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Building Science

Adventures In Building Science

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Arrhenius Equation

For Every 10 Degree K Rise
Activation Energy Doubles

$$k = Ae^{-E_a/(RT)}$$

Damage Functions

Water

Heat

Ultra-violet Radiation

2nd Law of Thermodynamics

Heat Flow Is From Warm To Cold

Moisture Flow Is From Warm To Cold

Moisture Flow Is From More To Less





Air Flow Is From A Higher Pressure to a
Lower Pressure

Gravity Acts Down





Exposure

Extreme		Over 60"
High		40" - 60"
Moderate		20" - 40"
Low		Under 20"

What is a Building?

A Building is an Environmental Separator

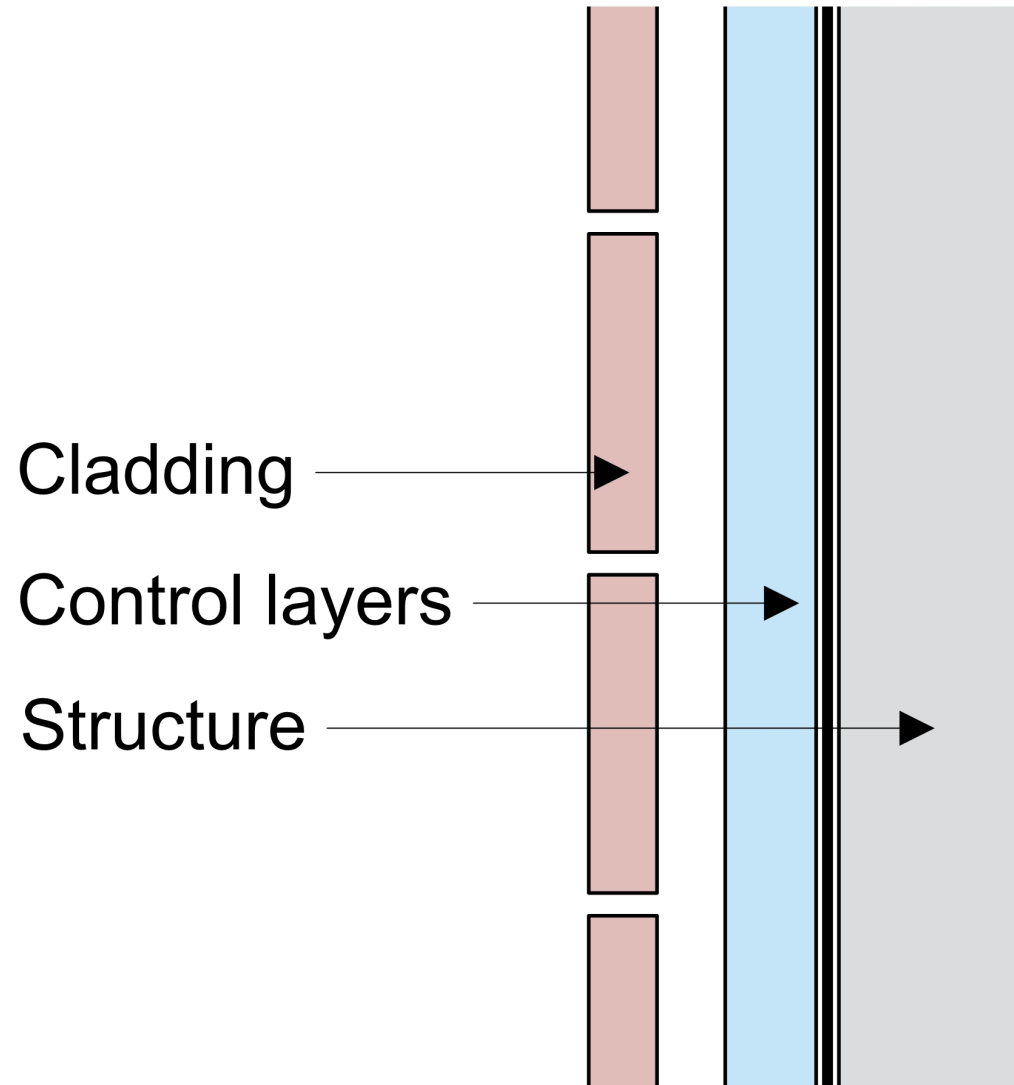
- Control heat flow
- Control airflow
- Control water vapor flow
- Control rain
- Control ground water
- Control light and solar radiation
- Control noise and vibrations
- Control contaminants, environmental hazards and odors
- Control insects, rodents and vermin
- Control fire
- Provide strength and rigidity
- Be durable
- Be aesthetically pleasing
- Be economical

Water Control Layer

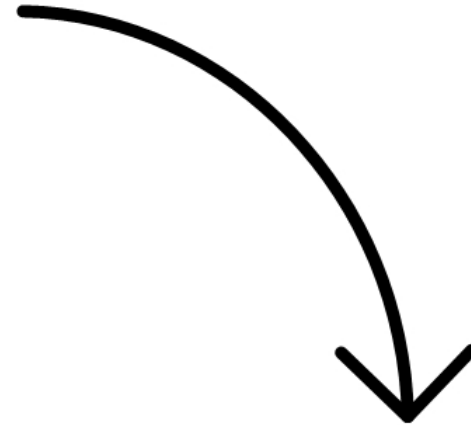
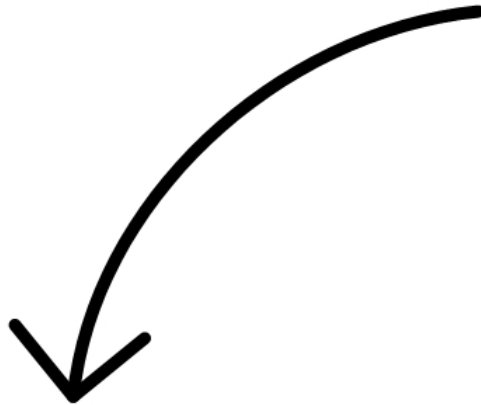
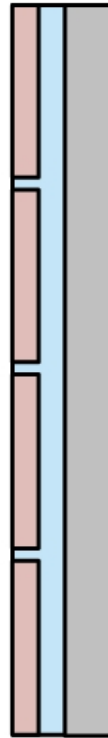
Air Control Layer

