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Building Science

The Perfect Wall....

www.buildingscience.com

The “Perfect Wall”evolves to...
The “Perfect Building”

Big Picture....Really Big Picture

Don't Kill People

Don't Make Them Sick

Don't Kill The Building

Don't Make The Building Sick

There is even more....it is getting
complicated because of...wait for it...

Durability, Sustainability and Resiliency

Buildings that last a long time...that are
energy efficient....are “green”...”carbon
sequestering”

They are durable, sustainable and resilient..
and...wait for it...don't make people sick..

“Long time” means a seriously long time

“Energy efficient” means seriously energy
efficient

There is even more....

New buildings are easy...
Existing buildings are hard...

Making existing buildings last a long time
making them more durable and energy
efficient is very “carbon sequestering” and
“green”

Don't Do Stupid Things

First Order...

Fire

Structure

Wind

Flood

Contaminants

Second Order

Materials

Energy

Damage Functions

Water

Heat

Ultra-violet Radiation

Evolution of the Codes

Fire first...Structure second...Energy third...

IAQ last...just getting there now...not easily...

Setting The Stage

Grenfell Tower

North Kensington, United Kingdom

June, 2017



Wild Fires

Wild Fires

Biggest Problem is Due to Embers Drawn into Vented Attics

Wild Fires

Biggest Problem is Due to Embers Drawn
into Vented Attics

Easy Solution...Unvented Attics

Hurricanes and Floods

Dry...Don't Die

Dry...Don't Die
Wash, Rinse and Dry





Energy Flow









Attic Venting





Vapor Barriers In the Wrong Place



Only two kinds of windows....





Materials....

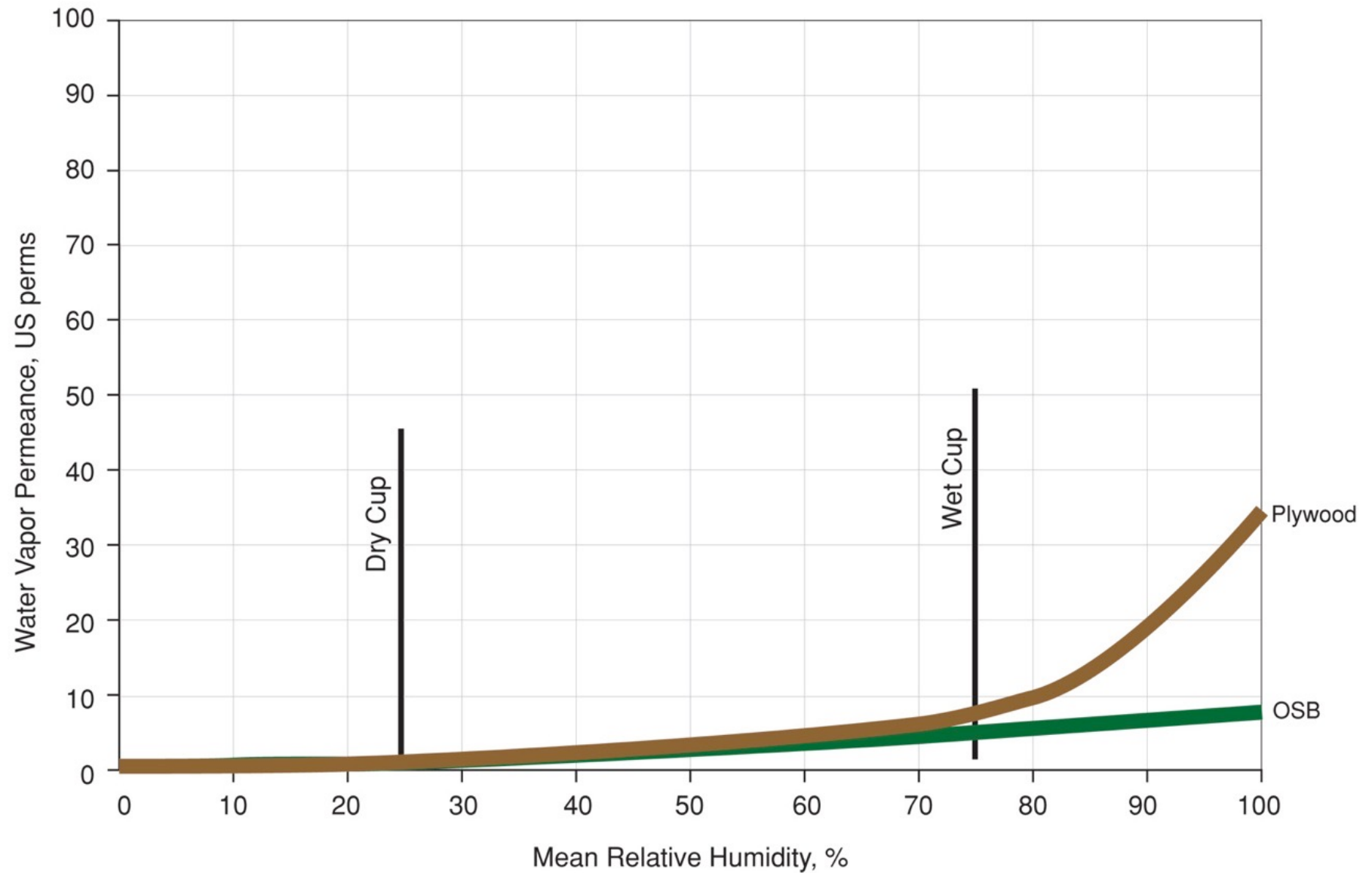
OSB







Water Vapor Permeance of Sheathing Materials



Contaminants

Contaminants

Dilution is not the solution to indoor pollution

Source control...source control...
source control...

Contaminants

Don't build out of bad stuff

Don't fill you building with bad stuff

Don't do bad stuff in your building

Build Tight - Ventilate Right
How Tight?
What's Right?

Air Barrier Metrics

Material	0.02 I/(s-m ²) @ 75 Pa
Assembly	0.20 I/(s-m ²) @ 75 Pa
Enclosure	2.00 I/(s-m ²) @ 75 Pa 0.25 cfm/ft ² @ 50 Pa

Getting rid of big holes	3 ach@50
Getting rid of smaller holes	1.5 ach@50
Getting German	0.6 ach@50

Best

As Tight as Possible - with -

Balanced Ventilation

Energy Recovery

Distribution and Mixing

Source Control - Spot exhaust ventilation

Filtration

Material selection

Worst

Leaky - with – Nothing

Spot Ventilation in Bathroom/Kitchen

Exhaust Ventilation – with – No Distribution
and No Mixing

New Motto...

