UL 448

STANDARD FOR SAFETY

Centrifugal Stationary Pumps for Fire-Protection Service

UL Standard for Safety for Centrifugal Stationary Pumps for Fire-Protection Service, UL 448

Tenth Edition, Dated June 8, 2007

SUMMARY OF TOPICS

These revisions for ANSI/UL 448 are being issued to include the following changes in requirements:

Dimensional Requirements for Pump Flanges and Threaded Connections

Clarification and Updating of Requirements Related to Pump Construction, Performance Testing and Marking

New Nameplate Fastener Material Requirements

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

The requirements are substantially in accordance with Proposal(s) on this subject dated April 19, 2013.

The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

The following table lists the future effective dates with the corresponding reference.

Future Effective Dates	References
January 12, 2015	Paragraphs 24.6 and 28.1

JUNE 8, 2007
(Title Page Reprinted: July 12, 2013)

ANSI/UL 448-2013

UL 448

Standard for Centrifugal Stationary Pumps for Fire-Protection Service

The first edition was titled Centrifugal Fire Pumps. The second edition was titled Pumping Equipment for Private Fire Service. The third through ninth editions were titled Pumps for Fire Protection Service.

First Edition – November, 1942
Second Edition – November, 1956
Third Edition – October, 1967
Fourth Edition – April, 1974
Fifth Edition – November, 1975
Sixth Edition – February, 1980
Seventh Edition – November, 1984
Eighth Edition – September, 1994
Ninth Edition – September, 2004

Tenth Edition

June 8, 2007

This ANSI/UL Standard for Safety consists of the Tenth Edition including revisions through July 12, 2013.

The most recent designation of ANSI/UL 448 as an American National Standard (ANSI) occurred on July 11, 2013. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at http://csds.ul.com.

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INTRODUCTION

1 Scope

1.1 These requirements cover centrifugal fire pumps intended for use in water-supply systems for fire-protection service.

1.2 The pumps covered by these requirements are intended for installation and use in accordance with the Standard for the Installation of Stationary Pumps for Fire Protection, NFPA 20.

2 Components

2.1 Except as indicated in 2.2, a component of a product covered by this standard shall comply with the requirements for that component.

2.2 A component is not required to comply with a specific requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product covered by this standard, or

b) Is superseded by a requirement in this standard.

2.3 A component shall be used in accordance with its rating established for the intended conditions of use.

2.4 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 Undated References

4.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

5 Glossary

5.1 For the purposes of this standard, the following definitions apply.

5.2 CORROSION-RESISTANT MATERIAL – A material having resistance to corrosion equivalent to or exceeding that of a brass, bronze, monel, or Series 300 stainless steel alloy.

5.2.1 PRESSURE, MAXIMUM NET – The maximum net pressure developed by the pump at the rated speed which typically occurs at or near shutoff pressure.

5.2.1 added July 12, 2013

5.3 PRESSURE, MAXIMUM WORKING – For performance tests specified in this standard, the maximum pressure developed at the pump discharge flange under any condition of intended use determined by the sum of the maximum net pressure developed by the pump and the allowed positive suction pressure . For production tests, this value may be lower, based on the conditions imposed by the particular installation for which the pump is constructed. The maximum net pressure and maximum positive suction pressure that are marked on the pump are those that indicate the acceptability of a pump (the limiting pressures) for an installation.

5.4 PRESSURE, NET (TOTAL HEAD):

a) For a split-case, end-suction, or in-line pump, or a vertical-turbine pump in a suction vessel, the algebraic difference in psi (kPa) between pressures measured at the discharge flange and at the suction flange, corrected to the pump centerline and corrected for differences in velocity head at the points of gauge attachment.

b) For a vertical-turbine pump in a sump or well, the pressure measured by a pressure gauge attached just beyond the discharge head, corrected for the velocity head at the point of gauge attachment and for the vertical distance from the pumping water level to the center of the gauge.

