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Building Science

Adventures In Building Science

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Life Is Tough Enough As It Is...

Life Is Tough Enough As It Is...
It's Harder When You Are Stupid...

Life Is Tough Enough As It Is...
It's Harder When You Are Stupid...
Don't Do Stupid Things...

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

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

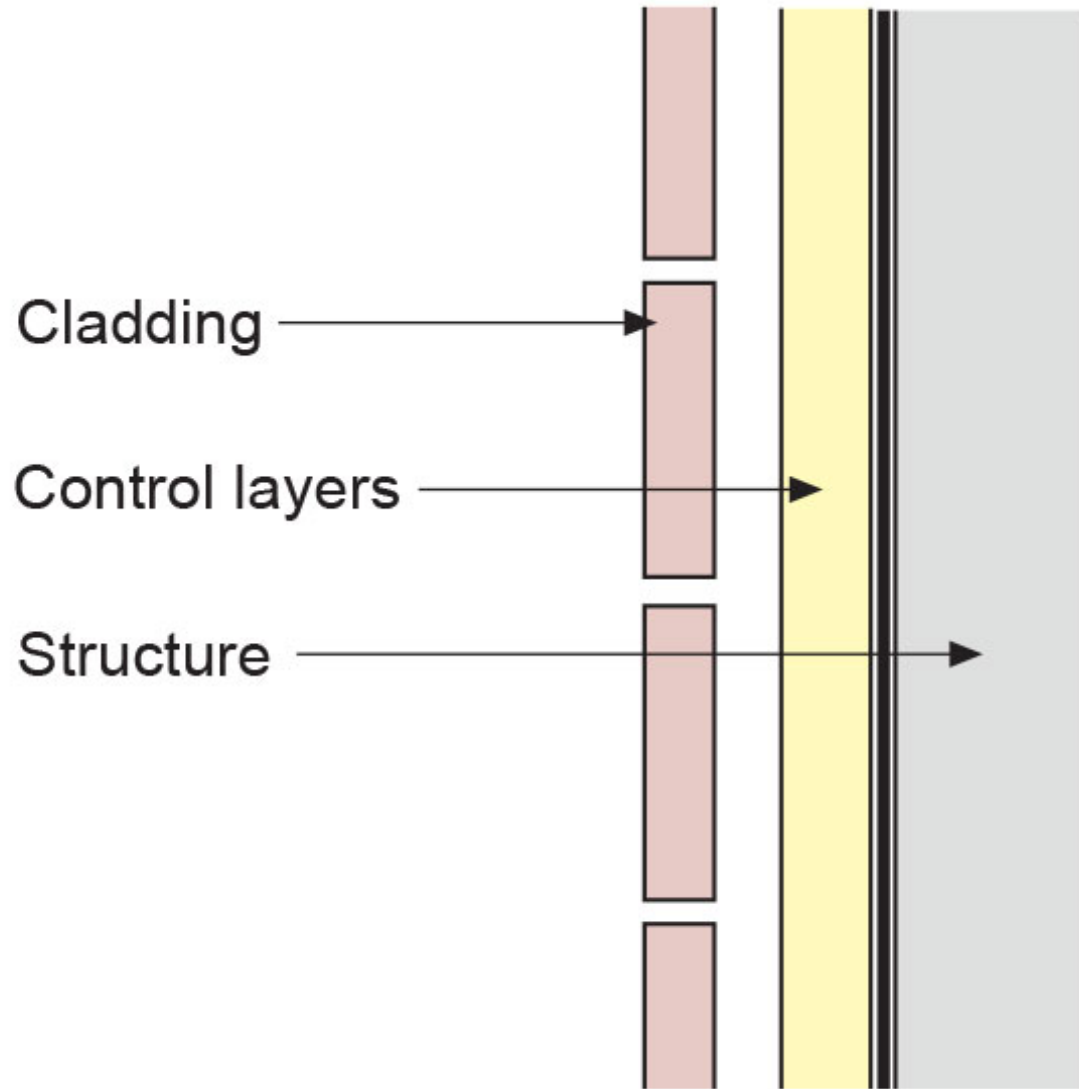
Extreme		Over 60"
High		40" - 60"
Moderate		20" - 40"
Low		Under 20"

Water Control Layer

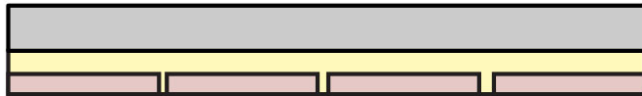
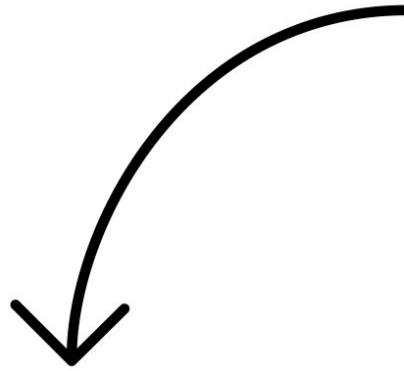
Air Control Layer

Vapor Control Layer

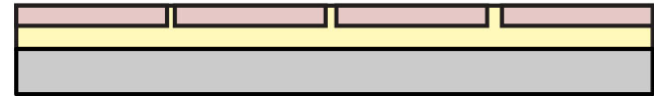
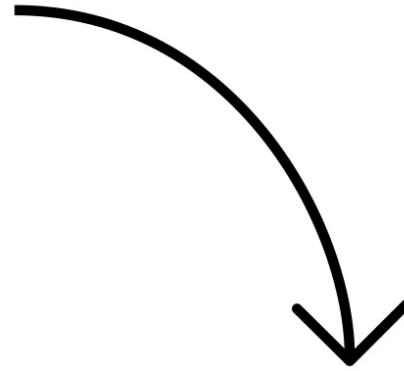
Thermal Control Layer



