



## PTCS Duct Sealing Specification

Updated: April 1, 2015

**Applicability:** This specification outlines the requirements for repairing and sealing new or existing ductwork in existing single family homes and existing manufactured homes, heated with an electric forced air furnace or a heat pump.

**Technician qualification:** Performance Tested Comfort Systems (PTCS) Duct Sealing shall be performed by a technician certified in PTCS Duct Sealing, or an approved alternative (as listed in the [PTCS Program Requirements](#)), and technicians shall be listed as active in the [online registry](#).

*Note: Sections A, B, and C reference the pre- and post-test specification. Sections 1 – 9 are in alignment with the Prescriptive Duct Sealing Specification.*

### PTCS Duct Leakage Pre-Test Specifications

- A. Duct System Diagnostic Procedures:** One of the following tests shall be used to measure the duct leakage in a system, unless otherwise specified in this document.
- A.1. **Duct Leakage to Exterior Test** (Appendix A)
  - A.2. **Duct Leakage to Exterior Supply Side Only Test** (Appendix B)
  - A.3. **Total Duct Leakage Test** (Appendix C)
- B. Home and Duct System Types**
- B.1. Existing Home / New Ducts**
    - B.1.1. To be certified as PTCS, new ducts shall be sealed as they are installed and meet the post-test requirements as listed in C.1.
  - B.2. Existing Home / Existing Ducts**
    - B.2.1. The air leakage of the duct system shall be measured before sealing the system using the **Duct Leakage to Exterior Test** (Appendix A).
    - B.2.2. In order to certify the ducts as PTCS, the CFM leakage in the duct system before sealing shall be greater than or equal to 15% of the floor area if the home is less than 1667 square feet. If the home is greater than or equal to 1667 square feet, the duct leakage shall be greater than or equal to 250 CFM50.
    - B.2.3. In cases where return ducts are non-existent (building cavity return), panned joist, or inaccessible, the **Duct Leakage to Exterior Supply Side Only Test** (Appendix B) may be used to determine the duct leakage.
  - B.3. Existing Manufactured Homes**
    - B.3.1. The air leakage of the duct system shall be measured before sealing the system using the **Duct Leakage to Exterior Test** (Appendix A).
    - B.3.2. In order to certify the ducts as PTCS, the CFM leakage in the duct system before sealing shall be greater than or equal to 100 CFM50 for a single-wide home, 150 CFM50 for a double wide home, or 225 CFM50 for a triple-wide home.

### Duct Sealing (Sections 1 - 9 align with the Prescriptive Duct Sealing Specification dated April 1, 2015)

- 1. Ducts in Unconditioned Space:** At least 30% of the supply ducts must be located in unconditioned space and are accessible. [*Exception: Where high operating pressure leaks are located in an unconditioned space, the system shall be eligible for duct sealing, even if less than 30% of the supply ducts are in unconditioned space. A high operating pressure leak is defined as any leak occurring on the main trunk line within 15 feet of the furnace, especially those at the furnace or plenum connection.*]
  - 1.1. For new duct systems, the entire duct system is considered to be accessible.
  - 1.2. Ducts in basements are considered to be in conditioned space; while vented crawlspaces, attics with floor insulation, and unheated garages are considered unconditioned.

