



**PEERLESS
PUMP**



NFPA 20
What makes this a fire pump?

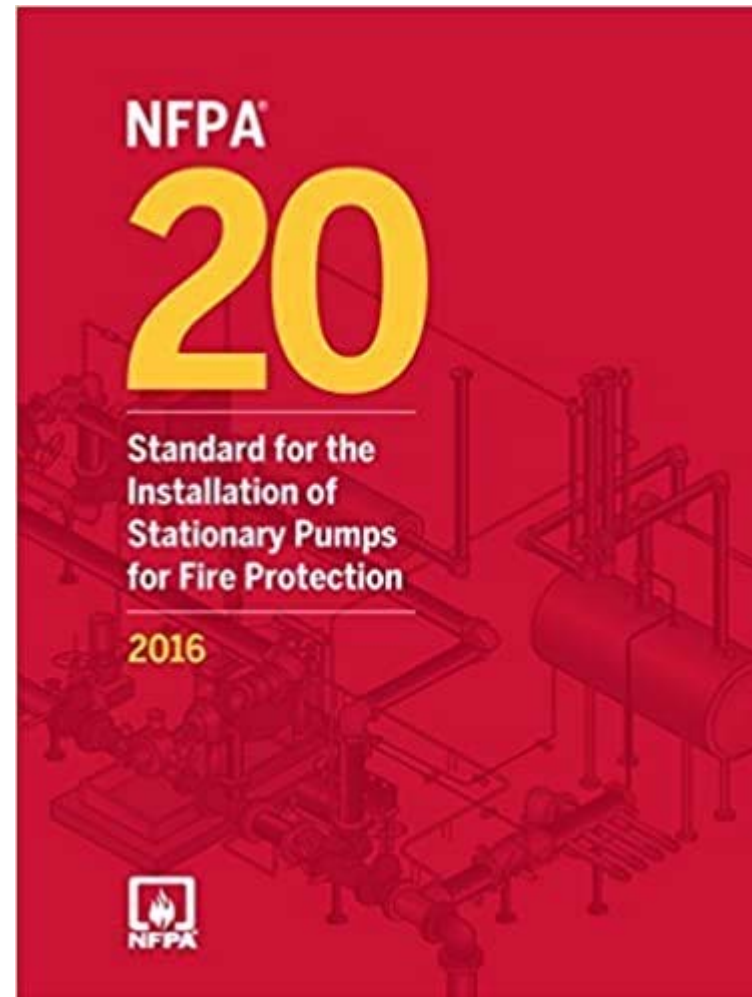
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Unequaled | Unrivaled | Performance

What Makes a Pump a Fire Pump



NFPA 20



Origin and Development



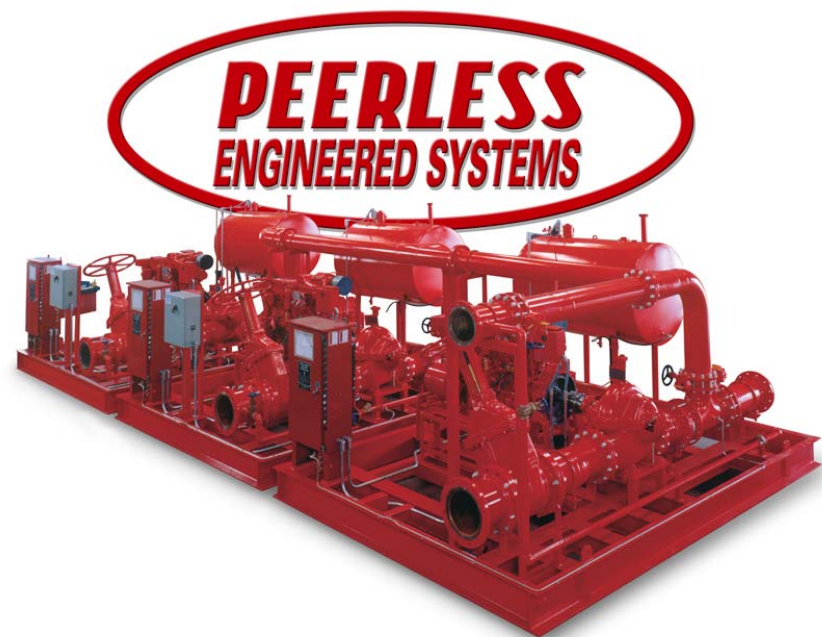
- 1896 – The first National Fire Protection Association Standard is published.
- 1899 – The Committee on Fire Pumps was formed with 5 members from underwriters associations.
- Early Fire Pumps were only secondary supplies for sprinklers, standpipes and hydrants and were started manually.
- Eventually the advent of centrifugal pumps caused the addition of horizontal Shaft pumps and Positive suction designs.





Origin and Development

- Later VTP were added to pull water from below ground services and meet intent of the code.
- Gasoline engine – driven pumps first appeared in this standard in 1913
- Fire Protection now calls for larger pumps, higher pressures and more varied units for a wide range of systems protecting both life and property.





