BACKDRAFT

Winter 2013

Special points of interest:

- Inaccurate date used for hydraulic calculations
- Fire alarm retrofits—New versus one for one replacement?

Inside this issue:

WELCOME BACK

Welcome to the newly redesigned website. After many years of a constant look, I decided it was time to revitalize the site. The new look provides more focus on those services that we have been providing to our clients, while downplaying or eliminating those for which there has been little interest. As a result, disaster recovery planning is no longer identified as a service provided by ESH Consultants. Preplanning and consulting to reduce the potential for business interruption and related financial losses will still be available to clients.

To those of you who have never had the opportunity to build or rebuild a website, you are the lucky ones. Efforts began in late July, starting with identifying a business that could do the work at a reasonable cost and with excellent service. In August a vendor was chosen and descriptions of the proposed new look were identified and discussed with the vendor.

For the original website, html code was the language used to build the website. Using a word processor I could make changes to text without affecting the code that determined the look and feel of the web page. The new design was constructed using WordPress. I can no longer easily make changes to the site until I learn how to use that software product. It is as if I have to learn a new language.

It is now the middle of February and the site is completely functional with all the features and items I requested. It is a long process, so when designing your site or asking someone to change your site, allow extra time to complete the process. All in all, the vendor who provided the service did a great job. We discussed many changes and refinements, and we will work together on any future major changes.

ON MY SOAPBOX

Based upon the economy and the anticipated tax increases I have decided to take a more political view in this newsletter. It is great to be able to exercise our rights from the First Amendment.

No matter where you live, you can expect costs to rise, whether for business or at home. There will be higher taxes and mandatory expenses forced on individuals and businesses resulting in increased costs of services and products that we use every day. Businesses will pass these increases on to their customers in the form of higher prices.

I will hold the fees for my service at the 2011-2012 levels during 2013 unless costs increase substantially. Over the years engineering consultants have not been increasing their fees as quickly as other professionals. Once the engineering community wakes up and finds they cannot pay their bills, this will stop.

In the past year I have had potential clients hesitate when they are told my hourly fee. They believe they are too high for the services to be provided. I guess they do not pay the bills for their businesses or at home and thus do not realize that engineers have become the most underpaid professional consultants. My CPA charges $75-$125 per hour more than I charge for various services.

As an engineering consultant I have a high risk of liability than a CPA. I have more downtime between projects since there are no regulations that cause everyone in the country to potentially need fire protection engineering services. Their mistakes may be corrected with some financial inconvenience, yet if an engineer makes an error someone can get seriously injured or die, or property can be destroyed.

If you ever had to hire an attorney, you would never

complain about the fees engineers charge. And we don't itemize and charge for every single copy and phone call. Yet businesses will pay the fee for accounting or legal services without complaining.

Another good example is medical fees. My last doctor's visit of twenty minutes was billed to my insurance company at over $345. Granted they won't pay that amount, but that makes engineering fees a great bargain.

To add to this situation, some agencies in the State of California must believe there is a glut of engineers and architects, and thus believe the rates for services must drop substantially. Recently a state agency advertised for architectural consulting service, needed for legal issues, code research and expert witness services and would not set a fixed minimum amount of work. In other words, prepare the proposal, get the proper insurance coverage, hire additional employees, and maybe we will have some work for you. In the RFP they indicated that the maximum compensation rate for an architect would be not greater than $75 per hour. There is no way that anyone can operate a technically oriented consulting business for even twice that rate and still breakeven. I am willing to guess that the hourly rate, including all benefits, for the agency's contract administrator is costing the tax payers far in excess of $75 per hour and they are only pushing paper. No need for technical training, no liability, and a great pension plan on top of 35+ days of various leave with pay. As a business owner, it is very simple, no work – no pay.

Our governments both at the local and federal level have taken us back to the days of aristocracy. Our president, governors or mayors all think they are kings, and the legislatures believe they are dukes and lords believe we work for them. They want to tax us to fill their coffers with funds for junkets, family vacations and other expensive goodies that most of us can hardly afford.

The American public must stop fighting each other, the so called haves versus the have-nots. Yes there are those that are have-nots, but not a large percentage versus the population of the country. The have-nots will grow in size as the middle class is beaten down into the lower class by taxes. And, some of the have-nots are by choice. They would rather complain and want a free ride rather than taking responsibility to do what it takes to support themselves. It is easier to get a free lunch than work for small amounts of money. Most of us are responsible and will do want it takes, but the additional taxes and fees to support runaway spending by the government makes it more difficult.

