

ULC Subject C343-1975



GUIDE
FOR
THE INVESTIGATION
OF
PUMPS FOR OIL-BURNING APPLIANCES

UNDERWRITERS' LABORATORIES OF CANADA

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Please Refer to ULC Subject C343-1975

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GENERAL

1. Scope

1.1 These requirements cover pumps that are intended to be used as part of oil-burning appliances or installed in fuel-oil piping systems serving such equipment. Oil-burning appliance pumps are classified as either automatic or power-operated.

1.2 Requirements for the installation and use of oil-burning appliance pumps are included in the Standard for the Installation of Oil-Burning Equipment, NFPA No. 31.

2. General

2.1 A component of a pump for oil-burning appliances shall comply with the requirements for that component, except that such requirements may be modified if appropriate for the particular application.

3. Glossary

3.1 For the purpose of this Guide, the following definitions apply.

3.2 AUTOMATIC PUMPS - Assemblies that automatically pump oil from the supply tank and deliver this oil by gravity under a constant head to an oil-burning appliance and which have automatic means to prevent the abnormal discharge of oil. These pumps are designed for installation at least 1 foot above the top of the supply tank and are arranged to stop pumping automatically in case of total breakage of the oil supply line between the pump and the appliance.

3.3 DIFFERENTIAL PRESSURE - The difference in pressure, as measured in pounds per square inch gauge (psig) at the discharge port, between the value obtained with the pump operating and after shutdown.

3.4 NORMAL OPERATING PRESSURE - The pressure at which the pump is normally operated on the appliance.

3.5 POWER-OPERATED PUMPS - Pumps for use in the assembly of power-operated oil burners, or for use as oil-transfer pumps.

3.6 RATED PRESSURE - The minimum and maximum operating pressures recommended by the manufacturer of the pump.

3.7 REGULATED PRESSURE - The minimum and maximum operating pressures obtainable by adjustment of the pressure-regulating valve.

CONSTRUCTION

4. Assembly

4.1 An automatic pump shall include all the components necessary for its normal function when used as intended.

4.2 A pump in which electrical components are located within a fluid-containing compartment or space is to be subjected to appropriate examination and tests to evaluate the probability of failures likely to create a hazard, giving due consideration to the voltage involved, materials used, construction employed, etc. Contacts or other mechanisms likely to cause an arc within a space containing or likely to contain a hazardous fluid are to be avoided.

4.3 The construction of a pump shall be such that parts can be readily assembled after being dismantled to the extent needed for normal care.



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4.4 Means shall be provided for the purpose of making any necessary field adjustment.

4.5 Screws or bolts used to attach parts which are detached for normal care or servicing of the pump shall be capable of holding the parts upon the application of the torques indicated in Table 1 after removal and replacement.

T A B L E 1
TORQUE REQUIREMENTS FOR SCREWS AND BOLTS

Screw or Bolt size	Torque, Pound-Inches
No. 8	20
No.10	25
1/4 inch	100
5/16 inch	200
3/8 inch	350
7/16 inch	550
1/2 inch	800
9/16 inch	1200
5/8 inch	1600

4.6 The pump shall incorporate a provision for support that is independent of piping, tubing, or conduit that may be connected thereto.

4.7 A brazing material used for joining liquid-confining parts of a pump shall have a melting point (solidus temperature) not less than 1000°F.

5. Materials

5.1 Liquid-confining and operating parts of a pump, other than an automatic pump, shall be made of material having a melting point (solidus temperature) of not less than 950°F and a tensile strength not less than 10,000 psi at 400°F.

5.2 A part in contact with the liquid to be handled by a pump shall be resistant to the action of the liquid.

5.3 A synthetic rubber part shall not show excessive volume change or loss of weight, when considered on the basis of its intended function, following immersion for 70 hours in No.3 Swelling Oil, ASTM D471-68.

5.4 A change in volume of not more than 25 per cent swelling or 1 per cent shrinkage is considered as indicating compliance with Clause 5.3.

5.5 A part made of synthetic rubber which may be affected by aging shall not crack or show visible evidence of deterioration following exposure for 96 hours to oxygen at a pressure of 300 psig, and at a temperature of 158°F.

5.6 Other parts are to be resistant to atmospheric corrosion and attack by the liquid they may normally contact in service if corrosion of such parts may permit external leakage. Ferrous materials of the thickness specified in Table 2 are considered adequate for the preceding when uncoated and when intended for use with the designated liquid.

TABLE 2

MINIMUM THICKNESS FOR UNCOATED
FERROUS MATERIALS

Liquid in Contact with Material	Minimum Thickness	
	Sheet Metal Inch	Castings Inch
Fuel Oils and Kerosene	0.042	1/8

5.7 If corrosion of a ferrous part will interfere with the proper operation of a pump or otherwise be conducive to the introduction of a detrimental condition, the part shall be provided with a protective coating to resist corrosion.

5.8 Cadmium plating shall have a thickness of not less than 0.0003 inch, and zinc plating shall have a thickness of not less than 0.0005 inch except on parts where threads constitute the major portion of the area, in which case, the thickness of the cadmium or zinc plating shall be not less than 0.00015 inch.

5.9 A part made of drawn brass or machined from brass rod shall be capable of withstanding, without cracking, the Mercurous-Nitrate Immersion Test for copper and copper alloys. See Section 32.

5.10 Gaskets used in the assembly of a pump to seal flanged joints shall be impervious to fuel oil. For flat flanges, a plant fibre gasket shall be not more than 1/32 inch thick.

