Fire Pump Inspection, Testing and Maintenance

NFPA 20; 2019 Edition
NFPA 25; 2020 Edition

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Housekeeping

- Participate in Polling
- Ask questions
- Post Training Assessment

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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

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Portfolio of Flagship Brands

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Learning Records

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

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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

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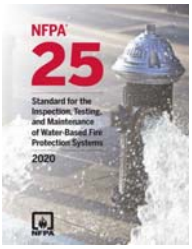
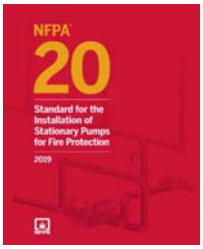
Introduction





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Pump Types & Pump Room Requirements

NFPA 20: 2019 Edition

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Fire Pumps

- **Purpose**
  - To provide adequate pressure and flow rate to satisfy the designed demand of the fire protection systems it supplies.
    - Systems can designed to be supplied from a municipal or private water supply or to be installed within a static water supply.
    - Can be driven by electric, diesel, or steam.

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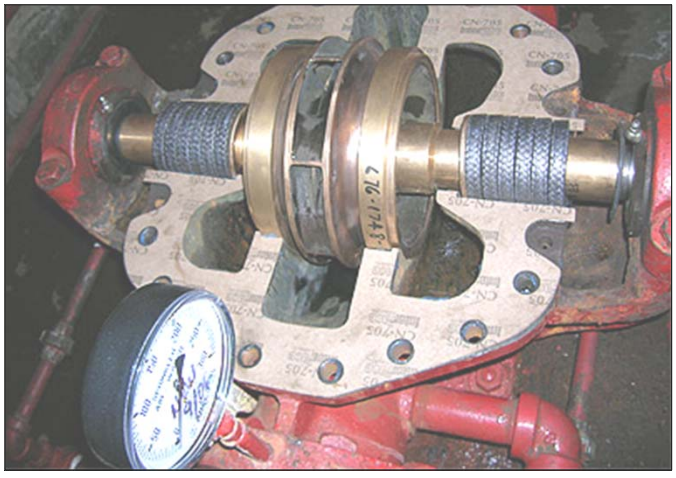
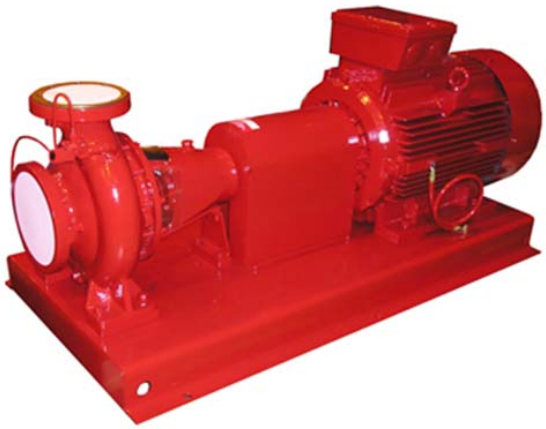
Horizontal Split Case

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

Horizontal Split Case Cut-Away



End Suction



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

Inline

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

Vertical

- 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 electric or diesel powered with right angle gear drive

4.14.3 Heat

- 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.

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

4.14.8 Guards

- 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.*

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

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Fire Pumps Components

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Drivers

- Electric motor
- Diesel engine

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Electric Motor

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

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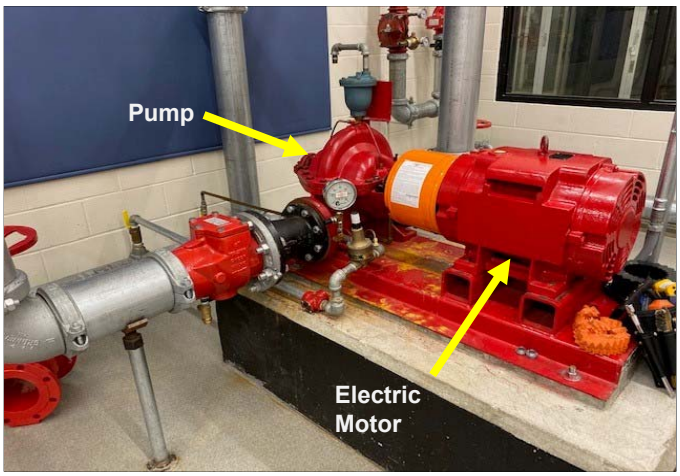
Electric Fire Pump



