

STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

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MINUTES PRIVATE RESIDENTIAL FIRE SPRINKLER SYSTEMS TECHNICAL ADVISORY GROUP

Date:May 20, 2008Location:Washington PUD Association, Olympia

TAG Members Present: John Neff, Chair; Stan Amas; Jerry Benner; Dick Bower; John Chelminiak; Don Davidson; Ted Hardiman; Joe Herr; Jim Hudson; John Kounts; Scott Kramer; Mac McDowell; Darrin Parsons; Anjela Pimentel; Doug Quinn; Greg Rogers; Brandy Smith; Stuart Turner

TAG Member Absent: John Cochran, Ron Greenman, John Norris

Other Council Members Present: Tom Kinsman, Pat McBride

<u>Visitors Present</u>: Jeffery Iacchei, Brian Minnich, Dave Cantrell, Travis Allen, Paul O'Connor, Patrick Conroy, Tony Lindgren, Joe Eltrich, Randy Black, Mike Ireland, David Bruell

CALL TO ORDER

John Neff, TAG Chair, called the meeting to order at 9:02 a.m. He welcomed everyone to the meeting. Introductions were made.

REVIEW AND APPROVE AGENDA

The agenda was reviewed and amended to insert "Review and Approve Minutes" as Item 2.5. With that addition, the agenda was approved as amended.

REVIEW AND APPROVE MINUTES

Mac McDowell, representing county elected officials, west side, amended his statement on page 6 to read: "Island County...doesn't have storage tanks in the vast majority of its cities <u>the county</u>..." With that correction, the minutes were approved as amended.

LAWS AND RULES REGULATING WATER PURVEYORS

Doug Quinn, representing public utility districts, said he'll begin the discussion by talking about design elements or system configuration. Doug will be followed by Marc Marcantonio, discussing water quality and regulation, then Ted Hardiman, discussing finances.

Doug said the presentation will give a broad view of water system regulation, with input from private systems, public systems, and state agencies. He said each system is unique.

Everything a water company does is about water quality. Fire protection, industrial and agricultural services are secondary, behind a water company's primary obligation to provide safe, clean drinking water.

Water systems are owned by a number of distinct entities: cities; water/sewer districts; private, nonprofit; public utility districts; investors; homeowners; and counties. Cities have other policing authorities and powers, such as land use planning and building codes. Municipalities regulate most, if not all, aspects of fire sprinkler installations. Water/sewer districts normally regulate just water and sewer. Public utility districts normally provide water, sewer and electric services.

Privately owned mutual systems are completely different from public systems. They may or may not be regulated by the Washington Utilities and Transportation Commission, whose legislative and regulatory authority isn't directly invested in the water companies. However many investor-owned utilities are UTC-regulated.

The size of water companies range from three connections up to 22,000 connections. One of the largest, Washington Water Service Company, manages about 270 systems. They'll provide services as a private company directly to homeowner associations, PUDs and other agencies.

John Neff asked if entities other than municipalities without police power still have authority to shut off water for nonpayment. Doug said yes, they do.

Doug said the state classifies water systems depending upon the number of connections: Group A, with 15 or more connections, and Group B, with less than 15. He said all Group A systems total 4,191 and serve a population of 5,558,700 people. The largest Group A user is cities and towns, with 345 systems serving 10,000 customers per system on average. Group A systems have an engineering, operations, water quality, water resource planning and water supply structure. Group A systems have a substantially higher performance standard than other systems.

Each Group A system has its own unique governing body, a board of commissioners or council with bylaws and tariffs. The consistency between Group A systems is that each has a water system plan that governs investments, system development and design standards. Debt tolerance or risk aversion is one big difference between systems.

The water system plan is a planning document, completed every six years, that guides everything the system does. Outlining projected system improvements as well as revenues and expenditures, this planning document shows the state that the water system has anticipated growth requirements and complies with regulations and standards imposed by its legislative authority.

Group B systems number 13,070 and serve about 111,000 people. Private wells number 320,000 and serve 800,000 people.

Jim Hudson, Department of Health, referred everyone to a handout entitled "Information for the Residential Fire Sprinkler TAG regarding Department of Health's Rules and Guidance."

Mac McDowell said he asked Island County's public health director to examine water systems as they relate to fire flow. He found that 43 percent of all Group A systems and 89 percent of all Group B systems don't have storage. State data combines A and B systems for 64 percent without storage.

Mac also asked the public health director to examine how the lack of storage affects the amount of water delivered by a well. Assuming six houses on a well with a pressure tank and no storage, 30.5 gpm is required for domestic use. A residential fire sprinkler system adds 26.5 gpm to that, for a total of 57 gpm. Mac said Island County doesn't have wells that provide that volume of water. 30 gpm is good water delivery there.

Doug said there is storage at the head of a complex line in a large system. Treatment is added at various stages in the system and must be in contact with the water for a given duration of time prior to delivery at the first connection. That's one of the reasons for storage. Water is treated for a broad range of chemicals in a variety of ways. Many systems add fluoride. Chlorine is injected many times for disinfection. However many systems, both Group A and Group B, don't disinfect.

Doug agreed with Mac that small systems usually don't have storage, especially for fires. He said they have an outbuilding and treatment vessels that may supply water to up to 15 homes. They normally don't have hydrants. Water lines are usually very small in diameter, traditionally two inches. It's important that the lines be able to serve sprinkler heads at a two-inch diameter. Doug said the duration is a measure of the source capacity.

Joe Herr, representing residential builders, asked if such small systems are Class B. Doug responded that they may be Class A or Class B.

