Scope of Work
Version 4 Prototypical Layout
Refrigeration, HVAC and EMS

Revised: January 1, 2014

You will find attached a revised document explaining the scope of work required to install the refrigeration, HVAC and EMS equipment supplied to Aldi, Inc for new store construction. This document contains all revisions from the January 1, 2012 document for Version 3 stores and includes specific references for the Version 4.0 floorplan. Summarizing some of the major changes:

- Additional multi-deck cases (medium temp) to be installed.
- Smaller grocery freezer complex.
- Horizontal Protocol cabinet with factory mounted receiver.
- 6-fan micro channel condenser (roof top)
- R407a has been approved for usage.
- Electronic EPR's to be factory supplied for field installation.

In addition to these equipment changes, your refrigeration contractor should be aware of the following control strategy changes:

- Split condenser control for the 6-fan micro channel. Includes two stages of coil surface reduction. An addendum has been added to the back of this document that provides detail on the operation and programming for this new strategy.
- Analog temperature sensors have been mounted on the electric defrost evaporator coils to terminate defrost.
- **(NEW) Special piping requirements for stores using hot air heat reclaim with CES units.**

If you have any questions about the content of this package please call one of the following individuals:

Hussmann – Mason Laster @ 630-343-1035.
Emerson – Art Guzowski @ 734-475-1148
CES – Marty Robbins @ 866-706-2647

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Scope of Work – Refrigeration Equipment

This document is not intended to serve as an architectural guide nor construction drawing for pulling permits. It is intended to provide guidelines on the equipment provided for an Aldi prototypical store.

The refrigeration equipment supplied for this project is based on the Hussmann Protocol Refrigeration System. Installing contractor should refer to the PROTOCOL PLANNING DATA MANUAL (posted to APDProjects website) for guidelines on how to implement the "loop piping" system required by Protocol. To further assist, you can consult your local Aldi representative to obtain the following documents that are also posted to the APDProjects website:

- Technical data sheets for the multi-deck cases
- Technical data sheets for the walk-in coils
- Technical data sheets for the roof top Micro Channel condenser
- Piping diagrams for a Version 4 prototypical store
- Refrigeration legends for the Protocol system

The refrigeration contractor is also asked to pay particular attention to the piping requirements as outlined in this document. These requirements are provided to insure that you as the contractor apply industry accepted "best practices" during the installation of the equipment. Contractor should take note that this list IS NOT EXHAUSTIVE and you are encouraged to provide Aldi a leak-tight system and one that is mindful of future serviceability.

REFRIGERATION CONTRACTOR

The following is an itemized list of those items that should be completed by the refrigeration contractor:

Compressors and multi-deck cases:

- Receive, unload and install (1) Protocol parallel compressor system. Protocol to be located in back-store room area. See store drawing for exact location.
- Receive, unload and install rooftop condenser. Micro-channel model MXF-06K. Roof curbs will typically be the responsibility of the general contractor or roofing contractor, unless otherwise noted. See store drawings for exact location.
- Receive, unload and install the Hussmann multi-deck display cases (model C5XEP for meat and D5XULEP for deli). Typical length of lineup is 44'; 28 allocated to deli and 16' allocated for meat. The applicable length of each case will either be 8' or 12'.
- Receive, unload and install Variable Frequency Drive (VFD) from Control Techniques to be mounted on the roof top condenser. A mounting plate for the VFD is provided on the micro channel.

Walk-in cooler and freezers:

