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### **Can We Learn Something About Residential Gas Safety from Europeans?**

CLARK, NJ November 16, 2011 -- According to a report posted on the US Homeland Security's US Fire Administration website, the United States has one of the highest fire death rates per capita among Western Nations.<sup>1</sup> To understand what can be done to improve fire safety, we examine US and European fire safety systems differences.

We know US fire deaths occur predominately in homes during the winter months when the number of cooking and heating fires increases. According to the National Fire Protection Association (NFPA), the U.S. fire departments face 2,110 home fires per year where natural gas is the first material ignited, and 1,170 home fires each year where LP-gas is involved with the start of a fire. Most home gas fires originate in the kitchen at the stove or gas range.

Although heat is generated from any number of fuel sources (gas, electric, oil, wood, coal), this article focuses on current European practices for gas fire safety, starting at the curb, to the gas meter and then throughout the home.

#### **Municipal Gas Supply to the Home**

Typical European gas supply to the meter provide for three safety devices. These include:

1. A universal shut-off valve designed to remain tight at high temperatures. If a fire does occur and the gas expands from the heat, the valve is able to withstand the additional gas pressure, preventing the gas from exploding.
2. An excess flow valve to stop gas flow when the flow rate dramatically changes. For example, if a back hoe damages the piping, the excess flow valve will automatically shut off the gas flow.
3. A combined active and passive mechanism which includes both a manual shut-off valve and an automated thermal shut-off fusible device, such as the TECO Americas FireBag®. This automatic shut-off device is triggered by a fusible plug and piston and it does not need a fire or heat detector to set it off. The TECO Americas' FireBag is designed for rugged applications, and it can

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<sup>1</sup> <http://www.usfa.dhs.gov/downloads/pdf/tfrs/v11i2.pdf>

undergo mechanical or thermal stress without misshaping. Since the FireBag is virtually maintenance free, it does not require regular inspections like active safety devices.

### **Meter Gas Safety**

Typical gas meter installations in Europe include two passive safety devices and a plug to safely test gas pressure and tightness. The gas meter is equipped with an excess flow valve and a shut-off valve armed with an automatic thermal shut-off device.

European standards (UNI TS 11147 February 2007) require a pressure plug placed right after the meter. To test gas pressure safely and quickly – in 30 seconds or less – the meter is equipped with a double safety valve to avoid risk of gas leakage. TECO America's CheckPoint was designed to meet this European standard. It includes an intercepting ball valve, and a pressure plug with the second safety valve which is installed with a safety handle that cannot be inadvertently turned. This double valve design allows pressure tests to be performed while the gas installation is operating.

### **Gas Appliance Fire Safety**

Europeans have been able to provide additional fire safety at the appliance level without adding excessive costs.

Unlike their U.S. counterparts, some European countries such as Germany have mandated safety fusible devices for all gas appliances that use natural gas, propane, and butane gas for over 17 years.

The internal fusible device is located in the gas line connected to the gas appliance. Due to their low cost, the internal fusible device can be used economically at each gas appliance. External fusible devices are significantly more expensive and they are normally used for liquid fuels or used with remote sensing devices. The external fusible devices normally have a manual override or resettable feature.

In Europe, as in the United States, inside gas lines are maintained by licensed plumbers hired by the home owner. In the US, the NFPA standards require gas appliances to be equipped with manual gas shut-off valves. These manual shut-off valves are not considered emergency valves, and are not required to be easily accessible. Few home cooks are knowledgeable about the location of these valves, and would not be inclined to search for the valve when a gas fire does occur. For these reasons, European lines feeding gas appliances throughout the home are protected with passive fire safety devices, such as the FireBag automated thermal shut-off device which can be provided with the shut-off valve as well:

- Basement gas appliances may include a furnace, water heater and dryer. In Europe the gas lines include dual-equipped shut-off valves at the appliance connection. The valve can be equipped with a safety handle for manual manipulation and the automated thermal shut-off device for passive fire safety.
- Kitchen gas appliances may include ovens and ranges. The gas appliance is already equipped with a manual shut-off valve, so there is no need to install an additional valve prior to the gas appliance connection. The inexpensive FireBag passive automatic shut-off is installed in the gas

line. The FireBag is manufactured in straight line versions and with elbow connections for flexible pipes.

- Decorative gas fireplaces, gas logs or space heaters are equipped with passive safety devices by inserting the inexpensive thermal shut-off device in the gas line.
- Outdoor patio gas appliances are also protected with automatic thermal gas shut-off devices. Gas grills are protected with extensible hoses equipped with a device such as the FireBag.

### **American and European Differences Regarding Passive Gas Safety**

U.S. state public utility commissions and state and municipal building codes frequently reference the NFPA, and also may require safety regulations that exceed the NFPA standards. Currently the NFPA does not require passive gas safety devices, although recommendations have been made to the NFPA Technical Committee on National Fuel Gas Code.

The Technical Committee met in February 2010, to discuss revisions for the 2011 edition of the NFPA National Fuel Gas Code (NFPA 54). The committee met again in October 2010 to act on the proposed revisions. A revision for passive safety devices was requested: “for each appliance, a fusible link automatic shutoff valve shall be installed within two feet of the equipment manual shutoff valve and upstream all other components of the fuel train.”

The proposed revision was rejected for lack of data demonstrating “building fires are aggravated by the release of gas from heat damaged piping system components.”

Peter Holmes from the State of Maine’s Gas, Oil and Solid Fuel Board reports he has experienced “several fires in recent years which were greatly aggravated by the release of gas from heat damaged piping system components.”<sup>2</sup>

Although the 2010 San Bruno, CA and 1981 San Francisco pipeline ruptures and their subsequent fires were exacerbated by the lack of automatic passive thermal gas shut-off devices, current fire reporting does not track when fires could be better contained if passive thermal shut-off devices were installed.

