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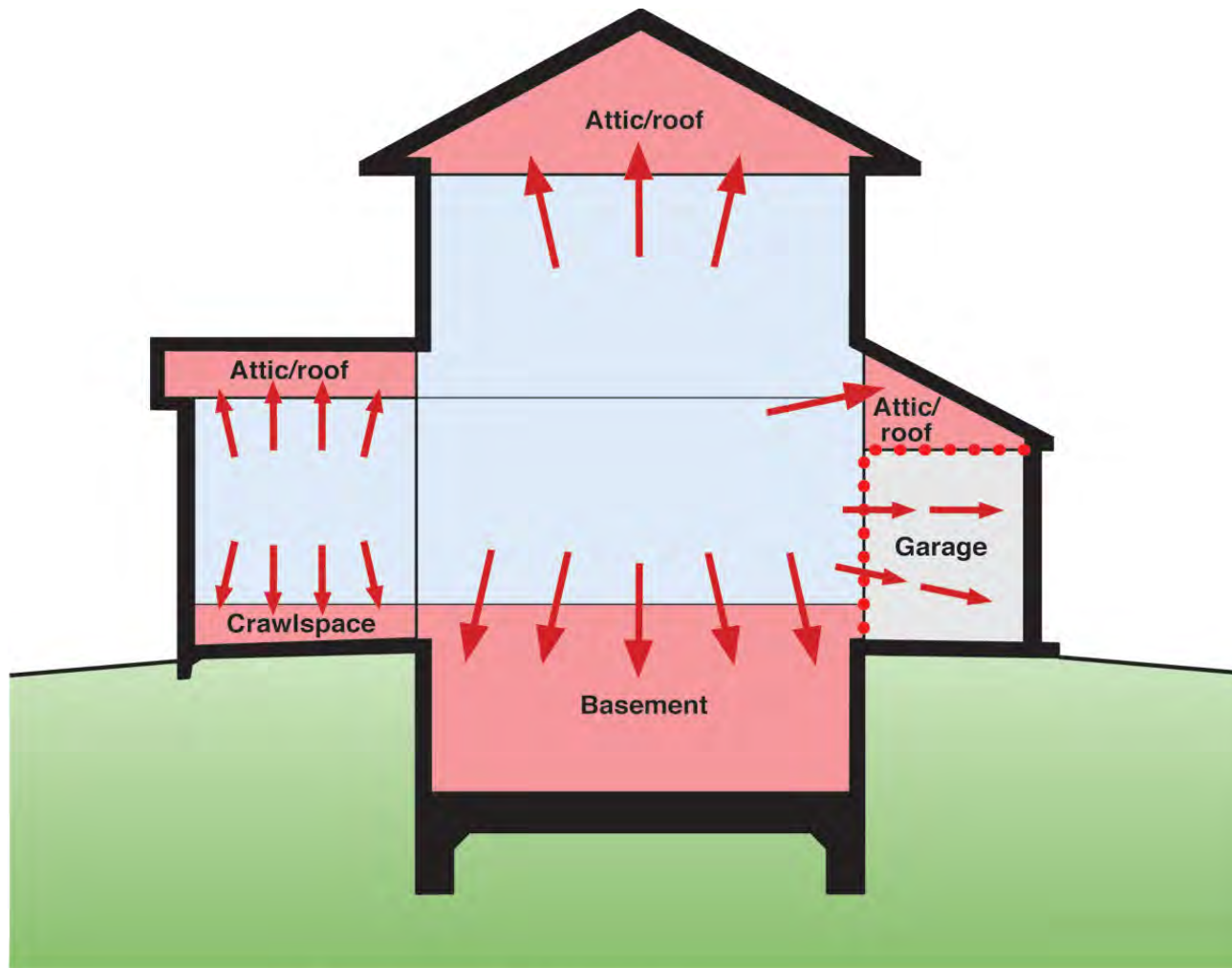
# Building Science

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Adventures In Building Science  
Foundations

[www.buildingscience.com](http://www.buildingscience.com)

# Basements



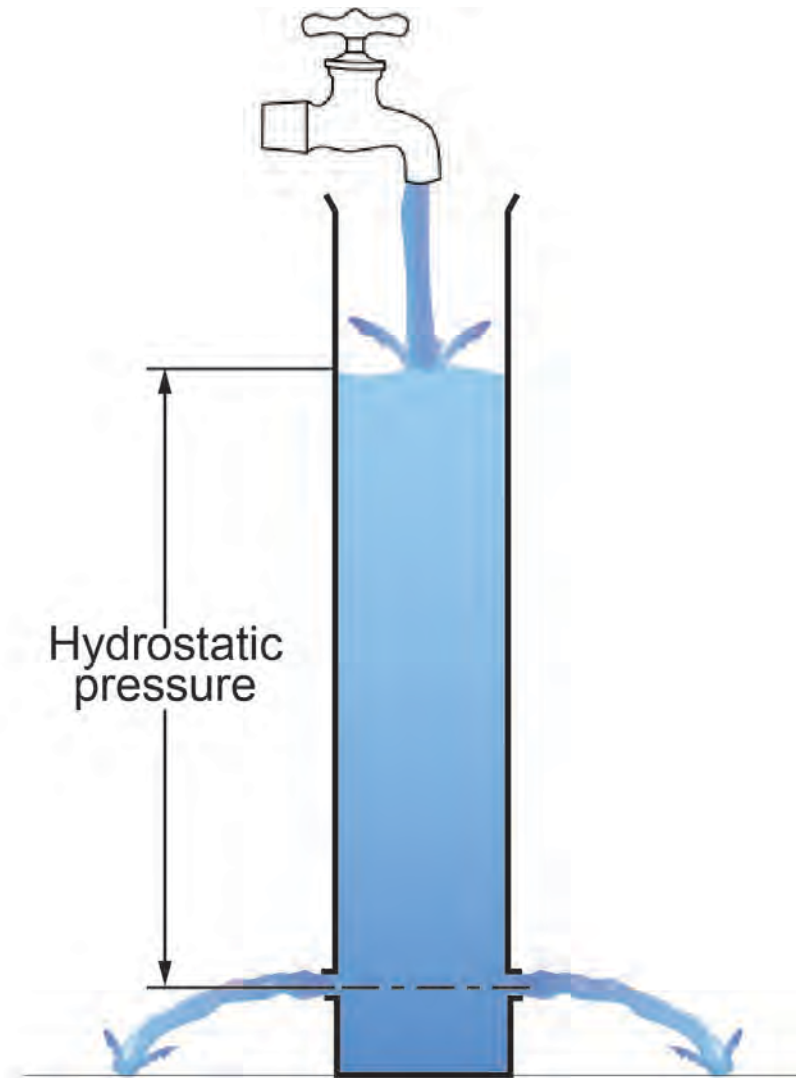
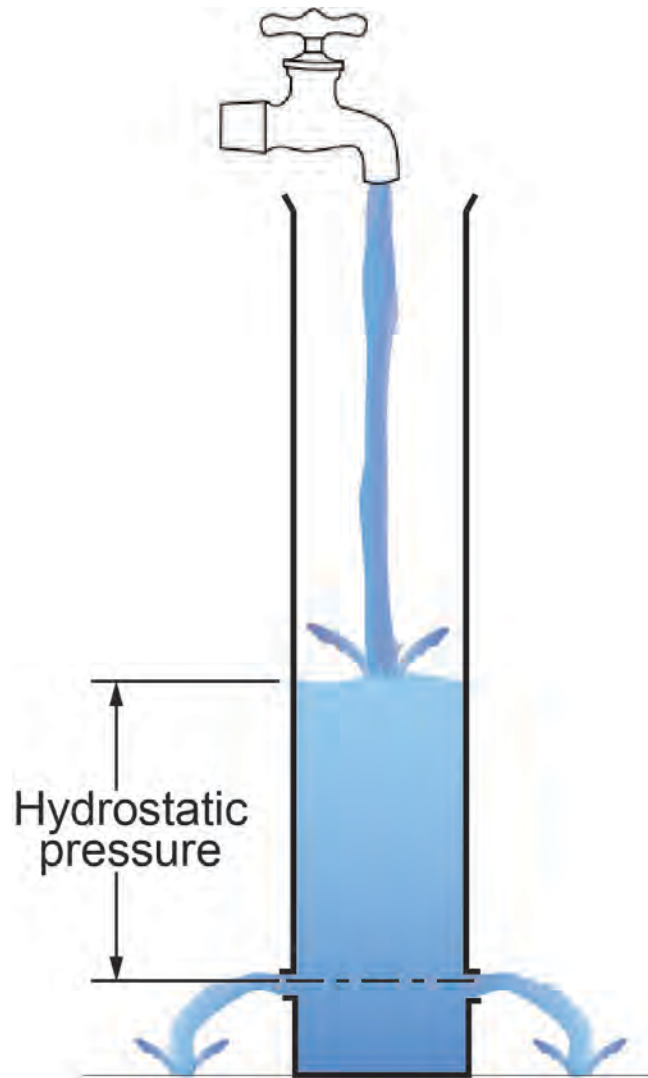
### Expansion of Conditioned Space

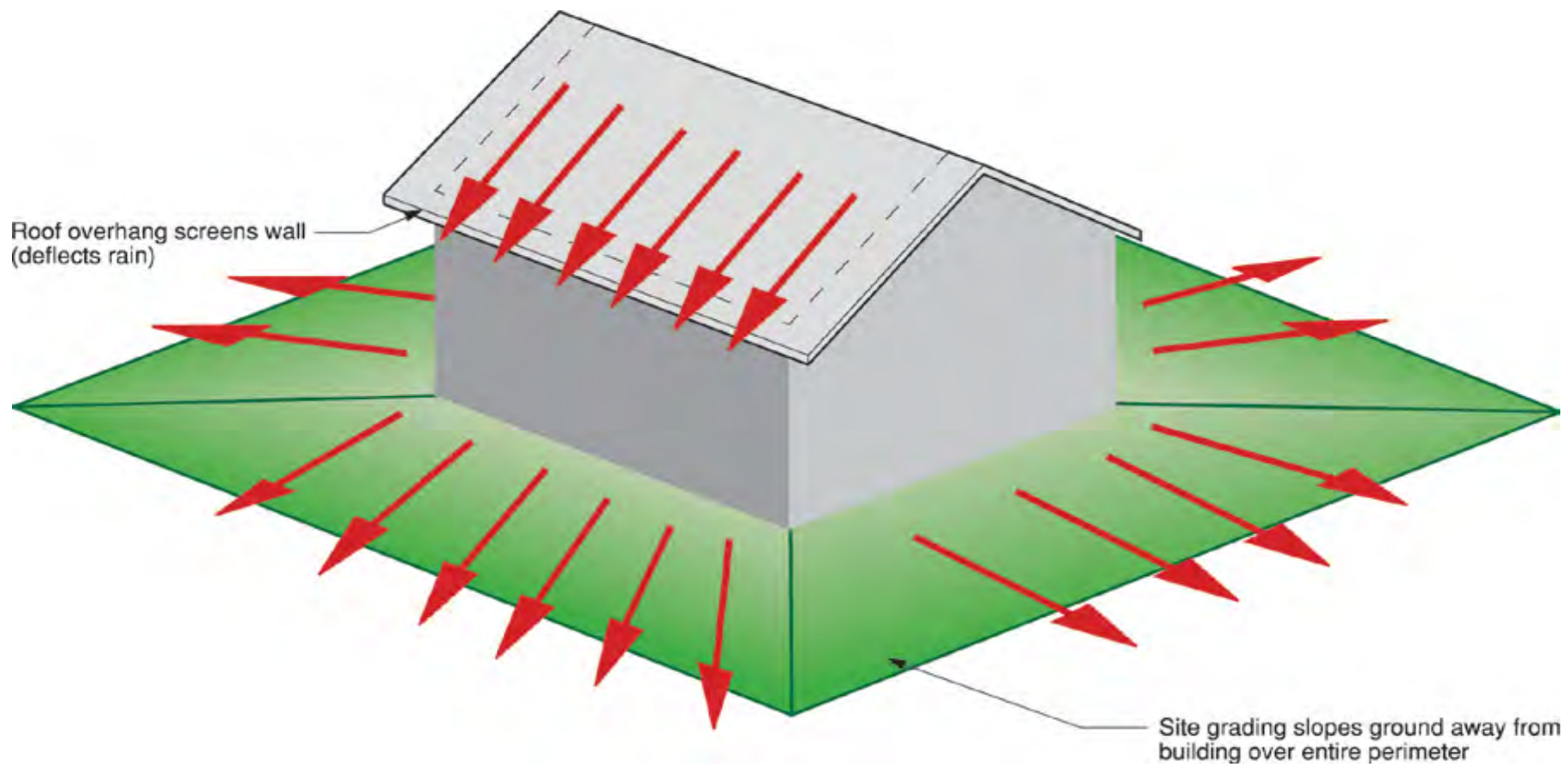
- Conditioned space boundaries moving towards exterior surfaces of building
- Garage isolated from house by air barrier/pressure boundary
- Garage ventilated and conditioned independently of rest of conditioned spaces

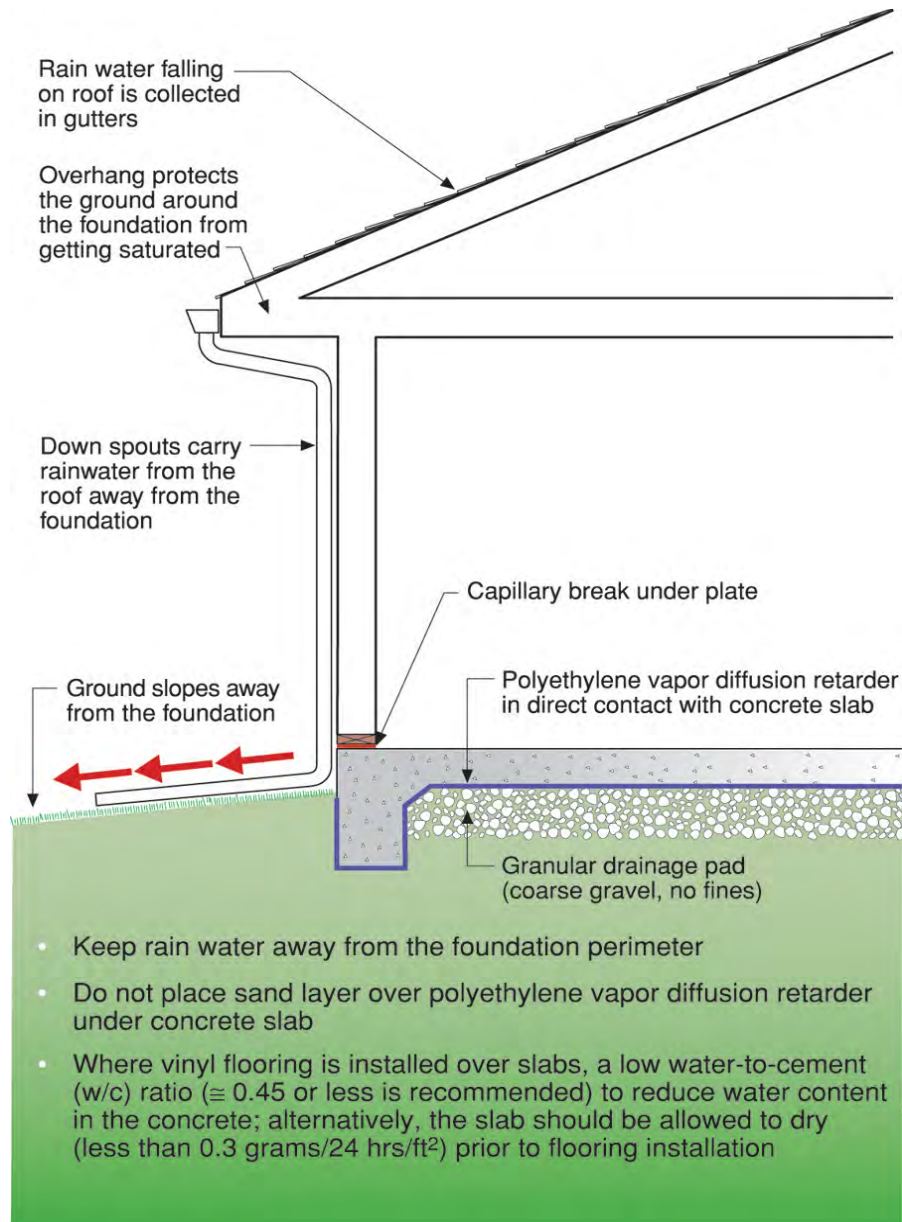
# Mechanisms of Flow

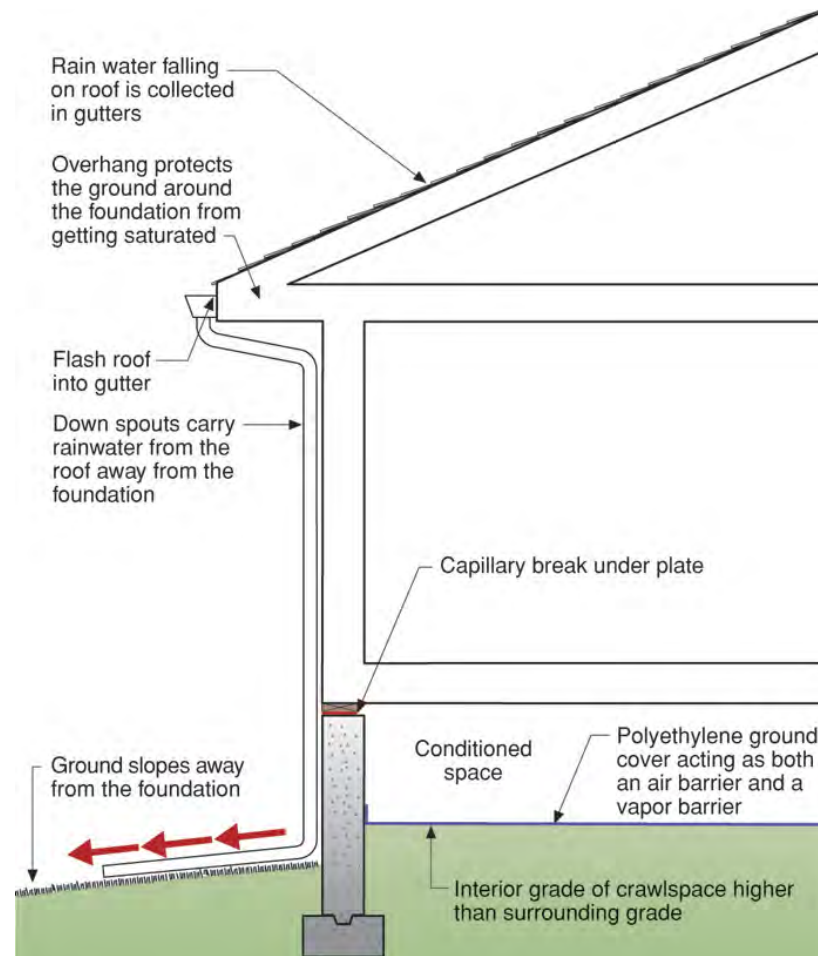
- Liquid      Gravitational      Hydrostatic Pressure  
                 Capillary            Suction Pressure  
                 Osmosis                    Solute Concentration
- Vapor        Diffusion            Vapor Pressure  
                 Convective          Air Pressure



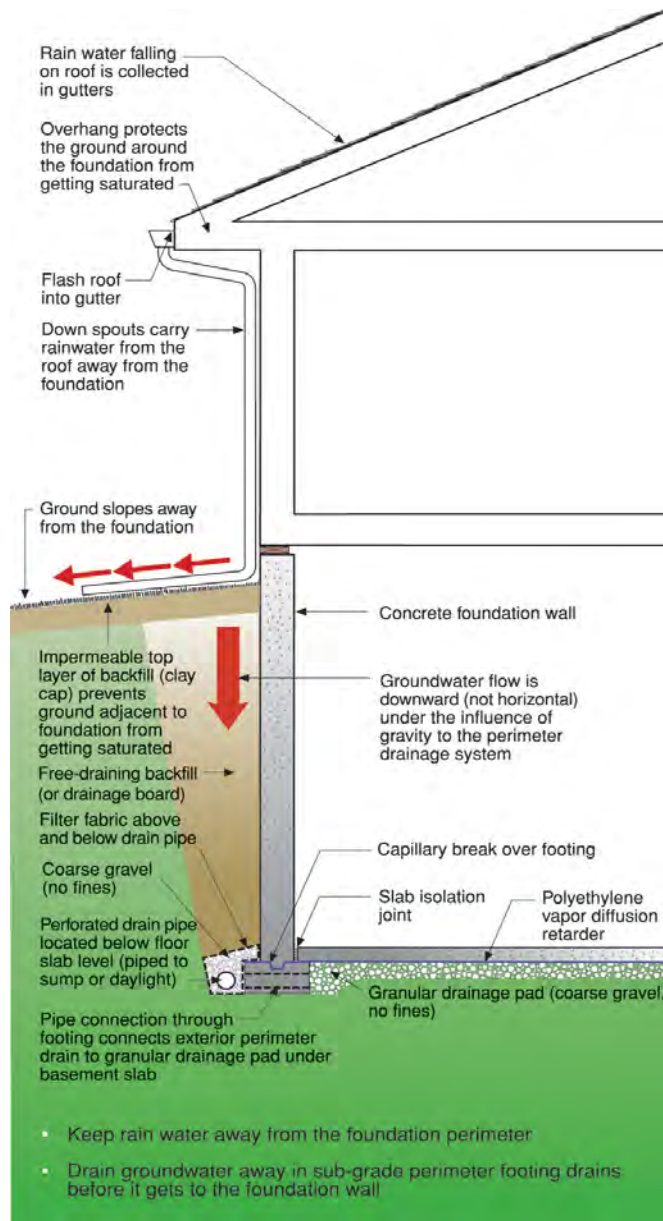






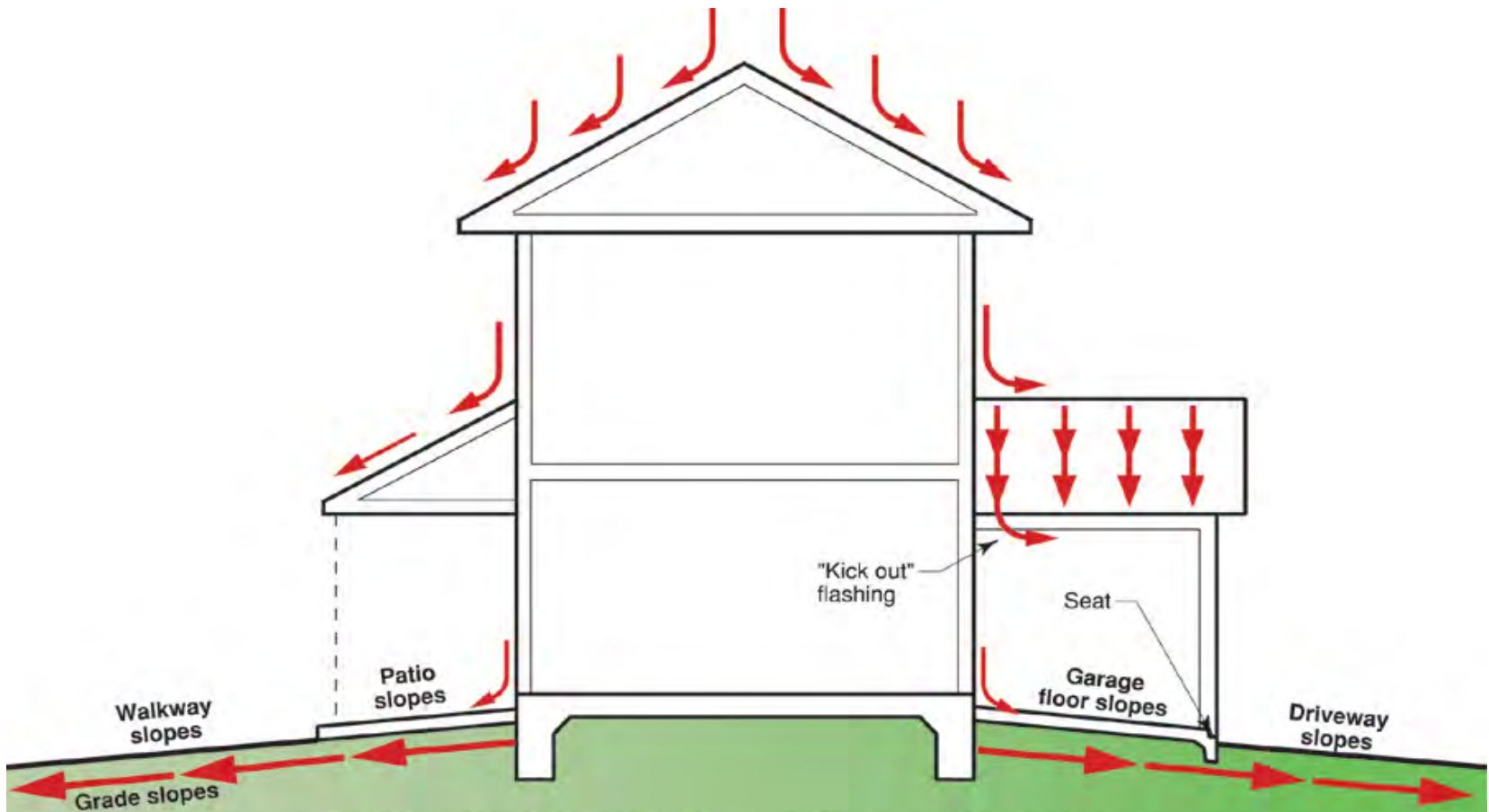


- Keep rain water away from the foundation perimeter
- If the interior crawlspace is lower than the exterior grade, a sub-grade perimeter footing drain is necessary as in a basement foundation
- The crawlspace is conditioned space; it is part of the "interior" of the building and should be heated, cooled and ventilated as part of the building's heating, cooling and ventilating strategy

