, TYPE III AND IV.
      F.2. NON–YELLOWING.
      F.3. FREE OF NUTRIENTS TO CONTRIBUTE TO MOLD OR FUNGUS.
      F.4. PUNCTURE RESISTANT
      F.5. SURFACE BURNING CHARACTERISTICS, ASTM E 84
         1) FLAME RATING: LESS THAN 25.
         2) SMOKE RATING: LESS THAN 50.
   G. SADDLES (TOP AND BOTTOM):
      G.1. MATERIAL: GALVANIZED STEEL, G–90
      G.2. GAUGE AND LENGTH: BASED ON MANUFACTURERS RECOMMENDATIONS FOR PIPE TYPE AND SIZE.
      G.3. ARC: 180 DEGREES.
      G.4. FLARED EDGE TO PROTECT VAPOR RETARDER JACKET AND INSULATION.
      G.5. BOTTOM SADDLE FITTED WITH PTFE LAYER AND CENTERED PARTIAL RIBS ON BOTTOM OF SADDLE TO PROPERLY SECURE SADDLE INSIDE CLEVIS HANGER OR STRUT SYSTEM AND TO PREVENT SADDLE SLIDING.

PIPE TESTING:

1. **TESTS**. ALL TESTS SHALL BE PERFORMED IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE AND SUCH OTHER PARTIES AS MAY HAVE LEGAL JURISDICTION. ALL DEFECTIVE WORK SHALL BE PROMPTLY REPAIRED OR REPLACED AT CONTRACTOR'S EXPENSE AND TESTS REPEATED UNTIL APPROVED BY OWNER'S REPRESENTATIVE. ANY DAMAGE RESULTING FROM TESTS SHALL BE REPAIRED AND DAMAGED MATERIALS REPLACED AT CONTRACTOR'S EXPENSE. OWNER'S REPRESENTATIVE AND ALL OTHERS HAVING LEGAL JURISDICTION SHALL BE NOTIFIED IN SUFFICIENT TIME TO ALLOW WITNESSING WHEN A TEST IS TO BE PERFORMED.
2. **TIMING AND APPROVAL OF TESTS**. TESTS SHALL BE PERFORMED AND APPROVAL OF TESTS OBTAINED IN WRITING PRIOR TO INSULATING, PAINTING OR CONCEALING IN ANY MANNER.
3. **TEST RECORDS AND REPORT**. PREPARE AND KEEP RECORDS OF EACH SYSTEM OR SECTION OF SYSTEM TESTED. TEST REPORTS SHALL BE SIGNED AND APPROVED BY THE OWNER'S REPRESENTATIVE AND TRANSMITTED IN TRIPLICATE TO ENGINEER WITH ONE COPY TO OWNER. IF ADDITIONAL COPIES ARE REQUIRED BY THOSE PERSONS HAVING LEGAL JURISDICTION, CONTRACTOR SHALL FURNISH THEM. TEST REPORTS SHALL INCLUDE, BUT NOT NECESSARILY BE LIMITED TO THE FOLLOWING:
   IDENTIFICATION OF PIPING SYSTEM OR SECTION TESTED.
   DATE OF TEST AND DATE OF OWNER'S REPRESENTATIVE'S APPROVAL SIGNATURE.
   TESTING MEDIUM, TEST EQUIPMENT DESCRIPTION (SKETCH IF NECESSARY), AND METHOD OR DESCRIPTION OF TEST PROCEDURE.
   TEST PRESSURE, DURATION OF TEST AND RECORDED PRESSURE DROP.
4. **TEST CONDITIONS**. TEST SHALL BE OBSERVED AFTER THE PIPE AND CONTENTS HAVE STABILIZED AT THE AMBIENT TEMPERATURE AND THE SOURCE OF TEST PRESSURE SHUT–OFF AND DISCONNECTED FROM THE PIPE BEING TESTED. PRESSURE TESTS IN GENERAL SHALL APPLY TO PIPING ONLY WITH ALL EQUIPMENT AND INSTRUMENTS BLOCKED OFF OR DISCONNECTED. IN NO CASE SHALL PIPING OR ANY COMPONENT BE SUBJECTED TO PRESSURES EXCEEDING THEIR RATING. ALL SYSTEM VALVES WITHIN THE SECTION BEING TESTED SHALL BE OPEN.
5. **TEST MEDIA AND PRESSURE GAGES**. UNLESS OTHERWISE INDICATED, HYDROSTATIC TESTING MEDIUM SHALL BE NITROGEN. GAUGES USED FOR PRESSURE TESTING SHALL BE CHECKED AND CALIBRATED AGAINST A DEAD WEIGHT TESTER AT LEAST ONCE PER MONTH AND CERTIFIED CORRECT OVER THE RANGE OF THE GAGE TO THE OWNER'S REPRESENTATIVE. GAGES USED FOR TESTING SHALL CONFORM TO ANSI B40.1 GRADE "AA" WITH MINIMUM DIAL DIAMETER OF 6 INCH AND SCALE DIVISIONS EQUAL TO OR LESS THAN THE MAXIMUM ALLOWABLE PRESSURE DROP.

   THE APPROVED TEST GAGE MANUFACTURER IS:
   DRESSER INDUSTRIES, INC.
   (ASHCROFT) – NO. 1082
   OR APPROVED EQUAL

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Project:

KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

Revision No.	Description/ Date
	BID DOCUMENTS 07/11/24

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MECHANICAL & PLUMBING SPECIFICATIONS

Sheet No.
MP700

HAVERFORD COLLEGE – KINSC BUILDING
HILLES WING – COMPUTER SCIENCE LABORATORY
MECHANICAL & PLUMBING PROJECT SPECIFICATIONS CONT.

6. **TEST PERFORMANCE**. HYDROSTATIC TESTS SHALL APPLY TO ALL PIPING. THE PRESSURE SHALL BE GRADUALLY RAISED TO THE VALUE GIVEN AND THE SOURCE THEN BLOCKED OFF AND DISCONNECTED. THE PRESSURE SHALL NOT DROP MORE THAN THE AMOUNT INDICATED DURING THE CORRESPONDING MINIMUM TIME INTERVAL. IF AN AUDIBLE OR VISIBLE LEAK IS DETECTED DURING TESTING, THIS SHALL BE CAUSE TO DISAPPROVE THE TEST EVEN THOUGH THE MAXIMUM ALLOWABLE PRESSURE DROP HAS NOT BEEN EXCEEDED. ALL JOINTS SHALL BE VISUALLY EXAMINED WHILE APPLYING A SOAPY–WATER SOLUTION OR "SNOOP". LEAKS SHALL BE REPAIRED AND COMPLETE TESTING PROCEDURE REPEATED. UPON SUCCESSFUL COMPLETION AND APPROVAL OF THE TESTS, THE PIPING SHALL BE RELIEVED OF PRESSURE, DRAINED AND PUT INTO NORMAL OPERATION EXCEPT FOR DOMESTIC WATER WHICH SHALL BE STERILIZED BEFORE PLACING IN SERVICE. PNEUMATIC TEST OF REFRIGERATION PIPING SHALL UTILIZE DRY NITROGEN.

   DRAIN PIPING SHALL BE HYDROSTATICALLY TESTED. OPEN ENDS OF THE PIPING SHALL BE BLANKED OR SEALED BY OTHER SUITABLE MEANS. PIPING SHALL BE FILLED WITH WATER AND VISIBLY CHECKED FOR LEAKS.

   CONTRACTOR SHALL BE RESPONSIBLE TO FURNISH ALL NECESSARY EQUIPMENT TO FACILITATE PIPE TESTING. THIS INCLUDES PRESSURE (BOOSTER) PUMPS, COMPRESSORS, BOTTLED GASES, TEMPORARY PIPING AND FITTINGS AS NEEDED TO PROPERLY PERFORM WORK.

PIPE TEST SCHEDULE

Symbol	Service	Working Press. Hg/psig	Hydronic(h) Test Press. psig/ft.hd.	Max. Press. Drop psig	Min. Time (hours)
RHHW	REHEAT HOT WATER	100 psig	120 psig (h)	0	24
CHW	CHILLED WATER	100 psig	120 psig (h)	0	24
DCW/DHW	DOMESTIC WATER	80 psig	120 psig (h)	0	24
SW	SANITARY WASTE	0	15 ft.hd. (h)	0	15 min.

9. **CLEANING PRIOR TO PIPE ASSEMBLY**. PRIOR TO ASSEMBLY OF PIPE AND PIPING COMPONENTS, ALL LOOSE DIRT, SCALE, OIL, AND OTHER FOREIGN MATTER OR INTERNAL OR EXTERNAL SURFACES SHALL BE REMOVED. CHIPS AND BURRS FROM MACHINERY OR THREAD CUTTING OPERATIONS SHALL BE BLOWN OUT OF PIPE BEFORE ASSEMBLY. CUTTING OIL SHALL BE WIPED FROM INTERNAL AND EXTERNAL SURFACES.

10. **CLEANING DURING FABRICATION AND ASSEMBLY**. DURING FABRICATION AND ASSEMBLY, SLAG, AND BRAZE SPATTER SHALL BE REMOVED FROM BOTH INTERNAL AND EXTERNAL PIPE JOINTS BY PEENING, CHIPPING, AND WIRE BRUSHING. ALL PARTIALLY INSTALLED PIPING SYSTEMS SHALL HAVE THE OPEN ENDS SUITABLY CAPPED (SEALED) WHENEVER THE SYSTEMS ARE LEFT UNATTENDED. PRIOR TO CAPPING OR SEALING, ENSURE THAT LOOSE BOLTS, NUTS, SMALL TOOLS, RAGS, OR ANY OTHER FOREIGN MATERIALS ARE NOT LEFT INSIDE THE PIPING SYSTEM.

DUCTWORK

1. MATERIALS

   A. INTERIOR DUCTWORK: GALVANIZED STEEL DUCTS, ASTM A924 AND ASTM A653 GALVANIZED STEEL SHEET, LOCK_FORMING QUALITY, HAVING G60 ZINC COATING OF IN CONFORMANCE WITH ASTM A90.

2. DUCTWORK FABRICATION

   A. FABRICATE AND SUPPORT IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS _ METAL AND FLEXIBLE, AND AS INDICATED. PROVIDE DUCT MATERIAL, GAGES, REINFORCING, AND SEALING FOR OPERATING PRESSURES INDICATED.

   B. CONSTRUCT T'S, BENDS, AND ELBOWS WITH RADIUS OF NOT LESS THAN 1_1/2 TIMES WIDTH OF DUCT ON CENTERLINE. WHERE NOT POSSIBLE AND WHERE RECTANGULAR ELBOWS ARE USED, PROVIDE AIR FOIL TURNING VANES.

   C. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSTREAM OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSTREAM.

   D. FABRICATE CONTINUOUSLY WELDED ROUND AND OVAL DUCT FITTINGS TWO GAGES HEAVIER THAN DUCT GAGES INDICATED IN SMACNA STANDARD. JOINTS SHALL BE MINIMUM 4 INCH CEMENTED SLIP JOINT, BRAZED OR ELECTRIC WELDED. PRIME COAT WELDED JOINTS.

   E. PROVIDE STANDARD 45 DEGREE LATERAL WYE TAKEOFFS UNLESS OTHERWISE INDICATED WHERE 90 DEGREE CONICAL TEE CONNECTIONS MAY BE USED.

   F. ALL ELBOWS SHALL HAVE SINGLE THICKNESS TURNING VANES.

   G. SEAL CLASS: CLASS A FOR ALL DUCTWORK.

   H. PRESSURE CLASS:

      1. AIR HANDLING UNIT 5: 15 INCHES OF WATER GAUGE
      2. ALL OTHER DUCTWORK: 8 INCHES OF WATER GAUGE

   I. INTERNAL TIE–ROD SUPPORTS ARE NOT ACCEPTABLE.

3. DUCTMATE SYSTEM

   A. MANUFACTURER:

      1. DUCTMATE INDUSTRIES, INC.

   B. DUCTMATE '35' ANGLE SHALL BE ROLL–FORMED FROM GALVANIZED STEEL WITH AN INTEGRAL SEALANT.

   C. METAL CLEAT SHALL BE ROLL–FORMED FROM GALVANIZED STEEL.

   D. GASKET SHALL BE EXTRUDED BUTYL FOR USE BETWEEN MATING FLANGES.

   E. CORNER CLIPS SHALL BE 16 GA GALVANIZED STEEL.

   F. ACCESSORIES:

      1. ANGLE STEEL: ASTM A–527 G 60/90.
      2. CORNER STEEL: ASTM A–526 G 60/90.
      3. MASTIC: 5511 M.
      4. GASKET: DUCTMATE 440

4. INSTALLATION

   A. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

   B. INSTALL AND SEAL DUCTS IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS _ METAL AND FLEXIBLE. ALL RECTANGULAR DUCTS SHALL HAVE JOINTS CONSTRUCTED WITH DUCTMATE.

   C. DUCT SIZES ARE INSIDE CLEAR DIMENSIONS. FOR LINED DUCTS, MAINTAIN SIZES INSIDE LINING.

   D. PROVIDE OPENINGS IN DUCTWORK WHERE REQUIRED TO ACCOMMODATE THERMOMETERS AND CONTROLLERS. PROVIDE PITOT TUBE OPENINGS WHERE REQUIRED FOR TESTING OF SYSTEMS, COMPLETE WITH METAL CAN WITH SPRING DEVICE OR SCREW TO ENSURE AGAINST AIR LEAKAGE. WHERE OPENINGS ARE PROVIDED IN INSULATED DUCTWORK, INSTALL INSULATION MATERIAL INSIDE A METAL RING.

   E. LOCATE DUCTS WITH SUFFICIENT SPACE AROUND EQUIPMENT TO ALLOW NORMAL OPERATING AND MAINTENANCE ACTIVITIES.

   F. USE CRIMP JOINTS WITH OR WITHOUT BEAD FOR JOINING ROUND DUCT SIZES 8 INCH AND SMALLER WITH CRIMP IN DIRECTION OF AIR FLOW.

   G. USE DOUBLE NUTS AND LOCK WASHERS ON THREADED ROD SUPPORTS.

   H. CONNECT DIFFUSER OR REGISTER BOOTS TO PRESSURE DUCTS DIRECTLY UNLESS OTHERWISE INDICATED.

   I. DURING CONSTRUCTION PROVIDE TEMPORARY CLOSURES OF METAL OR TAPED POLYETHYLENE ON OPEN DUCTWORK TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM.

   J. ALL DUCTMATE JOINTS SHALL UTILIZE DUCTMATE GASKET TAPE. DUCT SEALANT IN PLACE OF GASKET TAPE IS NOT ACCEPTABLE.

5. CLEANING

   A. CLEAN WORK UNDER PROVISIONS OF 01710.

   B. CLEAN DUCT SYSTEM AND FORCE AIR AT HIGH VELOCITY THROUGH DUCT TO REMOVE ACCUMULATED DUST. TO OBTAIN SUFFICIENT AIR, CLEAN HALF THE SYSTEM AT A TIME. PROTECT EQUIPMENT WHICH MAY BE HARMED BY EXCESSIVE DIRT WITH TEMPORARY FILTERS, OR BYPASS DURING CLEANING.

6. SCHEDULES

   A. DUCTWORK MATERIAL SCHEDULE

AIR SYSTEM	MATERIAL
INTERIOR LOW PRESSURE SUPPLY, RETURN, & OUTSIDE AIR STEEL	GALVANIZED
INTERIOR LOW PRESSURE EXHAUST STEEL	GALVANIZED

DUCTWORK INSULATION

GLASS FIBER, FLEXIBLE

A. MANUFACTURERS:

   1. JOHNS MANVILLE MICROLITE, EQ FSK.
   2. OTHER ACCEPTABLE MANUFACTURERS OFFERING EQUIVALENT PRODUCTS.
      a. OWENS-CORNING.
      b. KNAUF.

B. INSULATION: ASTM C553; FLEXIBLE, NONCOMBUSTIBLE.

   1. 'K' VALUE: ASTM C518, 0.27 AT 75ºF.
   2. MAXIMUM SERVICE TEMPERATURE: 250ºF.
   3. MAXIMUM MOISTURE ABSORPTION: 0.2 PERCENT BY VOLUME.
   4. DENSITY: 1.5 LB./CU FT.

C. VAPOR BARRIER JACKET

   1. ALUMINUM FOIL FACING REINFORCED WITH GLASS FIBER YARN MESH AND BONDED TO KRAFT PAPER (FSK).
   2. MOISTURE VAPOR TRANSMISSION: ASTM E96; 0.02 PERM.
   3. SECURE WITH LONGITUDINAL LAPS AND BUTT JOINTS WITH OUTWARD CLINCHING STAPLES AND SELF SEALING PRESSURE SENSITIVE TAPE WITH MATCHING FACING.

   3. EXTERIOR JACKET AND INSULATION

4. EXAMINATION

   A. VERIFY THAT DUCTWORK HAS BEEN TESTED BEFORE APPLYING INSULATION MATERIALS.

   B. VERIFY THAT SURFACES ARE CLEAN, FOREIGN MATERIAL REMOVED, AND DRY.

5. INSTALLATION

   A. INSTALL MATERIALS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

   B. INSULATED DUCTWORK CONVEYING AIR ABOVE AND/OR BELOW AMBIENT TEMPERATURE:

      1. PROVIDE INSULATION WITH VAPOR BARRIER JACKETS.
      2. FINISH WITH TAPE AND VAPOR BARRIER JACKET.
      3. CONTINUE INSULATION THROUGH WALLS, SLEEVES, HANGERS, AND OTHER DUCT PENETRATIONS.
      4. INSULATE ENTIRE SYSTEM INCLUDING FITTINGS, JOINTS, FLANGES, FIRE DAMPERS, FLEXIBLE CONNECTIONS, EXPANSION JOINTS. WHERE SERVICE ACCESS IS REQUIRED, BEVEL AND SEAL ENDS OF INSULATION.

6. TOLERANCE

   A. SUBSTITUTED INSULATION MATERIALS SHALL PROVIDE THERMAL RESISTANCE WITHIN 10 PERCENT AT NORMAL CONDITIONS, AS MATERIALS INDICATED.

7. GLASS FIBER DUCTWORK INSULATION SCHEDULE

DUCTWORK	THICKNESS	TYPE	FINISH
CONCEALED SUPPLY, RETURN, OUTSIDE AIR, & EXHAUST DUCTS	1-1/2"	FLEXIBLE	FOIL-FACED

EXHAUST AIR GRILLE & RETURN AIR REGISTER (EAG & RAR)

A. MANUFACTURER AND MODEL
   PRICE INDUSTRIES MODEL 80

B. FURNISH AND INSTALL PRICE MODEL 80 EGG CRATE GRILLES AND REGISTERS OF SIZES AND MOUNTING TYPES DESIGNATED BY THE PLANS AND GRD SCHEDULE. CONSTRUCTION SHALL BE ALUMINUM CONSTRUCTION, CONSISTING OF AN EXTRUDED ALUMINUM BORDER AN ALUMINUM ½ X ½ X ½ INCH GRID EGG CRATE CORE. THE MINIMUM GRILLE SIZE SHALL BE SIX INCHES BY FOUR INCHES. THE MAXIMUM ONE-PIECE GRILLE SIZE WITHOUT A MULLION SHALL BE 48 INCHES X 24 INCHES. THE MAXIMUM SIZE GRILLE SIZE WITH A MULLION IS 96 X 48 INCHES. PAINT FINISH SHALL BE COORDINATED WITH THE ARCHITECT AND OWNER. ALL COMPONENTS SHALL HAVE A BAKED-ON POWDER COAT FINISH. THE PAINT FINISH MUST DEMONSTRATE NO DEGRADATION WHEN TESTED IN ACCORDANCE WITH ASTM D1308 (COVERED AND SPOT IMMERSION) AND ASTM D4752 (MEK DOUBLE RUB) PAINT DURABILITY TESTS. THE PAINT FILM THICKNESS SHALL BE A MINIMUM OF 2.0 MILS. THE FINISH SHALL HAVE A HARDNESS OF 2H. THE FINISH SHALL WITHSTAND A MINIMUM SALT SPRAY EXPOSURE OF 500 HOURS WITH NO MEASURABLE CREEP IN ACCORDANCE WITH ASTM D1654, AND 1000 HOURS OF EXPOSURE WITH NO RUSTING OR BLISTERING AS PER ASTM D610 AND ASTM D714. THE FINISH SHALL HAVE AN IMPACT RESISTANCE OF 80 INCH-POUNDS. PROVIDE WITH OPPOSED BLADE DAMPER OF ALUMINUM MILL FINISH (TOILET ROOMS) AND COATED STEEL (COMPUTER LAB ROOM). BORDER STYLE:

   a. THE GRILLE SHALL BE SUITABLE FOR T-BAR LAY-IN MOUNTING, COMPLETE WITH A BORDER IN THE FOLLOWING:

   9/16 INCH BOLT SLOT OR FLAT T-BAR BORDER OR

   NARROW FLAT FACE BORDER FOR 15/16 INCH T-BAR LAY-IN. NO SCREW HOLES (DEFAULT FOR T-BAR FRAMES).

