**DIVISION 23 - HVAC SPECIFICATIONS**

**23 05 01.00 – COMMON REQUIREMENTS FOR HVAC**

General

General Provisions of the Contract including General and Supplementary Conditions and General Requirements apply to work of this section.

Scope

The base bid includes furnishing all materials, labor, tools, and equipment and the performance of all work required to install a complete heating and air conditioning system as outlined herein.

Guarantee

The contractor shall provide a guarantee in written form stating that all work under this section shall be free of defective work, materials, or parts for a period of one year from the date of owner's final acceptance and shall repair, revise or replace at no cost to the owner any such defects occurring within the guarantee period. Contractor shall also state in written form that any items or occurrences arising during the guarantee period will be attended to in a timely manner and will in no case exceed four (4) working days from date of notification by owner.

Quality Assurance

Provide a complete installation in conformance with the following standards.

ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers

NFPA: National Fire Protection Association

SMACNA: Sheet Metal and Air Conditioning Contractors National Association.

Statewide Building Code

Permits, Fees, Inspections, Laws and Regulations

Permits and fees of every nature required in connection with this work shall be obtained and paid for by this contractor who shall also pay for all the installation fees and similar charges. Laws and regulations, which bear upon or affect the various branches of this work shall be complied with by this contractor and are hereby made a part of this contract. All work, which such laws require to be inspected, shall be submitted to the proper public official for inspection and a certificate of final approval must be furnished.

Work in Existing Spaces

General: Care shall be taken when working in existing spaces so as not to damage existing walls and ceilings where work is being performed.

Ceilings: Where work is being performed above ceilings, and the architectural drawings do not indicate ceiling modifications by the general contractor, it shall be the responsibility of this contractor to remove and replace existing ceilings where work is being performed. In those instances, all repair and installation of new grid, ceiling panels, etc shall be the responsibility of this contractor. Match existing finishes.

Walls & Floors: It shall be the responsibility of this contractor to patch existing walls and floors and match existing finishes where work is being removed or installed and patching is being performed, unless noted otherwise on the architectural drawings.

Demolition

Any Equipment to be demolished shall also include the demolition of any and all ductwork, piping etc serving or served by the equipment, all accessories, air devices, wiring, gas piping, venting, control wiring and power wiring associated with the equipment.

Demolition shall be coordinated with all trades. All materials shall be turned over to the owner or disposed at the owner's direction.

Contractor is responsible for reclaiming any refrigerant in association with the demolition in accordance with all local, state and federal regulations.

Any roof or wall penetration shall be patched watertight to the satisfaction of the architect.

Tests and Adjustments

No ducts, piping, fixtures or equipment shall be concealed or covered until they have been inspected and approved by the Architect and the inspector who shall be notified by the contractor when the work is ready for inspection.

Work shall be completely installed, tested and leak tight before inspection is required. All tests shall be repeated to the satisfaction of those making the inspection.

Architectural coordination items

Cutting and Patching: Cut and drill all openings in walls and floors required for the installation. Secure approval of Engineer before cutting and drilling. Neatly patch all openings cut.

Fire Caulking: Patching through fire rated walls and enclosures shall not diminish the rating of that wall or enclosure. Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch.

Access Panels and Pathways: Furnish all access panels required for proper servicing of equipment. Provide access panels for all concealed valves, vents, controls, cleanout doors, and sprinkler devices required by NFPA. Provide access panels for all fire and/or fire & smoke dampers. Provide frame as required for finish. Furnish panels to General Contractor. Exact locations to be approved by the Architect. Minimum size to be 12" x 12", units to be 16 gauge steel, locking device shall be screwdriver cam locks.

project conditions

Where new HVAC systems are required to be connected to existing HVAC systems, it is the contractor's responsibility to verify the location, size, pressure, condition, and they shall verify that the existing HVAC system is indeed the correct and appropriate HVAC system before any work is done. Provide all necessary camera scoping and dye testing as necessary. If there is any need for concern, it is determined that the existing HVAC system is not a correct or appropriate HVAC system or not connected to a correct or appropriate HVAC system, if the condition of the existing HVAC system is not viable for re-use, or any other condition that would not allow the proper functioning of the new HVAC system, the contractor shall notify the engineer in writing immediately via RFI and wait for direction before proceeding.