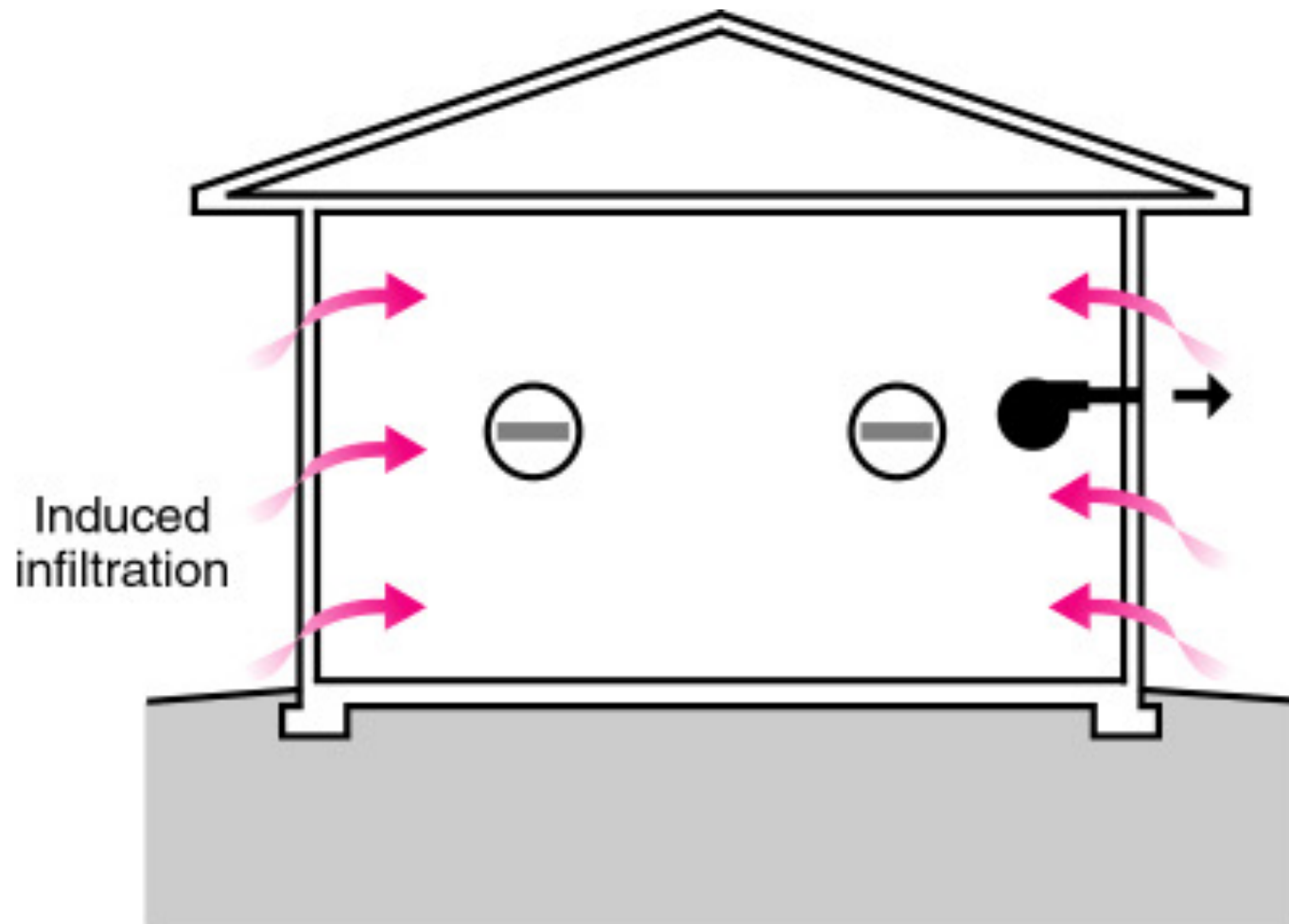
Build Tight – Over Ventilate Right

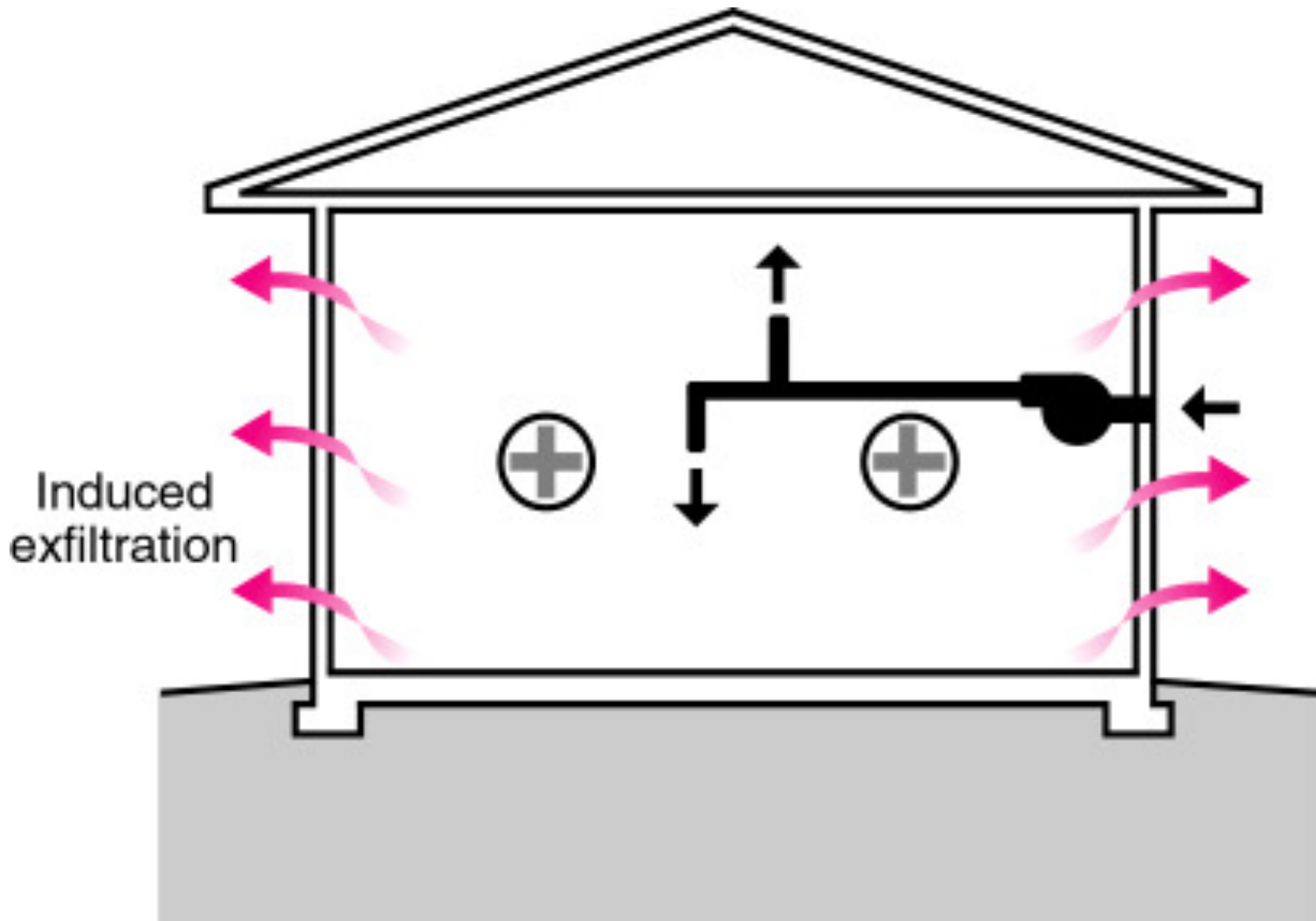
Three Types of Controlled Ventilation Systems

