Building Science

Adventures In Building Science

www.buildingscience.com
Water control layer
Air control layer
Vapor control layer
Thermal control layer
Figure 8-10. Wetting and drying potential for St. John's, Newfoundland.

Figure 8-11. Wetting and drying potential for Calgary, Alberta.

Figure 8-12. Wetting and drying potential for Montreal, Quebec.

Figure 8-13. Wetting and drying potential for Ottawa, Ontario.

Figure 8-14. Wetting and drying potential for Toronto, Ontario.

Figure 8-15. Wetting and drying potential for Frobisher Bay, NWT.
Figure 8-7. Outside vapour pressure, saturated vapour pressure and inside vapour pressure for Winnipeg.
Water control layer
Water control layer
Key is control of hydrostatic pressure
Water control layer
Key is control of hydrostatic pressure
All about “the gap”
Trick is to figure out how much hits the wall
Assume 30 percent bounces off
Assume 1 percent that stays on the wall passes through the cladding
Assume 1 percent of the 1 percent passes through the water control layer into the sheathing
To effectively uncouple a brick veneer from a wall system by using back ventilation, a clear cavity must be provided along with both air inlets at the bottom and air outlets at the top.
- To effectively uncouple a brick veneer from a wall system by using a condensing surface, the drainage plane must also be a vapor barrier or a vapor impermeable layer (i.e., rigid insulation) must be installed between the drainage plane and the brick veneer. Alternatively, the rigid insulation can be configured to act as both the drainage plane and vapor impermeable layer.

- When a condensing surface is used to uncouple a brick veneer from a wall system, a ventilated air space is no longer necessary. Additionally, the width of the drainage space is almost irrelevant.
Rain Screen
Beer Screen?
Vapor control layer
Permeance
Permeability
Vapor control layer

Class I  0.1 perms ("vapor barrier")
Class II 1.0 perms ("vapor semi impermeable")
Class III 10.0 perms ("vapor semi permeable")
Greater than 10 perms
Vapor permeable
Change in the storage of moisture in a porous building material as the partial pressure of water vapor in the ambient air increases from zero to full saturation value at a given temperature.

**Sorption Curve**

Water Vapor Permeance vs. Relative Humidity

Mean Relative Humidity, %

- $\mu_1 = $ Dry cup permeance
- $\mu_2 = $ Wet cup permeance

Dry cup limits

Wet cup limits

Dry cup test results

Wet cup test results
Water Vapor Permeance of MemBrain™ Smart Vapor Retarder, Primed and Painted Gypsum Board, Unpainted Gypsum Board and Asphalt-Coated Kraft Paper

Mean Relative Humidity, %

Water Vapor Permeance, US perms

Dry Cup

Wet Cup

Unpainted Gypsum Board

MemBrain™ Smart Vapor Retarder

Primed & Painted Gypsum Board

Asphalt-Coated Kraft Paper
Water Vapor Permeance of Sheathing Materials

- Plywood
- OSB

Water Vapor Permeance, US perms

Mean Relative Humidity, %

Dry Cup

Wet Cup
Condensing surfaces
Dewpoint (50% RH, 70°F)
Location of condensation and frost
Exterior sheathing

Outside

Inside

70°F

0°F
Simple linearized energy-temperature relation for water
From Straube & Burnett, 2005
The inside face of the exterior sheathing is the condensing surface of interest.

Wood-based siding
Building paper
Exterior sheathing
R-19 cavity insulation in wood frame wall
Gypsum board with any paint or wall covering

Dew point temp. at 50% R.H., 70°F
Mean monthly outdoor temperature
Dew point temp. at 35% R.H., 70°F
Dew point temp. at 20% R.H., 70°F

Potential for condensation
The inside face of the insulating sheathing is the condensing surface of interest.