Vapor Control Layer

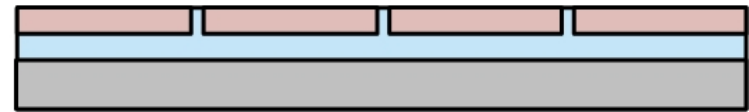
Thermal Control Layer



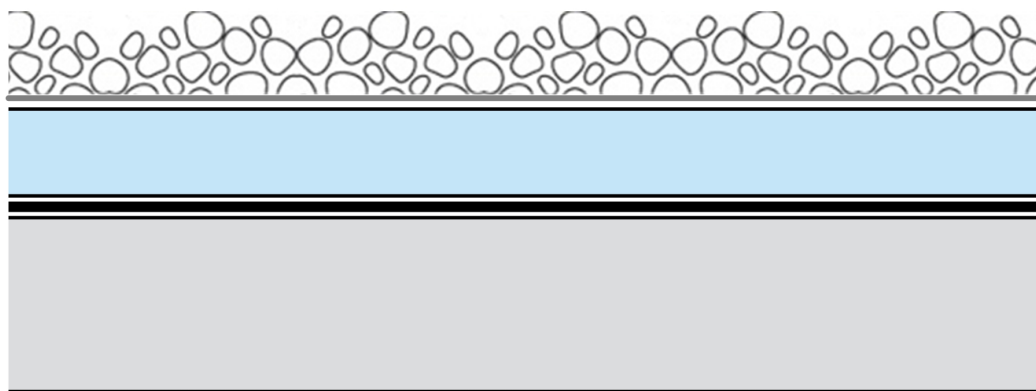
Wall



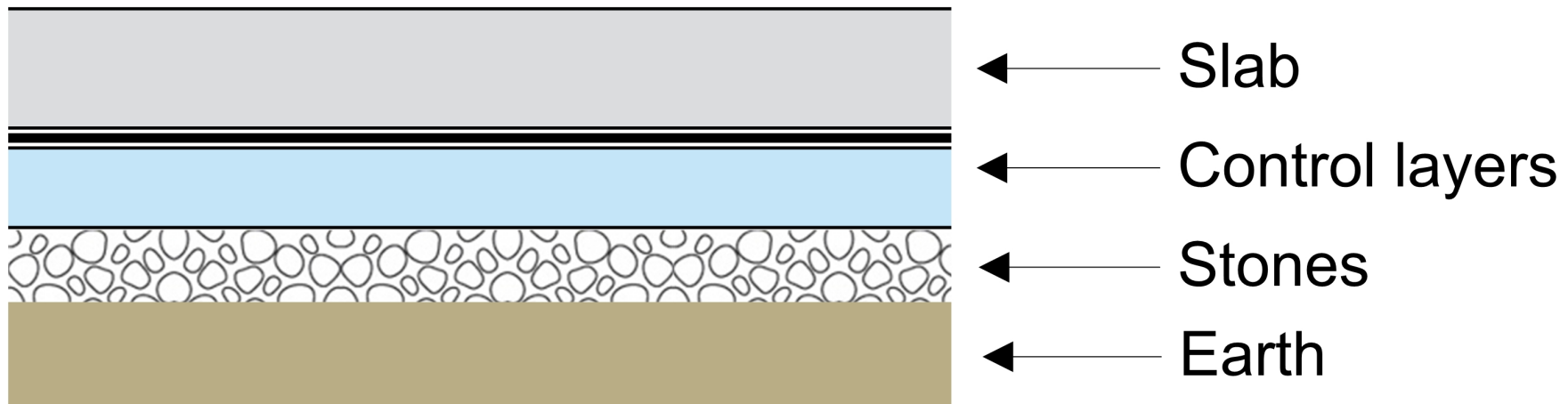
Slab

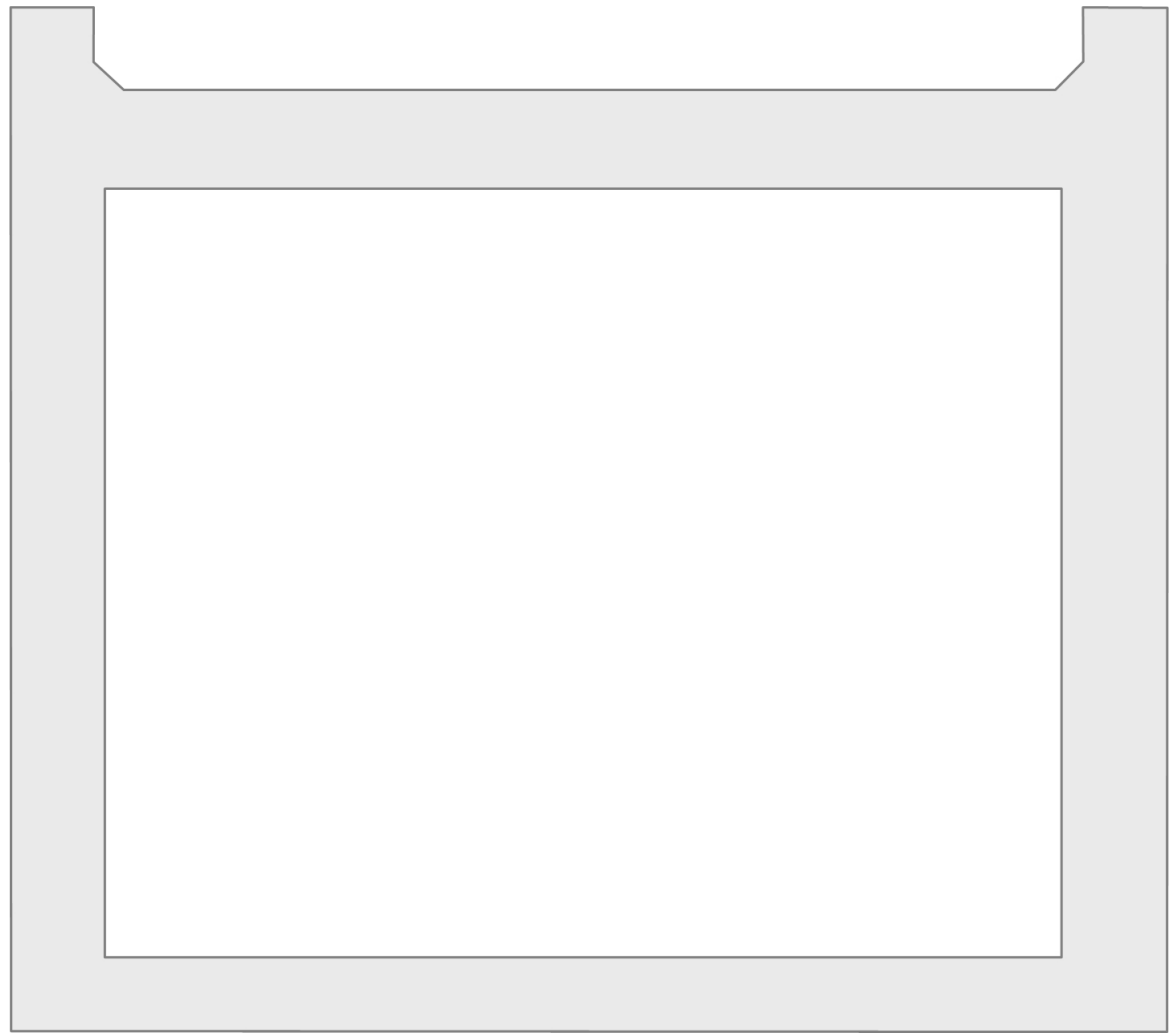


Roof

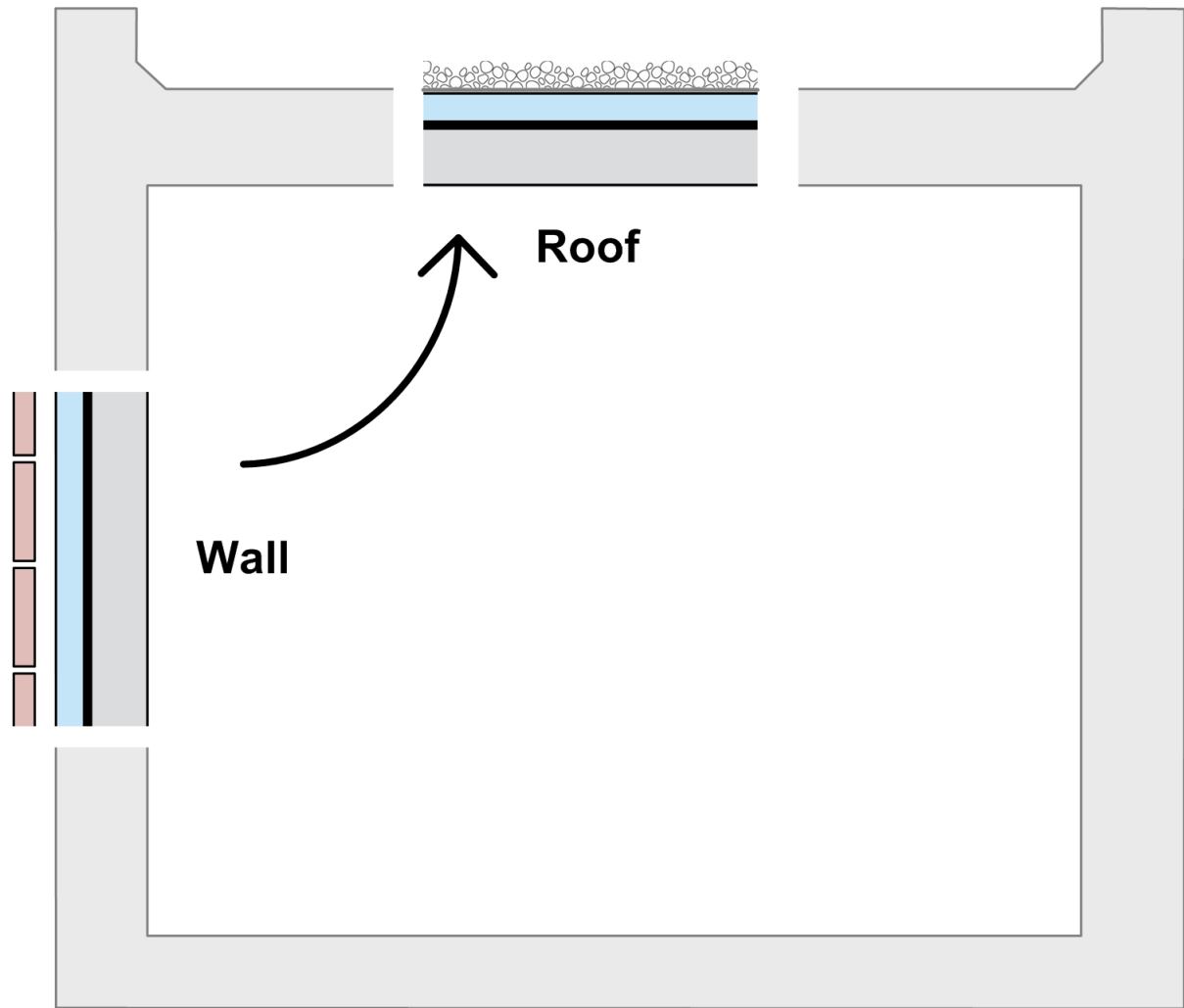


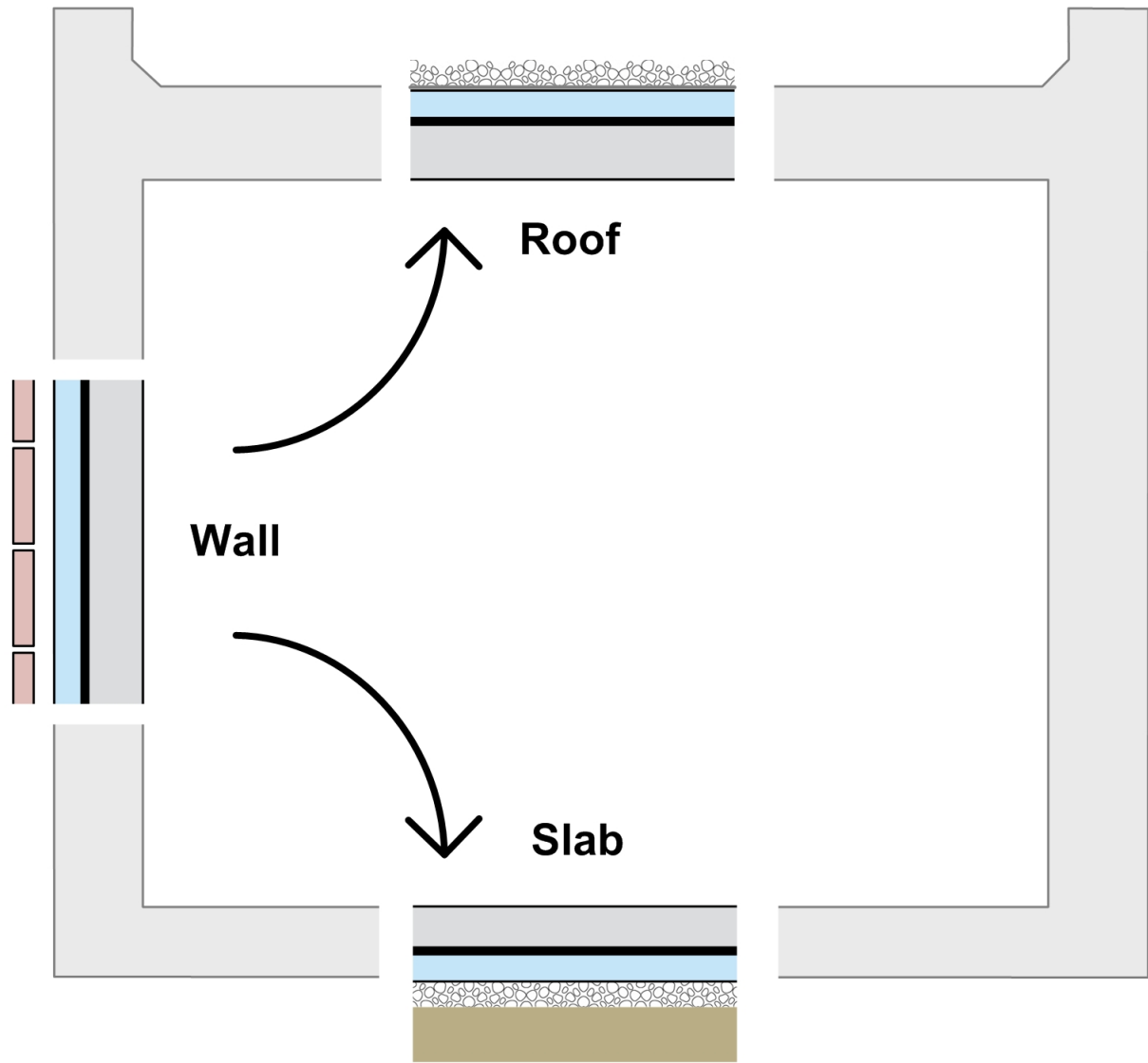
- ← Ballast
- ← Filter fabric
- ← Control layers
- ← Roof structure

