



ARCHITECTURE  
ENGINEERING

Date: June 19, 2018

Re: **NEW CAESAR RODNEY ELEMENTARY SCHOOL**  
Magnolia, Delaware  
2017073.00

#### **ADDENDUM FOUR**

The addendum forms a part of the contract documents and modifies the original bidding documents dated May 14, 2018, as noted below.

#### **GENERAL/CLARIFICATION**

1. Bid Date remains unchanged: **June 26, 2018 at 3:00 PM.**
2. Revised Last Day for Bidder Questions: **June 20, 2018.**
3. In addendum 3, Spec Section 237413 Packaged Rooftop Units with Energy Recovery was updated to include Modine per comments on substitution request form. See attached substitution request which is approved as noted.

#### **PROJECT MANUAL VOLUMES 1, 2, 3 and 4**

1. n/a

#### **BIDDER'S QUESTIONS**

1. Please provide details for security raceways
  - a. *Security wiring run on exposed wall will require conduit. Wiring run in ceiling space or concealed in drywall do not require any conduit.*
2. Can EMT be utilized in masonry walls in lieu of Rigid Metal Conduit?
  - a. *Rigid metal conduit shall be used in masonry walls.*
3. Please confirm the dimming module is needed, the Type N fixture does not appear to require an dimming ballast per the fixture schedule.
  - a. *Dimming driver is standard for the light fixture Type N specified.*
4. Is dedicated ground required for each circuit or for each raceway?
  - a. *Dedicated ground wire is required for each circuit or for each race way, sharing of neutral or ground wire is not permitted.*
5. Is the bonding required for lightning protection per drawing E800, this seems excessive?
  - a. *Bonding and cad welding are required for lighting protection system.*
6. Are millwork treads and risers intended at the Platform A119?
  - a. *No. Refer to architectural and structural for floor types.*
7. Please provide sheet A607.
  - a. *Issued in Addendum 3.*
8. Please provide a detail for the wood trim at 1/A703.
  - a. *Answered in Addendum 3. Refer to 9/A510.*

9. The Elevator sump pump is called out on P101C (S) as a Stancor Model SE-50. The spec section 22 30 00-6, 2.05 Sump Pumps, lists only approved manufacturer to be ITT Bell & Gossett. It is not listed in Plumbing Schedule. Please clarify desired Sump.
  - a. *Stancor is an approved equal model.*
10. Kitchen Hoods Cooking and Condensate are listed in Spec 233813, they are not listed on the mechanical Schedule or shown a drawing. They are also listed K-101 as Kitchen Equipment. Is the Kitchen Equipment contractor supplying them?
  - a. *Yes.*
11. There is no Spec for MAU-1, Roof Top Makeup Air Unit.
  - a. *See 23 74 13 (Packaged Outdoor Central Station Air Handling Units) for general specifications.*
12. P101A (S) has two 4" Storm Water drains coming down in the middle the Area A with a note "Down in Chase Coordinate with Civil Plans". Can we get desired routing out of the building.
  - a. *See Addendum #4, drawing P101A (S) and C302.*
13. Note S-7 on Drawing C-302-B calls out a 2,000 gallon precast grease interceptor. It then says to see the Plumbing plans for the grease interceptor detail. The Plumbing plans show a schematic depiction of a cylindrical shaped grease interceptor but there are no grease interceptor details on either the Plumbing plans or the Civil plans. Should we include furnishing and installing a 2,000 gallon precast concrete grease interceptor in our sitework proposal or will the plumbers be furnishing and installing this vessel, in the form of a steel or plastic tank, as part of their bid package?
  - a. *See Addendum #4, drawings P000, P101A (S), and C302. Plumbing Contractor will own grease interceptor.*
14. Please clarify which window types are to receive solid surface window sills.
  - a. *Refer to A607.*
15. Can more details be provided for the Pergola Roof System?
  - a. *Answer provided in Addendum 4. Refer to A405.*
16. Drawing A522 detail 4, will more blocking be required to attach metal cornice?
  - a. *All necessary blocking and attachments as necessary to make a complete attachment pursuant to manufacturers recommendations are required.*
17. Details are requiring to view Drawing A405, there is no Drawing A405. Please advise.
  - a. *Sheet included in Addendum 4.*
18. Drawing A303, detail 3 requires to view drawing A310, there is no drawing A310. Please advise.
  - a. *Detail should now reference A309. A309 sheet is included in Addendum 4.*

## **DRAWINGS VOLUMES I AND II**

1. G001 Cover Sheet – Volume 1
  - a. ADD the following drawings
    - i. A309 Wall Sections
    - ii. A405 Pergola Details
2. C302 Utility Plan
  - a. REVISE sanitary sewer construction note S-7.

- b. ADD two underground storm water connections.
3. C302-B Utility Plan
  - a. REVISE sanitary sewer construction note S-7.
  - b. ADD two underground storm water connections.
4. S101A – Foundation Plan – Area A
  - a. REVISE foundation dimensions per attached.
  - b. REVISE pier schedule per attached.
  - c. ADD thickened slab below cmu wall in kitchen.
  - d. ADD piers to columns along AU column line per attached.
5. S101B – Foundation Plan – Area B
  - a. REVISE foundation dimensions per attached.
6. S101C – Foundation Plan – Area C
  - a. REVISE foundation dimensions per attached.
7. S102A – Second Floor & Low Roof Framing Plan – Area A
  - a. ADD Roof Notes per attached.
  - b. ADD span arrow for roof and floor deck.
8. S102C – Second Floor & Low Roof Framing Plan – Area C
  - a. ADD beam sizes per attached.
  - b. ADD span arrows for floor deck.
9. S104 – Foundation & Roof Framing Plan – Alternate #1
  - a. ADD Foundation and Roof Notes, as well as Footing & Pier, Column Schedule per attached.
10. S105 – Foundation, Second Floor & Roof Framing Plan – Alternate #2
  - a. ADD Foundation, Framing and Roof Notes, as well as Footing & Pier, Column Schedule per attached.
  - b. ADD span arrow for floor deck.
11. A003 Construction Types – Fascia’s, FRP Columns, Cornices and Soffit
  - a. ADD Cornice Type 1C
12. A304 Wall Sections
  - a. Detail 1:
    - i. ADD window detail callouts.
  - b. Detail 3:
    - i. ADD note, “TRUSS – SEE STRUCT.”
    - ii. REVISE location of duct work in Corridor A101.
    - iii. ADD note, “BOND BEAM – SEE STRUCT.”
  - c. Detail 4:
    - i. ADD note, “TRUSS – SEE STRUCT.”
    - ii. ADD window detail callouts.
    - iii. ADD note, “BOND BEAM – SEE STRUCT.”
    - iv. REVISE GWB to run to bottom of deck.
    - v. ADD blocking to pre-engineered truss.
  - d. ADD detail 5.
13. A309 Wall Sections
  - a. ADD sheet.
14. A405 Pergola Details
  - a. ADD sheet.
15. A406 Enlarged Reception Desk, Elevations, and Details
  - a. Detail 7:
    - i. ADD section cut thru book drop.
  - b. Detail 9:
    - i. ADD dimensions to book drop.
  - c. ADD Detail 11A.

16. A407 Enlarged Reception Desk, Elevations and Details
  - a. Detail 5:
    - i. ADD note, "MTL. SUPPORT BRACKET AS REQ'D."
  - b. Detail 10:
    - i. ADD dimensions.
17. A607
  - a. REVISE S8 and S14 to show solid surface sill.
18. A703 Interior Elevations
  - a. REVISE paint colors of mechanical and structural.
  - b. Detail 4:
    - i. REVISE note "CEILING TYPE X, TYP" to "CEILING AS SCHEDULED".
19. P000 – Plumbing Cover Sheet
  - a. ADD Grease Interceptor to schedule
20. P101A (S) – First Floor Sanitary Plan – Area A
  - a. REVISE plan to show routing of Storm Water under building.
  - b. ADD information to clarify Grease Interceptor.
21. E000 – Electrical Cover Sheet
  - a. REVISE the description of the floor box in the electrical symbol legend.
22. EP101A – First Floor Power Plan - Area A
  - a. REVISE floor box note in conf. room A110.
  - b. REVISE receptacles circuits in media center A125 and added conduits trenched in slab.
23. E601 – Electrical Panel Schedules
  - a. REVISE panel schedules.
24. E700 – Electrical Site Plan
  - a. ADD Quazite box to site plan.
25. T000 – Information Technology Cover Sheet
  - a. Added notes to IFP symbols
26. T101A – Information Technology First Floor Plan - Area A
  - a. Deleted type B2 outlet in teacher resource room A130.
  - b. Added an IFP and outlets to teacher resource room A130.
  - c. Added C2 to Room A106
  - d. Added additional C2 to Room A103 and notation to location of outlets.
27. T300 – Information Technology Site Plan
  - a. ADD Quazite box to site plan.

