City of Miami Fire-Rescue
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High-Rise Standpipe Systems Guideline

Purpose: The intent of this guideline is to clarify the fire protection plan requirements for standpipe system design 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.

Standpipe system design is expected to be combined with overall fire protection system plans showing the fire pump and fire sprinkler designs. Refer to applicable codes and corresponding City of Miami technical guidelines for fire pump and sprinkler system requirements.

This guideline addresses the technical requirements for automatic standpipe 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 standpipe drawings submitted for AHJ review and 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 22, Standard for Water Tanks for Private Fire Protection, 2018 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 – Electronic plan submission required. 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.

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 control valves, check valves, butterfly valves, standard hose valves, pressure-reducing hose valves, fire department connection (FDC) and test header assembly.

(2) Refer to NFPA 170, 2018 edition for recommended drawing symbols.

2. Fire Protection General Notes / Design Criteria

a. Fire protection plans shall include all required design information as defined in FL Statutes 61G15-32.004 (4) items (a) through (m).

b. Indicate applicable codes and corresponding edition.

c. Include standpipe system design summary

(1) Identify system class in accordance with NFPA 14 Section 5.3. Class I, automatic wet-pipe standpipe system required for high-rise buildings (NFPA 14 Section 5.4.1.2).

(2) Identify standpipe system design flow rate in accordance with NFPA 14 Section 7.10. Maximum standpipe system flow rate required is 1,000 gpm for buildings sprinklered throughout (NFPA 14 Section 7.10.1.1.5).

d. Indicate the maximum standpipe system pressure.

(1) Standpipe system maximum pressure limited to 350 psi as per NFPA 14 Section 7.2.1.

(2) AHJ approval is required where design consists of express risers supplying high standpipe zones with system pressures exceeding 350 psi as per NFPA 14 Section 7.2.2.

(a) AHJ approval is necessary to ensure that the pressures required at Fire Department Connection inlets are within the operational limits of the fire department.

(b) AHJ approval is required for high-pressure system components.

(3) Pressure limitations and listing of high-pressure system components shall be verified and identified on drawings.

(4) Schedule 40 piping is required for portions of the system where the working pressure exceeds 300 psi (NFPA 14: 4.2.3, 2016 edition).

(5) Note: Most system components (listed fire protection control valves and check valves) are typically limited to a maximum working pressure of 350 psi. Equipment for sprinkler systems and standpipe hose valves are typically limited to 175 psi or below.

(6) The rated working pressure of each system component shall be equal to or greater than the standpipe system / zone working pressure.

e. Define standpipe system pressure zones (i.e., low, mid, high pressure zones) and method of pressure management.

(1) High-rise and very tall buildings will require careful design of the system to manage system pressures in accordance with NFPA 14 and the limitations of the system components.

(2) Pressure reducing hose valves shall be provided to limit static pressures at the outlet of the hose connection to no more than 175 psi as per NFPA 14 Section 7.2.3.2, and residual outlet pressure to no less than 100 psi at full system demand as per NFPA 14 Section 7.8.1.

(3) Due to system and component pressure limitations, the height of any standpipe system zone is limited to a maximum static system pressure of no more than 350 psi.

(4) Where the pressures required at the Fire Department Connection (FDC) exceed 350 psi, special approval is required from the AHJ, to address specific requirements for buildings that exceed the pumping capability of the fire department. Refer to NFPA 14 Sections 7.9.3 and 9.1.4.

(5) Standpipe system zones provided with separate fire pumps shall comply with NFPA 14 Section 7.9.1. Refer to City of Miami High-Rise Fire Pump System Guideline.

