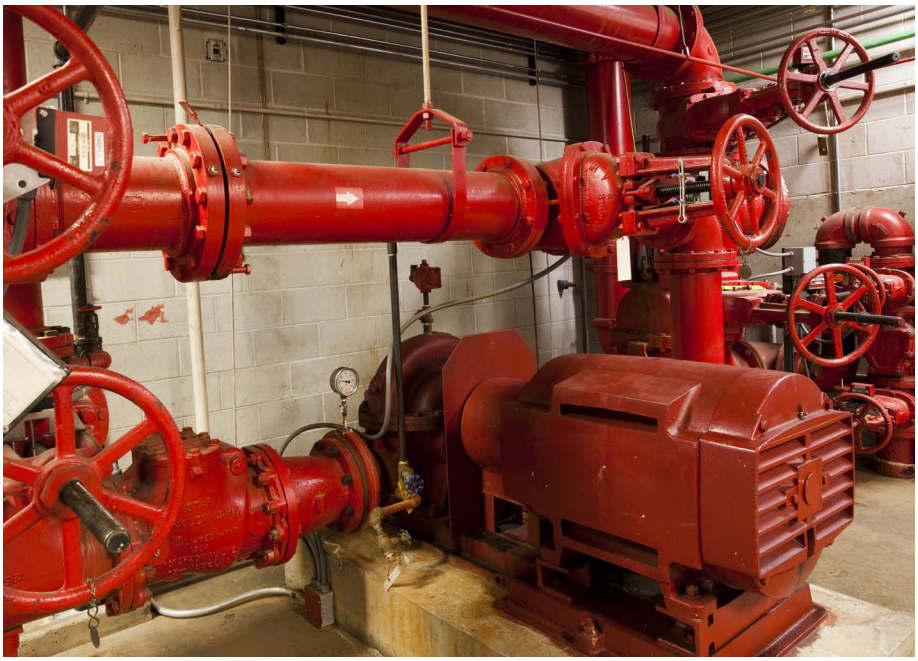
A guide to fire pump testing and maintenance.

Your fire pump is a critical component of your business's fire protection system.



The reliable operation of fire pumps is critical to your fire protection system. They deliver the flow and pressure required for your sprinkler system to respond to a fire. As with any mechanical system, preventive testing and maintenance are needed to ensure the pump operates when it's needed to help protect your business from a catastrophe.

There are two types of pumping systems based on the type of supply:

- **Fire pump** — A pump that draws water from a private supply such as a reservoir, tank, lagoon or other impoundment
- **Booster pump** — A pump directly connected to public waterworks for the purpose of increasing system operating pressure (e.g., in a high-rise requiring a "boost" in pressure to deliver water to upper floors)

The job of these pumps is to deliver water with adequate volume and pressure to sprinkler and standpipe systems. They're expected to operate at full capacity until all firefighting efforts have ceased.

Your sprinkler system must be supported by a pump when:

- Water is supplied by a private source
- There's insufficient pressure in the public water supply
- Changes in operations or storage require an increased water supply to meet increased sprinkler system density

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Pump System Components.

PUMP

Pumps can be horizontal or vertical. Horizontal pumps are most common where there's some available domestic supply pressure. Vertical pumps often draw water from underground supplies and are designed to lift water from tanks, reservoirs or other water storage. Both types are driven by a prime mover.

PRIME MOVER

The location of the pump and the reliability of the power supply are considered when selecting the prime mover for a pumping system. The most common prime movers are electric or diesel. In rare cases, steam turbines may be used to drive fire pumps. Electric motors are generally more popular and reliable. They are often supplied by a dedicated power line and provided with a backup supply.

Diesel engines are often used in areas with unreliable or unavailable electric power. They may also be used as a backup to an electrically pumped system. Because diesel-driven pumps require a much higher degree of care, they're less popular than electric pumps.

CONTROLLER

This electrical panel controls the starting and stopping of the prime mover and signals alarms. Controllers vary by the type of prime mover they control. All controllers should start automatically when a pressure drop occurs in the fire system. However, they should require manual intervention to shut down; they should not do so automatically.

ALARMS

The National Fire Protection Association (NFPA) recommends the following alarms for fire pumps and their related equipment:

- Fire pump running
- Fire pump power failure (for electric motors)
- Fire pump failure to start (for diesel engines)
- Pump controller not in automatic mode
- Diesel engine experiencing battery trouble, running too fast, and/or low on oil
- Pump house temperature too high
- Suction tank low water level

Testing and Maintenance.