Technical Committee on Fire Pumps

Gayle Pennel, Chair
Aon Risk Solutions, IL [I]

Michael E. Aaron, The RJA Group, Inc., IL [SE]
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Thomas R. Bocce, The DuPont Company, Inc., DE [U]
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Timothy S. Annon, Peerless Pump Company, NY [M]

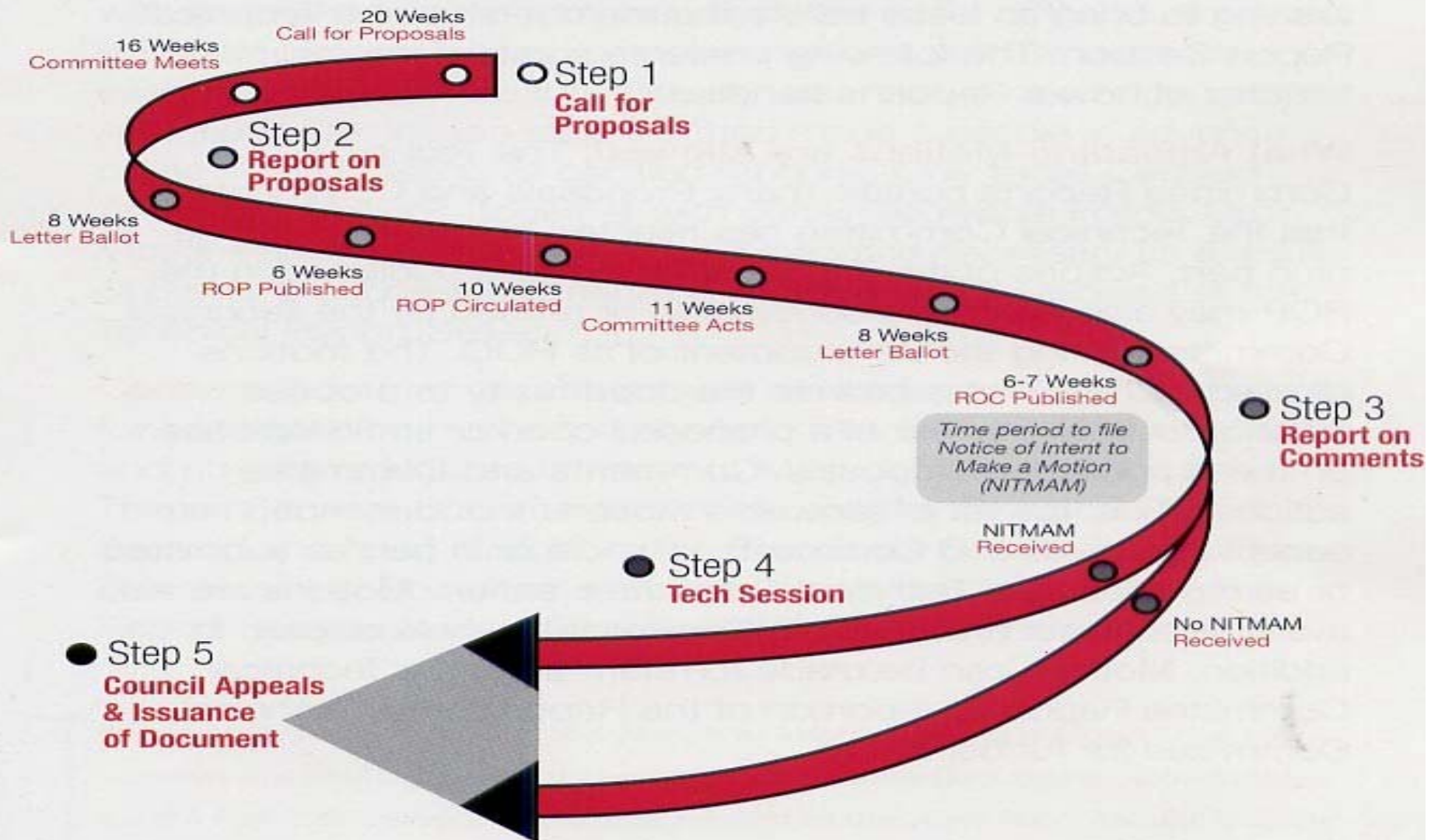
Alternates

Timothy Ballengee, Peerless Pump Company, NC [M]
(Alt. to T. S. Killion)

Bradford T. Cronin, Newport Fire Department, RI [E]
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Codes and Standards Making Process



NFPA-20

- Does not specify when or if a fire pump must be installed
- Specifies: How, Components, Equipment, Power Source are acceptable to use
- Provides the minimum requirements needed for satisfactory operation of listed fire pumps
- NFPA 20 provide requirements for every type of listed fire pump
 - Most common is centrifugal
- Does NFPA list pumps?