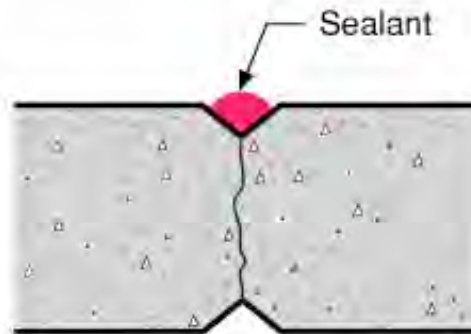
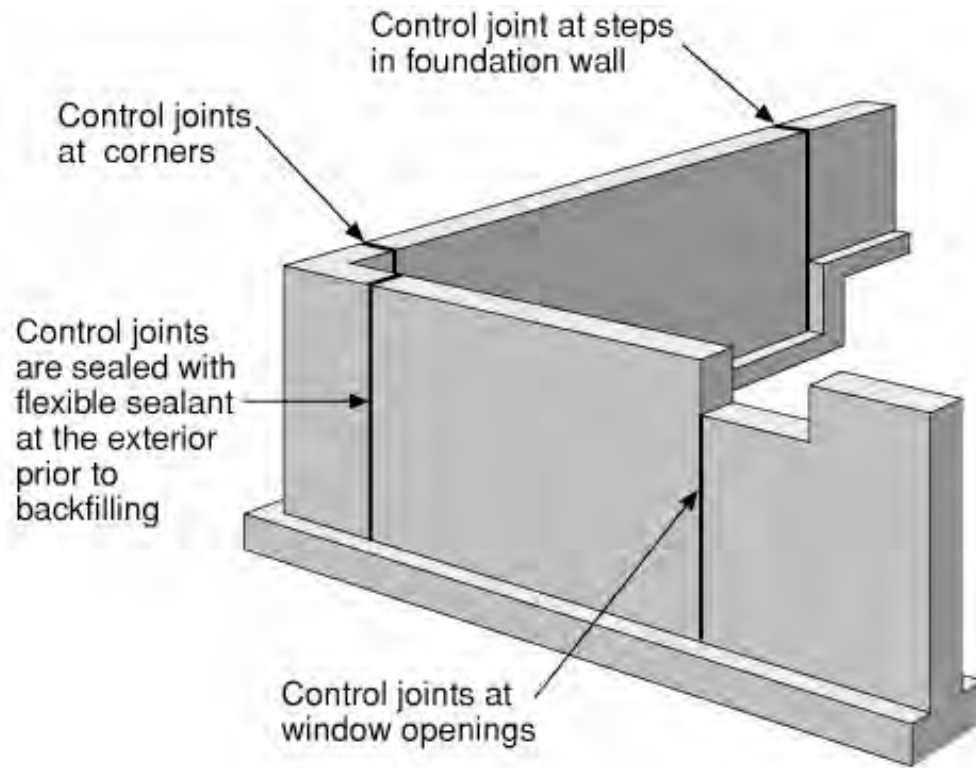




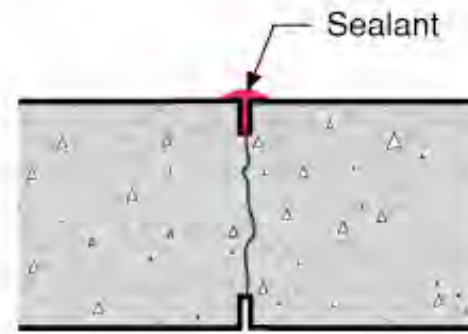




- Patios and decks lower than floors and slope away from building
- Garage floor lower than main floor and slope away from building
- Driveway lower than garage floor and slope away from building
- Grade lower than main floor and slope away from building
- Stoops and walkways lower than main floor and slope away from building
- Kick out flashings or diverters direct water away from walls at roof/wall intersections



Diagonally cut 2 x 2's in forms provide goose neck joint



Saw cut joint

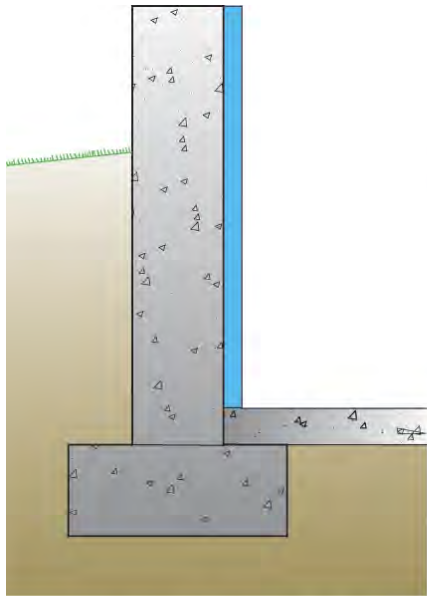




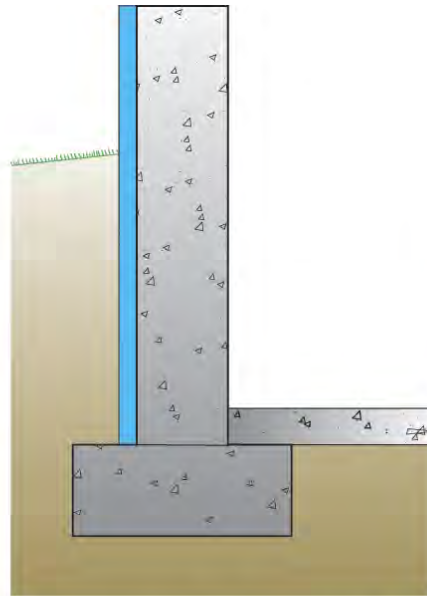




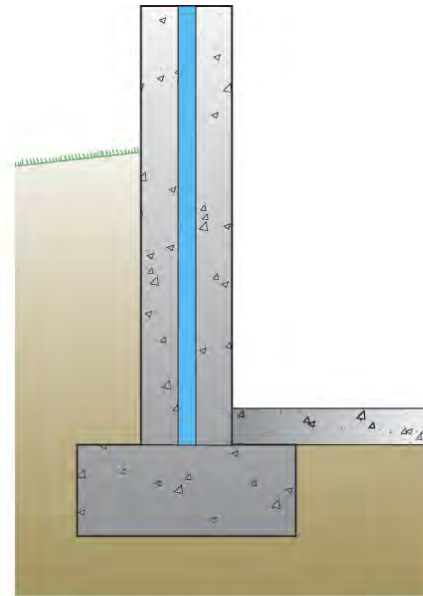




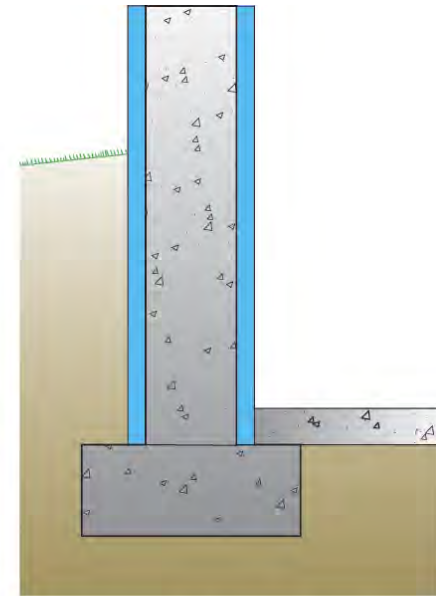
**Internally Insulated  
Basement**



**Externally Insulated  
Basement**



**Basement Insulated in  
the Middle**

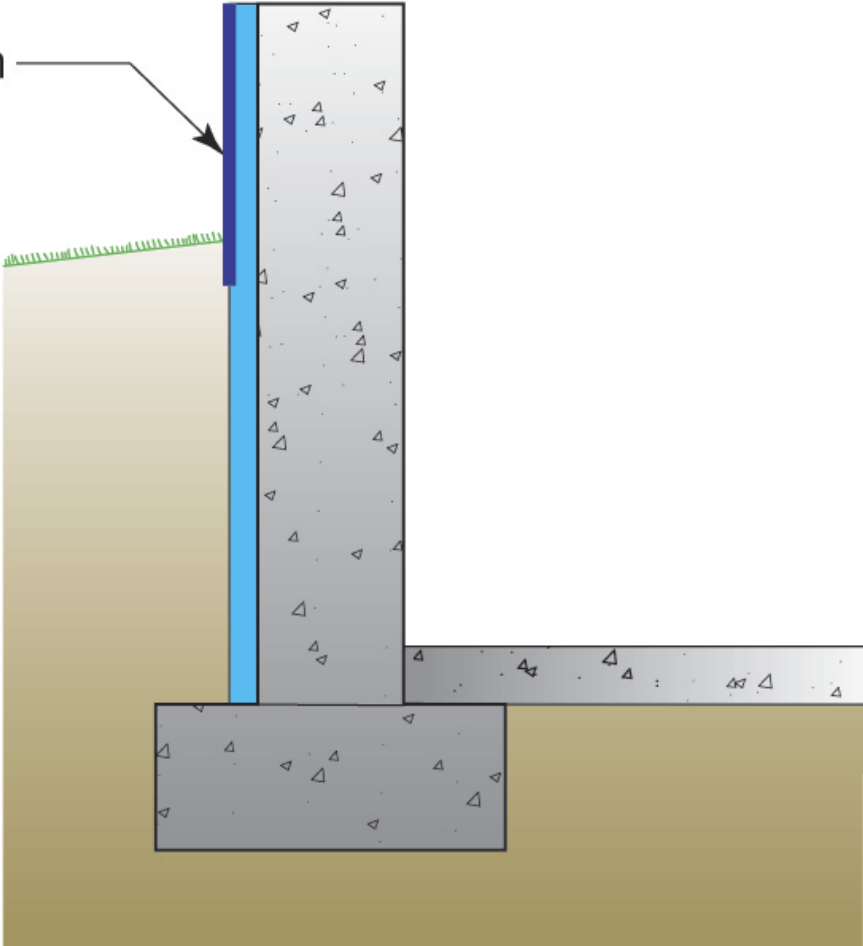


**Basement Insulated Both  
Externally and Internally**

Structure of house on foundation must be shifted outward to compensate for thickness of exterior insulation



Protection layer/system



















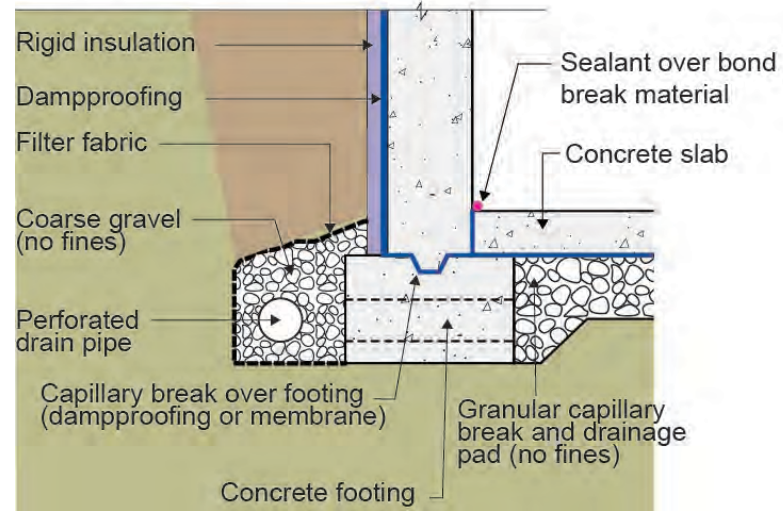
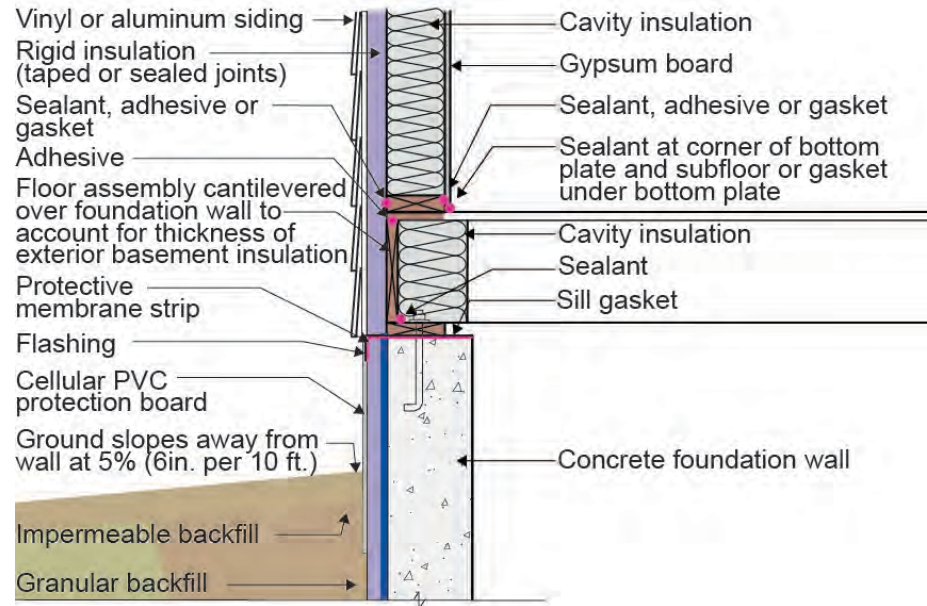




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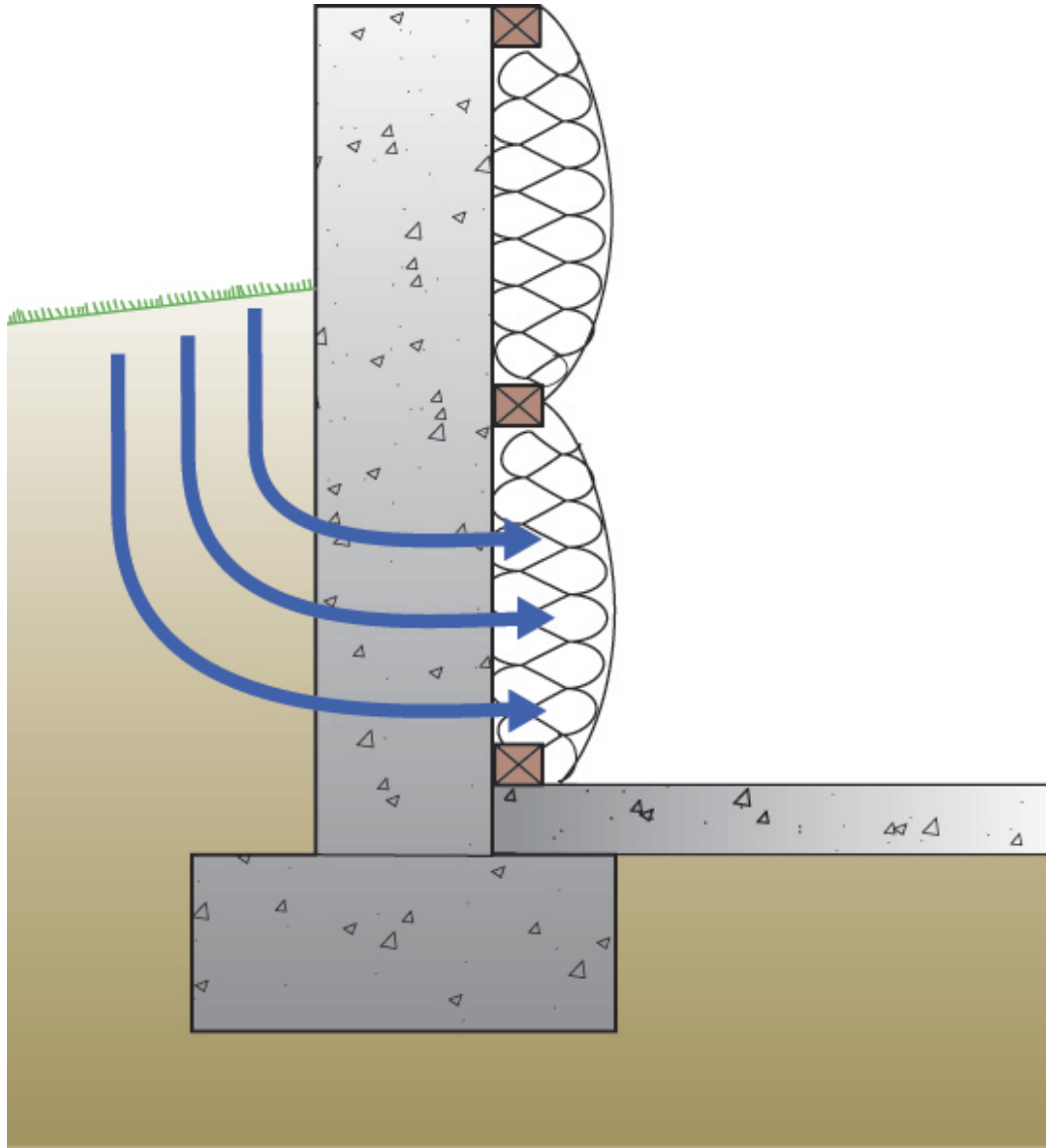