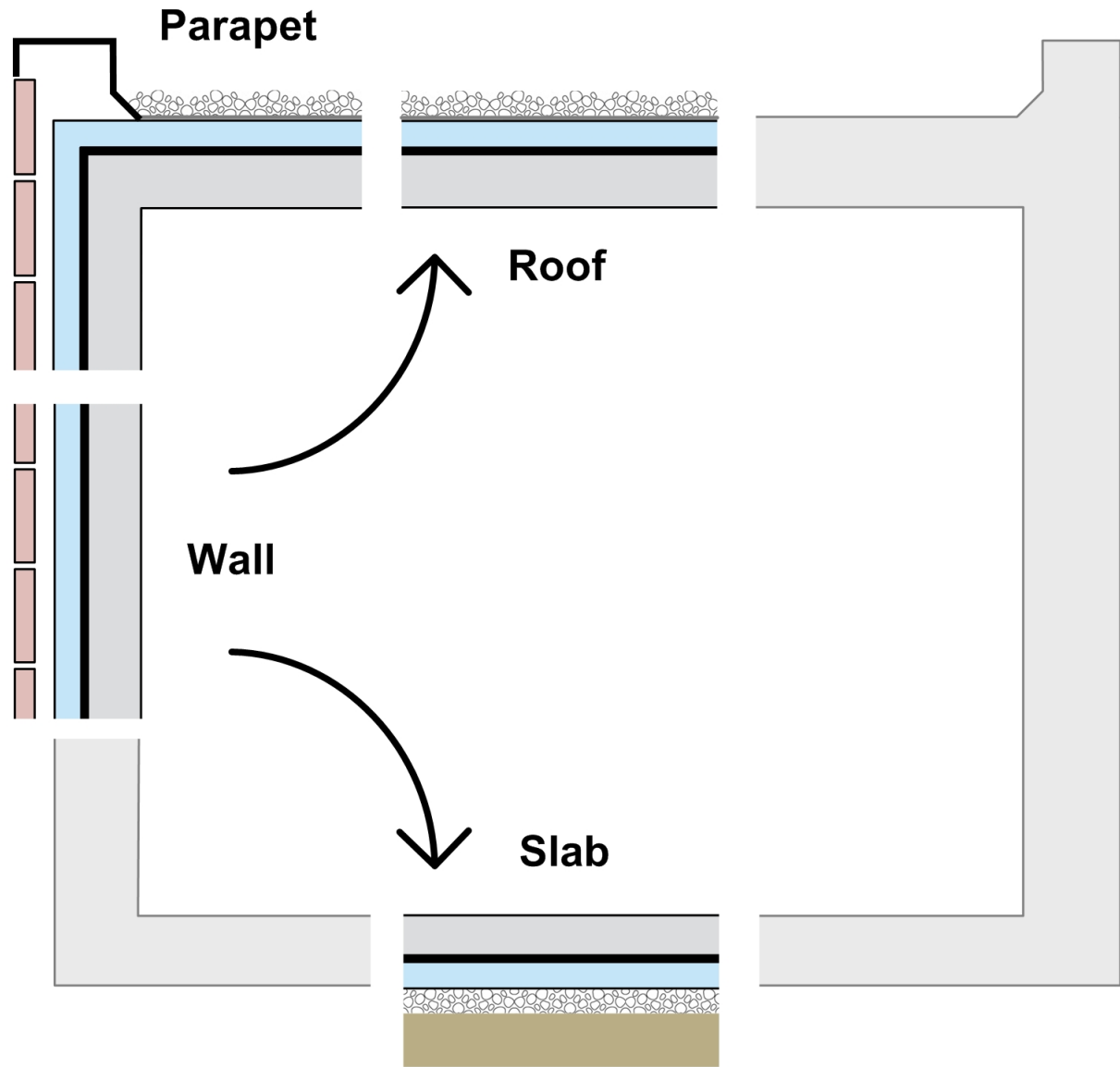


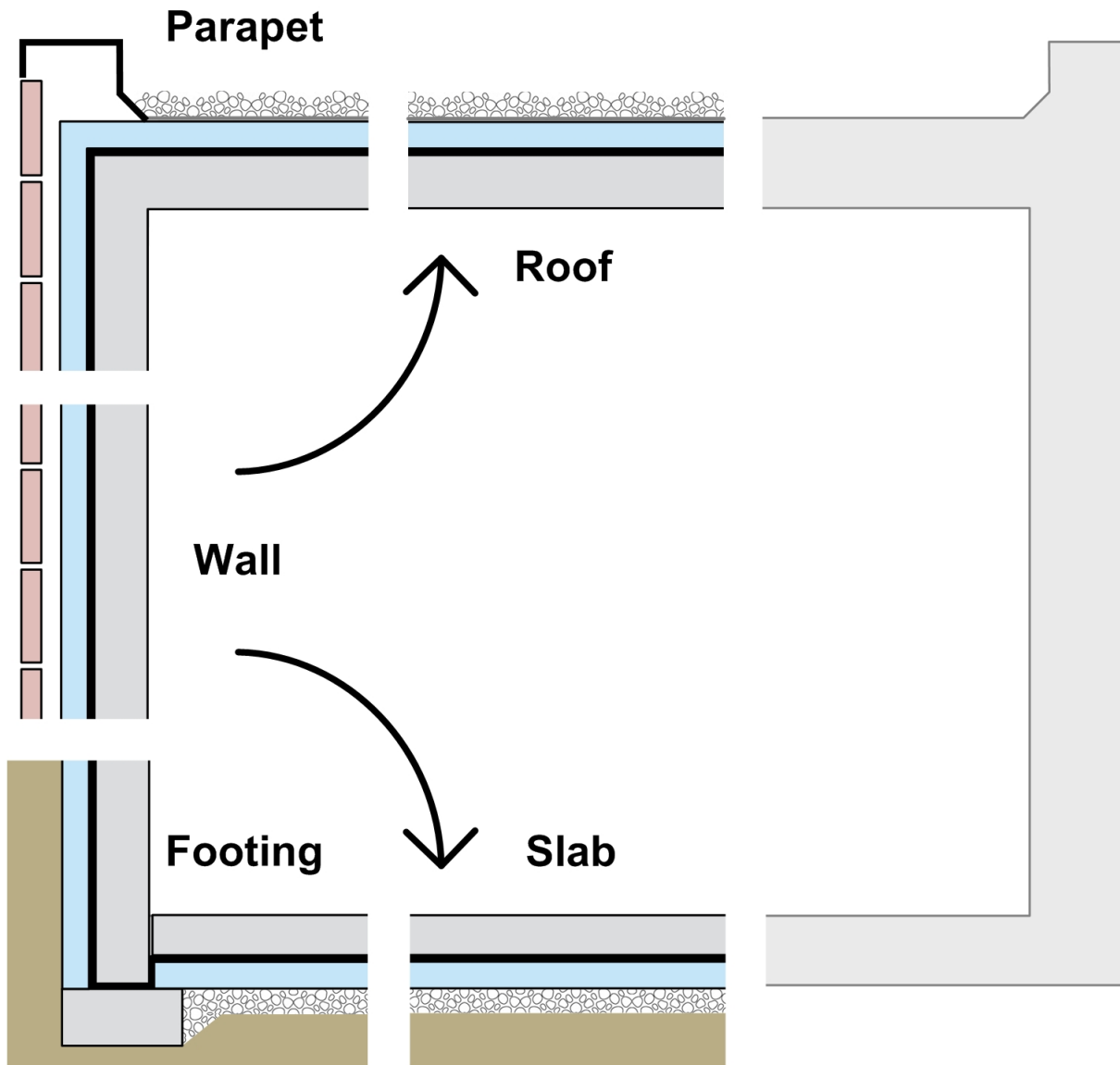


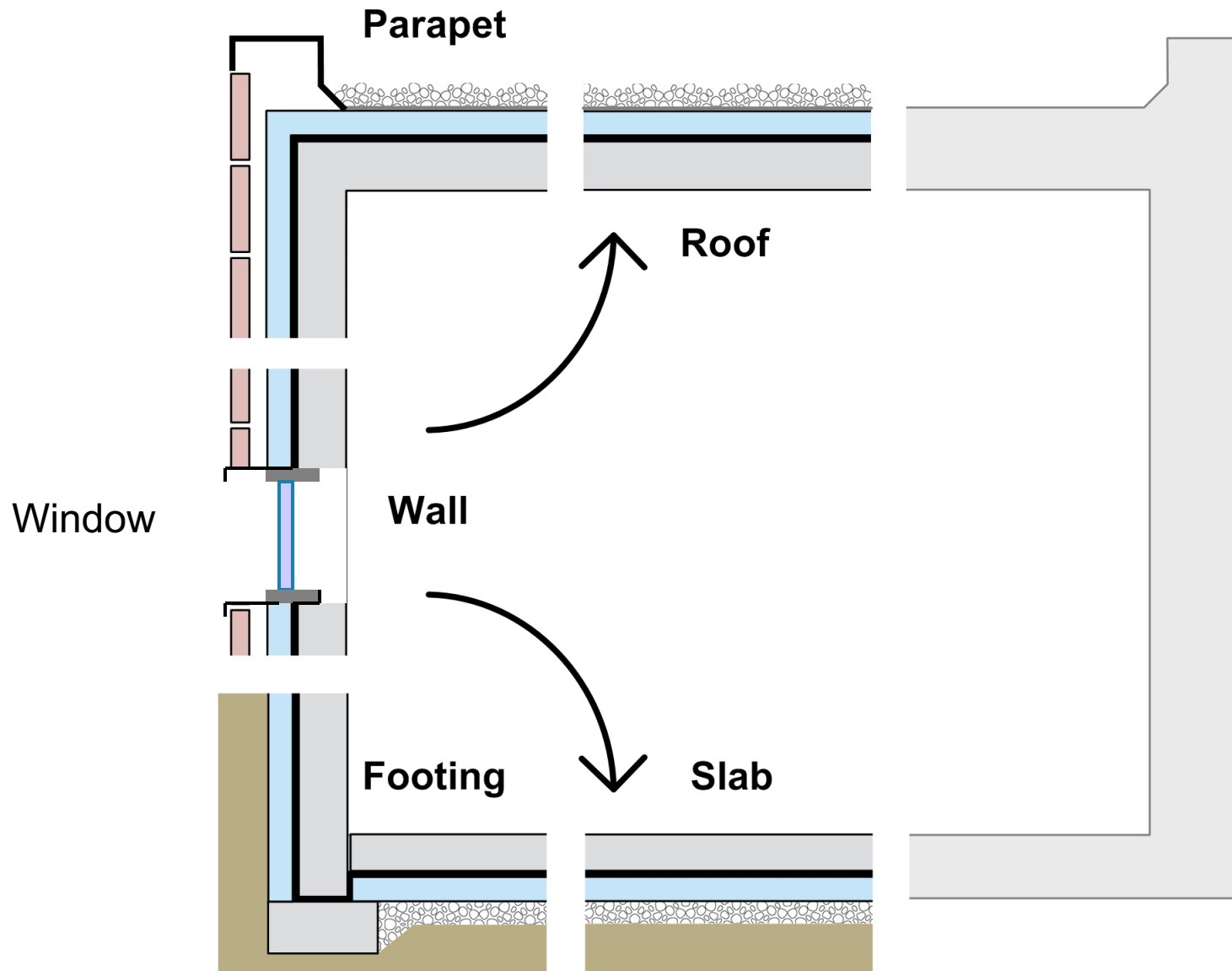


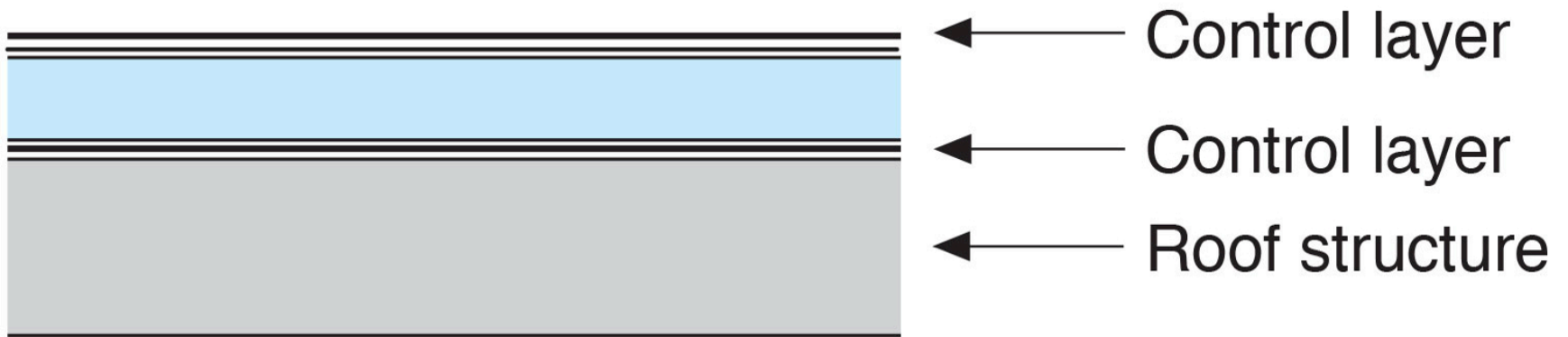


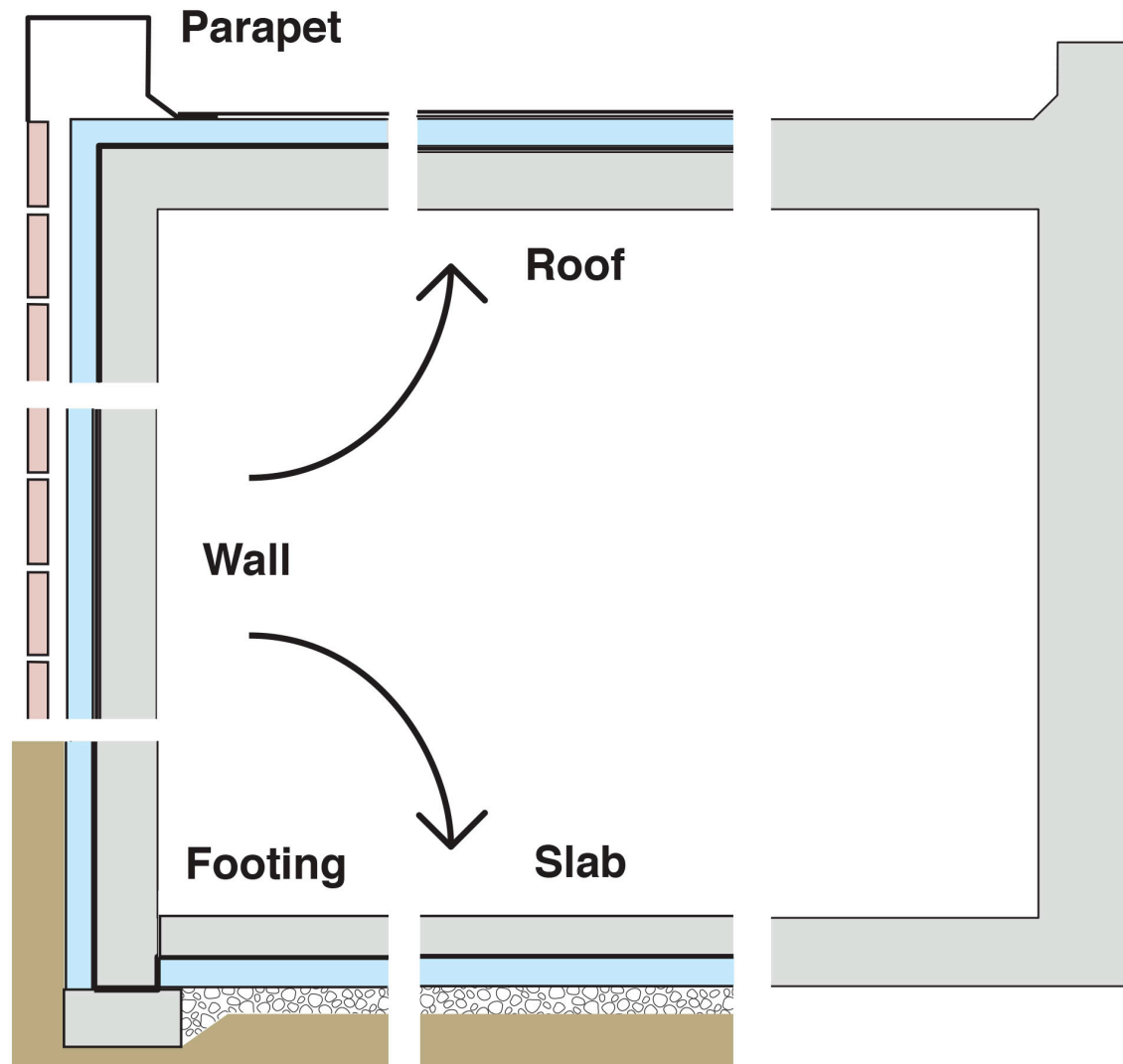


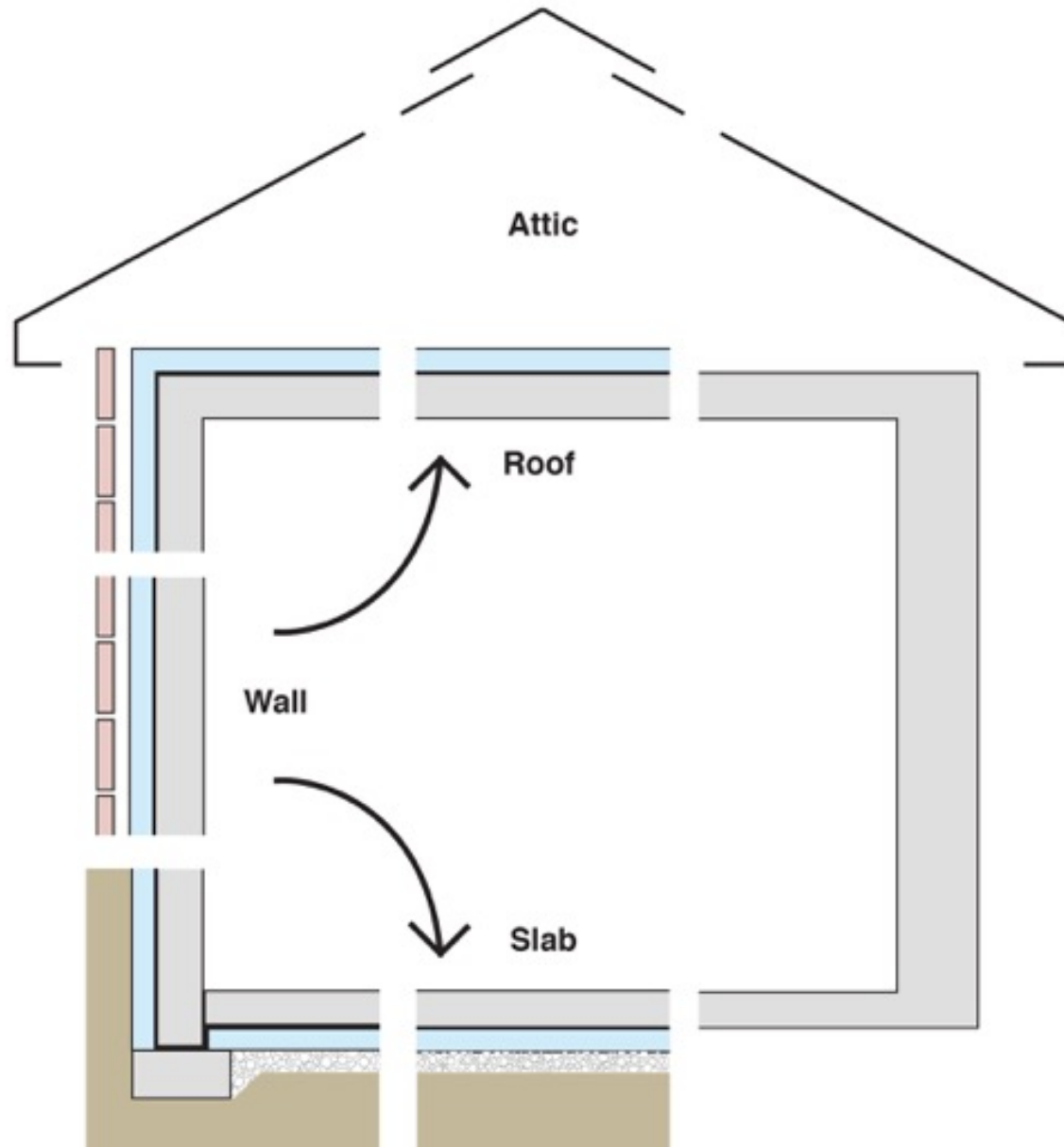


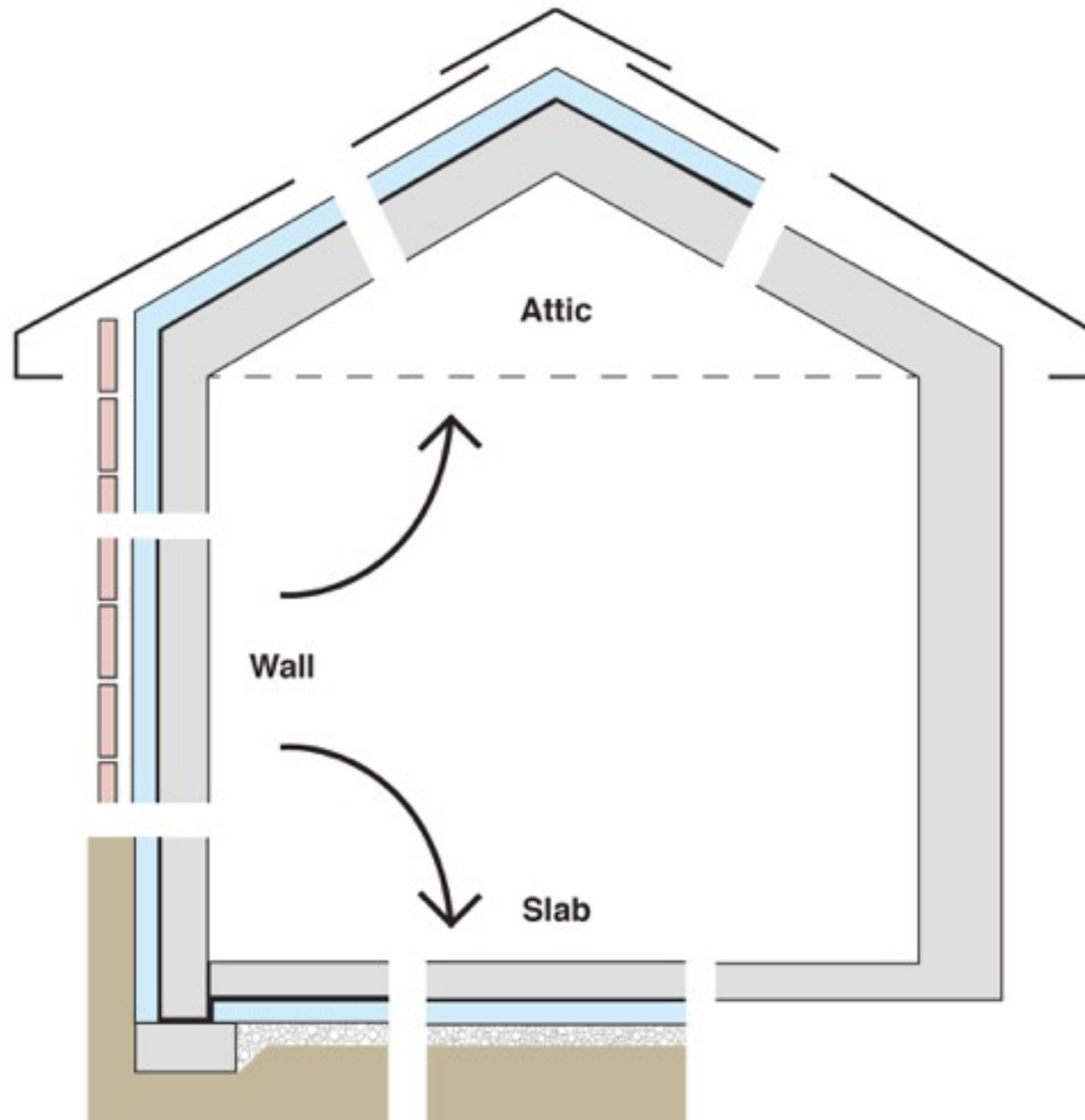