SUPPLY AIR DIFFUSER (SAD)

A. MANUFACTURER AND MODEL
   PRICE INDUSTRIES

B. PRICE MODEL SCDA & ASCDA - SUPPLY DIFFUSERS OF THE SIZES AND TYPES INDICATED ON THE PLANS AND SCHEDULEDS. DIFFUSERS SHALL BE OF ALUMINUM CONSTRUCTION (TOILET ROOMS) AND ALUMINIZED STEEL CONSTRUCTION (COMPUTER LAB). DIFFUSERS SHALL CONSIST OF A SEAMLESS, ONE-PIECE , PRECISION FORMED BACKPAN THAT INCORPORATES A ROUND INLET COLLAR OF SUFFICIENT LENGTH FOR CONNECTING RIGID OR FLEXIBLE DUCT. THE DIFFUSER SHALL INTEGRATE WITH ALL DUCT SIZES SHOWN ON THE PLANS WITHOUT AFFECTING THE FACE SIZE AND APPEARANCE OF THE UNIT. AN INNER CONE ASSEMBLY SHALL CONSIST OF [3 CONES] OR [OPTIONAL 4 CONES ON 24 X 24 SIZE] WHICH DROP BELOW THE CEILING PLANE TO ASSURE OPTIMAL AIR DIFFUSION PERFORMANCE. THE INNER CONE ASSEMBLY SHALL BE COMPLETELY REMOVABLE FROM THE DIFFUSER FACE TO ALLOW FOR FULL

   ACCESS TO ANY DAMPERS OR OTHER DUCTWORK COMPONENTS LOCATED NEAR THE DIFFUSER NECK. PAINT FINISH SHALL BE COORDINATED WITH THE ARCHITECT AND OWNER. ALL COMPONENTS SHALL HAVE A BAKED-ON POWDER COAT FINISH. THE PAINT FINISH MUST DEMONSTRATE NO DEGRADATION WHEN TESTED IN ACCORDANCE WITH ASTM D1308 (COVERED AND SPOT IMMERSION) AND ASTM D4752 (MEK DOUBLE RUB) PAINT DURABILITY TESTS. THE PAINT FILM THICKNESS SHALL BE A MINIMUM OF 2.0 MILS. THE FINISH SHALL HAVE A HARDNESS OF 2H. THE FINISH SHALL WITHSTAND A MINIMUM SALT SPRAY EXPOSURE OF 500 HOURS WITH NO MEASURABLE CREEP IN ACCORDANCE WITH ASTM D1654, AND 1000 HOURS OF EXPOSURE WITH NO RUSTING OR BLISTERING AS PER ASTM D610 AND ASTM D714. THE FINISH SHALL HAVE AN IMPACT RESISTANCE OF 80 INCH-POUNDS. REFER TO GRD SCHEDULE FOR ADDITIONAL SPECIFIED ACCESSORIES.

LOUVER

A. MANUFACTURER AND MODEL
   RUSKIN EME520DD

B. RUSKIN WIND-DRIVEN RAIN RESISTANT STATIONARY LOUVER. EXTRUDED ALUMINUM. FRAME CONSTRUCTION: 5" DEEP, 6063T6 EXTRUDED ALUMINUM WITH .081" NOMINAL THICKNESS. BLADE CONSTRUCTION: 6063T6 EXTRUDED ALUMINUM .063" NOMINAL WALL THICKNESS. DOUBLE DRAINABLE BLADES ARE SIGHTPROOF AND SPACED APPROXIMATELY 2" CENTER TO CENTER. SCREEN CONSTRUCTION: 5/8" x .040" EXPANDED FALTTENED ALUMINUM BIRD SCREEN IN REMOVABLE FRAME. SCREEN ADDS 1/2" TO LOUVER DEPTH. LOUVER CLOSELY SPACED HORIZONTAL BLADES MINIMIZE THE PENETRATION OF WIND-DRIVEN RAIN, REDUCING DAMAGE AND ADDITIONAL OPERATING EXPENSES. TESTED IN AMCA 500-L WIND-DRIVEN RAIN PENETRATION TEST. PERFORMANCE IN ACCORDANCE WITH AMCA PUBLICATION 511. 47% FREE AREA. PROVIDE WITH INSTALLATION ANGLES, BIRD AND INSECT SCREENS, AND EPOXY FINISH. COLOR OF LOUVER TO BE COORDINATED WITH OWNER AND ARCHITECT FOR CUSTOM SELECTION. LOUVER PERFORMANCE: 160 CFM @ .07 PRESSURE DROP

PLUMBING FIXTURES

A. WATER CLOSET
   EQUIP. TAG: WC–1
   MANUFACTURER: MATCH EXISTING IDENTICALLY
   MODEL: MATCH EXISTING IDENTICALLY

   BOWL: MATCH EXISTING IDENTICALLY

   FLUSH VALVE: MOEN MODEL 8311
   - BATTERY POWERED, SENSOR ACTIVATED, EXPOSED WATER CLOSET FLUSHOMETER WITH BRASS ANGLE STOP VALVE
   - BRASS CONSTRUCTION WITH CHROME PLATED FINISH
   - CHLORAMINE RESISTANT SEALS
   - 1" IPS INLET SUPPLY
   - 1-1/2" TOP SPUD
   - HIGH BACK PRESSURE VACUUM BREAKER
   - INTENDED FOR USE WALL HUNG TOP SPUD BOWLS WITH MATCHING FLOW RATES AS SPECIFIED BY THE FIXTURE MANUFACTURER
   - MECHANICAL OVERRIDE
   - ADJUSTABLE INFRARED SENSOR RANGE FROM 17" TO 36"
   - FOUR (4) ALKALINE AA BATTERIES INCLUDED
   - BATTERY LIFE: UP TO 8 YEARS*
   - LOW BATTERY INDICATOR LIGHT
   - OPTIONAL 24 HOUR SENTINEL FLUSH (FACTORY SETTING IS OFF)
   - OPERATING PRESSURE RANGE: 20-125PSI
   - VANDAL RESISTANT ANGLE STOP AND DOUBLE O-RING CONNECTIONS
   - 1.28 GPF
   - THIRD PARTY CERTIFIED BY IAPMO AND CSA TO MEET ASME A112.19.2M AND ALL APPLICABLE REQUIREMENTS REFERENCED THEREIN AND COMPLIES WITH REQUIREMENTS OF ASSE 1037
   - ADA
   - WARRANTED FOR 5 YEARS AGAINST MATERIAL OR MANUFACTURING DEFECTS

   SEAT: MATCH EXISTING IDENTICALLY

   INCLUDED ITEMS:
   - SWEAT SOLDER KIT INCLUDING COVER TUBE AND WALL FLANGE
   - SPUD COUPLING & FLANGE FOR 1-1/2" TOP SPUD

B. WATER CLOSET CARRIER
   MANUFACTURER: JOSAM Co.
   MODEL: SERIES 12674, 12684, & 12704 CLOSET CARRIER

   1. SERIES:
      - COATED CAST IRON
      - 4" PIPE ADAPTER
      - ADJUSTABLE CARRIER BODY
      - VANDAL PROOF TRIM
      - POSITIONING FRAME
      - NEOPRENE FIXTURE GASKET
      - CARRIER FOR WHEELCHAIR HIGH ROUGH

FAN COIL UNITS

A. UNIT MODEL: CARRIER 42CG

QUALITY ASSURANCE

UNITS SHALL BE TESTED AND CERTIFIED IN ACCORDANCE WITH AHRI (AIR–CONDITIONING, HEATING, AND REFRIGERATION INSTITUTE) STANDARD 440, LATEST EDITION. ALL BASE OR STANDARD UNITS SHALL HAVE C–ETL–US LISTING SIGNIFYING THE UNITS HAVE BEEN EXAMINED BY ETL AND ARE IN COMPLIANCE WITH BOTH THE US AND CANADIAN APPLICABLE STANDARDS. EACH COIL SHALL BE FACTORY TESTED FOR LEAKAGE AT 300 PSIG AIR PRESSURE WITH COIL SUBMERGED IN WATER. INSULATION AND ADHESIVE SHALL MEET NFPA (NATIONAL FIRE PROTECTION ASSOCIATION) 90A REQUIREMENTS FOR FLAME SPREAD AND SMOKE GENERATION. ALL EQUIPMENT WIRING SHALL COMPLY WITH NEC (NATIONAL ELECTRICAL CODE) REQUIREMENTS.

PRODUCTS

EQUIPMENT

A. GENERAL:

FACTORY–ASSEMBLED, HORIZONTAL, BLOW–THRU TYPE FAN COIL FOR DUCTED INSTALLATIONS. UNIT SHALL BE COMPLETE WITH WATER COILS, FANS, MOTORS, DRAIN PAN, AND ALL REQUIRED WIRING, PIPING, CONTROLS AND SPECIAL FEATURES. STANDARD INSULATION SHALL BE DUAL DENSITY FIBERGLASS INSULATION.

B. CABINET UNITS:

BASE UNIT WITH DUCTED SUPPLY AND RETURN DUCT CONNECTIONS, REMOVABLE BOTTOM ACCESS PANEL, FILTER RACK AND 1–IN. FIBERGLASS THROWAWAY FILTER. THE PANEL SHALL BE FASTENED WITH TAMPER PROOF QUARTER–TURN FASTENERS. THE CABINET SHALL BE COATED WITH AN ARCTIC WHITE POWDER–COAT FINISH.

C. FANS:

DIRECT-DRIVEN, DOUBLE-WIDTH FAN WHEELS WITH FORWARD-CURVED BLADES SHALL BE STATICALLY AND DYNAMICALLY BALANCED. SCROLLS SHALL BE CONSTRUCTED OF GALVANIZED STEEL. FAN WHEELS SHALL BE CONSTRUCTED OF GALVANIZED STEEL.

D. COILS:

ADDITIONAL COIL DEPTH AND CIRCUITING SHALL BE PROVIDED FOR INSTALLATION IN A 4-PIPE SYSTEM AS DESCRIBED IN THE SPECIAL FEATURES SECTION. ALL COILS SHALL HAVE 1/2-IN. COPPER TUBES AND ALUMINUM FINS (10 FINS PER INCH) SPACING. COIL FINS ARE MECHANICAL BONDED TO TUBE JOINTS. THE COPPER TUBES COMPLY WITH THE ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS) B-75. THE FIN THICKNESS IS 0.0045-IN. AND TUBE THICKNESS IS 0.016 INCH. ALL COILS SHALL BE LEAK TESTED WITH AIR AT 300 PSIG UNDER WATER.

E. CONTROLS AND SAFETIES:

THE FAN MOTORS SHALL BE EQUIPPED WITH INTEGRAL AUTOMATIC TEMPERATURE RESET FOR MOTOR PROTECTION.

F. OPERATING CHARACTERISTICS:

2.A DOUBLE-CIRCUIT COIL UNIT INSTALLED IN A 4-PIPE SYSTEM SHALL BE CAPABLE OF PROVIDING SEQUENCED HEATING AND COOLING.

G. ELECTRICAL REQUIREMENTS:

STANDARD UNIT SHALL OPERATE ON 115 V, SINGLE–PHASE, 60 HZ ELECTRIC POWER. ALL INTERNAL WIRING SHALL BE IN FLEXIBLE CONDUIT.

H. SPECIAL FEATURES (TO BE PROVIDED):

1. UNIT COILS SHALL BE EQUIPPED WITH AUTOMATIC AIR VENTS.
2. FAN MOTOR SHALL BE CONSTANT TORQUE ELECTRICALLY COMMUTATED TYPE, 115–V, SINGLE PHASE, 60 HZ AS SPECIFIED ON THE EQUIPMENT SCHEDULE. THE OPERATING SEQUENCE SHALL BE ONE OF THE FOLLOWING, AS SPECIFIED:
   a. VARIABLE AIRFLOW FOR 0 TO 10 VDC / 4 TO 20 MA INPUT. REQUIRES A 0 TO 10 VDC INPUT SIGNAL.
3. MANUAL STOP, BALANCING, COMBINATION BALANCE AND STOP, BALL TYPE, AND FLOW CONTROL VALVES SHALL BE FACTORY FURNISHED.
4. AUTOMATIC CHANGEOVER DEVICE(S) SHALL BE FACTORY WIRED FOR FIELD INSTALLATION ON THE SUPPLY PIPING.
5. A STAINLESS STEEL DRAIN PAN (FACTORY INSTALLATED).
6. CONTROL OPTIONS:
   a. FACTORY–INSTALLED 24–V TRANSFORMER AND RELAY BOARD FOR USE, WITH 24–V CONTROLS BY OTHERS.

TESTING, ADJUSTING, AND BALANCING

A. APPROVED CONTRACTORS:

   1. NEBB CERTIFIED FOR TESTING, ADJUSTING, AND BALANCING

B. EXAMINATION

   VERIFY THAT SYSTEMS ARE COMPLETE AND OPERABLE BEFORE COMMENCING WORK. ENSURE THE FOLLOWING CONDITIONS:
   1. SYSTEMS ARE STARTED AND OPERATING IN A SAFE AND NORMAL CONDITION.
   2. PROPER THERMAL OVERLOAD PROTECTION IS IN PLACE FOR ELECTRICAL EQUIPMENT.
   3. FINAL FILTERS ARE CLEAN AND IN PLACE. IF REQUIRED, INSTALL TEMPORARY MEDIA IN ADDITION TO FINAL FILTERS.
   4. DUCT SYSTEMS ARE CLEAN OF DEBRIS.
   5. FANS ARE ROTATING CORRECTLY.
   6. FIRE AND VOLUME DAMPERS ARE IN PLACE AND OPEN.

   SUBMIT FIELD REPORTS. REPORT DEFECTS AND DEFICIENCIES NOTED DURING PERFORMANCE OF SERVICES WHICH PREVENT SYSTEM BALANCE.

   BEGINNING OF WORK MEANS ACCEPTANCE OF EXISTING CONDITIONS.

C. PREPARATION

   1. PROVIDE INSTRUMENTS REQUIRED FOR TESTING, ADJUSTING, AND BALANCING OPERATIONS. MAKE INSTRUMENTS AVAILABLE TO PROFESSIONAL TO FACILITATE SPOT CHECKS DURING TESTING.

   2. PROVIDE ADDITIONAL BALANCING DEVICES AS REQUIRED.

   3. INSTALLATION TOLERANCES:

      AIR OUTLETS AND INLETS: ADJUST TOTAL TO WITHIN PLUS 5 PERCENT AND MINUS 5 PERCENT OF DESIGN TO SPACE. ADJUST OUTLETS AND INLETS IN SPACE TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN.

D. ADJUSTING

   1. ENSURE RECORDED DATA REPRESENTS ACTUAL MEASURED OR OBSERVED CONDITIONS.

   2. PERMANENTLY MARK SETTINGS OF VALVES, DAMPERS, AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STOPS.

   3. CONTRACTOR SHALL PROVIDE AIRFLOW AND VELOCITY READINGS IN RESTROOM EXHAUST DUCTWORK SHOWN ON DRAWINGS.

   4. CONTRACTOR SHALL PROVIDE SCHEMATICS PLANS OR SINGLE LINES. SHOWING LOCATIONS OF ALL MEASUREMENTS COMPLETED IN FIELD.

E. PRETESTING

   1. PRETESTING SHALL BE PERFORMED PRIOR TO CONSTRUCTION START, TO VERIFY EXISTING CONDITIONS AND AVAILABLE CAPACITIES. DOCUMENTED DATA SHALL INCLUDE POINTS CALLED FOR HEREIN, AND BE GIVEN TO THE ENGINEER FOR ANALYSIS A MAXIMUM OF 3 DAYS LATER.

   2. INFORMATION FOR MOVING EQUIPMENT SHALL BE DOCUMENTED AS CALLED FOR PER THESE DOCUMENTS. INCLUDING, BUT NOT LIMITED TO, ACTUAL AIRFLOW AT INLET.

   3. AIRFLOW SHALL BE DOCUMENTED FOR ALL GRD'S IN SUPPLY, EXHAUST, AND TRANSFER AIR SYSTEMS.

REPORT FORMS FOR TESTING, ADJUSTING AND BALANCING

TITLE PAGE:
- NAME OF TESTING, ADJUSTING, AND BALANCING AGENCY
- ADDRESS OF TESTING, ADJUSTING, AND BALANCING AGENCY
- TELEPHONE NUMBER OF TESTING, ADJUSTING, AND BALANCING AGENCY
- PROJECT NAME
- PROJECT LOCATION
- PROJECT PROFESSIONAL
- PROJECT PROFESSIONAL
- PROJECT CONTRACTOR
- REPORT DATE

SUMMARY COMMENTS:
- DESIGN VERSUS FINAL PERFORMANCE
- NOTABLE CHARACTERISTICS OF SYSTEM
- DESCRIPTION OF SYSTEMS OPERATION SEQUENCE
- NOMENCLATURE USED THROUGHOUT REPORT
- TEST CONDITIONS

INSTRUMENT LIST:
- INSTRUMENT
- MANUFACTURER
- MODEL NUMBER
- SERIAL NUMBER
- RANGE
- CALIBRATION DATE

EQUIPMENT – FCU
- LOCATION
- MANUFACTURER
- MODEL NUMBER
- SERIAL NUMBER
- AIR FLOW, SPECIFIED AND ACTUAL
- GPM, FINAL
- EWT & LWT
- TOTAL STATIC PRESSURE, SPECIFIED AND ACTUAL
- INLET PRESSURE
- INLET TEMPERATURE
- DISCHARGE PRESSURE
- DISCHARGE TEMPERATURE

DUCT TRAVERSE:
- AT EACH BRANCH & MAIN DUCT
- DUCT SIZE
- AREA
- DESIGN VELOCITY
- DESIGN AIR FLOW
- TEST VELOCITY
- TEST AIR FLOW
- DUCT STATIC PRESSURE
- AIR CORRECTION FACTOR

GRD'S
- AIRFLOW

CONTROLS:

A. THE CONTRACTOR SHALL ENGAGE RADIUS SYSTEMS TO PROVIDE NEW FCU CONTROL SYSTEM AND INTEGRATE INTO EXISTING ALC BAS.

CONTROL CONDUIT AND WIRING:

A. ALL FIELD DEVICES SHALL HAVE CONDUIT CONNECTIONS MADE TO THEM FROM JUNCTION BOXES, WITH A MINIMUM OF 18 INCHES OF FLEXIBLE PLASTIC COATED METALLIC CONDUIT WITH SUFFICIENT SLACK TO ALLOW FOR REMOVAL AND/OR SERVICING.

