# Building and Safety Codes

Crew Leader

Learning Objectives

By attending this session, participants will be able to:

* Recognize codes and rules affecting weatherization activities.
* Apply practical solutions to code and rule-related issues.

Key Terminology

ASHRAE 62.2

Codes

Cubic feet per minute (CFM)

DOE Knob and Tube Memorandum 1988

International Residential Code (IRC)

Knob and tube wiring

National Electric Code (NEC)

National Fire Protection Association (NFPA)

Occupational Safety and Health Administration (OSHA)

Rules

U.S. Environmental Protection Agency (EPA)

Supplemental Materials

Handouts & Resources

Applicable Codes Handout.

Appropriate ASHRAE guidelines.

National Fire Protection Agency. “Combustion Clearance Tables.” <www.nfpa.org>.

National Fire Protection Agency. “NFPA211: Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances.” <www.nfpa.org>.

National Fire Protection Agency. “NFPA31: Standard for the Installation of Oil-Burning Equipment.” <www.nfpa.org>.

National Fire Protection Agency. “NFPA54: National Fuel Gas Code.” <www.nfpa.org>.

Rose, William B. “Early History of Attic Ventilation.” Building Research Council – School of Architecture, University of Illinois at Urbana-Champaign. 1995.

U.S. Department of Energy. “Knob-and-Tube Wiring: Revised Policy Superseding Guidance of 7/25/83 and 7/13/88.” Memorandum. Oct. 21, 1988.

U.S. Department of Energy. Weatherization Assistance Program. “WPN 02-6 Weatherization Activities and Federal Lead-Based Paint Regulations. Attachment B: Lead Paint Decision Chart.” 12 July 2002. <www.waptac.org>.

U.S. Department of Energy. Weatherization Assistance Program. “WPN 08-6: Lead Guidance Program Notice.” 22 Sept. 2008. <www.waptac.org>.

U.S. Department of Energy. Weatherization Assistance Program. “WPN 09-6 Lead Safe Weatherization (LSW) - Additional Materials and Information.” 22 Jan. 2009. <www.waptac.org>.

Classroom Props & Activities

For exercises, divide the class into groups of four or so using a count-off system to group people who normally don’t work together.

**Exercise – What is required when the work order says…?**

Slides 5 through 10 illustrate common weatherization work order requests. For each slide, give the groups 3-to-5 minutes to decide which codes/rules apply to the situation, list any required actions, and perform any needed calculations to size installed measures or equipment. Have each group list the group’s answers on a flip chart. Compare answers and decide as a class on the correct response(s) to each situation.

Suggested responses are listed below.

**Work order says, “Insulate over knob and tube wiring.”**

* The National Electric Code (NEC) requires that all wiring junction boxes, not just knob and tube, be flagged before insulating over them.
* NEC 394.12 specifically forbids enveloping knob and tube wiring with thermal insulation.

DOE policy allows insulating around knob and tube wiring if the state has ensured that such work is in conformance with the applicable codes in the jurisdiction where the work is being performed. Some states require that certain conditions are satisfied. For example:

* + All affected live knob and tube wiring is visually examined to see that it is in good condition and tested to see that the circuit voltage drop is less than 10%.
	+ The circuit breaker or fuse controlling the circuit is matched to the wire gauge:
		- #14 wire = 15 amp fuse/circuit breaker
		- #20 wire = 20 amp fuse/circuit breaker
	+ Correct amperage “S” type fuses are installed if the fuse panel has screw-in fuses.
	+ Affected circuits in walls are evaluated, not just visible wiring in attics or elsewhere.

**Work order says, “Add attic venting as necessary.”**

* The International Residential Code requirement for attic venting is:
	+ 1 sq. ft. of net free vent area for every 300 sq. ft. of attic floor area if there is a vapor barrier.
	+ 1 sq. ft. of net free vent area for every 150 sq. ft. of attic floor area if there is no vapor barrier (2009 IRC 806.2).
* Sloped ceiling area is included in the attic floor area for this calculation.
* Existing ventilation:
	+ Three 8-ft. x 26-ft. ceiling sections = 624 sq. ft./300 sq ft. = 2.08 sq. ft. net free vent area required.
	+ (12 in. x 18 in.)/2 [screening blocks 1/2 of the free vent area] x 2 vents =
	2 x (1 ft. x 1.5 ft.)/2 = 1.5 sq. ft. net free vent area existing.
	+ Therefore, 0.58 sq. ft. additional net free vent area is needed.
* Choices:
	+ Add one 8 in. x 10 in. vent to each end = 2 vents x (0.67 ft. x 0.83 ft.)/2 =
	0.56 sq. ft. added net free vent area.
	+ Replace existing vents with 12 in. x 24 in. vents = 2 x (12 in. x 24 in.)/2 =
	2 x (1 ft. x 2 ft.)/2 = 2 sq. ft. net free vent area.
	+ Replace existing vents with 14 in. x 24 in. vents = 2 x (1.17 ft. x 2 ft.)/2 = 2.34 sq. ft. net free vent area.

Which is correct?

