**Building Science Education Solution Center – Combustion Safety**

Proficiency Level 1: Remember

**Learning Objective 1.1:**

* What is combustion safety, and what are three good practices to ensure combustion safety for gas-fired natural draft appliances?

**Lecture Notes 1.1:**

Reference:

Brand and Bohac, “Building America Combustion Safety Webinar”, 12/16/2015, Link: <https://www.energy.gov/sites/prod/files/2015/12/f27/BA%20Combustion%20Safety%20Webinar%20r3.pdf>

Combustion safety is the ability for combustion appliances (such as gas-fired water heaters, boilers, and furnaces) to safely operate without leaking exhaust gases back into the indoor airspace. In natural draft appliances, combustion safety generally refers to how these appliances create a draft in the vent shortly after ignition, ensuring that all flue gases are released to the outdoors through the exhaust and there is no excessive spillage to the indoor airspace.

Three good practices to ensure combustion safety are:

1. Make sure that any and all natural draft appliances are properly installed and operating, with sufficient air for combustion and dilution of gases.
2. Check that the appliance’s vent is properly sized and installed.
3. Verify the concentrations of ambient exhaust gases, including carbon monoxide (CO), are within safety certification limits in all areas.

**Learning Objective 1.2**

* Know the widely adopted fuel gas codes.

**Lecture Notes 1.2:**

Reference:

“Combustion Safety in the Codes” <https://www.energy.gov/sites/prod/files/2013/12/f6/combustion_safety_codes.pdf>

Three fuel gas codes have been widely adopted. These codes become requirements when adopted by governments or fire safety authorities, often referred to as Authorities Having Jurisdiction (AHJ). These codes are:

* NFGC: National Fuel Gas Code – ANSI Z223.1/NFPA 54
* IFGC: International Fuel Gas Code
* UPC: Uniform Plumbing Code

Many of the safety requirements in the National Fuel Gas Code are used in the International Fuel Gas Code, and most of the NFGC safety requirements are used in the UPC.

These codes apply to all installations of gas piping, appliance, equipment, and related accessories after the point of delivery, which is usually the utility gas meter. This applies to systems with gas pressure up to 125 psig.

The codes cover the materials, sizing, installation, inspection, and testing of gas piping. For appliance installation, they address clearances to combustible materials, combustion air, and testing. For appliance venting, they cover the materials, vent types, sizing, installation, and testing.

**Problem Set 1.2:**

1. The \_\_\_ has adopted **most** safety requirements from the National Fuel Gas Code. The \_\_\_\_ has adopted **many** safety requirements from the National Fuel Gas Code.

**Learning Objective 1.3**

* Define key combustion safety terms and know the different categories of vented gas-fired appliances.

**Lecture Notes 1.3:**

Reference:

Building Performance Institute: “Combustion Appliance Safety Inspection for Vented Appliances” (January 1, 2016), TERMS AND DEFINITIONS, Page 4: <http://www.bpi.org/sites/default/files/COMBUSTION%20APPLIANCE%20SAFETY%20INSPECTION%20FOR%20VENTED%20APPLIANCES.pdf>

Refer to definitions on page 4.

**Problem Set 1.3:**

1. What is a dangerous situation where combustion products enter a building from within the combustion or venting system of a vented combustion appliance, caused by backdrafting, blockages in the vents, or leaks within the system?
2. What is the part of a venting system that collectively ejects flue gases and other products of combustion from multiple combustion appliances to the outdoors?
3. What are some examples of rooms within a residence that could be considered combustion appliance zones?
4. What type of combustion appliance has been set up specifically to use only outdoor air for combustion and is able to eject all exhaust to the outdoors?
5. What can be installed between an appliance and the venting system to create a barrier to help regulate the air pressure?