Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

September 14, 2012

SUBJECT: Various Routes
Section 2012-045I
Will County
Contract No. 60V37
Item No. 49, September 21, 2012 Letting
Addendum A

NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Replaced the Schedule of Prices.
2. Revised the Table of Contents to the Special Provisions.
3. Revised pages 43 & 44 of the Special Provisions.
4. Added pages 95-119 to the Special Provisions.
5. Revised sheets 1-6, 10 & 11 of the Plans.
6. Added sheets 11A-11F to the Plans.

Prime contractors must utilize the enclosed material when preparing their bid and must include any Schedule of Prices changes in their bidding proposal.

Bidders using computer-generated bids are cautioned to reflect any and all Schedule of Prices changes, if involved, into their computer programs.

Very truly yours,

John D. Baranzelli, P. E.
Acting Engineer of Design and Environment

By: Ted B. Walschleger, P. E.
Engineer of Project Management

cc: John Fortmann, Region 1, District 1; Mike Renner; D.Carl Puzey; Estimates

dr

ILLINOIS DEPARTMENT OF TRANSPORTATION
SCHEDULE OF PRICES
CONTRACT NUMBER - 60V37

State Job # - C-91-546-12

Project Number

Route
VARIOUS

County Name - WILL- -
Code - 197 - -
District - 1 - -
Section Number - 2012-045I

* REVISED SEPTERMBER 14, 2012

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0323964	ROOF DRAIN COLL NET	FOOT	88.000				
X0325153	MASONRY CLEAN & TUCK	SQ YD	4,265.000				
X0327397	ROOF REPLACE, LOC 1	L SUM	1.000				
X0327468	ROOF DK CON CRNR REP	L SUM	1.000				
X0327469	MASONRY FC BRICK REPR	SQ FT	60.000				
X0327470	MASONRY SEALER	SQ FT	4,265.000				
X0327471	MOD & PAINT FIRE ESCP	L SUM	1.000				
X0327472	ROOF SMPLG & ACM ID	L SUM	1.000				
X0327473	HANDLING OF ACM	L SUM	1.000				
*ADD X0327494	MECH WORK COMPLETE	L SUM	1.000				
67100100	MOBILIZATION	L SUM	1.000				

TABLE OF CONTENTS

- SSPC-QP 1, Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Structures)
- SSPC-QP 2, Standard Procedure for Evaluating the Qualifications of Painting Contractors to Remove Hazardous Paint
- SSPC-SP 1, Solvent Cleaning
- SSPC-SP 3, Power Tool Cleaning
- SSPC-SP 10/NACE No. 2, Near White Metal Blast Cleaning

- SSPC-SP 12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
- SSPC-SP15, Commercial Grade Power Tool Cleaning
- SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
- SSPC-VIS 3, Visual Standard for Power- and Hand-Tool Cleaned Steel
- SSPC-VIS 4, Guide and Reference Photographs for Steel Cleaned by Water Jetting
- SSPC-VIS 5, Guide and Reference Photographs for Steel Prepared by Wet Abrasive Blast Cleaning
- The paint manufacturer's application instructions, MSDS and product data sheets

COMPLETION DATE PLUS WORKING DAYS

Effective: September 30, 1985
Revised: January 1, 2007

Revise Article 108.05 (b) of the Standard Specifications as follows:

"When a completion date plus working days is specified, the Contractor shall complete all contract items and safely open all areas of the building by 11:59 PM on, July 31, 2013 + except as specified herein.

The Contractor will be allowed to complete all clean-up work and punch list items within 5 working days after the completion date. Under extenuating circumstances the Engineer may direct that certain items of work, not affecting the safe use of the building, may be completed within the working days allowed for cleanup work and punch list items.

Article 108.09 or the Special Provision for “Failure to Complete the Work on Time”, if included in this contract, shall apply to both the completion date and the number of working days.

COORDINATION WITH ADJACENT AND/OR OVERLAPPING CONTRACTS

This contract may overlap with another contract on a future letting date. The other contract will include modifications to the second floor of the Joliet Bridge Office building. The other contract will provide for the installation of ductwork for the new RTU that is being installed as part of this contract. Start-up and commissioning of the RTU will also be part of the future contract. Close coordination between the Contractors of both contracts in regards to the sequence and timing for execution of work items will be required.

Add the following paragraph to the beginning of Article 105.08.

Revised 9/14/2012

"The Contractor shall identify all such work items at the beginning of the contract and coordinate the sequence and timing for their execution and completion with the other Contractors through the Engineer. All of these work items shall be identified as separate line items in the Contractor's proposed Construction Progress Schedule. Additional compensation or the extension of contract time will not be allowed for the progress of the work items affected by the lack of such coordination by the Contractor."

ROOF DRAIN COLLECTION NETWORK

Description:

Extent of roof drain collection network (gutter and downspouts) work is as shown on the drawings and as specified herein.

The Contractor shall review the drawings and make a pre-bid field visit to verify all work whether shown or not shown on the drawings.

