



Fire Pump Inspection, Testing and Maintenance

NFPA 20; 2019 Edition

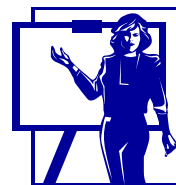
NFPA 25; 2020 Edition



Johnson Controls —

Housekeeping

- Remain muted with video off
- Participate in Polling
- Ask questions via chat
- Post Training Assessment



tyco.

2

Johnson Controls —



Guidelines for earning IACET CEUs

1. Attendee must register/sign-in with all required information.
2. Attendee must attend the entire online session (monitored by polling and the host).
3. Attendee must actively participate in discussion via polling and chat function.
4. A passing score of 70% on the final assessment (within 24 hours).
5. Successful completion will earn attendee 0.1 CEU



Johnson Controls Proprietary

- The training programs provided by Johnson Controls (JCI) are supported and funded by JCI. Attendance at a training program provided by JCI is in no way interpreted as a promise or agreement to purchase any services and/or products offered by JCI.
- Johnson Controls is a manufacturer of fire protection and mechanical products and will demonstrate the operation of Johnson Controls specific valves and appurtenances. Therefore a majority of the information conveyed will be Johnson Controls product specific.
- Johnson Controls owns any and all items printed with the Johnson Controls logo and statement. Anything produced and used during classes, unless otherwise stated is the property of Johnson Controls. All Materials produced are protected by Copyright. The materials cannot be reproduced, distributed, displayed or used without the permission of the speaker.

Portfolio of Flagship Brands

tyco.



5 Johnson Controls —



Learning Records

tyco.

If you need copies of your records from class
or the learning record policy
Please Contact Talya Pacheco
training@tycofp.com
401-781-8220 ex 0500
1467 Elmwood Avenue
Cranston, RI 02910

6 Johnson Controls —



Poll Questions 1 and 2

How comfortable are you with fire pump installation and ITM?

- A. This is brand new to me.
- B. I understand the concept but have limited experience.
- C. I am very familiar with the topic.
- D. I am extremely familiar with the topic.

How do pumps relate to your job?

- A. I inspect, test and maintain fire pumps for customers.
- B. I review inspection, testing and maintenance reports for customers.
- C. I am responsible for pumps on my site.
- D. They don't, I would like to gain more information.
- E. Other

7 Johnson Controls

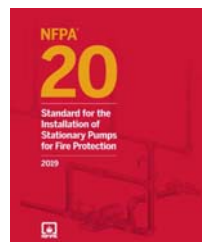


Introduction



Reprinted with permission from **NFPA 20-2019**, Standard for the *Installation of Stationary Pumps for Fire Protection*, Copyright © 2018, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the NFPA on the referenced subject, which is represented only by the standard in its entirety.

Reprinted with permission from **NFPA 25-2020**, *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*, Copyright © 2019, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the NFPA on the referenced subject, which is represented only by the standard in its entirety.



8 Johnson Controls





Pump Types & Pump Room Requirements

NFPA 20: 2019 Edition



Johnson Controls —



Fire Pumps

▪ Purpose

- To provide adequate pressure and flow rate to satisfy the designed demand of the fire protection systems it supplies.
 - Systems can be designed to be supplied from a municipal or private water supply or installed within a static water supply (tank, cistern, open body of water).
 - Can be driven by electric motor or diesel engine.

10 Johnson Controls —



tyco.

Horizontal Split Case

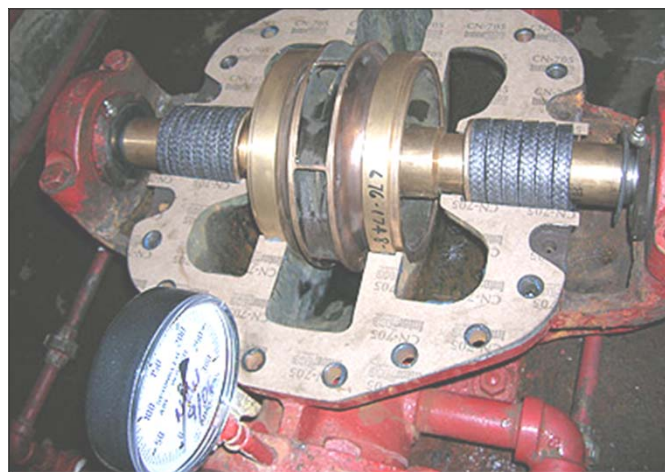


- Common fire pump type
- Capable of high flows and high pressures
 - 150-7000 GPM
 - 40-500+ psi
- Can be installed in either horizontal or vertical orientation

11 Johnson Controls —

Johnson
Controls

Horizontal Split Case Cut-Away

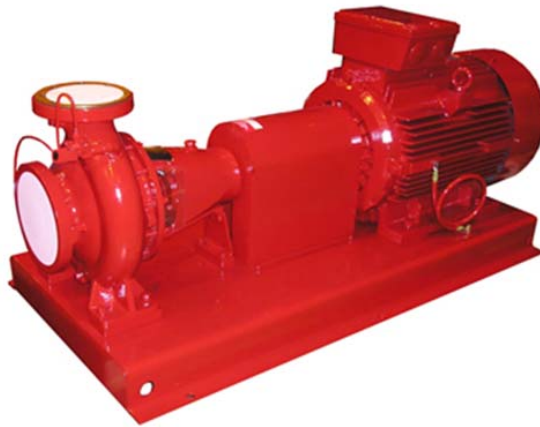


12 Johnson Controls —

Johnson
Controls

End Suction

tyco.



- Usually used in lower flow situations 50 -1500GPM.
- Lower pressures <175 psi
- Less dependent on additional base support.

13 Johnson Controls —

Johnson
Controls

Inline

tyco.



- Lower space requirements
- Lower flow rates 50-1500 GPM
- Lower pressures <175 psi
- Common centerline makes piping arrangement easier

14 Johnson Controls —

Johnson
Controls

Vertical

tyco.

- Utilized for pulling water from a below grade tank or well
- Common flows from 250-5000GPM
- Capable of high pressures in excess of 500 psi
- Can be driven by an electric motor or diesel engine powered with right angle gear drive

15 Johnson Controls —



Heat

tyco.

- 4.14.3 An approved or listed source of heat shall be provided for maintaining the temperature of the pump room or pump house, where required, above 40°F (4°C).
- The requirements of 11.6.5 shall be followed for higher temperature requirements for internal combustion engines.

16 Johnson Controls —





Normal Lighting and Drainage

- 4.14.4.1 Artificial light shall be provided in the pump room or pump house.
- 4.14.7.1* Floors shall be pitched for adequate drainage of escaping water away from critical equipment such as the pump, driver, controller and so forth.
- 4.14.7.2 The pump room or pump house shall be provided with a floor drain that will discharge to a frost-free location

17 Johnson Controls —



Guards

- 4.14.8 Couplings and flexible connecting shafts shall be installed with a coupling guard in accordance with Section 7 of ANSI B11.19, *Performance Requirements for Safeguarding*.

18 Johnson Controls —



Poll Question 3

Which of the following standards lays out the installation requirements for fire pumps?