- Receive, unload and install insulated wall panels for the freezer complex and dairy cooler. See table below for approximate sizes. Note that grocery and ice cream freezer share a common wall.
    - All ceiling and wall penetrations must be fully caulked and filled with urethane foam. This includes any sprinkler head penetrations. Please note that in the instance of the freezer penetrations, sprinkler line should have insulation extending 12" above top of ceiling roof panel.
    - All panels must be fully caulked and sealed to the floor.
    - Panels to be caulked at all seam and/or joints using BUTYL RUBBER. See Crown supplied installation instructions for further details.
    - For the grocery freezer complex: one row of ceiling supports installed to the top of bar joist. Typically, the quantity of supports is 17 for a 64' complex and 15 supports for a 59' complex. These quantities based on utilization of the steel support system along the front side of the box.
    - For the dairy cooler: one row of ceiling supports installed to the top of bar joist. Typically, 10 hangers for a standard 41'-6" box. These quantities based on utilization of the steel support system along the front side of the box.
    - Header support brackets must be installed before Anthony glass door can be installed. Header must be straight and plumb to accept Anthony glass doors. Do not over tighten glass doorframes.
- Receive, unload and install jar lights for each of the walk-ins as noted below in the table.
- Receive, unload and install evaporator coils for the insulated rooms previously mentioned. See table below for coil models.
- Receive, unload and install swing doors for the freezer complex and dairy cooler. See table below for approximate number of doors.
    - Frames to be caulked inside and outside.
    - Door swings vary per store. Confirm with owner's representative.
    - Doorframe alignment per owner.
    - Note that the milk doors to be installed in the dairy cooler have an "L" shaped bracket that must be installed from 2"x 6" to floor. These are supplied by the cooler manufacturer.
    - Do not leave door lights "on" until refrigeration is running.
- For the dairy cooler, four milk rails 2"x 10-1/2"x 60" should be installed to cooler floor per milk cart size. These are to be installed 28" apart, 14" right and left of the center of the milk door. Two 2"x 6" x60" milk rails to be installed on each end of the milk door.
- Milk rails must be caulked with clear silicone to floor on all sides.
- Install strip curtains on the blocking of the entry doors to the grocery freezer (outer compartment) and the dairy cooler. Strip curtains to be installed on inside of entrance doors below vent.
- Receive, unload and install the pallet doors for the grocery freezer and dairy cooler. Please note that in some instances, the freezer and dairy cooler doors may be a slider model rather than a swing door. In the instance of the slider door, the

refrigeration contractor will be responsible for installing the header assembly and slider door.

Description	Grocery Freezer	Ice Cream Freezer	Meat Holding Box	Dairy Cooler
Size	30x19x10	16x17x10	Various Sizes	22x 50-8"x10
Coils (Heatcraft)	2) BML-250	1) BML-330	WKE-100	2) BMA365
Coils (Hussmann)	2) MV24E-256	1) MK34E-315	GL24D-070	2) MK36A-354
Doors (Anthony)	11) Model ELM2 LT	6) Model ELM2 LT	None	11) Model ELM2 NT 4) Model EL23
Overhead Lights (a.k.a. Jelly Jars)	3) Back stock	1) Back stock	1) Back Stock	3) Back stock
Strip Curtains	1	1	1	1

INSTALLATION NOTE

Contractor should ALWAYS follow the Crown/Tonka Installation Manual for instructions and details on construction of the walk-in boxes.

Refrigeration Piping:

- The Protocol system comes with a factory mounted receiver. Contractor will receive the following shipped loose parts for installation to the exterior of the Protocol:
  - two suction filters
  - one liquid line drier
  - One A8 holdback valve and one ORD-4-20 receiver pressurization valve.

  Some municipalities require that the receiver be located outside at the condenser. In those instances, A8 (ORI) and ORD will be factory installed at the condenser.
- **In addition to the aforementioned items contractor will also receive the following valves shipped loose with the Protocol system. Contractor to refer to refrigeration legend for proper circuit allocation (NOTE: the following valves are specified for the V4 prototype. Variations in walk-in cooler/freezer boxes may require different CDS valves):**
  - **One Sporlan CDS-9 Valve (Ice Cream)**
  - **Five Sporlan CDS-7 Valves**
  - **One 3/8" Liquid Solenoid Valve (Meat Holding Box)**
- The Micro Channel condenser is equipped with a winter control valve to reduce coil surface during cold months. The control wiring for the fan motors (variable speed) and the winter control valve is identified in the drawings posted to the "APDProjects" site.

