The following is offered as showing how to use features available in AutoSPRINK and should not be construed as design guidance or used in lieu of code &/or local recommendations or requirements:

When determining pressure reducing hose or floor control valve requirements, you will need to know:

- a.) Demand flow gpm, (to pick the appropriate valve curve for the size needed)
- b.) Expected maximum residual inlet psi (at that flow)
- c.) Desired residual outlet psi (at that flow)

Using these values (a, b and c) and the Manufacturer's charts: find the valve that best suits the purpose. Code &/or local regulations will dictate the maximum residual psi allowable.

- d.) Expected maximum static inlet psi

Again, using this value (d) and the Manufacturer's chart for the valve (selected above), find the anticipated static psi

The easiest way to get the information needed for many PRV order forms is to set the 'Settings \ Hydraulic Calculations \ Calculator' tab to a demand calc (program default):

The general standpipe calculation is done with only the hose element(s) at the top of the standpipe(s) set to a 'Fixed Flow' of 500gpm @ 65psi or 100psi, or as otherwise required by code &/or local requirements, for the most remote standpipe and 250gpm @ 0.0psi for any additional standpipes. To obtain the standpipe results: 'Calculate with manually flowing devices', verify that all hose pressures are at least 100.0psi and then print the results.

Reminder: The “Outside Hose Flow” (hose allowance at source) should normally be set to 0.0gpm in the properties of the ‘Supply’ element.
To determine the expected maximum static inlet psi: With a gauge at each hose outlet on the standpipe and additional gauges attached to each floor control valve:

The 'Check Point Gauge Data' report will show the "Inlet Static Pressure" at each gauge.

Set the hose elements at the top of the standpipes to 'Not Flowing' prior to finding the residual inlet pressures at each floor hose valve and each floor control valve.

Residual inlet pressure for each Hose Valve: Select all of the Hose Valves and set the required Flow and Minimum Pressure:
Before clicking ‘OK’, set them to “Not Flowing”. Select the one (1) Hose Valve that you want to calculate and reset it to a “Fixed Flow”. Click on the 'System Optimizer' button, calculate with manually flowing devices and note the "Pressure Overage" psi.

In the following example: calculating for the Hose Valve adjacent to "Hose 2-26" gauge, the overage is 102.013psi.

Add this to the "Minimum Pressure" set for the valve (100psi), which equals 202.013psi, and use this value on the order form for the "Inlet “Residual (psi)". Use 250(gpm) as the "at Flow of GPM" value.

The "Outlet desired”: "Static (psi)" and "Residual (psi)" would both be 100( psi) or as required by code &/or local requirements. The valve Manufacturer supplies the “Actual” information.

Repeat for each Hose Valve.

Residual inlet pressure for each Floor Control Valve: On the Standpipe drawing, set all of the Floor Control PRVs to:

Double-check that all Hose Valves are set to "Not Flowing".
In each Floor System drawing: X-Ref the Standpipe drawing, connecting to the appropriate floor connection. **(Important:** See “Notes” at the end of this document.)

Add one Hose (Rack) to the appropriate standpipe hose outlet for the floor, snapping it to the x-ref (turn on ‘Snap into Symbol’). The Hose should default to:

100gpm is normal for a hose allowance on Light Hazard occupancies. Adjust the ‘Flow’ (gpm) if needed but leave the ‘Minimum Pressure” at 0.0psi.

Select the desired remote area and review the results using ‘Hydraulics \Analysis Reports’.

On the ‘Node Analysis’ tab, verify that the hose is included:
On the 'Remote Area Data' tab:

Scroll down the list of gauges (within the 'Supply Information' section) and select the proper System gauge for the floor that is being calculated. Note the system requirements on the graph. Add this required psi to the 'Pressure Overage' psi.

In this example: System 27 shows a system requirement (demand) of 270.78gpm @ 72.167psi. The overage shown is 113.251psi. Thus the maximum Residual (Inlet) pressure is 185.418psi at a Flow of 270.78gpm.

