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Building Science

ZERH

www.buildingscience.com

Net Zero Buildings.....

65 percent conservation

35 percent renewables

5 – 10 – 20 – 40 -60 @ 1.5

5 – 10 – 20 – 40 -60 @ 1.5

R-5 glass

R-10 slab

R- 20 basement

R-40 walls

R-60 roof

Airtightness 1.5 ach@50 Pa

Beyond Net Zero....

5 – 10 – 20 – 40 -60 @ 1.5

R-5 glass.....can't do much better now

R-10 slab.....R-20

R- 20 basement....R-40

R-40 walls.....R-60

R-60 roof.....R-80

Airtightness 1.5 ach@50 Pa....1.0 ach@50 Pa

Typical	5 ach@50
Getting rid of big holes	3 ach@50
Getting rid of smaller holes	1.5 ach@50
Beyond Net Zero	1.0 ach@50
Getting German	0.6 ach@50

A Building is an Environmental Separator

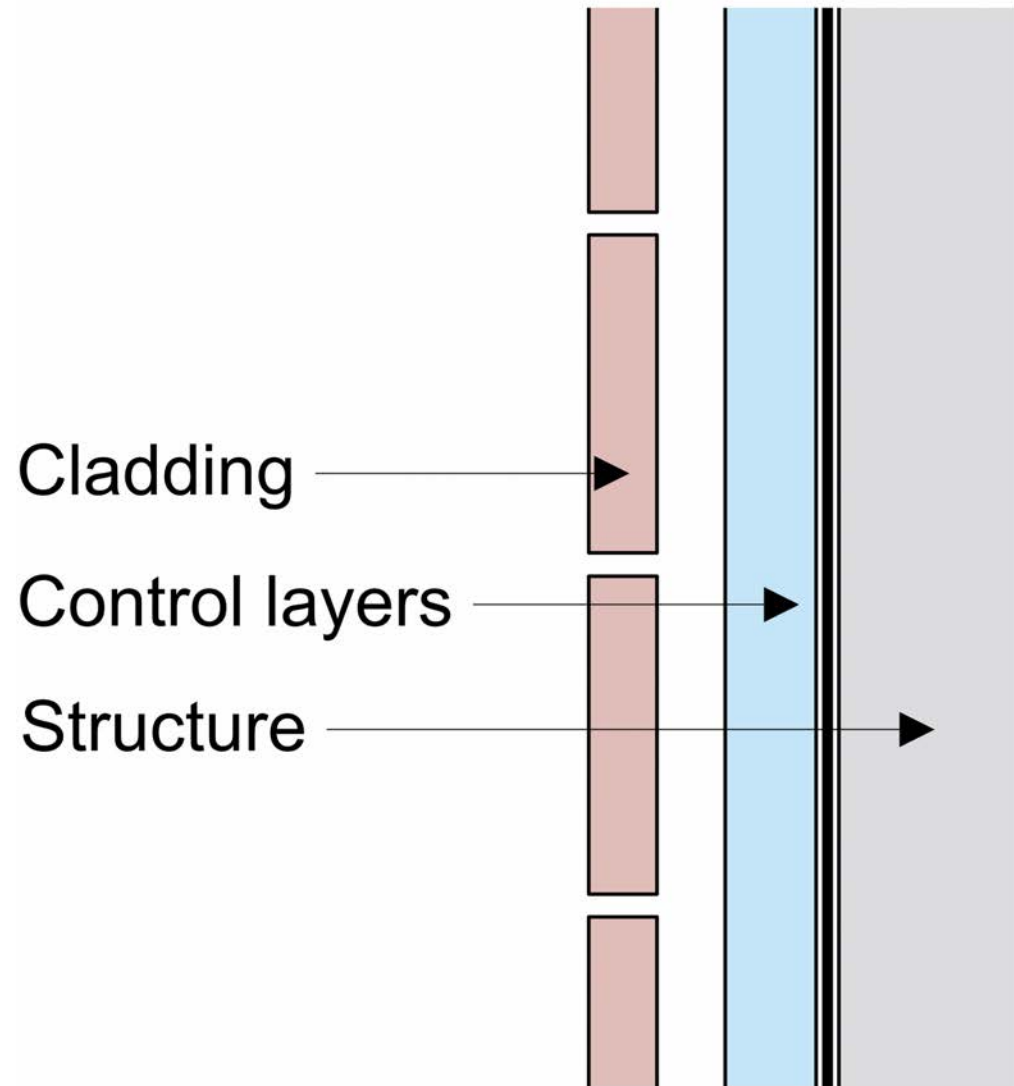
- Control heat flow
- Control airflow
- Control water vapor flow
- Control rain
- Control ground water
- Control light and solar radiation
- Control noise and vibrations
- Control contaminants, environmental hazards and odors
- Control insects, rodents and vermin
- Control fire
- Provide strength and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

Water Control Layer

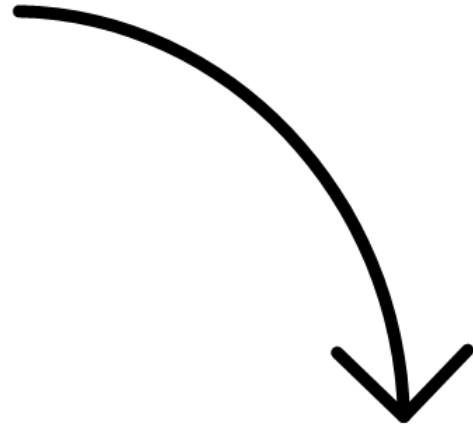
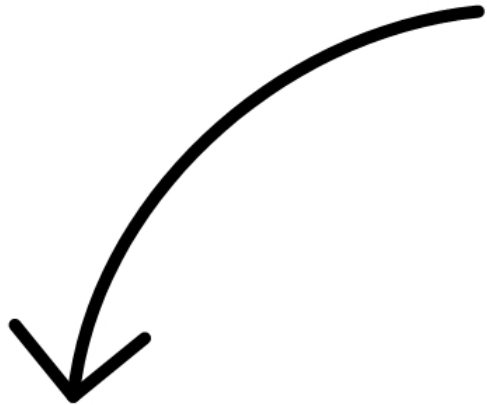
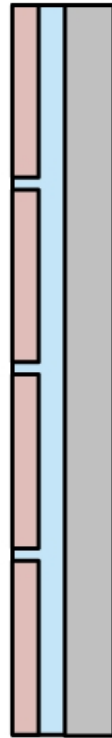
Air Control Layer

