



City of Miami Fire-Rescue
FIRE PREVENTION BUREAU
444 SW 2 AVE - 10th Floor; Miami, FL 33130
FPB@miamigov.com
(305) 416-1600

High-Rise Fire Pump Systems Guideline

Purpose: The purpose of this guideline is to address the technical requirements for fire pumps in high-rise buildings. The goal is to provide the customer with the minimum information required for successful plan review and approval by the AHJ.

This guideline addresses the technical requirements for fire pump systems in high-rise buildings. Please note this guideline does not provide a complete relisting of all code requirements. The design of the fire protection system is required to meet all applicable code sections, even if not presented within this guideline. Refer to adopted codes for all applicable code requirements. The following requirements apply to fire pump drawings submitted for AHJ approval:

Applicable Codes:

Florida Building Code, Building, 7th Edition

Florida Fire Prevention Code, 7th Edition

NFPA 13 Standard for the Installation of Sprinkler Systems, 2016 edition

NFPA 14, Standard for the Installation of Standpipe and Hose Systems, 2016 edition

NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, 2016 edition

NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems, 2017 edition

1. Submittal Requirements

- a. All Plan Sheets –Include architectural, structural and life safety drawings with the fire protection drawings.
- b. General Plan Requirements
 - (1) Engineer seal/Designer signature.
 - (2) Title block, Project name/address, owner name/address/contact, engineer/contractor name/address/contact.
 - (3) Scale: Identify the scale used. Scale to be appropriate for the level of detail required.
 - Civil scale of 1:20, 1:30, 1:40 for site plan.
 - Architectural scale of 1/8" = 1'-0", 3/32" = 1'-0" for floor plans.
 - Detail scale of 1/2" =1'-0", 1/4" =1'-0" or 3/16" =1'-0" for standpipe system stairwell sections, hose valve detail, pressure reducing valve detail, sprinkler control valve assembly detail and fire department connection (FDC) detail.
 - Isometric view of the standpipe system to be provided.



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- c. Point of Compass shall indicate true North direction on all plan view sheets.
 - d. Symbol Legend
 - (1) Define symbols used on drawings to represent fire pumps, jockey pumps, controllers, OS&Y gate valves, check valves, butterfly valves, fire department connections (FDCs), test header assembly and other required system components.
 - (2) Refer to NFPA 170, 2018 edition for recommended drawing symbols.
2. Fire Protection General Notes / Design Criteria
- a. Fire Protection System Engineering Documents shall include design information as defined in FL Statutes 61G15-32.004 (4) items (a) through (m).
 - b. Indicate applicable codes and corresponding edition.
 - c. Project description: Provide a description of the proposed building and required fire protection systems pressurized by the fire pump system. Identify the type and number of fire pumps provided. Define the pressure zones and their interconnection.
 - d. ID the systems served by the fire pump.
 - e. Indicate the greatest system demand for each fire pump system.
 - f. Note: NFPA 14 addresses zones, often each zone will have its own pump. If multiple zones, clarify the use of the fire pumps, address the set-up of the fire pumps for multiple zones, ID how the high-zone pumps activate, ensure that they activate with supply being secure.
 - g. Pump description
 - (1) ID manufacturer and model of each fire pump
 - (2) ID driver type, electric or diesel, See NFPA 20 Chapters 9 and 11
 - (3) ID Horsepower/RPM of driver vs horsepower/RPM requirements of pump, see NFPA 20 Section 4.7.6
 - (4) ID the pump type, centrifugal (including orientation) or Vertical shaft, NFPA 20 Chapters 6 and 7
 - (5) ID impeller size, compare to flow charts for pumps with multiple impeller choices, NFPA 20 6.1.1.1
 - (6) ID manufacturer and model of driver
 - (7) Provide jockey pump info, make/model, ID gpm and pressures, NFPA 20 Section 4.25
 - (8) Describe emergency power for high-rise, IBC 403 and NFPA 20 Section 9.3
 - (9) ID the monitoring signals required, electric vs diesel, onsite vs offsite, NFPA 20 Sections 10.4.6, 12.4.1 and 12.4.2.
 - h. ID performance of pump