- 1.3. The inner liner on manufactured home crossover ducts is considered accessible; while all other flexible duct connections, including those on single family homes, which have properly secured exterior liners, may be considered to have interior liners that are not accessible.
  - 1.4. The belly of manufactured homes is considered accessible if a visual inspection via non-intrusive methods (mirrors, digital cameras etc.) identifies large holes/leaks.
  - 1.5. The furnace to plenum connection is considered accessible.
- 2. Duct Insulation/Asbestos:** The presence of insulation alone shall not be considered a barrier to accessibility, unless the contractor suspects asbestos may be present. If at any time asbestos is suspected to be present, the contractor shall stop work immediately and notify the homeowner that the site requires professional assessment, and possibly remediation, before duct sealing work can be done.
- 3. Previously Sealed Ducts:** Ducts must not have been previously sealed through the Performance Tested Comfort Systems or BPA's Prescriptive Duct Sealing program unless a utility pre-inspection confirms that additional duct sealing is required.
- 4. Implementation Standards:** Installation must comply with all applicable codes.
- 5. Duct Repair**
    - 5.1. All accessible portions of the duct system shall be repaired and mechanically fastened, where needed.
    - 5.2. Inferior sections of duct—such as rusted, crushed, disconnected or sections otherwise ineffective—shall be repaired or replaced before duct sealing is performed.
    - 5.3. When there are large gaps in sheet metal or duct connections, repairs shall be made using sheet metal, sheet metal screws, and/or mastic with mesh-reinforcing tape. Gaps greater than 1/4 inch shall be reinforced using mesh-reinforcing tape before applying mastic.
    - 5.4. All metal ducts shall be secured using at least three sheet metal screws at each connection and an attempt be made to have them be equally distributed around the ducts.
    - 5.5. All flexible ducts shall be joined to a section of rigid duct of matching diameter, including locations where two separate sections of flex duct meet. Both the inner and outer lining shall be tightly fastened using a compression strap tightened with a tool designed for that purpose. Tape may remain as long as a compression strap is installed to maintain a permanent connection.
    - 5.6. In manufactured homes with two or more sections, defective or missing cross-over ducts shall be repaired or replaced.
- 6. Duct Support**
    - 6.1. All accessible portions of the duct system which require support shall be supported.
    - 6.2. To minimize the possibility of disconnection, flexible ducts shall be supported every 4 feet and within 3 feet of each connection to a rigid duct with straps that are not less than 1 1/2 inches wide each and that do not restrict airflow.
    - 6.3. Ducts shall be supported above the ground. When contact with the ground is unavoidable, a minimum of R-4 closed-cell rigid insulation shall be placed between the duct and the ground. This duct shall not come in contact with standing water.
- 7. Duct Sealing and Acceptable Materials**
    - 7.1. All accessible portions of the duct which require sealing shall be exposed and sealed with approved materials. The following are examples of sealing opportunities: Plenum; Air-handler cabinet to plenum; Plenum-to-take-off connections; Finger/dovetail joints; Branch T's, Y's and L's; Supply and Return Boots; Duct-to-duct connections; Gores on Adjustable Elbows; and End Caps.
    - 7.2. Loose tape shall be removed from rigid metal ducts prior to sealing. Secured tape that remains must be completely covered with mastic which shall extend at least 1/2 inch beyond the tape edge on either side and be at least 1/8 inch thick.

- 7.3. Non-flex duct joints, connections and seams shall be sealed with UL-181 listed mastic.
  - 7.3.1. The application of mastic shall be done according to manufacturer specifications.
  - 7.3.2. Take offs and crimped fitted joints shall be mechanically secured with screws and sealed with mastic. Non-leaking seams such as S-drives or snappies are exempt from being sealed with mastic.
  - 7.3.3. On the air handler, only foil or mastic HVAC tape labeled as meeting UL-181 standards may be used.
  - 7.3.4. Cloth-backed duct tape shall not be used to seal, secure, or fasten ducts.
  - 7.3.5. Boots shall be mechanically fastened to the subfloor and sealed with UL-181 mastic or UL-181 sealant.
- 7.4. Flexible duct connections shall have the interior and exterior liners secured and air-sealed with nylon straps (Panduit or equivalent) and tightened with a manufacturer-approved tensioning tool. Steel band clamps with worm drive tension adjusters are also acceptable.
- 7.5. The return should be sealed if it is easily accessible and in unconditioned space.
- 7.6. End caps must be made of either sheet metal or a UL-181 approved rigid product.

## 8. Insulation

- 8.1. When duct insulation is removed, the insulation shall be re-installed and securely attached to the duct system using mechanical fasteners such as, permanent plastic straps, nylon twine or fastening material specified by the insulation manufacturer. Mastic will not effectively hold insulation in place.

## 9. Combustion Appliance Requirements (Does not apply if there is no combustion appliance)

- 9.1. Whenever there is a Combustion Appliance present in the house, garage, or other attached space, a UL listed, C-UL listed, or equivalent carbon monoxide detector shall be installed.