- Furnish and install interconnecting refrigeration piping. NOTE: The Protocol refrigeration systems is based on a loop piping system with common liquid and suction lines from the Protocol to the cases and coils and then back to the Protocol.
    - No refrigeration lines to be installed on store partition walls.
    - Lines running through bar joists should be protected using a refrigeration saddle.
- **For stores utilizing hot air heat reclaim coils inside the CES AON unit; contractor to provide two check valves (one with a 10 or 20 lb. spring), one regulator valve (type A8) and one heat reclaim valve (type 12D). Contractor to pipe these components as called out in the Refrigeration Drawings dated 12/05/13.**
- Evaporator coils for walk-in coolers and freezer will be shipped from manufacturer with factory mounted expansion valves.
- Furnish and install all necessary hangers for overhead piping runs. Attached to this document is an appendix with piping details for best practices that contractor should follow.
- Furnish refrigerant (R407a) for proper system charge. Contractor is requested to supply 275 pounds of refrigerant for a Micro Channel application. In Northern Climates where heat reclaim is needed, additional refrigerant will be needed. Should contractor feel that additional refrigerant is needed; contractor to consult local Aldi Real Estate director.
- Furnish and install isolation ball valves for each refrigeration circuit. This will require two ball valves per circuit: one for the liquid line and one for the suction line. In the instance of the grocery freezer, contractor to supply (4) ball valves. Two for each of the two evaporator coils.
- Contractor to supply and install armaflex type insulation for refrigeration lines. All low temperature liquid lines to have a minimum of ½" insulation due to the sub cooling that takes place in the Protocol. Suction line insulation should follow these guidelines: 1" wall thickness to be used on freezer (low temp circuits); ¾" wall thickness on the medium temp circuits.
- All insulation applied to piping corners should be mitered and glued together. When installing insulation contractor should terminate at any valve fitting.
- Pitch pockets and roof penetrations will be done per Aldi specification. Refrigerant lines and conduit to be run through 24 gauge galvanized sheet metal pipe sleeve provided by roofing contractor. All lines should slope down (away) when leaving, or existing sleeve. Seal lines existing sleeve with spray urethane foam. Be sure to secure cap when work is complete.
- Furnish and install display case and unit cooler condensate drain piping. Note that ice cream freezer and grocery freezer box will require that condensate lines be installed with heated tape to prevent freezing.
    - Condensate lines for evaporator coils in walk-in coolers and freezers to be run in copper, each compartment to be trapped independently, preferably outside the box. Once the condensate line is outside the walk-in cooler/freezer box, contractor can transition copper to PVC.
    - Condensate lines should have a union at each evaporator coil.

    - Medium temp drain lines to be not less than 5’ from floor.
    - All low temperature condensate lines should have 1” wall insulation over heat tape.
- Hard hats are required to be worn at all times during construction of project.
- Clean boxes – dust, fingerprints, caulking on cooler and freezer when installed. Commercial gloves to be worn for box installation.
- System must be pressurized to 250 PSI (recommended) with dry nitrogen gas and held for 24 hours before final evacuation. Make sure all transducers access valves are close prior to pressurizing and pulling vacuum on the system,
- Refrigeration Contractor to pull a vacuum on system prior to system charge to insure a leak-free system. Vacuum should be pulled to 500 microns or lower and held for 24 hours.
- Contractor to furnish oil for compressors and system lubrication. Factory recommends Mobil Arctic 32 or equivalent.
- Start-up and adjust equipment. This Includes superheat adjustment for all expansion valves (cases and coils) and proper settings for winter control valves at condenser and the A8/OROA valves at the Protocol.
- All licenses, permits and inspection will be the responsibility of the refrigeration contractor.
- Refrigeration contractor to furnish 90-day service labor.

Electrical Considerations:

- Power to the Protocol system to be based on the MCA and MOPD values contained within the Buss bar Layout sheet that is attached to this document. A disconnect switch will be provided by the GC. It will be mounted next to the Protocol and wired (by the house electrician) back to the main electrical panel. Refrigeration contractor to provide electrical connection between disconnect and Protocol. NOTE: electrical connection to the Protocol should be a parallel (or dual) conductor feed so that minimum bending requirements inside the Protocol disconnect box are not exceeded.
- Power for the roof top condenser will be fed out of the Protocol system. Contractor is to furnish and install the interconnecting wires and conduit between the Protocol and roof-top condenser. Interconnecting wires to be defined as:
    - Main power feed to condenser as provided for by circuit breaker amounted on Protocol power distribution sheet: 45 Amps at 208-230/3/60.
    - Three phase power will be required from the L4, L5 and L6 terminals of the micro channel control panel to the corresponding lugs in the VFD. Returning power from the VFD (U1, V1 and W1) should be brought back to the micro channel and landed on lugs L7, L8 and L9.
    - Furnish and install control wiring between Protocol control panel (CPC multiflex boards) and appropriate terminals in the micro channel control panel (see Wiring Diagram for details).
    - Furnish and install control wiring between Protocol control panel (CPC multiflex board) and VFD control panel (see Wiring diagram for details).
    - Install and wire (1) shipped loose sensor (supplied with Protocol) at the roof top condenser (micro channel) and terminated on I/O board inside Protocol control panel. This will serve as the ambient temperature sensor for both refrigeration and EMS needs.
    - Furnish and install communication cable from E2E controller (Protocol control panel) to Network Interface Card/Ethernet port in VFD control panel (see Control Techniques I/O manual for details).