- Wood-based siding
- R-7.5 rigid insulation
- R-13 cavity insulation in wood frame wall
- Gypsum board with any paint or wall covering

Mean monthly outdoor temperature

Potential for condensation

Dew point temp. at 35% R.H., 70°F
Figure 8-7. Outside vapour pressure, saturated vapour pressure and inside vapour pressure for Winnipeg.
Air control layer
Air Barrier Metrics

Material 0.02 l/(s-m2)@75 Pa
Assembly 0.20 l/(s-m2)@75 Pa
Enclosure 2.00 l/(s-m2)@75 Pa
## Cladding Ventilation / Sheathing Ventilation

<table>
<thead>
<tr>
<th></th>
<th>Flow Rate</th>
<th>Gap</th>
<th>ACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Siding</td>
<td>0.1 cfm/sf</td>
<td>3/16”</td>
<td>20</td>
</tr>
<tr>
<td>Vinyl Siding</td>
<td>0.5 cfm/sf</td>
<td>3/16”</td>
<td>200</td>
</tr>
<tr>
<td>Brick Veneer</td>
<td>0.15 cfm/sf</td>
<td>1”</td>
<td>10</td>
</tr>
<tr>
<td>Stucco (vented)</td>
<td>0.1 cfm/sf</td>
<td>3/8”</td>
<td>10</td>
</tr>
<tr>
<td>Stucco (direct applied)</td>
<td>none</td>
<td>none</td>
<td>0</td>
</tr>
<tr>
<td>Sheathing flanking flow</td>
<td>0.05 cfm/sf</td>
<td>3/16”</td>
<td>10</td>
</tr>
</tbody>
</table>
Polyethylene
Caulking / sealant

Polyethylene
Caulking / sealant
Vapor permeable housewrap wrapped around floor assembly

Polyethylene
Caulking / sealant
Vapor permeable housewrap wrapped around floor assembly
Sill plate installed over sill gasket and air flow retarder

Note: shaded components designate air barrier system
Ceiling gypsum board taped to wall gypsum board

Gypsum board caulked, glued or gasketed to top plate

Gypsum board caulked, glued or gasketed to bottom plate
Bottom plate caulked or gasketed to subfloor

Subfloor glued, caulked or gasketed to rim joist/rim closure
Rim joist/rim closure caulked or gasketed to top plate

Gypsum board caulked, glued or gasketed to top plate

Gypsum board caulked, glued or gasketed to bottom plate
Bottom plate caulked or gasketed to subfloor

Subfloor glued, caulked or gasketed to rim joist/rim closure
Rim joist/rim closure caulked or gasketed to sill plate

Sill plate installed over sill gasket

Note: shaded components designate air control layer
Ceiling gypsum board caulked to top plate

Membrane strip

Building wrap with taped joints

Building wrap laps exterior of membrane strip “shingle fashion”; bottom edge taped to membrane strip

Membrane strip over primed concrete

Note: shaded components designate air control layer
Ceiling gypsum board caulked to top plate

Membrane strip

Membrane strip

Membrane strip

Membrane strip over primed concrete seals exterior sheathing to foundation

Note: shaded components designate air control layer
Ceiling gypsum board caulked to top plate

Membrane strip

Membrane strip

Membrane strip over primed concrete seals exterior rigid insulation to foundation

Note: shaded components designate air control layer
Building Science Corporation

Cladding
Building paper
Fiberboard
Fiberglass batt
2x4 wall framing
Kraft facing
Gypsum board
Interior latex paint

Flow-Through Assembly
Cladding

Furring

Building paper

OSB sheathing

Fiberglass batt/cellulose

2x6 wall framing

Gypsum board

Interior latex paint

Flow-Through Assembly
Building paper
OSB sheathing
Spray polyurethane foam (SPF) (2 lb/ft³ density) in wall cavity applied to interior side of exterior OSB sheathing
Fiberglass batt/cellulose
2x6 wall framing
Gypsum board
Interior latex paint

Drying to Interior
Cladding

Furring (partially embedded in SPF)

