



State of Ohio
Weatherization Program
Standards

Section	HIGH-RISE/CENTRALLY HEATED MULTI-FAMILY INSTALLATION
Subject	Building Shell

BUILDING SHELL 1102-1

See illustrations HR - 1 through 7, I - 1 through 7, C - 1 and 2, and LR - 1 through 9 (see 1102-1).

Note: Each illustration may have information that is valuable whatever the category of building.

**air leakage/high-rise
residential**
1102-1.1

Provide for continuity of the air/vapor barrier. Guided by a blower door or smokegun, air seal the following:

air/vapor barrier
1102-1.1a

1. Gypsum board at roof slab, floor and around perimeter of sliding patio door.
2. Wall/roof junctions at drain scuppers, and at other mechanical equipment including vent stacks located on the roof.
3. All basement, corridor and parking garage penetrations made vertically through floor or horizontally through walls.
 - a. Plumbing and duct penetrations in corridors and behind fire hose cabinets.
 - b. Junctions between block walls.
 - c. In cavity wall construction at the parapet, around perimeters of windows, and at exhaust vents and soffits.
 - d. Where mechanical and electrical services penetrate the roof.
 - e. At expansion joints.
 - f. In cavity wall construction at intermediate slab and low roof junctions.

SPECIAL NOTE: *The following clauses are applicable to all window types e.g. vinyl, wood, and metal, for high-rise residential buildings. See HR - 1 through 7 in 1102-2.*

**window retrofit
(replacement
windows)**
1102-1.1b

1. Ensure the continuity of the air and vapor seal between wall and window frames in accordance with the requirements of the 3/10/97 draft of ASTM E06.51.11 "Standard Practice for Installation of Windows and Doors", and CSA A440.4 "Window and Door Installation" standard.

roof/wall joints
1102-1.1c

SPECIAL NOTE: The following clauses are applicable to existing or new high-rise residential buildings with flat metal deck roofs to prevent uncontrolled air leakage. See HR -1, 2, 4, 5, 6, 7, C -1, 2 in 1101-2.

Inspect the roof perimeter for air leakage paths such as the fluted deck, truss and structural beam penetrations above and below the top of the wall, open mortar joints, and conduit and pipe penetrations. Use a blower door and/or smoke guns to identify and locate leakage.

- a. Use an air-impermeable material such as foam sealant or other material or in combination with foram to create a continuous seal between the wall and the roof air/vapor barrier.
- b. Where deck flutes run perpendicular to the wall, seal the open flutes completely out to the fascia.
- c. Where closed flutes occur, punch flutes and inject foam through holes. Locate holes as close to all as possible so that the plane of injected and cured foam within the closed flute is level with the plane of the exposed foam in the open flutes.
- d. Where the steel deck is parallel in the wall, fill the void with either one component or two component materials, depending on gap size.

air sealing/low-rise residential
1102-1.2

Reduce air leakage into and out of building(s) by sealing gaps, leaks and holes in interior and exterior surfaces. Provide for continuity with the air/vapor barrier, guided by a blower door or smokegun (see LR - 1 through 9 in 1102-2).

cleaning
1102-1.3

Clean and repair surfaces soiled or damaged by work performed in accordance with this section. Remove excess sealant with a recommended solvent. Remove debris and surplus materials upon completion of work.

baseboard sealing with caulking or foam
1102-1.4

Roll away any carpet or provide suitable masking to protect adjacent surfaces from spillage.

Seal the top of baseboards to the wall and seal both edges of other trim such as quarter round, or, if baseboards are removed, apply a uniform and continuous bead of sealant in the first floor/wall joint. Place a sealant bead at floor/sole plate joint.

For gaps wider than 25mm (1 in.), apply one bead at the sole plate/floor joint and one bead at the sole plate/wall joint.

sealing door trim
1102-1.5

Apply sealant and joint fillers according to manufacturer's instructions.

Form the surface of the sealant with a full smooth bead, free from ridges, wrinkles, sags, air pockets, and embedded impurities. Neatly tool the surface to a slight concave joint.

Apply the sealant to the joints between the door trim and the wall finish, between the door trim and the doorframe or jamb, at all joints in the trim, and on all sides including the sill in the schedule, if they are determined to be leaking.

Clean adjacent surfaces immediately and leave the work area neat and clean. Remove excess sealant.

See C-2, HR-1, 5, 7, LR-4 in 1102-2.