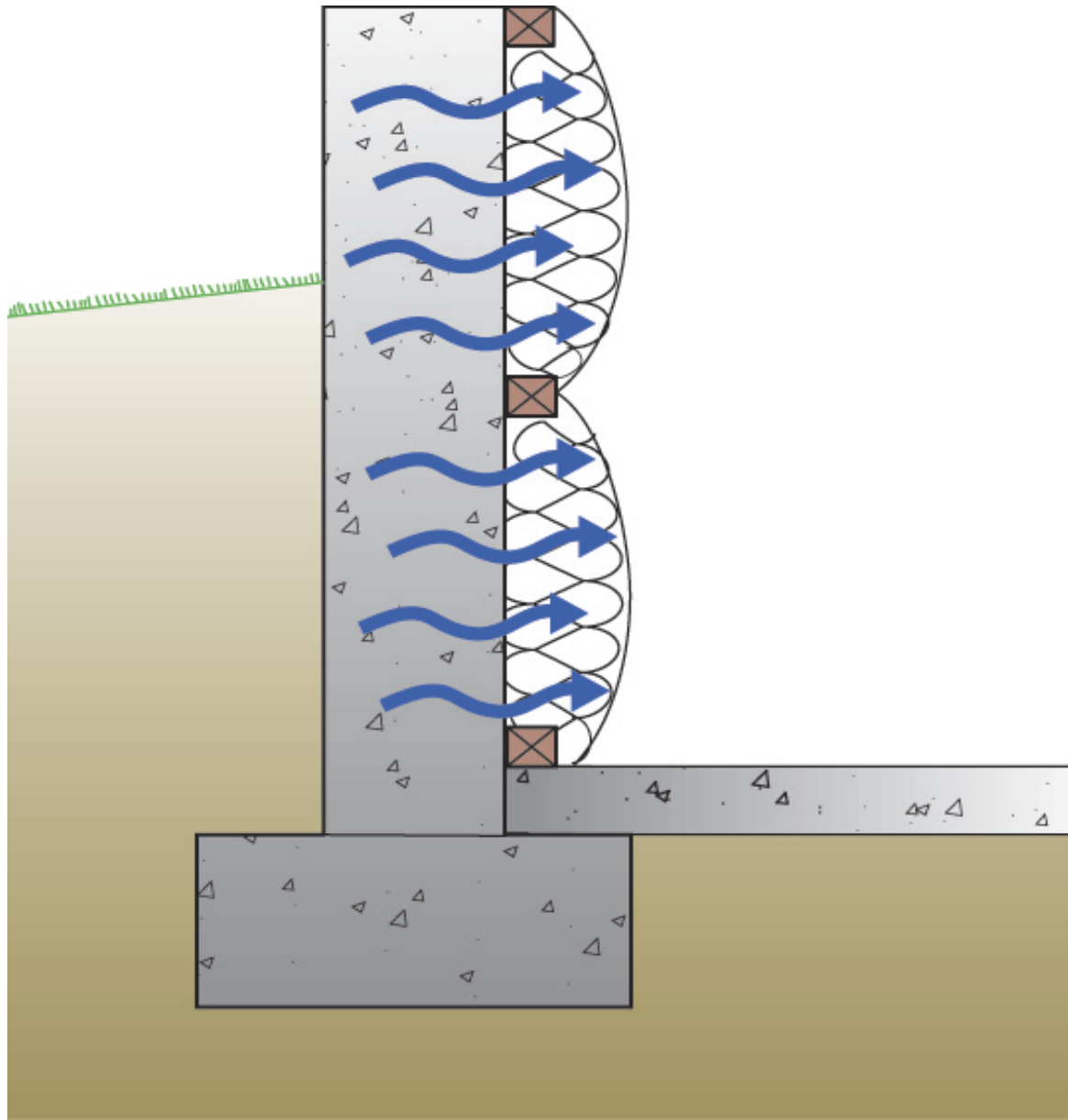


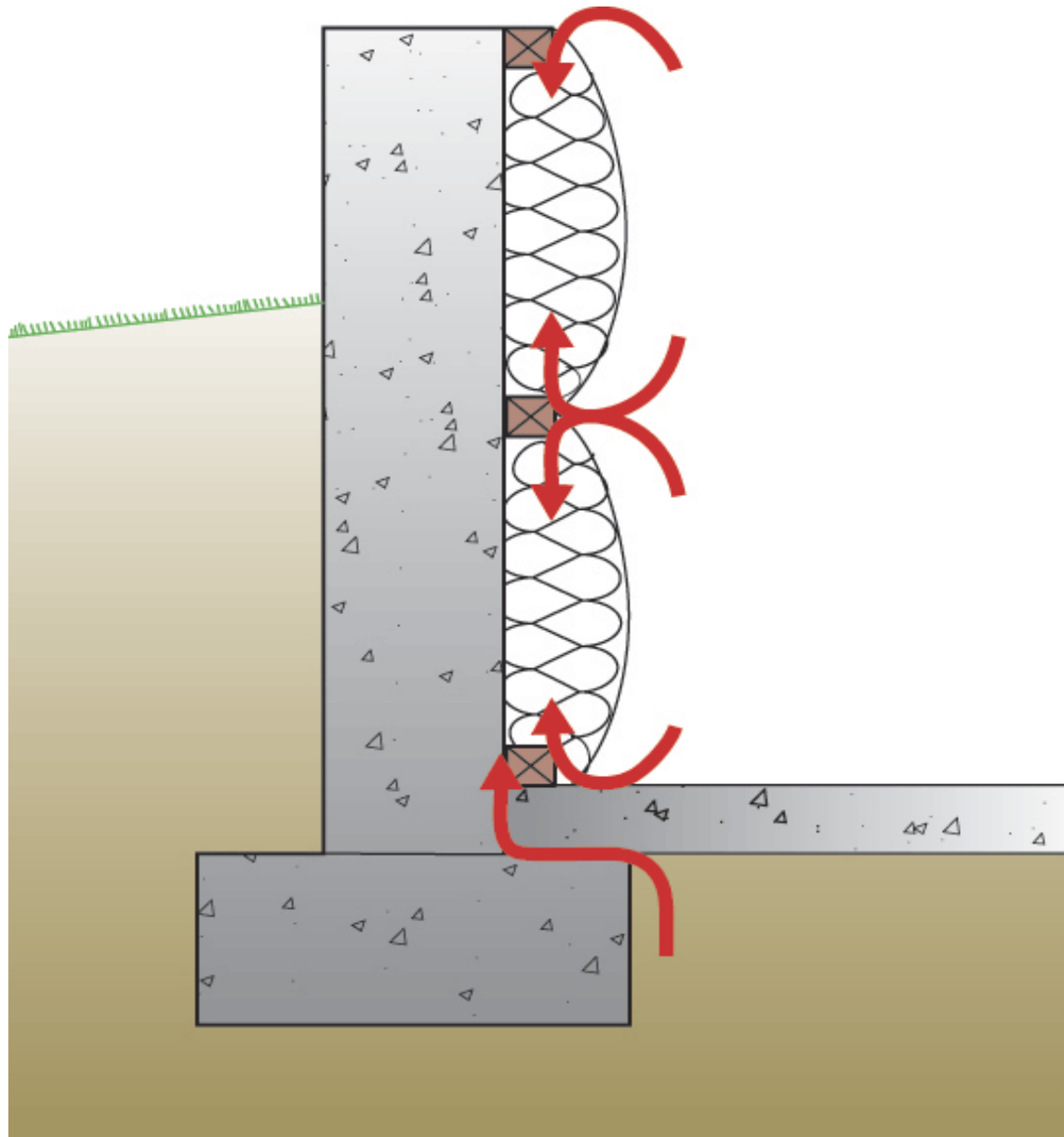


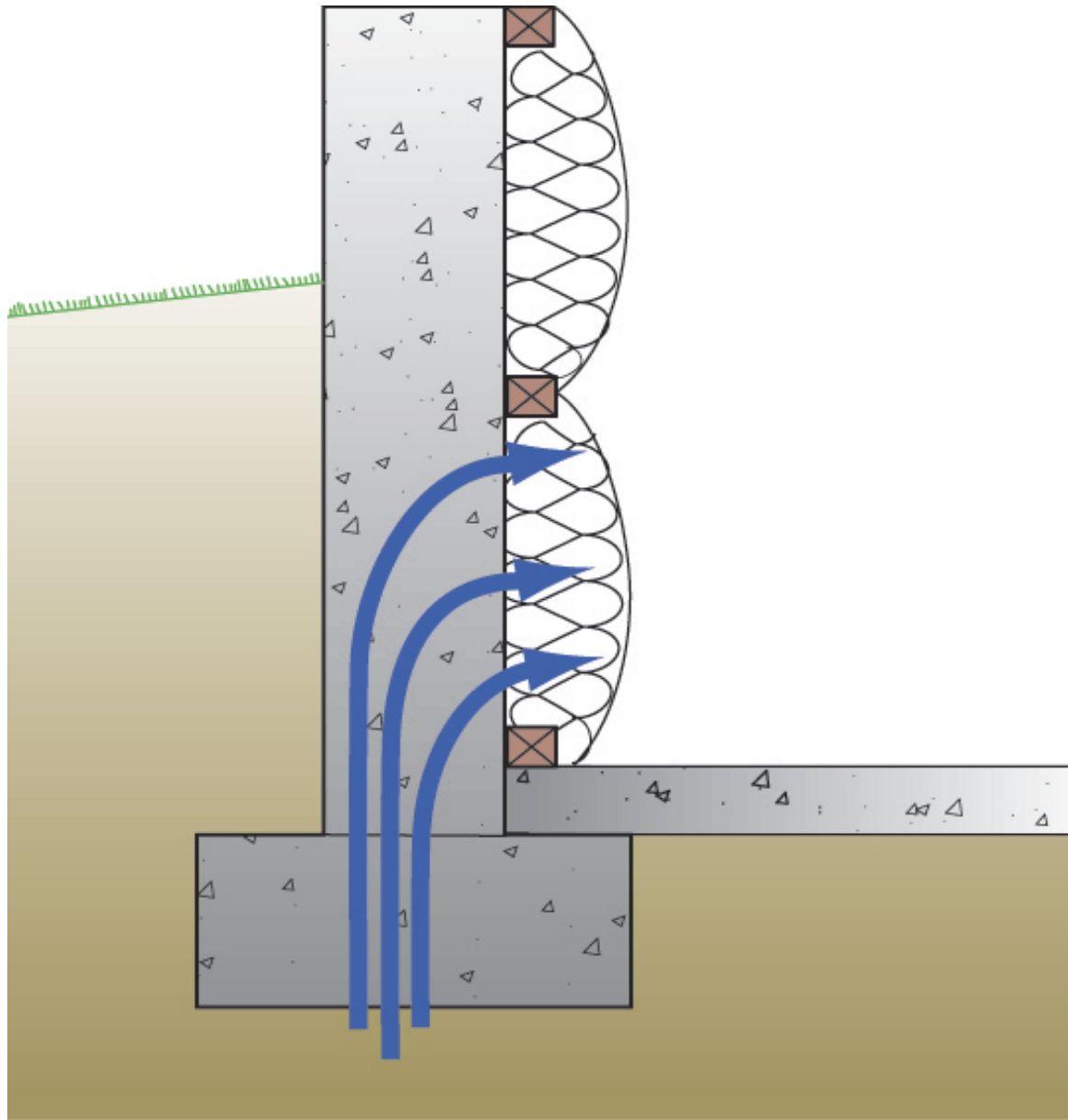


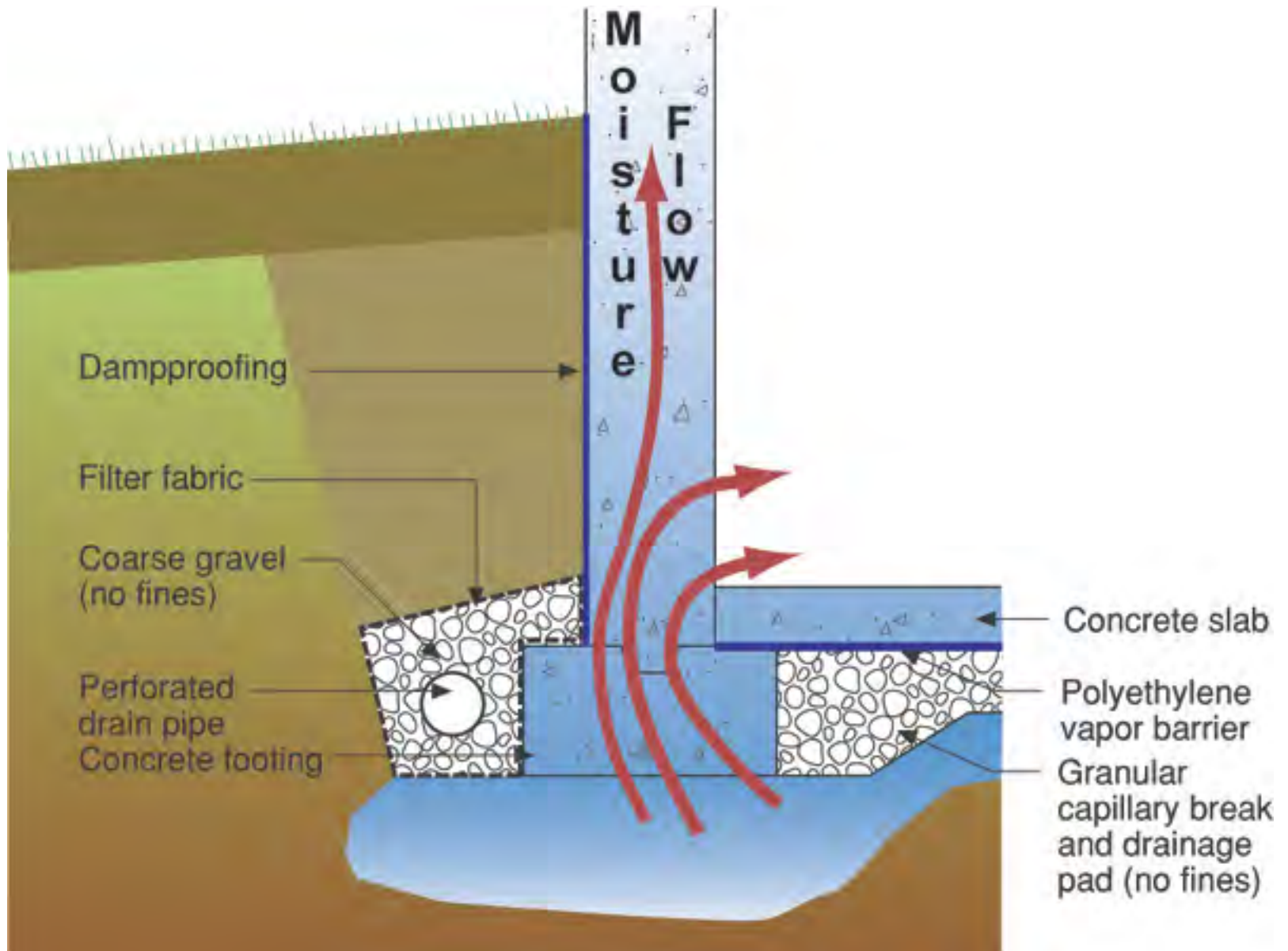


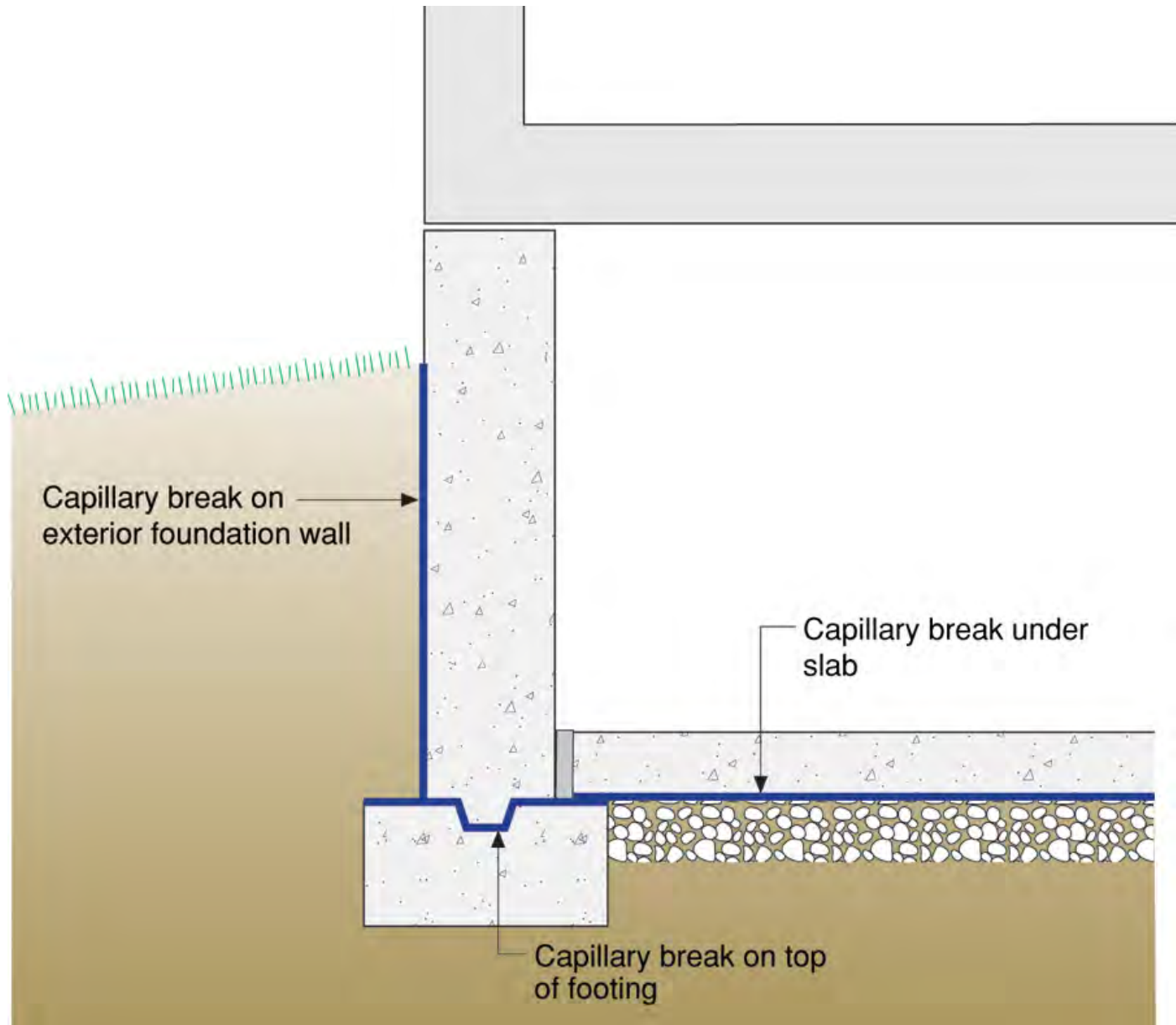




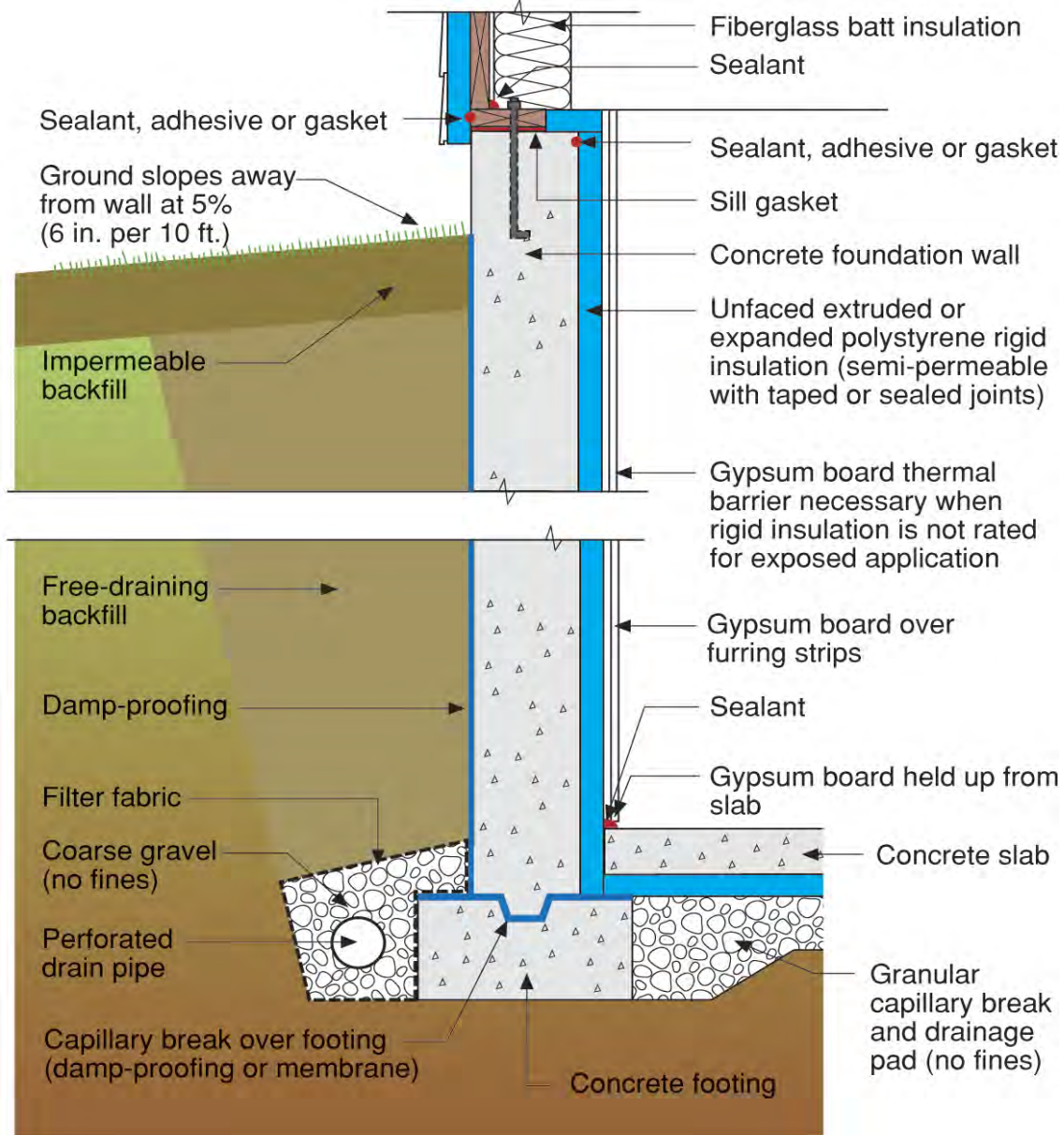






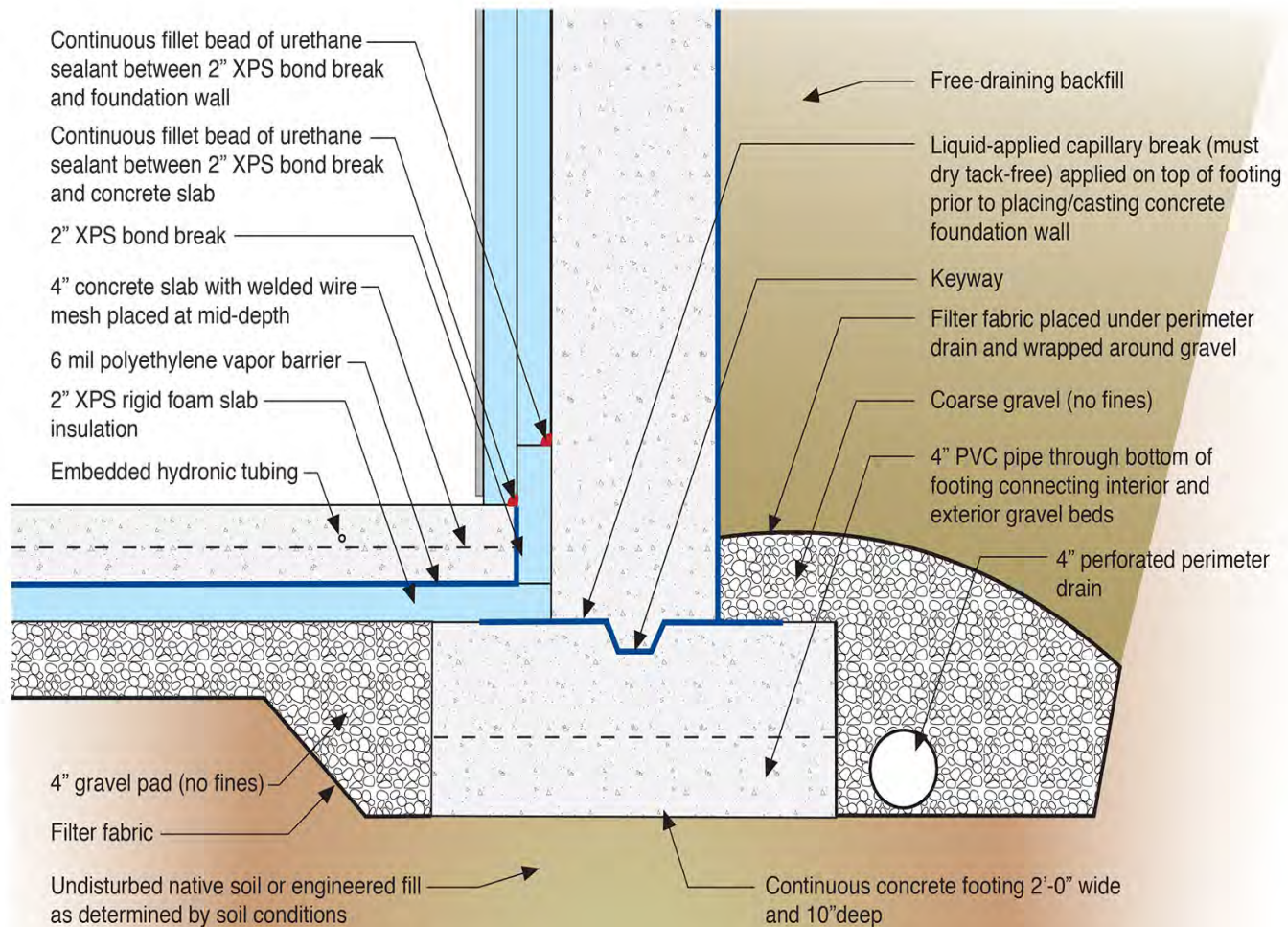






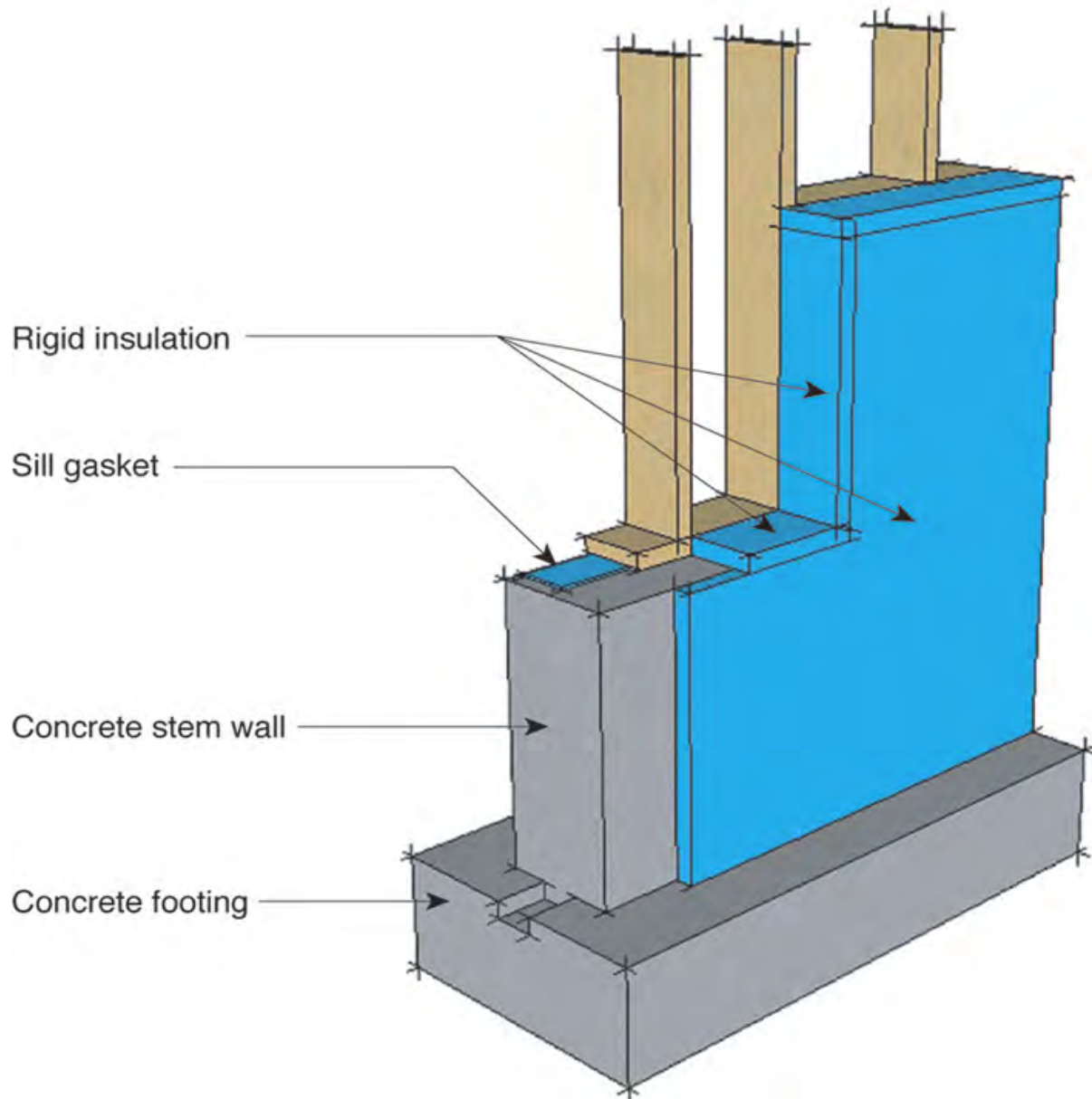


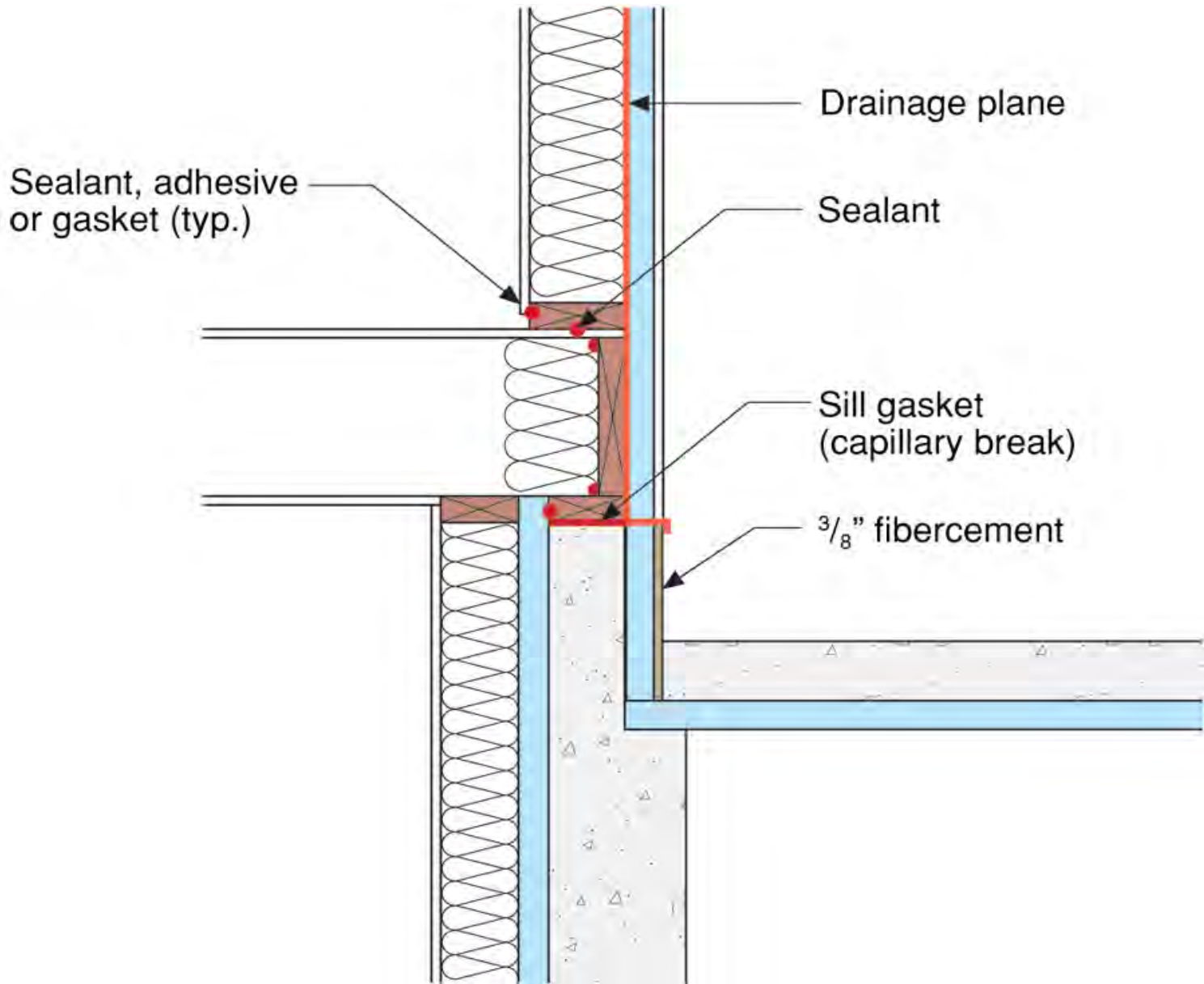




