NATIONAL FIRE SPRINKLER ASSOCIATION, INC.

Tuesday e-Tech Alert
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Number 80

Best Questions of March 2007

We have selected the following questions as the "best of March 2007" answered by the engineering staff as part of the NFSA "Engineer of the Day" member assistance program:

Question 1 – Sprinkler System Water Flow Alarm Retard Times

The National Fire Code NFPA 72 1999 Edition has the following requirement:

> 2-6.2 Initiation of the alarm signal shall occur within 90 seconds of waterflow at the alarm initiating device when flow occurs that is equal to or greater than that from a single sprinkler of the smallest orifice size installed in a system. Movement of water due to waste, surges or variable pressure shall not be indicated.

Does NFPA 13 address alarm retard times?

Answer: Yes, but the NFPA 13 requirement can be considerably more liberal, allowing 5 minutes from the start of flow to the requirement for the sounding of an audible alarm (Section 6.9.1 in the 2007 edition). Both standards recognize that fluctuations in water pressure may occur, and allow the use of retarding devices to avoid false alarms. Section 8.17.1.2 of NFPA 13 (2007 edition) states "On each alarm check valve used under conditions of variable water pressure, a retarding device shall be installed." For a system equipped with an alarm check valve the retard chamber will collect the water and allow it to slowly drain before it reaches the water motor gong. If a sprinkler opens the continuous flow will be too great to drain from the retard chamber and the alarm will be triggered. Electrical flow switches can be set with specific retards to avoid false alarms from surges. Since the sprinkler alarm is traditionally not considered an evacuation alarm and since the sprinkler system is presumed to be addressing the fire when it operates, the time delay in alarm has not been a major concern. Where NFPA 72 applies per Section 6.9.4.1 of NFPA 13 for a required protective signaling system, the 90 second rule must be met. Where NFPA 72 does not apply, NFPA 13 Section 6.9.4.2 allows electrical water flow switches to be installed in accordance with NFPA 70, the *National Electrical Code*, and the 5 minute limit would apply.

Question 2 – In-Rack Sprinklers for Lumber Storage

A new lumber storage building under construction is protected by two dry pipe sprinkler systems designed for extra hazard. A wooden rack system has been built in the building for lumber. It is two levels with a metal grate floor on the second level to access the bins. Some of the bins have solid wood shelving, while other bin spaces are open.

According to Section 8.5.5.3.1 of the 2007 edition of NFPA 13, sprinklers must be installed under fixed objects over 4 ft. wide, including grated floors. I'm fairly confident that sprinklers are needed under the grated floor, but what about within the rack system? Does it need to be sprinklered as well?

Answer: The answer depends on the height of storage. There is an expectation of shielding in extra hazard occupancies, and if the storage height is limited to no more than 12 ft then the protection of Class I–IV commodities in racks are protected as miscellaneous storage per Section 16.2.1.2.1. Table A.5.6.3 suggests that solid piles of lumber can be protected as Class II commodity, and Table 13.2.1 actually allows Class II in racks to be protected as low as Ordinary Hazard Group 2 for racks up to 12 ft in height. For higher racks, the solid shelving rules of Section 16.1.6 would apply, since the Committee views loads that block flue spaces to provide the equivalent of solid shelves. Section 16.1.6.2 states, "Where solid shelving in single-, double-, and multiple-row racks exceeds 64 square feet in area or where the levels of storage exceed 6 feet, sprinklers shall be installed at the ceiling level and below each level of shelving." This information was added to the standard in the 2002 Edition. You are correct that sprinklers should be installed below the grating if it is wide enough to trigger the obstruction requirements.

Question 3 – Water Curtain Sprinklers

Do you know of any fire modeling, fire testing or any other documentation that supports the use of standard spray sprinklers in a water curtain application that satisfies the requirements of the IBC for a rated separation at a glass curtain wall such as those found in atria? I have a situation where I need to provide a 2-hour separation along an atrium curtain wall with a fire sprinkler water curtain and there is a question of whether I need a special listed window sprinkler. If I can supply the local authorities with documentation of standard spray sprinklers being an acceptable method of providing a rated separation meeting the intent of the IBC, I can help minimize the owner's cost.