Run a continuous bead of sealant around the gap between the window trim and the wall. Adjust the width of the bead according to the size of the gap.

sealing window trim
1102-1.6

Run a needle bead into the trim miter joints, where required. Similarly, run a needle bead into any gap between the trim and the window frame. Remove excess sealant and wipe clean.

Remove the cover plates.

sealing electrical receptacles
1102-2.7

Apply a thin bead of caulking to back of an outlet/switch plate gasket, and stick the gasket to the wall, over the electrical outlets/switch plate. Ensure that caulk effectively seals the flanges at top and bottom of receptacle.

Re-install the receptacle over plates.

Locate all services such as pipes, electrical wiring, stacks, plumbing and heating lines, and ductwork that may penetrate the attic ceiling(s), sidewalls, foundation walls and floor(s).

locate service penetrations
1102-1.8

Seal Penetrations using caulking (See HR - 2, 3, 4, 5, 6) in 1102-2:

seal penetrations
1102-1.9

- a. If the gap around the service penetration is 6mm (1/4") or less, apply a uniform and continuous bead of sealant in the gap.
- b. If the average gap around the service line is greater than 6mm (1/4"), use single component polyurethane foam.

weather-stripping a hinged wood or metal door

1102-1.10

Measure all the dimensions of the jambs and sill, and pre-cut the weather-stripping.

baseboard heaters

1102-1.11

Apply the weather-stripping to prepared surfaces in accordance with the manufacturer's instructions.

Remove all baseboard heaters to expose the floor/wall crack as well as the wire penetrations servicing the heater.

- a. Switch off the power at fuse box.
- b. Remove screws holding the heater against wall and pull heater forward.
- c. Seal the floor/wall gap.
- d. Seal electrical wire penetrations through the wall.
- e. Re-install the baseboard heater.
- f. Be careful not to push the sealant into the wall cavity with the electrical wire.
- g. Switch on the power.

weatherstrip and tighten casement and awning (metal and wood)

1102-1.12

These techniques apply to casement, hopper, and awning windows. To keep the descriptions as simple as possible, the techniques described below refer only to outward opening units. The techniques assume the window has a wood frame, although with minor modifications, the techniques will apply to wood-frame windows clad in vinyl.

GAPS OF 6.0 MM (1/4") OR LESS

- a. Install weather-stripping. Apply it to the window stop on all sides of the window.

- b. At the corner, cut the ends of the weather-stripping at an angle to allow for a tight fit and a continuous seal.

GAPS GREATER THAN 6.0 MM (1/4")

- a. Install weather-stripping on the frame so that it makes contact with the edge of the sash.

**weather-strip
moveable sash of hung
window**
1102-1.13

Three locations require weather-stripping:

- a. Between the checkrails.
- b. Between the bottom rail and sill on a lower sash (or the top rail and head jamb of an upper sash).
- c. Between the stiles and the side jamb.

Balloon frame wall construction leaves very large air passages between each floor joint and into the stud cavity, which may be open to the attic space. Foam as well as caulking materials must usually be used to effectively control air leakage at the main floor header.

**control air leakage at
a balloon framewall**
1102-1.14

Foamed-in-place polyurethane foam may be used as an alternative to the sealing procedure just described.

- a. Stuff a piece of glass fiberglass batt up into the stud cavity just above the header area. This will act as temporary blocking to stop the flow of foam into the stud cavity.
- b. Foam the joint between the exterior sheathing and the studs and the joint between the sheathing and the sill plate.
- c. Apply sealant or foam to the exterior sheathing across the top of the header space. As the foam is setting up, apply additional foam to it to create a block at the top of the header cavity. Perform a visual inspection to ensure proper coverage
- d. Once all of the header spaces have been sealed, apply a continuous bead of sealant or foam to the joint between the sill plate and the top of the foundation.

sill plate: all situations
1102-1.14.1

Seal the entire length of the joint between the sill plate and the top of the foundation wall. If the joint is wide, install the appropriate sized backer material along the entire sill length first. Apply a high-solids content butyl-rubber or polysulphide sealant or single-component foam to the joint around the top of the entire length of the foundation wall.

where fire stops block stud cavity at main floor level
1102-1.14.2

- a. Apply a bead of sealant to the joints between the exterior sheathing and the studs reaching as high as possible into the stud cavity. Apply sealant to the joint between the exterior sheathing and the sill plate.
- b. Apply sealant around the entire perimeter of each fire stop to complete the air leakage control measures.

control air leakage at box sill main floor headers
1102-1.14.3

Apply appropriate sealants to the following areas:

- a. Apply a uniform and continuous bead sealant to the joint between the top of the foundation wall and bottom of the sill all of the way around the foundation. Where necessary, install backer material before applying the sealant.
- b. Workings within each box sill header area seal all visible joints. Apply a uniform continuous bead of sealant at the joints between:
 - the header and the seal plate,
 - the header and the sub floor,
 - the header and the joists; and
 - the joists and the sill plate, including the little bank under each joist.