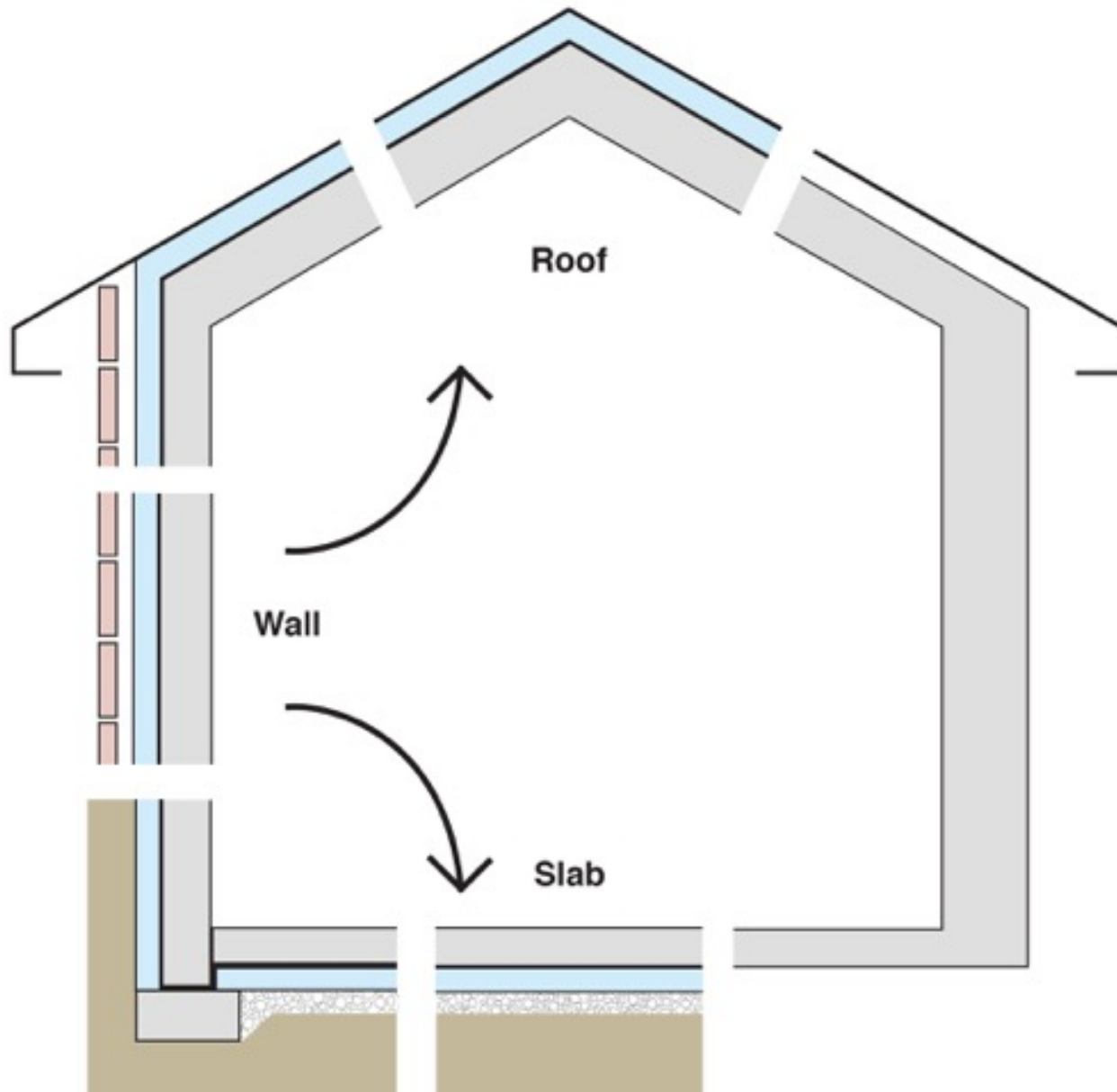


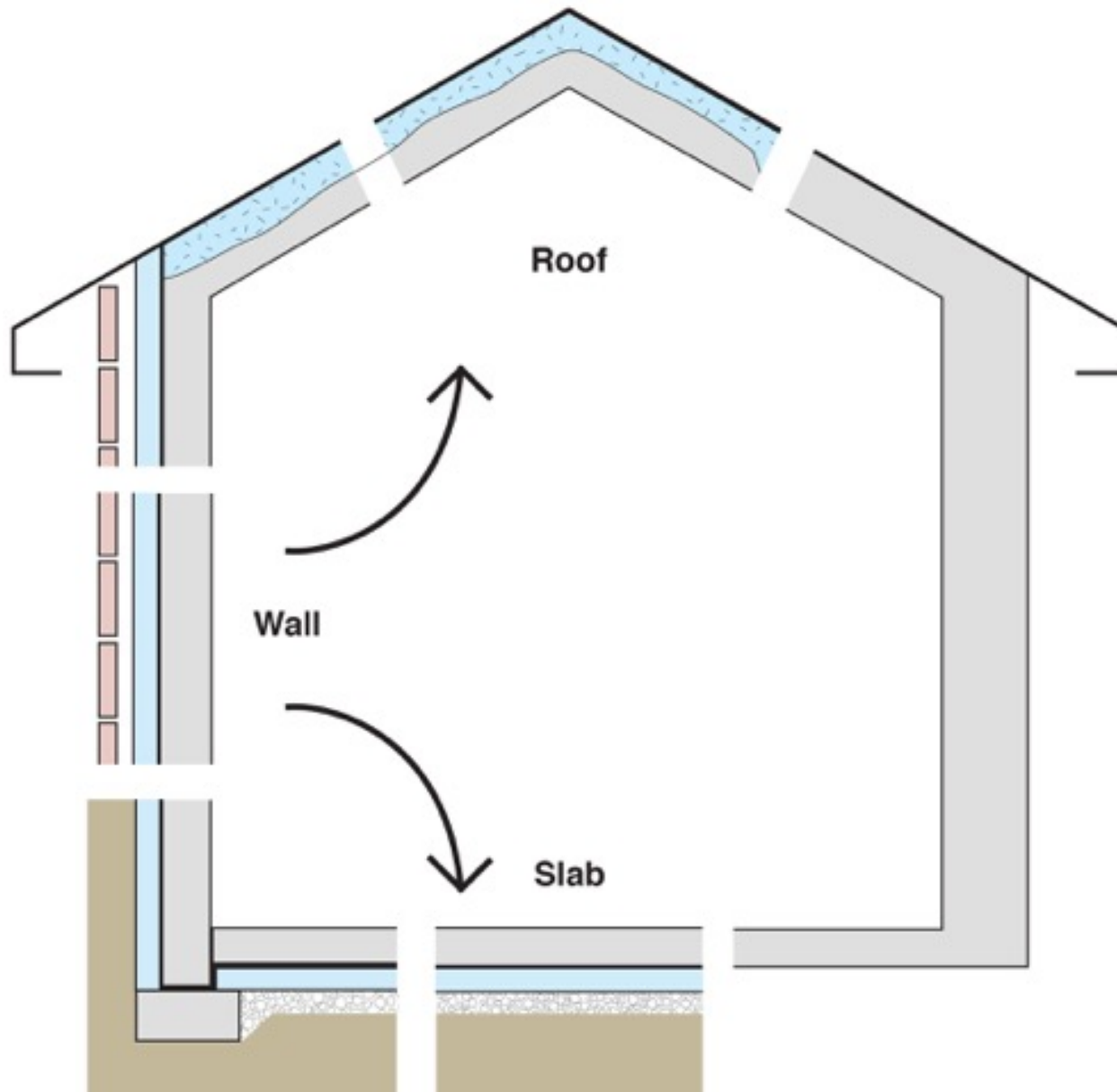




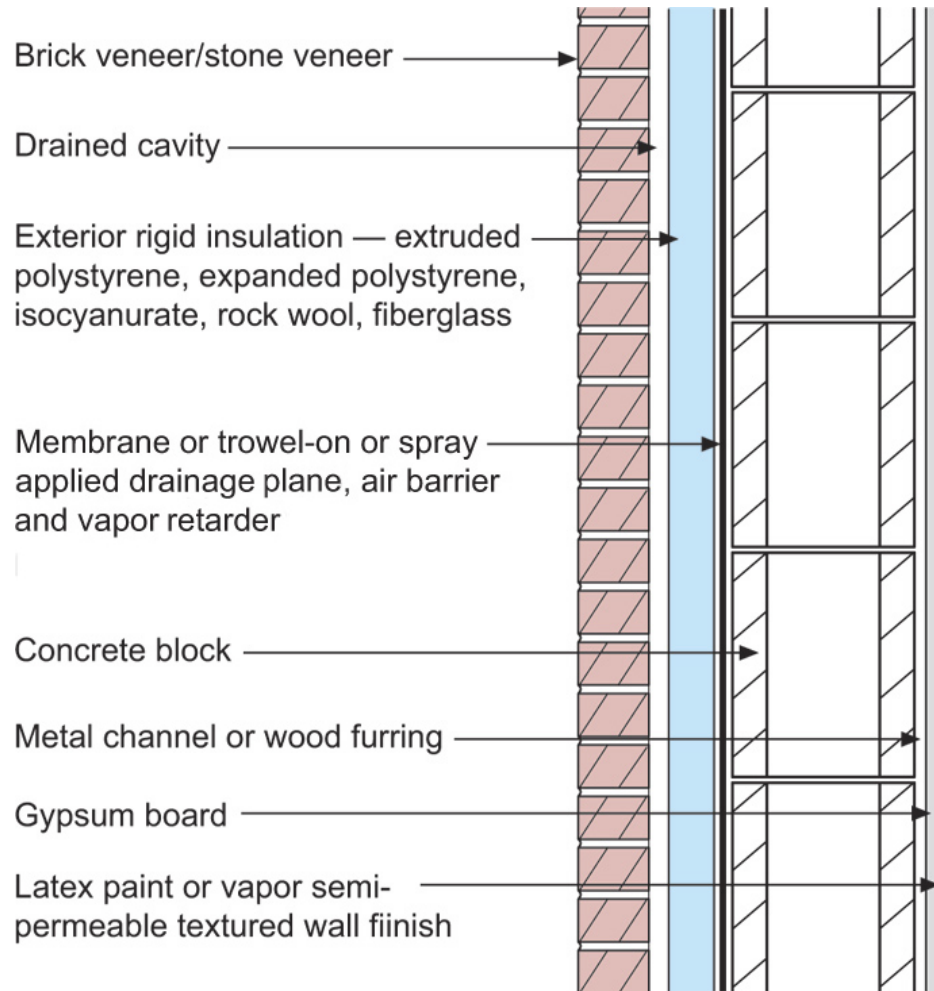




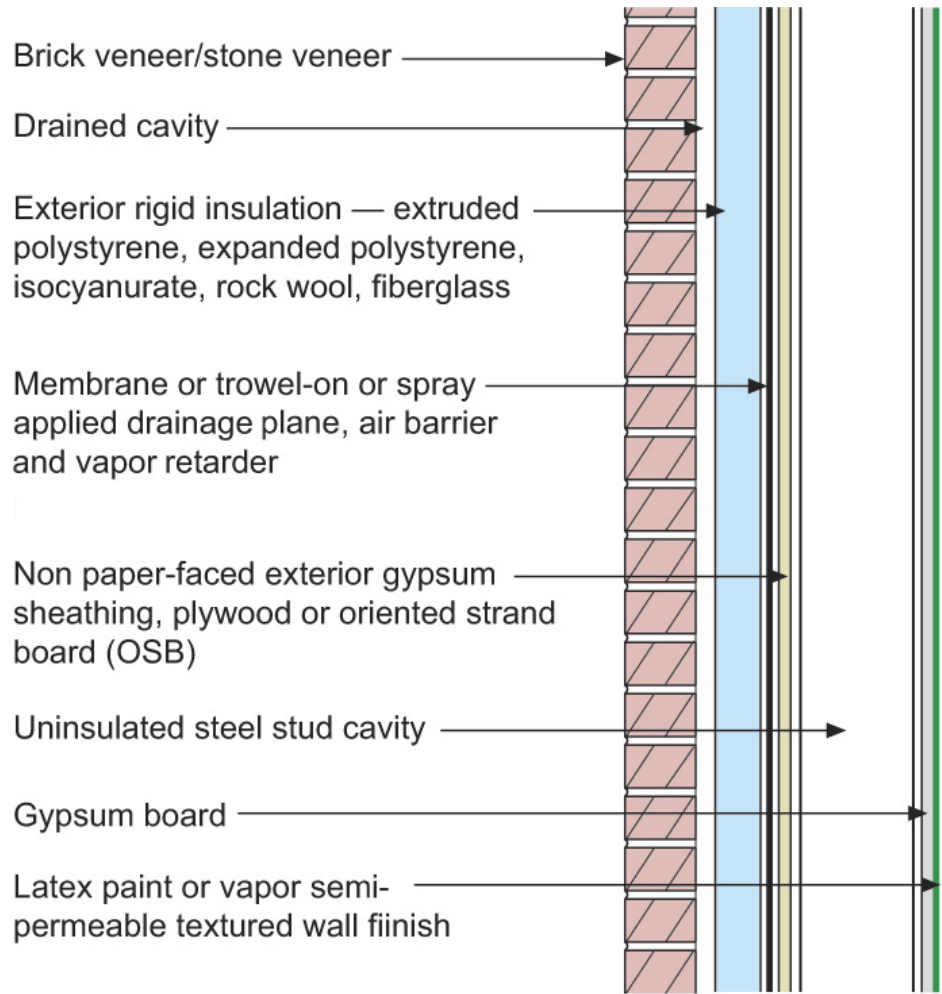




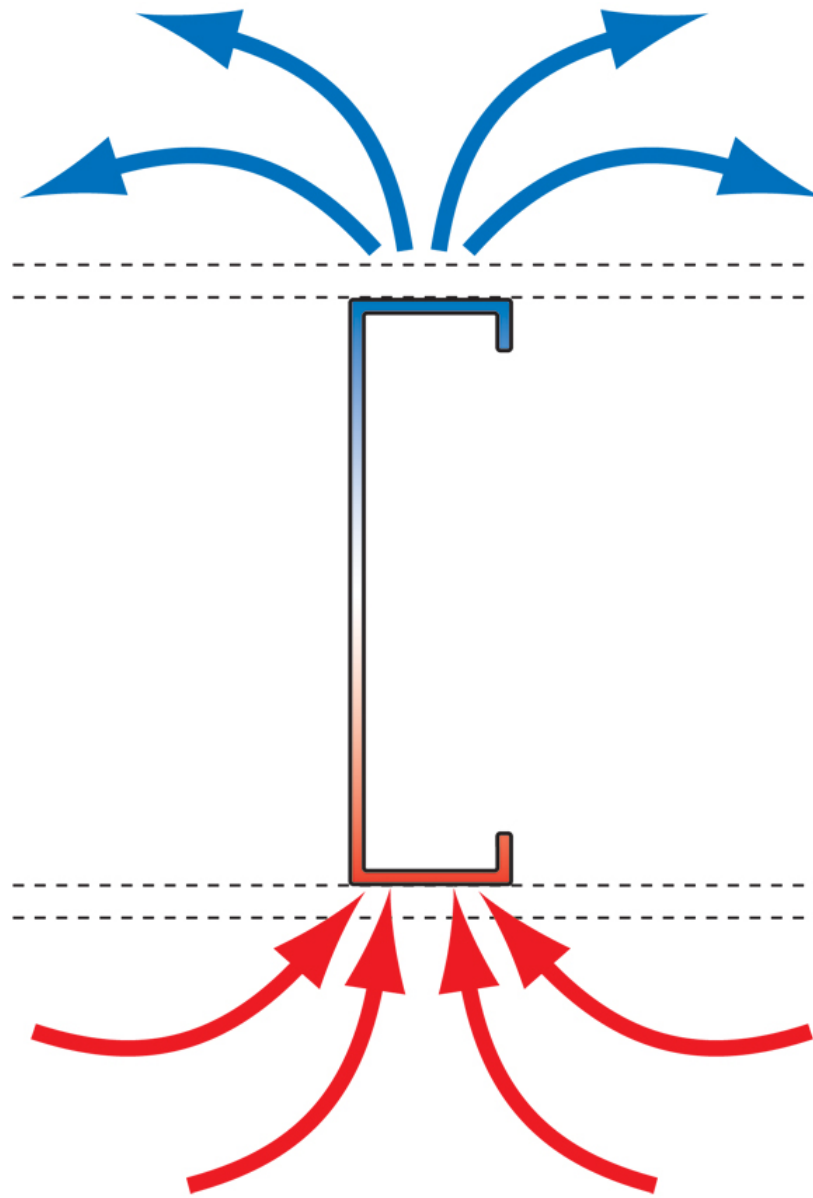
Configurations of the Perfect Wall



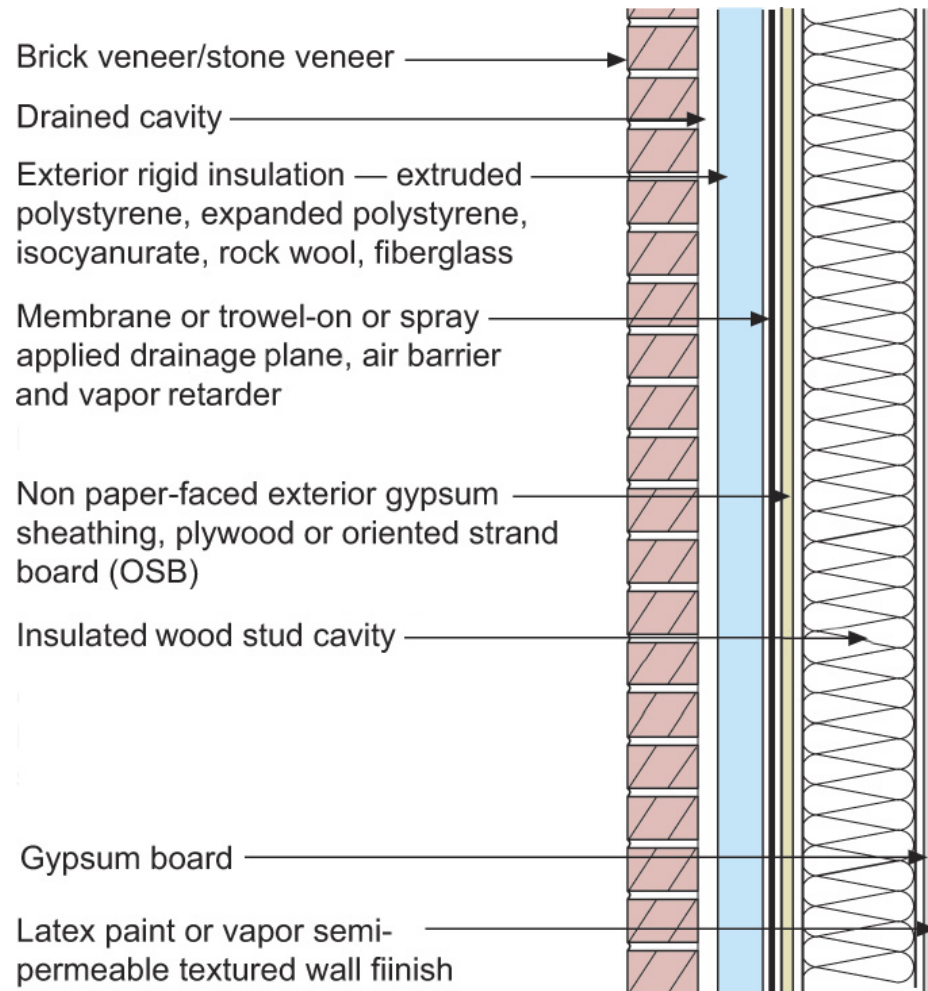