NO

Equivalency

- 1.5 – 1.5.2
 - NFPA 20 is not intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed in this standard.
- AHJ has the final call

NFPA 20 Terms

- **Shall**
 - **Mandatory requirement**

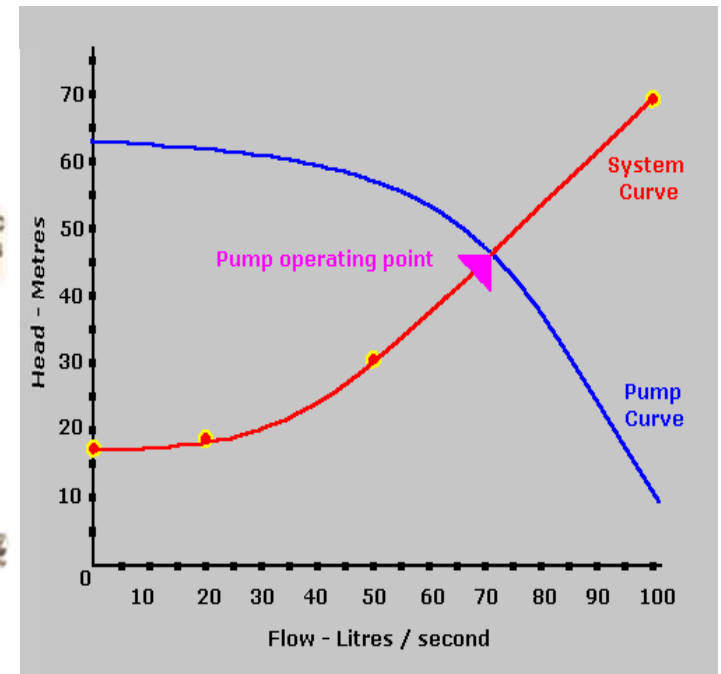
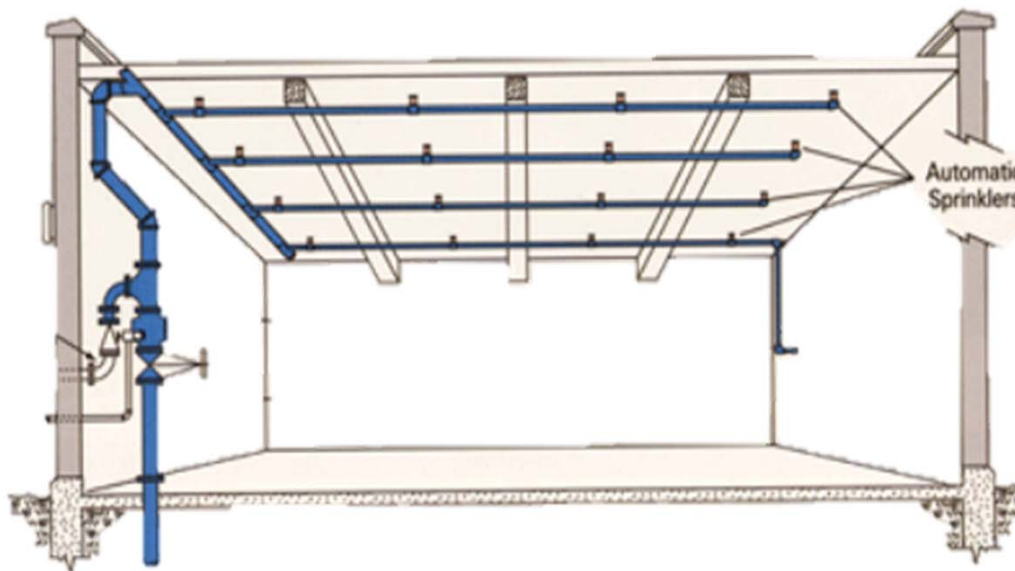
7.3.4.1 – A cast or heavy fabricated, corrosion resistant metal cone or basket type strainer SHALL be attached to the suction manifold of the pump.
- **Should**
 - **Indicates a recommendation that is advised but not required**

A.4.13.6 – The exterior of the aboveground steel piping SHOULD be kept painted.



What Makes a Pump a **Fire Pump**

- 4.2.1 Stationary pumps shall be selected based on the conditions under which they are to be installed and used
 - Capacities are based on calculated system demand, and pressures are based on available pressure from the water supply



Performance

What Makes a Pump a Fire Pump

- 4.2.2 The pumps manufacturer or its authorized representative shall be given complete information concerning the liquid and power supply characteristics.

Request for quotation GRUNDFOS

Project Name	Destination	End User	No. Of Fire pumps	Dead line Date	Date	Revision
			1	24-May-14	21-May-14	00

Peerless YTE

Type of fluid	
Duty Flow	Check unit
Rated Flow [US GPM]	Check unit
Duty Head	Check unit
Standard materials	
UL listed Materials	
FM Approved Materials	
Special Materials	FM UL
Impeller	
Bowl	
Head	
Column	
Shaft	
Freight terms	

LABEL: A used A/FH used AC used Fire Service Only

DRIVER TYPE: Diesel Electric ACCESSORIES TO: Other Panel Full tank Jockey

Electric Drive		Diesel Drive	
Max Motor Rpm (if required)		Diesel Engine rpm (for bare shaft only)	
Voltage		FM Label on gear	
Cycle		Marine package on gear	
Phase		Panel Enclosure	
Motor Enclosure		Preheaters Voltage	
Starting Method		Jockey pump	
Panel Enclosure		Jockey pump duty point	
Jockey pump			
Jockey pump duty point			