Doug emphasized that every gallon of water in all water systems except homeownerowned is treated for purposes of human consumption. That's why purveyors' find it difficult to see water used for landscaping, irrigation or firefighting.

Chemicals are rapidly mixed into the water, binding together the organic particles. The water is then run through a flocculation process, allowing gravity to pull out the coagulated mass to sink to the bottom. The sedimentation process frequently involves running it through a mechanical sand filtration. The water is then disinfected and pushed into a large, clear well.

Joe Herr asked what happens to the sedimentation that settles out of the water. **Doug** said that sedimentation is called sludge. It's scraped out. If it's not a hazardous material like arsenic that has to go to Arlington, it's stockpiled and used as needed for topsoil. Regulations for dealing with sludge have become substantially more restrictive over the last 10 years.

Doug said storage is probably one of the single most important components related to a discussion of residential fire sprinkler systems. Storage can be by a ground-level tank, an in-ground tank, or an elevated tank. Because old-style elevated tanks don't meet today's seismic requirements, they are no longer being built.

Storage pressurizes the distribution system to keep contaminants out of the water, allows systems to meet peak demands, and protects pumps. Gravity flow is the process used for storing water. Water is pumped up into the large upper chamber. It's simply the sheer static weight of elevated water that causes pressure on the system. Water can also be pumped into an "air bladder" tank where water is pushed and compressed into the tank. That compressed air forces the water back out into the system under pressure. That pressure is needed to maintain a positive push out on the system, ensuring good water quality. As long as water is pushing itself outward, contaminants aren't being drawn in.

Many systems have a float switch or a sensor. Limitations of the sensor drive the surface water in the tank. You don't want narrow operational storage at the top of the tank, because a large motor won't operate correctly. If the level is set too tightly, the motor will simply cycle on and off.

There are several levels of storage. The top level is operational storage. Immediately below that is equalizing storage. This storage is necessary to meet daily demands. It must be delivered to the system at the bottom of the zone and able to serve connections at a minimum of 30 pounds per square inch. The equalizing storage carries the peak hour forward to a daily calculation, becoming the volume that the system is required to meet.

Standby storage is the third tier from the top. This storage is important for fire suppression. Stored water here isn't generally relied upon to meet daily operational

needs. However, during the heated summer months of August and September, it's not uncommon to enter this zone of the tank. Fire storage in the standby storage level of a tank is established by the local fire marshal in a municipality or by a coordinated water system plan elsewhere.

Numbers like 1,000 gallons per minute over a period of time drive the volume of stored water. The bottom line is a system must deliver water to the first customer at 20 pounds per square inch. Such requirements drive line sizing, tank elevation, and whether to use ground-level or elevated tanks. Changes in elevation throughout the system make even, adequate pressure difficult. To counter that purveyors alter line sizes, because everyone in the system has to meet set performance standards. Water moving through the lines over about 10 feet per second introduces some very high stresses on the water system and may result in broken lines during peak months.

Transmission lines carry water from the source to treatment or through major junctions in the system. These lines aren't tapped except for a main branch. Service taps on transmission lines are discouraged. The two main issues facing a water utility are water quality and main line ruptures.

Hydrants are used mostly for line flushing. Velocity needs to be high enough to pick up and scour the sediments that accumulate over time. Predominately hydrants are fire suppression devices on the system. They will be discussed later.

Water meters measure the use of water and help regulate withdrawals from the system. From a purveyor's standpoint, meters are holes in the system. Doug made an analogy to a colander full of water. That colander drains at a certain rate of speed. If one or more holes are plugged, the rate the colander drains will be different. Similarly, if the diameter of a meter is changed, the rate of flow will change.

Leaks are patterned on a daily and a seasonal basis. There is a basic yearly flow that increases three times during summer months. Peak hours are 7-8 p.m. Peaks drive source requirements. Peak use is predominantly driven by standard irrigation. It's affected to a lesser degree by industrial and commercial use. A system has to have well supplies and the hydraulic capacity to meet peak demands. System designs are rated and tested against peaks.

The state sets reliability and redundancy standards for Group A water systems. Storage requirements are calculated for maximum daily, peak-hour flow, assuming fire flow delivered at 20 psi with the system's largest pump out of service.

Joe Herr asked how water utilities can plan for a worst case scenario, assuming mandated private residential fire sprinkler systems activated during a wildfire. **Doug** said every six years the entire system is taken apart and modeled. Computers can pretty accurately determine demands. On his system, Doug said a subdivision of 100 lots with sprinkler systems active because of a wildfire would be invisible in use characteristics. His daily use requirements wouldn't be altered. However, an engineer might be able to calculate a difference in an entire community.

John Neff asked if sprinklers were mandatory and all meters had to be changed to one inch, would that cause a higher flow out of the system. Doug returned to the sieve analogy. He said the larger the holes in the sieve, the faster the drain, requiring more water to be added to keep the sieve full.

Marc Marcantonio, representing Mountainview/Edgewood Mutual Water

Company, said he is General Manager of a private, mutual, member-owned, nonprofit water company that serves the City of Edgewood, about 10,000 people. His customers are the owners of his system. Regulation isn't like other water companies. It has a different financial model, to be discussed later by Ted Hardiman.

Water purveyors are in the public health business. As Doug mentioned, the purity of water quality is their number one concern. They test and treat for a variety of chemicals. Marc said the Mountainview/Edgewood Mutual Water Company is the largest water company that doesn't disinfect its water in the State of Washington. He said they don't treat their water for anything. No chemicals are added, because that's the way his customers want it.