Vapor Profile



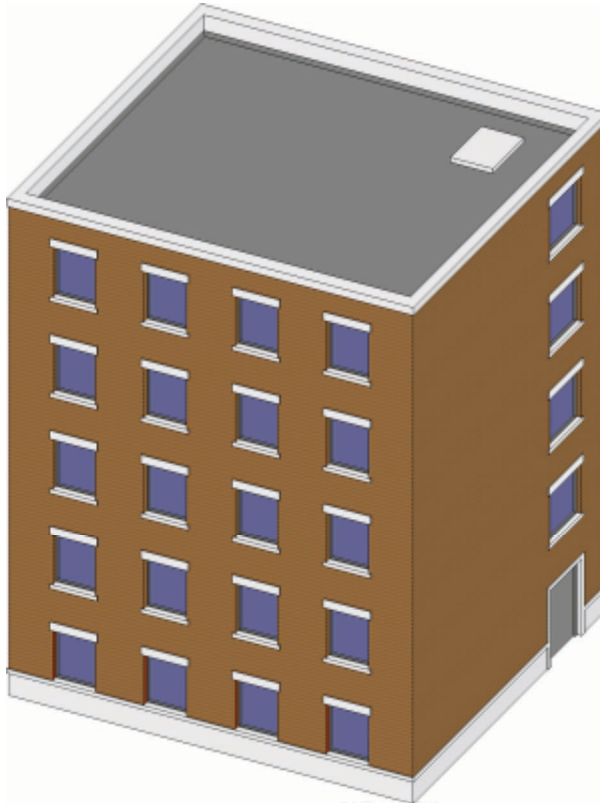
Vapor Profile



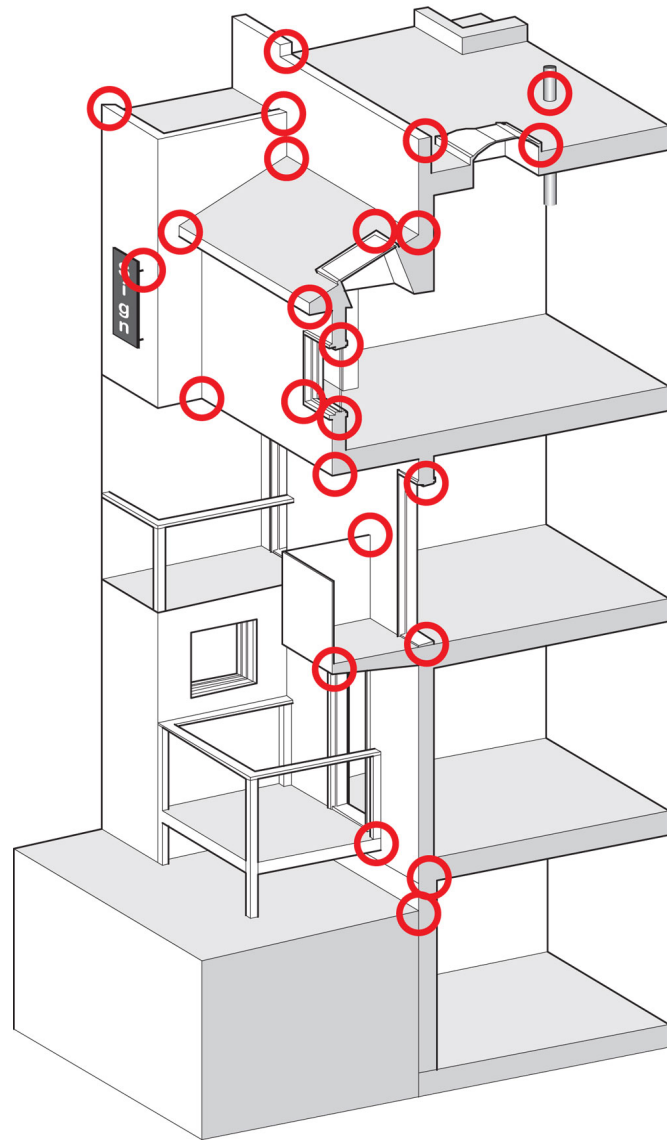




Commercial Enclosure: Simple Layers



- Structure
- Rain/Air/Vapor
- Insulation
- Finish













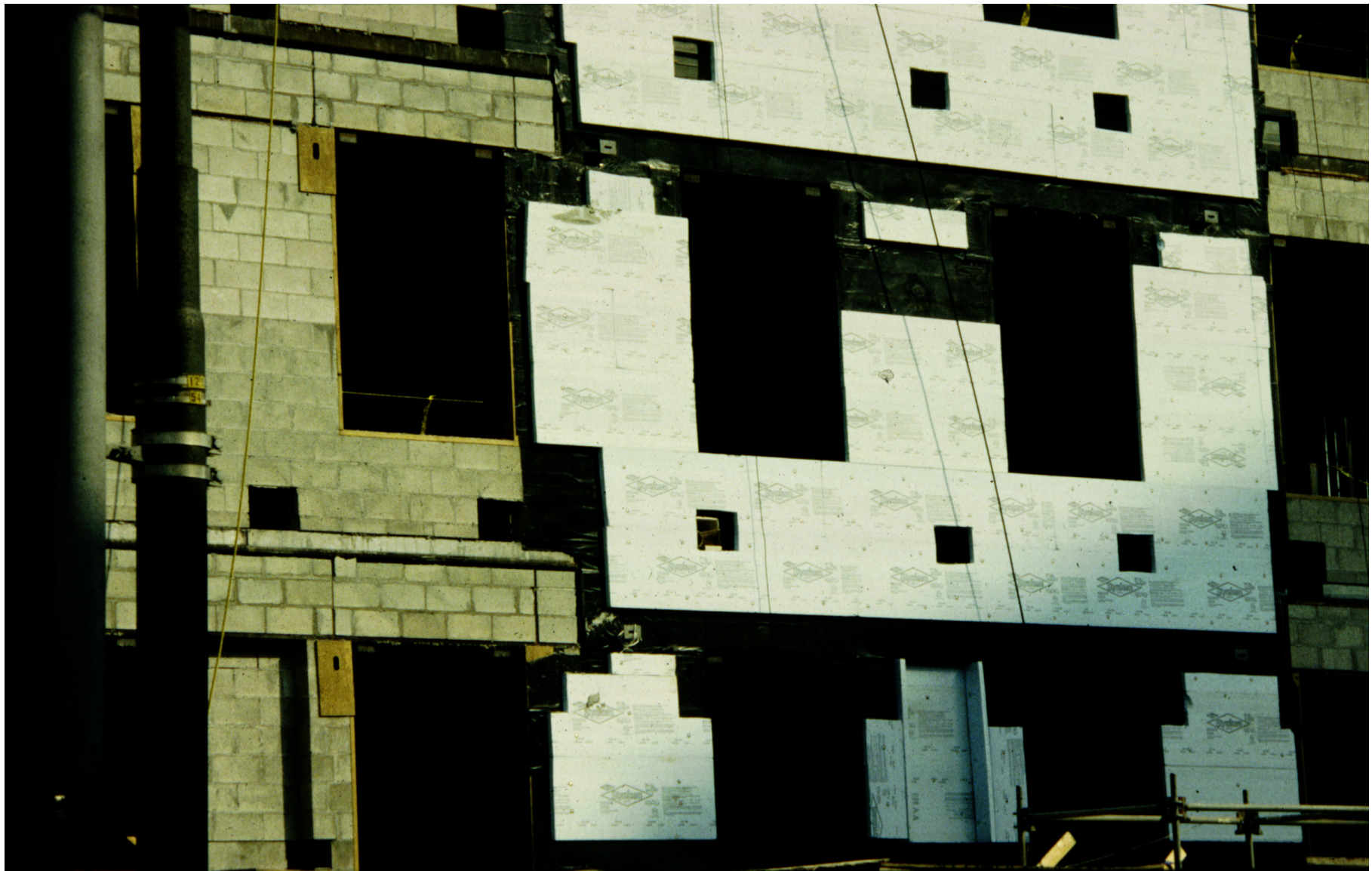