As an example when I finished graduate school I could not find a job because of a recession. To pay my bills and to keep my mind active, I took a job making sandwiches at a local restaurant/deli (Seattle, WA). The university was nearby and the instructors from the MBA program would come in for lunch. Some would say: "What are you doing here after receiving your MBA"? My reply: "An expensive degree but no available MBA jobs on the local market".

Keeping college professors working at our expense is truer today as education costs rise 5% or more each year while inflation is nil. Being a university instructor has become the ultimate socialist yet capitalist dream. Keep raising the fees and salaries, and enjoy the benefits of capitalist while increasing the charges to the masses. We work hard and pay the fees and taxes while they enjoy ever increasing salaries and benefits, without the risk of unemployment, and without having to work a normal 40 hour work week.

The same is true for our politicians. We work, making a living and they live like royalty knowing they are set for life, and they do not have to follow the rules they establish for us.

It is time for the voters to give up the party partisan politics. Stop voting party line and start voting by what the candidate will do. They cannot meet all your issues, but pick someone that meets your highest issues. There is no perfect candidate. Vote out all long term incumbents and those that will not support term limits, substantial pay reductions for themselves, and a 30% reduction in their support staff and office expenses. They must agree to live with social security and "Obamacare" just as they want us to. No special pensions. Be in office for five years to vest your pension, and then wait until age 65 to receive it based upon the number of years in office and your average pay over that time. No more government pri-

"We work, making a living and they live like royalty"

vate jets (yes you Ms. Pelosi), no more government cars and drivers, no more government stores and food service facilities for the politicians. Buy personal products and services for the same price as the general public. How many of you knew that there are separate dining facilities in Congress based upon party affiliation and whether the position is Senator or Congressman (woman). Why? Because "royalty" demands it.

This is America not 18th century Britain. If we wanted to stay that way we would not have had the revolutionary war. Stop sleeping. Wake up, and make certain your children don't believe all the political propaganda fed to them by the leftists in their schools and universities. Remind them that they and their children and their children's children will be paying for the politicians' free ride of the past twenty years.

FIRE PROTECTION

Water Supply Data for Sprinkler System Design – Are reviewers setting too strict of a pass fail criteria considering the accuracy of water supply test data?

You may ask why I am upset about a method that has been in the NFPA and insurance standards for generations. Why is it such an issue now? Very simply, there are more accurate means of gathering water supply data that will provide a more accurate design thus reducing installation costs and save raw materials (pipe size increases, fire pumps, etc.).

NFPA 13 requires, with a few exceptions, that all new sprinkler systems be hydraulically designed and calculated. Calculations on sprinkler system hydraulics are based upon the available water supply to the sprinkler system. If that data is inaccurate, then the hydraulic calculations will be wrong. I am concerned that we are placing too much emphasis on accuracy while the water supply data is not very accurate.

Assuming there are no fire pumps or pressure tanks, and that the water supply is derived from a common domestic/fire main system, the water supply information is obtained by conducting a fire hydrant flow test. The static and residual pressures are measured at one fire hydrant and the system flow is measured at an adjacent fire hydrant. I would like to point out that this works very well when dealing with a dead end main however when the water distribution system consists of multiple loops (grids) then the residual pressure at the gage hydrant may not be 100% accurate as the water flowing from the flow hydrant is coming from multiple directions. However, this is usually accurate enough for calculation purposes.

Some jurisdictions require a redesign if the minimum available pressure at the required flow is slightly deficient. This would result in a slight deficiency with respect to the minimum acceptable density. Rejecting the design would be reasonable if we knew the static and residual pressure readings from the flow test were 100% accurate. Since the flow test readings are not that accurate we appear to be placing too high of an accuracy standard on the hydraulic calculations. Those of us with experience can attest to the fact that when conducting a flow test with a pitot tube, there is a great variation in needle swing. Thus we tend to use the center point of the swing; so much for accuracy. Also the flow test usually takes only a few minutes, and provides only a single data sample. This provides a picture of the water supply system for an extremely small sample size. For statistical purposes a single sample would be unacceptable and subject to error.