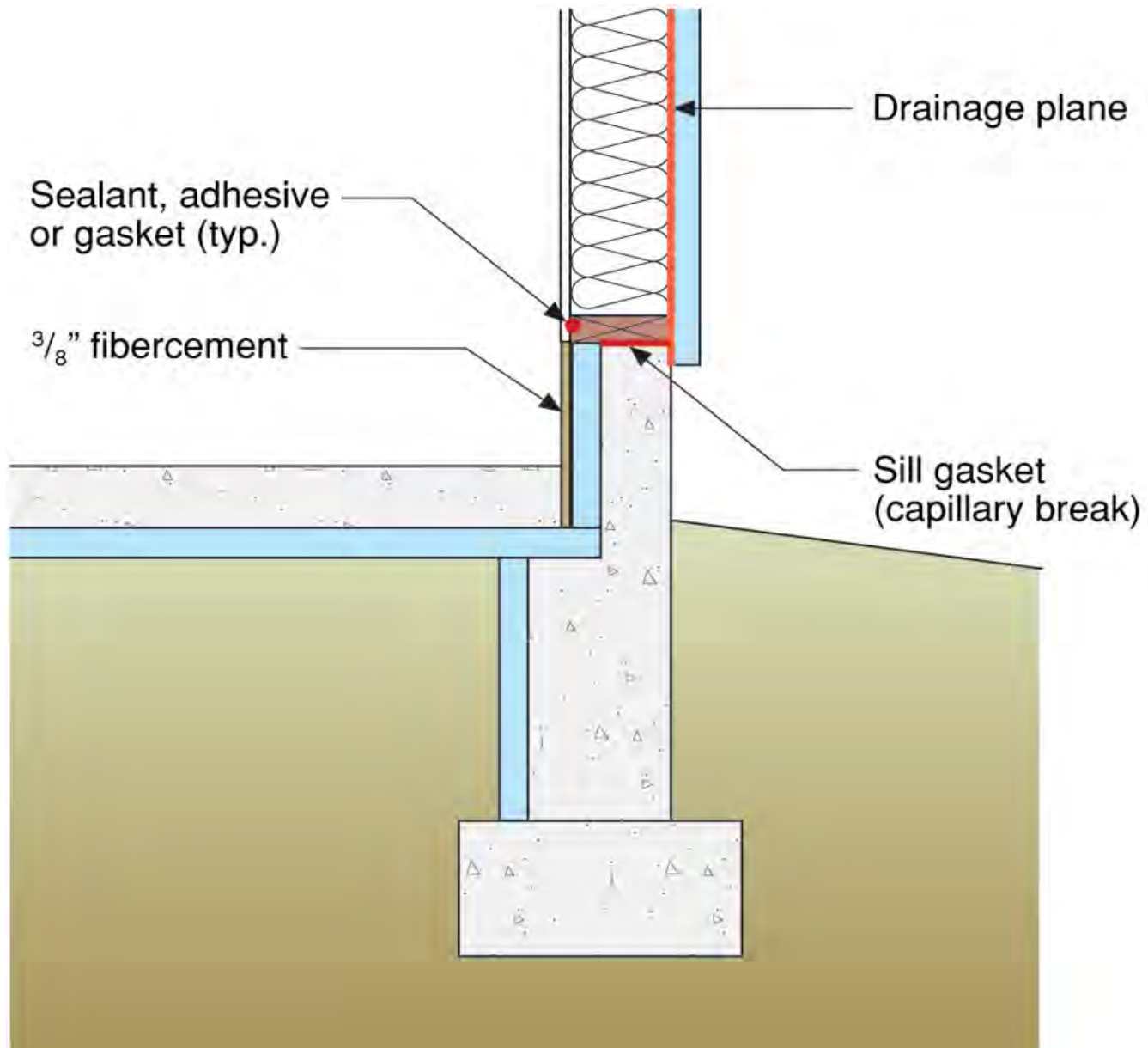


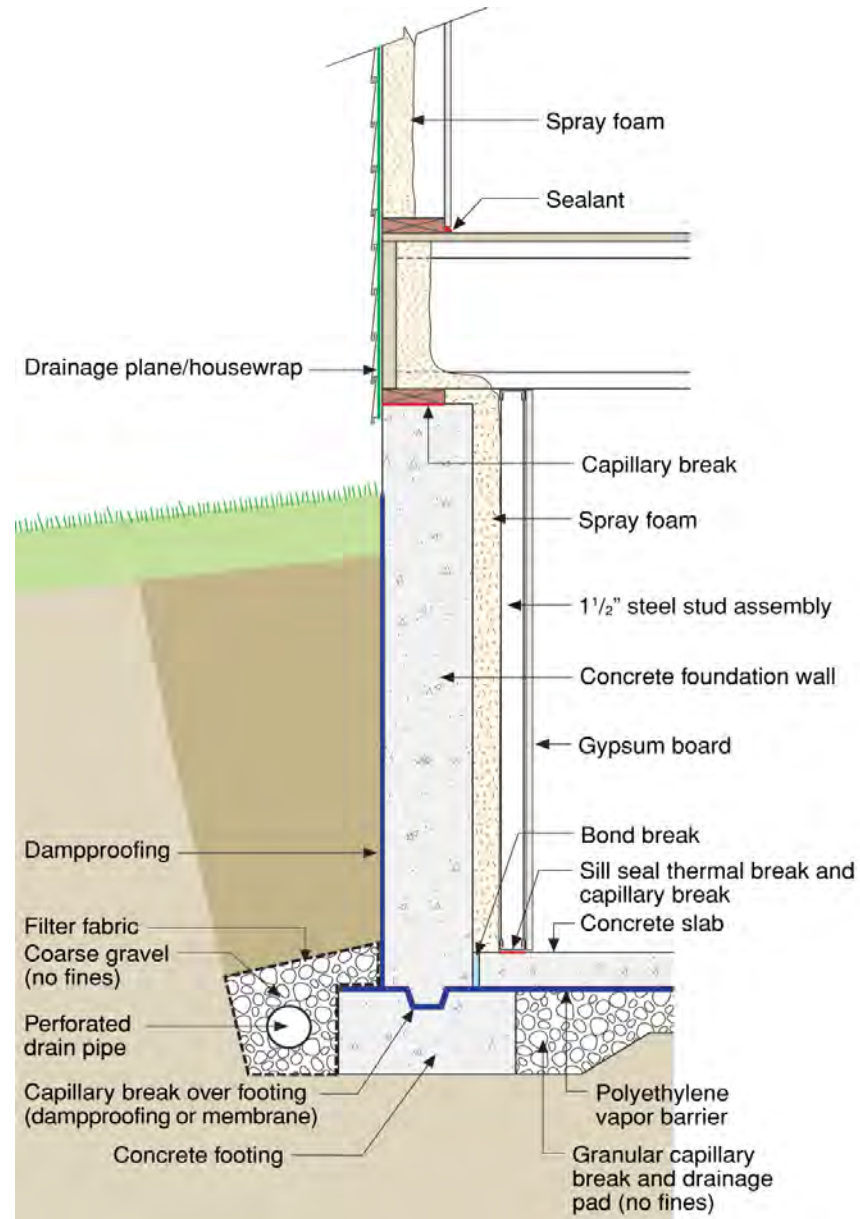








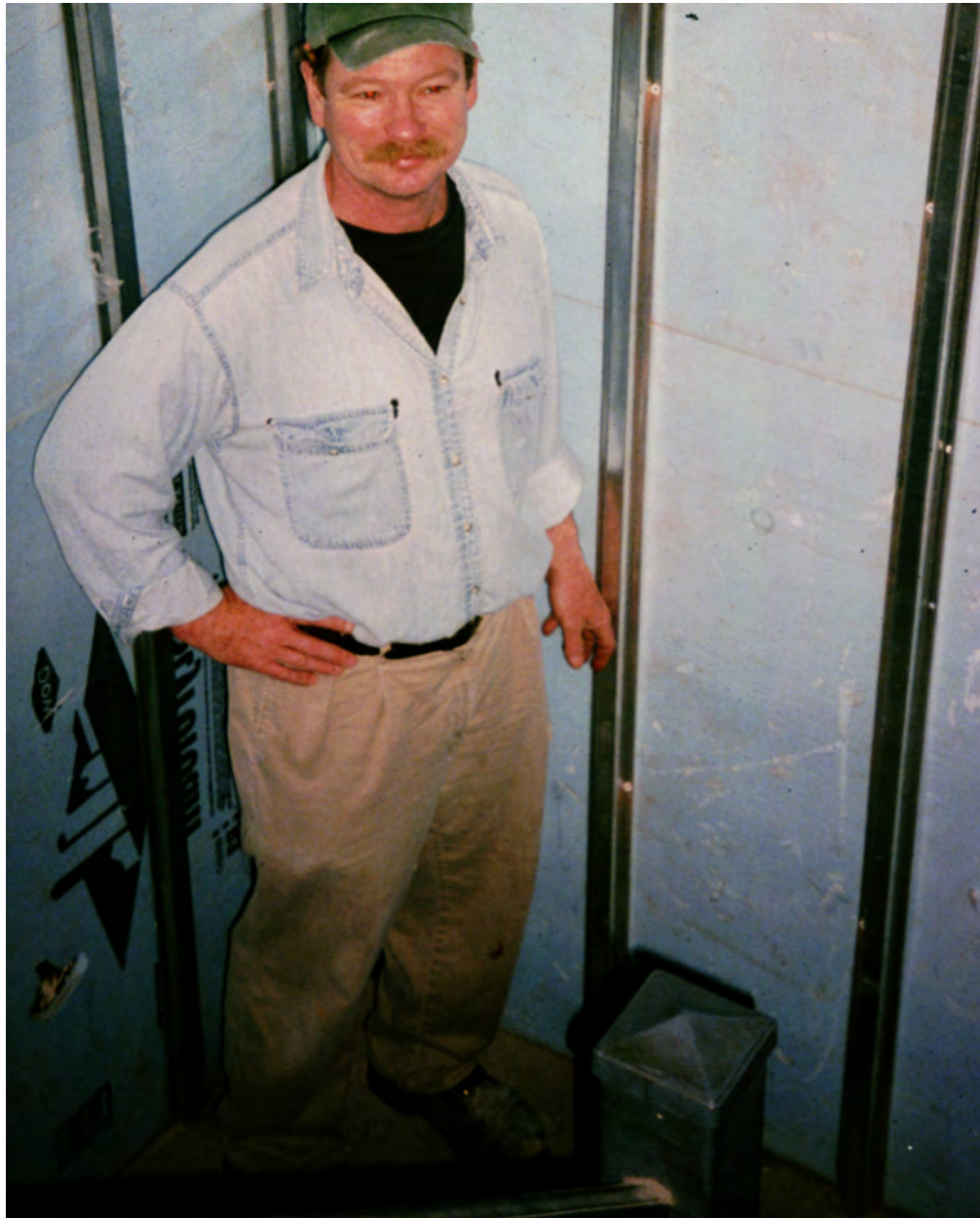












# Crawl Spaces



Crawl spaces must be completely connected to either the outside or the inside

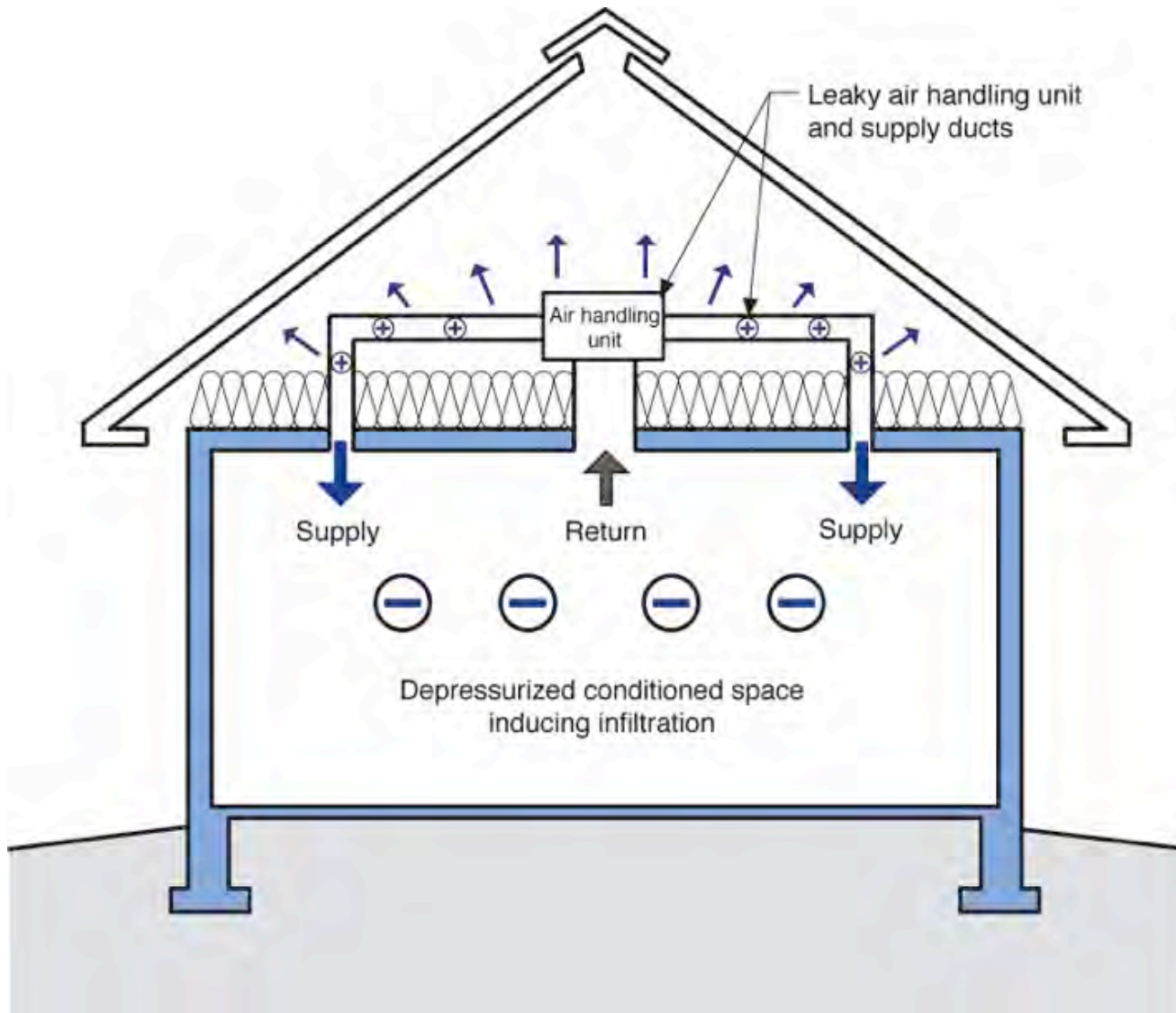
Crawl spaces must be completely connected to either the outside or the inside

