# GENERAL

## RELATED DOCUMENTS

### Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to the work of this Section.

### Division 26 "Basic Electrical Materials and Methods" section apply to the work specified in this Section.

### Control Devices: Division 23 control devices such as aquastats, electric-pneumatic and pneumatic-electric switches, thermostats, freezestats, etc. are furnished and connected by the Division 23 Contractor unless specifically noted otherwise.

### Motors: All motors shown on the drawings shall be furnished and set in place under the specific section in which the motor is specified.

### Motor starters specified in other sections of this specification such as Division 23 shall be provided with power wiring by the Division 26 Contractor.

## DESCRIPTION OF WORK

### Extent of motor starter work is indicated by drawings and schedules.

**NOTE TO SPECIFIER: REVISE THE FOLLOWING LIST ACCORDING TO PROJECT REQUIREMENTS.**

### Type of motor starters specified in this Section are as follows:

#### Full Voltage Non-Reversing Magnetic Starters

#### Reduced Voltage Starters

#### Manual Motor Starters

#### Remote Controls

## QUALITY ASSURANCE

### Manufacturers: Firms regularly engaged in the manufacture of motor starters of types, ratings and characteristics required, whose products have been in satisfactory operation in similar service for not less than five (5) years.

### Firm with at least three (3) years of successful installation experience on projects utilizing motor starters similar to that required for this project.

## REFERENCES

### NEC Compliance: Comply with NEC requirements as applicable to wiring methods, construction, and installation of motor starters.

### NFPA Compliance: Comply with applicable requirements of NFPA standard 70E "Standard for Electrical Safety Requirements for Employee Workplaces."

### UL Compliance: Comply with applicable requirements of UL 486A "Wire, Connectors, and Soldering Lugs for Use with Copper Connectors," and UL 508 "Electrical Industrial Control Equipment" pertaining to the installation of motor starters. Provide motor starters and components which are UL listed and labeled.

### IEEE Compliance: Comply with applicable requirements of IEEE Standard 241 "Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to motor starters.

### NEMA Compliance: Comply with applicable requirements of NEMA Standard ICS 2, "Industrial Control Devices, Controllers and Assemblies," and Pub. No. 250, "Enclosures for Electrical Equipment (1000 volts Maximum)" pertaining to motor controllers/starters and enclosures.

## SUBMITTALS

### Product Data: Submit manufacturer's data on motor starters.

### Provide shop drawings of equipment being provided and control diagrams for each motor starter.

# PRODUCTS

**NOTE TO SPECIFIER: REVISE THE FOLLOWING LIST ACCORDING TO PROJECT REQUIREMENTS.**

## Manufacturers: Subject to compliance with the requirements, provide motor starters of one of the following:

### Allen Bradley Co.

### General Electric Co.

### Siemens

### Square D Co.

### Westinghouse Corp.

## GENERAL

### Except as otherwise indicated, provided motor starters and ancillary components which comply with the manufacturer's standard materials, and which are designed and constructed in accordance with published product information as required for a complete installation. Unless specifically indicated otherwise provide all power wiring, disconnects, starters, relays, hand-off-auto switches, pilot lights, motor connections, supports and all miscellaneous and necessary appurtenances required for a satisfactory and complete working system.

## FULL VOLTAGE NON-REVERSING MAGNETIC STARTERS

### Provide magnetic starters for three phase motors. Motor starters shall be full voltage non-reversing across the line magnetic type rated in accordance with NEMA standard sizes and horsepower ratings. Magnetic starters shall not be less than NEMA size one.

#### Each starter shall have a removable hinged cover capable of being padlocked. Enclosures shall be NEMA 1 general purpose type unless indicated otherwise. Provide watertight and dust tight enclosures for units installed outside, or as indicated on the drawings. Starters shall be provided with double break silver alloy contacts. All contacts shall be replaceable without removing wiring or the starter from the enclosure.

### Magnetic starters shall be provided with the following additional equipment:

#### Overload relays shall be an integral part of the motor starter. Overload relays shall have a minimum +10 percent adjustment from the nominal heater rating. Heaters shall be available such that when used with the +10 percent adjustment, a continuous selection of motor full load currents can be obtained through the size limitations of the starter. Overload relays shall be manual reset and field convertible from manual to automatic reset. Overload relays shall be melting alloy or bimetallic type. Thermal units shall be of one piece construction and interchangeable. The starter unit shall be inoperative if the thermal unit is removed. Provide 3 overload relays, one for each phase of the three phase starter.