END OF ADDENDUM NO. FOUR

Attachments: Becker Morgan Group, Inc. drawings C302, C302-B, A003, A304, A309, A405, A406, A407, A607, A703, issue block dated 6.19.2018  
Baker Ingram Associate drawings S101A, S101B, S101C, S102A, S102C, S104, S105 issue block dated 6.19.2018  
Studio JAED drawings, P000, P101A (S), E000, E601, E700, EP101A, T000, T101A, T300, issue block dated 6.19.2018

# SUBSTITUTION REQUEST – Bidding and Negotiating Phase

Project: Caesar Rodney Elementary School Date: 06/14/2018

Project No: 17070 From: (Name, Title, Company): Courtney Bauer  
Sales Engineer

Contract For: HVAC Equipment Building Systems & Services, Inc.

Specification Section No.: 237413 Specification Title: Packaged Outdoor Air Handling Units

Article / Paragraph No.: 2.01 Description: Manufacturers

Proposed Substitution: Modine

Manufacturer: Modine Rep Email: cbauer@bssinc.net Phone: 302-996-0900

Trade Name: Modine Model No.: MPR

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

Supporting Data Attached:  Drawings  Product Data  Samples  Tests  Reports

By Requesting this Substitution, the Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.

Submitted by (Name, Title): Courtney Bauer, Sales Engineer

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

Company: Building Systems & Services, Inc.

Address: 1504 Kirkwood Highway, Wilmington, DE 19805

Telephone: 302-996-0900 Email: cbauer@bssinc.net

## A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 012500 Substitution Procedures.
- Substitution approved as noted - Make submittals in accordance with Specification Section 012500 Substitution Procedures.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.
- No action taken – Insufficient supporting data.

By: *DLB* Date: 6/15/2018

ENGINEER REVIEW COMMENTS:

1. THIS SUBSTITUTION REQUEST HAS BEEN REVIEWED FOR GENERAL COMPLIANCE TO PROJECT REQUIREMENTS. A FORMAL SUBMITTAL AND SHOP DRAWINGS ARE REQUIRED AFTER PROJECT AWARD TO GUARANTEE PARTICULAR COMPLIANCE TO PERFORMANCE REQUIREMENTS.
2. ANY AND ALL CHANGES AS A RESULT OF PRODUCT SUBSTITUTION FROM THE BASIS OF DESIGN ARE SOLELY AT THE BURDEN OF THE CONTRACTOR, INCLUDING DESIGN AND INSTALLATION COSTS, AND COORDINATION. THESE CHANGES INCLUDE BUT ARE NOT LIMITED TO STRUCTURAL STEEL, ARCHITECTURAL WORK, ELECTRICAL REQUIREMENTS AND DUCTWORK.
3. THE ROOF CURB PROVIDED SHALL BE A CUSTOM, SIDE-DISCHARGE, STRUCTURAL, VIBRATION ISOLATION CURB WITH INTEGRAL, ADJUSTABLE SPRING ISOLATORS HAVING MINIMUM 2" STATIC DEFLECTION, AND SHALL NOT EXCEED 36 INCHES IN HEIGHT.



## SUBMITTAL SCHEDULE & DATA

### Atherion™ Packaged DX Rooftop Unit

Job Name: Caesar Rodney New Elementary School  
 Location:  
 Submitted by: Courtney Bauer

Engineer:  
 Architect:  
 Contractor:

UNIT TAG	RTU-1	RTU-2	
<b>MODEL NUMBER</b>	MPR15CB1A1AEU16J2KLD NNNN	MPR20CB1A1AEU16J2KLD NNNN	
<b>UNIT QUANTITY</b>	1	1	
<b>UNIT CONFIGURATION</b>	Fresh & Return Air Dampers, with Energy Recovery Exhaust	Fresh & Return Air Dampers, with Energy Recovery Exhaust	
Discharge Arrangement	Bottom Supply	Bottom Supply	
Supply Voltage	460/60/3	460/60/3	
Altitude (ft. above sea level)	0-2000	0-2000	
<b>FULL LOAD COOLING CAPACITY<sup>1</sup></b>			
Refrigerant Type	R-410A	R-410A	
<b>DX Cooling Capacity Data</b>			
Total – Nominal Tons	15	20	
Total – (Gross / Net) Btu/hr	197,563 / 178,001	249,381 / 229,815	/
Sensible – (Gross / Net) Btu/hr	143,773 / 124,211	163,780 / 144,214	/
<b>FULL LOAD HEATING CAPACITY<sup>2</sup></b>			
<b>HEATING TYPE</b>	Natural Gas	Natural Gas	
<b>HEAT CONTROL TYPE</b>	Modulating	Modulating	
<b>SUPPLY FAN</b>			
Nominal Airflow (CFM)	5,500	5,500	
Ext/Total Static Pressure ("W.C.)	2.00 / 3.84	2.00 / 3.84	/
Fan Quantity	2	2	
Fan Diameter (inches) and Type	16 Dual ANPA	16 Dual ANPA	
Fan BHP (Per Fan) / Speed (RPM)	3.27 / 2,369	3.27 / 2,369	/
Motor Size (Per Fan) / Motor Type	5 / ODP - High Eff	5 / ODP - High Eff	/
Motor Speed Nominal / Typical	1800 / 1746	1800 / 1746	/
Design VFD Frequency (Hz)	81.4	81.4	
<b>POWERED EXHAUST</b>	48" Total Energy Recovery Wheel	48" Total Energy Recovery Wheel	
Nominal Airflow (CFM)	5,500	5,500	
Ext/Total Static Pressure ("W.C.)	1.00 / 2.31	1.00 / 2.31	/
Fan Diameter (inches)	20	20	
Fan Power (BHP) / Speed (RPM)	3.64 / 1,545	3.64 / 1,545	/
Motor Size (HP) / Motor Type	5 / ODP - High Eff	5 / ODP - High Eff	/
<b>OPERATING WEIGHT EACH (lbs)</b>			
Base Model (model MPR)	5,907	6,091	
Total Unit/Option/Accessories <sup>3</sup>	6,769	6,959	

- For complete Cooling conditions and capacity data, please refer to the Cooling Performance section.
- For complete Heating conditions and capacity data, please refer to the Heating Performance section.
- If an Energy Recovery Module (model ERM) has been selected, the weight is included with Total Unit/Option/Accessories.



## PERFORMANCE DATA - COOLING

### Atherion™ Packaged DX Rooftop Unit

<b>UNIT TAG</b>		RTU-1		
<b>MODEL NUMBER</b>		MPR15CB1A1AEU16J2KLDNNNN		

DESIGN CONDITIONS				
Outside Air Temp (°F DB/WB)	°F	90.0/75.0		
Return Air Temp (°F DB/W B)	°F	75.0/62.5		
Evap Inlet Air Temp (°F DB/WB)	°F	76.6 / 64.1 (with ERW)		
Nominal Airflow	CFM	5,500		
FULL LOAD COOLING CAPACITY <sup>1</sup>				
DX Cooling Capacity Data				
Total – Nominal	Tons	15		
Total – Actual		Total	Sensible	Latent
Gross	Btu/hr	197,563 (16.5 Tons)	143,773	53,790
Net	Btu/hr	178,001 (14.8 Tons)	124,211	53,790
Supply Air Temperature Data				
Air Off Temperatures	°F	Evaporator Coil 52.4 / 51.7	Unit Discharge 55.6 / 53.1	Dew Point 51.3
Additional Data				
Compressor Loading	%	100.0		
Total Unit Power	Watts	24,109		
Base Unit Efficiency <sup>2</sup>	EER	10.9		
	IEER	13.5		
Application Efficiency <sup>3</sup>	EER	14.1 CEF		
	MRE <sup>4</sup>	5.9 lb/kWh CEF		
Refrigerant Data				
Refrigerant Type		R-410A		
Refrigerant Charge per Circuit	lbs.	39		
Circuit Quantity		1		

- Capacities and temperatures shown at actual design conditions.
- The Base Unit Efficiencies shown for a base model MPR15C unit without energy recovery exhaust, when rated in accordance with ANSI/AHRI Standard 340/360 at a design airflow of 4000 CFM, are for reference only. The configuration of the selected unit and/or conditions of operation may not match the base unit, which will impact the actual unit efficiency, and may be outside the scope of ANSI/AHRI 340/360.
- The Application Efficiency is based on actual design conditions and selected unit configuration at full load. Because the unit selected includes energy recovery exhaust, the full load EER is shown as CEF (Combined Efficiency) as defined by AHRI Guideline V to include the combined efficiency of the DX unit and the energy recovery section. The MRE shown as CEF, while not defined by AHRI Guideline V, follows the same calculation methodology of combining capacity of the DX unit and the energy recovery section.
- MRE (Moisture Removal Efficiency) is a measure that best represents the unit performance at full load for applications with high latent loads, typically 100% outside air applications. If the application is less than 100% outside air or the entering air has a low dew point, the calculated MRE may be low and not applicable.