5.4 revised July 12, 2013

5.5 PRESSURE, SHUTOFF (CHURN) – The net head developed by a pump at rated speed with no water being delivered (discharge valve closed).

5.6 PUMP, END-SUCTION – A horizontal centrifugal pump characterized by having its suction nozzle on the pump centerline at the opposite side of the casing from the stuffing box and having the face of the suction nozzle perpendicular to the longitudinal axis of the shaft. This type of pump is not intended to be used where a static suction lift is involved.

5.7 PUMP, FIRE – A pump for horizontal or vertical mounting, having rated capacities in accordance with the requirements in the Standard for the Installation of Stationary Pumps for Fire Protection, NFPA 20.

5.8 PUMP, IN-LINE – A centrifugal pump, the drive unit for which is supported solely by the pump, and that is characterized by suction and discharge connections having a common centerline that intersects the shaft axis. This type of pump is not intended to be used where a static suction lift is involved.

5.9 PUMP LOAD – The brake horsepower (kW input) required to drive a pump at rated speed and at the capacity requiring maximum power.

5.10 PUMP, SPLIT-CASE – A centrifugal pump characterized by a housing that is split axial or radial to the shaft, and mounted in the horizontal or vertical position. This type of pump is not intended to be used where a static suction lift is involved.

5.11 PUMP, VERTICAL-TURBINE – A centrifugal pump with one or more impellers discharging into one or more bowls and a vertical eductor or column pipe used to connect the bowls to the discharge head on which the pump driver is mounted. The pump may also be provided with a suction vessel as an integral part. Vertical turbine pumps not provided with suction vessels are intended for installation in sumps or wells.

CONSTRUCTION

ALL PUMPS

6 General

6.1 An end-suction or in-line pump shall be of a single- or two-stage construction. A split-case pump may be of a single-stage or multistage construction. A vertical-turbine pump may have any number of bowls and impellers.

6.2 A split-case, vertical-turbine, end-suction, or in-line pump shall have a rated capacity equal to a value specified in Table 6.1, or greater than 5000 gallons per minute (18925 liters per minute) in 500 gallons per minute (1892 liters per minute) increments.

6.2 revised January 26, 2011

Table 6.1
Pump capacities

Gallons per minute	(Liters per minute)	Gallons per minute	(Liters per minute)
25	(95)	2000	(7570)
50	(189)	2500	(9462)
100	(379)	3000	(11355)
150	(568)	3500	(13247)
200	(757)	4000	(15140)
250	(946)	4500	(17032)
300	(1136)	5000	(18925)
400	(1514)		
450	(1703)		
500	(1892)		
750	(2839)		
1000	(3785)		
1250	(4731)		
1500	(5677)		

6.3 A casting shall be smooth and free from scale, lumps, cracks, blisters, sand holes, and defects of any nature that may affect the use for which it is intended. A casting shall not be plugged or filled, but may be impregnated to remove porosity.

6.4 A bolt, stud, cap screw, or gland swing bolt used to assemble parts subject to stress due to water pressure shall not be less than 3/8 inch (9.5 mm) in diameter.

6.5 An interior bolt or screw that is exposed to pumped fluid shall be of rolled bronze or other corrosion-resistant material.

6.6 The maximum stress on any bolt of a pressure-holding casting shall not exceed one-fourth the elastic limit of the material as computed by using the stress area. The stress area is defined by the equation:

$$A_S = 0.7854\left(D - \frac{0.9743}{n}\right)^2$$

in which:

A_s is the stress area in square inches ($m^2 \times 1550$);

D is the nominal diameter of bolt in inches (mm $\times$ 0.04); and

n is the number of threads per inch (25.4 mm).

The load on the bolts is to be computed on the basis of the water pressure equivalent to the maximum working pressure over the area out to the centerline of the bolts.

6.6 revised July 12, 2013

6.7 The maximum combined shear stress for a pump shaft shall not exceed 30 percent of the elastic limit in tension or be more than 18 percent of the ultimate tensile strength of the shafting steel used. Compliance with this requirement is to be verified by a review of manufacturers' stress calculations.