(6) Zones defined by the use of a master pressure-reducing valve shall comply with NFPA 14 Section 7.2.4. Refer to City of Miami Master Pressure-Reducing Valve Guideline.

f. List of Materials presented in a chart/table format on the plans. List shall include each component, manufacturer, model number (as applicable), and corresponding maximum working pressure. Where high pressure components are required at certain points within the system, the high-pressure components are to be identified with a “HP” designation on the material list and on the plans. Identify pipe schedule on the isometric and/or riser diagram. List of materials shall include the following:

(1) Pipe

(2) Fittings

(3) Couplings

(4) Hose valves

(5) Pressure regulating hose valves

(6) Pressure regulating devices

(7) Control valves

(8) Check valves

(9) Waterflow switch

(10) Gauges

(11) Drain components

(12) Fire department connection

(13) Roof manifold

g. Identify pressure requirements at hose valve discharge (min residual, max static)

(1) Maximum static pressure at Class I hose valves is 175 psi, NFPA 14 Section 7.2.3.2.

(2) Minimum residual pressure of 100 psi required at full design flow at the outlet of the hydraulically most remote 2-1/2 in. hose connection at the system, NFPA 14 Section 7.8.1.

h. Indicate water supply, municipal water supply, fire pumps, etc.

(1) Include fire flow test results. Fire flow test results on drawings is required to be within 1-year of permit date.

(2) Summarize static and residual pressures at supply flow of municipal water supply.

(3) Summarize fire pump pressures at churn (zero flow), rated pump flow, and 150% of rated pump flow

(4) 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.

(5) 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.

(6) Refer to City of Miami High-Rise Fire Pump System Guideline for water supply and fire pump requirements.

i. Commissioning requirements

(1) Hydrostatic test: All new systems shall be tested hydrostatically at not less than 200 psi or 50 psi in excess of the system working pressure, whichever is greater, for 2 hours as required by NFPA 14 Section 11.4.

(2) Standpipe system flow test shall be performed to verify system demand as required by NFPA 14 Section 11.5.

(3) PRV flow test in accordance with NFPA 14 Section 11.5.5 shall be performed for master pressure reducing valves, pressure reducing hose valves and sprinkler assemblies. Each pressure-regulating device is required to be tested to verify that inlet and outlet static and residual pressures are in accordance with the standpipe system design and minimum/maximum pressures prescribed in NFPA 14.

3. Specific Sheet Content

a. Fire Protection Site Plan

(1) Drawing to be shown in plan view and to scale.

(2) Show adjoining streets, identify street names, show property lines and building outline on ground level.

(3) Indicate connections to municipal water supply.

(a) Identify size of existing or new municipal water mains supplying the proposed building.

(b) Minimum of two water sources for buildings over 420 ft as required by FBC 403.3.2.

(c) Show size and routing of fire service mains to proposed building.

(d) Indicate location of backflow prevention devices.

- Backflow preventers required along building exterior, visible from the street.
- Where backflow preventers are preferred inside of the building, they shall be in a room along the exterior of the building. Room shall be well-lit and provided with a glass panel such that the devices are visible from the building exterior at any time.

(4) FDC locations

(a) FDC's shall be located on the street or visible from street as per NFPA 14 Section 6.4.5.1.

(b) For high rise buildings a minimum of two remotely located FDC's shall be provided for each zone in accordance with NFPA 14 Sections 7.12. One FDC is required on the address side of the building.

(c) FDC design requires minimum of two 2-1/2-inch inlets (NFPA 14 Section 4.8.2) with a minimum of one inlet for each 250 gpm of flow (NFPA 14 Section 7.12.3).

(d) Indicate location of FDC check valve. Check valve shall be located as close as possible to the FDC.

(e) Final FDC locations shall be approved by the fire department.

(f) FDC's shall be located to ensure that a fire hydrant is located within 100 feet of each FDC as required by NFPA 14 Section 6.4.5.4. Indicate distance from FDC to nearest fire hydrant on site plan.

b. Fire Protection Floor Plans

(1) All floor levels to be shown in plan view

(2) Building layout, walls/doors, room tags, fire ratings to be included.

(3) Class I Hose Valve locations as required by FBC 905.4 and NFPA 14- 7.3.2

(a) At each intermediate floor landing of required exit stairs.