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## PERFORMANCE DATA – HEATING

### Atherion™ Packaged DX Rooftop Unit

<b>UNIT TAG</b>	RTU-1
<b>MODEL NUMBER</b>	MPR15CB1A1AEU16J2KLDNNNN

<b>HEATING CONDITIONS</b>		
Outside Air Temp (DB)	°F	15.0
Return Air Temp (DB)	°F	70.0
Mixed Air Temperature (DB)	°F	39.8 (without ERW)
<b>HEATING TYPE</b>		Natural Gas
<b>HEAT EXCHANGER MATERIAL</b>		Tubular 409 Stainless Steel
<b>HEAT CONTROL TYPE</b>		Modulating
<b>GAS MODULATION RANGE</b>		20-100% (10% with 1 furnace disabled)
<b>FULL LOAD HEATING CAPACITY<sup>1</sup></b>		
Heating Capacity Input	Btu/hr	400,000
Thermal Efficiency	%	81%
Heating Capacity Output	Btu/hr	324,000
Temperature Rise	°F	54.5
Supply Air Temperature	°F	94.3
<b>GAS CONNECTION SIZE</b>		1"

1. Capacities and temperatures shown for Design Conditions.



AccuSpec V4.13k

## PERFORMANCE DATA – ELECTRICAL

### Atherion™ Packaged DX Rooftop Unit

<b>UNIT TAG</b>	RTU-1
<b>MODEL NUMBER</b>	MPR15CB1A1AEU16J2KLDNNNN

COMPONENT/SYSTEM		COOLING MODE	HEATING MODE
Compressor 1	Amps	12.8	N/A
Compressor 2	Amps	12.8	N/A
Compressor 3 (D-Cabinet Only)	Amps	0.0	N/A
Compressor 4 (D-Cabinet Only)	Amps	0.0	N/A
Condenser Fan Motors (Total)	Amps	5.4	N/A
Supply Fan Motor 1	Amps	7.6	7.6
Supply Fan Motor 2	Amps	7.6	7.6
Exhaust Fan Motor	Amps	7.6	7.6
Energy Recovery Wheel Motor	Amps	0.5	0.5
Energy Recovery Preheat	Amps	N/A	0.0
Heating Circuit	Amps	N/A	1.6
Unit Controls	Amps	0.0	0.0
Powered Convenience Outlet	Amps	0.0	0.0
Unit Full Load Amps	Amps	54.3	24.9
Min Circuit Ampacity (MCA)	Amps	57.5	26.8

FINAL UNIT ELECTRICAL DATA			
Nameplate Full Load Amp (FLA)	Amps	54.3	
Min Circuit Ampacity (MCA)	Amps	57.5	
Max Overcurrent Protection (MOP)	Amps	70.0	



AccuSpec V4.13k

## PERFORMANCE DATA - COOLING

### Atherion™ Packaged DX Rooftop Unit

<b>UNIT TAG</b>		RTU-2		
<b>MODEL NUMBER</b>		MPR20CB1A1AEU16J2KLDNNNN		

DESIGN CONDITIONS				
Outside Air Temp (°F DB/WB)	°F	90.0/75.0		
Return Air Temp (°F DB/W B)	°F	75.0/62.5		
Evap Inlet Air Temp (°F DB/WB)	°F	78.3 / 65.7 (with ERW)		
Nominal Airflow	CFM	5,500		
FULL LOAD COOLING CAPACITY <sup>1</sup>				
DX Cooling Capacity Data				
Total – Nominal	Tons	20		
Total – Actual		Total	Sensible	Latent
Gross	Btu/hr	249,381 (20.8 Tons)	163,780	85,601
Net	Btu/hr	229,815 (19.2 Tons)	144,214	85,601
Supply Air Temperature Data				
Air Off Temperatures	°F	Evaporator Coil 50.7 / 50.1	Unit Discharge 54 / 51.6	Dew Point 49.7
Additional Data				
Compressor Loading	%	100.0		
Total Unit Power	Watts	28,517		
Base Unit Efficiency <sup>2</sup>	EER	10.8		
	IEER	13.2		
Application Efficiency <sup>3</sup>	EER	13.7 CEF		
	MRE <sup>4</sup>	5.8 lb/kWh CEF		
Refrigerant Data				
Refrigerant Type		R-410A		
Refrigerant Charge per Circuit	lbs.	42		
Circuit Quantity		1		

- Capacities and temperatures shown at actual design conditions.
- The Base Unit Efficiencies shown for a base model MPR20C unit without energy recovery exhaust, when rated in accordance with ANSI/AHRI Standard 340/360 at a design airflow of 5300 CFM, are for reference only. The configuration of the selected unit and/or conditions of operation may not match the base unit, which will impact the actual unit efficiency, and may be outside the scope of ANSI/AHRI 340/360.
- The Application Efficiency is based on actual design conditions and selected unit configuration at full load. Because the unit selected includes energy recovery exhaust, the full load EER is shown as CEF (Combined Efficiency) as defined by AHRI Guideline V to include the combined efficiency of the DX unit and the energy recovery section. The MRE shown as CEF, while not defined by AHRI Guideline V, follows the same calculation methodology of combining capacity of the DX unit and the energy recovery section.
- MRE (Moisture Removal Efficiency) is a measure that best represents the unit performance at full load for applications with high latent loads, typically 100% outside air applications. If the application is less than 100% outside air or the entering air has a low dew point, the calculated MRE may be low and not applicable.



AccuSpec V4.13k

## PERFORMANCE DATA – HEATING

### Atherion™ Packaged DX Rooftop Unit

<b>UNIT TAG</b>	RTU-2
<b>MODEL NUMBER</b>	MPR20CB1A1AEU16J2KLDNNNN

<b>HEATING CONDITIONS</b>		
Outside Air Temp (DB)	°F	15.0
Return Air Temp (DB)	°F	70.0
Mixed Air Temperature (DB)	°F	44.0 (without ERW)
<b>HEATING TYPE</b>		Natural Gas
<b>HEAT EXCHANGER MATERIAL</b>		Tubular 409 Stainless Steel
<b>HEAT CONTROL TYPE</b>		Modulating
<b>GAS MODULATION RANGE</b>		20-100% (10% with 1 furnace disabled)
<b>FULL LOAD HEATING CAPACITY<sup>1</sup></b>		
Heating Capacity Input	Btu/hr	400,000
Thermal Efficiency	%	81%
Heating Capacity Output	Btu/hr	324,000
Temperature Rise	°F	54.5
Supply Air Temperature	°F	98.5
<b>GAS CONNECTION SIZE</b>		1"

1. Capacities and temperatures shown for Design Conditions.



AccuSpec V4.13k

## PERFORMANCE DATA – ELECTRICAL

### Atherion™ Packaged DX Rooftop Unit

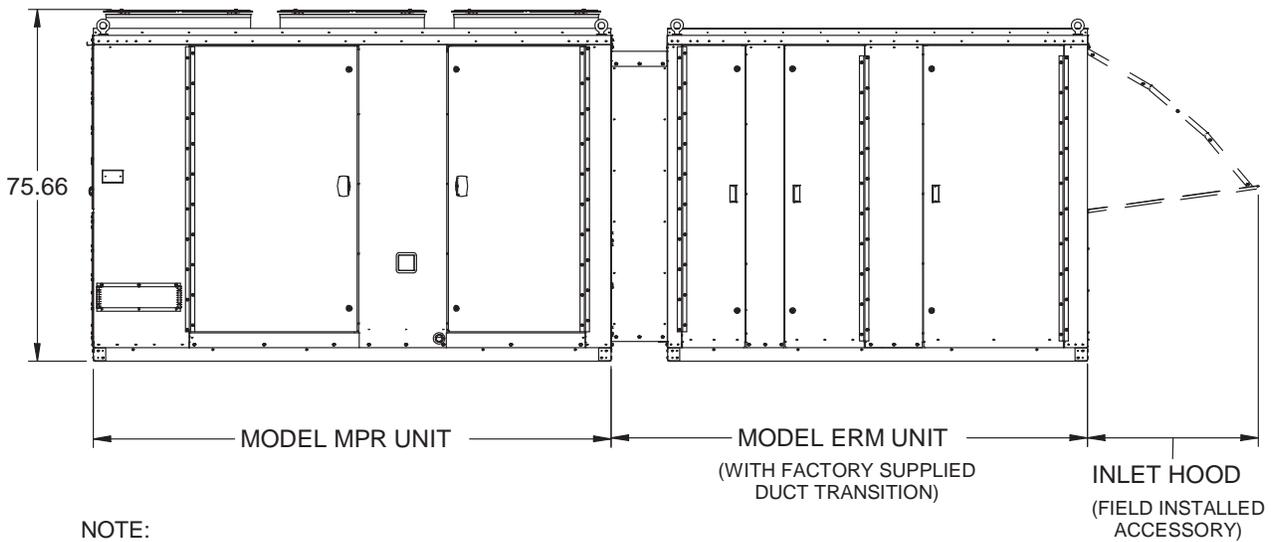
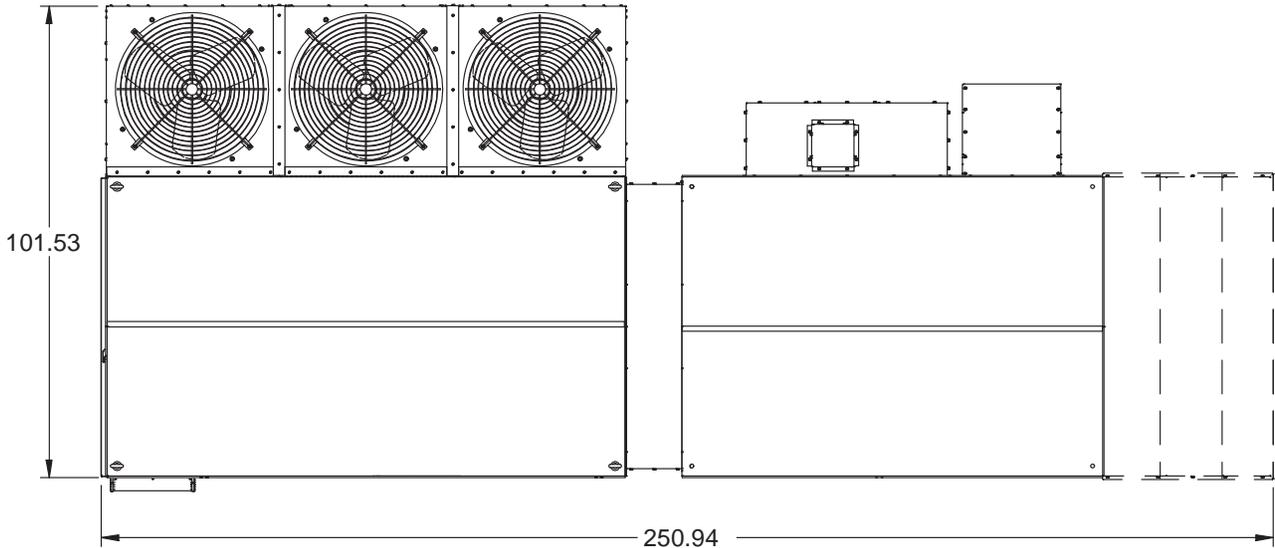
<b>UNIT TAG</b>	RTU-2
<b>MODEL NUMBER</b>	MPR20CB1A1AEU16J2KLDNNNN