#### Starters shall be suitable for the addition of at least three normally open and three normally closed auxiliary contacts. Provide a minimum of two normally open and two normally closed contacts unless additional contacts are scheduled on the drawings or required for proper control of the equipment.

#### In each magnetic starter provide cover mounted hand-off-auto selector switch complete with a manual overload reset button and a red "On" pilot light. Provide a control transformer with a secondary voltage of 120V, complete with primary overload and short circuit protection.

#### Time delay relays with time delay after energization shall be provided for starters indicated, or as required for proper control of equipment. Time delay feature shall be adjustable from 0 to 60 seconds and set as indicated on the drawings.

**NOTE TO SPECIFIER: REVISE THE FOLLOWING LIST ACCORDING TO PROJECT REQUIREMENTS.**

## PART WINDING REDUCED VOLTAGE MANETIC STARTERS

### Provide Allen-Bradley Bulletin 736 part-winding starters, closed-transition, magnetic, non-reversing, reduced-inrush, two-step type. Limit line current to a maximum of 65 percent of the locker rotor current. Coordinate and verify compatibility with the motor and driven equipment. Provide starter capable of interrupting 10 times motor full load rating.

### Provide starters with the equipment listed in paragraph 2.3, B above.

### Provide additional equipment for combination starters in accordance with paragraph 2.3, B above.

## WYE-DELTA REDUCED VOLTAGE MAGNETIC STARTERS

### Provide Allen-Bradley Bulletin 737 wye-delta starters, magnetic, non-reversing, reduced-inrush, closed-circuit transition type. Limit the inrush line current to a maximum of 35 percent of the locked rotor current. Coordinate and certify compatibility with the motor and driven equipment. Provide three thermal overload relays in series with each winding. Provide starter capable of interrupting 10 times motor full local rating.

### Provide starters with the equipment listed in paragraph 2.3, B above.

## AUTO-TRANSFORMER REDUCED VOLTAGE MAGNETIC STARTERS

### Provide Allen-Bradley Bulletin 746 auto-Transformer starters, magnetic, non-reversing, reduced-inrush, closed-circuit transition type. Provide minimum tap of 65 percent for motors 30 hp or less, and 50 percent for motors in excess of 30 hp. Limit the inrush line current to a maximum of 43 percent and 25 percent respectively, of the locked rotor current. Provide thermal overload protection in each phase. Provide starter capable of interrupting 10 times motor full load rating.

### Provide starters with the equipment listed in paragraph 2.3, B above.

## FULL VOLTAGE NON-REVERSING COMBINATION STARTERS

### Full voltage non-reversing combination starters shall be Westinghouse Class A200 (or equal) unless otherwise indicated. Provide additional equipment for combination starters in accordance with the requirements outlined in paragraph 2.3, B above. Where combination starters are shown on the drawings, a separate starter and disconnect switch may be substituted at the Contractor's option, provided adequate space is available for the installation.

### Provide fused disconnect switches with Class R type fuse rejection clips. If breakers are shown, provide breakers with a minimum of 22,000 RMS symmetrical amps interrupting capacity.

## MANUAL MOTOR STARTERS

### Thermal element type manual motor starters for single phase motors shall be Westinghouse Type MS. Provide flush mounted units in finished areas and surface mounted units in unfinished areas. Starter shall have NEMA I general purpose enclosure, unless otherwise indicated, and be rated for the motor horsepower required.

## REMOTE CONTROLS

### Provide Westinghouse standard duty oil-tite pushbuttons, pilot lights, and/or selector switches where indicated on the drawings, or wherever required for proper control of the equipment. Units shall be flush mounted in finished areas and surface mounted in unfinished areas.

# EXECUTION

## INSTALLATION

### Install motor starters as indicated, in accordance with equipment manufacturer's written instructions and with recognized industry practices; complying with applicable requirements of the NEC, UL and NEMA Standards, to ensure that products fulfill requirements.

### Coordinate with other work including motor and electrical wiring/cabling work as necessary to interface installation of motor starters with other work.

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

### Install fuses in fusible disconnect switches as required.

### Adjusting and Cleaning: Inspect electrical starter's operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movements.

### Field Quality Control: Subsequent to connecting wire/cables, energize motor starter circuitry and demonstrate functioning of equipment in accordance with specified requirements. Where necessary, correct malfunctioning units and retest to demonstrate compliance. Ensure that direction of rotation of each motor fulfills requirements.

END OF SECTION 262913