- A. NFPA 20
- B. NFPA 25
- C. NFPA 13
- D. NFPA 72

19 Johnson Controls —



Fire Pumps Components

Johnson Controls —



Drivers

- Electric motor
- Diesel engine



21 Johnson Controls



Electric Motor

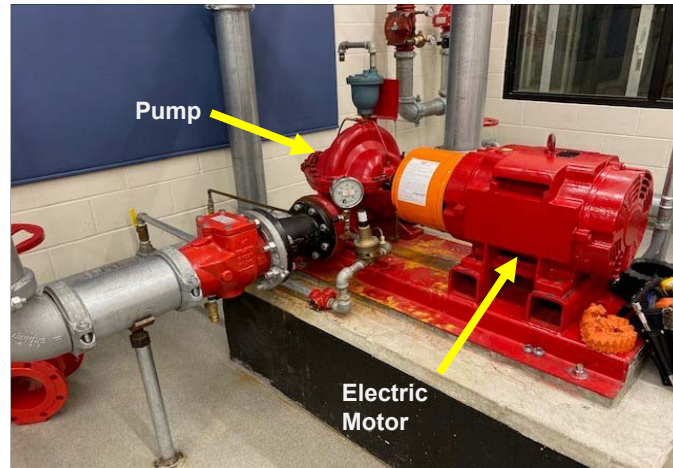
- Most common
- Direct feed from utility
 - Disconnect ahead of building power shut-off
- High voltage
- Risk of arc flash



22 Johnson Controls



Electric Fire Pump

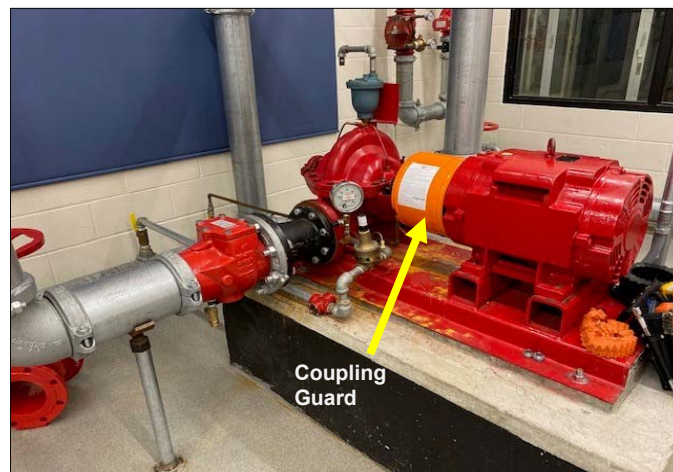


23

Johnson Controls



Electric Fire Pump

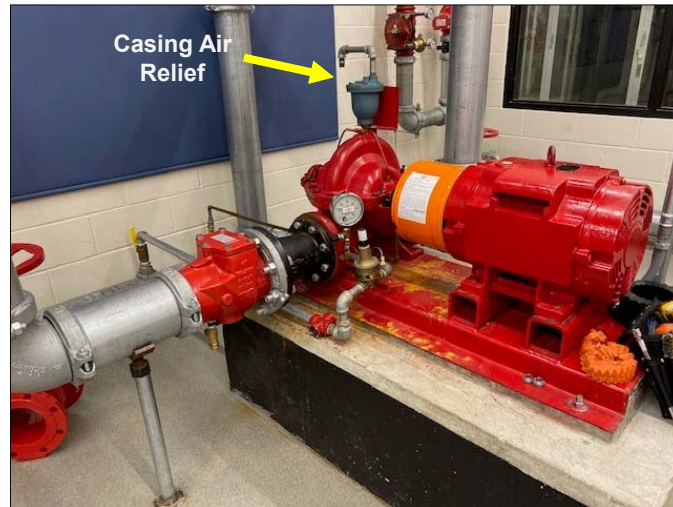


24

Johnson Controls



Electric Fire Pump



25

Johnson Controls



Electric Fire Pump



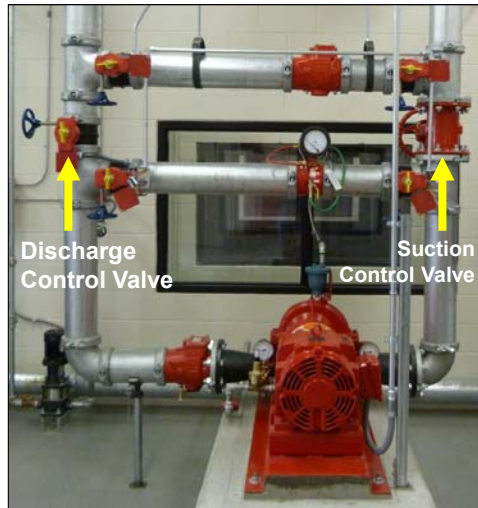
26

Johnson Controls



Electric Motor Driven Pump

- Both suction control & discharge control valves must be open



27 Johnson Controls —



Electric Pump Controller

Pressure Sensing Line



28 Johnson Controls —



Electric Pump Controller



Manual Start Button

Stop Button

29

Johnson Controls



Diesel Engine

- More reliable than electric motor driven pumps
- More required maintenance



30

Johnson Controls



Diesel Fire Pump



31 Johnson Controls



Diesel Pump Cooling Line



32 Johnson Controls



Diesel Fire Pump Batteries



33

Johnson Controls



Diesel Pump Controller



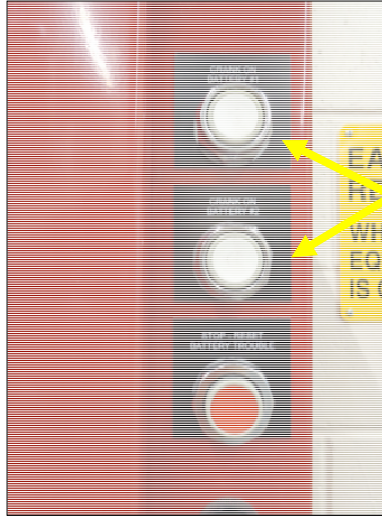
Pressure Sensing Line

34

Johnson Controls



Diesel Pump Controller



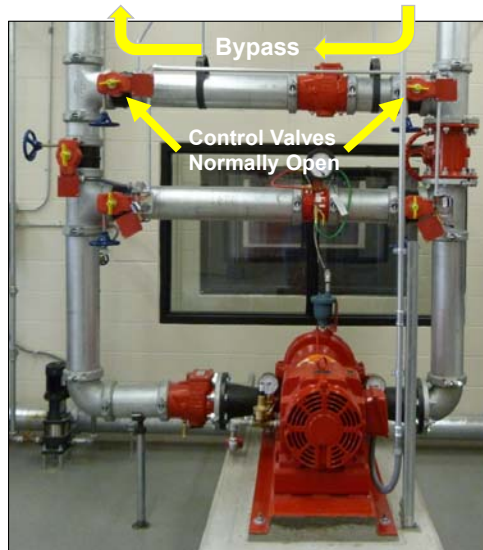
Ability to manually start using either button