Answer: There have been numerous research projects addressing the protection afforded by water spray on glass. In general, these projects have found that as long as the following three criteria are met, a standard spray sprinkler can maintain the integrity of glass for at least a two-hour period:

1) The sprinkler is activated prior to the glass breaking
2) The entire surface of the glass is wetted by the sprinkler
3) The water supply lasts for the minimum expected duration

In the late 1970's data was provided to major code organizations and used as the basis of the atrium provisions that allow sprinklers protecting glass to substitute for fire resistance ratings. Presumably, as long as the sprinklers were installed in accordance with these requirements, the entire surface of the glass would be wetted by the sprinkler. In 1986, fire tests carried out at Lawrence Livermore Laboratories showed that tempered glass was adequate under the atrium rules included in NFPA 101, but that laminated glass worked better than tempered glass. In 1987, Grinnell received special approvals from Canadian product approval laboratories after tests with their FR-1 standard spray horizontal sidewall showed an equivalent of a two-hour rating for tempered glass and semi-tempered glass at spacing up to 10 ft x 10 ft. Since 1987, there has also been work at the National Fire Laboratory in Canada on this subject by J. K. Richardson and I. Oleszkiewicz, much of which was published in NFPA's *Fire Technology* magazine. The atrium

protection rules for sprinklers along glass walls that are found within both the IBC and NFPA 101 are based on the use of standard spray sprinklers and represent decades of successful experience.

Question 4 – NFPA 20 and 110

I have a question that crosses both the pump and generator standards. NFPA 20 sections 9.6.2.1 and 9.6.2.2 appear to contradict each other for earthquake zones. I understand that the 8 hour duration includes enough fuel for weekly testing of the fire pump. Therefore it is not truly an 8 hour run requirement. The difficulty we are having is relating to 9.6.2.1 which refers you to NFPA 110 and requires Level 1, Type 10, Class X emergency power systems (EPS). Section 5.1.2 of NFPA 110 states that the duration must be 96 hours for seismic risk areas such as the Pacific Northwest. It seems that if an emergency generator is used to run building life safety systems, including the fire pump, it would not have to be sized to run the fire pump for 96 hours, especially since the water supply is not required for that duration. However, the Annex material (A.4.4.1) specifically identifies fire pumps as part of a Level 1 system. What duration should an emergency generator set which supplies power to an electric pump be prescribed to run?

Answer: we do not see a conflict between section 9.6.2.1 and 9.6.2.2, or a conflict between NFPA 20 and NFPA 110. Sections 9.6.2.1 and 9.6.2.2 first appeared in NFPA 20 as an attempt to stop the use of Class 6 or less generators from being used to provide back-up power for fire pumps. Prior to that, the standard was silent on the class of generator being installed, and many fire protection professionals were installing Class 2 generators (to last for 2 hours) and Class 6 generators (to last for 6 hours). There was some concern that this would not be sufficient duration for the fire protection system since the fuel supplies are never completely full. Following a fire, the Committee wanted the fire protection system to be able to be returned to service in case of another fire with fuel still available to the generator. After a great deal of discussion, the Committee chose 8 hrs of fuel as an appropriate amount of run time for a generator to make it consistent with the requirement that the fuel tank for a diesel driven fire pump (See section 11.4.3 and A.11.4.3) last for at least 8 hrs.

Section 9.6.2.1 was added to the standard to make sure that generators were Type 10 (because some people were using Type 60 or Type 120 in the absence of any rules in NFPA 20) but there was no way to specify 8 hours worth of fuel directly because there is no such thing as a “Class 8” generator. So the Committee wrote section 9.6.2.2 to clarify that the duration of the Class X generator needed to be at least 8 hours.

The way that the Fire Pump Committee envisions section 9.6.2.2 to be used, the design engineer needs to determine what the generator is going to provide power for and determine the amount of fuel necessary to provide the demand for all of the equipment except the fire pump. The engineer then needs to add an additional amount of fuel to supply the fire pump demand (100% of rated load) for 8 hours.

For example, if the lights, refrigerators and other power devices (except the fire pump) being fed by a generator cause the generator to burn 50 gallons of fuel per hour and if the generator is in a location that requires 96 hours of power, then the fuel load for all sources except the fire pump is 4800 gallons. Assuming that the fuel load for the fire pump is another 50 gallons of fuel per hour, the fuel supply will need to be increased by another 400 gallons in order to run the fire pump. The total fuel load would then be 5200 gallons for the generator.