Spray polyurethane foam (SPF)  
(2 lb/ft³ density)

OSB sheathing

Fiberglass batt/cellulose

2x6 wall framing

Gypsum board

Interior latex paint

Drying to Interior
Brick veneer/stone veneer

Drained and vented cavity

Thermal control layer - exterior rigid insulation - extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass

Membrane or trowel-on or spray applied or liquid applied water control layer, air control layer and vapor control layer

Concrete block

Metal channel or wood furring

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Figure 1a

Vapor Profile
Figure 1b

Vapor Profile

- Brick veneer/stone veneer
- Drained and vented cavity
- Thermal control layer - exterior rigid insulation - extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass
- Membrane or trowel-on or spray applied or liquid applied water control layer, air control layer and vapor control layer
- Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)
- Uninsulated steel stud cavity
- Gypsum board
- Latex paint or vapor semi-permeable textured wall finish
Brick veneer/stone veneer

Drained and vented cavity

Thermal control layer - exterior rigid insulation - extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass

Membrane or trowel-on or spray applied or liquid applied water control layer, air control layer and vapor control layer

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Insulated wood stud cavity

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Figure 1c

Vapor Profile
Brick veneer/stone veneer

Drained and vented cavity

Thermal control layer - exterior rigid insulation - rock wool or fiberglass

Membrane or trowel-on or spray applied or liquid applied water control layer and air control layer

Concrete block

Metal channel or wood furring

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Figure 2a

Vapor Profile
Building Science Corporation

Brick veneer/stone veneer

Drained and vented cavity

Thermal control layer - exterior rigid insulation - rock wool or fiberglass

Membrane or trowel-on or spray applied or liquid applied water control layer and air control layer

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Uninsulated steel stud cavity

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Figure 2b

Vapor Profile
Brick veneer/stone veneer
Drained and vented cavity
Thermal control layer - exterior rigid insulation - rock wool or fiberglass
Membrane or trowel-on or spray applied or liquid applied water control layer and air control layer
Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)
Insulated wood stud cavity
Gypsum board
Latex paint or vapor semi-permeable textured wall finish

Figure 2c

Vapor Profile
Brick veneer

Drained cavity

Water control layer, air control layer, vapor control layer and thermal control layer: insulated metal panel

Uninsulated steel stud cavity

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Brick veneer/stone veneer

Drained and vented cavity

Water control layer, air control layer and thermal control layer - exterior rigid insulation - extruded polystyrene, isocyanurate

Insulated wood stud cavity

Vapor control layer and air control layer - polyethylene

Gypsum board

Latex paint

Vapor Profile
Brick veneer/stone veneer

Drained cavity

Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass

Membrane or trowel-on or spray applied vapor barrier (Class I vapor retarder), air barrier and drainage plane (impermeable)

Concrete block

Metal channel or wood furring

Gypsum board

Latex paint or vapor semi-permeable textured wall finish
Building Science Corporation

Brick veneer/stone veneer

Drained cavity

Membrane or trowel-on or spray applied vapor barrier (Class I vapor retarder), air barrier and drainage plane (impermeable)

Concrete block

Insulated steel or wood stud cavity

Cavity insulation (unfaced fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Latex paint

Stucco rendering

Concrete block

Rigid insulation (vapor semi-permeable) — unfaced extruded polystyrene, unfaced expanded polystyrene, fiber-faced isocyanurate

Metal channel or wood furring

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Latex paint

Stucco rendering

Concrete block

Rigid insulation (vapor semi-permeable) — unfaced extruded polystyrene, unfaced expanded polystyrene, fiber-faced isocyanurate

Insulated steel or wood stud cavity

Cavity insulation (unfaced fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish
Brick veneer/stone veneer

Drained cavity

Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass

Membrane or trowel-on or spray applied vapor barrier (Class I vapor retarder), air barrier and drainage plane (impermeable)

