

North Carolina Weatherization Assistance Program

RESIDENTIAL ENERGY ASSESSMENT TOOL INSTRUCTIONS

Note: Initial readings are the readings the auditor must take during the initial audit. The interim readings are the readings the crew/contractor must take during weatherization.

The nominal dimensions taken with a tape measure are less than the standard dimensions listed. For example, a modern 2x4 in. board will actually have the dimensions of a 1½x3½ in board. The options listed in the Residential Energy Assessment Tool (REAT) are the standard dimensions used by the U.S. lumber industry. Note that older homes may have different standard dimensions.



Assessment (Page 1)

General Information

1. Record the client's name, address, and telephone number.
2. **Job Number:** Record the AR4CA generated job number from the client's file.
3. **Auditor(s):** Record the names of the people conducting the Residential Energy Audit. Initials are acceptable, but they must be legible.
4. **Directions:** Record the driving directions to the client's dwelling.

Dwelling/Application Information

1. **Wind Shielding:** *For mobile homes,* record the option that best describes how it is shielded.
 - a. **Good:** A well-shielded home may be surrounded by thick vegetation in a small valley that seldom experiences windy conditions, or closely surrounded by other homes and buildings.
 - b. **Normal:** A normally shielded home may be found in a typical mobile home park where there are surrounding homes and some surrounding vegetation.
 - c. **Exposed:** An exposed home has no surrounding homes or vegetation to protect it from the wind.
2. **Number of Conditioned Stories:** Record the number of conditioned stories. Include a finished attic if it is heated or cooled. Include a basement if it is heated or cooled and the majority of its wall area is above-grade.
3. **Ambient Temp (Initial/Interim):** Record the ambient temperature at the time of the initial and interim weatherization blower door tests.
4. **CFM50 (Initial/Interim):** Record the initial and interim weatherization blower door reading in CFM50.
5. **Dwelling:** Indicate if the dwelling is Site Built or a Mobile Home.
6. **Perimeter (ft):** Record the length in feet of the perimeter of the foundation (i.e., measure around the outside of the house at the foundation). Exclude porches and attached non-conditioned spaces.
7. **Area (ft²):** Record the square foot area or floor area. For a house with a rectangular floor plan, the square foot area is the length of the house (in feet) multiplied by the width (in feet). For

houses with additions or complicated floor plans, break up the floor plan into easy-to-measure rectangles and add the square foot area of each rectangle.

8. **Ceiling Height (ft):** Record the height in feet from the floor to the ceiling. For varying heights, record the approximate percentage of the dwelling that each height comprises.
9. **Volume (ft³):** Multiply the square foot area of the house (Area ft²) by the ceiling height (Ceiling Height ft) to determine the volume of the house in cubic feet. Take varying heights into account when calculating the volume by running separate calculations for each varying height and the area it covers and then adding the volumes together for an accurate total volume.
10. **Target:** Record the target ventilation rate in CFM50. The target is determined using the Target Chart and cross-referencing the initial CFM50 rate (rounded up to the next 250 CFM) and the house volume (rounded up to the next 1000 ft³).
11. **Audit Date:** Record the date of the Residential Energy Audit.
12. **Date Work Started:** Record the date that weatherization work started (crew/shell subcontractor start date).
13. **Date Work Completed:** Record the date that weatherization work was completed. (This is not the Job Closure date.)
14. **Year Built:** Indicate the year the dwelling was built. This date should correspond to the date on the tax card located in the client file. Note that some counties report the year built as the last major renovation date. For mobile homes, the year built should correspond to the date on the license information.

Health and Safety Information

1. **Smoke Alarms:** Circle *Yes* or *No* to indicate the presence of smoke alarms. If yes, record the location and if the units tested OK. If no, record how many smoke alarms are required and where they should be located.
2. **CO Alarms:** Circle *Yes* or *No* to indicate the presence of carbon monoxide (CO) alarms. If yes, record the location and if the units tested OK. If no, record how many CO alarms are required and where they should be located.

Appliance and Heating Information

Note: The tables for Appliances and Heating Systems located on page 1 are for summary information, which is to be transferred from the detailed Appliance and Heating System information on pages 6, 7, 8, and 10 after the REAT has been completed. These summary tables are placed on page 1 so that the most important information about the type of weatherization work to be done and the level of effort required for the job can be determined by quickly scanning the front page of the REAT.

1. Appliances

- a. **Water Heater:** Circle the type of fuel the water heater uses. Check the appropriate columns to indicate whether or not the water heater passed required tests, requires repair, or requires replacement, as recorded during the audit on page 6.

- b. **Cook Stove:** Circle the type of fuel the cook stove uses. Check the appropriate columns to indicate whether or not the cook stove passed required tests or requires repair as recorded during the audit on page 6. [**Keep in mind that cook stoves may not be replaced or removed by weatherization personnel.**]

2. Heating Systems

- a. For the primary heating system and all supplemental units, circle the fuel type.
 - i. Electric (E)
 - ii. Kerosene (K)
 - iii. Natural Gas (NG)
 - iv. Oil (O)
 - v. Propane (P)
 - vi. Wood (W)
- b. For the primary heating system and all supplemental units, circle the type of unit.
 - i. Forced Air (FA)
 - ii. Gravity (G)
 - iii. Boiler (B)
 - iv. Space Heater (SH)
 - v. Unvented Space Heater (UN)
- c. For the primary heating system and all supplemental units, check the appropriate columns to indicate whether or not the heating system passed required tests, requires repair, or requires replacement, and/or should be removed as recorded during the audit. Keep in mind that supplemental heating units may not be replaced.

Client Information (Application Verification)

- 1. **Number of Persons:** Record the number of full-time occupants in the home. Check to ensure this is consistent with the number stated on the application. If the number is not consistent, notify the Coordinator of the discrepancy.
- 2. **Existing Health Condition:** Circle *Yes* or *No* to indicate whether or not the client/ other occupants have any pre-existing health conditions that could affect weatherization.

Incidental Repairs Required

- 1. Record any incidental repairs that were required in order to preserve the weatherization measures taken and circle *Yes* or *No* to indicate whether or not a National Energy Audit Tool (NEAT) or Mobile Home Energy Assessment (MHEA) will be required.

House Footprint (Page 2)

Draw the house footprint (floor plan as viewed from above) in the space provided. Record the dimensions. Record the location of windows and exterior doors. Also, record the location of any obstructions or construction details that might complicate insulation or air sealing work.

Windows (Page 3)

Window information is typically recorded by starting in the front of the house, numbering the left-most window #1, and working to the right around the house.

- 1. **Location:** Record location of window (i.e. kitchen, bedroom #1, family room). Windows may also be shown on the house footprint (page 2) and identified with corresponding numbers.

2. **Window Type:** Record the type of window.
 - a. **Awning (A):** Hinged at the top or side so that when opened, usually by turning a crank, the glass angles out from the home exterior down or to the side, depending on where the window is hinged to the home
 - b. **Door Window (DW):** Sealed in the window frame of a door and cannot be opened
 - c. **Fixed (F):** Sealed in the window frame and cannot be opened
 - d. **Jalousie (JA):** Constructed of several horizontal panes 6 in. wide that open at the same angle when a crank is turned; always single pane
 - e. **Slider (S):** Usually has one or two panes of glass and either one or both slide past the other when the window is opened; can be horizontal or vertical
 - f. **Sliding Glass Door (SGD):** Large windows that extend to the floor and can be opened to enter/exit
 - g. **Skylight (SL):** Glass or plastic windows in the ceiling
3. **Frame Type:** Record the type of window frame and sash construction materials.
 - a. **Improved Metal (IM):** (*Improved* metal frames have a thermal break between the indoor and outdoor framing members.)
 - b. **Metal (M)**
 - c. **Wood/Vinyl (WV)**
4. **Orientation:** Record the cardinal direction the window faces (N = North, S = South, E = East, W = West). If in between, choose the one that is closest to the cardinal direction.
5. **Size (in):** Record the width and height of each window. Unless the window requires replacement, measurements to the nearest inch are adequate. Record the width and height in feet of each individual window so it can be subtracted from gross wall area to estimate the number of bags of sidewall insulation that will be required (see page 12).
6. **Glazing Type:** Record the type of glazing depending on the number of panes of glass in the primary window and the characteristics of any storm window that may cover the primary window.

| | |
|---|--|
| <ol style="list-style-type: none"> a. Single Pane (SP) b. Single Wood Storm (SWS) c. Single Metal Storm (SMS) d. Single with Glass Storm (SGS) e. Single Bad Storm (SBS) | <ol style="list-style-type: none"> f. Single with Plastic Storm (SPS) g. Double Pane (DP) h. Double with Glass Storm (DGS) i. Double with Plastic Storm (DPS) j. Double Pane Low-e (DPLE) |
|---|--|
7. **Glass Panes**
 - a. **Broken (Y/N):** Write *Y* for yes or *N* for no to indicate if any glass is broken and requires replacement.
 - b. **Size (in) to Replace:** If any glass is broken and requires replacement, record the size of the pane that requires to be cut.
8. **Interior Shading:** Record the type of interior shading.

| | |
|---|--|
| <ol style="list-style-type: none"> a. Blinds or Shades (BS) b. Drapes (D) | <ol style="list-style-type: none"> c. Drapes with Blinds or Shades (DBS) d. None (N) |
|---|--|
9. **Exterior Shading:** *For mobile homes*, record the type of exterior shading.

| | |
|---|---|
| <ol style="list-style-type: none"> a. Awning (A) | <ol style="list-style-type: none"> b. Car port or Porch (CP) |
|---|---|

- c. Low-e Film (LEF)
 - d. Sun Screen (SS)
 - e. None (N)
10. **Exterior Shading %:** Record the approximate percentage of window area frequently shaded by eaves (typically 20%), porches (typically 100%), or other physical exterior barriers.
11. **Leakiness:** Record the approximate leakiness of the window type. (VT = Very Tight, T = Tight, M = Medium, L = Loose, VL = Very Loose). These are some typical leakiness values for specific window types.
- a. **Loose Leakiness (L)**
 - i. Jalousie Windows
 - b. **Medium Leakiness (M)**
 - i. Awning/Hopper Awning Windows
 - ii. Older Single/Double Hung Vertical Wood Slider Windows
 - iii. Horizontal Slider Windows
 - c. **Tight Leakiness (T)**
 - i. Newer Single/Double Hung Non-Wood Vertical Slider
 - d. **Very Tight Leakiness (VT)**
 - i. Fixed Windows
 - ii. Awning/Hopper Casement Windows

Degrade the description one level if the window panes themselves have become significantly loose in their mounting and/or a small (i.e. half-dollar sized) piece of window is broken out. Degrade the leakiness two levels if there is a larger hole in a window pane and/or an entire pane is missing. Upgrade the leakiness description one level if a storm window in average or better condition is installed.

Doors (Page 4)

Record information for the main entry doors and any other *exterior* doors.

1. **Location:** Record location of door (e.g., front, back, side). Doors may also be shown on the house footprint (page 2) and identified with corresponding numbers.
2. **Door Type:** Record type of door.

| | |
|---------------------------|-------------------------------------|
| a. Wood Hollow Core (WHC) | d. Single Sliding Glass (SSG) |
| b. Wood Solid (WSC) | e. Double Sliding Glass (DSG) |
| c. Steel Insulated (SI) | f. Standard Mobile Home Door (SMHD) |
3. **Orientation:** Record the cardinal direction the door faces.
4. **Size (ft):** Record the width and height in feet of each individual door so it can be subtracted from gross wall area to estimate the number of bags of sidewall insulation that will be required (see page 12).
5. **Storm Door Condition:** Select one of the three choices for the presence and condition of the storm door (A = Adequate, D = Deteriorated, N = None).