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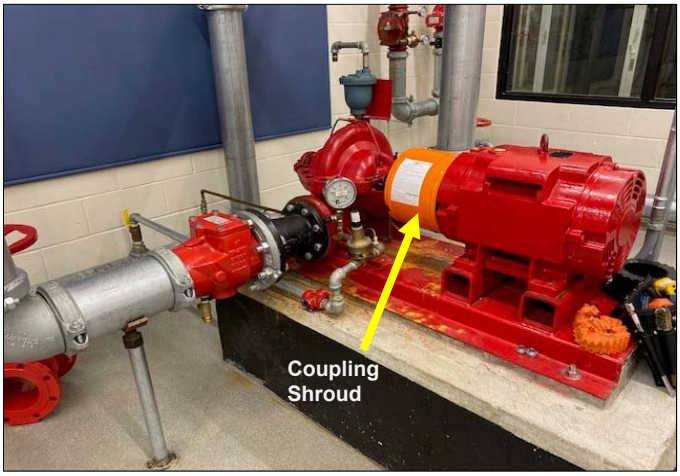
Electric Fire Pump



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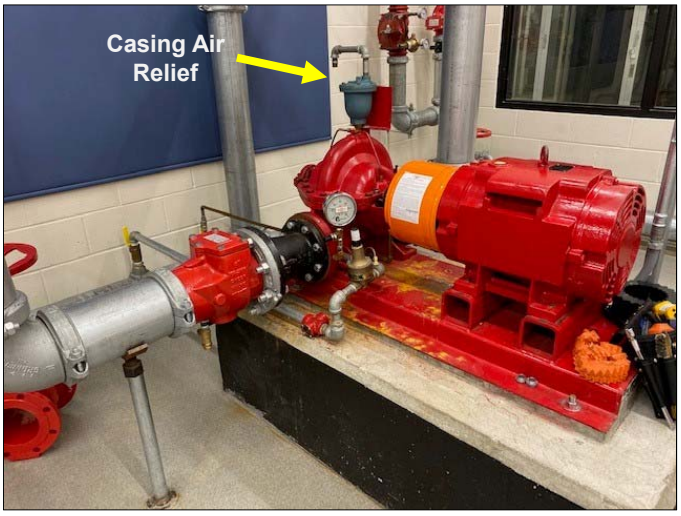
Electric Fire Pump



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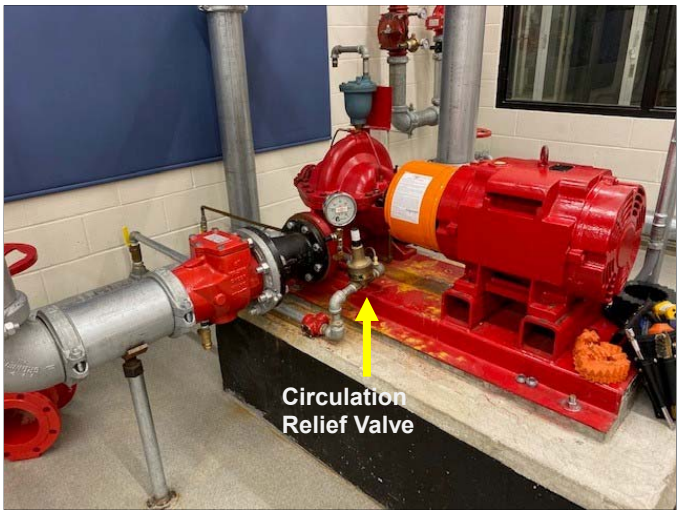
Electric Fire Pump



