Backdraft

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*ESH*Consultants

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Special points of interest:

- Lack of consistency with jurisdictional requirements for Hazardous Materials Business Plans
- Do you review water supplies for compliance with existing sprinkler requirements?
- Record retention, what does that have to do with fire protection engineering

Inside this issue:

Welcome to the 2009 edition of **Backdraft**, my irregularly issued newsletter for viewers of this website.

ESH Consultants has completed our ninth year in business. As with others, the economy has caused a slow down in work load. This provides time for preparing this newsletter, updating the website, and additional research on codes and standards. And, the company is now completing a two year plan review and construction inspection project.

Our major project for the past two years has been working as a consultant for the City of Sunnyvale Department of Public Safety, specifically on the Sunnyvale Town Center project. This is a multi-use development covering about 26 acres with an estimated construction cost of $400 million. The project includes parking garages, town houses, condominiums, office buildings, mall structures, multiplex cinema, a hotel, and standalone stores. Just do a web search for "Sunnyvale Town Center" to get sites for plans, development, photographs and other information on this project. At times there is a live webcam of the construction site.

With about 40-50% of the construction completed, most of the construction was put on hold due to the economy. This October will be the completion of a new Target store which will be the first retailer to open on the site.

As in past years we continue to provide consulting services to John Deere Landscapes in the preparation and revision of hazardous materials business plans, expanding from 15 locations to more than 40 locations. We also provide fire protection engineering consulting, dealing with hazardous materials inventory versus fire and building codes for John Deere locations in South Carolina, Florida, Colorado, Pennsylvania, and Wisconsin.

This year we renewed project work evaluating sprinkler systems that will be modified with backflow prevention devices as a result of the proposed installation of recycled water systems. More on that project in the body of this newsletter.

This project has brought into question the validity of hydraulically designed sprinkler systems based upon the accuracy of water supply tests.

Before you read the newsletter, I would like to point out that the newsletter is based upon projects and observations noted in California. As such, some of the observations may not apply in other jurisdictions; however, there is always something to learn.

I hope you enjoy this issue. As always, if you have any questions, comments, or opinions forward them to esh.fire@sbcglobal.net.

Elliot L. Gittleman, FPE, MBA

HVAC installer solution to a sprinkler installation interference

Hazardous Materials Business Plans – Is This a Program Out of Control

HMBP Inventory Form

As a consultant who prepares and submits Hazardous Materials Business Plans (HMBP) I sometimes believe the entire process is out of control. The rules and regulations are spread amongst various federal government agencies and their regulations, changed again at the state level and finally at the local level.

There appears to be only one unified rule; a plan must be submitted, or maybe not. If you operate or own a business that uses chemicals in production, repackaging or resale at the wholesale level, then your business may be required to file an HMBP with the local agency or CUPA. That may be a health department, a county environmental health agency or a fire department.

"The purpose of the HMBP is to identify for the local emergency authorities, those hazardous materials that are located at the business location."

The purpose of the HMBP is to identify for the local emergency authorities, those hazardous materials that are located at the business location. Any business that uses or has in their possession, for internal use or for wholesale sales, could be required to file an HMBP and annual recertification statements. The key trigger for requiring the HMBP is based upon the amount of chemicals of any specific product that is in the possession of the business at a specific location. An HMBP is required if the quantities are greater than 55 gallons for liquids, 500 pounds for solids, or 200 cubic feet at standard temperature and pressure (STP) for gases. If the materials are only for retail sales, and there is no mixing or repackaging, the business can be exempt from filing.

The purpose of this article is to identify and discuss issues with the preparation of an HMBP. This article is based upon conditions in California, and may also exist in other states.

For the past three years ESH Consultants has been submitting HMBPs for a client with operations in California and other states. In California, many of the operations are in different jurisdictions, requiring a customized submittal for each jurisdiction based upon local regulations. This may not sound like a bother especially if you have to meet the requirements of one jurisdiction; however, when working with 30-40 jurisdictions it can become a nightmare.

