

Generic HERS Combustion Safety & Work Scope Agenda (7/2014)

Time Topic

Day I

Day 1 - Southface HERS CAZ Training Module

- I. Overview of RESNET Work Scope & Combustion Safety Procedure (*slide*)
- II. Building Science Recap (*slides*)
 - a. House as a System / Building Thermal Envelope
 - b. Rules of air movement
 - c. Pressure dynamics (*slides + life-size House Of Pressure demo with fog*)
 - i. Mechanical driving forces & Exhaust devices
 - ii. Make up air concepts
 - iii. CAZ backdrafting demonstration
 - iv. Return air pathways
 - v. Dominant duct leakage
- III. What is Carbon Monoxide? (*slides*)
 - a. The Process of Combustion - Products of Combustion (pollutants)
 - b. Combustion safety as part of house = system
 - c. Carbon Monoxide (CO)
 - i. What is it?
 - ii. Effects of CO exposure
 - d. Two Essentials for safe combustion
 - i. Separate supply of oxygen
 - ii. Flue to exhaust combustion products to outside
- IV. Defining the Combustion Appliance Zone (CAZ) (*slides*)
 - a. Example scenarios of failures within the CAZ
 - b. Designs & Strategies that are bad and good
 - c. Types of Combustion equipment installations
 - i. Natural draft
 - ii. Induced draft
 - iii. Sealed combustion, direct vent
 - iv. Combustion Appliance Identification Game
- V. Testing Equipment (*slides*)
 - a. Combustion analyzer (also, belt CO detector)
 - b. Pressure gauge
 - c. Gas Leak detector
 - d. Smoke pencil
 - e. Temperature gauge
 - f. PPE – safety glasses, etc.
- VI. RESNET Combustion Safety Protocol – (*Chapter 8 + Standard Explanations document + slides*)
 - a. Overview and disclosure
 - b. Gas Leakage Test
 - c. Visual Inspection & NFPA Vent Classifications Table
 - d. WCD Procedure - What to Inspect (*slides*)
 - i. Chimney / Vent Pipes / Flues
 - ii. Unvented Appliances
 - iii. Wiring
 - iv. Heat Exchanger
 - v. Nearby flammable material
 - b. Worst Case Depressurization (WCD)
 - i. Establishing baseline (close all doors)
 - ii. Establishing worst case negative pressure (fans, doors, AHU, doors again)
 - iii. Determining net WCD
 - iv. Compare to pass / fail criteria as per RESNET standards
 - c. Check spillage under WCD (“failure to draft” via smoke) at 5 minutes of operation
 - d. Measure CO under WCD at 5 minutes of operation
 - e. Natural Condition - Repeat spillage and CO tests if WCD fails after 5 minutes operating
 - f. Measure ambient CO during inspection and testing
 - g. Measuring oven and burner CO levels
- II. Field Testing part 1 (*use actual equipment in Diagnostic training cabins*)
 - a. Calibrating equipment and outdoor checks
 - b. Gas leak detection sniffing
 - c. Base case pressure
 - d. Establishing gross WCD, determining net WCD

- e. Testing under net WCD
- f. Testing under natural conditions (if required)
- g. Testing for ambient CO
- h. Testing for oven CO
- i. Interpreting results
- III. Work Scope details (*slides + Chapter 8*)
 - a. Contractors
 - i. Work must meet code
 - ii. CAZ testing required at end of each day
 - iii. Improvements based on assessment, client needs & budget, priorities....
 - iv. Priority items – prompt attention, safety, licensed trade
 - v. Detail capable of being sent out for bids
 - vi. Disclaimer statement - “The estimated energy use and savings...”
 - vii. Upgrade emphasis on ducts inside the shell or seal and...
 - viii. House as a system disclaimer – “This work scope is not a list of...”
 - ix. New equipment shall be sized based on proposed shell and duct upgrades
 - x. Combustion “test out” is required for any duct or shell tightness upgrades
 - b. CO
 - i. Repair or replacement by qualified technician is highest priority upgrade
 - ii. CO detector specified
 - iii. Equipment CO shall be serviced if required
 - c. WCD – examples of upgrades
 - i. Targeted air sealing
 - ii. Room pressure balancing
 - iii. Exhaust device makeup air
 - iv. Power or direct vent upgrades
 - v. Combustion closet with proper combustion air
 - vi. Remove unvented appliances or do not improve envelope or duct upgrades
 - d. Action Chart for Natural Draft appliances
 - i. Fail CO – Fix appliance
 - ii. Fail spillage/draft – Fix building
- IV. Intro to RESCAZ simulation tool
 - a. Navigation tutorial
 - b. Example training scenario
 - c. Simulation premise/protocol*
 - d. HW assignments – simulation + reading

*Teaching premise/protocol for RESCAZ simulation tool: [Southface Methodology - provided in class]

Day 2

Day 2 - Southface HERS CAZ Training Module

- I. Review major concepts and highlights of Day 1 slides
- II. Discuss Failure Modes that can lead to dangerous CO exposure to occupants/
- III. Discuss RESCAZ Simulation premise/protocol*
- IV. Split into two groups –
 - a. Group A goes into field for second chance with actual equipment
– reinforce premise/protocol and perform all tests in different diagnostic cabin
 - b. Group B performs additional simulations – instructor led, subsequent are self-paced
 - c. Reverse groups and repeat
- V. Review work scope concepts and scenarios
 - a. Gas leak detection
 - b. WCD
 - c. CO
 - d. Contractor
 - e. Searching Chapter 8 pdf for details – Adobe Reader features
- VI. Discuss example test type concepts – practice questions

Day 2 afternoon Testing

Work scope
RESCAZ simulation