Building Enclosure Concept Design Checklist

SUPPORT

1. **Support** mechanical loads
- Sufficient strength and stiffness (from structural engineer)

CONTROL

2. Heat Flow **Control** (Temperature and Energy)
- avoid thermal bridges, reasonable insulation: HVAC energy + capital cost savings
- control air leakage,
- excessive glazing = winter discomfort and summer overheating (esp. west glass)

3. Condensation **Control**
- surface condensation, i.e. thermal bridges, corners, etc.
- interstitial condensation (summer & winter) by vapour diffusion and air leakage

4. Air Flow **Control**
- air barrier systems, compartmentalization, convection loops in batts
- control of stack effect, HVAC,and wind-induced air flows, odour, dust

5. Rain **Control**
- climate, site, building orientation, shape
- deflection, surface drainage, drying, and enclosure rain control strategies

6. Crack/movement control
- control of cracking and movement are complementary
- consider creep, sag, shrinkage, swelling, both moisture and temperature movement

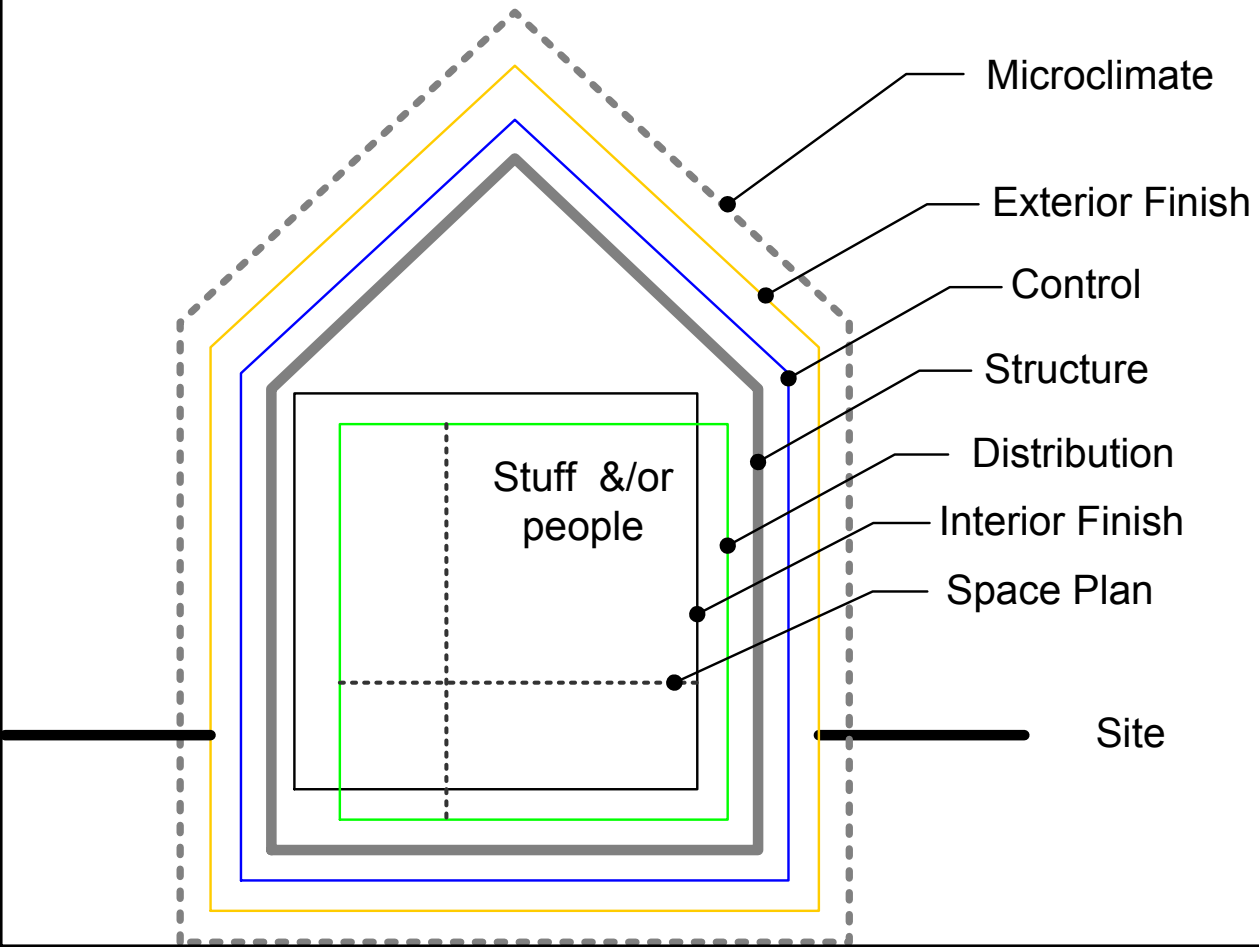
7. Fire and Smoke **Control**
- fire resistance rating, flame spread, smoke produced, toxins generated
- special situations, often involved in design decisions (e.g., combustible vs non-combustible)