B. SIGNAL WIRING:

   1. SIGNAL WIRING TO ALL ANALOG FIELD DEVICES, INCLUDING BUT NOT LIMITED TO TEMPERATURE TRANSMITTERS, DIFFERENTIAL PRESSURE TRANSMITTERS, GAGE PRESSURE TRANSMITTERS, CAPACITANCE PROBES, REFRIGERANT SENSORS, SHALL BE TWISTED, 100% SHIELDED PAIR, MINIMUM 16 GAUGE WIRE WITH PVC COVER BELDEN #8760 OR PRE–APPROVED EQUIVALENT PRODUCT OF OTHER MANUFACTURERS, RUN IN EMT CONDUIT WITH NO SPLICES, SEPARATE FROM ANY WIRING ABOVE 30 VOLTS. CONDUIT SHALL BE EMT.

   2. SIGNAL WIRING TO DIGITAL FIELD DEVICES (FOR CIRCUITS OF 30 VAC OR LESS) SHALL BE AS SPECIFIED HEREIN BELOW FOR LOW VOLTAGE CONTROL WIRING.

   3. SIGNAL WIRING SHIELD SHALL BE GROUNDED.

C. COMMUNICATION WIRING:

   1. ALL COMMUNICATION WIRING CABLES SHALL INCLUDE A MINIMUM OF ONE (1) CABLE AS AN UNUSED SPARE.

   2. ALL WIRING SHALL BE PROVIDED IN EMT CONDUIT. ALL DEVICES AND EQUIPMENT SHALL BE MOUNTED IN MINIMUM NEMA 1 ENCLOSURES.

   3. LOW VOLTAGE CONTROL WIRING (30 VAC OR LESS):

      a. LOW VOLTAGE CONTROL WIRING SHALL BE MINIMUM 16 GAUGE, TWISTED PAIR, 100% SHIELDED WITH PVC COVER BELDEN #9316 OR APPROVED EQUIVALENT PRODUCT OF OTHER MANUFACTURERS RUN IN CONDUIT WITH NO SPLICES, SEPARATE FROM ANY WIRING ABOVE 30 VOLTS.

CONTROL SEQUENCE OF OPERATION

FAN COIL UNIT

RUN CONDITIONS – AUTOMATIC OPERATION:

THE UNIT SHALL RUN ACCORDING TO A USER DEFINABLE TIME SCHEDULE IN THE FOLLOWING MODES:

OCCUPIED MODE: THE UNIT SHALL MAINTAIN SHALL MAINTAIN THE FOLLOWING TEMPERATURE SET POINTS AND THE FAN SHALL RUN CONTINUOUSLY WITH THE OUTSIDE AIR DAMPER AND THE RETURN DAMPER OPEN TO MINIMUM POSITIONS.

A 75°F (ADJ.) COOLING SETPOINT

A 70°F (ADJ.) HEATING SETPOINT.

UNOCCUPIED MODE (NIGHT SETBACK): THE UNIT SHALL MAINTAIN THE FOLLOWING TEMPERATURE SET POINTS AND THE FAN SHALL RUN INTERMITTENTLY WITH THE OUTSIDE AIR DAMPER CLOSED AND RETURN DAMPER OPEN 100%.

A 80°F (ADJ.) COOLING SETPOINT.

A 65°F (ADJ.) HEATING SETPOINT.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

HIGH ZONE TEMP: IF THE ZONE TEMPERATURE IS GREATER THAN THE COOLING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

LOW ZONE TEMP: IF THE ZONE TEMPERATURE IS LESS THAN THE HEATING SETPOINT BY A USER DEFINABLE AMOUNT (ADJ.).

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Project:

KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

Revision No.	Description/ Date
	BID DOCUMENTS 07/11/24

Project No:	2413
Scale:	AS NOTED
Plot Scale:	NONE

Sheet Title:

MECHANICAL & PLUMBING SPECIFICATIONS

Sheet No.

MP701

RUN CONDITIONS – MANUAL OPERATION:

THE OCCUPANT SHALL BE ABLE TO OVERRIDE AUTOMATIC OPERATION THROUGH THE ZONE SENSOR AS FOLLOWS:

ADJUST THE COOLING AND HEATING SETPOINTS

ZONE SETPOINT ADJUST:

THE OCCUPANT SHALL BE ABLE TO ADJUST THE ZONE TEMPERATURE HEATING AND COOLING SETPOINTS AT THE ZONE SENSOR.

ZONE OPTIMAL START:

THE UNIT SHALL USE AN OPTIMAL START ALGORITHM FOR MORNING START–UP. THIS ALGORITHM SHALL MINIMIZE THE UNOCCUPIED WARM–UP OR COOL–DOWN PERIOD WHILE STILL ACHIEVING COMFORT CONDITIONS BY THE START OF SCHEDULED OCCUPIED PERIOD.

ZONE UNOCCUPIED OVERRIDE:

A TIMED LOCAL OVERRIDE CONTROL SHALL ALLOW AN OCCUPANT TO OVERRIDE THE SCHEDULE AND PLACE THE UNIT INTO AN OCCUPIED MODE FOR AN ADJUSTABLE PERIOD OF TIME. AT THE EXPIRATION OF THIS TIME, CONTROL OF THE UNIT SHALL AUTOMATICALLY RETURN TO THE SCHEDULE.

EMERGENCY SHUTDOWN:

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING AN EMERGENCY SHUTDOWN SIGNAL.

FREEZE PROTECTION (FCU WITH OUTSIDE AIR ONLY):

THE UNIT SHALL SHUT DOWN AND GENERATE AN ALARM UPON RECEIVING A FREEZESTAT STATUS.

FAN:

THE FAN SHALL RUN ANYTIME THE UNIT IS COMMANDED TO RUN, UNLESS SHUTDOWN ON SAFETIES. THE FAN SPEEDS SHALL AUTOMATICALLY BE INDEXED AS FOLLOWS:

COOLING MODE

OCCUPIED MODE: THE CONTROLLER SHALL MEASURE THE SPACE TEMPERATURE AND MODULATE THE SUPPLY FAN ECM SPEED TO MAINTAIN THE COOLING TEMPERATURE SETPOINT. THE SUPPLY AIR TEMPERATURE SHALL REMAIN FIXED AT 55°F UNTIL THE FOLLOWING OCCURS: THE FAN IS AT MINIMUM SPEED AND THE SPACE TEMPERATURE DROPS BELOW THE COOLING SPACE TEMPERATURE SET POINT. THE SPEED SHALL NOT DROP BELOW 12 % (ADJ.).

UNOCCUPIED MODE: SAME AS ABOVE BUT THE OUTSIDE AIR DAMPER SHALL BE CLOSED DURING THIS OPERATING MODE. REFER TO OUTSIDE AIR AND RETURN AIR DAMPER SEQUENCE OF OPERATION.

HEATING MODE

OCCUPIED MODE: THE SUPPLY FAN ECM SHALL OPERATE AT THE SPEED NECESSARY FOR DESIGN AIRFLOW.

UNOCCUPIED MODE: THE CONTROLLER SHALL MEASURE THE SPACE TEMPERATURE AND MODULATE THE SUPPLY FAN ECM SPEED TO MAINTAIN THE HEATING TEMPERATURE SETPOINT. THE FAN SHALL START AT MINIMUM SPEED AND RAMP UP INCREMENTALLY TO SATISFY SPACE TEMPERATURE SET POINT. THE SUPPLY AIR TEMPERATURE SHALL START AT A MINIMUM TEMPERATURE OF 80°F (ADJ.) AND INCREASE INCREMENTALLY AFTER FAN HAS REACHED FULL SPEED. THE SPEED SHALL NOT DROP BELOW 12% (ADJ.). THE OUTSIDE AIR DAMPER SHALL BE CLOSED DURING THIS OPERATING MODE. REFER TO OUTSIDE AIR AND RETURN AIR DAMPER SEQUENCE OF OPERATION.

COOLING COIL VALVE:

THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE COOLING COIL VALVE TO MAINTAIN THE COOLING TEMPERATURE SETPOINT WHEN FAN IS AT MINIMUM SPEED.

THE COOLING SHALL BE ENABLED WHENEVER:

OUTSIDE AIR TEMPERATURE IS GREATER THAN 55°F (ADJ.).

AND THE ZONE TEMPERATURE IS ABOVE COOLING SETPOINT.

AND THE FAN IS ON.

THE COOLING COIL VALVE SHALL OPEN AND THE OUTSIDE AIR DAMPER CLOSE WHENEVER THE FREEZESTAT (IF PRESENT) IS ON.

HEATING COIL VALVE:

THE CONTROLLER SHALL MEASURE THE ZONE TEMPERATURE AND MODULATE THE HEATING COIL VALVE TO MAINTAIN ITS HEATING SETPOINT.

THE HEATING SHALL BE ENABLED WHENEVER:

OUTSIDE AIR TEMPERATURE IS LESS THAN 55°F (ADJ.).

AND THE ZONE TEMPERATURE IS BELOW HEATING SETPOINT.

AND THE FAN IS ON.

THE HEATING COIL VALVE SHALL OPEN AND THE OUTSIDE AIR DAMPER CLOSE WHENEVER THE FREEZESTAT (IF PRESENT) IS ON.

OUTSIDE AND RETURN AIR DAMPERS:

THE OUTSIDE AIR DAMPER SHALL OPEN TO PROVIDE A FIXED PERCENTAGE OUTSIDE AIR VENTILATION ANYTIME THE UNIT IS OPERATING IN OCCUPIED MODE AND SHALL CLOSE ANYTIME THE UNIT IS OPERATING IN UNOCCUPIED MODE. THE RETURN AIR DAMPER SHALL OPEN TO A FIXED PERCENTAGE ANYTIME THE UNIT IS OPERATING IN OCCUPIED MODE AND SHALL OPEN 100% ANYTIME THE UNIT IS OPERATING IN UNOCCUPIED MODE. THE OUTSIDE AND RETURN AIR DAMPERS' FIXED PERCENTAGE OPEN POSITIONS SHALL BE SET DURING TESTING AND BALANCING. THE DAMPERS SHALL MODULATE TO THEIR COMMANDED POSITIONS 1 SECOND (ADJ.) AFTER THE FAN STOPS.

FILTER DIFFERENTIAL PRESSURE MONITOR:

THE CONTROLLER SHALL MONITOR THE DIFFERENTIAL PRESSURE ACROSS THE FILTER.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

FILTER CHANGE REQUIRED: FILTER DIFFERENTIAL PRESSURE EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

DISCHARGE AIR TEMPERATURE:

THE CONTROLLER SHALL MONITOR THE DISCHARGE AIR TEMPERATURE.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

HIGH DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS GREATER THAN 98°F (ADJ.).

LOW DISCHARGE AIR TEMP: IF THE DISCHARGE AIR TEMPERATURE IS LESS THAN 48°F (ADJ.).

FAN STATUS:

THE CONTROLLER SHALL MONITOR THE FAN STATUS.

ALARMS SHALL BE PROVIDED AS FOLLOWS:

FAN FAILURE: COMMANDED ON, BUT THE STATUS IS OFF.

FAN IN HAND: COMMANDED OFF, BUT THE STATUS IS ON.

FAN RUNTIME EXCEEDED: FAN STATUS RUNTIME EXCEEDS A USER DEFINABLE LIMIT (ADJ.).

ENVIRONMENTAL INDEX:

WHEN THE ZONE IS OCCUPIED, THE CONTROLLER WILL MONITOR THE DEVIATION OF THE ZONE TEMPERATURE FROM THE HEATING OR COOLING SETPOINT AND CALCULATE A 0 – 100% ENVIRONMENTAL INDEX WHICH GIVES AN INDICATION OF HOW WELL THE ZONE IS MAINTAINING COMFORT. THE CONTROLLER WILL ALSO CALCULATE THE PERCENTAGE OF TIME SINCE OCCUPANCY BEGAN THAT THE ENVIRONMENTAL INDEX IS 70% OR HIGHER. OPTIONALLY, A WEIGHTING FACTOR CAN BE CONFIGURED TO ADJUST THE CONTRIBUTION OF THE ZONE TO THE ROLLUP AVERAGE INDEX BASED UPON THE FLOOR AREA OF THE ZONE, IMPORTANCE OF THE ZONE, OR OTHER STATIC CRITERIA.

FAN COIL UNIT – COMPUTER LAB

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Discharge Air Temp	x								x		x
Filter Differential Pressure	x								x		x
Zone Setpoint Adjust	x										x
Zone Temp	x								x		x
Cooling Valve		x							x		x
Heating Valve		x							x		x
Fan Status	x								x		x
Freezestat			x						x	x	x
Zone Override			x						x		x
Fan Speed				x					x		x
Outside Air Damper				x					x		x
Return Air Damper				x					x		x
Cooling Setpoint					x				x		x
Environmental Index					x				x		
Heating Setpoint					x				x		x
Percent of Time Satisfied					x				x		
Emergency Shutdown						x			x	x	x
Schedule								x			
Fan Failure										x	
Filter Change Required										x	
High Discharge Air Temp										x	
High Zone Temp										x	
Low Discharge Air Temp										x	
Low Zone Temp										x	

FAN COIL UNIT – TOILET ROOMS

	Hardware Points				Software Points						
Point Name	**AI**	**AO**	**BI**	**BO**	**AV**	**BV**	**Loop**	**Sched**	**Trend**	**Alarm**	**Show On Graphic**
Discharge Air Temp	x								x		x
Filter Differential Pressure	x								x		x
Zone Setpoint Adjust	x										x
Zone Temp	x								x		x
Cooling Valve		x							x		x
Heating Valve		x							x		x
Fan Status	x								x		x
Fan Speed				x					x		x
Cooling Setpoint					x				x		x
Environmental Index					x				x		
Heating Setpoint					x				x		x
Percent of Time Satisfied					x				x		
Emergency Shutdown						x			x	x	x
Schedule								x			
Fan Failure										x	
Filter Change Required										x	
High Discharge Air Temp										x	
High Zone Temp										x	
Low Discharge Air Temp										x	
Low Zone Temp										x	

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Project:

KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

Revision No.	Description/ Date
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Project No:	2413
Scale:	AS NOTED
Plot Scale:	NONE

Sheet Title:

MECHANICAL & PLUMBING SPECIFICATIONS

Sheet No.

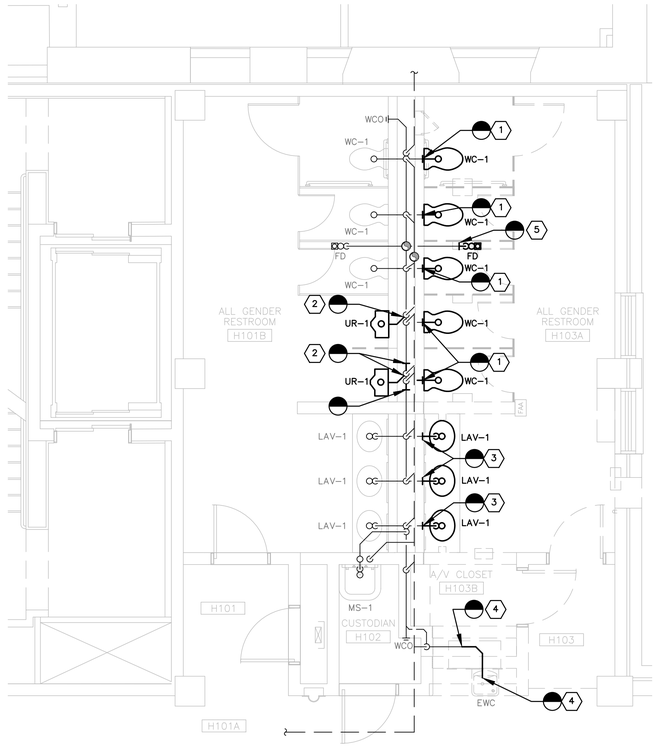
MP702

DEMOLITION SCOPE OF WORK

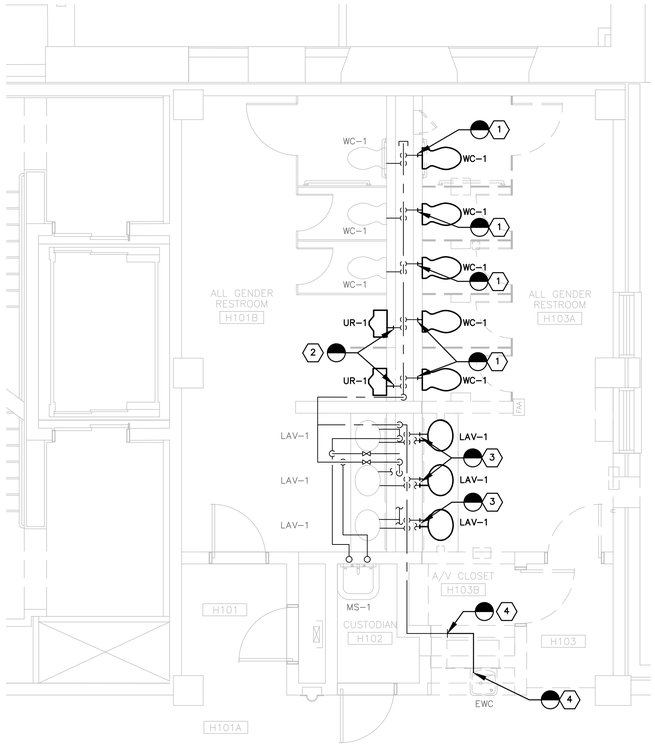
1. THE PLUMBING FIXURES WITHIN ALL GENDER REST ROOM H103A AND THE WATER COOLER ARE TO BE DEMOLISHED ENTIRELY. THE ASSOCIATED PLUMBING PIPING IS TO BE DEMOLISHED ENTIRELY BACK TO THE SERVICE MAINS IN THE PLUMBING CHASE. FOR BACK-TO-BACK WATER CLOSETS, THE WATER CLOSET CARRIERS ARE TO REMAIN AND THE SANITARY WASTE FIXTURE CONNECTIONS CAPPED. THE CARRIER TO REMAIN SHALL BE ANCHORED TO THE SLAB. URINAL CARRIERS IN ALL GENDER RESTROOM H101B SHALL BE DEMOLISHED ENTIRELY BACK TO SERVICE MAINS IN THE PLUMBING CHASE.

DEMOLITION NOTES:

1. DEMOLISH EXISTING WATER CLOSET AND CAP AT WATER CLOSET CARRIER. DEMOLISH EXISTING DOMESTIC COLD WATER PIPING BACK TO MAIN AND CAP
2. DEMOLISH EXISTING URINAL, URINAL CARRIER, DOMESTIC COLD WATER, SANITARY WASTE, AND SANITARY VENT PIPING BACK TO MAINS AND CAP.
3. DEMOLISH EXISTING LAVATORY, LAVATORY SUPPORTS, DOMESTIC COLD AND HOT WATER, SANITARY WASTE, AND SANITARY VENT PIPING BACK TO MAINS AND CAP.
4. DOMESTIC COLD WATER, SANITARY WASTE, AND SANITARY VENT PIPING BACK TO MAINS AND CAPPED. EXISTING WATER COOLER SHALL BE RETAINED IN GOOD CONDITION FOR RE-INSTALLATION IN NEW WORK PHASE.
5. DEMOLISH EXISTING FLOOR DRAIN AND CAP. DEMOLISH EXISTING TRAP PRIMER PIPING AND CAP.