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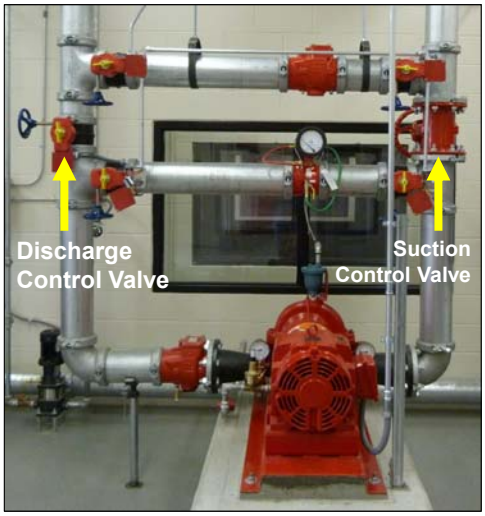
Electric Motor Driven Pump

- Both suction control & discharge control valves must be open



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Electric Pump Controller

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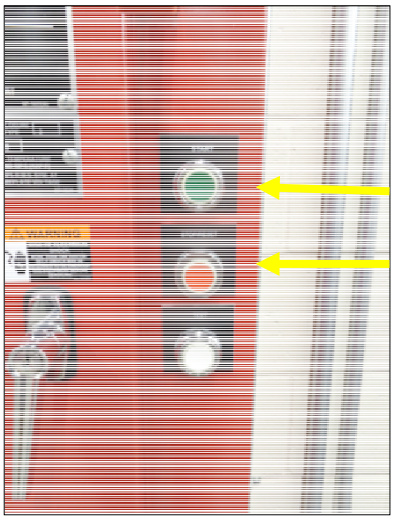
Electric Pump Controller



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Diesel Engine

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

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Diesel Fire Pump

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Diesel Pump Cooling Line

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Diesel Fire Pump Batteries

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Diesel Pump Controller

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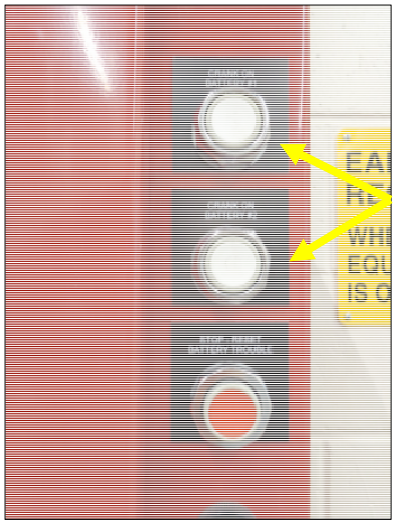
Diesel Pump Controller



Ability to manually start using either button

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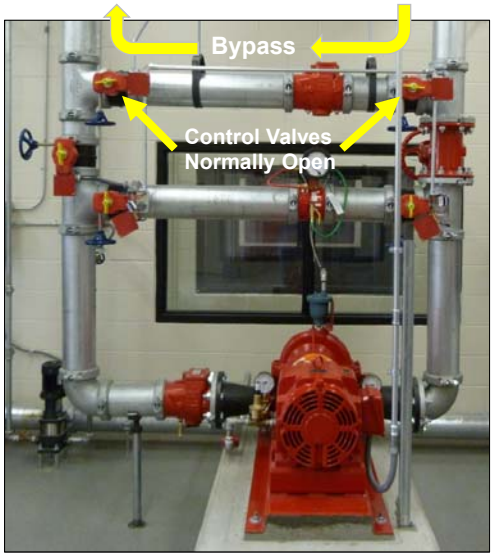
By-pass



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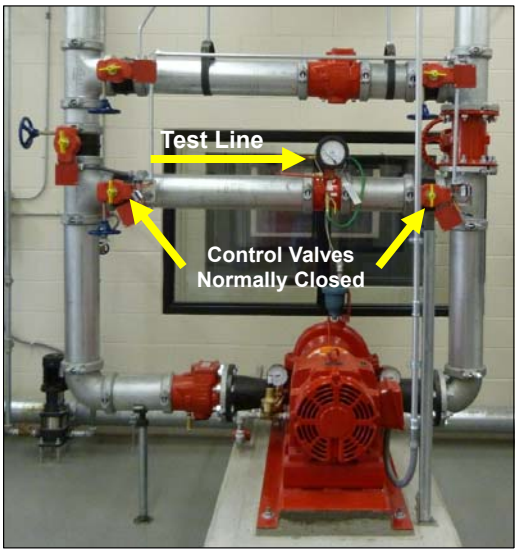
Test Line



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Jockey Pump

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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

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Inspection, Testing & Maintenance- No Flow Conditions

NFPA 25: 2020 Edition

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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.