8. Sound and Vibration **Control**
- airborne sound reflection, transmission, and impact borne sound transmission
- special situations are sometimes important, always needs some consideration

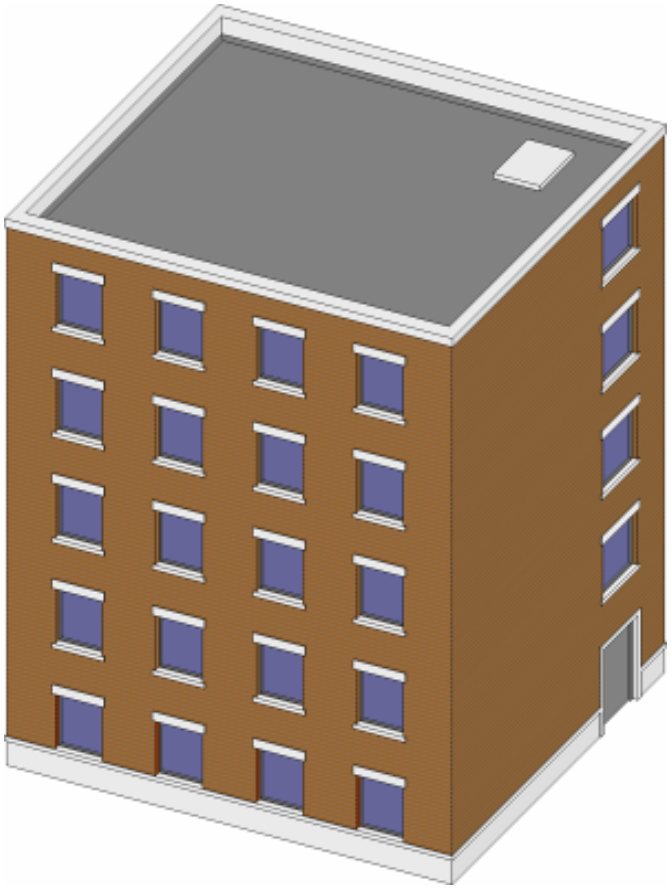
FINISH

9. **Finish**
- colour, pattern, texture, etc of interior and exterior interfaces
- architecture and interior designers

1. Structure
2. Exterior Screen / finish
3. Interstitial heat flow control system
4. Vapor diffusion control system
5. Rain control system
6. Air flow control system
7. Exterior continuous heat flow control
8. Interior Finishes
9. Service Distribution

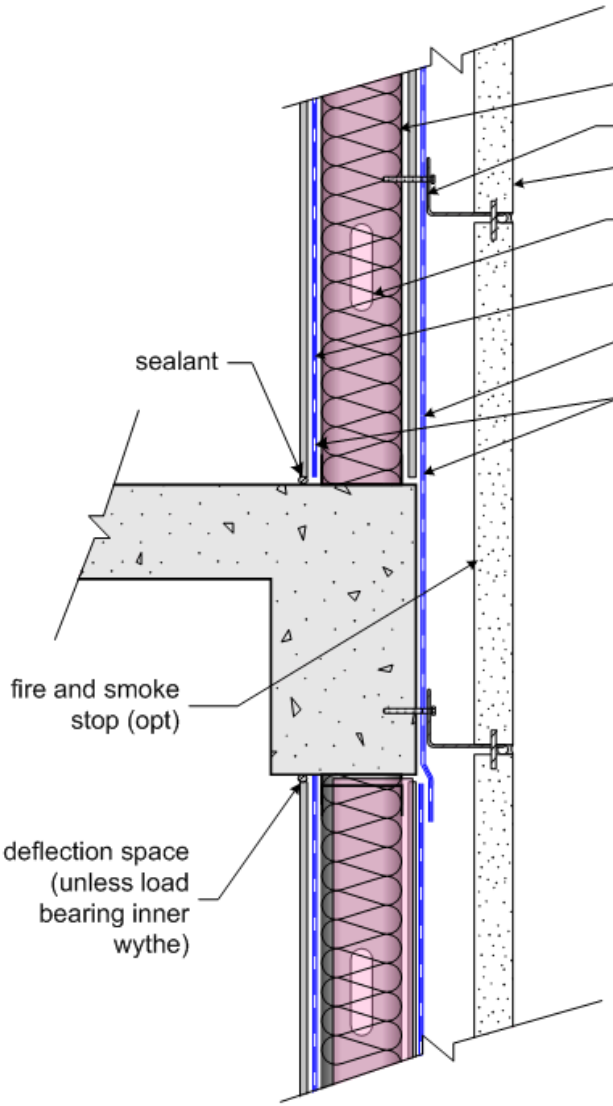


The Enclosure: Defining the Layers



- Structure — Support
- Air Barrier — Control
- Insulation — Control
- Rain Control — Control
- Finish — Finish