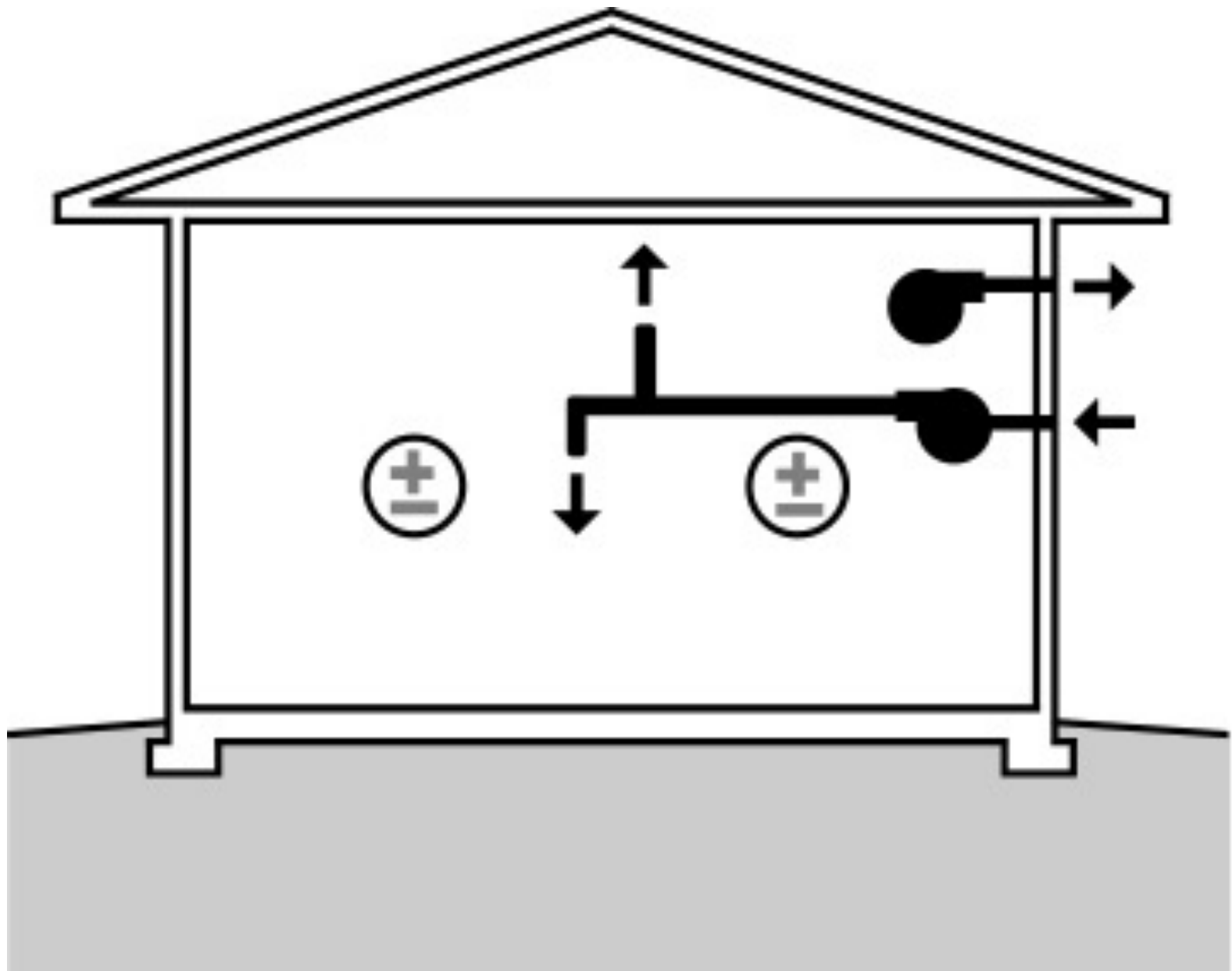
Exhaust Ventilation

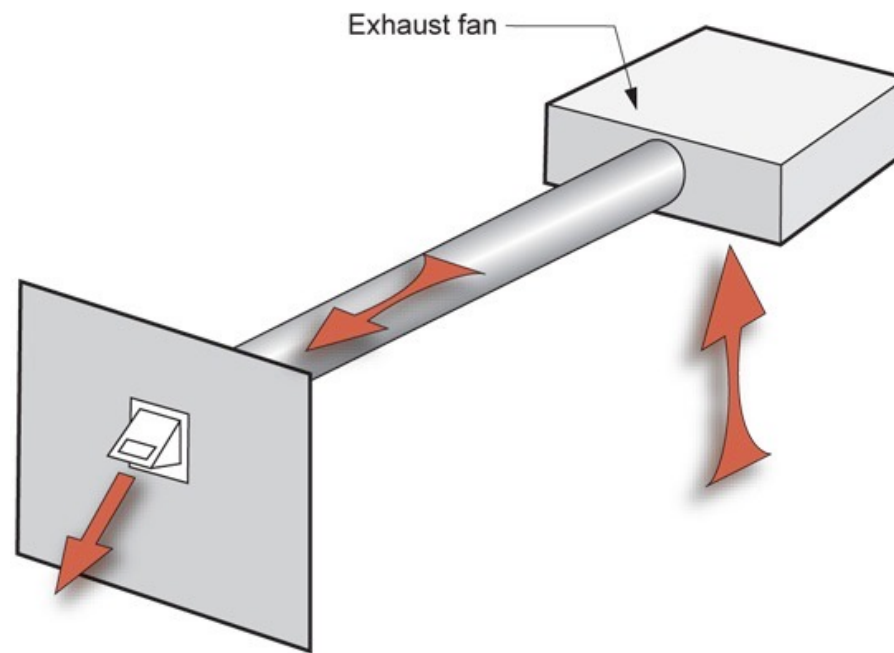
Supply Ventilation

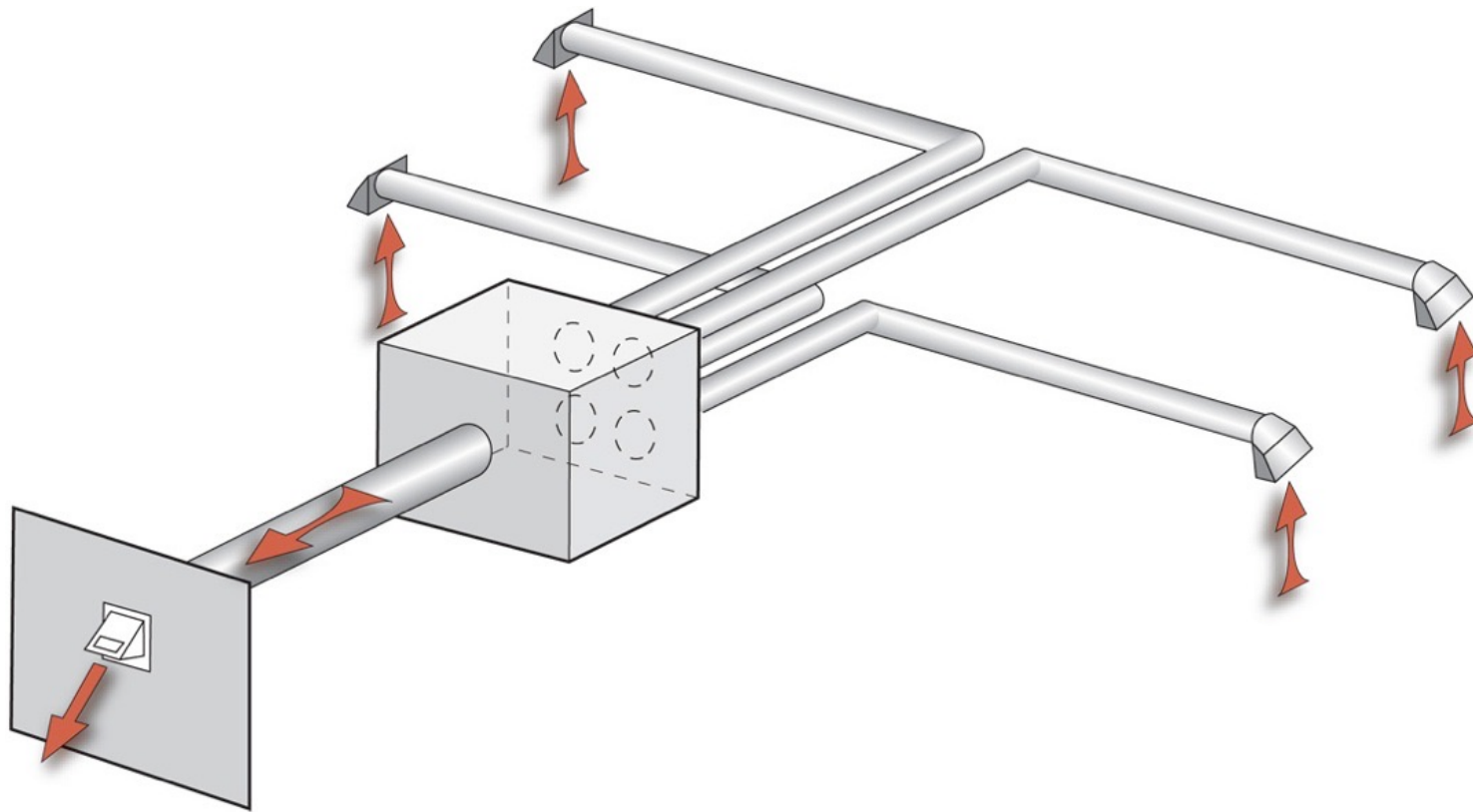
Balanced Ventilation

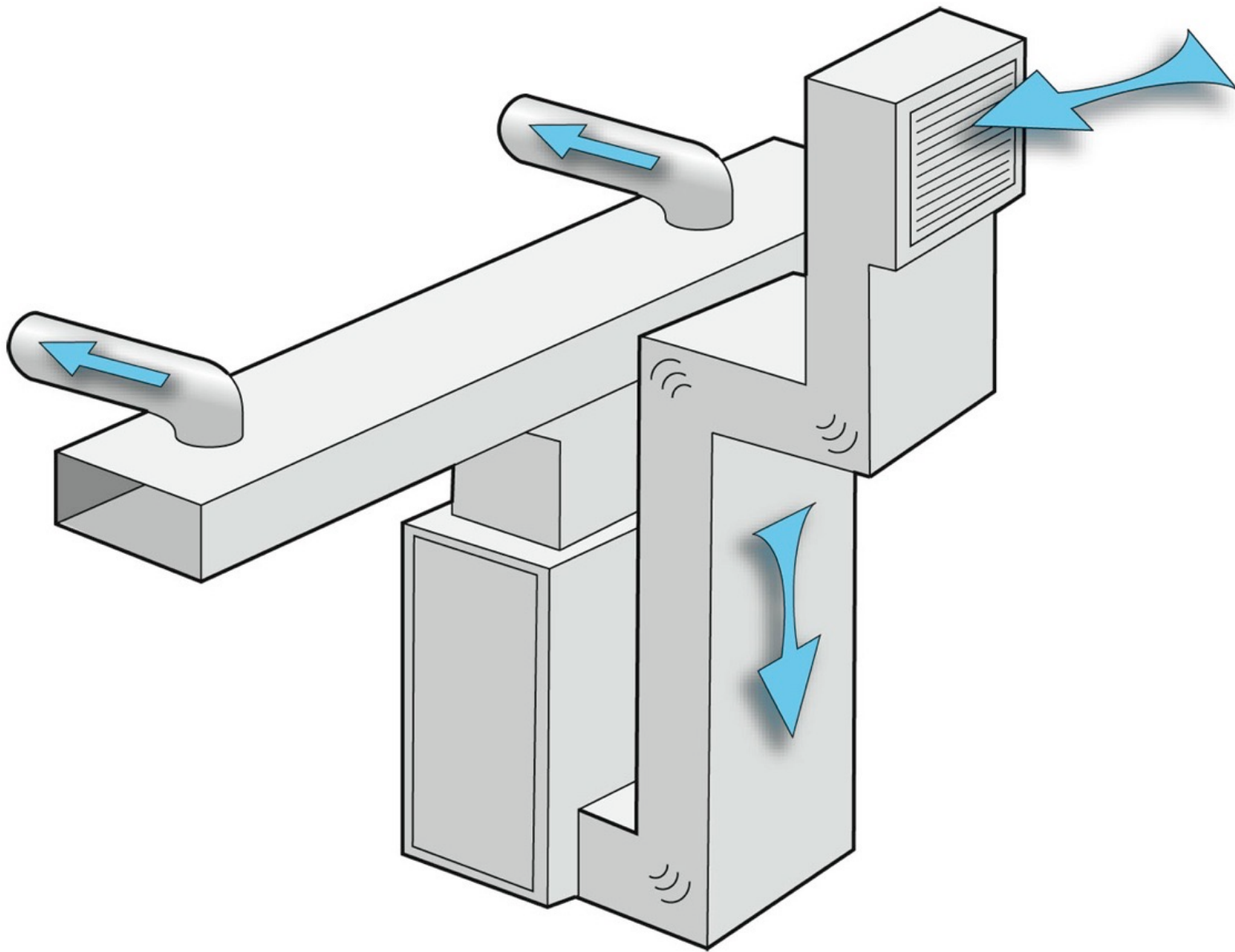












