

# OREGON HOUSING & COMMUNITY SERVICES Multifamily Energy Program

## Multifamily Health & Safety

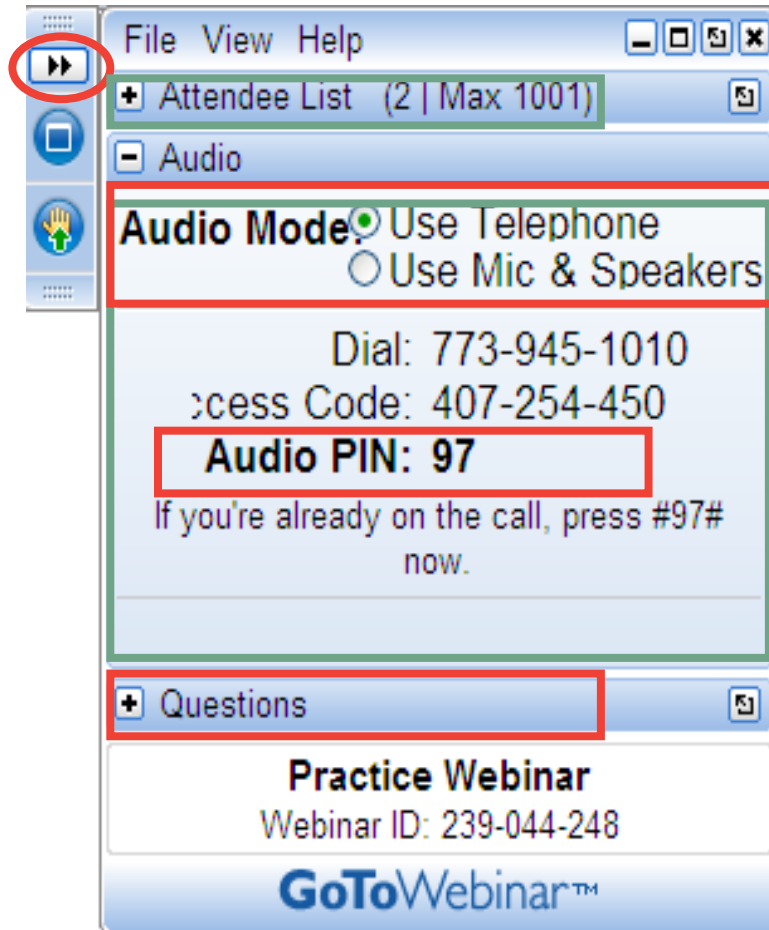
**Date:** October 25, 2018

**Presenter:** Nick Young – AEA, Inc.



# USING GOTOWEBINAR

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**Questions will be taken at the end of the presentation.**

# AGENDA



**Combustion Safety**



**Electrical Safety**



**Ventilation & Moisture**



**Products & Pollutants**





# COMBUSTION SAFETY





# WHAT IS COMBUSTION SAFETY?

- ◆ Combustion safety is a set of **health and safety protocols** and procedures for equipment that involves the **combustion of fossil fuels**.
- ◆ Combustion appliances may include:
  - Furnaces
  - Boilers
  - Space heaters
  - Water heaters
  - Stoves
  - Ovens
  - Gas fireplaces
- ◆ A **Combustion Appliance Zone (CAZ)** is any area of the building that contains a combustion appliance.



# COMBUSTION SAFETY BASICS



## Are there any safety hazards?

- Gas leaks
- Parking garage ventilation
- Disconnected flues



## How is combustion equipment performing?

- Drafting properly?
- Producing acceptable levels of carbon monoxide?
- Can pressure dynamics adversely affect draft of appliances?



# BPI COMBUSTION TESTING PROCEDURES

THE SYMBOL OF EXCELLENCE FOR HOME PERFORMANCE CONTRACTORS

SEPTEMBER 22, 2017

**COMBUSTION APPLIANCE SAFETY INSPECTION FOR VENTED APPLIANCES\***

\*Vented appliances refer to natural draft appliances equipped with a barometric draft regulator or Category I appliances equipped with a draft hood or connected to a natural draft venting system.

The following combustion appliance safety inspection must be completed to determine if fossil fuel-fired appliances are operating safely under a depressurized condition.