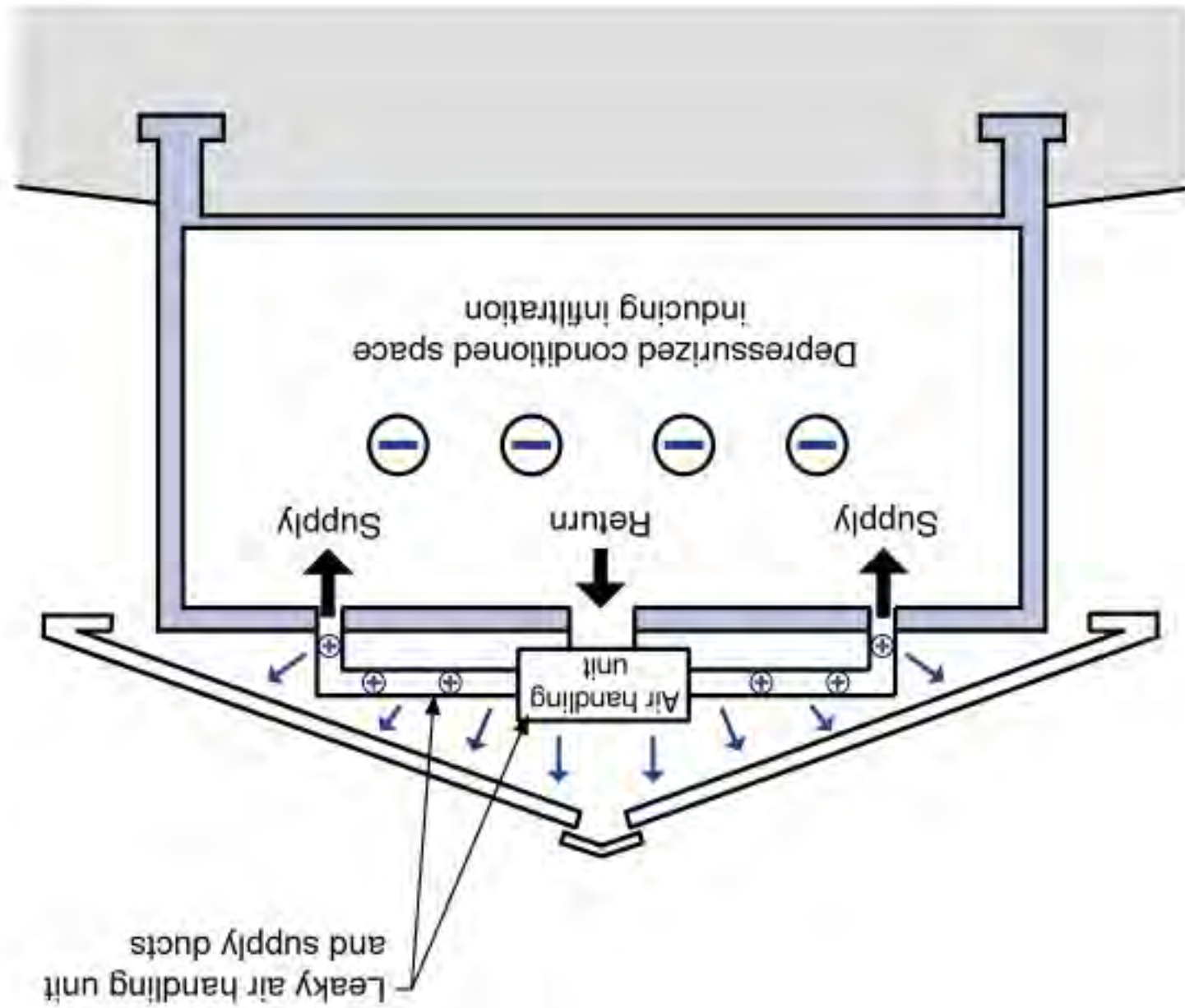
Vented crawl spaces work

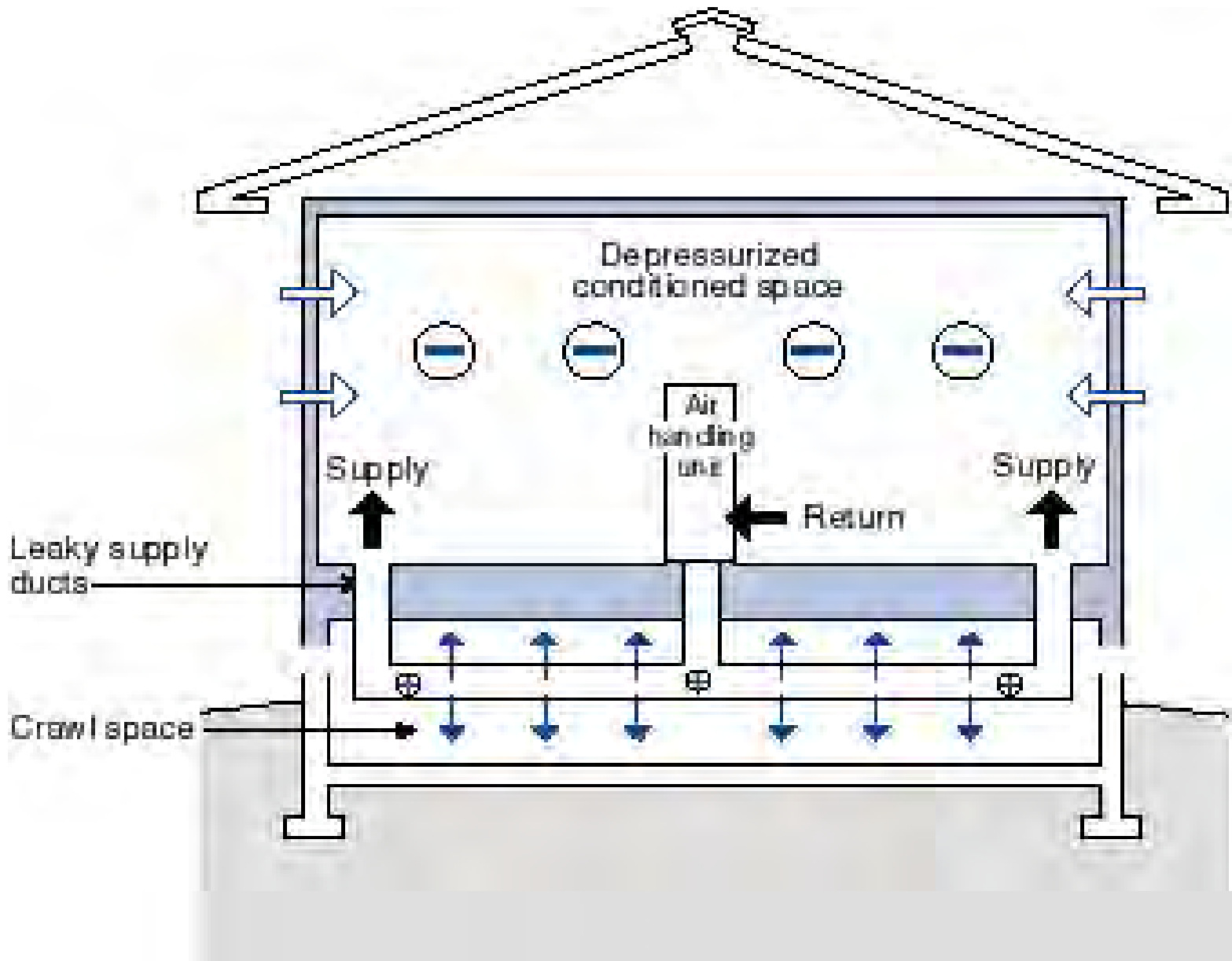
Unvented conditioned crawl spaces work

# Don't Do Stupid Things











# Smart Thing











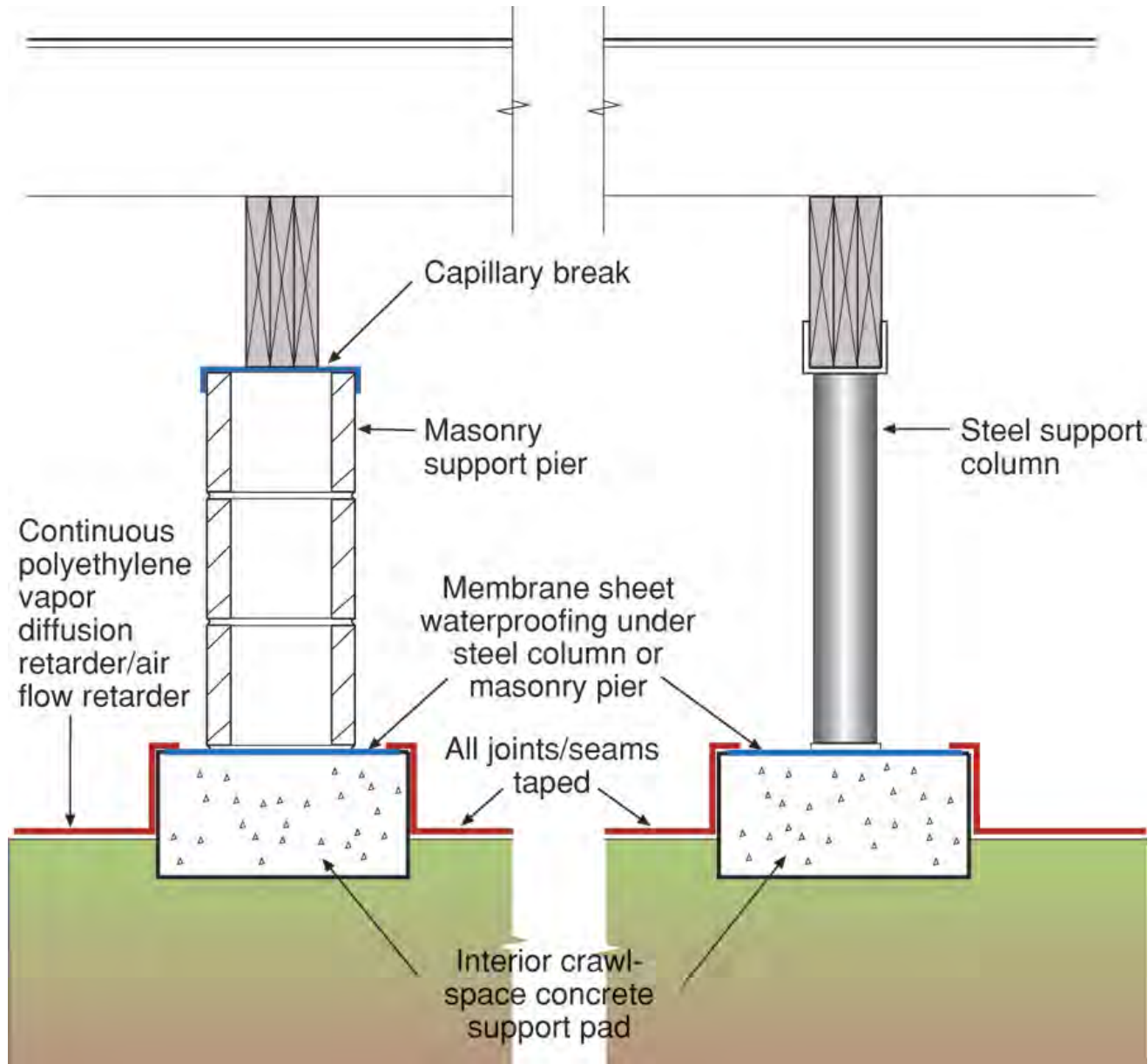












Conditioned Crawlspace Not Unvented  
Crawlspace

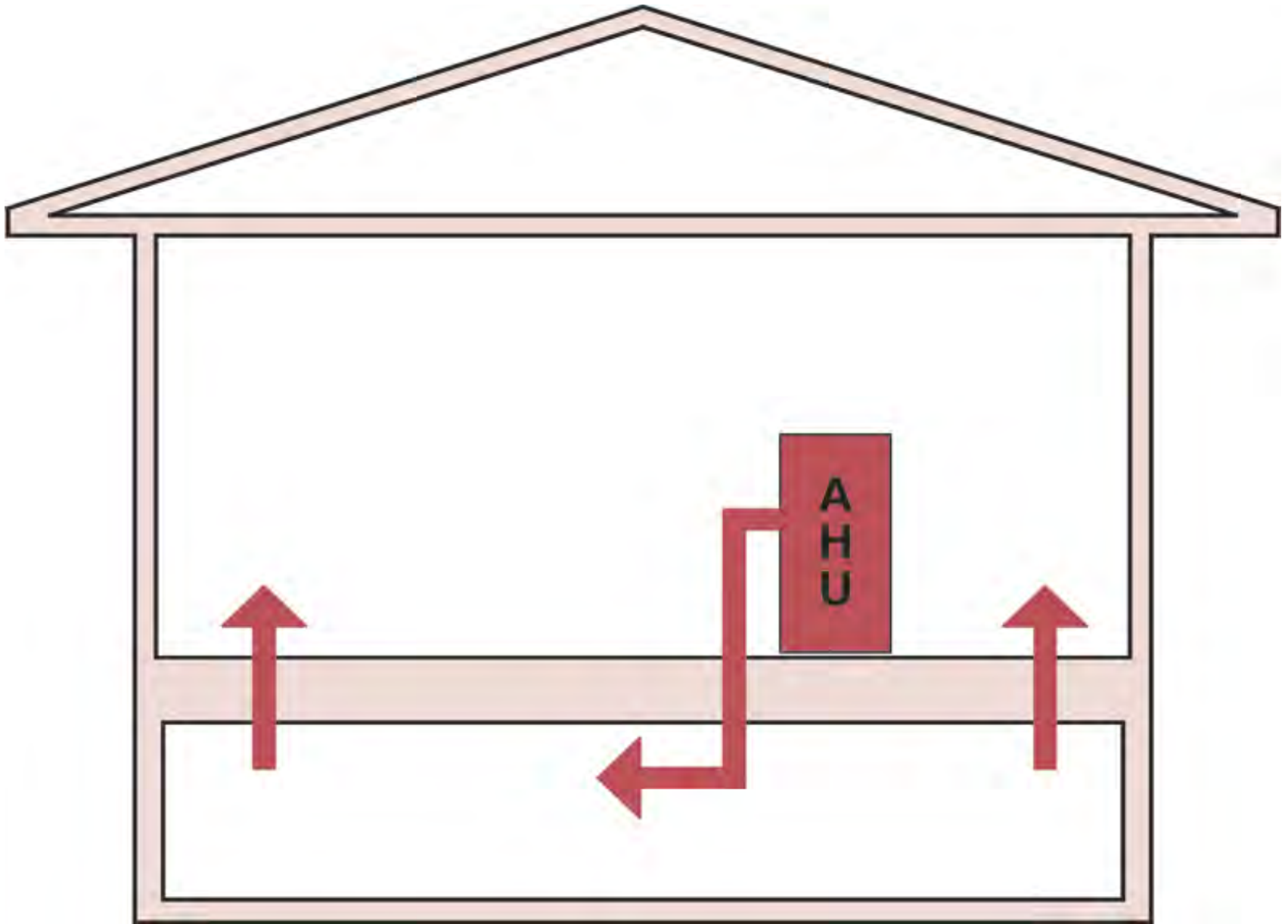
Need Supply Air

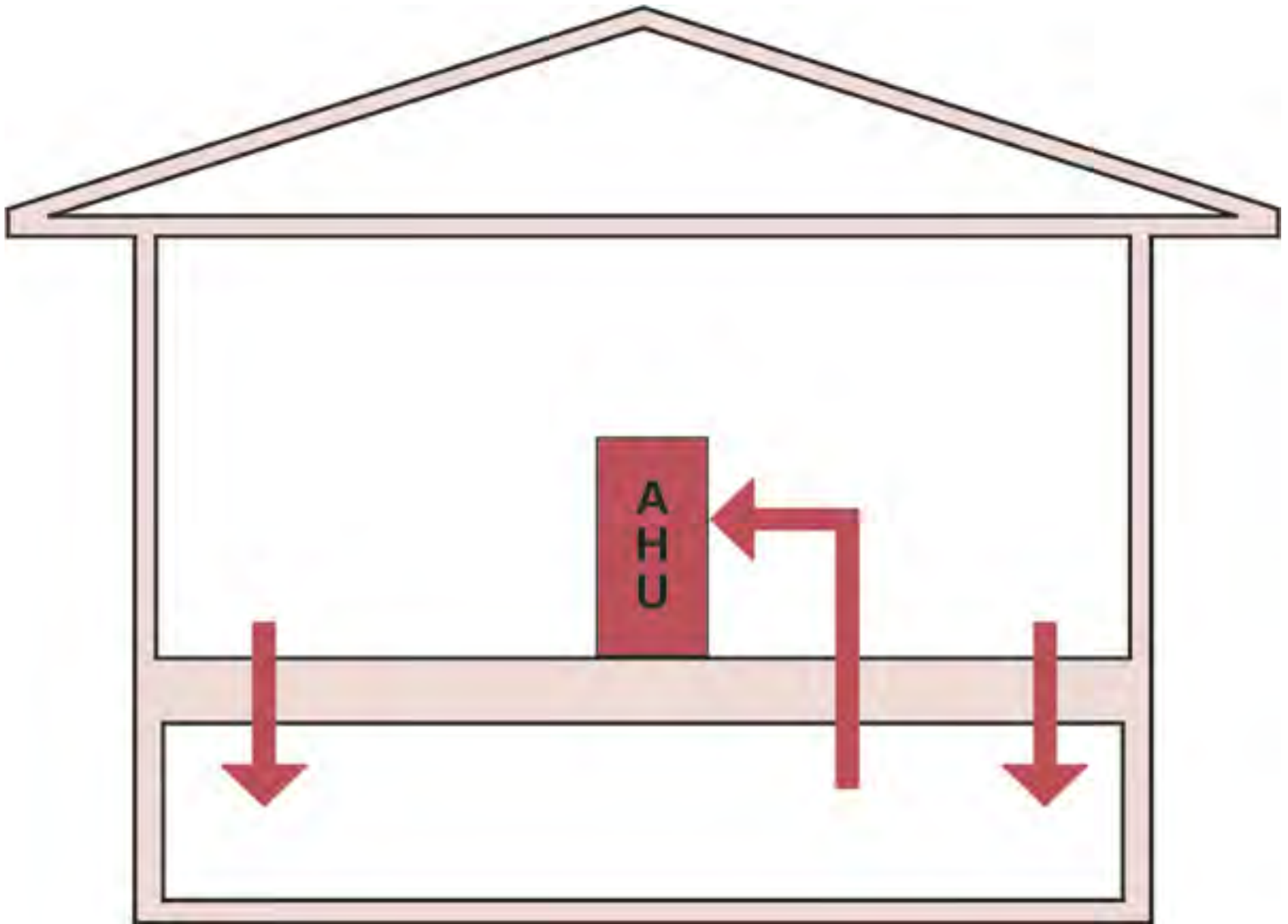
50 cfm/1000 ft<sup>2</sup> of Crawlspace Area