Typical Interstitial Insulated Wall



Typical Materials/Sub-systems

1. Masonry - brick or block
   Steel Stud and Drywall (shown)
   Wood Stud and Drywall
   Concrete
2. Masonry or Siding
   Stucco or DEFS
   Panels (metal, stone, ceramic, etc)
   Precast concrete (shown)
3. Batt (in studspace)
   Cellulose
   Spray Foam
4. Paint or vinyl wallpaper on drywall
   Polyethylene
   foil-backed drywall
   Kraft facing on batt
5. Spray-foam
   Trowel- / spray- applied membrane
   Sheet membrane
6. Exterior sheathing
   Interior sheathing or sheet
   Spray-foam
   Trowel- / spray- applied membrane
   Sheet membrane

Conceptual Drawing only! Important details not shown, just arrangement of layers. Some combinations may not be practical or may perform poorly

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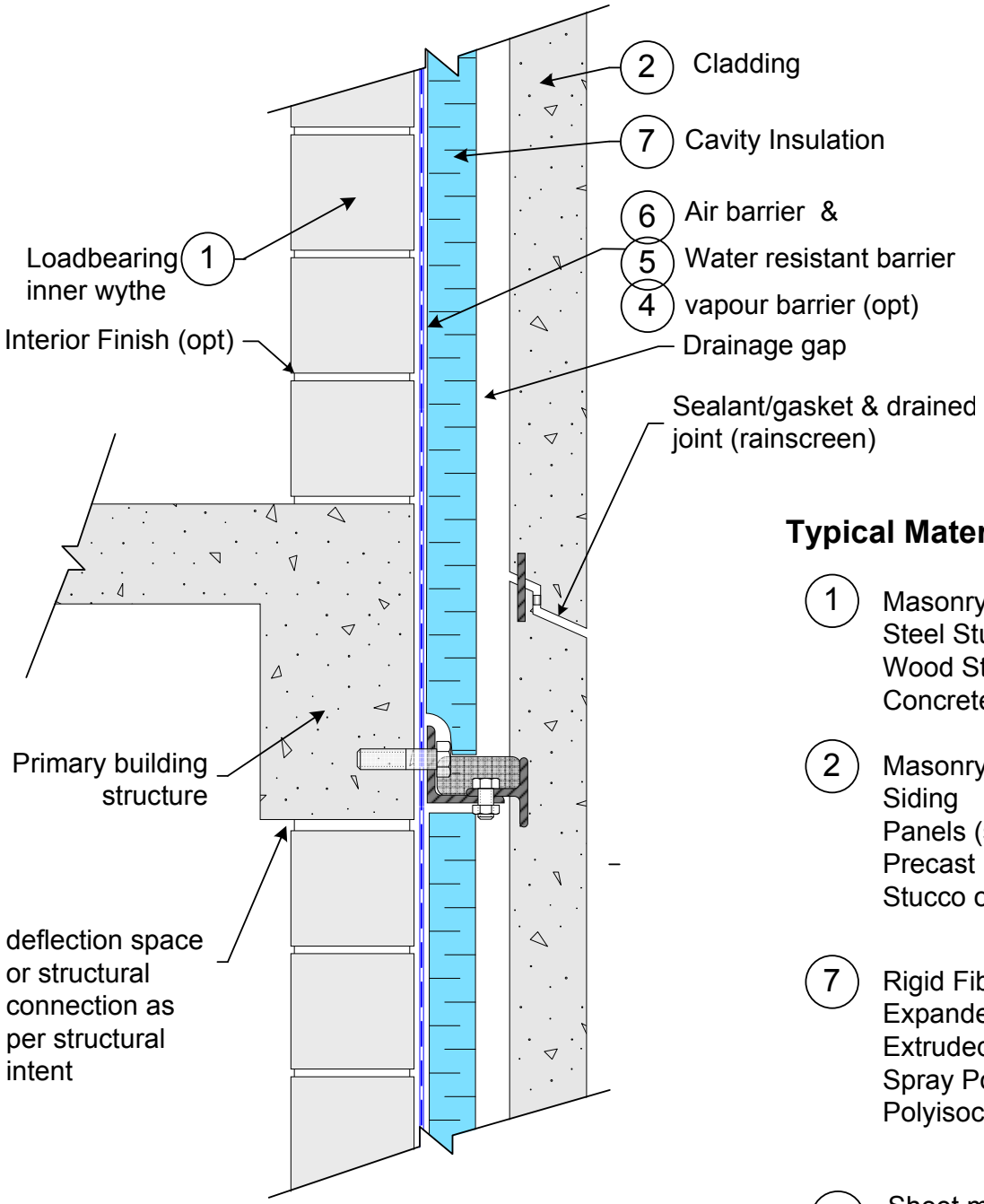
8. **Interior Finishes**
9. **Service Distribution**

