

1 **P5 – Proposed Home Performance with ENERGY STAR® Post-Installation**  
2 **Test-Out Guidance**

3  
4 Background

5  
6 The National Home Performance with ENERGY STAR (HPwES) Program believes that  
7 providing clear guidance on the post-installation test-out is important to local sponsors. One of  
8 the features that distinguishes HPwES as a value-added service for residential customers is the  
9 series of instrumented tests and inspections that the home performance contractor or consultant  
10 (here after referred to as “contractor”) performs after the improvements have been made to a  
11 home. These tests support the “do-no-harm” principal which is a hallmark of home performance  
12 contracting. While the home performance contractor cannot give an absolute guarantee that the  
13 home is going to operate safely under all conditions, s/he is nevertheless concerned about  
14 health and safety of the occupants. In addition to conducting tests that address health and  
15 safety, the blower door and the duct leakage test (conducted when air and duct sealing have  
16 been performed) provide information on the progress made by the home performance  
17 contractor while installing air and duct sealing measures.

18  
19 Program sponsors need to adopt “test-out” requirements in their program policies and  
20 procedures that meet or exceed the guidance in this proposal. This guidance and a test-out  
21 form template have been developed to define minimum requirements for program sponsors.  
22 When a participating contractor completes home performance improvements for a customer,  
23 they should perform the post-installation tests and inspections described in this guidance, and  
24 enter the results in the “Post-Installation Tests and Inspections” Form. If any of the tests or  
25 inspections show the need for corrective action, the contractor can record the action item(s) in  
26 the document or postpone completing the Form (including having the customer sign it) until  
27 those corrective actions have been made. The job will not be considered complete until the  
28 program sponsor has received a signed Post-Installation Tests and Inspection Form that  
29 indicates that all standards have been met (i.e., all tests and inspections have been passed  
30 successfully) and that no further actions are required.

31  
32 Comments Requested

33  
34 The National HPwES Program is seeking comments on the proposed elements to be included in  
35 the Post-Installation Test-out Guidelines; specifically:

- 36  
37 1. Are the Test-out Guidelines for visual inspection, diagnostics, and reporting clear and  
38 reasonable minimum requirements? If not, how should they be modified?  
39 2. Does the template Test-out Form provide assistance in the development of program  
40 policies and reporting procedures?  
41 3. Should any of the proposed minimum elements be deleted or should others be added?  
42  
43

44 Proposed Guidance

45  
46 The Post-Installation Tests and Inspections Form can be used to complete the process for  
47 reporting post-installation tests and inspections (commonly referred to as the “test-out” process).  
48 The following sections provide guidance on completing the Form:  
49

50  
51 **Blower Door Test and Ventilation Compliance**

1  
2 A post-installation blower door test is required if the contractor has installed measures that could  
3 affect building tightness, per the Building Performance Institute (BPI) Building Analyst Technical  
4 Standard. The contractor must enter the blower door test result on the Form.  
5

6 The contractor may use any of several approaches to determining compliance with ventilation  
7 air requirements. These approaches are listed in the BPI Building Analyst Technical Standard,  
8 and are based on ASHRAE ventilation standards:  
9

10 BPI Simple Universal Approach: Provide Whole Building Mechanical Ventilation: Controlled  
11 ventilation is preferable to accidental ventilation through the cumulative gaps and holes in the  
12 building pressure barrier, since accidental ventilation avenues, however reduced, can be  
13 problematic in terms of customer comfort and satisfaction, moisture build-up, building durability,  
14 etc. Therefore, the preferred approach is to simply provide whole building mechanical  
15 ventilation, consistent with ASHRAE 62.2 – 2007. The contractor is required to use the  
16 ASHRAE 62.2 – 2007 ventilation formula or the table provided by BPI in Section 7 of the  
17 Building Analyst Technical Standard. The contractor enters the ASHRAE standard from the  
18 referenced equation or table in the Building Leakage Standard field and circles the “Mech.  
19 Ventilation CFM” selection next to it. The contractor then indicates in the checkboxes on the  
20 next line whether the home passes or fails and, if the latter, what corrective actions should be  
21 taken. The contractor completes the section by checking the “Whole Building Mechanical  
22 Ventilation per ASHRAE 62.2 – 2007 box in the section entitled “Method Used to Determine  
23 Building Leakage Standard.”  
24

