Standpipe Systems: Problems and Solutions

Charles Bailey

April 2005

Standpipe Risers: Problems and Solutions

Standpipe risers are small, vertically or horizontally oriented water mains found in very large or very tall buildings. What the standpipe does is to provide firefighting crews with water in areas that are too remote for typical pre-connected hand line deployment. Examples of buildings with standpipes include high-rise buildings (both residential and commercial), tall garden apartment buildings, shopping malls, and strip centers with large anchor stores, i.e., grocery, department, and home improvement stores.

Because these systems are integral to the building they age along with the building. Because the building's occupant's and workers are typically not firefighters they rarely understand the importance of system maintenance. You will therefore find many systems with problems.

In each of the sections that follow we will take a lot at some common problems and some common solutions to problems encountered with standpipe risers. This discussion is quite limited as it only discusses problems directly related to standpipe systems. It does not include discussions of fire pumps, stationary roof based water tanks, sprinklers, or any other method of fire protection found in high-rise structures or large buildings. This discussion is also limited by the experience of the author who does not claim to be an authority on these matters but is rather passing on lessons learned over a career that has included numerous high-rise fires.

I am well aware that this discussion can be expanded greatly but I just don't have the time to do that in the near future. It is my sincere hope that this becomes the genesis of a living document, that is that each person who touches it adds to it his or her personal experiences or their more intense technical knowledge of the subject matter and passes that information on to others.

Problems/Solutions

Inadequate Hose Reach

Problems

Sometimes the floor lay out of high-rise structures varies. This variance can be the result of numerous factors including but not limited to:

- On-going renovation
- Owners purchasing multiple adjacent units and combining them
- Mixed used buildings i.e., business and residential occupancies in the same building.
- Core design in commercial high-rises.

Each of the problems outlined about can prove to be an obstruction to the timely advancement of a hose line of sufficient length to impact the fire. Of course the primary mechanism for addressing this problem is careful pre-planning and more importantly the placement of that pre-plan information in a usable form on the response maps. Typically the first in companies are well aware of the peculiarities of a given building but what happens when transfer companies are now running first due?

The other problem we face is that we only carry 200' hose in our standpipe compliment of hose. Fire codes drive the amount of hose we carry. There are rules about how far away occupied spaces can be from the nearest standpipe riser. However, for whatever reason there are situations where 200' will not be enough hose to get the job done. For example, if a crew stretches the line and charges it in the stairwell, then tries to advance down a hallway, they might find that the really don't have a true 200' of attack line when they count the amount of hose that stuck in the stairwell or around corners.

Solution

There is no easy answer to this one. It sounds intuitive to say that we should take more hose with us, just to be sure, however, in most places we don't know for sure how many people are going to be on our rigs when the call comes in. What we should do though is to keep readily deployable sections of hose in a convenient location on each engine. If there are more that two people on the engine (not including the driver) then we should be taking extra hose with us. In the next section we will talk a little about fire flow but it would not be advisable to extend 200' of 1.75" hose with more 1.75" hose, especially on upper floors.

Inadequate flow

Problems

Many things can either act alone or combine to produce inadequate fire flows or poor hose stream quality when using standpipe risers. First of all these risers are typically 4” pipes, installed when the building was constructed. You may also find buildings that have standpipe risers installed during retrofitting. Over time sediment and corrosive deposits can form in the standpipe. These obstructions narrow the diameter of the pipe and subsequently reduce available fire flow.

Less common but also possible are standpipe globe valves on floors below the hook-up floor that are left open. When this happens of course, a significant portion of firefighting water is lost and it is difficult to generate pressure in the system.

