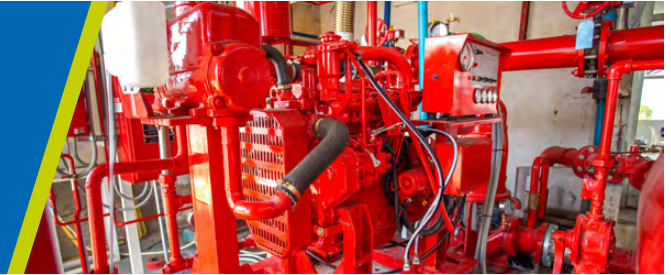


AIRE Bulletin

Diesel Fire Pumps



Diesel fire pumps, also known as booster pumps, are used to boost water pressure from sources that do not provide adequate pressure for sprinklers to work to a given specification. A fire pump can be connected to a city water main, tank, or reservoir/pond used for firefighting. The reliability of the fire protection system depends on the operation of the pump. In some instances, there may be a secondary source of water (e.g., a tank or pond) where the pump is critical for that system to function. Diesel fire pumps can help ensure fire protection will reliably remain in service during power outages resulting from issues with the local electrical grid or from natural catastrophes. While they can often act as the primary pumping source for fire protection water, diesel fire pumps may also serve as secondary backups in conjunction with a primary electric pump. This can provide redundancy in protection for large sites, high-valued facilities, or those located in seismic zones.

Operation

The fire pump set-up consists of a pump with a suction port where water enters from the source and a discharge side where the water is discharged at an elevated pressure. This is followed by a check valve to prevent the high pressure from leaking back to the source after the pump stops. The pump is driven by a diesel engine through a flexible coupling. The engine should have the same rpm rating as the pump for proper operation.

The motor and pump assembly is started by a controller box where, in automatic mode, a pressure-sensing device will initiate pump starting if the pressure goes below a set point. This set point can be adjusted in the field. There is often a smaller jockey pump that is installed to supplement small pressure changes and small volumes of water due to leaks in the system or expansion within the system. This is set to cut in before the main pump. The jockey pump also has a field-adjustable pressure-sensing device.

Pressure Settings

A fire pump engages automatically when the sensing device detects a pressure drop in the sprinkler system. The National Fire Protection Association recommends that the jockey pump (if used) be set to shut off at "pump churn" pressure plus the minimum static pressure on the suction side of the pump"

For the correct pressure settings:

- 1. Set the jockey pump start pressure at approximately 10 psi less than the jockey pump shut off pressure.

- 2. The main fire pump should be set to kick on about 5 psi less than the jockey pump start pressure, and should be configured for manual stop only to ensure the pump is allowed to run continuously in the event of a fire."

The prescribed pressure setting recommendations found in NFPA 20 (2025) maintain consistency in system operating pressures and avoid excessive swings or drops, which could cause a "water hammer" effect. This phenomenon can occur if the main pump quickly boosts the system pressure by a large margin during testing or normal operation, and is usually the result of wider set allowing pressure to drop significantly before pump activation. Water hammer puts undue strain on system components and could potentially lead to leaks, but can be easily mitigated by maintaining proper pressure setting for both jockey and fire pumps.

Pump Maintenance

To ensure the reliable operation of site fire protection pumps during an emergency, periodic inspection, testing, and maintenance (including alarm devices) are required. These critical procedures can be accomplished either by a qualified fire protection contractor, or by in-house staff with the knowledge and capabilities to perform & record the proper procedures per NFPA requirements. It is recommended that the annual flow test be performed by a qualified contractor due to the necessary equipment required. If the sprinkler system is monitored by the fire department or central station, whomever is tasked with performing any system testing should notify the monitoring company before the test commences.

Inspections: Suggested Weekly Intervals

- Verify valves are open between the water source and the sprinkler system (including system bypass valves, if any). The valve to the test connection should remain closed for normal operation.
- Confirm that suction-side and system-side pressure levels are normal.
- Ensure the controller power switch is on "auto" and the power light is on.
- Verify adequate heat in the pump area. If subject to seasonal freezing, heat should maintain at least 40°F (4°C).

- Check piping for leaks. It is normal for the pump to drip water from the two pump shaft seals for lubrication and cooling when running.
- Check that battery voltages are normal for both sets of batteries.
- Verify that no alarm conditions are shown on the controller or alarm panel (if present in the pump room).
- Check the fuel float level (should be at least 2/3 full).
- Check the engine oil level and oil heater operation (if installed).
- Inspect water and fuel hoses for leaks and inspect the water pump.
- Check battery water level if not the sealed type.

Maintenance: Suggested Intervals

Suggested Maintenance Intervals	
Quarterly	Clean fuel filter Change crankcase breather
Semi-Annually	Lubricate & inspect pump bearings & coupling
Annually	Change engine oil (every 50 running hours), Change Antifreeze, Calibrate gauges (Main & Jockey), Verify pressure switch accuracy (Main & Jockey), Tighten Electrical connections

Testing: Intervals as Indicated

Pump Churn Test – Weekly

- Start the pump with a drop in pressure. Read and record the gauges on both suction and discharge. Operate the pump for 30 minutes and confirm oil pressure, oil temperature, water temperature, and engine speed are within guidelines. NFPA 20 (2025) includes expanded provisions for automatic testing and remote automatic testing for both electric-driven and diesel-driven fire pumps; coordinate with the AHJ before implementing automated routines and maintain appropriate frequency.

Pump Alarm Tests – Quarterly

- Test pump alarms for pump running switch position/power failure, trouble, and valve tamper – quarterly. Verify receipt at the central station.

Pump Flow Test – Annually

- Operate with water flowing through the unit. Test at churn, at 100% rated GPM, and at 150% rated capacity. The resulting pressure at 100% rated capacity should equal the pump-rated pressure; at 150% of rated flow, it should be no less than 65% of the rated pressure at 100% flow. Use a qualified contractor where required; where system flow meters are provided, onsite discharge may be avoided. Maintain annual test records on site.

Transfer Switch Operation (if provided): Conduct annual testing of manual or automatic transfer of power supplies.

References

NFPA 25 (2025 Edition) – Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

NFPA 20 (2025 Edition) – Standard for the Installation of Stationary Pumps for Fire Protection.

Arch Insurance Risk Engineers (AIRE) Bulletin

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