MECHANICAL EQUIPMENT COMMON REQUIREMENTS

INSPECTION

Examine areas and conditions under which mechanical equipment is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

Uncrate equipment and inspect for damage. Verify that nameplate data corresponds with unit designation.

INSTALLATION

General: Install mechanical equipment as indicated, and in accordance with manufacturer's installation instructions.

Location: Install each unit level/plum and accurately in position indicated in relation to other work; and maintain sufficient clearance for normal service and maintenance, but in no case less than that recommended by manufacturer.

Coordinate with other trades to assure correct recess size for recessed units.

Protect interior mechanical equipment with protective covers during balance of construction.

For ducted equipment, connect ductwork to units with flexible duct connections. Provide transitions to exactly match unit duct connection size. Provide 1" acoustic duct lining on return air side a minimum of 10' from fan.

Provide trap at drain piping connection to unit sized per manufacturer's recommendations.

Access: Provide access space around and over mechanical equipment for service as indicated, but in no case less than that recommended by manufacturer or required by code in effect.

Access Panels: Furnish all access panels required for proper servicing of equipment. Provide access panels for all concealed valves, vents, controls and cleanout doors, and sprinkler devices required by NFPA.

Provide frame as required for finish. Furnish panels to General Contractor. Exact locations to be approved by the Architect. Minimum size to be 12" x 12", units to be 16 gauge steel, locking device shall be screwdriver cam locks.

Rooftop mechanical equipment shall be installed a minimum of 10'-0" from any roof edge regardless of location indicated on plans, unless a screen wall or railing is installed per the local building code. See the architectural plans for coordination.

Roof Curbs: Furnish roof curbs to roofing Installer for installation. Install and secure roof curb to roof structure, in accordance with National Roofing Contractor's Association (NRCA) installation recommendations and shop drawings. Install and secure units on curbs and coordinate roof penetrations and flashing. Install according to roofing manufacturer's recommendation and specifications.

ELECTRICAL COORDINATION ITEMS

Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

Install electric heating terminal units including components in accordance with equipment manufacturer's written instructions, and with recognized industry practices; complying with applicable installation requirements of NEC and NECA's "Standard of Installation".

Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A.

Grounding: Provide equipment grounding connections for electric heating terminals as indicated. Tighten connections to comply with tightening torque values specified in UL Std 486A to assure permanent and effective grounding.

FIELD QUALITY CONTROL

Testing: After installation has been completed, test to demonstrate proper operation of mechanical equipment at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units, which cannot be satisfactorily corrected. Test controls and demonstrate compliance with requirements.

Cleaning: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean coils and inside of cabinets. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

START-UP

Provide the services of a factory-authorized service representative to start-up rooftop units, in accordance with manufacturer's written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

TRAINING OF OWNER'S PERSONNEL

Provide services of manufacturer's technical representative for 1-half day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

SPARE PARTS

Provide one complete extra set of filters for each unit. Install new filters at completion of system work, and prior to testing, adjusting, and balancing work. Obtain receipt from Owner that new filters have been installed.

**23 05 03.00 – SUBMITTALS FOR HVAC**

General

Where submittals are required by the Contract Documents, they shall be prepared and supplied in accordance with the Contract Documents. In addition to Division 01, the Contractor is advised to review and comply with the requirements articulated within each Division and within each section of that Division.

Some Divisions may include a division-specific "Submittal Requirements for …." section. Where this section exists, it articulates additional requirements for submittals that apply to the work of that Division.

The following requirements help to identify, track and keep the project organized for all parties involved. They are necessary to ensure a timely turnaround and an appropriate technical review. Submittals that do not conform to the administrative requirements are rejected and returned, without technical review.

Requirements

Supply submittals for each section. Submittals shall be supplied on a section-by-section and type-by-type basis. For example, independent product data submittals shall be furnished for each section that requires product data submittals. Independent shop drawing submittals shall be furnished for each section that requires shop drawings. Refer to the specifications for identification of which submittals are required for the project. Separate PDF file packages shall be supplied for each section, for each submittal type, where electronic submittals are required. Each PDF shall represent a single standalone submittal.

Separately bound and identified submittals shall be provided where hardcopies are required.

Include a transmittal: Transmittals shall enumerate each submittal for each section of each type and iteration.

Include cover sheet / title page: The cover sheet shall include the information identified in the contract documents. It shall be included as the first page of each electronic and/or hardcopy document-based submittal. An editable and printable PDF form created with editable fields and specification compliant appearance is available from KLH upon request. It is also downloadable from the KLH website at www.klhengrs.com.