General Performance: Gutter and downspouts shall resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

Submittals

Product Data: Submittal of product data shall include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

Shop Drawings: Submit gutter and downspout plan, elevation, expansion-joint locations, attachments to other work, details for expansion joints, pattern of seams and layout of fasteners, and special conditions whether shown in the contract documents or not.

Samples: Submit a sample for each type of gutter and downspout indicated.

Delivery, Storage and Handling:

General: Do not store gutter and downspouts in contact with other materials that might cause staining, denting, or other surface damage

Warranty:

Special Warranty on Painted Finish: Manufacturer's standard form in which manufacturer agrees to repair finish or replace gutter and downspouts that show evidence of deterioration of factory-applied finishes within twenty (20) years from date of Substantial Completion.

Exposed Metals:

Fluoropolymer Finish: Manufacturers deterioration includes, but is not limited to color fading more than five (5) Hunter units when tested according to ASTM D 2244, chalking in excess of a No. 8 rating when tested according to ASTM D 4214, cracking, checking, peeling, or failure of paint to adhere to bare metal.

Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper to suit forming operations with a smooth flat finish.

Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

Miscellaneous Materials;

General: Provide all materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

Fasteners for Aluminum: Stainless Steel

Rivets: Stainless Steel

Masonry Anchors: Stainless Steel

Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

MECHANICAL WORK COMPLETE

MECHANICAL WORK COMPLETE

Description:

This work shall include the removal of the existing roof mounted gooseneck gravity intake ventilator, restroom exhaust fan and associated equipment curbs and the furnishing and installation of new intake ventilator, restroom exhaust fan, and curbs. Existing roof mounted DX split system air cooled condensing unit and associated equipment platform are also to be removed from the roof. DX split system condensing unit to be temporarily stored for re-installation. Once the installation of new roofing system is complete, the condensing unit is to be reinstalled on the roof with new equipment mounting supports, refrigerant piping and a refrigerant piping curb. A packaged, outdoor central station air handling unit (RTU) is also to be furnished and installed on the roof. To accommodate the mechanical system improvements, electrical materials and equipment will be furnished and installed to allow for the disconnection and reinstallation of the existing roof mounted DX split system air cooled condensing unit and new roof mounted restroom exhaust fan. Electrical conduits will also be roughed into the base of the new roof mounted packaged, outdoor central station air handling unit to allow for wiring connection during the next construction phase.

This work also includes the modifications to the roof structure to accommodate the new equipment. These modifications include saw cutting of the concrete roof deck and the furnishing and installation of structural steel for supplemental roof deck support.

MOTOR REQUIREMENTS – FOR ROOF TOP UNIT AND EXHAUST FANS

Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600-Volt and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

Coordination:

Coordinate features of motors, installed units, and accessory devices to be compatible with the following.

A. Motor controllers.

B. Torque, speed, and horsepower requirements of the load.

C. Ratings and characteristics of supply circuit and required control sequence.

D. Ambient and environmental conditions of installation location.

General Motor Requirements:

Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

Comply with NEMA MG 1 unless otherwise indicated.

Comply with IEEE 841 for severe-duty motors.

Motor Characteristics:

Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3,300 feet above sea level.

U:\Working-Folder-Central-Office\District_1\9-21-12\60V37\Addendum\Mechanical_Work_Complete.docx

Added 9-14-2012

Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

Polyphase Motors (Applicable To Roof Top Unit):

Description: NEMA MG 1, Design B, medium induction motor.

Efficiency: Energy efficient, as defined in NEMA MG 1.

Service Factor: 1.15.

Multispeed Motors: Variable torque.

A. For motors with 2:1 speed ratio, consequent pole, single winding.

B. For motors with other than 2:1 speed ratio, separate winding for each speed.

Multispeed Motors: Separate winding for each speed.

Rotor: Random-wound, squirrel cage.

Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

Temperature Rise: Match insulation rating.

Insulation: Class F.

Code Letter Designation for Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

A. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

B. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.

C. Inverter-Duty Motors: Class F temperature rise; Class H insulation.

D. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

Single-Phase Motors (Applicable to Exhaust Fan):

Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

A. Permanent-split capacitor.

B. Split phase.

C. Capacitor start, inductor run.

D. Capacitor start, capacitor run.

Multispeed Motors: Variable-torque, permanent-split-capacitor type.

Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

Motors 1/20 HP and Smaller: Shaded-pole type.

Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

REFRIGERANTS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

A. Atofina Chemicals, Inc.

B. DuPont Company; Fluorochemicals Div.

C. Honeywell, Inc.; Genetron Refrigerants.

D. INEOS Fluor Americas LLC.

ASHRAE 34, R-22: Monochlorodifluoromethane.

REFRIGERANT PIPING

This Section includes refrigerant piping used for air-conditioning applications.

Performance Requirements:

Line Test Pressure for Refrigerant R-22:

A. Suction Lines for Air-Conditioning Applications: 185 psig.

B. Hot-Gas and Liquid Lines: 325 psig.

Quality Assurance:

Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

Product Storage and Handling:

Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

Copper Tube and Fittings:

Copper Tube: ASTM B 280, Type ACR.