6. **Weatherstripping:** Record if weatherstripping is required to reduce infiltration and improve comfort (A = Adequate, D = Deteriorated, N = None).
7. **Door Sweep:** Record if the door requires a door sweep to reduce infiltration and improve comfort (A = Adequate, D = Deteriorated, N = None).
8. **Glass Panes:**
 - a. **Broken (Y/N):** Write Y for yes or N for no to indicate if any glass is broken and requires replacement.
 - b. **Size (in) to Replace:** If any glass is broken and requires replacement, record the size of the pane that requires cutting.
9. **Comments:** Record any observations that will affect potential weatherization work on the doors.

Lighting (Page 4)

For each lighting fixture that is regularly used over one hour per day, record the following information.

1. **Location:** Record which room the lighting fixture is located in.
2. **Existing Wattage:** Record the total (combined) wattage of all incandescent bulbs in the lighting fixture.
3. **Replacement CFL Wattage:** Using the *Wattage Equivalency Table*, select the CFL lamp that will maintain or somewhat improve existing lighting levels. Record the wattage of the CFL selected.
4. **Fixture Type:** Circle the appropriate choice to indicate the type of fixture (Standard, Flood, Other).
5. **Hours per Day Used:** Record the average number of hours per day the lamp is normally on.
6. **New Lighting Cost per Bulb:** Calculate the new lighting cost for each bulb installed, taking into account any added cost in dollars per lamp that would not normally be associated with the installation of a compact fluorescent and not included in the standard material costs. For example, replacing a fixture's harp to allow the CFL to fit, or other size modification.
7. **Comments:** Record any observations that will affect potential lighting retrofits.

Refrigerators and Freezers (Page 5)

Note: The savings to investment ratio (SIR) must be done on a current refrigerator SIR calculator.

1. **Year Manufactured:** Record the year the refrigerator was manufactured from the nameplate.
2. **Manufacturer:** Record the brand name of the refrigerator.
3. **Model Number:** Record the model number from the nameplate.
4. **Serial Number:** Record the serial number from the nameplate.
5. **Type:** Record the type of refrigerator/freezer configuration (Side-by-Side, Top Freezer, Bottom Freezer).
6. **Total Cubic Feet (ft³):** Record the total (combined) cubic foot volume of the freezer and fresh food compartment from the nameplate.

7. **Icemaker:** Circle *Yes* or *No* to indicate if an icemaker is present.
8. **Door Hinge:** Circle *Left* or *Right* to indicate which side of the refrigerator the hinges are located on.
9. **Dimensions:** Record the width, depth, and height of the refrigerator in inches.
10. **Condition of Door Seals:** Record the condition of the door seal on the existing refrigerator (Good, Some Wear, Gaps Visible).
11. **Is Water Hookup Copper Tubing:** Circle *Yes* or *No* to indicate whether or not the water hookup tubing is made of copper.
[If using an approved computer database, metering is not necessary.]
12. **Metering – Total Kilowatt Hours (kWh):** Record the results of the two-hour (minimum) refrigerator metering from the plug-in power meter. Record the kilowatts consumed per hour.
13. **Metering – Duration (minutes):** Record the plug load metering duration in minutes.
14. **Metering – Peak Kilowatts (kWh):** From the plug load meter, record the results of the two-hour refrigerator metering. Record the peak kilowatts. If the peak watts exceed approximately .4 kilowatts, the defrost heaters came on during the test and the results will not be accurate.
15. **Cost per Kilowatt:** Use actual electric rate at dwelling.
16. **Kilowatts per Year:** Assuming the peak watts during the metering were less than 390 watts, use the equation to estimate the annual energy use of the refrigerator. The equation simplifies to $[(\text{kWh metered}/\text{time metered in minutes}) \times 60 = \text{kWh} \times 8766 \times *1.08 = \text{kWh per year}]$. (*Omit multiplying by 1.08 if metering for 24 hours.)
17. **What is the narrowest sized door opening that must be passed through (in):** Record the width and height of the narrowest door that a new refrigerator will have to fit through during delivery.
18. **Comments:** Record any observations that will affect replacing the existing refrigerator. Record if there are any special features in comments.

Electrical Service Panel (Page 5)

1. **Location:** Record the location of the main and sub-electrical panels.
2. **Manufacturer:** Record the manufacturer.
3. **Size Amp Rating:** Record the size amp rating.
4. **Type:** Circle the appropriate choice to indicate if the panel has circuit breakers or fuses.
5. **Cover:** Circle the appropriate choice to indicate if the panel has a cover.
6. **Knob and Tube Wiring Present:** Circle the appropriate choice to indicate if the dwelling has knob and tube wiring and indicate the location where it is found.
7. **Knob and Tube Wiring Active:** Circle the appropriate choice to indicate if the dwelling's knob and tube wiring is active.
8. **Aluminum Wiring Present:** Circle the appropriate choice to indicate if the dwelling has aluminum wiring.
9. **Comments:** Record any observations that will affect potential lighting retrofits.

Fuel-fired Cook Stove Inspection (Page 6)

1. **Fuel-fired Stove Present:** Circle *Yes* or *No* to indicate whether or not a fuel-fired cook stove is present.
2. **Fuel Leak Present:** Circle *Yes* or *No* to indicate whether or not a fuel leak is present.
3. **If so, Location of Leak:** If there is a fuel leak, record its location (e.g., supply line before connection to stove, at stove/fuel supply line connection, at burner feed tube, etc.).
4. **Type of Fuel:** Circle the appropriate choice to indicate the type of fuel that the cook stove uses (NG = Natural Gas, LP = Liquid Propane).
5. **Stove Manufacturer:** Record the manufacturer of the cook stove.
6. **Flex Connector Type:** Circle the appropriate choice to indicate the type of flexible connector pipe that is used to supply fuel to the cook stove (Stainless Steel, Epoxy-Coated, Hard-Piped, Copper, *Brass). *If the existing connector is brass, it **must** be replaced with a stainless steel or epoxy-coated brass connector.
7. **CO Testing:**
 - a. **Oven:** Record the initial and interim weatherization as-measured CO readings under the columns titled *CO*. Record the initial and interim weatherization air-free CO readings under the columns titled *AF*.
 - b. **Burners:** Record the initial and interim weatherization as-measured CO readings under the columns titled *CO* for each burner.

Exhaust Vents (Page 6)

At least one bathroom in each dwelling must have an operating bath fan capable of continuous exhaust. Existing kitchen fans must pull at least 75 CFM. Existing bathroom fans must pull at least 25 CFM. Replaced kitchen fans must have a measured exhaust of at least 100 CFM. Replaced bathroom fans must have a measured exhaust of at least 50 CFM. In order to meet this requirement the installed fans must be 70 and 120 CFM, respectively.

1. Circle *Yes* or *No* to indicate whether or not the dryer vent, kitchen exhaust, bathroom exhaust, and other exhaust vents are operational. Circle *None* if there is no vent. Circle *Yes* or *No* to indicate whether or not the vent exhausts to the outdoors.
2. Record the CFM from the flow pan measurement for the kitchen exhaust, bathroom exhaust, and other exhaust vents. The air flow of kitchen exhaust fans may be difficult to test with standard flow pans.

Unvented Space Heaters (Page 6)

1. **Location:** Record the location of any unvented space heater.
2. **Manufacturer:** Record the manufacturer of the unit.
3. **Model Number:** Record the model number of the unvented space heater (not the serial number).

4. **Btu per hour:** Record the Btu input (in Btu/hour) from the nameplate.
5. **O₂ Depletion Sensor:** Write *Y* for yes or *N* for no to indicate whether or not the O₂ depletion sensor is present.
6. **CO (ppm):** Record the results of the CO test in parts per million (ppm).
7. **Primary/Supplemental:** Record if the unvented space heater is the primary heat source or a supplemental heat source.
8. **Fuel Shutoff:** Write *Y* for yes or *N* for no to indicate the presence of a fuel shutoff valve.
9. **Fuel Leak:** Check *Yes* or *No* to indicate the presence of a fuel leak as determined by a fuel sniffer.
10. **Fuel Leak Location:** If the fuel sniffer confirms a leak, record the exact location of the leak so that it can be fixed.
11. **Comments:** Record any observations concerning which units will be repaired, removed, replaced, and/or vented.

Fuel Tank (Page 6)

1. **Location:** Record the location of the fuel tank.
2. **Oil Tank:** Record the condition of the major oil tank components (A = Adequate, D = Deteriorated, N = None).

| | | | |
|----------|--------------|-----------------|------------------|
| a. Stand | c. Cap Block | e. Fill Cap | g. Fuel Line |
| b. Legs | d. Vent Cap | f. 2 Line Gauge | h. Cut-Off Valve |
3. **LP Tank:** Record the condition of cap block, fuel line, and cut-off valve (A = Adequate, D = Deteriorated, N = None). ✓
4. **If tank is located in conditioned space, is vent cap run to outdoors:** Circle *Yes* or *No* to indicate whether or not the vent cap pipe runs outdoors (if an indoor tank oil tank exists).
5. **Is fill cap run to outdoors:** Circle *Yes* or *No* to indicate whether or not the fill cap pipe runs outdoors (if an indoor tank oil tank exists).

Water Heater Inspection (Page 7)

Items 1-6 apply to all tank storage water heaters. Items 7-23 only apply to fuel fired water heaters.

1. **Pass/Fail:** Circle *Pass* or *Fail* to indicate the results of the safety tests conducted on the water heater. If the water heater fails, record why (e.g., high CO, tank corroded and leaking, etc.) in the *Comments* section.
Repair or will Replace with: Circle *Repair* or *Replace* to indicate whether or not the existing water heater will be repaired or replaced with a new unit. If the unit is replaced, record the type and size of the replacement water heater.
2. **Location:** Record the location of the existing water heater.
Type of Fuel: Circle the type of fuel that the water heater uses (Natural Gas, Propane, Electric).
3. **Manufacturer:** Record the manufacturer of the water heater.
Model Number: Record the model number of the water heater.
Serial Number: Record the serial number of the water heater.

4. **Rated Input (Btu/hour):** Record the rated Btu input (Btu/hour) from the nameplate.
Size (gals): Record the size of the water heater tank in gallons.
Measured Temperature (°F): Record the hot water temperature in degrees Fahrenheit at the faucet that is as close to the water heater as is practical.
5. **Existing Insulation Type:** Select one of the two insulation types used in the existing water heater (Fiberglass, Polyurethane), or circle *None* if not applicable. Often an access plate can be removed to view the insulation and determine its type and thickness.
Existing Insulation R-Value: Record the existing tank insulation R-Value. This R-value might be listed on the water heater's nameplate or the unit's specification sheet.
6. **Can Water Heater be Insulated:** Circle *Yes* or *No* to indicate whether or not there is adequate clearance to wrap the water heater with an insulation blanket.
Can First 5 Feet of Hot Water Line be Insulated: Circle *Yes* or *No* to indicate whether or not there is adequate clearance to install pipe insulation on the first 5 feet of the hot water line. On fuel-fired water heaters, the vent may not allow sufficient clearance for the safe installation of pipe insulation.
Can First 5 Feet of Cold Water Line be Insulated: Circle *Yes* or *No* to indicate whether or not there is adequate clearance to install pipe insulation on the first 5 feet of the cold water line. On fuel-fired water heaters, the vent may not allow sufficient clearance for the safe installation of pipe insulation.
Is Pressure Relief Piping Required: Circle *Yes* or *No* to indicate whether or not piping is required at the outlet of the pressure and temperature relief valve. If the valve pops, hot water could scald occupants and damage the house if no discharge piping has been installed on the pressure and temperature valve outlet.
Is There Evidence of Flame Rollout: Circle *Yes* or *No* to indicate the presence of scorch marks near the fuel-fired burner access plate.
Is Pilot Safety Shutoff OK: Circle *Yes* or *No* to indicate if the fuel valve closes when the pilot flame goes out.
7. **Is Fuel Leak Present:** Circle *Yes* or *No* to indicate the presence of a fuel leak as determined by a fuel sniffer.
Location of Leak: If the fuel sniffer confirms a fuel leak, record the exact location of the leak so it can be fixed.
8. **Is Fuel Natural Gas:** Circle *Yes* or *No* to indicate whether or not the water heater fuel is natural gas.
Clock Meter: If the water heater fuel is natural gas, clock the meter. Record which "Dial" (in cubic feet) on the gas meter was clocked. Record how many seconds it took for the dial to make one full revolution. From the *Carl's Calibration & Repair card/Southeastern Weatherization Field Guide* provided, look up the Btu per hour for the dial clock and time for one revolution.
Within 10% of Rated Btu: Circle *Yes* or *No* to indicate whether or not the clocked Btu per hour is within 10% of the rated Btu per hour from the nameplate.

