ARCHITECHNICS, INC.
510 MAINE STREET
QUINCY, ILLINOIS 62301

PROJECT NO. : 6573

ADDENDUM NO.: **1**
ISSUED: 02/11/25

Project: New HVAC System For
Adams County (IL) Courthouse
521 Vermont Street
Quincy, Illinois 62301

This addendum becomes a part of the bidding and contract documents and modifies the drawings and specifications dated February 5, 2025. Acknowledge receipt of this addendum by noting such on the Bid Proposal Form.

FAILURE TO DO SO MAY SUBJECT BIDDER TO DISQUALIFICATION

ITEM			DESCRIPTION
Specifications			
1.0	23 0993 Sequence of Operations	Add	Add section in its entirety.
2.0	23 3113 Ductwork	Revise	Para. 2.1.B.1.a. & b. a. Ducts connected to Downstream of Air Terminal Units, Constant Volume Air-Handling Units and Single Zone Variable-Air Volume Units. 1). Pressure Class: Positive 2-inch wg 2). Minimum SMACNA Seal Class A 3). SMACNA Leackage Class for Rectangular: 8 4). SMACNA Leakage Class Round: 4 b. Ducts connected to Multi Zone Variable-Air-Volume Air-Handling Units from AHU discharge to Air Terminal Units. 1). Pressure Class: Positive 4-inch wg 2). Minimum SMACNA Seal Class A 3). SMACNA Leackage Class for Rectangular: 4 4). SMACNA Leakage Class Round: 2
2.0	23 7313 Indoor Air Handling Unit	Add	Add section in its entirety.
3.0	23 7314 IT Cooling Unit	Add	Add section in its entirety. This section was not part of the original Table of Contents.
3.0	23 7416 Air Cooled Condensing Unit	Add	Add section in its entirety.
Drawings			
1.0	Dwg. S103	Replace	Replace drawing in its entirety.
2.0	Dwg. S104	Replace	Replace drawing in its entirety.
3.0	Dwg. S105	Replace	Replace drawing in its entirety.

4.0	Dwg. S300	Replace	Replace drawing in its entirety.

Attachments: Pre-Bid Attendance Records; Plan Holder's List; Specification Sections 23 0993, 23 7313, 23 7314, 23 7416; Dwgs. S103, S104, S105 & S300.

End of Addendum No. 1

ARCHITECHNICS
ARCHITECTS • ENGINEERS • INTERIOR DESIGNERS

ATTENDANCE RECORD

Owner: Adams County

Project Name: Roof Replacement /NEW HVAC SYSTEM

Project Number: 6621

Meeting Description: **Pre-Bid Meeting**

Date: January 20, 2025

Time: 1:00 p.m.

Location: Adams County Courthouse

Attendants

Name	Representing	Email	Phone
Todd Moore, PE	Architechnics	tmoore@architechnicsinc.com	217-222-0554
Paul Westerhoff, AIA	Architechnics	pwesterhoff@architechnicsinc.com	217-222-0554
Isaac Miller, PE	Architechnics	imiller@architechnicsinc.com	217-222-0554
Brian Spencer, SE	Architechnics	bspencer@architechnicsinc.com	217-222-0554
Olivia Rueter	Architechnics	orueter@architechnicsinc.com	217-222-0554
Eric Meyer, PE	DMI	emeyer@designmechanical.com	217-224-4289
~~Chris Livesay, PE~~ Kris Rueter, PE	DMI	~~elivesay@designmechanical.com~~ KRueter	217-224-4289
Aaron Thompson	[illegible]	Aaron@[illegible]	630-341-1283
Melanie Allan	Shortridge	melanie@shortridgeconst.com	217-222-6647
Charles Shortridge	Shortridge	charlie@shortridgeconst.com	217-222-6647
Mitchell Morrell	Morrell Electric	morrellelectric@[illegible]	217-222-[illegible]
Jessica Coca	Klingner	jcoca@klingner.com	319-572-7449
Cathy Zanger	MAAS Const.	maas@maasconstruction.net	217-257-7464
Matt O'Banion	Maas Const.	"	217 228 1105
Donnie Breden	General Waste Serv.	dbreden@aol.com	618-407-6177
Chris Schott	Koch Air	cschott@kochair.com	314-265-6278
Austin Tyler	M+O Environmental	atyler@mocompany.com	309-657-8596
Terry Setterlund	ENTEC	TSETTERLUND@ENTECSOLUTIONS.COM	309-697-2122
John Wicks	Union	John@roofers local112.com	217-529-2229
Richard Tournear	Tournear Roofing	richtourroof@yahoo	217-440-4982
Robert Tournear	Tournear Roofing	tourroof@yahoo.com	217-257-4885
JT Gray	Full Service Roofing	jt@fullserviceroofing.com	573-822-6449

Name	Representing	Email	Phone
Cory Campbell	River City Roofing	Corey@rivercityroofs.com	309-397-[illegible]15

ARCHITECHNICS
ARCHITECTS • ENGINEERS • INTERIOR DESIGNERS

ATTENDANCE RECORD

Owner: Adams County

Project Name: New HVAC System / ROOF REPLACEMENT

Project Number: 6573

Meeting Description: **Pre-Bid Meeting**

Date: January 20, 2025

Time: 1:00 p.m.

Location: Adams County Courthouse

Attendants

Name	Representing	Email	Phone
Todd Moore, PE	Architechnics	tmoore@architechnicsinc.com	217-222-0554
Paul Westerhoff, AIA	Architechnics	pwesterhoff@architechnicsinc.com	217-222-0554
Isaac Miller, PE	Architechnics	imiller@architechnicsinc.com	217-222-0554
Brian Spencer, SE	Architechnics	bspencer@architechnicsinc.com	217-222-0554
Olivia Rueter	Architechnics	orueter@architechnicsinc.com	217-222-0554
Eric Meyer, PE	DMI	emeyer@designmechanical.com	217-224-4289
~~Chris Livesay, PE~~ Kris Rueter, PE	DMI	~~clivesay~~ KRueter@designmechanical.com	217-224-4289
Jesse Gaerke	Architechnics		573-418-9258
Tim Scott	4AA dba MSG	tscott@msg-stl.com	636 875 2106
Dave Spencer	Spencer Plumbing	bid@adams.net	
Aaron Thompson	Provantage	Aaron@provantagesystems	630-391-1293
Johnny Schnettgoecke	Great Western Abatement	johnny@greatwesternabatement.com	(618)535-4893
R. Travers	Abateco	abateco@mail.com	618.406.1288
MIKE STILLWELL	ALLOY ABATEMENTS	MStillwell@alloygroup.com	314-327-1650
Phil Brown	Thornbrush Abatement	PhilB@Thornbrushstl.com	636-428-0057
Blake Bowen	Mac's Ltd		217-223-8268
David Schuster	Mac's LTD		"
Bryce Beaston	PowerFactor Electrical	Bryce@pf-es.com	217-430-4047
Ryan Vielmeyer	Power Factor	ryan@PF-es.com	
Rick Brown	Brown Electric	Rickc@Brownelectric.net	
John Howard	PETERS HVAC	jhoward@petershvac.net	(217) 222-3268
Logan King	ELPruitt	LKing@ELpruitt.com	217-685-0610
Josh Havens	havenclr	bcramer@larconinc.com	309-332-4013

Name	Representing	Email	Phone
John Wicks	Roofers local 112	John@roofers local112.com	217-529-2229
JARED WYATT	THORNBURGH INSULATION	JARED@THORNBURGHSTL.COM	314-332-8192
Ryan Fischer	Fischer Builders	ryan@fischer	217 222 4322
Austin Tyler	M&O Environmental	atyler@mocompany.com	309-657-8596
Melanie Allen	Shortridge	Melanie@shortridgeconst.com	217-222-6647
RYAN RECIC	RECIC		217-223-5325
Charles Schott	Koch air	CSchott@Kochair.com	314-265-6278
Will Fenton	AC Environmental	will@acenvironco	618-570-1587
[illegible]	MAAS CONST.	maas[illegible]	217 2258 1105
David Lunt	AH Kennard Sons	david.tcwpainting@gmail.com	217-2221559
Tyler Jansen	Brechtkamp		217-242-8610

RECORD OF PLANS AND SPECIFICATIONS

NAME OF PROJECT ADAMS COUNTY COURTHOUSE HVAC

PROJECT NO. 6573 **DATE BIDS DUE** Friday, February 21, 2025 **DEPOSIT** $0.00

TIME AND PLACE OF LETTING 2:00 PM ADAMS COUNTY COURTHOUSE

*** Indicates Potential Bidding Contractor

	CONTRACTOR NAME ADDRESS/PHONE/EMAIL	COPY NO.	DATE RECEIVED	DATE RETURNED	DEPOSIT RECEIVED	DEPOSIT RETURNED
	Architect	#1				
	Owner	#2				
***	**Peters Heating & A/C** **4520 Broadway** **Quincy, IL 62305** **217-222-1368** **Fax 217-222-1088** **jhoward@petershvac.net**	**D**	**2/5/2025**			
	Midwest Service Group **560 Turner Blvd** **St Peters, MO 63376** **636-926-7800** **tscott@msg-stl.com**	**D**	**2/5/2025**			
	Full Service Roofing **822 Hampshire St.** **Quincy, IL 62301** **217-224-7663** **217-222-7668** **jt@fullserviceroofing.com**	**D**	**2/5/2025**			
***	**Henson Robinson Co** **P.O. Box 13137** **Springfield, IL 62791-3137** **217-544-8451** **Fax: 217-544-0829** **nstetter@henson-robinson.com**	**D**	**2/5/2025**			
	Sparrow Plumbing **313 Delaware** **Quincy, IL 62301** **217 223-9289** **Fax: 217 223-9880** **bird@adams.net**	**D**	**2/5/2025**			
***	**E. L. Pruitt Co.** **3090 Colt Rd** **Springfield, IL 62707** **217-789-0966** **Fax: 217-789-2694** **bids@elpruitt.com**	**D**	**2/5/2025**			
	Jansen Electric **4421 N. 60th Street** **Quincy, IL 62305** **217-223-4016** **Fax 217-223-8046** **jansen@adams.net**	**D**	**2/5/2025**			
	Tournear Roofing Co **2605 Spring Lake Rd** **Quincy, IL 62305** **217-222-5879** **Fax: 217-222-8346** **tourroof@adams.net**	**D**	**2/5/2025**			

RECORD OF PLANS AND SPECIFICATIONS

NAME OF PROJECT ADAMS COUNTY COURTHOUSE HVAC

PROJECT NO. 6573 **DEPOSIT:** $50.00

	CONTRACTOR NAME ADDRESS/PHONE/EMAIL	COPY NO.	DATE RECEIVED	DATE RETURNED	DEPOSIT RECEIVED	DEPOSIT RETURNED
	Abel Plus Services 504 Sundown Rd South Elgin, IL 60177 847-888-0198 guido@abelplusservices.com	D	2/5/2025			
	Power Factor Electrical 715 S Front St Quincy, IL 62301 217-430-4047 bryce@pf-es.com	D	2/5/2025			
	Mac's Ltd. Electrical Contractor 402 Delaware Street Quincy, IL 62301 217 223-8268 Fax: 217 223-0733 bthomas@macsltdelectrical.com	D	2/5/2025			
	Laverdiere Construction 4055 W. Jackson Macomb, IL 61455 309-837-1258 Fax 309-833-4993 janderson@lavconinc.com	D	2/5/2025			
	Marold Electric Co. 129 S 10th Quincy, IL 62301 217-222-6267 Fax: 217-222-6289 maroldelectric@comcast.net	D	2/5/2025			
	Damon's Plumbing 625 N. Madison Street Pittsfield, IL 217-285-2856 damonsplumbingllc@gmail.com	D	2/5/2025			
***	Commercial Mechanical Inc. 50 N 1st St Dunlap, IL 61525 309-243-7768 cmi@cmipiping.com	D	2/5/2025			
	Brinkman Plumbing Co. 2510 Ellington Rd. Quincy, IL 62301 217 223-1962 Fax: 217 223-1972 janderson@brinkmanplumbing.com	D	2/5/2025			
	Environmental Operations 7733 Forsyth Boulevard, Suite 1600 Clayton, MO 63105 314-403-6813 jbradshaw@environmentalops.com	D	2/5/2025			
	Maas Construction Co. 3615 St. Anthony's Rd. Quincy, IL 62305 217-228-1105 Fax: 217 228-1151 maas@maasconstruction.net	D	2/5/2025			

RECORD OF PLANS AND SPECIFICATIONS

NAME OF PROJECT ADAMS COUNTY COURTHOUSE HVAC

PROJECT NO. 6573 **DEPOSIT:** $50.00

	CONTRACTOR NAME ADDRESS/PHONE/EMAIL	COPY NO.	DATE RECEIVED	DATE RETURNED	DEPOSIT RECEIVED	DEPOSIT RETURNED
	Triple A Asbestos 705 S. Oak St Pana, IL 62557 217-562-7002 jeff@tripleaasbestos.com	D	2/5/2025			
	Shortridge Construction Co. 3908 North 24th Street Quincy, IL 62305 217-222-6647 Fax: 217-222-3475 melanie@shortridgeconst.com	D	2/5/2025			
	Brown Electric Const. Co. 1309 Watts Lane Quincy, IL 62305 217-222-3483 Fax: 217-222-7733 nathann@brownelectric.net	D	2/5/2025			
	DEM SERVICES INC 1765 Cortland Ct A Addison, IL 60101 708-544-2244 dem@demservices.com	D	2/5/2025			
	A.H. Kemner & Sons P.O.Box 16 Quincy, IL 62301 217 222-1559 Fax: 217 222-0131 david.kemnerpainting@gmail.com	D	2/5/2025			
***	Keck Heating & A/C 431 State Street Quincy, IL 62301 217-223-5325 Fax 217-223-8325 keckhvac@keckheatingandair.com	D	2/5/2025			
***	Integrated Facility Services 10501 S. Hardwick Lane Columbia, MO 65201 573-442-6100 leet@intfs.com	D	2/5/2025			
	United Systems Inc 1008 Jersey St Stop 5 Quincy, IL 62301 217-228-0315 Fax: 217-228-0317 mmelton@4unitedsystems.com	D	2/5/2025			
	Fischer Builders, Inc. 814 Ohio Quincy, IL 62301 217-222-4322 Fax 217-222-2393 ryan@fischerbuilders.com	D	2/5/2025			
	M&O Environmental 1625 W Altorfer Dr Peoria, IL 61615 309-692-6700 Fax: 309-692-9812 tshafer@mocompany.com	D	2/5/2025			

RECORD OF PLANS AND SPECIFICATIONS

NAME OF PROJECT ADAMS COUNTY COURTHOUSE HVAC

PROJECT NO. 6573 **DEPOSIT:** $50.00

CONTRACTOR NAME ADDRESS/PHONE/EMAIL	COPY NO.	DATE RECEIVED	DATE RETURNED	DEPOSIT RECEIVED	DEPOSIT RETURNED
Abatement Specialties 1814 E. Ave. NE Cedar Rapids, IA 52402 319-221-1043 tom@abatement-specialties.com	D	2/5/2025			
Thornburgh Abatement 6280 Knox Industrial Drive Saint Louis, Missouri 63139 314-644-5323 philb@thornburgh-stl.com	D	2/5/2025			
Alloy Group 717 Crown Industrial Ct, Suite A-C Chesterfield, MO 63005 636-383-8328 jgiesler@alloygroup.com	D	2/5/2025			
Siemens 570 E North Street Warrensburg, IL 62573 217-672-8200 thomas.ward@siemens.com	D	2/5/2025			
Koch Air LLC 3141 RiverPort Tech Center Drive Maryland Heights, MO 63043 314-595-7600 cschott@kochair.com	D	2/6/2025			
Dodge Data & Analytics 4300 Beltway Place, STE #180 Arlington, Texas 888-667-8198 Dodge.Docs@construction.com	D	2/7/2025			
Environmental Control Solutions 2020 Timberbrook Drive Springfield IL 62702 217-793-8966 rbond@ecsi-alc.com	D	2/7/2025			
DEM SERVICES INC 1765 Cortland Ct A Addison, IL 60101 708-544-2244 dem@demservices.com	D	2/7/2025			
Meglio and Associates 14220 Ladue Road Chesterfield, MO 63017 314-524-4424 mmiller@meglio.com	D	2/7/2025			
Great Western Abatement RR1 Box 49 Nebo, IL 62355 217-734-1745 randygwa@hughes.net	D	2/10/2025			

RECORD OF PLANS AND SPECIFICATIONS

NAME OF PROJECT ADAMS COUNTY COURTHOUSE HVAC

PROJECT NO. 6573 **DEPOSIT:** $50.00

CONTRACTOR NAME ADDRESS/PHONE/EMAIL	COPY NO.	DATE RECEIVED	DATE RETURNED	DEPOSIT RECEIVED	DEPOSIT RETURNED
Trane **4801 Grand Ave** **Davenport, IA 52807** **563-271-4062** **jordan.cummings@trane.com**	**D**	**2/10/2025**			

SECTION 23 0993
SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operations for:

1. Single Duct Air Terminal Units (VAV).
2. Single Zone VAV Rooftop Units (RTU)
3. Multi-Zone VAV Rooftop Units (RTU)
4. Custom Air Handling Unit & Remote Condensing Unit (AHU) & (CU).
5. Heating Hot Water Boilers & Associated Circulating Pumps.
6. Heating Hot Water Main Circulating Pumps.
7. Exhaust Fans (EF).
8. Elevator Equipment rooms
9. Existing HVAC Equipment Located in County Clerk's Office.