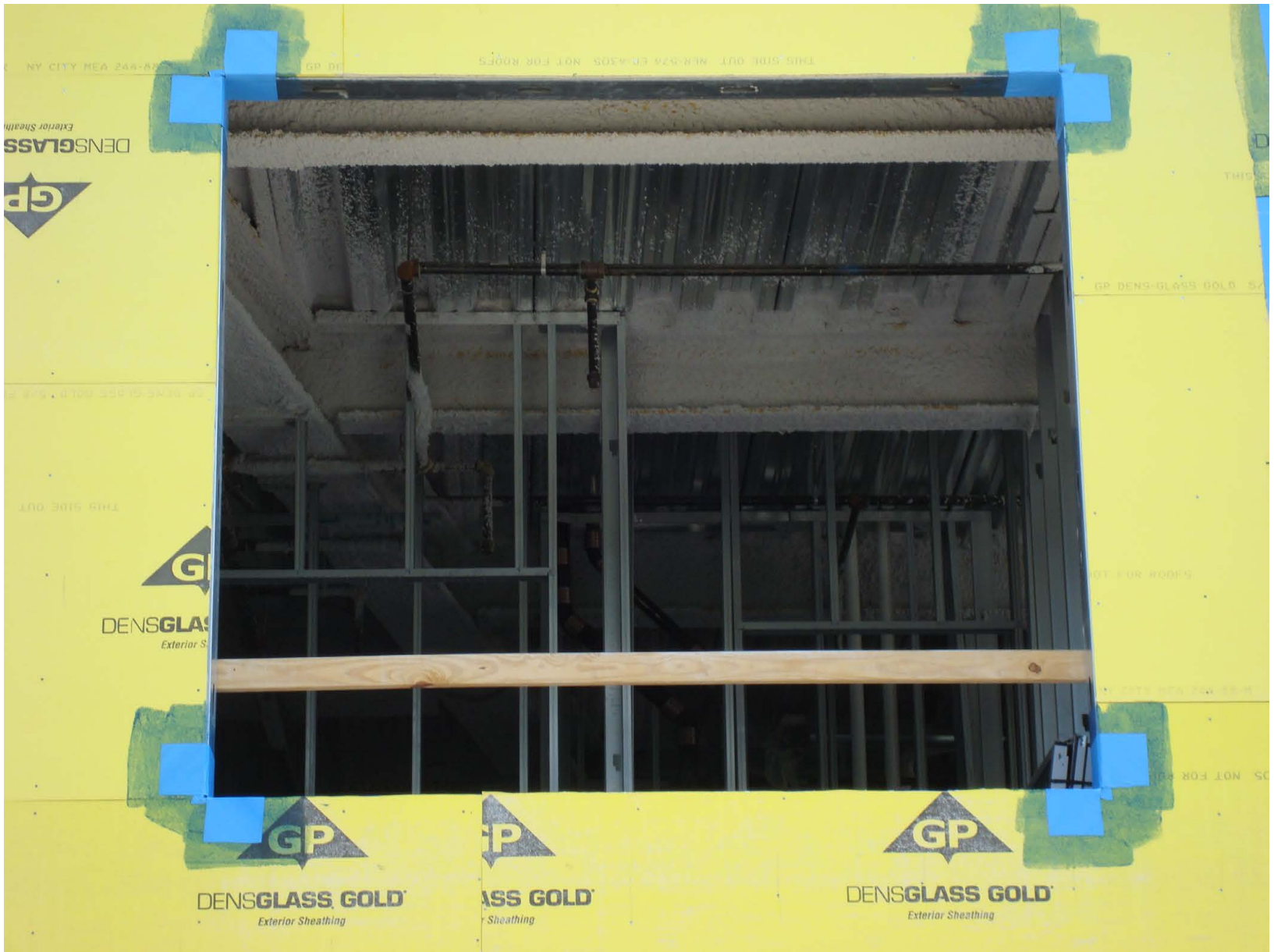




























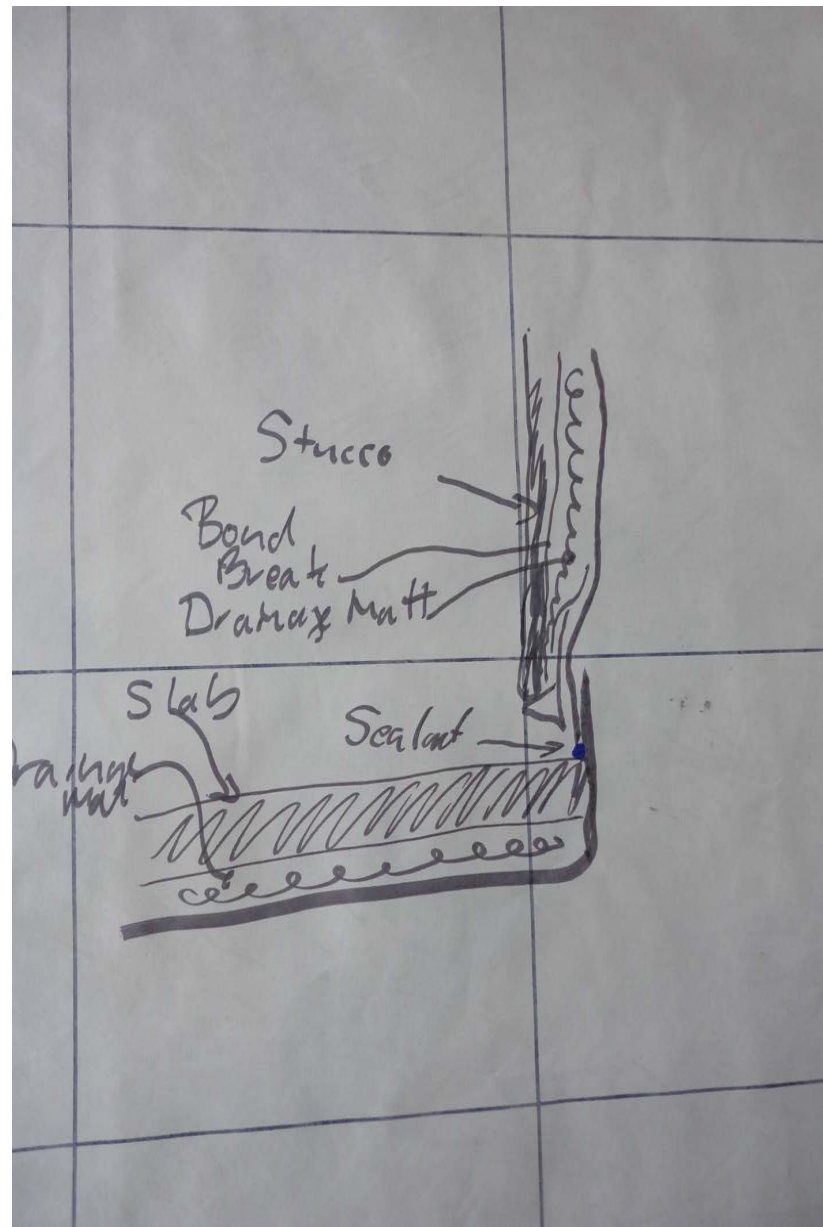


















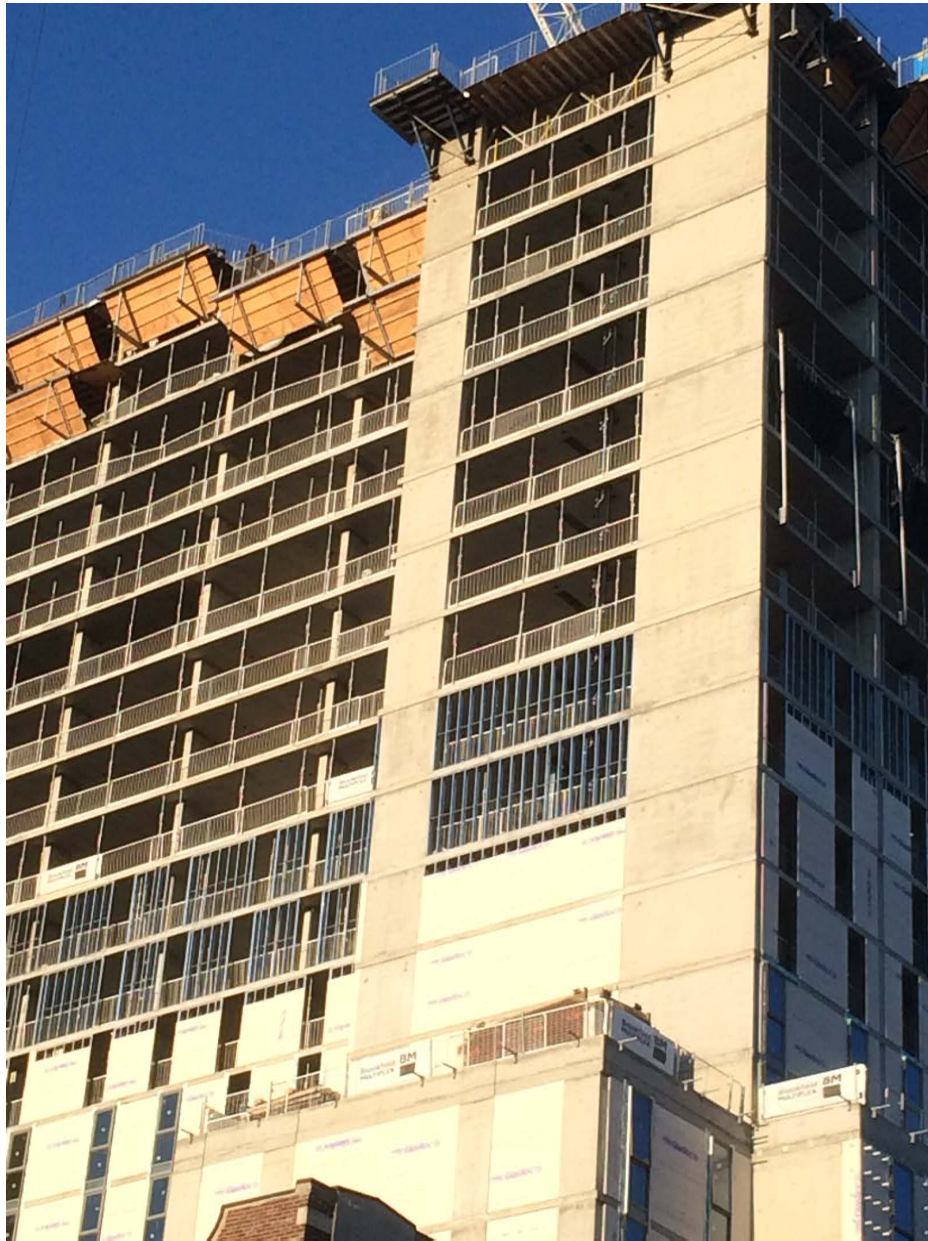












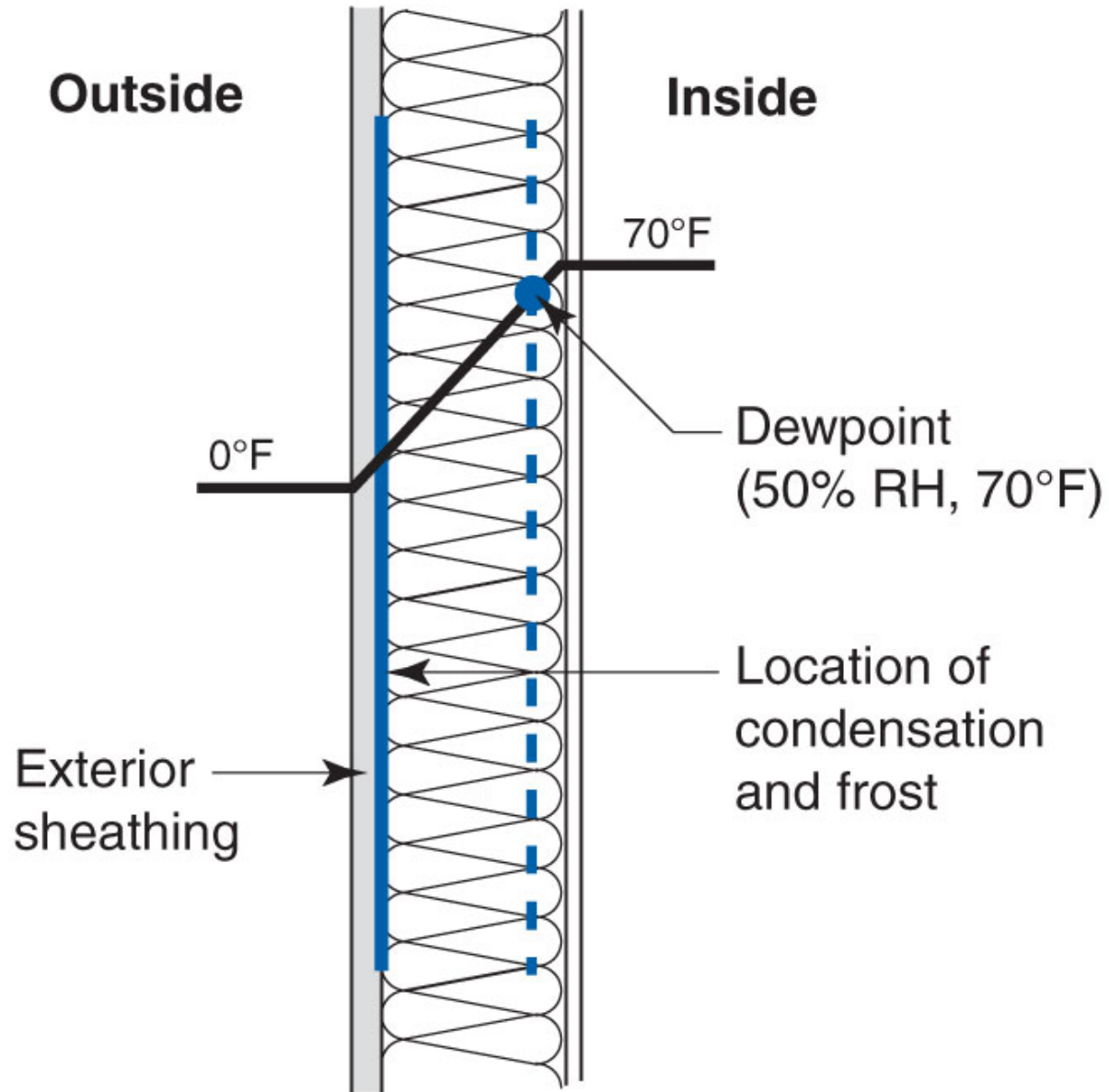




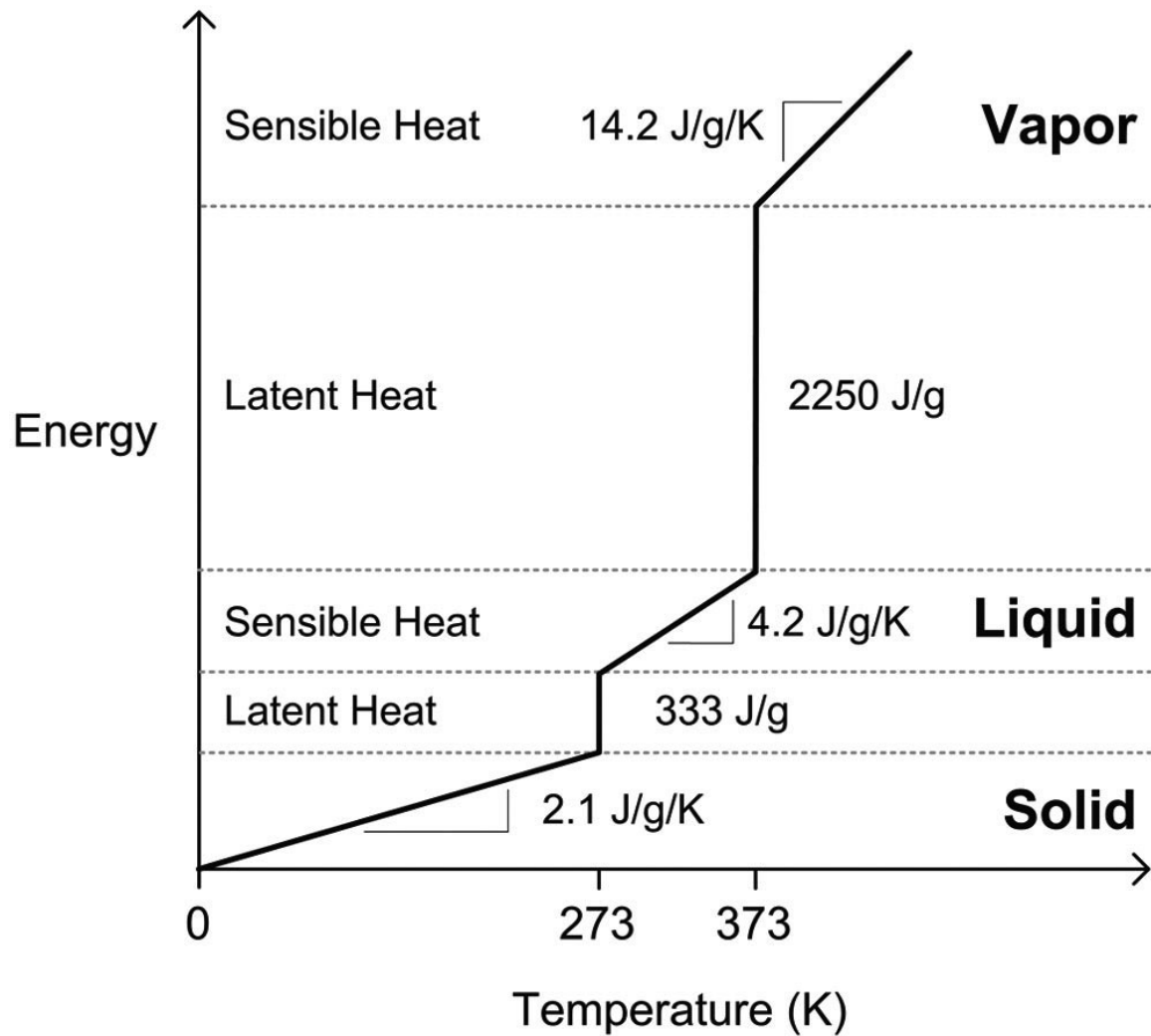










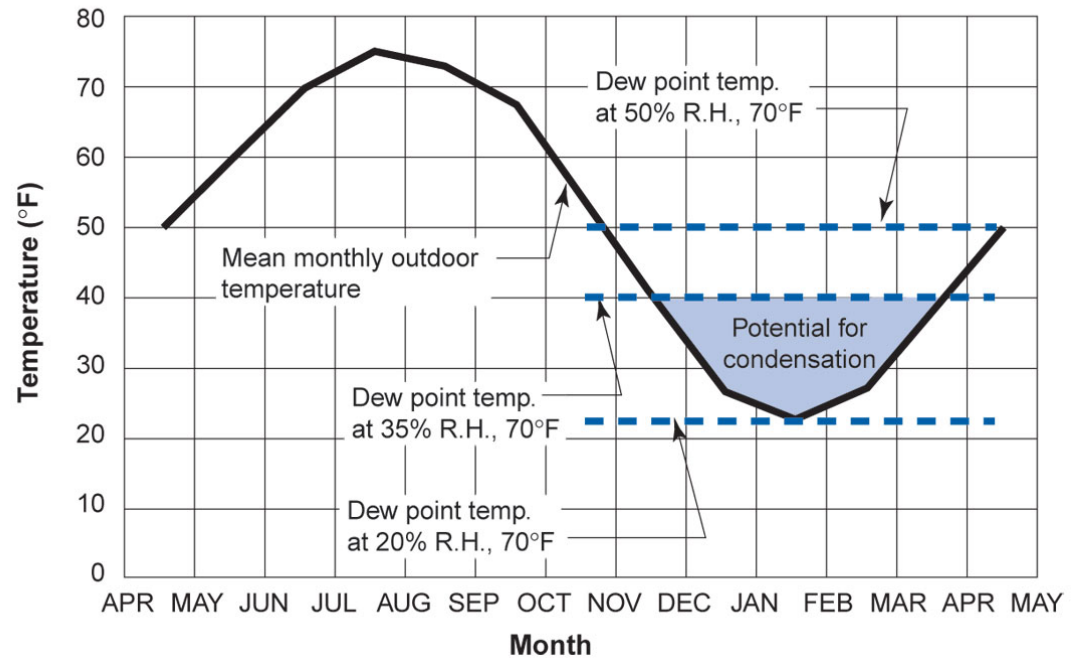