Δ 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

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

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

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

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

Maintenance

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

8.3.1 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

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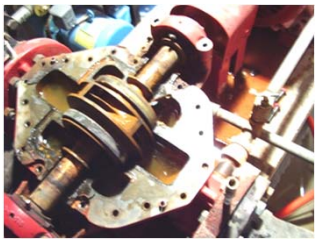
Common Components, Obstruction Investigations and Impairments

- 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.



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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

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

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

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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.

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Weekly

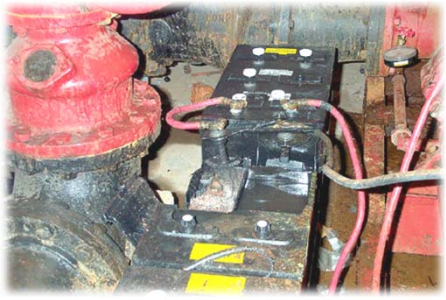
- Diesel engine system conditions
  - Fuel tank is at least two-thirds full.
  - Controller selector switch is in auto position.
  - Batteries' (2) voltage readings are within acceptable range.
  - Batteries' (2) charging current readings are within acceptable range.
  - Batteries' (2) pilot lights are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

Weekly

- 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.

Battery Inspections

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



Battery Maintenance PPE

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

Weekly

- Steam system conditions
  - Steam pressure gauge reading is within acceptable range

8.3.1 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.

8.3.1 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.

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

No-Flow Checklist

- 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)

No-Flow Checklist

- 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

No-Flow Checklist

- Steam System
  - Record steam pressures
  - Observe time for turbine to reach full speed

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.

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.

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).

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. Suffices the NFPA standard

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.

Johnson Controls 69

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	8.3.4.1
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
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

Johnson Controls 70

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.

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

Johnson Controls 73

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.

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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.

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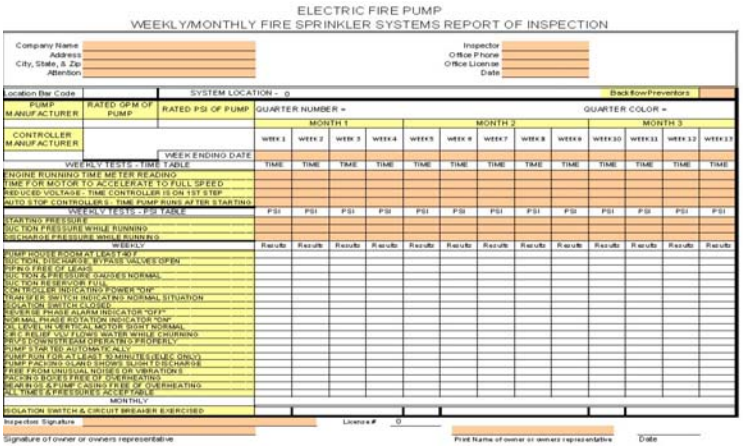
8.4 Reports

- 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
Address
City, State, & Zip
Attention