Jurisdictional Inconsistencies and Recommended Solutions or Changes

ESH Consultants has identified various inconsistencies on the filing or preparation of HMBP documents based upon the various CUPA requirements.

- Where to file the HMBP

  If you perform an Internet search, a DTSC site is identified, for providing all the contract information for CUPA's within California. Using that list has resulted in documents not arriving at the CUPA or being sent to the wrong agency. The list is not accurate and needs to be regularly updated. Another and more reliable method is to search for the CUPA by County. Usually this is a department of health, or similar. But then again that may also be incorrect. Sometimes there is a PA (Participating Agency) which is the local fire department. Or, you may find out that the specific city has the CUPA agency and not the County. And sometimes you have to submit to more than one organization such as the health department and the fire department, as sending multiple copies does not assure that they will be distributed to each of the agencies. **Solution**: The HMBP process is required by state law. All documentation should be filed electronically by the state and made accessible to local jurisdictions. A recent law requires this to occur, in California, by 2013.

- Do you have to file an inventory statement for a material where the MSDS indicated no hazardous components?

  The answer is yes and no. Some jurisdictions have taken the position that if an MSDS was issued, then the material must be hazardous even if not labeled as such. As a result they want an inventory page. In some instances this will involve a product with an HMIS or NFPA designation of 0-0-0 and no Federal hazard classification.

It should be noted that there are federal requirements on when an MSDS must be prepared. This does not stop a business from preparing an MSDS to show their clients that the material is not hazardous, yet this could require filing an inventory statement. **Solution**: If there is not HMIS or NFPA designation, and the components are listed as non-hazardous, then the material should be exempt from reporting.

- Do you have to file an inventory statement for a material where the MSDS indicates no hazardous components yet one category of either the HMIS or NFPA designation is 1.

  A good example is a product that may be slightly irritating but has not listed hazardous materials. Another good example is water. Based upon this method, water would need to be on the inventory. **Solution**: At least one fire department has stated in their requirements that there must be a rating value of 3 or 4 before the material has to be reported. An agreement should be made to not report materials with values of 1 or less.

- If you sell both wholesale and retail, is a HMBP required?

  For most jurisdictions, they consider even as little as 1% wholesale as violating the rule of retail exemptions. In reality the only difference is typically price and volume for delivery. Some jurisdictions consider the site to be retail if there are any retail sales, and if there are no materials used for internal use, then the location is exempt. Again this must be confirmed with the specific CUPA inspector. **Solution**: All sales both retail and wholesale should be changed to mercantile. Mercantile would not be required to report or file unless hazardous materials are used for internal operations, or are process and/or packaged on site inventory sheet, or if they collect hazardous waste.

- If you have the same product or very similar products under different brand names, is an inventory statement due for each one that exceeds quantity limits?

  As an example PVC cements, or various fertilizers with slightly different rating numbers such as 16-8-8 versus 16-6-8. Again this depends on the CUPA agency or inspector. Many locations in Southern California have indicated that they do not want an inventory sheet for similar products, they want one inventory sheet. For example if you have 5 variations of PVC cement you can aggregate the quantities and submit one form. **Solution**: Generic naming and aggregating quantities should be allowed.

- If you have the same product in various size packaging. Do you review each size versus the quantity limits or do you aggregate them together?

  Most of the CUPA inspectors want all the material quantities aggregated since the material is the same. **Solution**: Make aggregating the rule.

- Are you required to report materials whose category is no longer indicated in the building or fire code hazardous materials sections, i.e. carcinogens, irritants, sensitizers?

  You would expect to answer no since those classifications are no longer considered as a hazardous material per code. Guess again, if these are still classified as a hazardous material per federal regulations, which have not caught up to the building and fire codes, then it very possible that they would need to be reported with an inventory form. What do you do if the MSDS does not provide any federal hazard classification, and the description does not provide sufficient data (the case in many MSDS documents)? **Solution**: If the state or local agency is responsible for the implementation of the program, and their regulations are more up to date than the Federal regulations, then the local/state regulations should override. Thus is the local code no longer classifies a category as a hazardous material, then reporting of the material should not be required.

