Subpart J—Electric Motor Assemblies

SOURCE: 57 FR 61193, Dec. 23, 1992, unless otherwise noted.

§ 7.301 Purpose and effective date.

This subpart establishes the specific requirements for MSHA approval of certain explosion-proof electric motor assemblies intended for use in approved equipment in underground mines. Applications for approval or extensions of approval submitted after February 22, 1996 shall meet the requirements of this part. Those motors that incorporate features not specifically addressed in this subpart will continue to be evaluated under part 18 of this chapter.

§ 7.302 Definitions.

The following definitions apply in this subpart:

Afterburning. The combustion of any flammable mixture that is drawn into an enclosure after an internal explosion in the enclosure. This condition is determined through detection of secondary pressure peaks occurring subsequent to the initial explosion.

Cylindrical joint. A joint comprised of two contiguous, concentric, cylindrical surfaces.

Explosion-proof enclosure. A metallic enclosure used as a winding compartment, conduit box, or a combination of both that complies with the applicable requirements of § 7.304 of this part and is constructed so that it will withstand the explosion tests of § 7.306 of this part.

Fastening. A bolt, screw, or stud used to secure adjoining parts to prevent the escape of flame from an explosion-proof enclosure.

Flame-arresting path. Two or more adjoining or adjacent surfaces between which the escape of flame is prevented.

Internal free volume (of an empty enclosure). The volume remaining after deducting the volume of any part that is essential in maintaining the explosion-proof integrity of the enclosure or necessary for operation of the motor. Essential parts include the parts that constitute the flame-arresting path and those necessary to secure parts that constitute a flame-arresting path.

Motor assembly. The winding compartment including a conduit box when specified. A motor assembly is comprised of one or more explosion-proof enclosures.

Plane joint. A joint comprised of two adjoining surfaces in parallel planes.

Step (rabbet) joint. A joint comprised of two adjoining surfaces with a change or changes in direction between its inner and outer edges. A step joint may be composed of a cylindrical portion and a plane portion or of two or more plane portions.

Stuffing box. An entrance with a recess filled with packing material for cables extending through a wall of an explosion-proof enclosure.

Threaded joint. A joint consisting of a male- and a female-threaded member, both of which are the same type and gauge.

§ 7.303 Application requirements.

(a) An application for approval of a motor assembly shall include a composite drawing or drawings with the following information:

(1) Model (type), frame size, and rating of the motor assembly.

(2) Overall dimensions of the motor assembly, including conduit box if applicable, and internal free volume.

(3) Material and quantity for each of the component parts that form the explosion-proof enclosure or enclosures.

(4) All dimensions (including tolerances) and specifications required to

ascertain compliance with the requirements of § 7.304 of this part.

(b) All drawings shall be titled, dated, numbered, and include the latest revision.

§ 7.304 Technical requirements.

(a) Voltage rating of the motor shall not exceed 4160 volts.

(b) The temperature of the external surfaces of the motor assembly shall not exceed 150 °C (302 °F) when operated at the manufacturers' specified ratings.

(c) Minimum clearances between uninsulated electrical conductor surfaces, or between uninsulated conductor surfaces and grounded metal surfaces, within the enclosure shall meet the requirements of table J–1 of this section.

TABLE J–1—MINIMUM CLEARANCES BETWEEN UNINSULATED SURFACES

Phase-to-phase voltage (rms)	Clearances (inches)	
	Phase-to-phase	Phase-to-ground or control circuit
0 to 250	0.25	0.25
251 to 600	0.28	0.25
601 to 1000	0.61	0.25
1001 to 2400	1.4	0.6
2401 to 4160	3.0	1.4

(d) Parts whose dimensions can change with the motor operation, such as ball and roller bearings and oil seals, shall not be used as flame-arresting paths.

(e) The widths of any grooves, such as grooves for holding oil seals or o-rings, shall be deducted in measuring the widths of flame-arresting paths.

(f) An outer bearing cap shall not be considered as forming any part of a flame-arresting path unless the cap is used as a bearing cartridge.

(g) Requirements for explosion-proof enclosures of motor assemblies.

(1) Enclosures shall be—

(i) Constructed of metal;

(ii) Designed to withstand a minimum internal pressure of 150 pounds per square inch (gauge);

(iii) Free from blowholes when cast; and

(iv) Explosion proof as determined by the tests set out in § 7.306 of this part.

(2) Welded joints forming an enclosure shall be—

(i) Continuous and gas-tight; and

(ii) Made in accordance with or exceed the American Welding Society Standard AWS D14.4–77, ''Classification and Application of Welded Joints for Machinery and Equipment,'' or meet the test requirements set out in § 7.307 of this part. AWS D14.4–77 is incorporated by reference and has been approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be obtained from the American Welding Society, Inc., 2501 NW 7th Street, Miami, FL 33125. Copies may be inspected at the U.S. Department of Labor, Mine Safety and Health Administration, Approval and Certification Center, 765 Technology Drive, Triadelphia, WV 26059, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html*.

(3) External rotating parts shall not be constructed of aluminum alloys containing more than 0.6 percent magnesium. Non-metallic rotating parts shall be provided with a means to prevent an accumulation of static electricity.

(4) Threaded covers and mating parts shall be designed with Class 1A and 1B (coarse, loose fitting) threads. The covers shall be secured against loosening.

(5) Flat surfaces between fastening holes that form any part of a flame-arresting path shall be plane to within a maximum deviation of one-half the maximum clearance specified in paragraph (g)(19) of this section. All surfaces forming a flame-arresting path shall be finished during the manufacturing process to not more than 250 microinches. A thin film of nonhardening preparation to inhibit rusting may be applied to these finished metal surfaces as long as the final surface can be readily wiped free of any foreign materials.

(6) For a laminated stator frame, it shall be impossible to insert a 0.0015 inch thickness gauge to a depth exceeding ⅛ inch between adjacent laminations or between end rings and laminations.

(7) Lockwashers, or equivalent, shall be provided for all fastenings. Devices other than lockwashers shall meet the requirements of §7.308 of this part. Equivalent devices shall only be used in the configuration in which they were tested.