Carl's Calibration & Repair Card / Southeast Weatherization Field Guide
Input in Thousands of Btu/hr for 1000 Btu/cf Gas

| Seconds per Revolution | Size of Meter Dial | | | Seconds per Revolution | Size of Meter Dial | | | Seconds per Revolution | Size of Meter Dial | | |
|------------------------------|--------------------|-----------|-----------|------------------------------|--------------------|-----------|-----------|------------------------------|--------------------|-----------|-----------|
| | ½ cu. ft. | 1 cu. ft. | 2 cu. ft. | | ½ cu. ft. | 1 cu. ft. | 2 cu. ft. | | ½ cu. ft. | 1 cu. ft. | 2 cu. ft. |
| 15 | 120 | 240 | 480 | 40 | 45 | 90 | 180 | 70 | 26 | 51 | 103 |
| 16 | 112 | 225 | 450 | 41 | 44 | 88 | 176 | 72 | 25 | 50 | 100 |
| 17 | 106 | 212 | 424 | 42 | 43 | 86 | 172 | 74 | 24 | 48 | 97 |
| 18 | 100 | 200 | 400 | 43 | 42 | 84 | 167 | 76 | 24 | 47 | 95 |
| 19 | 95 | 189 | 379 | 44 | 41 | 82 | 164 | 78 | 23 | 46 | 92 |
| 20 | 90 | 180 | 360 | 45 | 40 | 80 | 160 | 80 | 22 | 45 | 90 |
| 21 | 86 | 171 | 343 | 46 | 39 | 78 | 157 | 82 | 22 | 44 | 88 |
| 22 | 82 | 164 | 327 | 47 | 38 | 77 | 153 | 84 | 21 | 43 | 86 |
| 23 | 78 | 157 | 313 | 48 | 37 | 75 | 150 | 86 | 21 | 42 | 84 |
| 24 | 75 | 150 | 300 | 49 | 37 | 73 | 147 | 88 | 20 | 41 | 82 |
| 25 | 72 | 144 | 288 | 50 | 36 | 72 | 144 | 90 | 20 | 40 | 80 |
| 26 | 69 | 138 | 277 | 51 | 35 | 71 | 141 | 94 | 19 | 38 | 76 |
| 27 | 67 | 133 | 267 | 52 | 35 | 69 | 138 | 98 | 18 | 37 | 74 |
| 28 | 64 | 129 | 257 | 53 | 34 | 68 | 136 | 100 | 18 | 36 | 72 |
| 29 | 62 | 124 | 248 | 54 | 33 | 67 | 133 | 104 | 17 | 35 | 69 |
| 30 | 60 | 120 | 240 | 55 | 33 | 65 | 131 | 108 | 17 | 33 | 67 |
| 31 | 58 | 116 | 232 | 56 | 32 | 64 | 129 | 112 | 16 | 32 | 64 |
| 32 | 56 | 113 | 225 | 57 | 32 | 63 | 126 | 116 | 15 | 31 | 62 |
| 33 | 55 | 109 | 218 | 58 | 31 | 62 | 124 | 120 | 15 | 30 | 60 |
| 34 | 53 | 106 | 212 | 59 | 30 | 61 | 122 | 130 | 14 | 28 | 55 |
| 35 | 51 | 103 | 206 | 60 | 30 | 60 | 120 | 140 | 13 | 26 | 51 |
| 36 | 50 | 100 | 200 | 62 | 29 | 58 | 116 | 150 | 12 | 24 | 48 |
| 37 | 49 | 97 | 195 | 64 | 29 | 56 | 112 | 160 | 11 | 22 | 45 |
| 38 | 47 | 95 | 189 | 66 | 29 | 54 | 109 | 170 | 11 | 21 | 42 |
| 39 | 46 | 92 | 185 | 68 | 28 | 53 | 106 | 180 | 10 | 20 | 40 |

9. Main Vent/Chimney

- a. **Is Main Vent/Chimney OK:** Circle Yes or No to indicate if the water heater vent or chimney complies with applicable codes. If No, circle all of the choices below that apply. The questions listed for each choice are single examples; there may be other situations that warrant circling that particular choice.
- I. **Type:** Is single-wall vent used in unconditioned space?
 - II. **Location:** Are the water heater and vent located in a bedroom?
 - III. **Clearance:** Is the vent too close to combustible materials like drywall, studs, or joists?
 - IV. **Height:** Is the vent outlet within 10 feet of the roof peak, but less than 2 feet taller than the roof peak?
 - V. **Size:** Has the vent diameter been reduced in violation of code?
 - VI. **Cap:** Does the vent terminate with an appropriate vent cap?
 - VII. **Liner:** Does the water heater vent to an unlined brick chimney?
 - VIII. **Mortar:** Is the mortar in a brick chimney deteriorated?
 - IX. **Flashing:** Are there signs of water leakage around inadequate or missing chimney flashing?

- X. **Unused Flue Holes:** Does the water heater vent to a chimney with open, unused flue holes?
 - XI. **Thimble:** Does the water heater vent through a wall without an approved thimble (collar)?
 - XII. **Other:** If the reason for *No* is not listed above, circle *Other* and record the reason in the *Comments* section provided.
- b. **Chimney Type:** Record the type of chimney (e.g., metal, brick, etc.).
Chimney Size: Record the size of the chimney in inches (e.g., 9 in. by 12 in., 9 in. diameter, etc.).
Chimney Height: Record the height of the chimney in feet.
- c. **Liner:** Circle *Existing* or *Required* to indicate whether or not an existing chimney liner is present.
Liner Type: Record the type of existing liner or the type of liner required.
Liner Size: Record the size of the existing liner's length and width in inches or the size of the required liner's length and width in inches.
Liner Height: Record the height in feet of the existing liner or the height in feet of the liner required.

10. Vent Connector

- a. **Is Vent Connector from Water Heater to Chimney OK:** Circle *Yes* or *No* to indicate whether or not the vent connector from water heater to chimney complies with applicable codes. If *No*, circle all of the choices below that apply. The questions listed for each choice are single examples; there may be other choices that warrant circling that particular one.
- I. **Type:** Is the proper type of pipe (e.g., single-wall vent) used in unconditioned space?
 - II. **Connections:** Are the vent pipe sections secured properly with sheet metal screws, or are snap connectors securely fastened?
 - III. **Corroded:** Is the vent pipe corroded or otherwise leaky?
 - IV. **¼ in. Rise per Ft:** Is the vent inclined at least ¼ inch vertically for every foot of horizontal run? Any condensate inside the vent should flow back towards the water heater.
 - V. **Excessive Elbows:** Does the vent have more than two elbows? One elbow has as much resistance to airflow as 20 feet of straight vent pipe.
 - VI. **Clearance:** Is the vent connector too close to combustible materials like drywall, studs, or joists?
 - VII. **Other:** If the reason for *No* is not listed above, circle *Other* and record the reason in the *Comments* section provided.
- b. **Vent Connector Type:** Record the vent connector type (e.g., single-wall, B vent, etc.).
Vent Connector Size: Record the vent connector diameter size in inches.
Vent Connector Run: Record the vent connector run length to the chimney in feet.

11. **Is Added Combustion Air Required:** Circle *Yes* or *No* to indicate whether or not additional venting is required to bring combustion air to the water heater. The water heater closet or

mechanical room must be at least 50 cubic feet in volume for every 1000 Btu/hour of rated input, otherwise combustion air venting must be added. For example, a 30,000 Btu/hour water heater would require at least 600 cubic feet (30,000/50) of open space, which is slightly less than a room measuring 9 ft by 9 ft with an 8 ft ceiling.

Rated kBtu Input: Record the rated kBtu input.

12. **kBtu Allowed:** To calculate the Btu/hour allowed in an existing water heater closet, measure the length (L), width (W), and height (H) of the water heater closet or mechanical room in feet. Multiply $L \times W \times H$ to determine the cubic foot volume of the water heater closet. Divide the volume by 50 to determine the allowed Btu/hour rating allowed in thousands of Btu/hour. Record the answer in the space provided.
13. **kBtu Required:** To calculate the Btu required, subtract the *kBtu Allowed* result (12) from the *Rated Btu Input* result (11). Record the answer in the space provided.
14. **in² of NFA (Net-Free Area) Combustion Air Required:** Record the kBtu Required from (17) and divide by 1 (if getting additional air from indoors), by 4 if getting additional air from outdoors) or by 2 (if getting additional air from horizontal piping passing through two walls – rarely used) and then multiplying by 2. If getting additional air from indoors, the size of each open shall not be less than 100 in² of NFA.
15. **NFA Vent Size Required (High):** Record the width (W) and height (H) in inches of a grill that will fit high on the water heater closet door or wall. Multiply $W \times H \times 0.75$ to determine the NFA of the specified grill. This should equal at least half of the value computed in (14) above. If not, record a larger grill and repeat the $W \times H \times 0.75$ calculation. If the door to the water heater closet is a wood louvre door, multiply $W \times H \times 0.25$ to determine the NFA.
Size High: Record the answer in the space provided.
16. **NFA Vent Size Required (Low):** Record the width (W) and height (H) in inches of a grill that will fit low on the water heater closet door or wall. Multiply $W \times H \times 0.75$ to determine the NFA of the specified grill. This should equal at least half of the value computed in (14) above. If not, record a larger grill and repeat the $W \times H \times 0.75$ calculation. If the door to the water heater closet is a wood louvre door, multiply $W \times H \times 0.25$ to determine the NFA.
Size Low: Record the answer in the space provided.

Diagnostic Inspection of Water Heater (Page7)

17. **CAZ Worst Case WRT Outside:** For initial and interim weatherization tests, complete the combustion appliance zone (CAZ) sheet on page 9 and recreate worst case. Record worst case pressure, in Pa (Pascals), in CAZ with reference to (WRT) the outdoors, in the space provided.
18. **Draft (Worst Case):** Record the initial and interim weatherization draft in the water heater vent under *worst case* conditions in Pa.
19. **CO Living Area:** Measure and record the CO level in the living area under *normal* conditions in ppm.
20. **CO Flue Gases:** Measure the CO level in the water heater vent under *normal* conditions. Record the as-measured value indicated by *CO* on the Bacharach PCA 55 display. The as-measured CO

should be less than 100 ppm. Record the air-free value indicated by *CF* on the Bacharach PCA 55 display. The air-free CO should be less than 400 ppm.

21. **Stack Temperature:** On both sides of the baffle, measure for each port and record the stack temperature of the water heater indicated by *TS* on the Bacharach PCA 55 display.
22. **Oxygen Percentage:** On both sides of the baffle, measure for each port and record the percentage of oxygen in the water heater flue gases indicated by *O₂* on the Bacharach PCA 55 display.
23. **Efficiency Percentage:** On both sides of the baffle, measure for each port and record the percentage efficiency of the water heater indicated by *EF* on the Bacharach PCA 55 display.
24. **Comments:** Record any important observations regarding the water heater.