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Uninsulated steel stud cavity

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Brick veneer/stone veneer

Ventilated and drained cavity

Drainage plane (vapor permeable building paper, house wrap)

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Insulated steel or wood stud cavity

Cavity insulation (unfaced fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Brick veneer/stone veneer

Ventilated and drained cavity

Drainage plane (glass fiber-faced exterior gypsum sheathing with mesh tape and mastic at joints — vapor permeable)

Insulated steel or wood stud cavity

Cavity insulation (unfaced fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Brick veneer/stone veneer

Drained cavity

Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass

Membrane or trowel-on or spray applied vapor barrier (Class I vapor retarder), air barrier and drainage plane (impermeable)

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Insulated steel or wood stud cavity

Cavity insulation (unfaced fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Brick veneer/stone veneer

Ventilated and drained cavity

Drainage plane (vapor permeable building paper, house wrap)

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Insulated steel or wood stud cavity

Cavity insulation (fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Kraft facing on a fiberglass batt or a "smart vapor barrier membrane"

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Building Science Corporation

Brick veneer/stone veneer

Ventilated and drained cavity

Drainage plane (vapor permeable building paper, house wrap)

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Insulated steel or wood stud cavity

Cavity insulation (unfaced fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Polyethylene vapor barrier (Class I vapor retarder)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Latex paint

Stucco rendering

Building paper bond break

Drainage space between bond break and drainage plane

Building paper or house wrap drainage plane

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Insulated steel or wood stud cavity

Cavity insulation (unfaced fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Latex paint
Stucco rendering
Building paper bond break
Drainage space between bond break and drainage plane
Building paper or house wrap drainage plane
Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)
Insulated steel or wood stud cavity
Cavity insulation (fiberglass batts, spray-applied cellulose or spray-applied low density foam)
Kraft facing on a fiberglass batt or a "smart vapor barrier membrane"
Gypsum board
Latex paint or vapor semi-permeable textured wall finish
Polymer-based (PB) stucco rendering

Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass

Drainage space between exterior rigid insulation and drainage plane

Building paper or house wrap drainage plane

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Insulated steel or wood stud cavity

Cavity insulation (unfaced fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Latex paint

Precast concrete

Insulated steel or wood stud cavity

Cavity insulation (unfaced fiberglass batts, spray-applied cellulose or spray-applied low density foam)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Latex paint

Precast concrete

Rigid insulation (vapor semi-permeable) — unfaced extruded polystyrene, unfaced expanded polystyrene, fiber-faced isocyanurate

Metal channel or wood furring

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Latex paint

Precast concrete

Spray-applied low density or high density foam insulation

Uninsulated steel or wood stud cavity

Gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Brick veneer/stone veneer

Drained cavity

Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate

Spray foam insulation

Gypsum board

Latex paint or vapor semi-permeable textured wall finish
Brick veneer/stone veneer
Drained cavity
Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass
Membrane or trowel-on or spray applied drainage plane, air barrier and vapor retarder
Non paper-faced exterior sheathing, plywood or OSB
Spray foam insulation
Gypsum board
Latex paint or vapor semi-permeable textured wall finish
Brick veneer/stone veneer
Drained cavity
Drainage plane
Non paper-faced exterior sheathing, plywood or OSB
Spray foam insulation
Gypsum board
Latex paint or vapor semi-permeable textured wall finish
Stucco

Expanded polystyrene insulation (EPS)

Air gap

Water control layer

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Uninsulated steel stud cavity

Gypsum board

Latex paint or vapor semi-permeable textured wall finish
Stucco

Expanded polystyrene insulation (EPS)

Air gap

Water control layer

Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)

Insulated wood stud cavity

Gypsum board

Latex paint or vapor semi-permeable textured wall finish
Brick veneer cladding

Drained and vented cavity

Spray-applied closed-cell high-density foam (2 lb/ft³) water control layer (also air control layer, vapor control layer and thermal control layer)