(b) On each side of the wall adjacent to the exit openings of horizontal exits. Note that outlets are not required on both sides of a horizontal exit where an interior exit stair hose connection can reach floor areas on that side of the horizontal exit by a 30 ft. hose stream from a nozzle attached to 100 ft. of hose, FBC 905.4 (2).

(c) In exit passageways at each entrance to the building.

(d) For covered mall buildings, at the entrance to each exit passageway or exit corridor and at the interior side of public entrances from the exterior to the mall.

(e) At the rooftop stair landing or on roof with slope of less than 4 in 12. Note that the rooftop does not require full hose valve coverage if the roof is not intended for general occupancy. Refer to NFPA 14 Section 7.3.2.11.3.

(f) Additional hose valves shall be provided as needed to ensure that the maximum distance from a hose valve at any point on the floor does not exceed 200 ft. as required by NFPA 14 Section 7.3.2.11. This shall apply for roof areas intended for general occupancy.

(4) Pressure management

(a) 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 fire protection plans.

(b) Where master pressure reducing valves are used to create a lower pressure zone or to reduce the number of pressure reducing hose valves, the master PRV assembly shall be clearly identified on the plans. Drawings shall indicate the design system pressure downstream of the PRV. This design pressure shall be consistent with hydraulic calculations. Refer to City of Miami’s Master Pressure-Reducing Valve Guideline.

(c) Where standpipe system static pressures exceed 175 psi, pressure reducing hose valves shall be provided and identified on the floor plans. Static and residual pressures both upstream and downstream of the PRV shall be indicated on the plans and shall be consistent with hydraulic calculations.

(5) Standpipe system piping

(a) Show standpipe supply piping from the fire pump discharge to the system.

(b) Show standpipe supply piping to all FDCs. Supply piping to FDCs shall be sized to handle maximum system demand.

(c) Show standpipe supply piping to all risers.

(d) Standpipe supply to upper pressure zones shall consist of at least two supply pipes as required by NFPA 14 Section 7.9.2.

(e) Provide a supervised valve at the base of each standpipe riser to allow isolation of a standpipe without interruption the supply to the other standpipes as required by NFPA 14 Section 6.3.2.

(f) Show standpipe branch lines to remote hose valve cabinets.

(g) Provide listed indicating-type valve for controlling standpipe system branch lines where the distance to the remote hose station exceeds 40 ft. measured along the pipe as required by NFPA 14 Section 6.3.3.

(h) Indicate pipe diameters for all system piping including system supply piping, FDC supply piping, standpipe risers and branch line piping. Pipe diameters shall be consistent with hydraulic calculations. Refer to NFPA 14 Section 7.6 for minimum pipe diameters.

(i) Standpipe interconnection shall be provided as required by NFPA 14 Section 7.5.

(j) Where upper pressure zones are supplied by a tank at the top of the building or zone, the standpipes shall be interconnected at the top as per NFPA 14 Section 7.5.2.

(k) Where standpipes are interconnected at the top and bottom, check valves shall be installed at the base of each standpipe to prevent circulation as required by NFPA 14 Section 7.5.3.

(l) Standpipe system piping support in accordance with NFPA 13 as required by NFPA 14 Section 6.5.1.

(m) Protection of standpipe system piping (in stair or similar protection) shall be in accordance with NFPA 14 Section 6.1.2.2.

(6) System Drains. Refer to NFPA 14 Section 7.11.

(a) Test Drain- A 3-inch drain riser shall be provided adjacent to each standpipe equipped with pressure-regulating devices to facilitate tests of each device. Drain riser connections shall be located on at least every other floor. Refer to NFPA 14 Section 7.11.1.

(b) Main drain – Refer to NFPA 14 Section 7.11.2.

(c) Auxiliary Drain – Refer to NFPA 14 Section 7.11.2.5.

(7) Pressure gauges shall be provided as required by NFPA 14 Section 5.5.

(8) Waterflow and supervisory alarms– Refer to NFPA 14 Section 5.6

(a) Waterflow devices required for standpipe systems.