Typical Wall Externally Insulated



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Typical Materials/Sub-systems

(1) Masonry (shown)
Steel Stud (uninsulated)
Wood Stud (uninsulated)
Concrete

(2) Masonry (shown)
Siding
Panels (steel, stone, etc)
Precast
Stucco or EIFS

(7) Rigid Fibrous
Expanded Polystyrene
Extruded Polystyrene
Spray Polyurethane
Polyisocyanurate

(4) Sheet membrane
(5) Trowel- and spray-applied
Spray foam

Typical Insulated Inner Wythe Wall w/ Insulating Sheathing

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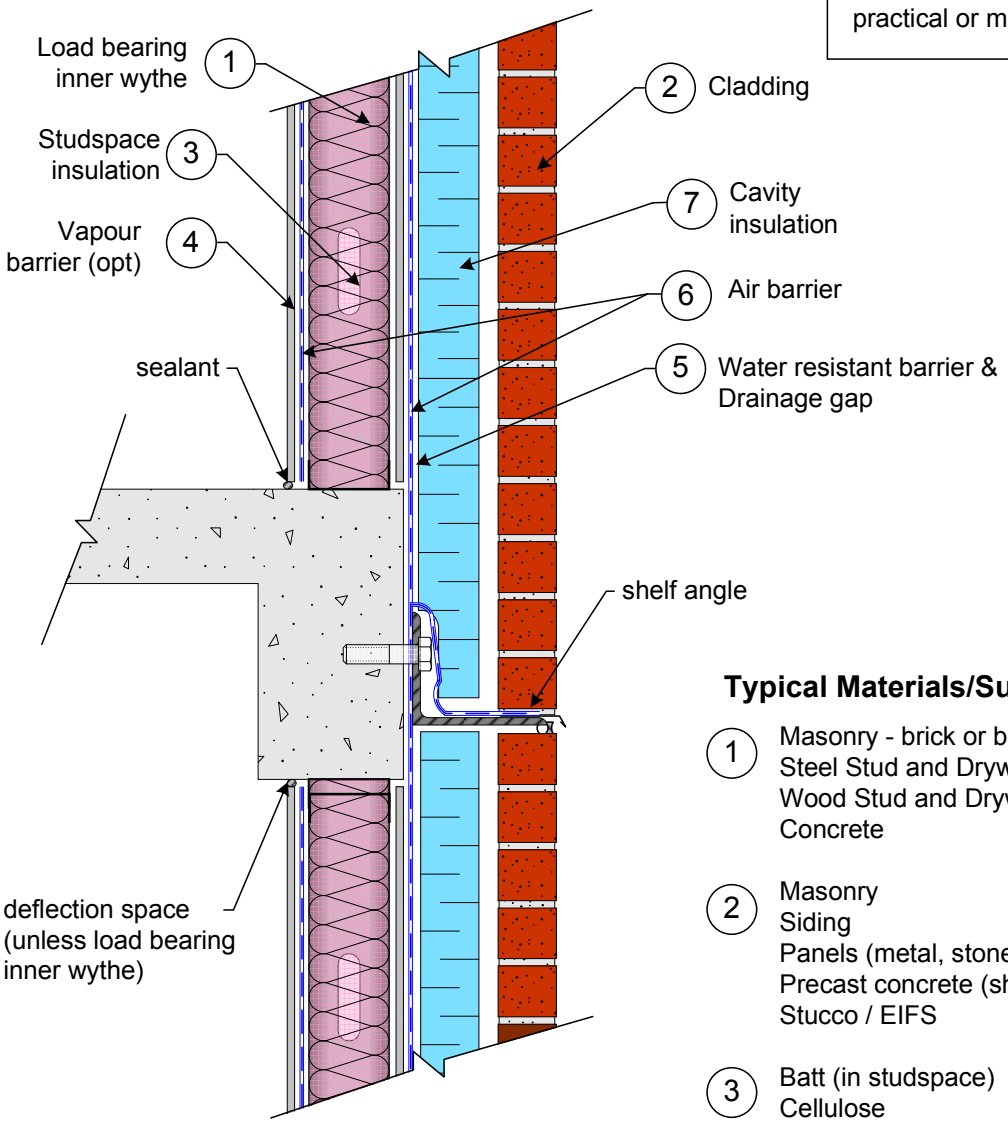