1 P100 PARTIAL IST FLOOR SANITARY DEMOLITION PLAN
SCALE: 1/4" = 1'-0"



2 P100 PARTIAL IST FLOOR DOMESTIC WATER DEMOLITION PLAN
SCALE: 1/4" = 1'-0"

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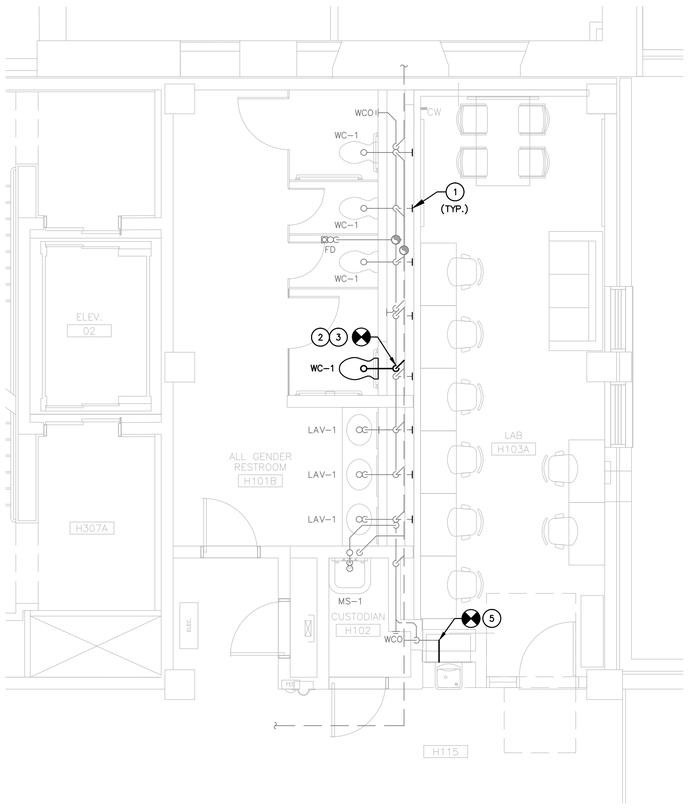
PLUMBING PARTIAL FIRST FLOOR DEMOLITION PLANS

Sheet No.

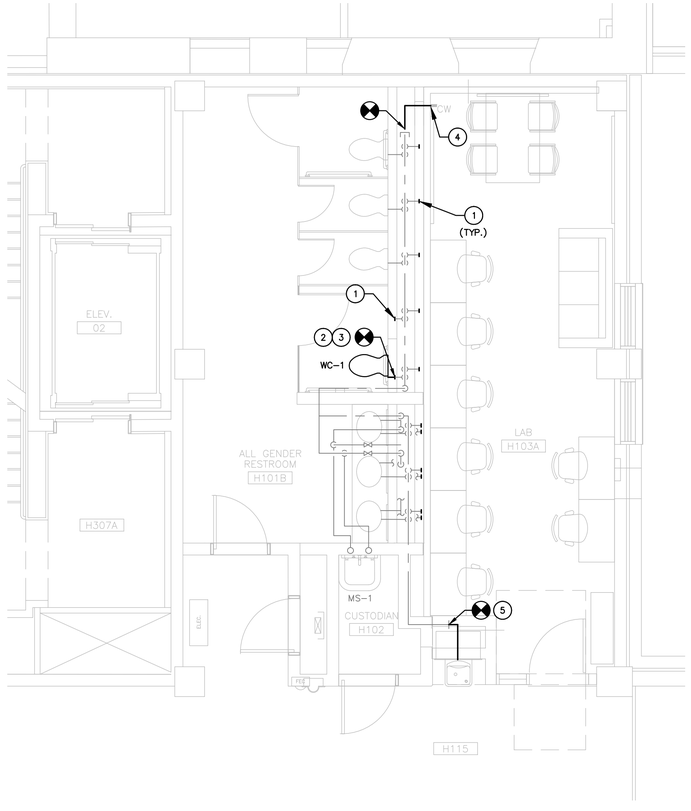
P100

NEW WORK NOTES:

1. DEMOLISHED PIPING SHALL BE CAPPED INSIDE OF WALL.
2. ROUTE NEW SANITARY WASTE AND VENT PIPING FROM NEW FIXTURES TO EXISTING SERVICES AND CONNECT. NEW PIPING TO BE CONCEALED WITHIN PLUMBING CHASE.
3. PROVIDE NEW CARRIER FOR WATER CLOSET AND VENT BACK TO EXISTING VENT RISER.
4. PROVIDE WATER SUPPLY LINE TO OATEY RECESSED WATER COOLER SUPPLY BOX W/WATER HAMMER ARRESTOR.
5. RE-INSTALL RETAINED ELECTRIC WATER COOLER. PROVIDE ALL NECESSARY APPURTENANCES TO RE-CONNECT TO WATER SUPPLY AND SANITARY DRAIN PIPING.



1 P101 PARTIAL IST FLOOR SANITARY NEW WORK PLAN
SCALE: 1/4" = 1'-0"



2 P101 PARTIAL IST FLOOR DOMESTIC WATER NEW WORK PLAN
SCALE: 1/4" = 1'-0"

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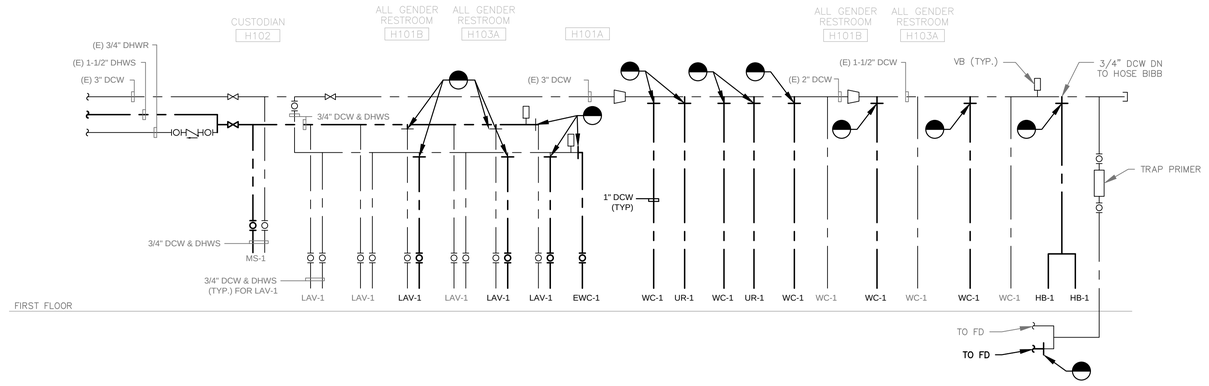
PLUMBING PARTIAL NEW WORK PLANS TEMPLATE

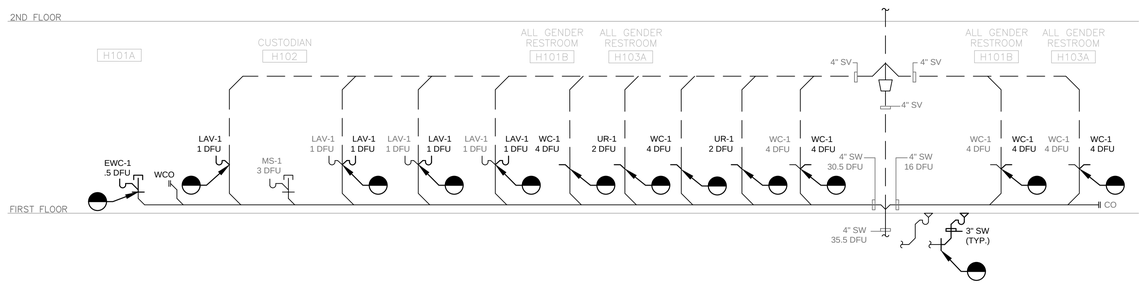
Sheet No.

P101



1 / P600 IST FLOOR WATER SUPPLY DEMOLITION RISER DIAGRAM

SCALE: 1/4" = 1'-0"



1 / P600 IST FLOOR SANITARY DEMOLITION RISER DIAGRAM

SCALE: 1/4" = 1'-0"

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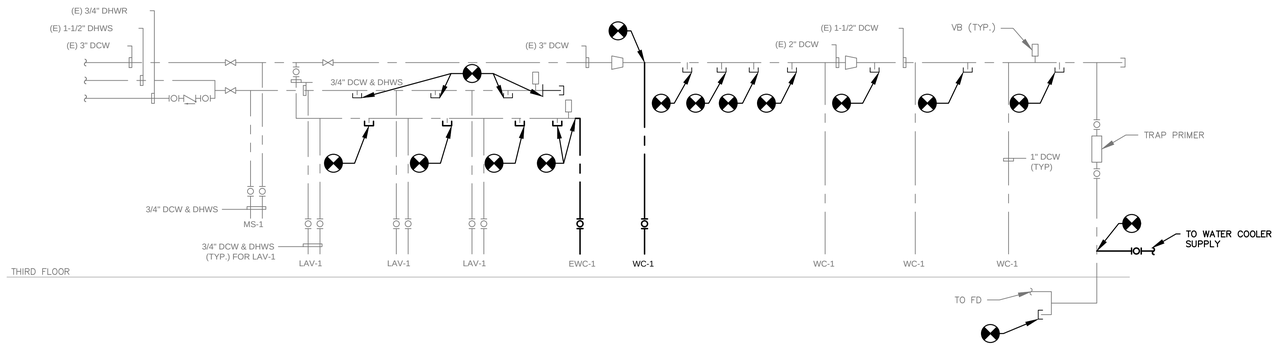
PLUMBING DEMOLITION RISER DIAGRAMS

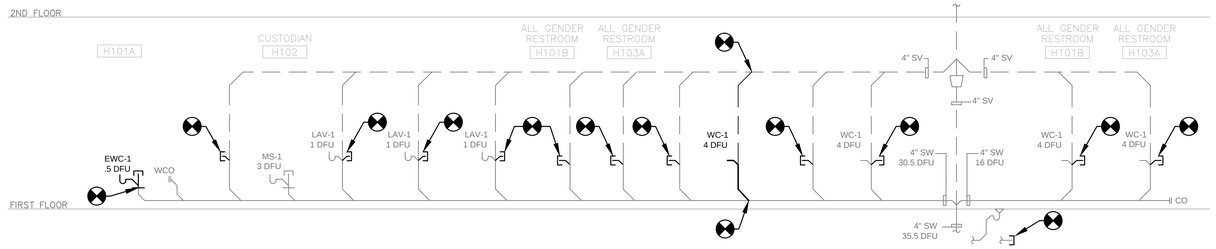
Sheet No.

P600



1 / P601 IST FLOOR WATER SUPPLY NEW WORK RISER DIAGRAM

SCALE: 1/4" = 1'-0"



1 / P601 IST FLOOR SANITARY NEW WORK RISER DIAGRAM

SCALE: 1/4" = 1'-0"

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Sheet Title:

PLUMBING
NEW WORK
RISER DIAGRAMS

Sheet No.

P601

LEGEND

- POINT OF CONNECTION BETWEEN NEW WORK AND EXISTING WORK
- EXTENT OF DEMOLITION
- EXISTING WORK TO REMAIN
- NEW WORK/DEMOLITION
- EQUIPMENT NUMBER
- PLAN NUMBER / SHEET WHERE DRAWN
- SECTION LETTER / SHEET WHERE DRAWN
- END OF SECTION INDICATOR
- DEMO NOTE
- NEW WORK NOTE
- ROOM NUMBER OR AREA DESIGNATION
- CONCEALED PENDENT SPRINKLER HEAD
- PENDANT SPRINKLER HEAD
- UPRIGHT SPRINKLER HEAD
- SIDEWALL SPRINKLER HEAD
- PIPE OR ROUND DUCT (SECTION)
- PIPE DOWN (90°)
- PIPE DOWN (ANGLE OTHER THAN 90°)
- PIPE UP (90°)
- BREAK IN PIPE
- BLIND FLANGE
- PIPE TAKE-OFF (BOTTOM)
- PIPE CAP
- CONCENTRIC REDUCER/INCREASER
- DIRECTION OF FLOW
- CENTER LINE
- GATE VALVE

ABBREVIATIONS

℄	CENTER LINE
CO	CLEANOUT
D	DEEP
DN.	DOWN
FD	FLOOR DRAIN/FIRE DAMPER
FDC	FIRE DEPARTMENT CONNECTION
FP	FIRE PROTECTION
FPP	FIRE PROTECTION PIPING
GPM	GALLONS PER MINUTE
(TYP.)	TYPICAL
V	VENT
w/	WITH

GENERAL PROJECT NOTES:

1. CONTRACTOR SHALL VISIT THE SITE, BECOME FAMILIAR WITH THE EXISTING FIELD CONDITIONS, AND OWN ESTIMATE OF THE DIFFICULTIES ATTEMPTING THE EXECUTION OF THE WORK PRIOR TO SUBMITTING THEIR BID.
2. CONTRACTOR SHALL COORDINATE WITH OWNER REPRESENTATIVE PRIOR TO DOING ANY WORK AFFECTING ANY OPERATIONAL AREA ADJACENT TO THE AREA OF WORK.
3. CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL DEMOLISHED MATERIALS, EQUIPMENT, AND CONSTRUCTION DEBRIS FROM SITE COMPLETELY. NO DEMOLISHED MATERIALS, EQUIPMENT AND CONSTRUCTION DEBRIS SHALL BE STORED ON SITE.
4. BEFORE LEAVING THE SITE AT ANYTIME THE CONTRACTOR SHALL ENSURE CONSTRUCTION AREA IS SECURE, ALL MATERIALS AND EQUIPMENT ARE STORED SO NOT TO CREATE A HAZARD, AND ALL CONSTRUCTION DEBRIS IS CLEANED UP. THE CONSTRUCTION AREA SHALL BE SWEPT DAILY.
5. CONTRACTOR SHALL COORDINATE WITH OWNER REPRESENTATIVE TO DETERMINE APPROVED LOCATIONS FOR NEW EQUIPMENT AND MATERIAL LAY-DOWN AREAS PRIOR TO SUBMITTING THEIR BID.
6. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, SIZES, CLEARANCES AND LOCATIONS PRIOR TO THE START OF CONSTRUCTION.
7. ALL DRAWINGS ARE DIAGRAMMATIC AND ARE FOR CONTRACTOR'S REFERENCE ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL DIMENSIONS, EQUIPMENT CONNECTION SIZES, AND EXISTING FIELD CONDITIONS.
8. CONTRACTOR IS RESPONSIBLE FOR COORDINATING AND SCHEDULING ALL SHUTDOWNS REQUIRED TO COMPLETE WORK WITH OWNER. CONTRACTOR SHALL NOT BEGIN WORK UNTIL SCHEDULE IS APPROVED BY OWNER. CONTRACTOR SHALL REFER TO PLANS, SCHEDULES, DETAILS, DIAGRAMS AND SPECIFICATIONS FOR PROJECT INFORMATION AND REQUIREMENTS.
9. CONTRACTOR SHALL PROVIDE ALL PIPING TIGHT TO UNDERSIDE OF BUILDING STRUCTURE. WHERE EXISTING UTILITIES PREVENT SUCH INSTALLATION, THE CONTRACTOR SHALL OFFSET NEW PIPING AROUND EXISTING UTILITY AND PROVIDE PIPING IMMEDIATELY BELOW SUCH EXISTING UTILITY AND PROVIDE PIPING IMMEDIATELY BELOW SUCH EXISTING UTILITY. NEW INSTALLATIONS SHALL NOT BLOCK SERVICE AND MAINTENANCE CLEARANCES TO EXISTING MATERIALS AND EQUIPMENT.

GENERAL FIRE PROTECTION NOTES:

1. PROVIDE A HYDRAULICALLY CALCULATED WET-PIPE SPRINKLER SYSTEM IN ACCORDANCE WITH THE LATEST ISSUE OF NFPA 13, ALL APPLICABLE NFPA STANDARDS, CITY OF PHILADELPHIA CODE, INTERNATIONAL FIRE CODE, INTERNATIONAL BUILDING CODE, PENNSYLVANIA CODES AND FM GLOBAL REQUIREMENTS.
2. REFER TO SPECIFICATION SECTIONS FOR ACCEPTABLE PIPING MATERIALS, SPRINKLER, HEADS, VALVES AND ACCESSORIES.
3. SPRINKLER DATA:

   USE:
   DENSITY: 0.15 GPM/SQ. FT.
   REMOTE AREA: 1,500 SQ. FT.
   HAZARD CATEGORY: LIGHT HAZARD/HC-1
   HOSE DEMAND: 250 GPM FOR 60 MIN.
   MIN. K-FACTOR: 5.6
   MOST REMOTE HEAD MIN. PRESSURE: 7 PSI
   HEAD TYPE: QUICK RESPONSE (QR)

4. SYSTEM TYPE:

   WET SPRINKLER SYSTEM – CLASS I AUTOMATIC

5. ALL PIPING SHALL BE RUN CONCEALED ABOVE NEW AND EXISTING CEILINGS WHERE APPLICABLE. COORDINATE PIPING LAYOUT AND ELEVATIONS WITH ALL OTHER TRADES. PROVIDE RETURN BENDS AND OFFSETS AS REQUIRED TO ACCOMMODATE ALL DUCTWORK, PIPING, CONDUITS, CABLE TRAYS, LIGHTING FIXTURES, BEAMS, AND SIMILAR OBSTRUCTIONS.
6. HEAD LAYOUT INDICATED IS FOR CONTRACTOR'S REFERENCE ONLY AND MAY NOT BE THE MOST HYDRAULICALLY EFFICIENT DESIGN. THE CONTRACTOR MAY REVISE THE DESIGN INDICATED PROVIDED THE NEW DESIGN FOLLOWS THE GUIDELINES REFERENCED IN NOTE #1. THE CONTRACTOR SHALL COORDINATE WITH THE ARCHITECTURAL CEILING PLANS AND SHALL LOCATE FUTURE SPRINKLER HEADS AS INDICATED, CENTERED IN CEILING TILES, SHOULD THE SPRINKLER LAYOUT MEET THE CODES REFERENCED ABOVE.
7. PROVIDE COORDINATION DRAWINGS FOR APPROVAL IN COORDINATION WITH ALL OTHER CONTRACTORS AND RCP PRIOR TO SUBMISSION OF SPRINKLER LAYOUT AND DESIGN. ONCE COORDINATION DRAWINGS ARE APPROVED CONTRACTOR SHALL SUBMIT LAYOUT AND DESIGN.
8. CONTRACTOR SHALL NOT BEGIN WORK WITHOUT PRIOR WRITTEN APPROVAL FROM ARCHITECT/ENGINEER, FM, AND LOCAL FIRE MARSHALL.
9. PROVIDE SPRINKLERS REQUIRED UNDER ALL OBSTRUCTIONS OVER 48 INCHES WIDE. COORDINATE LOCATION WITH ARCHITECTURAL, MECHANICAL AND ELECTRICAL PLANS.
10. CONTRACTOR IS RESPONSIBLE FOR REMOVAL, STORAGE, AND REINSTALLATION OF CEILING AS REQUIRED TO FULFILL SCOPE OF WORK AS OUTLINED HEREIN. WHERE ANY DAMAGE OCCURS TO THE EXISTING CEILING, THE CONTRACTOR SHALL REPLACE IN KIND AT THEIR OWN COSTS.