- TPQ or RQ quantities, when do you report?

  Again this varies as some agencies have set TPQ or RQ levels much lower than the Federal reporting limit. **Solution:** Set a state limit and make it the same for every jurisdiction.

- Inventory quantities are to be reported from the previous year's inventory. Many businesses do not use a point of sale (POS) system with a continuous inventory database. They could not tell you what was in inventory in the past month let alone during the entire year. They cannot identify number of days on site,

Hazardous Materials Business Plans – Is This a Program Out of Control

nor average or maximum quantities. **Solution**: Simplify the inventory data form. Most of the information on the form is of no value to emergency responders and appears to have been requested by politicians or bureaucrats that have never been to an emergency operation. All inventory should be based upon a snapshot taken just prior to reporting for the year and not based upon the previous year, and should also include any materials expected during the year that are not in inventory at the date of the snapshot. Remove the requirement for average daily quantity and only indicate maximum expected quantity.

- Propane – Is it a gas or a liquid?

  Technically it is a liquid when it is compressed in the cylinder and not a gas until released. Most CUPAs enforce the cubic foot rule thus containers greater than a tank for a barbeque would exceed the reporting limit. If measured as a liquid, 55 gallons or 500 pounds would be a much greater and reasonable reporting quantity. It seems ridiculous to have to file an HMBP because you have a spare cylinder for your lift truck, and that is the only product used in house. By the way some CUPA's grant a waiver for one spare cylinder but many others do not. **Solution**: Report propane as a liquid.

". . . there is no standardization of the regulations from one jurisdiction to another. . ."

As noted above, there is no standardization of the regulations from one jurisdiction to another, and probably not from one state to another. There needs to be one set of rules at the state level that cannot be modified at the local level. CUPAs and PAs must realize that their clients and stakeholders do not live in a vacuum and are not restricted to only one jurisdiction. One reason we cannot compete in the world market is because there has been no simplification of regulations, and there are multiple regulations and reporting requirements for the same issue. To make the system portable, useful and cost effective, it needs to be uniform and the same throughout the state if not the country.

In addition, CUPAs must work closely with fire and building departments when reviewing chemical inventories, and not operate in a vacuum. When preparing inventory summaries for client HMBPs it has not been unusual to find out that the quantity of a hazardous material (usually flammables) exceeds the exempt limits or maximum allowable quantities as stipulated in the hazardous materials sections of the building or fire codes. Those violations would require a reduction in inventory, addition of control areas, flammable liquid rooms, sprinkler systems, and possibly a complete redesign of the structure and use. Knowing that there is proper fire protection and separation based upon the material quantities is of greater importance to emergency responders than just a listing of the individual materials. Emergency responders do not have the time during the response to the incident to aggregate the quantities of all materials based upon building/fire code classification.

Water Supplies and Sprinkler Systems

Available pressure versus pressure used for hydraulic calculations

When designing a sprinkler system it is necessary to establish the available water supply for the system. Assuming we are not using a tank or fire pump, the water supply is obtained via public water mains that are typically used for both potable and fire service use.

The preferred method with a gridded or looped water distribution system would be to flow water at the property while measuring the static and residual pressures at an adjacent hydrant. If the water supply is fed from a dead-end main, it would be better to flow the hydrant downstream of the property while measuring the static and residual pressures at the property. This will provide a more accurate measure of the available water and pressure close to the point of connection to the sprinkler system lead-in main.

