

## Duct Testing Standard (RS-33) For New and Existing Construction

### New Construction

Based on the protocol for “Total Leakage Testing,” or “Leakage Testing to Outdoors” duct leakage in new construction shall not exceed  $0.04 \text{ CFM}_{25} \times \text{floor area}$  (in square feet) served by the system for leakage to outdoors or for total leakage when tested post construction. When testing at rough-in, targets should not exceed  $0.04 \text{ CFM}_{25} \times \text{floor area}$  (in square feet) for total leakage or  $0.03 \text{ CFM}_{25} \times \text{floor area}$  (in square feet) if the air handler is not installed.

**Exception:** The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope. Ducts located in crawl spaces do not qualify for this exception.

### Existing Construction

When a space-conditioning system is altered by the installation or replacement of space-conditioning equipment (including replacement of the air handler, outdoor condensing unit of a split system air conditioner or heat pump, cooling or heating coil, or the furnace heat exchanger), the duct system that is connected to the new or replacement space-conditioning equipment shall be tested. The test results shall be provided to the building official and the homeowner.

**Exception 1:** Duct systems that are documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in RS-33.

**Exception 2:** Ducts with less than 40 linear feet in unconditioned spaces.

**Exception 3:** Existing duct systems constructed, insulated or sealed with asbestos.

**Exception 4:** Additions of less than 750 square feet of conditioned floor area.

### **In addition, the following requirements must be met:**

1. All testing must be done by a qualified technician. The minimum qualification requirement is documented attendance at a duct testing training course approved by the building official. The following existing training programs are recognized as equivalent to this requirement:
  - a. Northwest ENERGY STAR Homes Program, Performance Testing training for new construction.
  - b. Performance Tested Comfort Systems (PTCS) training for existing homes and new construction.
2. Duct systems must be designed, sized, and installed using recognized industry standards and International Residential Code (IRC) requirements, so that calculated heating and/or cooling loads are delivered to each zone.

## Total Duct Leakage Test

### Testing Procedure Application:

This test is appropriate in new construction when ducts are to be tested at the rough-in stage before the house envelope is intact and can also be done post construction. The test measures the total collected leaks in the system at an induced pressure of 25 Pascals (PA). Compared to the leakage to exterior test, the total leakage test is simpler, but does not discriminate between leakage to inside and outside the heated space; as such, this test is not recommended for homes with complete house envelopes and HVAC systems. In such cases, the leakage to outside test is recommended.

### Standard:

- 1) For certification, the measured duct leakage must not exceed ***0.04 CFM<sub>25</sub> x floor area*** (in square feet) served by the system at rough-in **when the air handler is installed.**
- 2) The measured duct leakage at rough-in must not exceed ***0.03 CFM<sub>25</sub> x floor area*** (in square feet) served by the system **when the air handler is not installed.**
- 3) If testing post construction, the total leakage must not exceed ***0.04 CFM<sub>25</sub> x floor area*** (in square feet) served by the system.

**Example** - For a 2240 Ft.<sup>2</sup> home:

- Total leakage target                      2240 X .04 = 90 CFM
- Leakage to exterior target                2240 X .04 = 90 CFM

### Tools and Equipment:

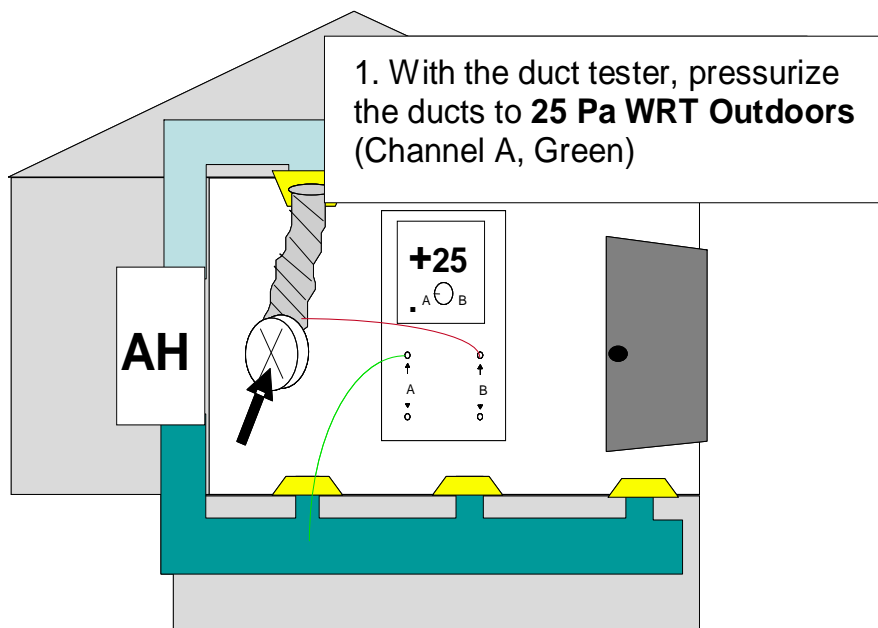
- Duct testing device
- Manometer
- Tape and paper or duct mask to seal registers

