

SECTION 11030 - VARIABLE SPEED DRIVES, GENERAL

City of San Diego, CWP Guidelines

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

- A. The WORK of this Section includes providing general requirements for variable speed drives with drive motors, speed control units, connections, supports, housings, accessories, spare parts and tools.
- B. The WORK of this Section applies to the WORK of the following Section[s]:
 - [1. Section 11031 Eddy Current Drives]
 - [2. Section 11033 Variable Frequency Drives]
 - [3. Section 11034 Adjustable Belt Drives]
 - [4. Section 11036 DC-SCR Drives]

1.2 RELATED SECTIONS

- A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.
 - 1. Section 11000 Equipment General Provisions
 - 2. Section 16030 Electrical Tests

1.3 SHOP DRAWINGS AND SAMPLES

- A. In addition to the requirements of Section 11000, the following shall be submitted in compliance with Section 01300:
 - 1. Enclosure outline and dimensions.
 - 2. Schematic and interconnection diagrams, including wire and terminal strip numbers.
 - 3. The shop drawings shall include the following, where applicable:

\$# _____

NTS: Items in brackets [] below are applicable only to eddy current drives.

#\$

Name of manufacturer.
Type and model.
Temperature rise and class of insulation.
[Normal field excitation at full load.]
[Maximum windage loss.]
[Percent slip of unit at maximum output speed when transmitting a load equal to nameplate rating of driving motor with normal field excitation applied to unit.]

Ambient temperature range.
Power factor at 1/2, 3/4 and full load.
Guaranteed overall efficiency at 1/2, 3/4 and full load.

1.4 OWNER'S MANUAL

- A. In addition to the requirements of Section 11000, the following shall be included in the OWNER'S MANUAL in compliance with Section 01300:
1. Manufacturer's two-year warranty.
 2. Written descriptions explaining ladder diagram operation, system operation, and analog signal processing.
 3. System block diagram.
 4. System schematic diagrams.
 5. Assembly drawing and nomenclature.
 6. Maximum heat dissipation capacity in horsepower.
 7. Bearing selection data and calculations for [50,000] [100,000] hours minimum life.

1.5 SERVICES OF MANUFACTURER

- A. Services of manufacturer shall be provided in accordance with Section 11000. These services shall be coordinated with the manufacturer services specified for each type of equipment driven by a variable speed drive.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. **Equipment Compatibility:** Variable speed drive equipment shall be compatible with the equipment it serves. Variable frequency drives (VFDs) shall be capable of operating NEMA design B squirrel cage induction motors that have a 1.15 Service Factor and an inverter duty rating and comply with NEMA MG1, Part 31. Motors shall comply with the applicable variable-speed drive specifications.
- B. **Enclosures:** enclosures shall comply with the following:
1. Enclosures shall be of sufficient size to afford access to all parts, and shall have code-required clearances.
 2. Enclosures shall include proper lighting in the cabinet for maintenance work.
 3. Unless otherwise indicated, enclosures shall be NEMA 12 indoor and NEMA 4X (316 stainless steel) outdoor, and shall include locking and safety devices. Minimum sheet metal thickness shall be 12 gauge.
 4. Where exposed to the weather, drive housing shall be weather-protected, ventilated, or air conditioned, as required for trouble-free operation, with replaceable air filters to eliminate dust problems.

5. Control cabinets shall be mounted on concrete bases 4 inches above grade.

2.2 DESIGN AND CONSTRUCTION

- A. **Design:** The drives shall be of the horizontal or vertical type, as indicated, and include, where applicable, the following additional requirements:

\$# _____

NTS: Items in brackets [] below are applicable only to eddy current drives.

_____\$

1. Drives shall be capable of converting a fixed input speed from the specified motor to variable output speed indicated for the driven equipment.]
 2. Drives shall not permit slip when operating at top rated speed, or, for models where slippage complies with the manufacturer's published data, sufficient allowance shall be made in sizing the driven equipment to obtain the indicated capacity.]
 3. Drives shall be able to vary speed on demand with smooth acceleration and deceleration, without any vibration or shock loading, and shall comply with operating conditions of equipment specifications, without overloading or overheating the drive or the motor.
 4. The design shall include means to permit independent adjustment of minimum and maximum speeds and rate of acceleration. Acceleration function shall be a straight line relationship versus time.
- B. **Construction:** Rotating parts shall be of top grade steel or ductile iron, encased in a cast iron or steel housing. Input and output shafts and members shall be properly aligned in sleeve or antifriction bearings. The bearings shall be designed for axial and radial loads and shall comply with Anti-Friction Bearing Manufacturer's Association (AFBMA) standards for an L-10 life of [50,000] [100,000] hours at maximum speed. Motors shall comply with the requirements of the applicable variable speed drive specification [s] and Section 16040.
- C. **Lubrication:** Transmission parts and bearings shall be continuously lubricated and cooled by oil or grease for trouble-free operation.
- D. **Air Cooling:** [Outdoor drive installations shall include cooling equipment, complete with heat exchangers, fans, air conditioning, temperature probes, controls, safety shut-down, alarm, and accessories, and be fully integrated as a complete system. Cooling equipment shall be selected to dissipate excess heat (including solar heat gain) from each drive enclosure such that the maximum enclosure temperature will not exceed [40]° C. Cooling devices shall be constructed to permit regular maintenance or removal without dismantling of the drive.] [Indoor drive installations shall be in power ventilated rooms (motor control center room or control room) where the ambient temperature is not expected to exceed [40]° C. Drives shall be suitable for operation at the specified ambient temperature without requiring additional cooling of the drive enclosures.]

- E. **Controls:** Control systems shall be designed for the indicated signals corresponding to liquid level, flow, pressure, or temperature of the process as indicated, and shall automatically vary the output speed in proportion to the signal. The control unit shall include local speed indicator.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. Installation shall comply with Section 11000, the requirements of this Section, and the requirements of the individual variable speed drive sections.

** END OF SECTION **