On the end walls, where the wall runs parallel to the floor joists, seal the header area at the joists between:

- the sill plate and the top of the foundation wall,
- the header and the sill plate; and
- the header and the sub floor.

- c. Apply a uniform and continuous bead of sealant to joints around the main support beam where it meets the foundation wall, sill plate, and end joists.
- d. Single-component foam can be used in any or all of the above-mentioned areas to seal.

If the space above the foundation is large enough to work in with a caulking gun (perhaps with an extension nozzle), then an adaptation of the box sill technique can be used. Check the joints between the header and the foundation and between and the joists and the foundation. If the gaps are wider than 6mm, install single component polyurethane foam.

**control air leakage at
cast-in or beam-in-fill
joists**

1102-1.14.4

Apply sealant to the joints between:

- the header and the sub floor,
 - the header and the joists; and
 - the joists and the sub floor.
- a. If the space between the foundation and the sub floor is crack size, install backer material where needed and apply a continuous bead of sealant along all joints, including the areas under the joist where it meets the foundation.
 - b. If the space is large – up to 100 mm – the cavity can be completely filled with a one-part or two-part urethane foam sealant.
 - c. Seal joints between the joists and the concrete using urethane foam, or sealant.
 - d. Apply a uniform and continuous bead of sealant to joints around the main support beam where it meets the foundation wall, sill plate, and end joists.

Party walls are a potential attic air leakage site. Common walls often have an air space either in the form of an uninsulated cavity or between the wall finish and a masonry fire separation. These spaces are often open to the basement and allow heated house air to easily escape into the attic. Party walls can be sealed either at the top or bottom, but both are preferable.

party walls

1102-1.15

- a. Seal party walls at the bottom similar to balloon frame sills and headers.
- b. To seal from the attic usually requires the use of single- or two-component foam, depending on gap size.
 - Remove insulation from the party wall area.
 - Install sealant uniformly along entire length of wall where it enters the attic.
 - Replace insulation carefully.

floor drain sealing
1102-1.16

In some instances, air leakage may be detected from floor drains. There is also the possibility of radon to enter the building through floor drains. Therefore, it is necessary to be able to seal this opening with a Dranjer.

- a. Remove the floor drain cover from the hole.
- b. Clean the rim of the hole.
- c. Lay a bead of caulking compound around the rim of the hole.
- d. Hold the Dranjer and the cover plate together so that their centers are aligned and the cover plate is on top. Allow enough slack in the rubber flange of the Dranjer so that it hangs down about 12.5 mm (1/2").
- e. Lower the Dranjer and the cover plate back into the hole. Push the floor drain cover plate back into position, pinching the rubber flange of the Dranjer underneath it as shown in Figure 4.
- f. Stand on top of the floor drain plate to set it firmly.
- g. Trim off the surplus rubber around the edge of the flange with a knife.
- h. Leave a heavy weight on top of the floor drain cover plate until the caulking compound has dried.
- i. Pour about one pint of water into the drain to fill the Dranjer.

Note: If dirty water flows routinely through the Dranjer, deposits may stop the sliding ring seal from working properly. Regular cleaning of the Dranjer will prevent this. Provide owner/customer education.

Remove all insulation from around the chimney and inspect the structure. Look for a wood frame running around the chimney.

**chimneys, brick or
factory-built metal**
1102-1.17

- a. Check that the space between the wood frame and the chimney is clear of combustibles and that the wood frame is at least 50 mm (2") away from the chimney.
- b. Clear all dust and debris from around the chimney using rags. Clean all surfaces to which the sealant will be applied.
- c. Apply a thin bead of high-temperature silicone sealant along the top of the wood frame surrounding the chimney.
- d. Cut strips of sheet metal or drywall (1/2") to fit around the chimney. Nail (or screw) these in place on top of the sealant bead, so they butt tightly to each other and against the chimney.