All pumping systems require testing and maintenance to help ensure reliability. The test involves three variables — pump speed (rpm), pressure (psi) and discharge (gpm). Pump testing can be dangerous and must be completed by properly trained personnel with all safety precautions taken.

VERIFYING WATER SUPPLY

There must be an adequate and reliable water supply. This needs to be verified and checked regularly. Typically, a weekly visual check of tank water levels or supply pressures is sufficient.

EXERCISING THE PUMP

A pump that sits idle for months may not start or may fail shortly after a startup. Therefore, regular "exercising" is key to help ensure reliable pump operation. Pump exercising should be initiated by simulating system pressure drop at the pump controller unit. This test can be completed by trained, in-house staff once they learn the safe operation of the pump in churn mode from your licensed fire pump contractor.

Churn mode means the only water flowing will be from the casing relief valves. In most cases, electric drivers are to churn the pump monthly for 10 minutes. However, weekly churn testing is required for institutions with greater life safety risk, such as hospitals.

Diesel drivers should be operated weekly for 30 minutes. Because diesel-driven systems are inherently more complex, they require a more rigorous maintenance and testing protocol to ensure reliable emergency operation.

MAKING OBSERVATIONS AND RECORDING RESULTS

For any pump, the following should be recorded during churn testing:

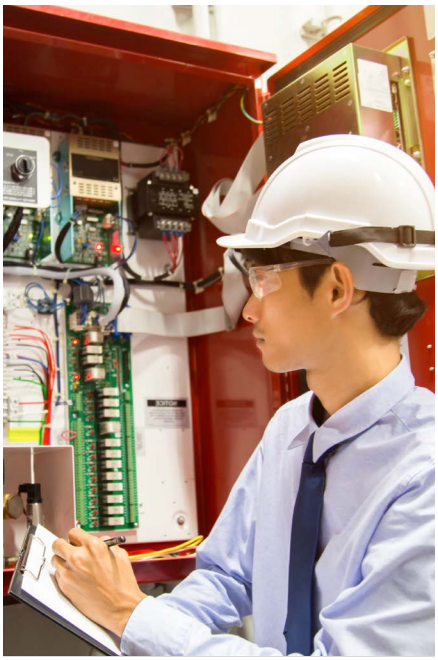
- System suction pressure gauge readings
- Discharge pressure gauge readings
- Pump starting pressure

Also, pump packing glands should be checked for slight discharge (adjust packing gland nuts, if needed), and packing boxes, bearings and pump casing should be observed for overheating.

In addition, depending upon the type of system you have, the items listed below should be checked.

Electric system

- Length of time before motor accelerates to full speed
- Length of time controller remains on first step (for reduced starting voltage or current)
- Pump run time following full start



Proper testing and maintenance of pumps greatly enhances the reliability of your fire protection system.

Questions? Contact Nationwide Loss Control Services: 1-866-808-2101 or LCS@nationwide.com.

Diesel system

- Engine cranking time
- Length of time before engine reaches running speed
- Engine oil pressure, speed indicator, water and oil temperatures
- Abnormalities
- Cooling water flow in heat exchanger

Steam system

- Steam pressure gauge reading
- Length of time for turbine to reach running speed

Maintain a log of all in-house churn testing / exercising in the pump area, and compare current and prior results to identify any significant differences. Then, engage a qualified, licensed fire pump contractor to troubleshoot all operating concerns noted while exercising the pump.

Annual Flow Testing.

Your licensed fire pump contractor should conduct annual flow testing, record all aspects of pump and driver operation, and provide you with completed report that identifies any deficiencies and lists suggested repairs. Review this report and take necessary corrective action. Also, be sure to require that your contractor complete testing of the driver per NFPA 20/25, including the following items:

At no-flow (churn) condition:

- Check circulation relief valve for operation to discharge water
- Check pressure relief valve (if installed) for proper operation
- Allow testing to continue for 30 minutes

At flow conditions approximating 100% and 150% of pump capacity:

- Record electric motor voltage and current on each line
- Conduct simultaneous readings of pump suction and discharge flow
- Record pump speed using a tachometer

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Make use of these additional resources.

To learn more about fire protection systems, refer to *NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection* and *NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.*

Also, ask your agent or our Loss Control Services team for our bulletins on Wet Pipe Sprinkler System Testing (CMO-0351AO) and our Fire Protection Impairment Program (CMO-0403AO).

Providing solutions to help our members manage risk.®

For your risk management and safety needs, contact Nationwide Loss Control Services: 1-866-808-2101 or LCS@nationwide.com.