(b) System water supply valves, isolation control valves and other valves in feed mains shall be supervised in accordance with NFPA 14 Section 6.3.7.1.

c. Isometric View: The isometric view is required as it assists with an overall view of the fire protection system. The items depicted in the isometric view are also contained on other plan

sheets but are provided in this arrangement to facilitate review. The isometric plan emphasizes the piping arrangement of the system to show the full system piping in a consolidated view. Building structure and floor plan details are de-emphasized or removed for clarity of the system design. Isometric plans to include the following items:

(1) Fire service lines

(2) FDCs

(3) Fire pumps

(4) Test header

(5) Master PRV devices

(6) Standpipe interconnection

(7) Standpipe risers

(8) Label standpipe risers to correlate with stair designation or other location description. Same designation to be used for required standpipe sections.

(9) Hose valves- Provide indication of floor levels requiring pressure reducing valves

(10) Diameter of all standpipe system piping. Provide note indicating pipe schedule to be used for zones/ floor levels.

(11) Rooftop outlets, manifold

(12) Auxiliary water tanks

(13) Note indicating floor levels requiring high pressure components designated as “HP” on the material list and on fire protection plans

d. Riser Diagram: A riser diagram is required for projects with more than one pressure zone in order to clarify design intent. A riser diagram is a single line schematic diagram which clearly illustrates fire service lines to the building, arrangement of fire pumps, standpipe system pressure zones, interconnection of zones, methods of system pressure management and the use of high-level water storage tanks. The riser diagram is not required to be scaled. The diagram shall depict the following major components and associated devices, piping, devices and valves.

(1) Fire service lines and backflow preventers

(2) FDCs

(3) Fire pumps

(4) Test header

(5) Master PRV devices

(6) Feed mains, express risers, standpipe risers and drain risers

(7) Standpipe/ zone interconnection piping

(8) Standpipe isolation valves

(9) Standard hose valves and sprinkler control valve assemblies

(10) Pressure reducing hose valves and sprinkler control valve assemblies

(11) Fire water tanks

(12) Rooftop outlets, manifold

(13) The following annotations shall be provided as part of the riser diagram drawing sheet:

(a) Available water pressure from source

(b) Size of fire service lines

(c) Size of FDCs for each zone

(d) Size of system feed mains, express risers, standpipes and drain risers

(e) Fire pump characteristics

(f) Capacity of high-level water storage tanks

(g) Identify pressure reducing hose valves and sprinkler control valve assemblies

(h) Identify floor levels requiring high pressure components designated as "HP" on the material list and on fire protection plans

(i) Identify interconnection of pressure zones

e. Sections and Enlarged Plans: Scaled sections and/ or enlarged floor plans are required for fire pump systems, auxiliary water storage tanks, standpipe risers and pressure reducing hose valves in order to adequately represent system components and their installation requirements. Sections and enlarged plans shall include all necessary annotations identifying system sizes, capacities, components, and accessories. The following minimum sections and enlarged plans are required:

(1) Section of each stairwell/standpipe riser

(a) Depict standpipe and drain risers. Include pipe sizes.

(b) Indicate hose valve locations including elevation in feet above grade and building floor level.

(c) Include node tags associated with hydraulic calculations for standard and pressure reducing hose valves at each floor level.

(d) Identify standard vs. pressure reducing hose valves.

(e) Provide tables for each standpipe riser indicating static and residual inlet/outlet pressures for each pressure reducing hose valve at each floor level. Refer to Hose Valve PRV and Pressure & Settings section for additional details. Tables may be provided on a dedicated drawing sheet or as part of the stairwell sections.

(f) Pressures indicated for each PRV shall be consistent with standpipe system static and residual hydraulic calculations. Refer to Hydraulic Calculations section for additional details.

(2) Enlarged plans and sections of fire pump systems serving the standpipe systems. Refer to City of Miami's High-Rise Fire Pump System Guidelines for additional requirements.