FIRE PROTECTION SPECIFICATIONS:

MATERIALS

1. PIPING FOR WET SYSTEMS SHALL BE SCHEDULE 40 BLACK STEEL PIPE WITH THREADED OR VICTAULIC GROOVED FITTINGS.
2. ALL PRODUCTS AND EQUIPMENT SHALL BE UL LISTED AND/OR FM GLOBAL APPROVED FOR USE AS PART OF A FIRE SUPPRESSION SYSTEM.
3. ROUTE PIPING IN ORDERLY MANNER, PLUMB AND PARALLEL TO BUILDING STRUCTURE. MAINTAIN GRADIENT.
4. INSTALL PIPING TO CONSERVE BUILDING SPACE, TO NOT INTERFERE WITH USE OF SPACE AND OTHER WORK.
5. GROUP PIPING WHENEVER PRACTICAL AT COMMON ELEVATIONS.
6. INSTALL PIPE SLEEVE AT PIPING PENETRATIONS THROUGH PARTITIONS, WALLS, AND FLOORS. SEAL PIPE AND SLEEVE PENETRATIONS TO MAINTAIN FIRE RESISTANCE EQUIVALENT TO FIRE SEPARATION WHICH IS PENETRATED.
7. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE, JOINTS, OR CONNECTED EQUIPMENT.
8. SLOPE PIPING AND ARRANGE SYSTEMS TO DRAIN AT LOW POINTS. INSTALL ECCENTRIC REDUCERS TO MAINTAIN TOP OF PIPE LEVEL.
9. PREPARE PIPE, FITTINGS, SUPPORTS, AND ACCESSORIES FOR FINISH PAINTING.
10. DO NOT PENETRATE BUILDING STRUCTURAL MEMBERS UNLESS INDICATED.
11. WHERE MORE THAN ONE PIPING SYSTEM MATERIAL IS SPECIFIED, INSTALL COMPATIBLE SYSTEM COMPONENTS AND JOINTS. INSTALL FLANGES, UNION, AND COUPLINGS AT LOCATIONS REQUIRING SERVICING.
12. DIE CUT THREADED JOINTS WITH FULL CUT STANDARD TAPER PIPE THREADS WITH RED LEAD AND LINSEED OIL OR OTHER NON-TOXIC JOINT COMPOUND APPLIED TO MALE THREADS ONLY.
13. INSTALL VALVES WITH STEMS UPRIGHT OR HORIZONTAL, NOT INVERTED. REMOVE PROTECTIVE COATINGS AFTER INSTALLATION.
14. INSTALL GATE VALVES FOR SHUT-OFF OR ISOLATING SERVICE.
15. INSTALL DRAIN VALVES AT MAIN SHUT-OFF VALVES, LOW POINTS OF PIPING AND APPARATUS.
16. ABOVE GROUND PIPING AND FITTINGS
    A. PRESSURE RATING 300 PSIG MINIMUM FOR ALL FITTINGS.
    B. STEEL PIPE: ASTM A53, THREADABLE, SCHEDULE 40 BLACK.
       a. STEEL FITTINGS: ASME B16.9, WROUGHT STEEL, BUTT WELDED; ASME B16.5, STEEL FLANGES AND FITTINGS; ASME B16.11, FORGED STEEL SOCKET WELDED AND THREADED.
       b. MALLEABLE IRON FITTINGS: ASME B16.3, THREADED FITTINGS, ASTM B47.
       c. MECHANICAL GROOVED COUPLINGS: MALLEABLE IRON HOUSING CLAMPS TO ENGAGE AND LOCK, "C" SHAPED ELASTOMERIC SEALING GASKET, STEEL BOLTS, NUTS, AND WASHERS; GALVANIZED FOR GALVANIZED PIPE.
       d. MECHANICAL FORMED FITTINGS: CARBON-STEEL HOUSING WITH INTEGRAL PIPE STOP AND O-RING POCKED AND O-RING UNIFORMLY COMPRESSED INTO PERMANENT MECHANICAL ENGAGEMENT ONTO PIPE.
17. PIPE HANGERS AND SUPPORTS
    A. CONFORM TO NFPA 13 & FM GLOBAL.
    B. HANGERS FOR PIPE SIZES 1/2 TO 1-1/2 INCH: CARBON STEEL, ADJUSTABLE SWIVEL, SPLIT RING.
    C. HANGERS FOR PIPE SIZES 2 INCH AND OVER: CARBON STEEL, ADJUSTABLE, CLEVIS.
    D. MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS.
    E. WALL SUPPORT FOR PIPE SIZES TO 3 INCHES: CAST IRON HOOK.
    F. WALL SUPPORT FOR PIPE SIZES 4 INCHES AND OVER: WELDED STEEL BRACKET AND WROUGHT STEEL CLAMP.

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Plot Scale:	NONE

Sheet Title:

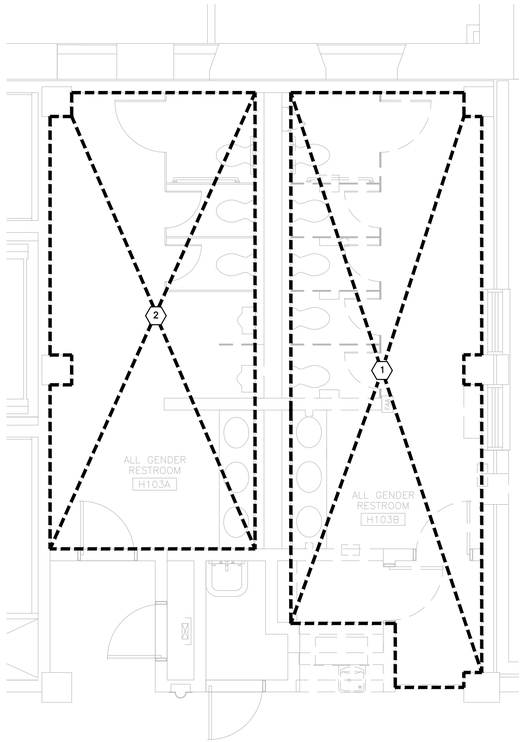
FIRE PROTECTION COVER SHEET

Sheet No.

FP000

DEMOLITION NOTES:

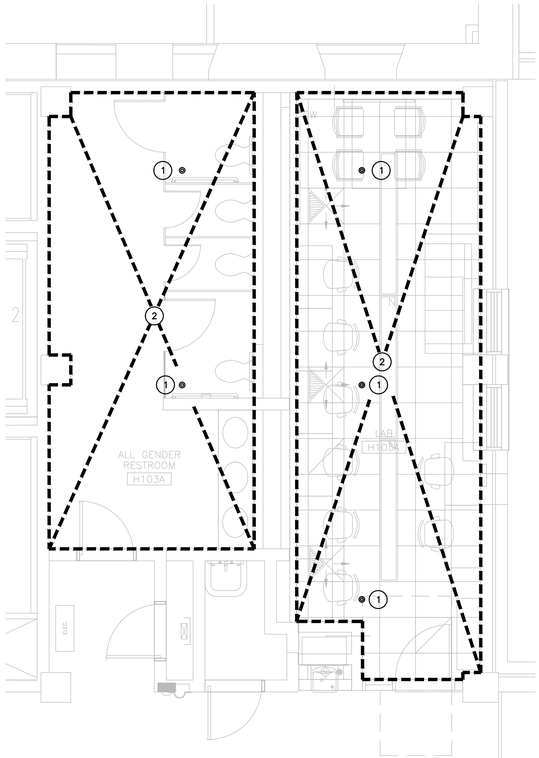
1. DEMOLISH ALL FIRE PROTECTION WET SPRINKLER PIPING AND HEADS.
2. DEMOLISH ALL FIRE PROTECTION PIPING BRANCHES AND SPRINKLER HEADS. FIRE PROTECTION MAINS SHALL REMAIN.



1 FP101 PARTIAL IST FLOOR DEMOLITION PLAN
SCALE: 1/4" = 1'-0"

NEW WORK NOTES:

1. LOCATION OF NEW SPRINKLER HEAD.
2. RE-ROUTE FIRE PROTECTION PIPING AROUND NEW WORK SERVICES. PROVIDE NEW SPINKLER HEADS. INSTALL NEW SPRINKLER HEADS IN CENTER OF CEILING TILE.



2 FP101 PARTIAL 1ST FLOOR NEW WORK PLAN
SCALE: 1/4" = 1'-0"

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FIRE PROTECTION PARTIAL DEMOLITION & NEW WORK PLANS

Sheet No.

FP101

LEGEND AND ABBREVIATIONS

TYPICAL WIRING

BRANCH CIRCUIT WIRING

XXX-# — BRANCH CIRCUIT WIRING TO PANELBOARD (HOMERUN)
- CIRCUIT NUMBER
- PANELBOARD DESIGNATION

TYPICAL FIXTURE DESIGNATION

a / b / XX
- a — LOWER CASE LETTER – CONTROLLING SWITCH DESIGNATION
- b — DIAGONAL LINE INDICATES HALF SWITCHED FIXTURE
- XX — FIXTURE TYPE – REFER TO LIGHTING FIXTURE SCHEDULE

2x4 FIXTURE

1x4 FIXTURE

2x2 FIXTURE

WALL MOUNTED FIXTURE

RECESSED, SURFACE OR PENDANT MOUNTED, CIRCULAR FIXTURE (REFER TO FIXTURE SCHEDULE FOR MOUNTING TYPE)

WALL MOUNTED FIXTURE

2x2 FIXTURE -- EMERGENCY

2x4 FIXTURE

1x4 FIXTURE -- EMERGENCY

WALL MOUNTED EXIT SIGN – SHADED PORTION REPRESENTS NUMBER OF FACES, ARROWS DENOTE REQUIREMENTS FOR DIRECTIONAL ARROWS

CEILING MOUNTED EXIT SIGN – SHADED PORTION REPRESENTS NUMBER OF FACES, ARROWS DENOTE REQUIREMENTS FOR DIRECTIONAL ARROWS

GENERAL SWITCHING NOTE:

LOWER CASE LETTER ADJACENT TO SWITCH IDENTIFIES CONTROLLED FIXTURES

S_X — SINGLE POLE SWITCH

[TYP. DESIGNATION]
- 2 = DOUBLE POLE SINGLE THROW SWITCH
- 3 = THREE WAY SWITCH
- 3POS = SINGLE POLE, 3 POSITION, CENTER OFF, MOMENTARY CONTACT SWITCH
- 4 = FOUR WAY SWITCH
- D = DIMMER SWITCH
- LV = LOW VOLTAGE RELAY CONTROL SYSTEM SWITCH
- T = TIME CONTROL SWITCH (WATTSTOPPER TS-400)
- OD = DUAL TECHNOLOGY OCCUPANCY SENSOR
- OP = PASSIVE INFRARED OCCUPANCY SENSOR
- OU = ULTRASONIC OCCUPANCY SENSOR
- SH = SHADE CONTROLLER (PROVIDED BY SHADE MANF.)
- PS = MOTORIZED PROJECTION SCREEN

OCCUPANCY SENSORS

OCCUPANCY SENSOR LAYOUT BASED ON WATTSTOPPER PRODUCTS. EQUIVALENT MANUFACTURERS ARE ACCEPTABLE. REFER TO SPECIFICATIONS.

PP — POWER PACK

OS/D — CEILING/PENDANT MOUNTED OCCUPANCY SENSOR

[TYP. DESIGNATION]
- D = DUAL TECHNOLOGY
- P = PASSIVE INFRARED
- U = ULTRASONIC

WALL MOUNTED OCCUPANCY SENSOR

RC — ROOM CONTROLLER

DS — CEILING/PENDANT MOUNTED DAYLIGHT SENSOR

PLC — PLUG LOAD CONTROLLER

TYPICAL TELECOMMUNICATIONS DESIGNATION

PROVIDE A TWO GANG BOX FOR EACH TELEPHONE/DATA OR TELEPHONE DEVICE WITH (1) 1" CONDUIT INSTALLED FOR EACH DEVICE TO TELECOMMUNICATIONS CLOSET OR ACCESSIBLE CEILING SPACE. INSTALL PULL LINE IN EACH CONDUIT. WHERE A TELE/DATA OUTLET IS PROVIDED IN SURFACE RACEWAY, EACH OUTLET SHALL ACCOMMODATE UP TO 4 DEVICES. PROVIDE A 1" CONDUIT FROM SURFACE RACEWAY TO ACCESSIBLE CORRIDOR CEILING SPACE FOR EACH TELE/DATA OUTLET.

TW — TELEPHONE OUTLET

[TYP. DESIGNATION]
- H = HOUSE PHONE

T — TELEPHONE/DATA OUTLET

TYPICAL POWER DESIGNATION

XX — DUPLEX RECEPTACLE – 125V, 2P, 3W

[TYP. DESIGNATION]
- 20/3 = INDICATES 20A, 3 POLE RECEPTACLE
- + = INDICATES MOUNTING HT 6" ABV COUNTER TOP
- +44 = INDICATES MOUNTING HEIGHT
- SS = SURGE SUPPRESSION
- ST = SAFETY TYPE
- TW = TWISTLOCK
- WP = WEATHER PROOF
- XXA = AMPERES (XX=RATING)
- PLC = PLUG LOAD CONTROLLED
- 1/2PLC = SPLIT CONTROLLED RECEPTACLE WITH THE TOP RECEPTACLE CONTROLLED

DUPLEX CEILING MOUNTED RECEPTACLE – 125V, 2P, 3W

SINGLE RECEPTACLE – 125V, 2P, 3W 20A, UON

SINGLE CEILING MOUNTED RECEPTACLE – 125V, 2P, 3W, TWISTLOCK L5-20R

XX — QUADRAPLEX RECEPTACLE – 125V, 2P, 3W

[TYP. DESIGNATION]
- PLC = 1 OF 2 DUPLEX RECEPTACLES ARE PLUG LOAD CONTROLLED

GFI DUPLEX RECEPTACLE – 125V, 2P, 3W

GFI QUAD RECEPTACLE – 125V, 2P, 3W

SINGLE RECEPTACLE – 250V, 2P, 3W 20A, UON

DUPLEX RECEPTACLE – 250V, 2P, 3W 20A, UON

FLOOR BOX

JUNCTION BOX

POKE THRU DEVICE

NEW PANELBOARD, DESIGNATION AS NOTED

EXISTING PANELBOARD, DESIGNATION AS NOTED

SYSTEM CONTROL PANEL, TYPE AS NOTED

TYPICAL MECHANICAL DESIGNATION

MOTOR

NON FUSED SAFETY SWITCH

FUSED SAFETY SWITCH

MOTOR STARTER

COMBINATION MOTOR STARTER/DISCONNECT

ENCLOSED CIRCUIT BREAKER

VARIABLE FREQUENCY DRIVE

VARIABLE FREQUENCY DRIVE/DISCONNECT

S_M — MANUAL MOTOR SWITCH

S_V — VARIABLE SPEED CONTROL SWITCH

M_S — MULLION SWITCH

TYPICAL FIRE ALARM DESIGNATION

FIRE ALARM AUDIBLE NOTIFICATION APPLIANCE

FIRE ALARM MANUAL PULL STATION

COMBINATION AUDIBLE/VISUAL NOTIFICATION APPLIANCE

— FIRE ALARM VISUAL NOTIFICATION APPLIANCE

CANDELA RATING, 15CD IF NOT SHOWN

D — AUTOMATIC DETECTOR

[TYP. DESIGNATION]
- D = DUCT SMOKE DETECTOR
- ER = ELEVATOR RECALL
- F = THERMAL, FIXED TEMERATURE
- FR = THERMAL, COMBINATION RATE OF RISE PLUS FIXED TEMPERATURE
- H = AREA HEAT DETECTOR
- PE = SMOKE REFRACTION, PHOTO ELECTRIC
- R = THERMAL, RATE OF RISE
- S = AREA SMOKE DETECTOR

NEW WORK

EXISTING WORK

DEMOLITION

SINGLE LINE DEMOLITION

TYPICAL ABBREVIATION

A, AMP	AMPERE
ABV	ABOVE
AC	AIR CONDITIONER
ADA	AMERICANS WITH DISABILITIES ACT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AIC	AMPERES INTERRUPTING CURRENT
AM	AMMETER
AT	AMP TRIP
AVC	AUDIO/VISUAL CONTRACTOR
AWG	AMERICAN WIRE GAGE
BATT	BATTERY
BKR	BREAKER
BLDG	BUILDING
BLK	BLACK
C, CND	CONDUIT
CATV	CABLE TELEVISION
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CH	CABINET HEATER
CIR, CKT	CIRCUIT
CLG	CEILING
CLR	CLEAR
COL	COLUMN
COMM	COMMUNICATION
CONC	CONCRETE
CONN	CONNECTION
CONTR	CONTRACTOR
CT	CURRENT TRANSFORMER
CU	COPPER
D	DEDICATED CIRCUIT
DB	DECIBEL
DED	DEDICATED
DIA	DIAMETER
DISC	DISCONNECT
DN	DOWN
DP	DISTRIBUTION PANEL
DWG(S)	DRAWING(S)
EA	EACH
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
ELEC	ELECTRIC
EMER, EM, E	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
EQUIP	EQUIPMENT
EWC	ELECTRIC WATER COOLER
EX, EXIST	EXISTING TO REMAIN
EXD	EXISTING TO BE DEMOLISHED
EXR	EXISTING TO BE RELOCATED
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FC	FOOTCANDLES
FIXT	FIXTURE
FL	FLOOR
FLA	FULL LOAD AMPS
FT	FOOT OR FEET
G or GND	GROUND
GA	GAGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GEN	GENERATOR
GFCI or GFI	GROUND FAULT CIRCUIT INTERRUPTING
GFP	GROUND FAULT PROTECTION
HP	HORSEPOWER
HT	HEIGHT
HVAC	HEATING, VENTILATING, & AIR CONDITIONING
HZ	HERTZ
JB	JUNCTION BOX
KV	KILOVOLT
KVA	KILOVOLT – AMPERES
KVAR	KILOVOLT AMPERES REACTIVE
KW	KILOWATT
KWH	KILOWATT-HOUR
LT	LIGHT
LTG	LIGHTING
LV	LOW VOLTAGE
MC	MECHANICAL CONTRACTOR
MC	METAL – CLAD CABLE
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MDP	MAIN DISTRIBUTION PANEL
MFR	MANUFACTURE
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MLO	MAIN LUGS ONLY
MTD	MOUNTED
MTG	MOUNTING
NAC	NOTIFICATION APPLIANCE CIRCUIT
NC	NORMALLY CLOSED
NEUT	NEUTRAL
NIC	NOT IN CONTRACT
NO or #	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OH	OVERHEAD
P	POLE OR PUMP
PB	PULL BOX
PC	PLUMBING CONTRACTOR
PH	PHASE
PNL	PANEL
PP	POWER PANEL
PRI	PRIMARY
RECEPT	RECEPTACLE
REF	REFERENCE
REQ	REQUIRED
RGS	RIGID GALVANIZED STEEL CONDUIT
RM	ROOM
SCH	SCHEDULE
SEC	SECONDARY
SECT	SECTION
SHT	SHEET
SPD	SURGE PROTECTIVE DEVICE
SPEC	SPECIFICATION
SS	SUBSTATION
STD	STANDARD
SW	SWITCH
SWBD	SWITCHBOARD
TEL	TELEPHONE
TL	TWIST LOCK
TYP	TYPICAL
UC	UNDERCOUNTER
UG	UNDERGROUND
UH	UNIT HEATER
UL	UNDERWRITERS LABORATORIES
UON	UNLESS OTHERWISE NOTED
UV	UNIT VENTILATOR
V	VOLTS
VM	VOLTMETER
W	WIRE
W	WATT
WP	WEATHERPROOF
XFMR	TRANSFORMER

STANDARD MOUNTING HEIGHTS

9" BELOW FINISHED CEILING	WALL-MOUNTED CLOCKS, PROGRAM BELLS, AND FIRE ALARM HORNS, P.A. HORN SPEAKERS (TOP OF UNIT).
12" BELOW FINISHED CEILING	BATTERY LIGHTING UNITS AND REMOTE WALL MOUNTED LIGHT HEADS
8'-6"	PENDANT MOUNTED INDUSTRIAL AND STRIP LIGHTING FIXTURES
6'-8" TO 8'	FIRE ALARM STROBE, COMBINATION HORN/STROBE
CENTER ABOVE DOOR OR WINDOW OPENING	WARNING AND SIGNALING FIXTURES/SIGNS
6'-6"	TOP OF FLUSH AND SURFACE MOUNTED ELECTRICAL LIGHTING OR POWER PANELBOARDS AND TELEPHONE CABINETS
6'-3"	TOP OF BACK-MOUNTED WALL EXIT FIXTURES (DOES NOT INCLUDE INSTALLATION ABOVE DOORS)
6'-0"	TOP OF HIGHEST ELECTRICAL SAFETY DISCONNECT SWITCHES MAGNETIC STARTERS AND CONTACTORS (MINIMUM 15" AFF) NOTES: LARGE EQUIPMENT MAY BE INSTALLED ABOVE 6'; HOWEVER, BOTTOM NOT LESS THAN 15" AFF. COORDINATE WITH ENGINEER
4'-0" TO TOP	WALL MOUNTED ELECTRICAL DEVICES: WALL MOUNTED TELEPHONE, PAY TELEPHONES (TOP OF COIN SLOT), FIRE FIGHTER'S PHONE JACK
3'-10"	WALL MOUNTED ELECTRICAL DEVICES INCLUDING: LIGHT SWITCHES, MANUAL MOTOR STARTERS, LINE VOLTAGE THERMOSTATS, INTERCOM, VOLUME CONTROL, PUSH BUTTONS, HANDICAPPED ACCESSIBLE TELEPHONES AND ANNUNCIATORS
3'-6"	FIRE ALARM PULL STATION
6" ABOVE BACKSPLASH	COUNTERTOP DEVICES -- COUNTERTOPS WITH BACKSPLASHES
8" ABOVE COUNTERTOPS	COUNTERTOP DEVICES -- COUNTERTOPS WITHOUT BACKSPLASHES
2'-0"	ELECTRICAL RECEPTACLE IN PARKING GARAGES, MECHANICAL SPACES, ELECTRICAL AND ELEVATOR ROOMS
1'-6" TO BOTTOM	ELECTRICAL RECEPTACLES TELEPHONE OUTLETS TELEVISION OUTLETS COMPUTER OUTLETS TELEPHONE /DATA OUTLETS
0'-0"	FINISHED FLOOR

1. FINAL MOUNTING HEIGHTS SHALL BE FIELD COORDINATED AND APPROVED BY THE ARCHITECT PRIOR TO COMMENCING INSTALLATION.
2. MOUNTING HEIGHTS TO CENTER OF OUTLETS UNLESS OTHERWISE NOTED. IN MASONRY CONSTRUCTION THE MOUNTING HEIGHTS SHALL BE USED FOR REFERENCE TO NEAREST BLOCK OR BRICK COURSING.
3. THE ABOVE MOUNTING HEIGHT FOR FIRE ALARM DEVICES SHALL BE ADHERED TO UNLESS OTHERWISE APPROVED BY THE ENGINEER. THESE HEIGHTS ARE INTENDED TO CONFORM TO AMERICANS WITH DISABILITIES ACT AND NATIONAL, STATE, AND LOCAL CODES. THE CONTRACTOR SHALL VERIFY CONFORMANCE PRIOR TO COMMENCING INSTALLATION.

