

DIESEL FIRE PUMPS

ALLIANZ RISK CONSULTING

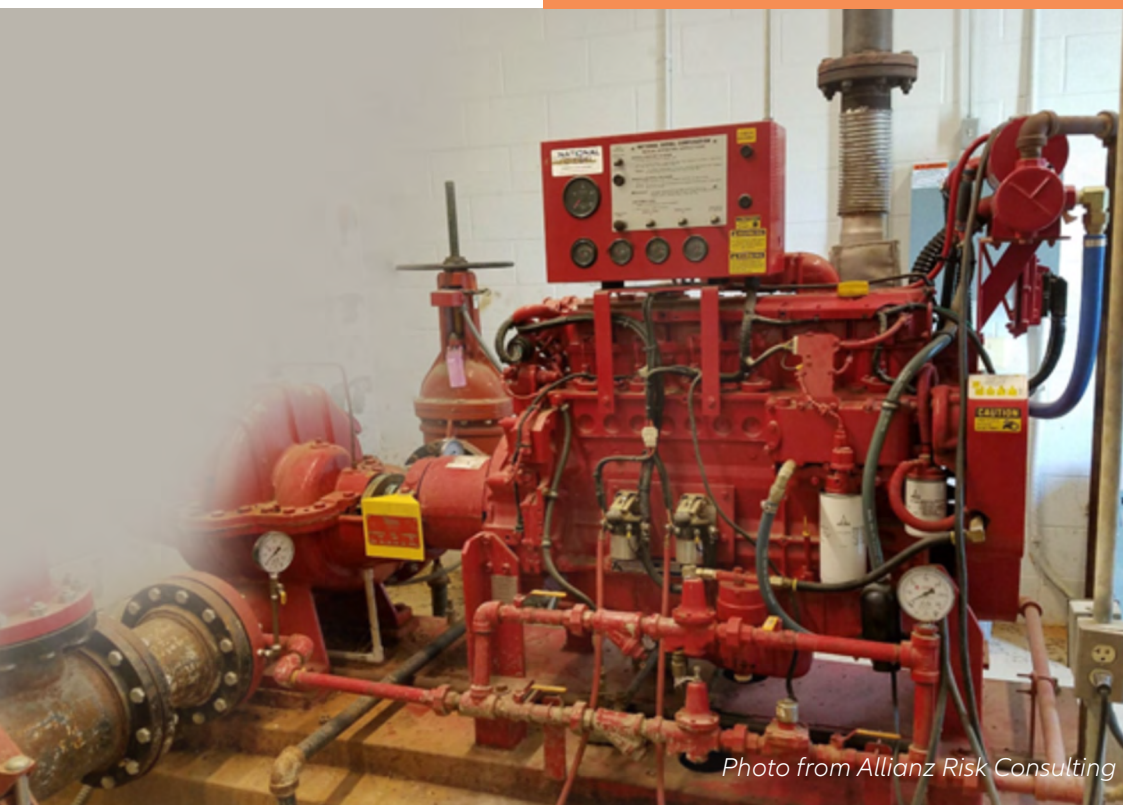


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OVERVIEW

Diesel fire pumps, also known as booster pumps, are used to boost water pressure from sources that do not provide adequate water pressure for the sprinklers to operate to a given specification. A fire pump can be connected to a city water main, tank or reservoir/pond used for firefighting purposes. 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 are often used where there is a potential reliability problem with the local electric grid. Often diesel fire pumps serve as a secondary water pumping source to a primary electric pump for large high valued facilities.

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 readily changed 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

When a fire pump system is set for automatic operation by a pressure drop in the sprinkler system, the National Fire Protection Association (NFPA) recommends that the jockey pump (if provided) be set to shut off at the pump churn pressure plus the minimum static pressure on the suction side of the pump.

The jockey pump start pressure should be approximately 10 psi less than the jockey pump shut off pressure. The main pump should be set to cut in about 5 psi less than the jockey pump start and cut out at the same shut off pressure as the jockey pump.