Wrought-Copper Fittings: ASME B16.22.

Brazing Filler Metals: AWS A5.8.

Valves and Specialties:

Moisture/Liquid Indicators:

A. Body: Forged brass.

B. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.

C. Indicator: Color coded to show moisture content in ppm.

D. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.

E. End Connections: Socket or flare.

F. Working Pressure Rating: 500 psig.

G. Maximum Operating Temperature: 240 deg F.

Permanent Filter Dryers: Comply with ARI 730.

A. Body and Cover: Painted-steel shell.

B. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.

C. Desiccant Media: Activated alumina or charcoal.

D. End Connections: Socket.

E. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.

F. Maximum Pressure Loss: 2 psig.

G. Rated Flow: 5 tons.

H. Working Pressure Rating: 500 psig.

I. Maximum Operating Temperature: 240 deg F.

Piping Applications:

Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.

Hot-Gas and Liquid Lines: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.

Valve and Specialty Applications:

Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

Install filter dryers in liquid line between compressor and thermostatic expansion valve.

Piping Installation:

Install refrigerant piping according to ASHRAE 15.

Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

Install piping adjacent to machines to allow service and maintenance.

Install piping free of sags and bends.

Install fittings for changes in direction and branch connections.

Select system components with pressure rating equal to or greater than system operating pressure.

Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection.

Slope refrigerant piping as follows:

A. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.

B. Install horizontal suction lines with a uniform slope downward to compressor.

C. Install traps to entrain oil in vertical runs.

D. Liquid lines may be installed level.

When brazing, remove sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Pipe Joint Construction:

Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

A. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.

B. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

Hangers and Supports:

Install the following pipe attachments:

A. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.

B. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

A. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.

B. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.

C. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.

D. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.

Field Quality Control:

Perform tests and inspections.

Tests and Inspections:

A. Comply with ASME B31.5, Chapter VI.

B. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

C. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

1. Fill system with nitrogen to the required test pressure.
2. System shall maintain test pressure at the manifold gage throughout duration of test.
3. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
4. Remake leaking joints using new materials and retest until satisfactory results are achieved.

System Charging:

Charge system using the following procedures:

A. Install core in filter dryers after leak test but before evacuation.

B. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.

C. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

Adjusting:

Adjust thermostatic expansion valve to obtain proper evaporator superheat.

U:\Working-Folder-Central-Office\District_1\9-21-12\60V37\Addendum\Mechanical_Work_Complete.docx

Added 9-14-2012

Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

Adjust set-point temperature of air-conditioning controllers to the system design temperature.

Field Quality Control:

Perform tests and inspections.

Tests and Inspections:

A. Comply with ASME B31.5, Chapter VI.

B. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

C. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

1. Fill system with nitrogen to the required test pressure.
2. System shall maintain test pressure at the manifold gage throughout duration of test.
3. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
4. Remake leaking joints using new materials and retest until satisfactory results are achieved.

System Charging:

Charge system using the following procedures:

A. Install core in filter dryers after leak test but before evacuation.

B. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.

C. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.

Adjusting:

Adjust thermostatic expansion valve to obtain proper evaporator superheat.

Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

Adjust set-point temperature of air-conditioning controllers to the system design temperature.

PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS (RTU)

Summary:

This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:

A. Direct-expansion cooling.

U:\Working-Folder-Central-Office\District_1\9-21-12\60V37\Addendum\Mechanical_Work_Complete.docx

Added 9-14-2012

B. Electric-heating coils.

C. Economizer outdoor- and return-air damper section.

D. Integral, space temperature controls.

E. Roof curbs.

Definitions:

RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

Supply-Air Fan: The fan providing supply-air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

Action Submittals:

Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

A. Wiring Diagrams: Power, signal, and control wiring.

Informational Submittals:

Field quality-control test reports.

Warranty.

Closeout Submittals:

Operation and maintenance data.

Quality Assurance:

ARI Compliance:

A. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.

B. Comply with ARI 270 for testing and rating sound performance for RTUs.

ASHRAE Compliance:

A. Comply with ASHRAE 15 for refrigerant system safety.

B. Comply with ASHRAE 33 for methods of testing cooling coils.

C. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

UL Compliance: Comply with UL 1995.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

Warranty:

Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

A. Provide two (2) year warranty (parts and labor, including hoisting cost) for all new mechanical system equipment and devices. Provide additional three (3) years (parts only) warranty for refrigeration compressors.

B. Warranty shall commence six (6) months after factory ship date or at start-up of RTU, whichever is earlier.

Manufacturers:

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include:

A. AAON, Inc.

B. Valent.

Casing:

General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

A. Exterior Casing Thickness: 0.052 inch thick.

Inner Casing Fabrication Requirements:

A. Inside Casing: Galvanized steel, 0.034 inch thick.

Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

A. Materials: ASTM C 1071, Type I.

B. Thickness: 1 inch.

C. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.

D. Liner Adhesive: Comply with ASTM C 916, Type I.

Condensate Drain Pans: Formed sections of polycarbonate or stainless-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1.

A. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.

B. Drain Connections: Threaded nipple, both sides of drain pan.

C. Pan-Top Surface Coating: Corrosion resistant compound.

Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

Fans:

Direct-Driven Supply-Air Fans: Double width, backward inclined or backward curved, centrifugal with permanently lubricated, high-efficiency VFD rated motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

Relief-Air Fan: Backward inclined or backward curved, shaft mounted on permanently lubricated motor.

Fan Motor: Comply with requirements in " Motor Requirements."

Coils:

Supply-Air Refrigerant Coil:

A. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.

B. Coil Split: Interlaced.

C. Condensate Drain Pan: Stainless steel or polycarbonate formed with pitch and drain connections complying with ASHRAE 62.1.

Electric-Resistance Heating:

A. Open Heating Elements: Resistance wire of 80 percent nickel and 20 percent chromium, supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

B. Overtemperature Protection: Disk-type, automatically reset, thermal-cutout, safety device; serviceable through terminal box.

C. Overcurrent Protection: Manual-reset thermal cutouts, factory wired in each heater stage.

D. Control Panel: Unit mounted with disconnecting means and overcurrent protection. Include the following controls:

1. Magnetic contactors.
2. Step Controller: Pilot lights and override toggle switch for each step.
3. SCR Controller: Pilot lights operate on load ratio, a minimum of five steps.
4. Time-delay relay.
5. Airflow proving switch.

Refrigerant Circuit Components:

Number of Refrigerant Circuits: One (1).

Compressor: Variable capacity scroll compressor, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

Refrigeration Specialties:

A. Refrigerant: R-410A.

B. Expansion valve with replaceable thermostatic element.

C. Refrigerant filter/dryer.

D. Manual-reset high-pressure safety switch.

E. Automatic-reset low-pressure safety switch.

F. Minimum off-time relay.

G. Automatic-reset compressor motor thermal overload.

H. Brass service valves installed in compressor suction and liquid lines.

I. Four-way reversing valve with a replaceable magnetic coil, thermostatic expansion valves with bypass check valves and a suction line accumulator.

Air Filtration:

Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

A. Pleated: Minimum 90 percent arrestance, and MERV 7.

Dampers:

Outdoor- and Return-Air Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

A. Damper Motor: Modulating with adjustable minimum position.

B. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IESNA 90.1, with bird screen and hood.

Electrical Power Connection:

Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection. If manufacturer's equipment requires a separate power feed for defrost heater, a separate disconnect shall be provided.

Controls:

Basic Unit Controls:

A. Control-voltage transformer.

B. Wall-mounted thermostat or sensor with the following features:

1. Programmable seven (7) day with auto change over.

Accessories:

Refer to Roof-top Unit Schedule on Construction Drawings.

Roof Curbs:

Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

A. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

1. Materials: ASTM C 1071, Type I or II.
2. Thickness: 2 inches.

B. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

1. Liner Adhesive: Comply with ASTM C 916, Type I.
2. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
3. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
4. Liner Adhesive: Comply with ASTM C 916, Type I.

Curb Height: Refer to roof-top Unit Schedule on Construction Drawings.

Capacities and Characteristics:

Refer to Roof-top Unit Schedule on Construction Drawings.

Installation:

Roof Curb: Install on roof structure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction. Secure RTUs to upper curb rail, and secure curb base to roof framing with welds.

Unit Support: Install unit level on structural curbs.

Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

A. Install ducts to termination at top of roof curb.

B. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

C. Install return-air duct continuously through roof structure.

EXHAUST FAN

Section includes general requirements for Centrifugal roof ventilators (Exhaust Fan).

Performance Requirements:

Project Altitude: Base fan-performance ratings on actual Project site elevations.

Operating Limits: Classify according to AMCA 99.

Submittals:

Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

A. Certified fan performance curves with system operating conditions indicated.

B. Certified fan sound-power ratings.

C. Motor ratings and electrical characteristics, plus motor and electrical accessories.

D. Material thickness and finishes.

E. Dampers, including housings, linkages, and operators.

F. Roof curbs.

G. Fan speed controllers.

Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

A. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

B. Wiring Diagrams: For power, signal, and control wiring.

Close Out Submittals:

Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

U:\Working-Folder-Central-Office\District_1\9-21-12\60V37\Addendum\Mechanical_Work_Complete.docx

Added 9-14-2012

Quality Assurance:

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

UL Standards: Power ventilators shall comply with UL 705.

Coordination:

Coordinate size and location of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

Centrifugal Roof Ventilators:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Carnes Company.

B. Loren Cook Company.

C. PennBarry.

Housing: Removable, spun-aluminum, dome top and outlet baffle; square, 1-piece, aluminum base with venturi inlet cone.

Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

Accessories:

A. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

B. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

C. Bird Screens: Removable, 1/2-inch mesh, aluminum.

D. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

A. Configuration: Built-in cant and mounting flange.
B. Overall Height: Contractor to determine curb height.

Capacities and Characteristics:

A. Airflow: 275 cfm.

B. External Static Pressure: 0.4 wg.

C. Drive Arrangement: Direct.

U:\Working-Folder-Central-Office\District_1\9-21-12\60V37\Addendum\Mechanical_Work_Complete.docx

Added 9-14-2012

D. Fan rpm: 1,550.

E. Curb Height: Determined by Contractor.

F. Damper: Heavy-duty backdraft damper.

G. Brake Horsepower: 0.06.

H. Motor Size: 1/15 hp.

I. Motor rpm: 1,550.

J. Electrical Characteristics:

1. Volts: 120.
2. Phase: 1.
3. Hertz: 60.

Motors:

Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 15 Section "Common Motor Requirements for HVAC Equipment."

A. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

Enclosure Type: Totally enclosed, fan cooled.

Source Quality Control:

Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

Installation:

Install power ventilators level and plumb.

Equipment Mounting:

A. Install roof curb to concrete roof deck with Tapcon concrete anchors.

Secure roof-mounted fans to roof curbs with cadmium-plated hardware.

Install units with clearances for service and maintenance

Connections:

Make final duct connections with flexible connectors.

Field Quality Control:

Tests and Inspections:

A. Verify that shipping, blocking, and bracing are removed.

B. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.

C. Verify that cleaning and adjusting are complete.

D. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system.

E. Adjust damper linkages for proper damper operation.

F. Verify lubrication for bearings and other moving parts.

G. Verify that manual volume control dampers in connected ductwork systems are in fully open position.

H. Remove and replace malfunctioning units and retest as specified above.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Adjusting:

Adjust damper linkages for proper damper operation.

Lubricate bearings.

INTAKE VENTILATOR

Section includes general requirements for roof hoods.

Performance Requirements:

Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

A. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

Action Submittals:

Product Data: For each type of product indicated.

Shop Drawings: For gravity ventilators. Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.

A. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

Samples for Initial Selection: For units with factory-applied color finishes. Provide color chart for Architect selection.

Coordination:

Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

Materials

Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.

Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by metal producer for required finish.

Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.

A. Use types and sizes to suit unit installation conditions.

B. Use Phillips flat, hex-head, or Phillips pan-head screws for exposed fasteners unless otherwise indicated.

Fabrication, General:

Factory fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

Fabricate units with closely fitted joints and exposed connections accurately located and secured.

Fabricate supports, anchorages, and accessories required for complete assembly.

Perform shop welding by AWS-certified procedures and personnel.

Roof Hoods:

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

A. Carnes.

B. Greenheck Fan Corporation.

C. PennBarry.

Factory fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 6-6 and 6-7.

Materials: Aluminum sheet, minimum 0.063-inch- thick base and 0.050-inch- thick hood, suitably reinforced.

U:\Working-Folder-Central-Office\District_1\9-21-12\60V37\Addendum\Mechanical_Work_Complete.docx

Added 9-14-2012

Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.

A. Configuration: Built-in cant and mounting flange.

B. Overall Height: 24 inches.

Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

Aluminum Sheet Finish:

A. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas. Apply a conversion coating suited to the organic coating to be applied over it.

B. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat and an overall minimum dry film thickness of 2 mils.

1. Color and Gloss. As selected by Architect from manufacturer's full range.

Capacities and Characteristics.

A. Refer to Roof Ventilator Schedule on Construction Drawings.

Installation:

Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.

Attach gravity ventilator roof curb to concrete roof deck with Tapcon concrete anchors.

Install gravity ventilators with clearances for service and maintenance.

Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

ELECTRICAL WORK

General:

This component of work shall include the furnishing and installing of all materials and electrical equipment necessary in order to provide a complete and operational electrical system for an exhaust fan, to provide rough-in for a new roof-top HVAC system and remove and reconnect an existing HVAC condensing unit.

Contractor shall furnish and install all materials necessary for a complete and operational installation of the electrical equipment. The complete installation and wiring shall be done in a neat, workmanlike manner. All electrical work shall comply with the requirements of NFPA 70 – National Electrical Code

(NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment shall be installed in conformance with the respective manufacturer's directions and recommendations for the respective application. Any installations which void the UL listing, FM Approval, ETL listing (or other third party listing), and/or the manufacturer's warranty of a device will NOT be permitted.

The electrical work and equipment specified is based on equipment of the type and size as noted on the Plans and specified herein. Should the proposed motors (or any other proposed loads) exceed the ratings of the electrical equipment specified, the General Contractor shall be solely responsible for furnishing any and all modifications necessary in order to provide a fully functional system to the satisfaction of the Engineer at no change to the contract cost. The Contractor shall also be required to submit for review, sufficient information determined by the Engineer to be necessary to review such alternates or modifications.

All work, power outages, and/or shut down of existing systems shall be coordinated with the Engineer. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety & Health Standards for electrical safety and lockout/tagout procedures, including, but not limited to, 29 CFR Section 1910.147 the control of hazardous energy (lockout/tagout).

Contractor shall keep a copy of the latest National Electrical Code in force on site at all times during construction for use as a reference.