Vapor Control Layer

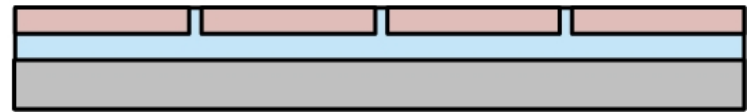
Thermal Control Layer



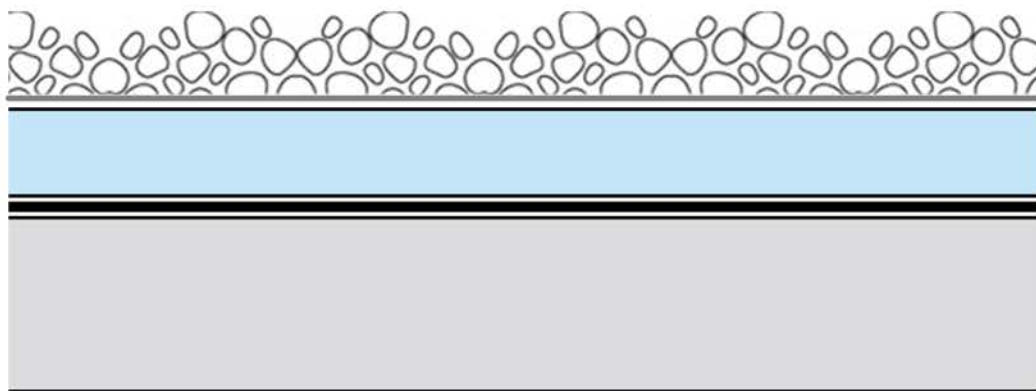
Wall



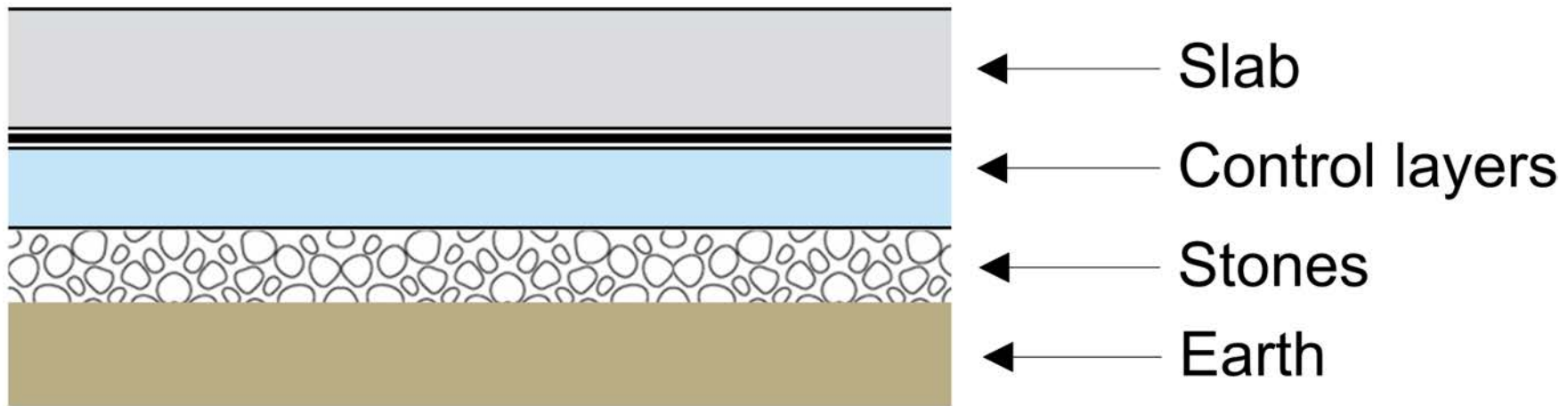
Slab

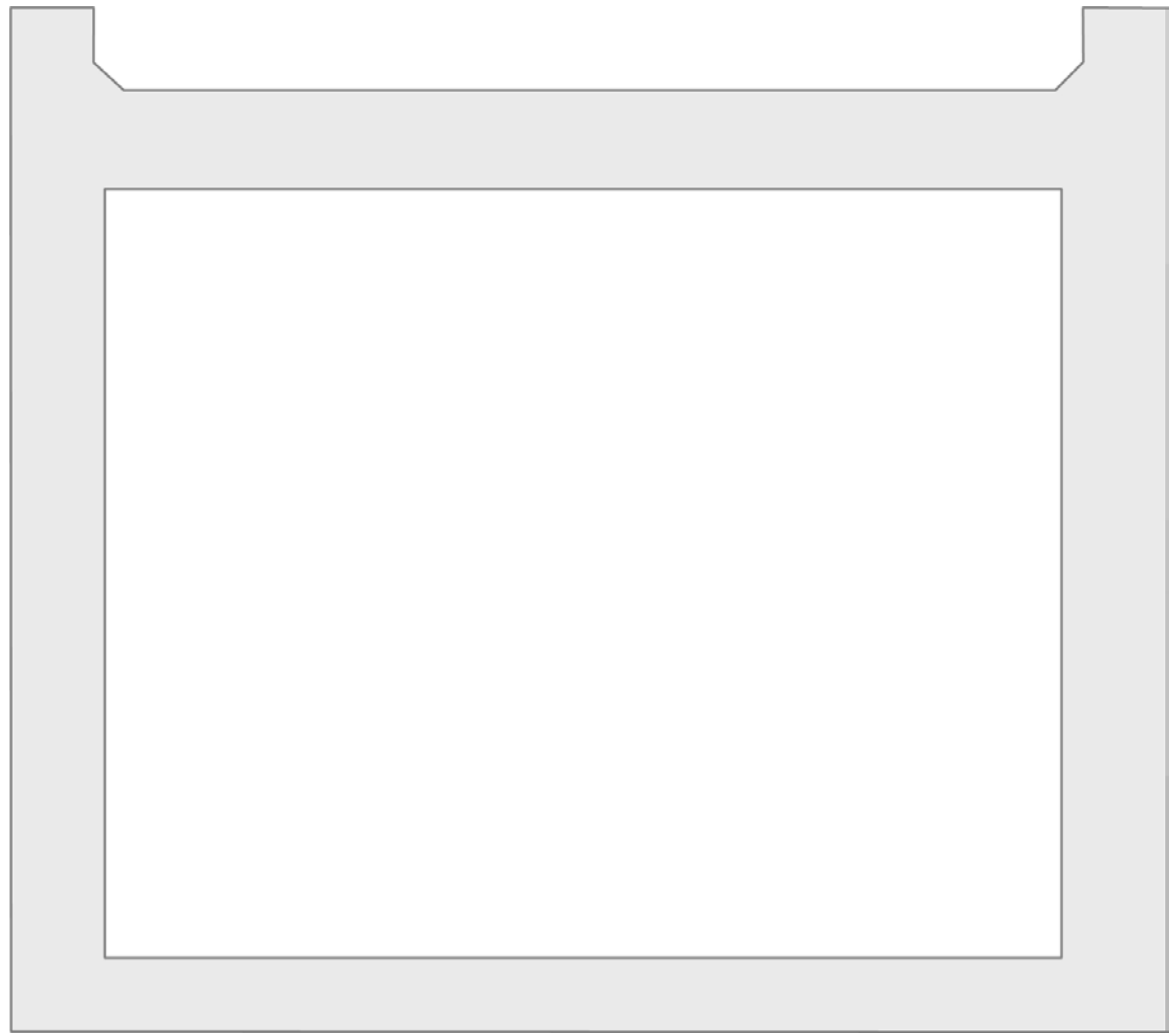


Roof

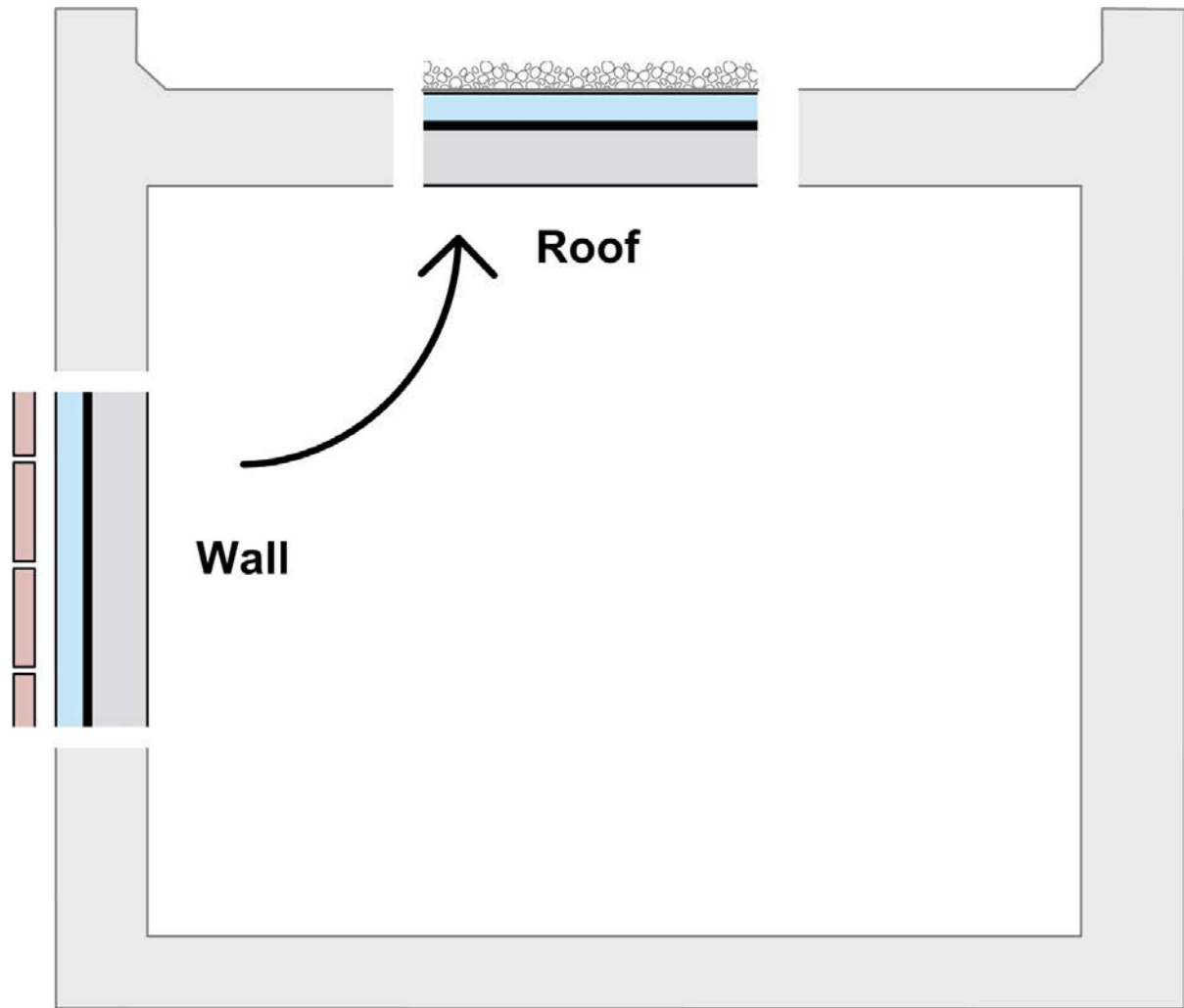


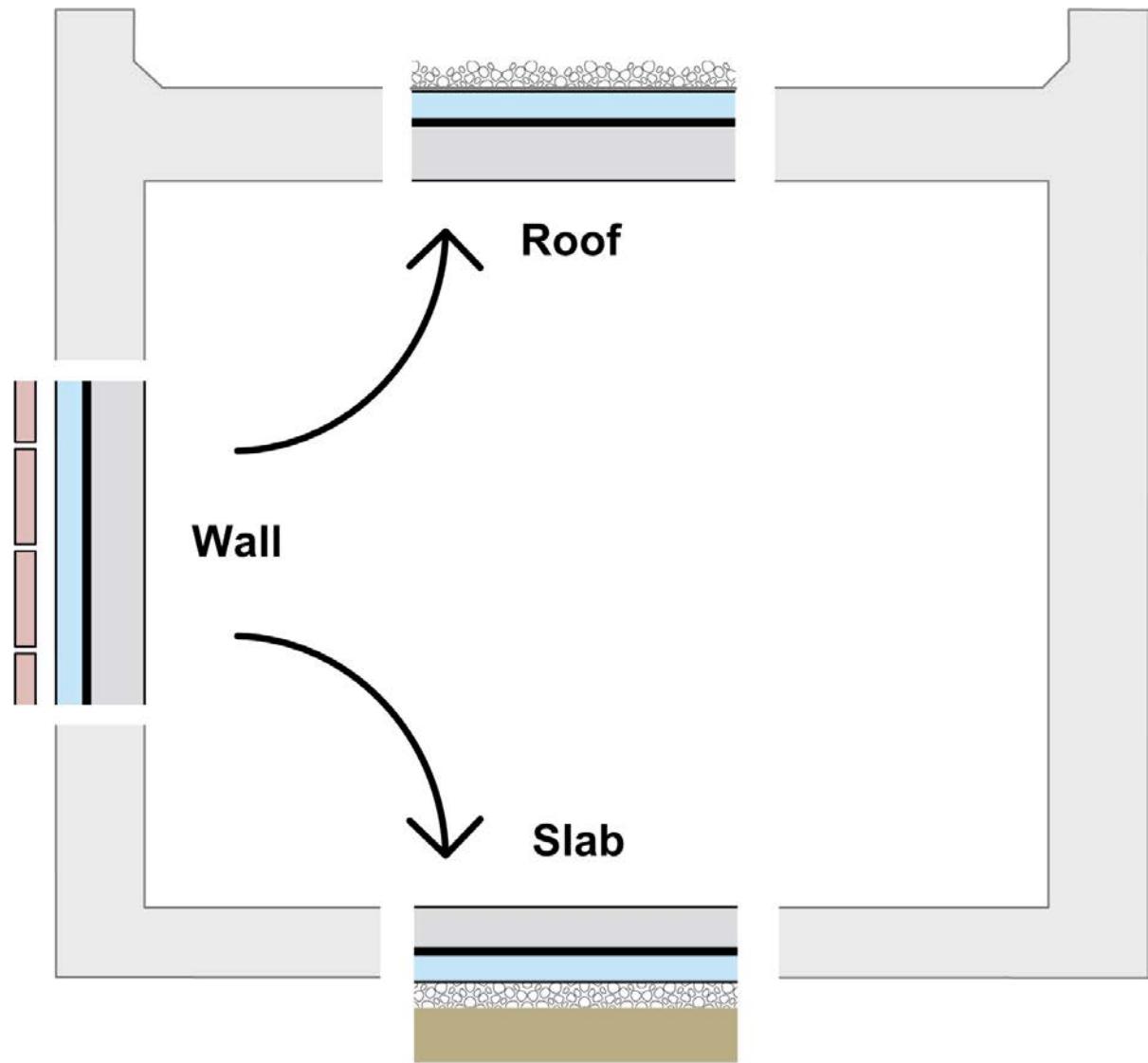
- ← Ballast
- ← Filter fabric
- ← Control layers
- ← Roof structure