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Typical Materials/Sub-systems

1
Masonry - brick or block
Steel Stud and Drywall (shown)
Wood Stud and Drywall
Concrete

2
Masonry
Siding
Panels (metal, stone, ceramic, etc)
Precast concrete (shown)
Stucco / EIFS

3
Batt (in studspace)
Cellulose
Spray Foam

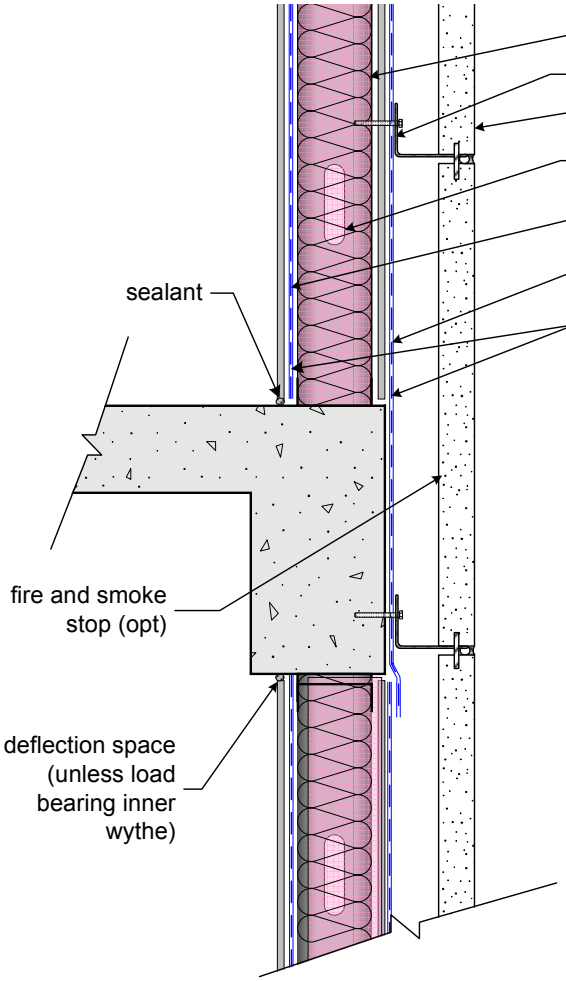
4
Paint or vinyl wallpaper on drywall
Polyethylene
foil-backed drywall
Kraft facing on batt

5
Spray-foam
Trowel- / spray- applied membrane
Sheet membrane

6
Exterior sheathing
Interior sheathing or sheet
Spray-foam
Trowel- / spray- applied membrane
Sheet membrane

7
Rigid Fibrous
Expanded Polystyrene
Extruded Polystyrene
Spray Polyurethane
Polyisocyanurate

Comparing Walls



1. Load-bearing inner wythe
   Steel tie back connection
2. Cladding
3. Studspace insulation
4. Vapour barrier (opt)
5. Water resistant barrier & drainage gap
6. Air barrier

Typical Materials/Sub-systems

1. Masonry - brick or block
   Steel Stud and Drywall (shown)
   Wood Stud and Drywall
   Concrete
2. Masonry or Siding
   Stucco or DEFS
   Panels (metal, stone, ceramic, etc)
   Precast concrete (shown)
3. Batt (in studspace)
   Cellulose
   Spray Foam
4. Paint or vinyl wallpaper on drywall
   Polyethylene
   foil-backed drywall
   Kraft facing on batt
5. Spray-foam
   Trowel- / spray- applied membrane
   Sheet membrane
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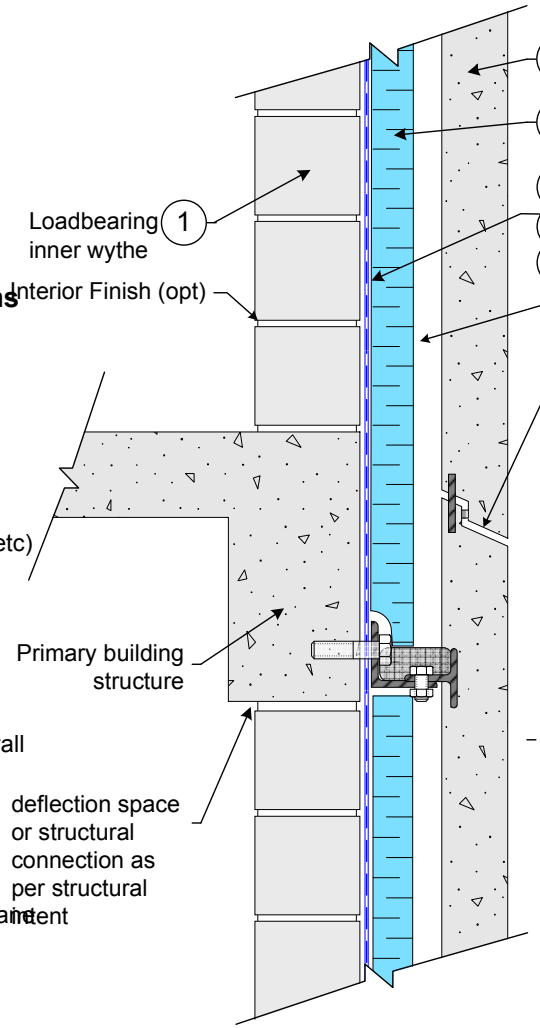