Combustion Fuel Heating Unit Inspection (Page 8)

1. **Pass/Fail:** Circle *Pass* or *Fail* to indicate the results of the safety tests conducted on the heating system. If the heating system fails, record why (e.g., high CO, corroded heat exchanger, etc.) in the *Comments* section.

Repair or will Replace with: Circle *Repair* or *Replace* to indicate if the existing heating system will be repaired or replaced with a new unit. If the unit is to be replaced, record the type and size of the replacement heating system.

2. **Location:** Record the location of the existing heating system.

Type of Fuel: Circle the type of fuel that the heating system uses.

- | | |
|---------------------|-----------------|
| a. Natural Gas (NG) | d. Wood (W) |
| b. Propane (P) | e. Kerosene (K) |
| c. Oil (O) | |

Type of Unit: Record the type of heating system.

- | | |
|---------------------------|--------------------------------|
| a. Forced Air (FA) | e. Vented Space Heater (VSH) |
| b. Gravity Furnace (GF) | f. Unvented Space Heater (USH) |
| c. Steam Boiler (SB) | g. Other (O) |
| d. Hot Water Boiler (HWB) | |

3. **Manufacturer:** Record the manufacturer of the unit.

Model Number: Record the model number of the heating system.

Serial Number: Record the serial number of the heating system.

4. **Rated Input:** Record the rated Btu input (in Btu per hour) from the nameplate.

Rated Output: Record the rated Btu output (in Btu per hour) from the nameplate.

System: Circle *Primary* or *Supplemental* to indicate if the heating system is the dwelling's primary source of heat or a supplemental source of heat.

5. **Is Fuel Natural Gas:** Circle *Yes* or *No* to indicate whether or not the heating system fuel is natural gas.

Clock Meter: If the heating system fuel is natural gas, clock the meter with the heating system firing. Record which "Dial" (in cubic feet) on the gas meter was clocked. Record how many seconds it took for the dial to make one full revolution. From the *Carl's Calibration & Repair*

card/Southeast Weatherization Field Guide table provided below *Water Heater Inspection question #6*, look up the Btu per hour for the dial clock and time for one revolution.

Within 10% of Rated Btu: Circle *Yes* or *No* to indicate whether or not the clocked Btu per hour is within 10% of the rated Btu per hour from the nameplate.

6. **Fuel-fired Leak Present:** Circle *Yes* or *No* to indicate whether or not a leak is present as determined by a fuel sniffer.
Location of Leak: If the fuel sniffer confirms a fuel leak, record the exact location of the leak so that it can be fixed.
7. **Is Clearance from Heating Unit to Combustibles OK:** Circle *Yes* or *No* to indicate whether or not clearances comply with code. If *No*, circle the building surface that is too close to heating unit (Ceiling, Walls, Floors).
8. **Automatic Vent Damper:** Circle *Present* or *Recommended* to indicate whether or not an automatic vent damper is already present or if it is missing and recommended.
Oil Furnace Retention Head: If the heating system fuel is oil, circle *Present* or *Recommended* to indicate whether or not a retention head is already present or if it is missing and recommended.
9. **Circuit Breaker/Fuse Size at Service Panel:** Record the amp rating of the circuit breaker or fuse serving the heating unit from the service panel.
Circuit Breaker/Fuse Size at Disconnect: Record the amp rating of the circuit breaker or fuse that is part of the electrical disconnect.
10. **Thermostat Location:** Record location of thermostat that controls the heating system.
Thermostat Anticipator Setting: Record the anticipator setting, which is visible when the thermostat cover is removed.
Mercury: Circle *Yes* or *No* to indicate whether or not the thermostat uses a mercury switch.
Smart Thermostat: Circle *Yes* or *No* to indicate whether or not the thermostat is a smart thermostat (see NC Weatherization Installation Standards for more information on smart thermostats).
Temperature Day/Night: Record the daytime and nighttime thermostat set points.
11. **Is Heating Unit on Separate Circuit:** Circle *Yes* or *No* to indicate whether or not the heating unit is supplied with electricity by a dedicated circuit that serves no other loads.
Is There an Electrical Disconnect: Circle *Yes* or *No* to indicate whether or not a disconnect to shut off the electrical power to the heating unit is present. (A circuit breaker in the main electrical panel does not count as a disconnect.)
Are There Any Burned Wires: Circle *Yes* or *No* to indicate whether or not scorch marks on wire insulation are present. This may indicate previous electrical overloads.
Is Heat Exchanger OK: Circle *Yes* or *No* to indicate whether or not the heat exchanger is free from leaks and excessive corrosion.
Visual Inspection of Safety Controls: Circle *Yes* or *No* to indicate whether or not safeties seem to be in place and that there is no loose, disconnected, or jumped wiring (e.g., door switch). If the unit is fuel-fired and has a standing pilot light, you may want to blow out the pilot to make sure the safety stops the flow of fuel to the pilot light. You should hear a soft click within approximately 45 seconds when the fuel flow shuts off.

Does Blower Need Cleaning: Circle *Yes* or *No* to indicate whether or not the blower requires cleaning.

Is Blower Noisy: Circle *Yes* or *No* to indicate whether or not the blower is excessively noisy, which may indicate that the blower motor bearings are worn out and the motor requires replacing.

Is This Unit Sealed Combustion: Circle *Yes* or *No* to indicate whether or not the heating unit draws combustion air directly from outdoors and exhausts combustion gases with a fan (no draft diverter present).

12. **Filter**

- a. **Filter Present:** Circle *Yes* or *No* to indicate whether or not an air filter is present to protect the heating system. If *Yes*, record the location of the filter (e.g., return duct at unit, return grill in hall).
- b. **Type:** Record type of furnace filter (e.g., disposable fiberglass filter, disposable pleated filter, cleanable/reusable filter).
- c. **Size:** Record the length and width of the filter in inches.
- d. **Reusable – Cleaned and Replaced:** If the air filter is cleanable/reusable, circle *Yes* or *No* to indicate whether or not the filter was cleaned and replaced.
- e. **Clean/Dirty:** Circle *Clean* or *Dirty* to indicate the cleanliness of the preexisting furnace filter.
- f. **Quantity to Leave:** Record how many air filters will be required to replace the existing filters and leave an extra six-month supply with the client.

13. **Main Vent/Chimney**

- a. **Is Main Vent/Chimney OK:** Circle *Yes* or *No* to indicate whether or not the heating system vent or chimney complies with applicable codes. If *No*, circle all of the choices below that apply. The questions listed for each choice below are single examples; there may be other situations that warrant circling that particular choice.
 - i. **Type:** Is single-wall vent used in unconditioned space?
 - ii. **Location:** Are the heating unit and vent located in a bedroom or other inappropriate area?
 - iii. **Clearance:** Is the vent too close to combustible materials like drywall, studs, or joists?
 - iv. **Height:** Is the vent outlet within 10 feet of the roof peak, but less than 2 feet taller than the roof peak?
 - v. **Size:** Has the vent diameter been reduced in violation of code?
 - vi. **Cap:** Does the vent terminate with an appropriate vent cap?
 - vii. **Liner:** Does the heating unit vent to an unlined brick chimney?
 - viii. **Mortar:** Is the mortar in a brick chimney deteriorated?
 - ix. **Flashing:** Are there signs of water leakage around inadequate or missing chimney flashing?
 - x. **Unused Flue Holes:** Does the unit vent to a chimney with open, unused flue holes?

- xi. **Thimble:** Does the heating unit vent through a wall without an approved thimble (collar)?
 - xii. **Other:** If the reason for *No* is not listed above, circle *Other* and record the reason in the *Comments* section provided.
- b. **Chimney Type:** Record the chimney type (e.g., brick).
Chimney Size: Record the chimney length and width in inches (e.g., 9 inches square, 9 inches by 12 inches).
Chimney Height: Record the height of the chimney in feet.
- c. **Liner:** Circle *Existing* or *Required* to indicate whether or not a chimney liner already exists.
Liner Type: Record the type of existing liner or the type of liner required.
Liner Size: Record the length and width in inches of the existing liner or the length and width in inches of the liner required.
Liner Height: Record the height in feet of the existing liner or the height in feet of the liner required.

14. **Vent Connector**

- a. **Is Vent Connector From Heating System to Chimney OK:** Circle *Yes* or *No* to indicate whether or not the vent connector from the heating unit to the chimney complies with applicable codes. If *No*, circle all of the choices that apply below. The questions listed for each choice below are single examples; there may be other situations that warrant circling that particular one.
- i. **Proper Type Pipe:** Is single-wall pipe used in unconditioned space?
 - ii. **Connected Properly:** Are the vent pipe sections secured with sheet metal screws, or are snap connectors securely fastened?
 - iii. **Leaky or Corroded:** Is the vent pipe corroded or otherwise leaky?
 - iv. **¼ in. Rise per ft:** Is the vent inclined at least ¼ inch vertically for every foot of horizontal run? Any condensate inside the vent should flow back towards the heating system.
 - v. **Excessive Elbows:** Does the vent have more than two elbows? One elbow has as much resistance to air flow as 20 feet of straight vent pipe.
 - vi. **Clearance:** Is the vent connector too close to combustible materials like drywall, studs, or joists?
 - vii. **Other:** If the reason for *No* is not listed above, circle *Other* and record the reason in the *Comments* section provided.
- b. **Vent Connector Type:** Record the vent connector type (e.g., single-wall, B vent).
Vent Connector Size: Record the vent connector diameter in inches.
Vent Connector Run: Record the vent connector run length to the chimney in feet.

15. **Is Combustion Air Venting Required/Rated kBtu Input:** Circle *Yes* or *No* to indicate whether or not additional venting is required to bring combustion air to the heating system. The CAZ must be at least 50 cubic feet in volume for every 1000 Btu/hour of rated input, otherwise combustion air venting must be added. For example, an 80,000 Btu /hour furnace would require

at least 1600 cubic feet (80,000/50) of open space, which is slightly less than a room measuring 15 ft by 15ft with an 8-ft ceiling.

Rated kBtu Input: Record the rated kBtu input.

16. **kBtu Allowed:** To calculate the Btu/hour allowed in an existing CAZ, measure the length (L), width (W), and height (H) of the CAZ in feet. Multiply $L \times W \times H$ to determine the cubic foot volume of the CAZ. Divide the volume by 50 to determine the allowed Btu/hour rating allowed in thousands of Btu/hour. Record the answer in the space provided.
17. **kBtu Required:** To calculate the kBtu required, subtract the *kBtu Allowed* result (16) from the *Rated Btu Input* result (15). Record the answer in the space provided.
18. **in² of NFA (Net-Free Area) Combustion Air Required:** Record the kBtu Required (17) and divide by 1 (if getting additional air from indoors), by 4 if getting additional air from outdoors) or by 2 (if getting additional air from horizontal piping passing through two walls – rarely used) and then multiplying by 2. If getting additional air from indoors, the size of each open shall not be less than 100 in² of NFA.
19. **NFA Vent Size Required (High):** Record the width (W) and height (H) in inches of a grill that will fit high on the CAZ door or wall. Multiply $W \times H \times 0.75$ to determine the NFA of the specified grill. This should equal at least half of the value computed in (18) above. If not, record a larger grill and repeat the $W \times H \times 0.75$ calculation. If the door to the CAZ is a wood louvre door, multiply $W \times H \times 0.25$ to determine the NFA.
Size High: Record the answer in the space provided.
20. **NFA Vent Size Required (Low):** Record the width (W) and height (H) in inches of a grill that will fit low on the CAZ door or wall. Multiply $W \times H \times 0.75$ to determine the NFA of the specified grill. This should equal at least half of the value computed in (18) above. If not, record a larger grill and repeat the $W \times H \times 0.75$ calculation. If the door to the CAZ is a wood louvre door, multiply $W \times H \times 0.25$ to determine the NFA.
Size Low: Record the answer in the space provided.