* + Adding the 8 in. x 10 in. vents is the least expensive way to satisfy the code requirement, however it is usually cosmetically unacceptable.
	+ Replacing the existing vents with 12 in. x 24 in. vents creates a net free vent area that’s slightly under the code, but it’s probably close enough for most authorities.
	+ Replacing the existing vents with 14 in. x 24 in. vents creates a net free vent area that’s slightly over the code. It’s the safe choice.

Think outside the box! Depending on your local code official, you may be able to use zonal pressure diagnostics (ZPD) to establish existing net free ventilation area from existing cracks and holes. Almost universally, older houses will have sufficient existing crackage to meet ventilation code requirements without actually adding any venting!

**Work order says, “Replace bedroom window.”**

* 2006 & 2009 IRC 310.1.2 & 3 require a minimum 20 in. wide by 24 in. high, 5.7 sq. ft. clear opening area, or 5.0 sq. ft. with direct grade level access for upper-story bedroom egress windows, including habitable attics. Note: 24 in. x 20 in. = 3.34 sq. ft., meaning one or the other dimension must be greater than the code minimum. Both dimensions can exceed the minimum.
* 27 in. x 44 in. = 1,188 sq. in./144 sq. in./ft. = 8.25 sq. ft., but the existing window is single hung, allowing only half the opening, or 4.125 sq. ft.

 *Q: Is the replacement window “grandfathered?”*

*A: No. It must be an egress window.*

* A casement window is the easy answer but it won’t match the building style or appearance.
* The pictured double-hung unit is acceptable because both sashes tilt in, allowing almost the full sash area to be free of any obstruction.
* For a home built before 1978:
	+ Installers must be Lead-Safe Certified by EPA. Lead-safe work practices must be used.

**Work order says, “Replace attic hatch.”**

* The International Code Council’s International Residential Code (IRC), 2009 IRC 807.1 requires a minimum rough opening of 22 in. by 30 in. if the attic is larger than 30 sq. ft. 2009 IRC 807.1 requires a minimum 30 in. of headroom at least one point above the hatch.
* For a home built before 1978:
	+ Installers must be Lead-Safe Certified by EPA.
	+ Lead-safe work practices must be used.

**Work order says, “Install new bath fan and control.”**

* The National Electric code applies. All wiring must be done by a licensed electrician.
* Legally, a resident homeowner can wire his own home. Over the years, some Community Action Agency employees and contractors have convinced homeowners to “twist the screws and wirenuts” to save a few dollars. DO NOT DO THIS! The potential liability risks are too high.
* For homes built before 1978:
	+ Installers must be Lead-Safe Certified by EPA.
	+ Lead-safe work practices must be used.
* What is the appropriate fan CFM?
	+ ASHRAE 62-1989 (if working in multifamily units taller than 3 stories): Greater of 15 CFM/person (minimum 5 persons) or 0.35 air changes per hour (ACH) (conditioned volume).
		- 5 x 15 = 75 CFM
		- 0.35 ACH = volume x 0.35 = 9,000 cu. ft. x 0.35 = 3,150 cu. ft. per hour (CFH)/60 minutes = 52.5 CFM
		- The fan must provide at least 75 CFM.
	+ ASHRAE 62.2-2010 (if working in single or multifamily units of 3 stories or less): Bath fan must be rated at 100 CFM. If used to satisfy indoor air quality, ventilation must provide 7.5 CFM/person (occupancy determined by number of bedrooms plus 1) plus 1% of the conditioned floor area in sq. ft.
		- [7.5 CFM x (3+1)] + [0.01 x (12 ft. x 20 ft. + 16 ft. x 8 ft. + 16 ft. x 26 ft. + 16 ft. x 26 ft.)] = (7.5 x 4) + [0.01 x (240 sq. ft. + 128 sq. ft. + 416 sq. ft. + 416 sq. ft.)] = 30 + 0.01 x 1,100 sq. ft. = 30 + 11 = 41 CFM
		- The fan should be set to deliver 41 CFM continuous, 20.5 CFM, ½ hour on, ½ hour off, etc.

 *Ask students to volunteer similar situations they regularly encounter, describing what was done and why.*

**Exercise – Code Recognition (20 minutes):**

Ask class members if they know any codes that might come into play in a typical weatherization job.

* List codes on a flip chart or overhead.
* Discuss how each might or might not apply.

Conclude the exercise by handing out a list of frequently applicable codes and regulations with sources.

**Class Overview**

Field staff members can grow restless in a lecture setting. Make the class as interactive as possible by integrating workshop/exercise sessions with the lecture.

* Use the presentation, discussion, and handouts to introduce students to the key elements of tool maintenance and tracking. Use the prompts within the presentation to introduce the class exercises described in detail above.
* If there is an Internet connection in the classroom, pause the presentation at appropriate places and walk the students through the web sites where various codes, guidance and regulations can be found.
* Work must follow federal and state codes, but there may be more descriptive rules within the state technical field manual that students need to be aware of. Be sure to acquire a copy of this before the class and become familiar with local best practices. If possible, provide each participant with a copy of the state technical field manual to use as a reference in class and a resource in the field in the future.