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Project:

KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

Revision No.	Description/ Date
	BID DOCUMENTS 07/11/24

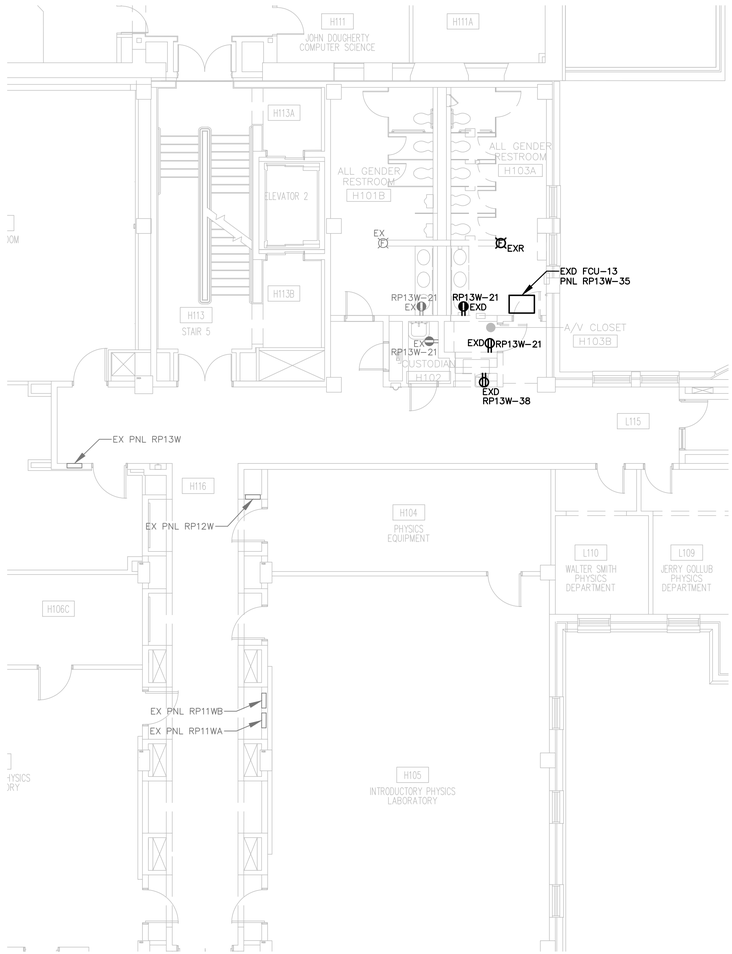
Project No:	2413
Scale:	AS NOTED
Plot Scale:	

Sheet Title:

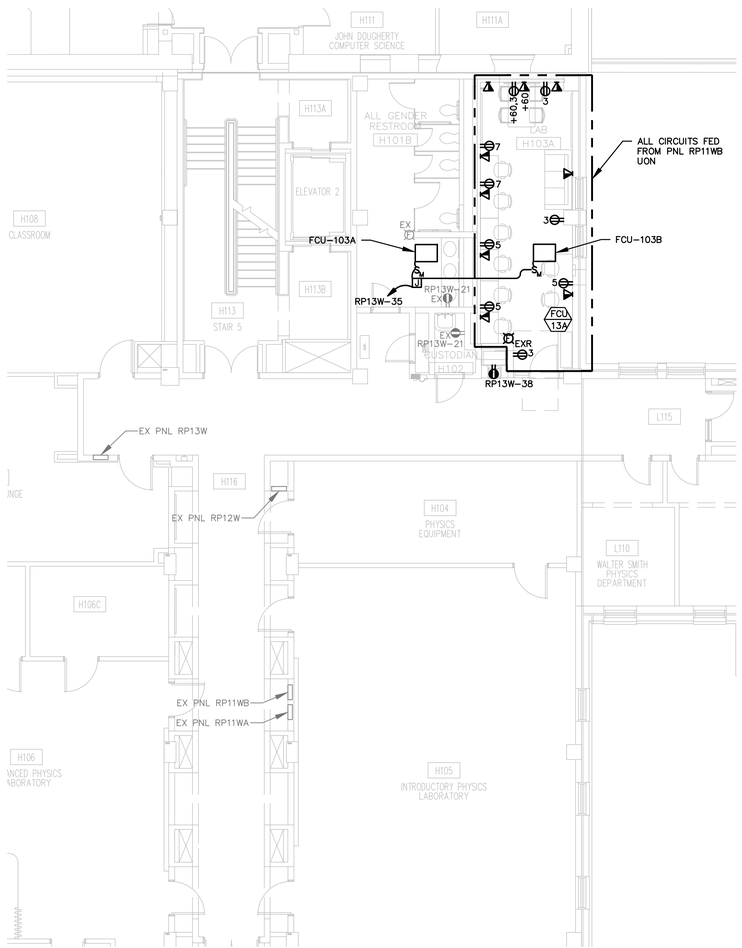
LEGEND AND ABBREVIATIONS

Sheet No.

E000



1 E100 PARTIAL 1ST FLOOR DEMOLITION POWER PLAN
SCALE: 1/8" = 1'-0"



2 E100 PARTIAL 1ST FLOOR NEW WORK POWER PLAN
SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. ALL CIRCUITING INFORMATION BASED ON EXISTING DRAWINGS AND PANEL SCHEDULES. ELECTRICAL CONTRACTOR TO CONFIRM IN FIELD.

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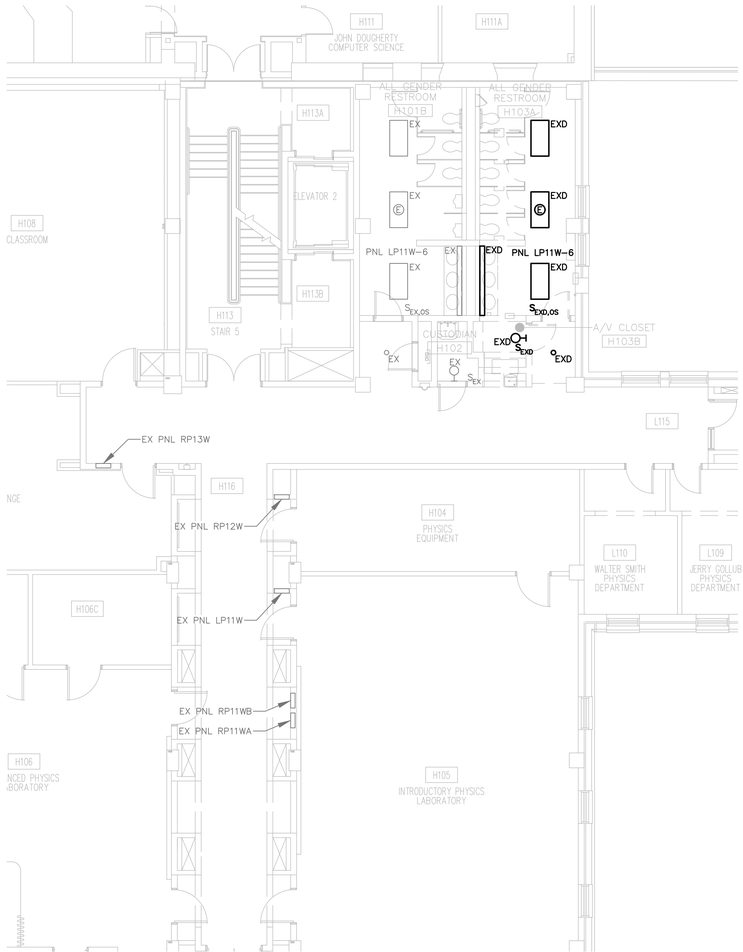
Scale:	AS NOTED
Plot Scale:	

Sheet Title:

PARTIAL DEMOLITION AND NEW WORK POWER PLANS

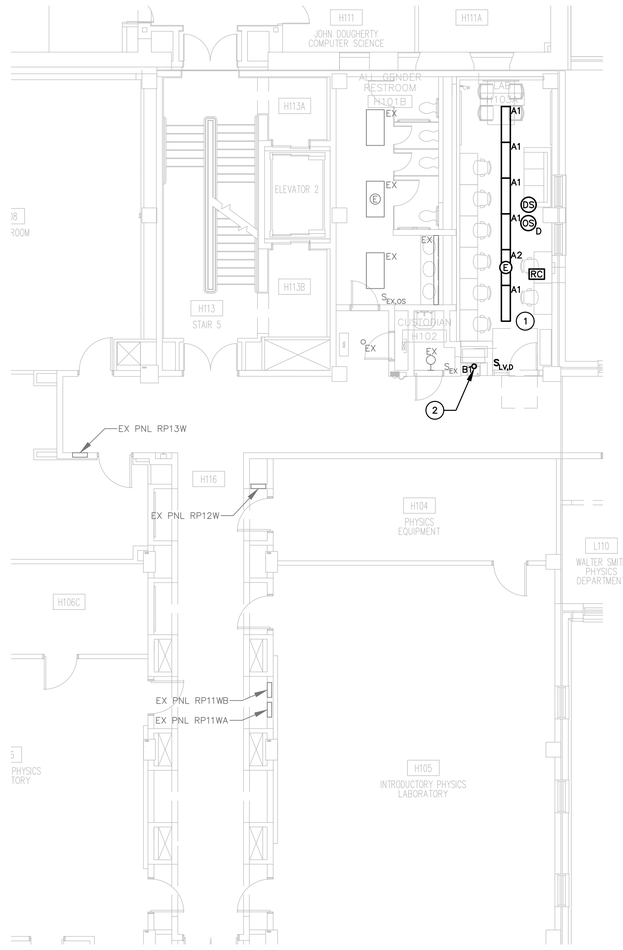
Sheet No.

E100



1 E101 PARTIAL 1ST FLOOR DEMOLITION LIGHTING PLAN

SCALE: 1/8" = 1'-0"



2 E101 PARTIAL 1ST FLOOR NEW WORK LIGHTING PLAN

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. ALL CIRCUITING INFORMATION BASED ON EXISTING DRAWINGS AND PANEL SCHEDULES. ELECTRICAL CONTRACTOR TO CONFIRM IN FIELD.

NEW WORK NOTES:

(1) PROVIDE 2#12, #12 GROUND IN A 3/4" CONDUIT TO CONNECT TO EXISTING ROOM LIGHTING CIRCUIT.

(2) PROVIDE 2#12, #12 GROUND IN A 3/4" CONDUIT TO CONNECT TO EXISTING CORRIDOR LIGHTING CIRCUIT.

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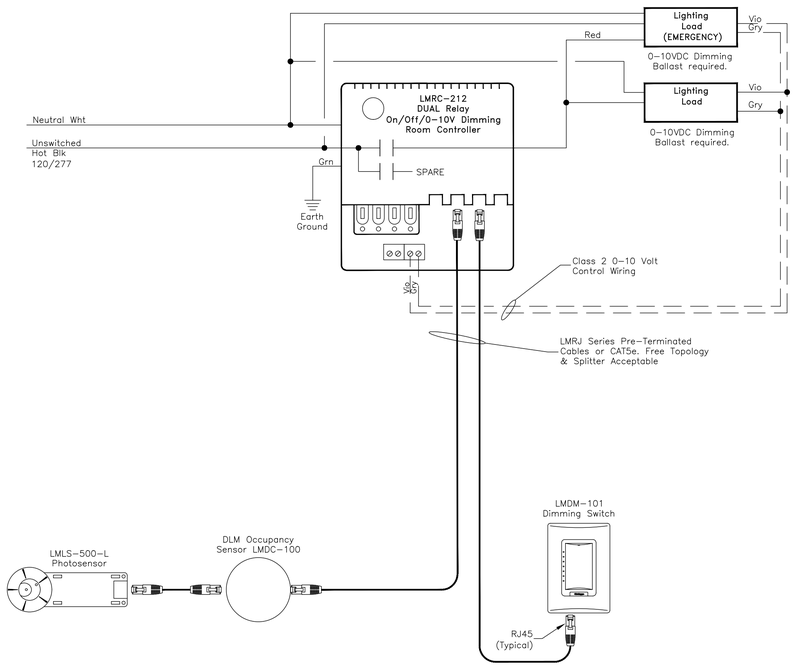
Sheet Title:

PARTIAL DEMOLITION AND NEW WORK LIGHTING PLANS

Sheet No.

E101



Sequence of Operation: Local manual dimming control, partial automatic on (50%); all relays turn off automatically within 20 minutes of all occupants leaving the space.

1 E500 TYPICAL LIGHTING CONTROL WIRING DIAGRAM

SCALE: NOT TO SCALE

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Revision No.	Description/ Date
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Project No:	2413
Scale:	AS NOTED
Plot Scale:	

Sheet Title:

DETAILS

Sheet No.

E500

Designation: **PANEL RP13W**
Panel Voltage: 208Y/120Volt 3 Phase 4 wire

Existing Panel

DEMOLITION

Main Circuit Breaker: **MLO**
Number of Poles: **42**

	FEEDER DATA				CIR NO	LOAD DESCRIPTION	C.B. POLE NO.	C.B. TRIP A	C.B. LOAD VA	PHASE A	PHASE B	PHASE C	C.B. LOAD VA	C.B. TRIP A	C.B. POLE NO.	LOAD DESCRIPTION	CIR NO	FEEDER DATA				
Notes	No.	WIRE	GND	CONDUIT														No.	WIRE	GND	CONDUIT	Notes
					1	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (4) ISODUCT-REC. H111, H11A	2					
					3	EX (5) ISODUCT-REC. H108	1	20						20	1	EX (4) ISODUCT-REC. H111, H11A	4					
					5	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (4) ISODUCT-REC. H111, H11A	6					
					7	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (3) REC. H110	8					
					9	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (3) REC. H110	10					
					11	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (3) REC. H110	12					
					13	EX (3) ISODUCT-REC. H108	1	20						20	1	EX (4) REC. H110	14					
					15	EX (6) ISODUCT-REC. H108	1	20						20	1	EX (1) FLOOR REC. H110	16					
					17	EX (6) ISODUCT-REC. H108	1	20						20	1	EX (1) FLOOR REC. H110	18					
					19	EX (2) RECEPT. H108	1	20						20	1	EX (1) FLOOR REC. H110	20					
					21	**EXD (2) RECEPT. H103A,H103B &** EX (2) RECEPT. H101B, H102	1	20						20	1	EX (1) FLOOR REC. H110	22					
					23	EX (1) FLOOR REC. H108	1	20						20	1	EX (1) FLOOR REC. H110	24					
					25	EX FCU-10	1	20						20	1	EX (1) FLOOR REC. H110	26					
					27	EX FCU-14	1	20						20	1	EX (1) FLOOR REC. H110	28					
					29	EX FCU-13	1	20						20	1	EX (1) FLOOR REC. H110	30					
					31	EX (4) REC. CORRIDOR	1	20						20	1	EX (1) FLOOR REC. H110	32					
					33	EX FLOOR REC. H103	1	20						20	1	EX (1) CLG & (1) QUAD REC. H110	34					
					35	**EXD FCU-13**	1	20						20	1	EX CUH-2	36					
					37	EX FIRE ALARM EQUIP	1	20						20	1	**EXD ELEC. WATER COOLER**	38					
					39	EX SPARE (ON)	1	20						20	1	EX (1) CLG & (1) QUAD REC. H108	40					
					41	EX SPARE (ON)	1	20						20	1	EX (1) FLOOR REC. H110	42					

Panel Type: NEMA 1
Mounting: Recessed

Location: 1ST FLOOR - WEST CORRIDOR
Fed From: MDP-G102W

Phase Conn. VA / AMPS
Total Connected Load KVA AMPS
Bus Ampacity **100** KAIC
Voltage **208**

Remarks:

- FEED THRU LUGS
- SUB FEED MAIN LUGS
- SPLIT BUS
- CONTACTOR CONTROLLED
- 200% RATED NEUTRAL
- SURGE PROTECTIVE DEVICE

- GROUND BUS
- INSULATED GROUND BUS
- DOUBLE PANEL
- GFCI BREAKERS
- SHUNT TRIP BREAKERS

Designation: **PANEL RP13W**
Panel Voltage: 208Y/120Volt 3 Phase 4 wire

Existing Panel

NEW WORK

Main Circuit Breaker: **MLO**
Number of Poles: **42**

	FEEDER DATA				CIR NO	LOAD DESCRIPTION	C.B. POLE NO.	C.B. TRIP A	C.B. LOAD VA	PHASE A	PHASE B	PHASE C	C.B. LOAD VA	C.B. TRIP A	C.B. POLE NO.	LOAD DESCRIPTION	CIR NO	FEEDER DATA				
Notes	No.	WIRE	GND	CONDUIT														No.	WIRE	GND	CONDUIT	Notes
					1	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (4) ISODUCT-REC. H111, H11A	2					
					3	EX (5) ISODUCT-REC. H108	1	20						20	1	EX (4) ISODUCT-REC. H111, H11A	4					
					5	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (4) ISODUCT-REC. H111, H11A	6					
					7	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (3) REC. H110	8					
					9	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (3) REC. H110	10					
					11	EX (4) ISODUCT-REC. H108	1	20						20	1	EX (3) REC. H110	12					
					13	EX (3) ISODUCT-REC. H108	1	20						20	1	EX (4) REC. H110	14					
					15	EX (6) ISODUCT-REC. H108	1	20						20	1	EX (1) FLOOR REC. H110	16					
					17	EX (6) ISODUCT-REC. H108	1	20						20	1	EX (1) FLOOR REC. H110	18					
					19	EX (2) RECEPT. H108	1	20						20	1	EX (1) FLOOR REC. H110	20					
	2	12	12	3/4"	21	**EX (2) RECEPT. H101B, H102**	1	20	360		360			20	1	EX (1) FLOOR REC. H110	22					
					23	EX (1) FLOOR REC. H108	1	20						20	1	EX (1) FLOOR REC. H110	24					
					25	EX FCU-10	1	20						20	1	EX (1) FLOOR REC. H110	26					
					27	EX FCU-14	1	20						20	1	EX (1) FLOOR REC. H110	28					
					29	EX FCU-13	1	20						20	1	EX (1) FLOOR REC. H110	30					
					31	EX (4) REC. CORRIDOR	1	20						20	1	EX (1) FLOOR REC. H110	32					
					33	EX FLOOR REC. H103	1	20						20	1	EX (1) CLG & (1) QUAD REC. H110	34					
	2	12	12	3/4"	35	**FCU-13A & FCU-13B**	1	20						20	1	EX CUH-2	36					
					37	EX FIRE ALARM EQUIP	1	20						20	1	**ELEC. WATER COOLER**	38	2	12	12	3/4"	
					39	EX SPARE (ON)	1	20						20	1	EX (1) CLG & (1) QUAD REC. H108	40					
					41	EX SPARE (ON)	1	20						20	1	EX (1) FLOOR REC. H110	42					

Panel Type: NEMA 1
Mounting: Recessed

Location: 1ST FLOOR - WEST CORRIDOR
Fed From: MDP-G102W

Phase Conn.	A	B	C	
		360		**VA**
		3		**AMPS**

Total Connected Load **0** **KVA** **1** **AMPS**
Bus Ampacity **100** **KAIC**
Voltage **208**

Remarks:

- FEED THRU LUGS
- SUB FEED MAIN LUGS
- SPLIT BUS
- CONTACTOR CONTROLLED
- 200% RATED NEUTRAL
- SURGE PROTECTIVE DEVICE

- GROUND BUS
- INSULATED GROUND BUS
- DOUBLE PANEL
- GFCI BREAKERS
- SHUNT TRIP BREAKERS

Designation: **PANEL RP11WB**
Panel Voltage: 208Y/120Volt 3 Phase 4 wire

Existing Panel

NEW WORK

Main Circuit Breaker: **MLO**
Number of Poles: **42**

	FEEDER DATA				CIR NO	LOAD DESCRIPTION	C.B. POLE NO.	C.B. TRIP A	C.B. LOAD VA	PHASE A	PHASE B	PHASE C	C.B. LOAD VA	C.B. TRIP A	C.B. POLE NO.	LOAD DESCRIPTION	CIR NO	FEEDER DATA				
Notes	No.	WIRE	GND	CONDUIT														No.	WIRE	GND	CONDUIT	Notes
					1	EX FLOOR REC. H106	1	20						20	1	EX FCU-2	2					
1	2	12	12	3/4"	3	**(4) RECEPTS LAB H103A**	1	20	**720**		720			20	1	EX FCU-2	4					
1	2	12	12	3/4"	5	**(3) RECEPTS LAB H103A**	1	20	**540**			540		20	1	EX FCU-2	6					
1	2	12	12	3/4"	7	**(2) RECEPTS LAB H103A**	1	20	**360**	360				20	1	EX FCU-2	8					
					9	EX SPARE	1	20						20	1	EX FCU-2	10					
					11	EX SPARE	1	20						20	1	EX FCU-4	12					
					13	EX SPARE	1	20						20	1	EX SPARE	14					
					15	EX SPARE	1	20						20	1	EX FCU-9	16					
					17	EX SPARE	1	20						20	1	EX SPARE	18					
					19	EX SPARE	1	20						20	1	EX SPARE	20					
					21	EX SPARE	1	20						20	1	EX SPARE	22					
					23	EX SPARE	1	20						20	1	EX SPARE	24					
					25	EX SPARE	1	20						20	1	EX SPARE (ON)	26					
					27	EX SPARE	1	20						20	1	EX SPARE (ON)	28					
					29	EX SPARE	1	20						20	1	EX SPARE	30					
					31	EX SPACE	1	20						20	1	EX SPACE	32					
					33	EX SPACE	1	20						20	1	EX SPACE	34					
					35	EX SPACE	1	20						20	1	EX SPACE	36					
					37	EX SPACE	1	20						20	1	EX SPACE	38					
					39	EX SPACE	1	20						20	1	EX SPACE	40					
					41	EX SPACE	1	20						20	1	EX SPACE	42					

Panel Type: NEMA 1
Mounting: Recessed

Location: 1ST FLOOR - WEST CORRIDOR
Fed From: MDP-G102W

Phase Conn.	A	B	C	
	360	720	540	**VA**
	3	6	4	**AMPS**

Total Connected Load **2** **KVA** **5** **AMPS**
Bus Ampacity **225** **KAIC**
Voltage **208**

Remarks:

PANELBOARD NOTES:
1.CONNECT NEW LOAD TO EXISTING SPARE CIRCUIT BREAKER.

- FEED THRU LUGS
- SUB FEED MAIN LUGS
- SPLIT BUS
- CONTACTOR CONTROLLED
- 200% RATED NEUTRAL
- SURGE PROTECTIVE DEVICE

X	GROUND BUS
	INSULATED GROUND BUS
	DOUBLE PANEL
	GFCI BREAKERS
	SHUNT TRIP BREAKERS

LIGHTING FIXTURE SCHEDULE

FIXTURE TYPE	MOUNTING	DESCRIPTION	LAMPING	WATT	VOLTS	MANUFACTURER NAME	CATALOG NUMBER	REMARKS
A1	RECESSED	1X4 LED TROFFER WITH 0-10V - 1% DIMMING DRIVER	LED 3585 LUMENS 3500K	35.6	120/277	METALUX	14RLN-LD5-35-UNV-L835-CD-1	
A2	RECESSED	1X4 LED TROFFER WITH 0-10V - 1% DIMMING DRIVER AND EMERGENCY DRIVER	LED 3585 LUMENS 3500K	35.6	120/277	METALUX	14RLN-LD5-35-UNV-EL14W-L835-CD-1	
B1	RECESSED	OPEN LED DOWNLIGHT, BLACK BAFFLE WITH WHITE TRIM AND 0-10V DIMMING DRIVER	LED 1000 LUMENS 3500K	20	120/277	HALO	HC6-20-D010 HM6-0525-835 61-WD-BB	

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HAVERFORD, PA 19041

Project:

KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

Revision No.	Description/ Date
	BID DOCUMENTS 07/11/24

Project No: 2413
Scale: AS NOTED
Plot Scale:

Sheet Title:
SCHEDULES

Sheet No.
E600

ELECTRICAL SPECIFICATIONS

1. GENERAL:

   A. PERFORM ALL WORK IN STRICT ACCORDANCE WITH THE LATEST EDITIONS OF THE NATIONAL ELECTRICAL CODE (NEC), OSHA REQUIREMENTS, AMERICAN WITH DISABILITIES ACT, COLLEGE REQUIREMENTS, AND FEDERAL, STATE, AND LOCAL CODES.

   B. INSTALLATIONS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

   C. MATERIALS, EQUIPMENT, AND METHODS OF INSTALLATION SHALL CONFORM TO ALL NATIONALLY AND LOCALLY RECOGNIZED STANDARDS.

   D. THE CONTRACTOR IS REQUIRED TO VISIT THE SITE DURING THE BIDDING PERIOD AND THOROUGHLY FAMILIARIZE HIMSELF WITH THE CONDITIONS, SCOPE, AND QUANTITIES OF WORK INVOLVED.

   E. WORK SHALL BE INSTALLED TO ACCOMMODATE OWNER'S OCCUPANCY REQUIREMENTS. THE COST OF ANY ANTICIPATED OVERTIME WORK SHALL BE INCLUDED IN THE BASE BID.

   F. THE CONTRACTOR SHALL NOTIFY THE OWNER OF THE INTENT TO PERFORM ANY WORK WHICH REQUIRES SERVICE INTERRUPTION – THIS INCLUDES: ELECTRICAL, COMMUNICATION, DATA, FIRE ALARM, AND ANY OTHER ELECTRICAL TRANSMISSION SYSTEM. THE CONTRACTOR SHALL PROCEED WITH SUCH WORK ONLY AFTER RECEIVING A TIME SCHEDULE APPROVED BY THE OWNER. THE OWNER SHALL HAVE THE RIGHT TO CANCEL OR DELAY THE TIME OF ANY SERVICE INTERRUPTION. A MINIMUM OF 14 DAYS ADVANCE NOTICE OF SHUTDOWN SHALL BE GIVEN.

   G. DAMAGED SURFACES SHALL BE PATCHED AND REPAIRED TO MATCH ADJACENT FINISHED SURFACES.

   H. PENETRATIONS THROUGH FIRE RATED WALLS SHALL BE MADE IN A MANNER SO THAT THE FIRE RATING IS MAINTAINED.

   I. PROVIDE ACCESS PANELS FOR JUNCTION BOXES, PULL BOXES, OUTLET BOXES, ELECTRICAL DEVICES, AND SPECIALTIES THAT ARE CONCEALED WITHIN OR BEHIND CONSTRUCTION. PANELS SHALL BE SIZED TO SUIT EQUIPMENT; MINIMUM SIZE 18" X 18". PANELS SHALL BE 16 GAGE STEEL FRAME, 14 GAGE FLUSH STEEL DOOR WITH CONCEALED HINGE, TAMPER RESISTANT HARDWARE, SCREWDRIVER OPERATED CAM LOCK AND FACTORY PRIME FINISH. COORDINATE FINAL LOCATION AND FINISH WITH ARCHITECT/OWNER.

   J. SUBMITTALS: THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND PRODUCT DATA AS REQUESTED BY THE ENGINEER. SUFFICIENT INFORMATION SHALL BE SUBMITTED TO VERIFY CONFORMANCE WITH THE SPECIFICATIONS. APPLY CONTRACTOR'S STAMP, SIGNED OR INITIALED CERTIFYING THAT REVIEW, VERIFICATION OF PRODUCTS REQUIRED, FIELD DIMENSIONS, ADJACENT CONSTRUCTION WORK, AND COORDINATION OF INFORMATION IS IN ACCORDANCE WITH THE REQUIREMENTS OF THE SCOPE OF WORK. AT A MINIMUM, THE CONTRACTOR SHALL SUBMIT THE FOLLOWING: CONDUIT, BUILDING WIRE AND CABLE, BOXES, WIRING DEVICES AND PLATES, CIRCUIT BREAKERS, AND LIGHTING FIXTURES. SUBSTITUTIONS OF EQUIPMENT OF THE SAME OR BETTER QUALITY THAN THE EQUIPMENT SPECIFIED SHALL BE CONSIDERED ONLY AFTER AWARD OF CONTRACT.

   K. FOR ALL MECHANICAL AND OTHER EQUIPMENT CONNECTIONS, THE CONTRACTOR SUPPLYING THE EQUIPMENT SHALL FURNISH AND INSTALL MOTORS AND OTHER EQUIPMENT LIKE THERMOSTATS, RELAYS, TIMERS, INTEGRATED CONTROLLERS, ETC AS WELL AS CONTROL WIRING AND CONDUIT. THE E.C. SHALL FURNISH AND INSTALL MOTOR STARTERS, ALL POWER WIRING, LOCAL DISCONNECTING MEANS AND ALL FINAL POWER WIRING CONNECTIONS AT THE EQUIPMENT. THIS INCLUDES THE INSTALLATION OF WIRING THROUGH STARTERS, CONTACTORS, ETC. THIS ALSO INCLUDES MAKING CONNECTIONS TO ONE OR MORE SETS OF POWER WIRING TERMINALS AT EQUIPMENT. THE E.C. SHALL OBTAIN CUTS FROM THE SUPPLYING CONTRACTOR TO VERIFY ALL REQUIREMENTS.

   L. PROVIDE ALL NEW ELECTRICAL EQUIPMENT (INCLUDING BRANCH CIRCUIT BREAKERS IN DISTRIBUTION PANELS) WITH LEXAN SIGNS – MINIMUM 1/4" LETTERING. SIGNS SHALL DESCRIBE THE EQUIPMENT LOAD/DEVICE SERVED, VOLTAGE, PHASE, RATED AMPS, AND PANEL AND CIRCUIT NUMBER FEEDING THE EQUIPMENT (I.E. #P-1-PUMP, 480V-3PH-3W, 15A, FED FROM DP8A – CIRCUIT #4 ETC). SECURE LEXAN SIGNS WITH SUITABLE SCREWS OR RIVETS SELF-ADHESIVE SIGNS ARE NOT PERMITTED.

   M. UPON COMPLETION OF THE PROJECT, SUBMIT A COMPLETE SET OF BLUEPRINTS MARKED UP WITH ALL AS-BUILTS CONDITIONS. AS-BUILTS SHALL INCLUDE DETAILED LOCATIONS AND ROUTING OF ALL CONCEALED WIRING. SUBMIT A PDF COPY OF OPERATING AND MAINTENANCE (O&M) MANUALS FOR ALL NEW EQUIPMENT SUPPLIED. O&M MANUALS SHALL INCLUDE MANUFACTURER RECOMMENDED MAINTENANCE SCHEDULES, ESTIMATED MAN-HOURS AND MATERIAL COSTS TO PERFORM RECOMMENDED MAINTENANCE, SPARE PARTS LIST AND FINAL SHOP DRAWINGS.

   N. ALL EQUIPMENT SHALL BE NEW AND SHALL BE UNDERWRITERS LABORATORIES LISTED.

   O. VERIFY EXACT LOCATIONS AND MOUNTING OF ALL SWITCHES, RECEPTACLES, OUTLETS, AND OTHER EQUIPMENT WITH ARCHITECT PRIOR TO ROUGH-IN.

   P. VERIFY ELECTRICAL RATINGS, CONNECTION REQUIREMENTS, AND EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT IN FIELD PRIOR TO PURCHASING ASSOCIATED ELECTRICAL EQUIPMENT, WIRING, ETC.

   Q. THE TERM "PROVIDE" SHALL MEAN "FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR", AND THE TERMS "CONTRACTOR" AND "E.C." SHALL MEAN ELECTRICAL CONTRACTOR, UNLESS INDICATED OTHERWISE. ALL WORK INDICATED ON THE ELECTRICAL DRAWINGS AND ELECTRICAL SPECIFICATIONS SHALL BE BY THE E.C. UNLESS INDICATED OTHERWISE.

   R. PROVIDE COMPLETE CONNECTIONS TO ALL EQUIPMENT AS REQUIRED. VERIFY REQUIREMENTS PRIOR TO ROUGH-IN. FOR EQUIPMENT RATED 120V AND 20A OR LESS, PROVIDE EITHER A DIRECT CONNECTION (INCLUDING THERMAL OVERLOAD SWITCH) OR A SUITABLE RECEPTACLE FOR EQUIPMENT SUPPLIED WITH CORD AND PLUG.

   S. WHERE EQUIPMENT IS INDICATED TO BE RELOCATED, THE CONTRACTOR SHALL MODIFY/EXTEND EXISTING CONDUIT AND WIRING AS REQUIRED TO ACCOMMODATE NEW LOCATION. CONDUIT AND WIRING TO MATCH EXISTING.

2. DEMOLITION:

   A. REMOVAL: REFER TO DRAWINGS FOR DEVICES AND EQUIPMENT BIEING DEMOLISHED. THE CONTRACTOR IS RESPONSIBLE FOR DISCONNECTING POWER TO ALL EQUIPMENT AND REMOVING ALL MATERIAL AND EQUIPMENT ASSOCIATED WITH THE ELECTRICAL SYSTEMS. THIS INCLUDES, BUT IS NOT LIMITED TO, CONDUIT, LIGHT FIXTURES, WIRING DEVICES, DISCONNECT SWITCHES, STARTERS, PUBLIC ADDRESS COMPONENTS, FIRE ALARM EQUIPMENT, SECURITY SYSTEM COMPONENTS, MECHANICAL AND PLUMBING EQUIPMENT, AND OTHER POWER UTILIZING EQUIPMENT. REFER TO ALL PLANS FOR EQUIPMENT AND DEVICES BEING BEING DEMOLISHED.

   B. THE DISCONNECTION OF POWER INCLUDES REMOVAL OF WIRES FROM THE CIRCUIT BREAKER IN THE PANELBOARD TO THE POWER UTILIZING EQUIPMENT. DISCONNECTION SHALL ALSO INCLUDE REMOVAL OF CONTROL WIRES TO NEXT DEVICE OR CONTROL PANEL.

   C. MAINTENANCE OF EXISTING SYSTEMS: ALL EXISTING SYSTEMS SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PHASE. PROVIDE MATERIALS AND EQUIPMENT AS REQUIRED TO MAINTAIN EXISTING SYSTEMS; THE INSTALLATION MUST BE IN ACCORDANCE WITH APPLICABLE SPECIFICATION REQUIREMENTS.

   D. THERE MAY BE CIRCUITS AND EQUIPMENT WHICH PASS THRU THE RENOVATED AREA AND SERVE OTHER PORTIONS OF THE BUILDING. THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING AND MAINTAINING THESE CIRCUITS AND EQUIPMENT. IF ANY OF THE CIRCUITS AND EQUIPMENT ARE REMOVED, THE CONTRACTOR SHALL IMMEDIATELY INSTALL NEW CIRCUITS AND EQUIPMENT IN ACCORDANCE WITH SPECIFICATIONS.

   E. THE CONTRACTOR SHALL COORDINATE DEMOLITION OF EXISTING SYSTEMS WITH THE OWNER TO ENSURE THAT EXISTING EQUIPMENT AND CIRCUITING THAT ARE TO REMAIN IN PLACE DURING DEMOLITION ARE NOT REMOVED.

   F. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER TO DETERMINE IF ANY EQUIPMENT SHOULD BE SALVAGED. SALVAGED EQUIPMENT SHALL BE DELIVERED TO THE OWNER'S BUILDING.

   G. CIRCUITS POWERING BOTH "EQUIPMENT TO REMAIN" AND "EQUIPMENT TO BE DEMOLISHED", SHALL BE MODIFIED SO THAT POWER TO "EQUIPMENT TO REMAIN" IS MAINTAINED. REMOVE PORTIONS OF THE CIRCUIT NOT IN USE. UPDATE INSTALLATION TO ENSURE COMPLIANCE WITH APPLICABLE CODES.

3. CONDUIT:

   A. CONDUIT SHALL BE 3/4" MINIMUM, UNLESS INDICATED OTHERWISE.

   B. UTILIZE METAL-CLAD CABLE FOR ALL CONCEALED BRANCH CIRCUIT WIRING.

   C. UTILIZE ELECTRICAL METALLIC TUBING WITH COMPRESSION TYPE FITTINGS FOR ALL EXPOSED WIRING IN THE CORRDIOR. SET SCREW TYPE FITTINGS SHALL NOT BE ACCEPTABLE.

   D. UTILIZE METAL-CLAD CABLE OR ELECTRICAL METALLIC TUBING WITH COMPRESSION TYPE FITTINGS FOR ALL CONCEALED WIRING. SET SCREW TYPE FITTINGS SHALL NOT BE ACCEPTABLE.