1.02 RELATED REQUIREMENTS

A. Section 23 0923 - Direct-Digital Control System for HVAC.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.

1. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.
2. Include at least the following sequences:
    a. Start-up.
    b. Warm-up mode.
    c. Normal operating mode.
    d. Unoccupied mode.
    e. Shutdown.
    f. Capacity control sequences and equipment staging.

g. Temperature and pressure control, such as setbacks, setups, resets, etc.

h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, heat exchanger, etc.

i. Sequences for all alarms and emergency shut downs.

j. Interactions and interlocks with other systems.

3. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.

4. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.

C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.

1. Label with settings, adjustable range of control and limits.

2. Include flow diagrams for each control system, graphically depicting control logic.

D. Points List: Submit list of all control points indicating at least the following for each point.

1. Name of controlled system.

2. Point abbreviation.

3. Point description, such as dry bulb temperature, airflow, etc.

4. Display unit.

5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.

6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.

7. Calculated point (Yes / No); i.e. a “virtual” point generated from calculations of other point values.

E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

1.04 QUALITY ASSURANCE

A. Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed at the State in which the Project is located.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SINGLE DUCT AIR TERMINAL UNITS

A. Single-duct Variable Volume:
   1. Cooling with Hot Water Reheat:
      a. On a rise in space temperature above the cooling set-point, the unit modulates to its maximum airflow.
      b. As the space temperature falls below the cooling set-point, the unit modulates to its minimum airflow.
      c. As the space temperature continues to fall to the heating set-point, the terminal modulates to its heating minimum airflow. At this point, the heat will be staged on and the hot water control valve shall modulate as required to maintain space setpoint. Temperature control of the air terminal shall be via remote temperature sensor with local setpoint adjustment and the following features:
         1) Local space temperature adjustment with maximum / minimum limits set throught the BAS.
         2) Schedululed start / stop through the BAS. AHU must be in operation before the air terminal can be enabled.
         3) Provide push button on thermostat to change the mode of operation of the box from the unoccupied mode to the occupied mode of operation for preset amount of time. Amount of time shall be adjustable through the BAS.

3.02 SINGLE ZONE VAV ROOFTOP UNITS

Run conditions - scheduled:
The unit shall run according to a user definable time schedule in the following modes:

Occupied mode: the unit shall maintain
A 75F (adj.) Cooling setpoint
A 70F (adj.) Heating setpoint.

Unoccupied mode (night setback): the unit shall maintain
A 85F (adj.) Cooling setpoint.
A 55F (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.).

Zone setpoint adjust:
- Local space temperature adjustment with maximum / minimum limits set through the BAS.

- Provide push button on thermostat to change the mode of operation of the RTU from the unoccupied mode to the occupied mode of operation for preset amount of time. Amount of time shall be adjustable through the BAS.

Return air smoke detection:
The unit shall shut down and generate an alarm upon receiving a return air smoke detector status.

Supply fan:
The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.

Alarms shall be provided as follows:
- Supply fan failure: commanded on, but the status is off.
- Supply fan in hand: commanded off, but the status is on.
- Supply fan runtime exceeded: status runtime exceeds a user definable limit (adj.).

Zone temperature control:
The controller shall measure the zone temperature and shall modulate the supply fan VFD speed to maintain zone temperature setpoint. The fan speed shall increase as the zone temperature rises above cooling setpoint, or as the zone temperature drops below heating setpoint. The supply fan VFD speed shall not drop below 30% (adj.).

Cooling stages:
The controller shall measure the zone temperature and stage the cooling to maintain its cooling setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.

The cooling shall be enabled whenever:
- Outside air temperature is greater than 60F (adj.).
- And the economizer (if present) is disabled or fully open.
- And the zone temperature is above cooling setpoint.
- And the supply fan status is on.
- And the heating is not active.

Gas heating stages:
The controller shall measure the zone temperature and stage the heating to maintain its heating setpoint. To prevent short cycling, there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.

The heating shall be enabled whenever:
- Outside air temperature is less than 65F (adj.).
- And the zone temperature is below heating setpoint.
- And the supply fan status is on.
- And the cooling is not active.

Economizer:
The controller shall measure the zone temperature and modulate the economizer dampers in sequence to maintain a setpoint 2F less than the zone cooling setpoint. The outside air dampers shall maintain a minimum adjustable position of 20% (adj.) open whenever occupied.

The economizer shall be enabled whenever:
- Outside air temperature is less than 65F (adj.).
- And the outside air enthalpy is less than 22 btu/lb (adj.).

- And the outside air temperature is less than the return air temperature.
- And the outside air enthalpy is less than the return air enthalpy.
- And the supply fan status is on.

The economizer shall close whenever:
- Mixed air temperature drops from 45F to 40F (adj.).
- Or on loss of supply fan status.
- Or freezestat (if present) is on.

The outside and exhaust air dampers shall close and the return air damper shall open when the unit is off. If optimal start up is available, the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.

Minimum outside air ventilation - Carbon Dioxide (CO2) control:
When in the occupied mode, the controller shall measure the return air CO2 levels and modulate the outside air dampers open on rising CO2 concentrations, overriding normal damper operation to maintain a CO2 setpoint of 750 ppm (adj.).

Dehumidification:
The controller shall measure the return air humidity and override the cooling sequence to maintain return air humidity at or below 60% rh (adj.).

During dehumidification, the heating shall modulate to maintain a setpoint 1F (adj.) less than the zone cooling setpoint.

Dehumidification shall be enabled whenever:
- The supply fan status is on.
- And zone temperature is greater than the cooling setpoint.

Filter differential pressure monitor:
The controller shall monitor the differential pressure across the final filter.

Alarms shall be provided as follows:
- Final filter change required: final filter differential pressure exceeds a user definable limit (adj.).

Mixed air temperature:
The controller shall monitor the mixed air temperature and use as required for economizer control (if present) or preheating control (if present).

Alarms shall be provided as follows:
- High mixed air temp: if the mixed air temperature is greater than 90F(adj.).
- Low mixed air temp: if the mixed air temperature is less than 45F (adj.).

Return air carbon dioxide (CO2) concentration monitoring:
The controller shall measure the return air CO2 concentration.

Alarms shall be provided as follows:
- High return air carbon dioxide concentration: if the return air CO2 concentration is greater than 1000 ppm (adj.) when in the occupied mode.

Return air humidity:
The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).

Alarms shall be provided as follows:
- High return air humidity: if the return air humidity is greater than 70% (adj.).
- Low return air humidity: if the return air humidity is less than 35% (adj.).

Return air temperature:
The controller shall monitor the return air temperature and use as required for economizer control (if present).
Alarms shall be provided as follows:
- High return air temp: if the return air temperature is greater than 90F (adj.).
- Low return air temp: if the return air temperature is less than 45F (adj.).

3.03 MULTI ZONE VAV ROOFTOP UNITS

Run conditions - requested:
The unit shall run whenever: any zone is occupied or a definable number of unoccupied zones need heating or cooling.

High static shutdown:
The unit shall shut down and generate an alarm upon receiving an high static shutdown signal.

Return air smoke detection:
The unit shall shut down and generate an alarm upon receiving a return air smoke detector status.

Supply fan:
The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj) minimum runtime.

Alarms shall be provided as follows:
- Supply fan failure: commanded on, but the status is off.
- Supply fan in hand: commanded off, but the status is on.
- Supply fan runtime exceeded: status runtime exceeds a user definable limit (adj.).

Supply air duct static pressure control:
The controller shall measure duct static pressure and shall modulate the supply fan VFD speed to maintain a duct static pressure setpoint of 1.5” WC (adj.). The supply fan VFD speed shall not drop below 30% (adj).

Alarms shall be provided as follows:
- High supply air static pressure: if the supply air static pressure is 25% (adj) greater than setpoint.
- Low supply air static pressure: if the supply air static pressure is 25% (adj) less than setpoint.
- Supply fan VFD fault.

Supply air temperature setpoint - optimized:
The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint reset based on zone cooling and heating requirements

The supply air temperature setpoint shall be reset for cooling based on zone cooling requirements as follows:
- The initial supply air temperature setpoint shall be 55 F (adj).

- As cooling demand increases, the setpoint shall incrementally reset down to a minimum of 53F (adj.).
- As cooling demand decreases, the setpoint shall incrementally reset up to a maximum of 65F (adj.)

If more zones need heating than cooling, then the supply air temperature setpoint shall be reset for heating as follows:
- The initial supply air temperature setpoint shall be 65F (adj).
- As heating demand increases, the setpoint shall incrementally reset up to a maximum of 75F (adj.).
- As heating demand decreases, the setpoint shall incrementally reset down to a minimum of 65F (adj.).

Cooling:
The controller shall measure the supply air temperature and stage the cooling to maintain its cooling setpoint.

The cooling shall be enabled whenever:
- Outside air temperature is greater than 60F (adj.).
- And the economizer (if present) is disabled or fully open.
- And the supply fan status is on.
- And the heating (if present) is not active.

Alarms shall be provided as follows:
- High supply air temp: if the supply air temperature is 5F (adj.) greater than setpoint.

Gas Heating:
The controller shall measure the supply air temperature and modulate the heating to maintain its heating setpoint.

The heating shall be enabled whenever:
- Outside air temperature is less than 65F (adj.).
- And the supply fan status is on.
- And the cooling (if present) is not active.

The heating stages shall run for freeze protection whenever:
- Supply air temperature drops from 40F to 35F (adj.).
- And the supply fan status is on.

Alarms shall be provided as follows:
- Low supply air temp: if the supply air temperature is 5F (adj.) less than setpoint.

Economizer:
The controller shall measure the mixed air temperature and modulate the economizer dampers in sequence to maintain a setpoint 2F (adj.) less than the supply air temperature setpoint. The outside air dampers shall maintain a minimum adjustable position of 20% (adj.) open whenever occupied.

The economizer shall be enabled whenever:
- Outside air temperature is less than 65F (adj.).
- And the outside air enthalpy is less than 22 btu/lb (adj.)
- And the outside air temperature is less than the return air temperature.
- And the outside air enthalpy is less than the return air enthalpy.

- And the supply fan status is on.

The economizer shall close whenever:
- Mixed air temperature drops from 40F to 35F (adj.)
- Or the freezestat (if present) is on.
- Or on loss of supply fan status.

The outside and exhaust air dampers shall close and the return air damper shall open when the unit is off. If optimal start up is available the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.

Minimum outside air ventilation - fixed percentage:
The outside air dampers shall maintain a minimum adjustable position during building occupied hours and be closed during unoccupied hours.

Filter differential pressure monitor:
The controller shall monitor the differential pressure across the final filter.

Alarms shall be provided as follows:
- Final filter change required: final filter differential pressure exceeds a user definable limit (adj.).

Mixed air temperature:
The controller shall monitor the mixed air temperature and use as required for economizer control (if present) or preheating control (if present).

Alarms shall be provided as follows:
- High mixed air temp: if the mixed air temperature is greater than 90F (adj.).
- Low mixed air temp: if the mixed air temperature is less than 45F (adj.).

Return air humidity:
The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).

Alarms shall be provided as follows:
- High return air humidity: if the return air humidity is greater than 70% (adj.).
- Low return air humidity: if the return air humidity is less than 35% (adj.).

Return air temperature:
The controller shall monitor the return air temperature and use as required for setpoint control or economizer control (if present).

Alarms shall be provided as follows:
- High return air temp: if the return air temperature is greater than 90F (adj.).
- Low return air temp: if the return air temperature is less than 45F (adj.).

Supply air temperature:
The controller shall monitor the supply air temperature.

Alarms shall be provided as follows:
- High supply air temp: if the supply air temperature is greater than 120F (adj.).
- Low supply air temp: if the supply air temperature is less than 45F (adj.).

3.04 CUSTOM AIR HANDLING UNIT & REMOTE CONDENSING UNIT

Run conditions - requested:
The unit shall run whenever: any zone is occupied or a definable number of unoccupied zones need heating or cooling.

Freeze protection:
The unit shall shut down and generate an alarm upon receiving a freezestat status.

High static shutdown:
The unit shall shut down and generate an alarm upon receiving an high static shutdown signal.

Return air smoke detection:
The unit shall shut down and generate an alarm upon receiving a return air smoke detector status.

Supply air smoke detection:
The unit shall shut down and generate an alarm upon receiving a supply air smoke detector status.

Supply fan:
The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj) minimum runtime.

Alarms shall be provided as follows:
- Supply fan failure: commanded on, but the status is off.
- Supply fan in hand: commanded off, but the status is on.
- Supply fan runtime exceeded: status runtime exceeds a user definable limit (adj.).

Supply air duct static pressure control:
The controller shall measure duct static pressure and shall modulate the supply fan VFD speed to maintain a duct static pressure setpoint of 1.5” WC (adj.). The supply fan VFD speed shall not drop below 30% (adj).

Alarms shall be provided as follows:
- High supply air static pressure: if the supply air static pressure is 25% (adj) greater than setpoint.
- Low supply air static pressure: if the supply air static pressure is 25% (adj) less than setpoint.
- Supply fan VFD fault.

Return fan:
The return fan shall run whenever the supply fan runs.

