EPS DIAGNOSTIC SURVEY and EPS PLUS AUDIT
FIELD PROTOCOL

The following protocol is to be followed when performing EPS Diagnostic Surveys. It outlines the preferred step-by-step method for inspecting a home, along with general timeframes for each portion of the inspection. Every home is different and may require a slight variation of the protocol. This protocol has been set to ensure accuracy and continuity among audits/surveys and auditors/technicians.

Preparing for the Audit

1. Make sure that you have your tools (tape measure, screwdriver, compass, awl or small drill, plastic crochet needle, caulking, flashlight, booties) before you approach the home.
2. Have your clipboard in hand with the EPS Audit Form on top.
3. Keep a copy of the *EPS Diagnostic Survey* and *EPS Plus Audit Field Protocol,* and associated documents in your vehicle at all times

Greet Homeowner (10-20 min)

1. Program Overview
    a. The EPS is a tool that will generate a miles per gallon type energy usage score for a home.
    b. We are rating the home not the homeowner.
    c. The homeowner will receive a scorecard and a report within 10 business days.
2. Workflow Overview
    a. Brief explanation of what you will be doing at the home.
3. Homeowner Questioning

    During an audit, homeowners are often able to provide insight into things that may not be apparent or that are difficult to verify. While **information received from homeowners should always be crosschecked by the auditor/technician**, the following are a few questions that should be asked before starting the inspection.

    a. Was any remodeling work done that changed windows or insulation levels?
    b. If the house was built before code required insulation levels, ask whether the enclosed exterior wall insulation is known.
    c. If you are unable to verify the enclosed exterior wall insulation by typical inspection techniques, ask the homeowner for permission to make a maximum 1/4” hole at walls in question. Holes will be placed in inconspicuous locations and sealed when verification is complete.
    d. Is there an A/C or a heat pump? Does the homeowner know the SEER or HSPF, when it was purchased, or have the equipment manual?
    Note: Asking about the A/C or heat pump may also keep you from missing the unit if it is under a deck or covered by landscaping.

e. Ask the homeowner whether he or she is aware of any major energy uses other than the heating and cooling equipment. Provide a couple of examples, such as a hot tub, steam shower, or any types of pumps.
f. Ask homeowner whether he or she knows when the primary refrigerator was purchased.
g. Ask homeowner whether there are any parts of the house that are noticeably colder or hotter than the rest of the house.
h. Scan the EPS Audit Form and verify that all homeowner input questions have been addressed.
i. Ask whether there are any reasons that you may not be able to perform these tasks (e.g., sleeping children, unfriendly pets) or whether there is anything you should be aware of (e.g., a cat that tries to run out as soon as the door is cracked).
j. While you are performing your external inspection, ask the homeowner to verify that all windows are closed and that any wood fireplaces with ashes have been addressed.
k. Ask homeowner whether there is access around the perimeter of house (e.g., locked gates). Ask whether he or she would you to knock before reentering after the exterior inspection or whether it is ok to enter house without knocking.

4. Collect the utility information for the house from the homeowner, and then obtain his or her signature on EPS Audit Waiver.
5. Homeowner walkthrough: Have the homeowner walk you through the house to show you the location of equipment, attic/crawlspace hatches. This is also the time when the homeowner should point out any things that you need to look out for in the home (e.g., sleeping children, caged pets, dangers).

Exterior Inspection (15-30 min)

1. Externally measure/sketch home (counterclockwise)
    a. Measurements should be made of foundation and above grade wall lengths (commonly the same) and any cantilevered floors or setbacks should be noted.
    b. Sketch a floor plan of the main floor of the building as you measure the home and note orientation. (If the basement or upper floors are a different footprint, you will sketch them later.)
    c. It may be helpful to draw or take a photograph of each side of the building and note vented foundation locations.
2. Record window type/shading
    a. Record all window types observed for energy analysis report. Window type used for input is determined by the window type with the largest area, if this is difficult to determine, use the window type with the majority area on the south side of house.