(3) Enlarged plans and sections of high-level fire water tank system. Refer to City of Miami's High-Rise Fire Pump System Guidelines for additional requirements.

f. Details: Specific items require large-scale drawings to clarify design details required by the applicable codes. These may be incorporated into plan sheets and/or shown on detail sheets.

(1) Standard Hose valve assembly detail

(a) Detail shall indicate hose valve at 3-5 feet above the floor. Refer to NFPA 14 Section 7.3.1.1.

(b) ID the make/model of the hose valve.

(2) Pressure reducing hose valve detail

(a) Provide section view detail of the standpipe hose valve PRV.

(b) ID the make/model and settings of the hose valve PRV.

(c) Show the drain riser location

(d) Show drain outlets where PRVs are installed.

(3) Master PRV assembly detail

(a) Provide section view detail of the master PRV assembly.

(b) Detail shall demonstrate compliance with NFPA 14 Section 7.2.4 requirements. The following shall be provided:

- Pressure regulating device, including set pressures
- Pressure relief device, including set pressures
- Isolation valves
- Pressure gauges
- Bypass line
- FDC interconnection
- Means to annunciate high-pressure failure. Such means may consist of water pressure monitoring downstream of the Master PRV, monitoring of flow with pressure switch downstream of the pressure relief valve, or other means suitable to indicate that high-pressure failure has occurred.
- Means for drainage

(c) Identify the flow range of the pressure regulating device. Note: Where the master PRV serves both fire sprinkler and fire standpipe systems, ensure that the flow range through the pressure regulating device allows for the range of demand flows from single sprinkler to full standpipe demand. Where the pressure regulating device has a limited range, multiple PRV devices in parallel are permitted; typically, a smaller device for low flows and a larger device for larger flows.

(d) Identify the relationship between the pressure at the fire pump discharge and the zone/system pressure downstream of the PRV. Verify and indicate the minimum pressure to the supply side of the PRV device. Refer to device specifications and hydraulic calculations for determination of static and residual supply side pressures. Provide supporting manufacturer specifications as part of the component specifications.

(e) Note: Master PRV devices typically are pilot operated allowing consistent pressure downstream of device as long as a minimum pressure differential is satisfied. Note that many such devices have a minimum requirement of a pressure 10-20 psi higher on the supply side to achieve the required downstream pressure.

(4) Detail of the combination standpipe/sprinkler riser. Include a detail for a typical lower floor requiring pressure reducing valves and one for a typical higher floor not requiring pressure management. Detail shall identify all of the following, as applicable to the project: hose valve, pressure reducing valves, sprinkler control valve assembly, pressure relief valve, pressure gauges, flow/tamper switches, test/drain assembly, drain riser and method to test downstream of any PRV control valves.

(5) Details of the FDC and FDC signage

(a) FDC design requires minimum of two 2-1/2-inch inlets (NFPA 14 Section 4.8.2) with a minimum of one inlet for each 250 gpm of flow (NFPA 14 Section 7.12.3)

(b) FDC height to be between 18 and 48 inches above surrounding grade. Refer to NFPA 14 Section 6.4.6

(c) FDC signage to indicate systems served, pressure required at the inlets to meet system demand, and building/location served. Refer to NFPA 14 Sections 6.4.5.2 and 6.4.5.3.

(6) Refer to City of Miami's High-Rise Fire Pump System Guideline for additional fire pump system details required.

(7) Refer to City of Miami's Sprinkler System Guideline for additional fire sprinkler system details required.

4. Hose Valve PRV Pressures & Settings

a. Provide information regarding the relationship between supply and discharge pressures across each hose valve PRV. Provide supporting manufacturer specifications as part of the component

specifications. Note that hose valve PRVs will have different settings, some of which are factory set and others which are field adjustable. Hose valve PRVs are typically direct acting therefore the settings will vary within the design based on the floor level. The setting used will affect the residual pressures on the system side of the hose valve PRV.

b. Provide a summary of hose valve PRV performance in tabular form. Hose valve PRV performance should be based on settings, static pressure, design flow, residual pressure, and commissioning flow residual pressures. A table, as shown below, shall be provided for each stairwell/standpipe riser. The table shall include every hose valve PRV connected to the standpipe. Each hose valve PRV shall be defined through use of a hydraulic node which shall be consistent with that utilized in hydraulic calculations. Note that a similar table can be utilized for sprinkler PRV valves based on flows for fire sprinkler demands.