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- (1) Summarize static and residual pressure, at supply flow, of municipal water supply.
 - (2) Summarize fire pump pressures at churn (zero flow), rated pump flow, and 150% of rated pump flow.
 - (3) ID the maximum pressure at churn developed at the pump discharge
- i. List of Materials presented in a chart/table format on the plans, listing each component manufacturer and model number (as applicable), and maximum working pressure for the system components. Where high pressure components are required at certain points within the system to accommodate system design, the high-pressure components are to be identified with a “HP” designation on the material list and on the plans:
- (1) Fire Pump
 - (2) Fire pump Driver
 - (3) Fuel tank information for diesel
 - (4) Battery sets for diesel
 - (5) Jockey pump
 - (6) Controllers for fire pump and jockey pump
 - (7) Control valves
 - (8) Clarify normally open versus normally closed status of valves, NFPA 20 Section 4.16
 - (9) Check Valves
 - (10) Backflow preventers
 - (11) Test Header valves
 - (12) Flow meter
 - (13) Pressure relief valve
 - (14) Pressure reducing valve
 - (15) Circulation relief valve, see NFPA 20 Section 4.11
 - (16) Air release device
 - (17) Pipe type and schedule
 - (18) Fittings
 - (19) Couplings
 - (20) Gauges, ID the pressure range, ensure that discharge pressure gauge has range to 2 times the working pressures, see NFPA 20 Section 4.10
- j. Backup Fire Pumps: A fully independent and automatic backup fire pump is required for the following:



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- (1) Standpipe system zones above the low zone (i.e., mid zone and high zone)
 - (2) Standpipe system zones supplied from a fire water storage tank
- k. High Zone Water Storage Tank Requirements
- (1) Per Miami Fire and Rescue policy, water supply tanks shall be provided in accordance with NFPA 20 Section 5.6 for buildings with hose valve outlets located at 575 feet or more above the lowest level of fire department access. While there exists a limited number of high-pressure pumping apparatus that can produce pressures sufficient for buildings taller than 575 feet, most apparatus within the fire department fleet are limited in discharge pressure. Hence the high-level water storage is required to ensure suitable water supply is available at all times for the upper zones.
 - (2) A primary water supply consisting of high-level water storage with additional pumping equipment shall be provided for standpipe system zones with a hose outlet/ roof manifold located more than 575 ft. above the lowest level of fire department access. Refer to NFPA 14 Sections 7.9.3 and 9.1.4 for requirements applicable to buildings where fire department pumpers cannot supply the required system demand through an FDC.
 - (3) The fire water tank supplying the upper zone(s) shall comply with requirements for Water Supply for Very Tall Buildings in NFPA 20 Section 5.6.1, 2016 edition.
 - (4) The fire water tank shall be sized for the full fire protection demand. Two or more tanks shall be provided, or the tank shall be divided into compartments sized so that at least 50 percent of the fire protection demand is stored with any one compartment or tank out of service.
 - (5) Fire water tank shall comply with all requirements of NFPA 20: 5.6.1. An automatic and manual refill valve is required for each tank or tank compartment. Each refill valve shall be sized and arranged to independently supply the system fire protection demand. The automatic and manual refill valve combination shall have its own connection to a standpipe riser that is supplied with a backup fire pump, or a reliable domestic riser sized to meet the fire protection system demand.
 - (6) In addition to the high zone fire water tank, fire department connections shall be provided to serve the high zone.
- l. Commissioning requirements
- (1) Flushing requirements for piping, see NFPA 20 Section 14.1.1
 - (2) Hydrostatic test required to be either 200 psi, or 50 psi above working pressure, whichever is greater, NFPA 20 Section 14.1.2.1
 - (3) Flow tests, 0%, 100%, 150%, NFPA 20 14.2.6.2.3
 - (4) Minimum of 6 auto and 6 manual starts and stops, NFPA 20 Section 14.2.7.2
 - (5) Testing on emergency power, NFPA 20 Section 14.2.8



