NEWPORT NEWS SHIPBUILDING

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APPENDIX C - DoD CONTRACTS

ELECTRIC MOTORS AND CONTROL EQUIPMENT

(June 1999)

I. GENERAL

It is the intent of this appendix to supplement Appendix B and to set forth certain general requirements for electric motors and control equipment with which the vendor must comply to the extent that they are applicable to the equipment covered by the accompanying purchase order.

Where the requirements of the purchase order and this appendix, which forms a part of the order, are at variance with other referenced specifications, the purchase order shall apply.

Unless otherwise specified in Military Specifications or approved by the Purchaser, all motors shall be 440 volts, 3 phase, 60 cycle, continuous duty, single speed, dripproof protected, squirrel cage, horizontal, flexible direct coupled, Class B or F insulation, and rated 50 degrees C ambient temperature. Motors rated 1/4 horsepower or less may be 115 volts, single phase. Unless otherwise specified or approved by the Shipyard, all motor controllers shall be non-combination, enclosed in dripproof protected enclosures, with full voltage starting, non-reversing, magnetic, low voltage protection and thermal overload protection features and rated for 50 degrees C ambient temperature.

All Navy Service A and Service C equipment, motors and motor control equipment, unless otherwise explicitly stated in the purchase order, shall be in strict accordance with the applicable following Military Specifications including all amendments thereto in effect on February 23, 1996.

MIL-M-17059 (Ships) -- Motors, Alternating-Current, Fractional HP (Shipboard Use)

MIL-M-17060 (Navy) -- Motors, 60 Hertz, Alternating-Current, Integral HP (Shipboard Use)

Drawings for motors complying with MIL-M-17060E shall be in accordance with Mil-Spec DOD-D-1000B including Amendment 3 Dated 13 May 1983 and Mil-Std DOD-STD-100C including Notice 4 Dated 4 May 1983. When using MIL-M-17060E, Paragraph 4.3.4.14.1.1.3 shall not apply.

MIL-C-2212 (Navy) -- Controllers, Electric Motor A. C. or D. C., and Associated Switching Devices.

MIL-B-16392 (Navy) -- Brakes Electric, Naval Shipboard Use.

MIL-S-901 (Navy) -- Shockproof Equipment, Class HI (High-Impact) Shipboard Application, Tests for.

MERCHANT MARINE EQUIPMENT

IEEE Standard No. 45 -- Recommended Practice for Electrical Installations on Shipboard.

Where IEEE Standard No. 45 motors are specified, Navy Service C motors may be submitted.

Insulation resistance measurement tests will be conducted on motors and control equipment after shipboard installation prior to operating. The insulation resistance measurements will be corrected to 25°C, based on insulation resistance doubling for each 15° decrease in temperature. Insulation resistance, corrected to 25°C shall not be less than the following values:

A. C. Motors	Megohms
Squirrel cage induction (3 phase) motors	25
Motor with sealed insulation system	500
All other a. c. motors	25
D. C. Motors	**Megohms**
Armature Circuit Class A	12
Armature Circuit Classes B and H	25
Field Circuit Class A	25
Field Circuit Class B and H	50
Controllers	**Megohms**
A. C. and D. C. Controllers	10

Equipment failing to meeting the above test values will be considered discrepant.

II. BEARINGS

Bearings of rigid coupled vertical motors shall be capable of withstanding the thrust of the motor rotor and of the driven apparatus.

Prelubricated double sealed bearings (radial, single row, both races extended, seated cartridge type, Type 120 per Specification FF-B-171) shall be installed in all motors unless otherwise specified or approved by the Purchaser, except in those instances where the DN value (bearing mean diameter x RPM) exceeds 350,000 or where the loading is such that the bearing would require relubrication within one year, in which case, prelubricated double sealed bearings shall not be used and the type of bearing shall be as approved by the Purchaser.

III. NAMEPLATES

Special nameplates warning, "Do Not Lubricate" shall be provided where Type 120 bearings are used.

Rotation: Each non-reversing (MIL-M-17060) motor shall be equipped with direction of rotation nameplate. Each non-standard rotation (MIL-M-17059) motor shall be similarly equipped. Observer shall face the front end or top (opposite the drive end) of the motor when specifying the direction of rotation.

IV. NOISE

Motors shall be designed for a minimum of mechanical noise (both air-borne and structure-borne noise) and radio interference.

All electrical equipment shall be capable of operating simultaneously with electronic devices without excessive radio interference. The generation of radiated and conducted radio interference voltages at frequencies between 14 kilocycles and 400 megacycles shall be inherently minimized in the design of motors and controllers without the use of filters or suppressors.

Within the requirements of their applicable equipment specifications, each machine shall be designed to minimize production of audible noise providing no undue delay results. Machines already developed which will give better performance than this, acoustically, may be used.

Rotors shall be dynamically balanced, laminations shall be tightly clamped and bearing fits shall be carefully controlled. Where necessary, slots shall be skewed and relation between stator and rotor slots shall be such as to reduce noise to a minimum.

Acoustical attenuation shall be provided, if necessary, to keep motor Airborne noise within specification limits.

V. MATERIAL

Magnesium and its alloys shall not be used in any equipment.

Parts in contact with grease (greaseable motors), such as slingers, locknuts and washers, shall not be plated with cadmium.

Neither silicone grease nor materials containing silicone shall be used in totally enclosed equipment using carbon brushes.

To enable the shipbuilder to adequately conduct shipboard tests, the vendor shall complete and forward motor drawings for final distribution within thirty days of completion of tests.

Each controller built to IEEE No. 45 or other Standards shall have mounted thereon a diagram showing its complete wiring including external connections.

Each motor drawing utilizing random wound or mush coils should contain a sketch showing dimension of winding form. Form wound coils should be dimensioned before and after forming to facilitate rewinding such motors.

Motor calculated weights and calculated full load amperes shall be coordinated with actual values after motors have been weighed and tests have been run.

Fuse clips used in controllers, except those furnished to commercial specifications, shall be a type which has passed shock test in a qualified Navy controller. The clips shall be equipped with screw type terminals of adequate size to accommodate control wiring.

Fuse clips in marine or commercial controllers should, if practicable, be of a type which will retain fuses under shock. Any deviation from this requirement shall be brought to the attention of the shipyard before proceeding.

Fuse clips employing removable wire spring shall not be used.

Each ventilation opening into the interior of motors, controllers and associated electrical equipment shall be closed with tape-on porous sheets of 1/2" Scott-foam filter material, or equivalent, to preclude the entrance of dust, lint, ferric material, emery dust or other material into the interior. All other openings into the interior of such equipment shall be closed with an adhesive tape. During shipyard operation of the equipment, the filter material will be temporarily removed from the ventilation openings if necessary to prevent overheating and then resealed, with precautions being taken to operate the equipment in a clean environment while the filter is removed.