(8) Fastenings shall be as uniform in size as practicable to preclude improper installation.

(9) Holes for fastenings in an explosion-proof enclosure shall be threaded to ensure that all specified bolts or screws will not bottom even if the washers are omitted.

(10) Holes for fastenings shall not penetrate to the interior of an explosion-proof enclosure, except holes made through motor casings for bolts, studs, or screws to hold essential parts, such as pole pieces, brush rigging, and bearing cartridges. The attachments of such parts shall be secured against loosening. The threaded holes in these parts shall be blind unless the fastenings are inserted from the inside, in which case the fastenings shall not be accessible with the rotor in place.

(11) For direct current motor assemblies with narrow interpoles, the distance from the edge of the pole piece to any bolt hole in the frame shall be at least ⅛ inch. If the distance is ⅛ to ¼ inch, the diametrical clearance for the pole bolt shall not exceed 1/64 inch for not less than ½ inch through the frame. Furthermore, the pole piece shall have the same radius as the inner surface of the frame. Pole pieces may be shimmed as necessary. If used, the total resulting thickness of the shims shall be specified. The shim assembly shall meet the same requirements as the pole piece.

(12) Coil-thread inserts, if used in holes for fastenings, shall meet the following:

(i) The inserts shall have internal screw threads.

(ii) The holes for the inserts shall be drilled and tapped consistent with the insert manufacturer's specifications.

(iii) The inserts shall be installed consistent with the insert manufacturer's specifications.

(iv) The insert shall be of sufficient length to ensure the minimum thread engagement of fastening specified in paragraph (g)(19) of this section.

(13) A minimum of ⅛ inch of stock shall be left at the center of the bottom of each blind hole that could penetrate into the interior of an explosion-proof enclosure.

(14) Fastenings shall be used only for attaching parts that are essential in maintaining the explosion-proof integrity of the enclosure, or necessary for the operation of the motor. They shall not be used for making electrical connections.

(15) Through holes not in use shall be closed with a metal plug. Plugs, including eyebolts, in through holes where future access is desired shall meet the flame-arresting paths, lengths, and clearances of paragraph (g)(19) of this section and be secured by spot welding or brazing. The spot weld or braze may be on a plug, clamp, or fastening (for example see figure J–1). Plugs for holes where future access is not desired shall be secured all around by a continuous gas-tight weld.

(16) O-rings, if used in a flame-arresting path, shall meet the following:

(i) When the flame-arresting path is in one plane, the o-ring shall be located at least one-half the acceptable flame-arresting path length specified in paragraph (g)(19) of this section from within the outside edge of the path (see figure J–2).

(ii) When the flame-arresting path is one of the plane-cylindrical type (step joint), the o-ring shall be located at least ½ inch from within the outer edge of the plane portion (see figure J–3), or at the junction of the plane and cylindrical portion of the joint (see figure J–4), or in the cylindrical portion (see figure J–5).

(17) Mating parts comprising a pressed fit shall result in a minimum interference of 0.001 inch between the parts. The minimum length of the pressed fit shall be equal to the minimum thickness requirement of paragraph (g)(19) of this section for the material in which the fit is made.

(18) The flame-arresting path of threaded joints shall conform to the requirements of paragraph (g)(19) of this section.

(19) Explosion-proof enclosures shall meet the requirements set out in table

J–2 of this section, based on the internal free volume of the empty enclosure.

TABLE J–2—EXPLOSION-PROOF REQUIREMENTS BASED ON VOLUME

	Volume of empty enclosure		
	Less than 45 cu. ins.	45 to 124 cu. ins. inclusive	More than 124 cu. ins.
Minimum thickness of material for walls [1]	1/8″	3/16″	1/4″
Minimum thickness of material for flanges and covers	[2] 1/4″	[3] 3/8″	[3] 1/2″
Minimum width of joint; all in one plane	1/2″	3/4″	1″
Maximum clearance; joint all in one plane	0.002″	0.003″	0.004″
Minimum width of joint, portions of which are in different planes; cylinders or equivalent	[4] 3/8″	[4] 5/8″	[4] 3/4″
Maximum clearances; joint in two or more planes, cylinders or equivalent: [5]			
(a) Portion perpendicular to plane [6]	0.008″	0.008″	0.008″
(b) Plane portion	0.006″	0.006″	0.006″
Maximum fastening [7] [8] spacing; joints all in one plane	(16)	(16)	(16)
Maximum fastening spacing; joints, portions of which are in different planes	(17)	(17)	(17)
Minimum diameter of fastening [9] (without regard to type of joint)	1/4″	1/4″	3/8″
Minimum thread engagement of fastening [10]	1/4″	1/4″	3/8″
Maximum diametrical clearance between fastening body and unthreaded holes through which it passes [8] [11] [12]	1/64″	1/32″	1/16″
Minimum distance from interior of enclosure to the edge of a fastening hole: [8] [13]			
Joint—minimum width 1″	.....	.....	[14] 7/16″
Joint—less than 1″ wide	1/8″	3/16″	
Cylindrical Joints			
Shaft centered by ball or roller bearings:			
Minimum length of flame-arresting path	1/2″	3/4″	1″
Maximum diametrical clearance	0.020″	0.025″	0.030″
Other cylindrical joints: [15]			
Minimum length of flame-arresting path	1/2″	3/4″	1″
Maximum diametrical clearance	0.006″	0.008″	0.010″

[1] This is the minimal nominal dimension when applied to standard steel plate.
[2] 1/32 inch less is allowable for machining rolled plate.
[3] 1/16 inch less is allowable for machining rolled plate.
[4] If only two planes are involved, neither portion of a joint shall be less than 1/8 inch wide, unless the wider portion conforms to the same requirements as those for a joint that is all in one plane. If more than two planes are involved (as in labyrinths or tongue-and-groove joints) the combined lengths of those portions having prescribed clearances are considered.
[5] For winding compartments having internal free volume not exceeding 350 cubic inches and joints not exceeding 32 inches in outer circumference and provided with step joints between the stator frame and the end bracket the following dimensions shall apply:

DIMENSIONS OF RABBET (STEP) JOINTS-INCHES

[See figure J–6 in appendix]

Minimum total width	Minimum width of clamped radial portion	Maximum clearance of radial portion	Maximum diametrical clearance at axial portion
3/8	3/64	0.0015	0.003
1/2	3/64	0.002	0.003
1/2	3/32	0.002	0.004

[6] The allowable diametrical clearance is 0.008 inch when the portion perpendicular to the plane portion is 1/4 inch or greater in length. If the perpendicular portion is more than 1/8 inch but less than 1/4 inch wide, the diametrical clearance shall not exceed 0.006 inch.
[7] Studs, when provided, shall bottom in blind holes, be completely welded in place, or have the bottom of the hole closed with a plug secured by weld or braze. Fastenings shall be provided at all corners.
[8] The requirements as to diametrical clearance around the fastening and minimum distance from the fastening hole to the inside of the explosion-proof enclosure apply to steel dowel pins. In addition, when such pins are used, the spacing between centers of the fastenings on either side of the pin shall not exceed 5 inches.
[9] Fastening diameters smaller than specified may be used if the enclosure meets the test requirements of 30 CFR 7.307 and then 7.306 in that order.
[10] Minimum thread engagement shall be equal to or greater than the diameter of the fastening specified, or the enclosure must meet the test requirements of 30 CFR 7.307 and then 7.306 in that order.
[11] This maximum clearance applies only when the fastening is located within the flame-arresting path.
[12] Threaded holes for fastening bolts shall be machined to remove burrs or projections that affect planarity of a surface forming a flame-arresting path.
[13] Edge of the fastening hole shall include the edge of any machining done to the fastening hole, such as chamfering.
[14] If the diametrical clearance for fastenings does not exceed 1/32 inch, then the minimum distance shall be 1/4 inch.

[15] Shafts or operating rods through journal bearings shall be at least ¼″ in diameter. The length of the flame-arresting path shall not be reduced when a pushbutton is depressed. Operating rods shall have a shoulder or head on the portion inside the enclosure. Essential parts riveted or bolted to the inside portion are acceptable in lieu of a head or shoulder, but cotter pins and similar devices shall not be used.
[16] 6″ with a minimum of 4 fastenings.
[17] 8″ with a minimum of 4 fastenings.

(h) *Lead entrances.* (1) Each cable, which extends through an outside wall of the motor assembly, shall pass through a stuffing-box lead entrance (see figure J–7). All sharp edges shall be removed from stuffing boxes, packing nuts, and other lead entrance (gland) parts, so that the cable jacket is not damaged.

(2) When the packing is properly compressed, the gland nut shall have—

(i) A clearance distance of ⅛ inch or more, with no maximum, to travel without interference by parts other than packing; and

(ii) A minimum of three effective threads engaged (see figures J–8, J–9, and J–10).

(3) Packing nuts (see figure J–7) and stuffing boxes shall be secured against loosening (see figure J–11).

(4) Compressed packing material shall be in contact with the cable jacket for a length of not less than ½ inch.

(5) Requirements for lead entrances in which MSHA accepted rope packing material is specified, are:

(i) Rope packing material shall be acceptable under § 18.37(e) of this chapter.

(ii) The width of the space for packing material shall not exceed by more than 50 percent the diameter or width of the uncompressed packing material (see figure J–12).

(iii) The maximum diametrical clearance, using the specified tolerances, between the cable and the through holes in the gland parts adjacent to the packing (stuffing box, packing nut, hose tube, or bushings) shall not exceed 75 percent of the nominal diameter or width of the packing material (see figure J–13).

(6) Requirements for lead entrances in which grommet packing made of compressible material is specified, are:

(i) The grommet packing material shall be accepted by MSHA as flame-resistant material under § 18.37(f)(1) of this chapter.

(ii) The diametrical clearance between the cable jacket and the nominal inside diameter of the grommet shall not exceed 1/16 inch, based on the nominal specified diameter of the cable (see figure J–14).

(iii) The diametrical clearance between the nominal outside diameter of the grommet and the inside wall of the stuffing box shall not exceed 1/16 inch (see figure J–14).

(i) *Combustible gases from insulating material.* (1) Insulating materials that give off flammable or explosive gases when decomposed electrically shall not be used within explosion-proof enclosures where the materials are subjected to destructive electrical action.

(2) Parts coated or impregnated with insulating materials shall be treated to remove any combustible solvent before assembly in an explosion-proof enclosure.

[57 FR 61193, Dec. 23, 1992, as amended at 73 FR 52210, Sept. 9, 2008]

§ 7.305 Critical characteristics.

The following critical characteristics shall be inspected on each motor assembly to which an approval marking is affixed:

(a) Finish, width, and planarity of surfaces that form any part of a flame-arresting path.

(b) Clearances between mating parts that form flame-arresting paths.

(c) Thickness of walls, flanges, and covers that are essential in maintaining the explosion-proof integrity of the enclosure.

(d) Spacing of fastenings.

(e) Length of thread engagement on fastenings and threaded parts that assure the explosion-proof integrity of the enclosure.

(f) Use of lockwasher or equivalent with all fastenings.

(g) Dimensions which affect compliance with the requirements for packing gland parts in § 7.304 of this part.

§ 7.306 Explosion tests.

(a) The following shall be used for conducting an explosion test:

(1) An explosion test chamber designed and constructed to contain an

explosive gas mixture to surround and fill the motor assembly being tested. The chamber must be sufficiently darkened and provide viewing capabilities of the flame-arresting paths to allow observation during testing of any discharge of flame or ignition of the explosive mixture surrounding the motor assembly.

(2) A methane gas supply with at least 98 by volume per centum of combustible hydrocarbons, with the remainder being inert. At least 80 percent by volume of the gas shall be methane.

(3) Coal dust having a minimum of 22 percent dry volatile matter and a minimum heat constant of 11,000 moist BTU (coal containing natural bed moisture but not visible surface water) ground to a fineness of minus 200 mesh U.S. Standard sieve series.

(4) An electric spark ignition source with a minimum of 100 millijoules of energy.