Typical Materials/Sub-systems

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   Steel Stud (uninsulated)
   Wood Stud (uninsulated)
   Concrete
2. Masonry (shown)
   Siding
   Panels (steel, stone, etc)
   Precast
   Stucco or EIFS
7. Rigid Fibrous
   Expanded Polystyrene
   Extruded Polystyrene
   Polyurethane Products
   Wood Fibreboard
   Polyisocyanurate
4. Sheet membrane
   Trowel- and spray-applied
5. Spray foam

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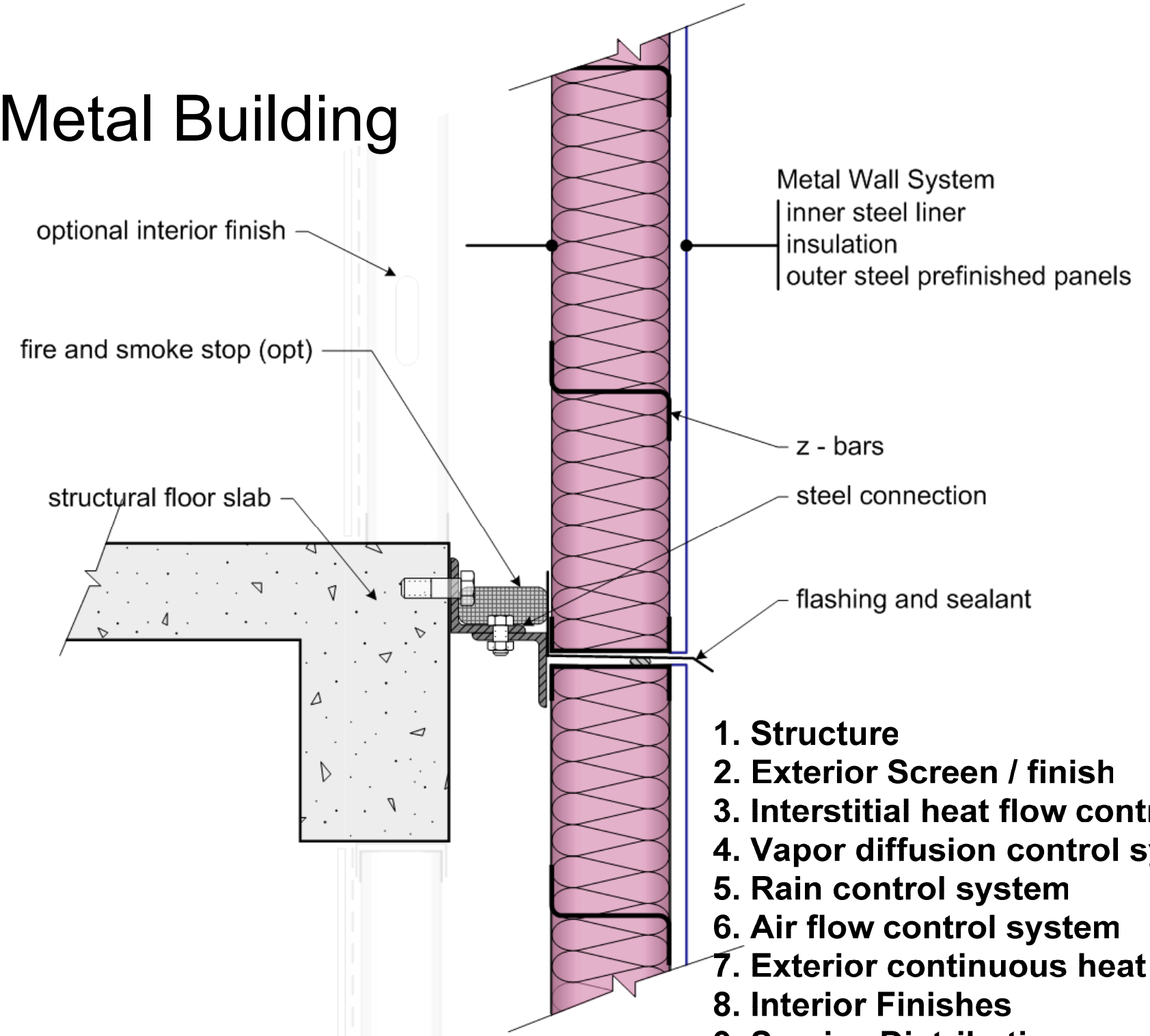
Metal Building