Table 1: Sample PRV Pressure Settings Table

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Floor Level	Hydraulic Node	Static Pressure, Inlet (psi)	Residual Pressure, Full Flow, Inlet (psi)	Residual Pressure, 250 gpm, Inlet (psi)	PRV Manufacturer & Model	PRV Valve Setting	Static Pressure, Outlet (psi)	Residual Pressure, Full Flow, Outlet (psi)	Residual Pressure, 250 gpm, Outlet (psi)

At a minimum, the following shall be included in the table:

(1) Column 1, Floor level – Provide numerical designation for floor level corresponding to the PRV.

(2) Column 2, Hydraulic node – Provide hydraulic node for hose valve PRV as defined in the stairwell/standpipe section views and in the hydraulic calculations.

(3) Column 3, Static pressure, inlet – Indicate the static pressure at the inlet of the PRV device. Refer to static hydraulic calculation at zero flow which considers pump churn pressure and provides the inlet static pressure at each hydraulic node defined for hose valves at each floor level.

(4) Column 4, Residual pressure, full flow, inlet – Indicate the residual pressure at the inlet of the PRV device during maximum flow at system demand. Refer to residual hydraulic calculation at full standpipe flow per NFPA 14 (750 gpm or 1,000 gpm) which shall provide a hydraulic node on each floor level to indicate the residual pressure at each PRV device.

(5) Column 5, residual pressure, 250 gpm flow, inlet – Indicate the residual pressure at the inlet of the PRV device while system is flowing only 250 gpm. This corresponds to the flow rate that will be used when testing PRV devices on hose valves during system acceptance. Refer to supporting hydraulic calculation at 250 gpm flow at the most remote standpipe outlet which shall provide a hydraulic node on each floor level of the most remote standpipe to indicate the residual pressure at each hose valve.

(6) Column 6, PRV valve manufacturer and model – Indicate the manufacturer and model number for the specific valve.

(7) Column 7, PRV valve setting – Indicate the hose valve setting or bonnet number proposed. The setting or bonnet number to be referenced in relation to the PRV device manufacturer specifications.

(8) Column 8, static pressure, outlet – Indicate the static pressure downstream of PRV device. The hose valve PRV device static pressure at the outlet is determined using the static pressure relation charts provided as part of the manufacturer specifications.

(9) Column 9, residual pressure, full flow, outlet – Indicate the residual pressure at the outlet of the hose valve PRV under full-flow conditions. For hose valve PRV devices, the residual pressure is determined using the residual pressure charts provided as part of the manufacturer specifications in order to ensure a minimum of 100 psi at all hose valves at full standpipe system flow.

(10) Column 10, residual pressure, 250-gpm flow, outlet – Indicate the residual outlet pressure at the PRV hose valve outlet when system is flowing only 250 gpm. This is necessary to establish the residual pressure expected during system acceptance testing. For hose valve PRV devices, the residual pressure is determined using the residual pressure charts provided as part of the manufacturer specifications.

(11) Note: For projects utilizing field adjustable pressure reducing hose valves, the inlet and outlet residual pressures at 250 gpm (Columns 5 and 10) are not required. The residual pressures for each PRV will be permitted to be based on maximum system flow.

5. Hydraulic Calculations

a. Static hydraulic calculation to determine where PRVs are required

(1) Use the municipal supply static pressure plus the churn pressure of pump(s) to determine the static pressures expected at each floor level.

(a) Maximum pressure permitted at Class I outlet: 175 psi, see NFPA 14 Section 7.2.3.2.