ELECTRICAL NOTE: VARIABLE FREQUENCY DRIVE

Installing contractor should refer to Control Techniques installation manual for proper grounding requirements needed for the variable speed application. Failure to follow proper grounding techniques will result in electrical magnetic interference to affect the overall system performance and possible system failure.

- Furnish and install the necessary control wires for the defrost termination analog temperature sensors located inside the evaporator coils; connected back to the Protocol control panel. The equipment manufacturer will supply temperature sensors.

- Furnish and install the necessary control wires for the EEPR's.
- Furnish and install the necessary interconnecting wires between the Protocol system and temperature sensors mounted in the display cases. Shipped loose sensors will accompany the Protocol system and contractor should mount these at each of the evaporator coils inside the walkins. You will need to refer to the attached diagram labeled as "CPC Board Assignments" to identify where the sensors are to be landed. The CPC input boards are located inside the Protocol control panel.
- Furnish and install the necessary interconnecting wires and conduit between the Protocol system and the attached requirement loads. These items will be identified as the following and labeled on the attached Protocol Distribution Panel Schedule along with voltage and amperages of the connected loads:

Refrigeration Load	Lights	Fans	Defrost Htrs	PMAC Frame Htrs	Heat Tape Condensate	Pallet Door Heater
Ice Cream Frz		Yes	Yes	Yes	Yes	
Grocery Frz		Yes	Yes	Yes	Yes	Yes
Dairy Cooler		Yes		Yes		
Meat Holding Box		Yes	Yes		Yes	Yes
Multi-Deck (Deli)	Yes	Yes				
Multi-Deck (Meat)	Yes	Yes				

NOTE: The Anthony Eliminator doors have a factory-applied, anti-fog coating. Door heaters on the Eliminator doors are to remain disconnected at the door unless contractor has specific direction from the Aldi Real Estate Director to make these connections.

- Furnish and install all necessary interconnecting wires and conduit for the luminaries located inside the walk-in boxes (ice cream, grocery freezer, dairy cooler and meat holding box). GC's electrician will provide power to a junction box located at each walk-in. Refrigeration contractor should verify location of this junction box with GC electrician.

ELECTRICAL NOTE: HEAT TAPE

Certain municipalities require that a GFI outlet be installed for the condensate line heat tape. Contractor should consult local code agency to determine if the GFI outlet can be installed outside the walk-in box.

The installation method will safeguard against moisture inadvertently tripping the GFI, which can lead to condensate lines freezing and ultimately breaking.

Scope of Work – Energy Management System

All sensor and panels will be provided as part of the Integrated Powerwall/EMS package by CD Controls. The following scope of work implies that contractor will mount sensors and wire them back to the CPC I/O boards located in the Powerwall system. Contractor should refer to the corresponding CPC EMS drawing set for exact location of sensors and cable requirements (reference APD Architects website).

The scope of work presented below is based on EMS package EME4.2, commonly referred to as a CES HVAC system with hot gas heat reclaim and a single Lennox unit for the office space. Contractor should also understand that there are at least three other EMS packages used by ALDI across the country:

EM5.1 CES (with E2 Controller) and (1) RTU
EM5.2 CES (with E2 Controller) and (2) RTU's

List of items to be supplied by equipment supplier:

EM4.2 material

Department	***Qty***	**Part #**	**Description**
Facility Status Display	1	850-5100	E2E Alarm Panel.
Alarm Device	1	851-0352	Alarm enunciator, indicator, horn & override switch.
Temperature Sensor	3	809-6590	Temperature Sensor in Wall Mount enclosure
	2	201-2112	12-inch temperature probe for duct
Humidity Sensors	1	203-5751	Relative Humidity sensor
	1	203-5754	Outdoor relative humidity transmitter
General Sensors	3	118-4102	General purpose door switch
	1	206-0002	Light level sensor
Anti-Cond Controller	3	851-1021	20 amp Single Channel PMAC