35

Johnson Controls



By-pass

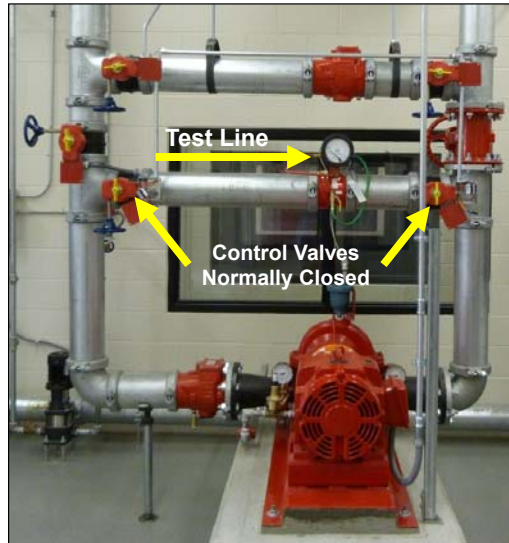


36

Johnson Controls



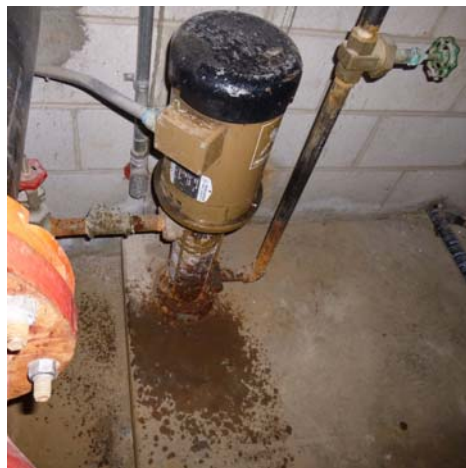
Test Line



37 Johnson Controls



Jockey Pump



38 Johnson Controls



Poll Question 4

How does a fire pump start in a fire scenario?

- A. Manual Green Button Start
- B. Pressure Loss Sensed by a Pressure Transducer
- C. Smoke Detection

39

Johnson Controls —



Component Review Demonstration

40

Johnson Controls —





Inspection, Testing & Maintenance- No Flow Conditions

NFPA 25: 2020 Edition



Johnson Controls —



NFPA 25 2020 8.1.1.2

- NFPA 25 (2020) Table 8.1.1.2 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

Table 8.1.1.2 Summary of Fire Pump Inspection, Testing, and Maintenance

Item	Frequency	Reference
Inspection		
Alignment	Annually	8.3.6.4
Cable/wire insulation	Annually	8.1.1.2.5
Diesel engine system	Weekly	8.2.2(4)
Electric system	Weekly	8.2.2(3)
Engine crankcase breather	Quarterly	8.1.1.2.12
Exhaust system, drain condensate trap, and silencers	Annually	8.1.1.2.13
Flexible hoses and connections	Annually	8.1.1.2.11
Fuel tank vents and overflow	Annually	8.1.1.2.10
Plumbing parts — inside and outside of panels	Annually	8.1.1.2.6
Printed circuit board (PCB) corrosion	Annually	8.1.1.2.4
Pump	Weekly	8.2.2(2)
Pump house/room	Weekly	8.2.2(1)
Shaft movement or endplay while running	Annually	8.1.1.2.1
Steam pump system	Weekly	8.2.2(5)
Suction screens	Annually	8.3.3.15

42 Johnson Controls —





NFPA 25 2020 8.1.1.2

- NFPA 25 (2020) Table 8.1.1.2 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

Test		
Automatic transfer switch	Annually	8.3.3.12
Automatic transfer switch and emergency/standby generators	Per NFPA 110	8.3.6.1, 8.3.6.2
Diesel engine-driven fire pump (no flow)	Weekly	8.3.1.1
Diesel fuel testing	Annually	8.3.4.1
Electric motor-driven fire pump (no flow)	Weekly/monthly	8.3.1.2
Electronic control module (ECM)	Annually	8.3.3.16
Fire pump alarm signals	Annually	8.3.3.13
Flow meters	Annually	8.3.3.5.3
Fuel tank, float switch, and supervisory signal for interstitial space	Quarterly	8.1.1.2.7
Gauges, transducers, and other devices used for testing	Annually	8.3.3.5.2
Main pressure relief valve	Annually	8.3.3.11, 13.5.6.2.3
Pump house/room environmental conditions		8.3.6.3
Pump operation (no flow)	Weekly/monthly	8.3.2, 8.3.5
Pump performance (flow)	Annually	8.3.3, 8.3.5
Supervisory signal for high cooling water temperature	Annually	8.1.1.2.8

43 Johnson Controls



NFPA 25 2020 8.1.1.2

- NFPA 25 (2020) Table 8.1.1.2 shall be used to determine the minimum required frequencies for inspection, testing, and maintenance.

Maintenance		
Batteries	Annually	8.1.1.2.15
Circulating water filter	Annually	8.1.1.2.21
Control and power wiring connections	Annually	8.1.1.2.16
Controller and all other components of the pump assembly	Per manufacturer	8.5
Diesel active fuel maintenance system	Annually or per manufacturer	8.3.4.3
Diesel engine system	Per manufacturer	8.5
Electric motor and power system	Per manufacturer	8.5
Electrical connections	Annually	8.1.1.2.2
Engine lubricating oil	50 operating hours or annually	8.1.1.2.17
Engine oil filter	50 operating hours or annually	8.1.1.2.18
Fuel filter	50 operating hours or annually	8.1.1.2.19
Fuel tank — check for water and foreign materials	Annually	8.1.1.2.9
Measure back pressure on engine turbo	Annually	8.1.1.2.14
Power transmission components with elastomeric materials (including torsional couplings)	5 years or per manufacturer	8.1.1.2.23
Pressure gauges and sensors	Annually	8.1.1.2.22
Pump and motor bearings and coupling	Annually or as required	8.1.1.2.3
Sacrificial anode	Annually	8.1.1.2.20

44 Johnson Controls



Maintenance



- Alternative Inspection, Testing, and Maintenance Procedures. In the absence of manufacturer's recommendations for preventive maintenance, can be found in NFPA 25 2020 (Table 8.6.1)

Table 8.6.1 Summary of Component Action Requirements

Component	Adjust	Repair	Rebuild	Replace	Test Criteria
Fire Pump System					
Entire pump assembly				X	Perform acceptance test in accordance with NFPA 20
Impeller/rotating assembly		X		X	Perform acceptance test in accordance with NFPA 20
Casing		X		X	Perform acceptance test in accordance with NFPA 20 with alignment inspection
Bearings				X	Perform annual test in accordance with 8.3.3
Sleeves				X	Perform annual test in accordance with 8.3.3
Wear rings				X	Perform annual test in accordance with 8.3.3
Main shaft		X		X	Perform annual test in accordance with 8.3.3
Packing	X			X	Perform test in accordance with 8.3.2
Mechanical Transmission					
Gear right-angle drives		X	X	X	Perform acceptance test in accordance with NFPA 20
Drive coupling	X	X	X	X	Perform test in accordance with 8.3.3 with alignment inspection

