

Plan Review's Greatest Hits (and Misses)!!!

Fire protection systems plan reviews affect many of us in our industry. Whether we are reviewing them or our plans are being reviewed, the definition of the accurate and complete information required for submittals is unjustly accused of being in the "eyes of the beholder".

Although the acceptable completeness of a submittal is subject to the Engineer of Record (EOR) or the Authorities Having Jurisdiction (AHJ) involved, Chapter 14 of the 2002 edition of the National Fire Protection Association, Standard for the Installation of Sprinkler Systems, (NFPA 13) lists the items required for approval submission. Paragraph 14.1.2 allows some leeway on these items (subject to AHJ approval), but the more information that is included, the better chance of success you will have with getting that first submittal through the system.

The rejection rate for plan reviews is still unacceptably high at the state and municipal levels and it is not because the reviewers are being too critical. It may be that the plan reviewers are becoming more educated on what to look for, and that competent training of designers, and/or the necessary time for design including training and in-house peer review has not been budgeted for by many companies. Also, and we hear this frequently, the fire protection contract is let out late and submittals are rushed through to meet the construction schedule. But nothing is more of a schedule-killer than re-submittal due to revise and resubmit, or a problem with the design being found after installation.

Focusing mainly on AHJ concerns (EOR concerns is another whole article), below is a partial list of items that frequently surface with submittals that are reviewed:

- **Product Data** – It is difficult for a reviewer or inspector to assess the design submittal without complete, accurate and current product data. This is especially critical with the sprinkler heads and the pipe types that are utilized in the design. The reviewer cannot accurately verify the sprinkler head coverage and hydraulic calculations without the sprinkler information.
- **Reference of Standards** – Much to the surprise of many people who submit plans, the Minnesota State Fire Code (MSFC) is utilized first for the review of fire sprinkler submittals and then NFPA 13 or other referenced standards. If you do not have a copy of this code, get it now! The MSFC does reference NFPA standards, but also has modifications to, and requirements above and beyond, NFPA. Although the 1999 edition of NFPA 13 is currently referenced by the MSFC, most contractors use the 2002 edition for their design submittals. In either case it should be stated plainly and clearly on the drawing to avoid confusion. And remember to use either edition in its entirety. It is not acceptable to pick and choose items between editions of standards. Also list any other applicable standards, specifications, engineering reports (include these in the submittal if possible) or insurance requirements if they deviate from the MSFC. Remember, they cannot be less restrictive than the MSFC.
- **Water Supply Information** – This is the most critical part of design, and often the most neglected. All of the information gathered during the hydrant/water flow test should be included in the submittal. Many times, the elevation of the water supply test hydrant location relative to the base of the riser or the finished floor is missing, hydrants (static and residual and flowing hydrants) have not been indicated on the site plan (if a site plan is even included), whether the main is circulating (gridded) or dead end is not indicated, and all of the coefficients have not been included in the conversion of the velocity pressure reading from the pitot to gpm. Frequently the coefficient for the use of the pumper connection has not been included in many of the conversions. The pitot reading, the opening type (square, smooth, etc), opening size, and all coefficients are required for accurate flow tests. Also, the seasonal fluctuations in water tower



height are not always accounted for, as many communities lower their tank levels during the winter months which results in lower pressures. In addition, the recorded residual flow submitted is less than the most demanding hydraulic calculation (including inside and outside hose streams). This last situation is usually seen in connection with high hazard or storage facilities where flow requirements can be much higher than in an office building, for example. The requirements of NFPA 13 (and especially NFPA 291) are not utilized nearly often enough.