    b. Some wood windows may have vinyl or metal cladding on the exterior. To verify the actual window frame material, check the interior side of the window.
    c. Verification of low-e windows may be difficult. Performing a "match test" should produce one reflection per pane or coating. Double pane with low-e coating should produce four reflections. If in doubt, ask the homeowner during the exit discussion. If unable to verify, do not consider low-e glazing.
    d. Note the percentage of window area that is shaded (or that would be shaded during times of full sun) by overhangs, adjacent buildings, and/or trees on the east, south, and west sides of the house.
3. Record AC SEER or heat pump HSPF and year if not verified by homeowner.
    a. Note the SEER for AC, the HSPF for heat pumps if it is printed on the unit.
    b. If there is no SEER or HSPF, record the year the unit was manufactured. The manufacture year is often difficult to find and a best guess may be required using visual inspection and age ranges listed on the audit form.
4. Check for exterior wall insulation. (Add to in-wall insulation to create a whole wall insulation level.)
    a. Inspect under the lowest course of siding for the presence of exterior foam insulation. This is particularly common on homes that have been retrofitted with vinyl siding.
5. Check for perimeter slab insulation.
    a. If you do not observe foundation vents and the house has no basement, the house or that section of foundation is likely slab on grade. Look for a protective covering above grade as opposed to the usual exposed slab edge at conditioned locations. Moving some dirt at the location in question may be helpful.
6. Record the roof slope and observable reflectance (The homeowner may provide more information regarding roof reflectance).
7. Count the number of exterior permanent lighting fixtures that will be added to the interior count. Separately note the amount of fluorescent lamped fixtures.

Interior Inspection (20-40 min)

1. Bring blower door equipment (and duct blaster, if necessary) to the door before beginning your internal home inspection.
2. Put on shoe protection before beginning internal home inspection.
3. Note the number of conditioned floor levels above grade, including daylight basements.
4. Take internal measurements for finished floor areas, if needed. Finished floor areas are those that are finished and conditioned with the purpose of being occupied as living space.
    a. If the basement or upper floor(s) are a different size than the main floor, they need to be measured and sketched separately.

    b. When measuring inside the house, be sure to add the exterior wall thickness to your measurements.
5. Verify whether any open combustion appliances are located within the building envelope.
6. Record lighting intensity.
    a. Count the number of permanent lighting fixtures and add them to the exterior count for a total fixture count. Separately record the amount of fluorescent lamp fixtures.
    b. Multiply the amount of fluorescent light fixtures by 0.75. Subtract this number from the total fixture count. Note: This is because fluorescent bulbs use 75% less energy than equivalent incandescent bulbs.
    c. To calculate the lighting intensity, divide the total fixture count by the finished floor area then multiply by 1,000.
7. Check foundation type/insulation and record floor insulation level.
    a. In the basement or crawlspace, record the wall insulation. If the basement walls are finished and insulation is not easily determined, see #10 “Verify wall insulation”.
    b. Record the ceiling insulation depth. (In a crawlspace or garage, this is the same as the floor insulation of the conditioned space above.)
    c. Slab insulation may be difficult to visually inspect unless there is a sump pump or other unsealed plumbing penetrations. If you are unable to visually verify, defer to local code requirements for the home or assume that there is no insulation (unless otherwise verified by the homeowner or a plan set).
    d. If more than one foundation type and insulation level exists, record them separately.
    e. While in a crawl space or unconditioned basement, record whether the hot water lines are insulated or whether they are located primarily in conditioned or insulated space (for reference on the Energy Analysis Report).
8. Check attic insulation.
    a. When checking enclosed rafter spaces, defer to code for the year that the home was built. If the home was built before code requirements, use the homeowner input or visual confirmation from adjacent attic or eave vents. If still unable to determine insulation level, use a best estimate based on other building elements.
    b. For flat ceilings, measure the average depth of insulation in the attic. Note the type and condition of insulation and any non-insulated areas.
    c. If more than one ceiling type exists, record them separately.
9. Visually inspect ducts.
    a. While in the attic and crawlspace/basement, you should visually inspect the ductwork.
    b. Record whether the system is mostly flex line or hard ducting. For hard ducting, note whether the seams are sealed with mastic, tape, or not at

all. **If friable asbestos is observed, notify homeowner and do not test ducts.** With flexible ductwork, check for proper Panduit strap (e.g., snap tie, zip tie) installation. Note whether there are any disconnected ducts, as well as the general condition of the duct system.

c. Record the percentage of ductwork that is located in the attic, the percentage of ductwork in the basement/crawlspace, and include the level of duct insulation.