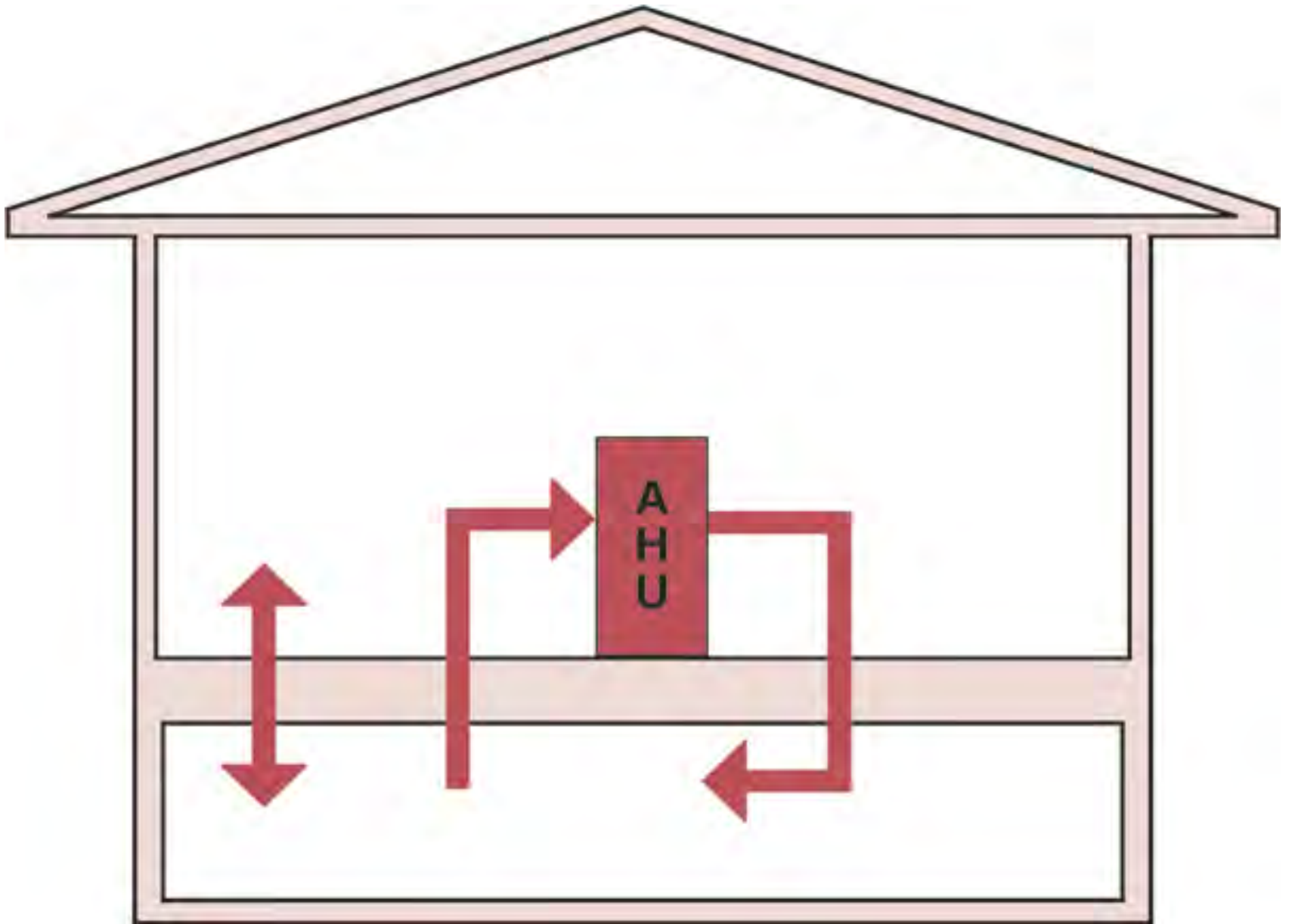
Or

Dehumidification

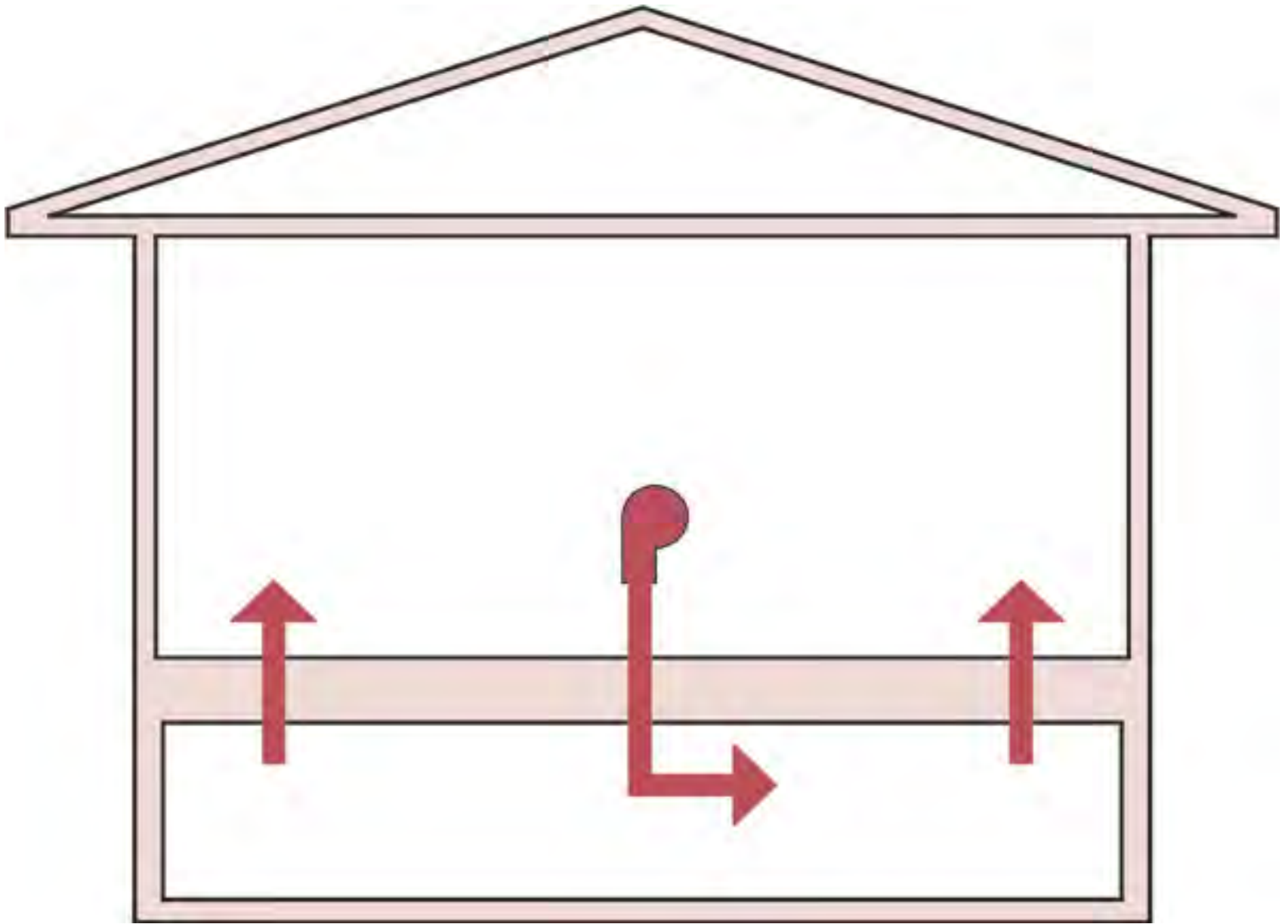


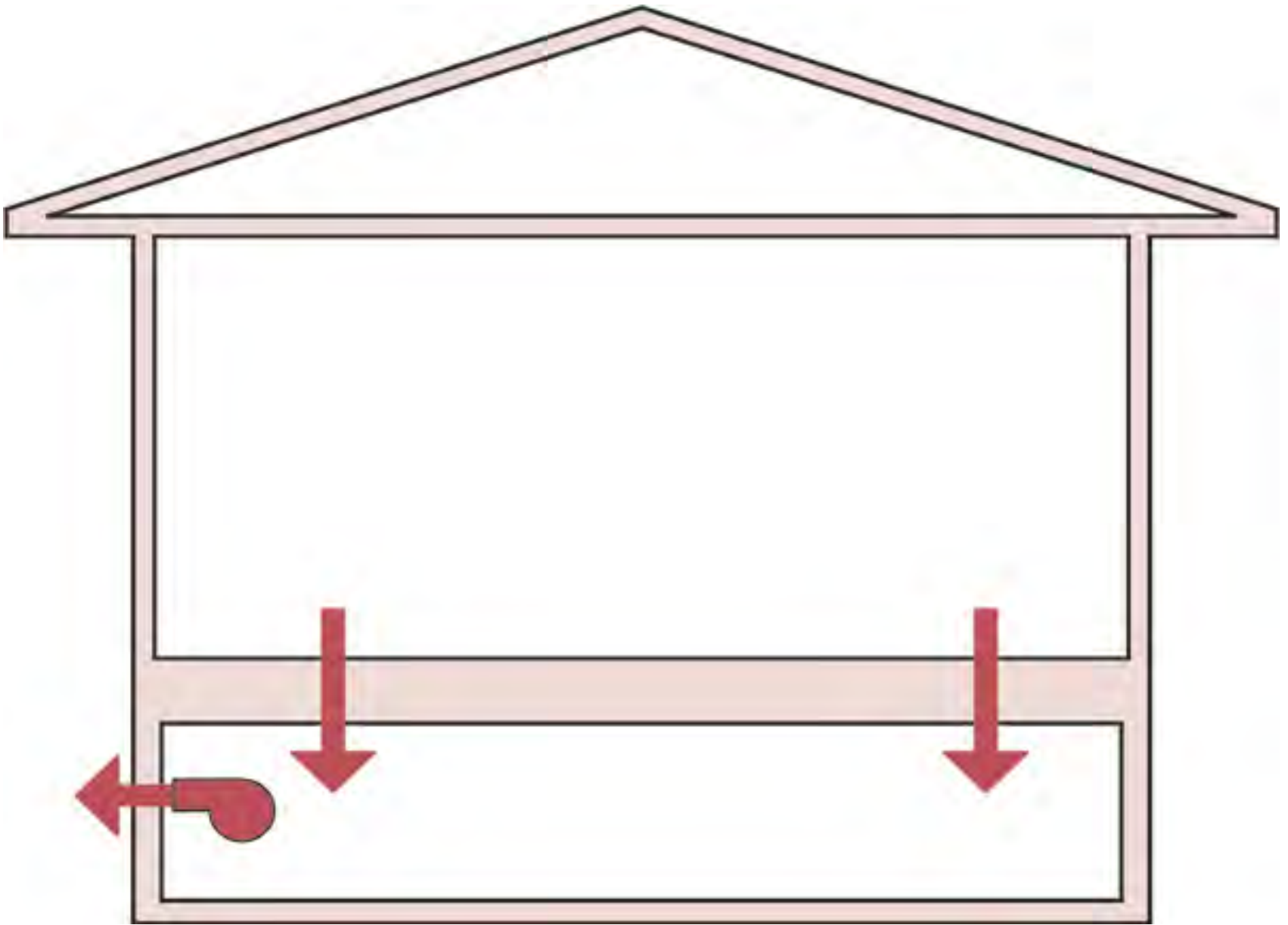


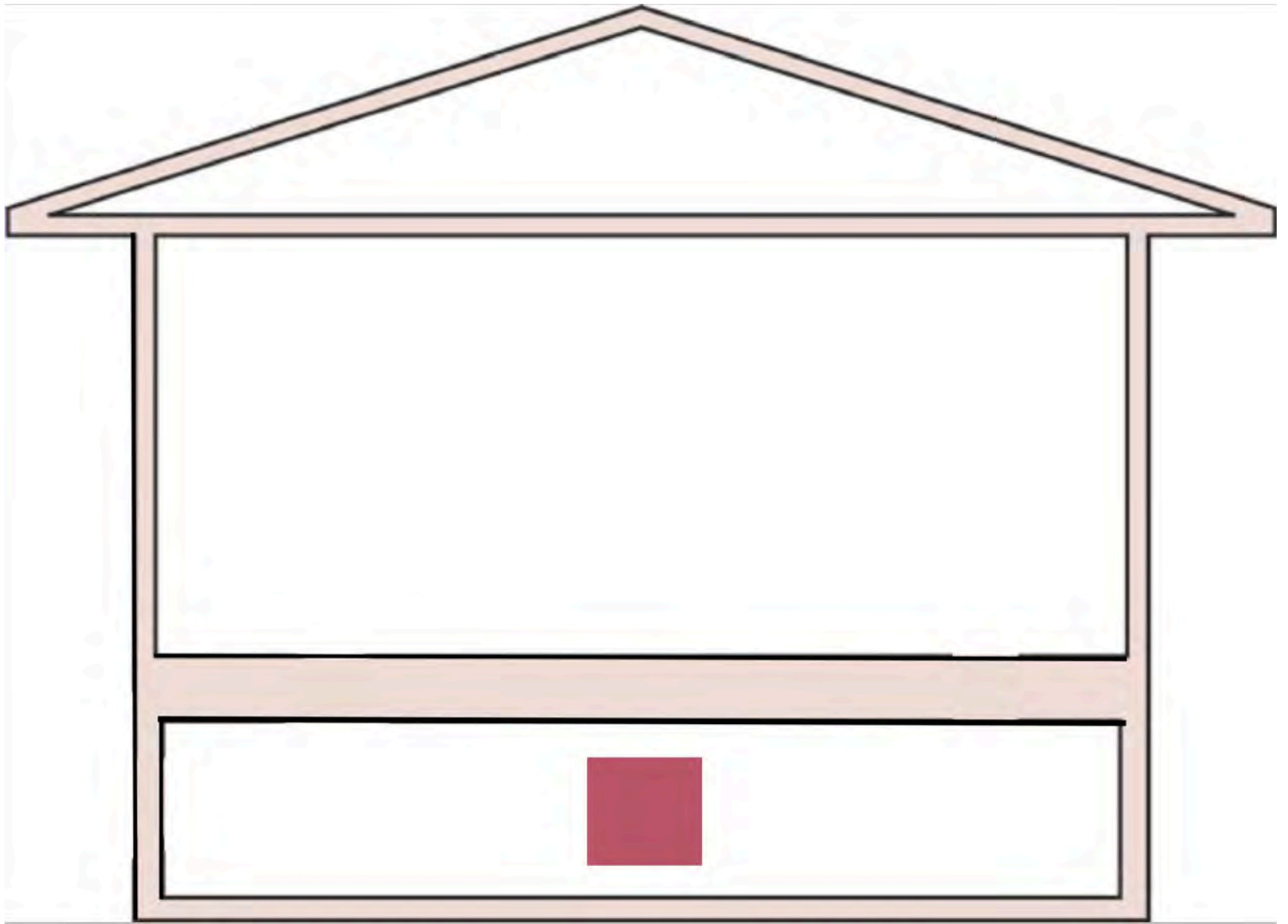




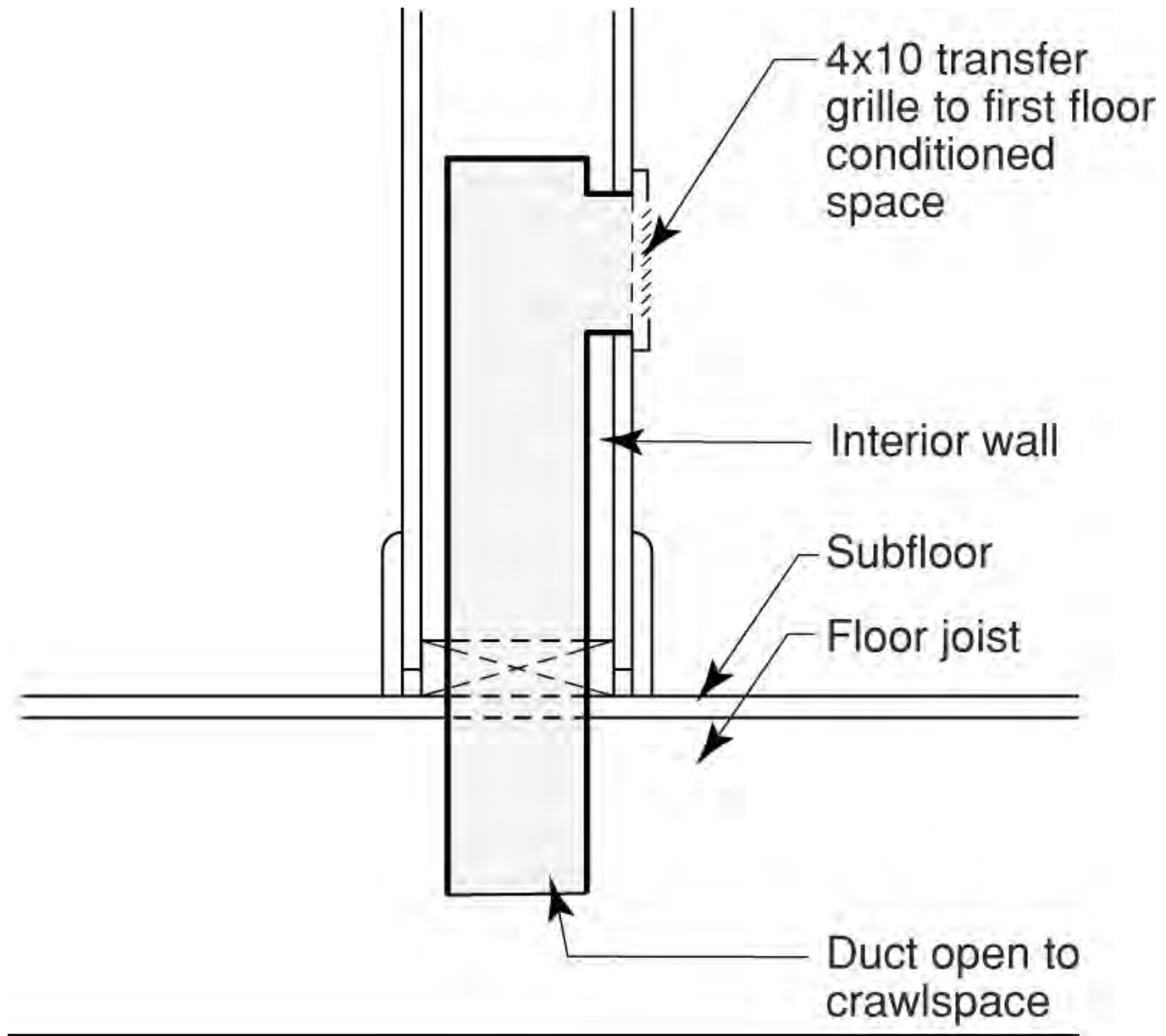




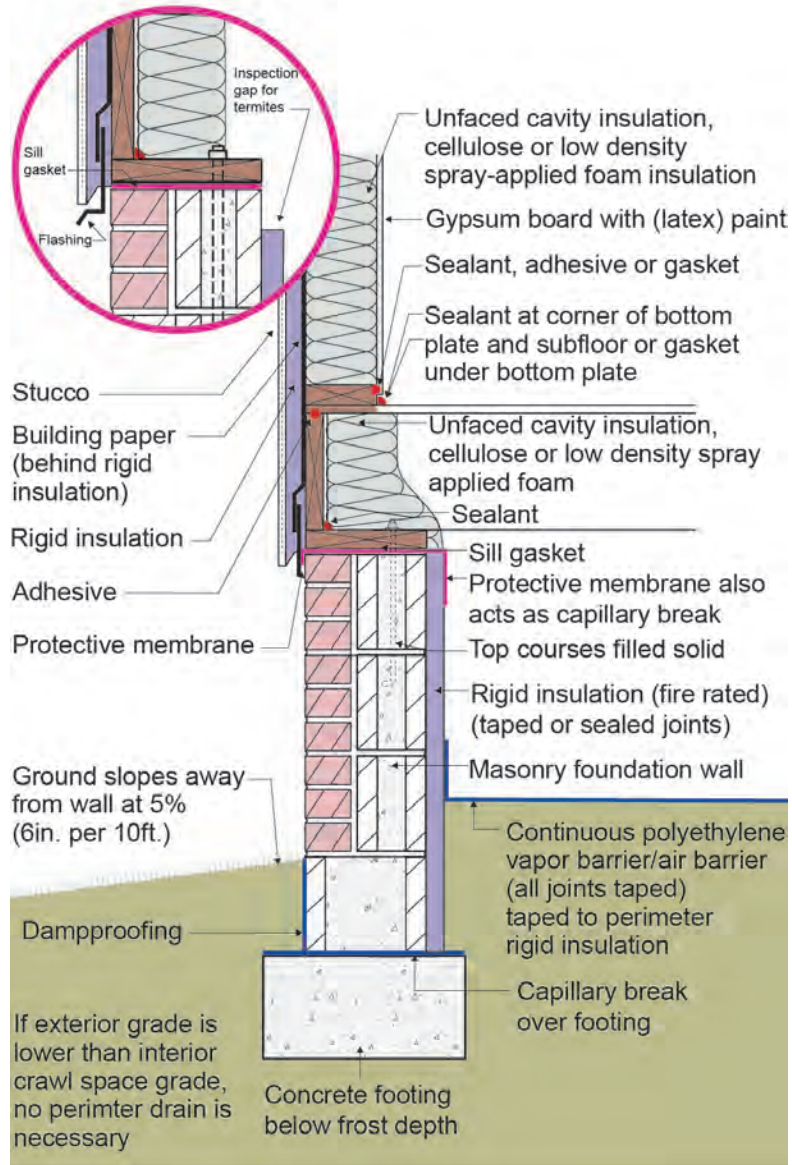






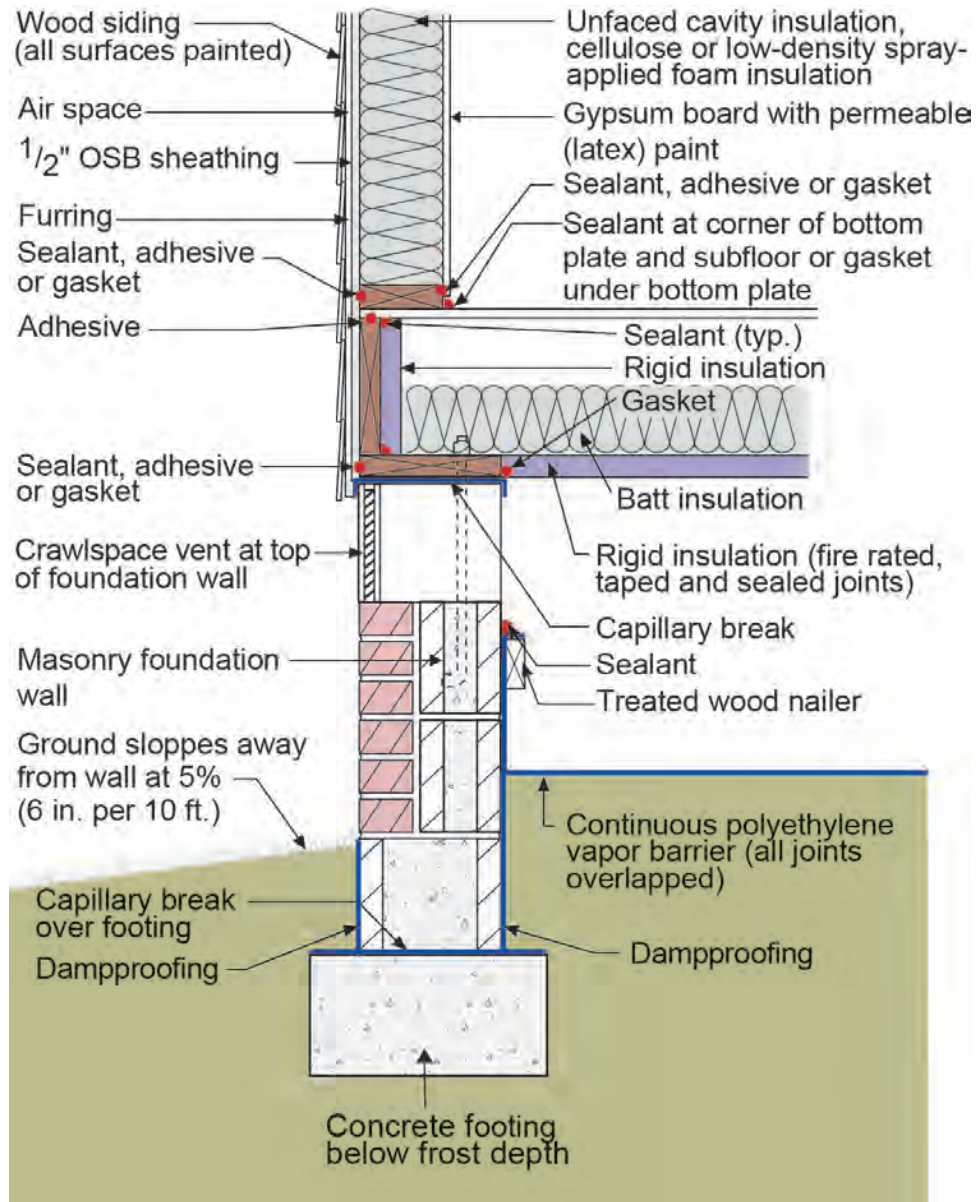


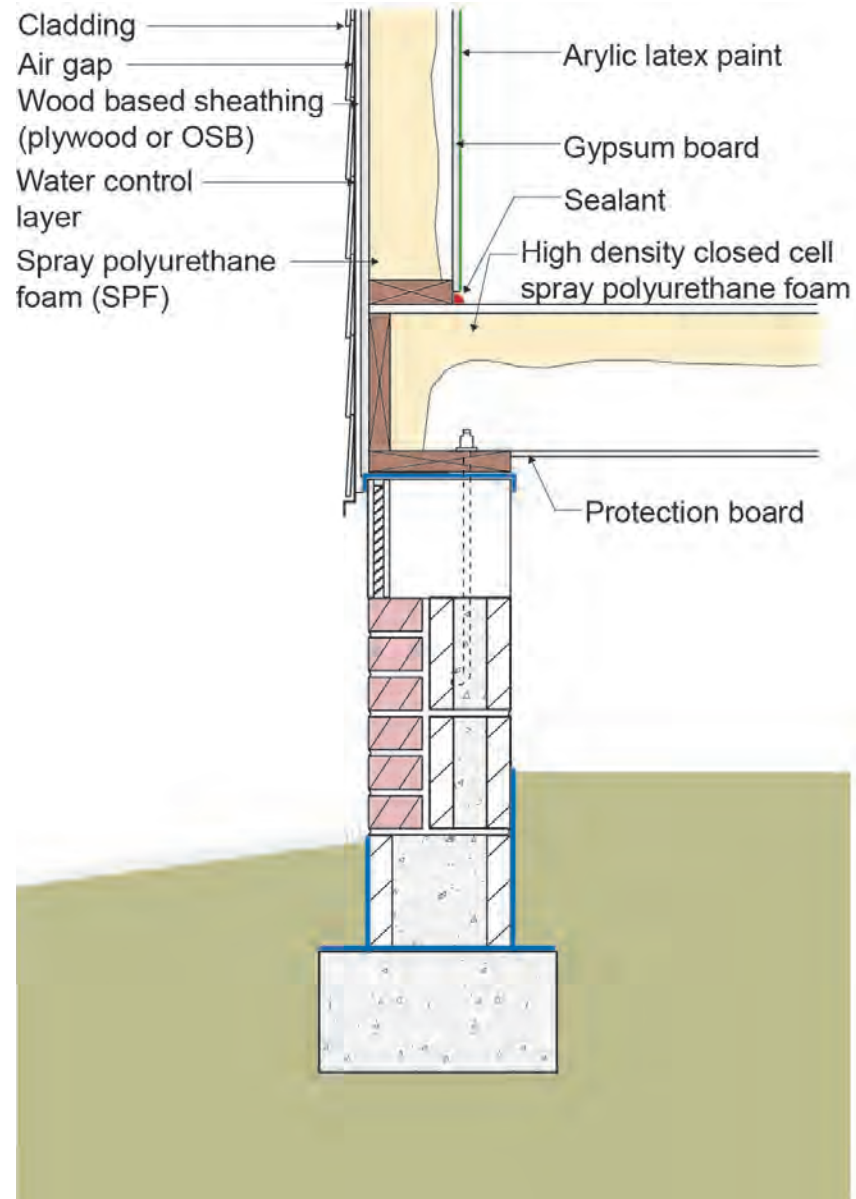