Another common culprit of fire flow troubles with standpipe systems is the use of 1.75” hose in standpipe packs. Luckily in the DC Metro area we rarely fight fires in large open spaces on upper floors, but the potential exists, and when this event occurs 1.75” hose will not be able to deliver the needed fire flow. To get adequate fire flow in hi-rise buildings we have to overcome the relatively large friction loss of 1.75” hose. To make matters worse many companies still use 100 psi combination nozzles in their standpipe packs. While this is beneficial in one way it is a highly deceptive practice in other ways. The final likely culprit inadequate fire flow is physical obstructions that exist in the piping system. These obstructions could be objects placed there by vandals or could be large sediment/corrosion deposits that have broken off the pipe and entered the fire hose.

Solutions

The solution to flow problems is to build flexibility into your hose system. It might be hard to convince people to put 2” or large hose into their hose packs but there are other options. One such flexibility option is to continue to use 1.75” hose but to put a 0.875” (7/8”) slug tip behind the combination nozzle. What this does is to reduce the needed nozzle pressure by 50% in some cases. Low-pressure combination nozzles are another option. This is not place to get into the fog vs. smooth bore debate; there are pros and cons to both.

Smooth bore nozzles allow you reduced nozzle pressures and generally lower nozzle reaction. They also allow you to pass obstructions through the nozzle more easily, reducing the chance that sediment will obstruct your flow. On the flip side, you have to get the nozzle pressure right and you have to correctly match the hose and nozzle diameter in order to get an effective stream. When using a smooth bore nozzle there will be no questions as to whether you are getting adequate pressure.

Combination nozzles, unless you have the low-pressure variety, require 100psi nozzle pressure. The fallacy with these nozzles is that as long as you can get the spring to activate you will get a decent stream. In other words it is difficult, if not impossible, to know what your actual flow is. This is also a plus for the combination nozzle if it is also an automatic nozzle: just get enough water pressure to open the spring and you will get a decent stream out the other end. Like the smoothbore nozzle there is a flip side; it is terribly easy to clog up combination/automatic nozzles with debris. The last thing you want to do in a burning apartment is to shut down and flush a line, hoping that the obstruction will pass.

Given the proper manpower the preferred solution to combating fires off of standpipe risers would be 2.5" hose. We understand the inherent difficulties of maneuvering this line and only advise its use when the proper manpower is available.

Enough of the hose/nozzle discussion…Another common issue with standpipes is the inability to know whether or not globe valves are open beneath you. To address this is a little more challenging. One option is to do what many jurisdictions do, including Montgomery County, MD, and the District of Columbia and that is to require one of the latter arriving engines to begin their trek to the floor above in the lowest level of the structure. If the first engine designated an attack stair, the third engine can use this stair to access the floor above and check all the globe valves on the way up.

Problems with obstructions are not limited to natural decay. Sometimes vandals put things like soda bottles, tennis balls, hypodermic needles, and general trash into the fire department connections (FDC) or into open risers. It is advisable to keep a pair of needle nose pliers hand to pull these items out if the are visualized in the FDC. It is not advisable to use your hands to do this, as sometimes there are dangerous objects present.

You may face the situation when the FDC is just unusable. In this situation you will have to run a line to the bottom of the riser from the engine and pump the system this way. This is not an evolution that can be done quickly. Many places, including some in Prince George's County, MD and FDNY, have a bag for the driver that includes this like spanner wrenches, fly wheels, and flashlights to assist the driver with making this interior connection.

Inoperable riser connections

Problems

The truth is that most buildings with a standpipe riser never have a fire. The other truth is that most buildings with a standpipe riser never exercise the valve or lubricate the caps. It is then very likely that when you attempt to connect to a standpipe riser you will either find the valve or the cap frozen in place.

Solutions

A small section of lightweight pipe added to the standpipe pack used in combination with the standard pipe wrench might get you enough leverage to open a frozen valve stem or loosen a frozen cap. You have to be careful when attacking these problems because you can create yet another: stripped or deformed threads on the connection. I have no solution for stripped threads other than to exercise a secondary option quickly.