Previously Annex Information

45 Johnson Controls



Maintenance



Electrical System/ Controller					
Entire controller				X	Perform acceptance test in accordance with NFPA 20
Electronic component or module that can prevent the controller from starting or running			X	X	Perform acceptance test in accordance with NFPA 20
Electronic component or module that will not prevent the controller from starting or running			X	X	Perform weekly test in accordance with 8.3.2
Plumbing part				X	Perform weekly test in accordance with 8.3.2
Isolating switch				X	Perform test in accordance with 8.3.2 and exercise six times
Circuit breaker	X				Perform six momentary starts in accordance with NFPA 20
Circuit breaker				X	Test in accordance with 8.3.3, including six starts at peak load and operate pump for a minimum of 1 hour
Electrical connections	X				Perform test in accordance with 8.3.2
Main contactor		X		X	Perform test in accordance with 8.3.3 with six starts
Power monitor				X	Perform six operations of the circuit breaker/ isolation switch disconnect (cycle the power on/off)
Start relay				X	Perform test in accordance with 8.3.2 with six starts
Pressure switch	X			X	Perform test in accordance with 8.3.2 and exercise six times automatically
Pressure transducer	X			X	Perform six automatic no-load starts
Manual start or stop switch				X	Perform six operations under load
Transfer switch — load-carrying parts		X	X	X	Test in accordance with 8.3.3, including six starts at peak horsepower load, operate pump for a minimum of 1 hour, and transfer from normal power to emergency power and back one time
Transfer switch — no-load parts		X	X	X	Perform six no-load operations of transfer of power
Electric Motor Driver					
Electric motor		X	X	X	Perform acceptance test in accordance with NFPA 20 with alignment inspection
Motor bearings				X	Perform annual test in accordance with 8.3.3
Incoming power conductors				X	Test in accordance with 8.3.3 and operate pump for a minimum of 1 hour, including six starts at peak load
Diesel Engine Driver					
Entire engine			X	X	Perform acceptance test in accordance with NFPA 20 with alignment inspection
Fuel transfer pump	X		X	X	Perform test in accordance with 8.3.2

46 Johnson Controls



Maintenance

tyco

Table 8.6.1 Continued

Component	Adjust	Repair	Rebuild	Replace	Test Criteria
Fuel injector pump or ECM	X			X	Perform test in accordance with 8.3.3
Fuel system filter		X		X	Perform test in accordance with 8.3.2
Combustion air intake system		X		X	Perform test in accordance with 8.3.2
Fuel tank		X		X	Perform test in accordance with 8.3.2
Cooling system		X	X	X	Perform test in accordance with 8.3.3
Batteries				X	Perform start/stop sequence from replaced battery in accordance with 8.3.2
Battery charger		X		X	Perform test in accordance with 8.3.2
Electric system		X		X	Perform test in accordance with 8.3.2
Lubrication filter/oil service		X		X	Perform test in accordance with 8.3.2
Steam Turbines					
Steam turbine		X		X	Perform acceptance test in accordance with NFPA 20
Steam regulator or source upgrade		X		X	Perform acceptance test in accordance with NFPA 20
Positive Displacement Pumps					
Entire pump				X	Perform acceptance test in accordance with NFPA 20
Rotors				X	Perform annual test in accordance with 8.3.3
Plungers				X	Perform annual test in accordance with 8.3.3
Shaft				X	Perform annual test in accordance with 8.3.3
Driver		X	X	X	Perform acceptance test in accordance with NFPA 20
Bearings				X	Perform annual test in accordance with 8.3.3
Seals				X	Perform test in accordance with 8.3.2
Pump House and Miscellaneous Components					
Baseplate		X			Perform test in accordance with 8.3.2 with alignment inspection
Baseplate				X	Perform test in accordance with 8.3.3 with alignment inspection
Foundation		X	X	X	Perform test in accordance with 8.3.2 with alignment inspection
Suction/discharge pipe		X		X	Perform visual inspection in accordance with 8.2.2(2)
Suction/discharge fittings		X		X	Perform visual inspection in accordance with 8.2.2(2)
Suction/discharge valves		X	X	X	Perform operational test in accordance with 13.3.3.1

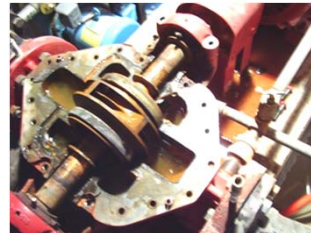
47 Johnson Controls

Johnson Controls

Common Components, Obstruction Investigations and Impairments

tyco

- 8.1.2 Valves and fire department connections shall be inspected, tested, and maintained in accordance with Chapter 13.
- 8.1.3 The procedures outlined in Chapter 14 shall be followed where there is a need to conduct an obstruction investigation.
- 8.1.9 The procedures outlined in Chapter 15 shall be followed where an impairment to protection occurs.



48 Johnson Controls

Johnson Controls



8.2 Inspection

- 8.2.1: The purpose of inspection shall be to verify that the pump assembly appears to be in operating condition and is free from physical damage.
- 8.2.2*: The pertinent visual observations specified in the following checklists shall be performed weekly:
 - (1) Pump house conditions
 - (2) Pump system conditions
 - (3) Electrical system conditions
 - (4) Diesel engine system conditions
 - (5)*Steam system conditions



49 Johnson Controls



Weekly

- Pump house condition
 - Heat is Adequate
 - Not Less than 40°F (4°C)
 - 70°F (21°C) for diesel driven pumps without engine heaters
 - Ventilating louvers free to operate
 - Excessive water does not collect on the floor.
 - Coupling Guard in place



50 Johnson Controls



tyco.

Weekly

- Pump system conditions
 - Pump suction and discharge and bypass valves are fully open.
 - Piping is free of leaks.
 - Suction line pressure gauge reading is within acceptable range.
 - System line pressure gauge reading is within acceptable range.
 - Suction reservoir has the required water level.
 - Wet pit suction screens are unobstructed and in place
 - Waterflow test valves are in the closed position, hose connection is closed, and the line to the test valves is free of water



51 Johnson Controls

Johnson
Controls**tyco.**

Weekly

- Electrical system conditions
 - Controller pilot light (power on) is illuminated.
 - Transfer switch normal pilot light is illuminated.
 - Isolating switch is closed — standby (emergency) source.
 - Reverse phase alarm pilot light is off, or normal phase rotation pilot light is on.
 - Oil level in vertical motor sight glass is within acceptable range.
 - Power to pressure maintenance (jockey) pump is provided.



52 Johnson Controls

Johnson
Controls

Weekly

tyco.

- Diesel engine system conditions
 - Fuel tank is at least two-thirds full.
 - Controller selector switch is in auto position.
 - Batteries' (2) voltage readings are within acceptable range.
 - Batteries' (2) charging current readings are within acceptable range.
 - Batteries' (2) pilot lights are on or battery failure (2) pilot lights are off.



53 Johnson Controls

Johnson
Controls

Weekly

tyco.

- Diesel engine system conditions
 - All alarm pilot lights are off.
 - Engine running time meter is reading.
 - Oil level in right angle gear drive is within acceptable range.
 - Crankcase oil level is within acceptable range.
 - Cooling water level is within acceptable range.
 - Electrolyte level in batteries is within acceptable range.
 - Battery terminals are free from corrosion.
 - Water-jacket heater is operating.