6.8 The impellers shall be dynamically balanced to the G6.3 balance quality grade in accordance with the requirements for pump impellers in the Standard for Mechanical Vibration – Balance Quality Requirements of Rigid Rotors, Part 1: Specification and Verification of Balance Tolerances, ISO 1940-1.

Exception: The impellers may be statically (single plane) balanced in accordance with ISO 1940-1 if the ratio of the maximum outside diameter to the width at the periphery (including the shroud but not including the back vane) is equal to or greater than 6.

6.9 Flange dimensions and bolt layouts used in pipe connections shall comply with the requirements of one of the following standards:

a) Standard for Cast Iron Pipe Flanges and Flanged Fittings, ANSI/ASME B16.1;

b) Standard for Ductile Iron Pipe Flanges and Flanged Fittings, ANSI/ASME B16.42; or

c) Standard for Pipe Flanges and Flanged Fittings: NPS 1/2 through 24, ANSI/ASME B16.5, when steel is used

Exception: A pump intended for use in installations where the connection piping has national pipe flange dimensions that are different from these standards shall be permitted to be constructed with flanges complying with the national pipe flange standard compatible with connection piping.

6.9 revised July 12, 2013

6.10 A threaded opening used for pipe connection shall comply with the requirements in the Standard for Pipe Threads, General Purpose, ANSI/ASME B1.20.1.

Exception: A pump intended for use in installations where the connected piping has national pipe threads that are different from ANSI/ASME B1.20.1 shall be permitted to be constructed with threads complying with the national pipe thread standard compatible with the connected piping.

6.10 revised July 12, 2013

6.11 A pump shall be provided with the following:

a) Automatic air-release valve (self-venting pumps excluded);

b) Circulation relief valve (except for engine driven pumps for which engine cooling water is taken from the pump discharge) and;

c) Pressure gauges.

6.12 The minimum internal dimensions of the passages at any point in the impeller shall not be less than:

a) 5/16 inch (7.9 mm) for a pump rated 500 gallons per minute (1893 L/min) or less; or

b) 1/2 inch (12.7 mm) for a pump rated more than 500 gallons per minute.

Added 6.12 effective January 26, 2013

SPLIT-CASE, END-SUCTION, AND IN-LINE PUMPS

7 Pump Casings

7.1 The pump casing shall be constructed to permit examination of impellers and other interior parts without disturbing suction or discharge piping. The casing shall include means to facilitate disassembly of the casing, and the stuffing box cover (if provided), without requiring the use of wedges or prying elements, such as by provision of tapped holes for jackscrews.

7.2 The pump shall be provided with feet or with provisions for accommodating feet or a fabricated base support such as bolt holes and a bearing surface for attaching the base to the pump.

7.3 A drain opening shall be provided so that all parts of the pump casing can be drained. The opening shall be threaded to receive a plug that is:

a) Not smaller than 1/2 inch (12.7 mm) nominal pipe size for pumps having rated capacities equal to or greater than 100 gallons per minute and 1/4 inch (6.4 mm) nominal pipe size for pumps having rated capacities less than 100 gallons per minute; and

b) Formed of corrosion-resistant material.

7.3 revised January 26, 2011

8 Impellers, Rings, and Other Internal Components

8.1 A pump shall be provided with case wearing rings that are made of material that will not gall. The rings shall be secured to the case in a manner that does not permit rotational or axial movement. Impeller wearing rings need not be provided.

8.2 Impeller, impeller wearing rings, case wearing rings, shaft sleeves, guide or diffusion vane rings, lantern rings, stuffing-box bottoms, interior nuts, linings of stuffing-box throats, glands, gland nuts, and drain plugs shall be of corrosion-resistant material.