Apply muffler cement or another non-combustible sealant to the sheet metal or drywall joints and to the joints between the metal or drywall and the chimney.

- e. Apply silicone sealant to the joints in the wood frame around the chimney.
- f. Replace the original insulation up to the sheet metal.

These aren't ESPs. In addition to the air leakage gap around the electrical conduit itself, there is the gap between the electrical conduit and the electrical cable running inside the conduit. Special sealant must be used when sealing the electrical cable.

**electric service
penetrations**
1102-1.18.1

- a. If there is a large gap around the duct, pipe, etc., install single-component foam.
- b. If the duct, pipe, etc., passes through a wood header, or concrete wall, seal the gap (in order of preference), with silicone or single component foam.

general
1102-1.18.2

If the service conduit is easily accessible where it passes through the foundation wall or header, seal it using the general techniques above, if the conduit passes through the foundation wall straight into the back of the service panel, making the air gap inaccessible from the inside. Apply the above sealing techniques outside of the foundation wall.

electrical service inlets
1102-1.18.3

Where applicable, remove the cover plate from the exterior service entrance. Apply sealant around cables to make an airtight seal, using an approved sealant type such as Uxseal. Note: Great caution should be taken when working in this area. All local codes and regulations should be followed. In some jurisdictions, only licensed persons can perform this work.

seal attic hatch
1102-1.19

If the attic hatch trim is easily removed, apply a uniform and continuous bead of sealant to the joint between the ceiling surface and the frame of the attic hatch. Re-install the trim using finishing nails.

If the trim is not easily removed, seal the joints between the trim and the ceiling and between the trim and the attic hatch frame. Seal the corner joints in the trim and in the attic hatch frame.

- a. Apply a self-adhesive closed-cell foam weather-stripping material to the top of the surface of the framework, that supports the hatch cover. Ensure that the corners of the weather-stripping fit tightly.
- b. Glue a piece of rigid insulation to the hatch cover. Be sure to use an adhesive compatible with the insulation material. Alternatively, construct a wood frame around the hatch cover and install a glass fiber insulation batt within the frame. Cover the frame and insulation with a plywood top.
- c. Attach some sort of clamp or lock to the hatch cover and frame. The device, when installed, should be able to pull the hatch tightly into the weather-stripping material, thereby providing a better seal.

seal heating duct
1102-1.20

This work is carried out beneath the floor, if accessible. It applies to both warm air and return air ducts.

- a. Apply mastic to all joints in the ducts, including joints between the ducts and the sub floor, as shown. Staple the duct tape to the sub floor.

Locate the partition walls from a map showing the floor below. Remove or brush aside the attic insulation from above the walls. Use a small brush or whiskbroom to clear all cracks of insulation or debris.

**partition and
perimeter walls with
top plates**
1102-1.21

- a. Apply a uniform and continuous bead of caulking sealant and/or one or two component polyurethane foam, along the entire length of the partition wall on both sides of the top plate.
- b. Replace the original insulation.

Weather-strip the door perimeters. Weather-strip the meeting rails of the double doors. This will be fastened to the exterior face of both doors and provide a seal from top to bottom through adjustment and butting of the finseal pile tongues.

**double commercial
doors** 1102-1.22

If cutting of the metal components is necessary to accommodate the handles and locks, the cut edges shall be smoothed and the gaps sealed using silicone caulking of the appropriate color.

Remove existing weather-stripping.

Measure sides and top of doorframe and cut pieces of weather-stripping to match.

overhead garage doors
1102-1.23

Install weather-strip with screws into wood jambs and use ramset for metal jambs.

Door bottom seals will be a bubble seal with aluminum holder fastened on the bottom edge of the door.

Weatherstrip operable sections of chutes and inspection hatches with open cell foam tape with adhesive backing. Reinforce adhesive backing with contact adhesive.

**attic hatches (garbage
chutes, inspection
hatches, service
hatches)**
1102-1.24

- a. Install weatherstripping on doors of chute and hatches as per metal so that upon closing a positive seal is achieved on all sides.
- b. Seal metal frames of chute and hatch which to surrounding wall surface with caulking sealant.
- c. Wipe off excess sealant.

**elevator cable
penetrations**
1102-1.25

These are operating elevators and therefore must be shut down before any work is started.

- a. Clean floor and frame areas around cables.
- b. Install good quality aluminum duct tape across the opening, being sure not to touch cable.

Apply enough tape to provide solid seal that will not blow off due to elevator operation.