Alarms shall be provided as follows:
- High return air static pressure: if the return air static pressure is 25% (adj) greater than setpoint.
- Low return air static pressure: if the return air static pressure is 25% (adj) less than setpoint.
- Return fan failure: commanded on, but the status is off.
- Return fan in hand: commanded off, but the status is on.
- Return fan runtime exceeded: status runtime exceeds a user definable limit (adj.).
- Return fan VFD fault.

Return fan tracking:
The return fan VFD shall modulate in unison with the supply fan VFD. The return fan VFD shall track the supply fan VFD at 80% (adj) of the supply fan VFD speed. The return fan VFD speed shall not drop below 20% (adj).

Supply air temperature setpoint - optimized:
The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint reset based on zone cooling and heating requirements

The supply air temperature setpoint shall be reset for cooling based on zone cooling requirements as follows:
- The initial supply air temperature setpoint shall be 55 F (adj).
- As cooling demand increases, the setpoint shall incrementally reset down to a minimum of 53F (adj.).
- As cooling demand decreases, the setpoint shall incrementally reset up to a maximum of 65F (adj.)

If more zones need heating than cooling, then the supply air temperature setpoint shall be reset for heating as follows:
- The initial supply air temperature setpoint shall be 65 (adj).
- As heating demand increases, the setpoint shall incrementally reset up to a maximum of 75F (adj.).
- As heating demand decreases, the setpoint shall incrementally reset down to a minimum of 65F (adj.).

Cooling:
The controller shall measure the supply air temperature and modulate the cooling to maintain its cooling setpoint.

The cooling shall be enabled whenever:
- Outside air temperature is greater than 60F (adj.).
- And the economizer (if present) is disabled or fully open.
- And the supply fan status is on.
- And the heating (if present) is not active.

Alarms shall be provided as follows:
- High supply air temp: if the supply air temperature is 5F (adj.) greater than setpoint.

Heating:
The controller shall measure the supply air temperature and modulate the heating coil valve to maintain its heating setpoint.

The heating shall be enabled whenever:
- Outside air temperature is less than 65F (adj.).
- And the supply fan status is on.
- And the cooling (if present) is not active.

The heating coil valve shall open whenever:
- Supply air temperature drops from 40F to 35F (adj.).
- Or the freezestat (if present) is on.

Alarms shall be provided as follows:
- Low supply air temp: if the supply air temperature is 5 deg (adj.) less than setpoint.

Heating coil pump:
The recirculation pump shall run whenever:
- The heating coil valve is enabled.
- Or the freezestat (if present) is on.
- Or the Outdoor air temperature is below 40F (adj).

Alarms shall be provided as follows:
- Heating coil pump failure: commanded on, but the status is off.
- Heating coil pump in hand: commanded off, but the status is on.
- Heating coil pump runtime exceeded: status runtime exceeds a user definable limit.

Economizer:
The controller shall measure the mixed air temperature and modulate the economizer dampers in sequence to maintain a setpoint 2F (adj.) less than the supply air temperature setpoint. The outside air dampers shall maintain a minimum adjustable position of 20% (adj.) open whenever occupied.

The economizer shall be enabled whenever:
- Outside air temperature is less than 65F (adj.).
- And the outside air enthalpy is less than 22 btu/lb (adj.)
- And the outside air temperature is less than the return air temperature.
- And the outside air enthalpy is less than the return air enthalpy.
- And the supply fan status is on.

The economizer shall close whenever:
- Mixed air temperature drops from 40F to 35F (adj.)
- Or the freezestat (if present) is on.
- Or on loss of supply fan status.

The outside and exhaust air dampers shall close and the return air damper shall open when the unit is off. If optimal start up is available the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.

Minimum outside air ventilation - fixed percentage:
The outside air dampers shall maintain a minimum adjustable position during building occupied hours and be closed during unoccupied hours.

Filter differential pressure monitor:
The controller shall monitor the differential pressure across the final filter.

Alarms shall be provided as follows:
- Final filter change required: final filter differential pressure exceeds a user definable limit (adj.).

Mixed air temperature:
The controller shall monitor the mixed air temperature and use as required for economizer control (if present) or preheating control (if present).

Alarms shall be provided as follows:
- High mixed air temp: if the mixed air temperature is greater than 90F (adj.).
- Low mixed air temp: if the mixed air temperature is less than 45F (adj.).

Return air humidity:
The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).

Alarms shall be provided as follows:
- High return air humidity: if the return air humidity is greater than 70% (adj.).
- Low return air humidity: if the return air humidity is less than 35% (adj.).

Return air temperature:
The controller shall monitor the return air temperature and use as required for setpoint control or economizer control (if present).

Alarms shall be provided as follows:
- High return air temp: if the return air temperature is greater than 90F (adj.).
- Low return air temp: if the return air temperature is less than 45F (adj.).

Supply air temperature:
The controller shall monitor the supply air temperature.

Alarms shall be provided as follows:
- High supply air temp: if the supply air temperature is greater than 120F (adj.).
- Low supply air temp: if the supply air temperature is less than 45F (adj.).

3.05 HEATING HOT WATER BOILERS & ASSOCIATED CIRCULATING PUMPS

A. The hot water boilers (B-1 or B-2) shall be enabled locally or through the BAS.

B. The BAS shall monitor outdoor air temperature and enable the hot water boilers (B-1 or B-2) when outdoor air temperature drops below 60F (adj.) or when any preset number of VAV boxes are calling for heat.

C. On a call for heating, the lead boiler shall be enabled at low fire. When the lead boiler can no longer maintain the hot water supply set point temperature, the boiler control panel shall enable the second boiler as required to maintain the hot water supply temperature set point.

D. Boiler operation shall be rotated to evenly distribute run time.

E. The hot water supply water temperature shall be reset based on outside air temperature in accordance with the following:

1. 0F: 140F HWS
2. 60F: 110F HWS

F. The boiler circulating pumps (P-3 & P-4) shall be energized whenever their respective boiler burner is energized. Flow shall be proved via flow switch before the burner is enabled. Pump operation shall continue for 5 minutes (adj.) after burner is shut off to dissipate boiler heat.

3.06 HEATING HOT WATER BOILERS & ASSOCIATED CIRCULATING PUMPS

A. The hot water boilers (B-1 or B-2) shall be enabled locally or through the BAS.

B. The BAS shall monitor outdoor air temperature and enable the hot water boilers (B-1 or B-2) when outdoor air temperature drops below 60F (adj.) or when any preset number of VAV boxes are calling for heat.

C. On a call for heating, the lead boiler shall be enabled at low fire. When the lead boiler can no longer maintain the hot water supply set point temperature, the boiler control panel shall enable the second boiler as required to maintain the hot water supply temperature set point.

D. Boiler operation shall be rotated to evenly distribute run time.

E. The hot water supply water temperature shall be reset based on outside air temperature in accordance with the following:

1. 0F: 140F HWS
2. 60F: 110F HWS

F. The boiler circulating pumps (P-3 & P-4) shall be energized whenever their respective boiler burner is energized. Flow shall be proved via flow switch before the burner is enabled. Pump operation shall continue for 5 minutes (adj.) after burner is shut off to dissipate boiler heat.

3.07 HEATING HOT WATER MAIN CIRCULATING PUMPS

A. The BAS shall monitor outdoor air temperature and enable the hot water circulating pump (either P-1 or P-2) whenever outdoor air temperature drops below 60F (adj.) or when an adjustable number of VAV boxes call for heat.

B. Should the selected pump fail to operate, the standby pump shall be energized and an alarm shall be initiated as the BAS control panel. The pump operation shall be alternated to evenly distribute run time.

C. The BAS shall monitor system differential pressure and vary pump speed as required to maintain the minimum system differential set point.

D. The bypass valve shall modulate open as required to maintain the maximum system differential pressure set point (adj.).

E. The bypass valve shall be sized for maximum flow of 25% for the hot water pump flow rate (44 gpm).

F. Provide temperature sensor in the bypass piping downstream of the bypass valve to monitor water temperature in the bypass piping for verification that bypass valve is full closed unless commanded open.

3.08 DUCTLESS SPLIT SYSTEM DX UNITS

A. Single temperature room thermostat set at 70F (adj) maintains constant space temperature by cycling condensing unit and fan coil unit. This sytem is self contained and not part of the BAS system.

3.09 ELEVATOR EQUIPOMENT ROOMS (2 REQUIRED)

A. Provide room temperature sensor with notification and alarm through the BAS system if temperature rises above 85F (adj.).

3.10 EXHAUST FAN EF 1-1E

A. Provide a differential pressure sensor located in Courtroom 1A.

B. The BAS shall modulate the Exhaust Fan to maintain a negative pressure of .01” WC (adj) in courtroom 1A.

3.11 EXHAUST FANS EF 3-2E & 4-1W

A. Exhaust fan shall run at continuously at full speed (set by balancer) during occupied time.

B. Exhaust fan shall run at 50% of full speed (adj) during unoccupied time.

3.12 EXHUAT FAN B-1W

A. Provide a room temperature sensor in the Main Electrical Room.

B. The BAS shall modulate the Exhaust fan to maintain a temperature below 85 F (adj.).

C. Provide an alarm through the BAS system if the temperature rises above 90F (adj.).

3.13 COUNTY CLERKS OFFICE (EXISTING EQUIPMENT)

A. Provide a programmable room thermostat (3 required) compatible with the exiting HVAC equipment located in the County Clerk’s Office.

B. T-Stat shall provide notification and alarms through the BAS system.

END OF SECTION

SECTION 23 7313
AIR HANDLING UNIT

1. GENERAL

1.1. SCOPE OF WORK

1.1.1. Custom-built air handling units shall be supplied to meet the performance requirements shown on the equipment drawings and schedules and specifications. To comply with job site constraints and/or freight restrictions, the units shall be shipped in modules. Shipping details shall be coordinated and included with submittal drawings.

1.1.2. The contractor shall be responsible for inspecting the units upon arrival at the jobsite or riggers yard. Any deficiencies and/or freight damage shall be documented on the packing slip and submitted to the truck drivers before departure from the delivery site. Rigging, installation, sealing of modules and field start-up work shall be executed by the mechanical contractor as outlined in the project specifications.

1.1.3. Ingenia Technologies Inc. shall warranty the equipment and parts only, for a period of one year commencing at the date of unit start-up, to a maximum of eighteen months from the date of shipment. Please refer to Ingenia's warranty policy.

1.2. REFERENCES

1.2.1. The design and fabrication of the units shall be in accordance with the latest standards listed herewith:

o AFBMA 9	Load ratings and fatigue life for ball bearings
o AMCA® 203	Field performance measurements
o AMCA® 210	Laboratory methods of testing fans for rating purposes
o AMCA® 300	Test code for sound rating air moving devices
o AMCA® 500	Test methods for louvers, dampers and shutters
o ARI 410	Forced-circulation air cooling and air heating coils
o ASHRAE	62-89 ventilation for acceptable indoor air quality
o ASTM A525	Steel sheet, zinc coated by hot-dip process
o ASTM E90-09	Standard for Measurement of Airborne Sound Transmission Loss
o NEMA MG1	National electrical manufacturers association (Motors and generators)
o NFPA 70	National fire protection code
o NFPA 90A	Installation of Air Conditioning and Ventilation Systems
o OSHA	Occupational safety and health administration
o SMACNA	HVAC metal duct association
o UL 900	Underwriters laboratory, (test performance of air filters quality)
o UL 1995	Heating and Cooling Equipment

1.2.2. The design and fabrication of the units shall be accurate reflections of the drawings shown on project drawings and schedules and specifications provided by the client.

1.2.3. The design and fabrication of the units will include equipment that meets the requirements of the equipment schedules shown on project drawings and plans.

1.3. QUALITY ASSURANCE

1.3.1. The following parameters define the selection criteria and are to be as specified: Airflow rates, external static pressures, water flow rates, electrical power supply.

1.3.2. The following parameters are to be as specified or improved upon: Coil face velocity, filter velocities, internal static pressure losses, cabinet air leakage, electrical power consumption, discharge/inlet and radiated sound power levels.

1.3.3. The units shall be produced by Ingenia Technologies Inc. whose design and processes are thoroughly documented and verifiable. The quality control program shall ensure the consistency of the product and the effectiveness of the production processes.

1.3.4. All components must be sourced from well recognized HVAC manufacturers whose products comply with their product-specific industry standards.

1.3.5. Air and sound performance of all air moving equipment shall conform to the AMCA® Standards and must bear the AMCA® certification label.

1.3.6. Heating and cooling coil capacity ratings shall be certified in accordance with ARI Standard 410. Heat transfer coils shall bear the ARI certification label.

1.3.7. Filter media shall be UL listed.

1.4. SUBMITTAL DRAWINGS

1.4.1. Ingenia Technologies Inc. shall provide submittal drawings showing the arrangement of each unit, nominal dimensions, weight of each shipping module and complete technical data for all mechanical and electrical accessories provided with the HVAC units.

1.4.2. The drawings shall detail the cross-section of the floor, perimeter structure, panel assembly, sealing between panels and detailing of all components including the material and thickness of all cabinetry components.

1.4.3. If the unit is shipped in a full or modular configuration, all AHU components shall be coordinated with the contractor for field fit. All cabinet parts and OEM equipment shall be clearly listed with sizes and weights.

1.4.4. Fan performance ratings shall have been based on tests and procedures performed in accordance with AMCA® Publication 211 and AMCA® Publication 311, and comply with the requirements of the AMCA® Certified Ratings Program. The fan operation point shall be clearly indicated including the impact of any system effect factors. For reference purposes, a family of performance curves shall be included for each fan. Sound power levels shall be provided for the fan inlet and discharge at each octave band. Construction drawings for each fan shall be included with the submittal drawing file.

1.4.5. Heat transfer coils' selection data for each coil shall be included with the submittal drawing file. The selection must indicate all input & output values as well as the characteristics of the fluids. Construction drawings for each coil bank shall be included with the submittal drawing file.

1.4.6. A detailed description of the filters including their "dust spot" efficiency evaluated under ASHARE Standard 52.1-1992, UL class, initial and final pressure losses for each filter bank shall be provided with the submittal drawings.

1.4.7. The unit manufacturer shall provide technical data for all other equipment being part of the air handling system. The data shall include: Performance and capacity information; certified drawings, clearly showing the arrangements; electrical interfaces; and weight.

1.4.8. Submittals and data sheets shall be in accordance with Section – 23 05 00 – Mechanical – General Requirements for HVAC Work.

1.5. DELIVERY, STORAGE AND HANDLING

1.5.1. The units shall be thoroughly cleaned and inspected before the application of a shrink wrap protective cover. The plastic cover must completely enclose all shipping modules individually.

1.5.2. The units must be shipped in modules, as documented in the specifications or instructed by the contractor. The units and/or modules shall be equipped with removable and adequately sized lifting lugs for field rigging and handling.

1.5.3. The units must be handled carefully in the field to avoid damaging internal components, cabinet walls and the exterior finish.

1.5.4. Store the units in a dry, clean environment protected from the outdoor weather. Factory applied shrink wrap is intended to protect the units while in transit to the job site. The units must not be stored with the factory applied shrink wrap still on.

1.5.5. The units must not be operated, for temporary or permanent purposes, until the official start-up is completed by the mechanical contractor and witnessed by a manufacturer representative.

