# Fire Sprinklers and Sustainability

## Fire Protection Research Foundation

## Chicago, IL

## November 7, 2012

Russell P. Fleming, P.E., FSFPE
National Fire Sprinkler Association

# Sustainability and Fire Sprinklers

**Q: What are the developers of automatic sprinkler systems doing to support sustainability needs of building?**

A: Everything the industry does promotes sustainability, because it results in the preservation of resources. Unfortunately, current concepts of sustainability utilize fairly narrow definitions, resulting in some advantages being overlooked.

# Burned building torn down

**By Will David**
wdavid@lohud.com

YONKERS — A Nodine Hill apartment building that was severely damaged by a four-alarm fire Sunday was demolished Wednesday.

Crews knocked down 103 Webster Ave. because it could not be repaired, Deputy Fire Chief John Flynn said.

Firefighters with the Arson Squad were at the scene looking for clues as to the origin of the fire while the building was torn down, Flynn said.

**Workers demolish 103 Webster Ave. in Yonkers. Sunday's four-alarm fire damaged the building.**
MARK VERGARI/THE JOURNAL NEWS

The fire has been declared suspicious, and firefighters said they believe it was intentionally set. No cause has been determined.

The building was one of three burned Sunday during the fire that left 28 people from 10 families homeless. All of the families have been relocated.

Specially trained dogs from the Westchester County police and Greenville Fire Department were used to search for traces of accelerants. Information was not available on whether they found any.

The fire started at 103 Webster Ave. and extended to 105 Webster and 350 Walnut St.

## MORE ONLINE

Watch a video with this report at LoHud.com.

# LEED and Fire Sprinklers

- In 2010 the National Fire Sprinkler Association retained the Green Building Systems firm in an effort to learn how recognition of fire sprinkler systems could be improved within the LEED (Leadership in Energy and Environmental Design) 2009 building design and construction rating systems.

# LEED – Materials & Resources

- For credits 3 through 6,  NC, CS and Schools all factored in only materials found within the Construction Specifications Institute (CSI) MasterFormat Divisions 03-10, 31 (Section 31.60.00 Foundations) and 32 (Sections 32.10.00 Paving, 32.30.00 Site Improvements, and 32.90.00 Planting).
- No material factors counted with regard to our Division 21 on Fire Suppression.
- As such, the reused value, the recycled content value, the regional content value, and the rapidly renewable content value of our fire sprinkler systems were simply not pertinent to the achievement of these credits.

# Materials & Resources

- It should be noted that while automatic sprinkler and other mechanical systems are exempt from specific requirements for recycled content, many component manufacturers have made this information publically available.
- Some manufacturer's products, including sprinklers, valves, and fittings, exceed 90 percent recycled content by weight.

# Other LEED Credits?

- **Energy and Atmosphere – only the fact that water-based systems do not contain ozone-depleting substances is noted as positive. Fire sprinkler systems were not considered within the energy model and were not addressed within the LEED measurement and verification aspects.**
- **Indoor Environmental Quality – possible small credits with the use of low emitting materials, i.e. adhesives, sealings, paints and coatings.**

# Water Efficiency

- The most obvious area for credit
- It was pointed out that if discharge water were collected for reuse, it could contribute to credit achievement in the areas of "water use reduction," "water-efficient landscaping," "innovative wastewater technologies," and "water use reduction," i.e. almost all aspects of water efficiency except "process water use reduction."

# 40 Years of Materials & Resources

- **Tremendous gains since the 1972 introduction of density/area curves to NFPA 13.**
- **The curves allowed the use of hydraulic calculations to size the piping for a system based on the strength of the water supply as opposed to the previous "one size fits all" pipe schedule system.**
- **The use of hydraulic calculations is considered to have reduced system costs by up to 40 percent overall, and most of that savings resulted from smaller pipe sizes.**

# Other Material & Resource Gains

- 1972 – First combined standpipe and sprinkler risers
- 1973 – First line of sprinklers with smaller frames
- 1973 – First extended coverage sprinklers (capped at 400 sq ft in 1996).
- 1974 – First allowance of nonthreaded thinwall (Schedule 10) steel pipe when joined by mechanical couplings
- 1978 – Introduction of special listed threaded thinwall steel pipe
- 1988 – First ESFR sprinklers, eliminating in-rack sprinkler piping