Two things protect water quality the most: rapid consumption and constant circulation within the system. Dead ends are the bane of water companies. They allow bad things, such as pipe encrustations, slimes or colonies of bacteria, chemical and corrosion problems, or biological health risk problems, to happen because they stop the water circulation. They allow organic matter that commonly occur from various sources in many water systems to settle in the pipes. Taking advantage of the nutrients present in the water, that organic matter grows into bacteria. An anaerobic condition develops when all the oxygen in the water is depleted, producing carbon dioxide, methane and foul sulfide odors.

Many systems chlorinate their water. That may create a false sense of security. Chlorine neutralizing and killing organisms depends upon contact time and having the proper concentration of chlorine to attack the organisms. Chlorine is consumed by the organisms. Without dead ends, new chlorine constantly added into the circulation attacks and neutralizes the organisms, discouraging the growth of biofilms or colonies of bacteria and microorganisms. If biofilms are present, they can break off and move to other parts of the system, forming new colonies or bacterial growth. Dead ends can store concentrations of disinfection byproducts that may cause cancer.

Greg Rogers, representing Washington State Association of Fire Marshals, asked if Marc was talking about dead ends of main lines. **Marc** said he's talking about any dead end, mains, branch lines, service connections.

Marc said fire lines are all dead ends unless the system is flow-through. Even then, to some degree the fire lines are dead ends. In his system, because they don't disinfect, fire hydrants' branch lengths are limited to three feet. If a water company designs a residential sprinkler line as a separate connection off of a main, that whole line is a dead end. It's storing water that's not circulating. The only time it circulates is if the system is flushed out.

John Neff said at a recent cross connection control seminar he asked the question, "What is the maximum lateral length a system allows without creating a dead end?" He didn't get an answer. John said this group needs to address that question as it relates to backflow and the NFPA standard for a multipurpose system. **Doug Quinn** said there are some factors that might have an effect, such as leaf drop on the surface water source and chlorine mixing with the organic compound to create a disinfection byproduct. He asked what would be comparable to three feet without chlorination, 100 feet if you do chlorinate? It's a question of risk. **Marc** added that there are lots of other variables, making the question very difficult, if not impossible, for water purveyors to answer. He said some companies have large staffs, with regular, routine, very aggressive flushing programs.

Jerry Benner, representing building inspectors, noted that John Neff was talking about an in-house sprinkler system, either pass-through or with a backflow and meter. John Neff agreed. Jerry asked if a voluntary residential sprinkler system with three-foot dead ends on a pass-through system would really jeopardize a big water system, considering the small amount of water a single house uses. **Marc** said it's completely variable, depending upon the system design. He would personally not be as worried if it's a flowthrough system off a domestic water line. He'd put a backflow device on it. With constant water movement, it wouldn't be as worrisome as a separate fire line to the same house. Even with a backflow device on the fire line, the fire line may be a long service that goes underneath a road before it connects to the main. So there may be 12, 15 or 20 feet of pipe between the main and the backflow device that is a long dead end created because of the installation of the fire line. Design, use and safety measures all have to be considered. Solutions exist, but some are more costly than others.

Brandy Smith, representing residential sprinkler contractors, asked what flow velocity is required to properly flush lines free of bacteria. **Marc** said there's no easy answer. It's variable, depending on the size of the lines, where they're located, how much system pressure is available in that area, what the lines are constructed of. He said you have to be careful that speeds required to adequately flush one line don't cause problems in another, such as loosening biofilm.

Marc said, as Doug mentioned, systems are kept pressurized at all times. While water purveyors can't control bad things growing in a single house's pipes, they are legally required to prevent those bad things from entering the public water supply. Normally there is always positive pressure in the service line feeding water to the house. However, if a drunk drives into the fire hydrant or there's some other hiccup in the system, the system pressure drops in the main and may cause a reverse flow of water from the house or perhaps from lawn sprinkler lines around the house. Thus garden chemicals and other contaminants can be introduced into the public water supply. Marc said that happens much more frequently than commonly realized.

Backflow is a common concern of all water purveyors. Backsiphonage may also occur during a water main break, inadequate source of supply capacity, undersized mains, unusual water demands, planned shutdowns for maintenance and repair, or the use of online booster pumps.

Tom Kinsman, representing structural engineers, asked if there are statistics on backflow incidents. **Marc** answered that statistics exist, but they aren't good. Most incidents are undetected and/or unreported. He said he, representing a private mutual water company, doesn't have the authority to inspect private homes or properties without the owner's permission or a special city ordinance. Many other water companies can't inspect to identify backflow incidents.

Backflow devices can be installed on lines to prevent water from backing up into the public water supply. Location and size are two important considerations. Such devices must be inspected and tested every year by a certified backflow assembly tester. The devices have to be on a state certification list. Thus they aren't cheap, but they help minimize the risk.

Marc said the bottom line is that all fire lines are dead ends, requiring the planning and use of measures to protect the public water supply. It doesn't make sense to protect the public health with a fire sprinkler system if it's at the expense of public health by contaminating water quality.

Pat McBride, representing general construction, residential and multifamily housing, asked what the best location is of backflow devices for inspection and testing. **Marc** answered that finding them is a common problem. Good location and accessibility are important. How they're mounted in the box also is important. **Pat** asked if they are located in the vicinity of the meter itself. **Marc** said that technically every connection

that can cause a problem, such as a sprinkler line, a hot tub or a swimming pool, should have a backflow device. All of those devices are supposed to be monitored by the local authority having jurisdiction.