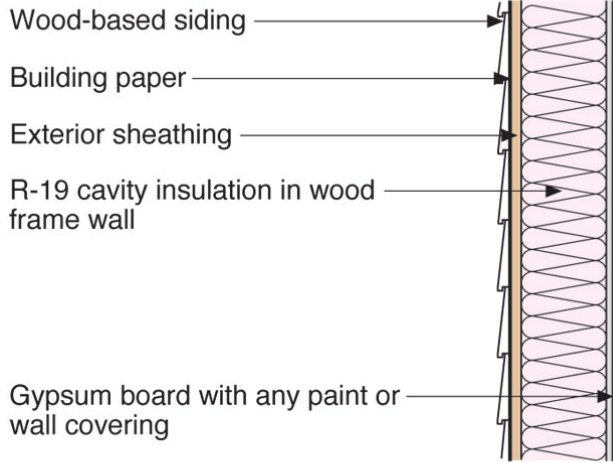


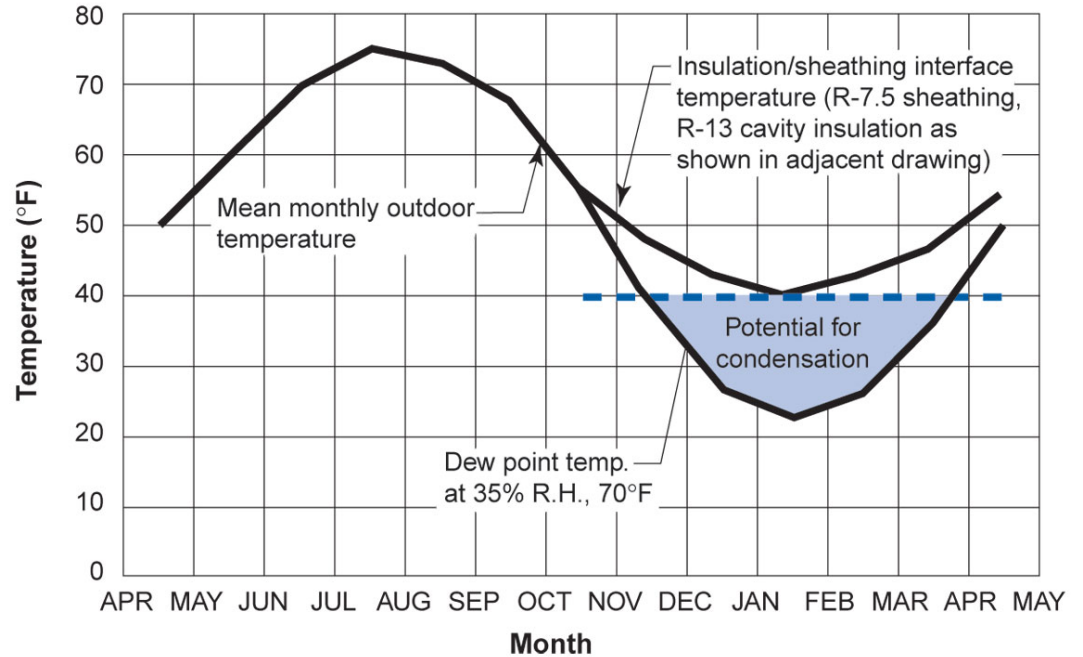
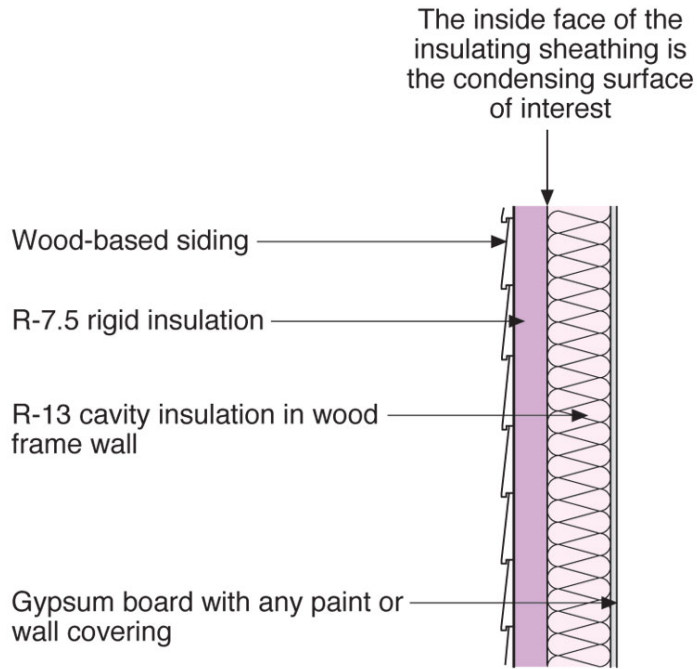
Simple linearized energy-temperature relation for water

From Straube & Burnett, 2005



The inside face of the exterior sheathing is the condensing surface of interest