Diagnostic Inspection of Combustion Fuel Heating System (Page 8)

21. **CAZ Worst Case WRT Outside:** For initial and interim weatherization tests, complete the CAZ sheet on page 9 and recreate worst case. Record worst case pressure in CAZ WRT outdoors in Pa in the space provided.
22. **Draft (Worst Case):** Record initial and interim weatherization draft in the heating system vent under *worst case* conditions in Pa.
23. **CO Living Area:** Measure and record the CO level in the living area in ppm under *normal* conditions.
24. **Smoke # (Oil Systems):** Measure and record the smoke number by visually comparing the filter paper from a smoke kit test to a smoke scale. Smoke numbers 2 and higher require further action.

25. **Heat Rise:** Measure and record the supply and return air temperature when the heating unit is firing. Compute and record the heat rise across the heat exchanger and record in degrees Fahrenheit (Supply Temperature – Return Temperature = Heat Rise).
26. **Draft Inducer and Pressure Switch OK:** Circle *Yes* or *No* to indicate whether or not the draft inducer functions properly. Circle *Yes* or *No* to indicate whether or not the pressure switch tests OK.
27. **CO Flue Gases:** Measure the CO level in the heating system vent under *normal* conditions. Record the as-measured value indicated by *CO* on the Bacharach PCA 55 display. The as-measured CO should be less than 100 ppm. Record the air-free value indicated by *CF* on the Bacharach PCA 55 display. The air-free CO should be less than 400 ppm.
28. **Stack Temperature:** On both sides of the baffle, measure for each port and record the stack temperature of the heating system indicated by *TS* on the Bacharach PCA 55 display.
29. **Oxygen Percentage:** On both sides of the baffle, measure for each port and record the percentage of oxygen in the heating system flue gases indicated by *O₂* on the Bacharach PCA 55 display.
30. **Efficiency Percentage:** On both sides of the baffle, measure for each port and record the percentage efficiency of the heating system indicated by *EF* on the Bacharach PCA 55 display.
31. **Comments:** Record any important observations regarding the heating system.

Combustion Appliance Zone (CAZ) Testing (Page 9)

If the ambient CO gets above 35 ppm, discontinue testing and remove the CAZ from worst case conditions.

There should be no spillage after one minute of worst case conditions and draft should be established after five minutes.

Pre-Test Setup

- a. **Visually Inspect Venting (of each combustion appliance):** Prior to running the CAZ test(s), check the condition of the venting of each combustion appliance for anything that would inhibit a successful CAZ test or create hazardous conditions while undergoing a CAZ test.
- b. **Turn Off All Combustion Appliances:** Prior to running CAZ test(s), verify that all combustion appliances have been turned off and/or will not turn on while the CAZ test is being conducted (e.g., turn off thermostat).
- c. **Close All Operable Vents and Dampers:** Prior to running the CAZ test(s), verify that all operable vents to the outdoors (e.g., chimney dampers) are closed.
- d. **Check Dryer Vent and Lint Filter:** Prior to running CAZ test(s), clean dryer vent and lint filter.
- e. **Check Furnace Filter (clean or replace if required):** Prior to running the CAZ test(s), clean or replace the furnace filter(s) as required.
- f. **Open All Interior Doors:** Prior to running the CAZ test(s), put the dwelling into wintertime conditions by verifying that all interior doors have been opened and all exterior doors and windows have been closed.

Test Steps

Note: If blower door is set up, ensure fan is covered.

1. **Setup manometer and pressure hoses to measure CAZ WRT outdoors:** Set up the digital manometer as indicated on the REAT. The hose(s) should be connected to measure the pressure of the CAZ With Reference To (WRT) outdoors.
2. **Take Baseline Pressure:** Open all interior doors in the dwelling (e.g., doors to bedrooms, bathrooms, other interior rooms). Record the reading from the digital manometer under the appropriate column depending on CAZ location and whether the test is initial or interim. This reading is the pressure difference between the CAZ WRT outdoors at the best possible conditions for combustion appliance draft. *The baseline pressure should be subtracted from all other CAZ test readings.*
3. **Turn on all exhaust fans (Do not turn on whole-house fans):** Turn on all kitchen and bathroom exhaust fans, as well as the clothes dryer (if present). *Do not* turn on the whole house fan (if present).
4. **Close all interior doors to rooms that do not have exhaust fans:** Close all interior doors in the house (e.g., doors to bedrooms, bathrooms, other interior rooms), except rooms that contain exhaust fans.
5. **If the house has a fireplace that the client uses, turn on the blower door to 300 CFM with Ring B to simulate:** When a fireplace is used, the fire draws air from the house up the chimney, which has the same effect as an exhaust fan. Since the REAT also includes a blower door test, fireplaces should not be in use. The blower door can be used to simulate the effect of a fire drawing air from the house. Set up the manometer and pressure hoses as indicated in the illustrated section of the REAT. With the dial set to *A* and the mode set to *Flow*, adjust the fan speed to read 300 CFM of air flow. Write *Yes* or *No* to indicate whether or not the blower door is being used to simulate a fireplace in use.
6. **Open door, if present, between CAZ and main body of house. Record reading:** If there is a door between the CAZ and the rest of the house, open it and record the manometer reading indicating the pressure difference between the CAZ WRT outdoors under the appropriate column depending on CAZ location and whether the test is initial (pre) or interim (post).
7. **Close door between CAZ and main body of house. Record reading. (If no door, skip to step number 8.):** If there is a door between the CAZ and the rest of the house, close it and record the manometer reading indicating the pressure difference between the CAZ WRT outdoors under the appropriate column depending on CAZ location and whether the test is initial (pre) or interim (post).
8. **Turn on furnace blower. Check position of interior doors with smoke puffer for worst case. If the smoke blows towards the CAZ, leave the door shut:** Turn on the furnace blower at the thermostat by moving the fan switch from *Auto* to *On*. If there is no fan switch, adjust the thermostat to call for heat. Use a smoke puffer near all interior doors to determine if opening or closing them will make the CAZ pressure more negative WRT outdoors. If smoke is blown from the room towards the CAZ, close the door. If smoke is sucked into the room from the direction

of the CAZ, open the door. (An easy way to remember this – If the smoke blows towards your nose, leave the door closed. Otherwise open the door.) With all interior doors positioned to result in worst case CAZ pressure (most negative), record the manometer reading indicating the pressure difference between the CAZ WRT outdoors under the appropriate column depending on CAZ location and whether the test is initial or interim.

9. **Open door between CAZ and main body of house. Record reading. (If no door, skip step.):** Reopen the door between the CAZ and the rest of the dwelling (if present) and again record the manometer indicating the pressure difference between the CAZ WRT outdoors under the appropriate column depending on the CAZ location and whether the test is initial or interim.
10. **Recreate worst case conditions for each CAZ. (Complete this step and following steps on each heating inspection form.):** From steps 1 through 9, remember the exhaust fan, door position, and furnace blower conditions that resulted in the most negative pressure in the CAZ WRT outdoors. Recreate these exact conditions when testing any other combustion appliances in the house.
11. **Perform worst case draft and combustion tests for each appliance under this worst case condition:** Recreate the worst case conditions determined from steps 1 through 9 when conducting draft and combustion tests for any other combustion appliance in the dwelling. For each appliance tested, there should be no spillage after two minutes, as tested by a smoke puffer (smoke blown from vent into CAZ) or positive manometer reading in the vent WRT outdoors. Adequate draft should be established on each combustion appliance after five minutes (check manometer reading of vent WRT outdoors against *the chart below*). If the CAZ pressure WRT outdoors is -5 Pa or worse, monitor the CO level in the CAZ while doing draft and combustion tests. If the ambient CO exceeds 20 ppm, discontinue the test and flush the CAZ with fresh air by opening nearby windows and exterior doors.

| Appliance | <20 | 21-40 | 41-60 | 61-80 | >80 |
|---|--------|--------|--------|-------|------|
| Gas-fired furnace, boiler or water heater with atmospheric chimney. | -5Pa. | -4Pa. | -3Pa. | -2Pa. | -1Pa |
| Oil-Fired furnace, boiler, or water heater with atmospheric chimney | -15Pa. | -13Pa. | -11Pa. | -9Pa. | -7Pa |

Fireplace (Page 9)

1. **Fireplace Vented:** Circle *Y* for yes or *N* for no to indicate whether or not the fireplace vents to the outdoors. If there is no fireplace present, circle *N/A*.
2. **Location:** Record the location of the fireplace.
3. **How Often Used:** Record the number of times per month the fireplace is typically used.
4. **Damper:** Circle *Open*, *Closed*, or *None* to indicate whether or not a fireplace damper is present and what its condition is.
5. **Damper Operable:** Circle *Yes* or *No* to indicate whether or not the fireplace damper can be opened and closed.

6. **Seal Off If Not Used:** Circle *Yes* or *No* to indicate whether or not the client agrees to seal off the fireplace to reduce air infiltration.

Window Air Conditioners (Page 10)

1. **Location:** Record which room the window unit serves (e.g., family room, back bedroom, etc.).
2. **Manufacturer:** Record the brand name of the window unit.
3. **Btu:** From the nameplate, record the Btu/hour output rating of the window unit. The front cover of the window unit may be required to be unclipped or unscrewed to gain access to the nameplate.
4. **EER:** From the nameplate, record the Energy Efficiency Rating (EER) of the window unit. If the EER is not listed on the nameplate, record the year that the window unit was manufactured, if listed. Then the efficiency of the unit may be estimated from the federal energy efficiency standard that was in effect when the unit was manufactured.
5. **Area Cooled:** Record the floor area in square feet of the part of the house cooled by the window unit.
6. **Permanent Seal Required:** Write *Yes* or *No* to indicate whether the window unit is permanent and requires air sealing.
7. **Comments:** Record any observations that will require further action during weatherization.

Heat Pump/Central Air Conditioning (Page 10)

1. **Area Cooled:** Record the floor area in square feet of the part of the house cooled by the air conditioner.
2. **Outdoor Unit**
 - a. **Outdoor Unit Location:** Record where the outdoor unit is located (e.g., behind the house, east side of house).
 - b. **Manufacturer:** Record the brand name of the outdoor unit.
 - c. **Model Number:** Record the model number for the outdoor unit from the nameplate.
 - d. **Serial Number:** Record the serial number for the outdoor unit from the nameplate.
 - e. **SEER:** Record the Seasonal Energy Efficiency Rating (SEER) from the nameplate. If the SEER is not listed on the nameplate, record the year that the outdoor unit was manufactured, if listed. Then the efficiency of the unit may be estimated from the federal energy efficiency standard that was in effect when the unit was manufactured.
 - f. **Disconnect Present:** Write *Yes* or *No* to indicate whether or not there is a disconnect to shut off the electrical power to the outdoor unit. (A circuit breaker in the main electrical panel does not count as a disconnect.)
 - g. **Suction Line Insulated:** Write *Yes* or *No* to indicate whether or not the suction refrigerant line is insulated. The suction line is the one with the larger diameter.