1.5.6. Air handling unit shall be shipped knocked down and erected on site.

1.5.7. Unit is to be designed for shipment to job site with all sections sized to fit through the following constraint: (“xxxx” x “xxxx” x “xxxx”).

2. PRODUCTS

2.1. ACCEPTABLE PRODUCTS

2.1.1. Ingenia Technologies Inc. custom air handling units.

2.1.2. The following manufacturers are approved to provide an equivalent product to the specified manufacturer:

2.2. UNIT PERFORMANCE

2.2.1. Provide factory manufactured custom air handling units that satisfies overall dimensions as shown on the construction drawings and schedules. Physical dimensions and unit arrangement are critical for equipment layout and must be as shown on the drawings and schedules.

2.2.2. Refer to the custom air handler schedules to determine the performance of all internal components: Fans, coils, filters, humidifiers, acoustical performance, etc.

2.2.3. The indicated total static pressure for each fan must be equal to the sum of the external static and the internal static, including all internal system effects.

2.2.4. The fan performance characteristics must be based on the actual elevation and operating temperature of the unit’s final destination.

2.2.5. All deviations from the specification must be clearly indicated on the submittal drawings. The contractor shall be held responsible for all additional expenses associated with the substitution of the specified product.

2.3. CABINET DESIGN PRESSURE

2.3.1. The cabinet shall be designed to resist a maximum design pressure of 8" w.g. The maximum panel deflection shall be 1/240 along the panel's length seam. Air leakage shall not exceed 0.5% of the total design air flow at the maximum design static pressure or the CFM allowed for by SMACNA leakage Class 3. The greater leakage rate is the acceptable maximum leakage.

2.4. CABINET CONSTRUCTION

2.4.1. UNIT BASE

2.4.1.1. The unit shall be constructed on a galvanized steel base. The base shall be designed to distribute loads properly to a suitable mounting surface and be braced to support internal components without sagging, pulsating or oil canning.

2.4.1.2. The floor perimeter support structure of each air handling unit shall be built with galvanized steel HSS members. Framing members shall be joined with 3/8" tapered head machine bolts. Perimeter corner segments shall be joined with galvanized steel precision machined adjoining corners. All assembly hardware shall be consistent with the basic construction material type: Cadmium plated.

2.4.1.3. The base frame height shall be selected to meet the structural design load. The maximum base deflection shall not exceed 1/300, given a maximum unsupported span of 8 feet [96"].

2.4.1.4. To ensure sufficient height for field installed condensate P-traps, the minimum height of the perimeter channels shall be 5 inches.

2.4.1.5. Each shipping module shall be equipped with a minimum of four (4) removable lifting lugs. The maximum space between the lifting lugs shall be 6 feet. Intermediate lifting lugs shall be provided if length and/or width requires it.

2.4.1.6. To ensure sustained product life, all structural base components shall be made of galvanized steel material. Painted carbon steel components shall not be utilized unless they are baked powder coated or sand blasted and finished with a baked enamel coating.

2.4.2. FLOOR SURFACE – INSULATION - UNDERLINER

2.4.2.1. The internal, visible floor surfaces shall be Diamond plate, 0.125" thick, aluminum.

2.4.2.2. Floor surfaces shall consist of multiple panels. To minimize heat gains/losses through the flooring system, the panels shall include a complete mechanical no-through metal break. The thermal barrier shall have an R-value that is equal or smaller than 0.4 (ft. °F h/ BTU) per inch.

2.4.2.3. The panel-to-panel joining method shall be accomplished with mechanical fasteners and seals that guarantee water tightness for the life of the unit. All fasteners must be concealed to ensure air and water tightness and also provide smooth surfaces.

2.4.2.4. Individual floor panels shall be insulated with injected polyurethane foam to ensure complete insulation fill as well as the highest possible thermal resistance. Floor panel thickness shall be consistent with the thickness of the air handler cabinet, 2.0 inch. The resulting thermal resistance shall be R-13.0.

2.4.2.5. Floors shall be equipped with a 1 1/4" contour/drainable. All drainable floors shall have machined aluminum catch basins with removable stainless steel grates. The minimum size of the catch basin shall be 2" wide x 2" long x 2" deep. 1 1/4" MPT Stainless steel drain pipes shall be installed to each catch basin and extended to the exterior of the unit.

2.4.2.6. Drain connections shall be 1 1/4" MPT aluminum.

2.4.2.7. The underside liners shall be G-90 galvanized steel.

2.4.2.8. All floor openings shall be equipped with a 1.5" raised floor collar to prevent water migration into the floor opening. Air inlet and discharge openings shall be protected with galvanized steel flat bar grating.

2.4.2.9. To minimize thermal gains/losses through the floor system, the entire floor system shall be totally thermally isolated from the floor surface.

2.4.3. UNIT CASING

2.4.3.1. All panels shall be double wall construction, load-bearing and capable of forming the enclosure without additional structural members. All panel joints shall be sealed to provide a permanent air-tight seal. Mullion spacing shall be regulated to eliminate panel pulsation and restrict the maximum deflection to 1/240 at the specified design conditions.

2.4.3.2. Individual panels shall be insulated with injected hydrophobic polyurethane foam, essentially a material that does not absorb nor transmit water thereby eliminating the risk of bacterial proliferation, mildew and mold. Fiberglass insulation or mineral wool is not acceptable due to the inherent characteristic of water and humidity absorption. Each panel shall have a complete no through metal break consisting of continuous High-Density Polyethylene (HDPE) material designed to inter-connect the outer and inner wall shells and eliminate metal to metal contact.

2.4.3.3. All panels shall be a minimum 2.0" thick and be insulated with polyurethane foam having an R-value equal to 13.0(ft.°F. h/BTU).

2.4.3.4. Adjacent panels shall be assembled to each other with bolted galvanized steel compression plates. The cabinet shall be air and water tight by individually sealing each panel joint with compressed rubber butyl membranes. The compression plates shall be mounted on the exterior of the units, exposing the assembly bolts to the exterior of the unit. **Self-tapping screws are not acceptable** due to their inherent inability to maintain torque over the life of the product.

2.4.3.5. To provide a cleanable internal finish and ensure a long product life, all internal panel joints shall be sealed with a non-silicon based caulking compound.

2.4.3.6. To prevent internal cabinet corrosion, all air-side panel joints shall include a solid vapor barrier thereby preventing moisture migration into the wall space. The internal seal shall be resistant to pressure wash down cycles.

2.4.3.7. The cabinets' external panels shall be 16 gauge solid galvanized steel.

2.4.3.8. The cabinets' internal panels shall be 22 gauge solid galvanized steel.

2.4.3.9. The panel system shall have been tested by an independent certified laboratory using ASTM Method - Test for Sound Transmission, adhering to the active standard for ASTM Designations: E90-09. SOUND TRANSMISSION CLASS (STC): 28

Frequency/HZ	125	250	500	1000	2000	4000
Wall Thickness	Transmission Loss					
2.0"	21	23	20	33	47	51
3.0"	21	24	19	41	47	53
4.0"	21	23	22	41	45	53

2.4.3.10. The construction of panel walls shall conform to the standards ASTM E84-10 and CAN / ULC S102-07 with regards to smoke developed and flame propagation.

2.4.3.11. To allow for water drainage from the roof surface, the roof panel system of outdoor unit shall be sloped at minimum 0.25" per foot. The roof weather-proofing system shall be independently constructed from the cabinet air seal. The interstitial space shall be vented through soffit and louvered exhaust outlets. Multiple slopes are required for units having widths greater than 128".

2.4.4. ACCESS DOORS

2.4.4.1. Access doors shall be provided as shown on drawings and schedules. Ingenia Technologies Inc. standards position doors on drive-access and piping side of the unit unless otherwise specified or requested. All access doors exposed to the weather (outdoor units) shall have rain gutters to prevent water from running down onto the door framing system.

2.4.4.2. Door panels shall be of NO-THROUGH-METAL construction using High Density Polyethylene (HDPE) to inter-connect the outer wall shells.

2.4.4.3. The door panels shall be double wall construction. To prevent air leakage and provide a rigid design, the external skin shall include all the forming segments of the double gasket base support.

2.4.4.4. The door frame shall be made of dual heavy gauge galvanized steel and shall be bolted to the cabinet wall panels. To reduce conductivity through the door framing system, the door frames shall have a complete NO-THROUGH-METAL break consistent with the rest of the cabinet.

2.4.4.5. Each access door shall be equipped with at least two precision machined aluminum hinges and two latches which shall be operable from the inside and outside of the unit. The handles shall be easy to operate and be made of fiberglass reinforced with nylon.

2.4.4.6. The air seal between the door and its frame shall be accomplished with a dual formed-in-place urethane foam gasket, extruded EPDM (PIPFG). The dual gasket system is designed to provide two points of contact providing a high level of thermal resistance. The individual gaskets shall be seamless. Adhesive and/or gaskets with joints are not acceptable due to the high air leakage characteristic and weak bonding.

2.4.4.7. Access door sizes and orientation shall be as indicated on drawings. Doors shall open against section pressure; positive-open in, negative-open out.

2.4.4.8. Each door shall include a double pane thermal glass window, a minimum of 10 inches x 10 inches, installed at eye level, unless otherwise specified, and properly sealed to operate safely against suction or pressure conditions.

2.4.4.9. All access doors shall have built-in static pressure ports for ease of reading static pressure across internal components therefore limiting unnecessary or unauthorized access inside the unit. Pressure test ports shall be DynAir PTP-1.

2.4.4.10. Doors shall be a minimum 2.0" thick and be insulated with polyurethane foam having an R-value equal to 13.0.

2.4.5. ACCESS PANELS

2.4.5.1. In order to facilitate maintenance and avoid compromising the structural integrity of the unit, major equipment must be easily removable through side access doors or removable access panels.

2.4.5.2. Access panels shall be provided on the connection side of the heat transfer coil sections to extract the coils for replacement purposes. The access panels shall have the same thickness as the nominal cabinet wall thickness. The access panels shall be sealed to the cabinet with butyl polymer membranes and bolted to high strength compression fittings for the ease of removal. Grommets are used to make a seal between the pipe connections and the panel openings.

2.4.5.3. Access panels shall include a NO-THROUGH-METAL break between the inner and outer surfaces, consistent with the wall construction of the unit with HPDE fasteners at 12” intervals.

2.4.5.4. Access panels shall be bolted to inserts located within the periphery of the wall opening. The air seal shall be accomplished with rubber butyl membranes and compression plates. Access panels secured to the wall cabinet by means of self-tapping screws shall not be acceptable due to the inability to remove and re-install multiple times.

2.5. COOLING COILS

2.5.1.1. Drain pans shall be made of 16 ga. 304 stainless steel. To ensure positive water flow the surfaces shall be multi-sloped and have a depth of 2" for 5 and 6 inch base heights.

2.5.1.2. Drain connections shall be schedule 40-pipe 304 stainless steel MPT. The diameters shall be 1 1/4" diameter for 5 and 6 inch base heights. The drain connection shall be accessible from the exterior of the unit casing.

2.5.1.3. Stacked cooling coils shall have independent multi-sloped drain pans. Secondary “gutter” drain pans shall not be acceptable. The secondary drain pan racking system shall be made entirely of 304 stainless steel.

2.5.1.4. Units up to 30,000 CFM and with secondary drain pans shall have 1” PVC downspouts to drain condensate into the main condensate pan. Units larger than 30,000 CFM shall have independent drain connections extended outside the cabinet. Drain material shall be as indicated under paragraph 2.4.6.2. Each drain connection requires an independent external P-trap, provided and installed by others.

2.5.1.5. The cooling coil racking system must be designed to allow for the individual removal of multi-stacked or side-by-side coils. Stacked cooling coils shall have independent accessible panels that will enable the ability to remove individual stacked coils.

2.5.1.6. The interior panels of the cooling coil and humidifier sections shall be solid 304 stainless steel, its thickness and finish shall be consistent with the air handler cabinet.

2.5.1.7. All coil piping connections that extend to the exterior of the cabinet, shall do so through neoprene rubber seals. Cooling coils must have double seals and heating coils shall have single exterior seals.

2.5.1.8. Direct expansion coil distributors are to be located inside the coil section downstream of the coils and be turned upward. Refrigerant vapor suction connections are to be extended to the exterior wall access panel if field connected to a remote condensing unit, otherwise, all piping shall be internal to the unit.

2.5.1.9. Single horizontal coil units must have all coil connections on the access door side, unless otherwise specified. Double horizontal coil units must have coil connections on both sides, unless otherwise specified.

2.6. EQUIPMENT BLANK-OFFS

2.6.1.1. Forced convergence of air streams toward the core area of internal equipment shall be accomplished with blank-off plates. Typical equipment requiring blank-offs are: Coil banks, filters, dampers, etc. The blank-offs must be securely fastened to the internal side walls and adjacent internal equipment. The blank off material shall be as specified under the specific modular segment.

2.7. FAN SECTIONS

2.7.1.1. Fan and motor assemblies shall be mounted on welded and powder coated integral bases. The entire assembly shall be supported by 2" deflection seismic isolators. The isolators shall be selected to provide an isolation efficiency equal to 95% or better.

2.7.1.2. The fan sections shall be equipped with solid liners

2.7.1.3. To obtain optimum aerodynamic performance, plenum fans shall be centered in the cabinet. To minimize pressure losses due to internal system effects, the minimum distance from the tip of the wheel to the inside surface of the cabinet shall be at least ½ of the wheel diameter.

2.7.1.4. To prevent injuries, access doors shall open against the positive pressure, therefore towards the inside of the fan section. Motor position relative to the fan shaft shall be X-Y and opposite of the access door.

2.7.1.5. Medium and high static pressure fans shall be equipped with horizontal thrust limiting restraints to ensure stable operation and to prevent the flexible connecting canvas from tearing.

2.8. AUXILIARY FLOOR DRAIN PANS

2.8.1.1. Provide auxiliary drain connections on AHU sections as indicated on the plans. The floors in such sections shall be recessed to create a watertight management system. The drain connections shall be MPT type and connected to precision machined aluminum catch basins. The catch basins shall be protected with removable stainless steel grates.

2.9. KNOCK DOWN ASSEMBLY.

2.9.1.1. To minimize field labor, rivet-nut inserts shall be installed at the factory for easy field bolting. Butyl gasket/membrane shall be provided for field installation on the exterior adjoining panels. Cadmium plated bolts shall be provided and field installed around the full perimeter of the connection joint.

2.10. INTERIOR AND/OR EXTERIOR POWDER COATING FINISH

2.10.1.1. The Exterior finish shall be not painted.

2.10.1.2. The Interior finish shall be not painted.

2.10.1.3. To ensure sustained product life, all structural base components shall be made of galvanized steel material. Painted carbon steel components shall not be utilized unless they are baked powder coated or sand blasted and finished with a baked enamel coating. If the base components are powder coated, then the process shall be the following:

2.10.1.3.1. The powder coating process shall include: Pre-washing; Rinsing; Re-washing; Rinsing cycle I; Rinsing cycle II; Oven dry @ 400 °F; Electrostatic paint application (powder format); Baked finish @ 400 °F

2.10.1.3.2. Paint shall be applied in an electrostatic powder coating system. The electrostatic spraying shall be accomplished by applying an electrical charge to the dry powder particles while the component to be painted is electrically grounded. The charged powder and grounded workpiece create an electrostatic field that pulls the paint particles to the workpiece. The coating deposited on the workpiece retains its charge, which holds the powder to the workpiece. The coated workpiece is placed in a curing oven, where the paint particles are melted onto the surface and the charge is dissipated. The paint system shall be environmentally friendly, therefore eliminating the use of volatile organic compounds (VOC's), hazardous air pollutants (HAP's) and solvents. Individual panels must be painted prior to final assembly to ensure painting of all sheared metal edges and concealed surfaces. The paint coating shall resist 10,000 hours to the Standard ASTM-B117 salt spray test.