**MONITOR INDOOR AMBIENT CARBON MONOXIDE (CO)**

Ambient CO must be monitored at all times during the test and actions taken as per the table below:

**Required Actions in Response to Ambient CO Measurements**  
(from ANSI/BPI-1200, Section 7.3.3.3)

70 ppm or greater	35 ppm-69 ppm	9 ppm- 35 ppm
<ul style="list-style-type: none"> <li>Terminate the inspection.</li> <li>Notify the homeowner –occupant of the need for all building occupants to evacuate the building.</li> <li>Leave the building and the appropriate emergency services shall be notified from outside the home.</li> </ul>	<ul style="list-style-type: none"> <li>Advise the homeowner –occupant that elevated levels of ambient CO have been detected.</li> <li>Open windows and doors. Recommend that all possible sources of CO be turned off immediately.</li> <li>Where it appears that the source of CO is a permanently installed appliance, recommend that the appliance be turned off and advise homeowner – occupant to contact a qualified professional.</li> </ul>	<ul style="list-style-type: none"> <li>Advise the homeowner – occupant that CO has been detected.</li> <li>Recommend that all possible sources of CO be checked and windows and doors opened.</li> <li>Where it appears that the source of CO is a permanently installed appliance, advise the homeowner – occupant to contact a qualified professional.</li> </ul>

**DEPRESSURIZE THE COMBUSTION APPLIANCE ZONE**

Complete the following steps to place the CAZ under the greatest depressurization achievable given the weather/temperature conditions at the time of the inspection. Once you have determined that the greatest possible depressurization has been achieved, keep the CAZ in this depressurized state during all spillage assessment and CO measurements of vented appliances.

- Place all combustion appliances located within the CAZ in their standby mode and prepare for operation.
- Fires in woodstoves and/or fireplaces must be fully extinguished, with no hot coals or embers. Close fireplace dampers and any fireplace doors.
- Close all building exterior doors and windows. Close all CAZ doors. Close the interior doors of all rooms except for rooms with an exhaust fan and rooms with a central forced air system return. Leave outdoor openings for combustion air open.
- Turn off any mechanical ventilation and forced air cooling or heating system blowers.
- Using a calibrated manometer or similar pressure measuring device intended for this purpose, measure and record the baseline pressure in the CAZ with reference to (WRT) outside. Compare this measurement with subsequent pressure measurements to determine the greatest negative pressure achievable in the CAZ.
- Turn on the following exhaust equipment: clothes dryers (check and clean the dryer filter and look for blockage at the external vent damper prior to operation), range hoods, and other exhaust fans. If there are speed controls, operate the exhaust equipment at the highest speed setting. Do not operate a whole house cooling exhaust fan.
- Measure and record the pressure in the CAZ WRT outside.
- Turn on any central forced air system blowers and measure and record the pressure in the CAZ WRT outside.
  - If the pressure in the CAZ becomes more negative WRT outside after the blower is turned on, leave the blower ON during combustion appliance safety inspection.
  - If the pressure in the CAZ becomes more positive WRT outside after the blower is turned on, leave the central forced air system blowers OFF during the combustion appliance safety inspection.
- Open interior door/s directly leading to the CAZ. Measure and record the pressure in the CAZ WRT outside.
  - If the pressure in the CAZ becomes more negative WRT outside after the door(s) are opened, leave the door(s) open during the combustion appliance safety inspection. (Alternatively, pressure differential diagnostics may be used to determine proper door configuration to create the greatest CAZ depressurization. Pressure differential diagnostics may include manometer readings or a visual indicator, such as smoke.)

Building Performance Institute, Inc. - January 1, 2016



# CO VS CO<sub>2</sub>

CO

## Carbon Monoxide

- Colorless, odorless, tasteless gas
- Byproduct of incomplete combustion
- Toxic

CO<sub>2</sub>

## Carbon Dioxide

- Colorless, odorless, tasteless gas
- Byproduct of combustion, as well as respiration (breathing)
- Non-toxic, but a greenhouse gas





# CO ALARM

- Is **CO alarm** installed?
- When was it last tested?
- Should be tested or get new batteries **annually**.





# MONITOR AMBIENT CO

- ❑ Should be done **at all times** when testing combustion equipment and while in mechanical rooms.
- ❑ Device should be **turned on outside the building** as a baseline.
- ❑ If alarm sounds, leave the space.





# VISUAL FLUE INSPECTION

☐ Is flue properly connected?





# TESTING FOR GAS LEAKS

WHY?