- h. **Coil Require Cleaning:** Write *Yes* or *No* to indicate whether or not the outdoor coil is dirty and requires cleaning.
3. **Indoor Unit**
- a. **Indoor Unit Location:** Record where the indoor unit is located (e.g., basement, mechanical closet).
 - b. **Manufacturer:** Record the brand name of the indoor unit.
 - c. **Model Number:** Record the model number for the indoor unit from the nameplate.
 - d. **Serial Number:** Record the serial number for the indoor unit from the nameplate.
 - e. **HSPF:** If the primary system is a heat pump, record the Heating Seasonal Performance Factor (HSPF). The HSPF is a measurement of a heat pump's energy efficiency over one heating season by taking the total heating output (supply heat) in Btu (including electric heat) during heating season and dividing it by the total electricity energy the heat pump consumed (in watts/hour) in the same season. (Total heating product Btu/Electricity used during same season in Watts per hour = HSPF).
 - f. **Heat Pump kW:** If the system is a heat pump, record the kilowatt rating of the auxiliary, or strip, heaters from the nameplate.
 - g. **Btu Input:** Record the Btu input rating of the indoor coil from the nameplate.
 - h. **Coil Require Cleaning:** Write *Yes* or *No* to indicate whether or not the indoor coil is dirty and requires cleaning.
4. **Thermostat**
- a. **Location:** Record where the thermostat is located (e.g., hall, exterior wall in family room).
 - b. **Mercury:** Circle *Yes* or *No* to indicate whether or not the thermostat contains a mercury switch.
 - c. **Temperature Day/Night:** Record the temperature to which the thermostat is typically set during the day and night.
5. **Filter**
- a. **Filter Present:** Circle *Yes* or *No* to indicate whether or not an air filter has been installed to protect the central air conditioner. If *Yes*, record the location of the air filter (e.g., return duct at unit, return grill in hall).
 - b. **Type:** Record the type of air conditioner filter (DFF = Disposable Fiberglass Filter, DPF = Disposable Pleated Filter, CRF = Cleanable/Reusable Filter).
 - c. **Size:** Record the length and width of the filter in inches.
 - d. **Reusable - Cleaned & Replaced:** If the filter is cleanable/reusable, circle *Yes* or *No* to indicate whether or not it was cleaned and replaced.
 - e. **Clean/Dirty:** Circle *Clean* or *Dirty* to indicate the pre-weatherization cleanliness of the existing air conditioner filter.
 - f. **Quantity to Leave:** Record how many filters will be required to replace the existing filters and leave a six-month supply with the client.
6. **Blower**
- a. **Require Cleaning:** Circle *Yes* or *No* to indicate whether or not the blower requires cleaning.

- b. **Noisy:** Circle *Yes* or *No* to indicate whether or not the blower is excessively noisy, which may indicate that the blower motor bearings are worn out and the motor requires replacing.
7. **Comments:** Record any observations that will require further action during weatherization.

Ducts/Heating Pipes (Page 10)

1. **Boots:** Visually inspect the boots (connections between ducts and registers) and check off (✓) if they are in good condition. Mark with an *X* if they require repair or replacement and record which boots require repair or replacement in the *Comments* section. Remember that all boots should be sealed even if they are in good condition.
2. **Registers:** Visually inspect the registers and check off (✓) if they are clean and in good condition. Mark with an *X* if they require cleaning or replacement, and record which registers require cleaning or replacement in the *Comments* section. If the dwelling is a mobile home all registers will generally be replaced, so record the size and quantity of registers required in the *Comments* section (e.g., 7 @ 4 in. x 10 in.).
3. **Supply Duct:** Visually inspect the supply ducts and check off (✓) if they are in good condition. Mark with an *X* if they require repair, reconnection, and/or sealing. Record where they require repair, reconnection, and/or sealing in the *Comments* section.
4. **Return Duct:** Visually inspect the return ducts and check off (✓) if they are in good condition. Mark with an *X* if they require repair, reconnection, and/or sealing. Record where they require repair or replacement in the *Comments* section.
5. **Supply Plenum:** Visually inspect the supply plenum and check off (✓) if it is in good condition. Mark with an *X* if it requires repair, replacement, and/or sealing. Record where it requires repair, replacement, and/or sealing in the *Comments* section. The supply plenum is the box attached to the furnace or air handler outlet.
6. **Return Plenum:** Visually inspect the return plenum and check off (✓) if it is in good condition. Mark with an *X* if it requires repair, replacement, and/or sealing. Record where it requires repair, replacement, and/or sealing in the *Comments* section. The return plenum is the ducting attached to the furnace for return air to flow through.
7. **Crossover:** Visually inspect the crossover and check off (✓) if it is in good condition. Mark with an *X* if it requires repair, reconnection, and/or sealing. Record where it requires repair, reconnection, and/or sealing in the *Comments* section. The crossover connects the two duct systems in a doublewide mobile home.
8. **Duct Insulation:** Visually inspect the insulation installed on ducts/heating pipes in unconditioned areas and check off (✓) if it is present and in good condition. Mark with an *X* if no duct/pipe insulation exists or is in poor condition, and if so record where and how many linear feet of the duct/heating pipe insulation requires added/replaced in the *Comments* section.
9. **Duct Location:** Record the location of the ducts/heating pipes (e.g., attic, crawlspace).
10. **Type Duct System:** Circle the appropriate choice to indicate the type of duct system.

- a. **Trunk Duct System:** Has a main trunk duct that runs down the length of the house with branch duct tapping off the trunk to the individual registers.
 - b. **Spider Duct System:** Has a central supply plenum with many flex ducts tapping off the plenum to the individual registers.
 - c. **Cottage-Base Duct System:** Has a down-flow furnace that sits on a sheet metal supply plenum that has registers cut into the plenum, or may have short supply runs. This system acts more like a space heater than a duct system.
 - d. **Other:** If the duct system type is not listed, circle *Other* and record the type in the *Comments* section.
11. **Replace Return Grill With Filter Grill:** Circle *Yes* or *No* to indicate whether or not the existing return grill should be replaced in order to provide the capability to filter air moving through the heating system.
 12. **Type Ductwork:** Circle the appropriate choice to indicate the presence of sheet metal, flex duct, or ductboard. If the ductwork type is not listed, circle *Other* and record the type in the *Comments* section.
 13. **Duct Space:** Circle the appropriate choice to indicate whether or not the ducts or heating pipes are in conditioned or unconditioned space.
 14. **Duct Insulation Location:** Circle the appropriate choice to indicate the location of the main heating/cooling supply air duct insulation as above, below, or wrapped completely around the duct. (Ductboard is a rigid insulation used to either insulate ducts or to create a plenum that is used as a duct. Record that the insulation is around the duct if ductboard is used.)
 15. **Comments:** Record comments that will assist in preparing to weatherize the dwelling.

Individual Room Pressure (Page 10)

With the air handler running, record the pressure of individual rooms WRT outdoors. The table has columns for initial and interim testing periods. *No room should exceed +/- 3Pa WRT outdoors.* Rooms exceeding +3Pa WRT outdoors will require additional return air, which can be obtained by installing a jumper duct or undercutting doors. Rooms exceeding -3Pa WRT outdoors may require additional supply air.

Single-Family Home Attic (Page 11)

1. **Attic Type:** Record the type of attic for each different attic area present.
 - a. Floored (F)
 - b. Unfloored (UF)
 - c. Cathedral (C)
 - d. Flat (FT)
2. **Dimensions:** Record the dimensions in linear feet for each different attic area.
3. **Square Footage:** Calculate the area in square feet for each different attic area from the previously recorded dimensions.
4. **Joist Spacing:** Record the joist spacing in inches for each different attic area.

5. **Kneewall Door Present:** Record whether or not any kneewall doors are present and what condition they are in for each different attic area.

6. **Initial Insulation Type:** Record the type of preexisting attic insulation in each different attic area. If the preexisting attic insulation type is not listed, write *O* for *Other* and record the type in the *Comments* section. If there is no preexisting attic insulation, write *N* for *None*.
 - a. Blown Cellulose (BC)
 - b. Blown Fiberglass (BF)
 - c. Rockwool (RW)
 - d. Fiberglass Batts (FGB)

7. **Initial Depth & R-Value**
 - a. Record the average depth in inches of the preexisting initial insulation found in each different attic area. Compression around the eaves may usually be ignored.
 - b. Record the R-value of the preexisting initial attic insulation of each different attic area. The R-value of preexisting loose-fill cellulose insulation is about 3.7 R-value per inch of thickness. If the existing cellulose insulation is less than 3 inches thick, use 3.7 R-value per inch. The R-value per inch of other types of insulation also varies with thickness. See the *Insulation R-Value & Depth* table below for the R-value of various thicknesses of loose-fill and batt insulation.

| Insulation R-Value & Depth | | | |
|---|---------|---------------------------------|---------|
| Fiberglass, Rockwool Loose Fill and Batt ¹ (Height in inches) | R-Value | Cellulose (Height in inches) | R-Value |
| 4.01 | 11 | 3.12 | 11 |
| 6.75 | 19 | 5.4 | 19 |
| 10.25 | 30 | 8.4 | 30 |
| 12.75 | 38 | 10.6 | 38 |
| 1. Varies according to density (decreases with increasing density) | | | |

8. **Interim Insulation Type:** Record the type of attic insulation to be added to each different attic area (BC = Blown Cellulose, BF = Blown Fiberglass). If the attic insulation type to be added is not listed, write *O* for *Other* and record the type in the *Comments* section. If no attic insulation is to be added, write *N* for *None*.

9. **Insulation Required:** Based on the existing and proposed R-values and the attic area square footage, estimate and record the number of bags of insulation required to insulate each different attic area. Base this estimate on the coverage charts on the insulation bags.

10. **Interim Wx Depth & R-Value**
 - a. Record the average depth in inches of the Wx interim insulation in each different attic area.
 - b. Record the R-value of the Wx interim insulation in each different attic area. See the table above for the R-value of various thicknesses of loose-fill and batt insulation.

Condition of Attic

11. **Water Leak:** Write *Yes* or *No* to indicate whether or not there are signs of past or present water leaks in each different attic area. If *Yes*, record in the *Comments* section.
12. **Recessed Light:** Write *Yes* or *No* to indicate whether or not there are any recessed lighting fixtures installed in the dwelling that penetrate the ceiling in each different attic area. If *Yes*, record in the *Comments* section. If the recessed lighting fixtures are not IC rated, baffles or shields will require to be installed to keep the attic insulation at least 3 inches from the fixtures.
13. **Chimney/Vent Shielding:** Write *Yes* or *No* to indicate whether or not shielding requires installation to keep attic insulation from coming into contact with chimneys or combustion appliance vents in each different attic area.
14. **Condition of Wiring:** Write *Good* or *Poor* to indicate whether or not the wiring in each different attic area is in good condition or if it is brittle, cracked, or missing. If there are any open connections or splices that require the installation of junction boxes, record in the *Comments* section. If there is live knob-and-tube wiring present that will require being replaced or blocked before attic insulation can be added, record in the *Comments* section.
15. **Access:** Record the location and size in inches of each preexisting attic access to each different attic area. If an attic access is required, record where the access should be located and what size in inches it should be.

By-Passes

16. **Open Exterior Wall Tops:** Write *Yes* or *No* to indicate whether or not the tops of the exterior walls are open to any of the attic areas and require air sealing.
17. **Open Interior Wall Tops:** Write *Yes* or *No* to indicate whether or not the tops of the interior walls are open to any of the attic areas and require air sealing.
18. **Wire Chases:** Write *Yes* or *No* to indicate whether or not there are any wire chases acting as air by-passes in any of the attic areas. If so, record in the *Comments* section.
19. **Plumbing Chases:** Write *Yes* or *No* to indicate whether or not there are any plumbing chases acting as air by-passes in any of the attic areas. If so, record in the *Comments* section.
20. **HVAC Chases:** Write *Yes* or *No* to indicate whether or not there are any HVAC chases acting as air by-passes in any of the attic areas. If so, record in *Comments* section.
21. **Stairwell Drop:** Write *Yes* or *No* to indicate whether or not there are any stairwell drops acting as air by-passes in any of the attic areas. If so, record in the *Comments* section.
22. **Closet Drop:** Write *Yes* or *No* to indicate whether or not there are any closet drops acting as air by-passes in any of the attic areas. If so, record in the *Comments* section.
23. **Soffit Drop:** Write *Yes* or *No* to indicate whether or not there are any soffit drops acting as air by-passes in any of the attic areas. If so, record in the *Comments* section.
24. **Comments:** Record comments that will assist in preparing to weatherize the dwelling.