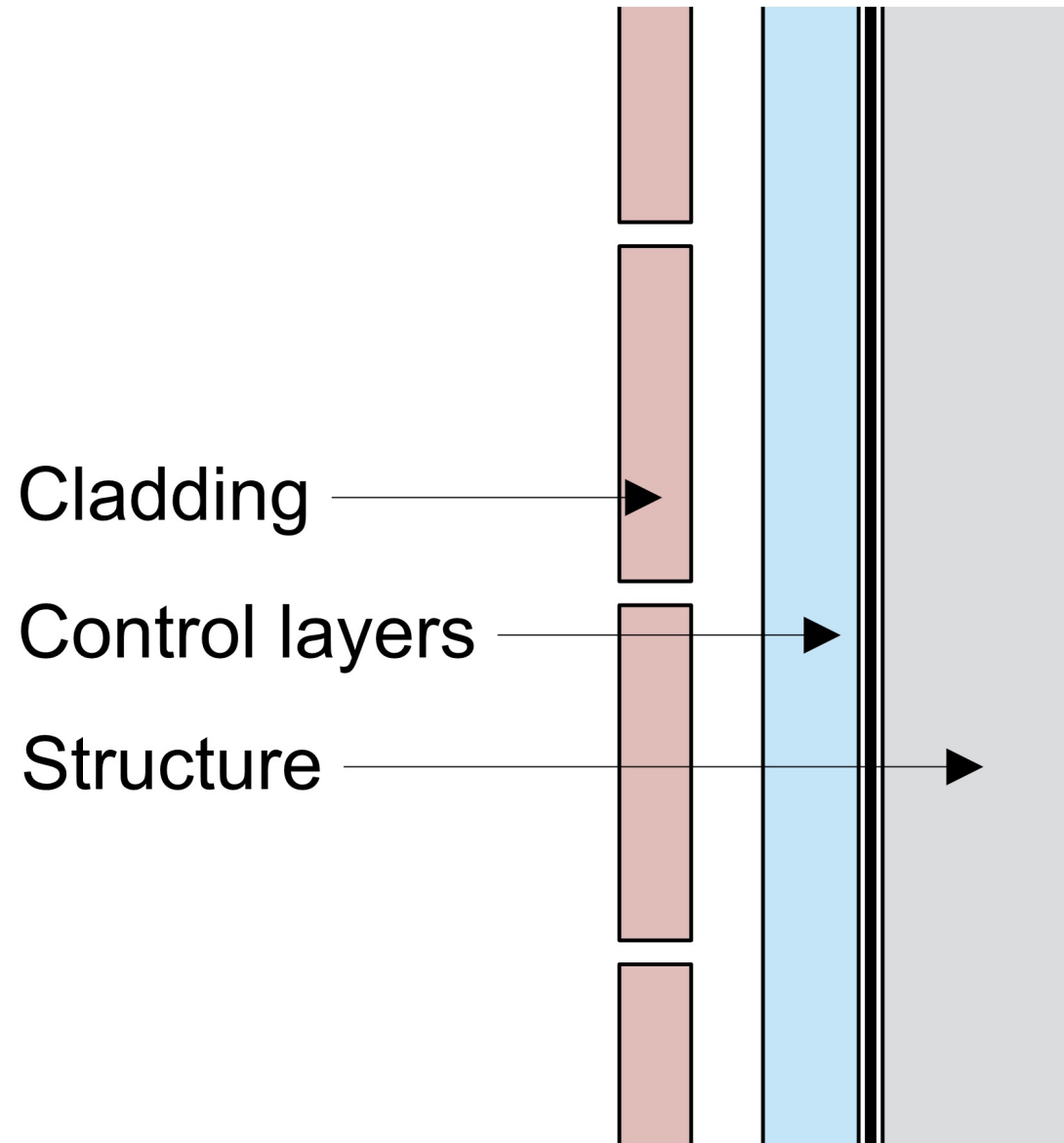
The Perfect Wall

Water Control Layer

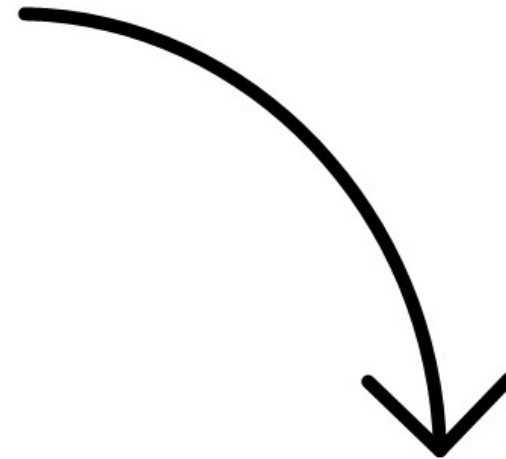
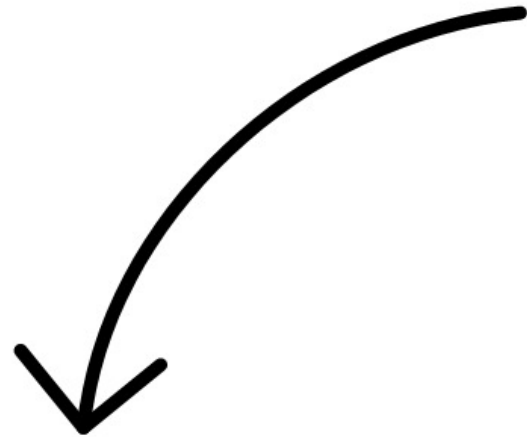
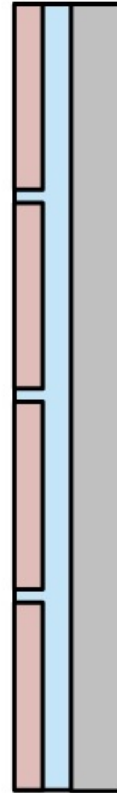
Air Control Layer