As the water supply system is used for both domestic (potable) and fire service, the static pressure is not truly static as there will be some flow for both residential and commercial purposes. As a result, the pressure in the system can vary by the time of the day, day of the week, or even the season of the year. NFPA 13 does not require the use of a safety factor for the water supply data when performing hydraulic calculations for sprinkler systems. This should be considered by NFPA, as it is typical industry practice for designers, or for AHJ's to include as much as a 10% pressure reduction as a safety factor. It is unknown to the author as to why this is not required by NFPA. Possibly it is belief that a "snapshot" of the system is sufficient. ESH Consultants does not agree as most water supply tests are not conducted when the water supply system is at it's worst (See Page 8 for more thoughts).

As an example, during the past year, working with a local water district, the static water pressure at a fire hydrant was measured over a three day period. Measurements were recorded automatically every minute and later down loaded to a spreadsheet for analysis.

It was determined that the static pressure varied from a low of 70.0 to a high of 85.99 PSI. Further evaluations determined a mean of 76.0 PSI, a median pressure of 75.8 PSI and a mode of 76.0 PSI. This compares with a static pressure during the official water supply test of 78 PSI (no safety factor). If the sprinkler system was calculated without a safety factor, then 0.475% of the time, the available pressure would have been less than that required to provide the required operating density. If the safety factor was applied, then 100% of the time the water supply would be deficient. This is based upon the demand point for the sprinkler system being on the flow curve with zero excess pressure available. A situation that does occur on a regular basis.

Changes in the Water Supply

Does your department or company verify water supply data every year? Do you know if the pressure is no longer sufficient for the existing sprinkler systems?

This is an interesting issue as some businesses or jurisdictions conduct regular water supply tests and compare the results with previous test, to determine if there has been a deterioration in capacity. The bigger question: Has this new data has been compared against the requirements of existing sprinkler systems? I would suspect the answer is no.

Recently while evaluating sprinkler systems for the addition of backflow prevention devices, it was noticed that the base of riser pressure of many of the sprinkler systems was higher than the static pressure from the water supply test. Considering the drop in pressure during rated flow, and the friction loss from the point of connection to the base of the riser, many of these systems had a pressure deficiency of +/-20 PSI. What this means is the system will no longer be able to operate at the designed density and will be deficient for the hazard classification.

If you check with many water departments you will find that they are not responsible for maintaining system pressure. For one jurisdiction, they were only responsible to provide a minimum pres-

". . . most water supply tests are not conducted when the water supply system is at it's worst."

Sprinkler riser with foam tank

"Were the two tests taken at the same time of the year, same day of the week, and same time of day?"

sure of 25 PSI at the fire hydrants. There was no requirement to provide a minimum flow, or sufficient operating pressure for the various water operated systems in the building (domestic or fire).

The solution to the problem is not to say, *we have a fire department connection for just that reason.* Fire departments, building owners, and businesses need to hold local water purveyors responsible for a minimum water supply pressure. If the system demand continues to grow, the water department needs to upgrade the distribution and supply, and not hide behind statements that they do not have to maintain a minimum acceptable pressure. If any area served by the water purveyor has a growing demand, then it is the responsibility of the building or fire department to require either a pressure guarantee from the water purveyor, or request a safety factor to allow for future reductions in available pressure.

If you choose to use the safety factor, this must be used with one clarification. If applying the safety factor to a water supply test conducted today, for say building x, then in the future, when evaluating whether the water supply is still acceptable, you cannot apply the safety factor to the new water test. This was already compensated for during the initial design.

For example, in 2000 we have a static of 100 PSI and a residual of 80 PSI. A 10% reduction in the pressure is made for deviations (safety factor). The result is a static of 90 PSI with a residual of 72 PSI. The sprinkler system is then designed to that data. Now in 2009 we determine that the available static pressure is 92 PSI with a static pressure of 72 PSI. Since the original design was based on a static pressure of 90 PSI with a residual of 72 PSI, the system will still operate as designed as long as the available flow meets or exceeds the original flow from the 2000 water test.

If instead you decide to use the safety factor on the 2009 data, the static pressure would be 82.8 PSI with a residual pressure of 64.8 PSI. You have now applied the safety factor a second time which was not the intention when applying the safety factor the first time. The result is that the system does not appear to have sufficient pressure and flow for proper operation.

