NFSA The Voice of the Fire Sprinkler Industry

TechNotes

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Sprinkler Extenders a.k.a. Brass Inserts

From time to time, the situation occurs where the sprinkler installer and the ceiling installer don't quite agree on their measurements and the fitting we expect to screw the sprinkler into is a little farther behind the ceiling than the sprinkler fitter expected it to be. In these cases, is it acceptable to install a small (typically ½ inch diameter) brass insert to extend the fitting a few inches so that the sprinkler is in the proper place with respect to the ceiling?

The answer to this question is "yes, as long as the hydraulics are taken care of and the fitting is made of a suitable material." The rest of this issue will be devoted to explaining this answer.

What About the Material/Listing?

Is the Sprinkler Extender/Brass Insert required to be listed? The answer to this question is, "no." Section 6.1.1.3 of NFPA 13 allows pipe and/or fittings to be unlisted if it meets or exceeds the manufacturing standards listed in Table 6.3.1.1 or Table 6.4.1. Whether these inserts are considered "pipe" or "fittings" is up for discussion, but since there is no definitive definition of either of these terms, we are taking the position that as long as it meets one of the standards in one of the tables, it is permitted to be used without being a listed product.

In the 2013 edition of NFPA 13, brass pipe complying with ASTM B43 and bronze fittings complying with ASME B16.15 were added to the tables. There is an unfortunate typo in NFPA 13 in that the standard should have been written as ASME B16.15, but it was printed in the table as ASTM B16.15. Hopefully people understand that this is an ASME standard, not an ASTM standard. There is no ASTM standard B16.15.

If you are using an edition of NFPA 13 that is prior to the 2013 edition, there are still two ways that you can use these brass inserts. The first is that section 6.3.1.1 and section 6.4.1 allow the use of unlisted materials that "exceed" the specifications of the materials in Table 6.3.1.1 or Table 6.4.1. Many AHJ's have accepted the position that the brass fittings made to ASME B16.15 exceed the requirements of ASME B16.22 or B16.18 that have been listed in Table 6.4.1 for many years and therefore can be used in sprinkler systems without a specific listing.

The second way that ASME B16.15 can be used in previous editions of NFPA 13 is to refer to sections 1.5 and 1.6 of NFPA 13. These sections allow "alternate arrangements" to be used as long as the level of safety prescribed by the standard has not been lowered. The committee has reviewed ASME B16.15 and determined that it meets their accepted level of safety, which is why they put it in the 2013 edition, therefore, an AHJ should accept this as an alternate arrangement under previous editions.

Another question that frequently comes up in this discussion is whether the

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brass in these fittings should be made from red brass or whether yellow brass is acceptable. The answer is that both types of brass are acceptable. As previously mentioned, NFPA 13 was revised by adding ASTM B43 to Table 6.3.1.1 in the 2013 edition. This is a specification for red brass, which certainly makes it clear that red brass fittings are allowed.

It turns out that yellow brass fittings are allowed as well, but it takes a bit more work to show that to an AHJ. Cast brass, bronze and other copper alloy fittings are allowed in accordance with ASME B16.15 since this standard was added to Table 6.4.1. In section 6(b) of this standard, it says:

> "Bar stock, when used for manufacturing smaller sizes of wrought plugs, bushings, caps, and couplings shall be in accordance with the requirements of ASTM B16, Alloy C36000, or ASTM B140, Alloy C32000 or C31400."

The standards referenced by section 6(b) of ASME B16.15 are referring to copper alloys commonly called "yellow brass". This means that yellow brass can be used in these sprinkler extenders (brass inserts) in accordance with ASME B16.15, which is referenced by Table 6.4.1 of NFPA 13.

While working on the 2016 edition of NFPA 13, the committee was asked to deal with this subject even more directly. The committee has tentatively given approval to a specific section that will say that sprinkler extenders can be used as long as the extra friction loss is accounted for in the calculations. This proposed change has not finished the balloting process, so it is too early to tell exactly what NFPA 13 will say in the future on this subject, but the committee seems pretty clear that they want to permit the use of these devices and wants to clarify it in some way.

Is the ½ Inch Size Okay?

The fact that these devices have an internal diameter similar to ½ inch pipe or tube is disturbing to some people. Certainly, this can cause some extra friction loss, but NFPA 13 does allow a small amount of ½ inch pipe in a system. Section 8.15.20.5.1 allows the use of ½ inch pipe for hydraulically calculated systems (a similar provision applies to pipe schedule systems in section 8.15.20.4). This pipe is limited to 4 inches in length and is permitted for the specific situation where a sprinkler system is being "revamped".