This philosophy is consistent with the thinking about how fires occur. We are not worried about running the fire pump during the entire blackout period. We are only worried about running the fire pump if there is a fire. It would not be consistent with this philosophy to size the generator to carry the whole load of the fire pump for 96 hours. It is unreasonable to believe that a fire pump would run for that length of time. All we need is for the fire pump to be able to run for it's maximum duration if a fire occurs some time during the 96 hour blackout and then have enough fuel left in the tank to run the fire pump again so that we can reoccupy the building after a fire with the fire protection system still operational in case something else happens.

Question 5 – Conflict on Hangers in Metal Deck

NFPA 13, 2007 edition, contains Section 9.2.1.4 Metal Deck, which restricts the attachment to metal decks to support 1-inch or smaller sprinkler pipe only. It also restricts the location of the attachment to the decking. There are UL-listed products on the market that allow hanging pipes larger than 1-inch that do not restrict the location on the metal deck of the attachment. Does the UL listing for these products overrule NFPA 9.2.1.4 and allow the support of pipes larger than 1-inch without regard to the attachment point to the metal deck?

Answer: You are asking if a listing for a hanger component would allow you to use that component when the requirements of NFPA 13 appear to be contrary to that component's use. You have specifically cited Section 9.2.1.4.1, which states, *"Branch line hangers under metal deck shall be permitted only for the support of pipe 1 in. (25.4 mm) or smaller in size, by drilling or punching vertical members and using through bolts."* The Committee felt that this application of standard products (through bolts, nuts and washers) was appropriate for the support of 1-inch pipe. Fastening a bolt through both vertical sides of the "valley" in a metal deck would easily support this arrangement.

The Committee has always allowed alternative products to be used in the installation of a sprinkler system, as long as the product can pass the rigorous requirements to obtain a listing. If the product you contemplate is installed in accordance with its listing, it may be used on the sprinkler system. It is important to follow all of the manufacturer's guidelines for installation of any listed product.

Question 6 – Sprinklers Installed Under Gratings

A facility has a level of grating at 8 ft above finished floor. The sprinkler system was installed in 1973 but, during a recent NFPA 25 inspection, was written up for not having sprinklers under the grating. As I read today's code, there is not a size of holes in the grating that is allowed to not have sprinklers protecting underneath the grating. I talked with the fire marshal and he said that if the 1973 standard had the same language, then sprinklers would need to be added. One more thing to add, this is a place where tires are stored on end, side by side in racks, until they sell and install them, but I still believe that I would not need to be finding my answer in the section under tire storage.

1. Where can I find an old code from 1973, if needed?
2. Should I be looking in the tire storage codes?
3. Would I need to bring the facility up to the 2002/2007 NFPA code 13?

Answer: The 1973 NFPA 13 standard contained an annex section A-3-15.8 which stated "Sprinkler under open grating should be provided with shields. Shields over automatic sprinklers

should be not less than…" and continued to describe the shields. The base section 3-15.8 dealt with guards and shields. It wasn't until the 1999 edition of NFPA 13 that Section 5-5.5.3.1 added "open grate flooring" to the examples of obstructions over four feet wide that required sprinklers below. However, grated floors, regardless of the size of the holes, have long been considered obstructions because of their potential to be loaded with combustibles. In fact, there are many grated mezzanine floors in warehouses and factories, and they are essentially treated as intermediate floors with sprinklers placed below them using standard spacing rules. The shields were required in the event storage did not protect the sprinklers below the grating from the discharge of higher sprinklers at the time of a fire.

The purpose of a typical NFPA 25 inspection is to review the operating condition of the system, and it should be recognized that NFPA 25 separately addresses hazard evaluations. Nevertheless, some deficiencies in the extent of protection do occasionally come to the attention of the inspectors, and it is helpful that they point these out to the owner. It should be kept in mind that the inspector does not usually have access to the entire code history of the building, and may not be aware of special alternatives or design features accepted at the time of construction or sprinkler system installation. It is obvious that it is not the responsibility of the inspector to remedy these apparent deficiencies, but it is useful to provide the owner not only with a statement of their existence, but a proposal for the cost of providing a remedy. The owner is then in a position to evaluate the costs and benefits of making the modification in consultation with the insurance carrier and other authorities having jurisdiction. In 1991 NFPA 13 first included a retroactivity clause in Chapter 1, which states that while the provisions of the standard do not apply to previously existing or approved construction, the authority having jurisdiction can make an exception where it is determined that the existing situation "involves a distinct hazard to life or property." The 2007 edition of NFPA 13 gives this allowance where the AHJ "determines that the existing situation presents an unacceptable degree of risk."

