WASHINGTON STATE UNIVERSITY
Energy Program

Washington State University RS-33 Standard 2021 Version

Duct Sealing and ventilation requirements

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Duct Testing Standard (RS33)

For New & Existing Construction – 2021 WSEC-R

New Construction

Based on the protocol for "Total Leakage Testing" or "Leakage Testing to Outdoors," the total leakage of the ducts shall be measured at a pressure differential of 0.1 inches w.g (25 Pa) across the system, including the manufacturer's air handler enclosure.

1. Rough-in Test:

Total leakage shall be less than or equal to 4.0 cfm per 100 square feet (equivalent to 0.04 CFM25 x floor area) of conditioned floor area. All registers shall be taped or otherwise sealed during the test.

If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3.0 cfm per 100 square feet (0.03 CFM25 x floor area).

2. Postconstruction Test:

Leakage to outdoors or total leakage shall be less than or equal to 4.0 cfm per 100 square feet (0.04 CFM25 x floor area) of conditioned floor area. All register boots shall be taped or otherwise sealed during the test. You may not tape a backdraft damper or seal the pipe where code would require the use of damper components.

3. Test for Ducts Within Thermal Envelope (NEW for 2021):

Where all ducts and air handlers are located entirely within the building thermal envelope, total leakage shall be less than or equal to 8.0 cubic feet per minute per 100 square feet (0.08 CFM25 x floor area) of conditioned floor area.

Allowance: A maximum of 10 linear feet of return ducts and 5 linear feet of supply ducts may be located outside the conditioned space.

Conditions: All metallic ducts located outside the conditioned space must have both transverse and longitudinal joints sealed with mastic. If flex ducts are used, they cannot contain splices. Flex duct connections must be made with nylon straps and installed using a plastic strapping tensioning tool. Ducts located in crawl spaces do not qualify for this exception.

Exception for New Construction:

A duct air leakage test is not required for distribution ductwork serving ventilation systems that are not integrated with duct system serving heating or cooling systems. These ventilation systems are tested independently for flow requirements per the IRC ventilation systems.

Existing Construction & Alterations

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.

Exceptions for Existing Construction Testing

- Duct systems that are documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in WSU RS-33.
- Where ducts from an existing heating and cooling system are extended, duct systems with less than 40 linear feet in unconditioned spaces.
- Existing duct systems are insulated with or sealed with asbestos.
- Additions of less than 150 square feet. (Note: This is a major update from the 2018 code, which previously exempted additions under 750 square feet.)

Testing Procedure Notes

The physical testing procedures (using a blower door, duct testing device, manometer, and sealing materials) remain unchanged from the prior RS-33 document. However, testers should ensure they calculate their pass/fail targets based on the updated 2021 code formulas (e.g., 4.0 CFM per 100 sq ft or 8.0 CFM per 100 sq ft for systems inside the thermal envelope). As required by code, the final certification should optionally include an electronic record containing a GPS location and timestamp to verify the test.

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 ensure 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).
    - Always set up to the manufacturer's specifications for your unit.

Test

1. With the duct testing device, pressurize the ducts to +25 Pa with respect to (WRT) outside pressurizing the duct system.

2. 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).

- You may need to adjust the ring size of the duct testing device.

Testing Procedure Application

In new construction, doors and windows must be installed and the building envelope capable of maintaining +25 Pa 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 CFM25 value for leakage in the duct system to outside of the conditioned space. Standard The measured duct leakage must not exceed 0.04 CFM25 x floor area (in sf) served by the system.

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