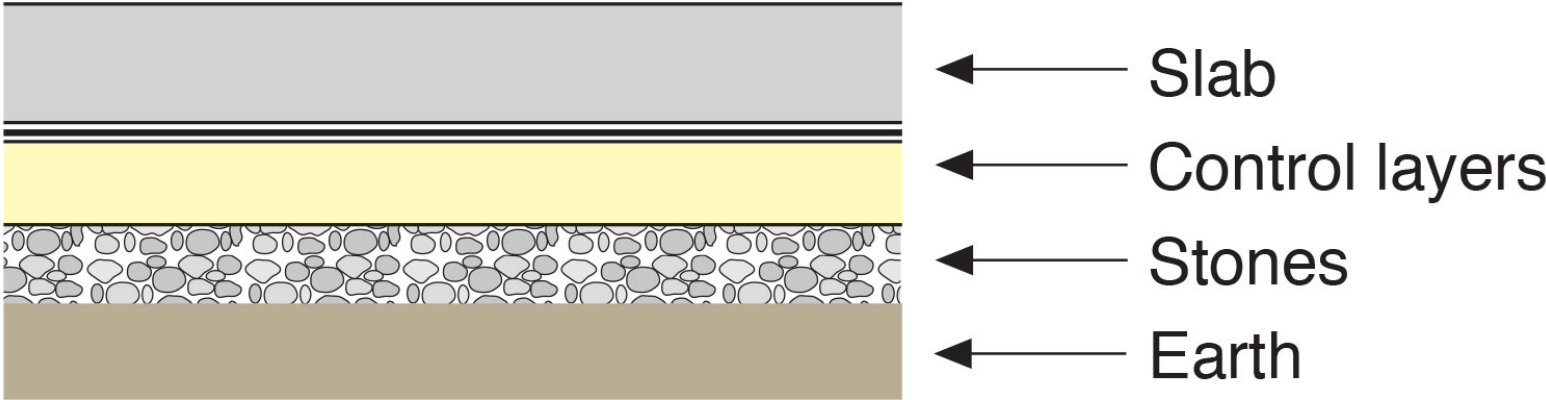
Wall



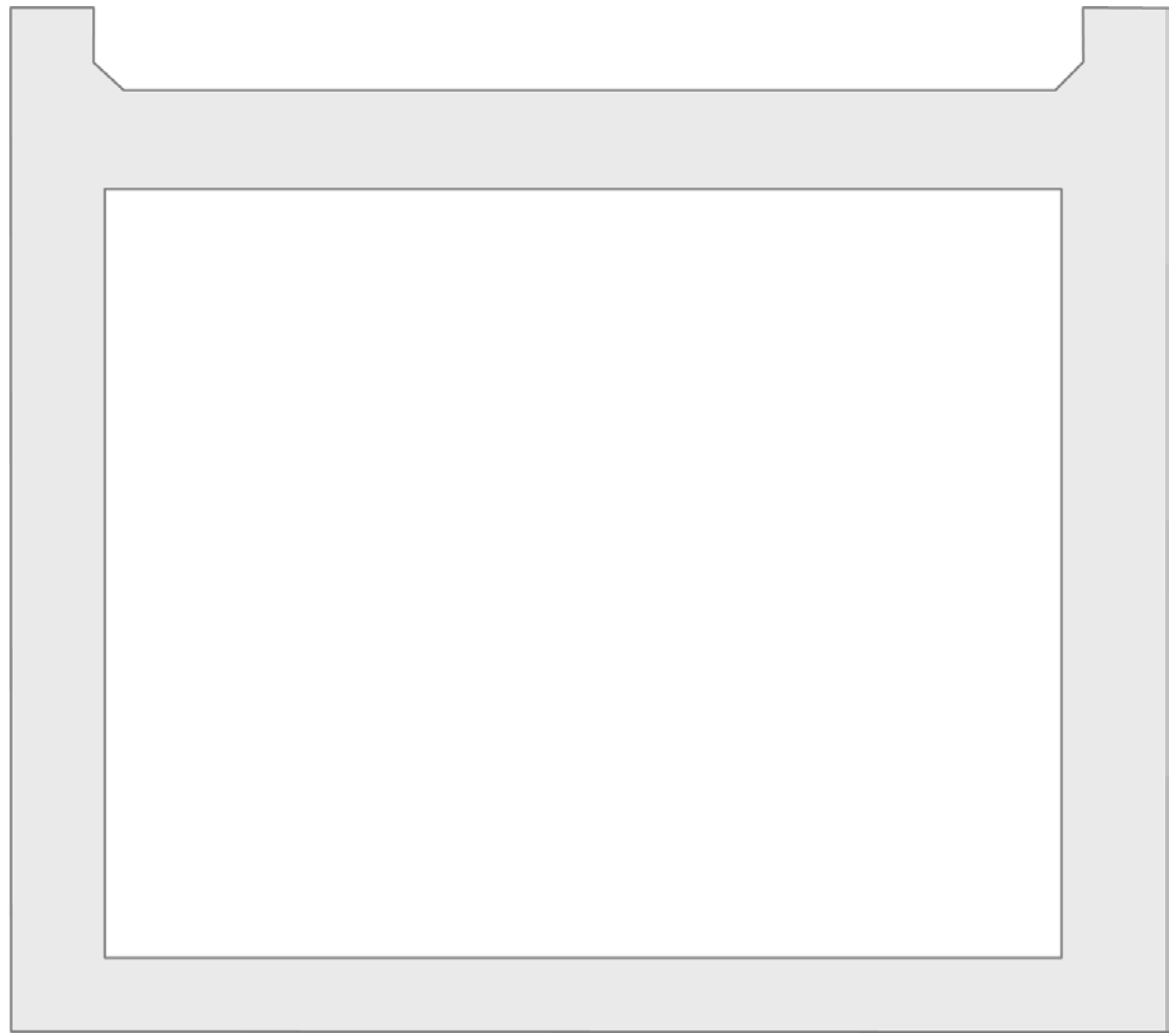
Slab

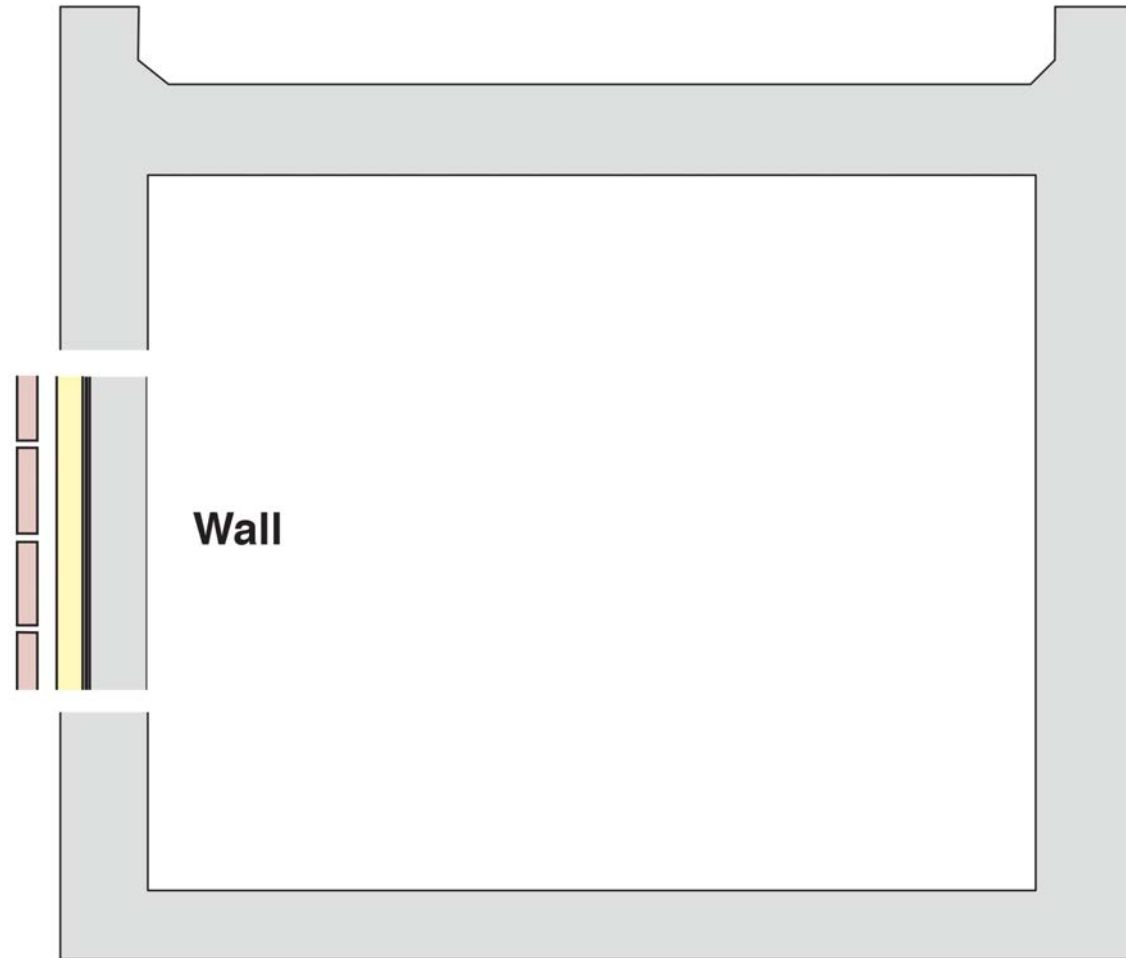


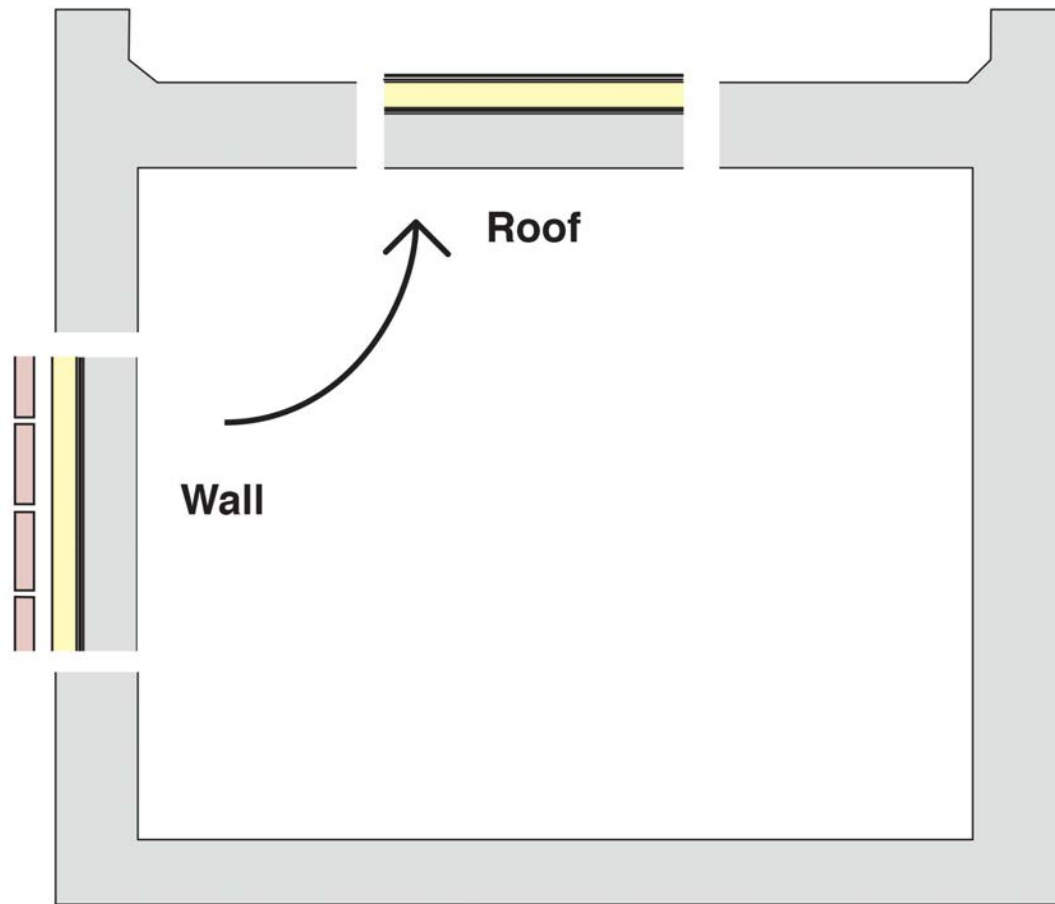
Roof

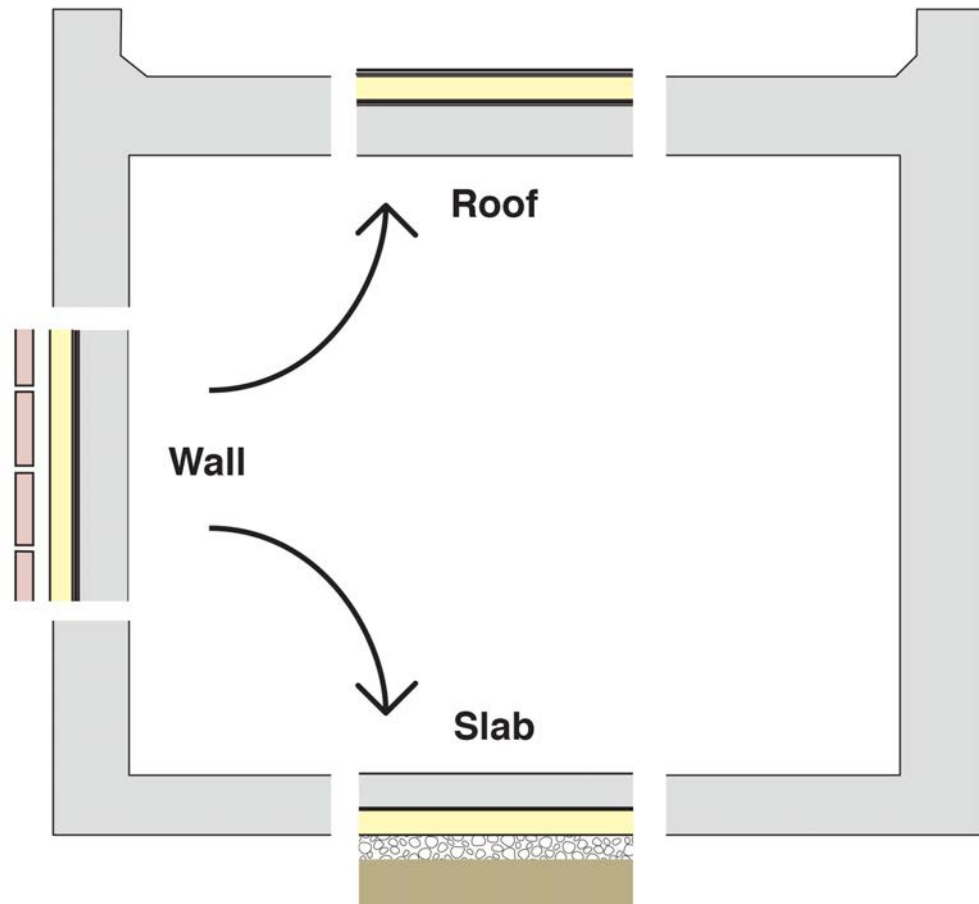


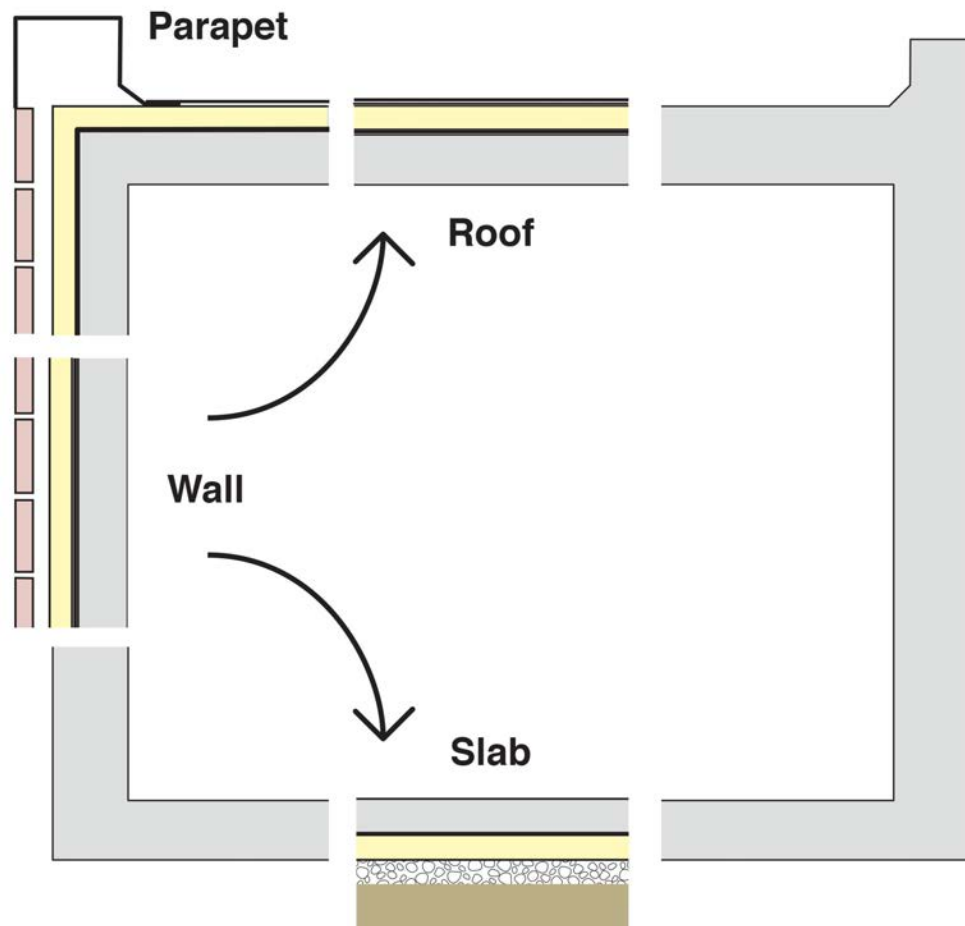


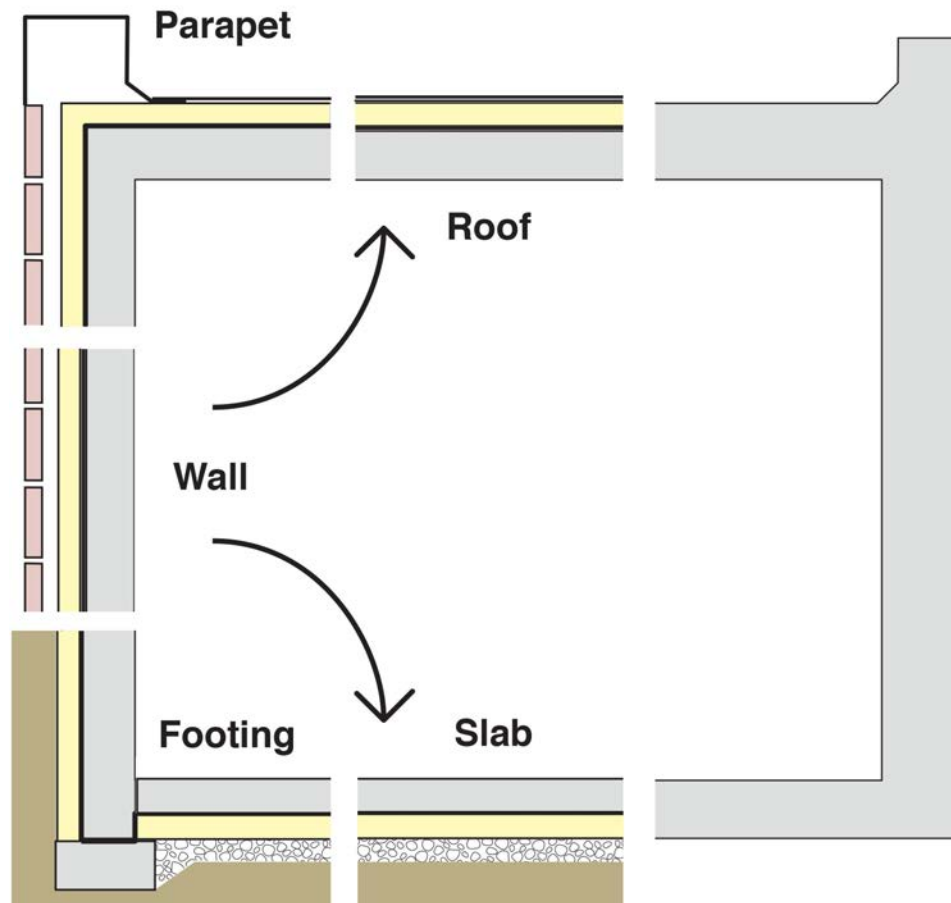


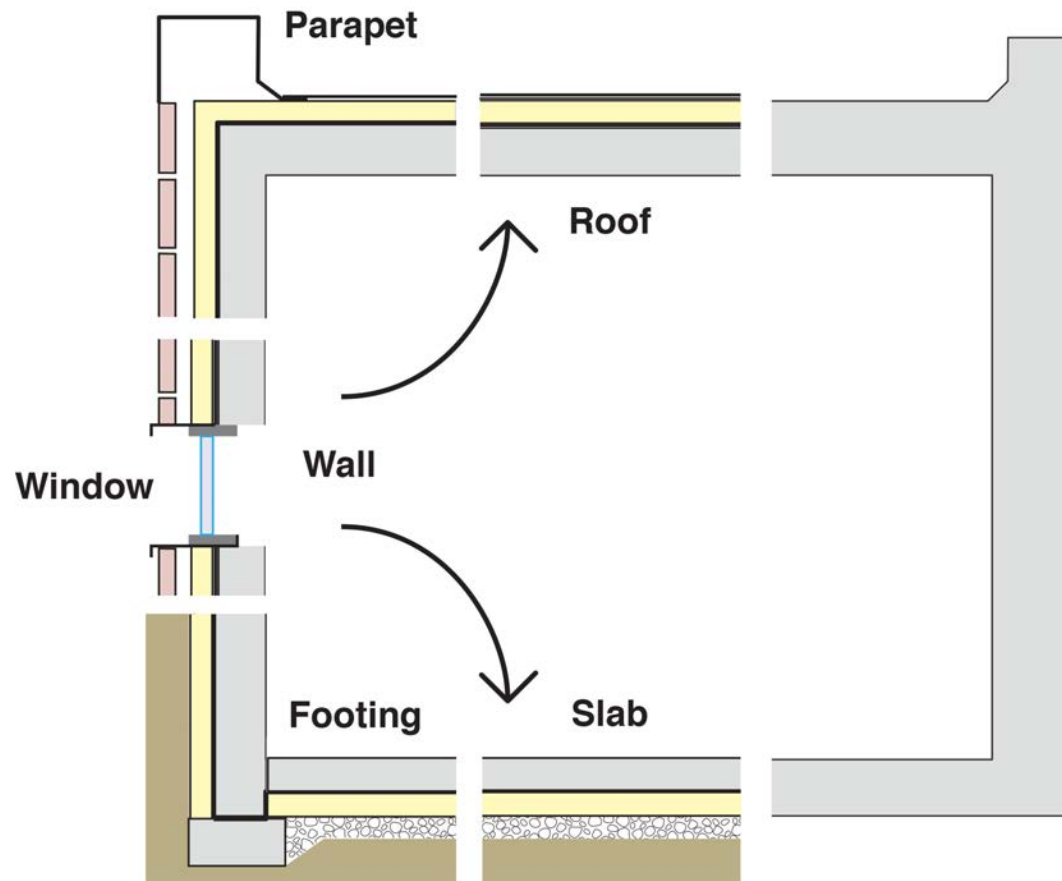


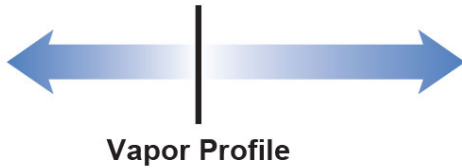
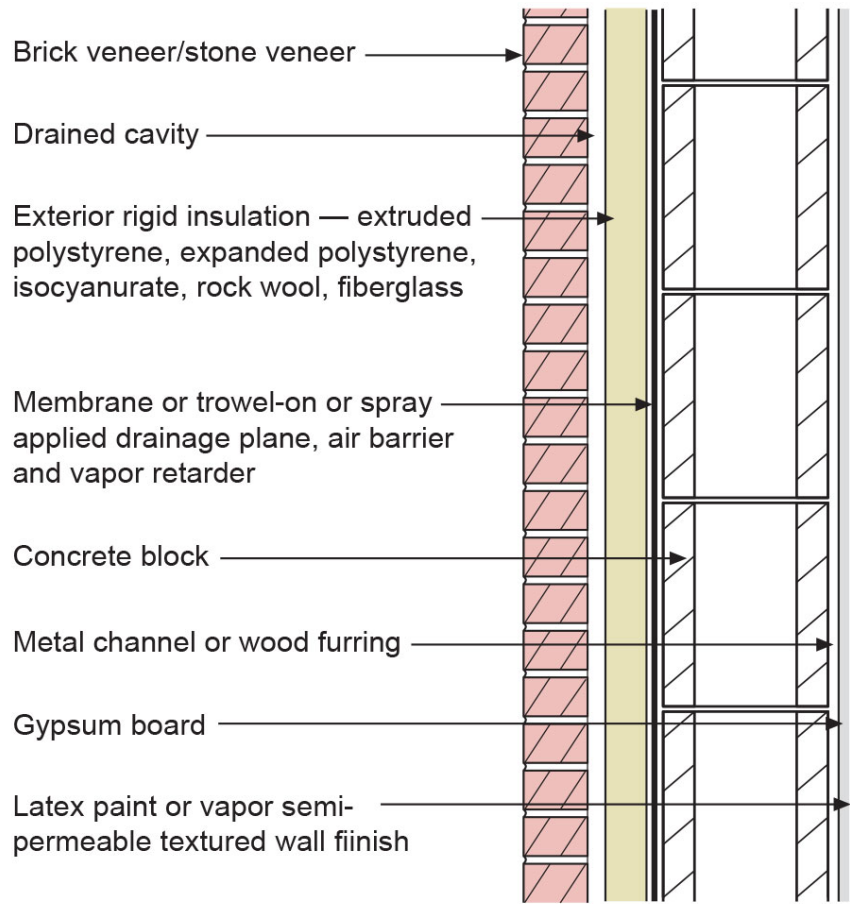


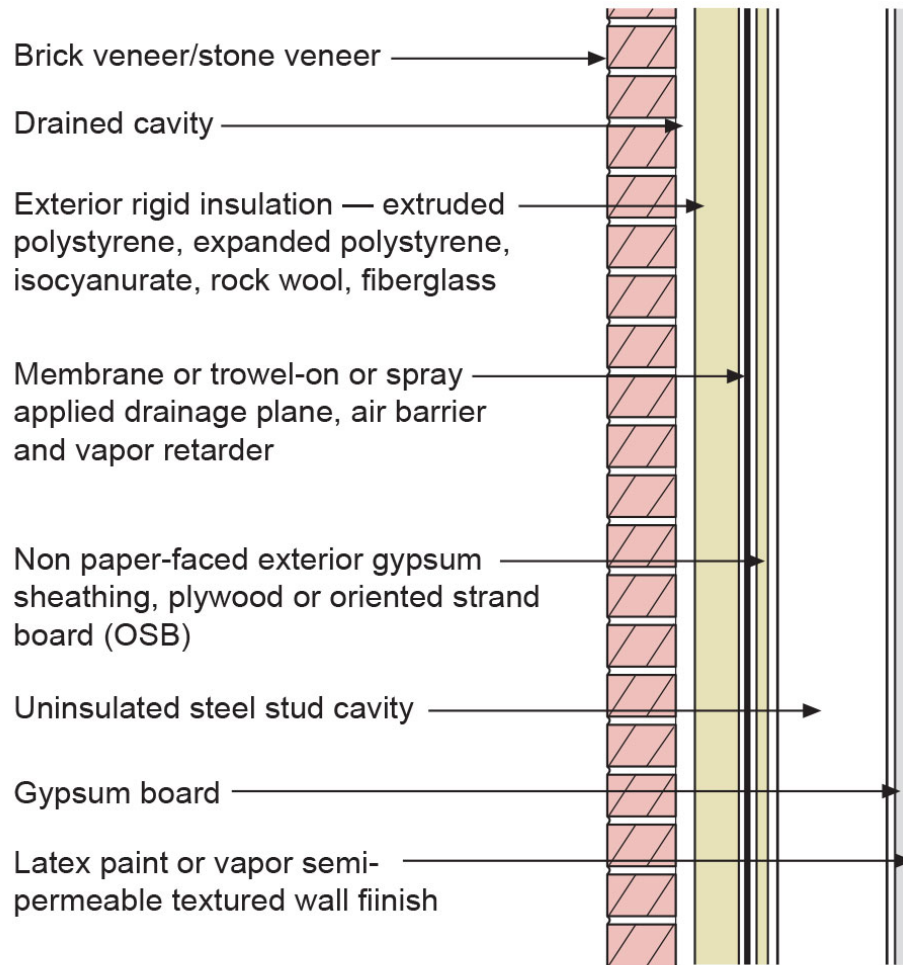


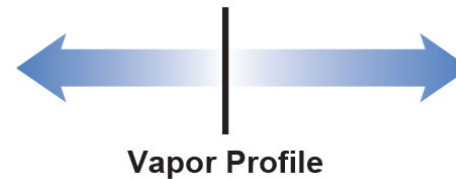
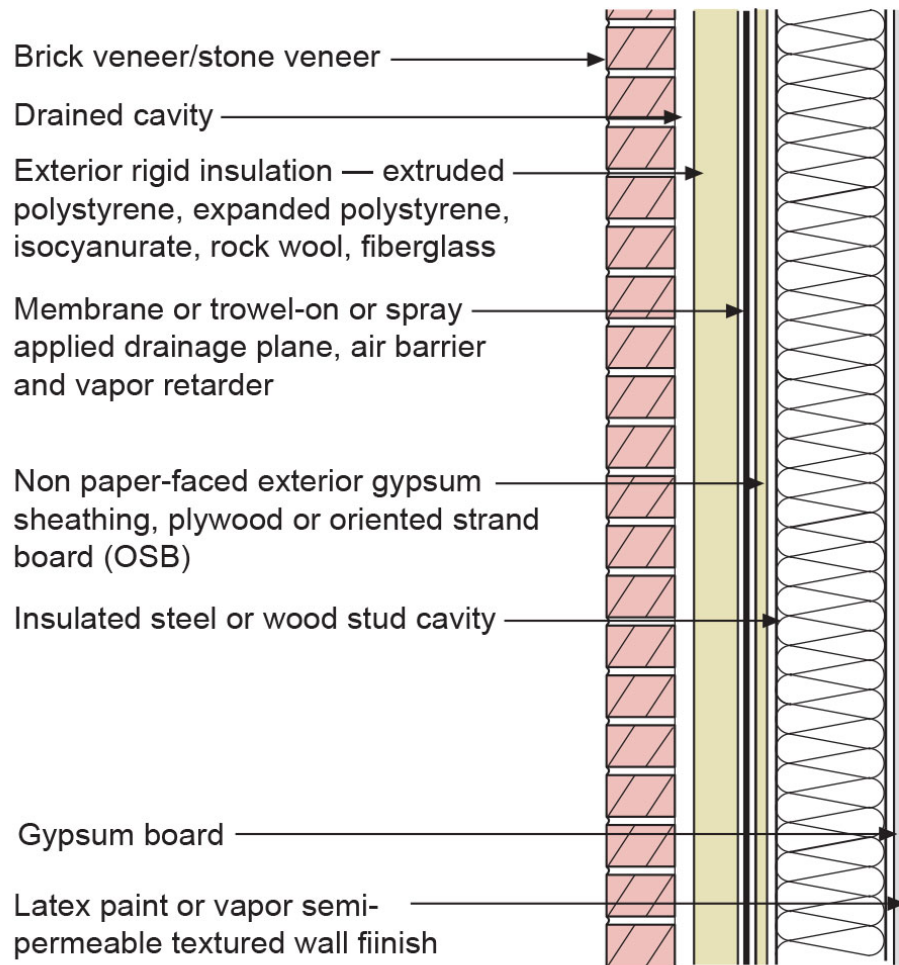