Concrete masonry unit wall

Metal channel

Gypsum board interior lining

Latex paint
Stone veneer

Drained cavity

Exterior rigid insulation

Membrane air barrier, vapor barrier (Class I vapor retarder) and drainage plane

Concrete block

Metal channel or wood furring

Gypsum board

Latex paint or vapor semi-permeable textured wall finish
Vinyl siding

Drainage plane (vapor permeable building paper, house wrap)

Plywood sheathing

Insulated wood stud cavity

Cavity insulation

Gypsum board air barrier

Latex paint or vapor semi-permeable textured wall finish
Latex paint

Stucco rendering

Concrete block

Rigid insulation (vapor semi-permeable) — unfaced extruded polystyrene, unfaced expanded polystyrene, glass fiber-faced isocyanurate

Uninsulated steel frame wall

Non-paper faced gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Fibercement siding
1x4 furring
Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass
Drainage space between exterior rigid insulation and drainage plane
Building paper or house wrap drainage plane
Non-paper faced exterior gypsum sheathing, treated plywood or treated oriented strand board (OSB)
Uninsulated wood stud cavity
Non-paper faced gypsum board
Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Latex paint

Precast concrete

Rigid insulation (vapor semi-permeable) — unfaced extruded polystyrene, unfaced expanded polystyrene, fiber-faced isocyanurate

Uninsulated steel frame wall

Non-paper faced gypsum board

Latex paint or vapor semi-permeable textured wall finish

Vapor Profile
Vinyl siding

Ventilated and drained cavity

Drainage plane (vapor permeable building paper, house wrap)

OSB sheathing

Insulated wood stud cavity

Cavity insulation

Polyethylene air barrier and vapor barrier (Class I vapor retarder)

Gypsum board

Latex paint or vapor semi-permeable textured wall finish
Fiber cement siding (non-combustible)

$\frac{3}{4}$" metal “hat-channel” (non-combustible)

Rockwool insulation (non-combustible)

Fully-adhered membrane

Gypsum board

Cavity insulation

Paperless gypsum board sheathing (non-combustible)
Wood or fiber cement siding

Furring or spacer strip

Building paper, housewrap or building wrap (PinkWrap® Housewrap)

Plywood or OSB sheathing

EcoTouch® Pink® Fiberglass Insulation in cavity

Gypsum board

Latex paint

Vapor Flow-Through Assembly
Wood or fiber cement siding

Furring or spacer strip

Exterior rigid insulation (Foamular® Extruded Polystyrene (XPS))

EcoTouch® Pink® Fiberglass Insulation in cavity

Gypsum board

Latex paint

Control of Condensing Surface Temperature Assembly
Veneer

Frame wall (steel stud or wood stud)

Cavity insulation

Sheathing (gypsum board, plywood or OSB)

Water control layer

Drainage mat

Frame wall (steel stud or wood stud)

Cavity insulation

Sheathing (gypsum board, plywood or OSB)

Water control layer

Draining insulation

Frame wall (steel stud or wood stud)

Cavity insulation

Sheathing (gypsum board, plywood or OSB)

Water control layer

Draining insulation

Air cavity (vented)
Building Science Corporation

2x3 interior wall

Plywood cavity closure at top of assembly

Taped and painted 1/8" gypsum wallboard as interior finish

Cellulose insulation in 2x3 interior wall stud spaces

Cellulose insulation in gap between framing

2x4 exterior wall @ 16" o.c.

Single top plate

3 1/2" high density spray foam (SPF)(2.0 pcf) against exterior sheathing

Plywood or OSB sheathing

Housewrap

Furring strips

Cladding

6" high density spray foam (SPF)(2.0 pcf) on inside of rim joist
Single top plate

Taped and painted 1/8" gypsum wall board as interior finish

2x6 @ 24" o.c. interior framing

Fiberglass or cellulose insulation in interior stud cavity

Spray foam insulation at rim joist

Closure board

2x3 exterior framing member

Substrate to support spray foam

4 1/2" high density spray foam (SPF)(2.0 pcf)

Minimum 1/8" drainage and ventilation gap between closure board and cladding

Cladding
Single top plate

Taped and painted 1/2" gypsum wall board as interior finish

2x6 interior framing member @ 24" o.c.

