THE COUNTY OF CHESTER

DEPARTMENT OF EMERGENCY SERVICES

Fire Marshal's Report
October 2014

Investigations/Inspections:	October:	YTD:
Intentional	1	6
Unintentional	12	144
Failure of Equipt or Heat Source	0	3
Act of Nature	1	13
Natural	0	0
Cause Under Investigation	2	4
Undetermined after Investigation	0	30
TOTAL:	16	200
Active Arson Cases	0	1
Fire Inspections Completed	11	98
Juvenile Fire Setter Courses Held	0	22
Fire Prevention Courses Held	0	0
Fire Services Casualties:		
Fatal	0	0
Injuries	1	7
Civilian Casualties:		
Fatal	0	1
Injuries	2	44

Property Type:	October:	October Property Loss	YTD	YTD Property Loss
Assembly	0	$0	1	$0
Educational	0	$0	0	$0
Healthcare, Detention, Correction	0	$0	3	$0
Residential	11	$905,250	141	$7,378,266
Mercantile, Business	1	$0	17	$750,601
Industrial, Utility Defense, Agricultural, Mining	0	$0	2	$65,000
Manufacturing and Processing	0	$0	5	$32,000
Storage	1	$300,000	11	$426,200
Outside or Special Property	2	$5,000	14	$159,000
Other	1	$50,000	6	$67,100
TOTAL	16	$1,260,250	200	$8,878,167

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Now that colder weather is upon us and we will be using our wood burning fireplace more often, the Chester County Fire Marshal's Office reminds residents not to dispose of ashes from the fireplace in combustible containers such as paper/plastic bags or cardboard boxes. DO NOT put any ash materials in trash containers. NEVER place ash containers on wooden or composite decks.

With the holidays approaching remember that turkey deep fryers are extremely dangerous if not used correctly and should be used with extreme caution. Keep out of buildings, off decks and away from all buildings. Use according to manufacture recommendations.

Have a safe Thanksgiving!

The following article on the hazards to firefighters of Green Buildings by John Shafer from the FireRescue magazine is very informative.

From PFESI!

Don Konkle Executive Director

Green Buildings: Design Features and Hazards for Firefighters

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The quest for energy efficiency is having a dramatic impact on building construction-and will therefore impact firefighting tactics

By John Shafer

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Ever since firefighters have been going to building fires, it has been paramount that if they want to survive the destructive force of fire in a building, they must have knowledge of how buildings are constructed. Successful firefighters have realized this and endeavored to keep up with changes in building construction.

Building construction methods change frequently, to meet supply and demand as well as societal needs. Today, the change within the building industry focuses on the need to minimize the operating costs and environmental impacts of buildings, while also increasing their functionality and appeal to occupants. Often, "green" methods and materials hold the key to meeting these needs-and the result is the new trend of "green" buildings.

When I teach about modern building construction I almost always hear firefighters say that they don't have any green buildings in their response area, so the changes don't affect them. This is simply not true.

The confusion comes from the fact that a building can be "certified" green (see sidebar). Many firefighters believe that unless the building is a certified green building it isn't green, but many developers never pursue certification even if they've built a green

building. The reality is that almost every fire department has structures that feature green methods and materials in their response jurisdiction. Therefore, if modern firefighters want to survive, it is essential that they learn about green buildings.

Site Design

More than any single factor of green construction, selection and use of a building site may have the greatest potential to affect a fire department's ability to provide service to the occupants. Whether it's a single building or an entire community being planned, site features and fire department access to the buildings on the site are critical factors in developing a reasonable plan for emergency response.

Two major issues resulting from site design are the use of permeable pavements and landscaping used for shading the building. Permeable paving uses a range of sustainable materials and techniques to create a base and sub-base that allow the movement of storm water through the surface. In addition to reducing runoff, this effectively traps suspended solids and filters pollutants from the water. Heat island mitigation requires that at least 50% of the hardscape of a development be either shaded or permeable material. To develop a sustainable site, it's necessary to minimize the amount of ground covered by impermeable materials.