(5) A pressure recording system that will indicate the pressure peaks resulting from the ignition and combustion of explosive gas mixtures within the enclosure being tested.

(b) *General test procedures.* (1) Motor assemblies being tested shall—

(i) Be equipped with unshielded bearings regardless of the type of bearings specified; and

(ii) Have all parts that do not contribute to the operation or assure the explosion-proof integrity of the enclosure, such as oil seals, grease fittings, hose conduit, cable clamps, and outer bearing caps (which do not house the bearings) removed from the motor assembly.

(2) Each motor assembly shall be placed in the explosion test chamber and tested as follows:

(i) The motor assembly shall be filled with and surrounded by an explosive mixture of the natural gas supply and air. The chamber gas concentrations shall be between 6.0 by volume per centum and the motor assembly natural gas concentration just before ignition of each test. Each externally visible flame-arresting path fit shall be observed for discharge of flames for at least two of the tests, including one with coal dust added.

(ii) A single spark source is used for all testing. Pressure shall be measured at each end of the winding compartment simultaneously during all tests. Quantity and location of test holes shall permit ignition on each end of the winding compartment and recording of pressure on the same and opposite ends as the ignition.

(iii) Motor assemblies incorporating a conduit box shall have the pressure in the conduit box recorded simultaneously with the other measured pressures during all tests. Quantity and location of test holes in the conduit box shall permit ignition and recording of pressure as required in paragraphs (c)(1) and (c)(4)(i) of this section.

(iv) The motor assembly shall be completely purged and recharged with a fresh explosive gas mixture from the chamber or by injection after each test. The chamber shall be completely purged and recharged with a fresh explosive gas mixture as necessary. The oxygen level of the chamber gas mixture shall be no less than 18 percent by volume for testing. In the absence of oxygen monitoring equipment, the maximum number of tests conducted before purging shall be less than or equal to the chamber volume divided by forty times the volume occupied by the motor assembly.

(c) *Test procedures.* (1) Eight tests at 9.4 ±0.4 percent methane by volume within the winding compartment shall be conducted, with the rotor stationary during four tests and rotating at rated speed (rpm) during four tests. The ignition shall be at one end of the winding compartment for two stationary and two rotating tests, and then switched to the opposite end for the remaining four tests. If a nonisolated conduit box is used, then two additional tests, one stationary and one rotating, shall be conducted with ignition in the conduit box at a point furthest away from the opening between the conduit box and the winding compartment.

(2) Four tests at 7.0 ±0.3 percent methane by volume within the winding compartment shall be conducted with the rotor stationary, 2 ignitions at each end.

(3) Four tests at 9.4 ±0.4 percent methane by volume plus coal dust shall be conducted. A quantity of coal dust

equal to 0.05 ounces per cubic foot of internal free volume of the winding compartment plus the nonisolated conduit box shall be introduced into each end of the winding compartment and nonisolated conduit box to coat the interior surface before conducting the first of the four tests. The coal dust introduced into the conduit box shall be proportional to its volume. The remaining coal dust shall be equally divided between the winding compartment ends. For two tests, one stationary and one rotating, the ignition shall be either in the conduit box or one end of the connected winding compartment, whichever produced the highest pressure in the previous tests. The two remaining tests, one stationary and one rotating, shall be conducted with the ignition in the winding compartment end furthest away from the conduit box.

(4) For motor assemblies incorporating a conduit box which is isolated from the winding compartment by an isolating barrier the following additional tests shall be conducted—

(i) For conduit boxes with an internal free volume greater than 150 cubic inches, two ignition points shall be used, one as close to the geometric center of the conduit box as practical and the other at the furthest point away from the isolating barrier between the conduit box and the winding compartment. Recording of pressure shall be on the same and opposite sides as the ignition point furthest from the isolating barrier between the conduit box and the winding compartment. Conduit boxes with an internal free volume of 150 cubic inches or less shall have one test hole for ignition located as close to the geometric center of the conduit box as practical and one for recording of pressure located on a side of the conduit box.

(ii) The conduit box shall be tested separately. Six tests at 9.4 ±0.4 percent methane by volume within the conduit box shall be conducted followed by two tests at 7.0 ±0.3 percent methane by volume. Then two tests at 9.4 ±0.4 percent methane by volume with a quantity of coal dust equal to 0.05 ounces per cubic foot of internal free volume of the conduit box and meeting the specifications in paragraph (c)(3) of this section shall be conducted. For conduit boxes with an internal free volume of more than 150 cubic inches, the number of tests shall be evenly divided between each ignition point.

(iii) The motor assembly shall be tested following removal of the isolating barrier or one sectionalizing terminal (as applicable). Six tests at 9.4 ±0.4 percent methane by volume in the winding compartment and conduit box shall be conducted using three ignition locations. The ignition shall be at one end of the winding compartment for one stationary and one rotating test; the opposite end for one stationary and one rotating test; and at the ignition point that produced the highest pressure on the previous test in paragraph (c)(4)(ii) of this section in the conduit box for one stationary and one rotating test. Motor assemblies that use multiple sectionalizing terminals shall have one test conducted as each additional terminal is removed. Each of these tests shall use the rotor state and ignition location that produced the highest pressure in the previous tests.

(d) A motor assembly incorporating a conduit box that is isolated from the winding compartment that exhibits pressures exceeding 110 psig, while testing during removal of any or all isolating barriers as specified in paragraph (c)(4) of this section, shall have a warning statement on the approval plate. This statement shall warn that the isolating barrier must be maintained to ensure the explosion-proof integrity of the motor assembly. A statement is not required when the motor assembly has withstood a static pressure of twice the maximum pressure recorded in the explosion tests of paragraph (c)(4) of this section. The static pressure test shall be conducted on the motor assembly with all isolating barriers removed, and in accordance with § 7.307 of this part.

(e) *Acceptable performance.* Explosion tests of a motor assembly shall not result in—

(1) Discharge of flames.

(2) Ignition of the explosive mixture surrounding the motor assembly in the chamber.

(3) Development of afterburning.

(4) Rupture of any part of the motor assembly or any panel or divider within the motor assembly.