Include an index: The index shall enumerate the contents of the submittal.

Include checklists: Where checklists are included with the specifications, complete and include them within the appropriate submittal. Supply complete submittals: Complete submittals of each type are required. Partial submittals will be rejected. Where a section requires a product data submittal, all product data for that section shall be supplied together, at one time, as one complete submittal. Do not send half the product data as one submittal and the other half as a separate one. When resubmittal is required (e.g. Revise and Resubmit) the revised submittal shall be more complete, more accurate and more contract-compliant than its rejected predecessor. The submittal number (for each section and type) shall increment for each subsequent submittal (00 – Original submission, 01 – First Resubmission, 02 – Second Resubmission, etc…). Resubmittals shall include a copy of the reviewers comments supplied with the prior submittal rejection and shall be amended with a description of the specific action taken to comply with the reviewer's comments. The absence of this on resubmittal is cause for rejection.

Name electronic files to match the submittal ID and cover sheet: The electronic file name of submittals shall match the submittal ID included on the submittals cover page. For example: The original/first product data submittal for Section 234116 would be labeled as "234116.00-PD-00"; the first resubmittal of same shall be labeled "234116.00-PD-01". The original/first shop drawings submittal file for the same section would be labeled "234116.00-SD-00"; the first resubmittal of same shall be labeled "234116.00-SD-01".

Use of Electronic Drawings from the Owner's Design Team

Plan drawings for the Project were created with AutoCAD.

If expressly permitted by the Owner and the terms of the Contract, editable electronic versions of standard-scale, AutoCAD-based plan drawings may be made available for the creation of shop and as-built drawings.

Due to the proprietary nature of internal design systems, editable native-software versions of some drawings, including but not limited to system diagrams and details will not be made available in an editable form. In these cases, electronic versions of the drawings may be made available only in PDF, JPG or similar non-editable electronic form, at the sole discretion of the Design Professional.

The Request Drawings form can be accessed, filled out and submitted at the following internet address (scroll down to bottom of home page): http://www.klhengrs.com.

**23 05 29.00 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT**

Submittal Requirements

Product Data: For each type of product indicated.

Shop Drawings: Fabrication and installation details.

General

Support all ductwork and equipment by hangers or brackets properly from the building structure. Support from decking above is prohibited. Furnish structural steel members where required to support piping and equipment. No portion of piping or valves shall be supported by equipment.

Ductwork - Support by means of hangers as follows:

| Duct Width | Hanger Size and Type | Max. Spacing |
|---|---|---|
| 30 or less | (#16 gage) | 8 |
| 31 to 60 | (#14 gage) | 8 |

A pair of hangers shall be located at every transverse joint and elsewhere according to the table.

**23 05 93.00 – TESTING, ADJUSTING AND BALANCING FOR HVAC**

Submittal Requirements

Shop Drawings: Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Final Report: Upon verification and approval prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final report to the landlord.

General

Test, adjust, and balance the following mechanical systems:

Supply air systems, all pressure ranges

Return air systems.

Exhaust air systems.

Test systems for proper sound and vibration levels.

Quality Assurance

Codes and Standards:

AABC: "National Standards for Total System Balance".

ASHRAE: ASHRAE Handbook, 2011 Applications, Chapter 38, Testing, Adjusting, and Balancing.

Qualifications

The contractor shall procure the services of an independent Balance and Testing Agency, approved by the Engineer, and a member of Associated Air Balance Council (AABC) or NEBB, which specializes in the balancing and testing of heating, ventilating and air conditioning systems, to balance, adjust and test all air and water systems and equipment as herein specified. All work by this agency shall be done under direct supervision of a qualified heating and ventilating Engineer employed by this agency. All instruments used by this agency shall be accurately calibrated and maintained in good working order.

Sequencing and Scheduling

Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 deg F wet bulb temperature of maximum summer design condition, and within 10 deg F dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.

Check all filters for cleanliness, provide new as required. Check dampers (volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans. Place outlet dampers in full open position. Lubricate all motors and bearings. Check fan belt tension. Check fan rotation.

Air balance and testing shall not begin until the system has been completed and is in full working order. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into full operation and shall continue the operation of same during each working day of testing and balancing. The contractor shall submit within 30 days after receipt of contract, 8 copies of submittal data for the testing and balancing of the air conditioning, heating, and ventilating systems. The Air Balance and Testing Agency shall provide proof of having successfully completed at least five projects of similar size and scope. The air balancing contractor shall include the additional cost to change every fan factory installed sheave, pulley and/or belt of in order to obtain the design air flows.