54 Johnson Controls

Johnson
Controls

Battery Inspections

tyco.

- Diesel engines equipped with lead acid batteries require electrolyte levels to be inspected weekly



55 Johnson Controls

Johnson Controls

Battery Maintenance PPE

tyco.

PPE required for battery maintenance includes at a minimum:

1. Goggle and face shields
2. Chemical-resistant gloves (Nitrile/Neoprene)
3. Protective aprons (Nitrile/Neoprene)
4. Protective overshoes (Nitrile/Neoprene)
5. Portable or stationary water facilities with 15 minute continuous flushing capability for rinsing eyes and skin in case of electrolyte Spillage
6. Battery spill containment kit
7. Battery Fluid filler bottle



56 Johnson Controls

Johnson Controls



Testing Frequency

- Diesel engine–driven fire pumps shall be operated weekly and shall run a minimum of 30 minutes.
- Electric motor–driven fire pumps shall be operated weekly/monthly and shall run a minimum of 10 minutes.



57 Johnson Controls



Testing Frequency

- 8.3.1.2.1 Except as permitted in 8.3.1.2.2 and 8.3.1.2.3, a **weekly** test frequency shall be required for the following **electric** fire pumps:
 - Fire pumps that serve fire protection systems in buildings that are beyond the pumping capacity of the fire department
 - Fire pumps with limited service controllers
 - Vertical turbine fire pumps
 - Fire pumps taking suction from a ground level tanks or a water source that does not provide sufficient pressure to be of material value without the pump



58 Johnson Controls





Testing Frequency

- 8.3.1.2.3* A monthly test frequency shall be permitted for electric pump systems having a redundant fire pump.
- 8.3.1.2.4* The test frequency shall be permitted to be established by an approved risk analysis.



59 Johnson Controls



No-Flow Checklist

- Pump System
 - Record the pump starting pressure from the pressure switch or pressure transducer
 - Record the system suction and discharge pressure gauge readings
 - Inspect the pump packing glands for slight discharge
 - Adjust gland nuts if necessary
 - Inspect for unusual noise or vibration
 - Inspect packing boxes, bearings, or pump casing for overheating
 - Record pressure switch or pressure transducer reading and compare to the pump discharge gauge
 - For pumps that use electronic pressure sensors to control the fire pump operation, record the current pressure and the highest and the lowest pressure shown on the fire pump controller event log
 - For electric motor and radiator cooled diesel pumps, check the circulation relief valve for operation to discharge water

60 Johnson Controls



No-Flow Checklist

tyco

▪ Electrical System

- Observe the time for motor to accelerate to full speed
- Record the time controller is on first step (for reduced voltage or reduced current starting)
- Record the time pump runs after starting (for automatic stop controllers)



61 Johnson Controls

Johnson
Controls

No-Flow Checklist

tyco

▪ Diesel Engine System

- Observe the time for engine to crank
- Observe the time for engine to reach running speed
- Observe the engine oil pressure gauge, speed indicator, water, and oil temperature indicators periodically while engine is running
- Record any abnormalities
- Inspect the heat exchanger for cooling waterflow

62 Johnson Controls

Johnson
Controls



8.3.2.10 Remotely Monitored Automated Testing

- The requirements of 8.3.2.10 are new to the 2020 Edition and have been added to specifically address automated testing, as it relates to fire pumps. For the general requirements on automated inspections and testing, see Chapter 4. These requirements ensure that the automated tests provide the same outcome as having a qualified person in the pump room performing the tests and recording the information.
- Remotely monitored automated testing performed in accordance with 4.6.6 shall be permitted for the no-flow test.

63 Johnson Controls



8.3.2.10 Remotely Monitored Automated Testing

- All of the pertinent observations or adjustments specified in the checklists described in 8.3.2.8 and 8.3.2.9 shall be performed.
 - Any abnormalities shall be recorded.
 - If, during the automated test, it becomes apparent that the packing gland nuts need to be adjusted as described in 8.3.2.9 (1) (d), the need for adjustment shall be recorded and the necessary adjustment shall be made by qualified personnel.
- The controller for a diesel engine-driven fire pump shall be equipped with automatic engine shutdown as referenced in 12.7.2.7 of NFPA 20.
- Qualified personnel shall be able to respond to the pump location upon abnormal condition within 5 minutes.

64 Johnson Controls





8.4 Reports

- Any abnormality observed during inspection or testing shall be reported promptly to the property owner or designated representative.
- Test results shall be recorded and retained for comparison purposes in accordance with Section 4.3 of NFPA 25 (2020).



65 Johnson Controls —



Churn Test (No Flow) Demonstration

66 Johnson Controls —



Poll Question 5

What is the purpose of churn (no-flow) testing a fire pump?

- A. To test the fire pump performance
- B. Ensure the fire pump is running normal based on pressure drop
- C. Ensure the green start button works
- D. Satisfies the NFPA standard

67 Johnson Controls —



Annual Testing, Testing Set-up, & Data Collection

NFPA 25: 2020 Edition

Johnson Controls —



8.1 General

- This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of fire pump assemblies.
- The minimum frequency of inspection, testing, and maintenance shall be in accordance with the manufacturer's recommendations and Table 8.1.1.2.

8.1.1.2

Table 8.1.1.2 Summary of Fire Pump Inspection, Testing, and Maintenance

Item	Frequency	Reference			
Inspection					
Alignment	Annually	8.3.6.4			
Cable/wire insulation	Annually	8.1.1.2.5			
Diesel engine system	Weekly	8.2.2(4)			
Electric system	Weekly	8.2.2(3)			
Engine crankcase breather	Quarterly	8.1.1.2.12			
Exhaust system, drain condensate trap, and silencers	Annually	8.1.1.2.13			
Flexible hoses and connections	Annually	8.1.1.2.11			
Fuel tank vents and overflow	Annually	8.1.1.2.10			
Plumbing parts — inside and outside of panels	Annually	8.1.1.2.6			
Printed circuit board (PCB) corrosion	Annually	8.1.1.2.4			
Pump	Weekly	8.2.2(2)			
Pump house/room	Weekly	8.2.2(1)			
Shaft movement or endplay while running	Annually	8.1.1.2.1			
Steam pump system	Weekly	8.2.2(5)			
Suction screens	Annually	8.3.3.15			
Test					
Automatic transfer switch	Annually	8.3.3.12			
Automatic transfer switch and emergency/standby generators	Per NFPA 110	8.3.6.1, 8.3.6.2			
Diesel engine-driven fire pump (no flow)	Weekly	8.3.1.1			
Diesel fuel testing	Annually	8.5.4.1			
Electric motor-driven fire pump (no flow)	Weekly/monthly	8.3.1.2			
Electronic control module (ECM)	Annually	8.3.3.16			
Fire pump alarm signals	Annually	8.3.3.13			
Flow meters	Annually	8.3.3.3			
Fuel tank, float switch, and supervisory signal for interstitial space	Quarterly	8.1.1.2.7			
Gauges, transducers, and other devices used for testing	Annually	8.3.3.5.2			
Main pressure relief valve	Annually	8.3.3.11, 13.5.6.2.3			
Pump house/room environmental conditions		8.5.6.5			
Pump operation (no flow)	Weekly/monthly	8.3.2, 8.3.5			
Pump performance (flow)	Annually	8.3.3, 8.3.5			
Supervisory signal for high cooling water temperature	Annually	8.1.1.2.8			
Maintenance					
Batteries	Annually	8.1.1.2.15			
Circulating water filter	Annually	8.1.1.2.21			
Control and power wiring connections	Annually	8.1.1.2.16			
Controller and all other components of the pump assembly	Per manufacturer	8.5			
Diesel active fuel maintenance system	Annually or per manufacturer	8.3.4.3			
Diesel engine system	Per manufacturer	8.5			
Electric motor and power system	Per manufacturer	8.5			
Electrical connections	Annually	8.1.1.2.2			
Engine lubricating oil	50 operating hours or annually	8.1.1.2.17			
Engine oil filter	50 operating hours or annually	8.1.1.2.18			
Fuel filter	50 operating hours or annually	8.1.1.2.19			
Fuel tank — check for water and foreign materials	Annually	8.1.1.2.9			
Measure back pressure on engine turbo	Annually	8.1.1.2.14			
Power transmission components with elastomeric materials (including torsional couplings)	5 years or per manufacturer	8.1.1.2.23			
Pressure gauges and sensors	Annually	8.1.1.2.22			
Pump and motor bearings and coupling	Annually or as required	8.1.1.2.3			
Sacrificial anode	Annually	8.1.1.2.20			