25 Ventilation Credit for Air Leakage: This method was developed by BPI in recognition of the fact  
26 that providing whole house mechanical ventilation sufficient to comply with the method above  
27 can sometimes be cost-prohibitive in a retrofit situation and therefore rejected by the customer.  
28 The method allows for a credit to be calculated for the natural ventilation that remains in the  
29 home after air sealing has been completed. It requires the use of software that can provide an  
30 adjusted mechanical ventilation rate that credits the air leakage. After filling in the blower door  
31 test number, the contractor enters the adjusted ventilation rate in the Building Leakage Standard  
32 field and circles the “Mech. Ventilation CFM” selection next to it. The contractor then indicates  
33 in the checkboxes below whether the home passes or fails the adjusted standard and, if the  
34 latter, what corrective actions will be taken. The contractor completes the section by checking  
35 the “Ventilation Credit for Air Leakage” box under “Method Used to Determine Building Leakage  
36 Standard” and indicates the software used to calculate the adjusted required mechanical  
37 ventilation rate.  
38

39 Ventilation Exemption for “Leaky” Homes: Again, some homes are sufficiently ventilated after  
40 air sealing that they do not require mechanical ventilation. According to Section 7.3 of BPI’s  
41 new Building Analyst Standard (currently in draft), BPI recommends, but does not require,  
42 whole-building ventilation for homes with a leakage rate above approximately 0.6 ACH as  
43 calculated using ASHRAE 136, 119 for existing homes. The contractor may either enter the  
44 post-installation blower door test result in ACH or CFM50 in the “Measured Building Leakage”  
45 field. If using ACH, the contractor would compare that result to 0.6, which would be the entry for  
46 the standard in the “Building Leakage Standard” field. Alternatively, the contractor may enter  
47 the blower door test and the standard in CFM50. Appendix A of BPI’s Building Analyst  
48 Technical Standard provides a helpful table of CFM50 factors that the contractor may use to  
49 calculate the standard in CFM50 for entry into the form. The contractor completes the section  
50 by checking the “Ventilation Exemption for Existing Homes per ASHRAE 62.2 – 2007” box  
51 under “Method Used to Determine Building Leakage Standard.”

1  
2 **BPI Legacy Building Air Tightness Standard (BAS) Approach:** As an alternative to using any of  
3 the three methods presented above, the contractor may use the BPI “Building Airflow Standard”  
4 from the previous BPI Building Analyst I Technical Standard (v2/28/05), which is based on  
5 ASHRAE 62-1989, until that time at which BPI phases out the method and no longer accepts it  
6 as a method for ventilation compliance. The contractor using this method enters the blower  
7 door test result in CFM50 and compares it to the BAS that s/he has calculated and entered into  
8 the “Building Leakage Standard” field. The contractor completes the section by checking the  
9 “BPI Legacy Building Air Tightness Std per ASHRAE 62.2 – 1989” box under “Method Used to  
10 Determine Building Leakage Standard.”

11  
12 **Combustion Equipment Testing / Combustion Appliance Zone Testing**

13  
14 **Vented Heating and Domestic Hot Water (DHW) System Tests and Inspections:** The contractor  
15 is required to perform post-installation tests on vented combustion appliance equipment in the  
16 home in order to determine that conditions are within the safety ranges expressed in the BPI  
17 Building Analyst Technical Standard. As specified in that Standard, the contractor is required to  
18 conduct spillage, draft and carbon monoxide (CO) tests as appropriate for the type of equipment  
19 that is present. The Post-Installation form provides a grid for filling out the results of the test  
20 under both worst case and, if needed, natural conditions, as described in the Standard. The  
21 contractor is required to follow the BPI testing standards and procedures or equivalent  
22 standards and procedures published by a recognized authority such as the National Fire  
23 Protection Association (NFPA) or the Canada General Standards Board, as approved by EPA  
24 and DOE.

