

SECTION 23 00 30 – ELECTRICAL REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical connections to equipment specified under other Divisions or furnished by Owner.

1.2 REFERENCES

- A. NEMA WD 1 - General Purpose Wiring Devices
- B. NEMA WD 6 - Wiring Device Configurations.
- C. ANSI/NFPA 70 - National Electric Code.

1.3 COORDINATION

- A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other Divisions.
  - 1. Should there be a difference between the design and the installed equipment; change orders shall only be paid for the difference in the rough-ins. If the Division 26 Contractor installs any rough-ins prior to requesting and receiving shop drawings for the equipment to be installed, and the equipment is different than designed, the required rework shall be performed at no additional cost to the owner aside from the difference in cost between the design documents and installed equipment.
  - 2. Should there be a need to install rough-ins ahead of equipment review and final shop drawing, the Division 26 Contractor shall submit a Request for Information, outlining the equipment to be fed, and how the schedule is impacted for review by the Engineer, Architect, Owner and Owner's Representative.
- B. Determined connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- D. Sequence electrical connections to coordinate with start-up schedule for equipment.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

- A. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.
- B. Cord Construction: Oil-resistant thermoset insulated Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.
- C. Cord Size: Same as rating of branch circuit overcurrent protection.

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PART 3 - EXECUTION

3.1 PREPARATION

- A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.
- B. The Contractor shall be responsible to coordinate all electrical which are installed for roof top equipment. Refer to "Coordination" in Section 260010 for additional requirements.

3.2 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.3 ELECTRICAL CONNECTIONS

- A. Electrical connections shall meet equipment manufacturer's instructions.
- B. Conduit connections to equipment shall use flexible conduit. Liquid-tight flexible conduit with watertight connectors shall be used in damp or wet locations.
- C. Wiring connections shall use wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Receptacle outlets shall be used where connection with attachment plug is indicated. Where attachment plug is required, equipment shall have a cord and cap.
- E. Suitable strain-relief clamps and fittings shall be used for cord connections at outlet boxes and equipment connection boxes.
- F. Disconnect switches, controllers, control stations, and control devices shall be located as indicated and per NEC requirements.
- G. Verify proper rotation of three phase equipment.
- H. Where applicable, power wiring shall be extended through external disconnect switches, local control switches, remote mounted control panels, etc. and connected to terminals in the equipment.
- I. Where applicable, wire and conduit shall be extended between control device (start/stop pushbuttons or lighted handle switch) and combination starter/disconnect switches.
- J. Coolers and Freezers: freezer and cooler walls, floors and ceilings shall be cut and sealed around conduit openings.

3.4 MISCELLANEOUS CONNECTIONS

- A. Fire alarm, security, data, telephone and other low voltage connections shall be installed as required at equipment.

3.5 CONTRACTOR RESPONSIBILITIES (DIVISION 23 CONTRACT)

A. HVAC Control System Panels & Equipment Controls

1. 120 volt – 1 phase.
2. Division 23 Contractor shall provide power connection to control panel from nearest 120/208 volt electrical panel unless shown otherwise. Power for control panels for equipment being fed from the emergency generator, including, but not limited to boilers, heating pumps, selected air handling and terminal equipment, etc., shall be derived from the nearest 120/208 volt normal/emergency panel.
3. In addition to HVAC control system panels, where terminal equipment, including, but not limited to shut-off VAV boxes are provided with 120V connection, Division 23 Contractor shall provide power connection to the unit as described above.
4. Division 26 Contractor shall assist the Division 23 Contractor in locating the appropriate panel, ensure there is a spare 20A/1P breaker to feed the control panels and label breaker accordingly.
5. All wiring associated with the unit shall be by the Division 23 Contractor per manufacturer requirements.

B. Duct-mounted Smoke Detector

1. Division 26 Contractor shall furnish duct mounted smoke detector, including detector base and appropriately sized sampling tube for duct being installed.
2. Division 23 Contractor shall install sampling tube and detector base in duct. Coordinate exact location with Division 26 Contractor.
3. Division 26 Contractor shall install detector in base, wire and program into fire alarm system.
4. Division 26 Contractor shall provide relay, and wiring to associated HVAC unit from fire alarm system so that unit shuts down and supervisory signal is provided upon detection of smoke. Refer to Division 28 "Fire Alarm and Detection System" and drawings for additional requirements.
5. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.

C. Ductless Air Conditioner (DAC)

1. 208 volt – 1 phase.
2. 2-pole toggle switch shall be furnished and installed by the Division 26 Contractor adjacent to unit.
3. Division 26 Contractor shall wire through switch and make one power connection to the line side terminals in the unit.
4. Power wire for AC unit shall come from the exterior unit. In systems where indoor unit receives separate power feed, provide junction box adjacent to the disconnect at the outdoor unit and run to the indoor unit for connection so that a single breaker controls both units.
5. All other wiring within the unit and between the unit and associated condensing unit shall be by the Division 23 Contractor per manufacturer requirements.