Notes - Special Requirements on motor

Notes - Special Requirements on diesel

Specials:

Fire hose size Suction pressure gauge Full tank package Main tank valve One inlet valve Flow meter Side Panel

Revision	Description
01	
02	
03	

Request for quotation GRUNDFOS

Project Name	Destination	No. Of Fire pumps	Dead line Date	Date	Revision
		1	24-May-14	21-May-14	00

Peerless Horizontal Fire Pump

Type of fluid	
Duty Flow	Check unit
Rated Flow [US GPM]	Check unit
Duty Head	Check unit
Standard materials	
UL listed Materials	
FM Approved Materials	
Special Materials	FM UL
Castings	
Impeller	
Shaft	
Shaft sleeves	
<i>Special materials only on selected Split Case</i>	
Freight terms	

LABEL: A used A/FH used AC used Fire Service Only

DRIVER TYPE: Diesel Electric ACCESSORIES TO QUOTE: Other Panel Full tank Jockey

Electric Drive		Diesel Drive	
Max Motor Rpm (if specified)		Diesel Engine rpm (to be specified for bare shaft only)	
Voltage		Panel Enclosure	
Cycle		Preheaters Voltage	
Phase		Jockey pump	
Motor Enclosure		Jockey pump duty point	
Starting Method			
Panel Enclosure			
Jockey pump			
Jockey pump duty point			

Notes - Special Requirements on motor

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Specials:

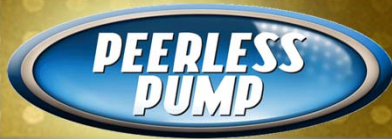
Fire hose size Suction pressure gauge Full tank package Main tank valve One inlet valve Flow meter

Revision	Description
01	
02	
03	

Performance and Responsibility

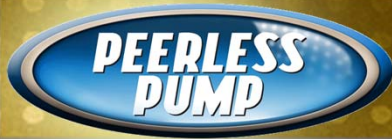
- 4.4.1 Fire Pump Unit Performance
 - Pump, driver, controls shall perform in compliance with this standard...
- A.4.4.1 Unit Responsibility
 - Typically falls on the pump manufacturer
 - *SHOULD* was used not *Shall*
 - Recommendation, having unit responsibility helps ensure that all components are compatible





FM Requirements

- FM 3-7N – Paragraph 1-6 from FM Global Property Loss Prevention
 - The pump manufacturer shall be responsible for:
 1. furnishing the complete unit consisting of pump, driver, controller, transfer switch equipment and all necessary accessories
 2. ensuring proper installation and performance during pumps acceptance test
 3. resolving all problems that may arise during installation and/or acceptance tests.
 4. Any sale or transfer of design, packaging or delivery of the unit does not relieve the pump manufacturer of its responsibility. If a pump physically leaves the manufacturer's facility with the FM approval mark, it is implicit that any third party receiving the unit is an authorized representative of the pump manufacturer, and the pump manufacturer and the authorized representative shall assume the responsibilities described above .



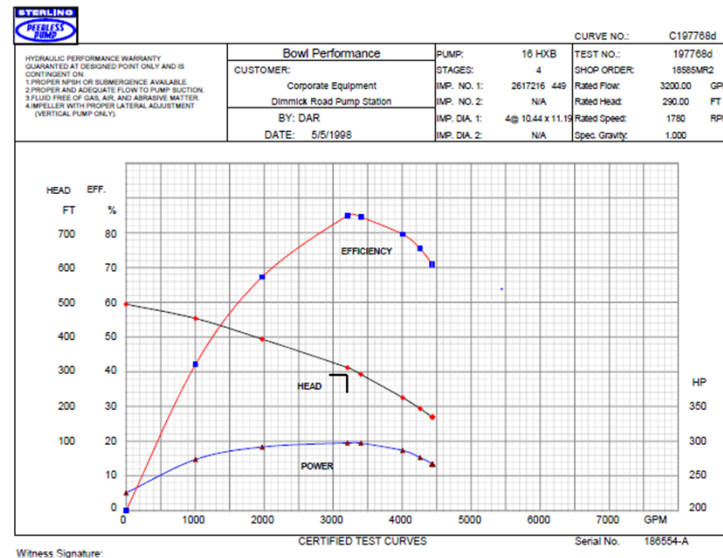
FM Requirements

FM Packagers

- FM 1311 and 1312
 - In the event that an Approved pump manufacturer chooses to have another company package their pumps as FM Approved, that company should be audited and receive an Approval certification from FM for packaging the pump with the driver, controller and other accessories. This is what is meant by the “Authorized Representative” in the pump standards.