EM4.0 material

Department	***Qty***	**Part #**	**Description**
Facility Status Display	1	850-5100	E2E Alarm Panel.
Alarm Device	1	851-0352	Alarm enunciator, indicator, horn & override switch.
Temperature Sensor	4	809-6590	Temperature Sensor in Wall Mount enclosure
	3	201-2112	12-inch temperature probe for duct
Humidity Sensors	1	203-5751	Relative Humidity Sensor
	1	203-5754	Outdoor relative humidity transmitter
General Sensors	3	118-4102	General purpose door switch
	1	206-0002	Light level sensor
Anti-Cond Controller	3	851-1021	20 amp Single Channel PMAC

EM4.1 material

Department	*Qty*	Part #	Description
Facility Status Display	1	850-5100	E2E Alarm Panel.
Alarm Device	1	851-0352	Alarm enunciator, indicator, horn & override switch.
Temperature Sensor	3	809-6590	Temperature Sensor in Wall Mount enclosure
	2	201-2112	12-inch temperature probe for duct
Humidity Sensors	1	203-5751	Relative Humidity Sensor
	1	203-5754	Outdoor relative humidity transmitter
General Sensors	3	118-4102	General purpose door switch
	1	206-0002	Light level sensor
	1	501-1121	Outside temperature sensor
	1	303-1111	Outside temperature sensor shield
	2	510-2001	CO2 Wall mount sensor
Anti-Cond Controller	3	851-1021	20 amp Single Channel PMAC

EM4.4 material

Department	*Qty*	Part #	Description
Facility Status Display	1	850-5100	E2E Alarm Panel.
Alarm Device	1	851-0352	Alarm enunciator, indicator, horn & override switch.
Temperature Sensor	4	809-6590	Temperature Sensor in Wall Mount enclosure
	3	201-2112	12-inch temperature probe for duct
Humidity/Dew Point Sensor	1	203-5751	Relative Humidity Sensor
	1	203-5754	Outdoor relative humidity transmitter
General Sensors	3	118-4102	General purpose door switch
	1	206-0002	Light level sensor
Anti-Cond Controller	3	851-1021	20 amp Single Channel PMAC

Scope of work:

- Contractor to supply shielded cable to connect all sensor and I/O panels together as outlined below in the detailed scope of work. Contractor should refer to CPC EMS drawing for exact specifications on cable to be used.
- Install I/O Net communication wire between CD Control panel and CX-400 controller located in Protocol system.
- Refrigeration contractor to install control wiring between CD Control panel and RTU's, gas fired unit heaters and alarm enunciator panel.
- Install (1) alarm panels, which include enunciator, alarm light indicator and horn with override switch, to be located in the receiving dock area.
- Install and wire (1) space temperature sensor in back stock area for each gas unit heater. (When used in northern climates).
- Programming for the gas fired unit heaters is not included in the base program provided in the Protocol E2E controller. Refer to supplemental document ALDI V4.0

EMR Unit heater programming instructions to add the required programming for the unit heaters. (When used in northern climates).

- Install and wire supply air temperature sensors. Locate in supply duct for the CES RTU and one in the supply duct for each additional RTU.
- Install and wire (3) space sensors: one in sales floor, one in the break room and one in the office area. (Install others as required for additional RTU's in southern climates)
- Install and wire (1) light level sensor on CES unit (locate facing north). Wire to CES board.
- Install and wire (1) wall mount indoor relative humidity sensor. Wire to CES board located on unit.
- Install and wire (1) outdoor relative humidity sensor (locate on CES unit, wire to CES board).
- Install and wire (3) door switches for the walk-in cooler and freezer boxes (grocery freezer main pallet door; dairy cooler pallet door and meat holding box pallet door). Contractor to use ½" thin wall conduit to protect the control wiring.
- Install and wire (1) 20-amp PMAC devices for grocery freezer doors.
- Install and wire (1) 20-amp PMAC device for ice cream doors.
- Install and wire (1) 20-amp PMAC device for dairy cooler doors.
- Install and wire control wiring for RTU-2 Refer to supplemental document ALDI V4.0 EMR RTU Control Wiring Requirements to determine the control wiring requirements for variations of Lennox models. (Install control wiring for additional RTU's as required when used in southern climates)
- Install Facility Status Display (FSD) in manager's office (power to be provided by G.C. electrical contractor).
- Install Cat-5 wire from FSD to Ethernet Hub (located in CD Control panel).