To remedy the situation of potential error in the water supply test, to adjust for seasonable variations, and to compensate for any possible future deterioration of a water supply, some jurisdictions are requiring either a 10 psi pressure reduction or a 10% pressure reduction of both the static and residual pressures measured during the flow test. This is a conservative approach that adds additional errors to the hydraulic calculation, and is not in the NFPA 13 standard. At a NFPA 13 training I asked one of the instructors, who was on the NFPA 13 committee, if they would standardize the safety factor and make it part of the code. The response was that NFPA 13 committee felt a single flow test without any safety factor was acceptable since it was only a snapshot of the water supply system. When I stated that the water supply conditions could vary during the year, I was told that the committee did not think it was an issue, that designing to the snapshot of the water supply was accurate enough.

"If that data is inaccurate, then the hydraulic calculations will be wrong".

It appears that the NFPA committee is not worried about extreme accuracy. Based upon that premise there should be some leeway given when reviewing hydraulic calculations. The densities indicated in the design tables should be applied with a statement saying the design would be acceptable if the calculated density is no less than 90% of the code indicated density. If the committee has any concern over that issue they could increase the design densities slightly; however, that would be something to discuss during the code cycle since the actual water supply information is not very accurate in the first place.

Some may say that it is better to have the extra pressure cushion rather than risk being slightly low on the residual pressure. That sounds good if you are making accurate water supply pressure measurements. With poor data, this could result in larger pipe or a fire pump. As an example, in a recent project the local fire department measured the static pressure as 80 psi with a residual pressure of 78 psi. They then applied a ten percent pressure reduction resulted in a static pressure of 72 psi and a residual pressure of 70 psi. Based upon that data, the hydraulic calculations indicated the existing system could not be retrofitted with a backflow prevention device.

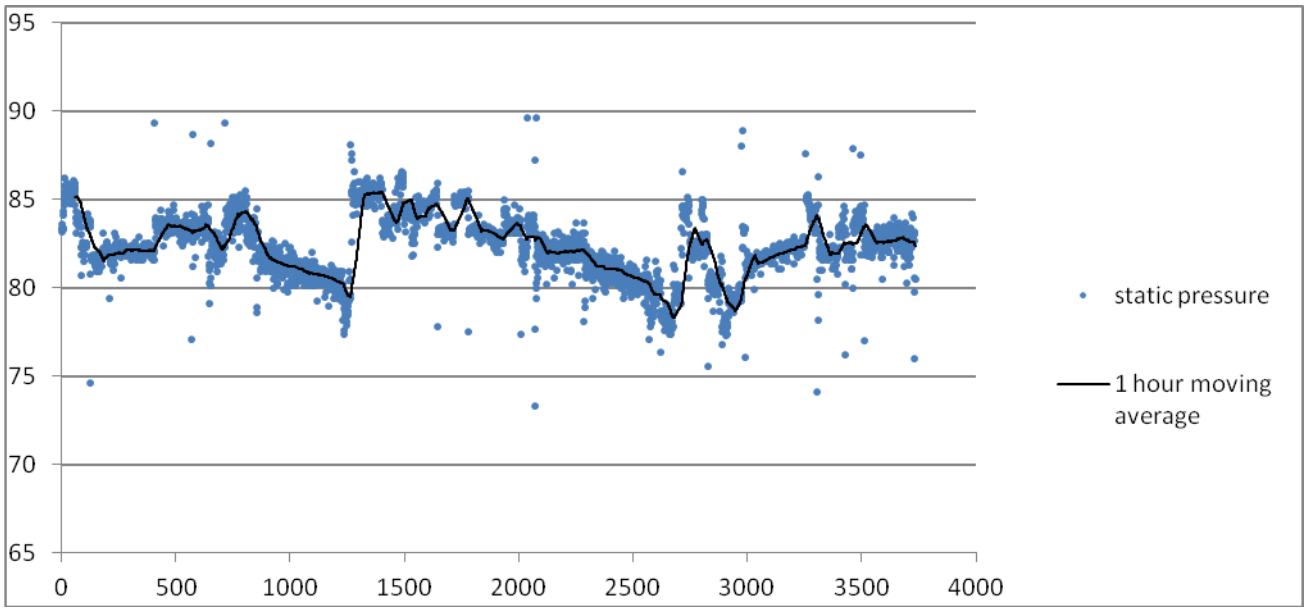
At our request, the local water department installed a recording cap gage on the gage hydrant. One static pressure measurement was obtained every minute over a three day period. The data was then downloaded into an Excel spreadsheet for analysis and charting. For the three day period 3751 data point were recorded. The maximum static pressure was 89.6 psi and the minimum static pressure was 73.3 psi. The average static pressure was 82.4 psi. The difference between the maximum and minimum pressure was 16.3 psi. Based upon that information, would you consider the single point flow test to be accurate? When reviewing the data, the maximum and minimum pressures occurred over short periods of time and were most likely the results of surges or instantaneous large demands on the municipal water supply. Also, at certain times of the day, the water department would turn on pumps to raise the water level in their storage tanks. The graph shows that most of the data was in the 83 psi range.