Contractor and respective electrical contractor shall keep a set of construction plans and specifications with all addenda and copies of any applicable change orders on site at all times.

Submittals:

Contractor shall provide shop drawings for all electrical equipment. Shop drawings shall clearly indicate proposed items, capacities, characteristics and details in conformance with the Plans and Specifications. The respective manufacturer shall certify capacities, dimensions, special features, etc. Shop Drawings for all items shall be prepared immediately upon award of Contract. No materials shown thereon shall be ordered until Shop Drawings are reviewed and approved by the Engineer. Contractor is responsible for compliance with the specified characteristics. Contractor's responsibility for error and omissions in submittals is not relieved by the Engineer's review of submittals. Accompany each submittal with a transmittal letter that includes the date, project title and number, Contractor's name and address, the number of shop drawings, product data, and/or samples submitted, notification of any deviations from the Contract, and any other pertinent data. Shop drawing submittals shall include the following:

A. Date and revision dates.

B. Project title and number(s).

C. Identification of product or material.

D. Certified outline and installation drawings.

E. Performance data and operating characteristics.

F. Catalog data marked to indicate materials being furnished.

G. Specified standards, such as ASTM numbers, ANSI numbers, UL listing/standard, NEMA ratings, etc.

H. Identification of previously approved deviation(s) from Contract documents.

I. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract documents.

J. Space for Prime Contractor's approval stamp.

MATERIALS

Conduit and Fittings:

Galvanized Rigid Steel Conduit: Rigid Steel Conduit and fittings shall be hot-dipped, galvanized, UL-listed, and produced in accordance with UL Standard 6 – Rigid Metal Conduit and ANSI C80.1 – Rigid Steel Conduit, Zinc Coated. Couplings, connectors, and fittings for rigid steel conduit shall be threaded, galvanized steel or galvanized, malleable iron, specifically designed and manufactured for the purpose. Fittings shall conform to ANSI C80.4 – Fittings Rigid Metal Conduit and EMT and UL 514B – Conduit, Tubing, and Cable Fittings. Set screw type fittings are not acceptable.

Electrical Metallic Tubing (EMT): EMT shall be galvanized steel tubing conforming to ANSI C80.3 and U.L. 797. EMT shall be as manufactured by Allied Tube and Conduit Corporation, or equal. All EMT and mounting hardware shall be constructed of corrosion restraint materials and be listed for use in wet locations. EMT fittings, couplings, and connectors shall be steel compression type. Set screw fittings will not be allowed. Steel used to manufacture conduits shall be 100 percent domestic steel. Contractor shall provide certification that the respective steel conduits used on this project are manufactured from 100 percent domestic steel.

Liquid-tight Flexible Metal Conduit: Liquid-tight flexible metal conduit shall consist of polyvinyl jacket over flexible, hot-dip, galvanized steel tubing. The flexible conduit shall be completely sealed from liquids, dust, dirt, and fumes and be resistant to oil, gasoline, grease, and abrasion. Jacket shall also be sunlight-resistant. Liquid-tight, flexible metal conduit shall be U.L.-listed, suitable for use as a grounding conductor and comply with Article 350 of the National Electric Code (NEC). Liquid-tight, flexible metal conduit and associated fittings shall be U.L.-listed to meet the requirements of NEC 350.6. Liquid-tight, flexible metal conduit shall be Anaconda Sealtite Type UA, as manufactured by Anamet Electrical Inc., 1000 Broadway Avenue East, Mattoon, Illinois 61938-0039, (Phone: 217-234-8844), Liquatite Type LA as manufactured by Electric-Flex Company, 222 W. Central Ave., Roselle, Illinois 60172, (Phone: 630-529-2920 or 1-800-323-6174), or approved equal. **Do not install liquid-tight, flexible metal conduit that is not U.L.-listed. Contractor shall confirm liquid-tight, flexible metal conduit bears the U.L. label prior to installation.**

Miscellaneous Fittings: Fittings shall be suitable for use with conduits and ducts supplied. All fittings for use with rigid metal conduit shall be threaded. Set screw type fittings are not acceptable.

Conductors:

THWN Wire: Cable shall be 1/C sized as indicated on the Plans. Cable shall comply with Underwriters' Laboratories Standard UL-83 and shall be UL-listed as VW-1. Conductor shall be soft annealed uncoated copper and shall comply with ASTM B3 and B8. Insulation shall be rated for 600-Volt. Insulation shall be polyvinyl-chloride conforming to Underwriters' Laboratories requirements for Type THW. The outer covering shall be nylon conforming to Underwriters' Laboratories for type THHN or THWN-2. Cable shall be UL-listed and marked THWN. Power and control wiring shall be Southwire Type THWN-2, or approved equal.

Nonfusible Switches.

Type HD, Heavy Duty, Single Throw, 600-Volt ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position. Provide NEMA 3R enclosure. Disconnect switches to be manufactured by Eaton Electrical, Square D, Siemens, or approved equal.