6. Strength of Parts

6.1 Parts of a pump, except mechanical shaft seals and vented tanks, which are subjected to pressure during normal usage shall be constructed to withstand, without bursting, a hydrostatic pressure equivalent to five times the maximum pressure to which the pump may be subjected. See Section 31.

7. Bodies, Covers, and Heads

7.1 An opening threaded for pipe connections shall be threaded in accordance with the Standard for Pipe Threads, ANSI B2.1.

7.2 Care shall be observed to remove webs, shoulders, and other obstructions from the inner ends of internally threaded openings in a body to permit making tight joints.

7.3 Inlet and outlet connections threaded for attachment to pipe shall be constructed so that when a pipe which is threaded two threads beyond standard size is run into the threaded portion of the opening, it will not distort any portion of the body or adversely affect the operation of the pump.

7.4 Male threads for attachment to pipe fittings shall have no shoulder within the distance given in Table 3 from the beginning of the thread, including any chamfer, nor shall any shoulder prevent an additional turn being made within this distance as determined by assembling the pump into a fitting within a tolerance of plus or minus one thread.

7.5 A pump assembly for attachment to pipe larger than 3 inch nominal size shall be provided with flanged pipe connections.

T A B L E 3

SHOULDER DISTANCE FROM BEGINNING OF THREAD

Pipe Size, ANSI B2.1 Nominal Inches	Shoulder Distance Inches
1/8	3/8
1/4, 3/8	9/16
1/2, 3/4	3/4
1	15/16
1-1/4	31/32
1-1/2	1
2	1-1/32
2-1/2	1-33/64
3	1-37/64



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7.6 If warping of a casting can affect the tightness of fluid confining joints or the necessary fit of parts, the casting shall be stress-relieved to reduce the possibility of warping to a minimum.

7.7 The removable head or heads of a pump shall be of a thickness that will prevent warping or distortion and, where necessary, shall be ribbed and constructed with bosses for the installation of bearings and the formation of stuffing box recesses, etc.

7.8 Clean-out and drain openings shall be closed by a standard pipe plug or a threaded shouldered plug. A gasket, if used, shall be retained by the pump body or the plug when the plug is removed.

8. Rotors

8.1 A rotor shall be balanced and securely attached to shafts to prevent loosening. Shafts and rotor assemblies shall be provided with bearings to reduce vibration and other conditions tending to cause unequal wear in the packing of the stuffing box.

9. Shaft Seals and Stuffing Boxes

9.1 If packing is used to prevent leakage around a shaft or stem of a pump part, a stuffing box conforming to Clauses 9.2 through 9.10 shall be used if the design is such that it is necessary for the user to adjust or renew the packing to prevent leakage during normal usage or as wear occurs. A conventional stuffing box design is shown in Figure 1.

9.2 A stuffing box shall be provided with a removable, shouldered, unthreaded follower gland and with a nut, spring take-up, or equivalent means for adjusting the gland to maintain pressure on the packing as wear occurs.

9.3 A stuffing box for an automatically operated valve or a moving shaft shall be constructed to avoid binding of the valve stem or shaft.

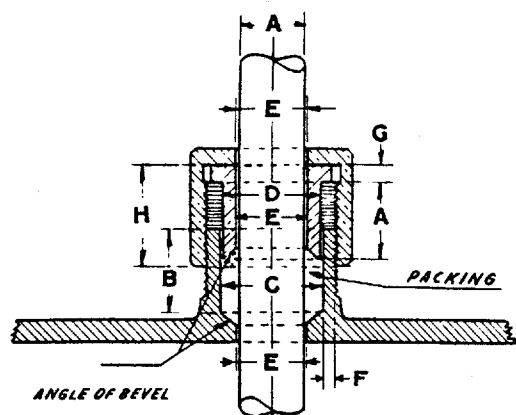
9.4 If an adjustable stuffing box is used to seal an automatically actuated stem of a safety valve or device or the shaft of a pump not normally in plain view, the construction shall be such that any allowable adjustment of the packing take-up will not bind the stem or shaft to prevent the valve or device from functioning automatically, or to cause overloading of a pump. A gland shall be spring loaded.

9.5 An automatic spring take-up for a gland shall employ a spring made of corrosion-resistant material or one coated to retard corrosion.

9.6 The physical characteristics of a take-up spring shall be such that it will advance the gland through not less than one-half its possible travel from its initial setting with the spring compressed.

9.7 At the advanced position of the gland, a take-up spring shall not require further adjustment to prevent leakage from the stuffing box.

F I G U R E 1
CONVENTIONAL STUFFING BOX DESIGN



A	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	Inches
B	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	Inches
C	5/16	13/32	1/2	19/32	11/16	25/32	7/8	31/32	1-1/16	1-5/32	Inches
D	19/64	25/64	31/64	37/64	43/64	49/64	55/64	61/64	1-3/64	1-9/64	Inches
E	13/64	17/64	21/64	25/64	29/64	33/64	37/64	41/64	45/64	49/64	Inches
F	3/32	→									Inches
G	1/16	1/16	5/64	3/32	3/32	1/8	1/8	9/64	9/64	5/32	Inches
H	3/8	7/16	33/64	19/32	21/32	3/4	13/16	57/64	61/64	1-1/32	Inches

NOTE: Thickness of retaining nut and wall of stuffing box at thinnest point shall be not less than 3/32 inch.

9.8 A stuffing box gland shall be made of corrosion-resistant material. The construction of parts shall be such as to result in compressing the packing against the stem or shaft when the stuffing box nut or yoke is tightened.

9.9 Before shipment, a stuffing box shall be fully packed with a material, the impregnation of which is not adversely affected by contact with the liquid for which the pump is intended for use.