Vapor Control Layer

Thermal Control Layer



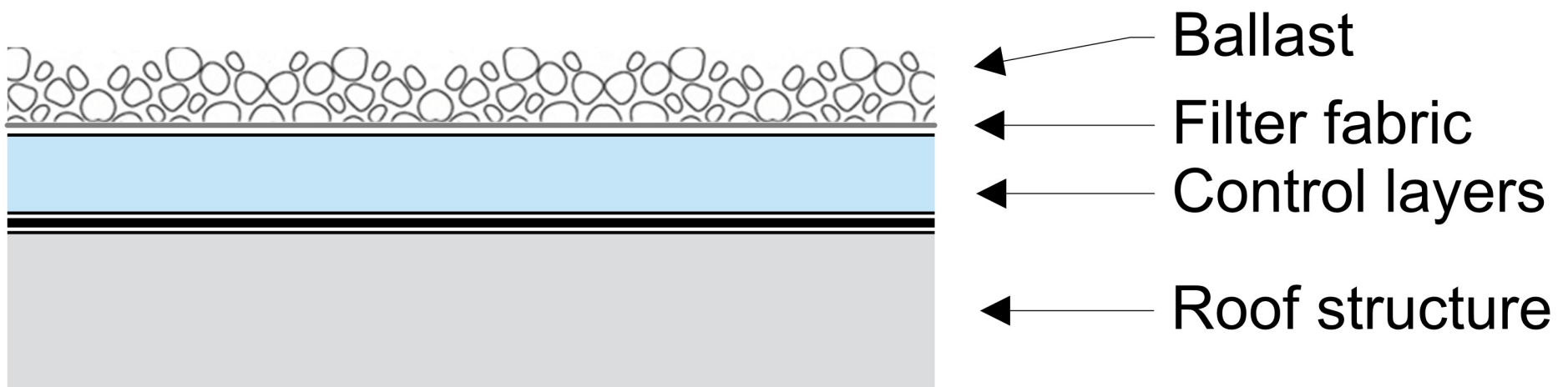
Wall

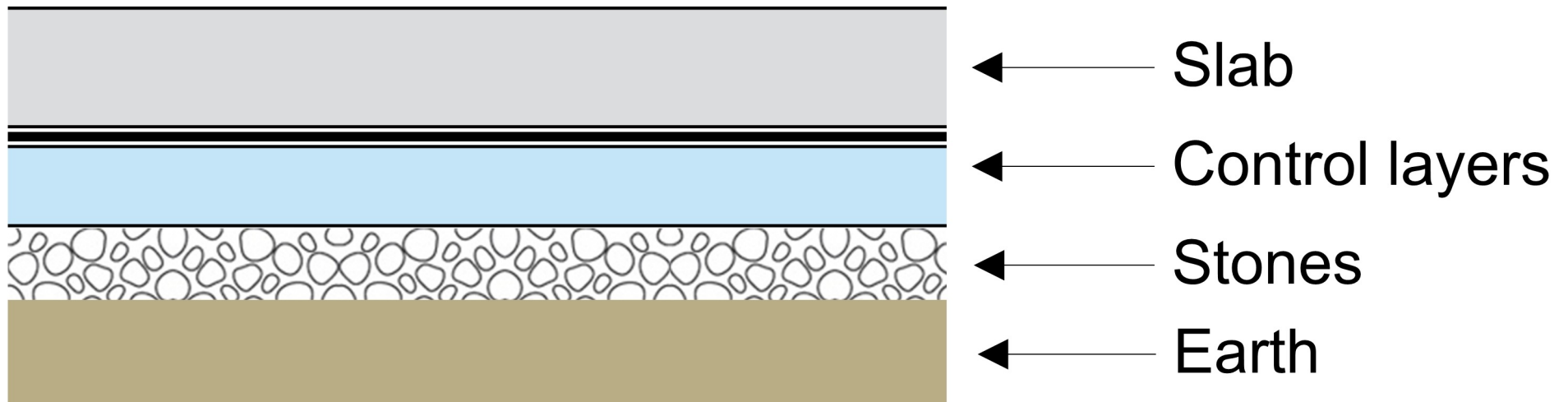


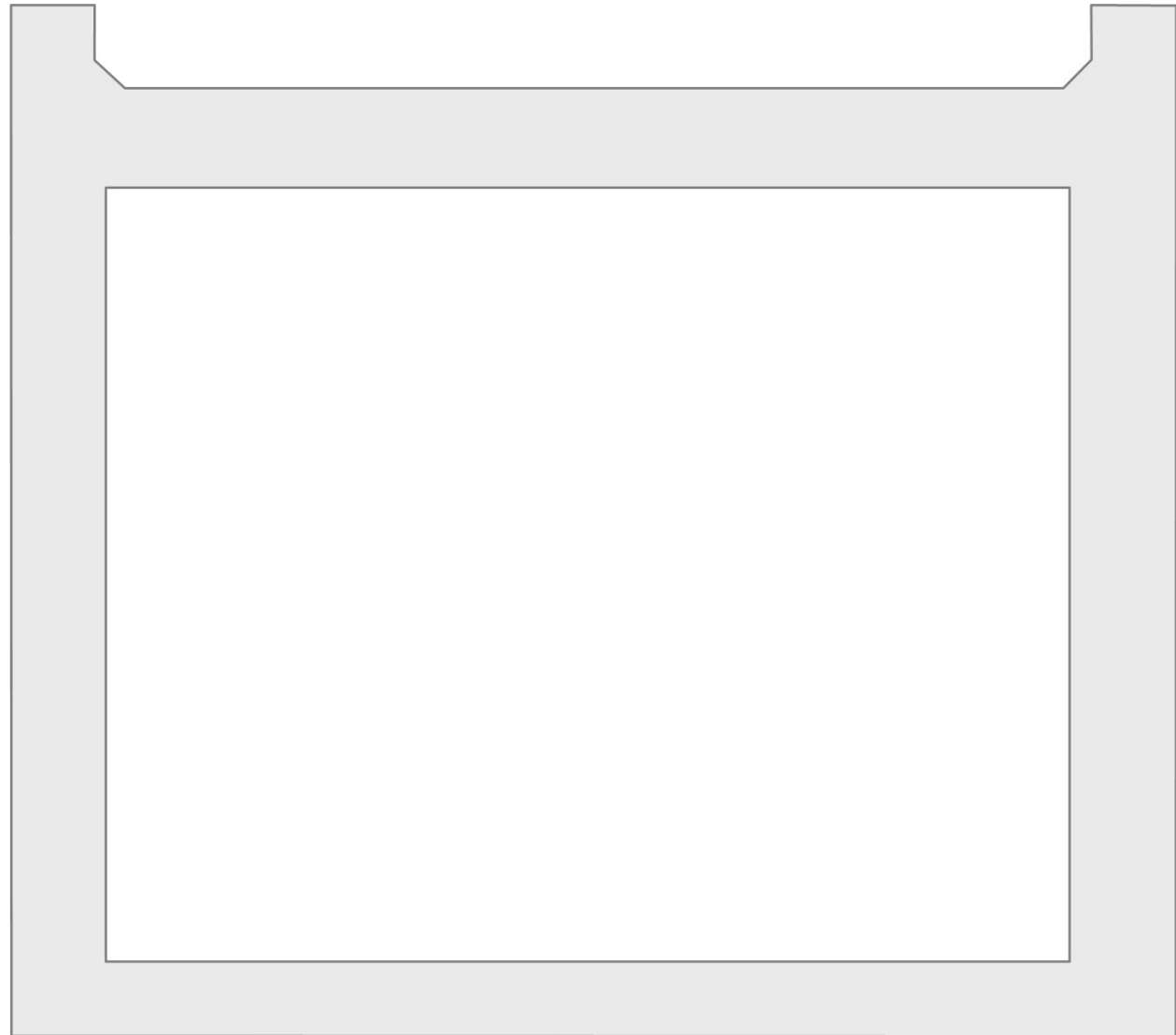