Accessories:

B. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

C. Lugs: Mechanical type, suitable for number, size, and conductor material.

Supporting Devices:

Strut supports for exterior applications shall be stainless steel strut support, Unistrut P-1000 or approved equal. Strut support for equipment located in the locations shall be galvanized steel as manufactured by Unistrut, B-Line, Aickinstruct, or approved equal. Provide necessary hardware, such as floor flanges, etc., as required to install equipment as specified and as shown on the Plans. All hardware shall be stainless steel.

Provide materials, sizes and types of anchors, fasteners, and supports necessary to carry the loads of equipment and conduits. Consider weights of conduit when selecting products.

Fasteners and anchors shall be corrosion resistant or stainless steel. Where suitable, nonmetallic clamps and fasteners may be used.

CONSTRUCTION REQUIREMENTS

Locate Existing Embedded Utilities:

The location, size, and type of material of utilities that may be embedded in the roof slab are not represented as being accurate, sufficient, or complete. It shall be the Contractor's responsibility to determine the actual location of all such items.

Installation of Conduits:

A. All exterior above grade exposed conduit shall be galvanized rigid steel (GRSC) as detailed on the Plans.

B. All work shall be laid out with sleeves for openings through slabs or building walls, etc. as required. If sleeves and inserts are not properly installed, the Contractor will be required to do all necessary cutting and patching to accommodate conduits.

C. Conduit size and fill requirements shall comply with Chapter 9 and Annex C of the NEC. It should be noted these are minimum requirements and larger conduit sizes or smaller fill requirements shall be used whenever specified or detailed on the Plans.

D. Ream conduits only after threads are cut. Cut joints square to butt solidly into couplings. Where necessary to join two (2) pieces of conduit and it is impossible to use standard coupling, use 3-piece malleable iron conduit coupling. The use of running thread is prohibited. This applies to all rigid conduit installations, underground or otherwise.

E. Hickey bends will not be acceptable for conduits 1-in. and larger. Use manufactured elbows or

bends fabricated with bending machine.

F. A run of conduit between a junction box, pull box, and/or fitting shall not contain more than the equivalent of four (4) quarter bends, including bends immediately at the respective box or fitting.

G. Where conduits enter a box or fitting, provide a steel locknut and an insulated metallic bushing. Use this method to terminate conduit in panels, pull boxes, safety switches, etc. Conduit terminations in service equipment shall have grounding bushings with ground wire connections between the bushing and the ground bus.

H. Run exposed conduits parallel with respective walls or supporting structure and at right angles to the respective building, vault, etc., not diagonally. Make bends and turns with pull boxes or hot-dipped galvanized malleable iron fittings and covers.

I. Conduit terminations shall include bushings to protect cables and wires from damage from conduit.

J. Set screw type fittings are prohibited.

K. Use only screws, bolts, washers, etc. fabricated from rust resisting metals for the supporting of boxes.

Installation of Wire and Cable:

A. Wire and cable shall be installed using accepted industry methods to prevent damage to conductors and insulation. Installation shall comply with all applicable sections of the NEC regarding conduit fill.

B. No splices shall be permitted in conduit bodies. All splices shall be made in junction boxes provided for that purpose as detailed or required by need.

C. All conduits shall be swabbed until all moisture and grit is removed before any wires are pulled.

D. Manufacturers recommended pulling tension shall not be exceeded during conductor installation. Use approved pulling lubricant on long pulls or when pulling No. 4 or larger wire.

E. Neatly train and lace wiring inside boxes, equipment and panelboards.

F. Color code conductor insulation for #6 AWG and smaller. Color code conductors with tape or colored insulation for #4 AWG and larger. Where conductors are color coded with tape, they shall be identified (color coded) at all points of access. Insulated ground wires shall have green colored insulation for all conductor AWG and/or Kcmil to comply with NEC 250.119. Neutral conductors shall have white colored insulation for No. 6 AWG and smaller to meet the requirements of NEC 200.6. Color coding shall be as follows:

120/240 VAC, 3-PHASE, 4-WIRE

Phase A – Black
Phase B – Red
Phase C – Blue – Neutral - White
Ground – Green

G. Splicing 600-Volt wire shall be as follows:

1. Wire #8 and smaller:

a) Ideal "wing nut" type insulated connectors.
b) Scotchlok R, B, and Y type insulated connectors.
c) Thomas and Betts, PT-1, PT-2, and PT-3 insulated connectors.

H. Connections and Terminations shall be as follows:

1. Identify each conductor in panelboards, junction or pull boxes, or troughs with a permanent pressure sensitive label with suitable numbers or letters for easy recognition. Identify control wiring at each end and in junction boxes with numeric wire number corresponding to control wiring diagram.
2. Thoroughly clean wire before installing lugs and connectors.
3. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
4. Terminate spare conductors with electrical tape and roll up in box. Label spare conductors "SPARE."

I. Inspect wiring for physical damage and proper connection. All wire and cable shall be tested for continuity and short circuits prior to energizing circuits. Verify proper phasing where applicable.