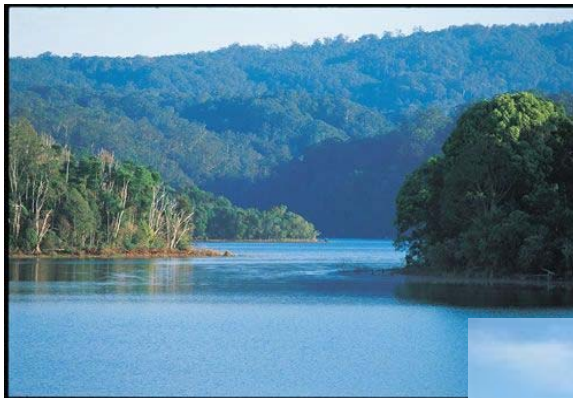
Performance and Responsibility

- 4.5 Certified Shop Test
 - Needs to be furnished from the pump manufacturer to the purchaser, and must include head capacity and BHP
 - Why?
 - To verify that the fire pump was tested by the manufacturer prior to shipment and met the conditions.



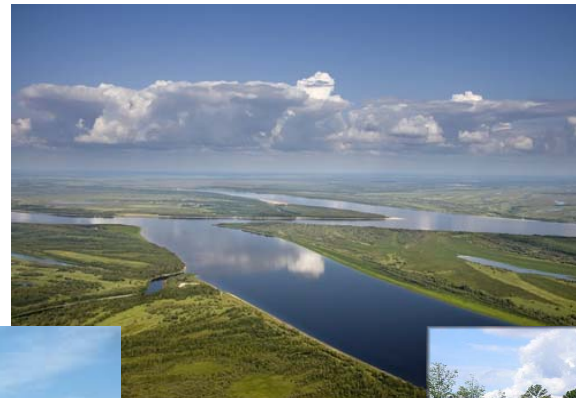
Adequate Water Supply

- 4.6.2 Sources
 - 4.6.2.1 Any source of water that is adequate in quality and quantity and pressure shall be permitted...



Lakes

Ocean



Rivers

Ponds





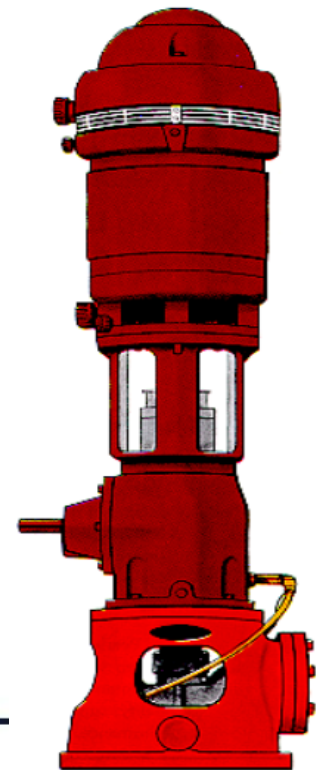
Adequate Water Supply

- 4.6.5 Head
 - The Head available from a water supply shall be figured on the basis of a flow for 150% rated capacity. (EG: 1000GPM pump shall be able to reach a capacity of 1500GPM)
 - Does failure to hit 150% mean the test is unacceptable?

No, Typically it is failure of water supply.

Motors, Engines and Controllers

- 4.7 Pumps, Drivers, and Controllers
 - 4.7.3
 - A Pump shall not be equipped with more than one driver
 - 4.7.4
 - Each pump shall have its own dedicated driver
 - 4.7.5
 - Each driver shall have its own dedicated controller



Pressure and Design Parameters

- 4.7.7 Maximum Pressure for Centrifugal Pumps
 - 4.7.7.1 The net pump shutoff pressure plus the maximum static suction pressure adjusted for elevation shall not exceed the pressure for which the system components are rated
 - Ex: 1000Gpm @ 145psi, shut off pressure is 168psi, and suction pressure is 30psi. You need to have 250# fittings on the discharge side of the system.
 - 4.7.7.2 - ...pressure regulating valves.. shall not be used as means to meet requirements of 4.7.7.1
- Don't over design the pump and use a throttle device to regulate pressure!!

NFPA Flows

- 4.8 Centrifugal Fire Pump Capacities
 - Centrifugal pumps shall have one of the rated capacities in gpm (L/min) identified in table 4.8.2

gpm	L/min	gpm	L/min
25	95	1,000	3,785
50	189	1,250	4,731
100	379	1,500	5,677
150	568	2,000	7,570
200	757	2,500	9,462
250	946	3,000	11,355
300	1,136	3,500	13,247
400	1,514	4,000	15,140
450	1,703	4,500	17,032
500	1,892	5,000	18,925
750	2,839		



NFPA Pipe and Accessory size

- 4.26 Summary of Centrifugal Fire Pump Data
 - The sizes indicated in table 4.26(a)...shall be used as minimum.