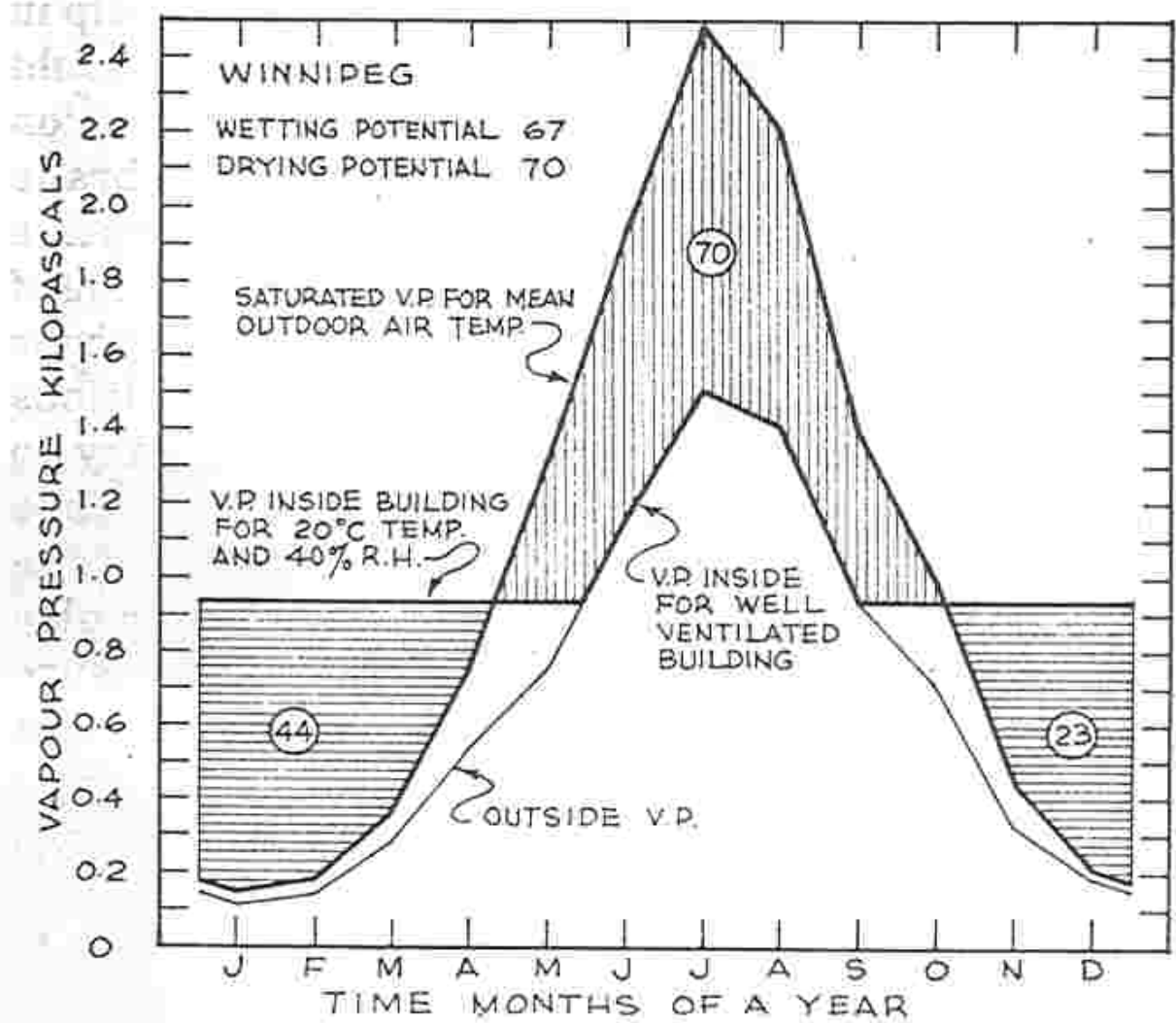
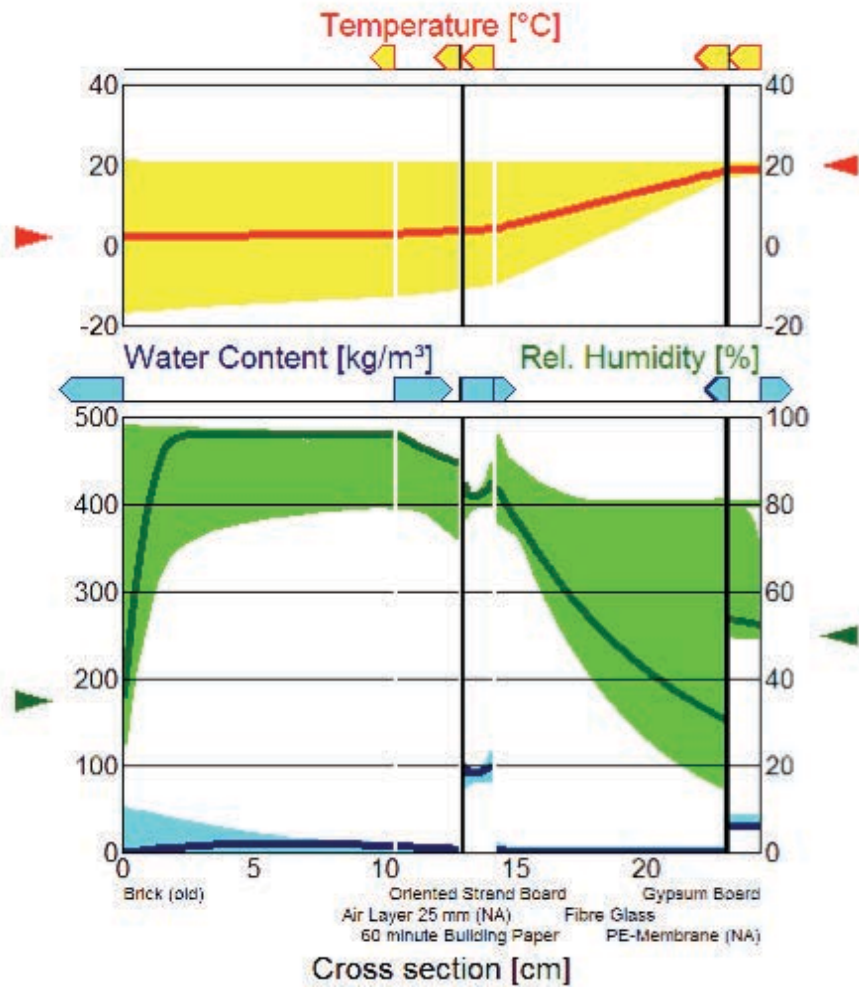


Figure 8-7. Outside vapour pressure, saturated vapour pressure and inside vapour pressure for Winnipeg.



WUFI® 3.3 Pro. IBP
Run

16 Feb
2001

100%

0% 100%

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