COMPONENT/SYSTEM		COOLING MODE	HEATING MODE
Compressor 1	Amps	17.9	N/A
Compressor 2	Amps	17.9	N/A
Compressor 3 (D-Cabinet Only)	Amps	0.0	N/A
Compressor 4 (D-Cabinet Only)	Amps	0.0	N/A
Condenser Fan Motors (Total)	Amps	8.1	N/A
Supply Fan Motor 1	Amps	7.6	7.6
Supply Fan Motor 2	Amps	7.6	7.6
Exhaust Fan Motor	Amps	7.6	7.6
Energy Recovery Wheel Motor	Amps	0.5	0.5
Energy Recovery Preheat	Amps	N/A	0.0
Heating Circuit	Amps	N/A	1.6
Unit Controls	Amps	0.0	0.0
Powered Convenience Outlet	Amps	0.0	0.0
Unit Full Load Amps	Amps	67.2	24.9
Min Circuit Ampacity (MCA)	Amps	71.7	26.8

FINAL UNIT ELECTRICAL DATA			
Nameplate Full Load Amp (FLA)	Amps	67.2	
Min Circuit Ampacity (MCA)	Amps	71.7	
Max Overcurrent Protection (MOP)	Amps	80.0	

## DIMENSIONS – UNIT AND ENERGY RECOVERY MODULE

**Model MPR15C and Model ERM48C Dimensions (inches)**  
 Tag: RTU-1, 2

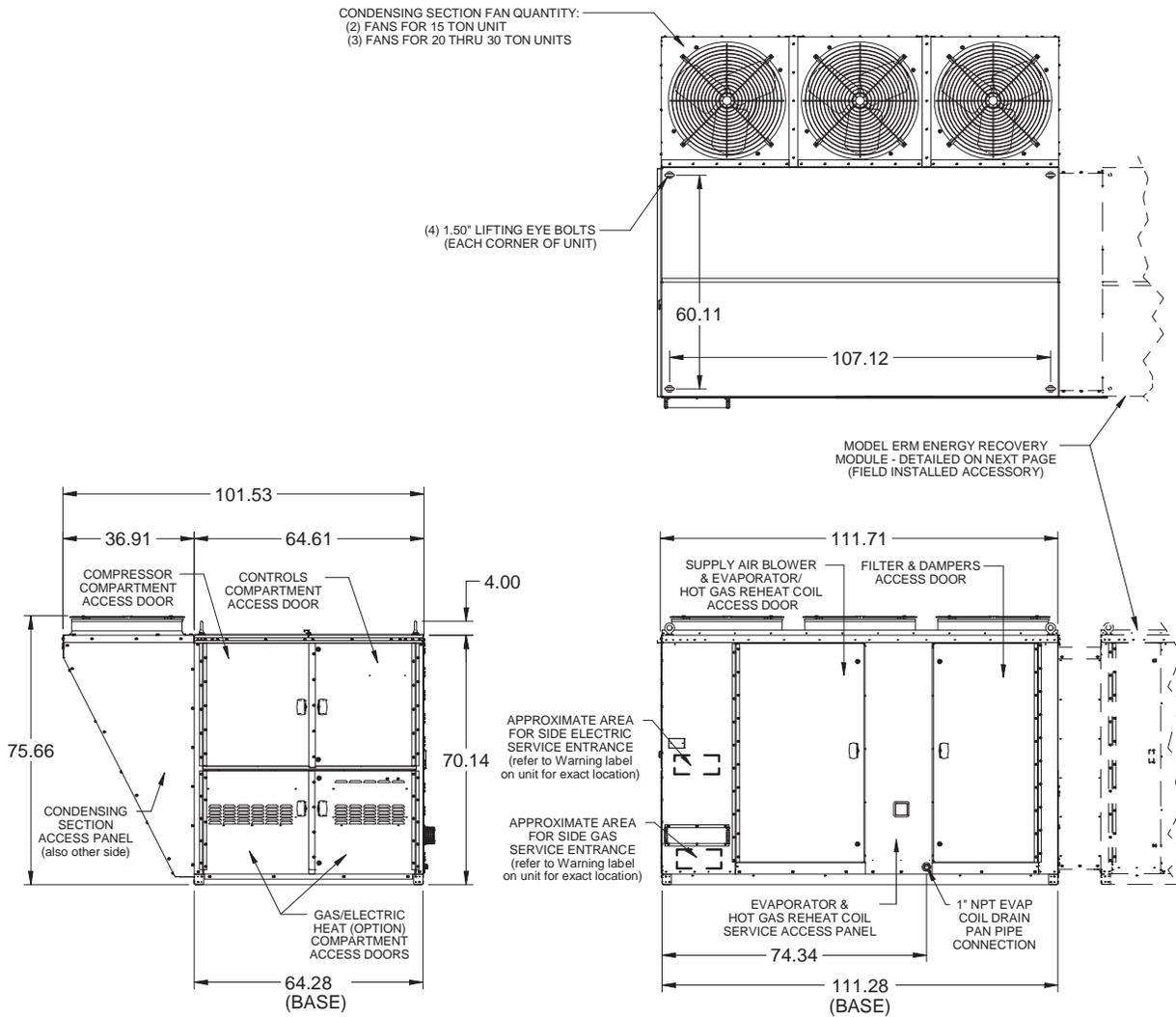


NOTE:  
 THESE ARE GENERAL OVERALL DIMENSIONS. FOR DETAILED DIMENSIONS, PLEASE REFER TO THE INDIVIDUAL DDRAWINGS FOR EACH UNIT.

