

Best Practices – Duct Testing Target

Subject 1: Duct Testing Requirements

Subject 2: Duct Testing Targets

Date: Revised January 5, 2017

Subject 1: Duct Testing Requirements

Problem or Question: Is duct testing required for an assessment?

Discussion: Yes, duct system testing is required for a whole-house assessment. As of 1 January 2011, Duct Testing became a requirement, via the use of a duct-blower. The IRC clearly states in the Energy Efficiency Chapter, *“Duct Tightness shall be verified by either of the following: 1. Post-construction test: leakage to the outdoors shall be less than or equal to 8 Cfms per 100 sq.ft. of conditioned floor area or a total leakage less than or equal to 12 Cfms per 100 sq.ft. of conditioned floor area when tested at a pressure differential of 0.1 inch w.c. (25Pa) across the entire system, including the manufacturer’s air handler end closure. All register boots shall be taped or otherwise sealed during the test.”* This required test can only be accomplished with a duct-blower.

Leaky ducts are one of the top causes of energy loss and waste in the United States. The duct-blower is a diagnostic tool used by a trained weatherization person to assess issues associated with leaky duct systems. This tool helps an assessor to determine the amount of duct leakage. However, one must investigate where the duct leakage is occurring to identify the best way to maximize CFM reduction and increase the efficiency. A pressure pan test can help to determine the location of leaks. See the “Texas Weatherization Field Guide” for more information on duct-blower use. This Guide also contains a section for pressure pan testing,

The principle goal for duct sealing is very similar to that of air sealing. Maximizing efforts and effectiveness of duct sealing positively impacts other measures in the home, not to mention increasing client comfort. Leaky ducts allow the conditioned air to escape into undesirable locations, like the attic or crawl space. Properly sealed ducts deliver conditioned air within the defined thermal boundary.

Recommendation Summary: In accordance with IRC, Subrecipients must use the duct-blower as part of every unit’s whole-house assessment. A duct-blower is an effective tool, used by weatherization contractors, to ensure maximum reduction to duct leakage. Subrecipients must verify satisfactory duct leakage reduction by conducting a final duct-blower test at the final inspection.

Subject 2: Duct Testing Targets

Problem or Question: We understand that duct leakage is a major cause of wasted energy. How do we determine our duct sealing targets? For DOE houses, how should we enter the duct test data into the energy audit?

Discussion: Two diagnostic tools, for obtaining the duct test information needed, for the energy audit are: a duct-blower and a pressure pan. A duct-blower test is to be performed as part of every assessment and during every final inspection in homes with central systems. The duct-blower quantifies the number of cfms being lost to duct leakage, or the success of duct sealing measures. A pressure pan

<http://www.tdhca.state.tx.us/ea/wap.htm>

is a simple useful tool that can help identify the location of leaks and make duct sealing work more effective. The pressure pan test provides a strong indication of the size of the leaks (1.0 Pa is a small hole, 7.5 Pa is a large hole); however it does not indicate the number of cfms lost or how many cfms need to be eliminated by the end of the job. Any pressure pan reading on a register that reads higher than 0.8 Pa is something that should be considered for additional sealing measures.

- The “blower-door subtraction” technique is not an approved method. This unsatisfactory technique is performed by obtaining a baseline during the initial blower door test, then taping up the ducts and running another blower door test, and calculating the difference between the two readings for the amount of duct leakage. This simplistic method does not allow the assessor to test for, and isolate, the duct leakage to the outside. This method only approximates the “total duct leakage.” It is possible for the “total duct leakage” to be under the minimum IRC cfm standard and, at the same time, for the “duct leakage to outside” to be well above the IRC standard. Such a high energy-loss situation cannot be recognized and documented without running both a pre and post duct-blower test.

Accurate duct sealing targets impact the amount of insulation that ranks and the size and/or possibility of mechanical (HVAC) being recommended. **The maximum “Total Duct Leakage” cannot exceed 12 CFM/100 sq/ft (12%), and “Duct Leakage to Outside” cannot exceed 8 CFM/100 sq/ft (8%).** It is important to note that the “Duct Leakage to the Outside” test requires simultaneous operation of a blower-door at 25 Pa. The duct target numbers are entered in the “Ducts and Infiltration” field, in the “After Weatherization Target” box. Use the optimal number in these fields to maximize benefit to the client. These numbers need to be as low, yet as realistic as possible, based upon the state of the individual house, the level of detail gathered by staff during the initial assessment to guide duct sealing efforts, plus the actual effectiveness of the contractor’s duct sealing ability. Unrealistically low numbers produce an inaccurate energy audit and therefore may not allow for the software to account for other factors such as; solar screens, storm windows, or AC replacements. Target numbers that don’t require much of a reduction, such as the 8% & 12% targets, may not allow the energy audit to recommend sufficient funds to achieve duct sealing reductions.