Electrical Safety

- There is a risk of arc flash due to high voltages within electric-motor-driven fire pump controllers.
- The 2020 edition of NFPA 25 no longer requires certain inspections be performed of electrical connections, printed circuit boards, cable and wire insulation, plumbing, and controls and power wire connections if this work **cannot** be completed without opening an energized electric-motor-driven fire pump controller.

8.3 Testing

- The purpose of testing the pump assembly is to ensure automatic or manual operation upon demand and continuous delivery of the required system output.
- An additional purpose is to detect deficiencies of the pump assembly not evident by inspection.
- Qualified operating personnel shall be in attendance whenever the pump is in operation.

8.3 Testing Constant Speed Pumps

- 8.3.3.1* Except as permitted in 8.3.3.4, an annual test of each constant speed pump assembly shall be conducted by qualified personnel under no-flow (churn), rated flow, and 150 percent of the pump rated capacity flow of the fire pump by controlling the quantity of water discharged through approved test devices.



73 Johnson Controls —

Johnson Controls 73

8.3 Variable-speed Pumps

- 8.3.3.2* Except as permitted in 8.3.3.4, an annual test of each variable-speed pump assembly shall be conducted by qualified personnel under variable-speed control under no-flow (churn), 25 percent, 50 percent, 75 percent, 100 percent, 125 percent, and 150 percent of the rated pump capacity flow of the fire pump by controlling the quantity of water discharge through approved test devices.
- 8.3.3.3 Except as permitted in 8.3.3.4, an annual test of each variable speed pump assembly shall be conducted by qualified personnel under constant speed control under no-flow (churn), 100 percent rate, and 150 percent of the pump rated capacity flow of the fire pump by controlling the quantity of water discharged through approved test devices.
- 8.3.3.4 If available suction supplies do not allow flowing of 150 percent of the rated pump capacity, the fire pump shall be tested at flow rates at 100 percent of the rated pump flow rate, and at the maximum flow allowed at the lowest permissible suction pressure.

New to 2020 Edition

74 Johnson Controls —

Johnson Controls 74

8.3.3.9.1 Use of Pump Discharge via Hose Streams

- Pump suction and discharge pressures and the flow measurements of each hose stream shall determine the total pump output.
- Prior to flow testing, the entity performing testing shall make the owner or their representative aware of the location, approximate flow rate, and duration of flow testing.



75 Johnson Controls —

Johnson Controls 75

8.3.3.9.3 Use of Pump Discharge via Bypass Flowmeter to Pump Suction (Closed-Loop Metering)

- Pump suction and discharge pressures and the flowmeter measurements shall determine the total pump output.
- If the test results are not consistent with the previous annual test, the test shall be repeated using the test arrangement described in 8.3.3.9.1.
- If testing in accordance with 8.3.3.9.1 is not possible, a flowmeter calibration shall be performed and the test shall be repeated.

76 Johnson Controls —

Johnson Controls 76

8.4 Reports

- A complete written report of the fire pump test results shall be prepared for and retained by the owner