D. Outdoor Modular Air Handling Units (AHU-1,2,3,4)

1. 480 volt – 3 phase.
2. All wiring from the input terminals to the respective devices in the unit shall be factory installed by the equipment manufacturer.
3. Starters with overload protection or variable frequency drive(s) for the fans shall be furnished and installed by equipment manufacturer.
4. Division 26 Contractor shall provide a NEMA 3R fused disconnect switch for unit, installed, where coordinated with the Division 23 Contractor to ensure all access doors remain functional.
5. Division 26 Contractor shall make one power connection to the unit terminals.
6. All other wiring in the unit shall be factory installed by the equipment manufacturer.
7. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.

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E. Outdoor Packaged Air Handling Units (RTU-1,2,3,4,5)

1. 208 or 480 volt – 3 phase.
2. All wiring from the input terminals to the respective devices in the unit shall be factory installed by the equipment manufacturer.
3. Starters with overload protection or variable frequency drive(s) for the fans shall be furnished and installed by equipment manufacturer.
4. Division 26 Contractor shall provide a NEMA 3R fused disconnect switch, installed, where coordinated with the Division 23 Contractor to ensure all access doors remain functional.
5. Division 26 Contractor shall make one power connections to the unit terminals.
6. Equipment manufacturer shall provide control power transformer as required to power controls, unit lighting and convenience outlet and other 120V accessories as required.
7. All other wiring in the unit shall be factory installed by the equipment manufacturer.
8. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.

F. Outdoor Packaged Energy Recovery Rooftop Units (ERU-1 to ERU-12)

1. 480 volt – 3 phase.
2. All wiring from the input terminals to the respective devices in the unit shall be factory installed by the equipment manufacturer.
3. Starters with overload protection or variable frequency drive(s) for the fans shall be furnished and installed by equipment manufacturer.
4. Division 26 Contractor shall provide a NEMA 3R fused disconnect switch, installed, where coordinated with the Division 23 Contractor to ensure all access doors remain functional.
5. Division 26 Contractor shall make one power connections to the unit terminals.
6. Equipment manufacturer shall provide control power transformer as required to power controls, unit lighting and convenience outlet and other 120V accessories as required.
7. All other wiring in the unit shall be factory installed by the equipment manufacturer.
8. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.

G. Condensing Boiler (Gas) (B-1,2,3)

1. 480 volt – 3 phase.
2. Fused disconnect switch shall be furnished and installed by the Division 26 Contractor adjacent to unit.
3. Division 26 Contractor shall wire through switch and make one power connection to the line side terminals in the unit.
4. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.

H. Cabinet Unit Heaters (CH)

1. 120 volt – 1 phase.
2. Power disconnect switch provided by equipment manufacturer.
3. Division 26 contractor shall make one power connection to the unit.
4. Any other connections and/or equipment required shall be provided by Division 23 Contractor.

I. Air Cooled Condensing Unit (CU-1 to CU-6)

1. 208 volt – 1 phase.
2. Division 26 contractor shall furnish and install a NEMA 3R fused disconnect switch at unit and shall extend power wiring thru switch to unit and shall make one connection to terminals in unit.

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3. Where CU is associated with an indoor DAC, power wire for DAC unit shall come from the exterior unit. In DAC systems where indoor unit receives separate power feed, provide junction box adjacent to the disconnect at the outdoor unit and run to the indoor unit for connection so that a single breaker controls both units.
  4. All other wiring within the unit and between the unit and associated indoor unit shall be by the Division 23 Contractor per manufacturer requirements.
- J. Roof Fans – Manually Controlled (EF-3,5,6,7,8,17)
1. 120 volt – 1 phase
  2. Single pole wall switch with pilot light shall be furnished and installed by the Division 26 Contractor.
  3. Integral disconnect switch provided by the equipment manufacturer.
  4. Division 26 Contractor shall install Division 23 Contractor speed control in space being served by fan. Coordinate location in field for balancing.
  5. Division 26 Contractor shall make one power connection from wall switch thru speed control where applicable.
  6. Any other connections and/or equipment required shall be provided by Division 23 Contractor.
- K. Indoor Fans – Time of Day or Humidity Sensor Controlled (EF-1,10,11,12,13,14)
1. 120 volt – 1 phase.
  2. Integral disconnect switch provided by the equipment manufacturer.
  3. Division 26 Contractor shall install Division 23 Contractor speed control in space being served by fan. Coordinate location in field for balancing.
  4. Division 26 Contractor shall make one power connection thru speed control where applicable.
  5. Any other connections and/ or equipment required shall be provided by Division 23 Contractor.
- L. Roof Fans – (EF-2,4,9,15,16,18,19,20,21,22)
1. 120 volt – 1 phase.
  2. Integral disconnect switch provided by the equipment manufacturer.
  3. Division 26 Contractor shall install Division 23 Contractor speed control in space being service by fan. Coordinate location in field for balancing.
  4. Division 26 Contractor shall make one power connection through speed control where applicable.
  5. Any other connections and/ or equipment required shall be provided by Division 23 Contractor.
- M. Kitchen Hood Makeup Air Unit and Kitchen Exhaust Fan (KVS & KEF)
1. 480 volt - 3 phase.
  2. A local control panel housing motor starters/VFD(s) shall be furnished by the Div. 23 Contractor and installed by Div. 26 Contractor.
  3. Division 26 Contractor shall make two power connections to the control panel for the supply and exhaust fans and extend to the fans.
  4. Division 26 Contractor shall provide 120V power for the hood lights and control panel power.
  5. Division 26 Contractor shall wire the remote interface (containing local switches for lights and fans) to the control panel. Field verify exact mounting location of remote interface with owner.
  6. Division 26 Contractor shall wire the lights, sensors, and other miscellaneous controls from the control panel to the devices.
  7. Division 26 Contractor shall make additional 120V connection to the MAU disconnect for IBT heaters, and provide additional control wiring between the MAU and the control panel per manufacturer requirements.
  8. Division 26 Contractor shall provide wiring from VFD control panel to microswitches and provide 120V power. Division 26 Contractor shall provide interconnecting wiring from microswitches to the fire alarm system, gas solenoid and contactor panel. Division 26 Contractor shall provide additional relays as required.