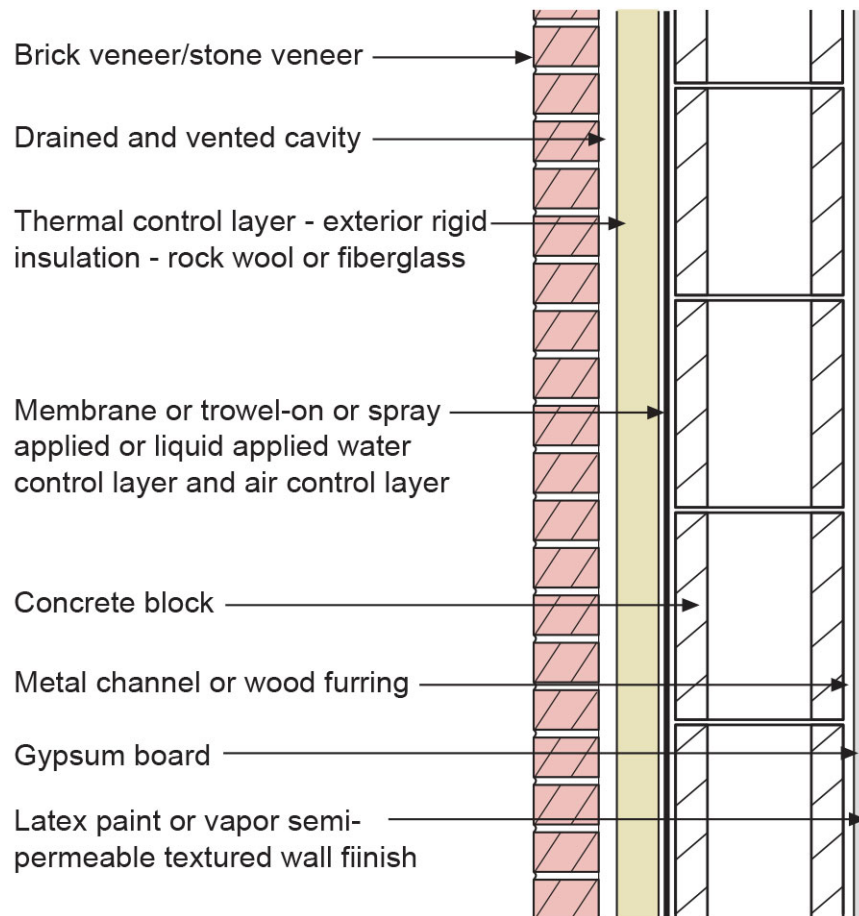


Figure 2a



Vapor Profile

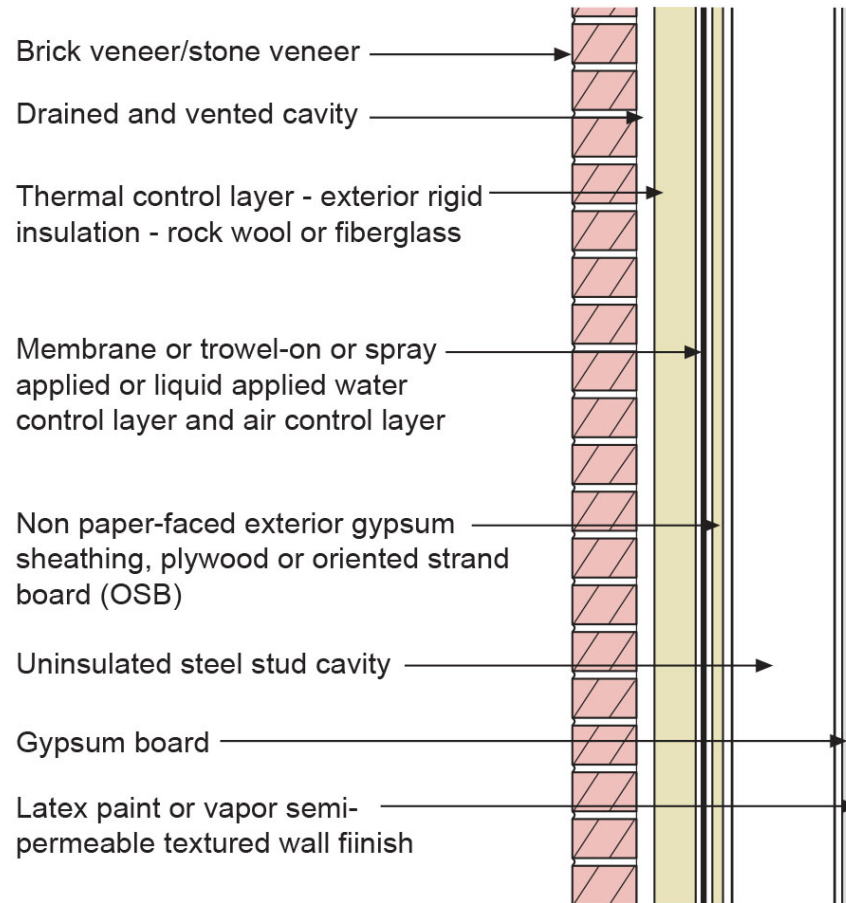


Figure 2b



Vapor Profile

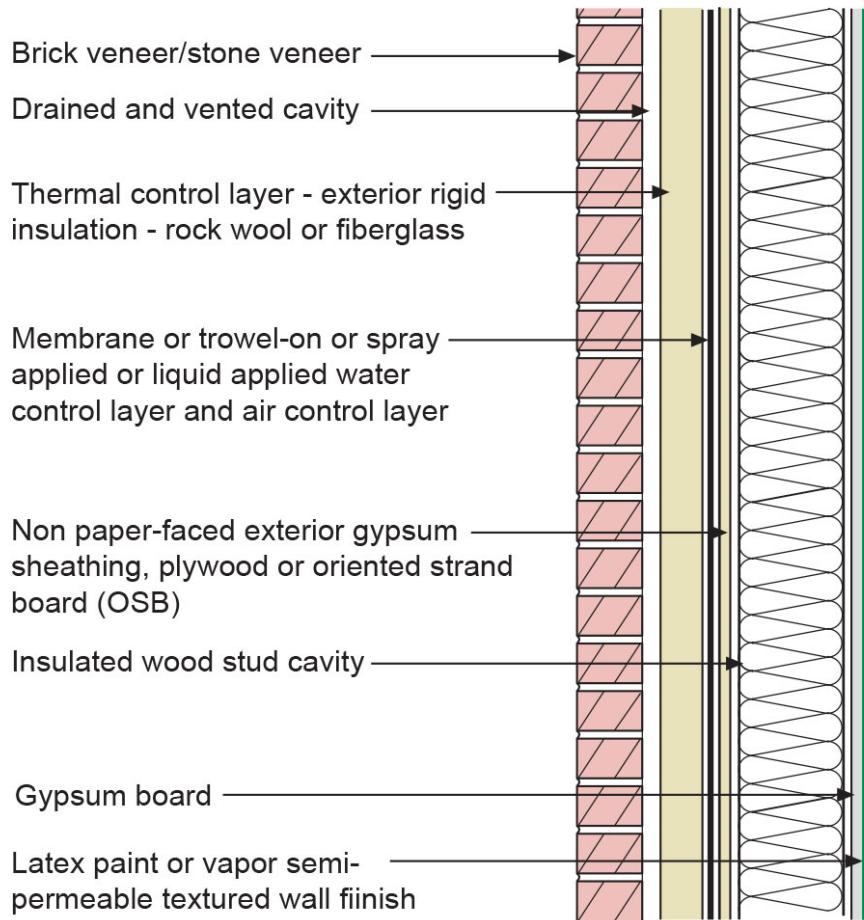
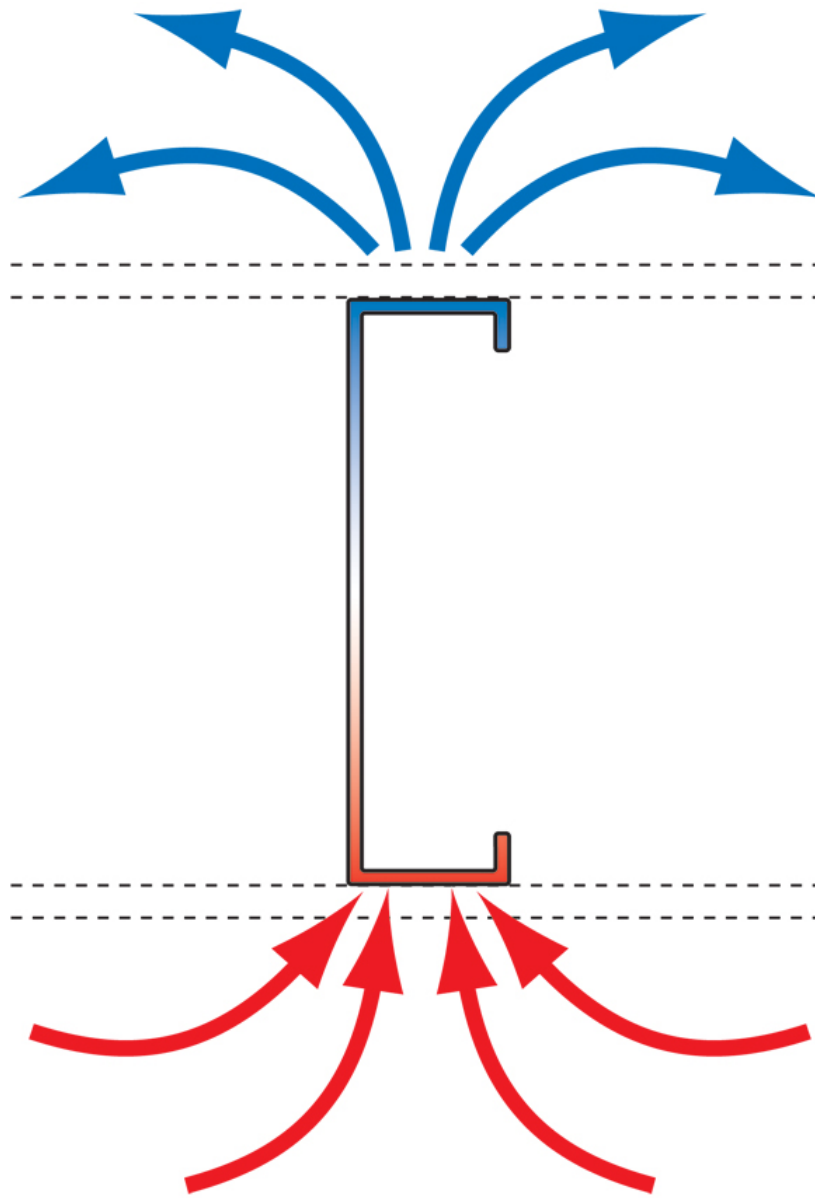