## DIMENSIONS – UNIT

### Model MPR15C Dimensions (inches)

Tag: RTU-1, 2

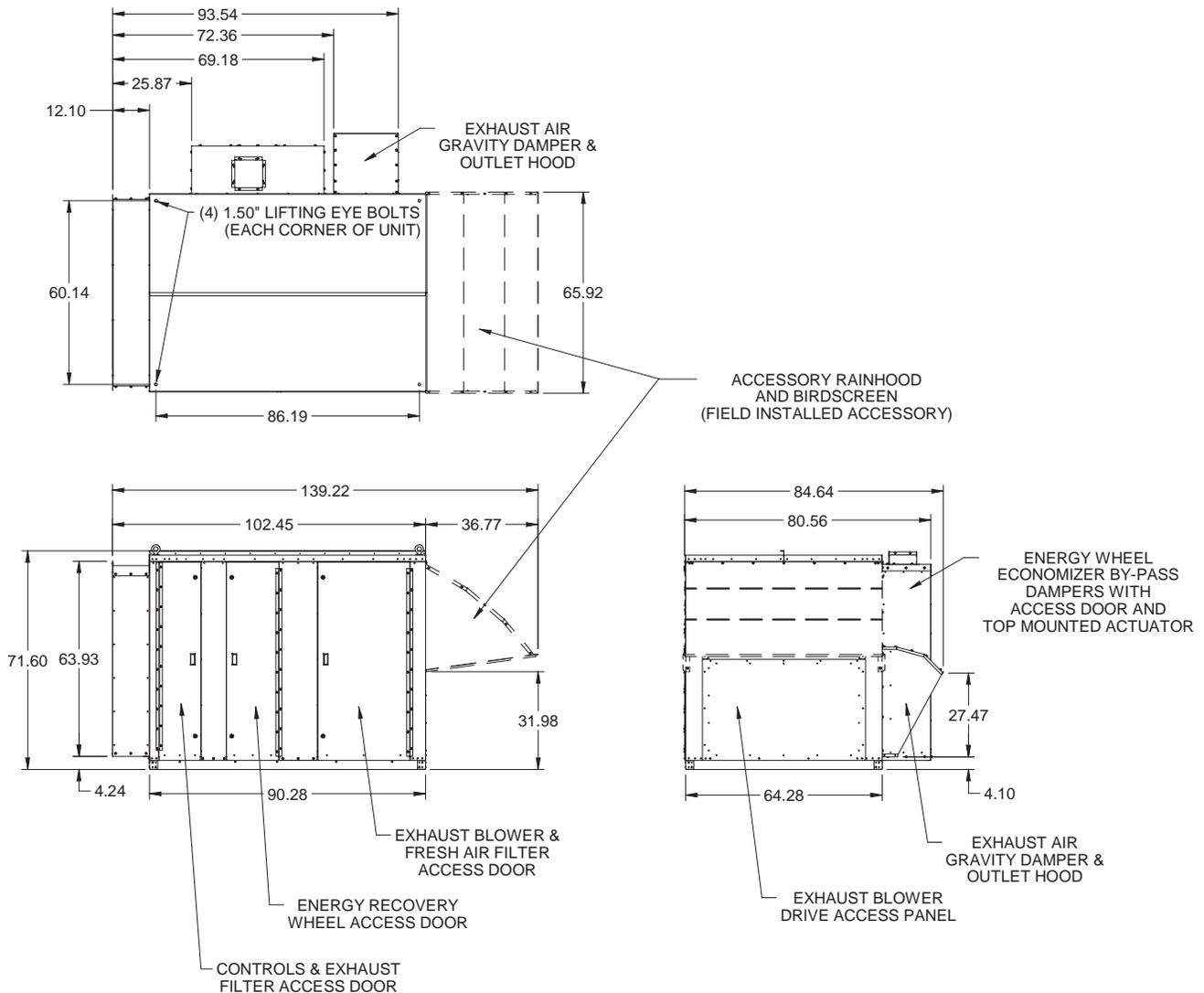


**Approximate Weight:** See Submittal Schedule & Data page.

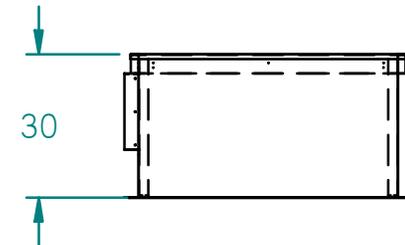
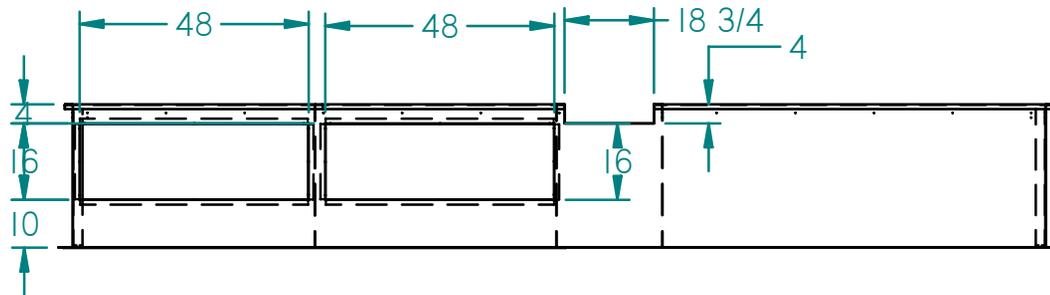
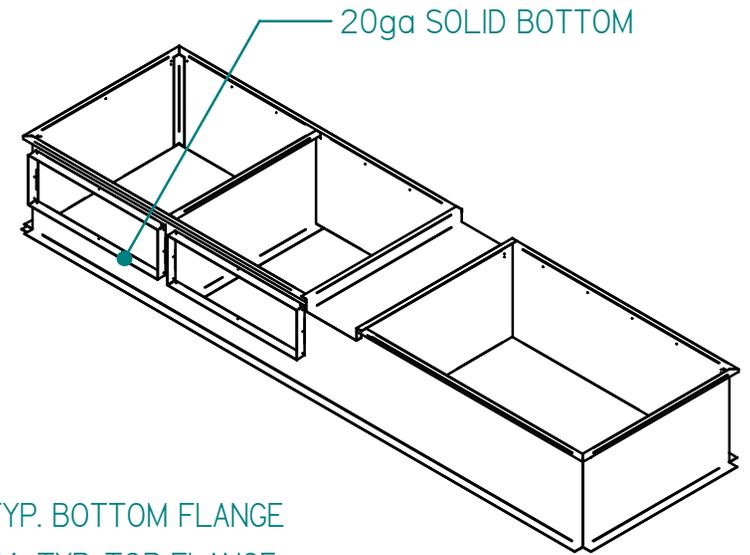
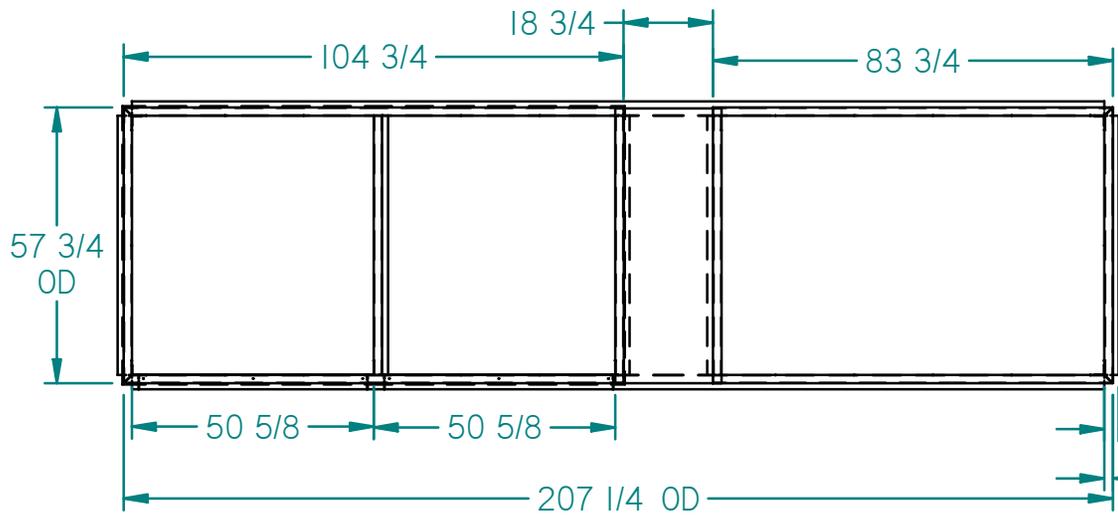
## DIMENSIONS – ENERGY RECOVERY MODULE

### Model ERM48C Dimensions (inches)

Tag: RTU-1, 2



**Approximate Weight:** See Submittal Schedule & Data page.



APPROX. WEIGHT
1000 LBS

Tag: RTU-1, 2

NOTES:

1. CURB SHIPPED WELDED, ONE PIECE
2. CURB MUST BE INSTALLED SQUARE AND LEVEL
3. MATERIAL IS GALVANIZED 14ga STEEL
4. FACTORY INSTALLED P.T. 2x4 WOOD NAILER
5. SUPPLIED WITH 1-1/2x1/4" CLOSED CELL NEOPRENE GASKET
6. INSULATED WITH 1" DUCT LINER
7. 1" ISOLATION RAILS (SHIPPED SEPARATELY FOR FIELD ASSEMBLY AND INSTALLATION) FLEX DUCT BY OTHERS



CURB TECHNOLOGIES™

QUANTITY: 1  
DIMENSIONS: INCHES

PROJECT: Caesar rodney New ES  
UNIT TAG:

DRAWN BY TBB

MODEL: MODJINE

Rev. 00	6/14/18
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**SECTION 23 74 33**  
**PACKAGED, OUTDOOR, HEATING AND COOLING**  
**MAKEUP AIR-CONDITIONERS**

**SPECIFICATIONS**

Tag: RTU-1, 2

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes rooftop heating and cooling units. Each unit shall be constructed in a horizontal configuration and shall incorporate additional product requirements as listed in the "PRODUCTS" section of this specification. If unit is intended for installation on a concrete slab, verify design requirements and construction responsibility for the slab.