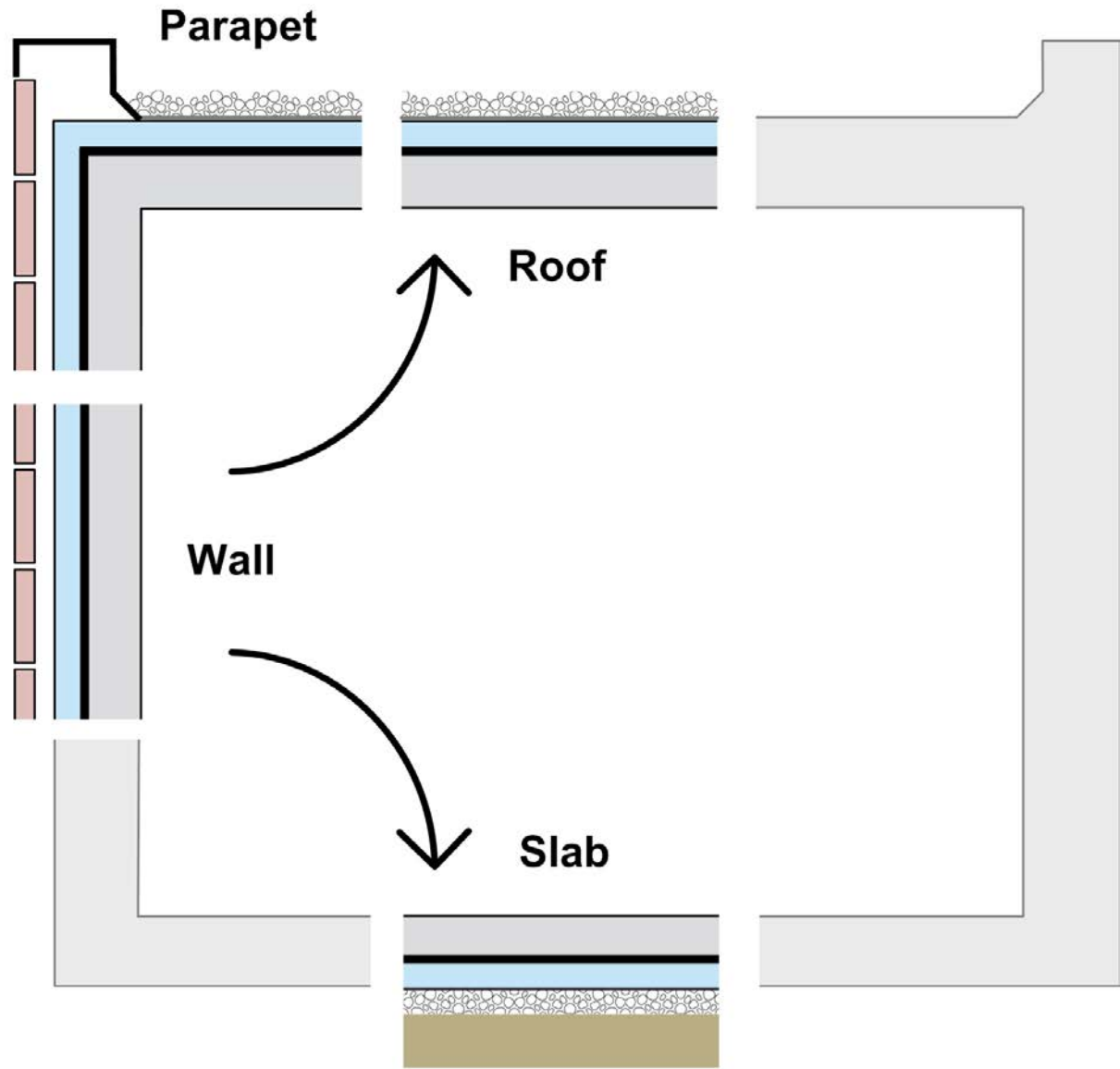


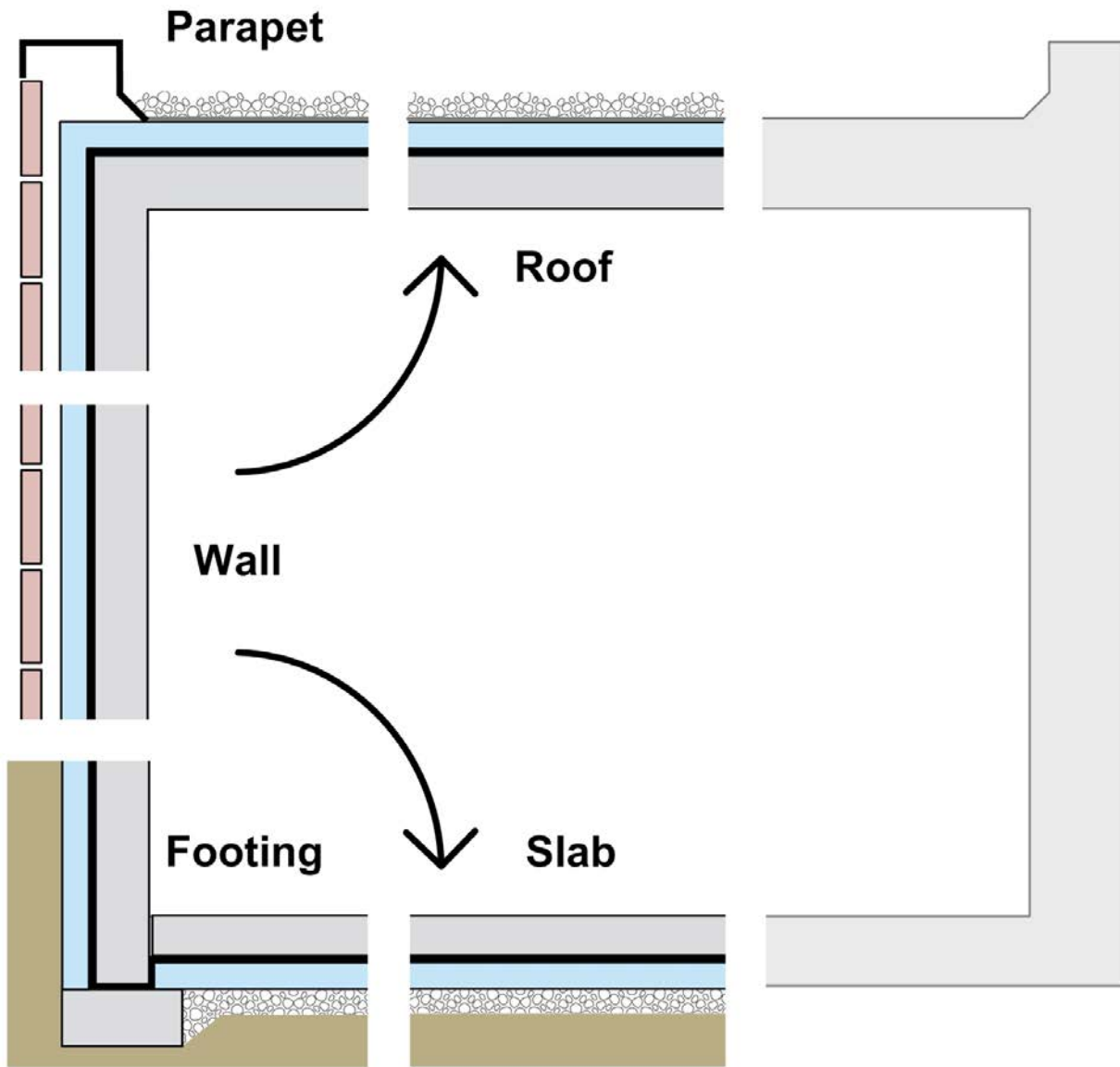


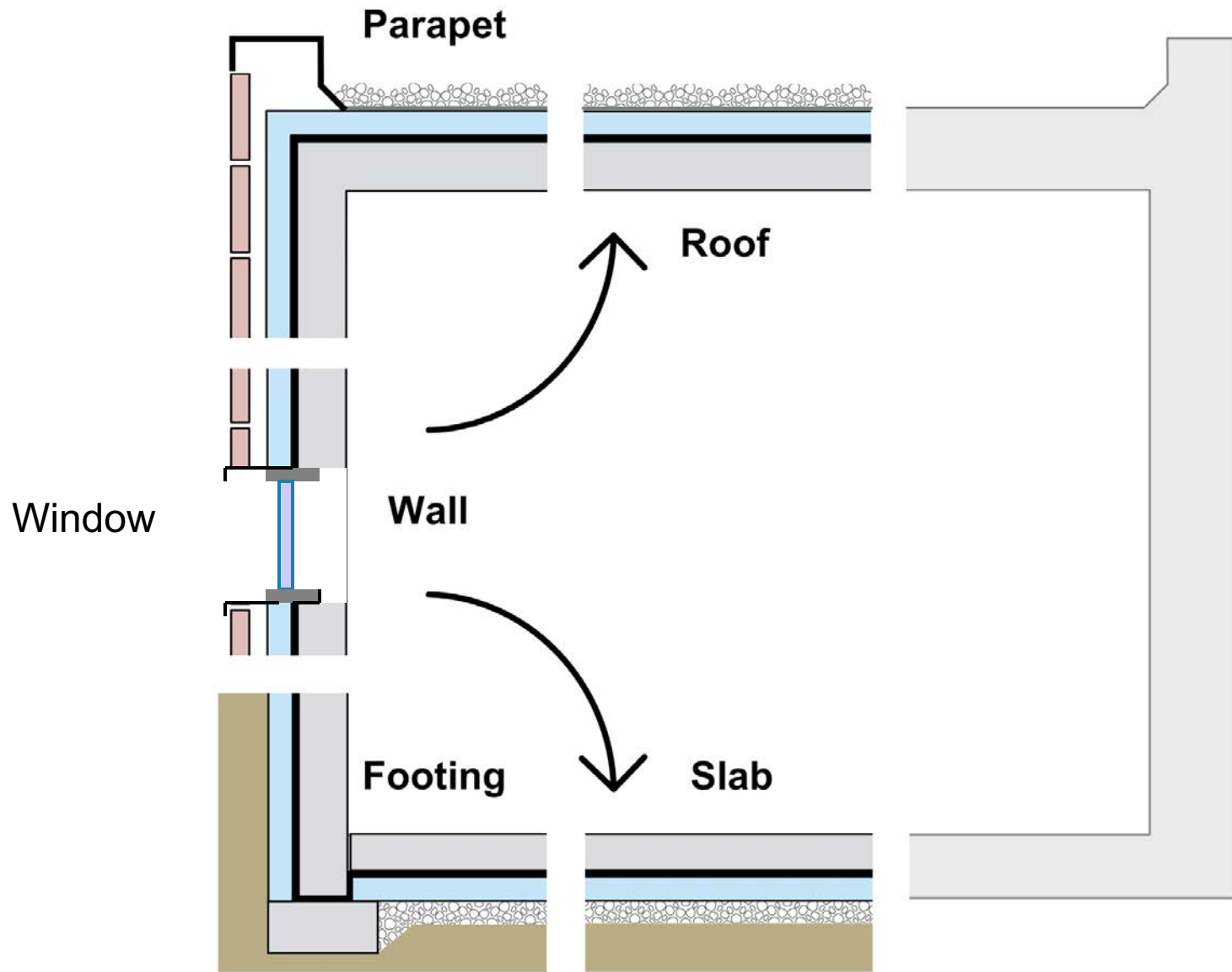


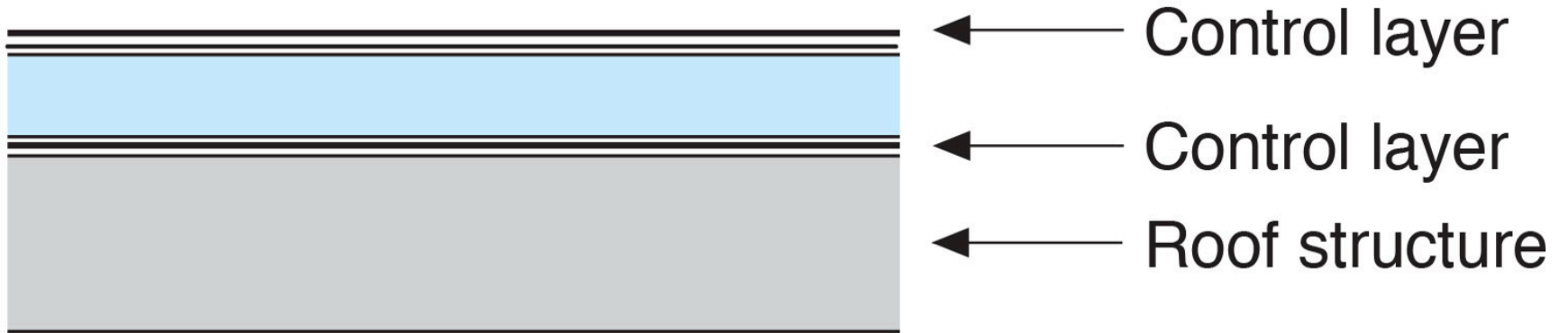


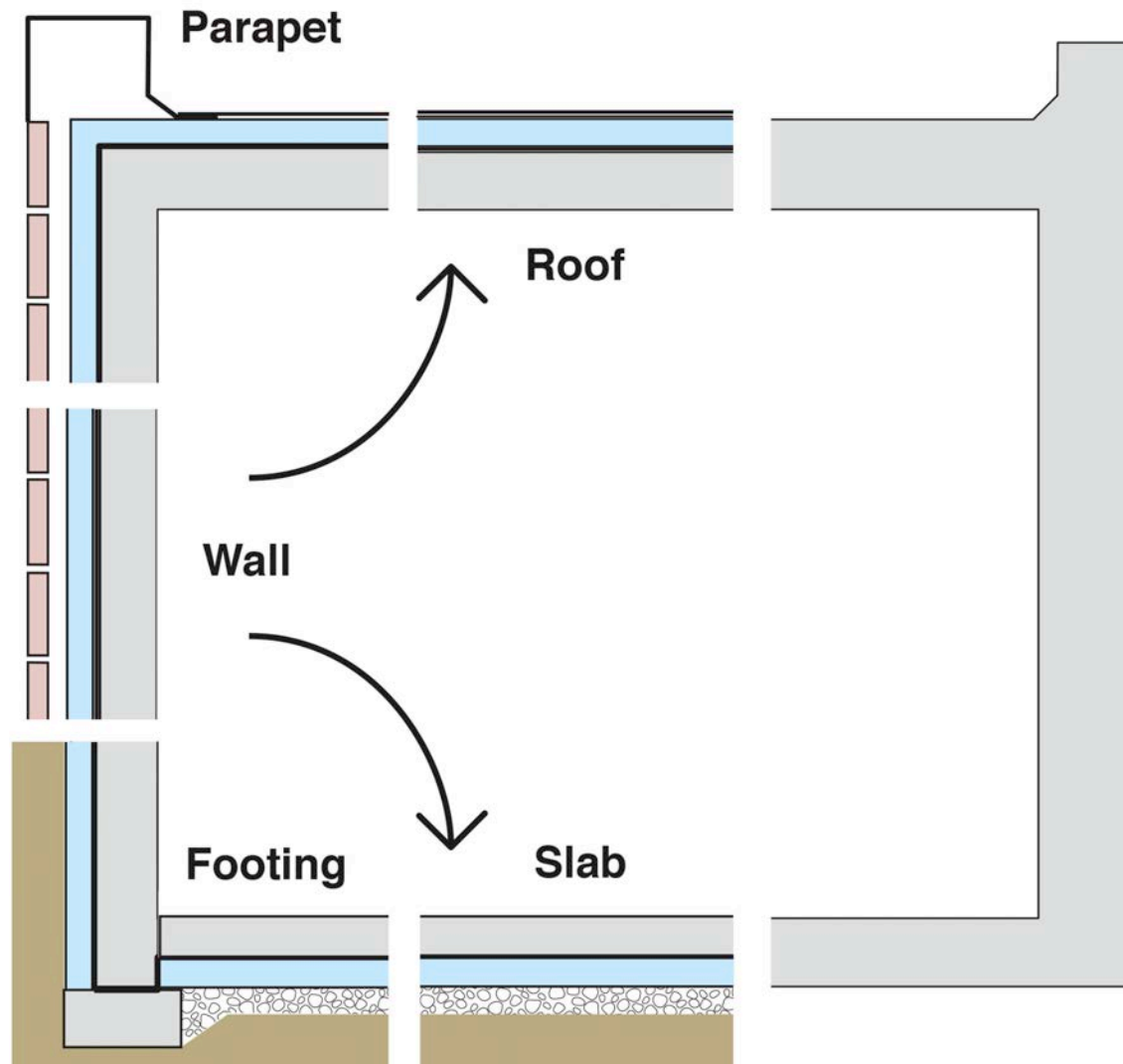


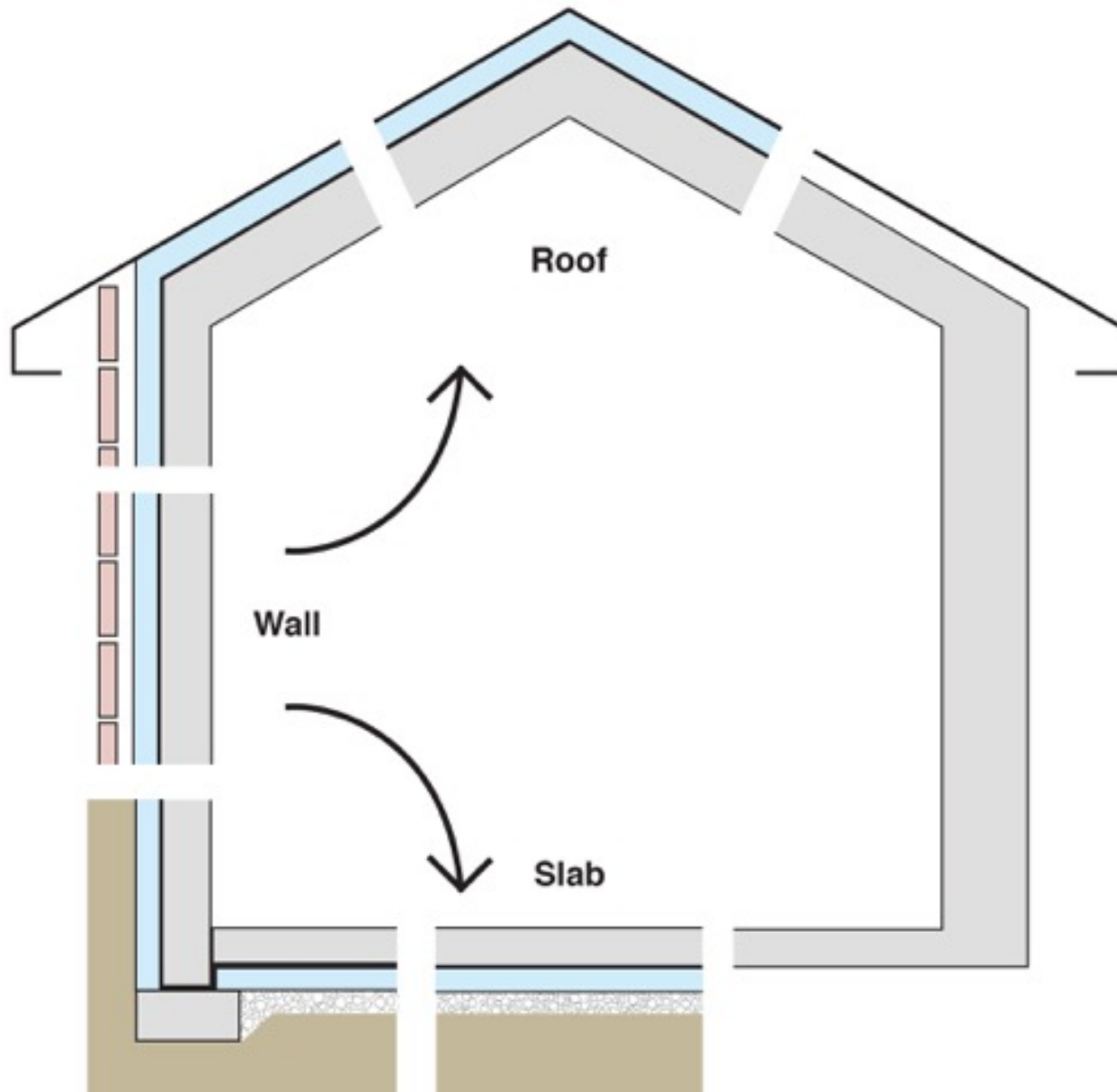