### Setup:

- Ensure air handler does not operate during test.
- Remove air filters from the air handler.
- Open all duct dampers (Note setting and return after testing).
- Attach the duct testing device to the air handler cabinet (preferred location), **or**:
  - Attach the duct testing device to the return register closest to the air handler.
- Place the duct pressure tap in the supply register closest to the air handler, **or**
  - Place the duct tap in the supply plenum.
- Seal all the duct system supply and return registers with tape, paper, or mask.
- If the duct testing equipment is not located outside of conditioned space, open an exterior door or window to insure all spaces exterior to the ducts are at outside pressure.
- Install a flow ring which you think best matches the needed capacity of the fan and will provide a duct system pressure of over 25 Pa (see duct testing equipment manual).

### Test:

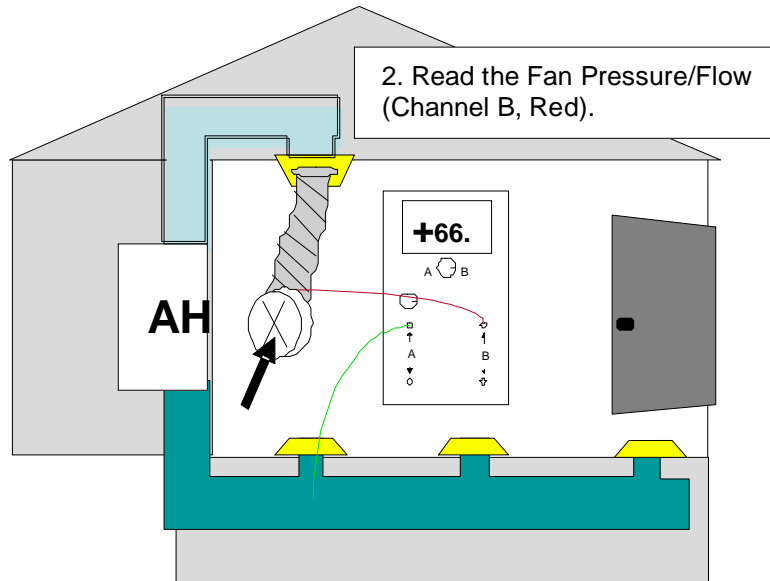
1. With the duct testing device, **pressurize** the ducts to **+25 Pascals with respect to (WRT) outside** (see Figure 1).



**Figure 1:** Pressurizing the duct system

2. Determine the duct leakage (with simple manometers, the fan pressure (Pa) is converted to CFM<sub>25</sub> using a flow table. Many digital manometers sold with duct testing equipment can automatically perform this conversion, and display CFM<sub>25</sub> directly.) Consult your duct testing equipment manual (see Figure 2).

- **Note:** You may need to adjust the ring size of the duct testing device (see duct testing equipment manual).



**Figure 2:** Determining duct leakage

## Duct Leakage to the Exterior Test

### Testing Procedure Application:

In new construction, doors and windows must be installed and the building envelope capable of maintaining +25 Pascals WRT outside pressure with the operation of a blower door. By pressurizing the interior of the home with a blower door while using a duct testing device, duct leakage to the interior is eliminated from the measurement. The test is designed to measure the CFM<sub>25</sub> value for leakage in the duct system to outside of the conditioned space.

**Standard:** The measured duct leakage must not exceed **0.04 CFM<sub>25</sub> x floor area** (in square feet) served by the system.

### Tools and Equipment:

- Blower Door
- Duct testing device.
- Manometer (a second manometer is helpful, but not required)
- Tape and paper or duct mask to seal registers.