8.2 revised January 26, 2011

8.3 A diffusion vane casting may be protected against corrosion and sticking by bronze-tipping the portion most exposed.

8.4 Deleted January 26, 2013

8.5 The radial clearance between a stationary and moving part of a pump shall not be less than 0.0075 inch (0.191 mm).

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8.6 The impellers shall be secured in an axial direction, permitting no contact with the casing under operating conditions.

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8.7 The impellers shall be of the closed type; that is, they shall incorporate shrouds or sidewalls that completely enclose the impeller waterways from the suction eye to the periphery.

9 Sleeve Bearings

9.1 The main shaft bearings shall be proportioned so that the stress on the projected area of any bearing will not be more than 20 psi (138 kPa).

9.2 Each bearing shall be of the removable-shell type. Each shell shall be lined throughout. The finished bearing shall not be less than 1/4 inch (6.4 mm) thick.

9.3 The removable shells shall be accurately machined to uniform cylindrical fits and shall be interchangeable.

9.4 Oil grooves that lubricate the entire bearing shall be provided.

9.5 Each bearing shall be provided with a ring or endless-chain oiler, its lower part running in an oil-filled chamber cast under the bearings. This chamber shall be provided with a 1/2 inch (12.7 mm) nominal pipe size drain hole fitted with a brass plug.

9.6 Each bearing cap shall be provided with a hinged lid large enough to permit application of oil and inspection of the bearing.

9.7 Water slingers of corrosion-resistant material shall be provided to seal the bearings at their inner ends. Dust caps shall be provided to seal the bearings at their outer ends.

10 Ball and Roller Bearings

10.1 Ball and roller bearings shall have an L-10 rating of not less than 5000 hours at maximum load (maximum hydraulic load on the largest impeller operated at any point on its rated speed curve) in accordance with the Standard for Load Ratings and Fatigue Life for Ball Bearings, ANSI/ABMA 9, and Load Ratings and Fatigue Life for Roller Bearings, ANSI/ABMA 11, respectively.

10.2 With reference to 10.1, the L-10 rating in hours is to be calculated from the L-10 rating in revolutions based on the following equation:

$L_h = (L_{10} \times 10^6) / (N \times 60)$

in which:

$$L_{10} = \frac{C^3}{P^3} = \frac{C^3}{(XF_r + YF_a)^3} \quad (Ball)$$

$$L_{10} = \frac{C^{10/3}}{P^{10/3}} = \frac{C^{10/3}}{(XF_r + YF_a)^{10/3}} \quad (Roller)$$

where:

L_h is the L-10 rating in hours;

L_{10} is the L-10 rating in millions of revolutions;

N is the rated speed in revolutions per minute;

C is the dynamic load rating of bearing in pounds-force;

P is the combined force on bearing in pounds;

X is the radial load factor of bearing;

F_r is the radial load on bearing in pounds-force;

Y is the axial load factor of bearing; and

F_a is the axial load on bearing in pounds-force.

10.2 revised January 30, 2008

10.3 If a pump utilizes the shaft bearings of the driver to carry the axial and radial forces of the impellers, compliance with the requirements in 10.1 and 10.2 is to be verified by a review of bearing life calculations for the driver based on the maximum loads applied by the pump.

10.4 The bearing assembly on one end of a split-case-pump shaft shall be arranged to float axially. Two bearing assemblies shall be provided for an end-suction pump; one that is free to float within the frame to carry radial forces, and the other arranged to carry both radial and axial thrust. The bearings shall be lubricated with grease.

10.5 Grease lubricated bearing housings shall be equipped with a tapped opening, with a plug or with a grease fitting, and a relief hole.

Exception: Bearings constructed such that additional lubrication is not necessary shall not require grease fitting or relief hole.

10.6 Bearings and their races shall be hardened throughout. Case-hardened material is not acceptable.

10.7 Means, such as water slingers and dust caps, shall be provided to limit the entrance of water or foreign matter to the bearings.