If the decision is made to install sprinklers below the grated areas at this time, then it is appropriate to use current sprinkler protection criteria appropriate for the hazard. Sprinkler protection criteria for rubber tire storage are now found within NFPA 13.

Question 7 – Sprinklers in Exterior Stair Shafts

If a stairway is open to the outside, are sprinklers still required at the top and bottom of the stair?

Answer: If the stairway is of noncombustible construction, then the exterior walls will have to be calculated for the percentage that they are open. The 2007 Edition of NFPA 13 has clarified this issue. Section 8.15.3.2.4 states, "Sprinklers shall be permitted to be omitted from exterior stair towers when the exterior walls of the stair tower are at least 50 percent open and when the stair tower is entirely of noncombustible construction." As long as the stairway walls are more than 50 percent open then the sprinklers would not be required in the stairwell.

Question 8 – Accuracy for Pump Field Acceptance Tests

A code official has refused, and testified in a trial, that he does not accept and is not familiar with, any reference to accuracy limits of test equipment. This is per NFPA 20-1996 Section 11-2.3 on Field Acceptance Test Procedures. I have the manufacturer's documentation on the gauges however how do I determine the ability to use that information?

Answer: You have asked what the accuracy requirements are for the field acceptance tests of a fire pump installed per NFPA 20, and referenced the 1996 Edition of NFPA 20. This edition provides a reference to the field test values being within the accuracy levels of the testing equipment. In the 2007 edition of NFPA 20 similar language can be found in Section 14.2.7, which covers "Field Acceptance Test Procedures." Specifically, in Section 14.2.7.1.2, it states, "Calibrated test gauges shall be used and bear a label with the latest date of calibration. Gauges shall be calibrated a minimum of annually. Calibration of test gauges shall be maintained at an accuracy level of ± 1 percent."

The standard clearly recognizes that any measured value should be within the accuracy of the equipment used to gather that value. Matching the pressure and flow values for a fire pump, in accordance with the manufacturer's information, is important, but it would be extremely difficult to achieve without the tolerance for small variations that come with the equipment that actually does the measuring.

Question 9 - Sprinkler Piping Passing through Generator Rooms

Can a sprinkler main with couplings or joints exposed be run through a generator room? We have heard that it is acceptable if there are no joints involved.

Answer: No. NFPA 110, *Standard for Emergency and Standby Power Systems* offers guidance on the rooms that contain the emergency power systems. In the 2005 Edition, Section 7.11.1 refers to the protection of the location where the emergency power system is located and states, "The room in which the EPS equipment is located shall not be used for other purposes that are not directly related to the EPS. Parts, tools, and manuals for routine maintenance and repair shall be permitted to be stored in the EPS room." This indicates that other equipment should not be run through the space. In addition, if the generate meets a Level 1 EPS, Section 7.2.1.2 states, "No other equipment, including architectural appurtenances, except those that serve this space, shall be permitted in this room." Again, this indicates that materials that do not serve the immediate space should not be run through it. If a different standard is used for the generator room, then there may be alternate requirements. In other words, if the guidelines for the specific generator room allow for equipment to be run in the space, then it would be acceptable to run the sprinkler main through the space.

Question 10 - Closely Spaced Wood Trusses with Pitch Over 4 in 12

I am in discussion with an authority having jurisdiction regarding the 20 psi requirement and the use of K-4.2 sprinklers protecting combustible concealed spaces with closely spaced wood trusses and slopes exceeding 4 in 12 heads. As I read Section 8.6.4.1.4.4 in the 2002 edition of NFPA 13 it says that “Nominal K-4.2 orifice sprinklers shall be permitted for use at the 20 psi minimum pressure option....”

I believe that since the section is written to allow the K-4.2 sprinkler at the 20 psi operating option, that the code is implying that a K-4.2 sprinkler is not allowed at the lower 7 psi minimum operating pressure option. My take on this portion of the code is that if the K-4.2 sprinkler were allowed for either the 7 or 20 psi operating option it would be silent on the issue or this section of the code would only state that once a K-4.2 sprinkler was utilized that the piping would have to be protected from corrosion as the remainder of the paragraph already states.

Answer: Section 8.6.4.1.4.4 was written while the Committee was developing the more restrictive rules for attics and realized that by decreasing the spacing, increasing the design area by 30% for the dry system, and then increasing the design area another 30% for the slope, the Committee had created a situation where the water supply was very demanding for a light hazard occupancy. Although small orifice sprinklers had previously been prohibited in dry systems, they agreed to an NFSA proposal that would allow the K-4.2 sprinklers with corrosion-resistant piping at the 20 psi pressure.