Performing Testing, Adjusting and Balancing

Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

Patch insulation, ductwork, and housings, using materials identical to those removed.

Seal ducts and piping, and test for and repair leaks.

Seal insulation to re-establish integrity of the vapor barrier.

Mark equipment settings, including damper control positions; valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

**23 07 13.00 – DUCT INSULATION**

Submittal Requirements

Product Data: For each product indicated.

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

All liners, insulation and adhesives shall have a flame spread index not more than 25 and a smoke developed index of not more than 50.

Insulation shall have a minimum installed thermal resistance value of R6 or code minimum, whichever higher.

Rigid Fiberglass Ductwork Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with vapor barrier all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

Flexible Fiberglass Ductwork Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with vapor barrier all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

Vapor Barrier Material for Ductwork: Paper-backed aluminum-foil, except as otherwise indicated, strength and permeability rating equivalent to factory-applied vapor barriers on adjoining ductwork insulation, where available; with following additional construction characteristics:

High Puncture Resistance: Low vapor transmission (for ducts in exposed areas: Mech. Rooms, etc.)

Moderate Puncture Resistance: Medium vapor transmission (for ducts in concealed areas).

All ductwork shall be insulated except:

Double wall ductwork

Fabric ductwork

Metal ducts with duct liner of sufficient thickness to comply with energy code.

Factory insulated flexible ductwork

Factory insulated plenums and casings

Flexible connectors

Vibration control devices

Factory insulated access panels and doors

Supply ductwork exposed in conditioned spaces excluding mechanical rooms, server rooms and electric equipment rooms

Toilet exhaust, general exhaust and return ductwork in an insulated joist or attic space.

**23 07 19.00 – HVAC PIPING INSULATION**

Submittal Requirements

Product Data: For each type of product indicated.

Insulation shall have a minimum thickness as required by Code.

All insulation and adhesives shall have a flame spread index not more than 25 and a smoke developed index of not more than 50.

**23 09 93.00 – SEQUENCE OF OPERATIONS FOR HVAC CONTROLS**

Submittal Requirements

Product Data: Provide written sequences of operation for each controlled system and piece of equipment.

Packaged Rooftop Unit (RTU-1,2,4,5)

1. Startup

The unit shall operate on a 7 day/night programmable thermostat. During startup, the fan shall run with the dampers in the full recirculation position. Provide occupied changeover sequence with optimum start function. When the return air temperature reaches occupied setpoint (adjustable), the minimum outside air damper shall open to the controlled minimum outdoor air position.

2. Supply Fan Control

The supply fan speed shall be constant, run continuously during occupied mode and set to the required CFM.

3. Space Temperature Control

Provide 7-day programmable thermostat with digital display of space temperature and setpoint (+/- deg. F. adjustable), with override feature and remote space temperature sensor.

4. Minimum Outside Air Control

During occupied mode the minimum outside air damper shall be open. Provide motorized outdoor air damper.

5. Economizer Control

Provide dual enthalpy economizer control. Economizer control shall be enabled whenever the outside air enthalpy is lower than the return air enthalpy. Enthalpy shall be calculated from sensors which are tied to the same controller for accuracy. During economizer mode, the outside air damper shall modulate to 100% open. The economizer damper shall modulate open on a call for cooling and modulate closed on a call for heating. The return damper shall modulate inversely with the economizer damper. Economizer shall have powered relief.

6. Cooling Control

Cooling shall be controlled to maintain space temperature setpoint. On a call for cooling, the heating shall be offthe refrigerant reversing valve shall be in the cooling position. On a further call for cooling, enable the economizer mode. On a further call for cooling, disable the economizer mode and the mechanical cooling shall be staged on.

7. Heating Control

Heating shall be controlled to maintain space temperature setpoint. On a call for heating, the mechanical cooling shall be off. On a further call for heating, the economizer mode shall be disabled. On a further call for heating the gas heating shall be staged on.

8. Dehumidification

Provide a hot gas reheat coil or duct mounted electric reheat coil for dehumidification. Provide space humidity sensor. When the space humidity rises above 60% (adjustable), provide full cooling and modulate the hot gas reheat coil to maintain space temperature setpoint. When the space humidity reaches setpoint, resume with normal heating & cooling operation.