(b) Maximum pressure permitted at Class II outlet: 100 psi, see NFPA 14 Section 7.2.3.1.

(c) Note: Where the static pressures exceed these limits, pressure regulation is required.

b. Residual Calculation at design flow to ensure system performance for top of zone and each PRV hose valve, automatic supply.

(1) Use the municipal water supply curve along with the fire pump curve to determine the water supply at the design flow rate.

(a) Minimum residual pressure required at Class I outlet: 100 psi, see NFPA 14 Section 7.8.1.

(b) Minimum residual pressure required at Class II outlet: 65 psi, see NFPA 14 Section 7.8.1.

(c) Provide a flow of 250 gpm at the two hydraulically most remote hose connections on the standpipe and at the topmost outlet of each of the other standpipes at the minimum residual pressure, NFPA 14 Section 7.10.1.2.1. The maximum system flow rate that shall be considered is 1,000 gpm as permitted for buildings sprinklered throughout, NFPA 14 Section 7.10.1.1.5.

(d) Calculations provide the incoming pressure to PRV hose valves and sprinkler control valves, identify the settings for each PRV device and provide the resulting pressure downstream of the PRV device to ensure minimum pressure requirements are obtained.

(e) Calculations shall provide minimum sizes for common supply piping based on providing the required flow rate for all standpipes connected to such supply piping, with the total not to exceed the maximum flow demand required. Calculations shall be based on the most demanding scenario.

(f) Where the standpipe system has risers that terminate on different floor levels, additional hydraulic calculations shall be performed as required by NFPA 14 – Section 7.10.1.2.1.1. For instance, for a standpipe system with two risers terminating at the roof level, a residual calculation is required to verify that the system can deliver 100 psi at the roof considering a flow rate of 750 gpm. If there is an additional stairwell that terminates at a lower floor level, an additional residual calculation is required to verify that the system can deliver 100 psi at the top of the third stairwell considering a flow rate of 1,000 gpm.

c. Residual Calculation at design flow to ensure system performance for top of zone and each PRV valve, FDC supply

(1) Repeat the residual calculations to meet system performance to the FDC supplies, provide the required pressures at the FDC for system operation.

(a) Pressures required at the FDC for system operation are required to be provided on signage at the FDC's as per NFPA 14 Section 6.4.5.2.2.

d. Residual Calculation at the PRV hose valve commissioning flow to determine expected outlet pressures during system acceptance testing. The calculation shall be based on a flow rate of 250 gpm at the most remote standpipe outlet and shall provide the incoming residual pressure to each PRV hose valve on that standpipe riser. This hydraulic calculation will be used to determine the outlet residual pressure expected during testing of individual PRV hose valves. Expected outlet residual pressures are based on residual pressure charts part of the manufacturer's specifications and shall be shown in the PRV Pressure Settings Tables.

(1) Note: For projects utilizing field adjustable pressure reducing hose valves, the hydraulic calculation at PRV hose valve commissioning flow is not required. The residual pressures for each PRV will be permitted to be based on maximum system flow.

6. Component Specifications
    a. Manufacturer documentation required for all components of the system
    b. Note: ensure that manufacturer specifications match those components listed on the drawings. General notes, legends and equipment schedules shall be consistent with manufacturer documentation and specifications provided.
    c. Component listing- All system components shall be rated for working pressures that do not exceed system pressures.
    d. Schedule 40 piping is required for portions of the system where the working pressure exceeds 300 psi (NFPA 14: 4.2.3, 2016 edition).

7. Signage
    a. Standpipe system hydraulic design information sign shall be provided in accordance with NFPA 14 Section 6.8.
    b. All main and section system control valves shall have a sign indicating the portion of the system that is controlled by the valve, NFPA 14 Section 6.3.8.1.
    c. All control, drain, and test connection valves shall be provided with signs indicating their purpose, NFPA 14 Section 6.3.8.2.
    d. Refer to City of Miami's Fire Department Connection Signage for High-Rise Buildings Guideline.
    e. Provides details of signage for review.