At 20 psi, a sprinkler with a k-factor of 5.6 will discharge a minimum of 25 gpm. Since the area of application for hydraulic calculations is counted on the floor, not the slope, this means that there can easily be 30 sprinklers in the design area of 2535 sq ft. Even with no overage, this would mean that the minimum flow demand for the sprinkler system would be 750 gpm. But since the slope forces the pressure to be higher at sprinklers closer to the water supply, the flow demand is more likely to be 800 or 900 gpm after calculation, which is much closer to a standpipe demand than a sprinkler demand. So, the Committee wrote section 8.6.4.1.4.4 to give the contractor some relief. Rather than start the calculations at 25 gpm at 20 psi, the k-4.2 sprinklers allows the contractor to start the calculations at 19 gpm at 20 psi. This makes the total flow a minimum of 570 gpm, or, more likely 600 to 680 gpm after overage is taken into account. Since the starting flows are lower, the friction losses will also be reduced, minimizing the overage caused by friction loss.

When developing the 2007 edition of the standard, the Committee decided to eliminate Section 8.6.4.1.4.4 and write a new Section 8.3.4.3, which allows K-4.2 sprinklers to be used on any dry-pipe system with any pressure demand as long as the pipe is corrosion resistant or galvanized steel.

Question 11 - Calculations with Mixed Standard and Extended Coverage Sprinklers

NFPA 13 states that when using extended coverage sprinklers, the design area must include five sprinklers or 1500 sq ft, whichever is greater. However, we have a layout in which the 1500 sq ft design area includes mixed standard and extended coverage pendent sprinklers, but only 3 of the extended coverage sprinklers. Does the remote area have to be increased to include a total of 5 extended coverage sprinklers? Do the extra standard pendent sprinklers in the expanded remote area then also have to be included in the calculations?

Answer: Just calculate 1500 sq ft and provide water for all the sprinklers that fall in that area, with a minimum of five sprinklers. There may be another portion of the building where there are five contiguous extended coverage sprinklers, in which case that area should also be calculated. If it is more demanding the water supply will need to support that area as well.

Question 12 – Need for Sprinkler Escutcheon Plates

Are sprinkler escutcheon plates strictly for aesthetic purposes, or are they required by code? We can not find anything in NFPA 13 that points to the latter.

Answer: NFPA 13 does not specifically require an escutcheon. However, there are two situations where they become necessary through other documents that do have legal standing:

1) Listing of a sprinkler. Some sprinklers such as recessed, concealed and flush-type sprinklers receive a listing for the sprinkler and escutcheon as an assembly. Since the sprinkler needs to be installed in accordance with its listing, and since the listing includes an escutcheon, then the sprinkler needs to be installed with the correct escutcheon. You will need to check with the manufacturer to understand which sprinklers carry this listing as an assembly.

2) Building code and fire resistance ratings. In many cases, sprinklers penetrate a single membrane in an assembly that needs to carry a fire resistance rating. In these cases, many building codes accept the use of a metal escutcheon to cover the hole in the assembly rather than the more expensive option of sealing the annular space with special filler or calking. In these cases, the lack of an escutcheon would violate the building code requirement for the ceiling or wall assembly to maintain a specific fire resistance rating. For an example of this code provision, see Exception 3 to section 712.3.2 of the International Building Code.

Upcoming NFSA "Business Thursday" Online Seminar – April 19th

Topic: Dealing with the AHJ during the Final Inspection
Instructor: Jeff Hugo, NFSA Codes Manager
Date: April 19, 2007

The job is done, and the final request for inspection is scheduled. This Business Thursday seminar will address scheduling, timing, inspection, and follow up of the final inspection. Many final inspections can make or break your performance with the owner, general contractor, and relationship with the building and fire department. Attend this seminar to give you an advantage over your competition and fellow sub-contractors.

Information and registration for this seminar is available at www.nfsa.org or by calling Dawn Fitzmaurice at 845-878-4200 ext. 133.

Upcoming NFSA "Technical Tuesday" Online Seminar – May 8th

Topic: Changes to the Residential Sprinkler Standards
Instructor: Kenneth E, Isman, P.E., NFSA Vice President of Engineering
Date: May 8, 2007

This seminar will discuss the major changes in the 2007 editions of NFPA 13R and NFPA 13D. Included in the discussion for this seminar will be a complete analysis of how to handle obstructions to residential sprinklers and the use of residential sprinklers under ceiling configurations that were not contemplated during the listing process.