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9. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.
- N. Pumps (P-1A,1B,2A,2B,3A,3B,4A,4B)
1. 480 volt – 3 phase.
  2. VFD (variable frequency drive) shall be furnished by the Division 23 Contractor and installed by the Division 26 Contractor.
  3. Division 26 Contractor shall wire thru VFD and connect to motor.
  4. Any other connections and/or equipment required shall be provided by the Division 23 Contractor.
- O. Shut-off Air Terminal Unit (SOV)
1. Control power (24V) or 120 volt – 1 phase (contractor discretion).
  2. Division 23 Contractor shall provide power to unit. Should 120 volt be selected, Division 23 Contractor shall provide power connection to unit from nearest 120/208 volt electrical panel. Power for units connected to air handling equipment connected to the emergency generator shall be derived from the nearest 120/208 volt normal/emergency panel. An attempt shall be made to minimize the quantity of breakers required by feeding multiple units from the same breaker, not exceeding 20 ampere of load on a single circuit.
  3. Division 26 Contractor shall assist the Division 23 Contractor in locating the appropriate panel, ensure there is a spare 20A/1P breaker to feed the unit and label breaker accordingly.
  4. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.
- P. Packaged Air Handling Unit (PAH-1 to PAH-14)
1. 120 or 277 volt – 1 phase, 480 volt – 3 phase.
  2. All wiring from the input terminals to the respective devices in the unit shall be factory installed by the equipment manufacturer.
  3. Remote disconnect switch shall be furnished and installed by the Division 26 Contractor.
  4. All required starters and overloads shall be unit mounted and wired.
  5. Division 26 Contractor shall make one power connection to the input terminals of the unit thru the disconnect switch.
  6. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.
- Q. Fan Coil Unit (FC)
1. 120 volt – 1 phase.
  2. All wiring from the input terminals to the respective devices in the unit shall be factory installed by the equipment manufacturer.
  3. Integrated disconnect switch shall be unit mounted.
  4. All required starters, variable frequency drives and overloads shall be unit mounted and wired.
  5. Division 26 Contractor shall make one power connection to the input terminals of the unit.
  6. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.
- R. Unit Ventilators (UV)
1. 120 volt – 1 phase.
  2. All wiring from the input terminals to the respective devices in the unit shall be factory installed by the equipment manufacturer.
  3. Integrated disconnect switch shall be unit mounted.
  4. All required starters, variable frequency drives and overloads shall be unit mounted and wired.

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5. Division 26 Contractor shall make one power connection to the input terminals of the unit.
  6. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor
- S. Air-Cooled Chiller (CHLR-1)
1. 480 volt - 3 phase
  2. An integral factory wired weatherproof control panel complete with a wye/delta closed transition starter shall be provided by the manufacturer.
  3. Division 26 Contractor shall provide a weatherproof fused disconnect switch, extend power wiring through the disconnect switch to the control panel and make one power connection to terminals in unit.
  4. Evaporator heater to be wired from control panel by factory.
  5. Division 26 Contractor shall provide dedicated 20A, 120V connection from nearest 120/208V panel to chiller control panel for heat trace connection.
  6. Any other connections and/ or equipment required shall be provided by Division 23 Contractor.
- T. Unit Heaters (Hydronic) (UH-1,2)
1. 120 volt – 1 phase.
  2. Thermal overload switch furnished and installed adjacent to unit by Division 26 Contractor.
  3. Division 26 Contractor shall make one power connection to the input terminals of the unit thru the thermal switch.
  4. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.
- U. Heat Trace Tape
1. 120 volt – 1 phase.
  2. Division 23 Contractor shall furnish and install heat tape on piping.
  3. Division 26 Contractor shall furnish and install weatherproof (cast) junction boxes and weatherproof lighted handle toggle switches.
  4. Division 26 shall extend power wiring through toggle switches and shall leave slack cables in junction boxes.
  5. All wiring from junction boxes to heat tape shall be by the Division 23 Contractor.
  6. Division 23 contractor shall provide control panel with GFCI protected breaker in weatherproof box to protect heat trace per NEC.
  7. Any other connections and/or equipment required shall be furnished and installed by the Division 23 Contractor.

END OF SECTION 23 00 30