11 Shaft Seals

11.1 The pump shall be provided with stuffing box(es) and packing. A stuffing box shall have a depth of at least five times the width of the packing ring plus lantern ring. A lantern ring shall be permitted to replace one ring of packing, but at least four packing rings shall be provided when a lantern ring is installed. The glands shall exert a uniform pressure on the packing. The stuffing box on the suction end of a pump shall be water-sealed at a suction pressure of 30 psi (207 kPa) or less. A stuffing box bottom ring, if used, shall be of a corrosion-resistant material. Shafts shall be provided with corrosion resistant sleeves.

Revised 11.1 effective January 26, 2013

11.2 Packing shall not be utilized as bearing supports for the shaft.

VERTICAL-TURBINE PUMPS

12 Pump Discharge Heads

12.1 The pump discharge head shall be either the aboveground-discharge or the underground-discharge type.

12.2 The discharge head shall be constructed to support and align the driver and the pump column. A separate combination pump-mounting plate and drive-support stand shall be furnished with the underground type.

13 Pump Columns

13.1 The column for a pump shall be:

a) Furnished in sections not exceeding a nominal length of 10 feet (3.05 m);

b) Of steel pipe complying with Table 13.1 or other pipe having equivalent strength and durability; and

c) Connected by threaded-sleeve type couplings or flanges. The ends of each section of threaded pipe shall be faced parallel and machined with threads to permit the ends to butt so as to form accurate alignment of the pump column. All column flange faces shall be parallel and machined for rabbet fit to permit accurate alignment.

Table 13.1
Pump column pipe weight

Nominal size (inside diameter)	Outside diameter		Weight (plain ends)	
inches[a]	inches	(mm)	pounds/foot	(kg/m)
6	6.625	(168.28)	18.97	(28.23)
8	8.625	(219.08)	24.70	(36.76)
9	9.625	(244.48)	28.33	(42.16)
10	10.750	(273.05)	31.20	(46.43)
12	12.750	(323.85)	43.77	(65.14)
14[b]	14.000	(355.60)	54.57	(81.21)

[a] ANSI B36 and B125 Series Specifications.
[b] Outside diameter.

14 Suction Vessels

14.1 The suction vessel shall have structural strength and rigidity acceptable for the application. The wall thickness shall not be less than that of:

a) Schedule 40 steel pipe or the equivalent if less than 8 inches (203 mm) in diameter; and

b) Schedule 30 steel pipe or the equivalent if 8 inches or more in diameter.

15 Bowl Assemblies

15.1 A pump bowl shall be provided with corrosion-resistant wearing rings that are made of material that will not gall. The rings shall be secured to the bowl in a manner that does not permit rotational or axial movement. Bowl bearings shall be made of rubber, bronze, or corrosion resistant material acceptable for the specific installation.

16 Impellers

16.1 An impeller shall be:

a) Made of corrosion-resistant material; and

b) Of the closed type.

16.2 An impeller shall be securely fastened to the impeller shaft.

17 Impeller Shafts

17.1 The impeller shafts shall be monel metal, stainless steel alloy (AISI Type 416 or the equivalent), or material having equivalent strength, rigidity, and resistance to corrosion.

18 Line Shafts

18.1 The line shaft of a water-lubricated type pump (open line shaft) shall be stainless steel alloy (AISI Type 416 or the equivalent) or of steel with corrosion-resistant shaft sleeves at bearings and at stuffing boxes.

18.2 The line shaft of an oil-lubricated type pump (enclosed-line shaft) shall be of steel or material having equivalent strength and rigidity.

19 Line-Shaft Couplings

19.1 The line-shaft sections of smaller diameter shall be connected by threaded couplings made of materials similar to those of the line shafts with which they are to be used. The threads shall be of the nontapered type. On shaft diameters larger than two and a half inches, a coupling connection built to accommodate keys to transmit torque and split thrust rings or other means to transmit thrust shall be permitted to be used.

20 Line-Shaft Bearings

20.1 Water-lubricated line-shaft bearings shall be of rubber or neoprene material housed in a spider and spaced no more than 10 feet (3.05 m) apart. The spider legs shall be streamlined to offer minimal resistance to the flow of water through the supporting column.