- Install Cat-5 wire from CES E2E Controller to Ethernet Hub (located in CD controls panel).
- Confirm E2E on Protocol is set at default settings of IP: 2.2.2.2, E2E on CES is set at default setting of IP: 2.2.2.4; subnet 255.255.255.0.
- Configure FSD addresses on-site as follows: FSD IP: 2.2.2.3 (refer to supplemental document ALDI V4.0 EMR E2E and FSD IP Address Programming Instructions).
- Coordinate with Security Company for wiring to CPC board (CD Control panel) for refrigeration alarm per board, 5.6.
- Test & commission for local alarming and remote contact closure with Security Company.
- Test supervisory alarm by removing power to board and confirm alarm with security provider.
- Run an 18-4 control wire from the alarm panel in the front office to the CD Controls Power wall panel.
    - 2 of the wires should be labeled as *stocking lights* and wired between relay #1 in the security alarm panel and input board point 4.6 labeled *Enable Stocking Lights.* The input point should receive a closed signal when the

alarm system is disabled in the morning and receive an open signal when the alarm system is enabled at night.
    - 2 of the wires should be labeled as *burglar alarm* and wired between relay #2 in the security alarm panel and input board point 4.16 labeled *All Lights On*. The input point should receive a closed signal when the burglar alarm has been activated and is sounding an alarm and receive an open signal at all other times.
- Provide and install standard flat phone cable between the modem (located inside the CX-400 controller) and telephone line #3. Contact CPC Technical Support Group at 800-829-2724 to commission modem, insure proper operation of modem and to backup all settings and finished program.
- Refer to supplemental documents for additional information, included as separate attachments in bid set. Supplemental documents include:
    1. ALDI V4.0 EMR VFD start-up procedure
    2. ALDI V4.0 EMR E2E and FSD IP Address Programming Instructions
    3. ALDI V4.0 EMR RTU Control Wiring Requirements
    4. ALDI V4.0 EMR Unit heater programming instructions

Scope of Work – HVAC

Any CES unit delivered after May 1, 2013 will include an Emerson E2E RX100 controller that is installed at the factory. The controller will be pre-programmed and the unit will be factory started and tested before delivery. It is the responsibility of the installing contractor to ensure that the unit is seated correctly on the roof curb, that all electrical connections are made according to local code and gas connections (if applicable) are made. The unit should be inspected for damage that might have occurred during shipping.

Sensors and Networking

The field installed sensors (space temp, space humidity and supply temp) that are used by the CES unit should be installed and connected before the CES unit can be commissioned. **These sensors must be wired to the inputs in the CES unit.**

Since the CES unit programming is no longer included in the Protocol E2E, the CES E2E must be networked together with the Protocol E2E and the FSD alarm panel.
An Ethernet work group switch is located in the I/O portion of the Power Wall for networking purposes. A CAT 5 Ethernet cable must be run from the CES unit to the switch located in the Power Wall. The network configuration of the CES controller has been done at the factory. To complete communication set up, a "group name" must be entered in both E2E controllers, Protocol and CES, in the "Peer Network" tab of the general controller information set up. The group name must be identical in both controllers for communication to begin.

Heat Reclaim

The Ces type 1 unit, used in northern regions, comes equipped with a refrigerant heat reclaim coil. This is a 4 row coil with 1 5/8" connections. It is the responsibility of the refrigeration contractor to provide the valves and piping for the heat reclaim system.

The three way valve will be controlled from an output point located on the Multiflex board in the CES unit and must be wired to that point. A Sporlan 12D13B is commonly used. Two ball valves should be installed (one inlet and one outlet) to allow isolation of the heat reclaim coil. Piping should be such that the reclaim coil is in series with the refrigeration condenser. The supply piping to the heat reclaim coil should be insulated.

Commissioning

Site commissioning of the CES unit will be coordinated by CES with a contractor. The check sheets and documentation for commissioning will be sent to the contractor by CES.

ADDENDUM: August 1, 2012 / Micro Channel Condenser Control Strategy

A new method of controlling the 6-fan Micro Channel condenser has been added to the E2 controller. This control method uses two separate Condenser applications to control the condenser during different ambient conditions. During warm weather, the CONDENSER SUMR application will be enabled and will control all 6 of the condenser fans. During cold weather, the CONDENSER WNTR application will be enabled and will control the 2 fans in the lead section of the condenser while the other 4 fans and 2 condenser sections are shut off.