During the unoccupied mode of operation, the RTU shall go into night setback mode.

Night Setback/Shutdown

At night setback/shutdown the RTU shall go to fail safe position. Fail safe position is defined by the following: The supply fan is off, the outdoor air intake damper is closed, the heating is off and the mechanical cooling is off. The supply fan shall cycle in conjunction with either the heating or cooling system to maintain a minimum/maximum space temperature depending on the season.

Packaged Rooftop Unit (RTU-3,6)

1. Startup

The unit shall operate on a 7 day/night programmable thermostat. During startup, the fan shall run with the dampers in the full recirculation position. Provide occupied changeover sequence with optimum start function. When the return air temperature reaches occupied setpoint (adjustable), the minimum outside air damper shall open to the controlled minimum outdoor air position.

2. Supply Fan Control

The supply fan shall be two staged and modulate up and down based on a call for heating or cooling.

3. Space Temperature Control

Provide 7-day programmable thermostat with digital display of space temperature and setpoint (+/- deg. F. adjustable), with override feature and remote space temperature sensor.

4. Minimum Outside Air Control

During occupied mode, the minimum outside air damper shall be open to the scheduled minimum outdoor air flow and modulate proportionally with the supply fan speed to maintain the scheduled minimum outside airflow. When the supply fan speed is set to high, outside air damper shall be partially closed allowing minimum outside air flow as scheduled. As supply fan speed is set to low, damper shall fully open allowing minimum outside air flow as scheduled. Provide motor operated dampers.

5. Economizer Control

Provide dual enthalpy economizer control. Economizer control shall be enabled whenever the outside air enthalpy is lower than the return air enthalpy. Enthalpy shall be calculated from sensors which are tied to the same controller for accuracy. During economizer mode, the outside air damper shall modulate to 100% open. The economizer damper shall modulate open on a call for cooling and modulate closed on a call for heating. The return damper shall modulate inversely with the economizer damper. Economizer shall have powered relief.

6. Cooling Control

Cooling shall be controlled to maintain space temperature setpoint. On a call for cooling, the heating shall be off and supply fan speed shall be low. On a further call for cooling, the economizer shall be enabled. On a further call for cooling, disable the economizer and energize first stage cooling on. On a further call for cooling, the supply fan speed shall be high and energized second stage of cooling.

7. Heating Control

Heating shall be controlled to maintain space temperature setpoint. On a call for heating, the mechanical cooling shall be off. On a further call for heating, the economizer mode shall be disabled. On a further call for heating, the supply fan shall be set to low speed and the gas heating shall be disabled. On a further call for heating, the supply fan shall be set to high speed and the gas heating shall be staged on. On a further call for heating, the supply fan shall be set to high speed.

8. Dehumidification

Provide a hot gas reheat coil or duct mounted electric reheat coil for dehumidification. Provide space humidity sensor. When the space humidity rises above 60% (adjustable), provide full cooling and modulate the hot gas reheat coil to maintain space temperature setpoint. When the space humidity reaches setpoint, resume with normal heating & cooling operation.

9. Smoke Detector

When the smoke detector is alarmed, the system shall be alarmed and the air handler shall fail safe with manual reset.

10. Unoccupied Mode

During the unoccupied mode of operation, the RTU shall go into night setback mode.

Night Setback/Shutdown

At night setback/shutdown the RTU shall go to fail safe position. Fail safe position is defined by the following: The supply fan is off, the outdoor air intake damper is closed, the heating is off and the mechanical cooling is off. The supply fan shall cycle in conjunction with either the heating or cooling system to maintain a minimum/maximum space temperature depending on the season.

Toilet Exhaust Fans (Manual)

Exhaust fans shall be controlled by local manual switch furnished, installed and wired by electrical contractor. When activated, exhaust fan motor damper shall open and fan shall start.

(Indicated by EC on HECS schedule)

Exhaust Fans (Timeclock)

Exhaust fans shall be tied to timeclock, which shall be furnished, installed and wired by electrical contractor. When activated, exhaust fan motor damper shall open and fan shall start.

(Indicated by EC on HECS schedule)

Controls

Electrical contractor will provide power wiring. HVAC contractor shall provide all the low voltage wiring of HVAC units and controls, thermostats and controllers. Thermostat shall be by the manufacturer of the HVAC unit (heat/cool/auto/off) with night setback. Provide plastic protective cover for all thermostats.