Currently the NFPA only requires manual gas shut-off valves gas appliances in the U.S. The requirement in 9.6.4 for manual shut-off valves is intended solely to isolate an appliance for servicing, removal, or replacement without shutoff off the gas supply to other appliances. Since this valve is not an emergency shut-off valve, it is not required to be readily accessible.

### **State and Municipal Regulations Regarding Automatic Gas Shutoff Devices**

Some U.S. cities, counties and states do have regulations requiring automatic gas shutoff devices. However, these regulations focus primarily on gas shutoff for excess gas flow and earthquakes. The

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<sup>2</sup> NFPA 54: National Fuel Gas Code Report on Proposals (ROP), 5/17/2010, <http://www.nfpa.org/Assets/files/AboutTheCodes/54/54-A2011-ROP.pdf> Viewed 12/12/2010

State of California requires excess flow gas shutoff valves and earthquake actuated gas shutoff valves be installed on building gas house-line piping, (the gas pipe connecting appliances to the gas meter) after the utility gas shutoff valve, the pressure regulator (if installed), the meter(s), and the service tee. Californian homes are, therefore, protected from gas pipe breakages and earthquakes -- but not from fire.

### **Don't Fuel the Fire**

A number of regulations exist for passive, automatic safety devices that supply oil supply to and within the home. Yet, similar protection is not required for gas service in the U.S. For example, the NFPA 31 standard for the installation of oil-burning equipment requires fusible fire safety devices in residential oil heating installations. State fire codes such as those in Maine and Massachusetts, require automatic fusible valves in oil supply lines at oil tanks and burners.<sup>3, 4</sup>

It is critical that both gas and oil supply lines are able to terminate automatically the fuel supply in the event of fire to minimize fire damage and save lives. Homes are protected by external gas shut-off valves which are accessible to fire departments. However, passive fire safety devices can provide additional protection. Internal fusible devices that automatically shut-off the flow of gas when the ambient temperature reaches a critical level can provide this protection at minimal cost.

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#### SIDEBAR #1

Diagram of European Residential Gas Safety Systems

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#### SIDEBAR #2

### **Fusible Fire Safety Links, Fuses, and Devices for Automatic Fuel Shutoff**

Most people experience the benefits of fusible links through the emergency ceiling sprinkler systems commonly installed in office buildings. The sprinkler's fusible device triggers the flow of water when fire is detected in order to rapidly extinguish the fire. Fusible links, thermal fuses, and fusible devices are all used to shutoff fuel sources in the event of fire. Recent fire safety improvements incorporate these fusible techniques.

Cost must be considered, however, in the application of safety devices. Sprinklers have become ubiquitous because they can be manufactured cheaply. Fuel shutoff devices are available in both internal fusible devices which are less expensive and external fusible devices which are more expensive.

Internal fusible devices are frequently used with natural, propane and butane gas systems because of their relative affordability. Their low cost allows them to be used with each gas appliance. External fusible devices are significantly more expensive and are more frequently used for liquid fuels or with

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<sup>3</sup> Maine Rules. 9-9 PIPING, PUMPS AND VALVES. 9-9.1 Supply Connections/Oil Shut-off Valves

<sup>4</sup> Massachusetts Fire Code 527 CMR: BOARD OF FIRE PREVENTION REGULATIONS

remote sensing devices. The external fusible devices normally have a manual override or resettable feature.

### **Fusible Links**

A mechanical fusible link involves two metal strips that are held together with a material that melts at a specific temperature, separating the metal strips. Warehouse fire wall doors are typically controlled by fusible links, which trigger automatic door releases during fires. Once triggered, the links need to be replaced, since they cannot be reset.

### **Fusible Fuses**

Fusible fuses are safety devices typically used to control electrical current for heat producing appliances such as coffeemakers and hair dryers. A search for “thermal fuse” on the eHow.com website offers homeowners at least 506 instructional videos on replacing fusible fuses on appliances with heating elements, once the fuse has been triggered.

### **Fusible Devices**

Fusible devices automatically shut-off fuel supply in the event of fire to meters and fuel-consuming appliances, such as heaters, boilers, ranges, varnishing booths, gas motors, and ovens. This passive safety device contains a fusible alloy which melts when the outside temperature reaches a trigger temperature, releasing the plug to completely close the flow of fuel.

### **The FireBag®**

The FireBag® is a thermal-activated shut-off device for propane, natural and butane gas. It automatically turns off the gas supply in a fire, preventing explosions and the spreading of fire. When the outside temperature reaches 203-212°F (95-100°C) the metal alloy that keeps the plug and cartridge together melts and the spring pressure pushes the plug against the gas opening closing it completely. No fire or heat detectors are required to automatically intercept gas flow. Once triggered, the shut-off device works up to 1,697°F (925°C) for one hour.

The FIREBAG® is compatible with other safety devices (e.g. gas leak detectors), working even when the cause of the fire is not inside the system. Since it is a passive device, it does not require regular inspections and is virtually maintenance-free. It is not affected by external factors and works even during servicing operations.

Typical applications for the FireBag include gas-fed ovens, boilers and heaters, gas meters and submeters, varnishing booths, and gas motors.

### **About the Author**

Jean Steckler provides marketing services to TECO Americas, a company that works to improve residential fire safety. TECO Americas flagship product is the FireBag®, a thermal activated automatic gas shutoff. Located in Clark NJ, Assured Automations customers include original equipment manufacturers,

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