20.1 revised July 12, 2013

20.2 Oil-lubricated line-shaft bearings, for the enclosed-line shaft, shall be of corrosion-resistant material.

21 Shaft-Enclosing Tubing

21.1 For a pump of the enclosed-line, shaft oil-lubricated type, the shaft-enclosing tube shall be furnished in interchangeable sections of Schedule 80 (ASME B36.10) or heavier pipe not more than 10 feet (3.05 m) long with bearings spaced a maximum of 5 feet (1.5 m).

22 Oil Lubricating Means for Enclosed Shafts

22.1 For oil-lubricated type pump, an automatic sight-feed oiler, and electrically operated valve energized from the driver circuit shall be provided on a mounting bracket with connection to the shaft tube.

23 Suction Strainers

23.1 The suction bell or tail pipe of a pump shall be provided with a cast or fabricated, corrosion-resistant, cone- or basket-type suction strainer. The strainer shall have a free open area equal to at least four times the minimum cross-sectional area of the inlet opening to the first stage of the pump. The openings of the strainer shall not permit the passage of a:

a) 5/16-inch (7.9-mm) or larger sphere for a pump rated 500 gallons per minute (1892 L/min) or less; or

b) 1/2-inch (12.7-mm) or larger sphere for a pump rated more than 500 gpm.

PERFORMANCE

24 Operation Test

24.1 A pump shall have a rated capacity as specified in 6.2 and shall have rated net pressures of 40 psi (276 kPa) or higher. More than one capacity-pressure rating may be developed for any pump. For each rated capacity, a pump shall develop not less than the rated total head as defined in 5.4.

24.1 revised July 12, 2013

24.2 A pump shall develop not less than 65 percent of rated total head when discharging at 1-1/2 times rated capacity.

24.3 The maximum net pressure for a fire pump shall not exceed 140 percent of rated head.

24.4 For the tests described in 24.5 – 24.9, the applicable Level 1U test tolerances as specified in the American National Standard for Rotodynamic Pumps for Hydraulic Performance Acceptance Tests, ANSI/HI 14.6-2011 are to be utilized. The operation test shall be permitted to be conducted at a speed within ±10 percent of the rated speed, and the performance curves for the exact rated speed determined by means of affinity relationships.

24.4 revised July 12, 2013

24.5 The pump is to be subjected to an operation test at rated speed. Performance curves are to be plotted showing the efficiency, brake-horsepower (kW), and total head developed at shutoff, at rated capacity, at 150 percent of rated capacity, and at selected intermediate capacities between shutoff and maximum capacities exceeding 150 percent of rated capacity.

24.6 A pump intended for a range of rated net pressures is to be tested with the minimum and maximum diameter impellers to demonstrate the ability of the pump to produce the minimum and maximum net pressures, and any pressure within the specified range for the pump model or type designation.

Revised 24.6 effective January 12, 2015

24.7 A vertical-turbine pump is to be tested with the least amount of submergence and the maximum bearing span intended for installation.

24.8 A test is to be conducted with a positive suction pressure sufficient to achieve the maximum brake-horsepower (kW input) required by the pump. This will be characterized by a leveling or gradual decline in the brake-horsepower (kW output) curve when plotted against increasing flow.

24.9 A split-case, end-suction, or in-line pump, or a vertical-turbine pump provided with a suction vessel, is to be tested at rated capacity and 150 percent of rated capacity with a water vacuum of 15 feet (4.57 m) at the pump suction flange (manometer location corrected to datum) at sea level and reduced by 0.001 feet (0.3 mm) for each foot (0.3 m) of elevation above sea level.

24.9 revised July 12, 2013

25 Endurance Test

25.1 A split-case pump with the shaft in the vertical position shall be subjected to an endurance test for 24 hours at maximum rated speed and rated capacity using the largest diameter impeller. During this test, the bearings shall not exhibit wear as indicated by an increase in horsepower required by the pump. Also, the lower bearings shall remain free of water during the endurance test and in the nonoperating condition.