**ELECTRIC FIRE PUMP
WEEKLY/MONTHLY FIRE SPRINKLER SYSTEMS REPORT OF INSPECTION**

Company Name		Inspector	
Address		Office Phone	
City, State, & Zip		Office License	
Attention		Date	
Location File Code	SYSTEM LOCATION - 0		
PUMP MANUFACTURER	RATED GPM OF PUMP	RATED PSI OF PUMP	Backflow Preventers
CONTROLLER MANUFACTURER	QUARTER NUMBER -		
	QUARTER COLOR -		
	MONTH 1		
	MONTH 2		
	MONTH 3		
	WEEK 1	WEEK 2	WEEK 3
	WEEK 4	WEEK 5	WEEK 6
	WEEK 7	WEEK 8	WEEK 9
	WEEK 10	WEEK 11	WEEK 12
	WEEK 13	WEEK 14	WEEK 15
	WEEK 16	WEEK 17	WEEK 18
	WEEK 19	WEEK 20	WEEK 21
	WEEK 22	WEEK 23	WEEK 24
	WEEK 25	WEEK 26	WEEK 27
	WEEK 28	WEEK 29	WEEK 30
	WEEK 31	WEEK 32	WEEK 33
	WEEK 34	WEEK 35	WEEK 36
	WEEK 37	WEEK 38	WEEK 39
	WEEK 40	WEEK 41	WEEK 42
	WEEK 43	WEEK 44	WEEK 45
	WEEK 46	WEEK 47	WEEK 48
	WEEK 49	WEEK 50	WEEK 51
	WEEK 52	WEEK 53	WEEK 54
	WEEK 55	WEEK 56	WEEK 57
	WEEK 58	WEEK 59	WEEK 60
	WEEK 61	WEEK 62	WEEK 63
	WEEK 64	WEEK 65	WEEK 66
	WEEK 67	WEEK 68	WEEK 69
	WEEK 70	WEEK 71	WEEK 72
	WEEK 73	WEEK 74	WEEK 75
	WEEK 76	WEEK 77	WEEK 78
	WEEK 79	WEEK 80	WEEK 81
	WEEK 82	WEEK 83	WEEK 84
	WEEK 85	WEEK 86	WEEK 87
	WEEK 88	WEEK 89	WEEK 90
	WEEK 91	WEEK 92	WEEK 93
	WEEK 94	WEEK 95	WEEK 96
	WEEK 97	WEEK 98	WEEK 99
	WEEK 100	WEEK 101	WEEK 102
	WEEK 103	WEEK 104	WEEK 105
	WEEK 106	WEEK 107	WEEK 108
	WEEK 109	WEEK 110	WEEK 111
	WEEK 112	WEEK 113	WEEK 114
	WEEK 115	WEEK 116	WEEK 117
	WEEK 118	WEEK 119	WEEK 120
	WEEK 121	WEEK 122	WEEK 123
	WEEK 124	WEEK 125	WEEK 126
	WEEK 127	WEEK 128	WEEK 129
	WEEK 130	WEEK 131	WEEK 132
	WEEK 133	WEEK 134	WEEK 135
	WEEK 136	WEEK 137	WEEK 138
	WEEK 139	WEEK 140	WEEK 141
	WEEK 142	WEEK 143	WEEK 144
	WEEK 145	WEEK 146	WEEK 147
	WEEK 148	WEEK 149	WEEK 150
	WEEK 151	WEEK 152	WEEK 153
	WEEK 154	WEEK 155	WEEK 156
	WEEK 157	WEEK 158	WEEK 159
	WEEK 160	WEEK 161	WEEK 162
	WEEK 163	WEEK 164	WEEK 165
	WEEK 166	WEEK 167	WEEK 168
	WEEK 169	WEEK 170	WEEK 171
	WEEK 172	WEEK 173	WEEK 174
	WEEK 175	WEEK 176	WEEK 177
	WEEK 178	WEEK 179	WEEK 180
	WEEK 181	WEEK 182	WEEK 183
	WEEK 184	WEEK 185	WEEK 186
	WEEK 187	WEEK 188	WEEK 189
	WEEK 190	WEEK 191	WEEK 192
	WEEK 193	WEEK 194	WEEK 195
	WEEK 196	WEEK 197	WEEK 198
	WEEK 199	WEEK 200	WEEK 201
	WEEK 202	WEEK 203	WEEK 204
	WEEK 205	WEEK 206	WEEK 207
	WEEK 208	WEEK 209	WEEK 210
	WEEK 211	WEEK 212	WEEK 213
	WEEK 214	WEEK 215	WEEK 216
	WEEK 217	WEEK 218	WEEK 219
	WEEK 220	WEEK 221	WEEK 222
	WEEK 223	WEEK 224	WEEK 225
	WEEK 226	WEEK 227	WEEK 228
	WEEK 229	WEEK 230	WEEK 231
	WEEK 232	WEEK 233	WEEK 234
	WEEK 235	WEEK 236	WEEK 237
	WEEK 238	WEEK 239	WEEK 240
	WEEK 241	WEEK 242	WEEK 243
	WEEK 244	WEEK 245	WEEK 246
	WEEK 247	WEEK 248	WEEK 249
	WEEK 250	WEEK 251	WEEK 252
	WEEK 253	WEEK 254	WEEK 255
	WEEK 256	WEEK 257	WEEK 258
	WEEK 259	WEEK 260	WEEK 261
	WEEK 262	WEEK 263	WEEK 264
	WEEK 265	WEEK 266	WEEK 267
	WEEK 268	WEEK 269	WEEK 270
	WEEK 271	WEEK 272	WEEK 273
	WEEK 274	WEEK 275	WEEK 276
	WEEK 277	WEEK 278	WEEK 279
	WEEK 280	WEEK 281	WEEK 282
	WEEK 283	WEEK 284	WEEK 285
	WEEK 286	WEEK 287	WEEK 288
	WEEK 289	WEEK 290	WEEK 291
	WEEK 292	WEEK 293	WEEK 294
	WEEK 295	WEEK 296	WEEK 297
	WEEK 298	WEEK 299	WEEK 300
	WEEK 301	WEEK 302	WEEK 303
	WEEK 304	WEEK 305	WEEK 306
	WEEK 307	WEEK 308	WEEK 309
	WEEK 310	WEEK 311	WEEK 312
	WEEK 313	WEEK 314	WEEK 315
	WEEK 316	WEEK 317	WEEK 318
	WEEK 319	WEEK 320	WEEK 321
	WEEK 322	WEEK 323	WEEK 324
	WEEK 325	WEEK 326	WEEK 327
	WEEK 328	WEEK 329	WEEK 330
	WEEK 331	WEEK 332	WEEK 333
	WEEK 334	WEEK 335	WEEK 336
	WEEK 337	WEEK 338	WEEK 339
	WEEK 340	WEEK 341	WEEK 342
	WEEK 343	WEEK 344	WEEK 345
	WEEK 346	WEEK 347	WEEK 348
	WEEK 349	WEEK 350	WEEK 351
	WEEK 352	WEEK 353	WEEK 354
	WEEK 355	WEEK 356	WEEK 357
	WEEK 358	WEEK 359	WEEK 360
	WEEK 361	WEEK 362	WEEK 363
	WEEK 364	WEEK 365	WEEK 366
	WEEK 367	WEEK 368	WEEK 369
	WEEK 370	WEEK 371	WEEK 372
	WEEK 373	WEEK 374	WEEK 375
	WEEK 376	WEEK 377	WEEK 378
	WEEK 379	WEEK 380	WEEK 381
	WEEK 382	WEEK 383	WEEK 384
	WEEK 385	WEEK 386	WEEK 387
	WEEK 388	WEEK 389	WEEK 390
	WEEK 391	WEEK 392	WEEK 393
	WEEK 394	WEEK 395	WEEK 396
	WEEK 397	WEEK 398	WEEK 399
	WEEK 400	WEEK 401	WEEK 402
	WEEK 403	WEEK 404	WEEK 405
	WEEK 406	WEEK 407	WEEK 408
	WEEK 409	WEEK 410	WEEK 411
	WEEK 412	WEEK 413	WEEK 414
	WEEK 415	WEEK 416	WEEK 417
	WEEK 418	WEEK 419	WEEK 420
	WEEK 421	WEEK 422	WEEK 423
	WEEK 424	WEEK 425	WEEK 426
	WEEK 427	WEEK 428	WEEK 429
	WEEK 430	WEEK 431	WEEK 432
	WEEK 433	WEEK 434	WEEK 435
	WEEK 436	WEEK 437	WEEK 438
	WEEK 439	WEEK 440	WEEK 441
	WEEK 442	WEEK 443	WEEK 444
	WEEK 445	WEEK 446	WEEK 447
	WEEK 448	WEEK 449	WEEK 450
	WEEK 451	WEEK 452	WEEK 453
	WEEK 454	WEEK 455	WEEK 456
	WEEK 457	WEEK 458	WEEK 459
	WEEK 460	WEEK 461	WEEK 462
	WEEK 463	WEEK 464	WEEK 465
	WEEK 466	WEEK 467	WEEK 468
	WEEK 469	WEEK 470	WEEK 471
	WEEK 472	WEEK 473	WEEK 474
	WEEK 475	WEEK 476	WEEK 477
	WEEK 478	WEEK 479	WEEK 480
	WEEK 481	WEEK 482	WEEK 483
	WEEK 484	WEEK 485	WEEK 486
	WEEK 487	WEEK 488	WEEK 489
	WEEK 490	WEEK 491	WEEK 492
	WEEK 493	WEEK 494	WEEK 495
	WEEK 496	WEEK 497	WEEK 498
	WEEK 499	WEEK 500	WEEK 501
	WEEK 502	WEEK 503	WEEK 504
	WEEK 505	WEEK 506	WEEK 507
	WEEK 508	WEEK 509	WEEK 510
	WEEK 511	WEEK 512	WEEK 513
	WEEK 514	WEEK 515	WEEK 516
	WEEK 517	WEEK 518	WEEK 519
	WEEK 520	WEEK 521	WEEK 522
	WEEK 523	WEEK 524	WEEK 525
	WEEK 526	WEEK 527	WEEK 528
	WEEK 529	WEEK 530	WEEK 531
	WEEK 532	WEEK 533	WEEK 534
	WEEK 535	WEEK 536	WEEK 537
	WEEK 538	WEEK 539	WEEK 540
	WEEK 541	WEEK 542	WEEK 543
	WEEK 544	WEEK 545	WEEK 546
	WEEK 547	WEEK 548	WEEK 549
	WEEK 550	WEEK 551	WEEK 552
	WEEK 553	WEEK 554	WEEK 555
	WEEK 556	WEEK 557	WEEK 558
	WEEK 559	WEEK 560	WEEK 561
	WEEK 562	WEEK 563	WEEK 564
	WEEK 565	WEEK 566	WEEK 567
	WEEK 568	WEEK 569	WEEK 570
	WEEK 571	WEEK 572	WEEK 573
	WEEK 574	WEEK 575	WEEK 576
	WEEK 577	WEEK 578	WEEK 579
	WEEK 580	WEEK 581	WEEK 582
	WEEK 583	WEEK 584	WEEK 585
	WEEK 586	WEEK 587	WEEK 588
	WEEK 589	WEEK 590	WEEK 591
	WEEK 592	WEEK 593	WEEK 594
	WEEK 595	WEEK 596	WEEK 597
	WEEK 598	WEEK 599	WEEK 600
	WEEK 601	WEEK 602	WEEK 603
	WEEK 604	WEEK 605	WEEK 606
	WEEK 607	WEEK 608	WEEK 609
	WEEK 610	WEEK 611	WEEK 612
	WEEK 613	WEEK 614	WEEK 615
	WEEK 616	WEEK 617	WEEK 618
	WEEK 619	WEEK 620	WEEK 621
	WEEK 622	WEEK 623	WEEK 624
	WEEK 625	WEEK 626	WEEK 627
	WEEK 628	WEEK 629	WEEK 630
	WEEK 631	WEEK 632	WEEK 633
	WEEK 634	WEEK 635	WEEK 636
	WEEK 637	WEEK 638	WEEK 639
	WEEK 640	WEEK 641	WEEK 642
	WEEK 643	WEEK 644	WEEK 645
	WEEK 646	WEEK 647	WEEK 648
	WEEK 649	WEEK 650	WEEK 651
	WEEK 652	WEEK 653	WEEK 654
	WEEK 655	WEEK 656	WEEK 657
	WEEK 658	WEEK 659	WEEK 660
	WEEK 661	WEEK 662	WEEK 663
	WEEK 664	WEEK 665	WEEK 666
	WEEK 667	WEEK 668	WEEK 669
	WEEK 670	WEEK 671	WEEK 672
	WEEK 673	WEEK 674	WEEK 675
	WEEK 676	WEEK 677	WEEK 678
	WEEK 679	WEEK 680	WEEK 681
	WEEK 682	WEEK 683	WEEK 684
	WEEK 685	WEEK 686	WEEK 687
	WEEK 688	WEEK 689	WEEK 690
	WEEK 691	WEEK 692	WEEK 693
	WEEK 694	WEEK 695	WEEK 696
	WEEK 697	WEEK 698	WEEK 699
	WEEK 700	WEEK 701	WEEK 702
	WEEK 703	WEEK 704	WEEK 705
	WEEK 706	WEEK 707	WEEK 708
	WEEK 709	WEEK 710	WEEK 711
	WEEK 712	WEEK 713	WEEK 714
	WEEK 715	WEEK 716	WEEK 717
	WEEK 718	WEEK 719	WEEK 720
	WEEK 721	WEEK 722	WEEK 723
	WEEK 724	WEEK 725	WEEK 726
	WEEK 727	WEEK 728	WEEK 729
	WEEK 730	WEEK 731	WEEK 732
	WEEK 733	WEEK 734	WEEK 735
	WEEK 736	WEEK 737	WEEK 738
	WEEK 739	WEEK 740	WEEK 741
	WEEK 742	WEEK 743	WEEK 744
	WEEK 745	WEEK 746	WEEK