Show these values on the order form for System 27:

<table>
<thead>
<tr>
<th>Location</th>
<th>Inlet Static (psi)</th>
<th>Residual (psi)</th>
<th>at Flow of GPM</th>
<th>Outlet desired Static (psi)</th>
<th>Residual (psi)</th>
<th>Actual Static (psi)</th>
<th>Residual (psi)</th>
<th>Flow (gpm)</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>System 27</td>
<td>215 psi</td>
<td>160 psi</td>
<td>270.78</td>
<td>160 psi</td>
<td>160 psi</td>
<td>160 psi</td>
<td>160 psi</td>
<td>270.78</td>
<td></td>
</tr>
</tbody>
</table>

Normally, the "Outlet desired…Static (psi)" and "…Residual (psi)" would both be the same (the maximum desired system pressure, in this example: 160.0psi). The valve manufacturer supplies the "Actual" information.

Repeat for each Floor Control PRV, where necessary.

If the “Inlet…Static (psi)” is equal to, or less than, the maximum desired system pressure, there is generally no need for a PRV.
Reminder: It is normally recommended &/or required that a small relief valve (175psi, for example) be installed on the discharge side of the floor control PRV to avoid excessive static pressure buildup.

Shortcut: The same approximate results can be obtained for the residual inlet pressure of the hose valves, by calculating the highest hose, set at 250gpm @ 100psi, (one standpipe at a time and all other hose valves closed), and then subtracting the friction loss and elevation for the hose valve at each lower floor. Individual hose valves generally need to reflect the hydraulic conditions (friction loss) flowing 250gpm.

For preliminary purposes, floor system requirements can be simulated in the Standpipe drawing by inserting a ‘Floating Node’ (found under ‘Hydraulics’ on the menu) at intended points of connection for the floor systems. Set the floating node to use the required flow and pressure that is anticipated for the floor system.

If multiple Floating Nodes are used, instead of moving a single FN from point to point, set them all to ‘No demand on current system’ with the exception of the one that you are
calculating. These must be calculated one-at-a-time. Delete all FNs when you are done.

Using a Floor Control PRV to include a pressure reduction in the hydraulic calculations:

Once the inlet static pressure is known

<table>
<thead>
<tr>
<th>Gauge</th>
<th>Pressure (psi)</th>
<th>K-Factor (K)</th>
<th>Flow (gpm)</th>
<th>Inlet Static Pressure (psi)</th>
<th>Elevation (Foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hose 1-1st</td>
<td>172.13k</td>
<td>19.06K</td>
<td>265.09gpm</td>
<td>187.54psi</td>
<td>31.9</td>
</tr>
<tr>
<td>Hose 1-2nd</td>
<td>192.46k</td>
<td>19.16K</td>
<td>220.09gpm</td>
<td>187.54psi</td>
<td>41.10%</td>
</tr>
</tbody>
</table>
| Hose 1-Th | 159.88gpm | 20.22K | 178.23psi | 44.0%

A Pressure Reducing Valve can be added to the floor control assembly and a “Pressure Loss” can be set within its Properties to achieve the desired pressure reduction. In this example: the “Inlet Static Pressure” is 176.94psi and the desired maximum pressure is 165.0psi, which equals an 11.94psi fixed Pressure Loss. (See Addendum A, page 10.)
Shortcut: Wherever a PRV is required and it is not necessary to include the standpipe in the hydraulic calculations (i.e.: the AHJ will allow the assumption), simply use a Supply element in the Floor drawing at the point of connection to the standpipe in lieu of using the Standpipe drawing as an X-Ref.

This is credible because, in this example, the standpipe calculation would prove that there is at least 165.0psi available at 500gpm at this floor connection; and, the intention is to have a Pressure Reducing Floor Control Valve set to an outlet pressure of 165.0psi @ 400gpm (or less). As long as the floor demand is less than this assumed available flow, the floor calculations prove that the supply assumption is adequate.

Notes:

To keep the supply node numbers consistent between drawings, when using a Standpipe drawing (or any drawing/chain of drawings) as an X-Ref for the hydraulic source, all hydraulic reference node tags must be placed within a drawing prior to using that drawing as an X-Ref in other drawings.