2.11. FANS

2.11.1.1. SELECTION

2.11.1.2. All fans, single or double width, with or without fan scrolls, shall have “BI” or “AF” type wheels with diameters corresponding to the fan schedules.

2.11.1.3. The fan diameters and the impeller surface areas shall have been determined and tested according to AMCA® Standards.

2.11.1.4. The fan construction shall be in accordance with the class required or specified in the project fan schedule. Fan shafts shall be sized so that the first critical rotational speed is at least 125% of the maximum operating rotational speed for Classes I and II, and at least 142% of the maximum rotational speed for Classes III and IV.

2.11.1.5. The manufacturer shall certify the sound power level ratings in the eight octave bands. Sound power levels shall be in decibels referenced to 10-12 watts.

2.11.1.6. All fans shall be certified to bear the AMCA® rating seal for air and sound, according to Standards 211 and 311.

2.11.1.7. The fan bearings (non-direct driven fans) shall be designed for continuous intensive operation and shall be rated for a minimum L-10 life 50,000 hours at the maximum speed for its class. The bearings shall be equipped with easily accessible extended lubrication lines to the interior of the cabinet.

2.11.1.8. The fans shall have been statically and dynamically balanced by the fan manufacturer. An IRD or PMC analyzer shall have been used to measure velocity. The final balanced reading shall not exceed 0.15 inches/second.

2.11.1.9. Fan inlets shall be equipped with removable fan inlet grilles, designed according to OSHA Standards.

2.11.1.10. Plenum fan shall have a protective and removable wheel enclosure designed according to OSHA Standards.

2.11.1.11. Blow through systems shall include a perforated diffuser plate installed on the septum wall downstream of the fan section to uniformly distribute the air across the face of the component downstream of the fan.

2.11.1.12. Approved fan manufacturers include: Twin City Fan, Greenheck Fans, Ziehl-Abegg, Rosenberg. Other manufacturers’ products must be an approved equivalent.

2.11.2. WALL MOUNTED FAN ARRAY SYSTEM

2.11.2.1. The Fan Array System shall consist of multiple, direct driven plenum fans constructed per AMCA® requirements. The number of fans per array shall be at least 2.

2.11.2.2. Fans shall have a sharply rising pressure characteristic extending through the operating range and continuing to rise beyond the peak efficiency to ensure quiet and stable operation.

2.11.2.3. Fans shall be tested in accordance with AMCA® 211 and AMCA® 311 test codes for air moving devices and shall be guaranteed by the manufacturer to deliver rated published performance levels. Fans shall be licensed to bear the AMCA® certified seal for both sound and air.

2.11.2.4. Performance data on fans with shaft, bearings, and bearing bar in the inlet shall be de-rated to account for inlet restrictions and be licensed to bear the AMCA® certified seal for both sound and air.

2.11.2.5. Fans shall be designed without scroll type housing and shall incorporate a non-overloading type backward curved impeller energy-optimized for operation without spiral housing using special

blade geometry with rotating bladeless diffuser for high efficiencies and favorable acoustic behavior.

2.11.2.6. Inlet plates shall be of heavy-gauge reinforced steel construction. The inlet plate incorporates a removable spun inlet cone designed for smooth airflow into the accompanying inlet retaining ring of the fan wheel. A square formed lip suitable for attachment of a boot connector shall surround the unit, or an optional round inlet collar can be provided.

2.11.2.7. Impeller made of steel, welded and powder coated. Design hub and attachment to NEMA motors Taperlock bush hub or fixed hub. All wheels shall be statically and dynamically balanced on precision electronic balancers. Balance quality G2.5 size 16-45 inch / G6.3 size 9-14 inch diameter.

2.11.2.8. Inlet ring made of galvanized steel sheet with measuring device for determination of flow rate.

2.11.2.9. All motors shall be NEMA standard pedestal mounted type (TEFC), T-frame motors selected at the specified operating voltage, RPM, and efficiency as specified or as scheduled elsewhere. All motors shall include isolated bearings or shaft grounding rings. For efficient operation in a direct drive application, motors shall be capable of running continuously from 0 to 120Hz and deliver full rated horsepower at 60 to 120Hz operating frequencies. All motors shall maintain a minimum service factor of 1.15 throughout a 60 to 120HZ operating range.

2.11.2.10. The fan/motor cubes shall be installed inside acoustical cubes that provide acoustical attenuation to reduce the bare fan discharge sound power levels as scheduled. The acoustical cubes shall not increase the fan total static pressure, nor shall they increase the airway tunnel length of the Air Handling Unit when compared to the same fan array unit without the acoustical cubes.

2.11.2.11. Manufacturers must submit acoustical data for review and approval prior to the bid indicating that the proposed alternate equipment can meet all specified performance requirements without impacting the equipment performance or design features; including duct connection location, unit weights, acoustical performance, or specified total fan HP for each fan array. Proposals submitted which indicate a higher connected fan HP than specified or scheduled will not be accepted.

2.11.2.12. The fan array shall consist of multiple fan and motor "cubes", spaced in the air way tunnel cross section to provide a uniform air flow and velocity profile across the entire air way tunnel cross section and components contained therein.

2.11.2.13. The Fan array shall produce a uniform air flow profile and velocity profile within the airway tunnel of the air handling unit not to exceed the specified cooling coil and/or filter bank face velocity when measured at a point 12" from the intake side of the Fan array intake plenum wall, and at a distance of 48" from the discharge side of the Fan plenum wall.

2.11.2.14. Each fan/motor cube shall be removable through a 24" wide, free area, access door located on the discharge side of the fan wall array.

2.11.2.15. Each fan/motor "cell" will be provided with a manual blank-off plate. Backdraft dampers shall be extruded aluminum on frames and blades and engineered to produce minimum static pressure loss at the designed operating conditions. Seals shall be solid rubber. Bearings shall be rubber shielded radial ball bearings, permanently lubricated.

2.11.2.16. Ingenia Technologies Inc. shall provide a sliding motor removal rail in all fan sections as specified on drawings and schedules (optional).

2.11.2.17. The fans shall be manufactured by Ziehl Abegg, Rosenberg or an approved equivalent.

2.12. FAN ARRAY POWER AND AIRFLOW CONTROL SYSTEM

Overview

2.12.1.1. Ingenia Technologies Inc. shall provide a power and airflow control system required to run the Fan Array System including all equipment, material, electrical enclosure, electrical components and electrical labor. The enclosure shall be surface-mounted to the exterior of the air handling unit, and NEMA rated.

2.12.1.2. Fan Array electrical design shall be in accordance with the NEC, UL 508A, and Local Codes.

2.12.1.3. There shall be a controller provided as an integral part of the fan system electrical panel. Through a touch screen user interphase, the controller can provide multiple functions. The fan array controller shall include an interface that is compatible with the building automation system and allow remote monitoring and/or control of the individual fans in the array. Each fan array control panel shall include motor status indicators, operating mode, individual fan air flow, total air flow and alarms. Other programmable functions are possible. Component's status shall be displayed at the unit control interface screen and at the remote building automation system. A communication interface with the BAS system shall be provided by the AHU manufacturer and shall require a single interface point at the multiple fan array system control panel by the project controls contractor. The controller interphase shall be BACnet/IP (standard).

Motor Circuit Protection

2.12.1.4. All motors in the Fan array shall be provided with individual Motor Protection for thermal overload protection. All motor circuit protectors shall be located in the main enclosure or a separate NEMA rated panel.

2.12.1.5. If required by design, all motor circuit protectors shall be mounted and located in a remote motor circuit protector panel as needed that is separate from the main enclosure. Motor circuit protector enclosure must be located and mounted at a minimal distance from motors in the Fan array and be properly NEMA rated as per design requirements.

2.12.1.6. Provide an array of indicator lights for motor status for each fan section (i.e. -supply, return, filtered fan unit).

Fan Array with Variable Frequency Drive Control

2.12.1.7. Ingenia Technologies Inc. shall provide dedicated Variable Frequency Drives to start and run each motor in each Fan Array System, unless otherwise specified.

2.12.1.8. Unless specified otherwise, each motor shall have a dedicated VFD. The Variable Frequency Drive shall be sized accordingly to start and run individual motors in the Fan Array.

2.12.1.9. Ingenia Technologies Inc. shall provide manual-changeover, backup VFD for each Fan Array System. The Variable Frequency Drive shall be sized accordingly to start and hold all motors in the Fan Array if one VFD per system is required.

2.12.1.10. Provide short circuit protection of motor circuits through means of using fuses with fuse blocks or circuit breakers.

2.12.1.11. All VFDs provided for the project shall be by the same manufacturer.

2.12.1.12. The Variable Frequency Drives shall be mounted in a dedicated, properly NEMA rated enclosure for connection to single point power. Provide cooling of enclosure appropriate for outdoor conditions.

2.12.1.13. Provide three-phase power distribution wiring, and control wiring as required. All three-phase power components shall have a rating listed for Short Circuit Current Rating.

2.13. FLOW MONITORING SYSTEM

2.13.1.1. Ingenia Technologies Inc. shall provide a piezometer ring system mounted in the throat of each fan to enable the measurement of the pressure drop across the inlet cone.

2.13.1.2. The pressure drop is measured from the tap located on the face of the funnel to the piezometer ring in the throat. The inlet tap is connected to the high pressure side of the transducer and the piezometer ring is connected to the low pressure side.

2.13.1.3. The measurement system does not impact the airflow characteristics in any way, resulting in a zero system effect.

2.13.1.4. The accuracy of the system is +/- 5%

2.14. AC MOTORS

2.14.1. Motors shall comply with NEMA MG-1 for designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 section “Common Motor Requirements for HVAC Equipment”. Enclosure type to be TEFC. Their efficiency must be in accordance with NEMA Premium suitable for inverter duty.

2.14.2. Motors shall be selected for operation with (460 Volts, 3 Phase, 60 Hz) power supply.

2.14.3. The motors shall be inverter duty and shall conform to the NEMA Standard MG-1, Section 31.

2.15. HEAT TRANSFER COMPONENTS

2.15.1. Each coil shall have been hydrostatically tested up to 150 psig for ≤200°F and five times the operating pressure for >200°F and shall be designed for continuous operation at 200 psig and 220°F.

2.15.2. Water or glycol-mix coils shall have copper headers and red brass threaded connections. Drain and vent connections shall be incorporated into the header and extended to the exterior of the casing.

2.15.3. Direct expansion cooling coils shall be equipped with distributors and suction lines. The suction lines shall be extended to the exterior of the casing, the distributors shall terminate inside the casing, downstream of the DX coils.

2.15.4. Steam coils shall be non-freeze steam distributing type. Internal tubes shall be perforated allowing for a uniform steam distribution to the interior of the external tubes. The steam coils shall be installed in such a way as to provide continuous and complete condensate drainage.

2.16. DX COILS

2.16.1.1. Coils shall be designed for use with R-410a refrigerant and constructed of Cu-Ni tubes with aluminum fins mechanically bonded to the tubes with 304 stainless steel end casings. Fin design shall be corrugated. Coil racks shall be of 304 stainless steel for all coil sections.

2.16.1.2. Coils shall be helium leak tested. Coils shall be furnished with factory installed thermostatic expansion valves. The coil frame material shall be 304 stainless steel. The tubes shall have a nominal diameter of 3/8" and 0.012” thick smooth wall. Heat transfer fins shall have a nominal thickness of 0.006”.

2.16.1.3. The coils shall be coated with no corrosion protection.

2.16.1.4. Each coil shall have been air pressure tested up to 400 psig under water, completely dehydrated and pressure tested with refrigerant.

2.17. HYDRAULIC HEATING COILS

2.17.1.1. The coil frame material shall be galvanized steel.

2.17.1.2. The tubes shall be Cu-Ni with a nominal diameter of 5/8” and 0.020" thick wall.

2.17.1.3. Heat transfer fins shall be aluminum and shall have a nominal thickness of 0.0075". Fin design shall be corrugated.

2.17.1.4. The coils shall be coated with no corrosion protection.

2.18. FILTERS

2.18.1. Filter types, efficiencies and quantities shall be provided according to the project specifications. In order to minimize filter inventory, the only pre-filter and final filter dimensions acceptable to the owner are 12” x 24” and 24” x 24”.

2.18.2. Filters and pre-filters shall be front loading whenever an accessible section is available upstream of the filter section. The front-loading filter frames shall be made of Aluminum extrusion channels Ingenia Filter Frame Plus. The filter holding system shall be mechanical, held in place with “keyhole fast-access clips” secured with ¼” bolts. Wire style holding clips are not acceptable. The gaskets shall be closed cell seamless poured in place urethane extruded EPDM (PIPFG). Adhesive gaskets are not acceptable.

2.18.3. The filters and pre-filters shall be side loading whenever an accessible section is not available upstream of the filter section. The filter slide tracks shall be fabricated with aluminum profiles. The filter side access doors shall be constructed with same features, including the thickness of the door and the HVAC unit.

2.18.4. Supply and factory install, for each filter bank, pressure differential manometers manufactured by Dwyer® under the brand name Magnahelic 2000 series.

2.18.5. CARTDRIGE FILTERS

2.18.5.1. Filters shall have a minimum efficiency rating of MERV-9.

2.18.5.2. Final filters shall be 12" deep.

2.18.5.3. The cartridges shall be disposable and shall be fabricated of reinforced synthetic fibers bonded to a resistant water resistant and incombustible carton frame.

2.18.5.4. Pre-filters shall be manufactured according to the standards established by UL class ll. Minimum efficiency shall meet the ASHRAE 52.1-1992 Standard.

2.18.5.5. The unit manufacturer shall supply and install all filters at the time of shipment. The unit manufacturer shall supply one additional set.

2.18.5.6. Acceptable products: AAF or approved equivalent.

2.19. MULTI-BLADE DAMPERS

OUTDOOR AIR DAMPERS (TAMCO 9000)

2.19.1.1. Dampers frames shall have prefabricated aluminum extrusions.

2.19.1.2. Damper blades shall be airfoil type, double wall, opposed and be made of aluminum extrusions.

2.19.1.3. Air seal gaskets shall be made of synthetic rubber type TPE and EPDM.

2.19.1.4. Dampers shall be thermally insulated. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.

2.19.1.5. All drive shafts shall be located out of the air stream, and it shall be possible to install the actuators inside the cabinet without interference to the airflow. Actuators for each damper shall be sized and installed by control division.

2.19.1.6. Dampers shall be AMCA rated for Leakage Class 1A at 1 in w.g. (0.25 kPa) differential static pressure.

2.19.2.1. Dampers frames shall have prefabricated aluminum extrusions.

2.19.2.2. Damper blades shall be airfoil type, double wall, opposed and be made of aluminum extrusions.

2.19.2.3. Air seal gaskets shall be made of synthetic rubber type TPE and EPDM.

2.19.2.4. Dampers shall be non-insulated.

2.19.2.5. All drive shafts shall be located out of the air stream, and it shall be possible to install the actuators inside the cabinet without interference to the airflow. Actuators for each damper shall be sized and installed by factory.