25  
26 In addition, the contractor is required to visually inspect the configuration, size, condition and  
27 integrity of the connections for the flue vents attached to the combustion equipment that is  
28 tested. The Form provides a field to indicate whether the flue system is adequate per the  
29 National Fuel Gas Code (see NFPA 54, Chapter 13 and Annex G) or other applicable codes  
30 such as state or local building or mechanical codes. If the flue system is not adequate, the  
31 contractor can note actions required to correct the deficiency in the space provided.

32  
33 **Fuel Leak Testing:** It is recommended that the contractor check fuel lines to combustion  
34 equipment wherever they are accessible for inspection. For natural gas and propane fuel line  
35 inspections, the tests should be performed using an electronic combustible gas detector and a  
36 non-corrosive leak detection fluid. The Form has a simple input section to indicate that there  
37 either are “No Leaks Detected” or, if any such leaks are detected, the entry of details for follow-  
38 up action.

39  
40 **Combustion Appliance Zone (CAZ) Depressurization and CO Tests:** The contractor is required  
41 to conduct combustion appliance zone depressurization and ambient carbon monoxide testing,  
42 as specified by the BPI Building Analyst Technical Standard or an alternative recognized  
43 standards organization, such as ASTM (e.g., ASTM E1998-99 or any updates thereof for  
44 depressurization testing). The ambient CAZ CO readings taken during equipment testing must  
45 be entered for each CAZ in the first column of the CAZ table on the Form. The contractor is  
46 then required to record the base and worst case pressure readings for the CAZ and calculate  
47 the net CAZ by subtracting the worst case pressure reading from the base case reading. Based  
48 on the combustion air and venting configuration on the equipment in the CAZ, the contractor  
49 determines and enters the BPI CAZ depressurization limit, and then indicates the “Result” as a  
50 “pass” or “fail” with space for an action to correct the problem.

51

1 Ambient CO: The contract is required to record readings for the kitchen and main living area  
2 and indicate any actions that will be taken if required per the BPI Building Analyst Technical  
3 Standard or other relevant codes or standards.  
4

5 Oven CO: BPI requires that gas ovens be tested for CO emissions in its Building Analyst  
6 Technical Standard. The contractor is required to record the CO levels per the testing  
7 procedure in the Standard and specify actions to mitigate those levels if they are at an action  
8 level per the Standard.  
9

10 Dryer Vent: If the dryer is fueled by gas, the contractor is required to inspect the dryer vent and  
11 ascertain that it is properly vented per the BPI Building Analyst Technical Standard. If not, the  
12 contractor must indicate actions required to address the problem.  
13

#### 14 **Distribution System Air Flow and Leakage Tests**

15  
16 If ducts are sealed and/or replaced as part of the job scope, the contractor is required at a  
17 minimum to conduct an air flow test. The airflow test is conducted to ensure that airflow is  
18 adequate for the system being tested. The contractor may use a test that is recognized by the  
19 industry (flow plate, flow hood, static pressure, temperature drop). The contractor enters the  
20 result in the “Airflow Test Result”, indicates whether the test is a “pass” or “fail” and, if the latter,  
21 actions required to correct the failure.  
22

23 In addition, EPA recommends that the contractor conduct a duct leakage test, as required by  
24 BPI’s Building Analyst Technical Standard. The contractor may choose a recognized duct  
25 leakage test (e.g., Duct Blaster®, Blower Door subtraction test, Delta Q, or pressure pan test).  
26 The contractor enters the results in the “Duct Test Result” field or, in the case of pressure pan  
27 test, can enter averaged “test-in” and “test-out” results in the “Pressure Pan Test” section of the  
28 Form. The contractor may use additional sheets if necessary to report more detailed test  
29 entries.  
30