Figure 2c

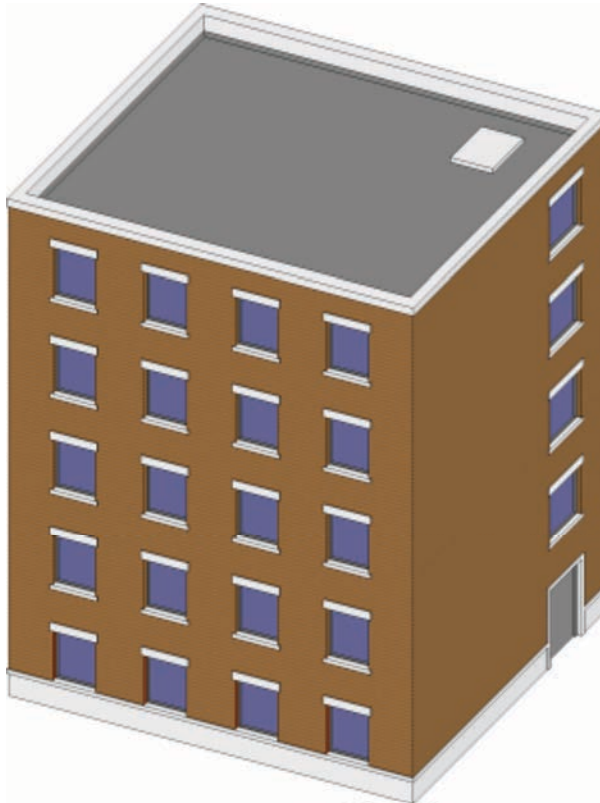


Vapor Profile

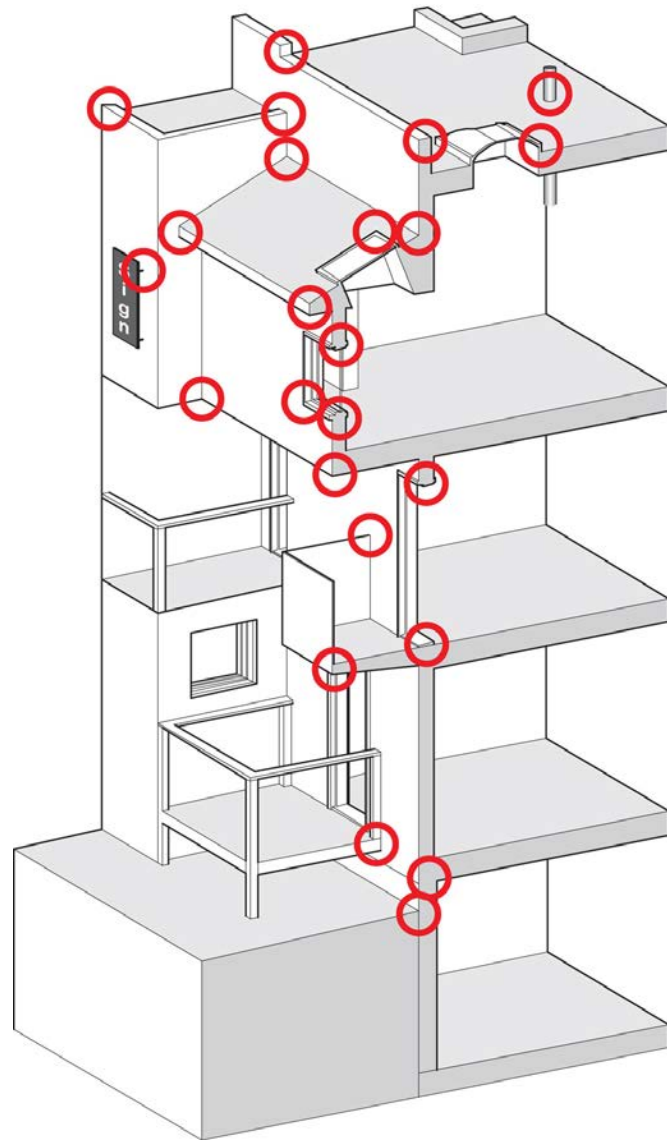




Commercial Enclosure: Simple Layers



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





















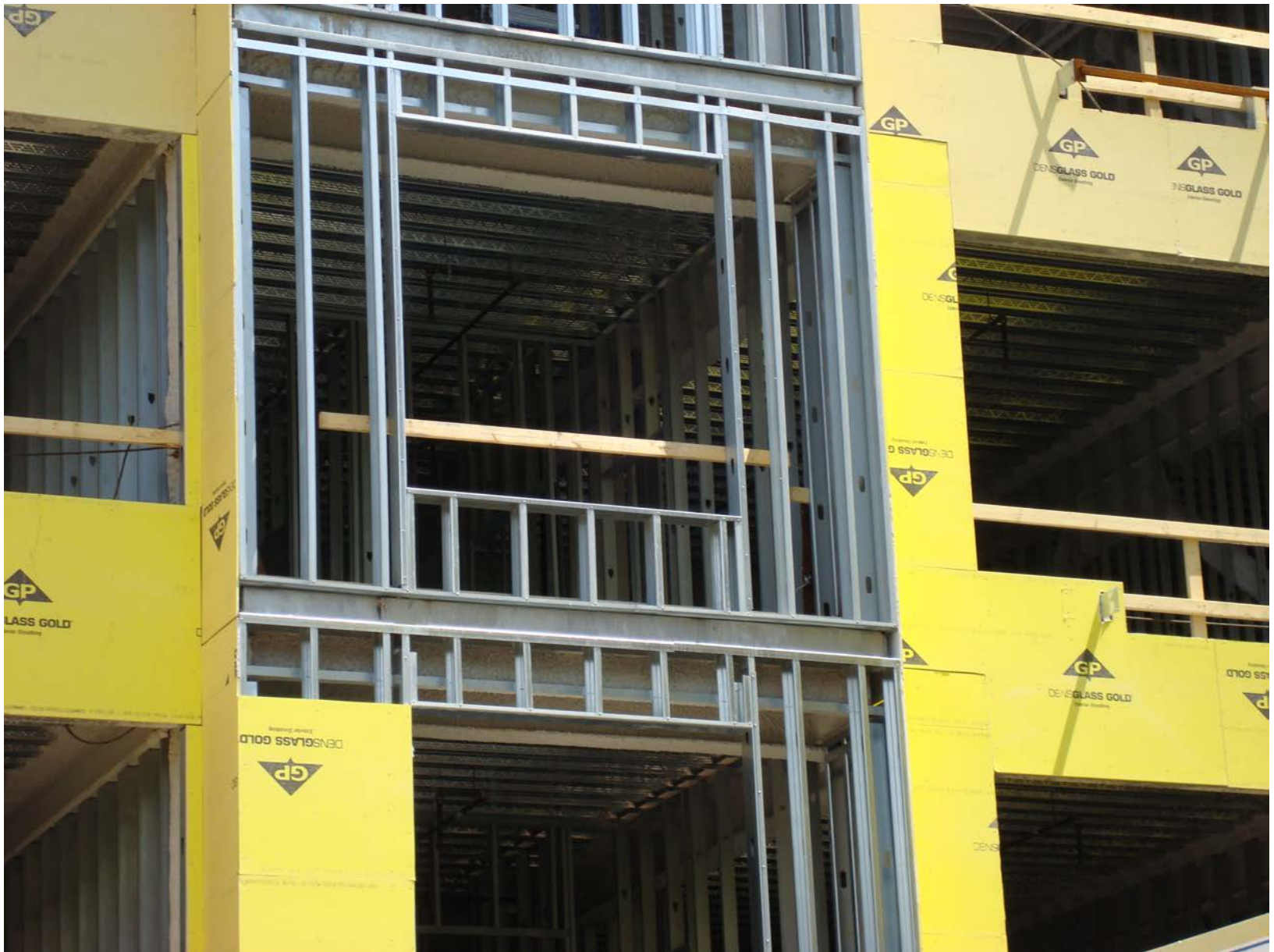
























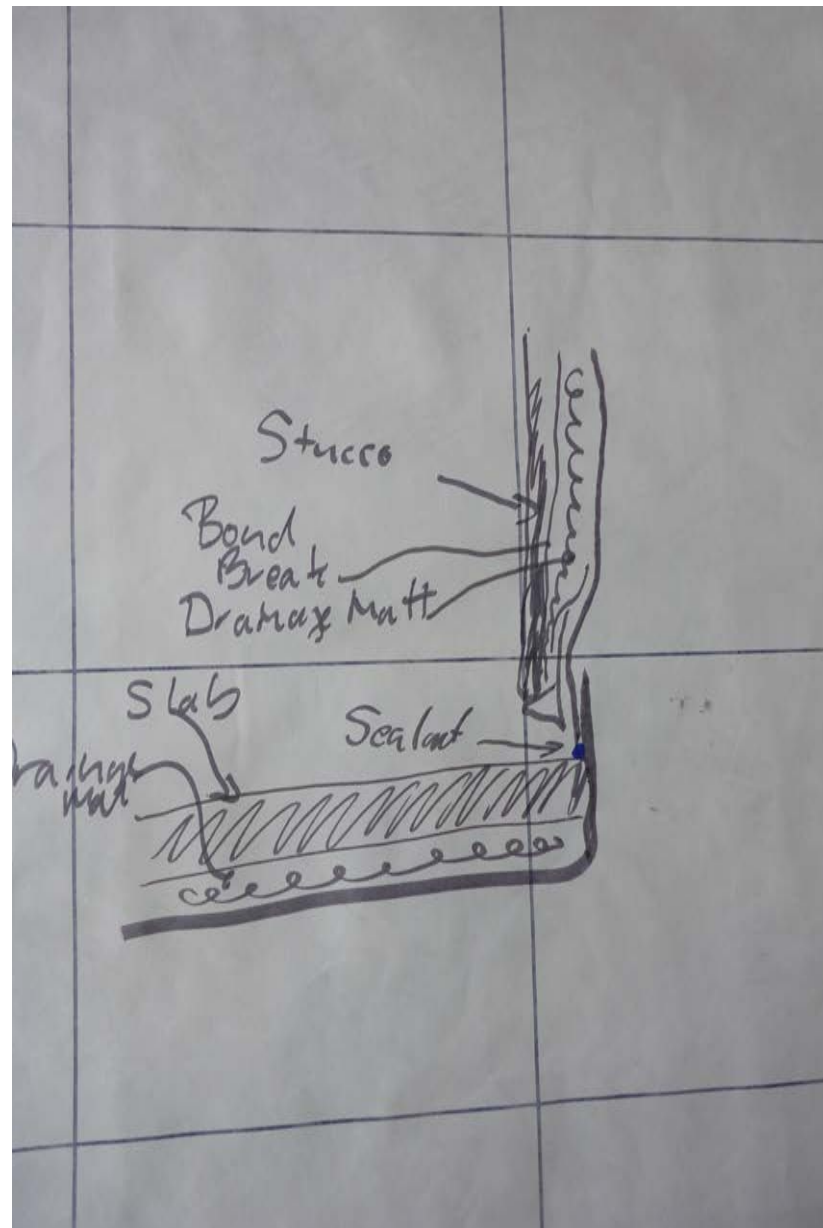












