### Alternative Detail

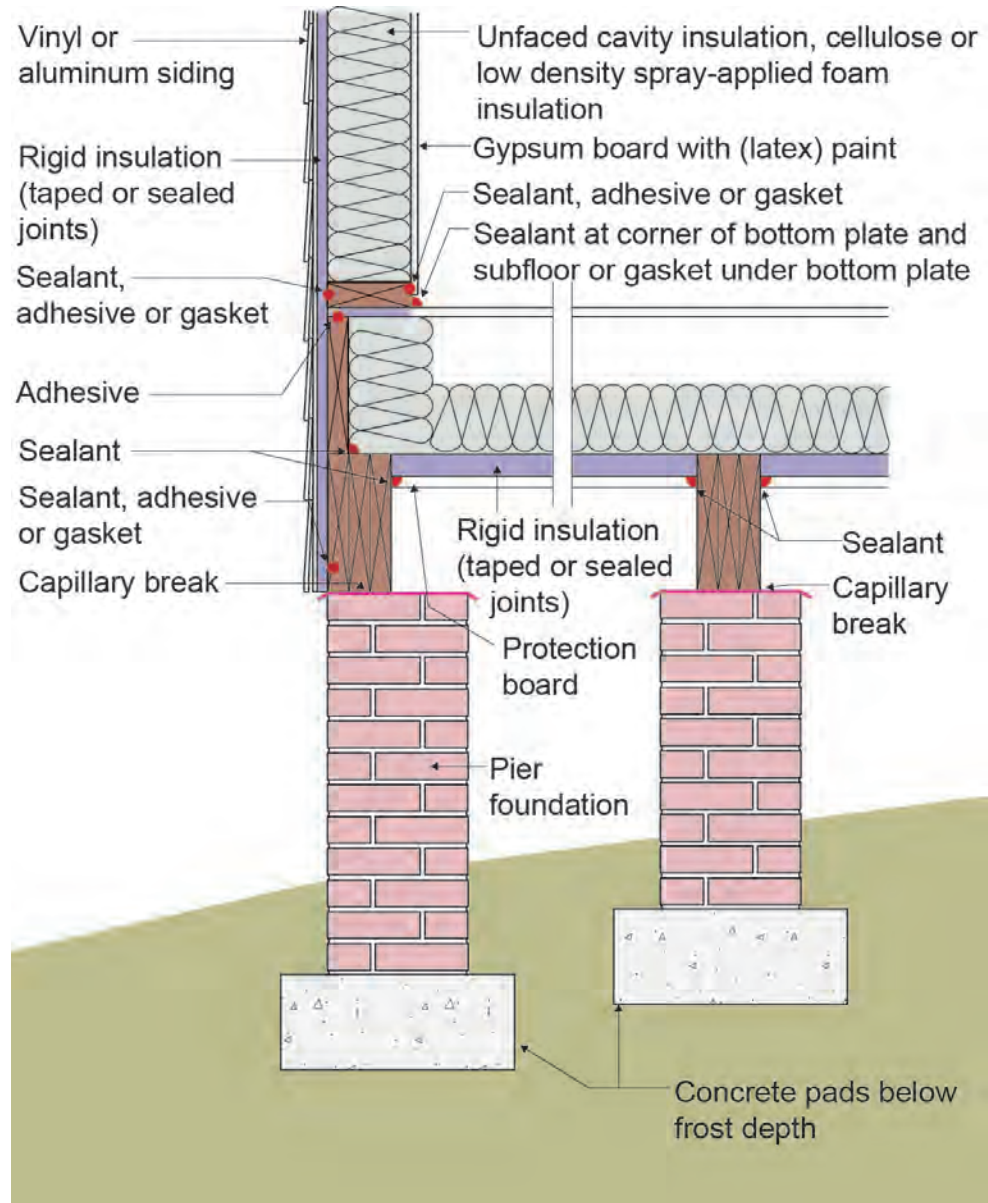


# Smart Thing













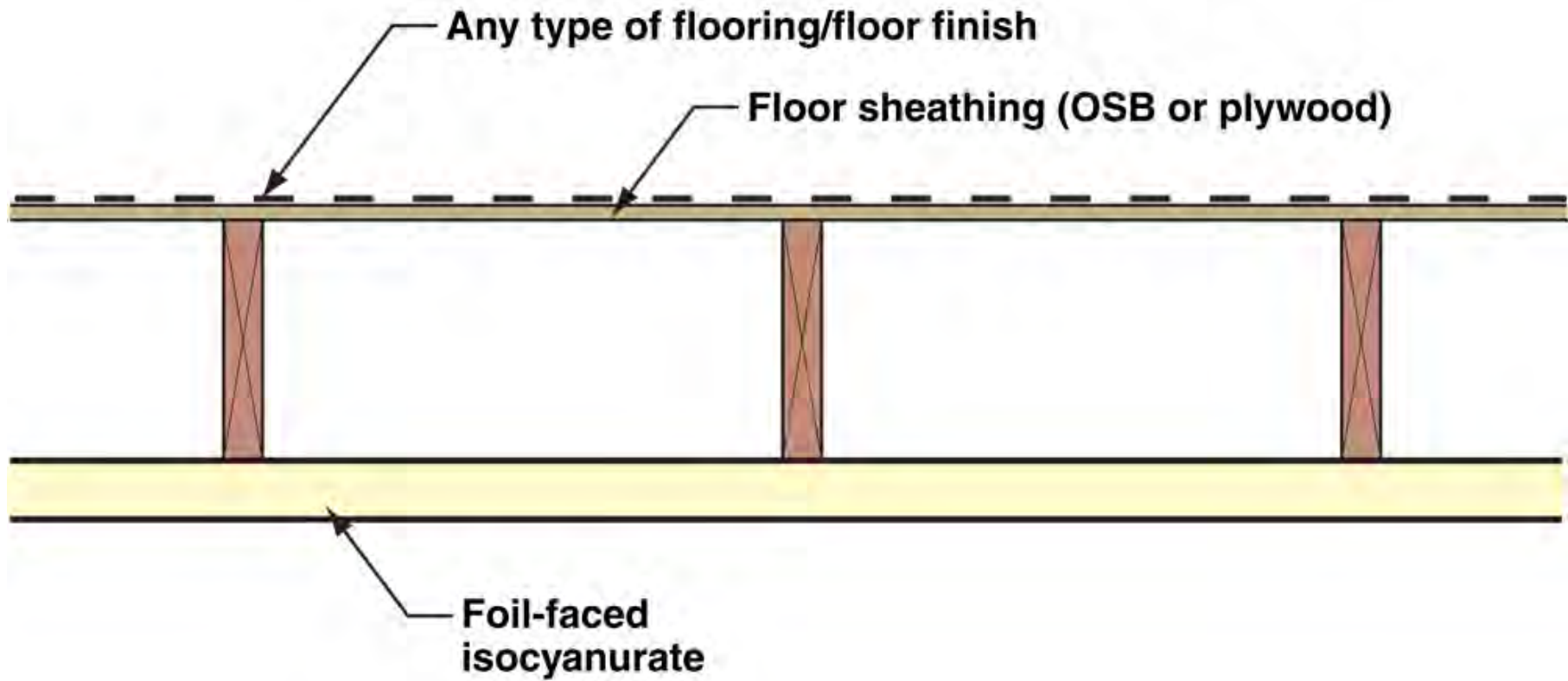


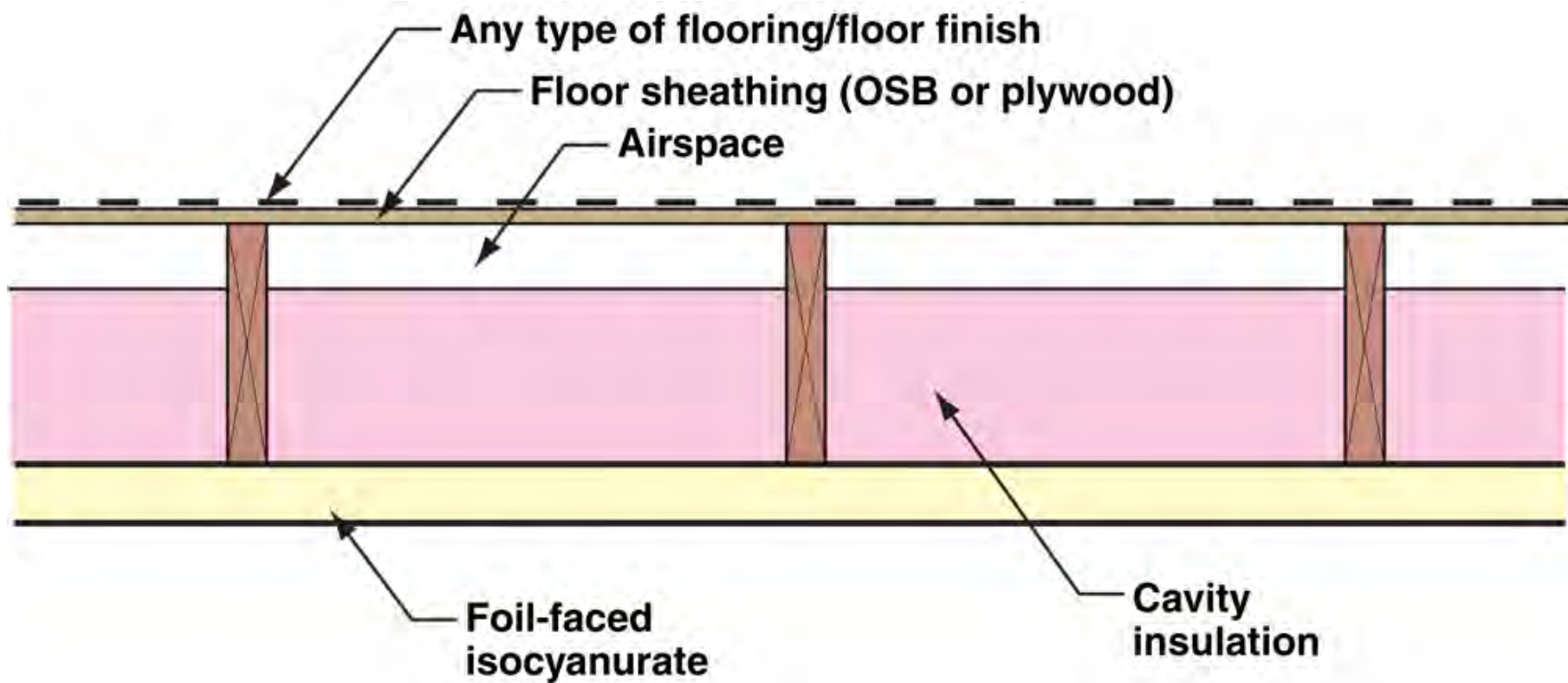














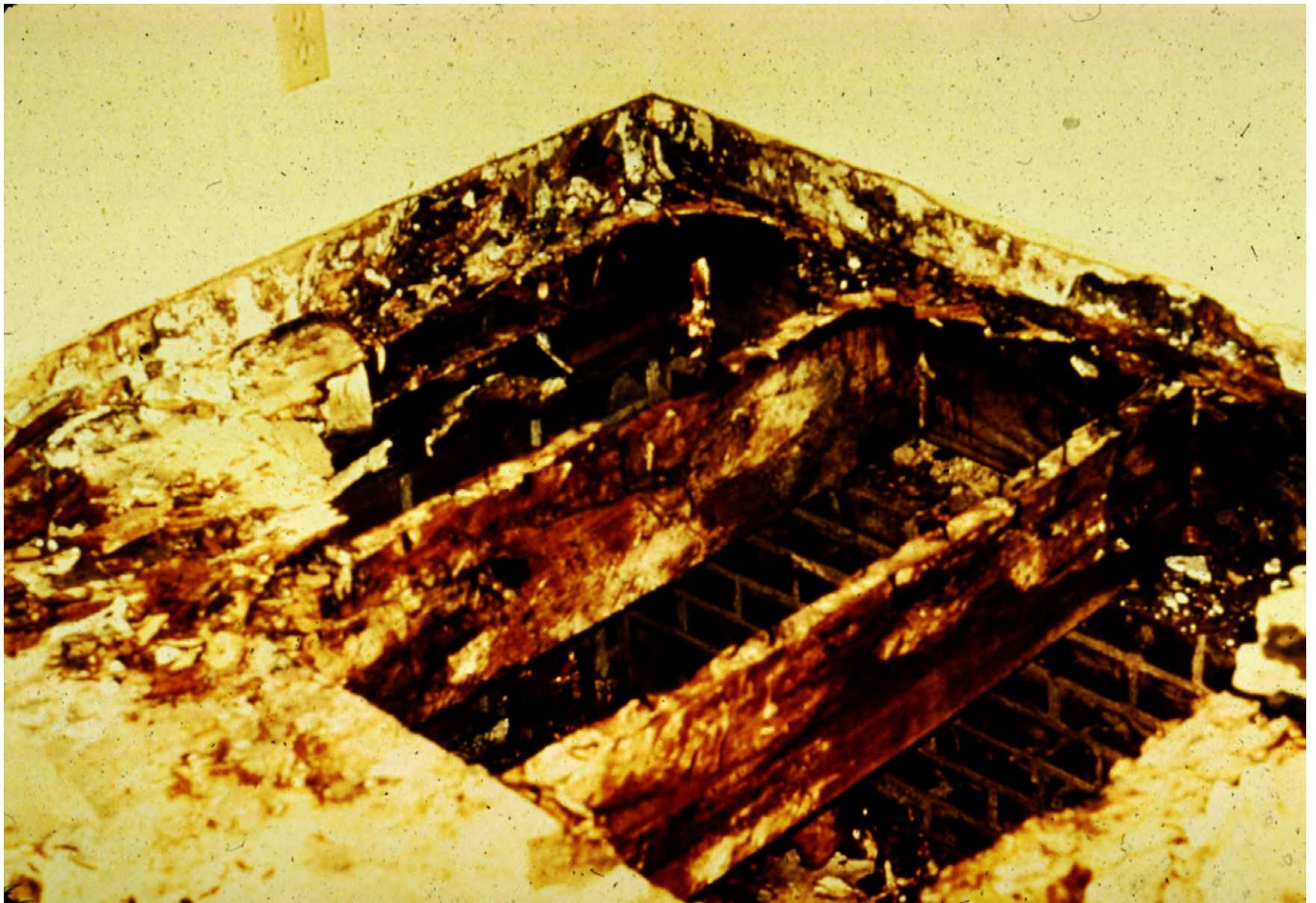








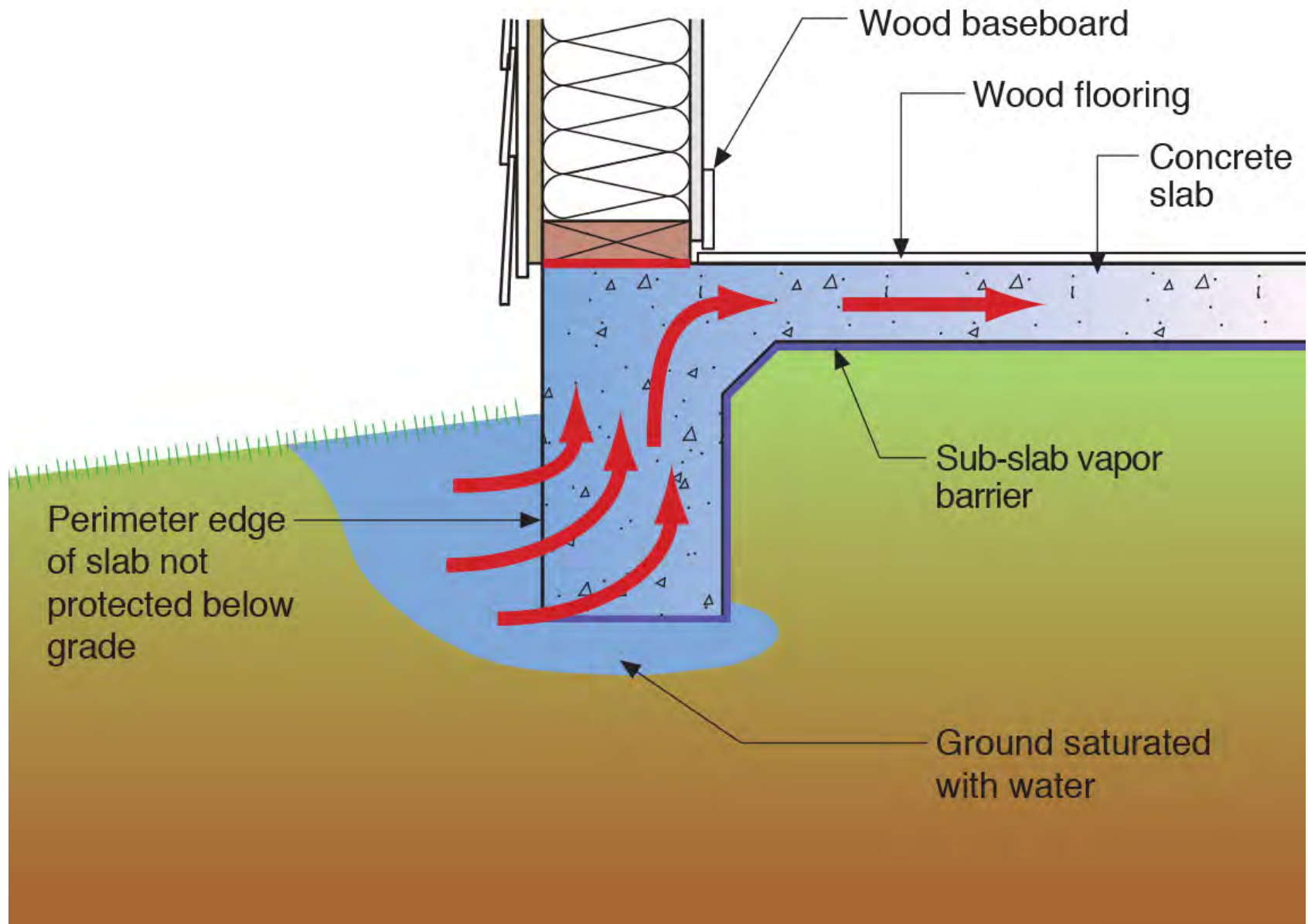






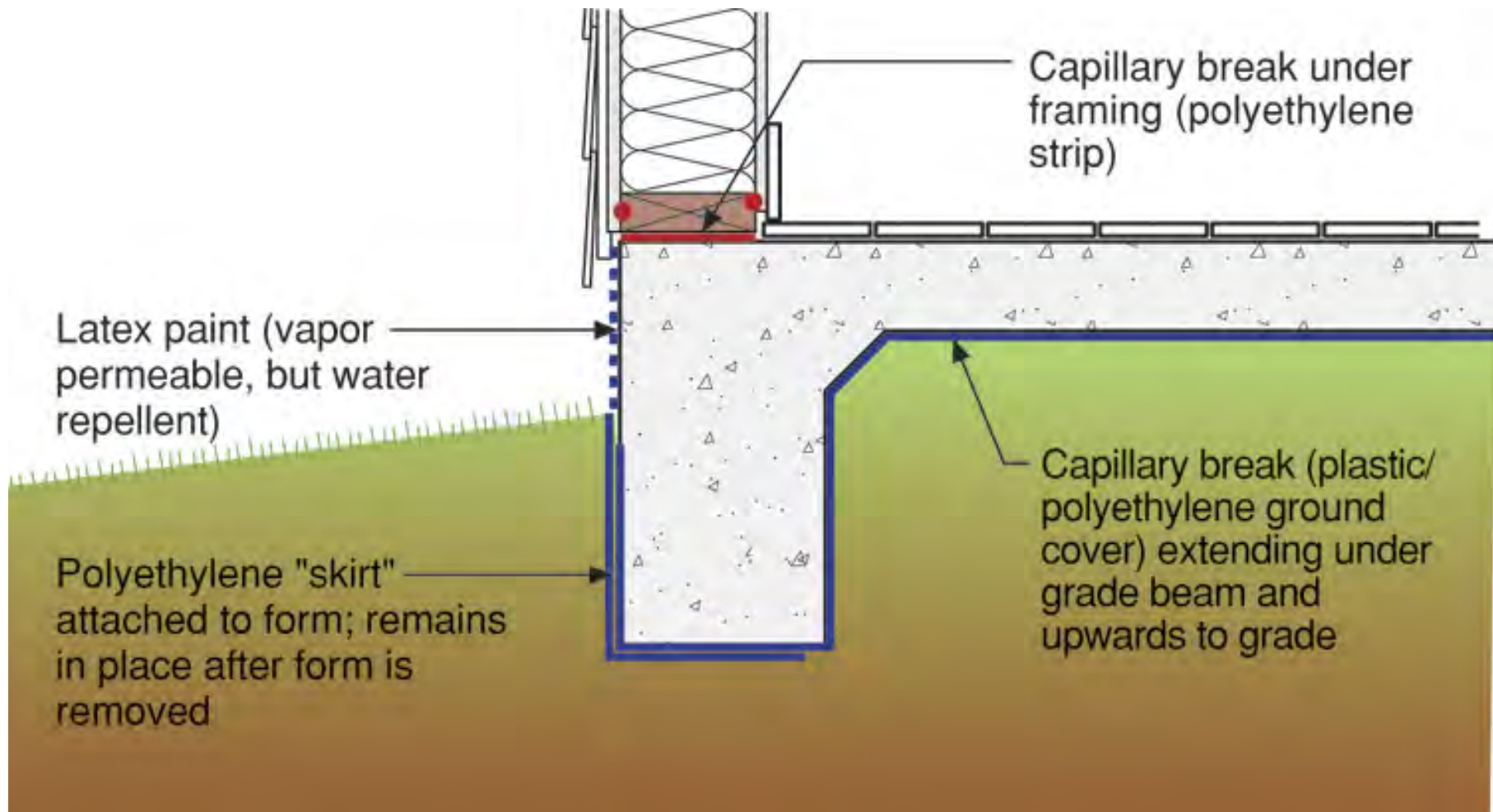