The existing uncorrected water supply test should be compared against the system's original design. If still at an acceptable level, then the water supply is acceptable. If it is very close to the current water supply data, it may be time to start discussions with the water purveyor on how they will prevent further deterioration of the water supply.

Keep in mind, that the 2009 data may not indicate any deterioration of the water supply. Were the two tests (2000 and 2009) taken at the same time of the year, same day of the week, and same time of day? Remember, the original water supply test was a snapshot of the system at a specific time. When conducting water supply tests it is important to conduct the water supply test using the same flow and test locations, and it is just as important that all other variables be maintained as close as possible to the original conditions.

With water supply tests conducted years after the installation of the sprinkler system, it is important to compare the point of connection pressure requirements against the new, uncorrected water supply test data. If at that point the pressure is below the minimum acceptable pressure, then you must determine if it is sufficiently deficient to warrant an investigation into the water supply system, or determine whether a change is needed in the sprinkler system design.

One key question that may have a different answer per jurisdiction is: Does the local AHJ have the legal authority to require the property owner to upgrade the sprinkler system design, or demand an on-site booster pump, if the local water purveyor is no longer providing a water supply with a pressure equal to or greater than that used for the initial design? Only your local AHJ and government legal counsel can answer that question; however, I would suspect the answer is NO.

NFPA 13 requires a hydraulic placard to be placed on the riser for hydraulically designed sprinkler systems. Specific information to be

posted includes the demand in GPM at the base of the riser (BOR), at the required pressure in PSI. It is our opinion that this requirement BOR data is of limited or no value. When performing hydraulic calculations the calculation is taken to the point of connection (POC) where the underground main to the sprinkler system connects to the water distribution system. In some instances with non-looped or gridded underground mains, the calculation must be taken to the point where the static and residual pressures were measured. Thus it would be more useful to show POC data on the placard. When comparing sprinkler system demands against the available water supply, POC data can be compared very quickly against the water supply test. BOR data must be calculated to the POC to allow for elevation changes and friction losses. Without available record showing the size and length of the buried pipe, as well as the number and type of fittings, it is not possible to easily compare the sprinkler demand against the water supply test data.

Recently a fire protection engineer built a new home. This home was provided with a sprinkler system. During the final inspection, the field inspector failed the installation because the pressure reading at the riser, during flow, was less than the pressure shown on the hydraulic calculations.

After much discussion, the fire protection engineer was able to educate the field inspector that the pressure shown in the calculations were at the POC, which would always be higher than the pressure required at the BOR. Next, the pressure at the BOR was determined from the calculations. The available pressure at the BOR was higher than that required based upon the calculations. The field inspector then passed the installation.

Remember when reviewing sprinkler system installation that you need to compare BOR against that shown in the *calculations* or POC against that shown in the calculation. Placing POC data on the hydraulic placard may eliminate that problem.

Record Retention

"Record retention, what does that have to do with fire protection. . ."

Record retention, what does that have to do with fire protection engineering you may ask. Everything! The retention of as-built drawings, calculations, or the original permit drawings for fire protection systems is of vital importance should it be necessary to modify the sprinkler system in the future.

Why is this of any importance to the AHJ? As the approving agency, you need to consider the needs of your stakeholders. They may be the current or original owner of the building, the tenants of the building, or more importantly the future owners of the building. Any assistance you can provide is one more reason for their keeping the business in your jurisdiction versus relocating to another location, thus transferring potential tax revenues.

The main issue to the stakeholders involves changes to the existing designs. With sprinkler systems, a change in occupancy, relocation of walls, or reduction in the available water supply will require a re-evaluation of the sprinkler system. With pipe hidden behind hard ceilings, or in areas that are not accessible, it is difficult if not impossible to recreate the sprinkler system layout. With pipe scheduled systems, you will not be able to determine the number of sprinklers served by specific system pipe sections; with hydraulic systems, you will not be able to provide a new calculation to determine current operating densities, or to prove modifications to the design. With installations with exposed piping, there is still the added expense of preparing a new drawing to be used for hydraulic calculations.