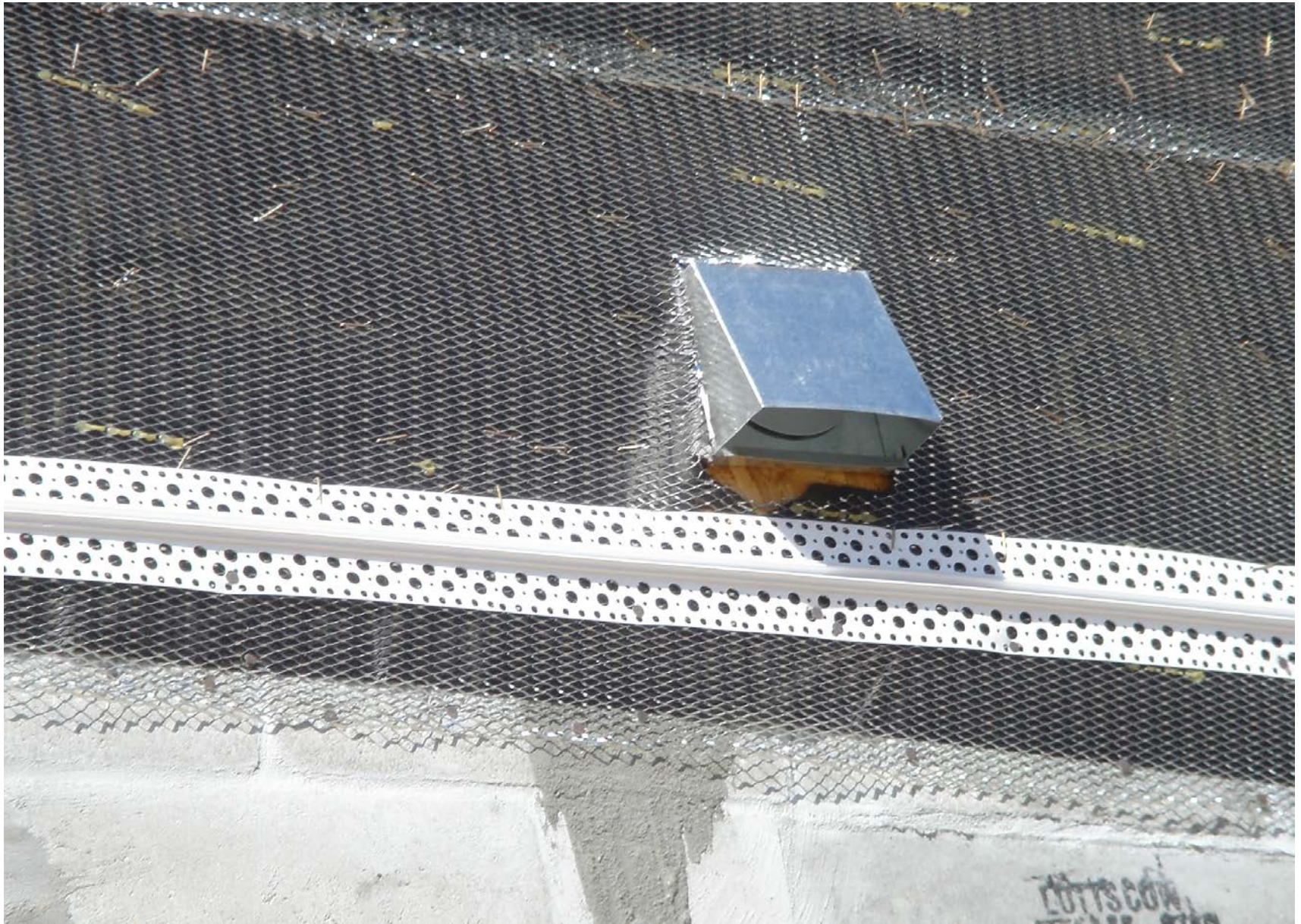


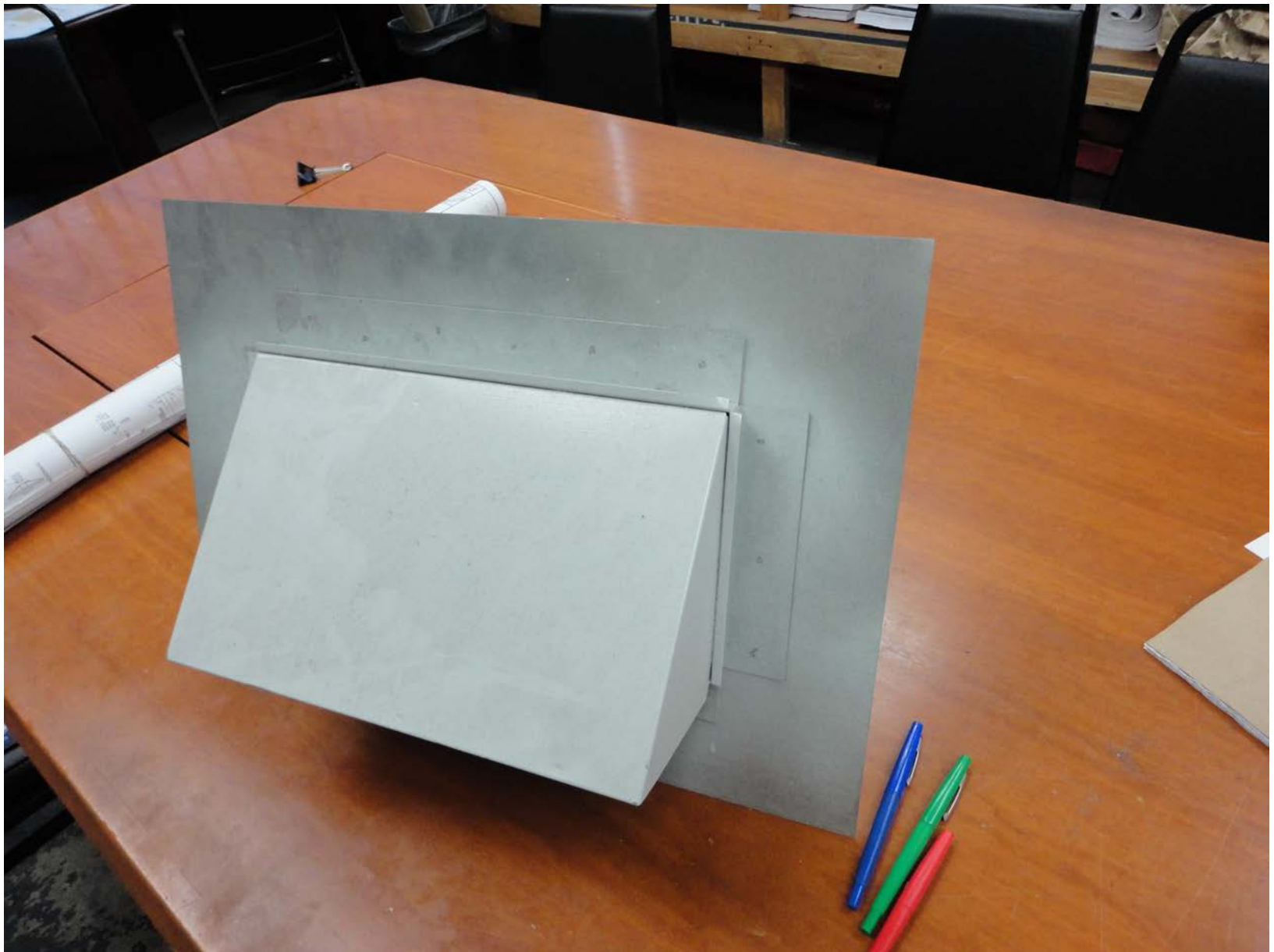




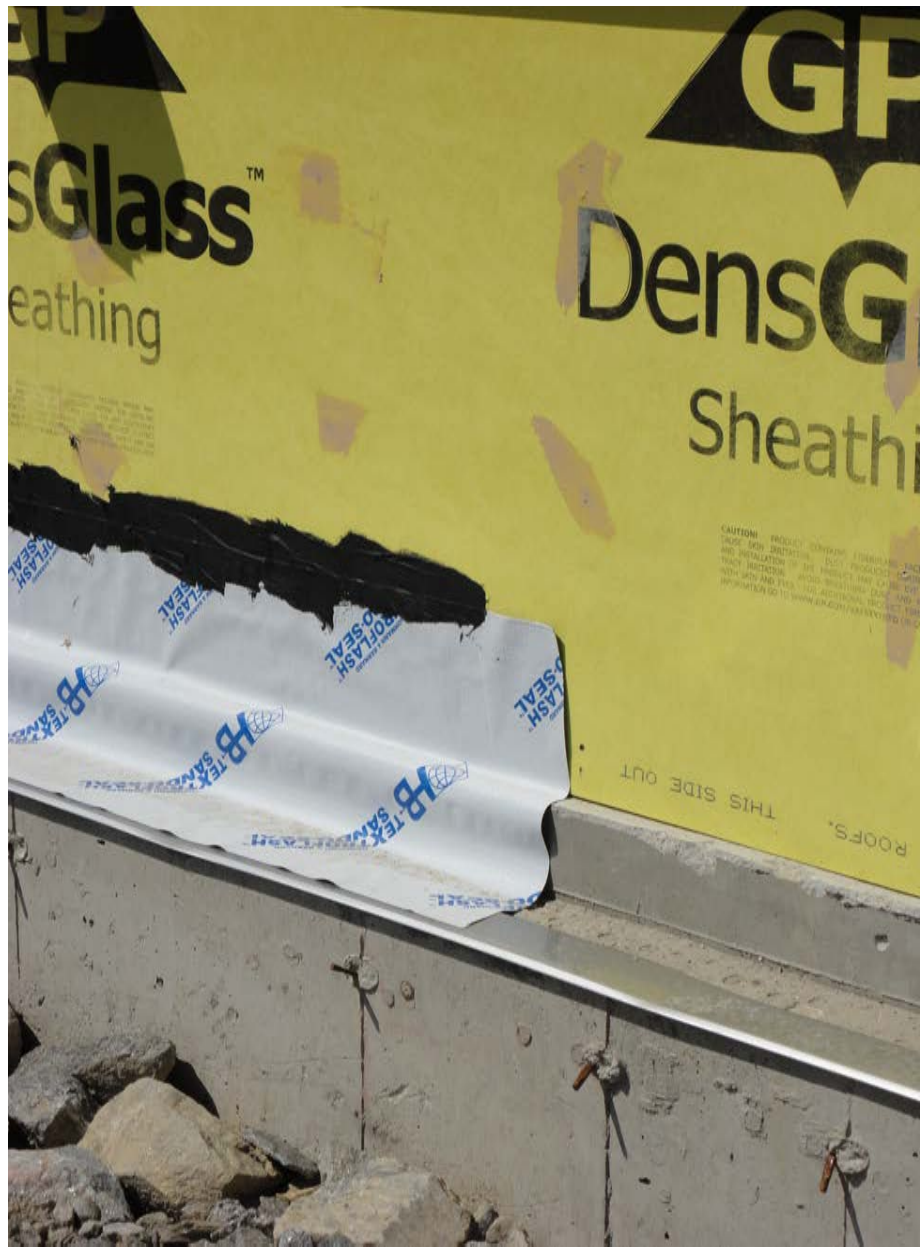




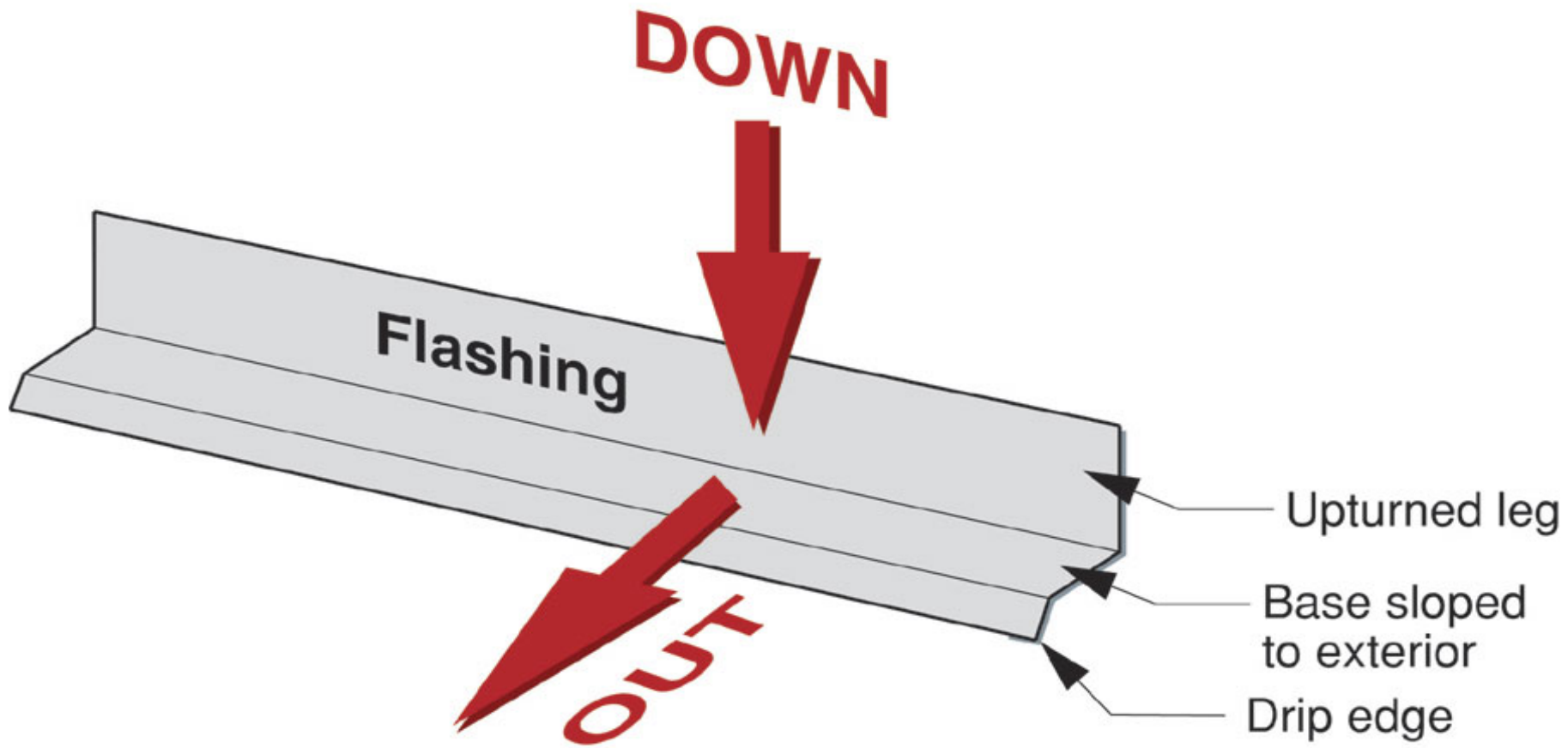


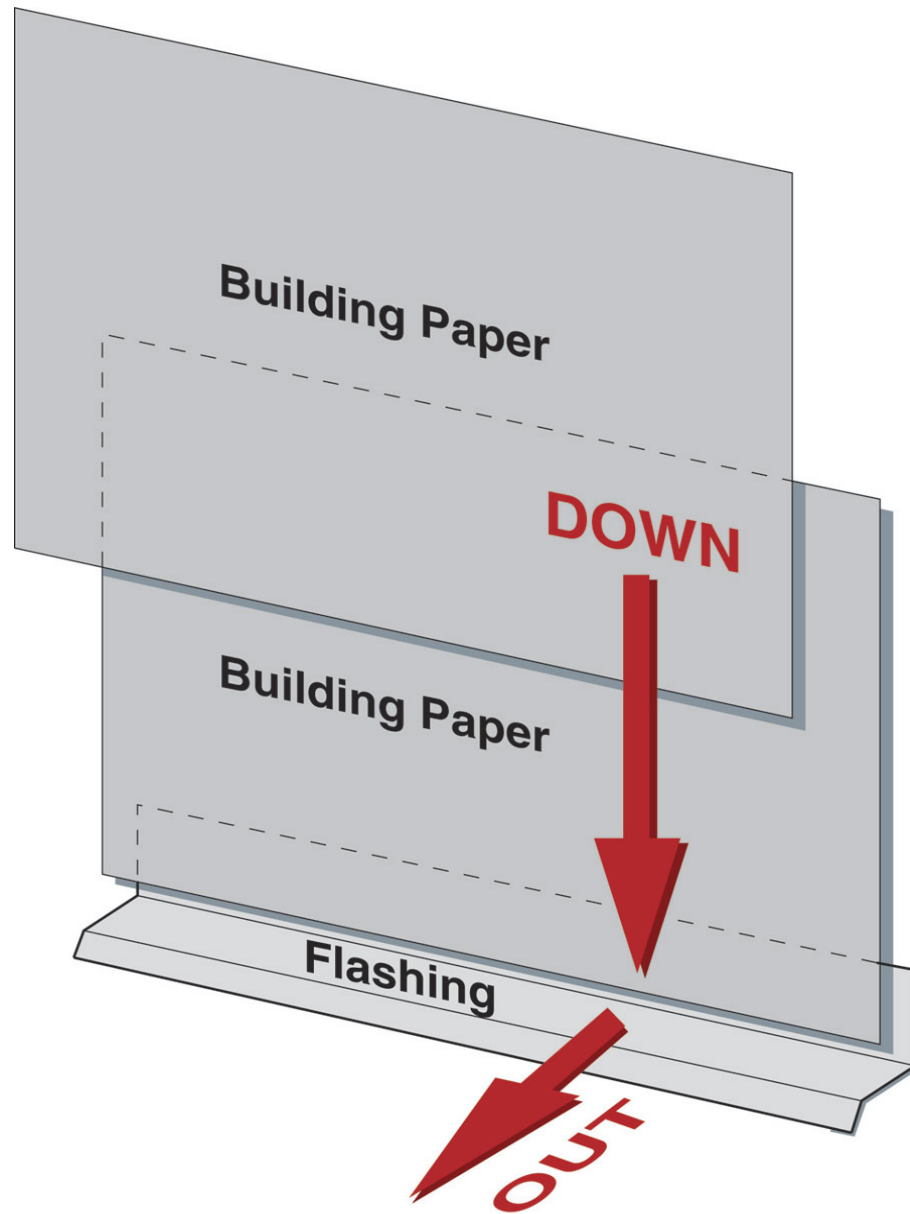


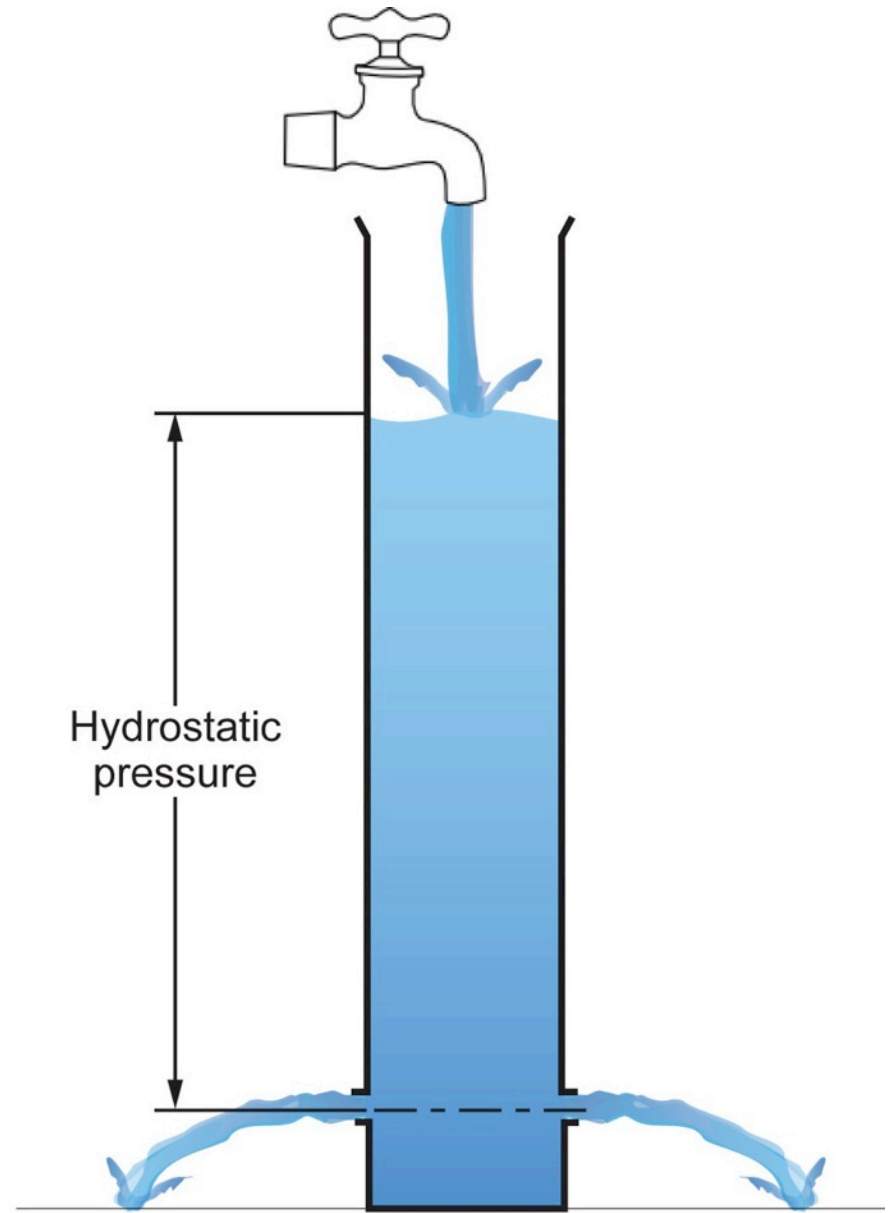
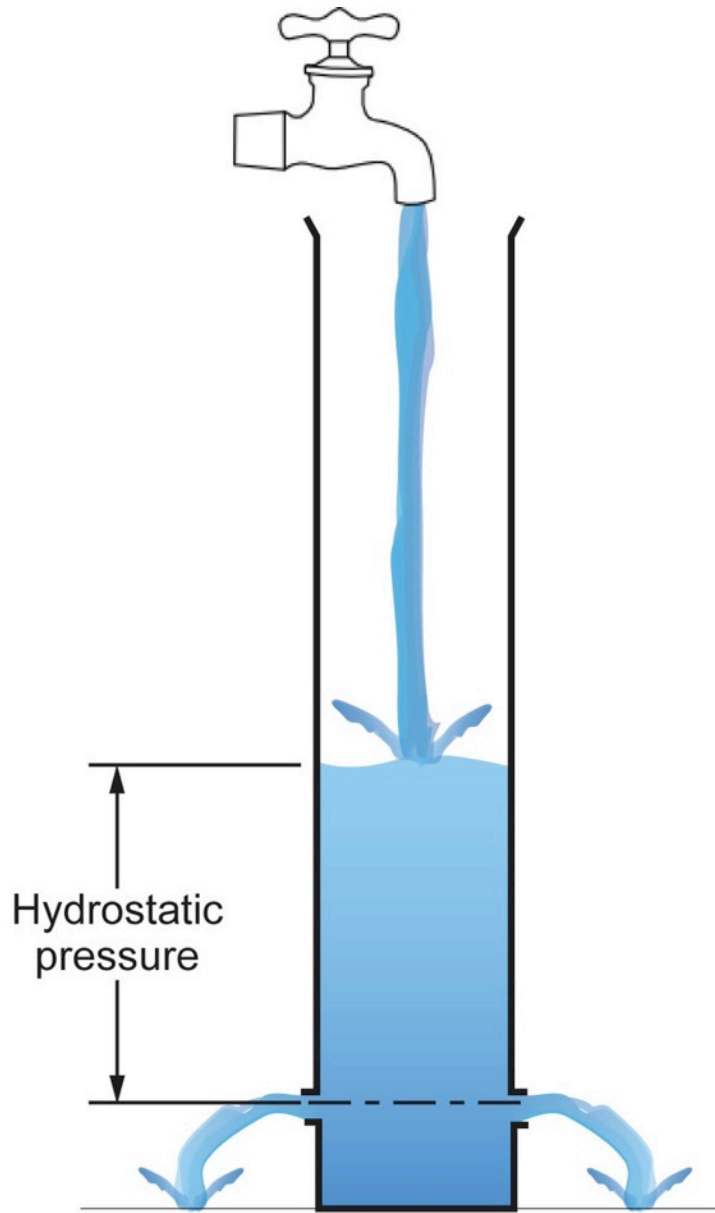




