

SANTA ROSA FIRE DEPARTMENT FIRE PREVENTION BUREAU STANDARD

July 1, 2010



FIRE PUMP

PURPOSE

This standard outlines the general requirements for the installation and maintenance of fire pumps. Information contained herein applies to typical instances and may not address all circumstances.

CODE REFERENCES

- 2007 California Building Code (CBC) 903 & 905
- 2007 California Fire Code (CFC) Chapter 9
- NFPA 20, 2003

PERMIT(S) REQUIRED

A Fire Pump Installation permit is required. Categories and fee amounts are found at: <http://ci.santa-rosa.ca.us/doclib/Documents/IB%20018.pdf>

ATTACHMENTS

- 1) Fire Pump Plan Review Checklist
- 2) Fire Pump Inspection Checklist

REQUIRED INSPECTIONS

- 1) Weld and Piping Inspection – NFPA 20, Section . Piping shall be on the ground for inspection of welds.
- 2) Hydrostatic Inspection – NFPA 20, Section . System shall be pressurized at 200 psi for two hours. Gage shall be marked upon pressurization.
- 3) Fire Pump Acceptance Test to include
 - a. Flushing
 - b. Hydrostatic Test
 - c. Flow test
 - d. Electrical system test (driver, phase, controller, generator)
 - e. Enclosure examination (heating, ventilation, alarms, lighting, security, drains)

Inspections shall be scheduled a minimum of 48 hours in advance. Directions for scheduling are found at: <http://ci.santa-rosa.ca.us/news/Pages/AutomatedFireInspectionRequestSystem.aspx>

PERMIT INFORMATION

Fire pumps shall be designed and installed in accordance with NFPA 20, 2003 Edition.

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A completed Permit and Plan Review Application Form and fee shall be submitted along with not less than three (3) sets of plans and calculations as required. A Santa Rosa BusinessTax Certificate, current appropriate contractor's license and proof of worker's compensation insurance shall be provided or shall be on file at the time of application.

Any deviation from plans as submitted during the installation requires Fire Department approval. Plans shall include the information specified below and failure to provide all of the required information may result in the plans being rejected. Rejected plans will be returned with a Plan Review Correction Form. Review the form and make the required additions/ changes which shall be clouded for identification. Provide a legend to describe the addition or change. Allow ten (10) working days for review of submitted plans.

Working plans shall be drawn to an indicated scale, on sheets of uniform size, with a plan of each floor and shall show the following data:

PLANS

- Three sets of drawings are provided.
- Equipment is listed for intended use, product listing data sheets are provided, 5.1.2.1, 5.7.
- A copy of a fire hydrant flow test summary sheet is provided, which includes static and residual pressures, flow rate, and the location of the flow and test hydrant(s).
- A common architectural scale is used and plan information is legible.
- Plan view and cross sectional views of installed equipment are provided, 5.2.
- Room dimensions are provided.
- Equipment symbol legend is provided.
- Suction pipe flushing requirements from Table 14.1.1.1 are on the plans.
- Plot plan illustrating connection to the water supply pipe and pipe diameter, and the pipe routing from the source to the fire pump.
- Driver, pump, and controller manufacturer, respective models, and driver type are specified.
- Copy of the factory pump test curve is provided, 5.5.
- Pump GPM rating, Head rating, RPM are provided.
- A pressure gauge complying with 5.10.1 is detailed as installed near the discharge casting.
- A compound and vacuum pressure gauge complying with 5.10.2.1 are detailed as installed to the suction pipe, (does not apply to vertical shaft turbine-type pumps taking suction from a well or open pit).
- A automatic relief valve complying with 5.11.1 is detailed as installed on the discharge side of the pump before the discharge check valve and it discharges to the drain. This requirement does not apply to engine-driven pumps provide cooling water from its discharge to the engine.
- A nonsprinklered fire pump room is separated by a 2 hour fire barrier. A sprinklered fire pump room in a nonsprinklered building is separated by a 2 hour fire barrier. A sprinklered fire pump room in a sprinklered building is separated by a 1 hour fire barrier. An exterior fire pump building is separated from adjacent buildings by at least 50 ft., Table 5.12.1.1.