## PTCS Duct Leakage Post-Test Specifications

### C. Home and Duct System Types

#### C.1. Existing Home / New Ducts

- C.1.1. The air leakage of the duct system shall be measured using either the **Duct Leakage to Exterior Test** (Appendix A) or the **Total Duct Leakage Test** (Appendix C).
- C.1.2. In order to certify the ducts as PTCS, the CFM leakage in the duct system after sealing shall not exceed 10% of the floor area served by the system (0.10 x SF CFM50) **OR** 75 CFM50, whichever is greater.

#### C.2. Existing Home / Existing Ducts

- C.2.1. The air leakage of the duct system shall be measured after sealing using the same test method as the pre-test, the **Duct Leakage to Exterior Test** (Appendix A) or **Duct Leakage to Exterior Supply Side Only Test** (Appendix B).
- C.2.2. In order to certify the ducts as PTCS, the CFM leakage in the duct system after sealing shall not exceed 10% of the floor area served by the system (0.10 x SF CFM50) **OR** shall document a reduction of at least 50%.

#### C.3. Existing Manufactured Homes

- C.3.1. The air leakage of the duct system shall be measured after sealing using the same test method as the pre-test, the **Duct Leakage to Exterior Test** (Appendix A).
- C.3.2. In order to certify the ducts as PTCS, the CFM leakage in the duct system after sealing shall not exceed 50 CFM50 for a single wide home, 80 CFM50 for a double wide home, or 110 CFM50 for a triple wide home **OR** shall document a reduction of at least 50%.
- C.3.3. If the final tested leakage rate is greater than that specified in C.3.2., the air-handler transition-to-trunk duct connection shall be sealed.

## Appendix A: Duct Leakage to Exterior Test

1. Install blower door with fan bringing air into house.
2. Turn OFF air handler, dryer, all fans and combustion equipment.
3. Tape off grilles/registers. Connect duct blaster hose to return grill.
4. Open all interior doors. Close all exterior doors and windows.
5. Connect hose as shown (house wrt outside on side A).
6. Manometer **MODE** should read PR/PR.

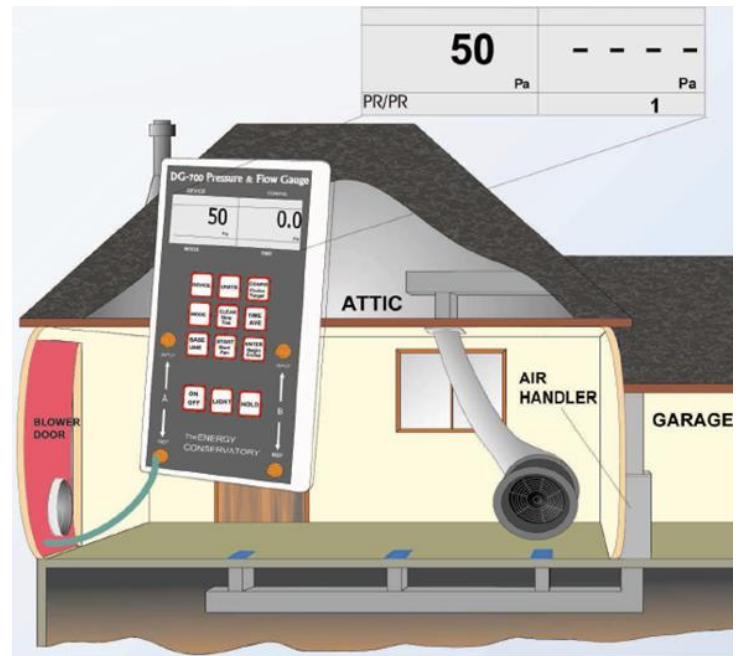


Figure 1: Duct Leakage to Exterior Test 1

7. Connect the manometer to Duct Blaster; side A to ducts (usually supply side) and side B to fan.
8. Configure manometer; **MODE:** PR/FL; **DEVICE:** DBA (if white) or DBB (if black); **TIME AVERAGE:** 1; **CONFIG:** ring you are using.
9. Turn on blower door, pressurize house to 50 Pascals (side A reading). Use cruise control if possible.
10. Pressurize the ducts (blowing air into the duct) until the pressure in the ducts side A reads 0 (with respect to the house – which means the ducts and house are both at 50 Pa with respect to outside).
11. Use the smallest ring possible to get 0 Pa. If you have to change the ring, be sure to reflect that in the manometer **CONFIG** setting.
12. Check blower door reading (house pressure wrt outside). Readjust to 50 Pa if necessary.
13. The CFM reading of the duct blaster is the leakage to outside at 50 Pa.