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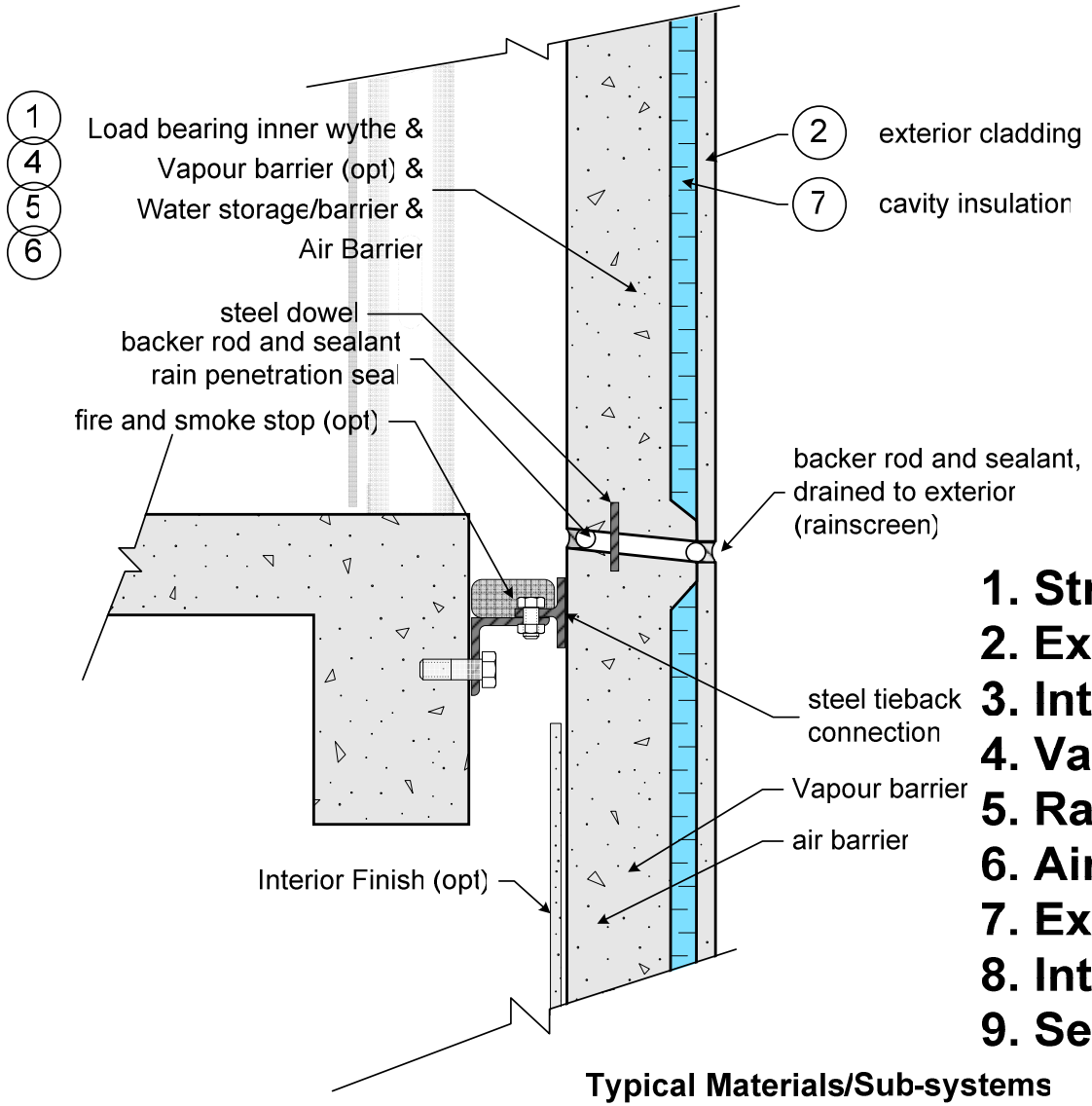
Example of Externally Insulated Wall:
Typical Integral Precast Concrete Panel Wall System

Sandwich



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Typical Materials/Sub-systems

