



Design Standard

Motor Requirements for HVAC & Plumbing Equipment

Purpose:

The motor requirements for heating, ventilating, and air-conditioning equipment are an essential to the proper functioning of the mechanical systems. This design standard has the purpose of creating a consistent application of heating, ventilating, and air-conditioning & plumbing equipment motor requirements throughout the South San Francisco Unified School District thereby achieving a standard of quality for maintenance, reliability, and energy efficiency throughout all renovation and new building projects.

Design Standard:

Common Motors

Specify work to include: Materials, installation and testing for complete and operable motors and starters for heating, ventilating, and air-conditioning equipment. These Design Standards are inclusive of motors that are field installed as well as integral to mechanical equipment.

All motors to meet the following requirements based on Code requirements and industry standard of care:

- Energy efficient, suitable for non-overloading operation, and capable of continuous operation at full nameplate rating. Motors 1 HP and larger must meet Energy Policy act of 1992. Motors to meet or exceed California Energy Commission Title 24 requirements.
- Take NEMA standards as minimum requirements for motor design and performance. Motors suitable for load, duty, voltage, frequency, hazard, and for service and location intended.
- For consistency and economy, motors, unless specified otherwise, to be general purpose open drip-proof type, ball bearing equipped, 40°C temperature rise, and rated for continuous duty under full load.
- At schools with motors exposed to the outside air stream (whether inside or outside of equipment) to be TEFC motors (totally enclosed, fan cooled).
- Motors smaller than 1/2 horsepower, 1 phase; and motors 1/2 horsepower and larger, 3 phase and voltage as indicated on Drawings. Maximum motor speed of 1750 RPM, unless otherwise noted. One phase motors to have internal thermal overload protection with automatic reset.
- Motors for belt drive to have adjustable bases with set screw to maintain belt tension.



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- Provide inverter rated motors per NEMA MG1-31 where variable frequency drives are applied or where soft start starters are utilized.
- Motors to have name plate giving manufacturer's name, shop number, HP, RPM and current characteristics.

Variable Frequency Motors

Design and specify work to include materials and installation for a complete adjustable frequency motor drive consisting of a pulse width modulated (PWM) inverter for use on a standard NEMA Design B induction motor. Design drive specifically for variable torque applications.

- Drives to be UL Listed.
- Solid state, with a Pulse Width Modulated (PWM) output waveform enclosed in a NEMA 1 enclosure (provide other NEMA enclosures as required for application), completely assembled and tested by manufacturer. Employ a full wave rectifier (to prevent input line notching), DC Line Reactor, capacitors, and Insulated Gate Bipolar Transistors (IGBTs) as the output switching.
- Device drive efficiency: 97 percent or better at full speed and full load.
- Fundamental power factor: 0.98 at all speeds and loads.
- Door interlocked thermal magnetic circuit breaker disconnect handle, through-the-door type, and pad-lockable in the "Off" position.
- Provide all VFDs with the same customer interface, including digital display, keypad and customer connections; regardless of horsepower rating. The keypad is to be used for local control (start/stop, forward/reverse, and speed adjust), for setting all parameters, and for stepping through the displays and menus

Approved Manufacturers:

Common Motors

- General Electric
- Westinghouse
- Baldor
- Reliance

Variable Frequency Motors

- ABB
- Siemens
- General Electric
- Danfoss
- Yaskawa
- Mitsubishi



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Substitutes Allowed:

Yes, if performance and quality equivalency can be evidenced.

Associated Design Standards

- 23 05 48 - Design Standard Vibration And Seismic Controls For HVAC Piping And Equipment
- 23 05 53 - Design Standard Identification For HVAC Piping And Equipment
- 01 91 00 – Design Standard Commissioning

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