- **Valve Supervision** – Although not specifically indicated on submittals, all valves controlling water supplies for automatic sprinkler systems, including sectional control valves, standpipe riser valves, and so on are required to be electrically monitored [MSFC (2003) Section 903.4]. In addition (here's the one that gets ignored the most), these valves are required to be locked or secured in the open position [MSFC (2003) Section 903.4.4] unless access to these valves are limited to essential personnel. In addition, the valve on the alarm line for dry, preaction, and deluge system is required to be sealed or monitored and that is usually overlooked.
- **Storage Occupancies** – Most submittals for storage occupancy buildings are rejected the first time. The owner's information certificate required by NFPA 13, paragraphs 4.3 and 14.1, usually is not provided. Also, room/area occupancy or hazard classification information has not been provided as required by the MSFC, and by NFPA 13, 14.1.3(7), along with commodity classification, storage arrangement and height, and so on. These items are especially critical when reviewing storage facilities or areas of the building containing storage. The owner's information certificate should be the first thing that goes out to the owner when you send back your contract. If this is a design/build project, the commodity, storage arrangement, height (of storage and building), aisle width and other items indicated in Chapter 23 of the MSFC and in Chapter 12 of NFPA 13 (2002) must clearly be identified. Request this information prior to bid, as it could protect you later on potential change orders (when was the last time you were asked by your client "Well, what did you bid?" on a design/build project). If it is a plan and spec project, and you are relying on the EOR's design criteria, include a copy of the specification section or (more importantly) the engineering report that was generated. Hopefully the EOR's information will be correct (it wouldn't be the first time if it wasn't), but at least if the submittal is rejected because of erroneous information, it's not your fault.
- **Retrofit Projects** – Many times, not enough information about the existing system, utilized for supply, is indicated to substantiate the design. The base building should be indicated, as new demising walls, etc., created by tenant modifications could affect the protection at the adjacent spaces and must be accounted for. Also, if a fire pump is utilized for the supply, the hydraulic calculations should reflect the most recent pump test information (the actual pump supply) and not a default pump curve generated by the hydraulic program or the pump curve in the manufacturer's data – this is true of new and existing fire pump installations.
- **Ceiling/Soffit Heights** – It amazes us when the submittals indicate a reduced remote area as allowed by NFPA 13, 11.2.3.2.3.1, but the ceiling heights are not indicated on the drawings. Also, any soffits, ceiling pockets, or ceiling height changes in the area affect the design. Many times, the maximum ceiling height in the area is not used, as required, just the predominant ceiling height. In addition, soffit obstructions could require additional sprinklers in the design area that must be accounted for.
- **Obstructions** – Obstructions by other trades' work are not typically shown on submitted plans and are generally field verified (known obstructions should be indicated). However, structural and general construction work obstructions should be shown and accounted for. In addition, all obstructions (other trades' work, structural, general construction, etc.) should be shown for use with specialty type design (e.g., ESFR systems) where the design and "listing" of specific application sprinklers takes obstruction criteria into account.



- ***Sprinkler Head Listing Criteria*** – Has anyone ever reviewed a design where a reduced remote area was utilized only to find out that the sprinkler head was not a quick response type? How about the use of the small room rule spacing in an ordinary hazard area? Unfortunately, extended coverage or specific application sprinklers seem to be the ones that are found to be the most abused when reviewing designs. A recent plan review included extended coverage sprinklers in areas where the slope of the structure above exceeded the “listing”. Also, the maximum area of coverage (between sprinklers and off walls) is not always utilized in the hydraulic calculations for the minimum required psi and gpm of the sprinklers used. These items are under scrutiny when reviewing hydraulic calculations.
- ***Other Items*** – Although not the primary reason for submittal rejection, enough of these items noted in a review are areas for concern. They include, but are not limited to:
 - Sprinkler coverage missing or too close together.
 - “Blind spots” in sprinkler coverage due to obstructions.
 - Close-spaced sprinklers and draft stops to protect vertical openings missing.
 - Sprinklers too far off walls for “Listed’ coverage.
 - The hydraulic summary information on the plan does not match or has not been updated to reflect the requirements determined in the hydraulic calculations.
 - The remote area is insufficient or the incorrect shape or length.
 - Pipe supports (hangers) were not indicated – especially critical where roof or structure loading may be a concern.
 - Lack of information for the domestic water connection off a combined service, especially if it exceeds the “4 to 1” rule and the domestic demand is not included in the calculations.
 - Location of the fire department connection with respect to the nearest hydrant, along with the connection not located on the address side of the building without prior permission from the AHJ.
 - Pipe pitch not indicated for dry pipe systems.
 - Actual coverage of sprinklers not used in the calculations.
 - Clearly indicating the heated areas of the building where wet pipe system components are shown.

We are sure many of you have your own list of common plan review deficiencies you’ve experienced with regularity. We’d like you to share your experiences with us, especially the strangest or most compelling experiences. Maybe in a future article, we can expound on this topic.