2.19.2.6. Dampers shall be AMCA rated for Leakage Class 1A at 1 in w.g. (0.25 kPa) differential static pressure.

2.20. AIR MIXERS

2.20.1. Air mixers shall be provided, as per the drawings and schedules, to reduce air stratification downstream of air-mixing sections.

2.20.2. The air mixers shall be manufactured by a well-established manufacturer who has thoroughly tested and documented the performance data.

2.20.3. The air mixer blades shall be fixed and made of heavy gauge aluminum.

2.20.4. Air mixers shall be Blender Products or approved equivalent. The air mixers shall be installed in the unit according to the manufacturer's recommendations.

2.21. ELECTRICAL (installation and wiring only applicable to factory assembled units)

2.21.1. Fluorescent light fixtures shall be EMERGI-LITE IPE™ series IP65. The lights shall be surface mounting vapor-tight, 1.2 m (4') long fixtures with two 32-watt lamps (T8), rapid start high efficiency electronic ballasts and CSA certified. The body and lens shall be constructed of UV stabilized, industrial grade, vandal resistant polycarbonate. A durable formed gasket shall be provided between the enclosure and the lens and shall be designed specifically for hostile environments. The reflector shall be made of highly specular material and formed to maximize light output efficiency. All parts shall be corrosion resistant. A metal plate used to retain the ballast and reflector also serves to dissipate heat, therefore lengthening ballast life.

2.21.2. Switches shall be Hubbell RC109W – 15 Amps , and 120 volt AC. The Single pole switch will include illuminated pilot light, be self-grounding, have side wire termination and be CSA certified. Unless otherwise shown or specified, all air handling unit lighting fixtures are to be connected to one switch. Junction boxes shall be THOMAS & BETTS™ universal FSU – 2-3/8" deep, cast aluminum and supplied with close-up plugs. Cover plate shall be made of stamped aluminum.

2.21.3. GFCI receptacles shall be Hubbell GF15WL - 15 Amps, duplex, heavy duty, white, and 125 volt AC. The GFCI shall be two pole, 3-wire, flashing red LED signals loss of GFCI protection, steady

on red LED signals ground fault condition and be CSA certified. Back and side wire terminations can accept up to #10 AWG wire.

2.21.4. 120 volt polymeric plug-in load centers shall be EatonGuard™ Single phase, 3 wire, and 250 volt max. and non-combination. Available in type-1 or 3R, max. 70 amps. Wire size range for main CU/AL is #14 - #2. CUTLER HAMMER type BR plug-in breakers shall be in the 1 inch per pole molded case and can be used as main and/or branch disconnect device. The product is CSA and ETL/UL listed. Typical ampacity for BR breakers is 15 amps for each circuit.

2.21.5. The unit manufacturer shall furnish and wire a complete electrical system for the 120 volt load components. All 120 volt components shall be wired to terminate at a breaker panel/load center.

2.21.6. Each circuit shall not exceed 15 Amps. Multi-circuit breaker panels shall be provided if required. Each air handling unit shall require a 480 volt power connection for each fan/motor system. Each motor shall include a non-fused, heavy duty rated, safety disconnect switch inside the fan section, if physically possible, and otherwise it shall be installed outside the fan cabinet within the line of sight of the motor. Disconnects shall include an auxiliary contact to stop the frequency drive if the disconnect action is activated prior to stopping the variable frequency drive. Disconnect shall be ETL/UL listed.

2.21.7. The unit wiring (**N/A for knockdown units**) shall be stranded copper wire sheathed in a THHN covering, which shall be distributed through the unit in EMT conduit; the use of aluminum wire or BX cable is prohibited. To allow for adjustment of fan motors, a 3’ section of weatherproof flex connects shall be provided at each motor. A separate ground wire for each motor shall be connected to a terminal within the disconnect switch. In addition to the requirements herein, wiring shall comply with NEC requirements. Inter-modular wiring shall terminate in a coiled configuration at the end of each module. The contractor shall pull the cables through the modules to complete the system wiring.

END OF SECTION

SECTION 23 7314
IT ROOM COOLING UNIT

1. General

1.1 The intelligent precision air-conditioning system shall be a ClimateWorx P Series or approved equal.

1.2 The unit shall be designed specifically for telecommunication, computer and critical room environmental control with automatic monitoring and control of cooling, heating, humidifying, dehumidifying and air filtration functions.

1.3 The unit shall be self-contained, factory assembled and tested, arranged for down flow front discharge air delivery.

1.4 See Drawings for performance and electrical requirements.

2. Mechanical Parts

2.1 Cabinet

2.1.1 The cabinet of the unit shall be constructed based on a frame and panel principle with removable panels for maximum service access.

2.1.2 The framework shall be fabricated by 14 gauge cold-formed steel to provide maximum strength.

2.1.3 All panels shall be formed and welded from 18 gauge steel and insulated with 25mm (1") thick, 24kg/m³ (1.5 lb/ft3) density fiber-glass insulation.

2.1.4 The panels shall be internally lined with 20 gauge sheet metal, for ease of cleaning.

2.1.5 All service panels shall be hinged and locked with ¼-turn captive fasteners to facilitate quickly and easily internal access.

2.1.6 The entire unit shall be finished with epoxy powder paint to ensure proper surface adhesion. The color of the panels shall be ClimateWorx standard off-white.

2.1.7 The cabinet is arranged for right hand side pipe access (when facing unit).

2.1.9 The pipe access shall be from the bottom on down flow units and top for up flow units.

2.2 Blower and EC Motor

2.2.1 The BACKWARD INCLINED Direct Drive Plenum Fan, single inlet, single width, centrifugal wheel with an ELECTRICALLY COMMUTATED external rotor motor, shall have a static and dynamic balance of the complete assembly. The fan shall operate from within the floor stand for optimum floor pressurization and energy efficiency. The fans shall ship in a raised up position inside the cabinet of the machine and shall PIVOT into the floor stand in the field after the machine is installed. The minimum floor height shall be 18”. The fan must be operable in the raised position for test purposes.

2.2.2 A floor stand with OSHA guards is required and the OSHA guard shall not exceed 18” when the floor stand is higher to allow pipes to run under the floor stand without special modifications.

2.2.3 No jacks or lifting rigs shall be required to raise and lower the fans.

2.2.5 The complete wheel and motor assembly shall be mounted on resilient neoprene mountings for vibration isolation.

2.2.6 Electronic commuted motors (EC motors) are DC motors with shunt characteristics. Contrary to the conventional DC motors with mechanical commutation, no wear and tear elements such as collectors and carbon brushes are required. They are substituted by maintenance-free electronic circuitry in the EC controller. EC motors are characterized by their high efficiency and optimal open-/closed-loop control. An electronic reversal of the motor's direction of rotation is possible.

2.2.7 Rotor - A rotor with permanent magnets replaces the short-circuit armature. An external electronic commutating unit, the so-called EC-Controller, provides for the electronic commutation. The EC-Controller provides the windings with electrical current so that, the motor rotates continuously and quietly.

2.2.8 Speed control - Method of fan speed control shall be attained by an analog signal from 0 to 10 volts DC. The speed control offers continuously variable control through the Microprocessor.

2.3 Filters

2.3.1 The filter section shall be an integral part of the system, located at the entrance of return air path, except PCD180 and should be serviceable from the top (down flow) and bottom (up flow) of the unit. Face velocity shall not exceed XXX FPM. PCD180 requires an external Plenum and Filter Box on top of the machine. This Plenum and Filter Box is factory assembled and shipped loose for field installation. See 2.3.5

2.3.2 The filter section shall have the provision to house 102 mm (4") high efficiency filters on Down Flow units and 51 mm (2”) efficiency filters on Up Flow units. Standard pleated filter shall be MERV 8. (30-45% ASHRAE 52.1)

2.4 Reheat

2.4.1 An electric resistance heater shall be provided to offset the sensible cooling effect during dehumidification mode.

2.4.2 The heating element shall have a total heating capacity of 15 kW.

2.4.3 The electric heaters shall be Silicon Controlled Rectifier (SCR) controlled, with an extruded aluminum heat sink, to prevent room temperature gradient from exceeding 1.5□C (2.7□F) in 10 minutes.

2.4.4 The heating element shall be of low density, tubular finned construction with a non-corrosive metal sheath.

2.4.5 The heating element shall be electrically and thermally protected.

2.4.6 Heater shall hinge out of the way for shipping on units with fans that are to be lowered into the floor stand. Once fans are lowered, heaters are rotated up and hooked into normal operating position. A locking screw holds the heaters in the normal position.

2.5 Humidifier

2.5.1 The humidifier shall be housed in a separate compartment which allows it to be serviced without disturbing the air flow. Humidifiers mounted in the air stream are not acceptable and humidifiers that disrupt air flow for routine inspection and service are not acceptable.

2.5.2 Units with humidifiers shall be 100% front serviceable.

2.5.3 The humidifier shall be a self-contained electrode boiler type complete with water level control and auto-drain functions.

2.5.4 The humidifier shall have a team generation capacity of 20 lbs/h.

2.5.5 The humidifier shall be designed to operate on ordinary tap water and shall be equipped with automatic water supply and flushing system to reduce mineral precipitation.

2.5.6 The humidifier shall have an Auto-Adaptive control system to optimize water conductivity, control automatic drain/flush cycles, minimize energy waste and maximize cylinder life.

3. Control System

3.1 Microprocessor

3.1.1. The unit shall have a microprocessor based control system with automatic control and monitoring capability.

3.1.2. The control system shall use Proportional + Integral + Derivative (PID) control algorithm to maintain the temperature and humidity to a close tolerance of ±0.5°C (0.9°F) and 3%RH.

3.1.3. The control system shall have a fascia with 240x128 dot resolution touch screen, graphical LCD display located on the front panel of the unit for the display and programming of functions.

3.1.4. The control system shall display simultaneously the following information on the fascia.

- **Room temperature in °C or °F**
- **Room humidity in %RH**
- **Unit no.**
- **On/Off mode indicator**
- **Operating status**
- **Active alarms**
- **Date & time**

3.1.5. System configuration and setting shall be stored in non-volatile memory and safeguarded in the event of power failure.

3.1.6. The system shall have at least three levels of programmable password access to prevent unauthorized changes of the system configuration and settings.

3.1.7. The control system shall have a built-in testing routine to simplify field testing and troubleshooting.

3.1.8. The system shall be capable of communicating with a Building Management System (BMS) via an RS485 serial link through an Optional BMS Interface (Communications Bridge) for remote monitoring function. The resident protocol shall be MODBUS RTU. Other popular open protocols are available and require an optional external gateway.

3.1.9. The system shall have a manual disconnect switch of the locking type, which can be accessed outside of the unit while the door is closed. High voltage electrical components will not be accessible unless the switch is off.

3.2 Control Features

3.2.1. System set points and configuration shall be programmable only when access is gained by entering the correct password.

3.2.2. The following programmable control parameters shall be provided for fine tuning the system to suit the site conditions and requirements:

- **Temperature set point**
- **Temperature high limit**
- **Temperature low limit**
- **Cooling proportional band**
- **Heating proportional band**
- **Temperature dead band**
- **Relax temperature dead band**
- **Temperature integral action time**
- **Temperature Derivative function**
- **Humidity set point**
- **Humidity high limit**
- **Humidity low limit**
- **Humidifying proportional band**
- **Dehumidifying proportional band**
- **Humidity derivative function**
- **Humidity dead band**
- **Relax humidity dead band**
- **Humidity integral action time**

3.2.3. The control system shall have the following programmable On/Off control mode options:

- **“Local” mode allows unit on/off control via the “I/O” key on the display**
- **“Remote” mode allows unit On/Off control via a switched input**
- **“Timer” mode allows 4 event/day weekly automatic on/off control**

3.2.4. A “Standby unit enable” input shall be provided to force the unit to start irrespective of the current On/Off status and On/Off mode setting.

3.2.5. For energy saving and extended system life, a “Relax” feature shall be provided in the “Timer” On/Off mode to allow wider temperature and humidity tolerances when the room is not operational.

3.2.6. The system shall have programmable, manual, or automatic restart option. A programmable startup delay shall be provided for the automatic restart option which allows multiple units to restart progressively when power resumes after a power failure.

3.2.7. The accumulated runtime of the following components shall be logged for energy analysis and planned maintenance:

- **Fan**
- **Compressor**
- **Heaters**
- **Humidifier**

3.2.8. Components shall be scheduled to activate sequentially to minimize inrush current.

3.2.9. The system shall have a temperature and humidity graph which shows the main temperature and humidity variation in the latest 7 Days. The data for the graph shall be logged in 15 minutes interval.

3.3 Alarms

3.3.1. The control system shall have the following standard alarms:

- **High/Low temperature**
- **High/Low humidity**
- **High/Low voltage**
- **Filter dirty**
- **Fan fault**
- **Low airflow**
- **Compressor high pressure, 1/2**
- **Compressor low pressure, 1/2**
- **Compressor overload 1/2 (only available on select compressors)**
- **Heater overheat (with Optional Heater)**
- **Humidifier Service (with Optional Humidification)**
- **Fire**
- **Loss of Sensor**
- **Loss of EX1, EX2 (DX only)**
- **Liquid Detection (Optional)**
- **Liquid High Limit (Optional)**
- **Custom Fault 1 and 2 (Optional)**
- **Filter Drier Dirty, 1/2 (Optional DX only)**

3.3.2. All alarms shall have programmable reporting / response options which include:

- **Polling enable / disable**
- **Unit shutdown**
- **Activate standby unit**
- **Activate common alarm output**
- **Log alarm event**
- **4 warning sound selection**

3.3.3. Alarm messages, when programmed, shall comprise text description and occurrence time.

3.3.4. Messages shall be ranked in the sequence of occurrence for fault analysis.

3.3.5. When a programmed alarm condition exists, the audible alarm shall sound and the common alarm output shall close until acknowledged. Active alarm record shall remain until the alarm condition is cleared.

3.3.6. A historical event log which maintains the latest 50 system events shall be provided. The text description and occurrence time of the following events shall be logged:

- **Power failure**
- **Power restore**
- **Unit start**
- **Unit stop**
- **Alarm raised**
- **Alarm acknowledged**
- **Alarm cleared**

4. Optional Accessories

4.7. Condensate Pump Options

4.7.1. Condensate pump shall remove condensate from evaporator and humidifier when a drain is not available nearby. Pump is shipped loose for field installation. Optional factory mounted and wired pumps are available. Pump shall be capable of 40 GPH at 20’ of head.

END OF SECTION

SECTION 23 7416
AIR COOLED CONDENSING UNIT

Part 1 — GENERAL

1.01 SYSTEM DESCRIPTION

Outdoor-mounted, air-cooled condensing unit with R-32 refrigerant suitable for on-the-ground or rooftop installation. The 38RCS unit shall have one refrigeration circuit and shall consist of two or three rotary scroll compressors. The 38RCD unit shall have two independent refrigeration circuits and shall consist of two or four rotary scroll compressors. Unit shall have air-cooled coils, aeroacoustic condenser fans, a control box, and shall discharge condenser air vertically upward as shown on certified drawings. Unit shall be used in refrigeration circuit with a central station air-handling unit or direct-expansion coils.