How does this affect firefighters? The load-carrying capacities of these permeable surfaces are a major concern if they are not able to hold the weight of your apparatus. In addition, both permeable pavements and shading can block your engine and ladders from accessing the building to conduct operations.

Increasingly, developers are designing entire communities using green methods. These developments are frequently built very high-

density and often even require walkable streets and bike pathways rather than roads, which could lead to buildings that you can't even get a fire truck close to. It's essential that the fire department have a seat at the table in the planning stages of these neighborhoods to voice your life-safety issues.

Building Changes

According to the Environmental Protection Agency website, buildings in the United States alone account for:

- 39% of total energy use;
- 12% of the total water consumption;
- 68% of total electricity consumption; and
- 38% of the carbon dioxide emissions.1

Wherever you stand on global warming, it's easy to see that with buildings having this much of an impact on the environment, building design is a big bull's-eye for significant changes meant to curb resource use.

Changes to building design have come in so many forms that one magazine article couldn't possibly scratch the surface of all of them, but just pointing out a few will hopefully underscore how much more you need to dig into learning about modern green buildings. Let's take a look at a few of these significant changes, starting with the foundation and progressing to the roof.

Foundations

When firefighters think of building foundations they probably don't think of an increase of plastics in the actual foundation itself. However, modern green structures have more plastics than ever before. Two examples: using at least 2" of closed-cell extruded polystyrene foam to insulate and create a vapor and moisture

barrier, and the increased usage of Insulated Concrete Forms (ICF).

Structural components

Structural components of modern buildings have seen a variety of changes in materials and methods. Having just mentioned ICF, we'll start there because they can be used for far more than foundations. ICF are forms for poured concrete walls that stay in place as a permanent part of the wall assembly. The forms, made of foam insulation, are either pre-formed interlocking blocks or separate panels connected with plastic ties. This union allows concrete to perform as a thermally efficient building structure, boasting otherwise unattainable R-values (a measure of thermal resistance).

Expanded Polystyrene (EPS), a foam insulation, may lower energy costs by up to 50% and noise abatement by as much as two-thirds compared to ordinary frame walls with fiberglass insulation; it also provides design flexibility and ease of construction.

Another modern energy-efficient structural component: the Structural Insulated Panel (SIP). SIPs are made with an EPS or extruded polystyrene (XPS) foam core laminated to sheets of high-strength oriented strand board. SIPs create a very airtight structural envelope that can save money on energy usage, but there's more to them than that. The laminated "sandwich" construction of SIPs provide buildings with wind and seismic resistance, snow loading and soundproofing characteristics. By eliminating a large portion of conventional wood framing, SIPs can use approximately 35% less raw lumber in home construction, generating less manufacturing and construction waste, and therefore earning much-needed points if a building is trying to achieve Leadership in Energy & Environmental Design (LEED) points for certification.

There have been large increases in using both ICF and SIPs to

achieve an airtight energy-efficient structure; however, they are far from the norm because most structures in the United States are wood frame. Lightweight engineered lumber is considered green by most standards and is the most widely used product. Although the use of engineered lumber is nothing new to the fire service, very few firefighters are aware of a fairly new design practice called advanced framing.

Advanced framing refers to a variety of framing techniques designed to reduce the amount of lumber used and waste generated in the construction of a wood-framed house. These techniques include:

- Designing homes on 2' modules to make the best use of common sheet-good sizes and reduce waste and labor.
- Spacing wall studs up to 24 inches on-center.
- Spacing floor joists and roof rafters up to 24 inches on-center.
- Using two-stud corner framing and inexpensive drywall clips or scrap lumber for drywall backing instead of studs.
- Eliminating headers in non-load-bearing walls.
- Using in-line framing in which floor, wall and roof framing members are vertically in line with one another and loads are transferred directly downward.
- Using single lumber headers and top plates when appropriate.

As mentioned before, this framing method is used to reduce the amount of lumber used, but it also can improve energy efficiency because builders replace lumber with insulation material. The whole-wall R-value is improved by reducing thermal bridging through the framing and maximizing the wall area that is insulated.