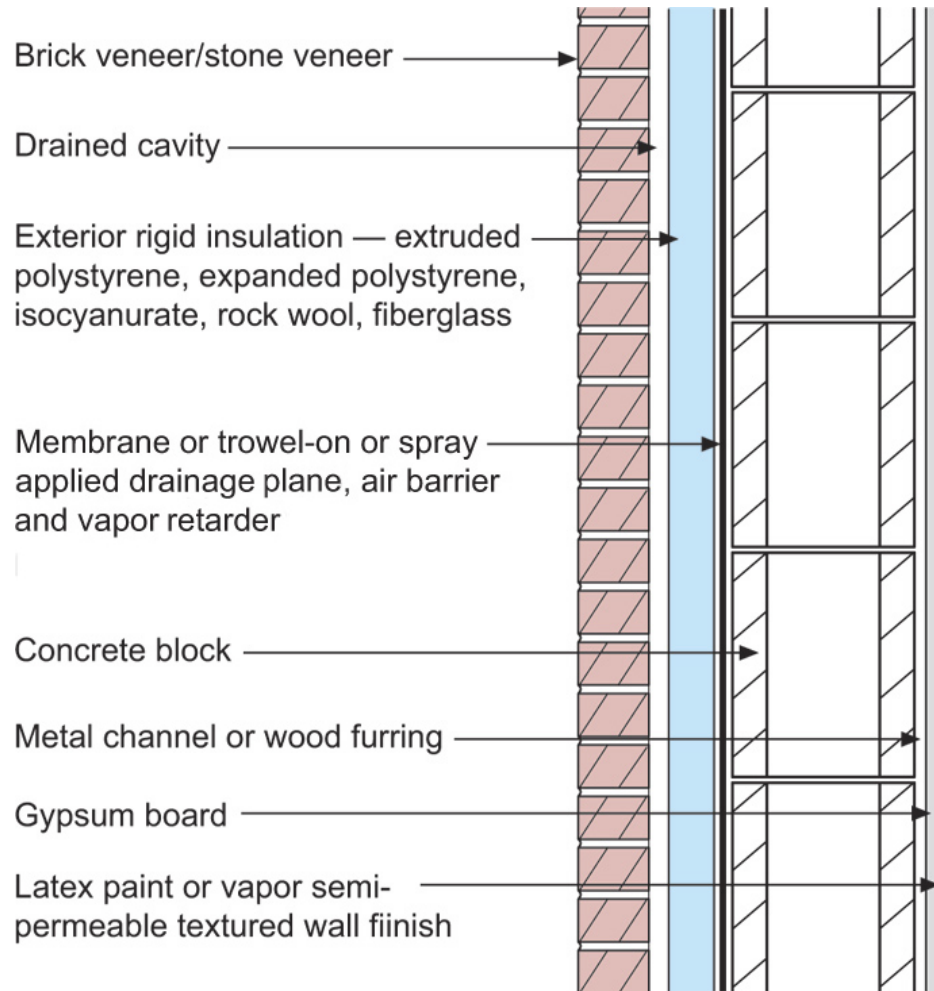




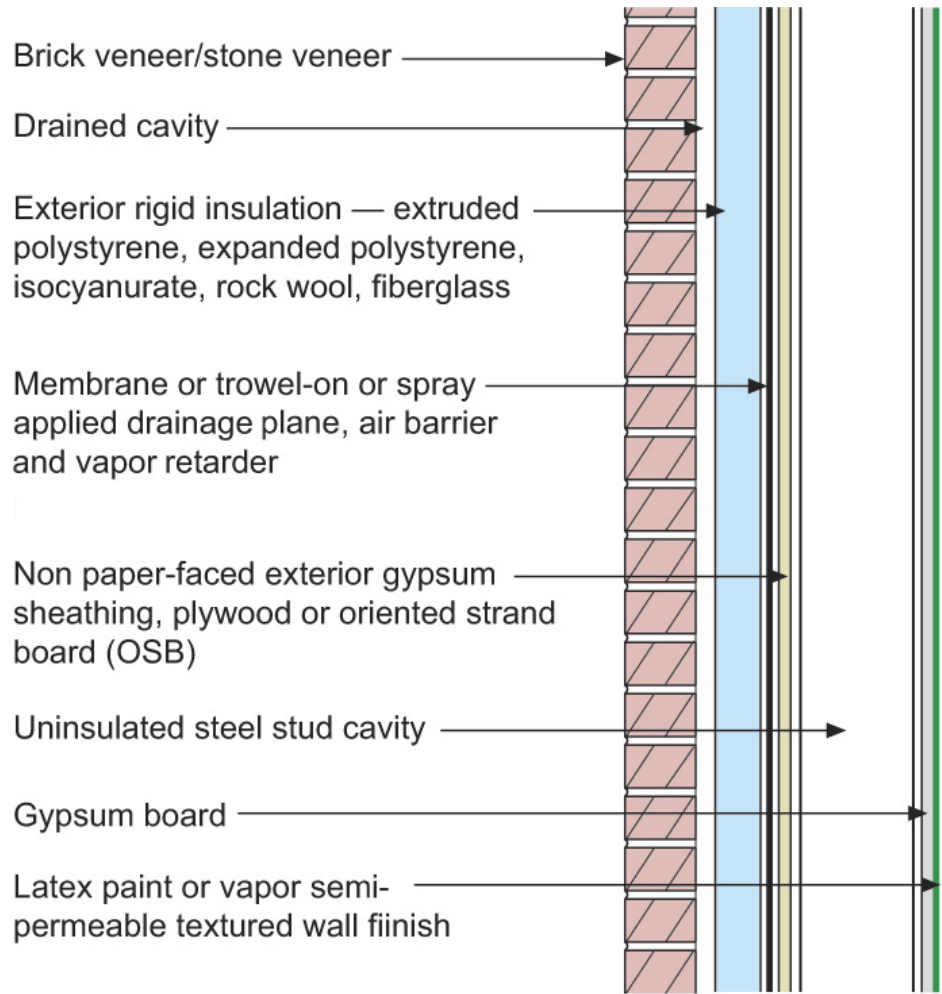


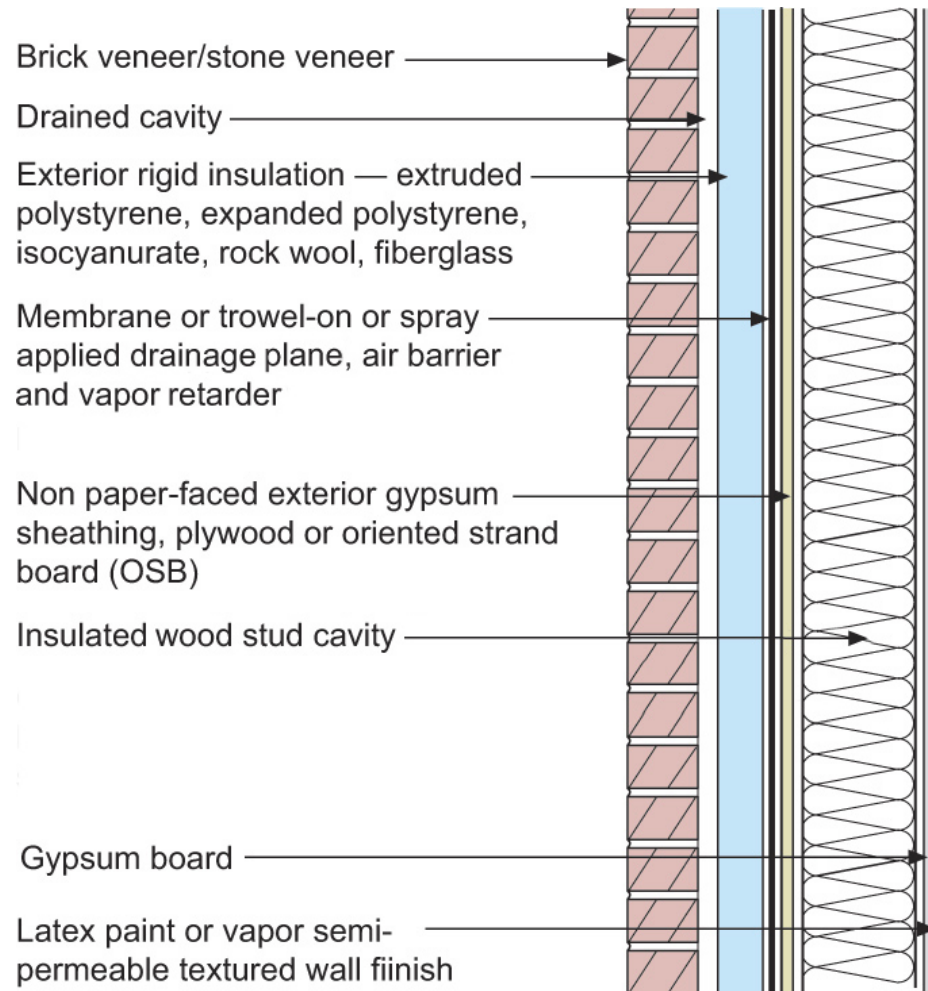


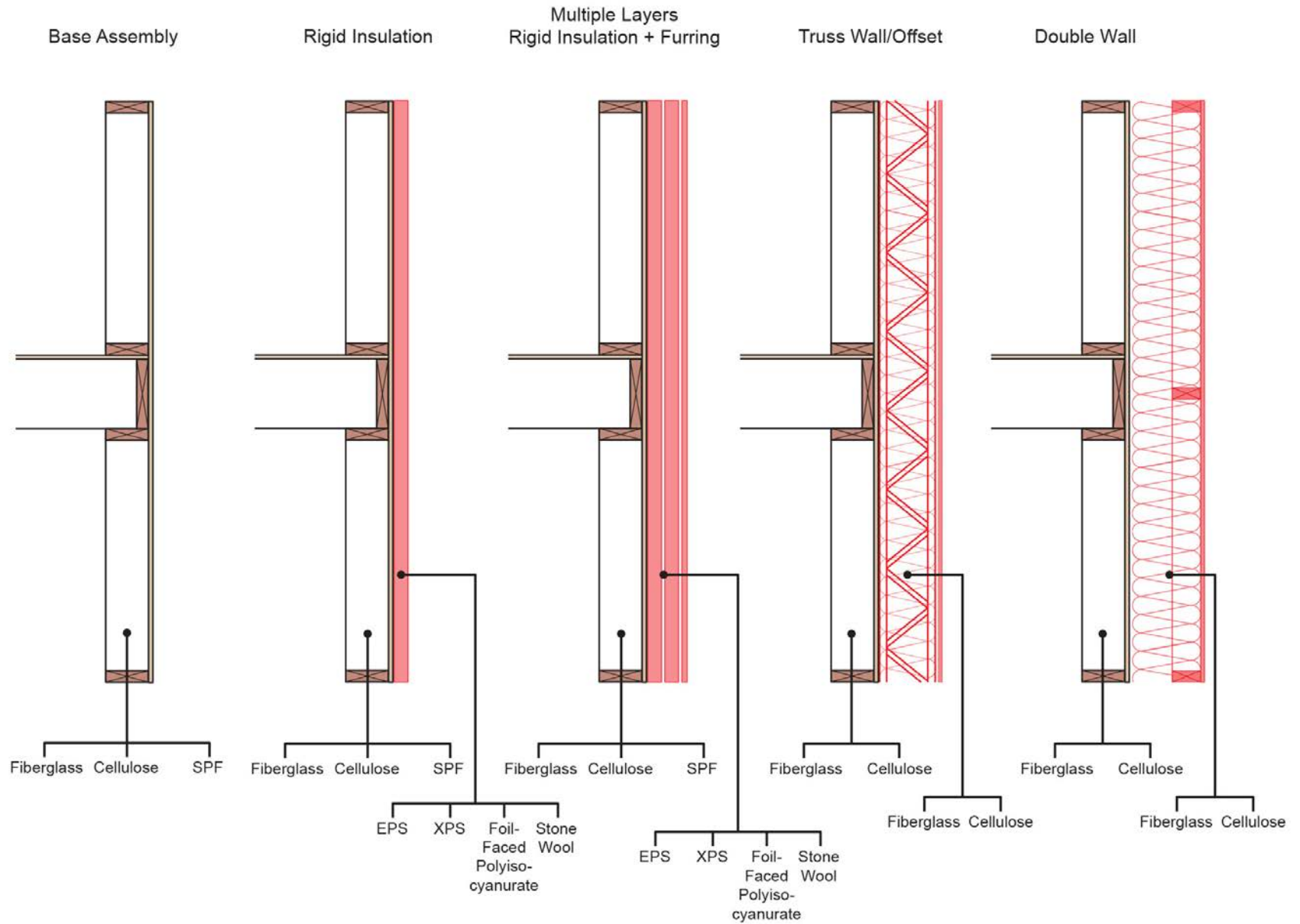


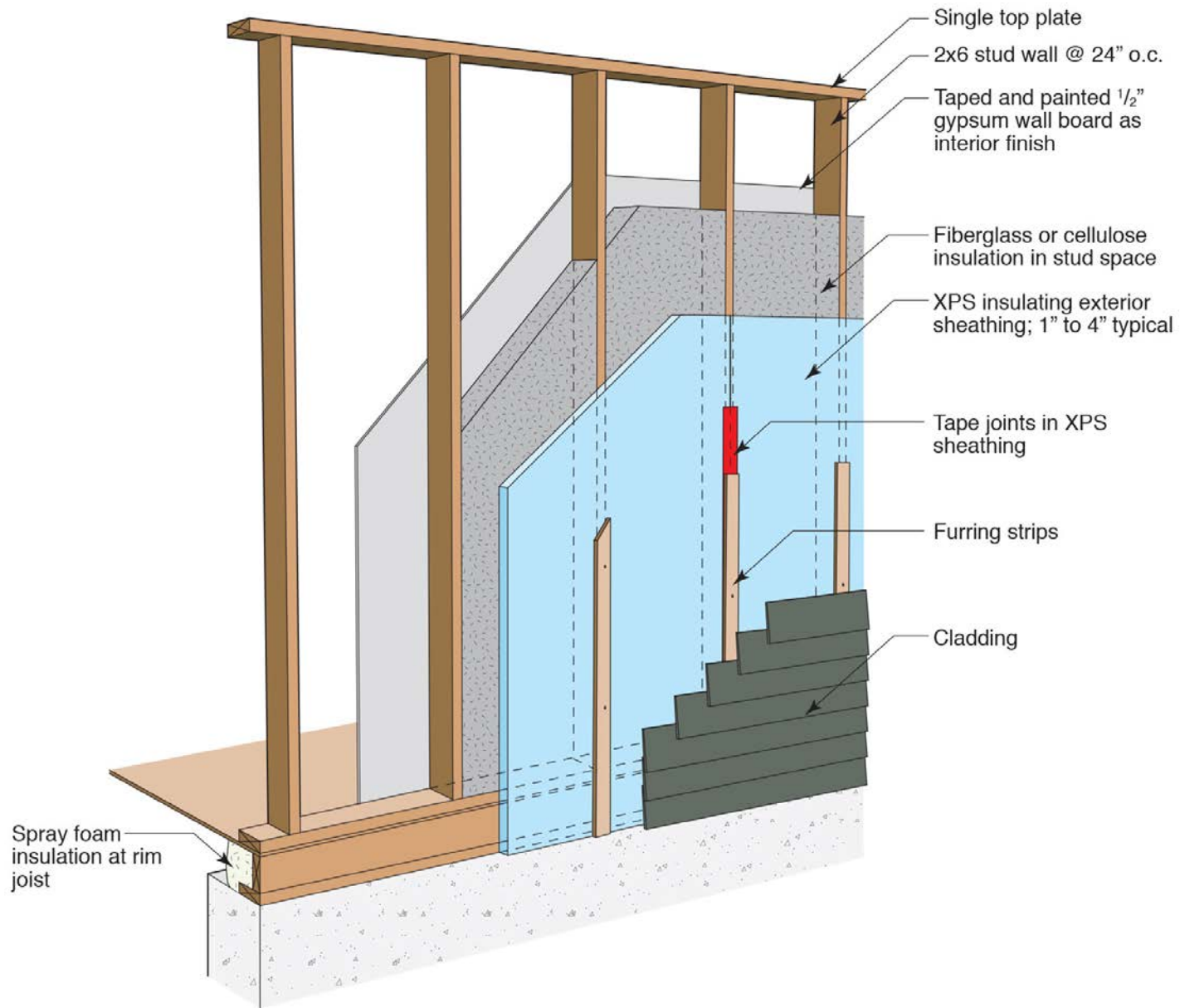


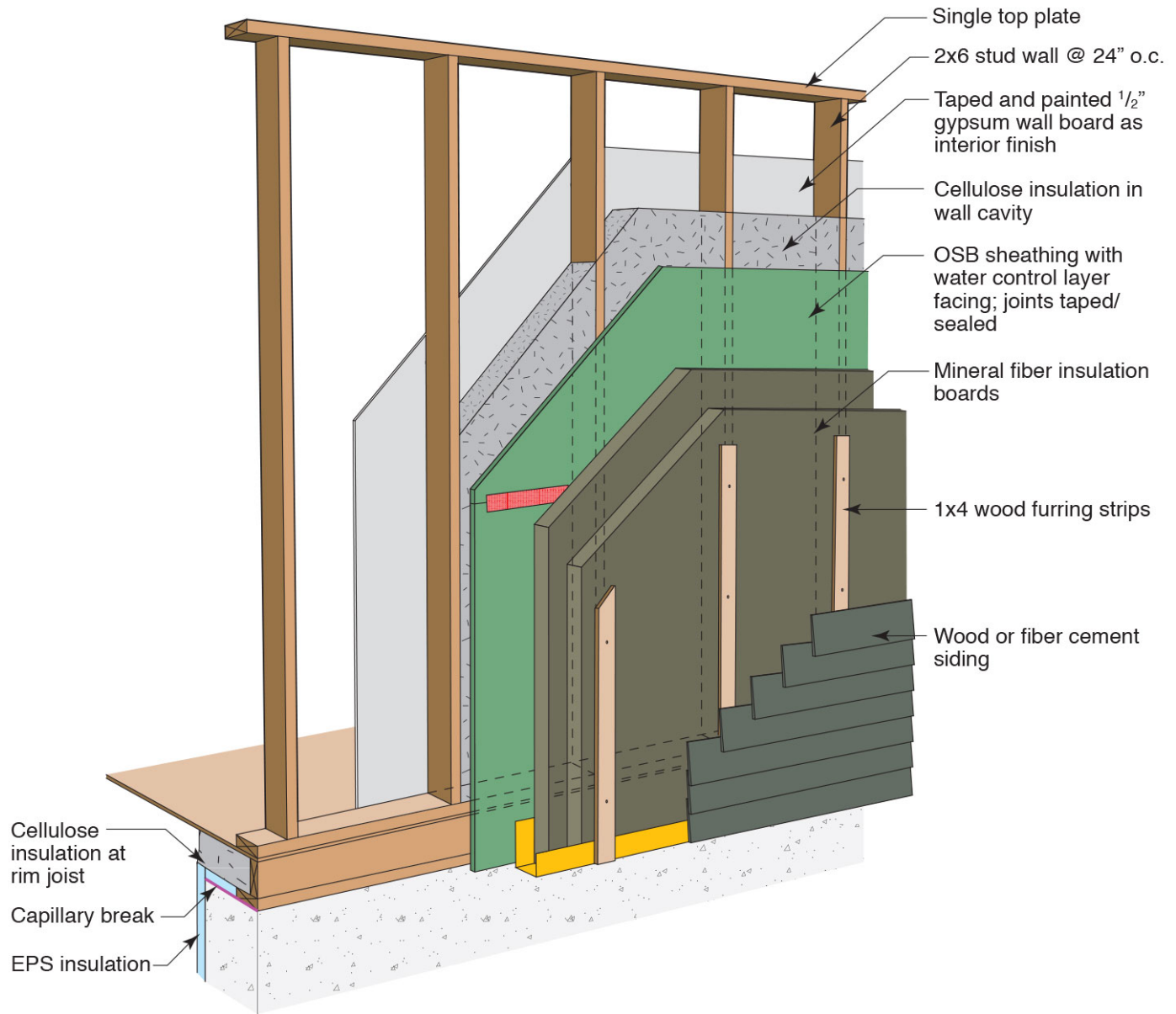