# A Common Example

Consider the simple substitution of a 4-inch Schedule 10 main for a 6-inch Schedule 40 main:

| Type of Pipe | 6-inch Schedule 40 | 4-inch Schedule 40 | 4-inch Schedule 10 |
|---|---|---|---|
| Wall Thickness | 0.280 in (7.1 mm) | 0.237 in (6.0 mm) | 0.120 in (3.0 mm) |
| Weight | 19.2 lb/ft (28.5 kg/m) | 10.9 lb/ft (16.2 kg/m) | 5.6 lb/ft (8.3 kg/m) |

- Typically using less than 30 percent of the steel, with corresponding reductions in energy use
- Driven by economy, not sustainability

# Industry Problem with LEED

- A minimum requirement for LEED is to meet code requirements, but fire sprinkler systems are already required for most LEED projects
- A matter of "What have you done for me lately?"
- Perhaps a complete automatic fire suppression system should be a prerequisite for all LEED recognition

# Member Toolkit

- Began development of a LEED toolkit for our members, focused on the water savings made available through sprinkler system installation
- While it is widely acknowledged that much less water is used in the event of fire in a sprinklered building as compared to a nonsprinklered building, fire events are not taken into account, only normal system use and testing
- Found that normal water used in system testing and maintenance tends to outweigh the water savings that would result from periodic fire events

# LEED Story

- September 5, 2012 article in the Wall Street Journal
- Durst Organization, known for building the country's first green skyscraper at 4 Times Square and the world's first LEED Platinum skyscraper at 1 Bryant Park, both in New York City,is abandoning the LEED system for its new residential high-rise on 57th Street in Manhattan, instead employing its own environmental criteria.
- Why? "To be more innovative and not be bound by the lengthy LEED checklist."

## Durst Tower To Give Green A New Shade

By Laura Kusisto

When the Durst Organization built the country's first green skyscraper at 4 Times Square, it kicked off more than a decade of trendy green building in the city. Now the developer is abandoning a ubiquitous green stamp of approval for its newest building, potentially changing how new construction is judged on its environmental merits.

For its new Bjarke Ingels-designed residential building on 57th Street, the Durst Organization will employ its own environmental criteria, saying it wants the chance to be more innovative and not be bound by the lengthy LEED checklist.

**'If any building can participate, then what is the point?' said critic Henry Gifford.**

"We found it to be a little confining. There are things we want to do that don't give us a benefit under LEED," said Douglas Durst, chairman of the Durst Organization.

The decision of the city's most prominent green developer to go a different direction could thus be seen as a blow.

"When I first heard about it, I was a little bit confused, I was a little bit shocked," said Rick Fedrizzi, president, chief executive and founding chairman of the U.S. Green Building Council, which oversees LEED, which stands for Leadership in Energy and Environmental Design.

But Mr. Fedrizzi noted that the council is currently developing an updated standard, which is expected to be released next year, and will help address a number of the developers concerns. "I hope our breaking up isn't forever," Mr. Fedrizzi said.

LEED was developed by the nonprofit U.S. Green Building Council in 2000. The city's first building to comply to LEED standards was Battery Park City's Solaire, a high-rise residential that was finished in 2003.

But LEED has come under fire over the years from environmental advocates and developers alike, who say the standards of energy efficiency are too lax now that green technology has advanced. They also say that LEED

# LEED Needs

- The fire sprinkler industry believes that the LEED system does not adequately address the broader contributions of fire sprinkler systems to environmental sustainability

- The fire sprinkler industry does acknowledge legitimate goals:
  - Reducing materials usage
  - Reducing energy demands
  - Reducing water consumption

- These goals have traditionally been pursued and balanced against each other.
  - Example, reduced pipe sizes vs. adding pump

# An Example

- For other than high-rise buildings, the fire sprinkler industry successfully championed changes in the building codes to allow the use of standpipe systems without permanent pumps provided the public water supply can meet the demand of the fire sprinkler system.
- The fire department brings the pump to the fire in the event it is needed.
- This represents a tremendous savings in initial and ongoing energy and water resources, but merits no LEED credit since it is recognized as a feature of the building code.