Table 4.26(a) Summary of Centrifugal Fire Pump Data (U.S. Customary)

Pump Rating (gpm)	Minimum Pipe Sizes (Nominal) (in.)						
	Suction ^{a,b,c}	Discharge ^a	Relief Valve	Relief Valve Discharge	Meter Device	Number and Size of Hose Valves	Hose Header Supply
25	1	1	¾	1	1¼	1 — 1½	1
50	1½	1¼	1¼	1½	2	1 — 1½	1½
100	2	2	1½	2	2½	1 — 2½	2½
150	2½	2½	2	2½	3	1 — 2½	2½
200	3	3	2	2½	3	1 — 2½	2½
250	3½	3	2	2½	3½	1 — 2½	3
300	4	4	2½	3½	3½	1 — 2½	3
400	4	4	3	5	4	2 — 2½	4
450	5	5	3	5	4	2 — 2½	4
500	5	5	3	5	5	2 — 2½	4
750	6	6	4	6	5	3 — 2½	6
1000	8	6	4	8	6	4 — 2½	6
1250	8	8	6	8	6	6 — 2½	8
1500	8	8	6	8	8	6 — 2½	8
2000	10	10	6	10	8	6 — 2½	8
2500	10	10	6	10	8	8 — 2½	10
3000	12	12	8	12	8	12 — 2½	10
3500	12	12	8	12	10	12 — 2½	12
4000	14	12	8	14	10	16 — 2½	12
4500	16	14	8	14	10	16 — 2½	12
5000	16	14	8	14	10	20 — 2½	12

Casing Relief Valve

- 4.11 Circulation Relief Valve.
 - 4.11.1.3 The valve shall provide flow of sufficient water to prevent the pump from overheating when operating with no discharge.
 - 4.11.1.6 ...shall have a nominal size of 0.75” for pumps not exceeding 2500 gpm and have a nominal size of 1” for pumps with a rated capacity of 3000 gpm to 5000gpm.



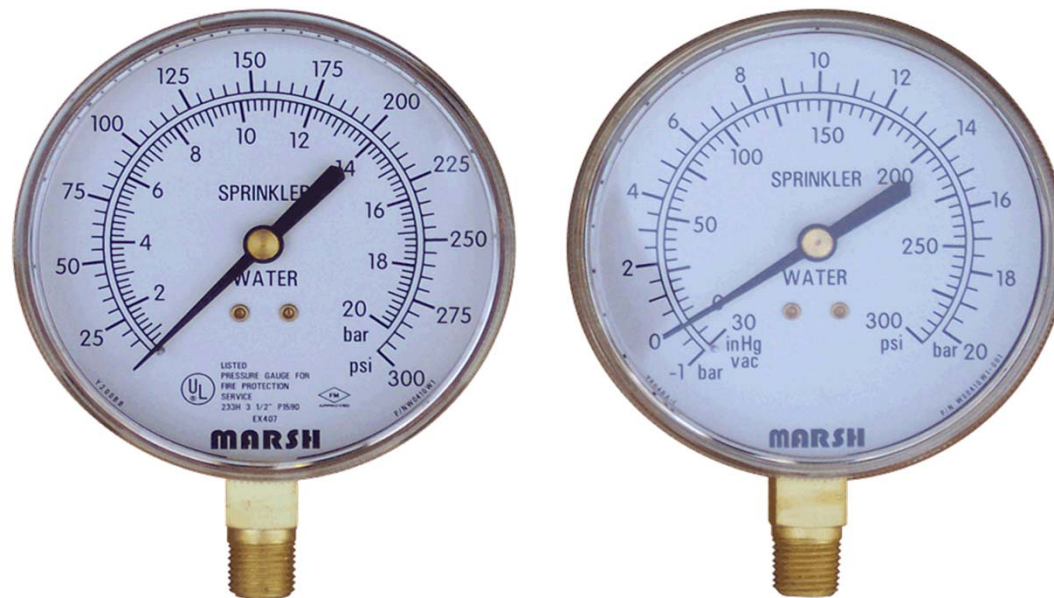
Casing Relief Valve

- When don't you need a Circulation Valve?
 - 4.11.1.7 The requirement 4.11.1 shall not apply to engine driven pumps...*



Suction / Discharge Guages

- Compound on the Suction Flange
 - Tank applications can read down to -3psi



Water Flow Test Devices

- 4.20 Water Flow Testing Devices
 - 4.20.1.1 A fire pump installation shall be arranged to allow the test of the pump at its rated conditions as well as the suction supply at the maximum flow available from the fire pump.

Two objectives:

- 1) To make sure the pump itself will function correctly
- 2) Make sure the water supply can deliver the correct amount

Under no circumstance may a fire pump be placed into service without an acceptance test!!!

Water Flow Test Devices

- Every fire pump needs a method for performing the acceptance test.
 1. Test Header – Flows readings are usually taken with a Pitot tube
 2. Flowmeter – A special pipe is run for the discharge back to the water supply with a flowmeter, control valve, and check valve in the line.

Water Flow Test Devices

- 4.20.3 Hose Valves
 - 4.20.3.1.1 Hose valves shall be listed.
 - 4.20.3.1.2 The number and the size will be specified in Section 4.26.
- 4.20.2 Meters and Testing Device
 - 4.20.2.1 Metering devices or fixed nozzles for pump testing shall be listed.