10. Verify wall insulation (if not confirmed by code default or homeowner).
    a. When attempting to verify wall insulation, check at plumbing penetrations under the sink or remove covers from outlets, switches, cable wires, or phone jacks located on exterior walls. If multiple additions or remodels were made, this should be repeated in each location.
    b. If unable to verify through previous methods, look for a closet or inconspicuous location. Using an awl or small drill bit, make a ¼" hole in the wallboard or plaster. Using a plastic crochet hook, draw a sample out of the cavity to determine insulation type. The depth of the cavity and whether the cavity is partially insulated may also be determined with this procedure.
    c. When finished, fill the hole with caulking. **Always ask a homeowner before doing this.**
11. Record HVAC system(s) type/efficiency/fuel/% of floor area heated.
    a. Record heating system fuel type and the percent of floor area heated.
    b. If the efficiency is noted on the exterior of the heating system, record it. Otherwise use the following defaults:
        i. Furnaces/boilers with an open draft collar (*old*) are categorized as 78% efficient or less; furnaces/boilers with B-venting (*standard*) are categorized as between 78%-89% efficient; and furnaces with plastic PVC venting (*efficient*) are categorized as 90% plus efficient.
        ii. Heat pumps manufactured before 1988 are categorized as *old*, those manufactured after 1988 are *standard*. Ground source, inverter drive, and ENERGY STAR heat pumps are considered *efficient*. Note: Heat pumps with a furnace as backup heat will be entered as a heat pump.
    c. Note any equipment conditions that may affect performance or safety.
    d. For electric resistance heat, note either *wall heater* or *furnace*.
12. Record primary water heater type.
    a. Visually inspect the water heater to place it into the following categories:
    b. Open draft collar or power assist, electric (no venting), PVC vent, tankless gas (vented), tankless electric (no venting), solar.
    c. Note any equipment conditions that may affect performance or safety.
13. Record secondary water heater type if present.
    a. Visually inspect water heaters to place them into the same categories listed for the primary water heater.

14. Record primary refrigerator type/year.
    a. Note the type of refrigerator (side-by-side, top freezer, bottom freezer).
    b. If the purchase date is not known by homeowner, locate the manufacturer label (usually inside the refrigerator or on the door seal) and record the manufactured year.
    c. If the manufactured year was not on the label, make a visual estimate and choose a year category from the audit form. As a last option, record the make, model, and serial number for further research.
    d. While conducting the interior inspection, note any additional refrigerators or freezers and if they are older or newer appliances. This information will be referenced on the final report.
15. Record clothes dryer fuel.
    a. The clothes dryer will either have a large 220v plug if it is electric, or a metal or flex gas line run to it if it is gas. Note: A gas dryer still has a standard 110v plug.
16. Record washing machine efficiency category
    a. *Efficient*: Front load and/or ENERGY STAR wash machines
    b. *Standard*: All wash machines that are not efficient
17. Record stove and oven fuel type.
18. Verifying other major energy uses.
    a. Record approximate energy use for equipment that adds greater than 500 kWh to the total energy consumption of the home (refer to *Major Energy Uses* section of the *Field Manual).*
    b. Only include equipment that is hardwired to the house.
    c. Visually inspect other major energy uses noted by homeowner or observed during audit and compare with options provided in *Field Manual*.

Testing (15-45 min)

1. Perform CAZ (combustion appliance zone test) in accordance with BPI standards (EPS Plus Audit only).
2. Perform blower door test using the proper set up method as outlined in ASTM E779-03. ******Always turn off combustion appliances before running blower door test.**
    a. While the blower door is running, walk around to feel for air leakage and record leakage points.
    b. Breakdown the equipment.

Exit Discussion with Homeowner (5-15 min)

1. Ask homeowner any questions that may have developed during the audit.
2. Discuss with the homeowner any general thoughts that you have about the home's energy performance.
3. A report will be sent within 10 business days outlining the findings and upgrades that could be made to the home.

4. The EPS scorecard will accompany the report.
5. Thank the homeowner for his or her time and provide an EPS Information Sheet so he or she can follow up on the EPS audit.