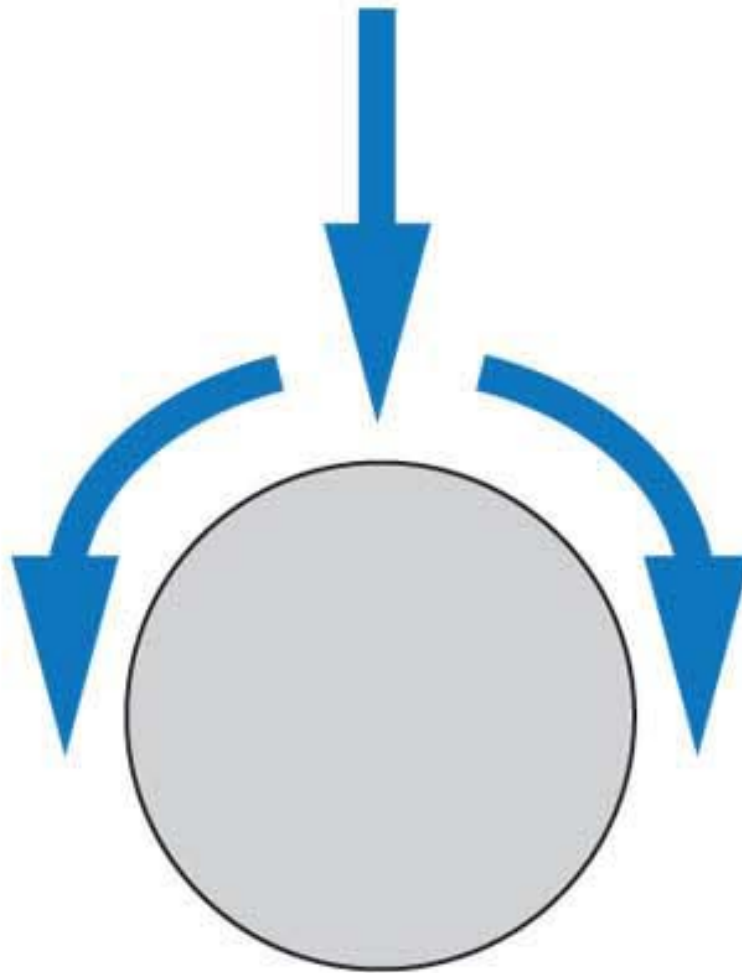


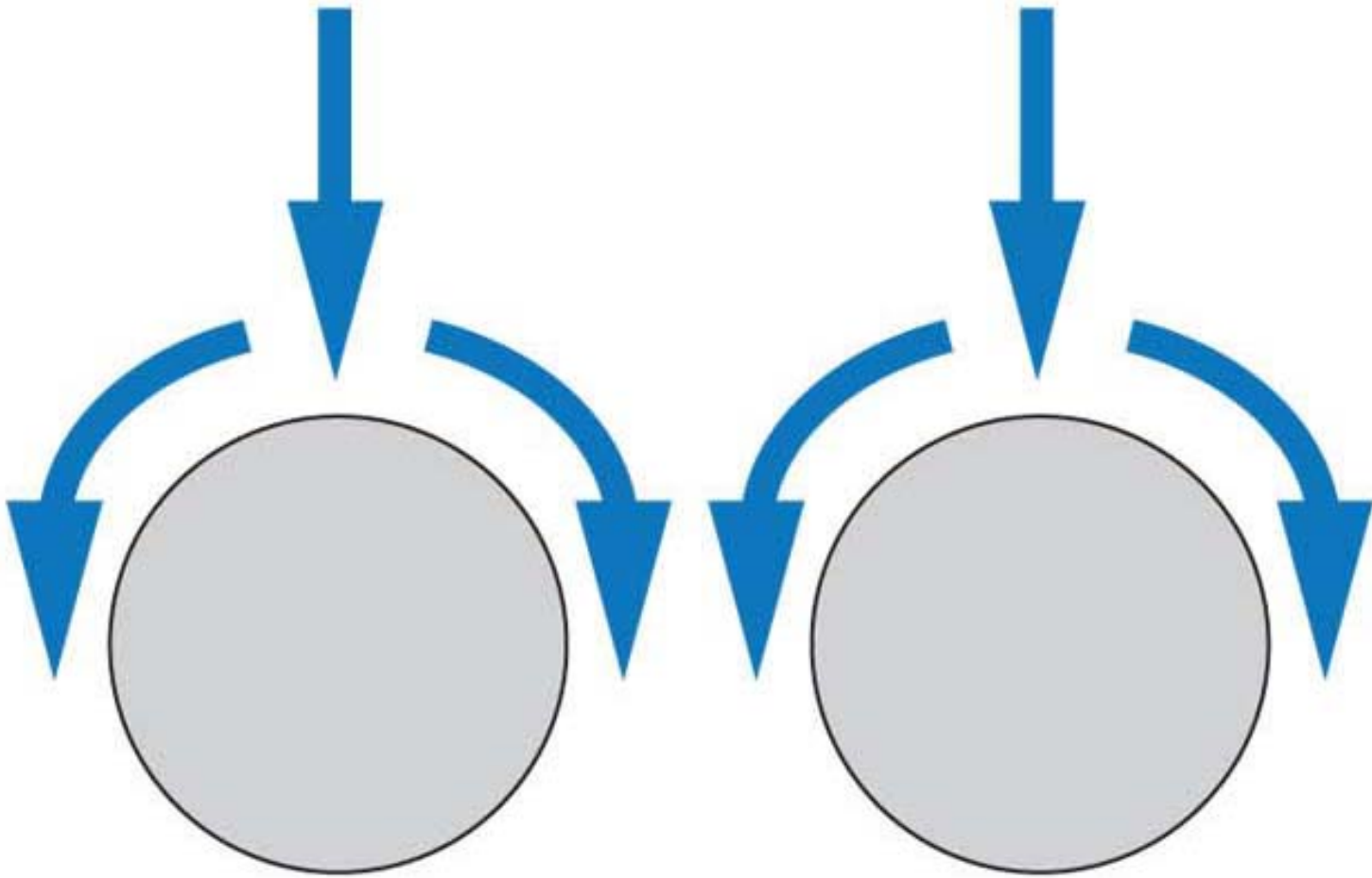


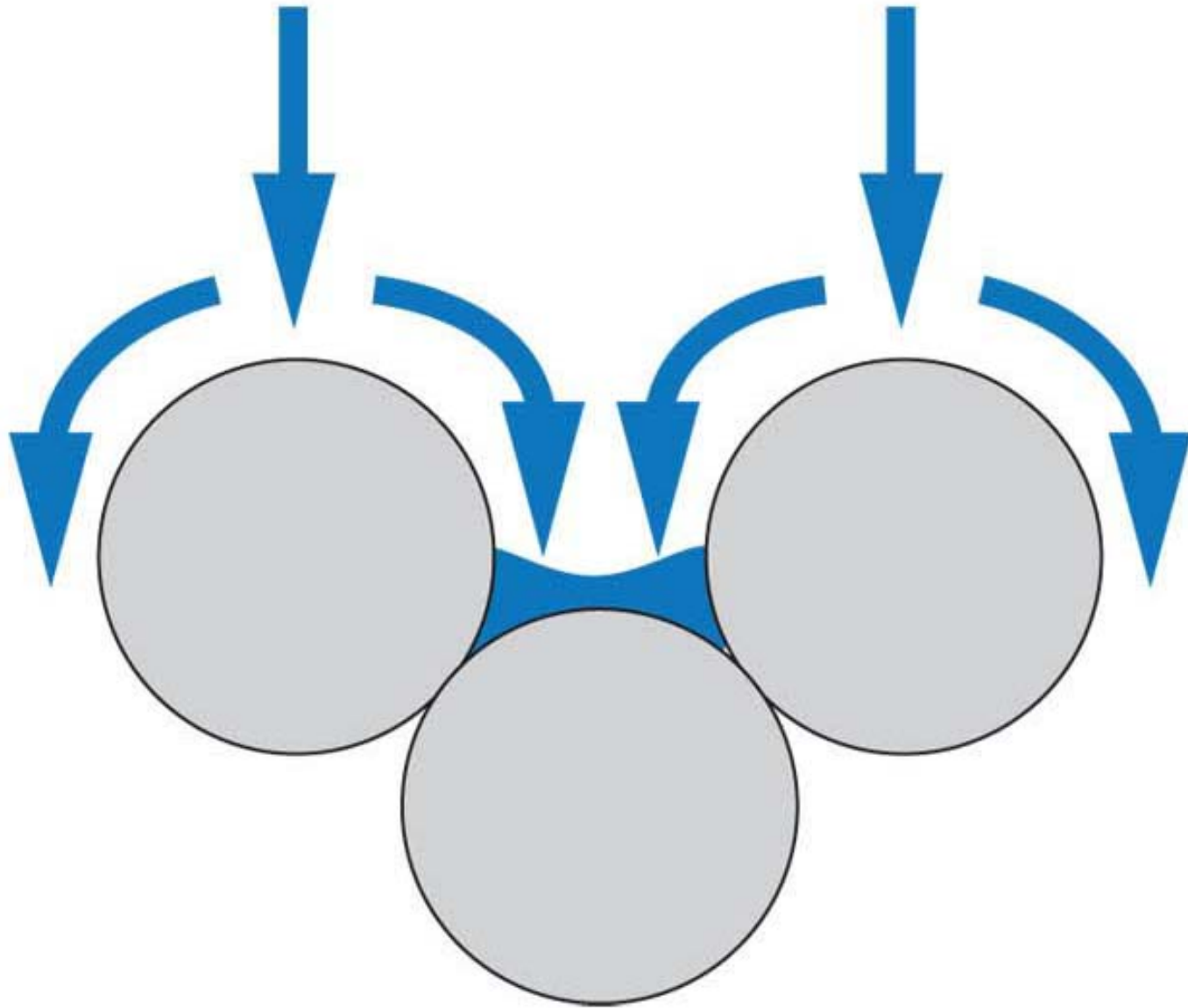


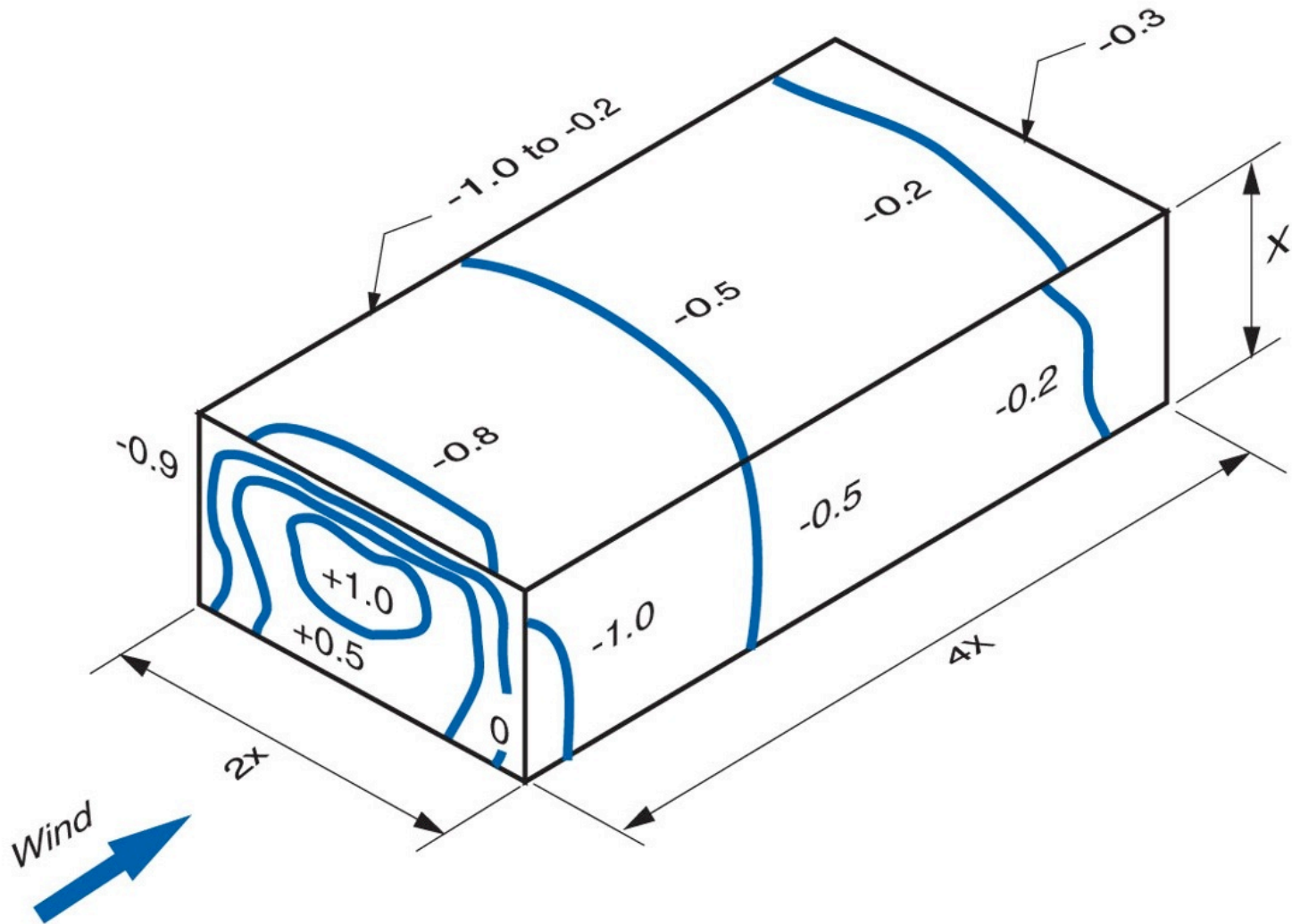








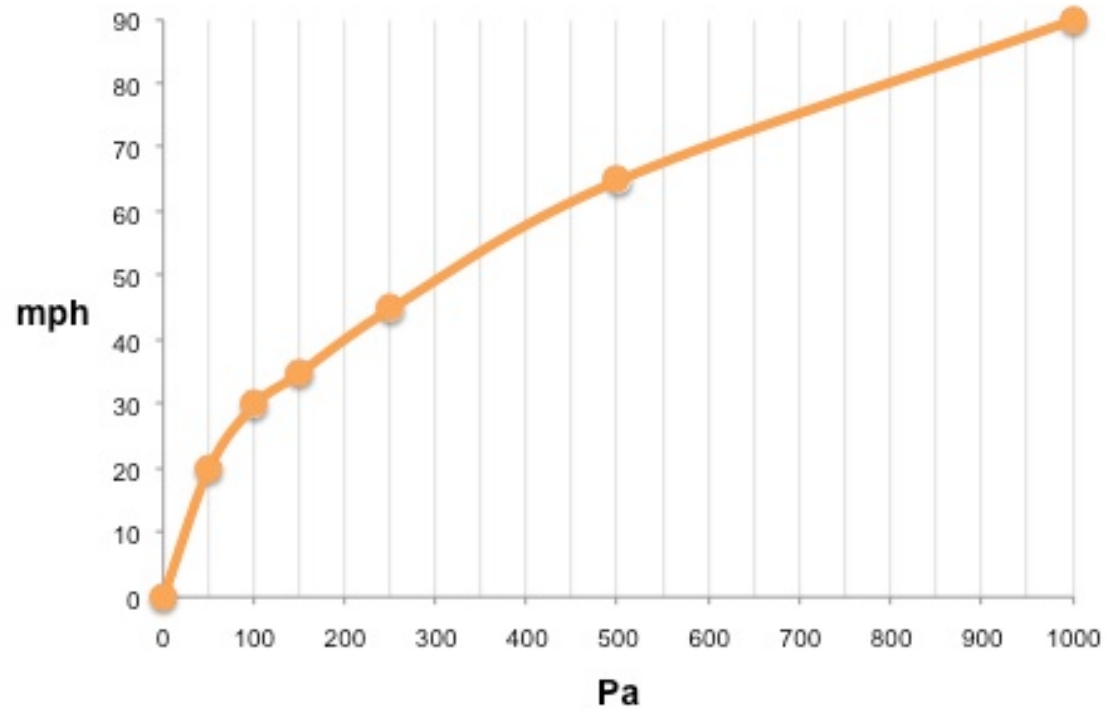




Pascals mph

50 Pa =	20 mph
100 Pa =	30 mph
150 Pa =	35 mph
250 Pa =	45 mph
500 Pa =	65 mph
1,000 Pa =	90 mph

Wind Speed (mph) vs. Stagnation Pressure (Pa)