Insulation

The area that I believe is the greatest fire concern in almost all modern construction-whether or not it's considered green-is the

increase in foam insulation products. Although there are many types of insulation that tout being green, I'm going to focus on rigid foams and spray polyurethane foam, since they are the types of insulation most commonly used to accomplish the air and moisture barriers required by new energy-efficient codes.

* Rigid foam can be made several ways but the most common are polyurethane (Polyiso), extruded polystyrene (XPS) and expanded polystyrene (EPS). Rigid foam can be used as wall sheathing in certain climates and can be added as an additional layer in all climates to address thermal bridging concerns.

* Spray foam insulation can be categorized into two different types: open cell and closed cell. Open cell is a type of foam where the tiny cells are not completely closed; it's less expensive because it uses fewer chemicals. It is a very good air barrier, but does not provide any type of water vapor barrier. Open cell foam insulation is sponge-like in appearance. It is often used for interior walls because it provides sound reduction by damping the movement of existing insulation. It is not recommended for outdoor applications. Closed cell foam insulation is a much more dense type of foam than open cell. It has a smaller, more compact cell structure and is a very good air barrier, as well as a water vapor barrier. It is often used in roofing projects and other outdoor applications, but can be used anywhere in the home. Spray foam insulation is used in several applications in today's energy-efficient buildings and may have many effects on fires in modern structures. To learn more, go to http://greenmaltese.com/2013/09/spray-foam-basics-for-the-fire-service-2/.

Windows

Windows are a key way green buildings reduce heating, air conditioning and lighting costs. Windows of many types and in

unusual locations bring in as much natural light as possible, and energy-efficient materials are used to construct the windows to prevent unwanted transfer of hot or cold air. These windows are often made of several panes of glass and use technologies including low-emittance (low-E) coatings and gas fills. A low-E coating is a microscopically thin, virtually invisible, metal or metallic oxide coating deposited on a glazing surface. The spaces between windowpanes can be filled with gases that insulate better than air; argon, krypton, sulfur hexafluoride and carbon dioxide are among the gases used for this purpose.

Energy-efficient windows will withstand the heat of a fire longer than older, single-pane glass. This is a concern for firefighters because they can mask the presence of a fire. And, because they don't fail as fast, they keep the fire inside and away from outside oxygen, creating a ventilation-controlled state that is very dangerous for firefighters.

Atrium

Another common attribute in commercial buildings that aids with day lighting is an atrium, situated somewhere in the middle of the building and featuring an extremely high ceiling. The atrium often goes from the ground floor to the ceiling of the top floor. This high ceiling will have windows that allow light to penetrate to the bottom floor of the building. The use of this kind of design in a large building will decrease the amount of energy used to light a building, and thus decrease electricity costs. However, atriums could be a concern for fire protection, with the possibility of these high ceilings affecting the operation of smoke detectors or sprinklers.2 These large, open spaces also allow for large volumes of smoke to move throughout the building.

Roofs

Although there are many green materials and changes to roofs in today's structures, I'll focus on two: green roofs and blue roofs.

Despite their modern sound, green roofs have been around in various forms for centuries, from the Hanging Gardens of Babylon to today's rooftop gardens. Simply put, a green roof is a vegetative layer grown on a rooftop. Green roofs provide shade and remove heat from the air through evapotranspiration (the combination of water moving from soil to air and from plants to air), reducing temperatures on the roof surface and in the surrounding air. Green roofs are generally divided into two categories: extensive and intensive. These categories are defined by the depth of growing medium and types of vegetative cover. Extensive green roofs generally have a growing medium layer of engineered soil 2-6 inches deep, with a saturated weight of 15-18 lbs. per square foot. Intensive green roofs feature a growing medium layer of more than 12 inches and saturated weights of 20-100 lbs. per square foot.

The two major fire department concerns with green roofs are the added weight to the roof and difficult vertical ventilation. With green roofs adding anywhere from 15 to over 100 extra pounds per square foot, the incident commander should always be cognizant of the roof's structural load-bearing capacity, especially in the case of a structure fire involving a green roof. As for ventilation, most firefighters use a saw and a hook to perform vertical ventilation. Once they've made roof access and encountered an intensive green roof, however, it could be very challenging for them to open it up due to the possibility of having more than 12 inches of soil below.