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- The fire pump room containing a diesel pump driver and fuel storage tanks is protected by an automatic sprinkler system in compliance with NFPA 13. 5.12.1.3.
- Outdoor fire pump unit is placed at least 50 ft. from any building that would be an exposure, 5.12.1.2.
- When required by the environment or engine manufacturer, the fire pump room has a heat source in accordance with Section 5.12.2.
- Emergency lighting for the fire pump room is provided in accordance with section 5.12.4.
- Ventilation is provided in the pump room, 5.12.5.
- The pump room floor is adequately pitched to provide drainage and it drains to a frost free location, 5.12.6.
- The coupling guards for the flexible couplings or shaft connections between the pump driver and pump are noted or illustrated, 5.12.7.
- If used, the operating angle of a flexible connecting shaft is detailed and does not exceed the manufacturer listing requirements, 7.5.1.7.2.
- Size and type of pump suction and discharge pipe used are specified and detailed.
- Steel pipe size is specified for aboveground pipe, 5.13.1.
- The method of joining the steel pipe is specified, 5.13.2.

SUCTION PIPE AND FITTINGS:

- Size and the arrangement of the suction pipe complies with Table 5.25 (a or b), 5.14.3.4.
- The suction piping arrangement and OS & Y gate valve comply with section 5.14.5.
- The installation of elbows and tees shall be in accordance with section 5.14.6.3.
- If provided, eccentric taper reducer or increaser (for suction pipe and pump flange size differentials) is detailed and complies with section 5.14.6.4.
- Open source water supplies shall be equipped with a suction screen in accordance with section 5.14.8 and 5.14.9.
- Screens for open water source are removable and the screen material is specified, 5.14.8.6.
- Screens have at least a 62.5 percent open area, 5.14.8.11.
- When devices are installed in the suction piping they shall comply with section 5.14.9.
- A vortex plate is provided on the suction fitting that obtains water from a stored water supply, 5.14.10.

DISCHARGE PIPE AND FITTINGS:

- The size of the pump discharge pipe and fittings are in accordance with Table 5.25 (a or b), 5.15.5.
- A listed check valve or backflow prevention device is installed within the pump discharge assembly, 5.15.6.

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- Indicating gate or butterfly valve is on system side of the check valve, 5.15.7.

GENERAL:

- When required, a pressure relief valve for centrifugal pump is provided in accordance with section 5.18.1.
- The pressure relief valve's listing data sheet is provided and the valve is either spring loaded or pilot-diaphragm type, 5.18.4.
- Pressure relief valve discharge is designed in accordance with section 5.18.5.
- The size of the discharge pipe is in accordance with Table 5.25 (a or b), 5.18.5. If the pipe has more than 1 elbow, enlarge the pipe one size.
- The test header pipe diameter, number of hose valves, or the flow meter size and piping are detailed in compliance with Table 5.25, 5.19.
- When provided, the location of the backflow prevention device is detailed, and the equipment data sheet and friction loss information are provided, 5.26.
- The pressure maintenance pump location and piping are detailed and equipment data sheets are provided, 5.24.
- A check valve in the pressure maintenance pump discharge pipe is detailed and the location of gate or butterfly valves for allowing component repair are detailed, 5.24.
- Where located, check valves and backflow prevention devices or assemblies are located a minimum 10 pipe diameters from the pump suction flange, 5.26.3.
- For seismic design areas, the fire pump, driver and associated equipment and piping is provided seismic bracing in accordance with section 5.27 and seismic calculations for each method of protecting equipment are provided.

CENTRIFUGAL PUMPS:

- The selected centrifugal pump is specified and meets the design requirements of 6.1.1.
- The application of a centrifugal pump complies with the requirements of section 6.1.2.
- When required, the automatically controlled centrifugal pump has a float operated air release valve at least ½ in. diameter, 6.3.3.
- When a pipe strainer is required, the distance from the suction flange, construction materials, and free area are in compliance with section 6.3.4.
- The foundation and setting for the pump are detailed and in compliance with section, 6.4.
- The method of securing the pump base plate to the foundation is detailed, 6.4.3.