Although two Condenser applications are used to control the condenser, only one of them will be enabled at any given time. The switchover between the two Condenser applications is controlled by an Analog Sensor Control application named COND SUMR STPT. This application works much like the control for a traditional split condenser in that it uses the ambient temperature to switch between the two Condenser applications.

The Analog Sensor Control application COND SUMR STPT has a cut-in and cut-out setpoint that can be adjusted to determine when the condenser control switches between the SUMR and WNTR applications. When the ambient temperature falls below the cut-out setting, the CONDENSER WNTR application will be activated to control the 2 fans in section 1 of the condenser. When the ambient temperature rises above the cut-in setting, the CONDENSER SUMR application will be enabled to control all 6 of the condenser fans.

In an attempt to maximize energy savings from the condenser VFD, the Condenser applications will be using a differential control strategy to control the condenser fans in lieu of the more traditional fixed pressure setpoint. Instead of using a single fixed pressure setpoint to control the condenser fans, a temperature differential control strategy will be used which will use a condensing temperature value that is calculated from the dropleg pressure transducer to maintain a condensing temperature setpoint that will vary with the ambient temperature. The condensing temperature setpoint will be calculated by adding the ambient temperate to the design temperature differential of the condenser (typically 10° for R404a and 9° for R407a). For example, on a system with R404a refrigerant and an ambient temperature of 80°, the target condensing temperature will be 90° (80° ambient plus the 10° differential). The calculated condensing temperature setpoint will vary between a range of 70° and 105°, meaning that for a system with R404a, the minimum setpoint will be used for ambient temperatures below 60° and the maximum setpoint will be used for ambient temperatures above 95°.

When the ambient temperature rises above the cut-in setting in the COND SUMR STPT Analog Sensor Control application, the CONDENSER SUMR application will be enabled and the CONDENSER WNTR application will be disabled. The CONDENSER SUMR application will control the condenser as follows.

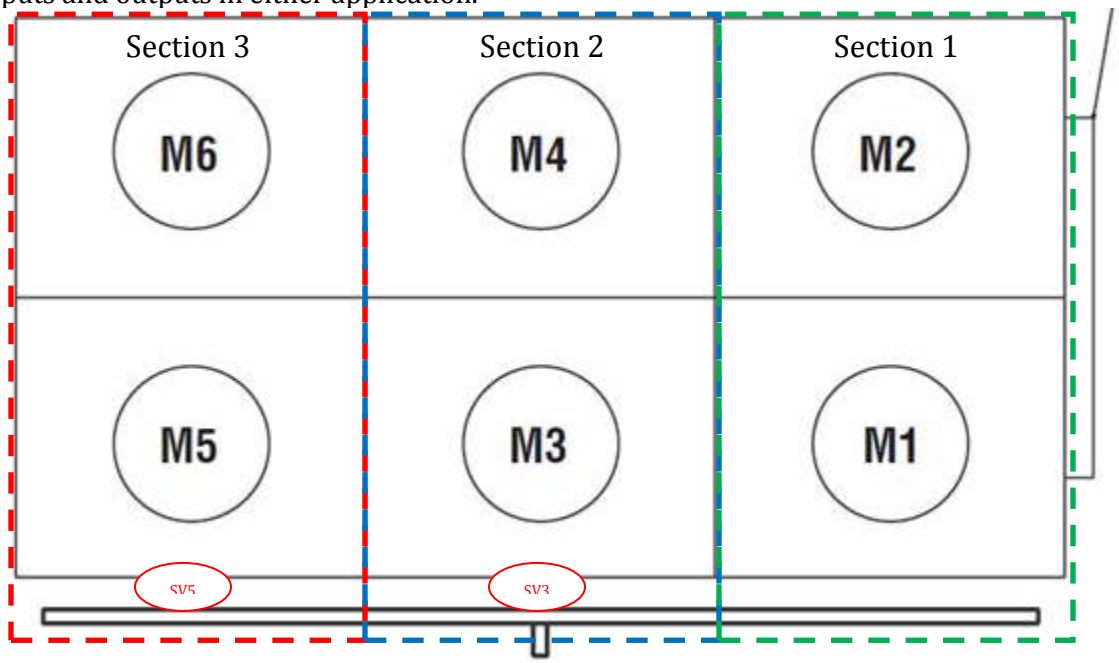
- At higher ambient temperatures and higher condenser load, all 6 condenser fans will run while the VFD ramps up and down to vary the condenser fan speed as needed to maintain the condenser pressure setpoint.
- As the ambient temperature drops or the condenser load decreases, the VFD will reduce the condenser fan speed as required to maintain the condenser pressure setpoint.
- Once the calculated condenser capacity, which is basically the PID output percentage, falls below the SPL BELOW % setting in the Condenser application (typically 20% and is user adjustable), the condenser will enter “split mode” operation which will shut off condenser fan motors M2, M4, and M6. All 3 condenser sections will remain open with just their header fans running.
- If the condenser is operating in “split mode” and the ambient temperature or condenser load increases, the condenser will exit “split mode” when the calculated condenser capacity, which is basically the PID output