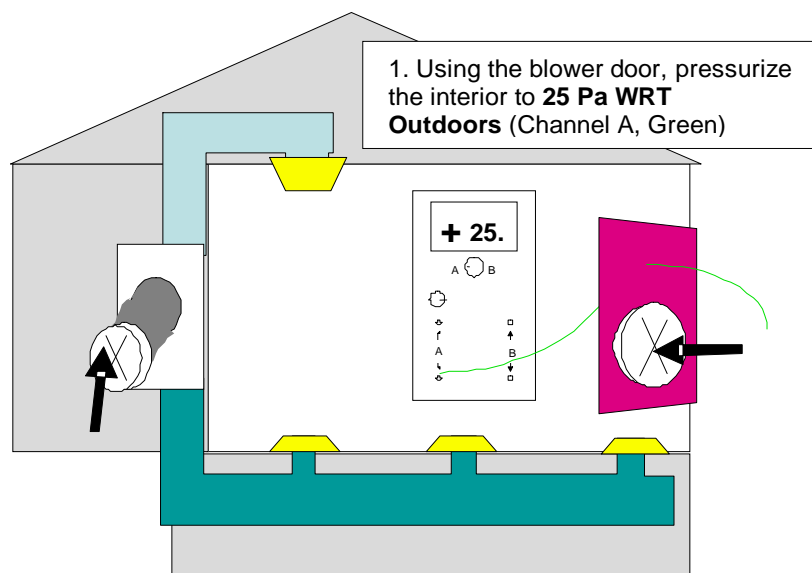
### Setup:

**Example 1.** Duct testing device is hooked up at **largest return register**. The duct testing equipment is **inside the pressurized zone** of the house when the blower door is turned on.

- Prepare house for a standard blower door test.
- Set up **blower door** and set to pressurize the house.
- Set up the **duct testing device** as in a total leakage test except **all exterior doors and windows must be closed**.

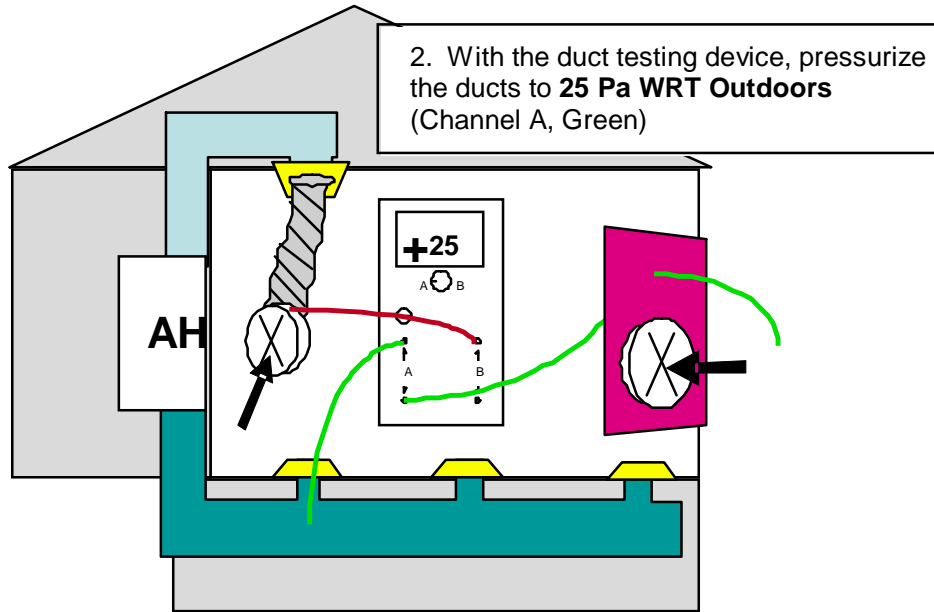
### Test:

1. Using the **blower door**, pressurize the interior to **+25 PA WRT outdoors** (see Figure 3).

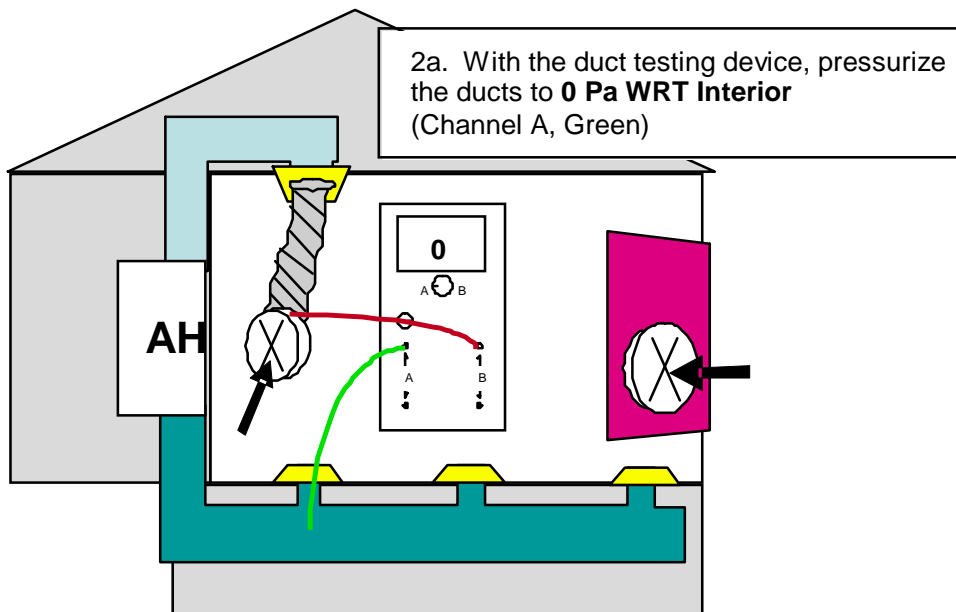


**Figure 3:** Pressurizing interior to +25 PA WRT outdoors.

2. With the duct testing device, pressurize the ducts to **+ 25 PA WRT outdoors**, or
  - o With the duct testing device, pressurize the ducts to **0 PA WRT interior** (see Figure 4).

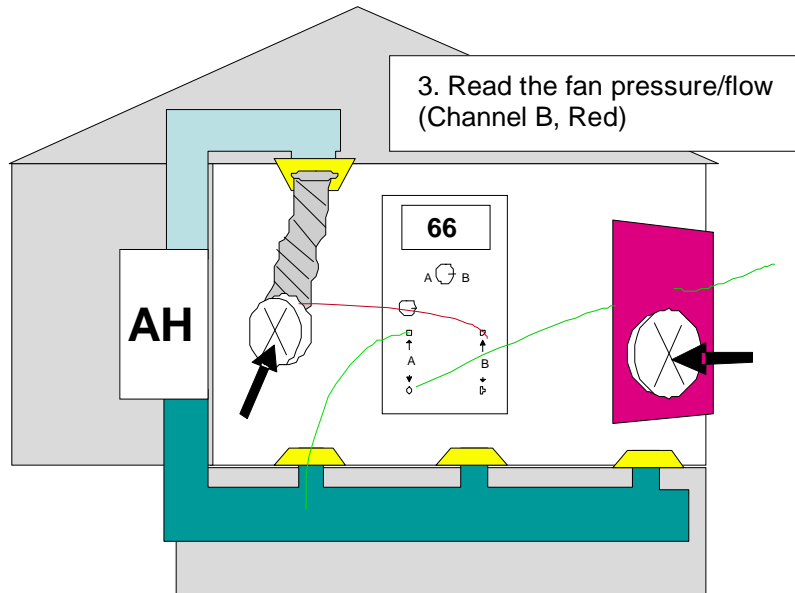


or



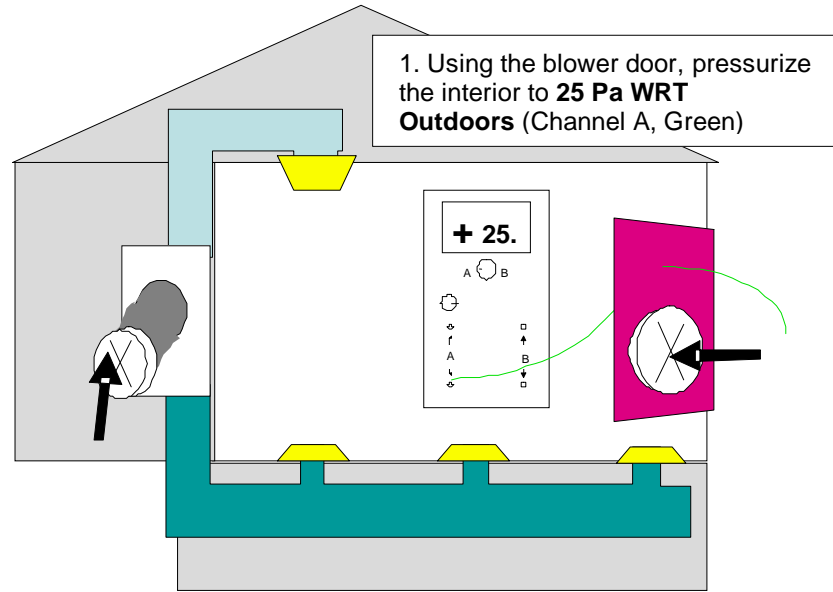
**Figure 4:** Pressurizing ducts to +25 PA WRT outdoors, or 0 PA WRT Indoors. (Duct testing device hooked up to largest return duct, inside the pressurized zone of the house).