Using this data, had the fire department conducted their test when the static pressure was 89.6 psi, they would have corrected it to 80.6 psi which is less than the average yet similar to their original test data. That pressure is 8.6 psi higher than their reduced static pressure. Also, had the fire department conducted their test when the static pressure was 73.3 psi, they would have corrected it to 66 psi which is 4 psi lower than their actual reduced residual pressure. What does this show? It shows that depending on the time or date of the test, the values obtained from a single flow test has a very wide range of possible results. The accuracy is non-existent, thus why are we so critical on the water supply data for a hydraulic calculation?

NFPA 13 needs to change with the changes in technology. With the use of recording cap gages, the water supply static pressure can be measured over a number of days, and at various times of the year (if needed). The static pressure used for the hydraulic calculations would be based either on the average static pressure or one standard deviation below the average static pressure (this would be decided by the NFPA 13 committee). The residual pressure would be based upon a flow test and modified based upon the difference between the flow test static pressure and the average static pressure. For the data collected by the recording gage, we have an average static pressure of 84 psi, a the flow test static pressure of 89 psi and a residual pressure of 72 psi. The static pressure from the flow test would be set at 84 psi and the residual pressure at 67 psi (The flow test residual pressure minus the difference between the flow test static pressure and the average static pressure (89-84=5, thus, 72-5 or 67 psi)). The actual flow would remain the same.

If that method were applied to the 3751 data points then the average static pressure used for our calculation would be 82.4 psi. The standard deviation was calculated at 1.8 psi. With a reduction of one standard deviation the static pressure would be reduced to 80.6 psi. That value almost matches the fire department's test data. Thus the ten percent reduction is redundant. Also the data collected from the larger sampling is more accurate.

This method would not be perfect but would provide a much better approximation of the existing water supply system. The advantages would be a potential reduction in pipe diameters, providing a cost saving to the owner, while reducing raw material waste and environmental impacts cause by producing larger than necessary pipe sizes, and having to excavate using larger trenches.



3570 data points with a one hour moving average trend line based on 60 points per hour

FIRE ALARM SYSTEM RETROFIT

A 17 story residential high-rise building was constructed in the 1920's. The existing alarm system was installed during the 1960's and has no features other than alarm. There are no lights to indicate the status of the panel. At one time neon lamps were added externally to the power circuit to confirm power to the alarm panel. The current system activates vibrating bells upon operation of a pull station. An alarm condition will transmit a signal to the local central station. There are no water flow alarms for the existing sprinklers or standpipes. The elevator lobby smoke detectors are not monitored by the fire alarm panel; they are connected directly to the elevator control panel. Believe it or not, it is a UL Certified system. The owners of the building took a pro-active approach and wanted to replace the entire system before it fails and parts are unavailable. What is required when modernizing an older existing fire alarm system?

In California, in 2012, there was an official interpretation by the Office of the State Fire Marshal. That interpretation states an existing system can be renovated and replaced with new equipment, without meeting current code (NFPA 72 2010), as long as it is a one for one replacement of the existing system. Access a copy of the formal interpretation 12-001 using the following link: http://osfm.fire.ca.gov/codeinterpretation/pdf/2012/12-001.pdf

". . . ***It is the intent that only the replacement FACU, devices and appliances are required to comply with the current edition of the code and standard.***

Note: However the existing fire alarm system shall conform to the codes and standards at the time the fire alarm system was originally installed . . ."

In other words, the hardware can be updated but the design of the system can remain the same. The formal interpretation also indicates that using that method must be approved by the the local AHJ.