Marc said rather than monitoring the installation and inspection of backflow devices, as well as dealing with annual certification letters, the Mountainview/Edgewood Water Company installs backflow devices itself at the water meter. The mutual company also pays for the annual testing of the devices itself. While that process works for his company, Marc said it won't work for all water companies.

Tom Kinsman noted that individual backflow devices shouldn't be necessary on each individual system if the city installs them at the meter. **Marc** said they're still required on each component of the system. The difference is that it's the city's responsibility to maintain and monitor those backflow devices rather than individual homeowners. **Tom**

asked for confirmation, saying that's redundant. **Marc** said it is redundant. The alternative is to intrude onto peoples' properties.

Dave Cantrell, representing Seattle/King County public health, said the plumbing code allows for cooperative working agreements between water purveyors and local jurisdictions. In his jurisdiction, the determination of backflow prevention needs are jointly worked out with the City of Seattle. One device may be all that's necessary to prevent backflow and protect the public water system.

Dave asked if there's a difference in dead end lines for different types of piping, copper or plastic CVCP piping. **Marc** said the smoothness of the wall makes a difference. **Dave** said dead ends commonly occur in residential construction because most model codes require piping to fixtures for future use, such as unfinished basements.

Ted Hardiman, also representing mutual water companies, discussed the financial structure of water systems. Despite lots of diversity among the various water systems, even the private mutuals have to demonstrate a balanced and viable financial system in their water system plan.

Revenue is broken down into water sales, development income and other income. Water sales begin with a base rate. Then there is a usage rate that may be flat, tiered or bulk. Irrigation and commercial water use may have a different rate than residential use. There may be surcharges, such as for ready-to-use and fire.

Greg Rogers asked if Ted was talking about irrigation as commercial or residential. **Ted** responded irrigation generally includes both residential and commercial. He said the irrigation rate may be lower or higher than normal domestic use of water. **Greg** noted that some jurisdictions have separate irrigation and residential meters.

Greg asked for more detail about surcharges, specifically for fire. **Doug Quinn** said there may be a high zone, an isolated area that it costs a lot more to get water to. **Ted** said that if a pressure booster station is required to provide the required flow, a surcharge may apply. **Doug** equated it to cities charging more for urban growth areas outside corporate limits. **Ted** gave another example as when mains must be upsized due to commercial growth.

Greg asked where standby fees fall in the water sales category. **Doug** said the same place as the above surcharges. Standby fees are quite common.

Greg asked for confirmation that capital improvements are paid for by new additions to the system rather than to all, including existing, users. **Marc** answered that's true many times but not always.

Ted said development income includes membership fees, system development charges, square footage assessments, and connection fees. Some water utilities charge just for fire

hydrants. The installation cost of fire hydrants can range from \$6,000-10,000, depending upon the system.

The cost of installing fire hydrants is one reason why people want to install a residential fire sprinkler system. **Marc** said in his system the fire hydrants are so old they don't meet current fire codes. As new development occurs, the city's fire marshal makes the developers pay to upgrade the fire hydrants. In many cases, the old hydrants have to be completely removed and replaced at a cost of \$10,000 each.

Ted said other revenue sources include investment interest, equipment rental, and miscellaneous connect and disconnect fees.

Pat McBride asked if water systems have planned to replace fire hydrants. **Marc** said no. His mutual water system has adopted the philosophy that new growth pays for those upgrades. However, that course is not set in stone. About 30 years ago, a grant replaced some fire hydrants. And if the membership of his mutual company decides that fire safety is more important than the cost of replacing the fire hydrants, the system's board will replace the hydrants and raise the system's rates. **Pat** asked if such capital improvement votes are by the entire membership or by the board. **Marc** said the membership voted in his system for 50+ years, until it became too unmanageable about 15 years ago. At that time, the system bylaws were changed to allow the board to make such decisions. Systems still exist, however, where the membership votes on such issues.

Pat asked if the typical water plan deals with capital improvement of an existing system. **Marc and Doug** both answered yes, absolutely. Marc said his system's capital improvement plan for the next 25 years includes such things as upsizing mains, changing main materials, drilling wells, adding more storage.

Randy Black, Lakeland Water District, said those are R&R programs or rehabilitation placement. He said each facility of a utility has a life expectancy, for example a pump, a water main, a storage tank. FEMA compliancy requires having a plan to replace those, because without one when the structure needs to be replaced, FEMA won't pay. **Pat** asked if by FEMA he meant the Federal Emergency Management Agency paid for such things. **Randy** answered yes. **Marc** said many systems have developed a predisaster, hazard mitigation plan and first responder training.

Ted said expenditures include capital expenditures, such as new reservoirs. Water service and main extensions expanding into new areas are also included. City and county road projects may severely impact water utilities, causing them to pay for moving water lines as roads are widened. Expenditures also include noncapital expenditures: water sales or utility bills; operational expenses, including maintenance, chemicals, fuels and water samples; interest on loan payments.

New customers of a water system pay upfront fees to buy into the system to get water for their points of connection. They're also paying for the future needs of the water system. Monthly charges of existing customers include consumption, and the daily operating

expenses of pumping and treating. Existing customers also pay some portion of the long-term plan for water development.

Water companies, with the philosophy that growth pays for growth, assess many different growth fees: system development charges, square footage assessments, meter installation fees, frontage fees, water purchase charges, and membership fees. Ted said square footage assessments help increase fire storage supply.

Fees have developed over the years to meet growth demands. The question of how to pay for future growth has resulted in many long, philosophical discussions at the board meetings of water companies.