2 Stone products
Precast concrete

7 Semi-rigid Fibrous
Expanded Polystyrene
Extruded Polystyrene
Polyurethane Products

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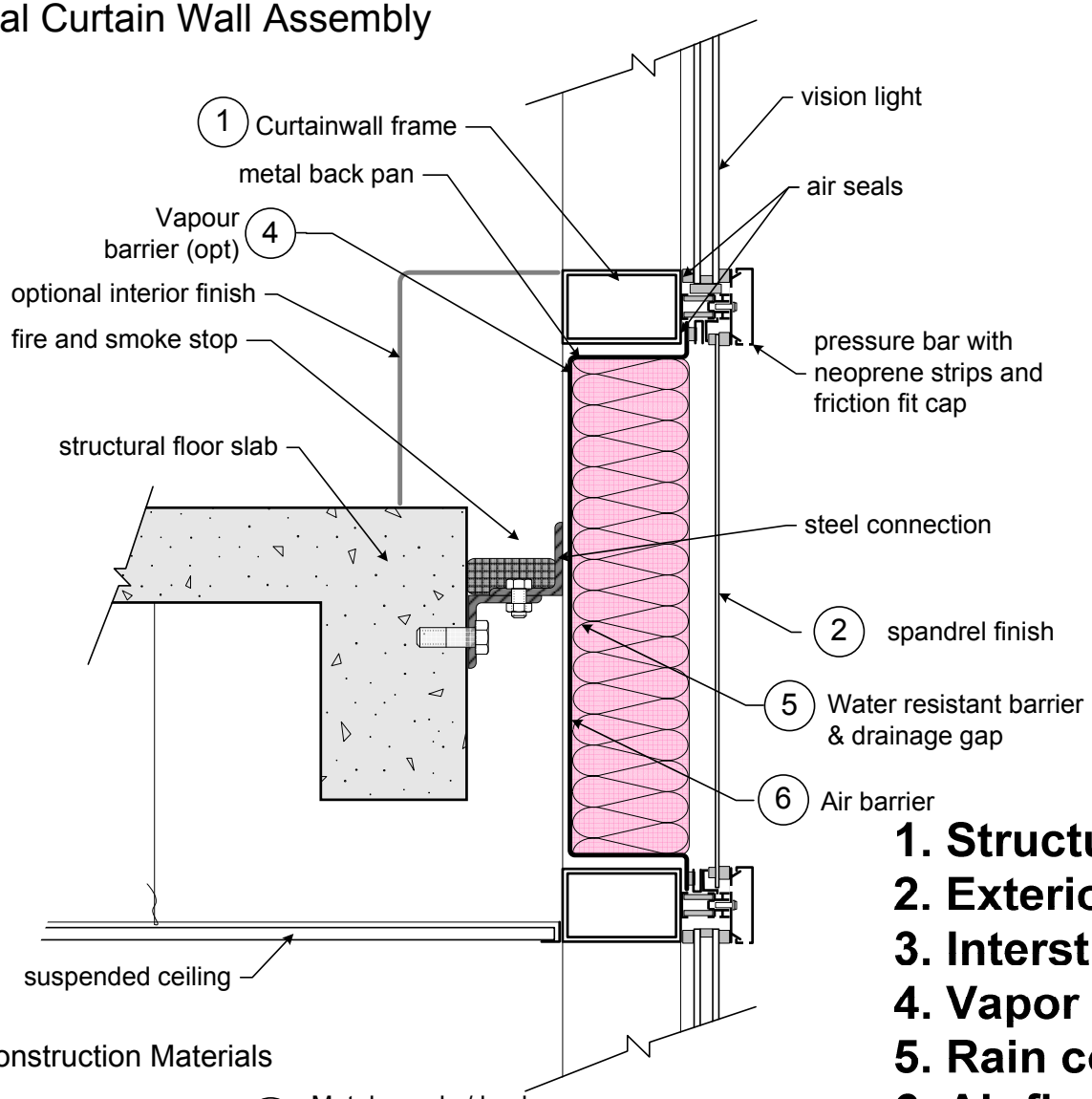
Curtainwall

Example of Interstitially Insulated Wall:
Typical Curtain Wall Assembly



Typical Construction Materials

1. Aluminum extrusions
   Metal shapes
   Wood
2. Metal Panels
   Glass
   Stone panels
3. Semi-rigid fibrous
   Rigid foam boards
4. Metal panels / back pan
   Paint or vinyl wallpaper on drywall
   Polyethylene sheet
   foil-backed drywall
5. Metal back pan,
   gaskets, membranes,
   sealants, glass, etc
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Enclosure Design Checklist

Building Enclosure Concept Design Stage Checklist

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Continuous Air Barrier

Continuous Insulation

Continuous Rain Control Layers