Automatic Air Release



- **6.3.3 Automatic Air Release.**
 - 6.3.3.1 Unless the requirements of 6.3.3.2 are met, pumps that are automatically controlled shall be provided with a listed float-operated air release valve having a normal 0.50 in. (12.7 mm) minimum diameter discharge to atmosphere.



Air in the impeller can cause cavitation, damage the impeller, and negatively impact pump performance!

AARV Epic Fail



Devices in Suction Piping

- 4.14.9 Devices in Suction Piping.
 - 4.14.9.1 No device or assembly, unless identified in 4.14.9.2 that will stop, restrict the starting, or restrict the discharge of a fire pump or pump driver shall be installed in the suction piping.

The purpose is to prohibit anything in the suction that would cause excess turbulence, friction loss, or cut off the flow to the pump while running at 150% capacity. Cutting off the supply would cause catastrophic failure to the pump.

OSY Valve

Pressure Maintenance (Jockey or Make-Up) Pumps

4.25* Pressure Maintenance (Jockey or Make-Up) Pumps. Fire pumps are not intended to operate for short time periods to maintain system pressure.

Jockey pumps will provide higher pressure for the first sprinklers that actuate and may improve their overall effectiveness, limiting the number of sprinklers that may actuate

4.25.2 Pressure maintenance pumps shall have rated capacities not less than any normal leakage rate. (10 Minutes or 1 Gpm)

Rule of thumb is to take 1 percent of capacity, at 10psi greater than rating

ex: 1000GPM @ 100 psi = Jockey rating of 10 Gpm at 110psi



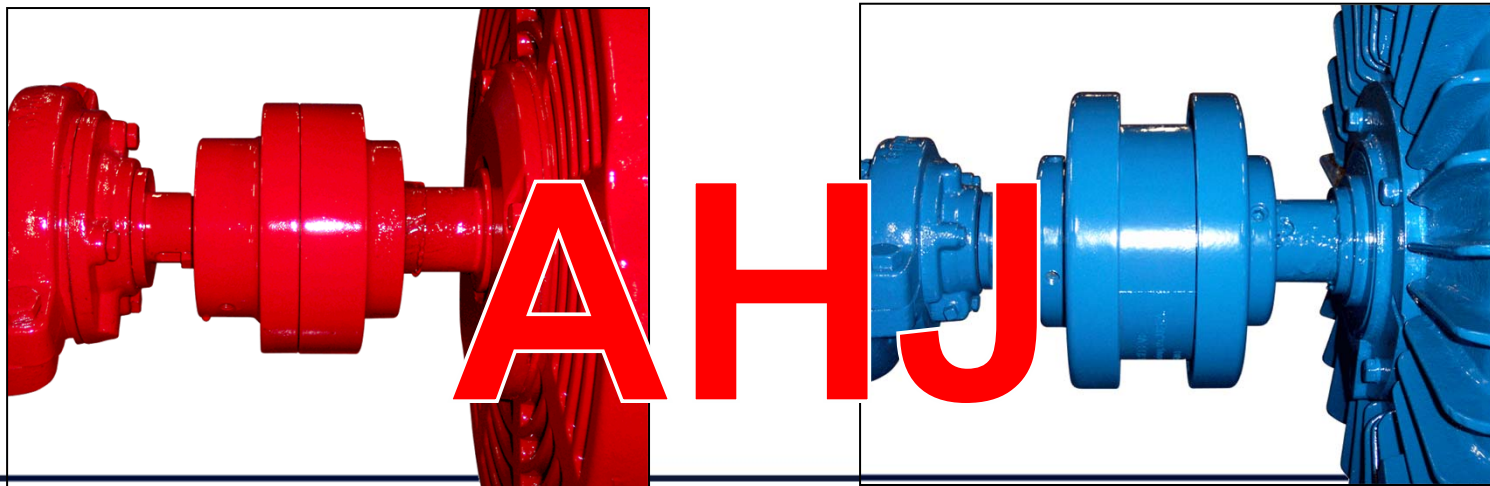
Pressure Maintenance (Jockey or Make-Up) Pumps

4.25.4.1 Where a centrifugal-type pressure maintenance pump has a total discharge pressure with the pump operating at shutoff exceeding the working pressure rating of the fire protection equipment, or where a turbine vane (peripheral) type of pump is used, a relief valve sized to prevent overpressuring of the system shall be installed on the pump discharge to prevent damage to the fire protection system.



Couplings

- **6.5.1 Coupling Type**
 - 6.5.1.1 Separately coupled-type pumps with electric motor drivers shall be connected by a flexible coupling, or flexible connecting shaft.
 - 6.5.1.2 All coupling types shall be listed for the service referenced in 6.5.1.1





Coupling Guard

- ANSI B15.1 Shell type coupling guard
 - Little challenging to install, but its in code!!
 - NFPA 2013
 - 4.12.8
 - Couplings and flexible connecting shafts shall be installed with a coupling guard in accordance with section 8 of ANSI B15.1



Main Relief Valve

- Where a diesel engine fire pump is installed and where a total of 121 percent of the net rated shutoff (churn) pressure plus the maximum static suction pressure, adjusted for elevation, exceeds the pressure for which the system components are rated, a pressure relief valve shall be installed
- Pressure relief valves shall not be used as a means to meet the requirements of 5.7.4.1.
- The net pump shutoff (churn) pressure plus the maximum static suction pressure, adjusted for elevation, shall not exceed the pressure for which the system components are rated.