26 Hydrostatic Strength Tests

26.1 The pump casing and discharge castings of a split-case, end-suction, or in-line pump, the pump bowls, and the discharge heads of a vertical turbine pump, shall withstand for 1 minute without rupture a hydrostatic pressure of twice the maximum working pressure or 400 psi (2758 kPa), whichever is greater. For a vertical turbine pump, the bowls tested are to include discharge bowls and intermediate bowls.

26.2 The suction vessel of a vertical-turbine pump shall withstand for 1 minute, without rupture, a hydrostatic pressure of four times the rated maximum suction pressure or 400 psi (2758 kPa), whichever is greater.

MANUFACTURING AND PRODUCTION TESTS

27 General

27.1 To verify compliance with these requirements in production, the manufacturer shall provide the necessary production control, inspection, and tests. The program shall include at least the following:

a) Each pump is to be subjected to the tests specified in 24.5, and shall comply with the applicable requirements in 24.1 – 24.4. For a vertical turbine pump provided with a suction vessel, the suction vessel is to be included in the test.

b) Each pump is to be tested hydrostatically for not less than 5 minutes. The test pressure is to be not less than 1-1/2 times the maximum working pressure of the pump, but in no case less than 250 psi (1724 kPa). There shall be no rupture or leakage through the castings at the test pressure. For a vertical turbine pump, both the discharge head and pump's bowls are to be tested. The suction vessel of a vertical-turbine pump is to be tested at twice the rated maximum suction pressure of the pump.

c) The impeller(s) of each pump shall be balanced in accordance with the requirement in 6.8.

d) Records are to be maintained of all tests conducted.

MARKING

28 General

28.1 Each pump shall be provided with a nameplate of corrosion-resistant metal that is securely attached to the pump and visible after installation. Fasteners used to attach the nameplate to the pump shall be constructed of a corrosion resistant material. Attachment of the nameplate to a steel base is not acceptable.

Revised 28.1 effective January 12, 2015

28.2 The nameplate shall have a surface area equal to or greater than 12 square inches (77.4 cm^2). The letters on the nameplate shall be at least 3/32 inch (2.4 mm) high, and shall be stamped or etched at least 0.005 inch (0.13 mm) deep.

28.3 The nameplate shall include the following information:

a) Manufacturer's or private labeler's name or identifying symbol;

b) Capacity of pump,____gallons per minute at ____pounds per square inch (rated net pressure), or ___ liters per minute at ___ kPa (rated net pressure);

c) Rated speed;

d) Model or type designation;

e) Serial number;

f) Shutoff pressure or the maximum net pressure if this pressure is higher than shutoff pressure (psi or kPa);

g) Net pressure at 150 percent rated capacity (psi or kPa);

h) Number of stages;

i) Impeller diameter;

j) Maximum brake-horsepower required at rated speed at any capacity condition;

k) Maximum positive suction pressure (psi or kPa) for pumps intended to be connected to suction piping; and

l) For a vertical turbine pump intended for installation in a sump or well, the minimum submergence (inches or centimeters).

28.3 revised July 12, 2013

28.4 A directional arrow shall appear on each pump, indicating the direction of rotation.

28.5 If a manufacturer produces fire pumps at more than one factory, each pump shall have a distinctive marking to identify it as the product of a particular factory.

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Superseded requirements for the Standard for Centrifugal Stationary Pumps for Fire-Protection Service

UL 448, Tenth Edition

The requirements shown are the current requirements that have been superseded by requirements in revisions issued for this Standard. To retain the current requirements, do not discard the following requirements until the future effective dates are reached.

24.6 A pump intended for a range of rated net pressures is to be tested with impellers of different diameters to produce the minimum and maximum net pressures.

28.1 Each pump shall be provided with a nameplate of corrosion-resistant metal that is securely attached to the pump and visible after installation. Attachment of the nameplate to a steel base is not acceptable.

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