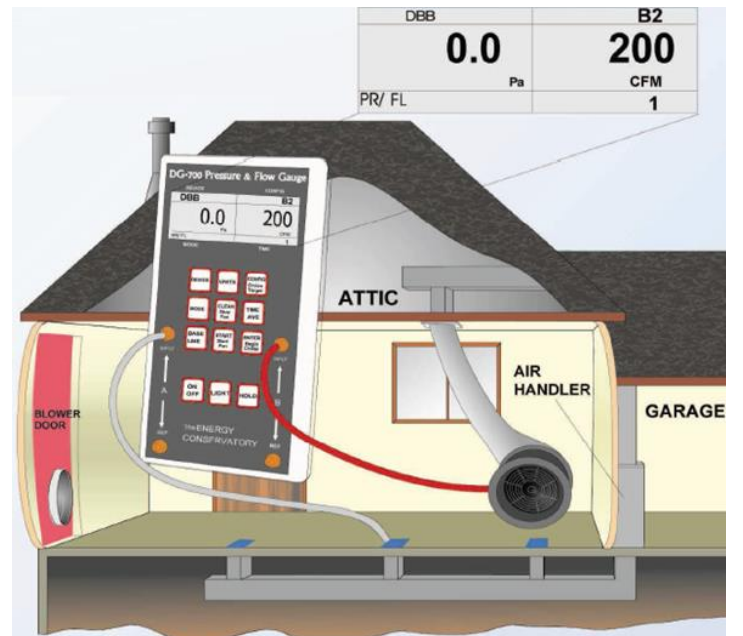


Figure 2: Duct Leakage to Exterior Test 2

## Appendix B: Duct Leakage to Exterior Supply Side Only Test

1. Isolate the supply duct from the return duct using a cardboard block or other method, typically at the furnace, and only pressurize the supply ducts with the duct blaster.

## Appendix C: Total Duct Leakage Test

1. Connect manometer to Duct Blaster; side A to ducts (usually supply side) and side B to fan.
2. Configure manometer; **MODE:** PR/FL; **DEVICE:** DBA (if white) or DBB (if black); **TIME AVERAGE:** 1; **CONFIG:** ring you are using.
3. Turn air handler and all combustion equipment off, interior doors open, and at least one window to exterior must be open.
4. Pressurize the ducts (blowing air into the ducts) until the pressure in the ducts side A reads 50 (with respect to the house).
5. Use the smallest ring possible to get to 50 Pa. If you have to change the ring, be sure to reflect that in the manometer CONFIG setting.
6. The CFM reading is the total leakage (leakage to outside plus leakage to the house) at 50 Pa.

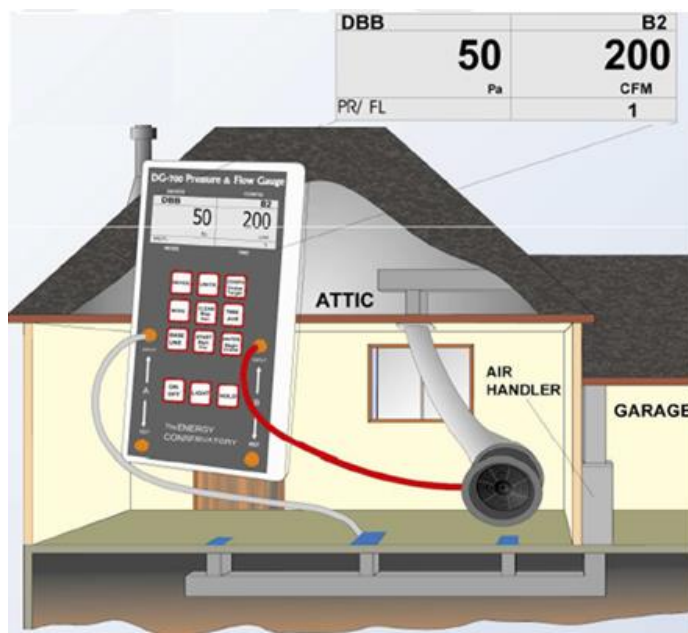


Figure 3: Total Duct Leakage Test