Slab



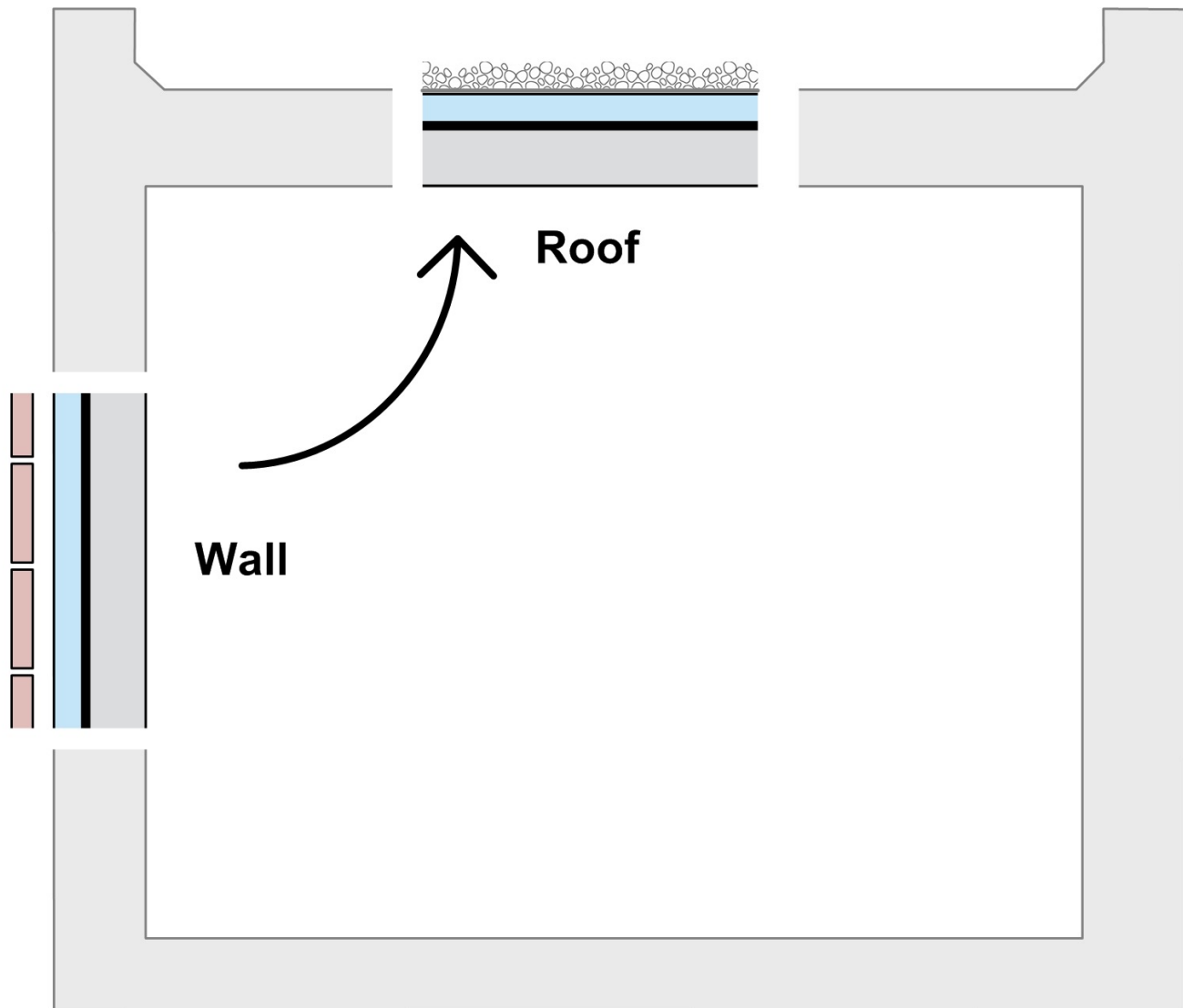
Roof

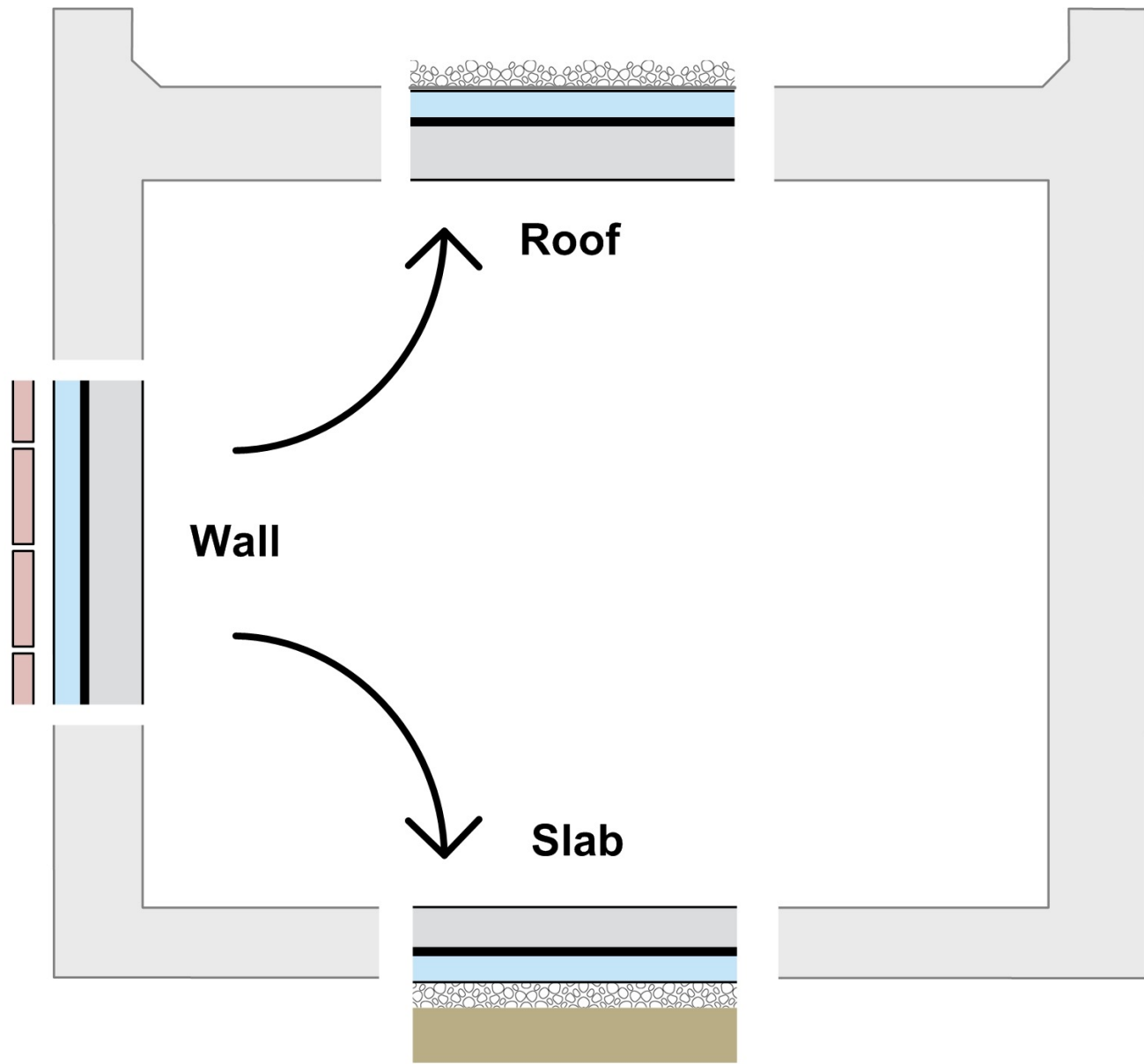


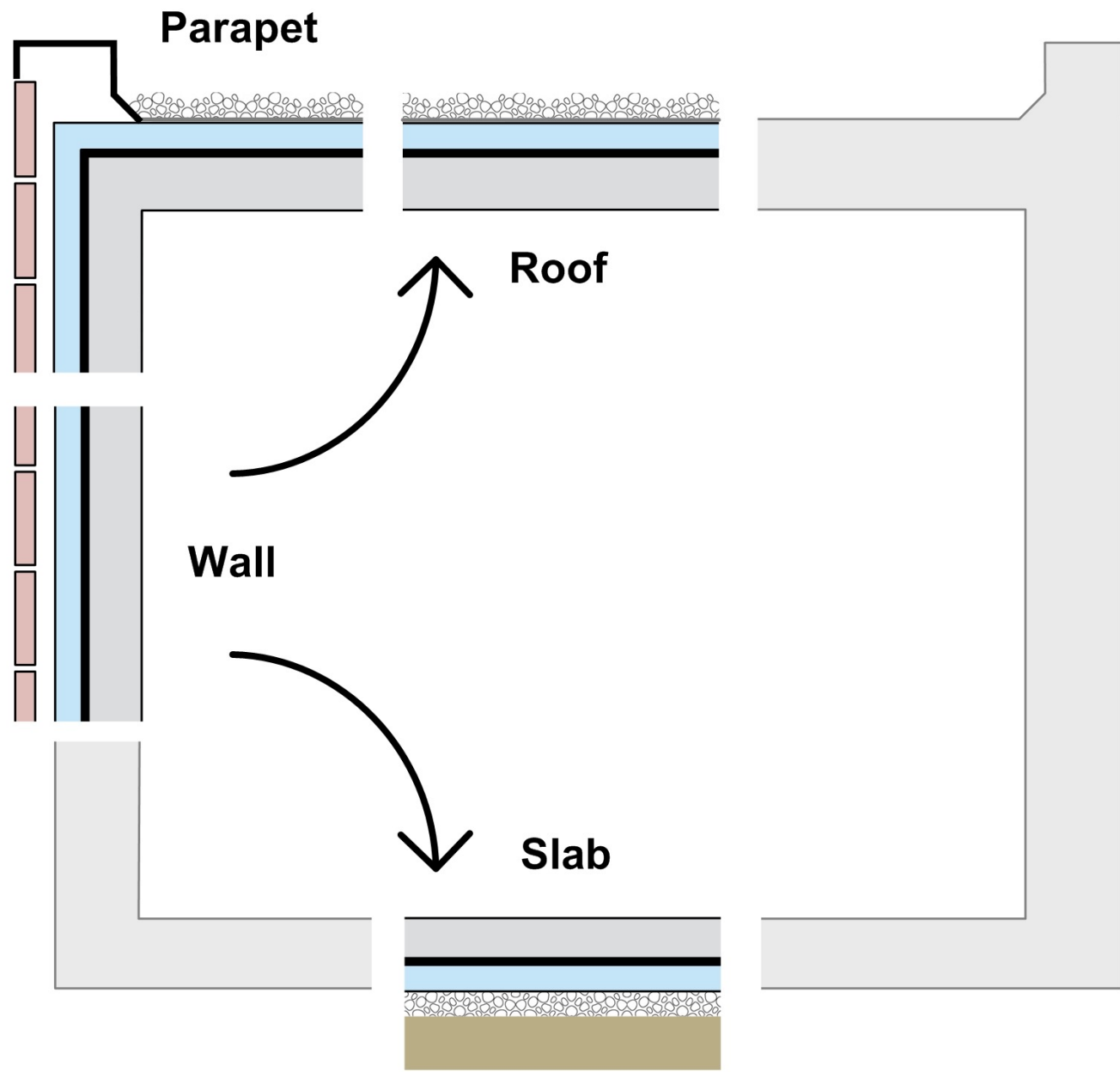


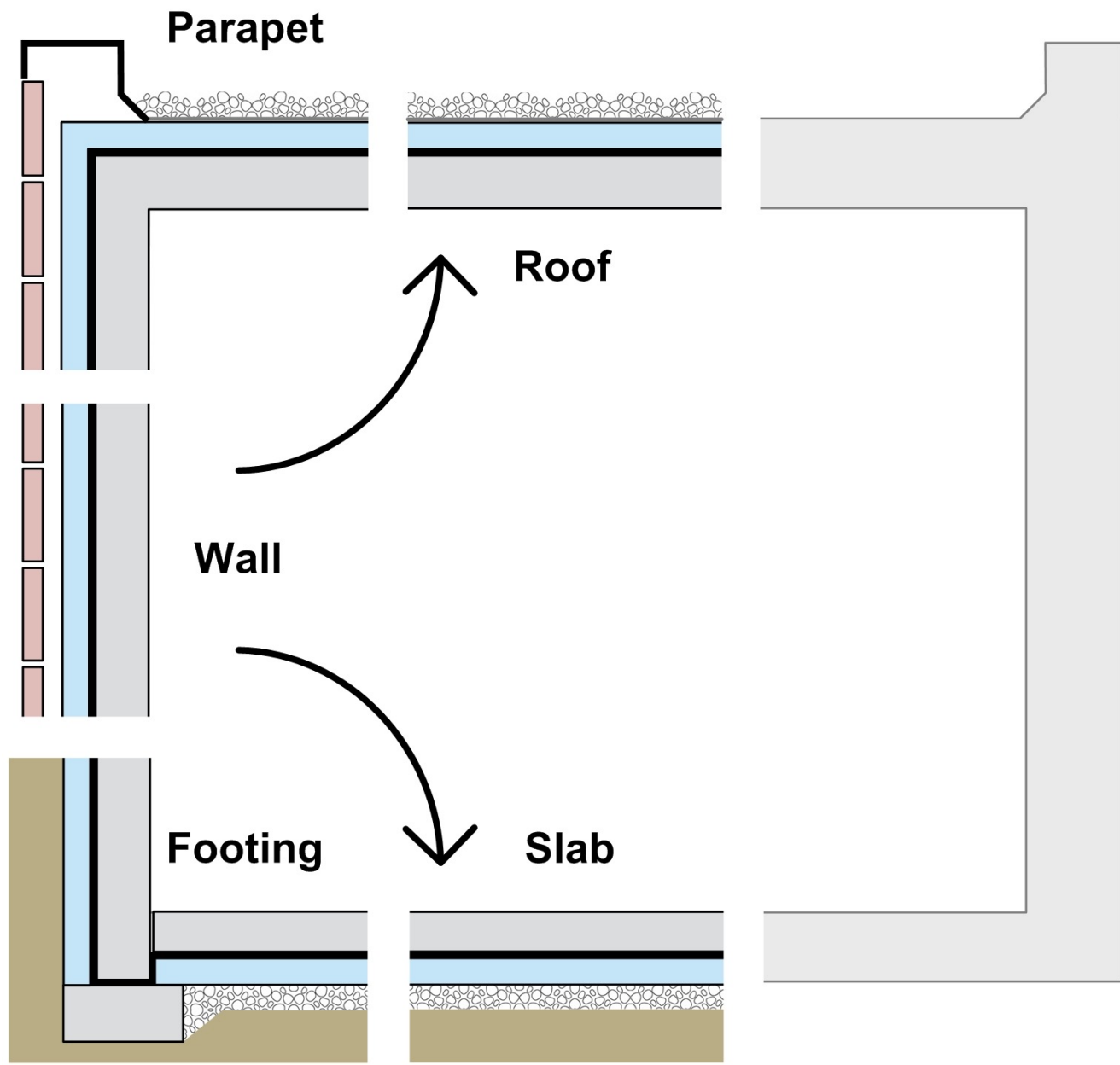