Or fire alarm and detection systems, wiring runs along with voltage drop calculations are invaluable in determining why audible or visual devices are not functioning properly, or to determine whether additional devices can be added to a circuit.

Over the years clients have asked to have sprinkler systems evaluated to determine if storage heights or storage configurations could be changed, or to determine the affect of adding a back-

flow prevention device to a sprinkler system. The clients wanted to know if it were possible to make modification to the sprinkler systems so that a new system would not be required.

In one instance there were two 155,000 sq. ft. office buildings that had been converted from a fruit drying facility. There were no drawings of the system. It was estimated that the as-built drawings would cost in excess of $30,000 to prepare, in order to perform a hydraulic calculation with an estimated cost of less than $4,000. Considering the economy, and the costs, with the understanding that the calculation may determine that no changes would be needed, the client opted to leave the system as is and take their chances.

A client asked for an evaluation of multiple sprinkler systems to determine if the addition of back flow prevention devices would be acceptable based upon the currently available water supply pressure. A calculation is needed to determine if the addition of the losses caused by the backflow device would still result in their being sufficient base of riser pressure, or point of connection pressure. Some of the buildings being evaluated were 6 floors in height , with multiple sprinkler system designs. Drawings were not available and there was no hydraulic data posted on or near the riser. In some similar instances with no data, the sprinkler contractor was contacted and indicated that once the project is more than 10 years old, they destroy all of the record for legal purposes. The result, the sprinkler systems could not be evaluated and the back flow devices could not be installed.

What if this had been a change in hazard classification? Without the necessary design information used for the original installation, someone would either need to create a system as-built drawing (fairly expensive), or the existing system would need to be removed and replaced with a newly designed system, with a different operating density. In some instances, if the drawings and calculations were available, an analysis may have shown that only certain pipes needed to be increased in size or cross connected, in order to increase the system operating density. Not having record documents can become and expensive omission.

Have you every had a fire alarm system which has over the years been modified. You run an annual fire drill in the building and the occupants complain that they could not hear the audible devices. They would only produce a low buzz. Additionally, the strobes failed to operate. Is this a situation where the power supply has failed, or has it been overloaded. Without as-built wiring diagrams this could be very difficult to determine. It could also be very expensive to remedy. With the drawings, a designer could determine the voltage drop to each device and determine if there is sufficient voltage. If not, devices may need to be removed and switched to another notification circuit, or additional power supplies added. In one instance, the fire alarm contractor wanted approximately 1-2 million dollars to replace an existing fire alarm system. By determining where the system was overloaded, additional notification power supplies were added, reducing the repair cost to about $70,000. This was only possible because partial as-built drawings were available, and it was feasible to use tone generators to trace the circuit wiring.

"...wiring runs along with voltage drop calculations are invaluable in determining why audible or visual devices are not functioning properly..."

Water Supply Data and Sprinkler Systems

Proper water supply data is critical for the operation of hydraulically designed sprinkler systems. As noted in the article on page 5, we discovered systems where the current water supply is not sufficient for existing systems. The local water department reviewed their operations and determined that there has been no change in their operations since prior to the system designs. At this time it is believed that the water supply tests were conducted while either the water level in the tanks was at a higher level, or the tank refilling pumps were in operation resulting in a higher system pressure.

This indicates a need to examine whether the water supply data to be used for the system design is accurate and conservative.

When collecting water supply data for sprinkler system designs, one must first have an understanding of the water supply system. Is it fed from a tank, boosted by a pump, or gravity feed from a lake or reservoir? From observations of water supply test data provided by fire departments, it appears that the only data collected is the "static" and residual pressures, as well as the flow. If the water is supplied from a tank or reservoir, with or without a boost from a pump, then the information may not be valid.