8.5 Maintenance

- A preventive maintenance program shall be established on all components of the pump assembly in accordance with the manufacturer's recommendations or an approved alternative maintenance plan.
- Records shall be maintained on all work performed on the pump, driver, controller, and auxiliary equipment.
- The preventive maintenance program shall be initiated immediately after the pump assembly has passed acceptance tests.

79 Johnson Controls —



Pump Testing Setup



Johnson Controls —

Safety

- Slips, trips, and falls
 - Liquids on floors of pump room, roofs, and driveways can lead to slip and falls
 - Drain pipes and grates can be trip hazards



83 Johnson Controls —

Johnson Controls 83

Pump Testing Setup

- Header
 - Before charging test header
 - Check header valve closed
 - Check header and valve integrity
- Flow Device
 - Safety cone off area
 - Always have 2 people on any pump test
 - Hose bursts
 - Pump room damage
 - Consider flow discharge and potential flooding issues



84 Johnson Controls —

Johnson Controls 84

Pump Testing Setup

- Determine the pumps:
 - Rated GPM
 - Data plate
 - Rated voltage
 - Rated amps



85 Johnson Controls

Johnson Controls 85

Pump Testing Setup

- Verify all equipment is off to prevent automatic start before working on any pump
 - Controllers
 - Electrical disconnects
 - Batteries disconnected
- Locate / install
 - Reflective tape for RPM
- Install your calibrated
 - Suction gauge
 - Discharge gauge



86 Johnson Controls

Johnson Controls 86

Pump Testing Setup

- Coupling Guard
 - Remove guard
 - Check pump shaft alignment
 - Inspect coupling guard condition
 - Replace coupling guard



87 Johnson Controls —

Johnson Controls 87

Fire Hose

- Hoses must be annually inspected per NFPA 1962



88 Johnson Controls —

Johnson Controls 88

Water diffusion

- Water diffusion risks
 - Poor placement of water diffuser
 - Use of non listed devices



89 Johnson Controls —

Johnson Controls 89

Annual Fire Pump Flow Test Demonstration

90 Johnson Controls —

Johnson Controls

Poll Question 6

What is the purpose of the annual flow test?

- A. Test the performance of the fire pump
- B. Wash off the parking lot
- C. To satisfy the NFPA 25 standard
- D. To make up for the fact that it hasn't been run in over 10 months

91

Johnson Controls —



Questions?

■ www.onlinetechxchange.com

■ training@tycofp.com

■ For more information, visit www.tyco-fire.com
 Or contact JCI Technical Services at
TechServ@jci.com
 1-800-381-9312

Johnson Controls
 1467 Elmwood Avenue
 Cranston, RI, 02910
training@tycofp.com
 (401) 781-8220

92

Johnson Controls —