# Water Conservation

- The biggest issue going forward
- Water mist systems offer advantages, but do not have the hundred years of reliability of fire sprinkler systems, have no generic design method, and are still considered expensive compared to fire sprinkler systems
- Gains to be made in this area must be made with sprinkler systems

# Advances in Water Savings

- 1974 – Introduction of "room design method"
- 1980 – Introduction of 2-sprinkler design in NFPA 13D
- 1985 – 4-sprinkler design in residential portions of other occupancies
- 1989 – 4-sprinkler design for new NFPA 13R standard
- 1996 – Design area reduction allowed for quick response sprinklers
- 2010 – Design curves for storage applications truncated due to availability of larger orifice sprinklers

# Water Savings in System Testing

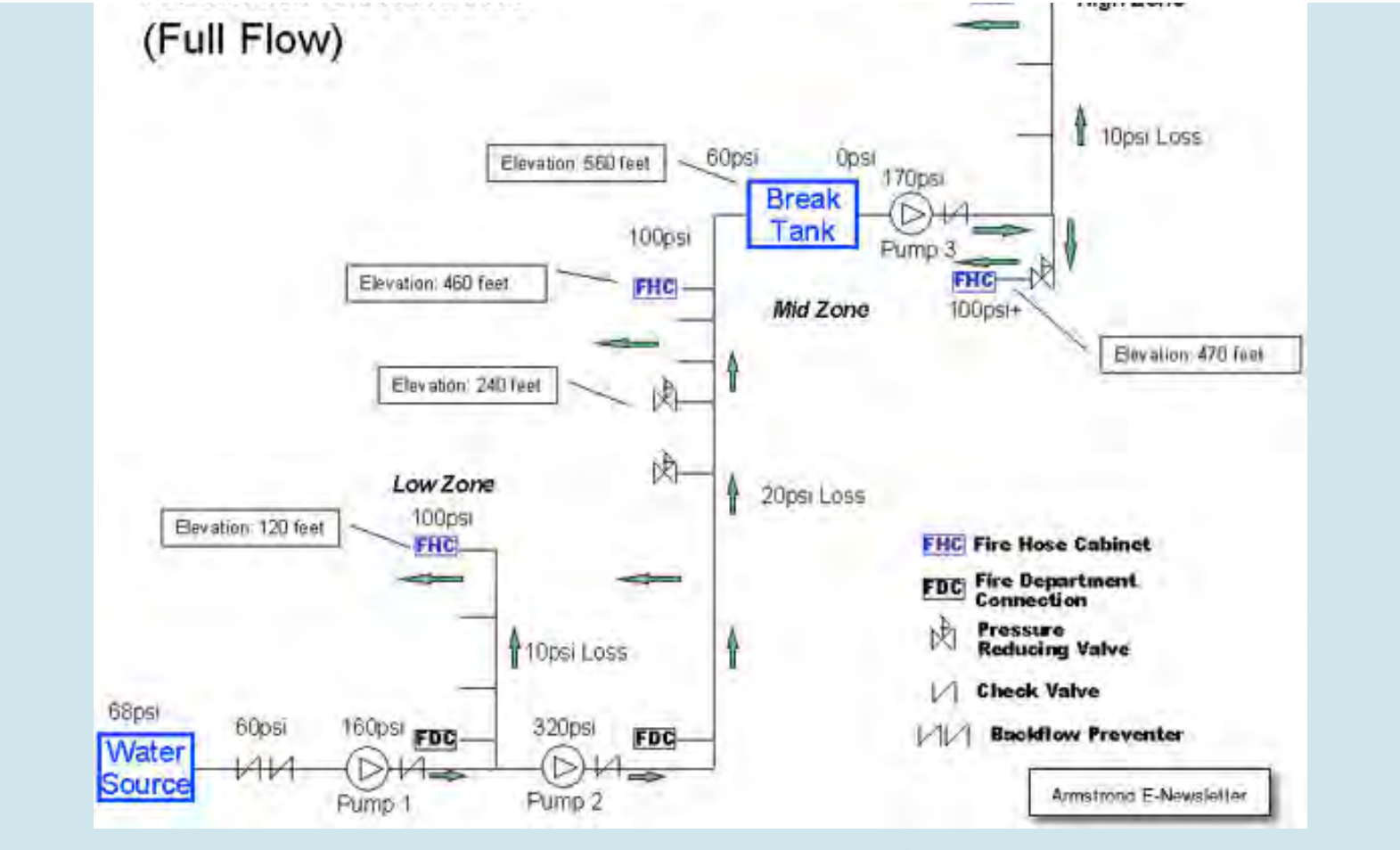
- **As it prepared the 2011 edition of NFPA 25, the NFPA Technical Committee was made aware of efforts in Australia to substantially curtail the amount of water used in maintaining fire protection systems.**
  - ***HB 233-2008 Fire Protection Systems Testing –Water Conservation Handbook*** **was published to provide building owners, consultants and system designers with recommendations for ways to reduce, re-use or recycle water used to test sprinkler systems, hydrants, pumps and hose reels.**
  - **Published as a companion guide to AS 1851-2005 –** ***Maintenance of fire protection systems and equipment*****, the Australian standard.**