(5) Clearances, in excess of those specified in this subpart, along accessible flame-arresting paths, following any necessary retightening of fastenings.

(6) Pressure exceeding 110 psig, except as provided in paragraph (d) of this section unless the motor assembly has withstood a static pressure of twice the maximum pressure recorded in the explosion tests of this section following the static pressure test procedures of §7.307 of this part.

(7) Permanent deformation greater than 0.040 inches per linear foot.

§7.307 Static pressure test.

(a) *Test procedure.* (1) The enclosure shall be internally pressurized to a minimum of 150 psig and the pressure maintained for a minimum of 10 seconds.

(2) Following the pressure hold, the pressure shall be removed and the pressurizing agent removed from the enclosure.

(b) *Acceptable performance.* (1) The enclosure during pressurization shall not exhibit—

(i) Leakage through welds or casting; or

(ii) Rupture of any part that affects the explosion-proof integrity of the enclosure.

(2) The enclosure following removal of the pressurizing agent shall not exhibit—

(i) Visible cracks in welds;

(ii) Permanent deformation exceeding 0.040 inches per linear foot; or

(iii) Clearances, in excess of those specified in this subpart, along accessible flame-arresting paths, following any necessary retightening of fastenings.

§7.308 Lockwasher equivalency test.

(a) *Test procedure.* (1) Each test sample shall be an assembly consisting of a fastening with a locking device. Each standard sample shall be an assembly consisting of a fastening with a lockwasher.

(2) Five standard samples and five test samples shall be tested.

(3) Each standard and test sample shall use a new fastening of the same specifications as being used on the motor assembly.

(4) A new tapped hole shall be used for each standard and test sample. The hole shall be of the same specifications as used on the motor assembly.

(5) Each standard and test sample shall be inserted in the tapped hole and continuously and uniformly tightened at a speed not to exceed 30 rpm until the fastening's proof load is achieved. The torquing device shall not contact the locking device or the threaded portion of the fastening.

(6) Each standard and test sample shall be engaged and disengaged for 15 full cycles.

(b) *Acceptable performance.* The minimum torque value required to start removal of the fastening from the installed position (minimum breakway torque) for any cycle of any test sample shall be greater than or equal to the average breakway torque of each removal cycle of every standard sample.

§7.309 Approval marking.

Each approved motor assembly shall be identified by a legible and permanent approval plate inscribed with the assigned MSHA approval number and a warning statement as specified in §7.306(d) of this part. The plate shall be securely attached to the motor assembly in a manner that does not impair any explosion-proof characteristics.

§7.310 Post-approval product audit.

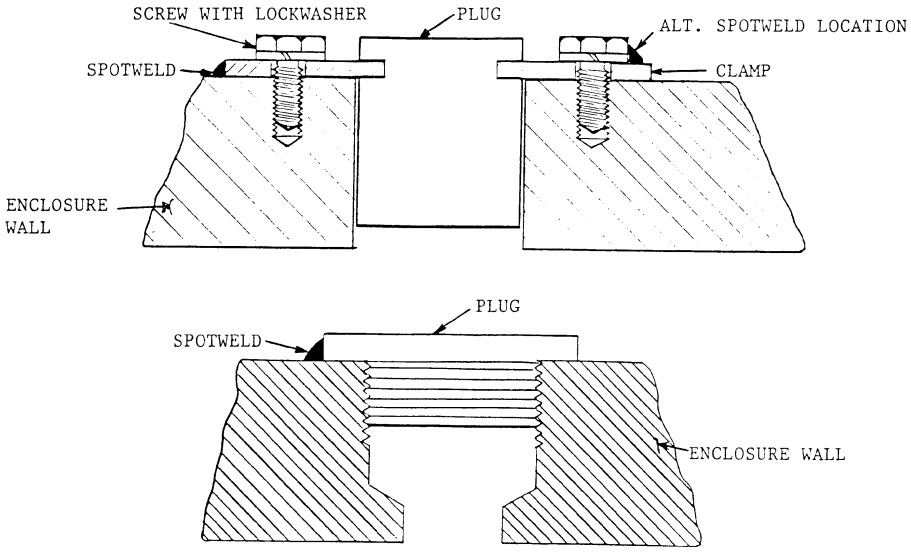
Upon request by MSHA but not more than once a year, except for cause, the approval holder shall make a motor assembly available for audit at no cost.

§7.311 Approval checklist.

Each motor assembly bearing an MSHA approval marking shall be accompanied by a list of items necessary for maintenance of the motor assembly as approved.

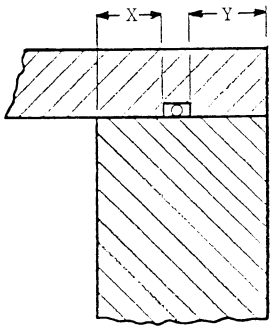
APPENDIX I TO SUBPART J OF PART 7

Appendix I to Subpart J—Figures J–1 through J–14



WELD (OR BRAZE) MAY BE ON PLUG, CLAMP, OR FASTENING

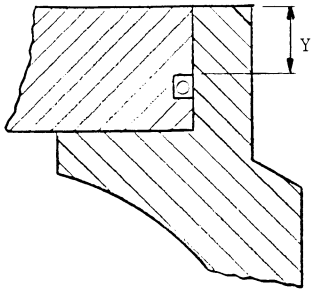
FIGURE J-1



X + Y = MIN. ACCEPTABLE FLAME-ARRESTING PATH LENGTH

$$Y = \frac{X + Y}{2}$$

FIGURE J-2



Y = 1/2" MIN.