VERTICAL SHAFT TURBINE-TYPE PUMPS:

- Detailed for well installations is the submergence level of the second pump impeller level being at least 10 ft. below the water level and 1 ft. submergence is added for each 1,000 ft. of elevation, 7.2.2.1.1, 7.2.2.1.2.

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- Detailed for wet pit installations is the submergence level of the second pump impeller level being below the lowest pumping level of the open body of supply water. A greater submergence is required for pumps rated 2,000 GPM or greater. Obtain submergence depth requirement data sheet from manufacturer 7.2.2.2.1 to 7.2.2.2.3.
- The well casing, screen, and suction strainer are detailed, 7.2.3, 7.3.4.
- A report verifying the well can produce the appropriate quantity of water supply for the specified pump is provided, 7.2.3.1.
- The dimensions of the well, its casing and casing materials, well screen, fill gravel around the well screen, method of sealing the well bottom are detailed, 7.2.4.
- Specified is whether the well is in consolidated or unconsolidated formations, 7.2.4.
- A certified performance test report of the well is provided, 7.2.7.
- The tubular well for fire pumps 450 GPM or less is designed in compliance with 7.2.4 except 7.2.4.11 through 7.2.4.15, 7.2.4.16.2.
- The suction strainer has a free area at least 4 times the area of the suction connection and the screen can restrict passage of a .5 in. sphere, 7.3.4.
- The air relief valve and size, water level detector, pressure gauges, relief valves, hose valve header, valves or metering device locations are detailed and in conformance with section, 7.3.5.
- The well is equipped with a water level detector, 7.3.5.3.
- The pump foundation, support, anchoring, etc. design is detailed on the plans and in compliance with section 7.4.3.

POSITIVE DISPLACEMENT PUMPS:

- The pump is listed for its intended use and the listing verifies the pump's performance curves, 8.1.2.
- When installed on a closed head fire system a listed dump valve type is specified, and detailed in accordance with section 8.1.6.
- When provided, foam concentrate and additive pumps installations are detailed in conformance with 8.2. Pump data sheets are provided.
- When provided, water mist pump installations are detailed in conformance with 8.3. Pump data sheets are provided.
- Detailed are compound suction and discharge pressure gauges, and a listed safety relief valve locations, 8.4.
- A pump suction strainer is provided and is in compliance with the requirements of 8.4.5.
- The pump foundation, support, anchoring, etc. design is detailed on the plans and in compliance with section, 8.7.
- A means for flow testing is provided and the piping schematic is provided, 8.9.

DRIVER INFORMATION:

- Type, manufacturer, model, rated H.P. RPM are to be provided provided.
- If the pump uses a diesel driver, calculations indicating the number of hours of fuel supply are provided.

CONTROLLER INFORMATION:

- Manufacturer and model must be provided.

ELECTRIC DRIVE AND ELECTRICAL, COMPLIES WITH NATIONAL ELECTRICAL CODE ARTICLE 695:

- An electrical circuit schematic is provided.
- When provided, the electrical schematic shall detail the design for the secondary power circuit and transfer equipment is provided, 9.2.4.
- A second power source is provided in accordance with 9.2.4 when electric motors are used and the building height exceeds fire apparatus pumping capability, 9.2.1.2.
- Supply conductors shall directly connect to a listed combination fire pump controller and transfer switch or to a disconnecting means and one or more overcurrent protective devices, 9.2.5.4.
- Circuit conductors feeding fire pump(s) shall be dedicated and protected from fire, structural failure, or operational accident, 9.3.1.
- Circuits that supply the electric motor and that directly connect the power source to a listed pump controller are designed with a means of power continuity in accordance with 9.3.2.2.
- The electric motor is listed for fire pump service and meets the construction, horsepower and locked rotor current requirement of section 9.5.1.1.
- When an on-site generator is required to meet the power reliability requirements of NFPA 20, it has the capacity to run under the loads identified in section 9.6.1. The loads are specified and provided.
- Required generator(s) shall comply with the foundation requirements in section 6.4 and be of the level, type, and class specified in section 9.6.2. The system shall be designed in accordance with NFPA 110, and have a minimum fuel supply to operate the fire pump at its 100 percent rated capacity, 9.6.2.
- Transfer of power shall occur in the pump room, 9.6.4.
- The controller installation is detailed. It is located near and in sight of the motors it controls and energized controller components are provided working clearances in accordance with the National Electrical Code Article 110. NFPA 20 10.2.
- The fire pump controller is listed for use with a electric motor-driven fire pump and labeled in accordance with section 10.1.2.1.
- The controller and accessories are mounted on a single noncombustible support foundation, 10.3.2.
- Enclosures for the controller and accessories are in compliance with Section 10.3.3.

