

CHAPTER 12: AIR LEAKAGE DIAGNOSTICS

This chapter focuses on pressure-testing homes, to determine their airtightness and to guide air-sealing during weatherization. Ideally the air barrier and insulation are installed together at the building's thermal boundary. The airtightness of the air barrier has a substantial effect on comfort, energy efficiency, and performance of the insulation. The testing described here helps to analyze the existing air barriers and decide whether and where air-sealing is needed.

12.1 SHELL AIR-LEAKAGE FUNDAMENTALS

Controlling air leakage is a key concern for successful weatherization. The decisions you make about sealing air leaks affect a building throughout its lifespan. Air leakage has these impacts.

- Air leakage accounts for a significant percentage of a building's heat loss.
- Air leakage through insulated assemblies reduces the R-value of insulation.
- Air leakage moves moisture in and out of the house, wetting and/or drying the building.
- Air leakage causes house pressures that can interfere with the venting of combustion appliances.

Air Leakage and Ventilation

Most homes depend on air leakage to provide outdoor air for diluting pollutants and admitting fresh air. However, air leaks can also bring pollutants into the home. Mechanical ventilation is a more reliable and efficient way to provide fresh air. See *“ASHRAE Standard 62.2–2016 Ventilation” on page 414.*

12.1.1 Goals of Air-Leakage Testing

Air-leakage testing accomplishes a variety of purposes.

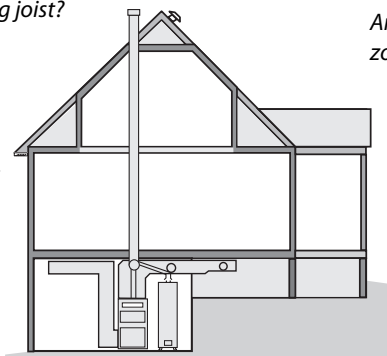
- Air-leakage and pressure testing measures the home's air-tightness level.
- It evaluates the home's ventilation requirements.
- It helps you to decide how much time and effort is required to achieve cost-effective air-leakage and duct-leakage reductions.
- It helps to compare the air-tightness of the air barriers on either side of an intermediate zone, such as an attic or crawl space. For example, comparing the airtightness of the plaster ceiling with that of the ventilated sloped roof gives the auditor an idea of how leaky the ceiling is.
- It helps decide the best place to establish the air barrier in an area that has no obvious thermal boundary such as an uninsulated crawl space.

The reason for the complexity of air-leakage testing is that there is so much uncertainty about air leakage. Testing is needed because there simply is no accurate prescriptive method for determining the severity and location of leaks, especially in complex homes. Depending on the complexity of a home, you may need to perform varying levels of testing to evaluate air leakage. In particular, the number of major components like stories, additions, corners, and gables indicates a home's potential for large air-leakage reductions.

*Where is the primary air barrier:
at the rafter or ceiling joist?*

*Are the intermediate
zones connected?*

*Are the floor cavities
connected to
outdoors?*



*Do ducts supply
heated air to the
addition?*

*Is the half-basement inside or outside the air
barrier? Is this space heated?*

*Are the crawl space ducts inside or
outside the air barrier?*

Questions to ask during an air-leakage evaluation: Your answers help determine the most efficient and cost-effective location for the air barrier.

Air Sealing with Air-Leakage Testing

Dedicate most of your effort to seal the large air leaks that pass directly through the thermal boundary first. Chasing small leaks or leaks that connect to the outdoors through interior walls or floors isn't worth as much effort if the budget is limited.

- ✓ Perform blower-door testing.
- ✓ Analyze the test results to determine if air sealing is cost-effective.
- ✓ Locate and seal the air leaks.
- ✓ During air-sealing, monitor your progress with blower-door testing.
- ✓ Stop air sealing when air-sealing goals have been achieved or the budget limit has been reached.