There is no specific definition of the word "revamped", but in the context of this section, it is intended to be a situation where the sprinkler system does not meet the conditions of the space and needs to be altered by moving the sprinklers so that the system can effectively fight a fire with the sprinkler in the proper location with respect to the ceiling. Rather than forcing the entire system to be torn apart so that larger pipes can be used to get water to the sprinkler in its new location, the committee has recognized the practicality of allowing a very short (4 inch maximum) piece of ½ inch pipe to get water to the sprinkler using the existing branch lines and fittings. If the pipe needs to be longer than 4 inches, NFPA 13 requires a transition to a larger size pipe after the 4-inch section of ½ inch pipe.

The necessary actions to fix the problem described at the beginning of this newsletter (a disconnect between the sprinkler installer and the ceiling installer leading to the installation of the sprinkler piping at a location where the sprinklers will not fit correctly) certainly falls into the definition discussed above for "revamping" a system. Since the sprinkler committee has already committed to the position that they do not wish to see building owners completely tear out their systems when sprinklers need to be moved a short distance, it would make sense to permit the use of these short brass inserts

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as long as the length does not exceed 4 inches in length.

What About the Hydraulics?

Since section 8.15.20.5 was used to justify the ½ inch inserts, this section needs to be followed in its entirety. This includes section 8.15.20.5.2, which says, "Calculations shall be provided to verify that the system design flow rate will be achieved." Therefore, if these brass inserts are going to be used on a system where the hydraulic calculations have already been performed, the calculations need to be redone with the brass inserts or the contractor will have to show that the additional friction loss is within the safety margins already provided in their calculations.

The NFSA is aware that some contractors are using section 23.4.4.7.1(9) to try and get out of the requirement to consider the additional friction loss through the short brass insert. This section states, "Friction loss shall be excluded for the fitting directly connected to a sprinkler." These contractors try to make the case that the sprinkler is directly connected to the brass insert, and therefore, they should not have to calculate it.

While that argument might have some merit, the fact is that if you consider the sprinkler directly connected to the brass insert, you would then have to calculate the friction loss through the tee or elbow on the branch line where the brass insert is being connected. According to Table 23.4.3.1.1, this could be adding somewhere between 1 and 3 feet of an equivalent length of ½ inch pipe to the calculations (depending on the exact conversions based on the actual inside diameter of the insert and the c-factor of the material). You would have to do this because the sprinkler would no longer be considered as being directly connected to the tee or elbow since you would be considering it directly connected to the brass insert. It would appear that you would be better off calculating the actual maximum 4-inch length of the brass insert rather than having to add 1 to 3 feet of equivalent length of ½ inch pipe to the calculations.

An example might be helpful here. Let's say, for the sake of discussion, that a 4-inch insert was being used instead of threading a sprinkler directly into a tee on a branch line and let's also say for the sake of discussion that the brass insert will have an inside diameter of 0.48 inches. If the sprinkler system was designed to discharge a minimum of 22.5 psi (so that a sprinkler could discharge a density of 0.1 gpm per sq ft over the 225 sq ft coverage area), the pressure demand of the situation would be changed by adding the brass insert by 1.5 psi (calculated with the Hazen-Williams formula using a C-factor of 150 psi for the brass and subtracting out 0.1 psi in elevation change for the 4-inch drop). So, if the sprinkler system's calculations already had an extra 1.5 psi in the safety margin, the 4-inch long brass insert could be safely added to the situation.

The hydraulic information can be taken a step farther by calculating the

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manner in which the insert alters the k-factor of the connection to the branch line. If the sprinkler directly screwed into the tee on the branch line has a k-factor of 5.6, then the sprinkler connected to the ½ inch brass insert would have a k-factor of 5.4. Knowing that the sprinkler connected to the brass insert has a k-factor of 5.4, any flow/pressure combination can be calculated to determine the effect of using the brass insert.

Summary

Sprinkler extenders (also known as brass inserts) can be used on fire sprinkler systems. Although there is no single section that you can point to in NFPA 13 to prove this, there are a series of sections that definitely allow their use. The 2013 edition of NFPA 13 is more direct in how it addresses the situation. The 2016 edition is expected to be even more clear on the subject.

The NFSA keeps a member of the Engineering Department staff on duty every business day to answer your technical questions live. We call this the Expert of the Day (EOD) program and it is available to our members by phone, fax, or e-mail. Call us at (845) 878-4200 and press 5, or you can send a fax to (845) 878-4215, or you can e-mail us at eod@nfsa.org. Last year we answered more than 2600 requests for assistance.