# NFPA 25 Actions

- Recent area of great debate - frequency of testing of fire pumps - is mainly a matter of energy use rather than water conservation.

- While preparing the current 2011 edition of the standard, the technical committee did accept a proposal from our association to clarify the minimum run time of pumps during their annual flow tests.
  - For electric pumps this was clarified to be 10 minutes, and for diesel-driven pumps 30 minutes.
  - Prior to this clarification, many of our members contractors were assuming that minimum run times were intended to take place prior to starting the flow tests.
  - Change clarified that these were intended as total run times, inclusive of the time needed to actually flow water.

# Break Tanks Offer Options



# Recycled Water?

- **Main concern is water quality and the potential for compatibility problems with system components.**
- **Integrating rainwater catchment is common practice throughout the Caribbean and elsewhere.**
- **If the water is potable, it is considered adequate for use.**

Rainwater catchment technology is similar to the rooftop tanks in New York City, whereby domestic water volume is only accessed down to a certain level, with only the sprinkler system having access to the fire protection reserve toward the base of the tank.

# NFPA 13 – 2013 Edition

- **23.2.1 Water supplies for sprinkler systems shall be one of the following or any combination:**

**(g) A source of recycled or reclaimed water where the building owner (or their agent) has analyzed the source of the water and the treatment process (if any) that the water undergoes before made available to the sprinkler system and determined that any materials, chemicals or contaminants in the water will not be detrimental to the components of the sprinkler system it comes in contact with.**

# NFPA 13 – 2013 Edition (annex)

- **A.23.2.1(g) In an effort to help comply with efforts for sustainable and renewable building construction, some engineers and architects have suggested the use of reclaimed or recycled water to use in fire sprinkler systems rather than the potable water typically used from the public water supply. While this effort has some merit, there is concern about the quality of the water from the recycled and reclaimed systems. The capture of rainwater is generally not considered a problem since NFPA 13 has long allowed the use of open lakes, rivers and ponds, which are nothing more than open collections of rainwater and melted snow. But other systems that are recycling water that has been used in some industrial or other process might have contaminants that are combustible, or they might be detrimental to the sprinkler system by preventing it form working properly or accelerating corrosion. Recycled or reclaimed water should never be used in a sprinkler system until an analysis of what contaminants might be in the water has determined that nothing will be detrimental to sprinkler system performance or the expected reasonable life of the sprinkler system. When such an analysis is completed successfully the information should be transmitted to the sprinkler contractor through the use of the Owner's Certificate required by section 4.3.**

# International Efforts

- **Internationally, efforts are being made to encourage the use of hydraulic calculations and new technology, to promote the same savings of resources that have been experienced in North America over the past 40 years**

**Fire Sprinklers Are Green!**

*Save your building. Save our environment.*

# Questions?

# fleming@nfsa.org