Risers That You Cannot Find

Problems

We mentioned the big box stores, shopping malls, and other large primarily horizontal occupancies earlier. These types of structures also have standpipe connections. The primary problem with these connections is that they tend not to be aesthetically pleasing and are therefore stuck inconspicuously into merchandise racks. Finding these connections in the middle of the day when nothing is going on is difficult enough, it is nearly impossible in a smoke-filled environment.

Solutions

The solution that we have settled on is to not use the riser system in these buildings at all. If the building has a combination FDC we will certainly support the sprinkler system. However, we tend to use long pre-connects or to stretch leader lines into the structure. [A leader line is a line of primarily 2.5 or 3” hose that is stretched into a structure, terminates with a gated wye, and is subsequently extended with the standpipe pack. The benefit to this method is obvious; no need to find hidden connections in the smoke. The primary downfall of this method is that it is hard to judge how much line you need and can be manpower intensive to deploy.

In Line Gauges

The only way to not be guessing about what the pressure coming off of the standpipe riser is, is to put an in line gauge on the riser. Once you charge the riser you will immediately know whether or not you have enough pressure to make the operation work. The other thing this does is to narrow the possible culprits of low pressure/low flow situations. If you have adequate pressure coming off of the riser but still have low pressure at the nozzle, that means you have kinks between the nozzle and the riser or you have some debris build up behind the combination nozzle. If the in-line gauge shows inadequate pressure it

might cause you to change to the slug-tip or another device to increase your ability to fight fire. Finally, having an in line gauge that shows low pressure at the riser helps to narrow the trouble shooting process.

Outside the Box

- Sometimes we have to leave the box. Consider using leader lines or long pre-connected lines to access fires on lower floors. Consider putting a section of utility rope in either the standpipe bag or the officer's bag, this will allow you to lower the rope to the outside and then hoist a pre-connected line or a leader line into the window.
- Consider using an aerial ladder to advance pre-connected line to floors within its reach.

You have to be careful in a few ways.

Beware of opposing hand lines when stretching trough windows. Stretch the line in such a fashion that you must first enter the common corridor and then enter the fire apartment. Trying to make entry from the balcony side of the fire apartment is a dangerous move for the occupants and might create opposing hand lines.

Command must be made aware of any of these non-standard maneuvers.

Fire hose was not designed nor was it tested to be loaded vertically. You have to be careful not to drop lines of out of upper floors. The weight of the water combined with the construction of the coupling might lead to hose failure.

Whenever stretching a line vertically you must take tie the line off behind a coupling.

Command Considerations/ Solutions

All of the problems we discussed above end at the command post. The incident commander assumes responsibility (which should be quickly delegated of course) for managing each of the possible issues that might arise.

Command should consider:

- Using multiple companies to place the initial attack line.
- Providing quick support to the initial company when they experience problems
- Assigning an interior water supply group if the water supply problem is large or complex.
- Modifying the incident action plan to reflect the inability of crews to put water on the fire quickly.
- Quickly build out the IMS and resource base to address the other problems that will arise is fire attack is delayed.
- In commercial occupancies with core designs ensure that companies are not creating opposing hose lines by accessing different stair cores.

Comments from Reviewers

This document was sent out to some trusted sources for review before publication. Some of Chief Ty Dickerson's comments are included below.

Only a couple of comments after I read it:

I'm a big fan of the smooth bore nozzle on high-rises

2" hose minimum, remember that FDNY with lots of experience mandates 2.5"

From my experience the most common problem with a stuck cap is that the cap is in place and valve is partially open and the FD pump operator charges the system to 175psi +/- and now the pressure is "locking" the cap in place. Fastest solution is probably to go to another valve like you said.

NFPA 25 does not require the valves to be exercised and doing so will only lead to problems. These valves are not designed to be used regularly.
They have a soft seat and if you open it after being closed for many years it will likely not seal again. I have rarely seen a valve that could not be opened with a pipe wrench and cheater bar.

This is based not only on my FD experience but 24 years as a fire marshal and fire protection contractor

Ty