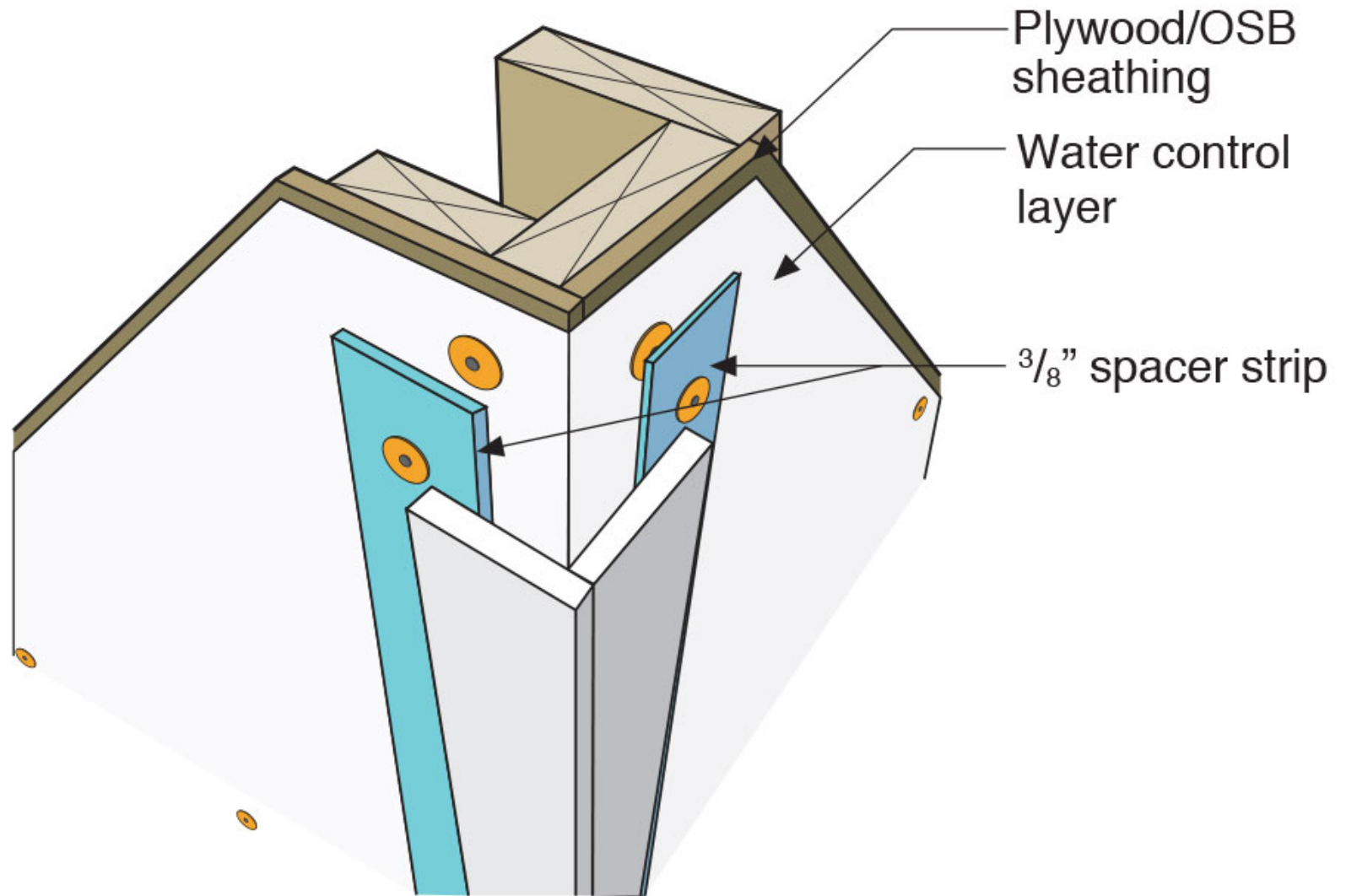


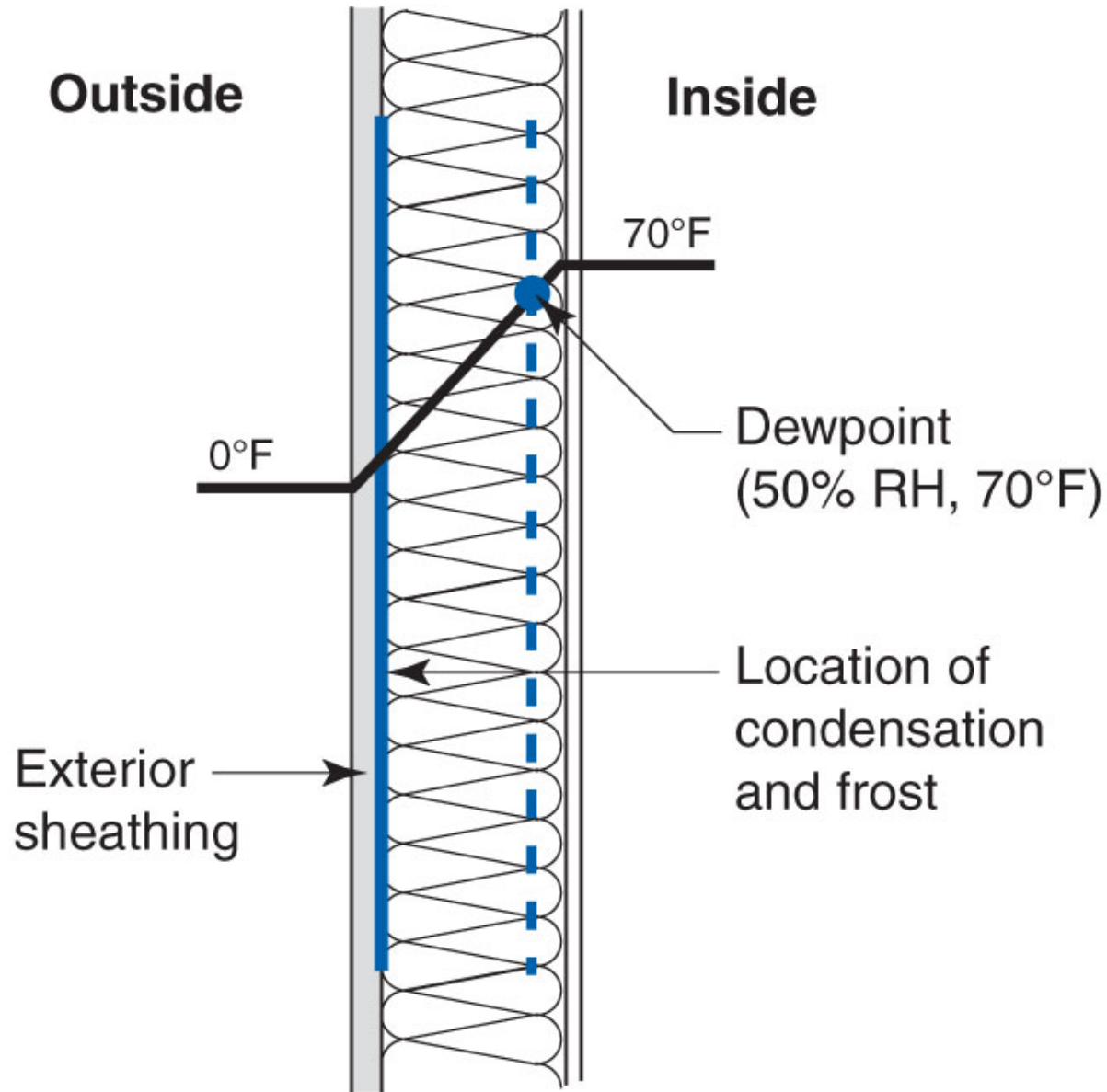




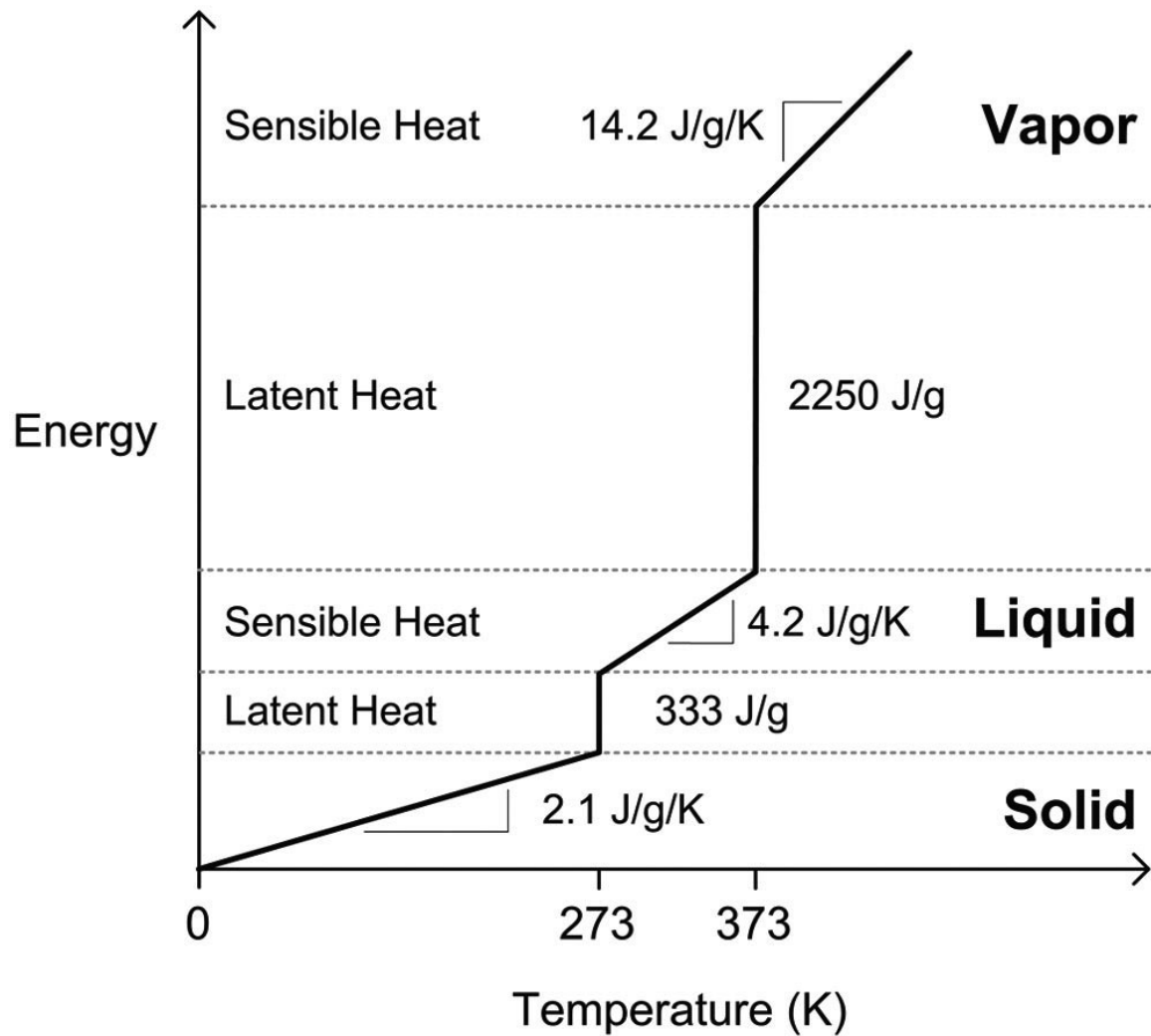








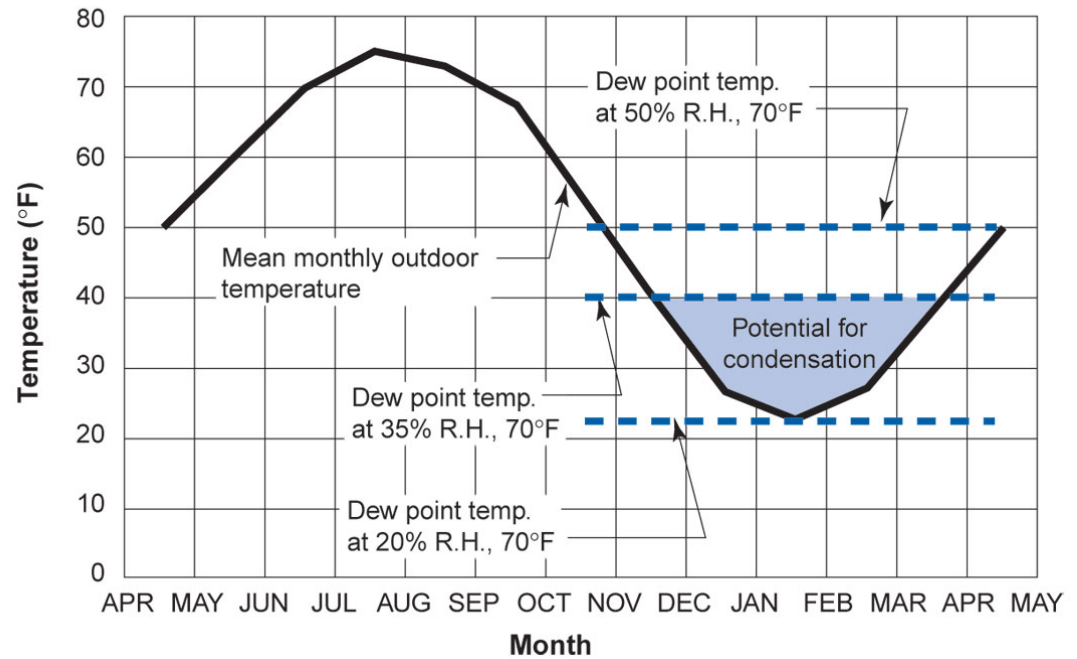
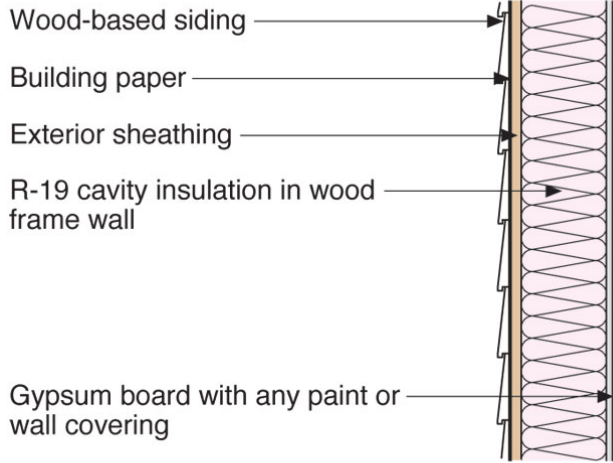


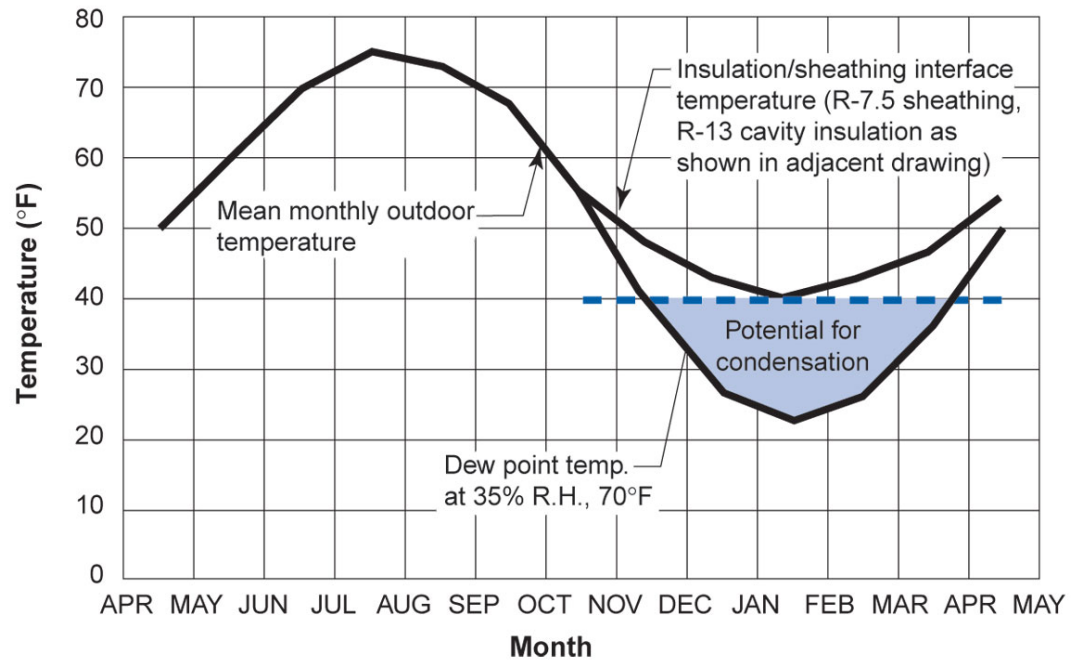
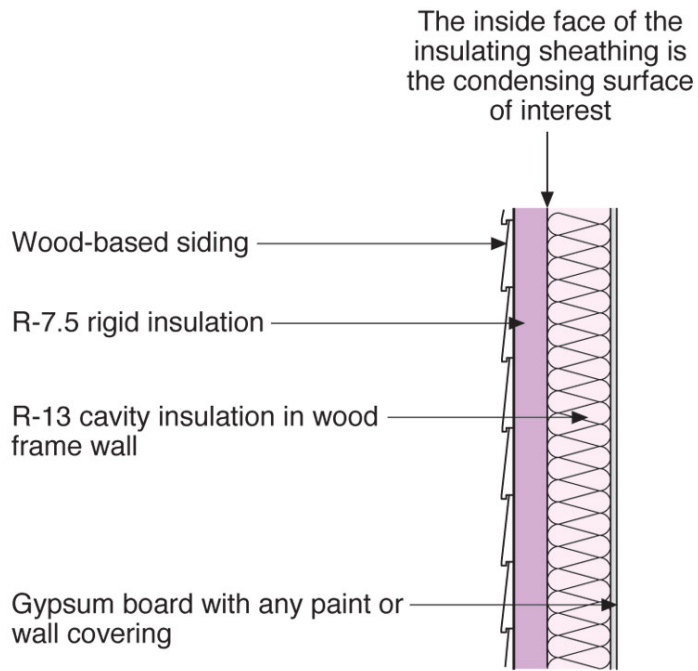


Simple linearized energy-temperature relation for water

From Straube & Burnett, 2005

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





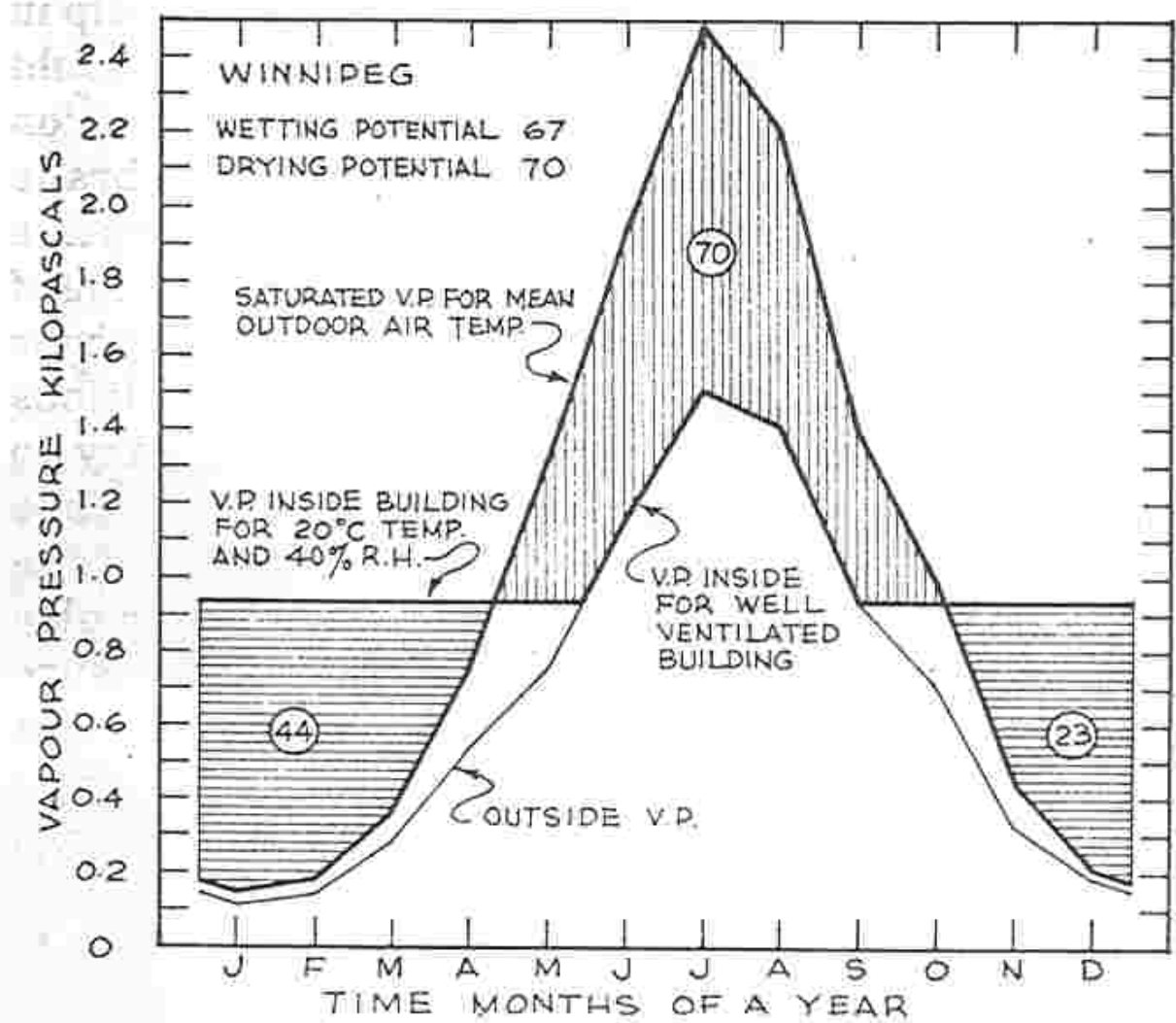
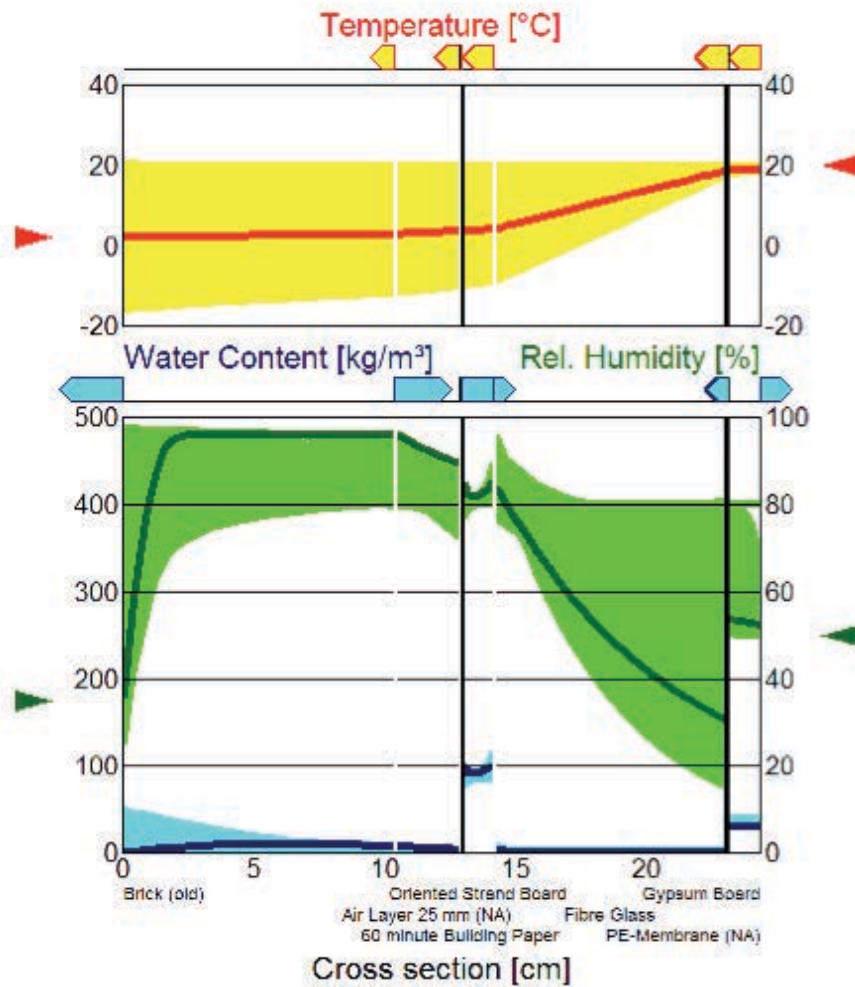


Figure 8-7. Outside vapour pressure, saturated vapour pressure and inside vapour pressure for Winnipeg.



