Chapter E 670

MACHINE TOOLS

A. GENERAL

E 670.01 Scope. The provisions of this chapter apply to the electrical equipment for motor-driven, complete metal-working machines, not portable by hand, having one or more tools and work holding devices used for progressively removing metal in the form of chips.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.02 Application of other chapters. The following provisions cover the requirements for electrical wiring and equipment on machine tools within the scope of this chapter. They are in addition to or amendatory of the applicable provisions of other chapters of this code which apply except as modified in this chapter.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.03 Identification. Each electrically operated machine tool shall be marked where plainly visible to show the voltage, full-load current and frequency required for each external circuit supplying the machine tool. For a multi-motored machine tool, this full-load current marking shall be not less than the sum of the full-load currents required for all motors which may be in operation at one time under normal conditions of use. Where only a single motor is used, the motor nameplate may serve when plainly visible.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.04 Lighting. Lighting fixtures which are a part of or attached to any machine tool shall conform to the following:

(1) VOLTAGE. The lighting circuit voltage shall not exceed 150 volts between conductors and shall be a grounded circuit.

(2) FLEXIBLE CORD. Flexible cord if used shall be of a type suitable for hard usage (see table E 400.11), and shall be resistant to coolant and oil. It shall be arranged so it cannot be damaged by moving parts of the machine.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

B. WIRING METHOD

E 670.11 Wiring method. Conductors shall be in rigid metal conduit or be type MI cable, except as provided in sections E 670.12 to E 670.14 inclusive.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.12 Flexible metal conduit. Flexible metal conduit, including the liquid-tight type, may be used only where necessary to employ flexible connections for small or infrequent movements, as at motor terminals.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.13 Continuously moving parts. Wiring connections to continuously moving parts of a machine tool shall be of approved type, extra-flexible, non-metallic-covered, multi-conductor cable. Conductors shall conform to section E 670.22. In lieu of cable, individual conductors enclosed in flexible tubing may be used. The tubing and its fittings shall be approved for the purpose, and conductors in such tubing shall be considered as subject to oil or coolant.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.14 Compartments and raceways. Compartments and raceways within the framework of a machine tool may be used to enclose conductors, provided they are isolated from coolant and oil reservoirs and are entirely enclosed. Conductors in machine compartments and raceways shall be secured and so arranged that they will not be subject to physical damage or abrasion.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.15 Number of bends in conduit. Where a run of rigid metal conduit does not exceed 25 feet in length, and the conductor fill does not exceed 30% of the cross-sectional area of the conduit, the requirements of section E 346.11 shall not apply.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

C. CONDUCTORS

E 670.21 Sizes permitted. Circuit and control conductors on or in machines shall not be smaller than No. 14 except as follows:

(1) CONDUCTORS TO MOVING PARTS. Copper conductors for control purposes to continuously moving parts may be No. 16 where all such conductors are insulated for the maximum voltage of any conductor in the cable or tubing.

(2) CONDUCTORS TO ELECTRONIC AND PRECISION DEVICES. Copper conductors to electronic and precision devices may be No. 20, except where pulled into raceways they shall be not smaller than No. 18.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.22 Type. Conductors shall be of a type suitable for conditions of use. Flexible, nonmetallic, multi-conductor cable shall have an oil- and moisture-resistant insulation with a flame-retardant outer covering.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.23 Identification of conductors. Conductors shall be identified either by color code or by other distinctive means. White or natural gray coloring shall be used only for a grounded conductor, and green only for a conductor used to ground the frame of equipment.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

D. CONTROL EQUIPMENT

E 670.31 Mounting. Controllers shall be mounted in such a manner as to guard against physical damage, oil, coolant, dust, and dirt.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.32 In machine compartments. Compartments in the column or base of a machine may serve as enclosures for control equipment where the following provisions are complied with:

(1) THICKNESS OF METAL. The wall thickness shall be not less than No. 14 MS (USS Revised) gauge when of sheet steel, not less than ⅛-inch when of cast metal, or not less than 3/32-inch where of malleable iron.

(2) COVERS. Compartments shall have tight-fitting hinged covers, not thinner than specified in subsection E 670.32 (1). Covers shall have adequate means for fastening securely in a closed position.

(3) CONTROL ENCLOSURES. Compartments used for control enclosures shall be readily accessible and shall not contain moving parts not directly connected to electrical control equipment, and shall be so located as to guard the control devices against oil, coolant, chips, and dirt.

(4) VENTING. A compartment enclosing group control equipment with branch circuit fusing as specified in subsection E 670.42 (2) shall have a clear opening of at least 2 square inches, vented to another compartment within the column or base and having at least one-half the volume of the control compartment.

(5) NO FLOOR OPENING. Compartments enclosing control equipment shall not be open to the floor or foundation upon which the machine rests.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.33 Not in machine compartments. Controllers not in machine compartments shall comply with the following:

(1) Controllers with overcurrent protection as permitted by section E 670.42 may be mounted on the outside of the machine tool or on the floor as close to the machine tool as possible provided the enclosures comply with all the provisions of section E 670.32.

(2) Other controllers may be mounted on the outside of the machine tool or elsewhere when they comply with the provisions of chapter E 430.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E. MOTOR BRANCH-CIRCUIT OVERCURRENT PROTECTION

E 670.41 Branch circuits. Any motor on a machine tool may be supplied from an individual branch circuit in accordance with the provisions of chapter E 430, or may be connected to a branch circuit

which also supplies other motors on the same machine tool in accordance with the provisions of section E 430.053 or of E 670.42. The conductors supplying all motors on a single machine tool may be considered a single branch circuit where all of these motors are protected in accordance with the provisions of section E 430.053 or of E 670.42.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.42 Several motors on one branch circuit. Controllers and running overcurrent protective devices for 2 or more motors connected to the branch circuit of a single machine tool need not comply with the provisions of section E 430.053, where all of the following provisions are complied with:

(1) MOTOR-RUNNING PROTECTION. Each motor shall be protected by a motor-running overcurrent protective device.

(2) RATING OF OVERCURRENT DEVICES. The branch circuit shall have overcurrent protection of a rating equal to that specified in section E 430.052 for the largest motor connected to the circuit, plus an amount equal to the sum of the full-load current ratings of all other motors on the machine tool which may be in operation at one time under normal conditions of use and which are connected to the same circuit. In no case shall overcurrent protection be more than 200 amperes at 250 volts or less, or 100 amperes at 600 volts or less.

(3) ENCLOSURES. Enclosures for control equipment and running protective devices enclosed in machine compartments, or mounted on or adjacent to the machine, shall comply in all respects with the provisions of section E 670.32 or E 670.33.

(4) CONDUCTORS. The conductors of the branch circuit shall comply with the provisions of subsection E 430.053 (2).

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.51 Protection against damage. Where the failure of one motor to operate while others continue to run could cause damage, they shall be so connected that the tripping of any overload or undercurrent device will result in stopping of all of these motors.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.52 Grounding. All machine tools within the scope of this chapter, including connected portable equipment, shall be effectively grounded as specified in chapter E 250.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.

E 670.53 Moving parts. A machine part that moves on grounded metal guides or supporting ways shall be considered as adequately grounded when the movable part may not readily be removed by hand.

History: Cr. Register, November, 1961, No. 71, eff. 12–1–61.