Sidewalls (Page 12)

If the dwelling wall count exceeds six, additional *Sidewall* tables may be printed and included in the REAT in order that a complete record is captured.

1. **Location/Orientation:** Record the closest cardinal compass direction that each sidewall faces (North, South, East, West).
2. **Initial Insulation:** Circle *Yes* or *No* to indicate whether or not each sidewall contains any preexisting sidewall insulation.
3. **Initial Insulation Type:** Record the type of preexisting sidewall insulation in each sidewall.
 - a. Blown Cellulose (BC)
 - b. Blown Fiberglass (BFG)
 - c. Rockwool (RW)
 - d. Fiberglass Batts (FGB)
 - e. Polystyrene Board (PB)
 - f. Batt or Blanket (BB)
 - g. Loose Fill (LF)
 - h. Foam Core (FC)

The type of insulation can often be determined by inspection of an electrical outlet or other penetration. If the preexisting sidewall insulation type is not listed, write *O* for *Other* and record in the *Comments* section. If there is no preexisting attic insulation, write *N* for *None*.

4. **Initial Insulation R-Value:** Record the R-value of any preexisting insulation for each sidewall.
5. **Added Insulation Type:** Record the type of insulation to be added to each sidewall. If the sidewall insulation type to be added is not listed, write *Other* and record in the *Comments* section. If no sidewall insulation is to be added, write *None*.
6. **Condition of Wiring:** Write *Good* or *Poor* to indicate whether or not the wiring in each different area is in good condition or if it is brittle, cracked, or missing. If there is live knob-and-tube wiring present that will require being replaced or blocked before sidewall insulation can be added, record in the *Comments* section.
7. **Are Walls Weak:** Circle *Yes* or *No* to indicate whether or not the interior drywall/paneling or exterior sheathing/siding flexes easily when pressed.
8. **Can Sidewalls be Blown:** Circle *Yes* or *No* to indicate whether or not the sidewalls can be dense-packed with cellulose insulation, taking into account any signs of wall weakness or other obstacles.
9. **Interior Type:** Record the type of interior wall finish (e.g., drywall, paneling). If the type of interior wall finish is not listed, write *Other* and record the type in the *Comments* section.
10. **Exposure:** Record the conditions experienced by the exterior surface of each wall. The surface is either *Exposed* to the outdoor air and temperature, *Buffered* by an unconditioned but enclosed space (e.g., garage, porch), or adjacent to unconditioned *Attic* space (e.g., kneewall).
11. **Exterior Type:** Record the type of exterior wall finish. If the type of exterior wall finish is not listed, write *Other* and record the type in the *Comments* section.
 - a. Wood (W)
 - b. Metal or Vinyl (MV)
 - c. Stucco (S)
 - d. Brick or Stone (BS)

12. **Wall Framing Type:** Record the type of wall framing. Keep in mind that balloon-framed walls do not have a top plate; the wall cavities are open to the attic and open between floors.
 - a. Balloon Frame (BF)
 - b. Platform Frame (PF)
 - c. Masonry/Stone (MS)
 - d. Concrete Block (CB)
 - e. Adobe (A)
13. **Width of Cavity:** Record how far apart the wall studs are spaced (24 in., 16 in., etc.).
14. **Depth of Cavity:** Record the type of wall studs (2x4, 2x6, etc.).
15. **Exterior Wall Surface Area:** Measure the length and height of all the above-ground wall sections and calculate the total wall/window/door surface area in square feet. For a typical one-story house, the total wall/window/door surface area would be the perimeter of the house multiplied by the ceiling height.
16. **Less Windows/Doors:** Calculate the total window/door surface area in square feet from the data recorded on pages 3 and 4 of the REAT.
17. **Net ft² Wall Surface Area:** Calculate the walls-only surface area in square feet by subtracting the window/door square footage (15) from the total wall/window/door square footage (14). $(14) - (15) = \text{Walls Only Surface Area ft}^2$.
18. **Total Number of Bags Required:** Calculate the total number of bags of insulation required to fill the sidewalls by using the coverage chart on the insulation bag. Take into account that some insulation may be wasted during the blow and that some coverage charts assume that the wall cavities will merely be filled with insulation, rather than dense-packed. For these reasons, add 15% to ensure enough insulation is transported to the worksite.
19. **Comments:** Record any observations that will affect the installation of additional sidewall insulation.

Basement/Crawlspace (Page 13)

1. **Conditioned/Unconditioned Type:** Record the type of foundation conditioning.
 - a. **Conditioned:** Space has thermostat control
 - b. **Unconditioned:** No source of heat
 - c. **Vented Unconditioned:** Vented directly to outdoors, no source of heat
 - d. **Unintentionally Conditioned:** By-waste heat from equipment
2. **Type of Foundation:** Record the type of foundation space.
 - a. Crawlspace
 - b. Basement
 - c. Pier/Exposed Floor
 - d. Insulated Slab
 - e. Uninsulated Slab
3. **Type of Subfloor:** Circle the appropriate choice to indicate the type of subfloor. (Plywood, Tongue and Groove, Plank)
4. **Total Square Feet of Floor:** Record the total area of the floor in square feet.
5. **Joist Spacing:** Record the joist spacing in inches.
6. **Linear Feet of Perimeter:** Record the length in linear feet of the perimeter of the foundation (e.g., measure around the outside of the dwelling at the foundation).

7. **Average Foundation Wall Height Above Grade:** Record the average height of the foundation wall that is above ground level in feet.
8. **Initial Vapor Barrier:** Circle *Yes* or *No* to indicate whether or not the ground in the crawlspace is covered with a preexisting vapor barrier (e.g., plastic sheeting, Visqueen, 6 mil poly).
9. **Open Exterior Wall Bottoms:** Circle *Yes* or *No* to indicate whether or not any exterior wall cavities are open at the bottom and exposed to the crawlspace.
10. **Open Interior Wall Bottoms:** Circle *Yes* or *No* to indicate whether or not any interior wall cavities are open at the bottom and exposed to the crawlspace.
11. **Chases:** Circle the appropriate choice to indicate whether or not any chases are acting as air by-passes (Wiring, Plumbing, HVAC). If there are no chases acting as air by-passes, circle *None*.
12. **Initial Floor Insulation:** Circle *Yes* or *No* to indicate whether or not preexisting floor insulation is present.
13. **Initial R-Value:** Circle the R-value of any preexisting floor insulation. If the R-value is not listed, record the R-value in the *Comments* section.
14. **Floor Insulation Required:** Circle *Yes* or *No* to indicate whether or not floor insulation should be added.
15. **R-Value Required:** Circle the R-value of the floor insulation required. If the R-value is not listed, record the R-value in the *Comments* section.
16. **Does Sill Plate Require Sealing:** Circle *Yes* or *No* to indicate whether or not the sill plate/band joist requires air sealing.
17. **Does Sill Plate Require Insulation:** Circle *Yes* or *No* to indicate whether or not the sill plate/band joist requires insulation. If *Yes*, record how many linear feet require insulation.
18. **Initial Foundation Wall Insulation:** Circle *Yes* or *No* to indicate whether or not there is any preexisting insulation on the crawlspace/basement wall.
19. **Existing Wall Insulation R-Value:** Record the R-value of any preexisting insulation currently on the crawlspace/basement wall. If only a part of the wall is insulated, record what percentage of the foundation wall has insulation and record the average R-value.
20. **Exposed Water Lines Wrapped:** Circle *Yes* or *No* to indicate whether or not any exposed water lines in the crawlspace/basement are wrapped with insulation to prevent freezing. If *No*, record the length in feet of water line that must be wrapped in the *Comments* section.
21. **Floor Joist Size:** Circle the appropriate choice to indicate the size of the floor joists (2x6, 2x8, 2x10, 2x12). If the joist size is not listed, record in the *Comments* section.
22. **Crawlspace Door:** Circle *Yes* or *No* to indicate whether or not a crawlspace door exists. Record the condition of the door in the *Comments* section.
23. **Comments:** Record any observations that will affect potential weatherization work in the crawlspace.

Mobile Home Ceiling Insulation (Page 14)

1. **Cathedral:** Record the square foot area of the cathedral ceiling. If no cathedral ceiling exists, write *None*.
2. **Flat:** Record the square foot area of flat ceiling. If no flat ceiling exists, write *None*.
3. **Total:** Calculate the total attic area in square feet by adding the calculated areas from (1) and (2). (Cathedral Attic Area ft² + Flat Attic Area ft² = Total Attic Area ft²).
4. **Peak Height:** Record the peak height of the attic cavity, which is the distance from the ceiling to the highest point of the roof. The easiest way to measure the peak height is usually from the outside of the short wall of the dwelling, taking into account the thickness of the roofing and ceiling materials. For Bowstring roofs, record the maximum height in inches of the roof above the ceiling.
5. **Joist Size:** Write the appropriate choice to indicate the size of the floor joists (2x4, 2x6, 2x8). If the joist size is not listed, record in the *Comments* section.
6. **Type of Roof:** Circle the appropriate choice to indicate the type of roof framing. In some cases, there will be a second roof constructed over the original mobile home roof. In such cases, record the data describing the original mobile home roof.
 - a. **Flat Roof:** Has an interior surface (interior ceiling) and an exterior surface (exterior roof) attached directly to either side of the wood framing, similar to wall construction.
 - b. **Bowstring Roof:** Has a lightweight exterior roofing material (usually aluminum) that is stretched over the roof frame structure. The roof has a slight curve with the highest point in the middle of the home width.
 - c. **Pitched Roof:** Sloped to a higher peak point. When viewing the home width from outdoors, the roof line creates a triangle. Unlike flat and bowstring roofs, pitched roofs are often also shingled.
7. **Roof Color:** Circle the appropriate choice to indicate the roof color. The reflectance of the roof affects how solar energy impacts the heating and cooling loads of the home. In some cases, there will be a second roof constructed over the original mobile home roof. In such cases, record the data describing the second exterior roof.
 - a. **White/Reflective/Shaded:** A white or reflective roof appears white or shiny and metallic, is clean and has little or no discoloration from weathering, and is often exposed to the sun.
 - b. **Normal/Weathered:** The majority of roofs will be classified as normal. Roofs not exposed to the sun should also be classified as normal, regardless of their finish.
8. **Type of Roof Covering:** Circle *Shingle* or *Metal* to indicate the type of roof material covering the mobile home. If the roof covering type is not listed, circle *Other* and record in the *Comments* section.
9. **Gutter Length Required:** Record the length of new gutter to be installed on the mobile home. If no new gutters are required, write *None*.
10. **Roof Blowing Access:** Circle the appropriate choice to indicate what kind of attic cavity access the insulation will be blown through. (Side, Top, Gable).
11. **Initial Insulation Type:** Record the type of preexisting attic insulation. If none exists, write *None*.

12. **Initial R-Value:** Record the R-value of any preexisting attic insulation. The R-value per inch of insulation varies with thickness. See the *Insulation R-Value & Depth* table for various thicknesses of loose-fill and batt insulation.
13. **Interim Insulation Type:** Record the type of attic insulation added. If none is to be added, write *None*.
14. **Interim Wx R-Value:** Record the interim R-value after insulation has been added.
15. **Total Number of Bags Required:** Record the total number of bags of insulation required. Base your estimation on the attic area and level of insulation to be added that has been previously recorded in the *Mobile Home Ceiling Insulation* table of the REAT. Use the coverage chart on the insulation bags that used to insulate the dwelling.
16. **Number of Peal and Seal Required:** Record the number of sheets or rolls of Peal and Seal patches that will be required to repair the roof after adding attic insulation.
17. **Plumbing Vent Caps:** Record the number and size of vent caps required to keep all plumbing penetrations watertight.
18. **Roof Coating:** Record how many gallons of roof coating will be required. If none is required, write *None*.
19. **Comments:** Record any observations that will affect insulating the attic.