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3. Fire Protection Site Plan

- a. Site plan to be shown in plan view.
- b. Show adjoining streets, identify street names, show property lines, building outline on ground level.
- c. Connections from municipal water supply
- d. Show backflow prevention devices, size to be capable to supply 150% of the fire pump rated flow to satisfy NFPA 20 Section 6.2.1
- e. Minimum of two water main sources for buildings over 420 ft, FBC 403
- f. FDC locations
- g. Minimum two FDC's required for each zone, NFPA 14 Sections 7.12.1 and 7.12.2
- h. FDC to be tied to discharge side of the fire pump, NFPA 14 Section 6.4.3.1

4. Fire Pump Room Enlarged Plan

- a. Show arrangement of pump design in top plan view, scale ½-inch or 1-inch to 1-foot
- b. Heating/conditioning/lighting, NFPA 20 Sections 4.12.2, 4.12.5
- c. Ventilation for combustion air in diesel NFPA 20 Section 4.12.6
- d. Pump room rating, NFPA 20 Section 4.12
- e. Pump room sizing, show sufficient clearances for equipment, NFPA 20 Section 4.12
- f. Pump room sprinklers, NFPA 20 Section 4.12
- g. Pump room, drains and floor pitched, NFPA 20 Sections 4.12.7 and 11.3.1
- h. Foundation for the pump, NFPA 20 Sections 6.4 and 7.4.3
- i. Piping Arrangement
 - (1) Show the suction, OS&Y valve, bypass, check valves, discharge, test header, FDC interconnection, air release, pressure relief valves, pressure reducing valves, and all components of the fire pump system. Where high pressure components are required at certain points within the system to accommodate system design, the high-pressure components are to be identified with a "HP" designation on the material list and on the plans.
 - (2) ID pipe diameters
 - (3) Detail pipe support/hangers, NFPA 20 Section 4.13.5
 - (4) Clarify protection of pipe and required clearances when pipe passes through building construction, NFPA 20 Section 4.17
 - (5) Coupling guards for flexible couplings and flexible connecting shafts, NFPA 20 4.12.8



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- (6) Confirm pipe sizing and accessory count, NFPA 20 Table 4.26
- (7) Show pressure relief valve, location, and discharge, when permitted, NFPA 20 Section 4.18
- j. Suction pipe
 - (1) Suction pipe arrangement for 10 pipe diameters to avoid turbulence, NFPA 20 Sections 4.14.3.3 and 4.14.6.3.2, Table 4.27
 - (2) Eccentric reducer, NFPA 20 Section 4.14.6.4
 - (3) OSY valve required on suction side, NFPA 20 Section 4.14.5.1
 - (4) Size of suction line shall be in accordance with NFPA 20 Table 4.27
- k. Discharge pipe
 - (1) Flow test device arrangement, NFPA 20 Section 4.20
 - (2) Discharge control valve, NFPA 20 Section 4.15.7
 - (3) No Pressure Regulating Device on discharge unless specifically allowed by standard, NFPA 20 Section 4.15.9.1, 4.18
- l. Pump Bypass
 - (1) Provide fire pump bypass, NFPA 20 4.15.4
- m. Electric motor requirements (NEC 695)
 - (1) Description of normal power arrangement, NFPA 20 Section 9.2
 - (2) Clarify that secondary power is provided, NFPA 20 Section 9.3
 - (3) Verify that secondary power for electric fire pump has minimum duration of 8 hours, NFPA 20 Section 9.6.2
 - (4) Describe disconnecting means arrangement, NFPA 20 Section 9.2.3, 9.6.4
- n. Diesel Engine requirements
 - (1) Confirm speed control governor, NFPA 20 Section 11.2.4.1
 - (2) Provide detail of diesel tank, show filling and venting piping, NFPA 20 Section 11.4
 - (3) Tank volume: 1 gal per hp, add 5% for expansion, add 5% for sump, NFPA 20 Section 11.4.2.1
 - (4) Batteries, 2 units, confirm sizing, minimum temperatures, recharging means NFPA 20 Sections 11.2.7.2 and 12.5-12.6
 - (5) Diesel pump room ventilation, NFPA 20 Section 11.3.2
 - (6) Describe the engine cooling system, clarify use of heat exchanger, cooling water from pump discharge, or radiator, ID the maximum temperature in combustion chamber, NFPA 20 11.2.8