- ❑ Health & Safety: potential fire or explosion hazard
- ❑ Wasted gas





# ADEQUATE COMBUSTION AIR OPENINGS



- ❑ Document that **combustion air openings** (size, net free area, condition, location) meets code requirements.
- ❑ **MUST** check **local codes** for actual requirements.
- ❑ Examples: *National Fire Gas Code (NFGC) and Oregon Mechanical Specialty Code (OMSC).*



# SPILLAGE, DRAFT, & CO

## BPI Building Analyst Standard requires:

- ✓ Undiluted combustion gases be measured for **CO levels**.
- ✓ Test appliance for **spillage** of combustion gases.
- ✓ Equipment **draft** measurement.
- ✓ All of these tests are required to be performed under **worst case depressurization**.







# CO TESTING GAS OVENS

- ☐ Monitor ambient CO in the breathing zone throughout test.
- ☐ Turn on the kitchen exhaust and open a window.
- ☐ Turn the oven on high (500°F) and note the time.
- ☐ Measure and record undiluted CO at steady state (after 5 minutes of operation).
- ☐ Consult BPI standards for CO levels and required actions.





# LAUNDRY ROOMS

- Test for gas leaks (dryers)
- Evaluate dryer venting
  - Loaded with lint?
  - Properly ducted?
  - Check manufacturer requirements.







# HOW TO MITIGATE COMBUSTION SAFETY HAZARDS





## Eliminate combustion

- All-electric new construction
- Switch from gas to electricity in existing buildings
- Bonus: Lower GHG emissions!



## Otherwise, must:

- Test combustion equipment regularly
- Ensure CO alarms are installed and functioning
- Engage with local gas utility to address any issues
- Educate residents



# **QUESTION BREAK**



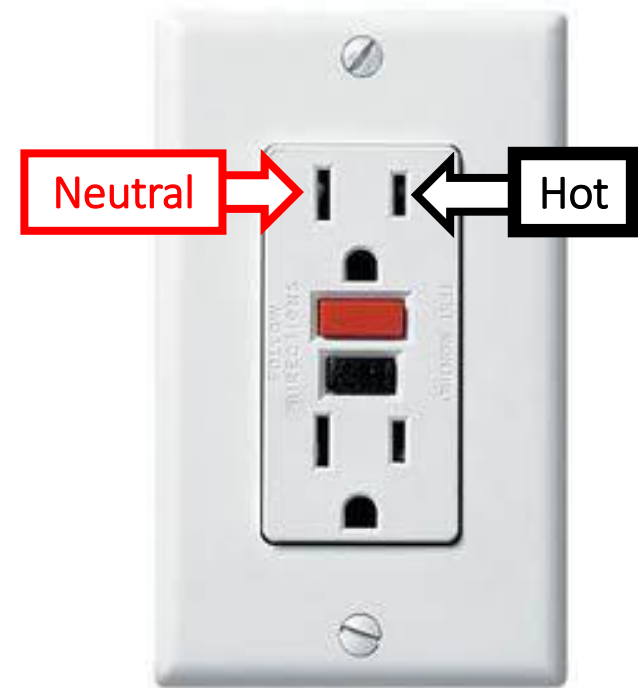
# ELECTRICAL SAFETY





# GFCI – WHAT DO THEY DO?

- ◆ **Ground Fault Circuit Interrupters** prevent electrocution by sensing when current is being grounded (as opposed to flowing from hot to neutral).
- ◆ When a **difference in current** is sensed between the **Hot** and **Neutral**, the GFCI breaks the circuit.
- ◆ Why would there be a difference? Because the current is flowing through something else (water, metal, or a person), which is bad!



NEUTRAL = HOT



# GFCI – TESTING

**GFCIs should be tested** as part of regular apartment inspections.

- ❑ Plug in an appliance (or GFCI tester), and after pressing the Test button, the GFCI should break the circuit, turning off the appliance.
- ❑ If it doesn't, the GFCI needs to be repaired or replaced.