FIGURE J-3

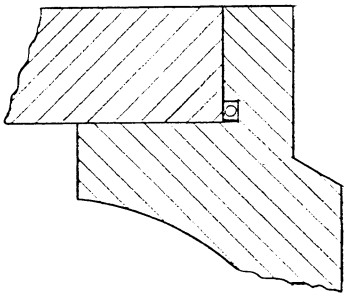
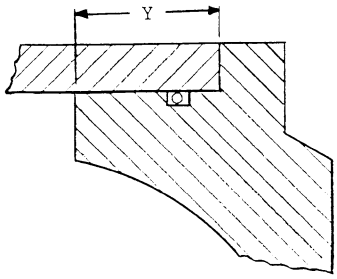
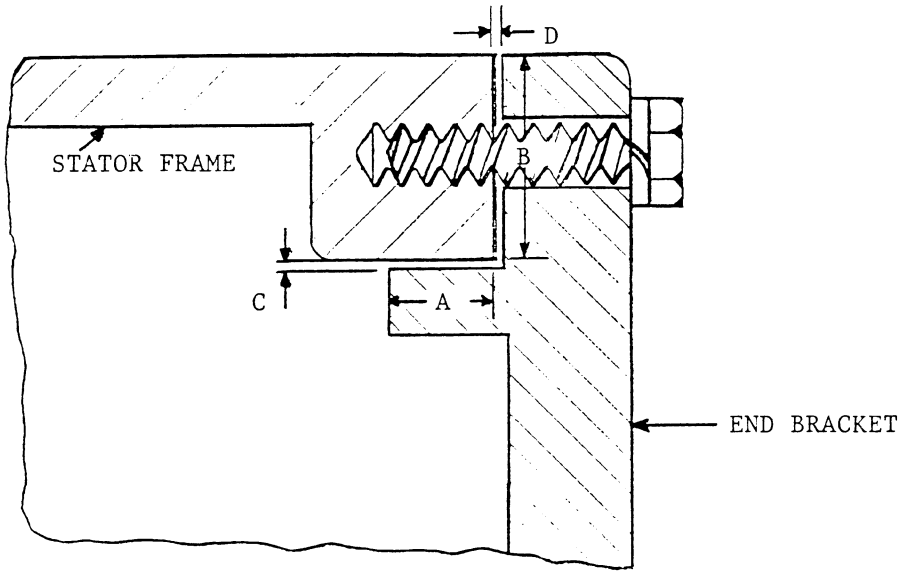


FIGURE J-4



O-RING CAN BE LOCATED ANYWHERE ALONG LENGTH OF (Y).