Various fees associated with residential fire sprinkler systems include meter installation fees. Meters must be maintained and replaced every 17-19 years. Meter boxes will fail. Meters must be regularly read. In addition, a membership fee may be attached to the meter rather than the property covered by the sprinkler system.

John Chelminiak, representing city elected officials, west side, asked for further explanation of membership fees attached to meters. Ted said his company ties the membership to the property. After initial payment, it passes to subsequent homeowners. Thus if a subsequent homeowner wants a fire sprinkler system installed, the membership fee has already been paid. Other water systems attach membership fees to the meter. In that case, subsequent owners installing a fire sprinkler system may have to pay a new membership fee.

Pat McBride asked who owns the meter. Ted answered the water company.

Ted said the billing structure varies by water company, some monthly and others bimonthly.

Another fee associated with residential fire sprinkler systems is variable size fees. Typically a homeowner with a one-inch meter will pay a higher base rate than the homeowner with a 5/8-inch or 3/4-inch meter. The larger meter is more expensive. It requires a bigger meter box.

Upsizing a meter may result in loss of some of the low-end accounting for water use efficiency. Water running through a one-inch meter totals three-fourths of a gallon per minute, compared to one-fourth of a gallon per minute in the standard 5/8-inch or 3/4-inch pipe. That's a difference of a half gallon of water every minute.

Ted said he researched meter brands and found only Hurskey as UL-listed meeting the NFPA codes for residential fire sprinklers.

Greg Rogers asked Ted to further explain the water use efficiency rule. **Doug Quinn** said it's driven by the Municipal Water Law of 2003. That law says "if water purveyors are going to be given water rights in perpetuity, they must be able to defend that through

demonstrated responsible use of water." Definitions of efficient use of water are included. **Greg** asked who established that rule. **Doug** said the state Department of Health. **Greg** corrected Doug, noting the state Legislature adopted the law that is enforced by the Department of Health. **Doug** asked everyone to relate this rule to the issue of a 5/8-inch versus a one-inch meter. Larger diameter meters take more water to detect use.

Greg Rogers said he believes the Legislature should amend the water use efficiency rule because it conflicts with larger meters required by residential fire sprinkler systems. He believes efficiency benefits should be given when larger meters are installed for residential fire sprinkler systems.

Marc Marcantonio noted that when meters are upsized for a residential fire sprinkler system, more water is available, so homeowners may add landscaping. **Greg Rogers** spoke against that impact, saying there may be a separate irrigation meter.

Doug Quinn suggested, rather than amending the water efficiency rule, encouraging the manufacture of a better meter that efficiently picks up both high-end and low-end flows with a 5/8-inch meter and also a one-inch meter.

John Neff said it would be difficult, if not impossible, for one state to solely recommend a different standard for manufacturing. He suggested recommending that a better standard be developed nationally. He asked the TAG to think about such a recommendation.

Greg Rogers proposed modifying the water efficiency rule to give water companies a credit for their calculated loss for using a larger meter for a residential fire sprinkler system.

Stuart Turner, representing the Washington Association of Sewer and Water Districts, disagreed that the amount of water annually used for firefighting in most districts is very substantial. He said it's very minimal, not even close to 10 percent. He said it may be less than one percent. **Doug Quinn** agreed. He said more water is probably lost each year from meter inaccuracy than what the fire service uses. **Stuart** said the water efficiency rule is a diminishing resource as population grows and water users increase.

The question was raised, "Why meter fire sprinkler systems?" During a recent survey of its system, the City of Birmingham found up to 200 illegal connections each month in their water system.

Paul O'Connor, representing Fire Sprinkler Advisory Board, said all meter manufacturers, to the best of his knowledge, publish the error rates of various meters. The small sized Hershey fire meter for residential use, as mentioned by Doug, has a vertical turbine adaptation, instead of horizontal turbine. And as Sean mentioned, the performance meter that has just been UL-listed for fire protection service is a jetted meter. Paul said many water purveyors don't care for jetted meters because of accuracy in detecting low flow. Neptune, pulled out of circulation, may be reintroduced. Manufacturers are sensitive to problems faced by water purveyors.

Joe Eltrich, representing Tacoma Water, said the issue of residential fire sprinkler systems has been approached from three angles: nonmetered, metering only the branch lines, and developing a new standard with specifications for new special meters. He said he finds it interesting that a group of meter manufacturers support nonmetered systems. He assumes that support represents their liability concerns.

Greg Rogers asked why one mutual water company doesn't allow flow-through systems. **Stuart Turner** said in a flow-through system if someone doesn't pay their bill and the water company shuts the meter off, sprinklers are no longer operational. Public safety supersedes the payment of bills. On the other hand, with a split system, the domestic side can be shut off, while still providing sprinklers through a separate meter. Even though water companies have the legal authority to shut water off for nonpayment, a lot of small companies don't want to because litigation will still occur. They know they'll win, but it still costs lots of money.

John Neff said residential fire sprinkler systems in his jurisdiction have to be flowthrough. He won't allow a stand-alone system. He asked if legislation can be enacted to allow private companies to recoup litigation costs, or are there other solutions to the nonpayment issue.

Randy Black said currently only PUDs, cities, towns and districts can lien property. Mutuals, privates, investor-owned and homeowner-owned water systems don't have the ability to lien property for unpaid or disputed bills. A possible solution might be to extend that authority to them. **John Neff** said a step above that would be similar to cities fixing substandard property. It then becomes a special tax assessment on the following year's property tax and goes to sheriff's sale if not paid. John said that's even better than a lien.