Considering that a sprinkler system is a critical portion of a building or process design, it is necessary to be conservative with the accuracy of data. It is better to over design than under design.

As an example, consider a tank with the maximum fill at 220 feet above sea level. The static pressure at sea level, with no other flows, would be 0.433 times 220 or 95.26 PSI. Next, the tank water level is allowed to drop to 190 feet above sea level before actions are taken to refill the tank. At that time, the static pressure at sea level is 190 times 0.433 or 82.27 PSI, a drop of almost 13 PSI.

As an example of how this affects a sprinkler system operation, let's evaluate a simple design based upon the water level at the high level in the tank, with a fire occurring when the water level in the tank is at the low level. Consider an ordinary hazard design sprinkler system designed to match the water supply without any safety cushion. With a maximum coverage of 130 sq. ft. per head, the end head (0.5 inch orifice) requires 19.5 GPM with a pressure at the head of 12.13 PSI. If a fire occurs when the tank water level is at 190 feet, the available pressure would be 13 PSI less, thus theoretically there would be no flow at the end head. In reality, there would be some flow since all of the sprinklers in the operating area would be operating at a decreased flow, thus a lower system friction loss, resulting in some pressure at the end head. We could perform a hydraulic analysis of the design to determine the actual flow based upon the reduced pressure, but the result would be the same: A deficient operation of the sprinkler system resulting in the potential for a larger and possibly uncontrolled fire.

Another example would be a water distribution system with multiple booster pumps. What happens if the fire occurs when one of the pumps is out of service and there is no spare pump to take its place? Once again we would have a sprinkler system that is not operating as designed.

You may ask why am I concerned, what is the possibility of either situation happening when there is a fire? My response would be, if that is your building and business, do you really want to have a fire and find out.

NFPA 13 spends pages and pages on how to properly calculate (hydraulically) a sprinkler system. Designers get overly accurate in providing pressure to four decimal places and flow to two or more decimal places, which in itself is of little accuracy. If you have ever watched the gauge needle when doing a flow test, then you know that the accuracy is not rocket science. The gauge needle may be fluctuating as much if not more than 10 PSI in either direction, so most of us use a mid-point. So why are we so "accurate" in our calculations when the true failure point that controls the entire design is the water supply.

For a more conservative approach the designer must determine the minimum available static pressure. If a tank is used, determine the water level at the time of the test, and correct the data to allow for the lowest water level in the source. If multiple pumps are used, determine the available pressure and flow if the largest single pump is not in service.

Many designers allow for a 10 PSI pressure cushion on their design. This may not be sufficient to overcome differences in the water pressure based upon the fill level of the tank or reservoir, or the failure of a pump to operate. The cushion should still be used to allow for future deterioration of water supply, condition of the interior of the pipes, or to allow for minor future changes to the system design.

In summary, when evaluating an existing sprinkler system water supply, a current deficiency may not be caused by a deterioration of the water supply system. It may be the result of differences in the water supply water level at the time of the water supply tests. To be have a higher level of confidence that the sprinkler system will function as designed, it is necessary to use water supply data that allows for a worst case situation, and not use data based strictly on whatever time of the day the test was conducted.

It would be interesting for NFPA to issue statistics on fires in sprinkled structures or processes where the fire was not controlled because of reduced operation of the sprinkler system. There may be many systems installed where they cannot operate as designed because of the improper use of water supply data.

"For a more conservative approach for a sprinkler design, you must determine the minimum available static pressure"

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Reality based engineering

ESH Consultants provides fire protection engineering and building/fire code consulting for our clients. Services include: Sprinkler system analysis for renovation and change of hazards. Building and fire code analysis for new construction, renovation projects, and change of use. Preparation of code analysis reports for submission to local code authorities. Assist or augment clients in the preparation and submission of Hazardous Materials Business Plans. Review building plans, and fire protection system submittals for proper design and code compliance. Construction inspection of the installation of fire protection systems.

Contact Elliot Gittleman, FPE, MBA for additional information.