NOTE: System (Main) Relief Valve (if used) is connected to the pump discharge BEFORE the Discharge Check Valve !! (4.18.3)*



Engine Cooling
Water Piping - NFPA
20 (11.2.8.1)

(4.18.5)

Relief Valve Waste

SEP 4 2002

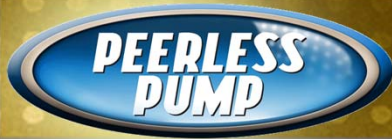
Listed Motors



9.5.1.1 All motors shall comply with NEMA MG-1, Motors and Generators, shall be marked as complying with NEMA Design B standards, and shall be specifically listed for fire pump service. *(See Table 9.5.1.1.)*

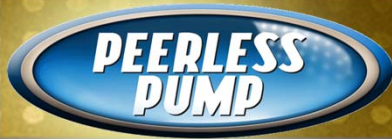
9.5.1.9.2 The motor shall be equipped with a non reverse ratchet.

9.5.2.1 The motor capacity in horsepower shall be such that the maximum motor current in any phase under any condition of the pump load and voltage unbalance shall not exceed the motor-rated full load current multiplied by the service factor.



Listed Fire Pump Controllers

- 10.1.2.1
 - All controllers and transfer switches shall be specifically listed for electric motor driven Fire Pump Service
- 12.1.3.1
 - All controllers shall be specifically listed for diesel engine-driven fire pump



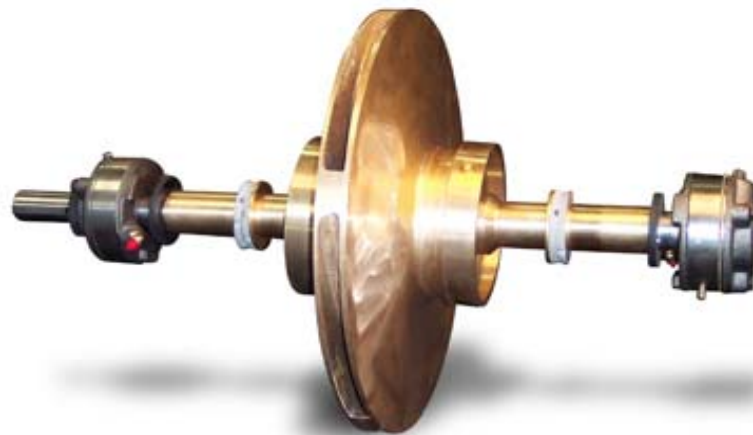
Field Acceptance Testing

- 14.2.4 .1
 - A copy of the manufacturers certified pump test characteristics curve shall be available for comparison of the results of the field acceptance test

- 14.2.5.2.1
 - The fire pump shall perform at minimum, rated, and peak loads without objectionable overheating of any component

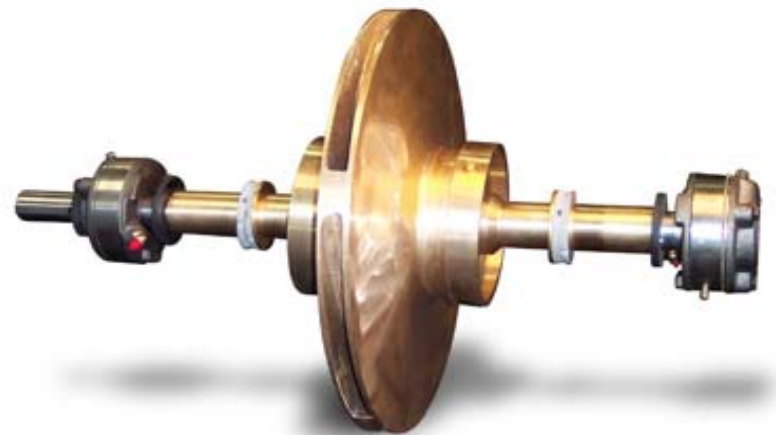
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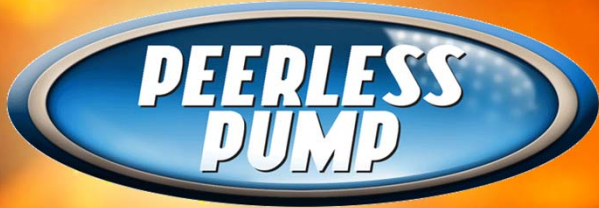
- 14.5.2.1
 - Whenever a critical path component in a piece of centrifugal pump equipment is replaced, changed, or modified, a field/on-site retest shall be performed



NFPA 20

- 14.5.2.5 Critical path components include the following...
 - Pumps
 - Impeller, Casing
 - Gear Drives
 - Fire Pump Controllers
 - Drivers





Any Questions?

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