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- Controllers shall be provided with voltage surge arrestor, isolating switch, circuit breaker, locked rotor protection, and motor contacts in accordance with sections 10.4.1 through 10.4.5.
- Provided and detailed is an alarm circuit and a signal device at a constantly attended location when the pump room is not constantly attended. The alarm signal transmission occurs in accordance with Sections 10.4.7.2(A) through 10.4.7.2(D), 10.4.7.
- When required, the dedicated fire pump transfer switch location is detailed, the listing data sheets are provided, and the design complies with Section 10.8.3.
- When required, one dedicated transfer switch is assigned to a fire pump, 10.8.2.3.

DIESEL DRIVER:

- The engine is a compression ignition type and is listed for fire pump service, 11.1.2.1 and 11.2.1.
- The engine meets the rating requirements of section 11.2.2.
- The engine connection to the fire pump is noted and designed in compliance with Section 11.2.3.
- The engine is equipped with a governor complying with the requirements of Section 11.2.4.1.
- When the engine uses a variable speed pressure limiting control system it is noted on the plans and complies with Section 11.2.4.2.
- The engine is equipped with overspeed shutdown device that complies with Section 11.2.4.3.
- The engine is equipped with an instrument panel containing: tachometer, oil pressure gauge, and temperature gauge, 11.2.4.4- 11.2.4.7.
- Batteries have two means of recharging detailed and the chargers are listed for fire pump service and comply with the requirements listed in Sections 11.2.5.2.3 and 11.2.5.2.4.
- Detailed or noted on the plans is that each engine has two batteries that are rack supported, and current carrying-parts (cables) are not less than 12 in. above the floor, 11.2.5.2.1.1. and 11.2.5.2.5 -6
- The engine cooling system is closed-circuit liquid type and is specified as radiator or heat exchange type, 11.2.6.
- Adequate ventilation is provided for the pump room and the engine, 11.3.2.
- Fuel supply tank capacity calculations are provided and are at least 1 gallon per horsepower plus 5 percent volume for expansion and 5 percent volume for sump, 11.4.3 and the fuel supply tank design complies with IFC 34.
- Fuel piping is designed in compliance with Section 11.4.6.
- The controller is listed for use with diesel engine-driven fire pumps and labeled in accordance with Section, 12.1.3.
- The controller installation is detailed. It is located near and in sight of the engine it controls and energized controller components are provided working clearances in accordance with the National Electrical Code Article 110, 12.2.2 -4.
- The controller and accessories are mounted on a single noncombustible support foundation, 12.3.2.

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- Enclosures for the controller and accessories are in compliance with Section 12.3.3.
- Provided and detailed is an alarm circuit and a signal device(s) in the engine room. The visible indicators and a common alarm signal occurs in accordance with events listed in sections 12.4.1.3(1) through 12.4.1.3(11), 12.4.
- When the pump room is not constantly attended, the alarm and signal devices are remote from the controller, in a constantly attended location, and are detailed and designed in accordance with section 12.4.2.
- Engine exhaust is vented to the exterior and where the exhaust will not harm persons or endanger buildings, 11.5.
- Engine exhaust piping connections, diameter, clearances to combustible materials, and termination points are detailed and design in accordance with Section 11.5.3.

OTHER:

- The pump room shall have suitable means to maintain the temperature >40 degrees F. CFC 913.3
- Valves shall be electrically supervised in their normal position, includes test valves. CFC 913.4