Vapor Profile

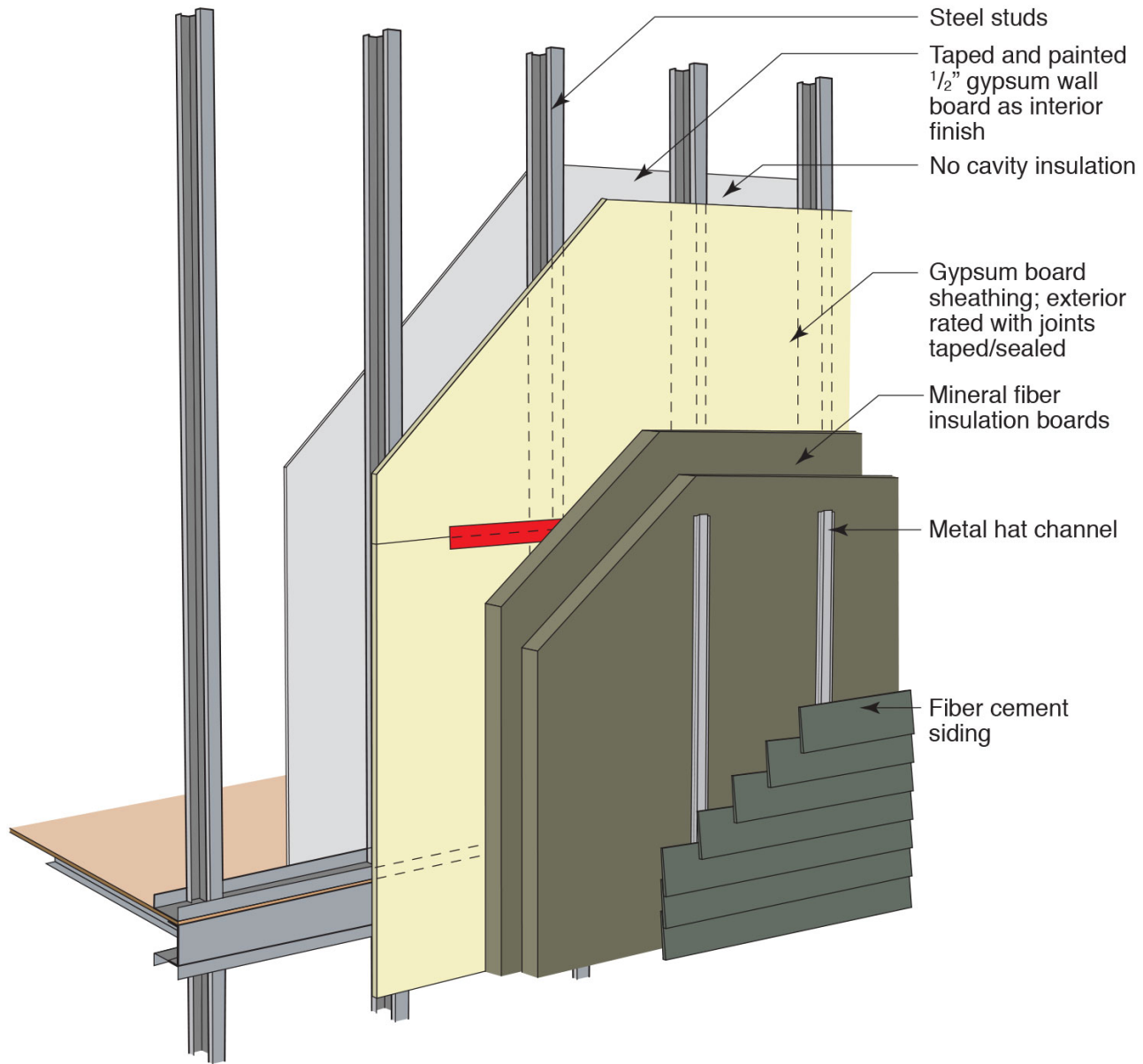


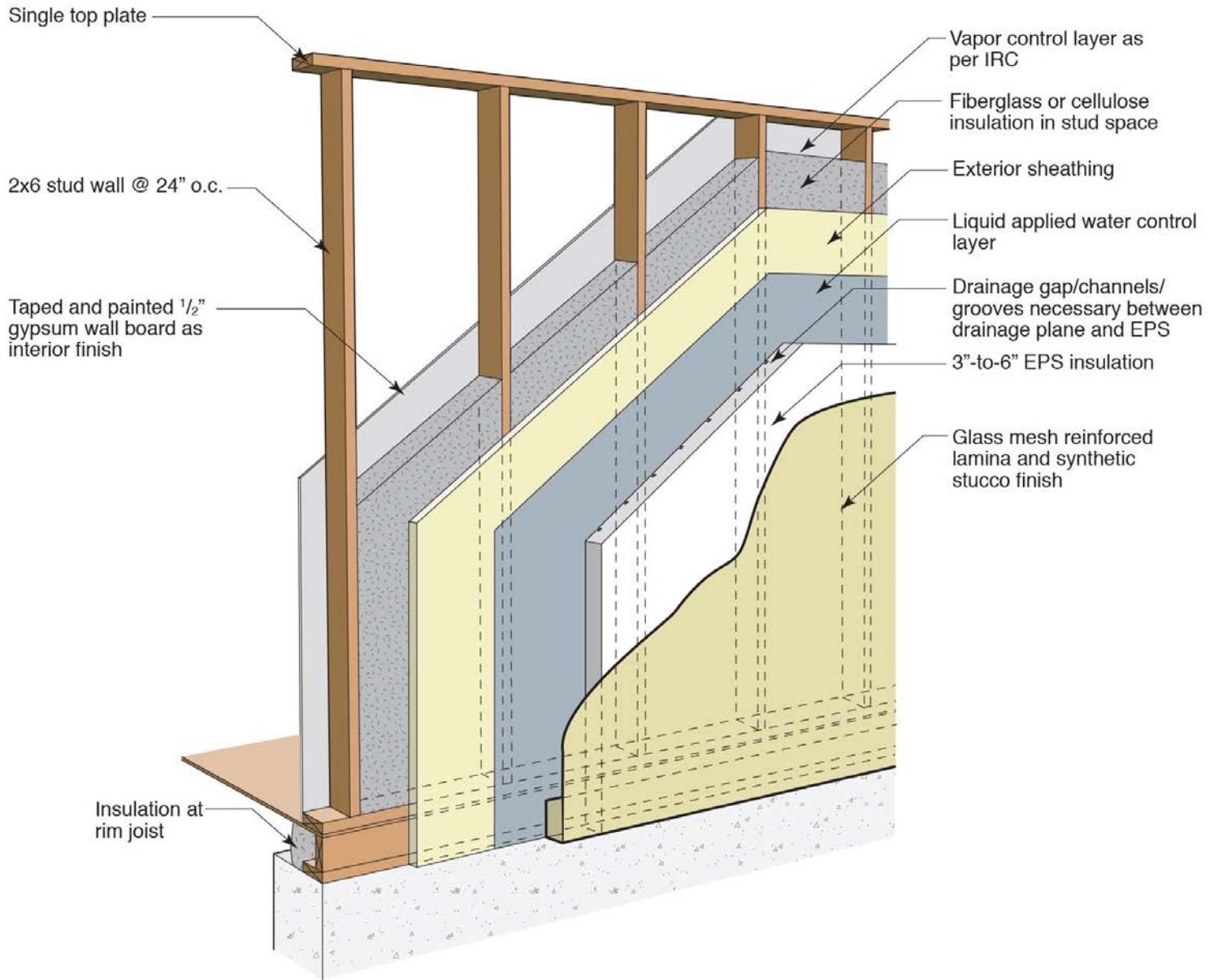


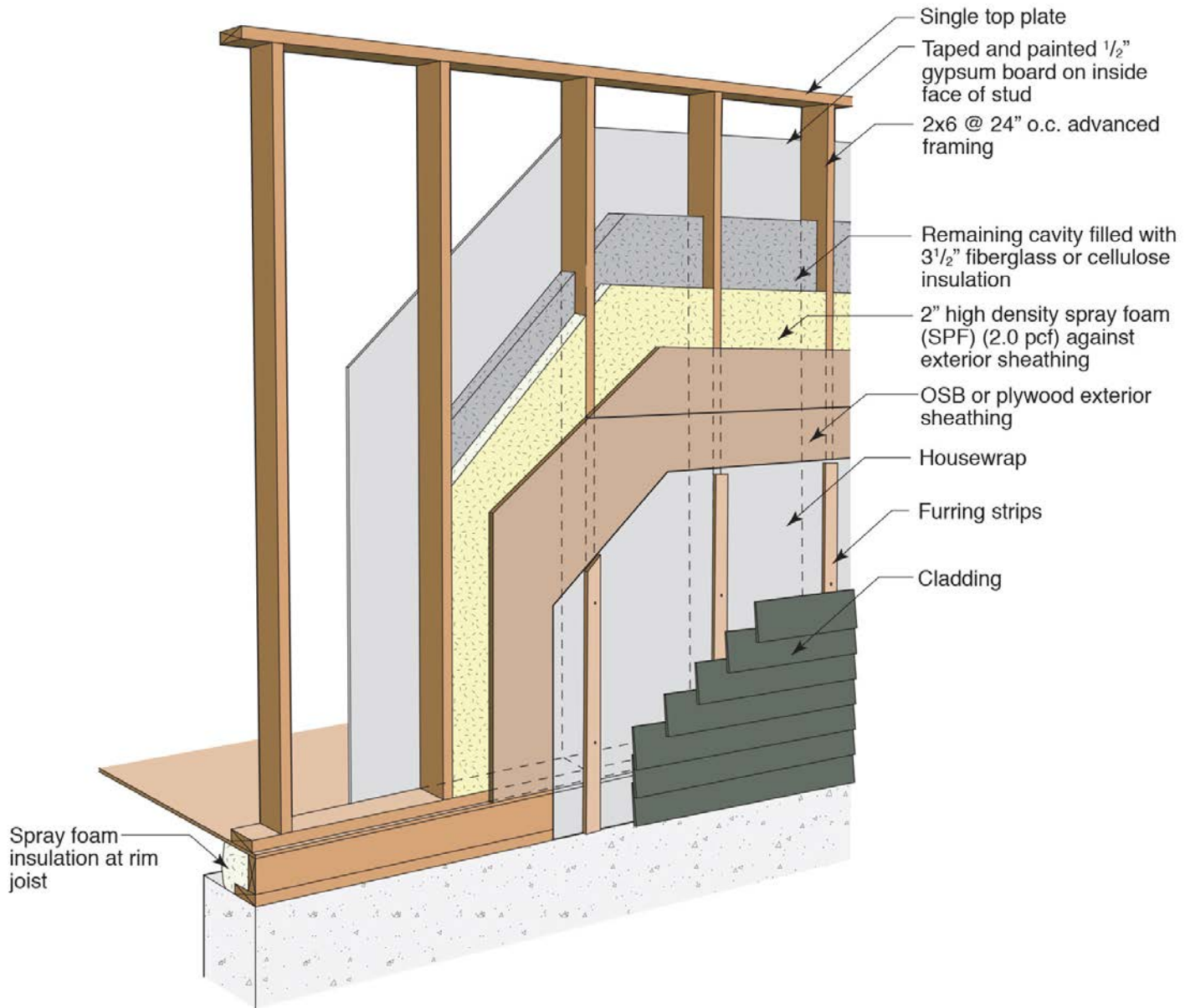


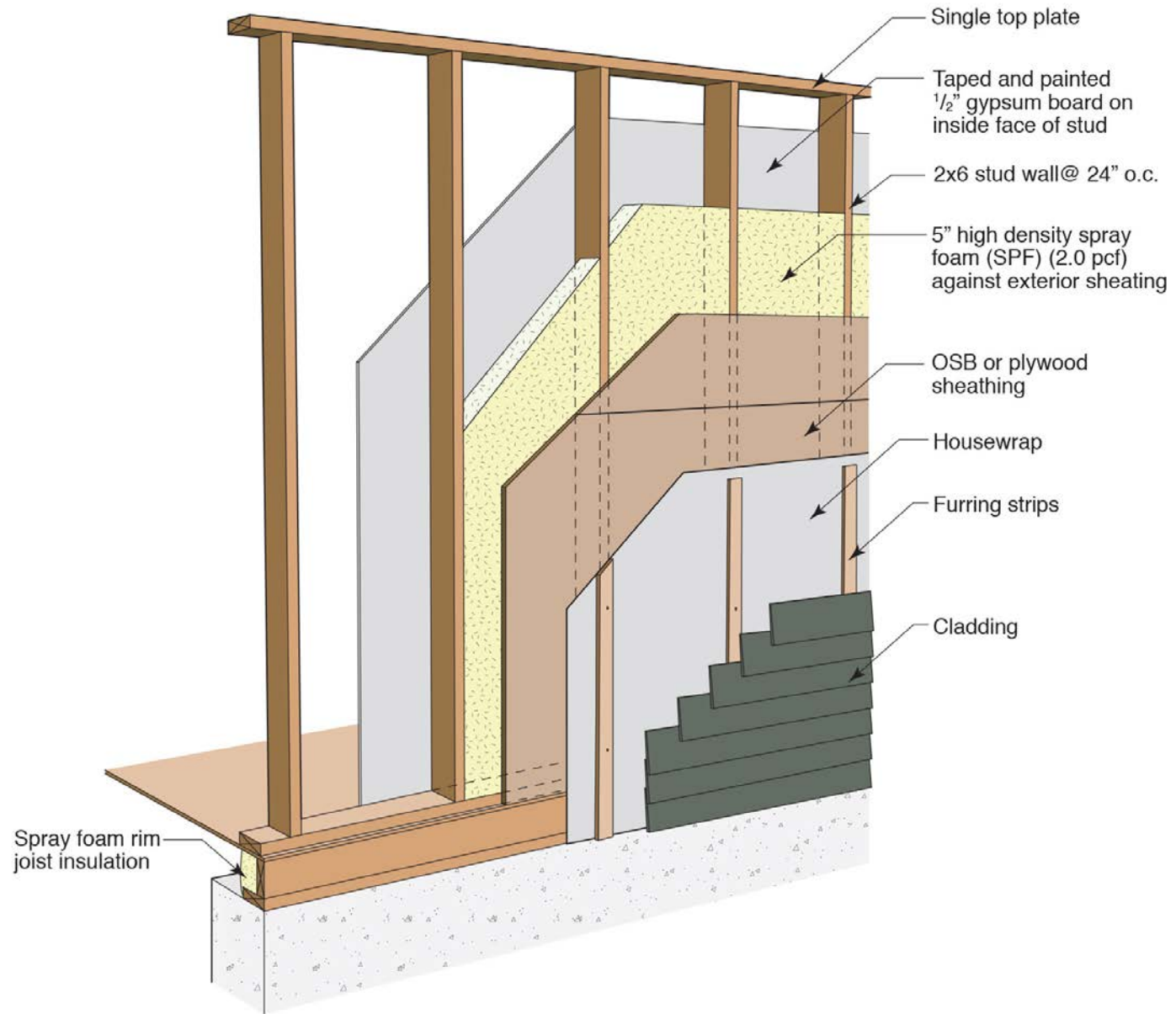


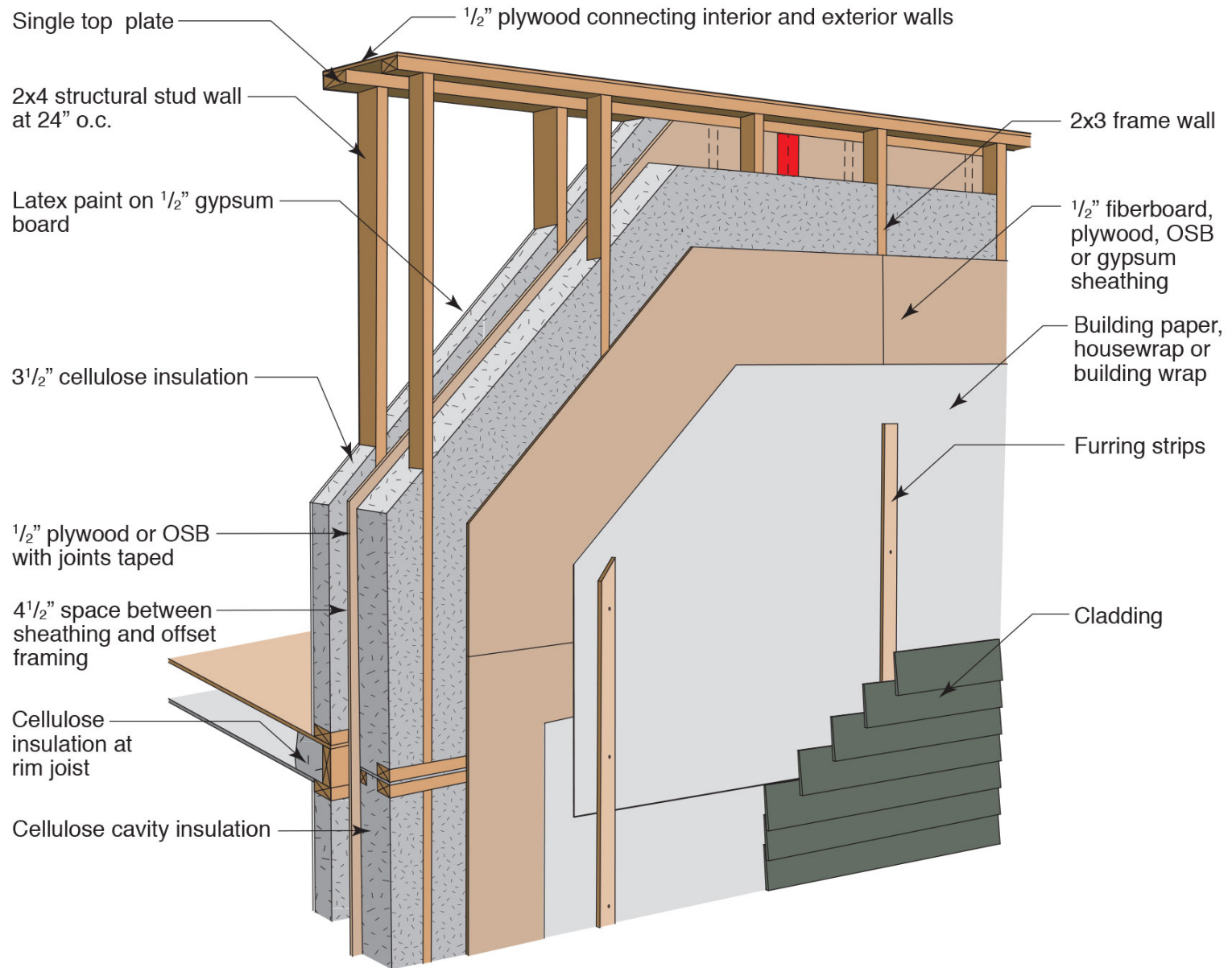


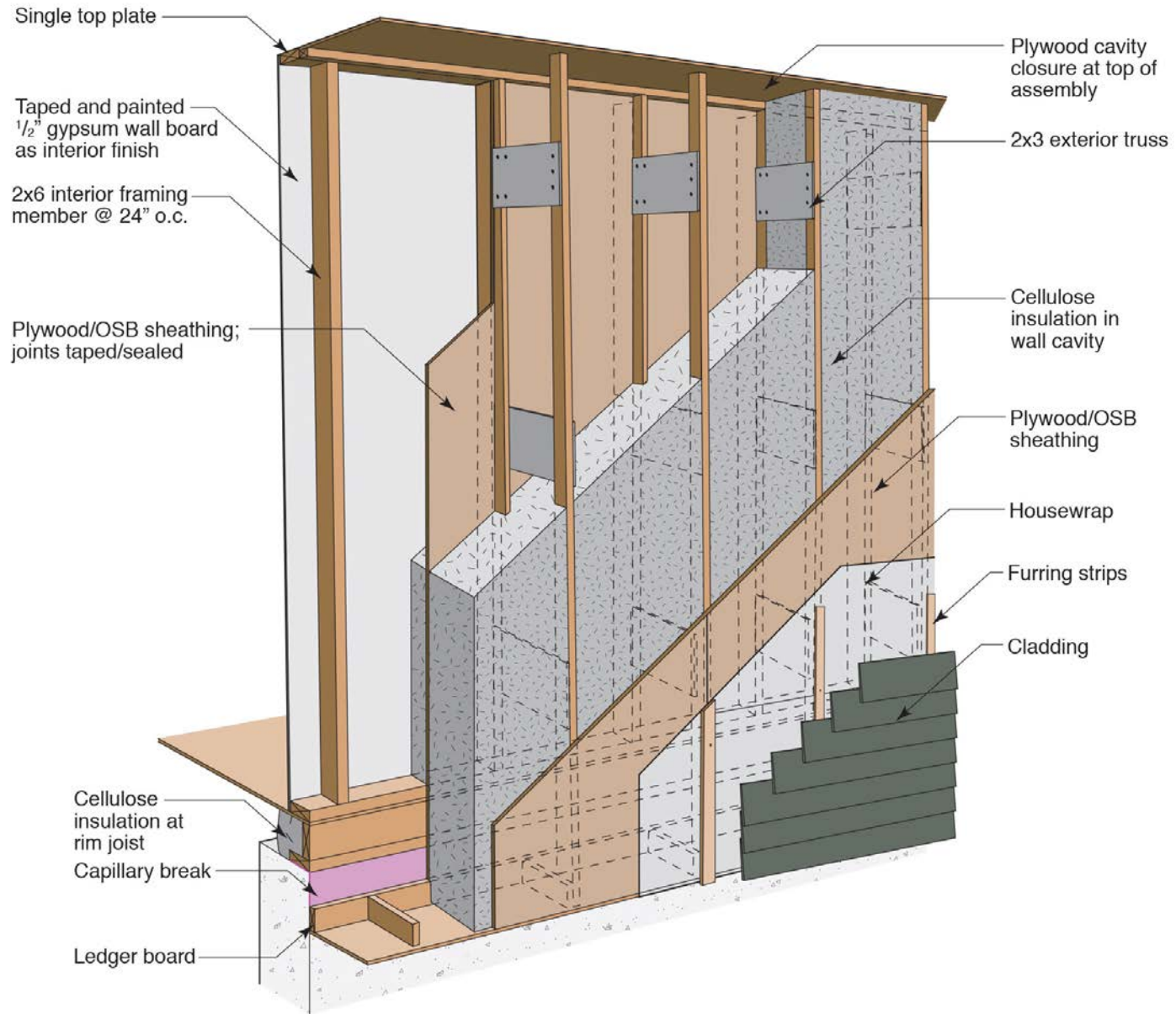