Many systems are set to cut in at a pressure that is too low, because the building manager is concerned about possible water damage from leaving high pressure in the system. The lower pressure will in fact cause a “water hammer” effect to occur when the pump is started for testing, which could cause damage to the system, resulting in leaks.

PUMP MAINTENANCE

If your property is provided with a pump for fire protection, it requires periodic inspection, maintenance and testing including alarm devices to ensure its reliable operation in event of an emergency. Depending on the capabilities of your in-house staff, inspection, maintenance and testing procedures can be handled in-house. Regardless, it is best to hire a sprinkler contractor for the annual flow test.

Diesel engines require more maintenance than electric fire pumps, which are usually maintained by a contractor familiar with this type of equipment. A sprinkler contractor is almost always used for the annual flow test. **If the sprinkler system is monitored by the fire department or central station it is imperative that the monitoring company be notified before any testing is conducted.** A list of some of the major maintenance and testing items for a diesel driven pump are listed below.

INSPECTIONS: SUGGESTED WEEKLY INTERVALS

- Check to make sure the valves are open between the source of water and the sprinkler system (including system bypass valves, if any). The valve to the test connection should remain closed for normal operation.
- Check to see whether suction-side and system-side pressure levels are normal.
- Check to make sure the controller power switch is on “auto” and the power light is on.
- Make sure there is heat in the pump area. If there is a separate pump room and you are located in an area subject to seasonal freezing temperatures, there should be a heater to maintain at least 40 degrees in the room.
- Check to see if any piping is leaking. It is normal for the pump to drip water from the two pump shaft seals. This provides lubrication when operating and helps prevent overheating.
- Check that battery voltages are normal for both sets of batteries.
- Check that no alarm conditions are noted 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).
- Check water and fuel hoses for leaks.
- Inspect water pump.
- Check battery water level if not the sealed type.

MAINTENANCE: SUGGESTED INTERVALS AS INDICATED

- Clean fuel filter quarterly.
- Change crankcase breather quarterly.
- Change oil annually or every 50 running hours.
- Lubricate and inspect pump bearings and coupling semiannually.
- Check gauge accuracy and pressure switch accuracy on both the main pump and jockey pump annually.
- Tighten electrical connections annually.
- Check battery charge level monthly.
- Change antifreeze annually.

TESTING: INTERVALS AS INDICATED

- **Pump Churn Test:** Pump is started by a drop in pressure. The gauges on the suction side and discharge side are read and recorded. The pump should be operated for 30 minutes. (Note whether oil pressure and temperature readings as well as water temperature readings and engine speed are within guidelines). NFPA recommends weekly tests.
- **Pump Alarm Tests:** Test pump alarms for pump running, switch position/power failure, trouble and valve tamper quarterly. Alarm function should be checked for receipt by the central station.
- **Pump Flow Test:** Pump is operated with water flowing through the unit. The pump is tested at churn, at 100% of its rated GPM capacity and at 150% of its rated capacity. The resulting pressure at its rated capacity should equal the pump-rated pressure. The resulting pressure at 150% of the rated flow should be no less than 65% of the rated pressure at 100% flow. This test is almost always done by a contractor equipped to perform this function. Some pumps have a flow gauge built into the system which does not require water to be discharged on the property. An annual testing interval is suggested and records of this test should be maintained on site for review by insurance company representatives.

- **Transfer Switch Operation** (if provided). Annual testing of manual or automatic transfer of power supplies is suggested.

The National Fire Protection Association has additional details on inspection, testing, and maintenance procedures listed in NFPA 25 Standard for the Inspection Testing and Maintenance of Water Based Fire Protection Systems (2020 Edition, Chapter 8 Fire Pumps, Sections 8.2 Inspection and 8.3 Testing) that can serve as an additional resource for help.

Design: [Graphic Design Centre](#)

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