Inspector
Office Phone
Office License
Date

Location Bar Code | SYSTEM LOCATION – 0 | Backflow Preventors

PUMP MANUFACTURER | RATED GPM OF PUMP | RATED PSI OF PUMP | QUARTER NUMBER = | QUARTER COLOR =

CONTROLLER MANUFACTURER

	MONTH 1				MONTH 2				MONTH 3			
WEEK ENDING DATE	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
WEEKLY TESTS - TIME TABLE	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME	TIME
ENGINE RUNNING TIME METER READING													
TIME FOR MOTOR TO ACCELERATE TO FULL SPEED													
REDUCED VOLTAGE - TIME CONTROLLER IS ON 1ST STEP													
AUTO STOP CONTROLLER (-) TIME PUMP RUNS AFTER STARTING													
WEEKLY TESTS - PSI TABLE	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI
STARTING PRESSURE													
SUCTION PRESSURE WHILE RUNNING													
DISCHARGE PRESSURE WHILE RUNNING													
WEEKLY	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
PUMP HOUSE ROOM AT LEAST 40°F													
SUCTION, DISCHARGE, BYPASS VALVES OPEN													
PIPING FREE OF LEAKS													
SUCTION & PRESSURE GAUGES NORMAL													
SUCTION RESERVOIR FULL													
CONTROLLER INDICATING POWER "ON"													
TRANSFER SWITCH INDICATING NORMAL SITUATION													
ISOLATION SWITCH LOCKED													
REVERSE PHASE ALARM INDICATOR "OFF"													
NORMAL PHASE ROTATION INDICATOR "ON"													
OIL LEVEL IN VERTICAL MOTOR SIGHT NORMAL													
JOCKEY RELIEF VLV FLOWS WATER WHILE CHURNING													
JOCKEY STARTS/RUNS/STOPS PROPERLY													
PUMP STARTED AUTOMATICALLY													
PUMP RUN FOR AT LEAST 10 MINUTES (EC ONLY)													
PUMP PACKING GLAND SHOWS SLIGHT DISCHARGE													
FREE FROM UNUSUAL NOISES OR VIBRATION													
BEARINGS FREE OF OVERHEATING													
BEARINGS & PUMP CASING FREE OF OVERHEATING													
ALL TIME & PRESSURES ACCEPTABLE													
MONTHLY													
ISOLATION SWITCH & CIRCUIT BREAKER EXERCISED													

Inspection Signature | License # 0

Signature of owner or owners representative | Print Name of owner or owners representative | Date

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8.4 Reports

- At a minimum, the report shall contain the following information:
  - All raw data necessary for a complete evaluation of the fire pump performance, including suction and discharge pressures, voltage and amperage readings, and pump speed at each flow rate tested
  - The fire protection system demand as furnished by the owner
  - Pump performance, whether satisfactory or unsatisfactory
  - Deficiencies noted during the testing and identified during analysis, with recommendations to address deficiencies as appropriate
  - Manufacturer's performance data, actual performance, and the available pump discharge curves required by this standard
  - Time delay intervals associated with the pump's starting, stopping, and energy source transfer
  - Where applicable, comparison with previous test results

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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.

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Pump Testing Setup

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Equipment

- Equipment List:
  - Fire hoses
  - Flow devices
  - Calibrated gauges
  - RPM meter
  - Electrical meter
  - Safety cones
  - PPE
  - Radios
  - 2 people for testing

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Before You Begin

- Establish communications like with your partner
  - Test hand-held radios
- Visually inspect fire pump installation
  - Test header
  - Pump
  - Controller area
- Monitoring/Fire Department
  - Contact before testing

81 Johnson Controls —

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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

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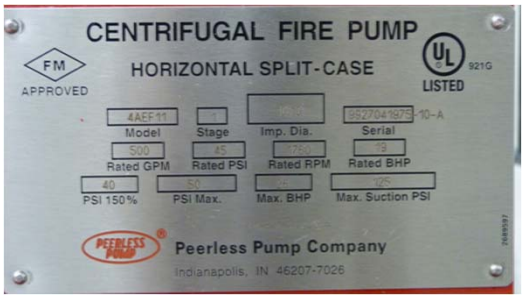
Pump Testing Setup

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



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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

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Pump Testing Setup

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

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Pump Testing Setup

- Install your calibrated
  - Suction gauge
  - Discharge gauge

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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

Fire Hose

- Hoses must be annually inspected per NFPA 1962

Water diffusion

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

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 suffice the NFPA 25 standard
D. To make up for the fact that it hasn't been run in over 10 months

Questions?

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