3. Check the blower door reading to assure it is still at +25PA.
4. Determine the duct leakage (with simple manometers, the fan pressure (Pa) is converted to CFM25 using a flow table. Many digital manometers sold with duct testing equipment can automatically perform this conversion, and display CFM25 directly.) Consult your duct testing equipment manual (see Figure 5).
  - **Note:** You may need to adjust the ring size of the duct testing device (see duct testing equipment manual).

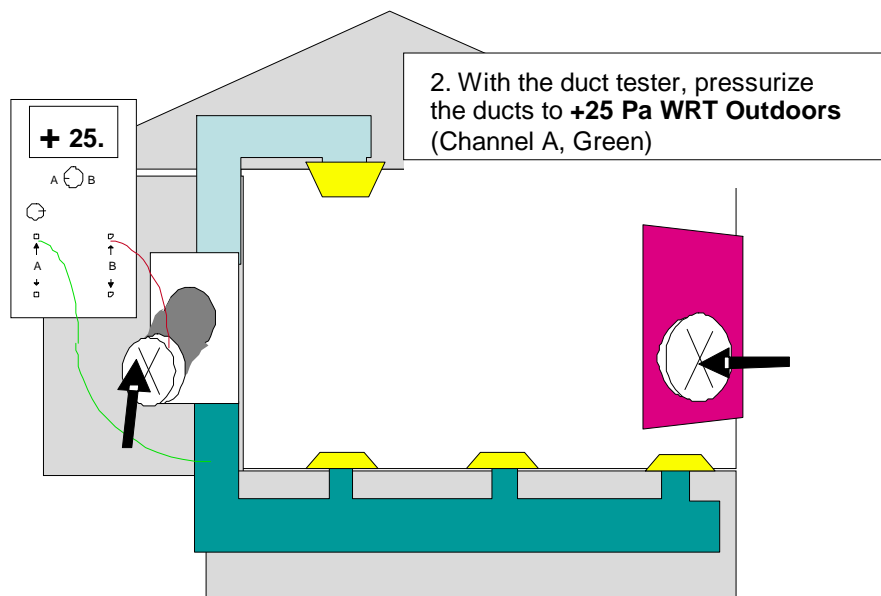


**Figure 5:** Determining duct leakage.

**Example 2.** Duct testing device is hooked up at **air handler**. Depending on the location of the air handler, the duct testing device may be either *inside or outside* the pressurized zone of the house. (Air handler is “Outside” in Figures 6, 7, 8). Follow the same steps as in Example 1.

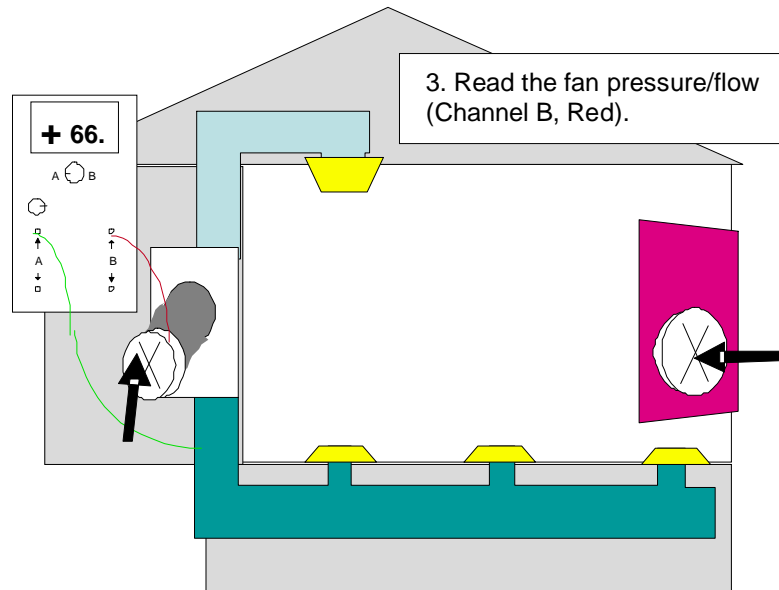


**Figure 6:** Pressurizing interior to +25 PA WRT outdoors



**Figure 7:** Pressurizing ducts to +25 PA WRT outdoors (duct testing device located outside the pressurized zone of the house).





**Figure 8:** Determining duct leakage

**Note:** When the duct testing device is **outside** of the pressurized zone of the house, it is no longer necessary to run a pressure tube from the reference pressure tap on channel A to the outside when determining the duct pressure WRT to outside as it was in Example 1.