A blue roof is a roof design that is explicitly intended to store water, typically rainfall. Blue roofs can provide many benefits including temporary storage of rainfall to mitigate runoff impacts, storage for reuse (such as irrigation or cooling water makeup), or recreational

opportunities. Blue roofs can include open water surfaces, storage within or beneath a porous media or modular surface, or below a raised decking surface or cover. Blue roofs that are used for temporary rooftop storage can be classified as active or passive depending on the types of control devices used to regulate drainage of water from the roof. Blue roofs are typically less costly than green roofs.

The biggest fire department concern with a blue roof is the additional weight that will be on a structure in the event that you have a fire right after a significant rainstorm. Although rooftops are generally built to accommodate rainfall build-up and snowpack, rooftop detention may require additional structural supports. Additional reinforcements will depend on the depth of water detained, HVAC and other rooftop equipment. The local fire department code official will need to address the aforementioned concerns with the building and plans division prior to installation.

Special Hazards

Today's buildings are high-performance structures designed to conserve water and energy and have a smaller impact on the environment. Because these buildings take into account all of these considerations, they feature hazards that are not necessarily an actual part of the building itself-from factors that influence indoor air quality to the type of plant life used in landscaping. Although there are many green building special hazards, I'll address two major ones: alternate power sources and water conservation systems.

Alternate power sources

Since the 1973 oil crisis sent the price of crude oil skyrocketing, there has been a major quest to rely less on fossil fuels and find

alternate power sources: wind, biomass, biofuels, geothermal and solar being the most common.

Solar energy systems in buildings include systems that capture heat, such as solar water heating systems and passive heating, as well as systems that convert solar energy into electricity. The most common type of solar power is a photovoltaic (PV) system.

The heart of PV technology is the silicon-based semi-conductor material used in the PV modules themselves. The modules convert sunlight to direct current (DC) energy; the DC energy is typically then converted to alternating current (AC) energy via inverters. From the inverters, energy is typically fed into a building's electric system or exported to the utility grid. PV systems come in many shapes and sizes; however, the three most common types are metal framed panels, building-integrated photovoltaic (BIPV) and flexible laminate.

Some of the major fire department concerns with solar power: access for roof operations, shock hazards and the multiple processes required to shut down these systems. UL has conducted some excellent research into solar power and firefighting hazards. For more information, go to http://ulfirefightersafety.com/projects_blog/firefighter-safety-and-photovoltaic-systems/.

Water conservation systems

Energy conservation is most often associated with green buildings, but in fact water conservation is just as important. Two water conservation methods found in green buildings that can create problems for firefighters are rainwater harvesting and gray and blackwater systems.

Rainwater harvesting is the collection of rainwater for use as a substitute for potable water, which is costly and in increasingly short supply in many regions. The water is usually collected from building roof areas and diverted from the roof drainage system to a storage tank, where it is held for use.

Most of the time this rainwater is collected in barrels or tanks on the ground; however, there are more and more elaborate systems being installed on roofs. These systems catch and hold the water on the roof, which adds more weight to the structural elements and could cause the building to collapse quicker in the event of fire attacking the structural components.

Graywater is defined as the wastewater produced from baths and showers, clothes washers and lavatories. The wastewater generated by toilets, kitchen sinks and dishwashers is called blackwater. Incidents in buildings that reuse water through these systems can present additional health hazards to firefighters. Both graywater and blackwater can be contaminated with organic matter, suspended solids or potentially pathogenic microorganisms.

More to Learn

With the world becoming ever more environmentally conscious, a trend toward sustainability is growing within residential and commercial buildings. Although we have discussed several hazards associated with modern green construction materials and methods, there are many more. Hopefully, this article makes clear that there's much more you need to know about building construction than the five types you were taught in the academy. The push to make buildings green has changed them in a way that most firefighters are not aware of. Firefighters and incident commanders are not immune to these changes and need to be aware of potential hazards they could encounter to keep themselves and their crews safe on the

modern fireground.

For more information, visit www.greenmaltese.com.

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Sincerely,

Don Konkle

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