**1.2 SUBMITTALS**

- A. All information in this document, as provided by Modine Manufacturing Company, is provided without representation or warranty of any kind as to the user or any other party, including, without limitation, ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR NON-INFRINGEMENT. To the greatest extent permitted by applicable law, Modine Manufacturing Company assumes no liability, and the user assumes all liability and risk, for the use or results from the use of this document or the information contained herein, whether as modified by the user or not. This document must be carefully reviewed by the Engineer to ensure it meets the requirements of the project and local building code(s).
- B. As Modine Manufacturing Company has a Continuous Product Improvement program, it reserves the right to change design and specifications without notice.

**1.3 QUALITY ASSURANCE**

- A. Unit basic model MPR20C shall be listed in the Department of Energy Compliance Certification Database to comply with Federal Requirement 10 CFR 429 - "Certification, Compliance, and Enforcement for Consumer Products and Commercial and Industrial Equipment".
- B. Gas-fired furnace options shall be certified in accordance with ANSI Z83.8/CSA 2.6, "Safety Standard Gas-Fired Furnaces".
- C. Units shall comply with applicable requirements in ASHRAE 62.1-2013, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. Units shall comply with applicable requirements in ASHRAE 90.1-2016, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- E. Unit shall be safety certified by ETL in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment. Unit nameplate shall include the ETL/ETL Canada listed mark.

## **1.4 WARRANTY**

### **A. Standard Unit Warranty:**

1. Gas Heat Option Heat Exchangers: Five years from date of first beneficial use by buyer or any other user, within five years from date of resale by buyer in any unchanged condition, or within 66 months from date of shipment from seller, whichever occurs first.
2. Compressors: Two years from date of first beneficial use by buyer or any other user, within two years from date of resale by buyer in any unchanged condition, or within 30 months from date of shipment from seller, whichever occurs first.
3. Coil Heat Exchanger, Sheet Metal: One year from date of first beneficial use by buyer or any other user, within one year from date of resale by buyer in any unchanged condition, or within 18 months from date of shipment from seller, whichever occurs first.
4. All Other Parts: Two years from date of first beneficial use by buyer or any other user, within two years from date of resale by buyer in any unchanged condition, or within 30 months from date of shipment from seller, whichever occurs first.

### **B. Extended Unit Warranty:**

1. Gas Heat Option Heat Exchangers: Extend to a total of ten years from date of first beneficial use by buyer or any other user, within ten years from date of resale by buyer in any unchanged condition, or within 126 months from date of shipment from seller, whichever occurs first.
2. Compressors: Extend to a total of five years from date of first beneficial use by buyer or any other user, within five years from date of resale by buyer in any unchanged condition, or within 66 months from date of shipment from seller, whichever occurs first.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Furnish and install a rooftop heating and cooling unit. Safety certified by ETL in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment. Unit nameplate shall include the ETL/ETL Canada listed mark. Unit shall be fully assembled, charged, wired, and tested prior to shipment. If unit is intended for installation on a concrete slab, verify design requirements and construction responsibility for the slab.

### **2.2 MANUFACTURERS**

- A. The basis-of-design product for the Rooftop Heating and Cooling Unit is based on the Modine Atherion® Model MPR.

### **2.3 CABINET**

- A. The casing shall be designed for outdoor application with a fully weatherproof cabinet.
1. Rigging Provisions: Unit shall include double nut lifting eye bolts on the top of the unit. The double nut will allow free rotation and secure lock-down of the eye bolts to accommodate varying spreader bar lifting orientations.

2. Roof Construction: Roof shall have a standing roof seam for maximum roof rigidity and prevention of standing water and perimeter drip edges to prevent water from dripping into the access doors.
  3. Exterior Cabinet Construction: Exterior casing parts shall be 18 gauge pre-painted G90 galvanized steel with a finish capable of withstanding a minimum 2500 hour salt spray and fog atmosphere exposure in accordance with ASTM B117 test procedure.
  4. Exterior Cabinet Finish: Paint color shall be standard Modine Commercial Gray Green.
  5. Internal Cabinet Construction: Unit shall be internally insulated on all surfaces with exterior exposure, including walls, floor, and ceiling. Insulation shall be completely encased within standard 20 gauge galvanized steel liners. These liners shall provide double wall construction that complies with ASHRAE 62.1 to prevent mold growth, allow easy cleaning, and protection of the insulation from the airstream and from entering the airstream.
  6. Insulation: Insulation shall be 2 inch R-8 faced fiberglass, 1-½ lb. density.
  7. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Refrigerant piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
- B. Service and Maintenance Access: Access to items needing periodic inspection or maintenance shall be through hinged access doors.
1. Access Door Construction: Access doors shall have full length hinges, painted to match the unit color and the hinge pin is to be stainless steel to prevent corrosion and rust staining. Doors are to have full perimeter gasketing.
  2. Access Door Hardware: Hinged doors shall have recessed door handles. Doors shall be secured closed with quarter turn latches. Doors shall be secured open with mechanical door stays to prevent movement of the door from wind.

## 2.4 AIR CONTROL CONFIGURATION

- A. Unit airflow control configuration shall be fresh and return air dampers with provisions for external interface to a Modine supplied Energy Recovery Module, model ERM, consisting of pre-wired wiring drops from the unit for direct connection to the ERM.
1. Dampers: Dampers shall be constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Dampers shall have a maximum leakage of Class 1A (3 cfm/sq. ft. of damper area @ 1" w.g. air pressure differential) when tested in accordance with AMCA Standard No. 500, Test Methods for Louvers, Dampers, and Shutters.
  2. Actuator: Fresh and return air direct drive damper actuators shall be spring return to close when not powered.
- B. Controls: Damper controls shall be as outlined in the "CONTROLS" section.

## 2.5 REFRIGERATION SYSTEM

- A. Compressor: Single Modulating Digital Scroll with Single Stage Scroll in Tandem Arrangement (2 compressors total).
1. Modulation: Compressor shall be capable of system capacity modulation from 12.5%-100%.
  2. Refrigerant: Unit shall be factory charged with R-410A refrigerant.

3. Service Access: Compressor(s) shall be mounted in an isolated compartment to permit operation of the unit without affecting air flow when the compartment door is open.
  4. Vibration Isolation: Compressor(s) shall be mounted on the compressor manufacturer's recommended rubber vibration isolators to reduce transmission of vibration to the building structure.
  5. Internal Overload Protection: Compressor(s) shall include internal thermal overload protection to protect against excessive motor temperatures.
  6. Crankcase Heater: Compressor(s) shall include a crankcase heater to protect against liquid flood-back and the elimination of oil foaming on startup.
- B. Refrigerant Circuit Safety Controls: The standard refrigerant circuit safety controls include:
1. A 5-minute anti-short cycle delay timer.
  2. Modulating condenser fan speed control to allow cooling system operation with outside air temperature as low as 45°F. If cooling is required when the outside air temperature is below 45°F, it is recommended that the unit be selected with economizer damper control to achieve free cooling.
  3. Ambient temperature compressor lockout (default 55°F, adjustable).
  4. An airflow proving switch is monitored to ensure proper airflow before the refrigeration circuit is energized.
  5. A liquid line sight glass.
  6. Automatic reset low pressure and manual reset high pressure refrigerant controls.
  7. Schrader type service fittings on both the high pressure and low pressure sides.
  8. Refrigerant liquid line filter/drier.
- C. Evaporator Coil: Evaporator coil shall be high capacity 4 row design with copper tubes and aluminum fins mechanically bonded to the tubes at a spacing of 14 fins per inch. The coil shall feature vertical tube headers and galvanized steel end casings with stainless steel lower bracket.
1. Expansion Valve: Each evaporator coil circuit shall be equipped with an electronic expansion valve with evaporator coil pressure transducer for precise refrigerant control over widely varying outside air conditions. Thermal expansion valves are not permitted.
  2. Evaporator Coil Drain Pan: The coil shall include a double sloped, 316 stainless steel drain pan for positive drainage of condensate. The drain pan shall include a condensate drain pan float switch to disable the compressors if the pan is not draining properly.
- D. Hot Gas Reheat Coil: The unit shall include a hot gas reheat coil to allow the unit to have a dehumidification mode of operation.
1. Hot Gas Reheat Control: The unit shall include hot gas reheat modulating valves, electronic controller, and supply air temperature sensor for enhanced dehumidification control.
  2. Hot Gas Reheat Coil Spacing: The hot gas reheat coil shall be located no less than 6" downstream of the evaporator coil to prevent condensate re-evaporation.
- E. Condenser Coil: The air-cooled condenser shall be a Modine Parallel Flow PF™ micro-channel aluminum fin/tube condenser coil.
1. Condenser Coil Orientation: The condenser coil shall be sloped approximately 60° from horizontal to protect the coil from hail damage.
  2. Condenser Fans: The condenser section shall have vertical discharge axial flow direct drive fans with variable frequency drive for condenser head pressure control.
- F. Controls: The refrigeration system controls shall be as outlined in the "CONTROLS" section.