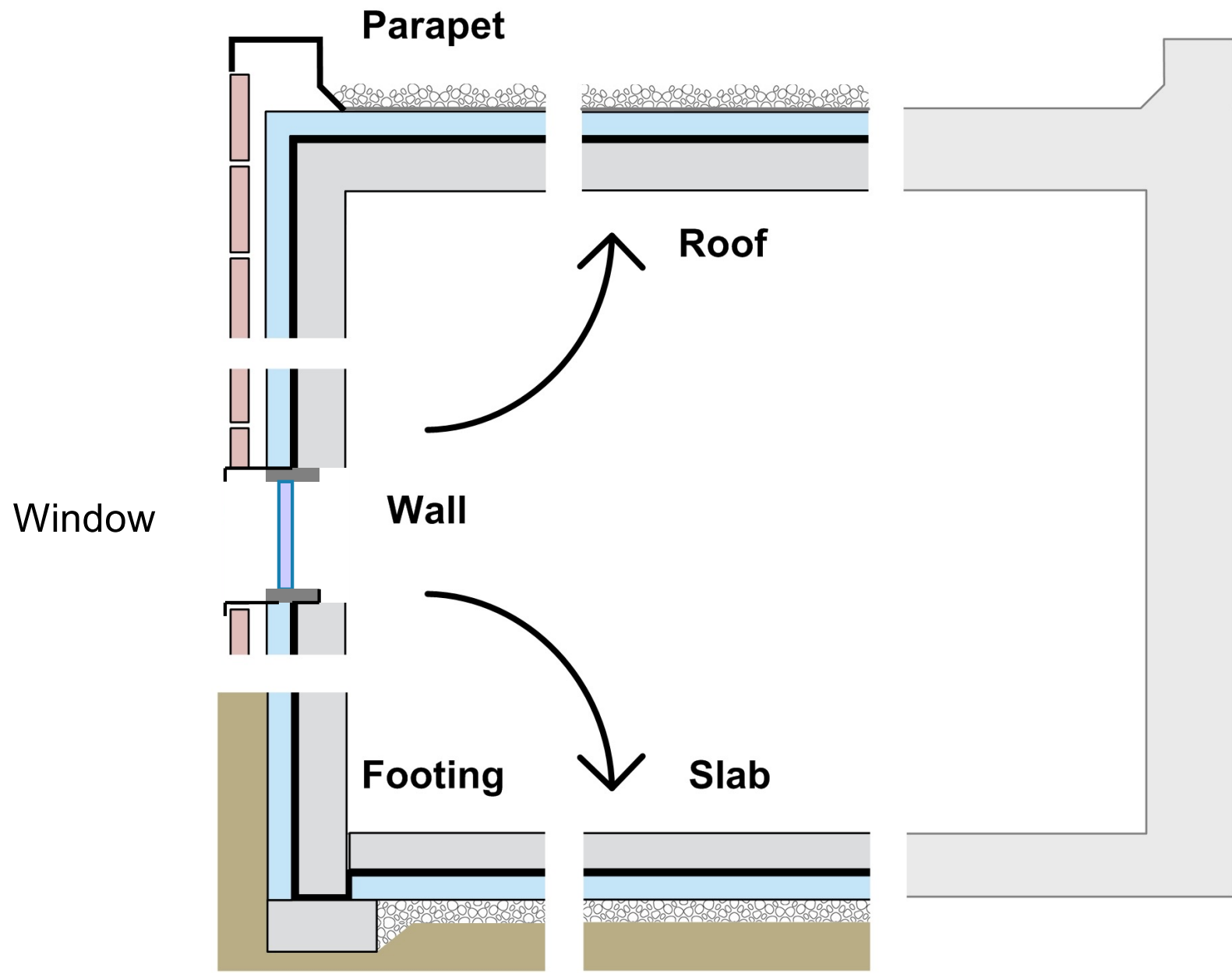


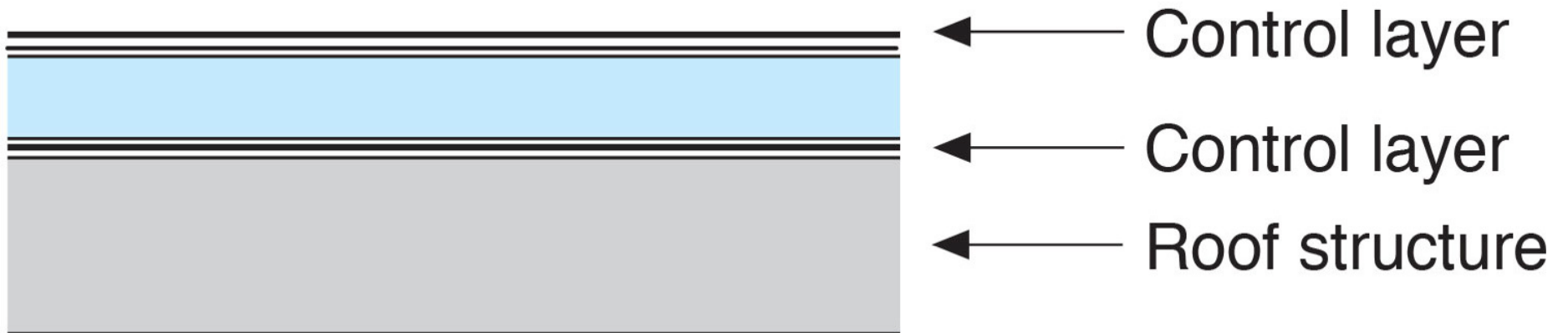


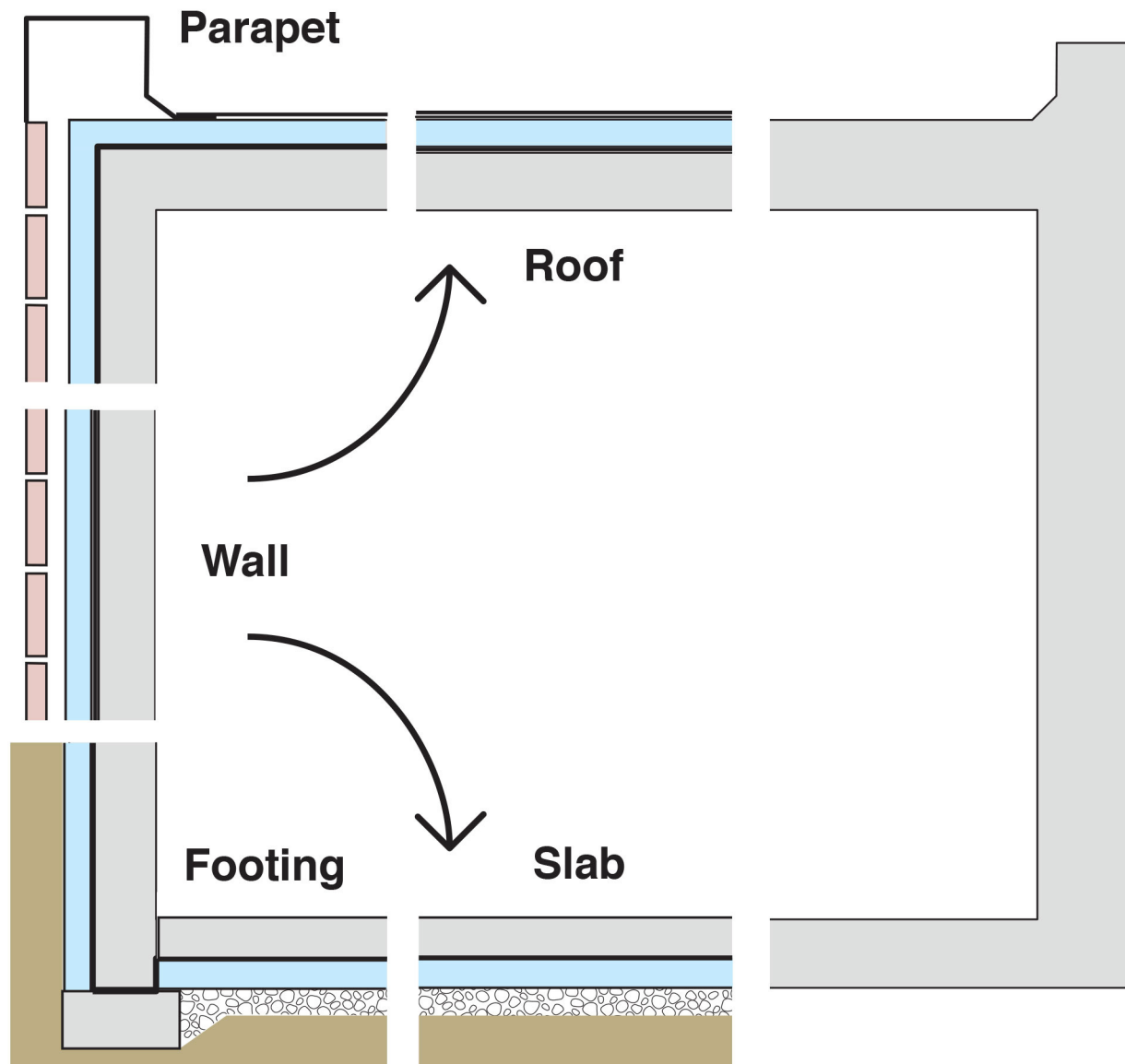


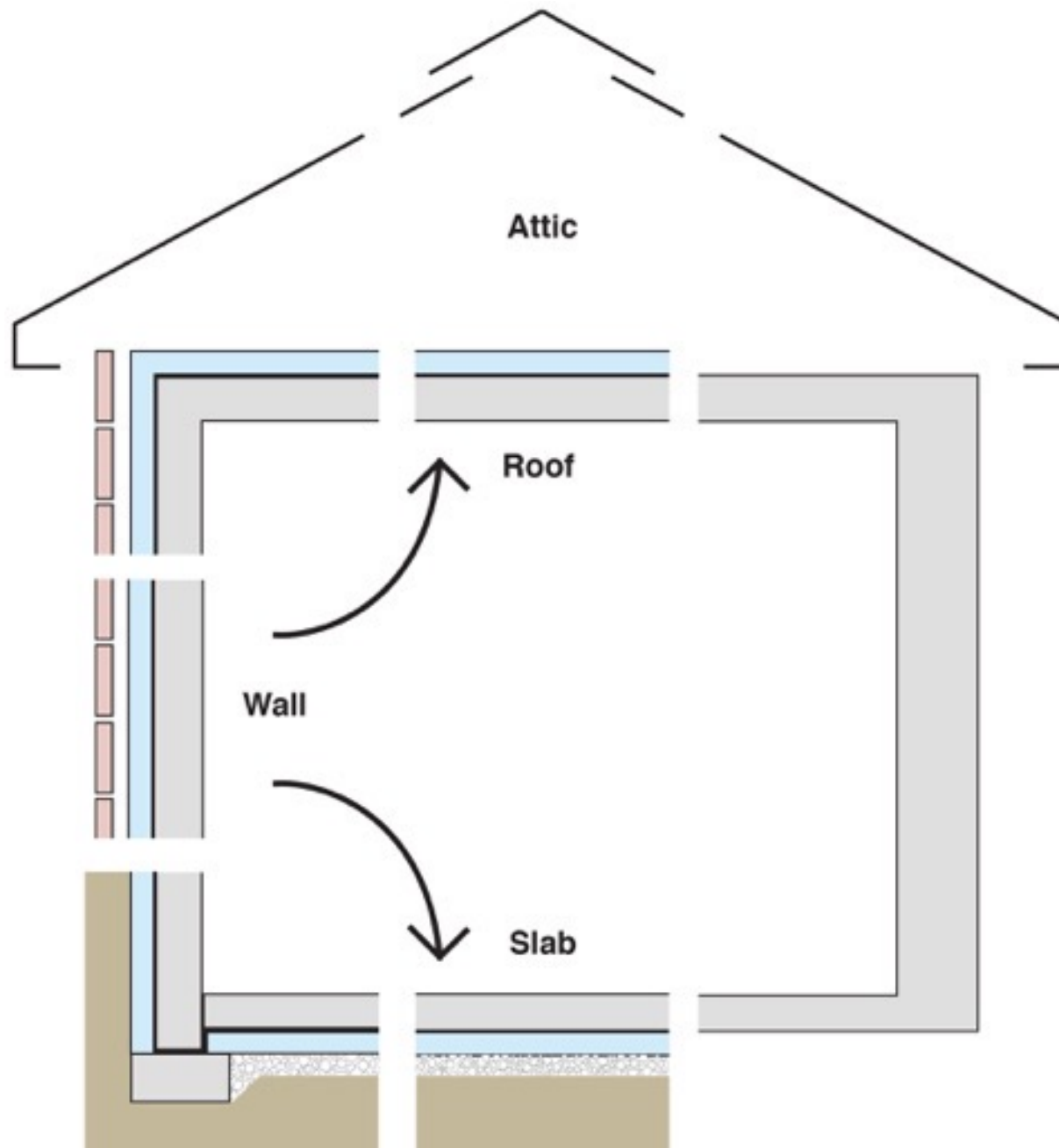