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- (7) Confirm engine over-speed shutdown, NFPA 20 Section 11.2.4.4.1
 - (8) Provide description of instrumentation panel with tach, oil pressure gauge, temperature gauge, NFPA 20 Section 11.2.5
- o. Controllers
- (1) Verify general controller requirements.
 - Electric: listed for use, including voltage surge arrestor, isolating switch, circuit breaker, locked rotor protection, motor contacts, 10.4.1 through 10.4.5
 - Diesel: listed for use, including pressure recorder, weekly program timer, NFPA 20 Sections 12.4.4 and 12.7.2.7
 - (2) Describe controller and transfer switch arrangement for electric pumps, NFPA 20 Section 10.8.2
 - (3) ID controller location, show free space in front, minimum 36 inch deep and 30 inch wide, NFPA 20 Sections 10.2.4 and 12.2.4
 - (4) Show the sensing line arrangement, NFPA 20 Sections 4.14.9.2(2) and 4.30
 - (5) ID controller settings, NFPA 20 Section A.14.2.6(4)
 - (6) For designs with multiple pumps in series, address sequence starting of pumps, NFPA 20 Sections 10.5.2.5 and 12.7.2.4
 - (7) ID signals on controllers and remote from controllers
 - Electric Pump, NFPA 20 Section 10.4.6: Pump running, loss of power, phase reversal.
 - Diesel, NFPA 20 Section 12.4.1: Controller switch off-automatic, pump running, trouble on controller, low oil pressure, high engine temp, failure to start, battery failure, battery charger failure, low fuel, shutdown(overspeed)
 - Note: first three diesel signals transmitted remotely, others are on controller only
- p. Jockey pump
- (1) Provide separate detail for the jockey pump installation.
 - (2) Show piping from water supply to jockey pump suction, and from jockey pump discharge to fire pump discharge piping after discharge control valve.
 - (3) Show sensing line arrangement between system piping and jockey pump controller, NFPA 20 Section 4.30
- q. Appurtenances
- (1) Gauges
 - (2) Anti-vortex plate (with tanks), NFPA 20 Section 4.14.10



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5. Section View

- a. The section views assist with review of the fire pump. Section views to be drawn at scale of ½-inch or 1-inch to 1-foot.
- b. The items provided on section views are to facilitate review. Where high pressure components are required at certain points within the system to accommodate system design, the high-pressure components are to be identified with a “HP” designation on the material list and on the plans:
 - (1) Municipal Water Supply into the pump room
 - (2) FDC tie-in to fire pump discharge
 - (3) Bypass
 - (4) Fire pump and associated piping
 - (5) Fire pump stands.
 - (6) Control valves
 - (7) Check Valves
 - (8) Master PRV devices
 - (9) test header supply
 - (10) for systems with multiple pumps, the interconnection between the pumps

6. Details: Specific items require detail drawing to clarify design as required by the applicable codes. These may be incorporated into plan sheets and/or shown on detail sheets

- a. Test Header
- b. FDC connection

7. Component Specifications

- a. Manufacturer documentation required for all components of the system
- b. Factory pump curve to be provided, NFPA 20 Section 14.2.4.1

Note: Ensure that manufacturer specifications match those components listed in the general notes