## 2.6 HEATING SYSTEM

- A. The unit shall have an indirect fired gas heating section.
1. The gas heat section shall consist of two single furnaces in parallel. Each furnace rating is 1/2 the total heat rating of the unit.
  2. The gas heating section shall be configured for use with Natural Gas. The inlet gas pressure shall be between 8" and 14" W.C.
  3. The thermal efficiency of the section shall be a minimum of 81% for all air flow ranges.
  4. Primary Heat Exchanger: Heat exchanger shall be tubular type with 18 gauge, 409 stainless steel tubes and header.
  5. The heat exchanger shall be certified to withstand 5.0" W.C. external static pressure without burner flame disturbance.
  6. The burners shall be in-shot type, directly firing each heat exchanger tube individually and designed for good lighting characteristics without noise of extinction.
  7. The unit shall be power exhausted and tested to insure proper ignition when the unit is subjected to 40 mile per hour wind velocities. The unit shall also include a factory mounted differential pressure switch designed to prevent main burner ignition until positive venting has been proven.
  8. The solid state ignition system shall directly light the gas by means of a direct spark igniter each time on a call for heat. The ignition control shall be 100% shut-off with multi-retry.
  9. The heating section shall be provided with electronic modulating gas control valve(s), main combination gas valves/regulators, ignition controllers, and automatic reset high limit switches. An airflow proving switch is included to ensure proper airflow before the heating circuit is energized.
  10. The gas controls can modulate the system gas flow between 20-100% (10% with 1 furnace disabled) of full fire. Disabling furnaces requires that installation guidelines be followed.
  11. Gas supply piping can be brought in through the unit base for through-the-curb piping, or in the outside cabinet wall for across-the-roof piping.
  12. Gas connections to the furnaces shall consist of individually piped manifolds with separate gas valves and separate ignition controllers. Individual furnace gas piping shall be joined internally to allow for single point connection of field supplied gas piping.
- B. The heating section controls shall be as outlined in the "CONTROLS" section.

## 2.7 SUPPLY AIR BLOWER AND MOTOR

- A. Direct Drive Supply Air Blowers: The fans shall be un-housed Dual 16 Inch Backward Curved Airfoil Plenum Fan (ANPA) to cover specified airflow and total static pressure drop. The blowers are to be directly connected to and supported by the motor shafts.
- B. Blower Motors: Motors shall be premium efficiency to meet the Energy Independence and Security Act requirements.
1. Motor Type: Motors shall be Open Drip Proof (ODP).
  2. Motor Speed: Motors shall have a synchronous speed of 1800 RPM.
  3. Inverter Duty: Motors shall be inverter duty rated.
  4. Motor Bearings: Bearings shall be ball bearings rated for 200,000 hours. Motors not marked as having permanently lubricated bearings will include grease fittings for periodic lubrication.

- C. Blower and motor assemblies shall be dynamically balanced. The entire blower and motor assemblies shall be mounted on rubber-in-shear vibration isolators.
- D. Maintenance: The blower and motor assemblies are to be self-contained for service or removal from the cabinet.
- E. Supply air blower controls shall be as outlined in the "CONTROLS" section.

## **2.8 FILTERS**

- A. Primary Filters: The unit shall include 2" thick primary filters located upstream of the refrigeration system evaporator coil to filter fresh and return air.
  - 1. Filter Rating: Filters shall be pleated disposable filters with a Minimum Efficiency Reporting Value of MERV 10 per ASHRAE standard 52.2.

## **2.9 POWER EXHAUST**

- A. The unit shall include power exhaust to remove air from the building.
- B. Installation: Power exhaust with energy recovery shall be in a fully assembled weatherproof energy recovery module, model ERM, that is field installed to the air inlet end of the packaged rooftop unit.
  - 1. Roof Construction: Roof shall have a standing roof seam for maximum roof rigidity and prevention of standing water and perimeter drip edges to prevent water from dripping into the access doors.
  - 2. Exterior Cabinet Construction: Exterior casing parts shall be 18 gauge pre-painted G90 galvanized steel with a finish capable of withstanding a minimum 2500 hour salt spray and fog atmosphere exposure in accordance with ASTM B117 test procedure.
  - 3. Exterior Cabinet Finish: Paint color shall be standard Modine Commercial Gray Green.
  - 4. Internal Cabinet Construction: Unit shall be internally insulated on all surfaces with exterior exposure, including walls, floor, and ceiling. Insulation shall be completely encased within standard 20 gauge galvanized steel liners to provide double wall construction that complies with ASHRAE 62.1 to prevent mold growth, allow easy cleaning, and protection of the insulation from the airstream and from entering the airstream.
  - 5. Insulation: Insulation shall be 2" faced fiberglass, 1-1/2 lb. density.
  - 6. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Electrical conduit through cabinet panels shall include sealing to reduce air leakage.
- C. Service and Maintenance Access: Access to items needing periodic inspection or maintenance shall be through hinged access doors.
  - 1. Access Door Construction: Access doors shall have full length hinges, painted to match the unit color and the hinge pin is to be stainless steel to prevent corrosion and rust staining. Doors are to have full perimeter gasketing.
  - 2. Access Door Hardware: Hinged doors shall have recessed door handles. Doors shall be secured closed with quarter turn latches. Doors shall be secured open with mechanical door stays to prevent movement of the door from wind.

- D. The ERM supply and return air connections shall be designed to match existing openings on the packaged rooftop unit for close coupled installation without the need for additional field transition ductwork. A factory installed transition is included to simplify mating the MPR and ERM models together.
- E. The ERM shall be pre-wired for direct connection to the package rooftop unit and shall be configured to match the supply voltage to the packaged rooftop unit.
- F. The energy recovery section shall feature a rotary energy recovery wheel mounted within a rigid, extruded aluminum framed module containing the wheel drive motor, drive belt, wheel seals, and maintenance free bearings. The module shall be able to slide out for servicing.
  - 1. All diameter and perimeter seals shall be provided as part of the assembly.
  - 2. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external adjustment.
  - 3. The energy recovery wheel shall be made of a corrosion resistant aluminum alloy that is composed of alternating corrugated and flat, continuously wound layers of uniform widths that guarantees laminar air flow, and low static pressure loss.
  - 4. The wheel shall be a Total Energy Recovery type wheel that allows transfer of both sensible and latent energy. The desiccant shall be a very long life and high performance Zeolite coating that is permanently bonded to the aluminum wheel substrate. Desiccant shall feature 4 angstrom (Å) pore diameter to allow high capacity and speed of adsorption and desorption without forming odors.
  - 5. The slide in energy recovery wheel assembly shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. Thermal performance shall be certified by the wheel manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and ARI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Assembly shall be listed in the ARI Certified Products.
  - 6. Wheel energy recovery effectiveness shall be a minimum of 60% as defined in ASHRAE 189.1, Standard for the Design of High-Performance Green Buildings except Low-Rise Residential Buildings at rated conditions.
- G. The ERM shall include economizer wheel bypass to reduce fan energy usage when energy recovery is not required.
- H. Wheel shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.
- I. The ERM shall have a dedicated microprocessor controller that is networked to the packaged rooftop unit microprocessor controller.
- J. Exhaust Air Fan: The fan shall be a Backward Curved Airfoil Plenum Fan to cover specified airflow and total static pressure drop.
  - 1. Blower Drive: The blower is to be belt driven by an adjustable V-belt drive with a minimum rating of 140% of the motor nameplate brake horsepower when the adjustable pulley is at the minimum RPM. The V-belt drive is to include an auto belt tensioner.
  - 2. Blower Bearings: Blower shall feature permanently lubricated bearings.
  - 3. Blower Motor: Motor shall be premium efficient to meet the Energy Independence and Security Act requirements.
  - 4. Inverter Duty: Motor shall be inverter duty rated.
  - 5. Blower Motor Bearings: Bearings shall be ball bearings rated for 200,000 hours. Motors not marked as having permanently lubricated bearings will include grease fittings for periodic lubrication.

- 6. Blowers, drives, and motors shall be dynamically balanced.
- K. The module shall include gravity exhaust air relief dampers that are sized for 100% relief of the power exhaust airflow capacity.
- L. The module shall include gravity exhaust air relief dampers that are sized for 100% relief of the power exhaust airflow capacity.
  - 1. The ERM shall include a field assembled and installed inlet rainhood and a factory mounted inlet birdscreen.
  - 2. Inlet Air Filters: The ERM shall include 2" MERV 10 disposable pleated filters upstream of the wheel on the inlet air side.
  - 3. Exhaust Air Filters: The ERM shall include 2" MERV 10 disposable pleated filters upstream of the wheel on the exhaust air side.
- M. Inlet Rainhood: Unit shall include a field assembled and installed inlet rainhood and a factory mounted inlet birdscreen.
- N. Controls: The exhaust and energy recovery controls shall be as outlined in the "CONTROLS" section.

