Joseph Lstiburek, Ph.D., P.Eng, ASHRAE Fellow

Building Science

Floodproofing

www.buildingscience.com
Floods
Site grading slopes ground away from building over entire perimeter.
Any type of flooring/floor finish

Floor sheathing (OSB or plywood)

Airspace

Protection board

Foil-faced isocyanurate

Cavity insulation
Site grading slopes ground away from building over entire perimeter.
Base flood elevation (BFE)

Crawlspace foundation wall

Flood vent

Lowest adjacent exterior grade (LAG)

Footing

Crawlspace interior grade
Raised Slab
Spray foam insulation
Roofing membrane
Roof sheathing
Tile roof
Drip edge sealed to roof sheathing
Polymer modified (PM) or traditional cement stucco
Paper-backed lath bond break
Membrane or trowel-on or spray-applied water control layer, air control layer and vapor control layer
Treated plywood or oriented strand board (OSB) sheathing
Membrane strip covering wood frame/masonry intersection under weep screed flashing
Weep screed flashing
Polymer modified (PM) or standard Portland cement stucco
Masonry wall
Weep screed/capillary break/termite shield for stucco rendering over polyethylene
Parge coat damp-proofed with latex paint to reduce water absorption
Horizontal fire stop
Non-paper faced gypsum board with latex paint or other permeable or semi-permeable interior finish; held up from slab
2x2 vertical wood furring
Permeable or semi-permeable rigid insulation
"Seat" in concrete to receive masonry block
Concrete slab
Polyethylene vapor barrier extends under slab and turned down over masonry block stem wall
Sub-slab stone layer (no fines)
Fill perimeter of stem wall with concrete
Concrete footing

For pest protection provide 2'-3' of pea gravel or crushed stone 4" thick.
Extruded polystyrene (XPS)

Spray polyurethane foam (SPF), 2\textquotesingle\ closed cell 2lb/ft\textsuperscript{2} density

Crown moulding

Gap in gypsum board at top of wall

Acrylic latex paint over all surfaces prior to installation of interior gypsum board

Gap in gypsum board to prevent wicking

Horizontal trim

Spray polyurethane foam (SPF), 2\textquotesingle\ closed cell 2lb/ft\textsuperscript{2} density

Removable wainscot (or removable gypsum board)

Gap in gypsum board at bottom of wall
Attic roof escape hatch (egress skylight)

Strip of gypsum board removed at top after moisture event to facilitate drying

Spray polyurethane foam (SPF), closed cell 2lb/ft³ density

Acrylic latex paint over all surfaces prior to installation of interior gypsum board

Strip of gypsum board removed at bottom after moisture event to facilitate drying

Remove baseboard after moisture event.
Note: Layering cut away in this figure shown for clarity, not as recommendation for installation sequencing.
Dry…Don’t Die
Dry…Don’t Die
Wash, Rinse and Dry
Flood-Tolerant Wall Reconstruction

Existing brick veneer

Flexible 1/4" to 3/8"-thick XPS insulation, 8-foot-long sheets run horizontally. Sheets fed into cavity between brick and studs, lapped 2" horizontally, shingle fashion.

Wedges made from 1" XPS insulation help hold insulation sheets in place. Align wedges with studs, place one wedge at top of sheet and one at bottom.

2"-thick 2-lb-density closed-cell foam sprayed in stud bays against new XPS rigid insulation.

Paint exposed studs, closed-cell foam (dotted purple line), bottom and top plates with a water-repellent, vapor-open material such as acrylic latex paint.

New drywall installed horizontally.

Alternate Detail

Latex paint

Closed-cell foam sprayed against mat's filter fabric. Spray foam seals retrofit brick ties.

3/8" to 1/2"-thick drainage mat

Existing brick veneer

Min. 2'

Liquid-applied pan flashing

Weep hole cover

Existing slab-on-grade foundation

Weep holes drilled from exterior (vertical mortar joints removed at 16" on-centers). Retrofit weep hole covers inserted into mortar joints to prevent insect/rodent intrusion.

Remaining wall assembly power-washed, particularly at bottom of wall where the bulk of the damage occurred.

Liquid-applied pan flashing applied to bottom of air cavity and run up and over on to horizontal surface of bottom plate. Run fluid up studs approx. 2" to seal bottom of studs to bottom plate.

1. Existing wall assembly gutted from interior, leaving the brick veneer and studwall intact.

2. Weep holes drilled from exterior (vertical mortar joints removed at 16" on-centers). Retrofit weep hole covers inserted into mortar joints to prevent insect/rodent intrusion.

3. Remaining wall assembly power-washed, particularly at bottom of wall where the bulk of the damage occurred.

4. Liquid-applied pan flashing applied to bottom of air cavity and run up and over on to horizontal surface of bottom plate. Run fluid up studs approx. 2" to seal bottom of studs to bottom plate.
Fluid applied flashing, cover top of bottom plate

Seal around bottom of studs

Seal face of bottom plate to slab foundation edge
Dry…Don’t Die
Dry...Don’t Die
Wash, Rinse and Dry
Spray polyurethane foam (SPF), 2” thick closed cell 2lb/ft³ density

Extruded polystyrene (XPS)sheets installed shingle fashion

Weep opening (retrofitted from exterior)

Fluid applied flashing
Extruded polystyrene (XPS) “wedges” - intermittent blocking (approx. 1 1/2” x 4”) holding sheathing in place prior to spray polyurethane foam (SPF) installation

Extruded polystyrene (XPS) sheets
Extruded polystyrene (XPS) “wedges” - intermittent blocking (approx. 1 1/2” x 4”) holding sheathing in place prior to spray polyurethane foam (SPF) installation

Extruded polystyrene (XPS) sheets

Spray polyurethane foam (SPF), 3” thick closed cell 2lb/ft³ density

Acrylic latex paint over all surfaces prior to installation of interior gypsum board
Spray polyurethane foam (SPF), 3” thick closed cell 2lb/ft³ density

Drainage mat - filter fabric to interior; ½” thick or greater

Weep opening (retrofitted from exterior)

Fluid applied flashing
Acrylic latex paint over all surfaces prior to installation of interior gypsum board

Spray polyurethane foam (SPF), 3” thick closed cell 2lb/ft³ density

Drainage mat - filter fabric to interior; 1/2” thick or greater
Existing brick ties

Acrylic latex paint over all surfaces prior to installation of interior gypsum board

Spray polyurethane foam (SPF), 3” thick closed cell 2lb/ft³ density

Drainage mat - filter fabric to interior; 1/2” thick or greater

Fluid applied flashing