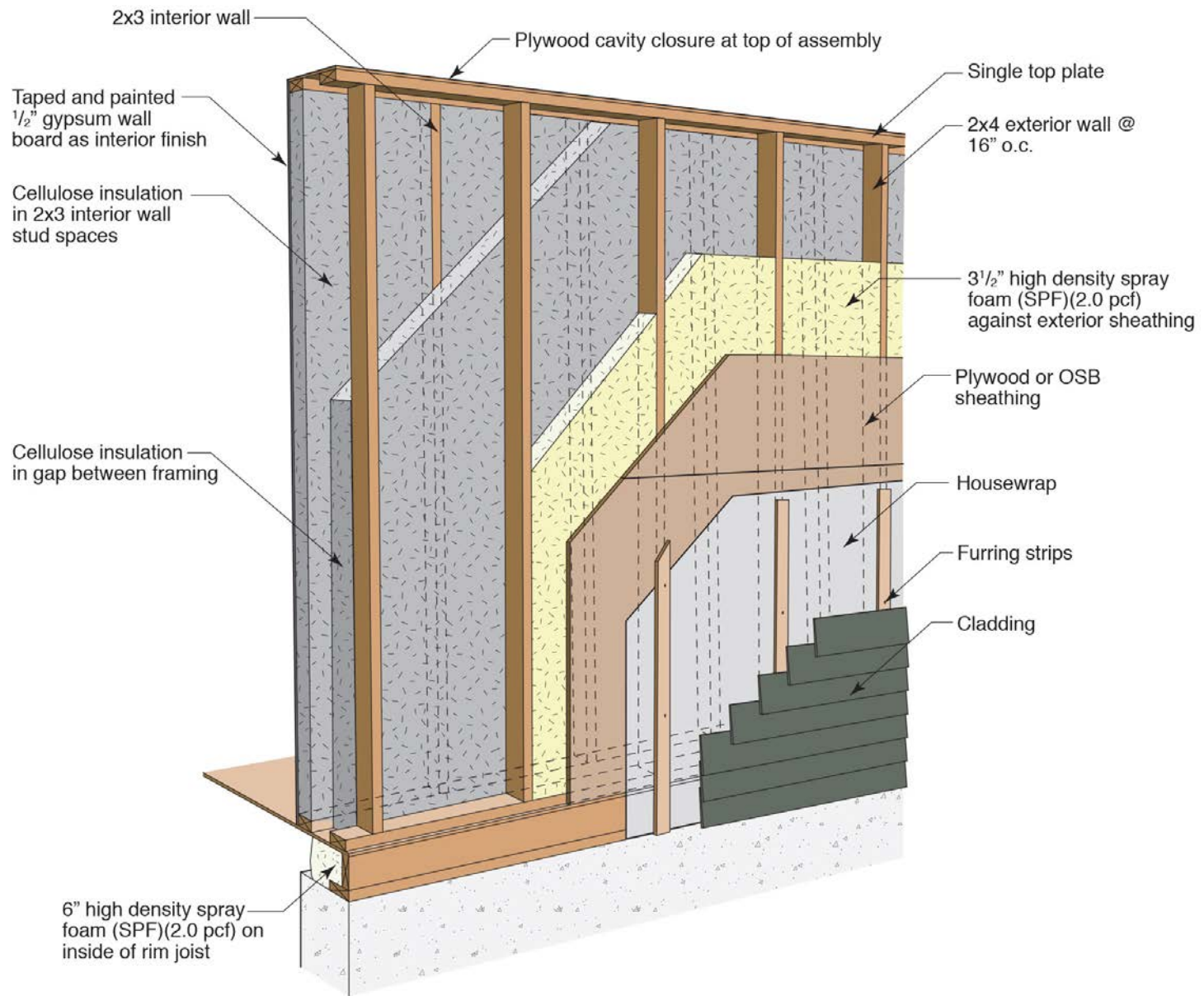


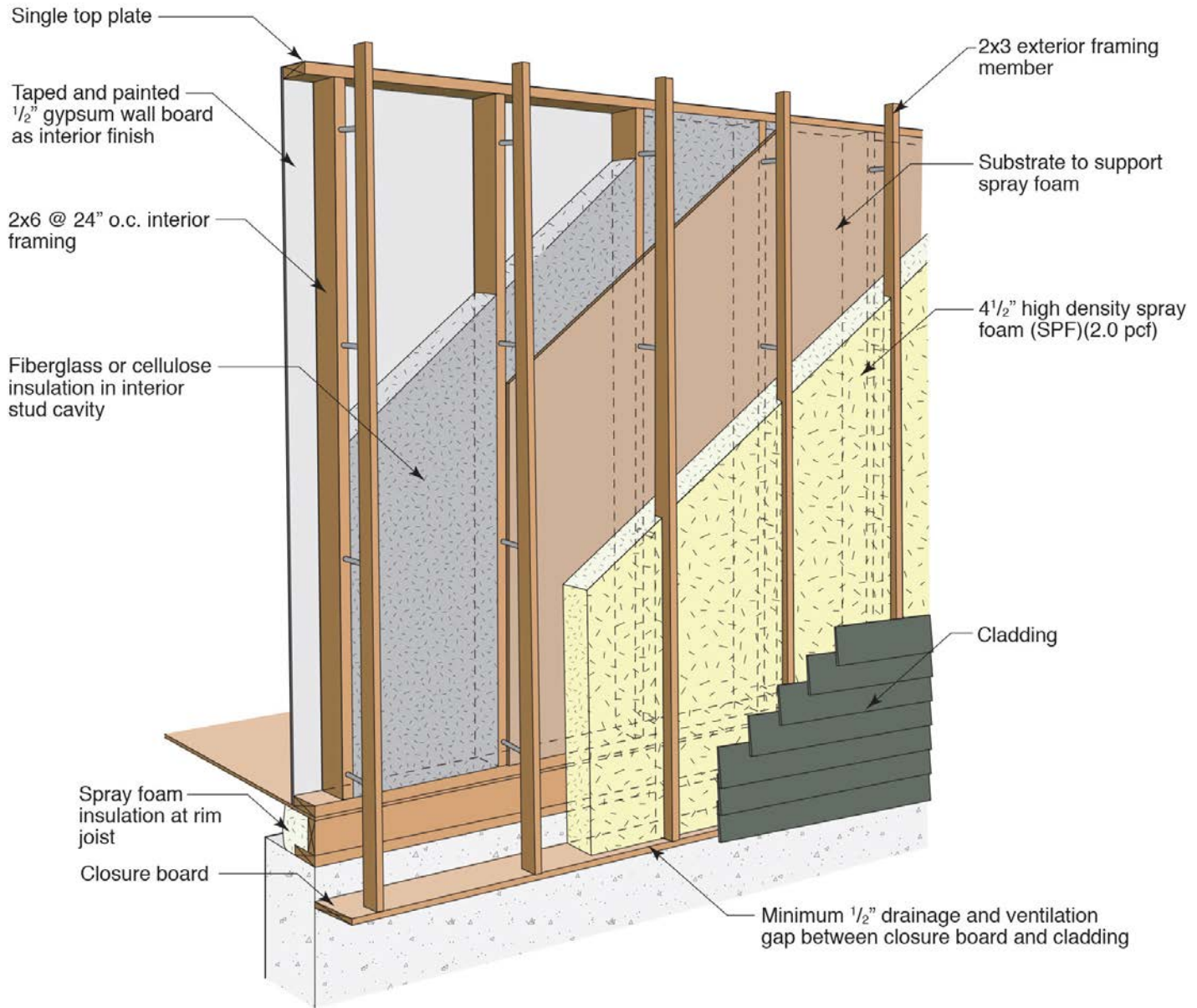


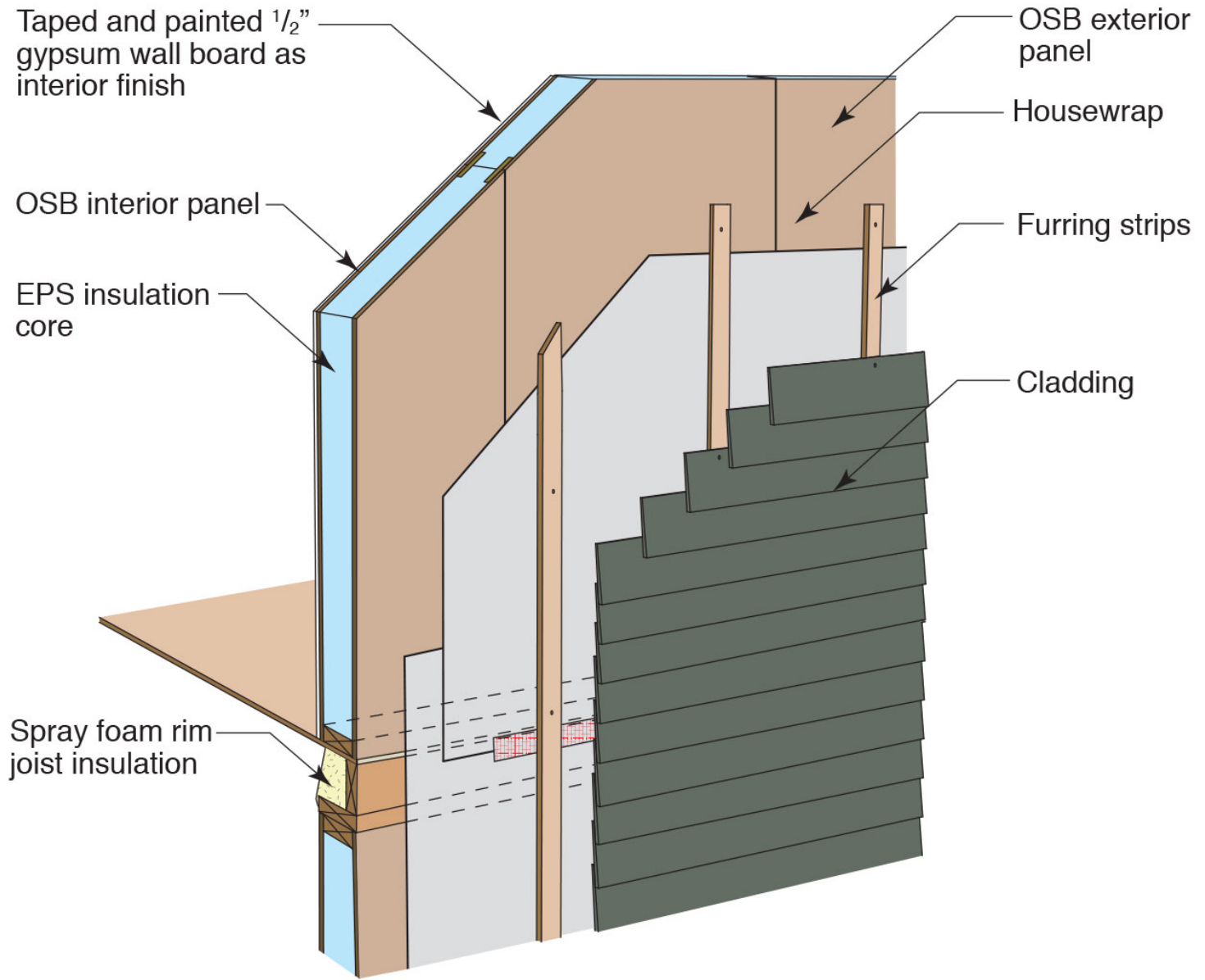








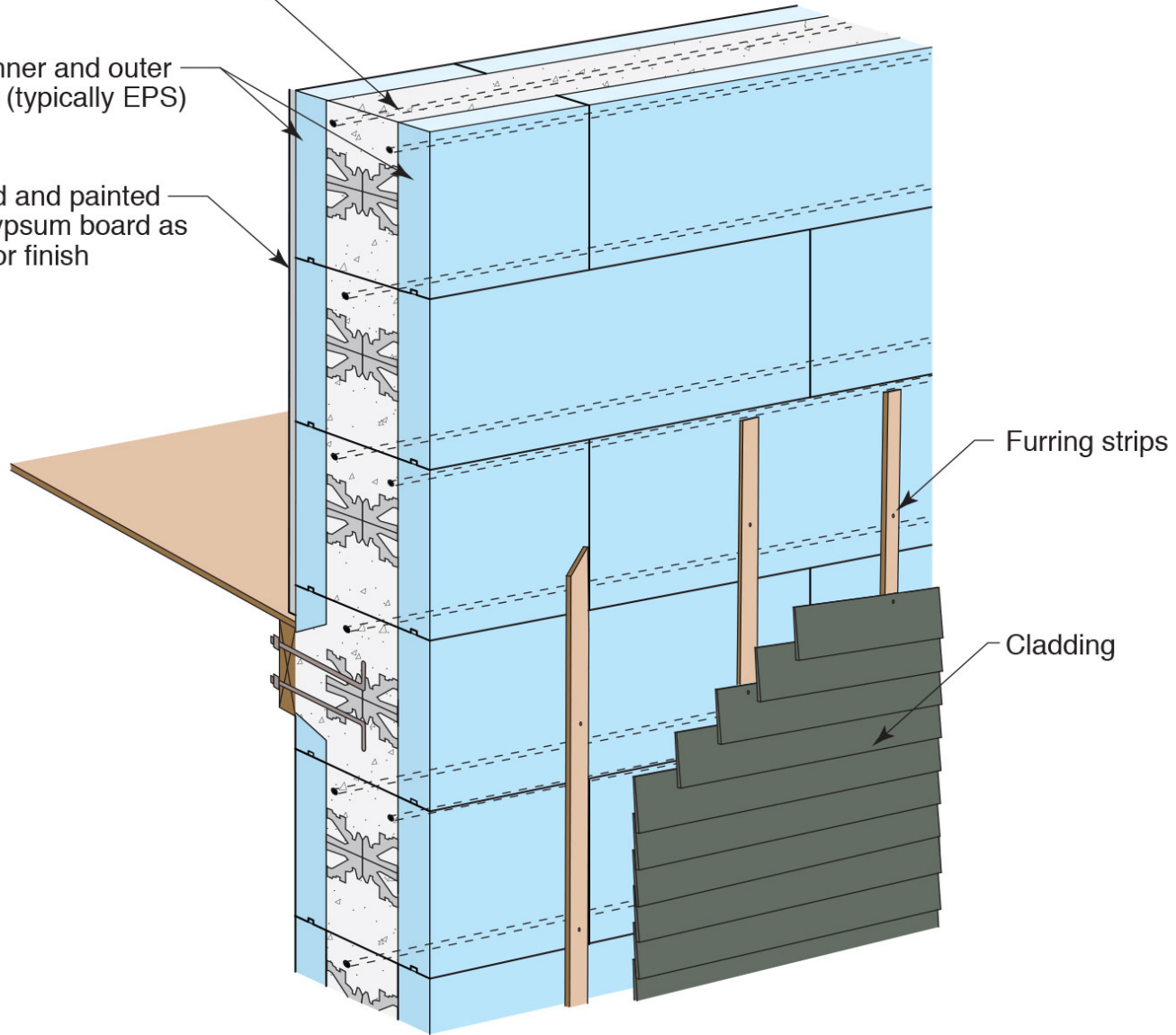




Cast-in-place concrete core

ICF inner and outer faces (typically EPS)