FIGURE J-5



A = Width of Axial Portion

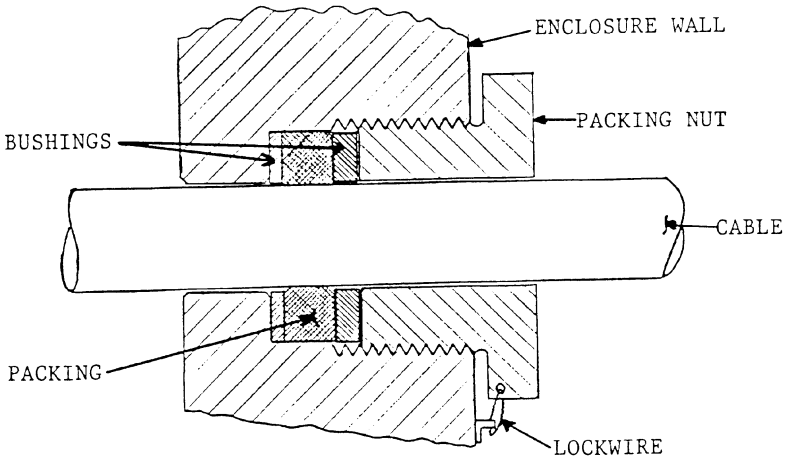
B = Width of Clamped Radial Portion

C = Clearance of Axial Portion

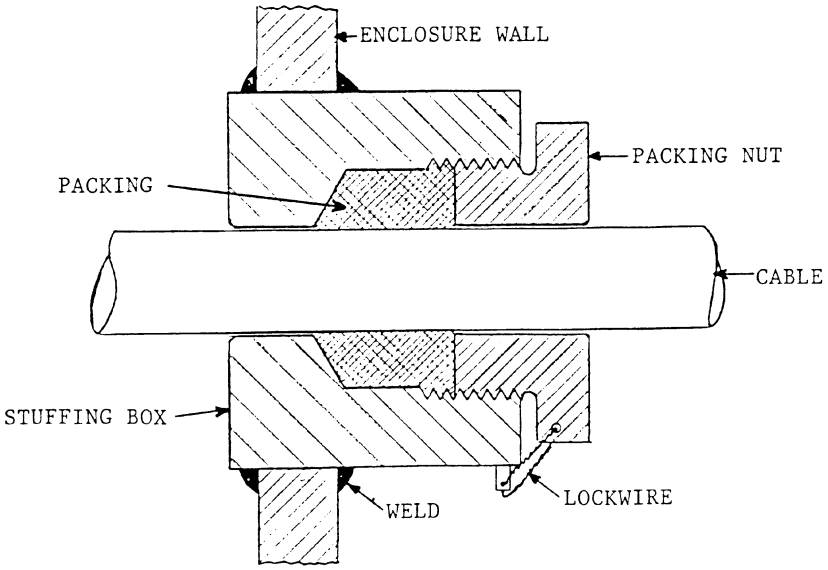
D = Clearance of Radial Portion

Total Width of Flamepath = A + B

FIGURE J-6

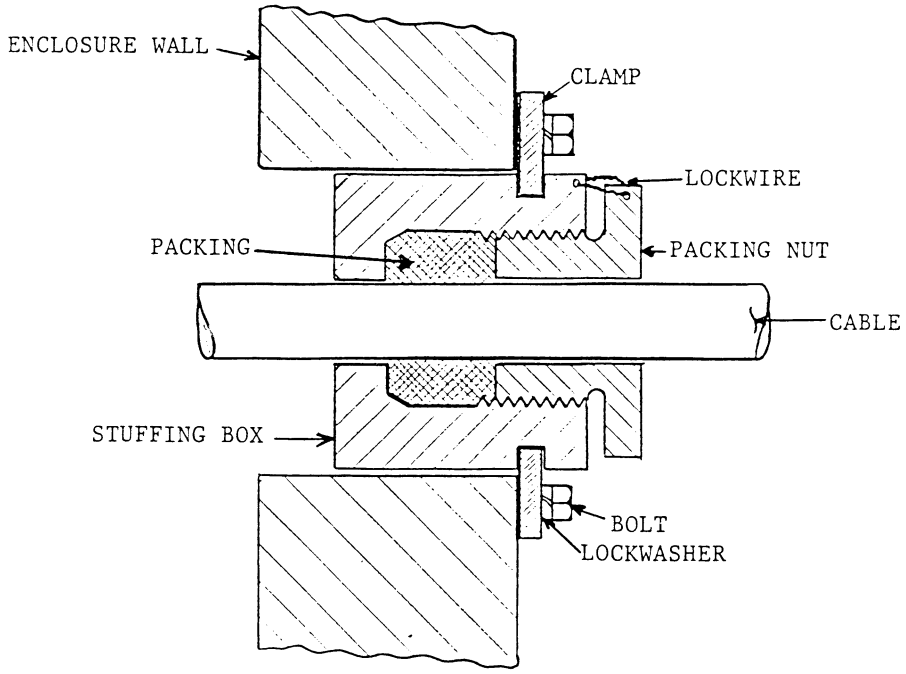


MACHINED-IN STUFFING BOX



WELD-IN STUFFING BOX

FIGURE J-7



SLIP-FIT STUFFING BOX

FIGURE J-7

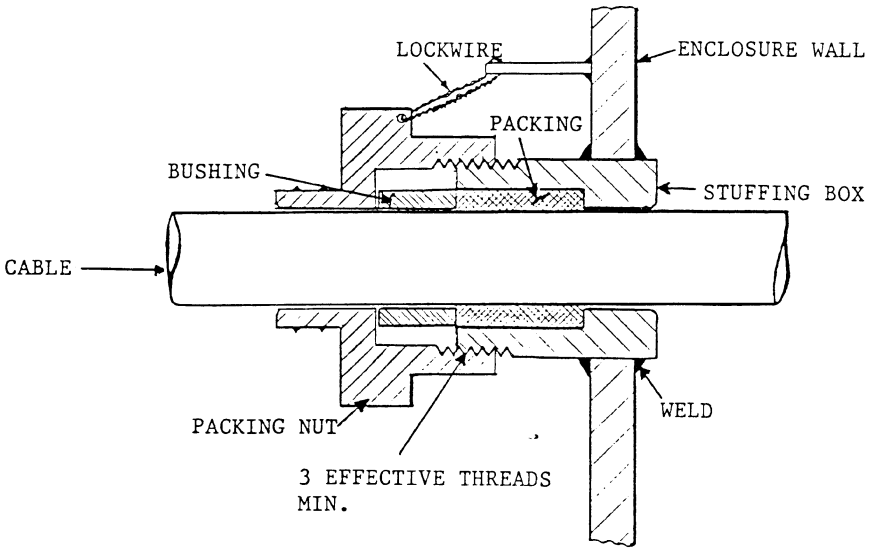


FIGURE J-8

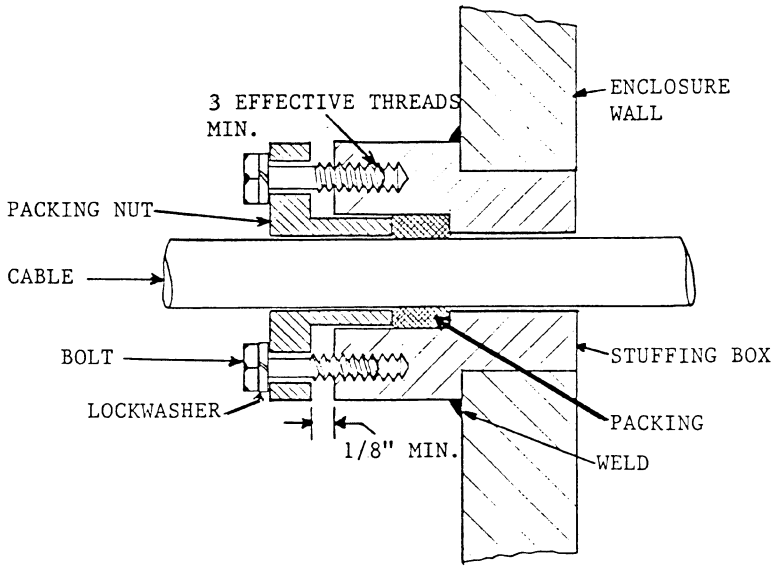


FIGURE J-9

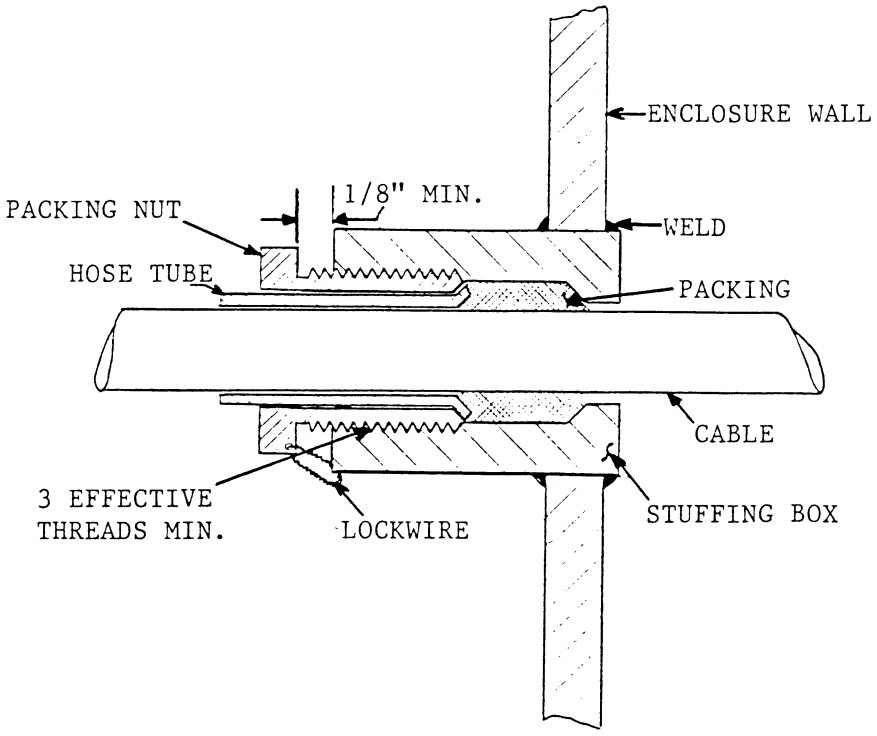

ENCLOSURE WALL
1/8" MIN.