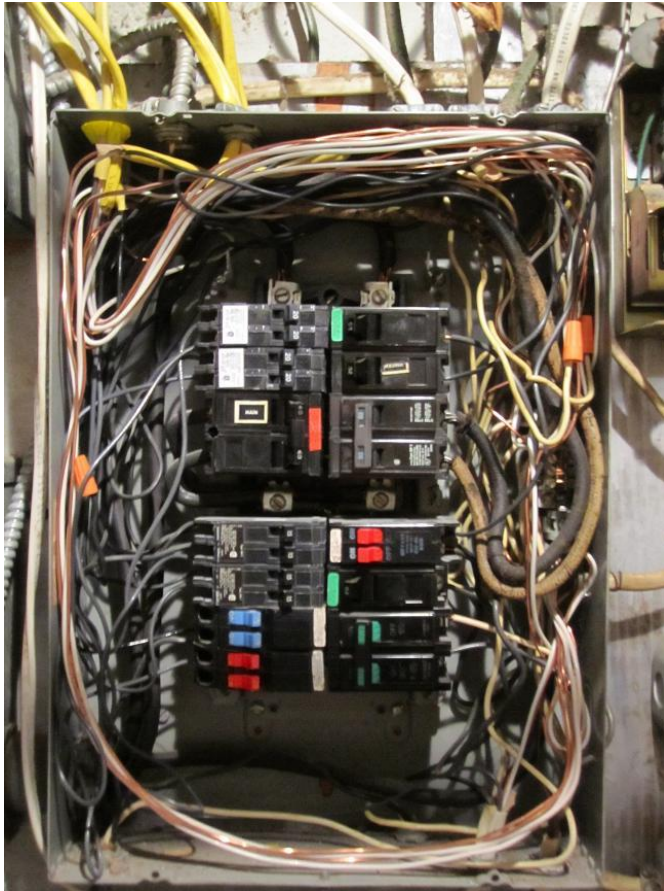
# KNOB & TUBE WIRING



- ◆ Older buildings may contain knob and tube wiring.
- ◆ This type of wiring is ungrounded and is **susceptible to overheating** if covered.
- ◆ Particular care should be taken when considering insulating a wall or attic space that contains knob and tube wiring. **May need to upgrade wiring** before insulating.
- ◆ Consult a **licensed electrical contractor**.



# OTHER ELECTRICAL ISSUES



- ◆ Older buildings may have other issues with wiring or electrical connections, including:
  - Splices outside of junction boxes
  - Uncovered junction boxes
  - Over-wired panels
  - Older fuses instead of modern circuit breakers
- ◆ For electrical issues, always consult a licensed electrician or electrical contractor.



# VENTILATION & MOISTURE







# VENTILATION AND IAQ



Ventilation has two functions:

- 1** Exhaust stale, moist, polluted indoor air from the building.
- 2** Supply fresh, clean (sometimes filtered) outside air to the building.



# VENTILATION AND IAQ

- ◆ If ventilation is good, more is better, right?  NO
- ◆ Flowrates should be sufficient to deliver **adequate air exchange, but not too high.**
- ◆ Find a balance between occupant control and continuous/automatic operation.
- ◆ Ensure supply air filters (MERV 8 or MERV 13), as well as charcoal filters on range hoods, are changed per manufacturer's recommendations.



# **QUESTION BREAK**



# PRODUCTS & POLLUTANTS





# INDOOR AIR POLLUTANTS: VOCS



## Volatile Organic Compounds

- Gasses emitted by solids or liquids at room temperature



## Indoor sources of VOCs

- Cooking
- Paints and finishes
- Cleaning products
- Air fresheners
- Building materials and furnishings
- Office equipment (printers)



# HEALTH EFFECTS OF VOCS

## Health effects may include:

- Eye, nose and throat irritation
- Headaches, loss of coordination and nausea
- Damage to liver, kidney and central nervous system
- Some VOCs can cause cancer in animals, some are suspected or known to cause cancer in humans.



# MINIMIZING VOCS

- Ensure kitchens are **adequately ventilated**.
- Select products with **3<sup>rd</sup> party verified low-VOC** or zero-VOC labels.
- Select unscented products when possible.
- Store chemicals in well ventilated area, preferably outside.
- Utilize **integrated pest management** practices to reduce the need for pesticides.

# CONCLUSION



## Minimize combustion safety hazards by:

- Eliminating combustion from building (all-electric)
- Regularly testing combustion appliances to ensure safe, efficient operation



## Electrical Safety

- Test GFCIs, watch out for knob and tube in older buildings
- When in doubt, ask a licensed professional



## Indoor Air Quality

- Ensure adequate but not excessive ventilation
- Select 3<sup>rd</sup> party verified low- or zero-VOC products



# THANK YOU FOR ATTENDING

**Oregon Housing and Community  
Services Multifamily Energy Program**

[www.oregonmultifamilyenergy.com](http://www.oregonmultifamilyenergy.com)

**Email:**

[OregonMultifamilyEnergy@trcsolutions.com](mailto:OregonMultifamilyEnergy@trcsolutions.com)