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



Furring strips

Cladding













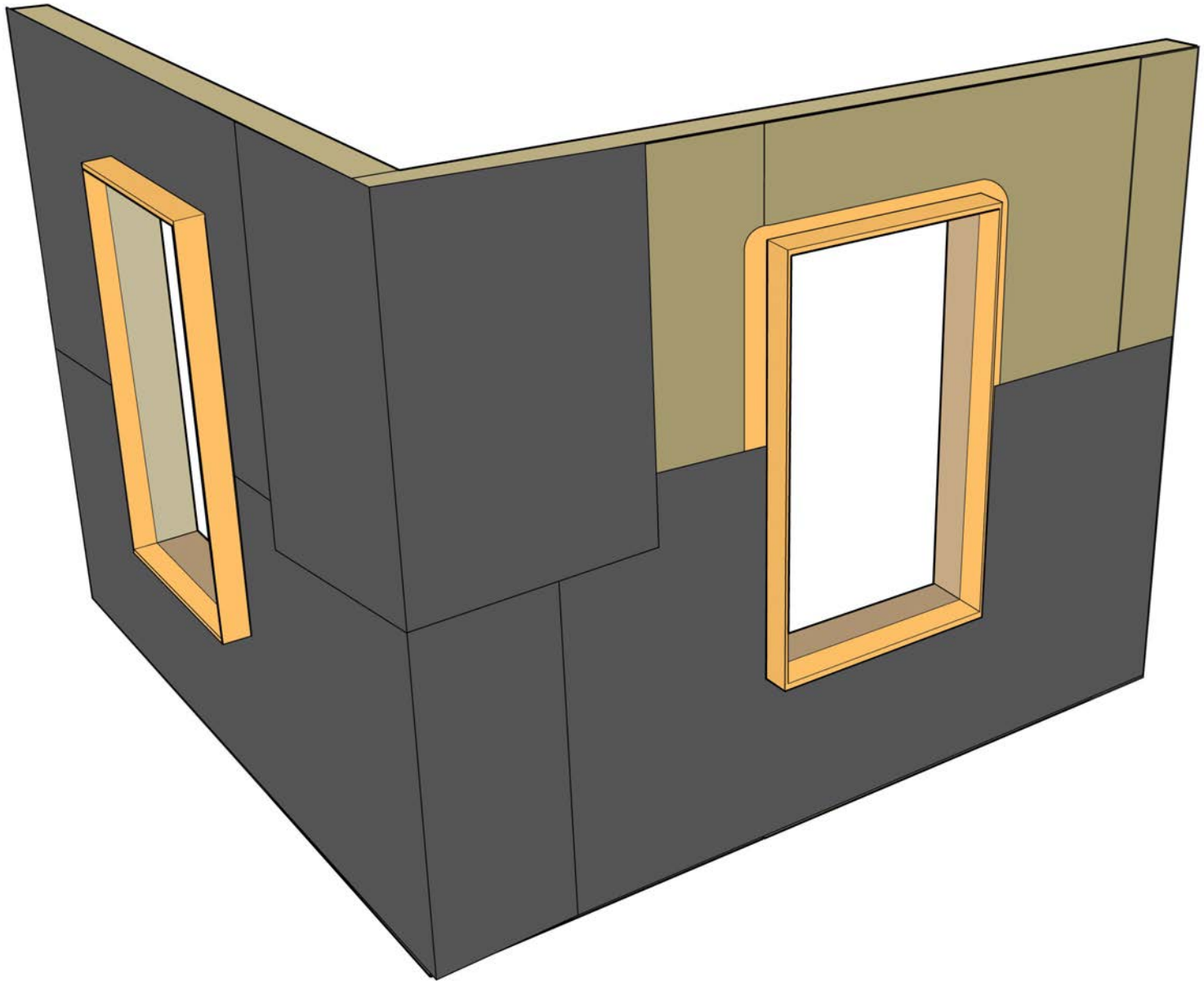


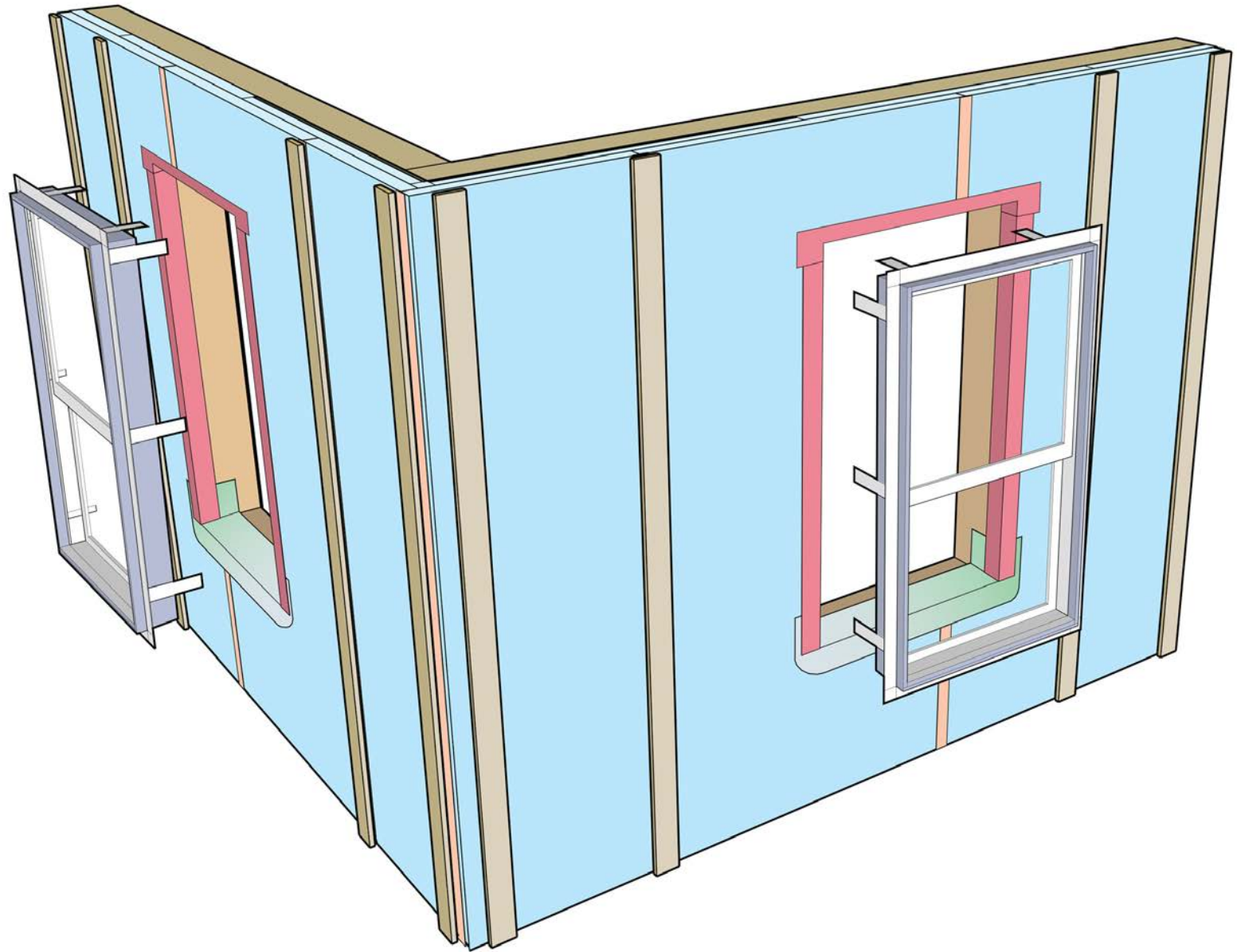


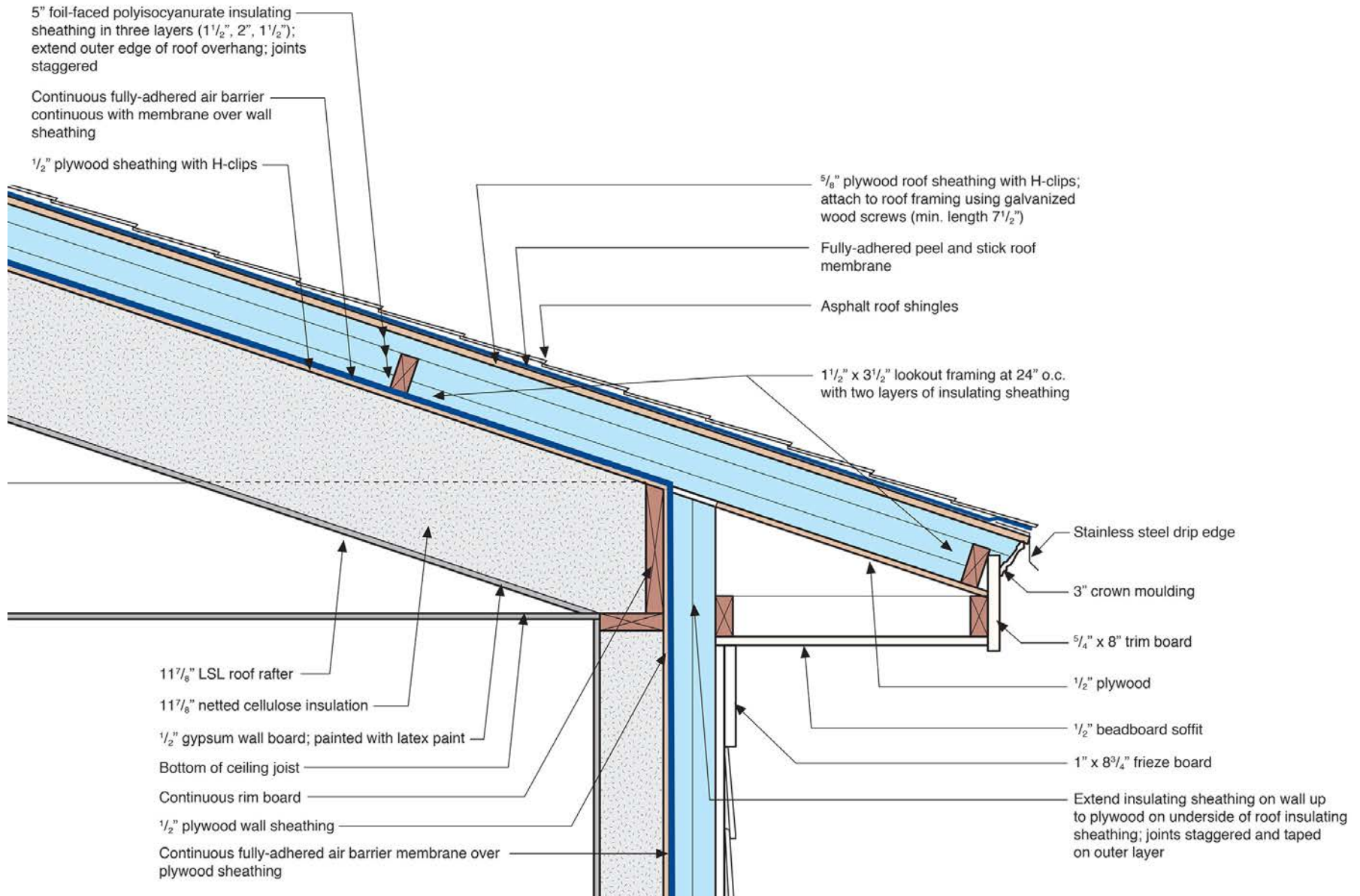


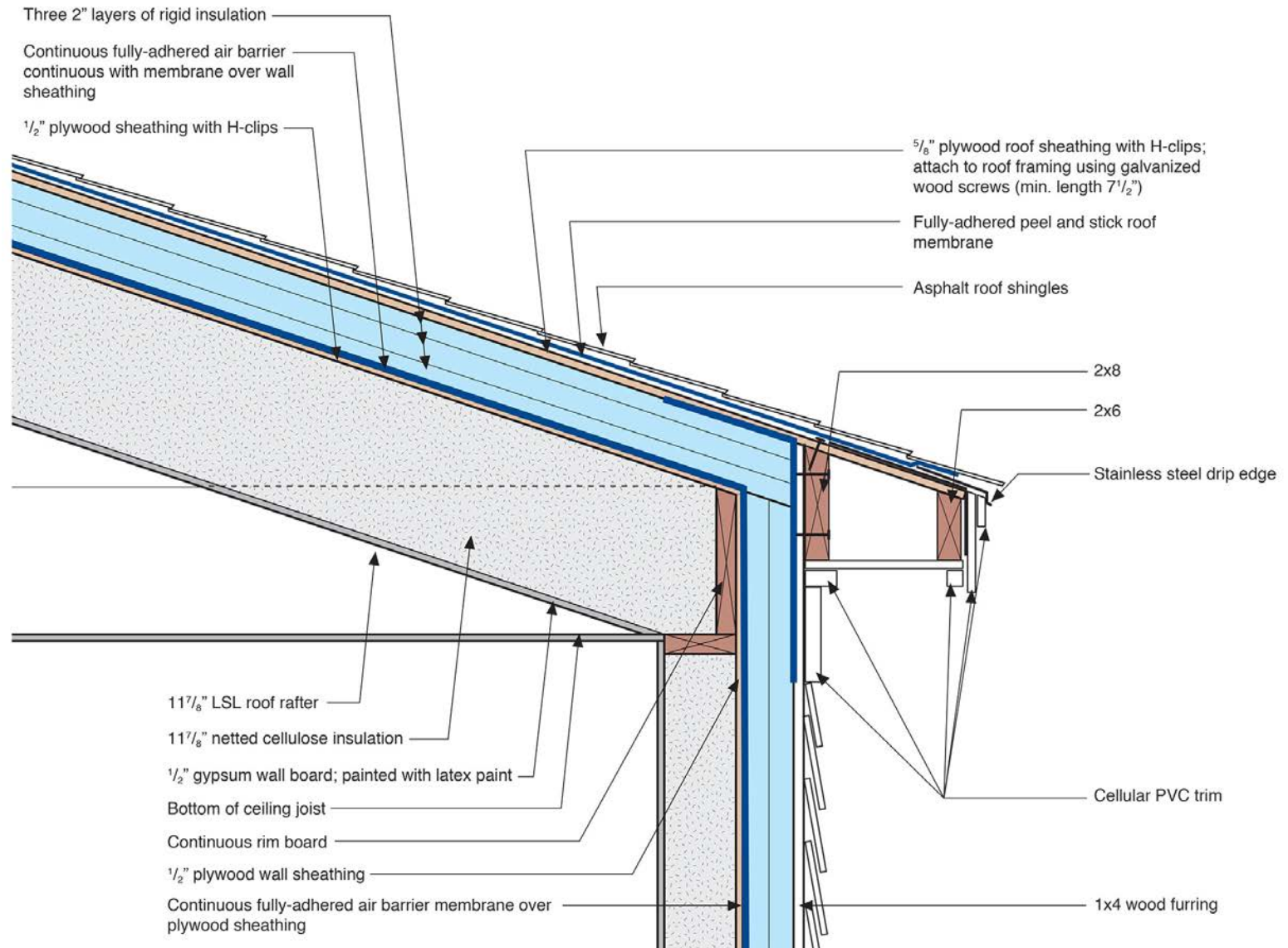


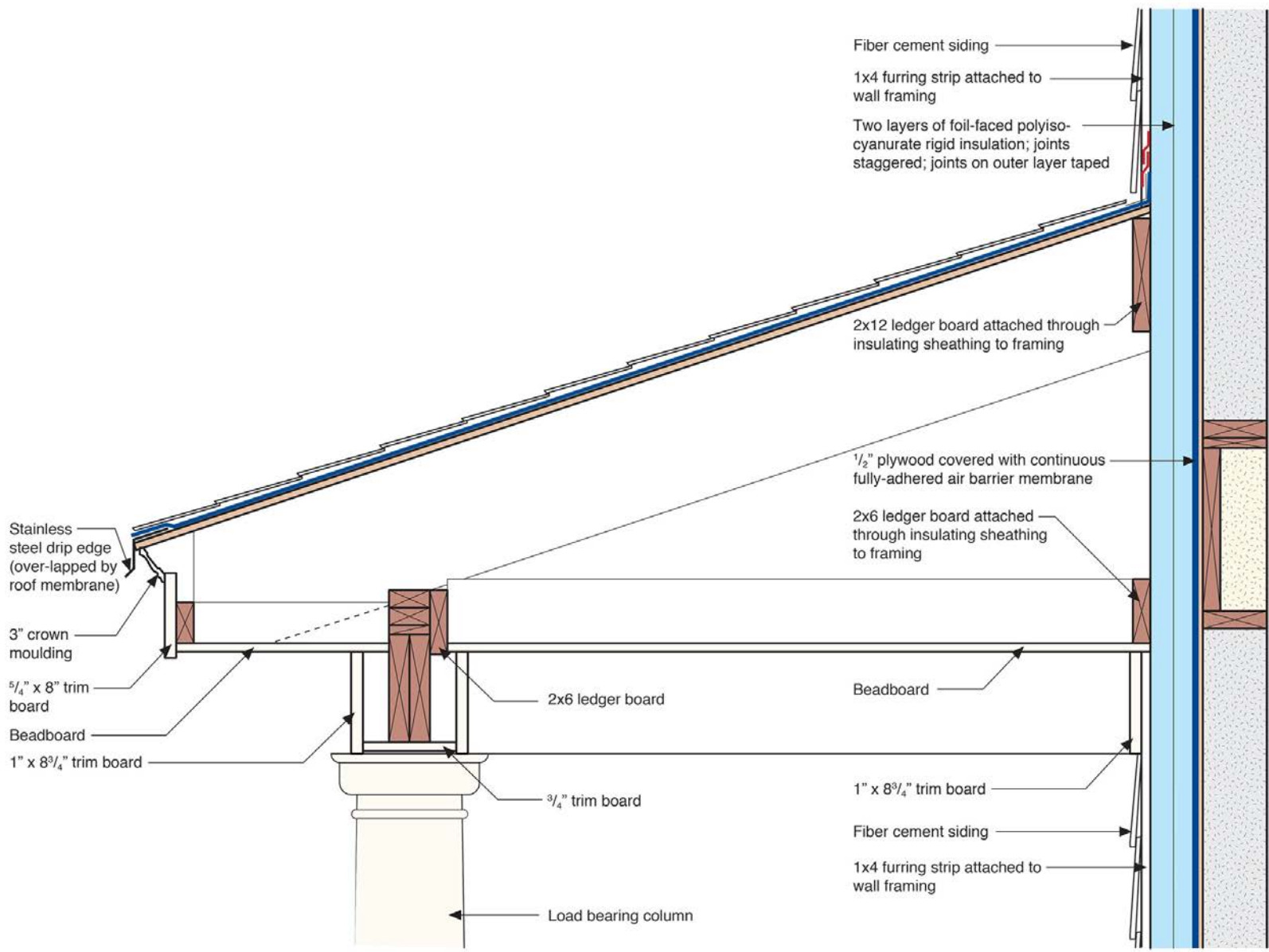


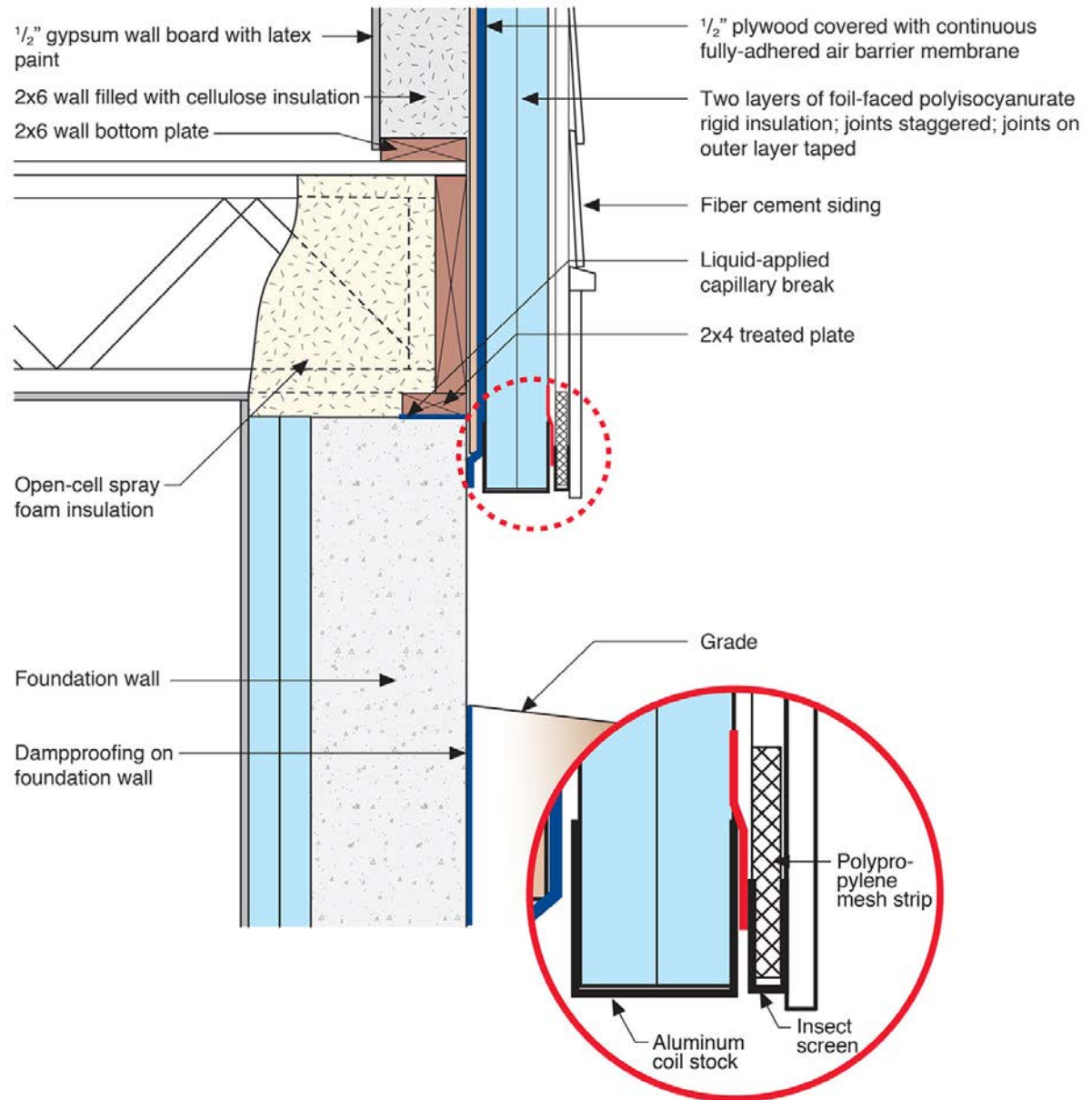


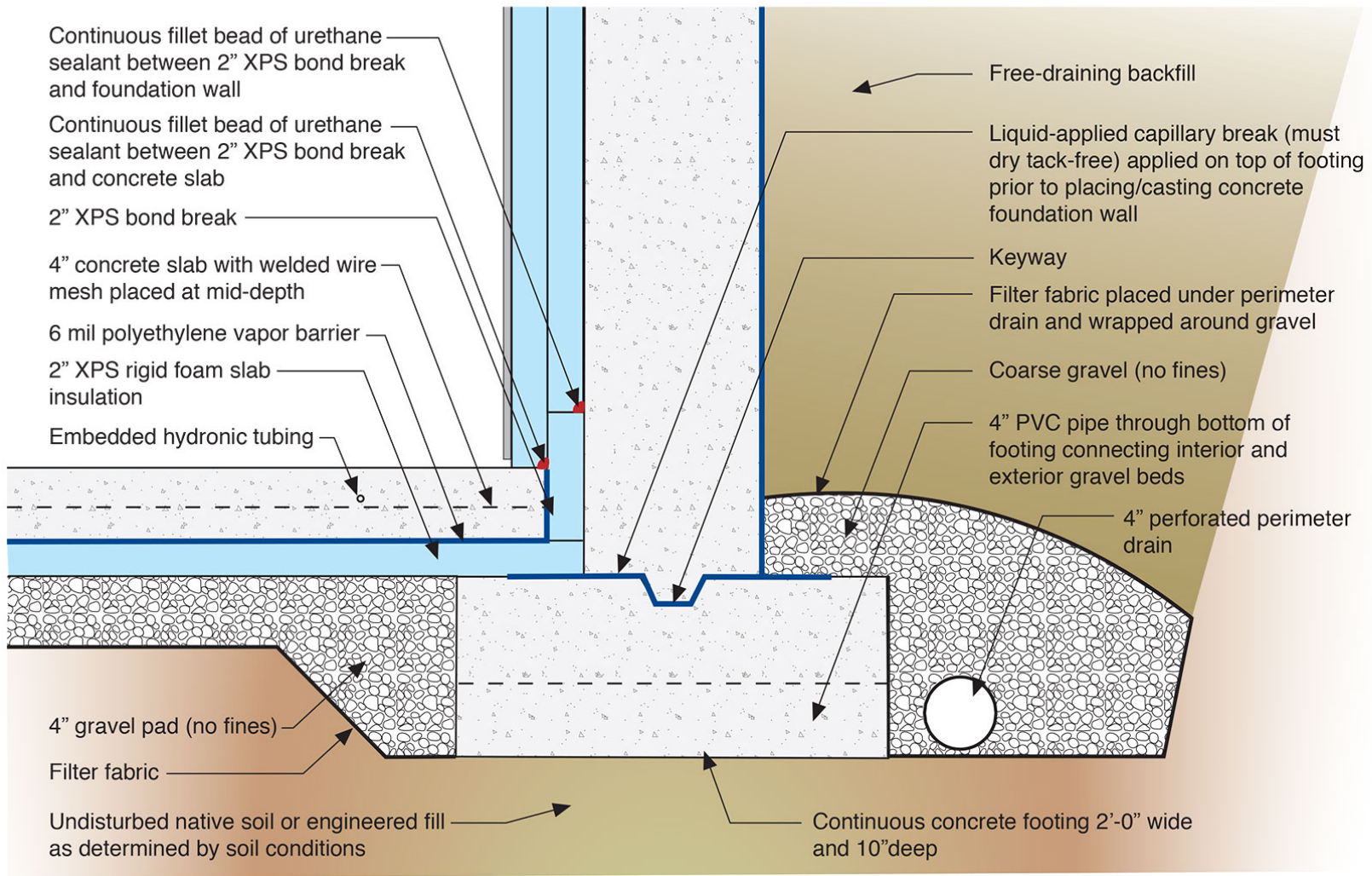




















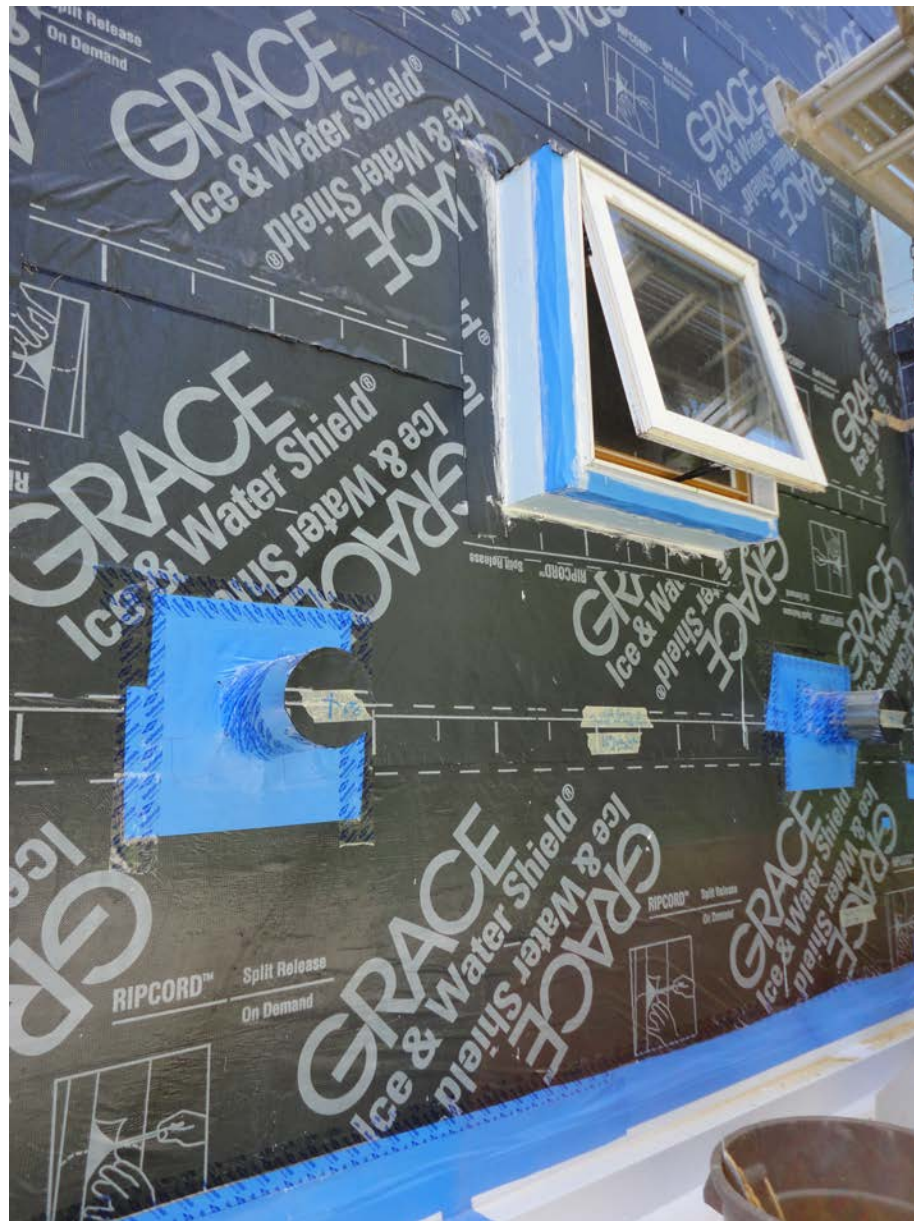












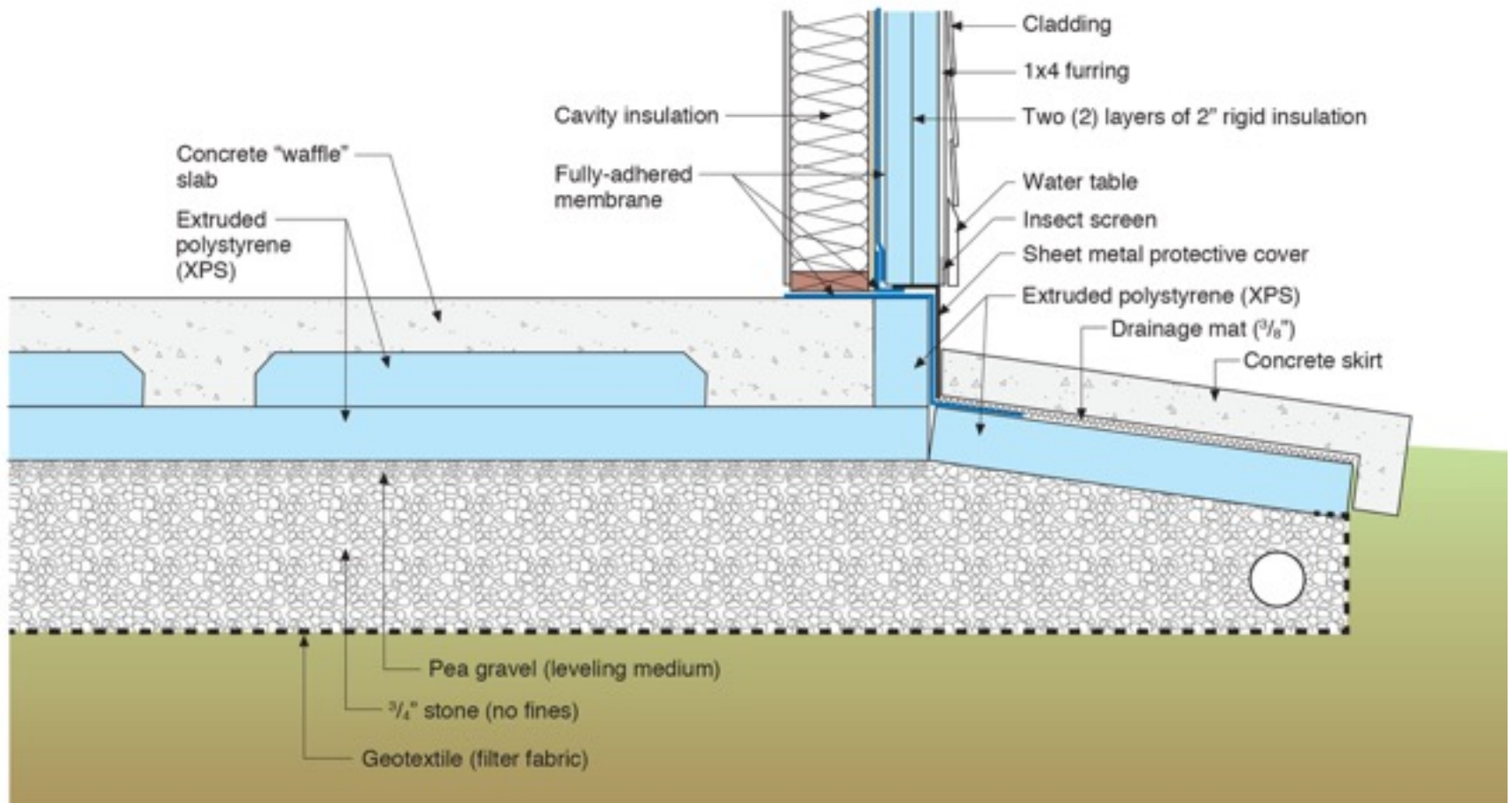


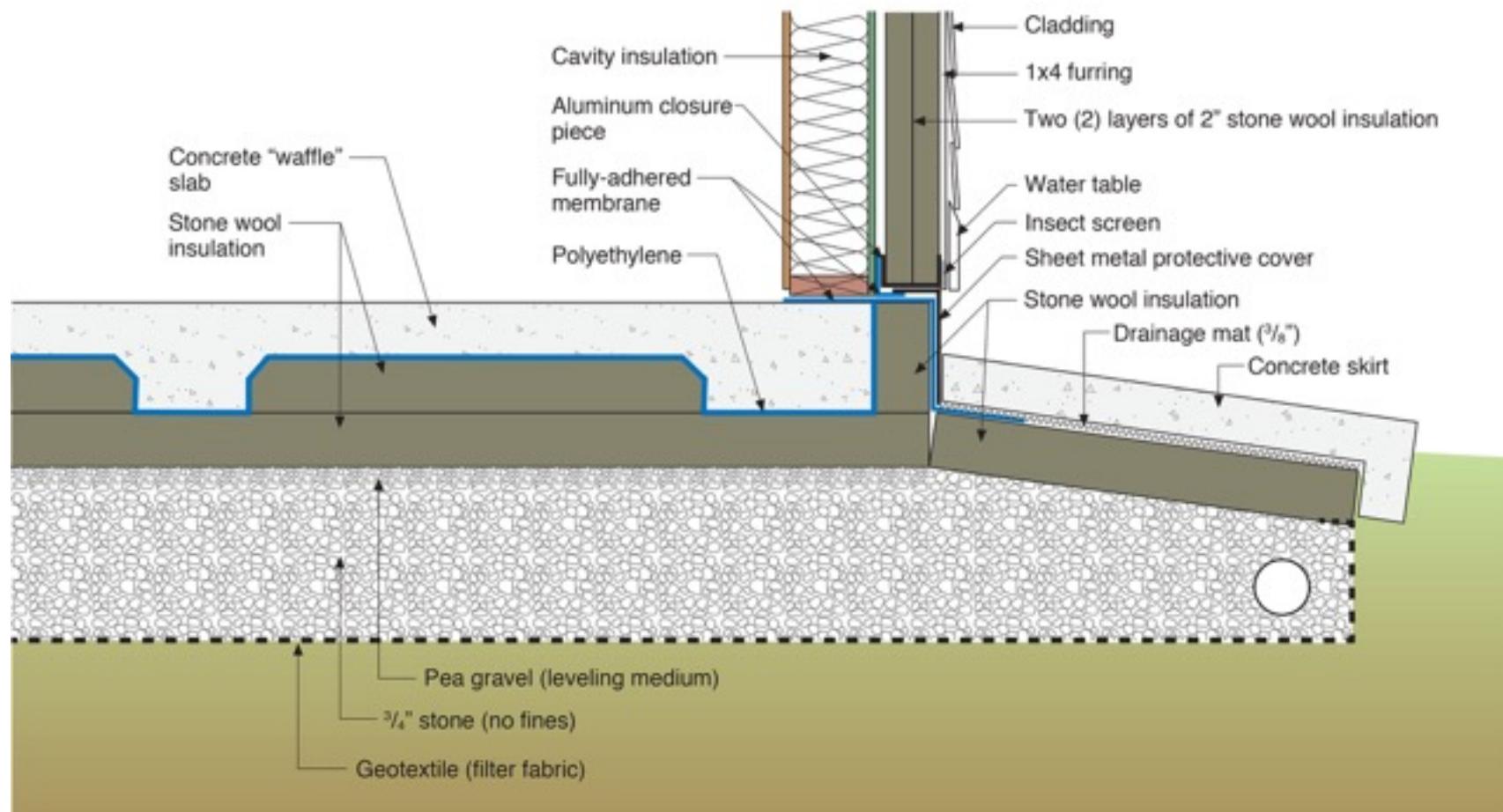


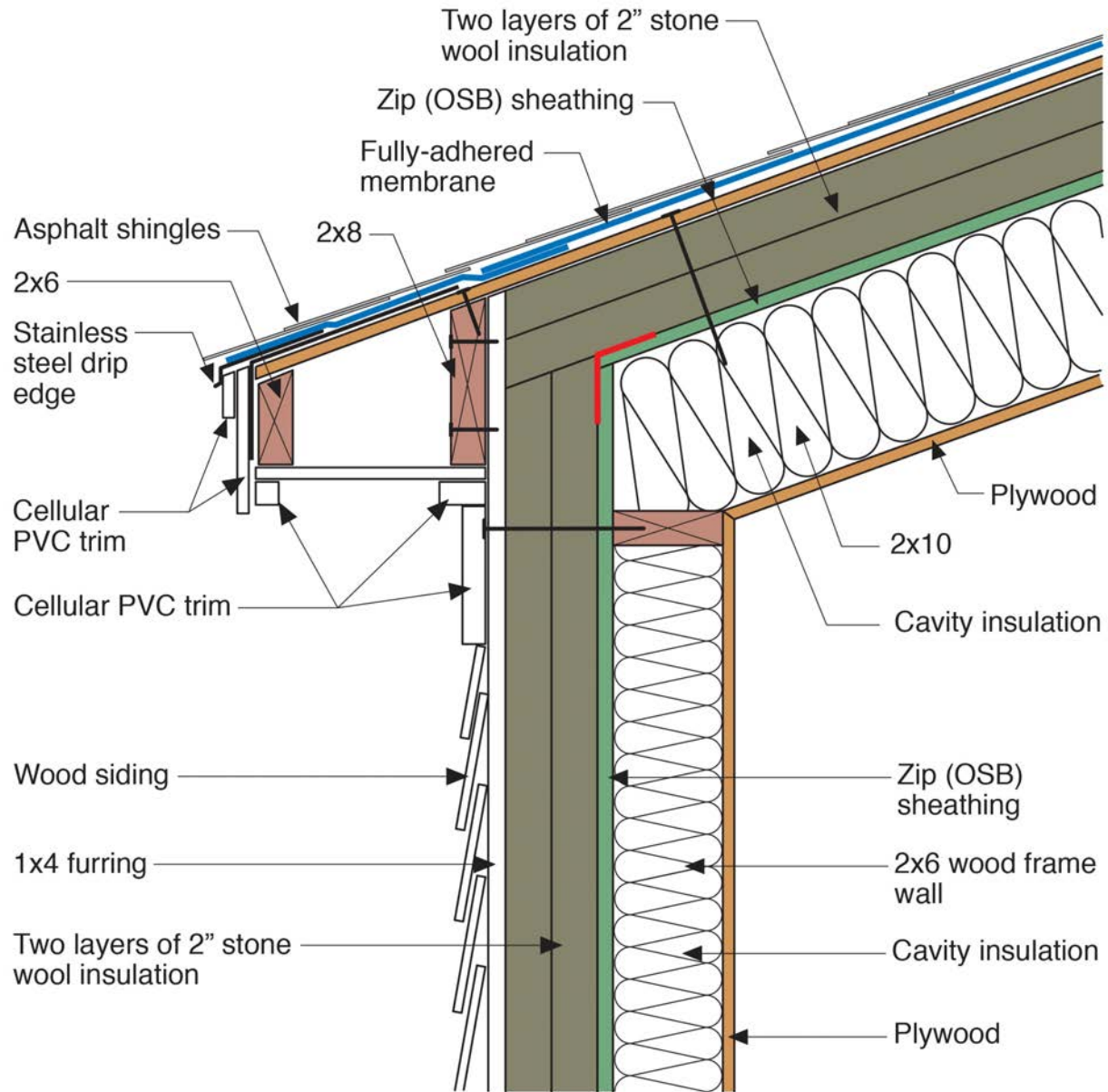


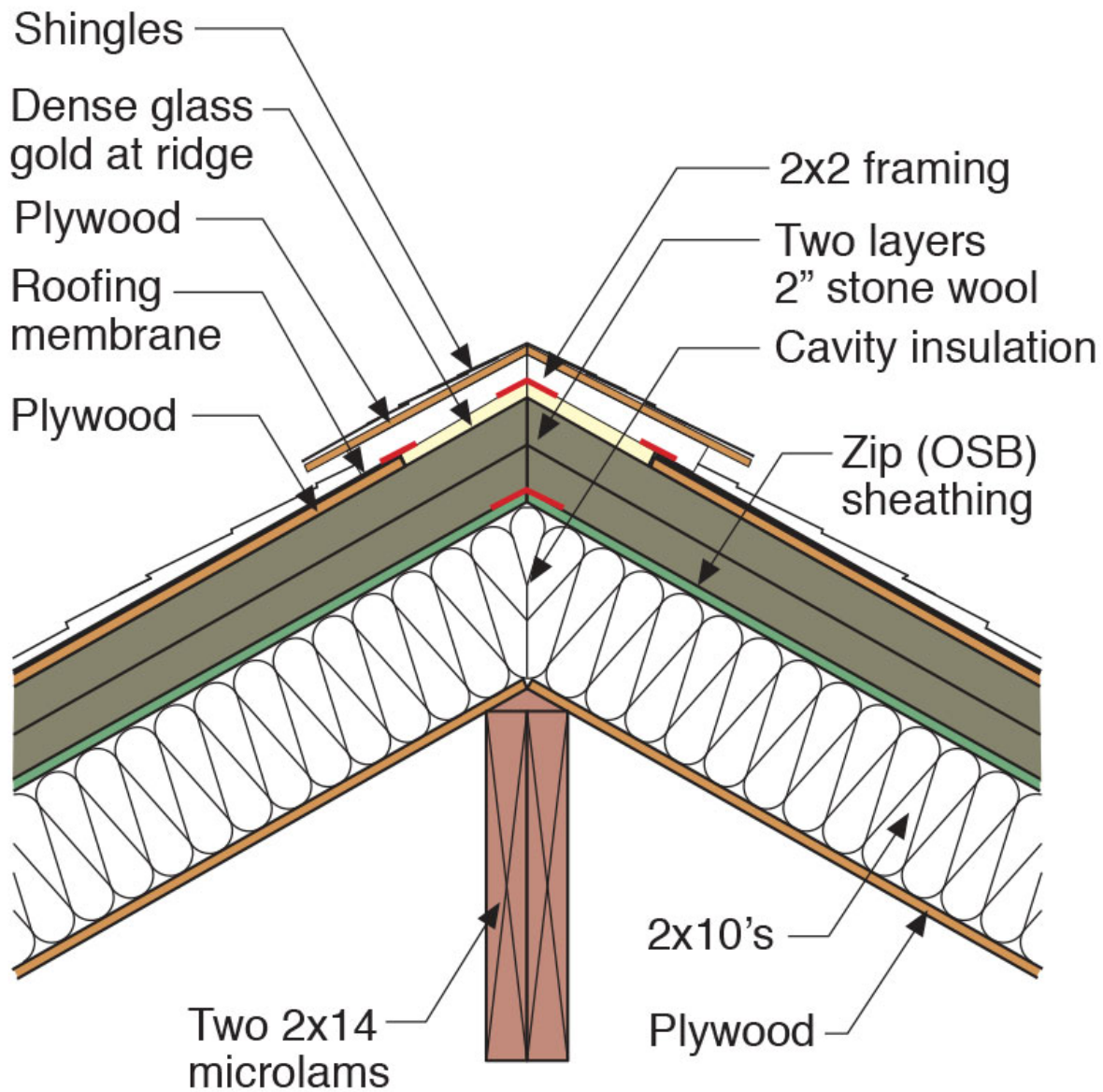


























































Mechanical Systems

Mechanical Systems

Cooling System To Make It Cold

Mechanical Systems

Cooling System To Make It Cold

Dehumidification System To Make It Dry

Mechanical Systems

Cooling System To Make It Cold

Dehumidification System To Make It Dry

Heating System To Make It Warm

Mechanical Systems

Cooling System To Make It Cold

Dehumidification System To Make It Dry

Heating System To Make It Warm

Energy Recovery System To Keep It Cold
and Dry and Warm and Comfortable

Mechanical Systems

Cooling System To Make It Cold

Dehumidification System To Make It Dry

Heating System To Make It Warm

Energy Recovery System To Keep It Cold
and Dry and Warm and Comfortable

Distribution System To Make It Uniform

Mechanical Systems

Cooling System To Make It Cold

Dehumidification System To Make It Dry

Heating System To Make It Warm

Energy Recovery System To Keep It Cold
and Dry and Warm and Comfortable

Distribution System To Make It Uniform

Range Hoods Are A Special Kind of Hell

Don't Try to Combine Them.....