PACKING NUT
WELD
HOSE TUBE
PACKING
CABLE
3 EFFECTIVE
THREADS MIN.
LOCKWIRE
STUFFING BOX

FIGURE J-10

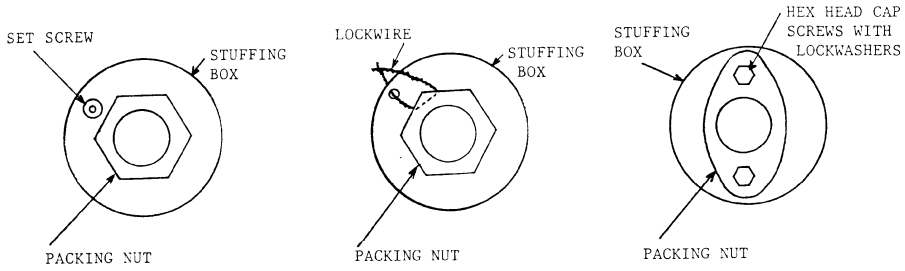
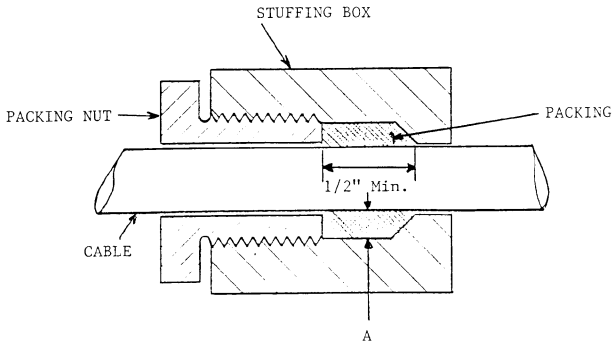
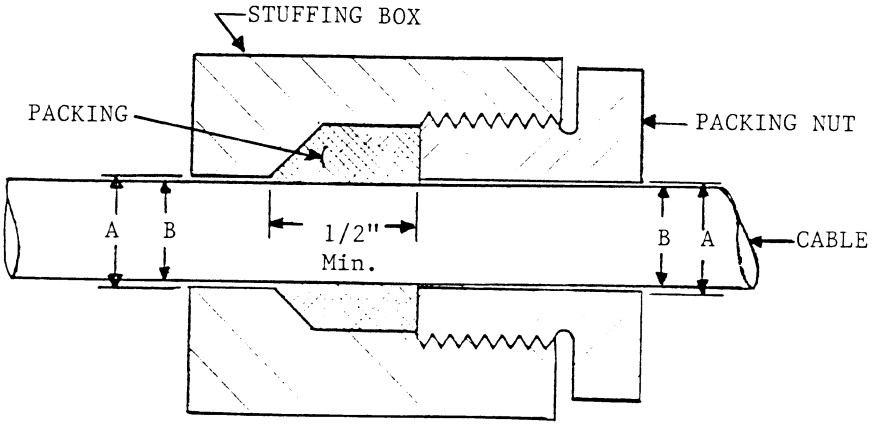


FIGURE J-11



A ≅ 150% of Packing Material Diameter or Width

FIGURE J-12



A - B ≤ 75% of Packing Material Diameter or Width

FIGURE J-13

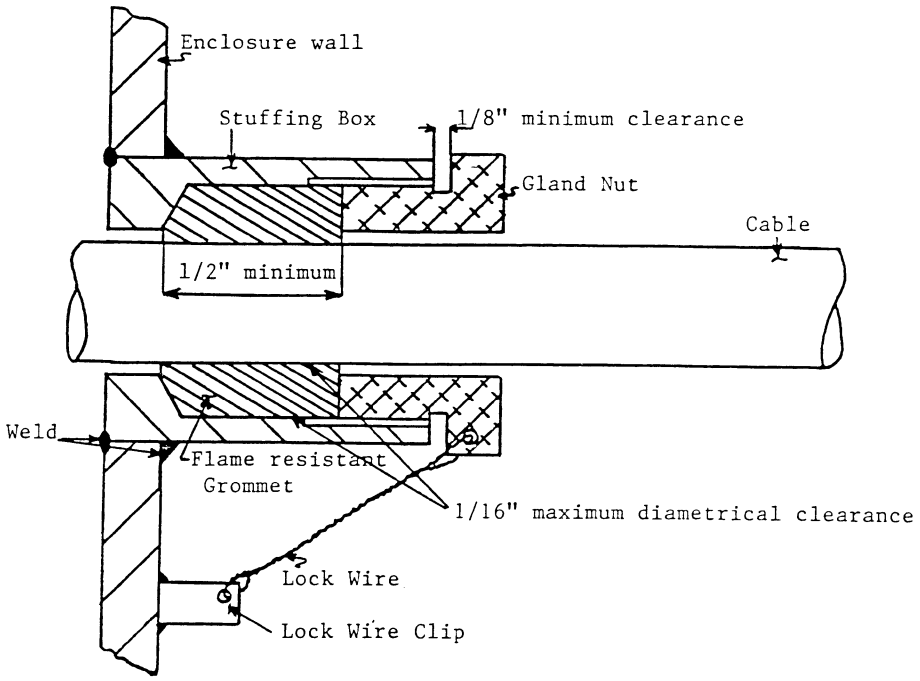

Enclosure wall
Stuffing Box
1/8" minimum clearance
Gland Nut
Cable
1/2" minimum
Weld
Flame resistant
Grommet
1/16" maximum diametrical clearance
Lock Wire
Lock Wire Clip

FIGURE J-14