Greg Rogers suggested that such legislation should include a caveat that allows flowthrough systems. Otherwise, the authority to lien property will be extended to water companies that still won't allow flow-through systems.

It was suggested that the Legislature might specifically define the liability a water company faces when it makes sprinkler systems inoperable by turning off a meter for nonpayment.

Stan Amas, representing residential sprinkler contractors, asked if a hold-harmless agreement would be helpful. He suggested a one-inch meter might be supplied if the homeowner signed a hold-harmless agreement for the residential sprinkler system, preventing litigation.

Stuart Turner said water companies don't want to shut the water off. The whole purpose of having residential sprinklers is to protect life and property. Shutting the system down compromises that purpose. He said whether sprinklers were voluntarily installed or mandated isn't known or important to the second and third homeowners of a sprinklered residence. They expect those sprinklers to be operational.

Greg Rogers said homeowners can have a stand-alone sprinkler system connected to a 320-360 gallon tank with a pull pump to feed the sprinkler system. There doesn't have to be a connection to the water supply. In the case of an electricity failure, the sprinkler system is nonoperational.

Doug Quinn said the difference is that one is an act beyond the control of the water purveyor, while the other is the act of the purveyor. It may be a subtlety, but water companies are nervous about disconnecting a customer's water and having the customer charge that action as arbitrary and capricious or harmful to their property.

Stuart Turner asked why flow-through systems are preferable. **Greg Rogers** said that flow-through systems are cheaper and easier to install because they're each a single component. They also require less maintenance for backflow prevention. He sees the industry moving in the direction of flow-through systems. Greg said problems affecting the operation of a flow-through system identify themselves immediately, compared to no way to identify problems in a stand-alone sprinkler system. Additional benefits of a flow-through system are that smaller sized piping can be used, as well as pex piping normally used by plumbers. If residential fire sprinklers are nationally mandated in the future, Greg said flow-through systems will have to be allowed to meet the demand.

John Neff added it's totally impractical for homeowners who can't change furnace filters or batteries in smoke detectors, or operate a whole house fan or bathroom exhaust fan to have a residential fire sprinkler system other than flow-through. He doesn't want to increase current problems caused by lawn sprinkler systems and backflow.

Darrin Parsons, representing residential sprinkler fitters, also certified as a backflow inspector, cross connection, said the advantage of a stand-alone system is that it can be accurately calculated for fire load, the rate at which a residence burns. Maintenance by ignorant homeowners is the disadvantage, that is costly to have professionally done. Darrin said air gap is the best solution for eliminating backflow problems. It's the best method of preventing cross contamination.

Darrin said the current problem with flow-through residential fire sprinkler system installations is that they're being done by plumbers. He said installers of these systems need to complete the education and apprenticeship required for certification of residential fire sprinkler system installation. Adding a sprinkler head off a plumbing line doesn't give the same life/safety assurance as certified installation. Darrin said he's unaware of state action to ensure that plumbers installing flow-through systems meet minimal qualifications with regard to head spacing and hanger spacing. **Stuart Turner** rephrased his question to ask if there's a different failure rate for a flowthrough system. **Darrin Parsons** said there's not enough history with flow-through systems to develop accurate data on their failure rate. However, stand-alone systems have been around for years. An NFPA research committee found, two years ago in Orlando, the failure rate of stand-alone systems, on a national basis, to be below 12 percent. Of that percentage, the vast majority (high 80s percent) occurred simply because the valve was closed.

Brandy Smith, representing residential sprinkler contractors, said there's no way of proving the integrity of stand-alone systems, whether or not the valve is shut off. However, that's not true of flow-through systems.

Jim Hudson, representing the Department of Health, said his agency supports the termination of service to nonpaying water customers as long as the health of adjoining properties is protected.

John Neff recessed the meeting for lunch. After lunch, a presentation on fire sprinkler systems was made by Paul O'Connor, representing the Sprinkler Advisory Board of Puget Sound, and Stan Amas, representing Residential Sprinkler Contractors.

Paul O'Connor began his presentation with a brief overview of NFPA 13D. He said 33 years ago last week NFPA issued the first residential standard. It wasn't until spring of 1980, after lots of testing, that a product was developed to meet the needs of a residential fire sprinkler system.

Even though they may look the same, residential fire sprinklers technologically differ from commercial fire sprinklers.

Two requirements of a residential fire sprinkler is RTI, response time index, a temperature rating, and the wetting characteristic that is achieved through the design of the deflector. Sprinklers are spaced about 20 square feet apart in a residence. Water is thrown from the sprinklers in a very wide umbrella. The goal is to distribute the water as high on the wall as possible.

Paul said NFPA 13D should be viewed in the context that the principal result achieved by fire sprinklers is life/safety. Property protection may be a side benefit, but life/safety is the driving force. At the conception of NFPA 13D, a group of engineers, manufacturers, contractors and interested parties brainstormed how to reduce the cost of sprinklers and still provide an adequate level of life/safety protection. Cost reduction was achievable through compromises that eliminated such areas traditionally sprinklered as attics, closets, bathrooms, foyers and garages. In addition to reducing the number of sprinklers in a residence, new hydraulic design criteria was set for the water flow and pressure requirements of those sprinklers.

The escape time for residents to exit a residential fire 20-30 years ago was 15-20 minutes once smoke or fire was detected. Today that time has decreased to three to four minutes because of the flammability of home furnishing materials.

