

Appendix

D

SPECIFICATION FOR VISUAL
INSPECTION OF ENVELOPE AIR
LEAKAGE

Specification for Visual Inspection of Envelope Air Leakage

Visual inspection of envelope air leakage will be performed in existing single-family housing units (detached or attached) that will retain a significant portion of the exterior envelope and current interior configuration. The purpose of this visual inspection is to identify major air-leakage locations such as attic bypasses and unblocked partition walls that need to be sealed during revitalization.

BACKGROUND

Infiltration control is based on minimizing the loss of conditioned air through the building envelope (floors, walls, and ceilings). Infiltration (and corresponding exfiltrations) is caused by two weather-related phenomena—wind pressure and the stack effect from the temperature difference between indoors and outdoors. Leaks in building envelopes contribute differently to infiltration depending on their location and the cause of airflow through the building.

Wind pressure acts primarily on walls, windows, doors, sill plates, and band joists. Examples of typical and recurring wall deficiencies are shown in Fig. D.1.

The stack effect acts mainly on fireplaces; penetrations in basements, crawl spaces, and attics (plumbing, electrical service, and other unsealed ceiling penetrations such as canned light fixtures and air distribution ducts); and “attic bypasses.” Attic bypasses are paths for convective air flow through interior and exterior walls (see Fig. D.2). Preventing air leakage into the lowest level of the building and out of the highest level is the best method for eliminating stack-driven infiltration.

Floor cavities of second-story overhangs and second-story floors over porches contribute significantly to infiltration because they connect the interior of the housing unit to the outside

and because they are affected by wind pressure and stack effect.

The stack effect typically contributes more significantly to building air leakage than the wind effect. Although sealing small cracks in walls and around windows is necessary to reduce infiltration, caulking small cracks does not significantly reduce stack-driven infiltration and is very labor intensive.

Other penetrations in building envelopes contribute little to naturally caused infiltration but respond primarily to occupant activities and HVAC equipment operation. These penetrations include exhaust vents (kitchen and bath) and air distribution system leaks. Inspection of air distribution systems is covered under Sect. 4.1.9, “Air Distribution System.”

INSPECTION PROCEDURE

Identify on the *Infiltration Inspection Checklist* the installation at which the unit is located. Assign a unique identification number to the housing unit, or use the identification number previously assigned to the housing unit if an energy inspection was performed by the A/E or if the air-leakage rate was measured. Document the address of the inspected unit, inspector, and inspection date.

This procedure starts with the lowest level of the building (basement or crawl space) and proceeds to the attic. Use a blower door to depressurize the unit to 20-30 Pa and a synthetic “smoke” source to promote leakage detection inside the housing unit. Pressurize the unit to 20-30 Pa to help identify leakage sites in the basement and attic. Observations from the inspection shall be recorded on the *Infiltration Inspection Checklist* to document the type and location of the problems that need to be sealed during revitalization. Leakage locations that need to be sealed must be documented with sufficient accuracy and detail so that a sealing

(a)

(b)

Fig. D.1. Wall penetrations under sinks (a) and behind appliances (b) open the interior of the housing unit to the outside, attic, crawl space, or basement through exterior and interior walls.

(a)

(b)

(c)

(d)

Fig. D.2. Attic bypasses connect the interior of the housing unit to the attic but are usually not visible from within the house. Chaseways for ducts, flues, and plumbing (a); unblocked interior partition walls that often exist between bathrooms and often have plumbing pipes through them (b); empty spaces built around and above closets that open up to the attic (c); and pocket doors (d) are typical and recur frequently in family housing.

contractor can locate the sites at a later date. The information recorded on the *Infiltration Inspection Checklist* should be supplemented with additional material (such as pictures, sketches, house layouts) as needed to provide this accuracy and detail.

Basement or Crawl Space

Air movement by the stack effect flows from low, cool locations such as basements and crawl spaces up through floor penetrations and around the sill plate. Therefore, infiltration inspection in the basement and crawl space focuses on identifying the leakage sites in and around the floor separating the basement or crawl space from the main living area to the house (the basement or crawl space ceiling) that must be repaired and eliminated by revitalization.

Main Floors

Inspection of the main floors between the basement, crawl space, or slab floor and the attic focuses on penetrations in the building envelope and interior walls that can allow air movement from wind and stack effects. For multilevel buildings, all levels should be inspected for conditions that can contribute to infiltration and exfiltration. Multilevel housing units can have substantial leakage areas where the second story floor opens into the exterior wall.

Attic

Inspection in the attic focuses on the top floor ceiling that forms the attic floor, because this surface is the final barrier for exfiltration of air from the stack effect. Check especially for attic bypasses such as open partition walls, plumbing chaseways, around electrical openings, and open floor joists in kneewall attics.

INFILTRATION INSPECTION CHECKLIST

Housing unit ID: _____

Installation:		Unit Address:	
Date:		Inspectors:	
Inspection point	Infiltration problem	Location	
BASEMENT/CRAWL SPACE			
Floor penetrations—electrical service			
Floor penetrations—plumbing service			
Floor penetrations—air ducts			
Sill plate			
Floor penetration—general			
MAIN FLOOR			
Wall penetrations under sinks and appliances			
Exterior doors			
Interior walls			
Exterior walls			
Ceiling penetrations above recessed lighting fixtures			
Attic hatch			
Whole-house fan			
ATTIC			
Ceiling penetrations—electrical service			
Ceiling penetrations—plumbing service			
Ceiling penetrations—air ducts			
Canned light fixtures			
Ceiling penetrations—general			
Unblocked interior partition walls			
Unblocked exterior walls			
Plumbing and duct chaseways			