Floating Nodes can be used to simply create a hydraulic demand at any point of future connection within the Standpipe drawing. To have the program place node tags at all necessary points on the standpipe (highly recommended): place a gauge at all desired points, place a floating node at each connection point for a floor/future floor (using the default flow options, gpm and psi), open all hose valves (set to ‘Fixed Flow’ with any gpm and psi) and then click on ‘Update Node Tags’.

If desired: additional node tags can be added (using ‘Hydraulics \Node Tags \Single’) and node numbers can be changed/re-sequenced manually but ‘Update Node Tags’ must be used to correct any possible duplication of reference numbers on the drawing. (The calculator will not use duplicate numbers so the drawing must be updated to match the calculations. By program default node tags are automatically updated on the drawing when the hydraulic calculations are previewed &/or printed, however, X-Ref nodes are not included in this update process.)

After all node tags are in place and updated, all floating nodes should be deleted and the hose valves closed (set to ‘Not Flowing’). The drawing is then ready to be used as an X-Ref.

For informational purposes only: Types of standpipes are defined in NFPA 14 (2003) 3.3.28. A “wet standpipe” is defined as “a standpipe system having piping containing water at all times”. 3.3.5 defines a “dry standpipe” as “a standpipe system designed to
have piping that contains water only when the system is being utilized.” Automatic vs.
manual standpipes are noted in 5.2. Per 5.2.2, the adequacy of the water supply must
be proven through hydraulic calculation for an “automatic-wet” standpipe system. A
“manual-wet” standpipe system is simply supplied by the available water supplies. 5.2.5
recognizes the latter as a type of wet standpipe that can be served by fire department
pumpers.

NFPA 14 only allows wet or dry manual standpipes for Class I service (non-occupant
use hose connections). Manual standpipes are generally not permitted in high-rise
buildings (defined in 3.3.9 as buildings being more than 75ft in height measured from the
lowest level of fire department access to the floor of the highest story).

Newer codes generally allow the use of manual wet standpipes in sprinklered buildings.
The 2003 Edition of the International Building Code allows Class I standpipe service, in
lieu of Class III, in fully sprinklered buildings. This might be interpreted as allowing the
use of manual-wet standpipes being supplied primarily with the pressures needed by the
sprinkler system. In Federal buildings, GSA has allowed this concept to be used in
high-rise buildings while NFPA 14 and most local authorities prohibit this.

Be aware that NFPA 14 (2003) states:

- 7.8* Minimum and Maximum Pressure Limits.
- 7.8.1.1 Hydraulically designed standpipe systems shall be designed to provide
  the waterflow rate required by Section 7.10 at a minimum residual
  pressure of 100 psi (6.9 bar) at the outlet of the hydraulically most
  remote 65-mm (2½-in.) hose connection and 4.5 bar (65 psi) at the
  outlet of the hydraulically most remote 38-mm (1½-in.) hose station.
- A.7.8 Where determining the pressure at the outlet of the remote hose
  connection, the pressure loss in the hose valve should be considered

“Annex A is not a part of the requirements of … NFPA … but is included for
informational purposes only”. It would, however, be recommended to verify local
requirements, as they may apply a more stringent interpretation to the meaning of
“…the outlet…” (7.8.1.1), than may be implied by NFPA. In any case, especially
considering that the loss through a 2½” angle hose valve can exceed 3psi @ 250gpm,
it seems inadvisable to allow the demand to come too close to the available supply.

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“Lives may someday depend on the safety provided by a fire protection system that you design.”
Addendum A

In the latest version of AutoSPRINK, the process of determining the fixed Pressure Loss for Floor Control Valves (page 7) has been automated.

To use: Select the ‘Pressure Loss’ option and then

Select the “Desired Maximum Static Outlet Pressure” option and type in the desired pressure.

If the Static Inlet Pressure exceeds the value that you have set, the fixed ‘Pressure Loss’ will automatically show the required loss to be used in the calculation for this valve.