Low Voltage Thermostats

Low voltage thermostats shall be furnished, installed and wired by the HVAC contractor. The electrical contractor shall provide 4" square x 1-1/2" deep wall outlet boxes (with single-gang rings) for all thermostats/sensors. The electrical contractor shall provide one 3/4" empty conduit from each thermostat/sensor location, turned out above accessible ceilings (in joist space or against overhead slab/deck). The HVAC/Temperature Control Contractor shall provide all other necessary conduit, raceway and wiring related work. Conduit shall be identified in ceiling cavity and shall be provided with sweep bends, bushings and dragline.

The HVAC/Temperature Control Contractor shall coordinate with the General Contractor to ensure thermal envelope is maintained at these locations.

Line Voltage Thermostats

The electrical contractor shall provide 4" square x 1- 1/2" deep wall outlet boxes at 48" above finished floor (with single-gang rings) for all thermostats. The electrical contractor shall provide line voltage power wiring, from thermostat outlet box to equipment that is to be controlled by the thermostat, in 3/4" conduit.

General Control Wiring Requirements and Installation Methods

Except where specifically indicated otherwise above, the HVAC/Temperature Control Contractor shall provide all electrical work as required for all temperature control related wiring (i.e. conduit, raceway, outlet boxes, junction boxes, wiring, etc.) in accordance with Electrical Specifications requirements. All conduit shall be 3/4" minimum.

Coordinate all thermostat/sensor locations in field (case by case) with Architect, Owner and Electrical Contractor to ensure that they are placed in locations that will not interfere with furniture, equipment, artwork, wall-hung specialties, room finishes, etc. All thermostat/sensor wall locations indicated on HVAC drawings are schematic only and must be verified case-by-case prior to rough-in.

All electrical work as described in this specification shall be per the latest edition of the National Electrical Code (NEC) and per applicable state and local codes.

Where "free-air" installation methods (either exposed above the ceilings, in bridle rings or in cable trays) are permitted under Electrical Specifications above ceilings, provide plenum-rated cables wherever plenum ceilings (if any) exist and install as defined under Electrical Specifications. Install low voltage circuits, located in concrete slabs and masonry walls, in inaccessible locations, or exposed in occupied areas, in electrical conduit regardless of what wiring methods are permitted under Electrical Specifications.

Where cable trays or bridle rings are provided by the electrical contractor for low voltage cables, these raceways may be utilized for control wiring by this contractor (provide special color coded jackets, label cable jackets per Electrical Specifications and group control wiring cables together). Provide conduit drops from cable tray/bridle ring paths to wall outlet boxes and equipment unless directed otherwise under Electrical Specifications.

Regardless of permitted methods in Electrical Specifications, all cables/wiring installed concealed by gypsum board, masonry or other inaccessible materials in walls or above ceilings shall be installed in conduit, 3/4" minimum.

All conduit, bridle rings, raceway, outlet boxes, etc. necessary for complete operational installation of control wiring shall be provided (furnished and installed) by the temperature control contractor in strict compliance with Electrical Specifications documents. Coordinate all work with all other applicable trades including the electrical contractor.

Provide all required conduit work to and between equipment in a manner compliant with that described above (i.e. between VAV boxes, to boilers, starters, condensing units, etc. as applicable).

Install control wiring without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code and per Electrical Specifications.

Install circuits over 25 volt with color-coded No. 12 wire in electrical metallic tubing, per Electrical Specifications. Install circuits under 25 volt with color-coded No. 18 wire with 0.031" high temperature (105 degs. F) plastic insulation on each conductor and plastic sheath over all. Install electronic circuits with color-coded No. 22 wire with 0.023" polyethylene insulation on each conductor with plastic-jacketed copper shield over all.

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**ISSUE** INFORMATION

1.10.2019

REVISIONS

**FRCH** / ARCHITECTURE, INC., P.C.

**PROJECT** INFORMATION

**Marketplace Center**

**MSS #5158**

1948 Old Fort Pkwy
Murfreesboro, TN 37129

**PROJECT #:** 20994

**SHEET** INFORMATION

MECHANICAL SPECIFICATIONS

**DRAWN BY:** DMT

**REVIEWED BY:** MCD

**SCALE:** As Noted

**AUTHORIZED FOR:** Bid/Permit/LL

M-4.0

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