Stan Amas, representing residential sprinkler contractors, said components of a traditional fire sprinkler system, not a flow-through system, are a riser manifold on top of a backflow preventer. The riser manifold displays the water pressure. There's also a flow switch. A little plastic panel gets put in the waterway, so that when there's flow in the system an alarm is activated. So one of the benefits of a stand-alone system over a flow-through system is an alarm upon activation of the sprinklers. A flow-through system is cheaper because there's no backflow preventer, riser manifold and the associated drain piping.

Pat McBride asked about the typical cost of that equipment. **Stan Amas** answered that they cost about \$1,000 total, including installation labor. **Pat** asked what size they are. **Stan** said the size varies from one inch to two inches. He said cost varies, depending upon the geographic location.

Residential fire sprinklers were designed for smooth, flat ceilings. The listing of fire sprinklers changes for sloped ceilings. For vaulted ceilings, manufacturers have increased the gallonage of water required out of the sprinklers. As a general rule, sprinklers must be spaced about 20 feet to pass the bucket test.

Pat McBride asked if the bucket test is required by the standard. **Paul O'Connor** said it's just a recommendation. While some jurisdictions don't require it, he personally isn't comfortable not doing it because of the number of manufacturers of residential sprinklers.

Jerry Benner asked about the placement of the bucket for the bucket test, if it's located in one room or every room in the system. **Paul O'Connor** answered that a hydraulic calculation of the residence defines a remote area, the furthest and highest away from the water supply. The bucket test is conducted there, because if it works there it will work anywhere in the system.

Marc Marcantonio asked if fire sprinkler systems are installed in retrofits or remodels where piping has been in place for 20-30 years. **Paul** answered yes, but rarely. **Marc** said that would then validate the need for doing a bucket test, because many homes have flow problems from their internal old galvanized piping.

Darrin Parsons reminded TAG members that national standards set the minimum to which fire sprinkler systems are installed and engineered. He said because the requirements are so tightly set, any modifications made in the field can substantially change the water flow. For that reason, bucket tests are recommended.

Pat McBride asked if the timing of the bucket test is at rough framing, once the fire sprinkler system is installed. **Stan Amas** answered that's the ideal time. However, if the

meters aren't in place, it can't be done then. In that case, the bucket test has to be done after the house is sheet rocked.

John Neff, addressing the site plan of a stand-alone system, asked if the riser and double check valve are 100 or so feet from the meter. Stan Amas answered they're about 200 feet. John then asked if it becomes a cross connection issue of concern to water purveyors. Stan said it's not an issue because domestic water is split from fire sprinkler water.

Jerry Benner asked what size pipe connects the house to the water main. **John Neff** answered one and one-half inch. **Paul O'Connor** noted that a second PSI pressure drop going across the meter is built into the calculations. **Stan Amas** said in large homes the plumbing fixture count often drives the meter size. While only a one-inch meter is needed for a residential fire sprinkler system, the number of plumbing fixtures may necessitate a larger meter.

Greg Rogers asked if NFPA 13D requires that domestic water flow be calculated together with water flow of the fire line. **Stan Amas** answered yes. He said the standard includes a list of fixtures with a gallon per minute conversion. **Greg** said an earlier statement was made that a fire sprinkler head requires 26 gallons of water, while residential flow requires 35 gallons; and those figures are added together to get the calculated flow for the fire line. **Stan** said it's a safety factor. It doesn't have to be included in the bucket test. But one should anticipate that someone may be showering when a fire happens.

Darrin Parsons said there are products that switch the direction of water flow to totally isolate the fire sprinkler in the event of water movement in the sprinkler system. He asked if those are used in the displayed example. **Stan Amas** said they used to be required in the City of Bellevue if someone had a lawn sprinkler system in conjunction with a fire sprinkler system. They're called residential shut-off valves. Unfortunately the manufacturer quit making them. They're no longer available. In instances where shut-off valves had been required, Bellevue now substitutes a one and one-half inch meter for the cost of a one inch meter.

Pat McBride asked for confirmation that the drawing shows a one inch meter with a one and one-half inch pipe. **Stan Amas** said doing so decreases friction loss through the long distance of the pipe. It uses poly pipe, which is fairly inexpensive. It's simply a method of reducing the friction loss and saving pressure from the sprinkler system.

Jerry Benner asked what would have been done differently if the fire sprinkler system had been flow-through rather than stand-alone. **Stan Amas** responded that the riser would be eliminated and all dead end lines would be looped. There could be no dead ends except for perhaps five-seven feet of pipe.

Greg Rogers asked how cold protection is addressed. **Stan Amas** said most piping is run in the attic, where the highest probability of freeze exists. A process called tenting is

done. All pipes on the second floor are covered with three and one-half inches of batting insulation. The insulation is stapled down to the rafters. Batts are placed over the pipes to create a tent so that the heat gets to the piping from below. **Paul O'Connor** added that insulation requirements are very specific in NFPA 13D.

Jerry Benner asked how sprinkler heads were installed in the garage. **Stan Amas** said the garage was heated from the above living space. The pipes were installed above the garage insulation using special heads.

Greg Rogers asked how a stand-alone residential fire sprinkler system would be installed in a residence in Kitsap County served by a well. **Stan Amas** said there are lots of standalone systems that have their own dedicated water tank. He returned to the sloped/nonsloped scenario. Assuming the property is sloped and you're using 36 gallons of water a minute, you calculate 36 x 10, allowing 10 minutes for the occupants to escape a fire. Thus 360 gallons of water has to be stored in a large tank. A pump then moves the water from the tank to the sprinkler system.

Jerry Benner asked if there's standby power. Stan Amas said without power, there's no fire protection.