For units that incorporate Greenspeed intelligence, all fans are controlled with variable speed fan drive motors. Unit software shall be specifically developed to coordinate optimal fan speed for application conditions and provide refrigerant circuit optimization, resulting in higher part load efficiency and reduced acoustic levels.

1.02 QUALITY ASSURANCE

A. Unit performance shall be rated in accordance with AHRI (Air-Conditioning, Heating, and Refrigeration Institute) Standard 365, latest edition (U.S.A).

B. Unit construction shall comply with latest edition of ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) 15 Safety Code, UL 60335-40-2, and ASME (American Society of Mechanical Engineers) applicable codes (U.S.A. codes).

C. The management system governing the manufacturer of the product is ISO (International Organization for Standardization) 9001: 2015 certified.

D. Base unit shall be constructed in accordance with UL (Underwriters Laboratories) standards and CSA (Canadian Standards Association).

E. Painted parts shall withstand 1000 hours in constant neutral salt spray under ASTM B117 conditions with a 1mm scribe per ASTM D1654. After test, painted parts shall show no signs of wrinkling or cracking, no loss of adhesion, no evidence of blistering, and the mean creepage shall not exceed 1/4 in. (Rating ≥ 4 per ASTM D1654) on either side of the scribe line.

F. Design pressure shall be 650 psig (4482 kPa).

G. Unit shall be functional checked at the factory.

H. Lifting holes shall be provided to facilitate rigging.

1.03 DELIVERY, STORAGE, AND HANDLING

Unit shall be shipped as single package and shall be stored and handled per the unit manufacturer's recommendations.

1.04 WARRANTY (FOR INCLUSION BY SPECIFYING ENGINEER)

Part 2 — PRODUCTS

2.01 EQUIPMENT

A. General:

Factory assembled, single-piece, air-cooled condensing unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressors, nitrogen holding charge, and special features required prior to field start-up.

B. Unit Cabinet:

1. Cabinet shall be galvanized steel casing with a baked enamel powder or pre-painted finish.
2. Control box access panels shall be hinged for service access.

C. Fans:

1. Standard condenser fans shall be direct-driven VFD (variable frequency drive) controlled, 9-blade airfoil cross-section, reinforced polymer construction, shrouded-axial type, and shall be statically and dynamically balanced with inherent corrosion resistance.
2. The variable speed drives for the condenser fans on 38RC units with Greenspeed intelligence shall include a DC link reactor.
3. Fan operation shall allow reduced sound levels during scheduled unoccupied operating periods. Manufacturers without unoccupied reduced sound capability shall submit 1/3 octave band data and sound power data as measured according to AHRI 370 as confirmation of unit sound characteristics.
4. Air shall be discharged vertically upward.
5. Fans shall be protected by coated steel wire safety guards.
6. Fan blades shall have serrated edges to minimize the sound that is produced.

D. Compressors:

1. Compressors shall be fully hermetic direct-drive, digital scroll.
2. Operating oil charge and a crankcase heater control oil dilution.
3. Compressors shall be mounted on two rails having rubber in shear vibration isolators.
4. Digital compressor unloading control shall be available on both circuits.
5. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have either internal line break thermal and current overload protection or external current overload modules with compressor temperature sensors.

E. Condenser Coils:

1. Coil shall be air-cooled microchannel heat exchanger (MCHX) and shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered between the refrigerant manifolds. Microchannel coils shall consist of a two-pass arrangement. Coil construction shall consist of aluminum alloys for the fins, tubes and manifolds in combination with a corrosion-resistant coating on the tubes.
2. Tubes shall be cleaned, dehydrated, and sealed.
3. Assembled condenser coils shall be leak tested and pressure tested at 650 psig (4482 kPa).

F. Refrigeration Components:

1. Refrigeration circuit components shall include liquid line temperature relief device, pressure transducers, liquid line shutoff valve, suction shutoff valve, suction line accumulators, nitrogen holding charge, and compressor oil.
2. Long line length check valves are required for liquid line installation on all linear line length applications of more than 100 ft (30.5 m) to prevent liquid migration during unit shutdown. For any 025-030 size dual circuit unit application where evaporator is located higher than the condensing unit, check valves are required for linear line length above 55 ft (16.8 m).
3. Units shall include one factory-installed suction line accumulator for each refrigerant circuit.

G. Controls, Safeties, and Diagnostics:

1. Unit controls shall include the following minimum components:
   a. Microprocessor with non-volatile memory. Battery backup system shall not be accepted.

b. Separate terminal block for power and controls.

c. Control transformer to serve all controllers, relays, and control components.

d. ON/OFF control switch.

e. Replaceable solid-state controllers.

f. Pressure sensors installed to measure suction and discharge pressures. Thermistors installed to measure cooler entering and leaving fluid temperatures.

g. Service run test capability.

h. Compressor minimum run time (3 minutes) and minimum off time (3 minutes).

i. Service diagnostic mode.

j. Self-contained low voltage control circuit.

k. Cycle condenser fans to maintain proper head pressure control.

l. Capacity control with staging compressors.

m. Optional digital scrolls to stage compressors and cycle digital compressor for maintaining desired leaving air temperature set point.

n. Alarm relay output to indicate when unit is in alarm condition.

2. Minimum unit safety devices shall include:

Solid-state compressor lockout to provide optional reset capability at the space thermostat if any of the following safety devices trip and shut off compressor.

a. Compressor lockout protection for internal or external overload.

b. Low pressure protection.

c. High pressure protection (high pressure switch or internal).

d. Compressor reverse rotation protection.

e. Loss of charge protection.

f. Low suction superheat protection.

g. Short cycle protection.

h. Suction and discharge pressure transducers.

i. Circuit breakers or fuses for short circuit protection of compressors.

H. Operating Characteristics:

1. See Drawings for performance characteristics.

I. Electrical Requirements:

All unit power wiring shall enter unit cabinet at a single location.

J. Special Features:

1. High-efficiency variable speed condenser fans:

All fans on the unit shall have variable speed fan motors to provide higher part load efficiency and reduced acoustic levels. Each fan circuit shall have a factory-installed, independent variable speed drive with display. Variable speed drives are rated IP-55 enclosures and UL Listed. The use of this option, with the addition of wind baffles or hail guards, shall allow running with outdoor ambient temperatures down to –20°F (–28.9°C). This option is available on unit sizes 025-060.

2. Sound Reduction:

   a. Low sound compressor blankets are available as a factory-installed option or as a field-installed accessory.

3. Digital Compressor Option:

   The digital compressor shall be available as a factory-installed option for all units to provide incremental steps for tighter temperature control.

4. Non-Fused Disconnect:

   A non-fused disconnect is available as a factory-installed option for all units.

5. 115V GFI Convenience Outlet:

   Shall be factory or field-installed to provide the unit with a 4 amp GFCI outlet. The receptacle shall have independent fuse protection. The convenience outlet is a 115-v female receptacle.

6. Long Line Length Check Valves:

   Long line length check valves are available as options shipped with the unit or accessories shipped separately. In either case, field installation is required.

7. High Short Circuit Current Rating (SCCR):

   The optional high SCCR interrupt capability shall allow the unit to tolerate a 65 kA (208/230-v, 380-v and 460-v units) or 25 kA (575-v units) short circuit current for a brief period of time while protecting downstream components. The high SCCR option shall provide a higher level of protection than the standard unit. High interrupt shall be available as a factory-installed option strictly in conjunction with a non-fused disconnect.

8. BACnet IP or MS/TP Communication:

   The BACnet Communication for i-Vu shall provide factory-installed communication capability with a BACnet MS/TP network. Allows integration with i-Vu® Open control system or a BACnet building automation system.

9. Security Grilles/Hail Guards:

   Units shall be supplied with factory-installed or field-installed louvered, sheet metal panels which securely fasten to the unit to provide condenser coil protection against hail and physical damage.

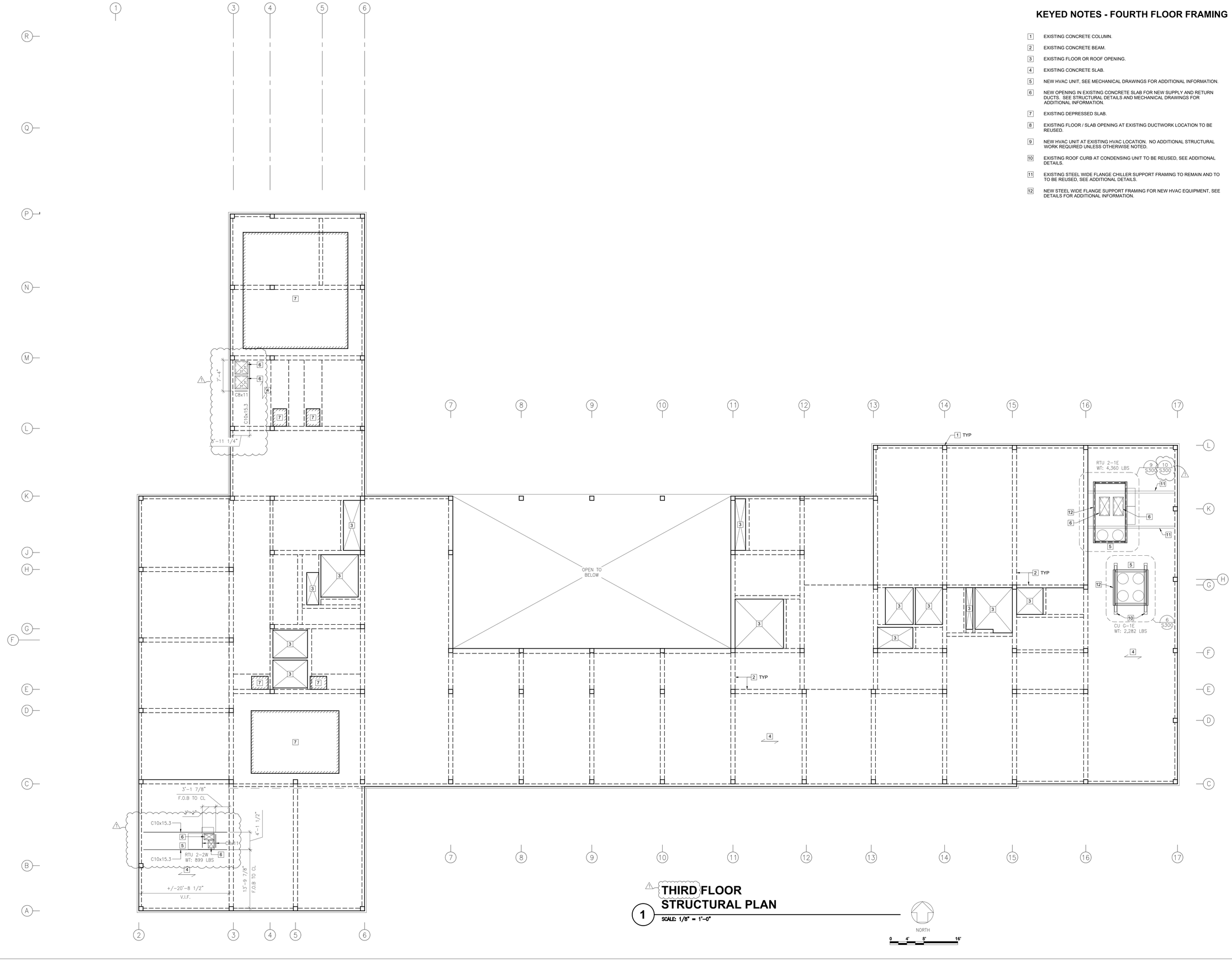
10. Vibration Isolation Pads:

    Neoprene vibration isolation pads (24 in. x 3 in. x 1/4 in.) shall be available for field installation to reduce vibration transmission from the compressor through the floor and into the conditioned space.

END OF SECTION

KEYED NOTES - FOURTH FLOOR FRAMING [X]

1. EXISTING CONCRETE COLUMN.
2. EXISTING CONCRETE BEAM.
3. EXISTING FLOOR OR ROOF OPENING.
4. EXISTING CONCRETE SLAB.
5. NEW HVAC UNIT, SEE MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
6. NEW OPENING IN EXISTING CONCRETE SLAB FOR NEW SUPPLY AND RETURN DUCTS. SEE STRUCTURAL DETAILS AND MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
7. EXISTING DEPRESSED SLAB.
8. EXISTING FLOOR / SLAB OPENING AT EXISTING DUCTWORK LOCATION TO BE REUSED.
9. NEW HVAC UNIT AT EXISTING HVAC LOCATION. NO ADDITIONAL STRUCTURAL WORK REQUIRED UNLESS OTHERWISE NOTED.
10. EXISTING ROOF CURB AT CONDENSING UNIT TO BE REUSED, SEE ADDITIONAL DETAILS.
11. EXISTING STEEL WIDE FLANGE CHILLER SUPPORT FRAMING TO REMAIN AND TO TO BE REUSED, SEE ADDITIONAL DETAILS.
12. NEW STEEL WIDE FLANGE SUPPORT FRAMING FOR NEW HVAC EQUIPMENT, SEE DETAILS FOR ADDITIONAL INFORMATION.



1 THIRD FLOOR STRUCTURAL PLAN

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

NORTH

0 4' 8' 16'

ARCHITECHNICS
ARCHITECTS • ENGINEERS • INTERIOR DESIGNERS
510 Maine Street • Quincy, Illinois 62301 • 217.222.0554

CURRENT DATE: 02.05.25

TODD J. MOORE 082-050495 REGISTERED PROFESSIONAL ENGINEER STATE OF ILLINOIS

LICENSE EXPIRES: 11.30.25

DMI DESIGN MECHANICAL, INC.

FULL SIZED PLANS HAVE BEEN PREPARED TO STANDARD SCALES. REDUCED SIZED PLANS MAY NOT CONFORM TO STANDARD SCALES. USE GRAPHIC SCALES WHEN MAKING MEASUREMENTS ON REDUCED PLANS.

DRAWING SIZES (PRINTED): 30"X42"

REVISIONS			
NO.	Date	Description
1	02.11.25	ADDENDUM 01

NEW HVAC SYSTEM FOR:

ADAMS COUNTY (IL) COURTHOUSE

521 VERMONT STREET
QUINCY, ILLINOIS

ISSUED FOR BIDDING

NOT FOR CONSTRUCTION

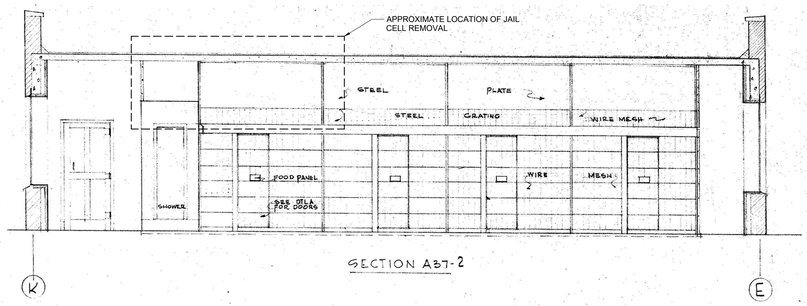
ISSUE DATE: 02.05.25

PROJECT NUMBER: 6573

THIRD FLOOR STRUCTURAL PLAN

DWG. NO.