   E. FLEXIBLE METAL CONDUIT MAY BE USED FOR THE FOLLOWING:

      a. MOTORS AND VIBRATING EQUIPMENT (3'-0" MAX. LENGTH).
      b. CONNECTIONS TO LIGHTING FIXTURES WITH CONCEALED WIRING (6'-0" MAX LENGTH).
      c. INSTALLATION OF WIRING IN EXISTING WALLS (MAX LENGTH IS LENGTH IN WALL PLUS 3'-0").

      UNLESS SPECIFICALLY NOTED, EXPOSED FLEXIBLE CONDUIT SHALL NOT BE USED FOR LIGHTING FIXTURES. LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT SHALL BE USED IN WET LOCATIONS AND CONNECT TO PUMPS.

   F. ALL WIRING IN PLENUM CEILINGS AND OTHER PLENUM SPACES SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. WIRING METHODS SHALL BE IN EMT OR OTHER APPROVED METALLIC CONDUIT.

   G. IN FINISHED AREAS, ALL WIRING SHALL BE RUN CONCEALED IN WALLS OR ABOVE CEILINGS. IN UNFINISHED AREAS, ALL WIRING SHALL BE RUN EXPOSED. WIRING SHALL NOT BE RUN UNDER THE SLAB OR EMBEDDED IN FLOORS UNLESS SPECIFICALLY INDICATED ON THE DRAWINGS OR IN SPECIAL CONDITIONS WHERE THIS IS THE ONLY OPTION.

4. WIRE AND CABLE:

   A. ALL CONDUCTORS SHALL BE COPPER. ALUMINUM SHALL NOT BE USED.

   B. USE ONLY BUILDING WIRE, DUAL RATED THHN/THWN-2, IN RACEWAY.

   C. PROVIDE GROUND WIRE FOR ALL BRANCH CIRCUITS AND FEEDERS.

   D. ALL WIRING SHALL BE IN CONDUIT.

   E. USE SOLID CONDUCTORS FOR ALL POWER WIRING #10 AWG AND SMALLER; LARGER CONDUCTORS SHALL BE STRANDED. MINIMUM SIZE CONDUCTOR SHALL BE #12 AWG.

   F. COLOR CODING SHALL MATCH BUILDING STANDARDS. IF THERE ARE NO STANDARDS, COLOR CODING FOR 120/208V, 3-PHASE SYSTEMS SHALL BE BLACK, RED, BLUE, WHITE, AND GREEN. COLOR CODING FOR 277/480V SYSTEMS SHALL BE BROWN, ORANGE, YELLOW, WHITE, AND GREEN.

   G. WIRES IN CABLES FOR CONTROL AND COMMUNICATION CIRCUITS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

   H. USE SUITABLE WIRE PULLING LUBRICANT FOR BUILDING WIRE #4 AWG AND LARGER AND AS REQUIRED TO FACILITATE INSTALLATION.

   I. MULTIPLE BRANCH WIRING CIRCUITS MAY BE INSTALLED IN THE SAME RACEWAY AS PERMITTED BY CODE, AND PROVIDED ALL OF THE FOLLOWING CONDITIONS ARE MET:

      a. APPLY NEC DERATING FACTORS AND ADJUST CONDUCTOR SIZES ACCORDINGLY.
      b. MAXIMUM CONDUCTOR SIZE (AFTER DERATING ADJUSTMENT) IS #10 AWG. GROUNDING CONDUCTORS MAY BE LARGER AS SPECIFIED BELOW.
      c. A SINGLE EQUIPMENT GROUNDING CONDUCTOR SHALL BE PERMITTED IN LIEU OF INDIVIDUAL EQUIPMENT GROUNDING CONDUCTORS FOR EACH INDIVIDUAL CIRCUIT.
      d. TO ALLOW FOR FUTURE WIRING, CONDUIT FILL SHALL NOT EXCEED 75% OF THE MAXIMUM NUMBER OF CONDUCTORS ALLOWED BY CODE. (REFER TO NEC CHAPTER 9, TABLES 3A, 3B, AND 3C).

   J. PROVIDE A SEPARATE NEUTRAL CONDUCTOR WITH EACH BRANCH CIRCUIT. MULTIWIRE BRANCH CIRCUITS WITH A SHARED COMMON NEUTRAL SHALL NOT BE UTILIZED UNLESS SPECIFICALLY INDICATED OTHERWISE ON THE DRAWINGS.

   K. ROMEX CABLE (TYPE "NM"), ARMORED CABLE (TYPE "AC"), PVC CONDUIT, AND ELECTRICAL NONMETALLIC TUBING SHALL NOT BE PERMITTED UNDER ANY CIRCUMSTANCE.

5. BOXES:

   A. INTERIOR OUTLET BOXES SHALL BE ONE PIECE DEEP DRAWN GALVANIZED STEEL. ACCESSORIES AS REQUIRED.

   B. WEATHERPROOF OUTLET BOXES SHALL BE CORROSION RESISTANT, CAST-METAL WEATHERPROOF BOXES WITH FEATURES AS REQUIRED TO SUIT APPLICATION.

   C. JUNCTION AND PULL BOXES SHALL BE GALVANIZED SHEET STEEL WITH SCREW ON COVERS. TYPE, SIZE, AND SHAPE TO SUIT APPLICATION. BOXES FOR OUTDOOR APPLICATIONS SHALL BE GALVANIZED AFTER FABRICATION.

   D. DRY INDOOR LOCATIONS – NEMA 1. DAMP OR WET INDOOR LOCATIONS AND EXTERIOR LOCATIONS – NEMA 3R.

6. WIRING DEVICES:

   A. WALL SWITCHES SHALL BE THE PRODUCT OF HUBBELL, BRYANT, OR ARROWHART. THE SWITCHES SHALL BE HEAVY DUTY SPECIFICATION GRADE, GENERAL USE QUIET TOGGLE SWITCH. SWITCH SHALL BE RATED 20 AMPS, 120-277 VAC. WALL SWITCHES SHALL BE EQUAL TO HUBBELL 1221. COORDINATE COLOR WITH ARCHITECT.

   B. RECEPTACLES SHALL BE MANUFACTURED BY HUBBELL, PASS & SEYMOUR, OR COOPER. THE RECEPTACLES SHALL BE HEAVY DUTY, SPECIFICATION GRADE, GENERAL USE RECEPTACLES. RECEPTACLES SHALL BE NEMA TYPE 5-20R. COORDINATE COLOR WITH ARCHITECT. RECEPTACLES SHALL BE EQUAL TO HUBBELL 5362. GFCI RECEPTACLES SHALL BE SPECIFICATION GRADE, FEED THROUGH FEATURE, SOLID STATE GROUND FAULT SENSING WITH 5 MA AMP TRIP AND UL LISTED 943 CLASS A. GFCI TYPE RECEPTACLES SHALL BE EQUAL TO HUBBELL GFR8300.

   C. OUTDOOR WEATHERPROOF RECEPTACLES: SHALL CONSIST OF A DUPLEX RECEPTACLE GFCI, MOUNTED IN BOX WITH A GASKETED, WEATHERPROOF COVER PLATE. THE WEATHERPROOF INTEGRITY SHALL NOT BE AFFECTED WHEN HEAVY DUTY SPECIFICATION OR HOSPITAL GRADE ATTACHMENT PLUG CAPS ARE INSERTED. COVERS SHALL UTILIZE A WEATHERPROOF WHEN-IN-USE COVER. COVER SHALL BE CAST METAL TAYMAC MX3200 OR EQUAL BY INTERMATIC OR THOMAS & BETTS.

   D. LIGHTING CONTROL SHALL BE WATTSTOPPER DLM OR EQUIVALENT. REFER TO DETAILS ON DRAWINGS.

   E. MANUAL MOTOR SWITCH: MANUAL SINGLE-PHASE STARTERS LESS THAN A 1 HP SHALL BE NEMA ICS 2, AC GENERAL-PURPOSE, CLASS A WITH A QUICK-MAKE/QUICK-BREAK TOGGLE MECHANISM WITH OVERLOAD PROTECTION. THE OVERLOAD SHALL HAVE A FIELD ADJUSTMENT ALLOWING UP TO +/- 10% VARIANCE IN RATINGS OF THE NOMINAL HEATER VALUE. STARTERS SHALL BE EQUIPPED WITH 1 OR 2 POLES AND 2-SPEED CONTROL AS REQUIRED. STARTER SHALL BE EQUIPPED WITH RED PILOT LIGHT AND [[NO] [NC] AUXILIARY CONTACT.] UNIT SHALL BE OF THE SURFACE MOUNTED TYPE IN EQUIPMENT ROOMS (UNFINISHED AREAS) AND FLUSH MOUNTED IN FINISHED AREAS. STARTERS IN UNFINISHED SPACES SHALL BE EQUIPPED WITH HANDLE GUARD/LOCK-OFF. THE ENCLOSURE SHALL BE GENERAL PURPOSE NEMA OR GENERAL PURPOSE NEMA 1B – FLUSH MOUNTED. STARTERS SHALL BE EQUIVALENT TO SQUARE D CLASS 2510.

   F. WALL PLATES: SINGLE OR COMBINATION TYPES THAT MATE AND MATCH WITH CORRESPONDING WIRING DEVICES. MATCH BUILDING STANDARD.

7. ELECTRICAL IDENTIFICATION:

   A. ENGRAVED PLASTIC LAMINATE LABELS SHALL BE ENGRAVING STOCK MELAMINE PLASTIC LAMINATE, 1/16" MIN. THICKNESS. ENGRAVE LEGEND IN WHITE LETTERS ON BLACK FACE. MECHANICALLY SECURE TO EQUIPMENT WITH SELF TAPPING STAINLESS STEEL SCREWS. PROVIDE LABELS FOR THE FOLLOWING EQUIPMENT:

      a. PANELBOARDS – INDICATE PANEL DESIGNATION, VOLTAGE, PHASE, WIRES AND AMPS.
      b. SAFETY SWITCHES – INDICATE EQUIPMENT SERVICED, PANEL AND CIRCUIT # ON INSIDE COVER FUSE SIZE.
      c. TRANSFORMER – INDICATE DESIGNATION, PANEL SERVED, AND FEEDER CIRCUIT NO.

   B. ALL RECEPTACLES SHALL BE IDENTIFIED AS TO PANEL AND CIRCUIT NO.; THIS INFORMATION SHALL BE PROVIDED WITH A TAPE TYPE LABEL ON EACH COVER PLATE OR WIREMOLD.

8. GROUNDING:

   A. PROVIDE GROUNDING IN ACCORDANCE WITH THE NEC. INSULATED GROUNDING CONDUCTORS SHALL BE INSTALLED WITH ALL CIRCUITS. INSTALL METALLIC RACEWAYS SO THAT A CONTINUOUS GROUNDING PATH IS MAINTAINED. THIS INCLUDES THE USE OF BONDING JUMPERS ETC. WHERE REQUIRED FOR FLEXIBLE CONDUIT, LOOSELY JOINTED RACEWAYS, ETC THE INSULATED GROUNDING CONDUCTOR REQUIRED ABOVE SHALL NOT BE CONSIDERED PART OF THIS PATH.

9. POWER DISTRIBUTION EQUIPMENT:

   A. MANUFACTURERS: MATCH EXISTING

      a. SQUARE D.
      b. EATON.
      c. SIEMENS.

   B. PANELBOARDS:

      a. PROVIDE ALL EXISTING BRANCH PANELBOARDS WITH ACCURATE AND DESCRIPTIVE UPDATED TYPEWRITTEN CIRCUIT DIRECTORIES. DIRECTORIES SHALL INCLUDE ALL MODIFICATIONS AS PART OF THIS PROJECT AS WELL AS PREVIOUS "PENCILED IN" CHANGES AND INFORMATION. ACTUAL TRACING AND IDENTIFICATION OF EXISTING CIRCUITS NOT PART OF THE RENOVATION IS NOT REQUIRED.
      b. THE INFORMATION SHOWN ON THE PANELBOARD SCHEDULES IS BASED ON THE CIRCUIT DIRECTORIES. THE CONTRACTOR SHALL FIELD VERIFY CIRCUIT BREAKER USAGE. ANY BREAKERS MADE SPARE DURING DEMOLITION MAY BE REUSED FOR FINAL INSTALLATION.
      c. WHERE NEW CIRCUIT BREAKERS ARE PROVIDED IN EXISTING BRANCH OR DISTRIBUTION PANELBOARDS, CIRCUIT BREAKERS SHALL MATCH OR BE COMPATIBLE WITH EXISTING CIRCUIT BREAKERS. SHORT CIRCUIT INTERRUPTING RATINGS SHALL BE EQUAL TO OR GREATER THAN THE HIGHEST RATED EXISTING BRANCH CIRCUIT BREAKER IN THE PANEL. CIRCUIT BREAKER TYPES INDICATED ON THE DRAWINGS (WHERE APPLICABLE) ARE AS A GUIDE FOR PRICING ONLY. FIELD VERIFY EXACT TYPE AND ALL REQUIREMENTS PRIOR TO RELEASING EQUIPMENT.

   C. ENCLOSED SWITCHES:

      a. ALL SAFETY SWITCHES SHALL BE OF THE HEAVY DUTY TYPE, ALL LUGS SHALL BE COPPER ONLY. ENCLOSURES SHALL BE SUITABLE FOR APPLICATION – NEMA 1 INTERIOR AND NEMA 3R EXTERIOR.

   D. GENERAL: ALL LUGS, BUS BARS, WINDINGS, AND CONDUCTORS OF ALL ELECTRICAL EQUIPMENT SHALL BE COPPER, CU/AL DUAL RATED LUGS SHALL NOT BE ACCEPTABLE, EXCEPT WHERE FACTORY INSTALLED LUGS ARE PROVIDED WITH EQUIPMENT AND WHERE COPPER-ONLY LUGS, OR DRILLED PADS TO ACCEPT COMPRESSION OR OTHER FIELD INSTALLED LUGS, ARE NOT OPTIONS LISTED IN MANUFACTURER'S STANDARD CATALOGS. WHERE LUGS ARE CAPABLE OF BEING REMOVED/REPLACED IN THE FIELD, THE E.C. SHALL REMOVE THE FACTORY LUGS AND PROVIDE NEW SUITABLE FIELD INSTALLED COPPER-ONLY LUGS (EXCEPT WHERE REMOVAL AND REPLACEMENT OF LUGS WOULD VIOLATE UL LISTING OR MANUFACTURER'S WARRANTY).

10. LIGHTING SYSTEM:

   A. LIGHTING FIXTURES SHALL BE AS SPECIFIED IN THE SCHEDULE. THE FIRST LISTED MANUFACTURER IS THE BASIS OF DESIGN. ALL LIGHTING CALCULATIONS WERE PERFORMED USING THE BASIS OF DESIGN MANUFACTURER. IF AN ALTERNATE LIGHT FIXTURE IS SELECTED, PROVIDE LIGHTING CALCULATIONS FOR ENGINEER REVIEW WITH LIGHT FIXTURE SHOP DRAWINGS.

   B. ALL DRIVERS SHALL BE SOLID STATE ELECTRONIC ENERGY SAVINGS TYPE AS FOLLOWS:
      a. MINIMUM POWER FACTOR: 0.90.
      b. MAXIMUM TOTAL HARMONIC DISTORTION (THD): 10%
      c. RATING: UL-P, "A" SOUND RATED.
      d. DRIVERS SHALL TOLERATE OPERATION IN AMBIENT TEMPERATURES UP TO 105 F (40 C) WITHOUT DAMAGE.

   C. EMERGENCY FLUORESCENT POWER SUPPLY UNIT
      a. SELF-CONTAINED, MODULAR, BATTERY-INVERTER UNIT FACTORY MOUNTED WITHIN FIXTURE BODY. COMPLY WITH UL 924.
      b. TEST SWITCH AND LIGHT-EMITTING DIODE INDICATOR LIGHT: VISIBLE AND ACCESSIBLE WITHOUT OPENING FIXTURE OR ENTERING CEILING SPACE.
      c. BATTERY: SEALED, MAINTENANCE-FREE, NICKEL-CADMIUM TYPE WITH 10-YEAR NOMINAL LIFE.
      d. CHARGER: FULLY AUTOMATIC, SOLID-STATE, CONSTANT-CURRENT TYPE.
      e. OPERATION: RELAY AUTOMATICALLY ENERGIZES LAMP FROM UNIT WHEN NORMAL SUPPLY CIRCUIT VOLTAGE DROPS TO 80 PERCENT OF NOMINAL VOLTAGE OR BELOW. WHEN NORMAL VOLTAGE IS RESTORED, RELAY DISCONNECTS LAMP, AND BATTERY IS AUTOMATICALLY RECHARGED AND FLOATED ON CHARGER.
      f. HOUSING (EXTERNAL TYPE): NEMA 250, CLASS 1 ENCLOSURE.

11. FIRE ALARM SYSTEMS:

   A. GENERAL

      a. PROVIDE THE SERVICES OF A QUALIFIED MANUFACTURER'S TECHNICAL REPRESENTATIVE, EXPERIENCED IN THE INSTALLATION AND OPERATION OF THE TYPE OF SYSTEM BEING PROVIDED. MANUFACTURER'S REPRESENTATIVE SHALL SUPERVISE ALL TESTING, ADJUSTMENTS TO THE SYSTEM AND SHALL PROVIDE INSTALLATION ASSISTANCE TO THE CONTRACTOR'S PERSONNEL AS NEEDED.
      b. FIRE ALARM WIRING SHALL BE INSTALLED IN CONDUIT.
      c. AT NO TIME SHALL THE EXISTING FIRE ALARM SYSTEM BE PUT OUT OF SERVICE WITHOUT NOTIFYING THE UNIVERSITY AND THE INSURANCE UNDERWRITER. THE CONTRACTOR SHALL MAKE EVERY ATTEMPT TO KEEP THE SYSTEM IN OPERATION. THE CONTRACTOR SHALL MAINTAIN A FIREWATCH WHEN THE EXISTING SYSTEM HAS BEEN SHUT DOWN.
      d. THE CONTRACTOR SHALL TRAIN THE APPROPRIATE EMPLOYEES.
      e. TESTING OF THE FIRE ALARM SYSTEM SHALL MEET THE REQUIREMENTS SET FORTH ON NFPA 72 AND OWNER REQUIREMENTS.
      f. EACH PORTION OF THE FIRE ALARM SYSTEM SHALL BE TESTED PRIOR TO BEING PLACED INTO SERVICE.
      g. AT THE CONCLUSION OF THE WORK AND PRIOR TO FINAL PAYMENT, A COMPLETE ACCEPTANCE TEST SHALL BE CONDUCTED.
      h. ALL TEST RESULTS SHALL BE RECORDED ON SUITABLE FORMS. SIX CERTIFIED COPIES OF ALL TESTS SHALL BE FILED WITH ENGINEER.

   B. PRODUCTS

      a. ALL NEW EQUIPMENT SHALL BE UL TESTED AND COMPATIBLE WITH THE EXISTING FIRE ALARM CONTROL PANEL.
      b. PROVIDE SECONDARY DC POWER SUPPLY FOR OPERATION OF SYSTEM IN THE EVENT OF FAILURE OF THE AC SUPPLY. TRANSFER FROM NORMAL TO EMERGENCY POWER OR RESTORATION FROM EMERGENCY TO NORMAL POWER SHALL BE FULLY AUTOMATIC AND SHALL NOT CAUSE TRANSMISSION OF A FALSE ALARM.
      c. PROVIDE SUFFICIENT BATTERY CAPACITY TO OPERATE THE ENTIRE SYSTEM UPON LOSS OF NORMAL POWER FOR A PERIOD OF 24 HOURS WITH 10 MINUTES OF ALARM OPERATION AT THE END OF THIS PERIOD. ALL BATTERY CHARGING AND RECHARGING OPERATIONS SHALL BE AUTOMATIC.

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Project:

KOSHLAND INTEGRATED NATURAL SCIENCE CENTER (KINSC) - COMPUTER SCIENCE LABORATORY

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SPECIFICATIONS

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