Brandy Smith noted that flow-through systems seem to be standardized at 13-15 gallons per minute per head. **Stan Amas** answered yes, but it depends upon spacing of the heads. He said the manufacturer recommends spacing the heads based on gallons per minute discharged. **Paul O'Connor** said a lower flow configuration can be used, but additional sprinkler heads have to be added. So, the question is which method is best from a cost standpoint. Is it better to address pressure or head count. **Stan** noted the cost of a sprinkler system is determined by the number of sprinkler heads.

Brandy Smith pointed out that for quite some time several sprinkler manufacturers have been competing to see who can produce the greatest spacing for the least amount of gallons and the lowest pressure. Hundreds of thousands of dollars have been spent for testing. Constraints they must meet are wetting the wall 18 inches down from the ceiling and a certain activation time for sprinkler heads.

Paul O'Connor said one has to operate a sprinkler head in the context for which the manufacturer had that particular head approved. It must be installed according to its listing.

Darrin Parsons asked how a sprinkler head is tested for failure. **Brandy Smith** said it's tested in a mock burn room. Two sprinkler heads can fuse during a 10-minute period. If the third head by the exit door fuses, it's a failure.

Dick Bower, representing Washington Association of Building Officials, said in doing land use and platting actions areas many times end up that have bad fire flow, which is mitigated by requiring the installation of fire sprinkler systems in residences in those areas. He said NFPA 13D systems are approved under the code for mitigating and

reducing fire flow. However, fire flow really involves property conservation rather than life safety. 13D systems may not sprinkler attics, crawl spaces, garages. He asked how different jurisdictions are dealing with that issue. **Stan Amas** said all residences, including garages, are required to be sprinklered in some Eastern Washington areas because of wildfires. **Dick Bower** said a consistent approach would be helpful. **Paul O'Connor** said his industry doesn't really use fire flow as part of its consideration. For the authority having jurisdiction, mitigation involves whether or not fire flow is reduced because of the presence of sprinklers. If it's viewed in the true sense of the application of the term "fire flow," there shouldn't be any conflict.

Dick Bower restated his concern. When buildings are sprinklered, the fire flow requirement for the subdivision can be reduced. That reduction affects the water purveyor's infrastructure cost, affecting pipe sizes and storage. By taking a 13D system, he wondered if opportunities are missed.

Paul O'Connor said that may be true in some instances, such as Weyerhaeuser in Dupont. All residences in Dupont were required to be sprinklered. By doing so, Weyerhaeuser planned to be able to reduce the size of water mains, stretch the spacing of hydrants, narrow the sprinkler list, and reduce the size of on-site storage. However, the Dupont development grew so quickly that the infrastructure developed before those benefits were realized.

Doug Quinn said sprinklers seem to be commonly required to offset such conditions as lengthy response time, limited access, grade and slope conditions, density and wildland interface. **Dick Bower** added that three new subdivisions in Gig Harbor were sprinklered because of lack of fire flow. **Greg Rogers** said if sprinklers are required for access reasons, the jurisdiction can still reduce the fire flow by 50 percent, like Dupont.

Doug Quinn proposed balancing the spacing of water reservoirs, whereby one area could take advantage of a lesser fire load of another area because of their sprinkler use. Storage might be lessened as a result. **Greg Rogers** said that would be possible if some of the local jurisdictions allowed massing fire flow. He supported the use of such an exchange formula. **Doug** said QA, annual allowed use, and QI, instantaneous allowed use, are two measures the state could use to set a formula.

John Chelminiak asked, when requiring sprinklers because of low fire flow or grade, if the sprinklers are required based on the life/safety standard, NFPA 13D, or a more stringent standard. **Dick Bower** said it's the life/safety standard, which reduces the fire flow available for property protection. **Greg Rogers** added that some jurisdictions require both a life/safety system and sprinklering of the garage.

Greg Rogers said there should be some state formula that if a certain percentage of homes are sprinklered in a community, the fire service jurisdiction serving that community should give it a certain percentage of its fire flow capability. **Pat McBride** disagreed with the willingness of jurisdictions to reduce their water storage for fire flow because fire sprinklers are installed in newly constructed homes there. **Travis Allen**,

representing fire marshals, said that idea is being discussed because there's not enough water at today's rate of growth to serve everyone's needs. So this is one idea for water conservation that's being considered. He said Bainbridge Island almost had a state moratorium placed on them because of salt water intrusion. **Mac McDowell** said it was a source of water problem on Bainbridge Island rather than a storage problem associated with fire flow.

Jerry Benner asked the cost of the previously displayed system. **Stan Amas** said it was installed about three years ago for \$1.70 per square foot.

OTHER BUSINESS

Anjela Pimentel, representing the State Fire Marshal's Office, said her agency has had regulatory authority over the fire sprinkler industry since 1991. They issue company licenses and certify individuals designing, installing, testing and maintaining fire sprinkler systems in Washington State. Training is also provided for quality control purposes, including contractor forums. Fire sprinkler demonstrations are presented to such groups as building industry fairs, counties and cities.

Brandy Smith noted that the Fire Sprinkler Licensing Program in the Fire Marshal's Office is totally funded by contractors. There are no state funds involved in the program.

NEXT MEETING

John Neff summarized proposed legislative remedies discussed today: water efficiency rules, liens, tax incentives, the ability of water purveyors to recover their costs, minimization of water company risk when disconnecting service for nonpayment.

The next meeting will be held on Tuesday, June 17, beginning at 9 a.m. at the same location, 212 Union Avenue SE, Olympia.

Topics for discussion next time include: cross connection, backflow, and insurance industry concerns.

John Neff adjourned the meeting at 3 p.m.