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

Building Science

Building for the Zombie Apocalypse

www.buildingscience.com
Floods
Site grading slopes ground away from building over entire perimeter.
Subfloor

2x4

Capillary break

1-1/2" rigid insulation

Concrete post

Plate under load bearing walls only

Concrete floor

Polyethylene
Site grading slopes ground away from building over entire perimeter.
Raised Slab
Spray foam insulation
Asphalt roof
Roofing membrane
Roof sheathing
Drip edge sealed to roof sheathing

Fibercement siding
1x4 furring
Rigid insulation (taped or sealed joints)
Membrane or trowel-on or spray-applied water control layer, air control layer and vapor control layer
Non-paper faced exterior gypsum sheathing, treated plywood or treated oriented strand board (OSB)
Rodent protection for continuous rigid insulation
Rigid insulation thermal break

Uninsulated framing
Non-paper faced gypsum board with semi-permeable (latex) paint; held up from slab
Protective membrane strip also acts as capillary break and also acts as a termite and insect barrier
Sealant, adhesive or gasket
Sill gasket
Concrete slab
Polyethylene vapor barrier
Sub-slab stone layer (no fines)
Concrete stem wall
Concrete footing

For pest protection provide 2" to 4" of pea gravel or crushed stone 4" thick

Ground slopes away from wall at 5% (6 in. per 10 ft.)
Extruded polystyrene (XPS)

Spray polyurethane foam (SPF), 2" closed cell 2lb/ft³ 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" closed cell 2lb/ft³ 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.
Siding installed such that 2 in. minimum space exists between end of siding and sloping roof. Siding end cuts sealed.

Adhesive membrane strip flashing under dormer roofing paper and under main roof roofing paper.

Top edge of adhesive membrane taped to sheathing with sheathing tape.

Roofing paper installed "shingle fashion".

Adhesive membrane strip sealing step flashing to rigid insulation.

Step flashing "woven" into shingles.

Note: Layering cut away in this figure shown for clarity, not as recommendation for installation sequencing.
Pests
Site grading slopes ground away from building over entire perimeter
Rainwater falling on roof is collected in gutters

Overhang protects the ground around the foundation from getting saturated

Down spouts carry rainwater from the roof away from the foundation

Ground slopes away from the foundation
Continuous exterior insulation

Cladding

Rodent protection for continuous rigid insulation

Removable strip of insulation and protection board

Cellular PVC protection board
  For pest protection provide 2'-0" of pea gravel or crushed stone 4" thick

Ground slopes away from wall at 5% (6 in. per 10 ft.)

Rigid insulation

Cavity insulation

Gypsum board

Termite shield set in mastic (also serves as capillary break)

Sill gasket

Sealant, adhesive or gasket

4" Concrete slab

4" granular capillary break and drainage pad (no fines)

Concrete grade beam

Polyethylene vapor barrier extended under grade beam where it also acts as a capillary break
Fire
Non combustible cladding - brick veneer/stone veneer
Drained and vented cavity

Thermal control layer - fire retardant or fire resistant continuous exterior insulation - mineral wool, fiberglass or phenolic foam
Membrane or trowel-on or spray applied or liquid applied water control layer and air control layer

Fire retardant or fire resistant sheathing - non paper-faced exterior gypsum sheathing or fire retardant treated plywood

Fire retardant treated wood framing

Fire retardant or fire resistant cavity insulation - mineral wool, fiberglass or cellulose

Non combustible interior lining - gypsum board
Latex paint or vapor semi-permeable textured wall finish
Non-combustible cladding - fiber cement siding
Non-combustible metal hat-channel
Thermal control layer - fire retardant or fire resistant continuous exterior insulation - mineral wool, fiberglass or phenolic foam
Membrane or trowel-on or spray applied or liquid applied water control layer and air control layer
Fire retardant or fire resistant sheathing - non-paper-faced exterior gypsum sheathing or fire retardant treated plywood
Fire retardant treated wood framing
Fire retardant or fire resistant cavity insulation - mineral wool, fiberglass or cellulose
Non-combustible interior lining - gypsum board
Latex paint or vapor semi-permeable textured wall finish
Two layers of 2" mineral wool or fiberglass

Water control and air control layer

Fire retardant sheathing - fire retardant treated plywood

Class A fire resistance shingles
2x6
Stainless steel drip edge

Fiber cement trim

Non combustible cladding - fiber cement siding

Fire retardant treated furring

Two layers of 2" mineral wool or fiberglass

Fully-adeded membrane

2x8

Non combustible interior lining - gypsum board

Fire retardant or fire resistant cavity insulation - mineral wool, fiberglass or cellulose

Fire retardant sheathing - fire retardant treated plywood

Fire retardant treated wood framing

Cavity insulation

Non combustible interior lining - gypsum board