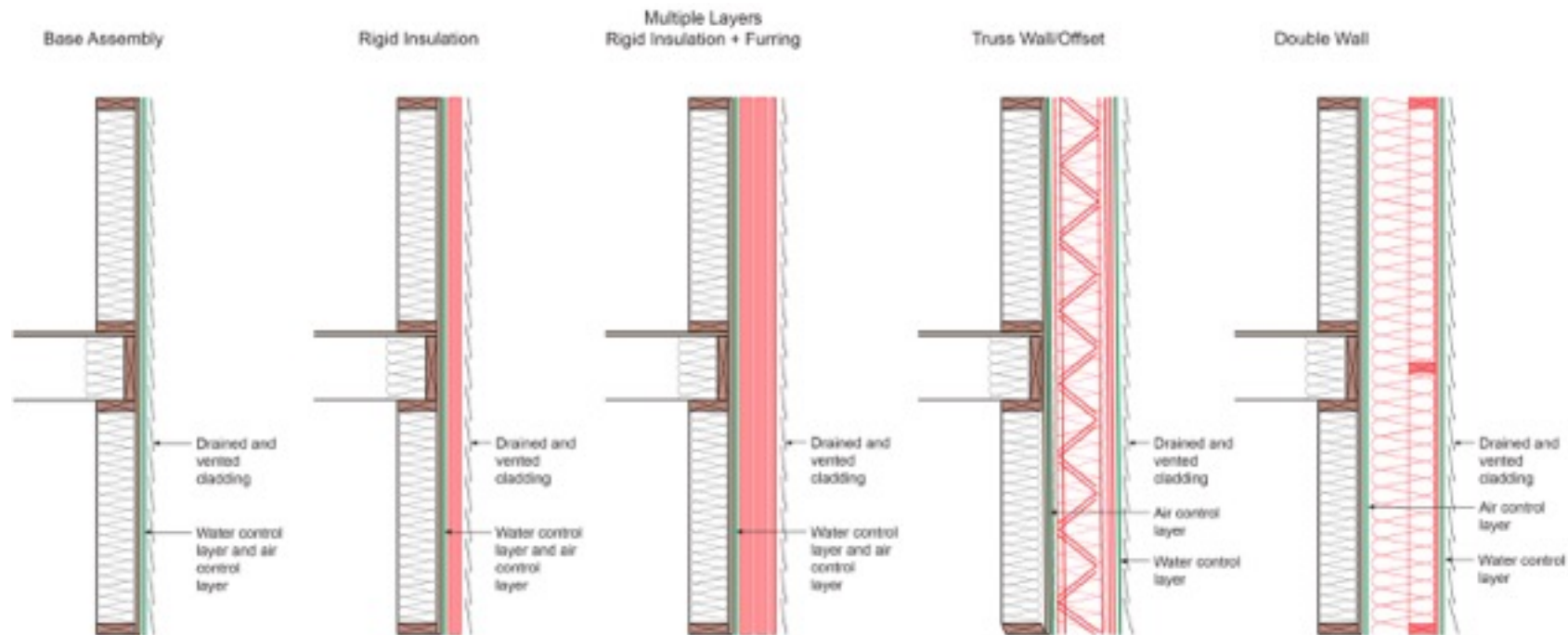
WUFI® 3.3 Pro. IBP
Run

16 Feb
2001

100%

0.00 1.00

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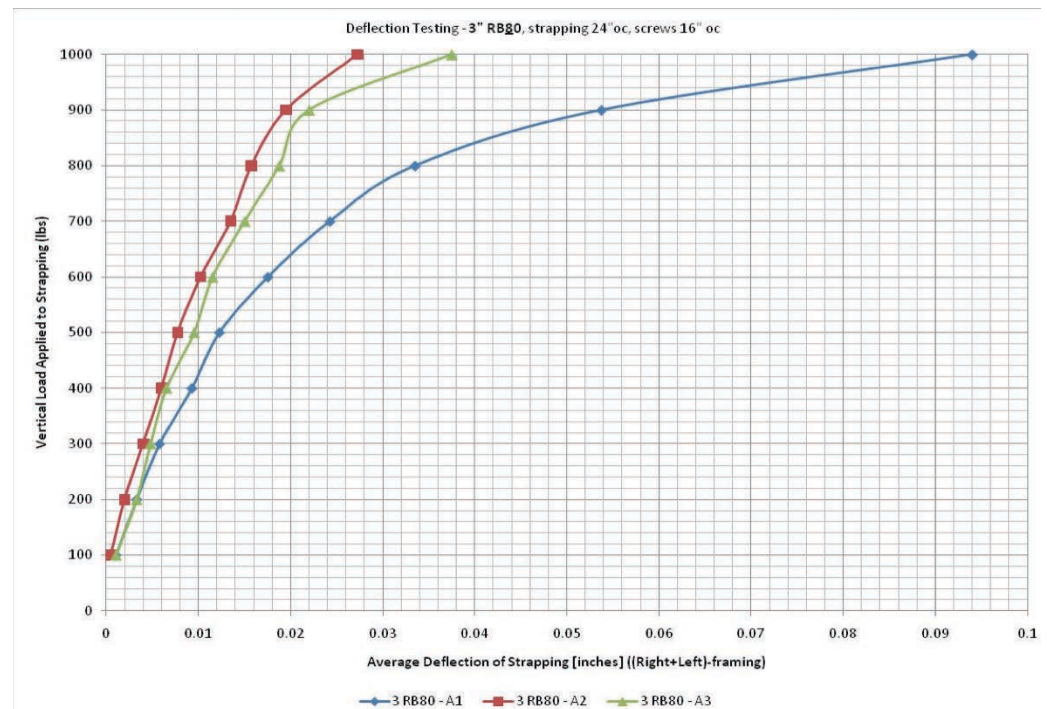


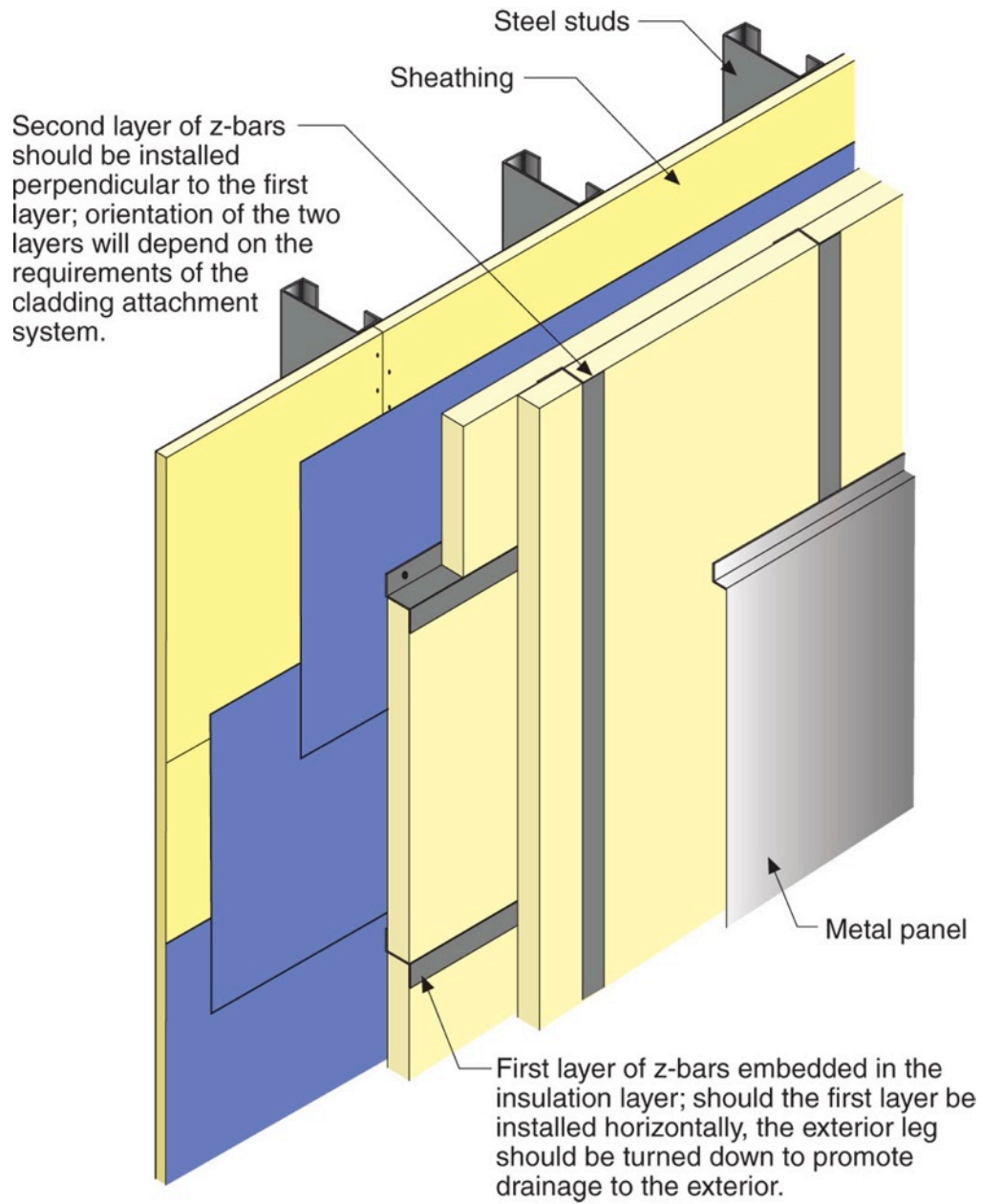


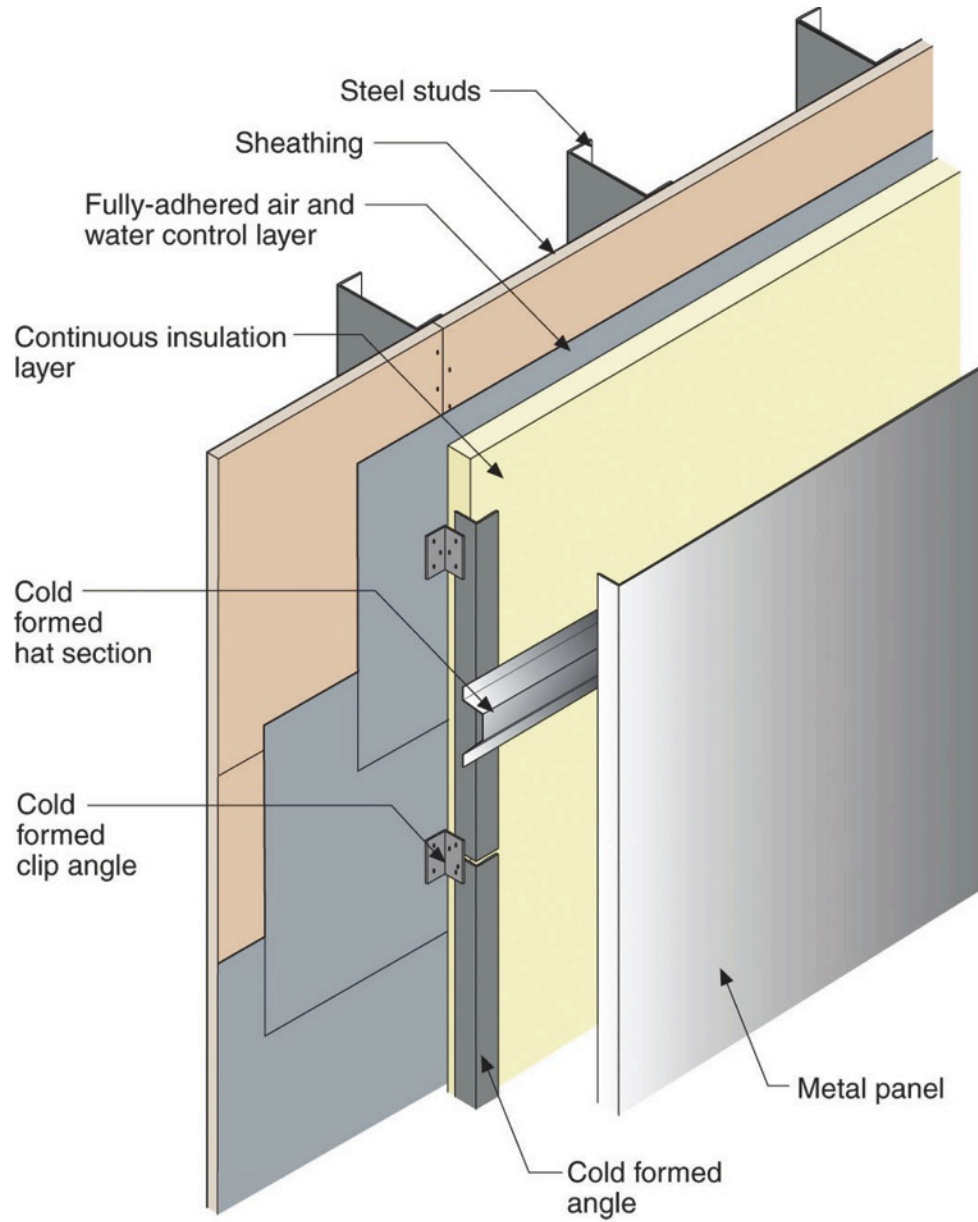


Rockwool

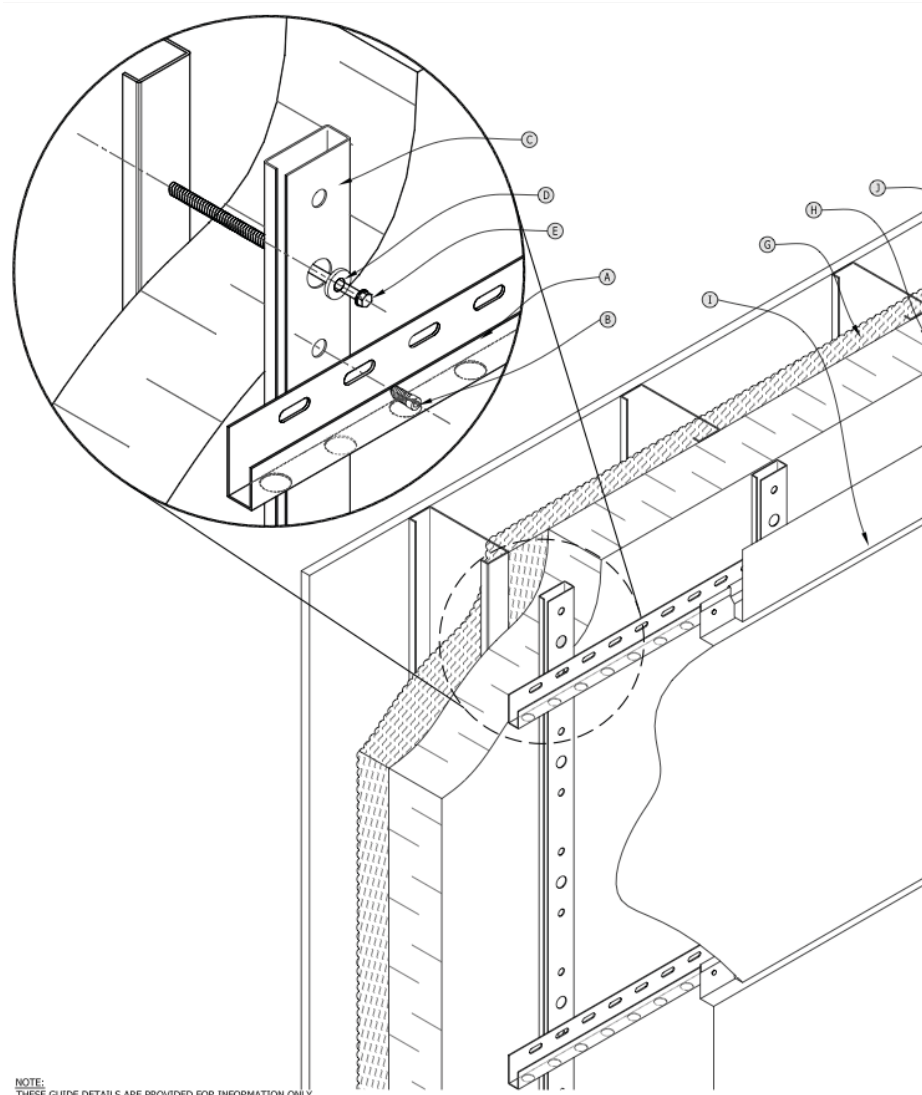
1x3 furring @ 24" o.c.
#10 screws @ 16" o.c. vertically
Result: 20 psf cladding weight
with < 2/100" deflection











NOTE:
 THESE DRAWING DETAILS ARE DEVELOPED FOR THERMAX™ CI ONLY