## **2.10 ELECTRICAL**

- A. Control Panel: The unit shall have an electrical control center where all high and low voltage connections are made.
  - 1. Power Connections: Control center shall be constructed to permit single-point high voltage power supply connections.
  - 2. Wire Management: All wiring is to be run in conduit that is located between the unit ceiling liner and roof casing with drops from the ceiling to keep wires clear of other internal components, prevent accidental damage to wiring during service, and improve cleanliness of unit interior.
  - 3. Wiring Diagram: The unit shall have a job specific wiring diagram affixed to the interior of the control compartment access door.
  - 4. Factory Installed Deadfront Disconnect Switch: Unit shall be provided with a factory installed and wired, dead-front, non-fused disconnect switch.
- B. Access Door Interlock Switch: The unit shall include a blower door switch that disables the unit supply blower operation if the blower access door is opened.
- C. Phase/Voltage Failure Relay: The unit shall be provided with an internally mounted phase measurement relay to monitor the 3-phase power supply for phase sequence, phase failure, asymmetry, under voltage and overvoltage.
- D. Convenience Outlet: Unit shall be provided with a factory installed 115 volt, 15 amp ground fault service receptacle mounted on the exterior of the unit casing. The outlet requires a separate power supply by others.

## **2.11 CONTROLS**

- A. Control Panel: All components located in the panel shall be clearly marked for easy identification. All terminal blocks and wires shall be individually numbered. All electrical wires in the control panel shall be run in an enclosed raceway.

- B. **Microprocessor Controller:** All units shall include a Carel programmable microprocessor controller mounted in a controls compartment outside the airstream. The controller will be programmed with the Modine Controls System® to operate the unit in an energy efficient manner using pre-engineered control strategies. The controller will monitor output from sensors within each unit subsystem and automatically adjust unit operating parameters to maintain programmed setpoints and strategies.
1. The controller shall contain LED's and/or LCD interface to indicate the power status, communications status, and fault conditions that arise during operation. Fault conditions indicated include but are not limited to supply air sensor failure, outdoor air sensor failure, space sensor failure, mechanical cooling failure, mechanical heating failure, low supply temperature alarm, high supply temperature alarm, and control temperature cooling or heating failure. The controller shall also monitor outside temperature for heating and cooling circuit lockout during mild conditions. If temperatures fall below the low supply temp alarm point, the unit shall be shut down.
  2. The Carel controller shall be capable of independent stand-alone operation with field configuration, setpoint adjustment, and scheduling accomplished at the unit with an integral user interface on the controller that includes a backlit LCD display, keypad, and status LEDs to allow the programming of the control parameters (set point, differential band, alarm thresholds) and basic functions by the user (ON/OFF and display of the controlled values).
  3. The unit shall be provided with a Carel space mounted digital module, model pAD, which includes a temperature and humidity sensor and backlit LCD display to review unit setpoints and unit output and operating conditions. The pAD module does not allow remote programming of the control parameters, but does allow temporary override of the unit. The device shall be field wired to the main unit controller via the Carel pLAN network using shielded cable by others.
  4. The controller shall have a full calendar schedule for occupied, unoccupied, and holiday scheduling.
  5. The controller shall retain all programmed values in non-volatile memory in the event of a power failure.
  6. The Carel controller shall include a pCONet interface to provide the ability to communicate and integrate with BACNet® MS/TP communication networks.
- C. **Damper Controls:** The damper controls subsystem shall be controlled by the microprocessor controller as follows:
1. The damper control shall be fully modulating with economizer control based on dual point enthalpy sensing comparing indoor against outdoor enthalpy. The position can be overridden based on the reading from a field installed CO2 sensor to proportionately increase the ventilation rate when the level of CO2 rises over a predetermined set point. The shipped loose sensor shall have the capability of measuring CO2 levels from 0 to 2,000 parts per million (ppm) with an accuracy of + 40 ppm CO2 + 3.0% of the reading.
  2. The fresh and return air dampers shall be independently controlled by separate direct mounted damper actuator motors. The damper actuators shall work opposite of one another so that the mixed damper position always totals 100%. The exception is when the unit is in the "OFF" mode of operation, at which point both dampers will be 100% closed to both the outside air and return air.
- D. **Supply Blower Controls:** The supply blower controls subsystem shall be controlled by the microprocessor controller as follows:
1. The supply fan shall be single speed with variable frequency drive. The fan speed can be adjusted manually, within design limits, from within the Modine Control System.
  2. The variable frequency drive will operate the supply fan at a reduced speed during energy recovery wheel economizer by-pass operation. The reduction in fan speed during economizer bypass mode is to prevent a significant increase in airflow from the

reduction in system static pressure when the supply air by-passes the energy recovery wheel.

- E. Exhaust Blower Controls: The exhaust blower controls subsystem shall be controlled by the microprocessor controller as follows:
1. The exhaust blower control shall be modulating variable frequency drive control to maintain a customer specified building pressure setpoint relative to the outside atmosphere. Lowest speed setting must be within the limits of the unit. The building pressure sensor has three selectable ranges: 0-0.1", 0-0.25", and 0-0.5" w.c.
  2. The variable frequency drive will operate the exhaust fan at a reduced speed during energy recovery wheel economizer by-pass operation. The reduction in fan speed during economizer bypass mode is to prevent a significant increase in airflow from the reduction in system static pressure when the exhaust air by-passes the energy recovery wheel.
- F. Temperature Controls: The temperature controls subsystem shall be controlled by the microprocessor controller as follows:
1. Supply Air Temperature Control with Room Temperature Reset – The Carel controller shall monitor and control the supply air temperature to maintain the desired setpoint. An additional room temperature sensor is used and if the temperature does not meet the programmed setpoint for that sensor, the supply air temperature setpoint is lowered to increase cooling or raised to increase heating.
  2. Dehumidification Control based on Room Humidity and Outside Dewpoint – The Carel controller shall monitor both a room mounted temperature/humidity sensor and an outside air enthalpy sensor and enter dehumidification mode if the space humidity and/or outside air dew point exceeds the desired setpoints. In dehumidification mode, the Carel controller shall monitor an evaporator coil suction line pressure sensor and calculate corresponding coil temperature. The controller shall then modulate the digital scroll compressor to maintain the desired coil temperature, based on suction line pressure, necessary to increase latent heat (moisture) removal. The hot gas reheat option is highly recommended to avoid overcooling the space.
  3. When equipped with the hot gas reheat option, the Carel controller shall monitor a factory supplied, field installed supply air temperature sensor and control the modulating hot gas reheat valve to vary the flow of hot condenser gas through the reheat coil to maintain the desired supply air temperature setpoint and prevent temperature swings and overcooling of the space during dehumidification.
  4. The Carel controller shall monitor the outside air temperature sensor and lockout each compressor at a preset adjustable temperature setpoint.
- G. Energy Recovery Controls: The energy recovery controls subsystem shall be controlled by the microprocessor controller as follows:
1. The energy recovery module wheel operation is controlled to rotate when energy recovery is maximized without causing a rise in latent loading to the mechanical cooling equipment.
  2. Economizer Bypass: The module shall include an economizer wheel bypass damper. To maximize energy recovery effectiveness, the energy recovery module bypass damper is closed when the wheel is rotating and to minimize supply fan energy consumption, the damper is open when the wheel is not rotating.
  3. Economizer Bypass Jog Mode: The module shall include energy recovery wheel start-stop-jog control to periodically rotate the wheel position during economizer mode to avoid wheel contamination from the airstream.
  4. Wheel Defrost Mode: The module shall include energy recovery wheel defrost control to periodically stop the wheel rotation to allow the warm exhaust air to defrost the wheel.

## **2.12 ROOF CURB**

- A. Roof Curb: The unit shall be supplied with a fully assembled, field installed roof curb with welded mitered corners and internal support channels.
  - 1. Construction: The curb shall be constructed of 14 gauge G90 galvanized steel and include 1" x 4" pressure treated wood nailing strips and 20 gauge galvanized steel sheet metal flashing. The curb shall include a 20 gauge galvanized sheet metal plenum baffle with solid bottom for horizontal supply and/or return air duct connections. The curb is designed for installation on a flat, no-pitch roof only.
  - 2. Insulation: The roof curb shall be fully insulated with 1-1/2 inch, 3 lb. density acoustical and thermal insulation. The insulation shall be fiberglass with a foil face.
  - 3. Gasketing: Curb gasketing shall be furnished with the curb and is to be affixed to the curb immediately before mounting of the rooftop unit to provide an air seal.
  - 4. Installation: The curb shall be designed for installation on a flat, non-sloped roof.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit Installation & Service Manual.
- B. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit Installation & Service Manual.
- C. Proceed with installation only after all unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's Installation & Service Manual, Best Practices and all applicable building codes.

### **3.3 CONNECTIONS**

- A. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.
- B. Piping installation requirements are specified in Division 22 (Plumbing). Drawings indicate general arrangement of piping, fittings and specialties.
- C. Duct installation and connection requirements are specified in Division 23 (Heating Ventilating and Air Conditioning).
- D. Electrical installation requirements are specified in Division 26 (Electrical).

### **3.4 FIELD QUALITY CONTROL**

- A. Refer to section 01 40 00 "Quality Requirements" for additional requirements.

### **3.5 SYSTEM STARTUP**

- A. Start-up units in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.