#### 31 **Confirmation of Measures Installed**

32  
33 The contractor is required to complete this section, which provides a simple check-off list so that  
34 the contractor can confirm that the home performance measures were installed. The contractor  
35 simply checks off the measures that were installed and the customer agrees that they were  
36 installed by signing off on the job’s completion.  
37  
38

Sponsor or Contractor Logo Here

## Home Performance with ENERGY STAR

### Post-Installation Tests and Inspections

[Enter Company Name]

HOME PERFORMANCE WITH ENERGY STAR

**Customer Name:** \_\_\_\_\_ **Customer Phone Number (h):** \_\_\_\_\_  
**Customer Address:** \_\_\_\_\_ **Customer Phone Number (w):** \_\_\_\_\_  
**City, State, Zip:** \_\_\_\_\_ **Customer Email:** \_\_\_\_\_  
**Inspection Date:** \_\_\_\_\_ **Home Performance Analyst:** \_\_\_\_\_

**Blower Door Test and Ventilation Compliance**

<b>Method Used to Determine Building Leakage Standard (check one):</b> <input type="checkbox"/> Whole Building Mechanical Ventilation per ASHRAE 62.2 - 2007 <input type="checkbox"/> Ventilation Credit for Air Leakage (indicate software used): <input type="checkbox"/> TECTITE <input type="checkbox"/> ZipTest Pro2 <input type="checkbox"/> Ventilation Exemption for Existing Homes per ASHRAE 62.2 - 2007 <input type="checkbox"/> BPI Legacy Building Air Tightness Std per ASHRAE 62.2 - 1989 <input type="checkbox"/> Other: _____	<table style="width: 100%;"> <tr> <td style="width: 50%;"> <b>Bldg Leakage (Test-In):</b> _____ CFM50 / ACH (circle one)            _____ CFM50 / ACH / Mech. Ventilation CFM (circle one)         </td> <td style="width: 50%;"> <b>Bldg Leakage (Test-Out):</b> _____ CFM50 / ACH (circle one)         </td> </tr> <tr> <td colspan="2"> <input type="checkbox"/> Pass    <input type="checkbox"/> Pass w/ Ventilation Recommended  <input type="checkbox"/> Fail - Action Required: _____         </td> </tr> </table>	<b>Bldg Leakage (Test-In):</b> _____ CFM50 / ACH (circle one) _____ CFM50 / ACH / Mech. Ventilation CFM (circle one)	<b>Bldg Leakage (Test-Out):</b> _____ CFM50 / ACH (circle one)	<input type="checkbox"/> Pass <input type="checkbox"/> Pass w/ Ventilation Recommended <input type="checkbox"/> Fail - Action Required: _____	
<b>Bldg Leakage (Test-In):</b> _____ CFM50 / ACH (circle one) _____ CFM50 / ACH / Mech. Ventilation CFM (circle one)	<b>Bldg Leakage (Test-Out):</b> _____ CFM50 / ACH (circle one)				
<input type="checkbox"/> Pass <input type="checkbox"/> Pass w/ Ventilation Recommended <input type="checkbox"/> Fail - Action Required: _____					

**Combustion Equipment Testing / Combustion Appliance Zone Testing**

	Worst Case Test Results			Natural Condition Test Results			Flue Inspection
	Spillage	Draft	CO	Spillage	Draft	CO	
Heating System 1:	Pass Fail	pa	ppm	Pass Fail	pa	ppm	Pass Fail <input type="checkbox"/> Action Required:
Heating System 2:	Pass Fail	pa	ppm	Pass Fail	pa	ppm	Pass Fail <input type="checkbox"/> Action Required:
DHW System 1:	Pass Fail	pa	ppm	Pass Fail	pa	ppm	Pass Fail <input type="checkbox"/> Action Required:
Other:	Pass Fail	pa	ppm	Pass Fail	pa	ppm	Pass Fail <input type="checkbox"/> Action Required:

  

	Base Pressure	Worst Case Pressure	Net CAZ Depress.	Limit for CAZ	Result
CAZ 1:					Pass Fail <input type="checkbox"/> Action Required:
CAZ 2:					Pass Fail <input type="checkbox"/> Action Required:

**Gas Leak Testing:**  No Leaks Detected     Leaks Detected as Noted: \_\_\_\_\_  
**Ambient CO:** Kitchen \_\_\_\_\_ Main Living \_\_\_\_\_ Other - ppm \_\_\_\_\_  Action Required:  
**Oven CO:** Fuel \_\_\_\_\_ CO ppm \_\_\_\_\_ Vent Out? Yes No  Action Required:  
**Dryer Vent:**  Electric     Gas Properly Vented     Gas Improperly Vented. Action Required: \_\_\_\_\_

**Distribution System Air Flow (required if ducts were sealed as part of project) and Leakage Test**

<b>Airflow Test Result:</b> _____ <input type="checkbox"/> Pass <input type="checkbox"/> Fail <b>If fail, action to be taken:</b> _____	<b>Duct Leakage Test:</b> Duct Blaster    BD Subtract    Delta Q    Press Pan <b>Duct Test Result (enter here or attach separate form):</b> _____ <b>Pressure Pan Average (Test-In):</b> _____ <b>Pressure Pan Average (Test-Out):</b> _____
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<b>Verification of Measures Installed:</b> <input type="checkbox"/> Basement Air Sealing <input type="checkbox"/> Attic Air Sealing <input type="checkbox"/> Basebrd / Molding Air Sealing <input type="checkbox"/> Windows / Doors Air Sealing <input type="checkbox"/> Ext. Wall to Garage Air Sealing <input type="checkbox"/> Attic Flat Insulation <input type="checkbox"/> Attic Slope Insulation <input type="checkbox"/> Attic Kneewall Insulation <input type="checkbox"/> Exterior Wall Insulation	<input type="checkbox"/> Attic Stairs Insulation <input type="checkbox"/> Attic Tent <input type="checkbox"/> Window Replacement / Repair Qty: _____ <input type="checkbox"/> Window Film / Solar Screen Qty: _____ <input type="checkbox"/> Door Replace / Repair Qty: _____ <input type="checkbox"/> Heating System Replace / Repair <input type="checkbox"/> Central Air Conditioner Replace / Repair <input type="checkbox"/> Htg / DHW Flue Replace / Repair <input type="checkbox"/> Air Handler Replace / Repair <input type="checkbox"/> Duct Sealing / Insulation / Replacement	<input type="checkbox"/> DHW System Replace / Repair <input type="checkbox"/> DHW Blanket / Pipe Insulation <input type="checkbox"/> Exhaust Fans - Qty _____ / HRV <input type="checkbox"/> Exhaust Vents Reroute / Insulate <input type="checkbox"/> Attic Vents Qty: _____ <input type="checkbox"/> Appliance: _____ <input type="checkbox"/> Appliance: _____ <input type="checkbox"/> Appliance: _____ <input type="checkbox"/> Lighting: CFL's / Fixt. Qty: _____ <input type="checkbox"/> Renewable Energy Syst: _____	<input type="checkbox"/> Health & Safety: _____ <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____ <input type="checkbox"/> Notes/Items Requiring Follow-Up: _____
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**Contractor Statement and Signature:**

I attest that all of the information entered above is correct to the best of my knowledge. I agree to complete any items noted above for follow-up corrective action, and will submit an additional Post-Installation Tests and Inspections form that verifies the successful completion of those items and records required follow-up tests or inspections:

Contractor Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Customer Statement**

I attest that I am the owner of the property specified above, and that all materials and equipment included my home improvement contract with the above Contractor have been furnished and installed by the Contractor, and that the work has been completed pursuant to the contract.

Customer Signature: \_\_\_\_\_ Date: \_\_\_\_\_