Mobile Home Sidewalls (Page 14)

1. **Wall Stud Size:** Record the type of wall studs (2x2, 2x3, 2x4, 2x6, etc.). Mobile homes are typically constructed using standard wood framing.
2. **Long Wall Orientation:** Record the cardinal direction that one of the long walls faces.
3. **Wall Ventilation:** Write *Yes* or *No* to indicate whether or not the mobile home walls are ventilated. A mobile home wall may be intentionally or unintentionally ventilated. A ventilated wall has a space for air to flow between the exterior and interior wall material. One technique to determine if a wall is ventilated is to check if the wall insulation is dirty inside the wall cavity. Pull up slightly on the lower end of an exterior wall panel to check for dirty insulation. If a wall is ventilated, the insulation will be dirty.
4. **Carport/Porch Roof:** Record the length and width in linear feet of any carport or porch roof. The roof length is the dimension parallel to the mobile home. A carport/porch roof is a shelter that has no walls and extends out from one wall of the mobile home. The client will often park a car under this shelter or use it to shade an outdoor sitting area.
5. **Initial Insulation:** Write the appropriate choice to indicate the type of preexisting wall insulation (Batt/Blanket, Loose Fill, Foam Core). Record the depth in inches. If there is no preexisting wall insulation, write *None*.
6. **Comments:** Record any observations that will affect weatherizing the mobile home walls.

Mobile Home Bellyboard (Page 14)

1. **Floor Area:** Record the square foot area of the mobile home floor.
2. **Direction of Joists:** Circle *Longways* or *Crossways* to indicate if the floor joists run the length of the mobile home (parallel to the I-beams) or run the width of the mobile home (perpendicular to the I-beams).
3. **Depth of Joists:** Circle the appropriate choice to indicate the depth of the floor joists (2x4, 2x6, 2x8, etc.). Sometimes the floor joist size in the wing section is different from the floor joist size in the belly/center section. If the size of the floor joists in the wing sections are different from the size of the floor joists in the belly, record in the *Comments* section.
4. **Plumbing Leaks:** Circle *Yes* or *No* to indicate whether or not there are plumbing leaks that require repair.
5. **Wrap Exposed Water Lines:** Circle *Yes* or *No* to indicate whether or not exposed water lines beneath the mobile home are wrapped with insulation to prevent freezing. If they are not, record the length in feet of exposed water line that requires wrapping.
6. **Initial Vapor Barrier:** Circle *Yes* or *No* to indicate whether or not there is a vapor barrier present beneath the mobile home.
7. **Belly Cavity Configuration:** Circle the appropriate choice to indicate the appropriate belly center cavity configuration. The mobile home belly cavity is the deep section that runs the length of the dwelling and usually houses the main supply air duct.
 - a. **Square Cavity:** Has vertical sides and a horizontal base. The main iron support beams usually act as the vertical sides.
 - b. **Rounded Cavity:** Has belly wrap draped in the middle portion of the home. The wrap is usually draped between the main iron support beams of the home.
 - c. **Flat Cavity:** Has no center belly section lower than the belly wing section. This type of belly is often found on homes where the main air supply duct is located between lengthwise floor joists or where the main supply air duct is located in the roof section.
8. **Belly Condition:** Circle the appropriate choice to indicate the condition of the mobile home belly wrap.
 - a. **Good:** A belly wrap in good condition does not have any tears, holes, or other openings in the belly wrap and is tightly attached around the entire perimeter of the home.
 - b. **Average:** A belly wrap in average condition has some small tears, holes, or other openings in the belly wrap or may not be well attached to the perimeter of the home.
 - c. **Poor:** A belly wrap in poor condition has large tears, holes, or other openings or is not well attached to the dwelling perimeter.
9. **Belly Repair Required:** Circle *Yes* or *No* to indicate whether or not the belly requires repair.
10. **Insulation Location:** Record where the insulation is located in the wing and belly sections.
 - a. **Attached to Flooring:** When the insulation is attached to the underside of the flooring.
 - b. **Between Joists:** When the insulation lies between but at the bottom of the joists, leaving the potential for an air space between the top of the insulation and the flooring.
 - c. **Attached Under Joists:** When the insulation is attached to the underside of the floor joists.

- d. **Draped Below Joists:** When the insulation in the belly section is draped below the underside of the floor joists and attached only around the perimeter of the belly section.
11. **Initial Insulation Depth:** Record the depth in inches of any preexisting belly insulation. If the insulation existing in the wing sections is different in depth from the insulation existing in the belly section, record the depth of both.
12. **Max. Depth of Belly Cavity:** Record the maximum depth of the belly in inches as measured from the underside of the flooring to the lowest part of the belly.
13. **Total Number of Bags Required:** Record the total number of bags of insulation required. Base your estimation on the floor area and the depth of the joists and the belly. Use the coverage chart on the insulation bags that are to be used to insulate the belly.
14. **Comments:** Record any observations that will affect insulating the belly.

Blower Door Diagnostics (Page 15)

Only initial and interim readings are captured on the REAT. Final diagnostics must be recorded on the final inspection form.

1. **Location:** Record the location of the door in which the blower door was installed for both the initial and interim weatherization blower door tests.
2. **Configuration:** Circle *Open*, *Ring A*, or *Ring B* to indicate whether or not any of the blower door rings were installed in the blower door during the initial and interim weatherization tests.
3. **Adjust for Baseline:** Circle *Yes* or *No* to indicate whether or not the baseline pressure difference of the house WRT outdoors was recorded for the initial and interim weatherization tests. Take the baseline measurement with the blower door fan off. The baseline pressure will be added to the pressure difference during the blower door test to ensure a 50 Pa pressure difference between the house and outdoors. (For example, the baseline pressure difference between the house and outdoors is +3 Pa. During the blower door test, we want the pressure of the house WRT outdoors to be -50 Pa. We are sucking air out of the house, so the pressure difference is negative. Since $-50 + 3 = -47$, adjust the fan speed during the blower door test to -47 Pa.)
4. **Pa:** Record the pressure difference of the house WRT outdoors, taking into account the baseline pressure.
5. **CFM:** Record the CFM displayed on the digital manometer. Ensure that the dial is set to *Flow*.
6. **Comments:** If a 50 Pa pressure difference could not be achieved during the blower door test, record in the *Comments* section.

Zonal Pressures (Page 15)

Note: Zones that are commonly tested for zonal pressures are pre-printed on the form. There are also rows listed as *Other* for the auditor to record the location of other zones tested.

1. **Initial WRTH:** Record the pressure difference of the zone WRT the main body of the house with the blower door running and prior to any sealing of bypasses or any other air leaks.
2. **Interim WRTH:** Record the pressure difference of the zone WRT the main body of the house with the blower door running and subsequent to any sealing of bypasses or any other air leaks.
3. **Comments:** Record any observations that require further action during weatherization.

Pressure Pan Test (Page 15)

Note: When labeling the ducts, do so in a methodical logical fashion. Duct information is typically recorded by starting at the front of the dwelling, with the left-most duct being #1, and working to the right around the dwelling. In mobile homes, duct information is typically recorded going from one end of the mobile home to the other.

1. **House WRT Duct Location:** Record the initial and interim pressure differences of the house WRT where the ducts are located (e.g., attic, basement, crawlspace) in Pa before and after sealing the ducts while the blower door is running.
2. **Location:** Record the location of every register (e.g., master bedroom, family room).
3. **Initial:** Record the pressure difference of the duct register WRT the house before sealing the ducts while the blower door is running. The duct reading shall be measured to the tenth of a Pa, e.g., 1.1 instead of 1.
4. **Interim:** Record the pressure difference of the duct register WRT the house after sealing the ducts while the blower door is running.
5. **Return:** Record the pressure difference of the return register WRT the house before and after sealing the ducts while the blower is running.
6. **Pressure Pan Multipliers:** If the pressure of the zone that the ducts are located in WRT inside of the home with the blower door running is 45 Pa or less during either the initial or interim testing, use the multipliers in the *Pressure Pan Multipliers* table of the REAT to convert measured pressure pan values to actual values.
7. **Comments:** Record any observations that will require further action during weatherization.

Air Sealing Cost-Effectiveness Chart (Page 15)

1. **Interim Reading:** On the day that weatherization work on the dwelling begins, run the blower door and record the interim reading in the *CFM50 Reading* column. The reading should be taken

by the crew/contractor before air sealing begins. The interim blower door reading *must* be distinct and exclusive from the initial reading taken by the auditor.

2. **After Duct Sealing:** After the duct sealing has been completed, run the blower door and record the reading in the *CFM50 Reading* column.
3. **After Primary Air Sealing:** After the primary air sealing has been completed, run the blower door and record the reading in the *CFM50 Reading* column. Primary air sealing addresses the larger sources of air leakage or infiltration that often may be diagnosed through visual inspection (e.g., holes in ceilings, walls, floors, or doors; missing or broken windows, missing dampers in chimneys, furnace flues, or exhaust fans; leaks around window air conditioners). Infiltration sources of this type tend to reflect direct openings between the interior of the dwelling and the outdoors.
4. **1st Discrete Hour:** Discrete or secondary air sealing addresses smaller sources of air leakage that may not be easily visible but are often still cost-effective to correct (e.g., penetrations around chimneys, flues, exhaust vents, plumbing and heating pipes, electrical service entries and wiring; other small seams and gaps between conditioned and unconditioned space; loose window glazing where panes are in jeopardy of falling out). The discrete air sealing measures shall only be performed after the duct sealing and primary air sealing has been done.
 - a. **CFM50 Reading:** After the first hour of discrete air sealing has been completed, run the blower door and record the reading in the *CFM50 Reading* column.
 - b. **CFM50 Per Crew-Hour:** Subtract the *1st Discrete Hour CFM50 Reading* from the *Primary Air Sealing CFM50 Reading* to get the *CFM50 Per Crew-Hour*. For example – a *Primary Air Sealing CFM50 Reading* of 2348 minus the *1st Discrete Hour CFM50 Reading* of 2105 would result in a *CFM50 Per Crew-Hour* of 243 CFM50.
 - c. **Cost-Effective Factor Per Hour:** Record the CFM50 reduction required for air sealing to continue. To calculate the *Cost-Effective Factor Per Hour*, multiply the number of people in the sealing crew by 75. For example – two people in the sealing crew multiplied by 75 CFM50 will result in a *Cost-Effective Factor Per Hour* of 150 CFM50.
5. **2nd, 3rd, 4th Discrete Hour:** Repeat *Discrete Hour* steps *a* through *c* until the *CFM50 Per Crew-Hour* reading falls below the *Cost-Effective Factor Per Hour* reading. At that point it will no longer be cost-effective to air seal. The air sealing crew should be reduced when appropriate to further facilitate cost-effective air sealing. For example – a four-person crew with a *275 CFM50 Per Crew-Hour* reduction would require to stop air sealing, because the *Cost-Effective Factor Per Hour* for a 4-person crew is 300 CFM50 ($4_{\text{Number of People in Sealing Crew}} \times 75_{\text{CFM}_{\text{Cost-Effective CFM50 Per Crew Hour}}} = 300_{\text{Cost-Effective Factor Per Hour}}$); the *275 CFM50 Per Crew-Hour* reduction is less than the 300 *Cost-Effective Factor Per Hour*. However, a three-person crew with *275 CFM50 Per Crew-Hour* has a reduction greater than the *225 Cost-Effective Factor Per hour*, and should continue air sealing ($3_{\text{Number of People in Sealing Crew}} \times 75_{\text{CFM}_{\text{Cost-Effective CFM50 Per Crew Hour}}} = 225_{\text{Cost-Effective Factor Per Hour}}$).

Do not stop air sealing when the Target CFM is reached if it is still cost-effective to air seal. The Target number is a mathematical guide based on volume and the initial CFM50 recorded before weatherization begins. The Target number should **not** be used as a stopping point.