Information and registration for this seminar is available at www.nfsa.org or by calling Dawn Fitzmaurice at 845-878-4200 ext. 133 or email: dawn@nfsa.org.

Additional NFSA Training Opportunities

Two-Week Technician Training Seminar

September 24- October 5 *Kansas City, MO*

This seminar, the last available for 2007, also serve as a starting point for the NFSA's two-year Certificate Program for Fire Sprinkler Technicians. For more information, contact Nicole Sprague at 845-878-4200 ext. 149 or email: Sprague@nfsa.org.

3-day Advanced Technician Training Classes

July 24-26	*Chicago, IL*
September 5-7	*St Louis, MO*

For more information, contact Nicole Sprague at 845-878-4200 ext. 149 or email: Sprague@nfsa.org.

NICET Inspector Certification Review Classes

May 22-24	*Anchorage, AK*
June 19-21	*Wilmington, DE*
August 14-16	*San Antonio, TX*
November 6-8	*Providence, RI*

For more information, contact Nicole Sprague at 845-878-4200 ext. 149 or email: Sprague@nfsa.org.

In-Class Training Seminars

NFSA also offers in-class training on a variety of subjects at locations across the country. Here are some upcoming seminars:

Apr 18	Sprinkler Protection for Rack Storage////Bozeman, MT
Apr 19	Inspection, Testing & Maintenance////Bozeman, MT
May 2	Foam Water Systems (1/2 day) (AM)////Las Vegas, NV
May 2	Advanced Pump Layout Procedures (1/2 day)(PM)////Las Vegas, NV
May 8	Inspection, Testing & Maintenance////Colorado Springs, CO
May 9	Residential Sprinklers Homes to High-Rise////Colorado Springs, CO
May 10	Underground Piping (1/2 day) (AM)////Colorado Springs, CO
May 10	Standpipe Systems (1/2 day) (PM)////Colorado Springs, CO
May 15-16	Two-day NFPA 13 Overview & Intro to Plan Review////Richmond, CA
May 17	Inspection, Testing & Maintenance////Richmond, CA
May 29	Introduction to Sprinkler Systems (1/2 day)(AM)////Southfield, MI
May 29	NFPA 13 2002 Update (1/2 day)(PM)////Southfield, MI
May 30	Sprinkler Protection for General Storage////Southfield, MI
May 31	Sprinkler Protection for Rack Storage////Southfield, MI
May 29-30	Two-day NFPA 13 Overview & Intro to Plan Review////Rogers, AR

May 31	Hydraulics for Fire Protection////Rogers, AR
June 5-6	Two-day NFPA 13 Overview & Intro to Plan Review////Anchorage, AK
June 7	Inspection, Testing & Maintenance////Anchorage, AK
June 5-6	Two-day NFPA 13 Overview & Intro to Plan Review////Willoughby, OH
June 7	Underground Piping (1/2 day) (AM)////Willoughby, OH
June 7	Advanced Pump Layout Procedures (1/2 day)(PM)////Willoughby, OH
June 6	NFPA 13 2002 Update////Albany, NY
June 7	Pumps for Fire Protection////Albany, NY
June 12-13	Two-day NFPA 13 Overview & Intro to Plan Review////Holland, MI
June 14	Hydraulics for Fire Protection////Holland, MI
July 31	Introduction to Sprinkler Systems (1/2 day)(AM)////Pataskala, OH
July 31	Underground Piping (1/2 day) (PM)////Pataskala, OH
Aug 1	Pumps for Fire Protection////Pataskala, OH
Aug 2	Sprinkler Protection for Rack Storage////Pataskala, OH

For more information or to register, visit www.nfsa.org or call Michael Repko at 845-878-4207 or email: seminars@nfsa.org.

In the promotion of the fire sprinkler concept, the National Fire Sprinkler Association represents all fire sprinkler industry interests including fire sprinkler contractors, manufacturers and suppliers of fire sprinklers and related equipment and fire protection professionals. Established in 1905, the National Fire Sprinkler Association provides publications, nationally accredited seminars, representation in codes and standards-making, market development, labor relations and other services to its membership. Headquartered in Patterson, New York, the National Fire Sprinkler Association has regional operations offices throughout the country.