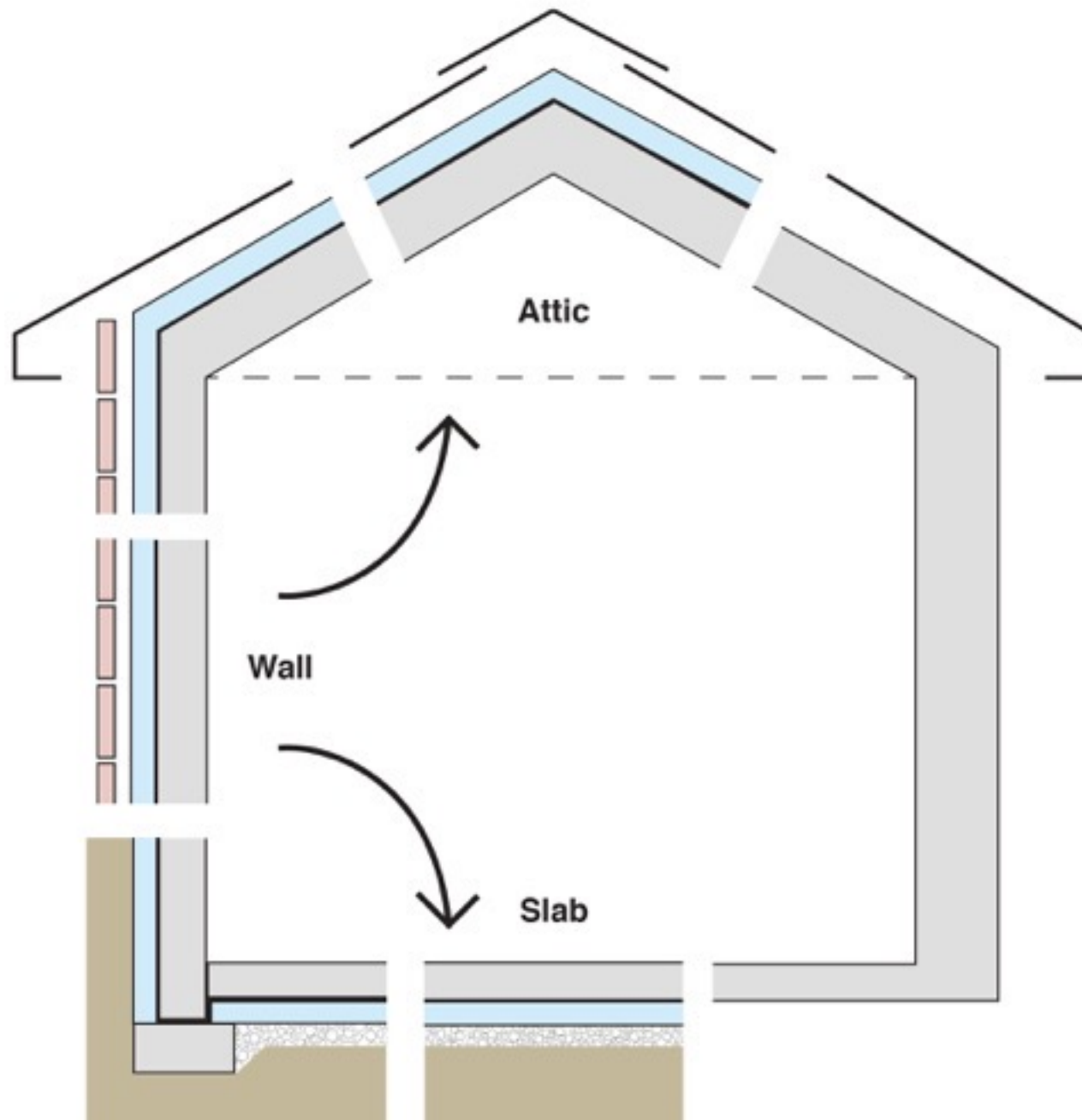


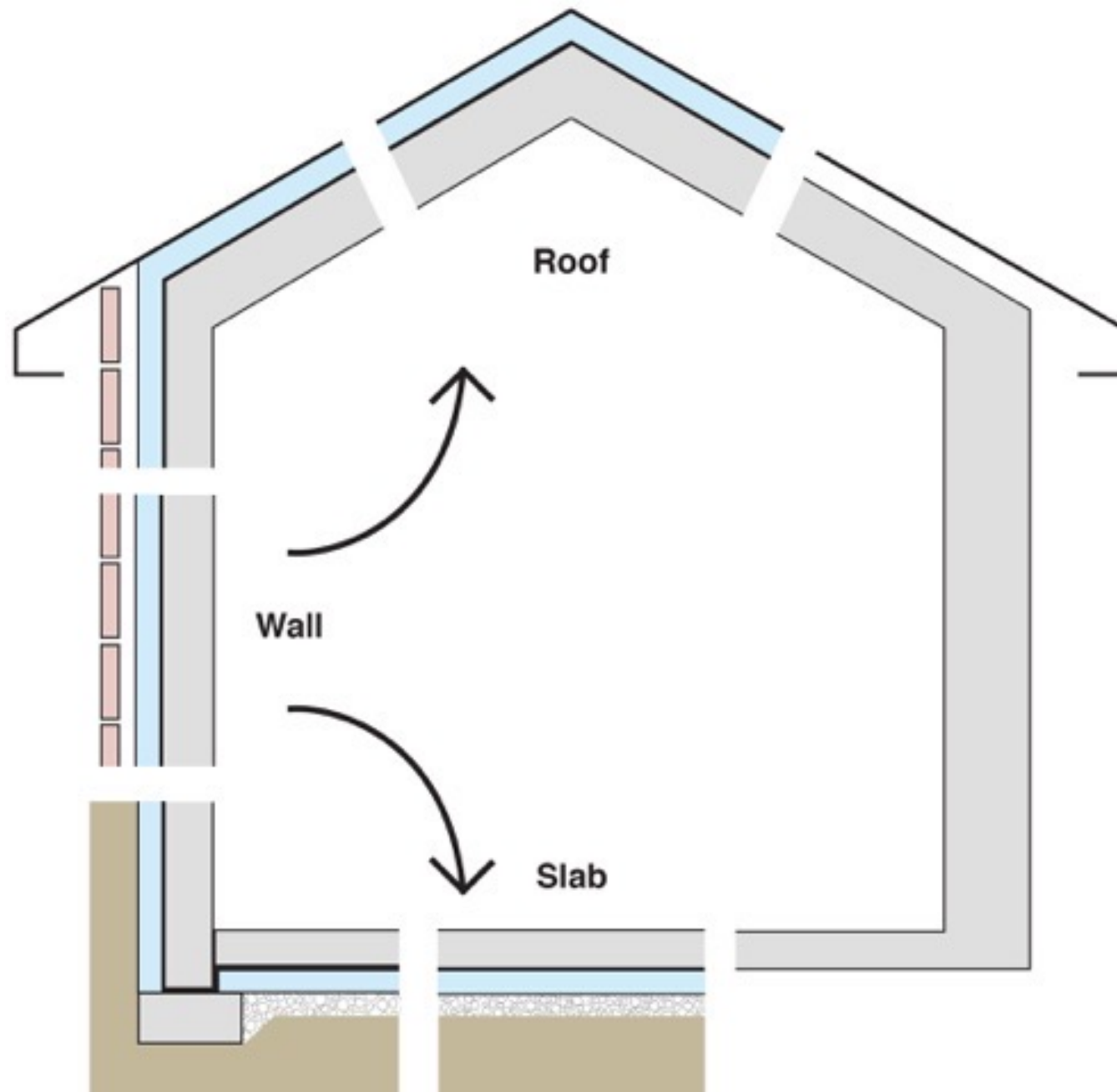


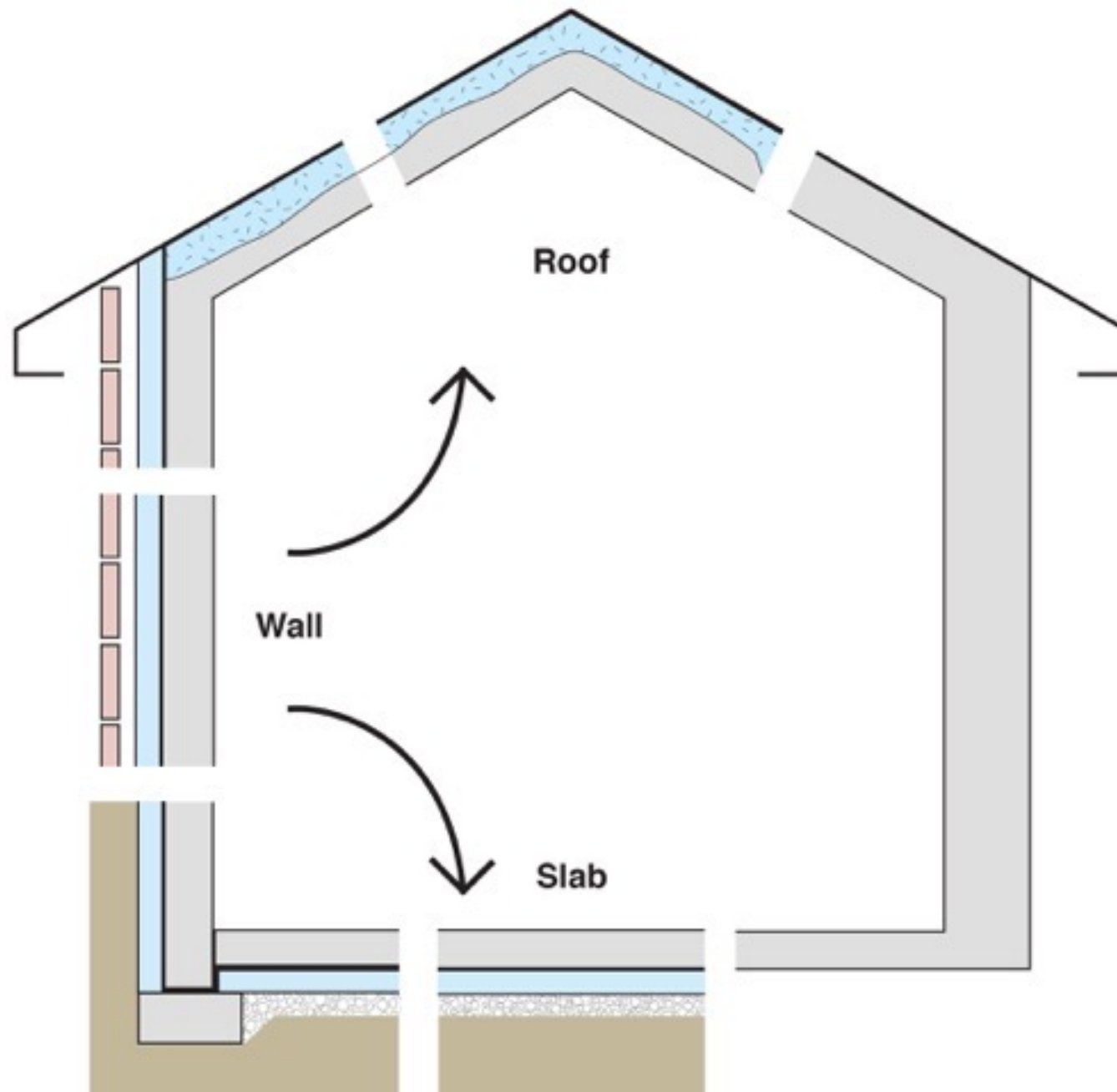












Configurations of the Perfect Wall