Prior to 2012, the City of San Francisco required fire alarm system designs must meet the current codes as if they were newly designed and installed systems. The primary exception was an emergency replacement of a fire alarm control panel if it becomes defective and could not be repaired. During 2012 the San Francisco Fire Department's Office of the Fire Marshal retracted their Administrative Bulletin (AB 3.04) that required a system installation to meet all current codes. Thus, in San Francisco you may now replace an existing obsolete system with new equipment as long as it is a one for one replacement, no additional devices or design changes. This decision aligns the requirements of the City of San Francisco with the State Fire Marshal's interpretation. Should the property owner voluntarily decide to upgrade the system, then the San Francisco codes would require the new system to meet the currently code.

For this building we started the design prior to the San Francisco Fire Department retracting AB 3.04. As such, the new design would have smoke detectors in common hallways, new smoke detectors for elevator recall, ADA compliant and NFPA 72 compliant visual notification devices, additional manual stations on each floor, monitoring of valve position and water flow for both the risers and the fire pump, and a full voice/PA alarm notification system including multiple speakers in each residential unit. Per San Francisco codes the minimum acceptable sound level required would be 75 dba at the pillow of every sleeping room. The client also opted to install a fire department radio repeater system in lieu of a fire fighter communication system (telephones).

". . . ***It is the intent that only the replacement FACU, devices and appliances are required to comply with the current edition of the code and standard."***

The system was also designed to allow up to 30% of the residences on each floor to be upgraded to ADA requirements for those with hearing impairments. In the future that would have required an addressable smoke detector in each bedroom as well as a 177 cd strobe.

The estimated cost for the installation, not including patching and painting (all wiring was to be concealed), was estimated at over $300,000. Construction was to take place over a three year period with the backbone being installed in year one, and 35 residential units per year in years two and three.
Prior to formal bid submittal, the San Francisco Fire Department retracted the administrative bulletin. At the request of the client, the system was redesigned to replace the existing bells with horns, replace the pull stations with addressable pull stations, and relocate and replace the existing elevator recall smoke detectors with addressable devices. A new fire alarm control panel, backup power supply, and wiring would be part of the new system. The new system would be a one for one replacement of the existing system. The bid prices were approximately $55,000 without painting and patching.

The client was willing to provide additional horns on each floor, and to provide monitoring of the existing flow

switches and tamper switches. They were willing to add monitoring modules for a future fire pump control panel (the current pump serves occupant hoses and does not have a pump control panel capable of meeting today's standards). The fire department stated that those changes would constitute a new design and thus a one for one replacement would not be allowed. As a result, none of those features will be included in the new system. An attempt to make replacement system better than the original system would not be accomplished. As we used to say in the 1970's, a choice between a VW or a Cadillac. Based on the all or nothing requirements it was decided to maintain the original design.

The client will still install a fire department radio repeater so that the fire fighters would be able to communicate on the fire ground. Since that is a standalone system, its installation will not affect the fire alarm system design.

It is unfortunate that it has to be an all or nothing decision. We all know that retrofitting an existing high-rise building to meet current codes is cost prohibitive especially when the building is not being remodeled. Yet, to continue with an obsolete and antiquated system that may or may not function during a fire is not reasonable or acceptable. The codes or regulations need to be modified so that the building owners can install a one for one replacement for an existing system, and at their discretion improve some features of the system without triggering a design to meet current code.

The addition of smoke detectors in the common hallways, the installation of a new voice evacuation system with increased audibility would be a great improvement to any existing fire alarm system. The need to provide acceptable audibility in the residential units, especially sleeping areas, would have been a reasonable improvement, yet based upon the fire department's decision, it is not critical as the currently acceptable audibility would not exist with a one for one replacement.

We need a reasonable retrofit code for use in existing buildings that will not be undergoing a renovation. Without it, we will have older and less reliable notification and suppression systems in our older buildings.

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Reality Based Engineering

ESH Consultants provides fire protection engineering and code consulting services to our clients. Services include: Sprinkler system analysis for change of occupancy, hazard or building configuration. Building and fire code analysis and review for new construction, renovation projects and change of use. Preparation of code reports for submission to local government agencies. Hazardous materials business plans and annual inventory submissions. Plan and submittal reviews as a third party reviewer. Construction inspections for fire protection features and the installation of fire protection systems. Witnessing system acceptance tests. Property loss prevention inspections.

Contact Elliot Gittleman, FPE, MBA to discuss how we can assist you on your projects.