NOTE: *before conducting either of the duct blower tests, the following steps should be followed.*

1. *Ensure the unit is turned off at its power source and that the thermostat will not trigger the unit to start up.*
2. *Conduct a visual inspection of the “A” coil. If a visual inspection cannot be accomplished call in a certified HVAC technician. Do not touch the “A” coil or any unit components. Do not attempt to clean a dirty or clogged “A” coil. A certified HVAC technician should be utilized for these tasks. The “A” coil should be cleaned/serviceable before attempting to gather the data/information for duct entry numbers 3 through 10 below.*

Recommendation Summary: Use a duct-blower to reduce duct leakage and to comply with IRC standards. Enter the lowest achievable duct sealing target number for the optimal CFM reduction value into the energy audit software. Proper data entry will result in the most adequate and authorized funds (SIR >1) to accomplish duct sealing. **The ideal final duct-blower target is 0 cfm; work to get as close to zero as possible.**

For DOE houses, the following is a screenshot of the energy audit data entry screen:

NEAT AUDIT -- NEAT AUDIT -- NEAT AUDIT -- NEAT AUDIT -- NEAT AUDIT -- NEAT AUDIT -- NEAT AUDIT

Audit Name **Audit (4)** Client ID **SL-2010-003** Client Name _____ Alt. Client ID _____

Audit Information | Status | Shell | Heating (2) | Cooling (2) | Ducts/Infiltration | Baseloads | Health & Safety | Itemized Costs (2) | Utility Bills (0) | Measures (19)

Air and Duct Leakages | Optional Blower Door and Zonal Pressures (0) | Optional Pressure Balance (0) | Optional Pressure Pans (0)

Evaluate Duct Sealing Duct Leakage Method **Duct Blower Measurements**

Whole House Blower Door Measurements

	Before Weatherization (Existing)	After Weatherization (Target or Actual)
Air Leakage Rate (cfm) at House Pressure Difference (Pa)	1 / 50	2 / 50

Duct Operating Pressures

	Before Duct Sealing	After Duct Sealing
Supply (Pa)	3	4
Return (Pa)	3	4

Duct Blower Measurements

	Before Duct Sealing (Existing)		After Duct Sealing (Target or Actual)	
	Total	Outside *	Total	Outside *
Fan Flow (cfm) at Duct Pressure (Pa)	5 / 25	6 / 25	7 / 25	8 / 25
House Pressure WRT Outside (Pa)	25	25	25	25

* 'Outside' readings are taken while the house to outdoor pressure difference provided by a blower door is maintained at the same level as the duct to outdoor pressure difference created by the duct blower. Thus, the 'Duct Pressure' and the 'House Pressure With Respect To Outside' should be equal.

Costs

Infiltration Reduction (\$) **9** Comment _____

Duct Sealing (\$) **10**

Refresh Tightness Limit The minimum recommended CFM at 50pa is: 1352 CFM

Run Audit
Last Run On 2/25/2011 at 12:24 PM

1. This is where your Blower Door CFM50 number goes.
2. This is where your Blower Door Target CFM50 number goes.
3. Duct operating pressures must be taken in the supply and return. NOTE: The air handler should be turned on AND any cooling or heating functions should be turned off, as these measurements are taken.
 - a. Obtaining the operating pressure for supply pressure (in Pa): Drill a small hole in the supply plenum. Care should be taken not to drill into the "A" coil—you may cause a (coolant / Freon) leak. You could use a drill stop to ensure the drill bit only penetrates 1/8 of an inch into the plenum (a ring of plastic PVC piping measured to your drill tip and bit is an excellent drill stop, especially when drilling through metal sheeting). Use a static pressure probe w/ a metal magnetic tip that is "hooked" or curved. Insert the tip into the plenum to get a pressure reading with your manometer. Make sure the hole of the probe is facing into the flow of the air when you get the reading.
 - b. Obtaining the operating pressure for the return pressure (in Pa). Follow the same instructions above. Drill and measure the pressure in the return air duct.
4. After duct sealing these numbers should increase.
5. This is the reading on the duct blower as you run total duct leakage.
6. This is the number on the duct blower manometer as you run duct leakage to outside.
7. This is where you will put the target 12 CFM/100 SF of home – maximum target option.
8. This is where you will put the target 8 CFM/100 SF of Home – maximum target option.
9. This is where the dollars that you want to spend on air sealing goes (based on the whole-house assessment, prices of materials & labor, and funds justification [based on the audit and agency policies]).