Plywood/OSB sheathing; joints taped/sealed

Cellulose insulation at rim joist

Capillary break

Ledger board

Plywood cavity closure at top of assembly

2x3 exterior truss

Cellulose insulation in wall cavity

Plywood/OSB sheathing

Housewrap

Furring strips

Cladding
Single top plate

2x6 stud wall @ 24” o.c.

Taped and painted ⅛” gypsum wall board as interior finish

Insulation at rim joist

Vapor control layer as per IRC

Fiberglass or cellulose insulation in stud space

Exterior sheathing

Liquid applied water control layer

Drainage gap/channels/ grooves necessary between drainage plane and EPS

3”-to-6” EPS insulation

Glass mesh reinforced lamina and synthetic stucco finish
Taped and painted $^{1/2}$” gypsum wall board as interior finish

OSB interior panel

EPS insulation core

Spray foam rim joist insulation

OSB exterior panel

Housewrap

Furring strips

Cladding
Building Science Corporation

Cast-in-place concrete core

ICF inner and outer faces (typically EPS)

Taped and painted \( \frac{1}{2}'' \) gypsum board as interior finish

Furring strips

Cladding
Steel studs
Taped and painted 1/2" gypsum wall board as interior finish
No cavity insulation
Gypsum board sheathing; exterior rated with joints taped/sealed
Mineral fiber insulation boards
Metal hat channel
Fiber cement siding
Single top plate

2x6 @ 24” o.c.

Taped and painted 1/2” gypsum wall board as interior finish

Blown cellulose insulation in stud space

Insulating sheathing

Furring strips

Cement siding
1x4 wood furring attached through rigid insulation to 2x4 wood furring

2x4 wood furring mechanically attached to masonry wall

Fluid-applied water control layer and air control layer

Cladding

Joints offset horizontally and vertically with each layer taped

Masonry wall

Interior plaster and lath
2" semi-rigid mineral fiber insulation; seams offset horizontally and vertically

2x4 wood furring mechanically attached to masonry wall

Fluid-applied water control layer and air control layer

Metal hat channel

Fiber cement panel

"Reveal" in panel joint

Spacer/joint backer

1\(\frac{1}{2}\)" semi-rigid mineral fiber insulation

Masonry wall

Interior plaster and lath
Multi-wythe mass wall

- Interior lining (gypsum board)
- Interior framing
- Rock wool or Roxul rigid mineral wool insulation
- Fluid-applied water control layer (vapor semi-permeable)
- Cementitious rendering
Multi-wythe mass wall

Interior lining (gypsum board)

Cellulose or fiberglass cavity insulation

Wood frame wall (2x6)

Fluid-applied water control layer (vapor semi-permeable)
Multi-wythe mass wall

Interior lining (gypsum board)

“Strapped wall”; horizontal framing

Membrane “smart vapor barrier”

Cellulose or fiberglass cavity insulation

Wood frame wall (2x6)

Fluid-applied water control layer (vapor semi-permeable)

Cementitous rendering
Building Science Corporation

- Brick veneer/stone veneer
- Drained cavity
- Exterior rigid insulation — extruded polystyrene, expanded polystyrene, isocyanurate, rock wool, fiberglass
- Membrane or trowel-on or spray applied drainage plane, air barrier and vapor retarder
- Concrete block
- Metal channel or wood furring
- Gypsum board
- Latex paint or vapor semi-permeable textured wall finish

Vapor Profile

WATER THAT PENETrATES IS DIVERTED OUTWARD BY FLASHINGS