percentage, rises above the USPL ABOVE % setting in the Condenser application (typically 85% and is user adjustable).

When the ambient temperature falls below the cut-out setting in the COND SUMR STPT Analog Sensor Control application, the CONDENSER WNTR application will be enabled and the CONDENSER SUMR application will be disabled. The CONDENSER WNTR application will control the condenser as follows.

- As the CONDENSER WNTR application is enabled, condenser fans M3, M4, M5, and M6 will be shut off and the condenser capacity control valves SV3 and SV5 will be energized shutting off section 2 and 3 of the condenser.
- Condenser fans M1 and M2 will run while the VFD ramps up and down to vary the condenser fan speed as needed to maintain the condenser pressure setpoint.
- As the ambient temperature drops or the condenser load decreases, the VFD will reduce the condenser fan speed as required to maintain the condenser pressure setpoint.
- Once the calculated condenser capacity, which is basically the PID output percentage, falls below the SPL BELOW % setting in the Condenser application (typically 20% and is user adjustable), the condenser will enter “split mode” operation which will shut off condenser fan motor M2. Condenser section 1 will remain open with just the header fan running.
- If the condenser is operating in “split mode” and the ambient temperature or condenser load increases, the condenser will exit “split mode” when the calculated condenser capacity, which is basically the PID output percentage, rises above the USPL ABOVE % setting in the Condenser application (typically 90% and is user adjustable).
- As a safety, if while operating in the CONDENSER WNTR mode the discharge pressure rises abruptly and the Fast Recovery setpoint is reached, the CONDENSER SUMR application will be enabled allowing all 6 condenser fans and all 3 condenser sections to run and reduce the discharge pressure.

In addition to the two Condenser applications, there are also 2 Flexible Combiner applications and a Digital Sensor Control application that are used to control some of the features of the Condenser applications. The two Flexible Combiners are named COND CONTROL and COND S/W XOVER and the Digital Sensor Control is named VSD STATE. There are no user adjustable settings in these applications and they should be left as is. The settings in the Condenser applications can be adjusted as on any normal condenser, however, there should be no changes to the assignment of the inputs and outputs in either application.



Header End

Refrigeration Installer Contractor Checklist

___ 1. Hussmann Protocol System installed per design requirements and latest Scope of Work*.
Comments:

Scope of Work Date _____

___ 2. System pressurized to 150 PSI with dry nitrogen and held for 24 hrs.
(0 drop in pressure is required, otherwise find the leak)
Comments:

___ 3. Vacuum pulled to 500 microns or lower and held for 24 hours. (0 vacuum loss is required).
Comments:

___ 4. Energy Management System installed per latest EMS & Hussmann Protocol
Aldi User Guide* (Only change allowed by Aldi is lighting times)
Comments:

___ 5. Piping installed per diagram and Hussmann Workmanship Guidelines*
- Properly supported
- All insulated 90° angles to be mitered

Comments:

___ 6. System to be charged with no more than 250 lbs of refrigerant without written authorization from Aldi.
Total pounds of refrigerant charge _____

- List any reason additional refrigerant is necessary.

Comments:

___ 7. Leak check the system after charging
Comments:

* Indicates documents sourced from www.sharepoint.apd.com/aldi/vendor information

I certify that the previously listed items have been completed according to the specifications set forth in the scope of work. Any deficiencies found during commissioning will be corrected at the sole expense of the installation contractor within 30 days of notification.

Installation Contractor _____

Signature: _____

Director of Real Estate _____