Installation of Fusible Switches:

Comply with NECA 1. Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components. Perform each visual and mechanical inspection and electrical test stated in NETA and certify compliance with test parameters. Correct malfunctioning units on-site or replace and retest to demonstrate compliance. Provide an engraved metal or laminated plastic nameplate on each enclosure stating: Panel fed from, circuit number, voltage and phase, and name of equipment served.

Installation Of Supporting Devices:

Install products in conformance with manufacturer's instructions and as detailed on the Plans. Provide anchors, fasteners and supports in accordance with NECA Standard of Installation, and as recommended by the equipment manufacturer for the respective application.

Do not fasten/secure supports to pipes, ducts, mechanical equipment, or conduit. Do not use spring steel clips or clamps. Install surface-mounted cabinets, enclosures and panelboards with a minimum of four (4) anchors. Use spring-lock washers under all nuts. Install supports with stainless steel hardware.

Grounding Requirements:

Grounding shall conform to the following as applicable: The Contractor shall furnish and install all grounding shown on the Plans and/or as may be necessary or required to make a complete grounding system as required by the latest National Electrical Code (NFPA 70) in force. The reliability of the grounding system is dependent on careful, proper installation and choice of materials. Improper preparation of surfaces to be joined to make an electrical path, loose joints, or corrosion can introduce impedance that will seriously impair the ability of the ground path to protect personnel and equipment and to absorb transients that can cause noise in communications circuits. The following functions are particularly important to ensure a reliable ground system:

A. All products associated with the grounding system shall be UL-listed and labeled.

B. All bolted or mechanical connections shall be coated with a corrosion preventative compound before joining, Sanchem "NO-OX-ID A Special" compound, Burndy Penetrox E, or approved equal.

C. Metallic raceway fittings shall be made up tight to provide a permanent low impedance path for all circuits. Metal conduit terminations in enclosures shall be bonded to the enclosure with UL-listed fittings suitable for grounding. Provide grounding bushings with bonding jumpers (from bushing to the respective ground connection/enclosure frame) for all metal conduits entering service equipment (meter bases, CT cabinet, service disconnects, service panelboards, main service breaker enclosure, etc.). Provide grounding bushings with bonding jumpers for all metal conduits entering an enclosure through concentric or eccentric knockouts that are punched or otherwise formed so as to impair the electrical connection to ground. Standard locknuts or bushings shall not be the sole means for bonding where a conduit enters an enclosure through a concentric or eccentric knockout.

D. All metal equipment enclosures, conduits, cabinets, boxes, receptacles, motors, etc. shall be bonded to the respective grounding system.

E. Each feeder circuit and/or branch circuit shall include an equipment ground wire. The equipment ground wire shall not be smaller than allowed by NEC Table 250-122 "Minimum Size Conductors or Grounding Raceway and Equipment." When conductors are adjusted in size to compensate for voltage drop, equipment-grounding conductors shall be adjusted proportionately according to circular mil area. All equipment ground wires shall be copper either bare or insulated green in color. Where the equipment grounding conductors are insulated, they shall be identified by the color green and shall be the same insulation type as the phase conductors.

F. Equipment ground wires shall be identified with green colored insulation for all conductor AWG or Kcmil. Green tape shall not meet this requirement.

Marking and Labeling

Mark all J-boxes with the panelboard and circuit number(s) that are routed through them. Mark all manual starters with panel and circuit number and provide a phenolic nameplate indicating equipment served.

CONCRETE CUTTING (CORING AND SAWING) AND REMOVAL

Contractor shall locate embedded utilities prior to concrete cutting operations. Consult with Engineer if interference of any embedded item requires the relocation of any of the specified equipment.

Protective construction shall be in place prior to concrete cutting to control the spread of dust and dropping of concrete sections to be removed.

Concrete sections to be removed shall be saw-cut full depth. Corners shall be cored prior to concrete cutting to result in a finished 1 in. radius.

Supplemental framing for RTU need not be installed prior to concrete cutting. However, the section between openings shall not be subjected to construction live loads until the supplemental framing has been installed.

STRUCTURAL STEEL FRAMING

Structural steel submittals and fabrication shall conform to the requirements of Section 505 of the Standard Specifications for Road and Bridge Construction.

Hollow structural sections (HSS) shall conform to ASTM A-500 Grade B (46ksi). Angles shall conform to the material requirements specified in Article 1006.04 of the Standard Specifications. Bolts shall be ASTM A325.

Structural steel frame shall be shop primed with an Inorganic Zinc-Rich primer in accordance with Article 505.06 of the Standard Specifications. No other shop or field coats of paint is required.

Method of Measurement:

This work, including all material and labor for Mechanical, Electrical, and Structural Steel Work described in this Special Provision, will be measured for payment as a single lump sum.

Basis of Payment:

This work, including labor, equipment and material, will be paid for at the contract lump sum price for MECHANICAL WORK COMPLETE as specified herein.

U:\Working-Folder-Central-Office\District_1\9-21-12\60V37\Addendum\Mechanical_Work_Complete.docx

Added 9-14-2012