S103



2 EXISTING JAIL CELL SECTION

SCALE: NTS

KEYED NOTES - FOURTH FLOOR FRAMING

1	EXISTING CONCRETE COLUMN.
2	EXISTING CONCRETE BEAM.
3	EXISTING ROOF OPENING.
4	EXISTING CONCRETE SLAB.
5	NEW HVAC UNIT, SEE MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
6	NEW OPENING IN EXISTING CONCRETE SLAB FOR NEW SUPPLY AND RETURN DUCTS. SEE STRUCTURAL DETAILS AND MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
7	EXISTING DEPRESSED SLAB.
8	EXISTING FLOOR / SLAB OPENING AT EXISTING DUCTWORK LOCATION TO BE REUSED.
9	NEW HVAC UNIT AT EXISTING HVAC LOCATION. NO ADDITIONAL STRUCTURAL WORK REQUIRED UNLESS OTHERWISE NOTED.
10	REMOVE TOP 6'-0" EXISTING JAIL CELL ENCLOSURE TO ALLOW FOR INSTALLATION OF NEW ROOF TOP MECHANICAL SUPPORT FRAMING AND DUCTWORK.

1 FOURTH FLOOR STRUCTURAL PLAN

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

NORTH

0 4' 8' 16'

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CURRENT DATE: 02.05.25

TODD J. MOORE 082-050495 REGISTERED PROFESSIONAL ENGINEER STATE OF ILLINOIS

LICENSE EXPIRES: 11.30.25

DMI DESIGN MECHANICAL, INC.

FULL SIZED PLANS HAVE BEEN PREPARED TO STANDARD SCALES. REDUCED SIZED PLANS MAY NOT CONFORM TO STANDARD SCALES. USE GRAPHIC SCALES WHEN MAKING MEASUREMENTS ON REDUCED PLANS.

DRAWING SIZES (PRINTED): 30"X42"

REVISIONS

NO.	Date	Description
1	02.11.25	ADDENDUM 01

NEW HVAC SYSTEM FOR:

ADAMS COUNTY (IL) COURTHOUSE

521 VERMONT STREET
QUINCY, ILLINOIS

ISSUED FOR BIDDING

NOT FOR CONSTRUCTION

ISSUE DATE: 02.05.25

PROJECT NUMBER: 6573

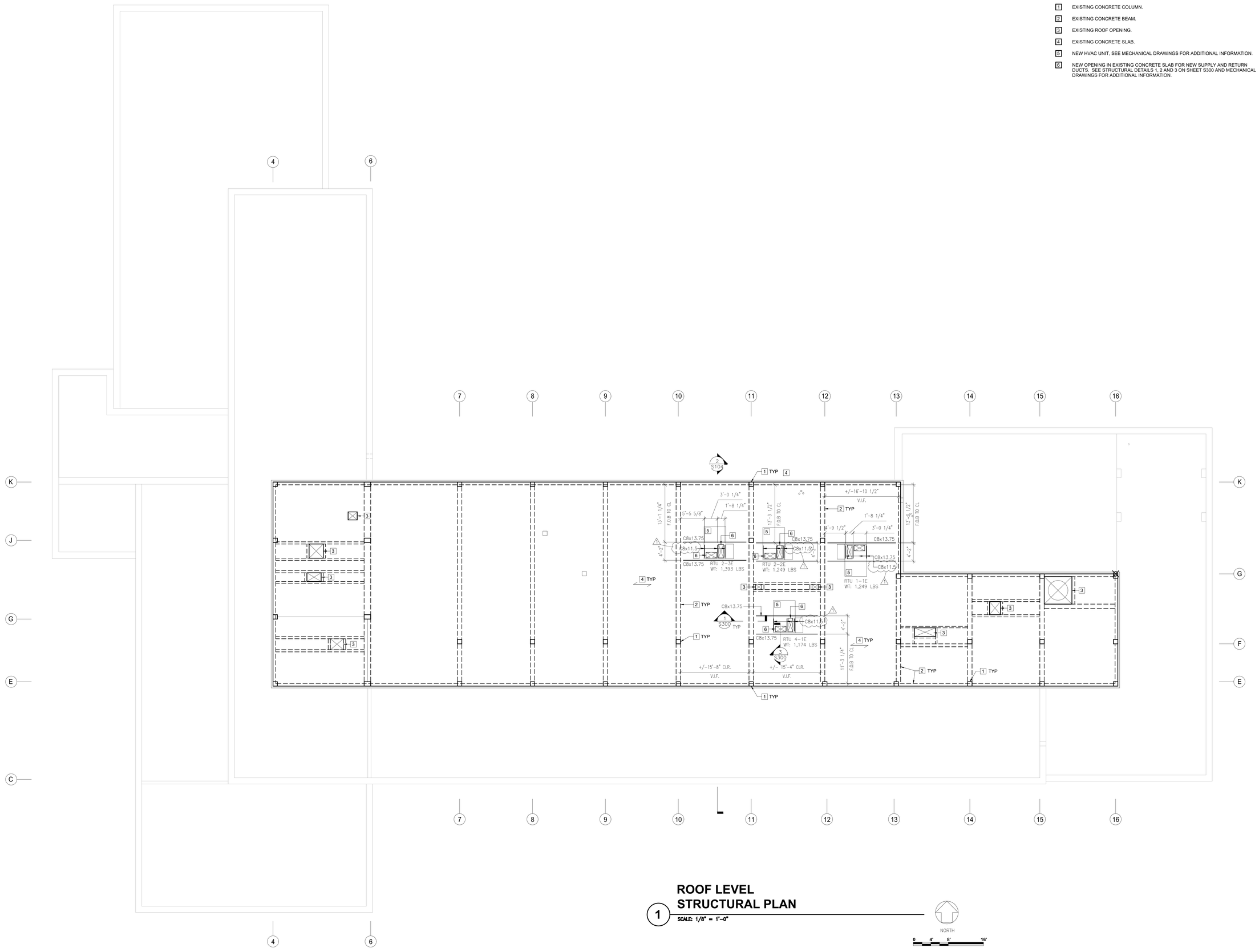
FOURTH FLOOR STRUCTURAL PLAN

DWG. NO.

S104

KEYED NOTES - ROOF FRAMING

1. EXISTING CONCRETE COLUMN.
2. EXISTING CONCRETE BEAM.
3. EXISTING ROOF OPENING.
4. EXISTING CONCRETE SLAB.
5. NEW HVAC UNIT, SEE MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.
6. NEW OPENING IN EXISTING CONCRETE SLAB FOR NEW SUPPLY AND RETURN DUCTS. SEE STRUCTURAL DETAILS 1, 2 AND 3 ON SHEET S300 AND MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.



ROOF LEVEL STRUCTURAL PLAN

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

NORTH

0 4' 8' 16'

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CURRENT DATE: 02.05.25

TODD J. MOORE 062-050495 REGISTERED PROFESSIONAL ENGINEER STATE OF ILLINOIS

LICENSE EXPIRES: 11.30.25

DMI DESIGN MECHANICAL, INC.

FULL SIZED PLANS HAVE BEEN PREPARED TO STANDARD SCALES. REDUCED SIZED PLANS MAY NOT CONFORM TO STANDARD SCALES. USE GRAPHIC SCALES WHEN MAKING MEASUREMENTS ON REDUCED PLANS.

DRAWING SIZES (PRINTED): 30"X42"

REVISIONS

NO.	Date	Description
1	02.11.25	ADDENDUM 01

NEW HVAC SYSTEM FOR:

ADAMS COUNTY (IL) COURTHOUSE

521 VERMONT STREET
QUINCY, ILLINOIS

ISSUED FOR BIDDING

NOT FOR CONSTRUCTION

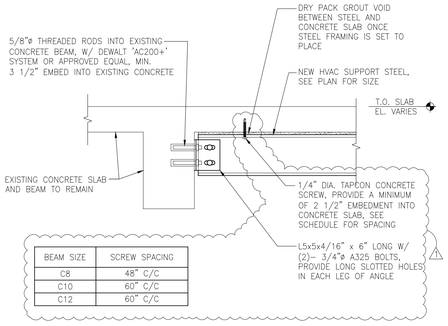
ISSUE DATE: 02.05.25

PROJECT NUMBER: 6573

ROOF LEVEL STRUCTURAL PLAN

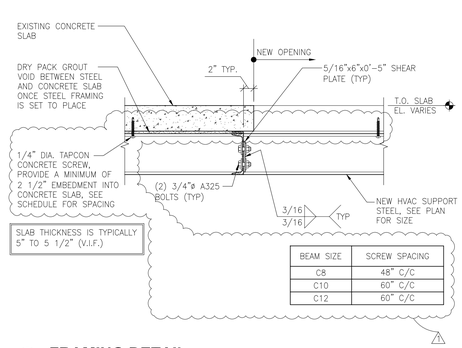
DWG. NO.

S105



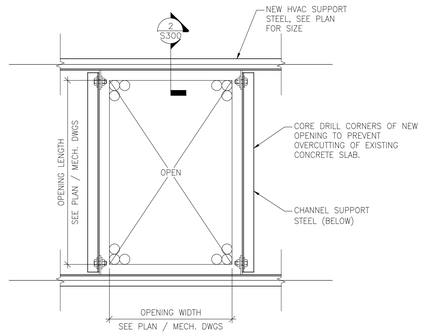
BEAM SIZE	SCREW SPACING
C8	48" C/C
C10	60" C/C
C12	60" C/C

1 FRAMING DETAIL
SCALE: 1" = 1'-0"

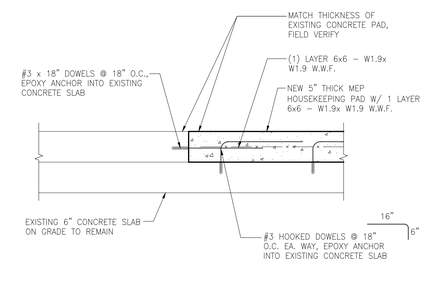


BEAM SIZE	SCREW SPACING
C8	48" C/C
C10	60" C/C
C12	60" C/C

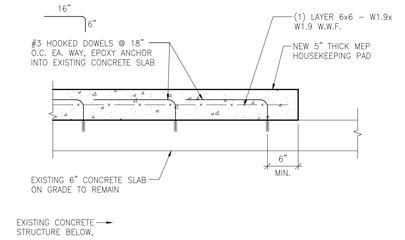
2 FRAMING DETAIL
SCALE: 1" = 1'-0"



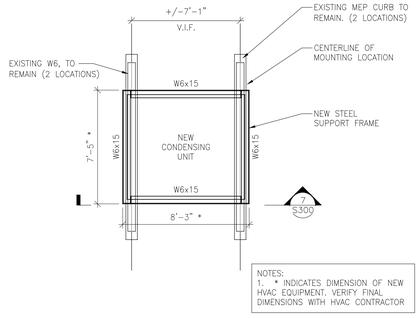
3 NEW CONCRETE OPENING DETAIL
SCALE: 1" = 1'-0"



4 NEW MEP HOUSEKEEPING PAD DETAIL
SCALE: 1" = 1'-0"

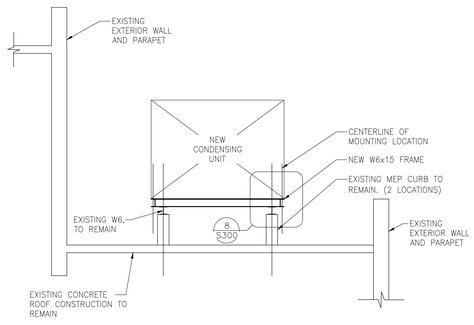


5 NEW MEP HOUSEKEEPING PAD DETAIL
SCALE: 1" = 1'-0"

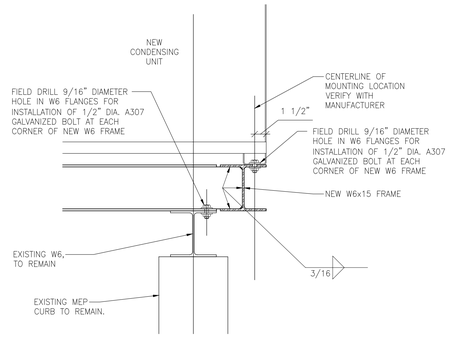


NOTES:
1. * INDICATES DIMENSION OF NEW HVAC EQUIPMENT. VERIFY FINAL DIMENSIONS WITH HVAC CONTRACTOR

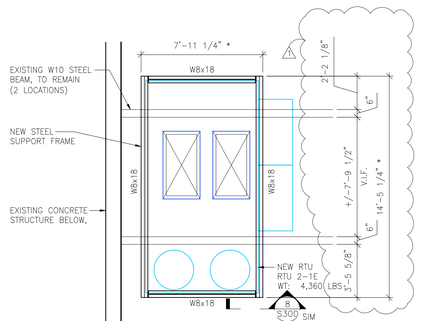
6 NEW CONDENSING UNIT FRAMING
SCALE: 1/4" = 1'-0"



7 NEW CONDENSING UNIT FRAMING
SCALE: 1/4" = 1'-0"

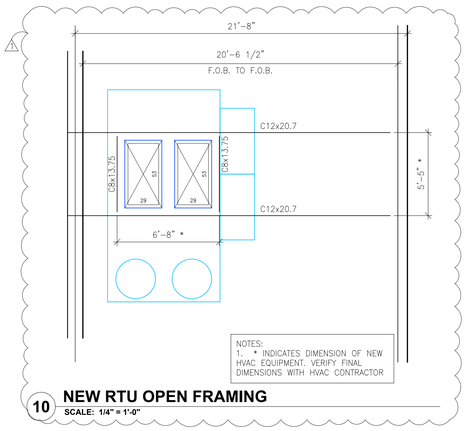


8 CONDENSING UNIT FRAMING DETAIL
SCALE: 1 1/2" = 1'-0"



NOTES:
1. * INDICATES DIMENSION OF NEW HVAC EQUIPMENT. VERIFY FINAL DIMENSIONS WITH HVAC CONTRACTOR

9 NEW RTU UNIT FRAMING
SCALE: 1/4" = 1'-0"



NOTES:
1. * INDICATES DIMENSION OF NEW HVAC EQUIPMENT. VERIFY FINAL DIMENSIONS WITH HVAC CONTRACTOR

10 NEW RTU OPEN FRAMING
SCALE: 1/4" = 1'-0"

ARCHITECHNICS
ARCHITECTS • ENGINEERS • INTERIOR DESIGNERS
510 Maine Street • Quincy, Illinois 62301 • 217.222.0554

CURRENT DATE: 02.05.25

LICENSE EXPIRES: 11.30.25

DMI
DESIGN MECHANICAL, INC.

FULL SIZED PLANS HAVE BEEN PREPARED TO STANDARD SCALES. REDUCED SIZED PLANS MAY NOT CONFORM TO STANDARD SCALES. USE GRAPHIC SCALES WHEN MAKING MEASUREMENTS ON REDUCED PLANS.

DRAWING SIZES (PRINTED): 30"X42"

REVISIONS

NO.	Date	Description
1	02.11.25	ADDENDUM 01

NEW HVAC SYSTEM FOR:
ADAMS COUNTY (IL) COURTHOUSE
521 VERMONT STREET
QUINCY, ILLINOIS

ISSUED FOR BIDDING

NOT FOR CONSTRUCTION

ISSUE DATE: 02.05.25

PROJECT NUMBER: 6573

CONCRETE AND HVAC SUPPORT DETAILS

DWG. NO.
S300