# Slabs









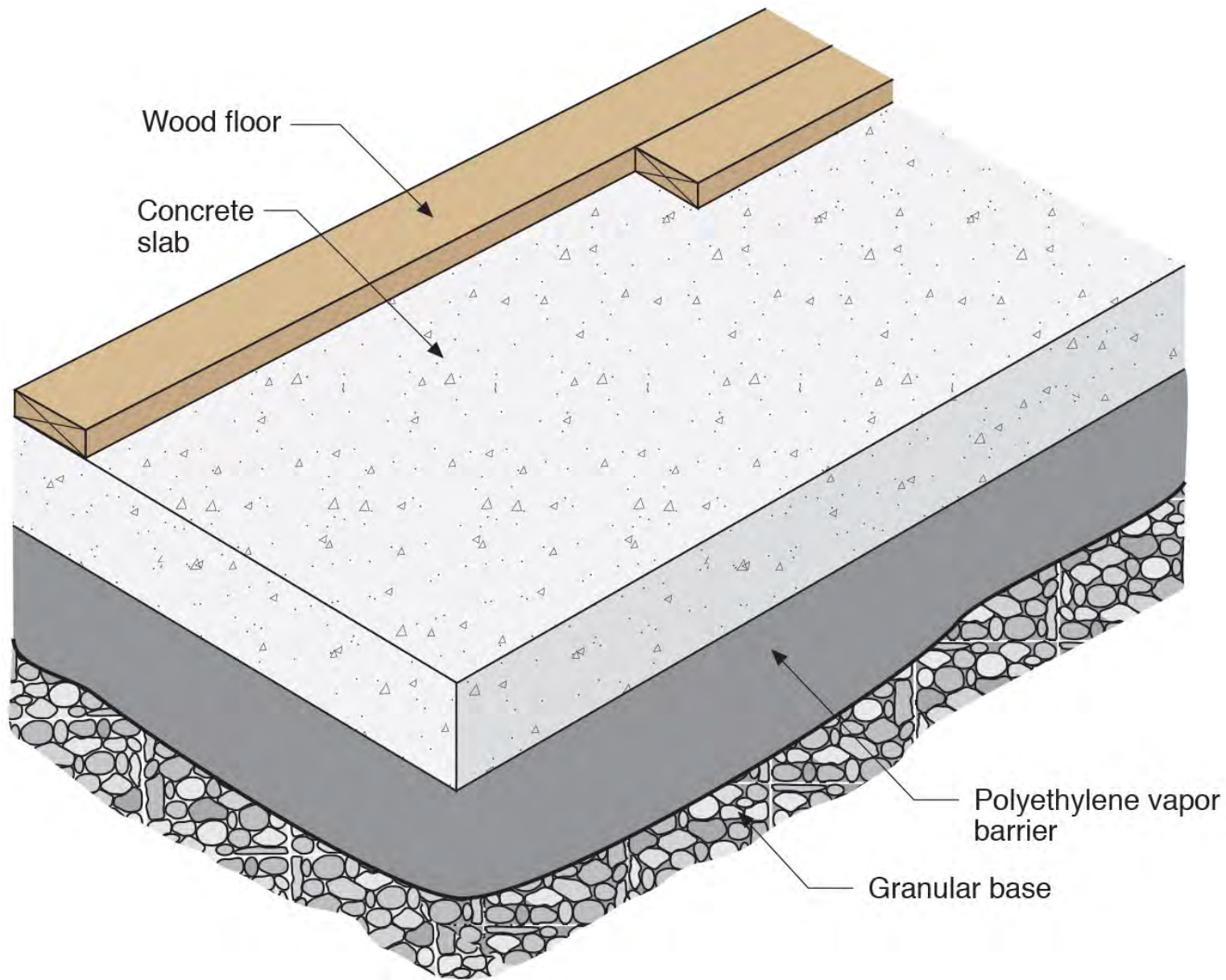




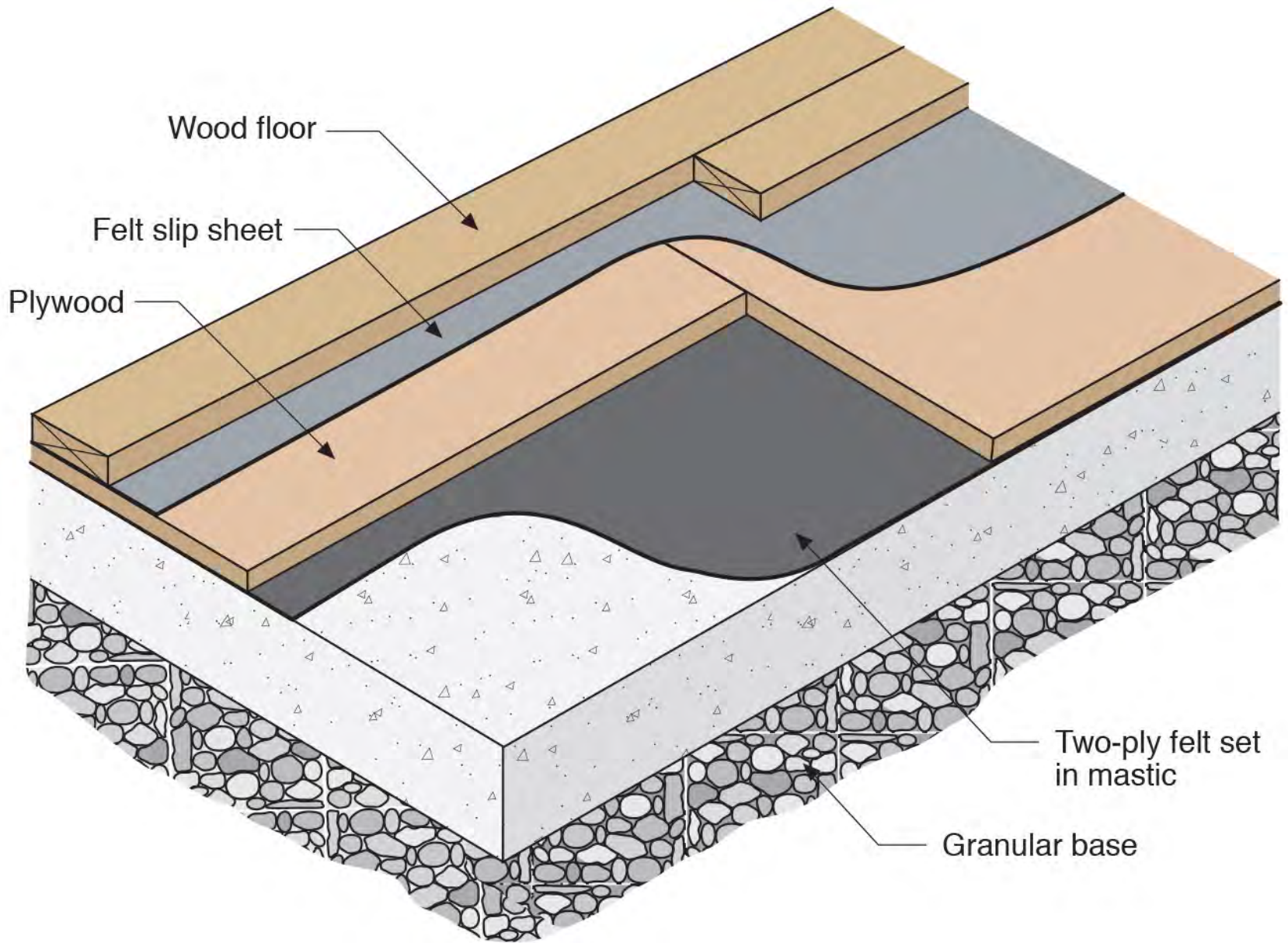






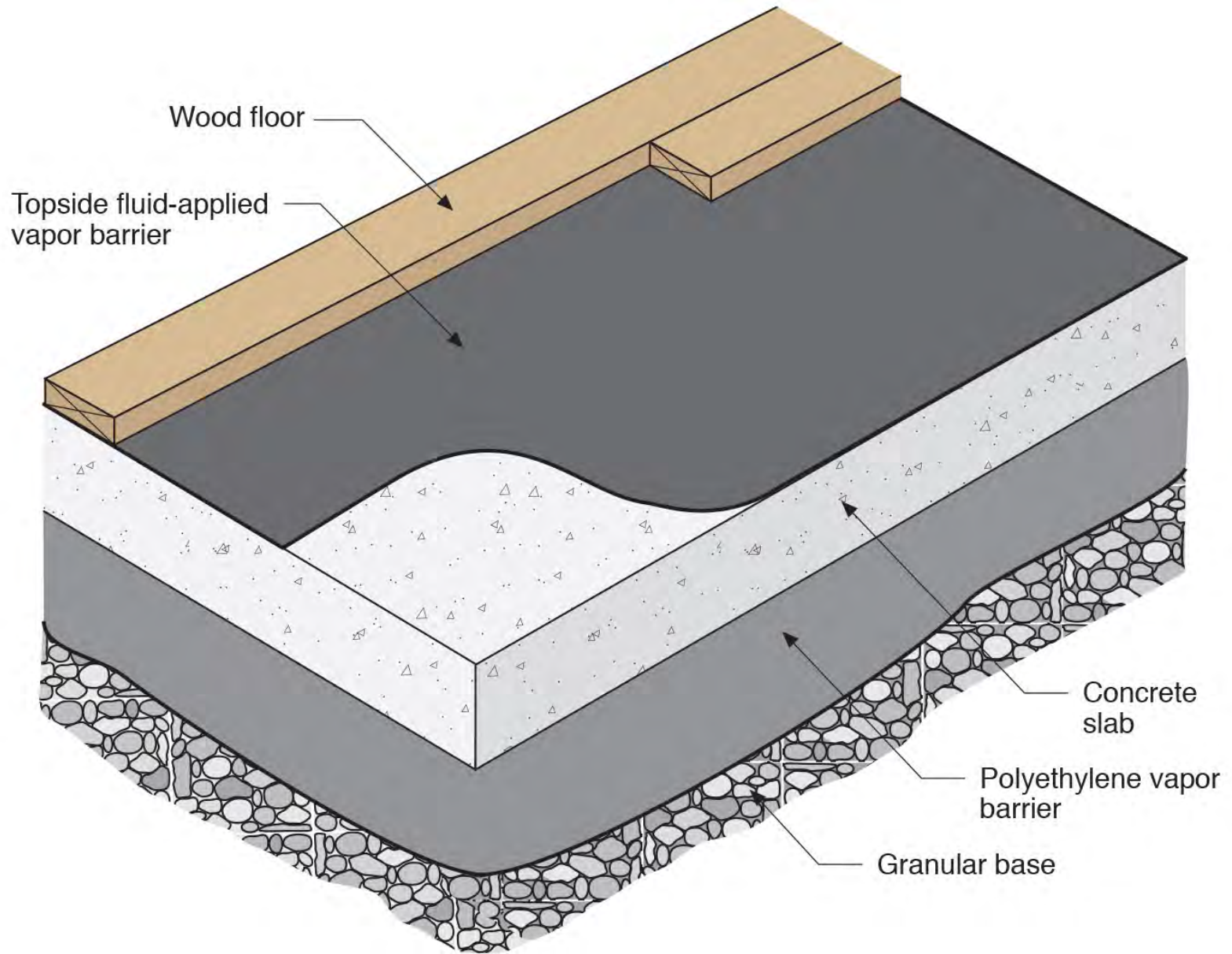










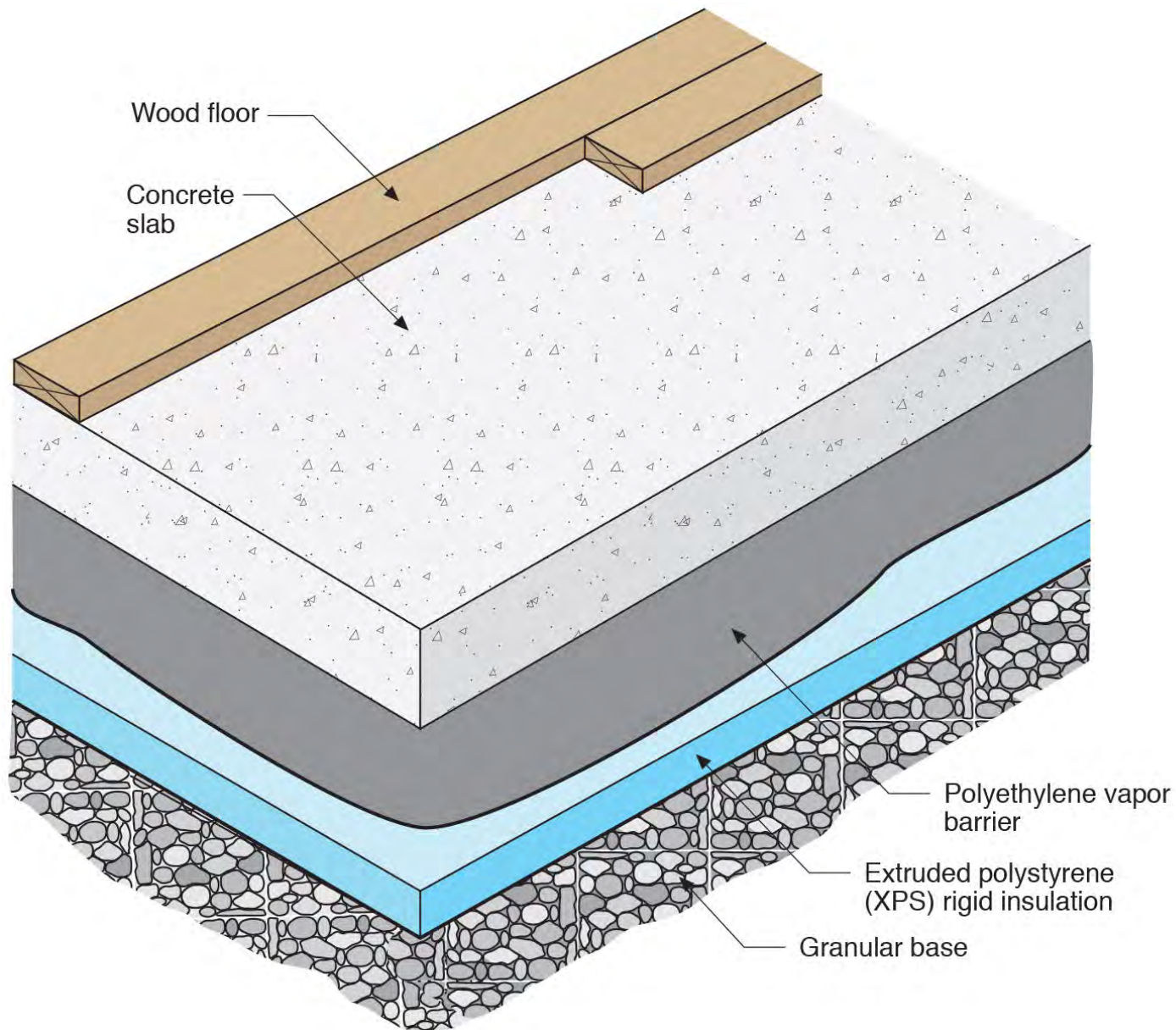






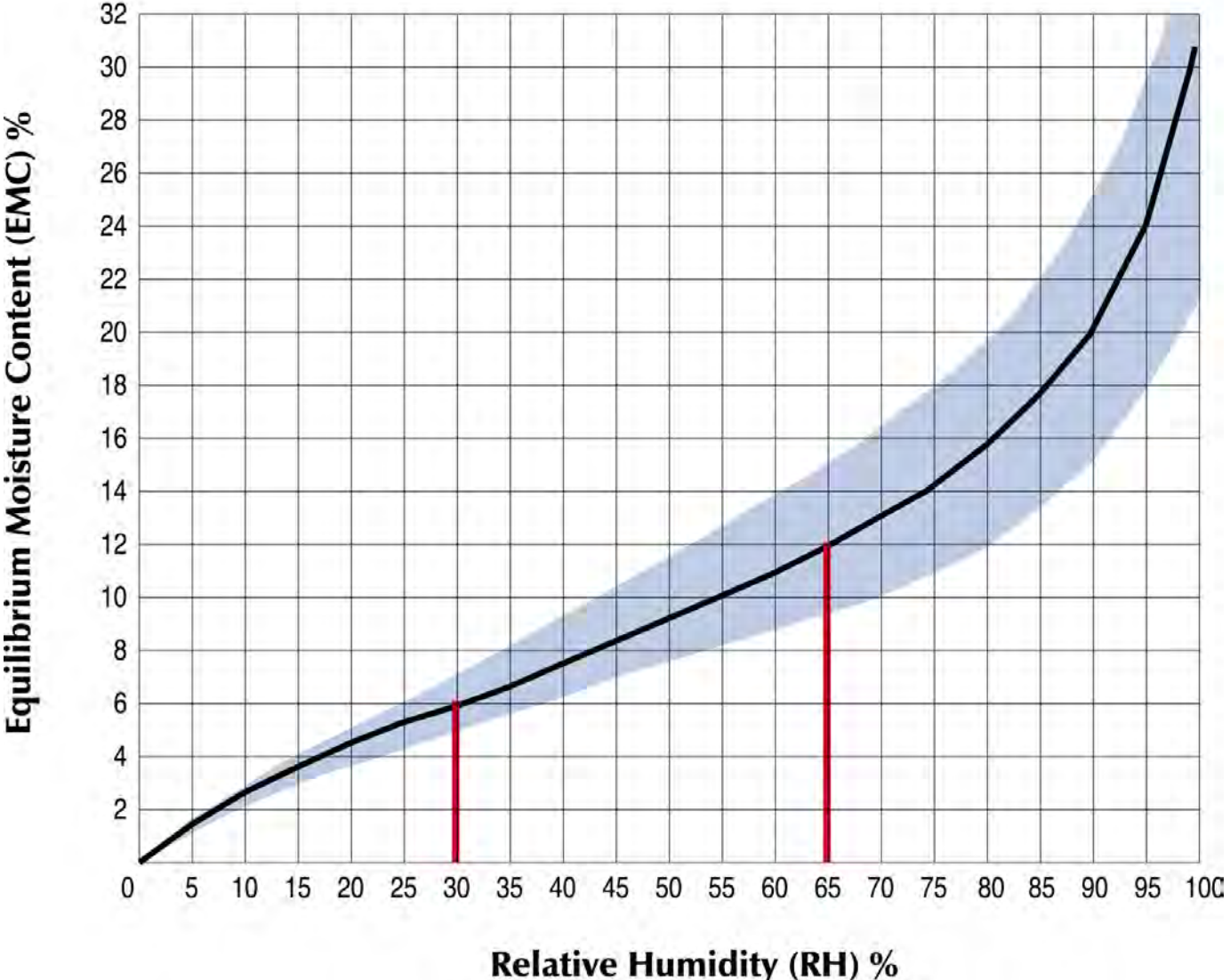


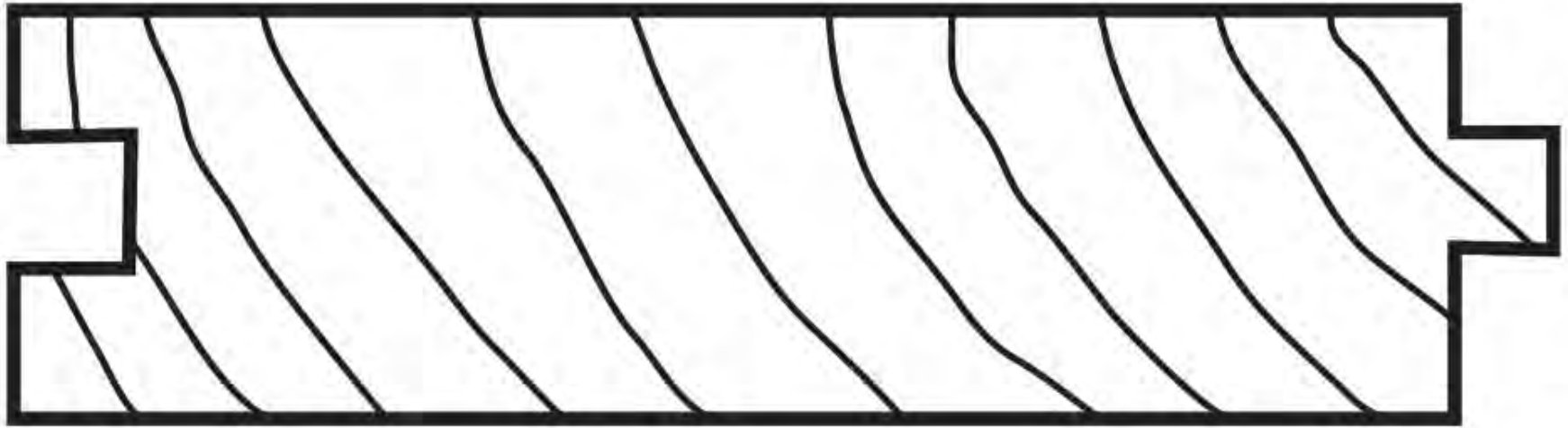




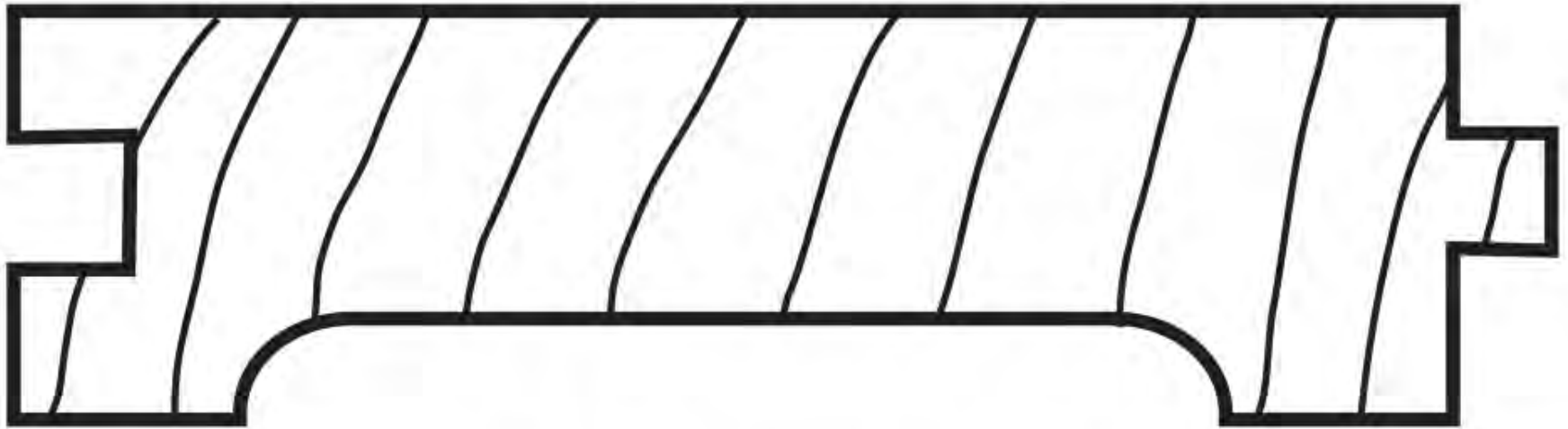


# Moisture Content vs. Relative Humidity



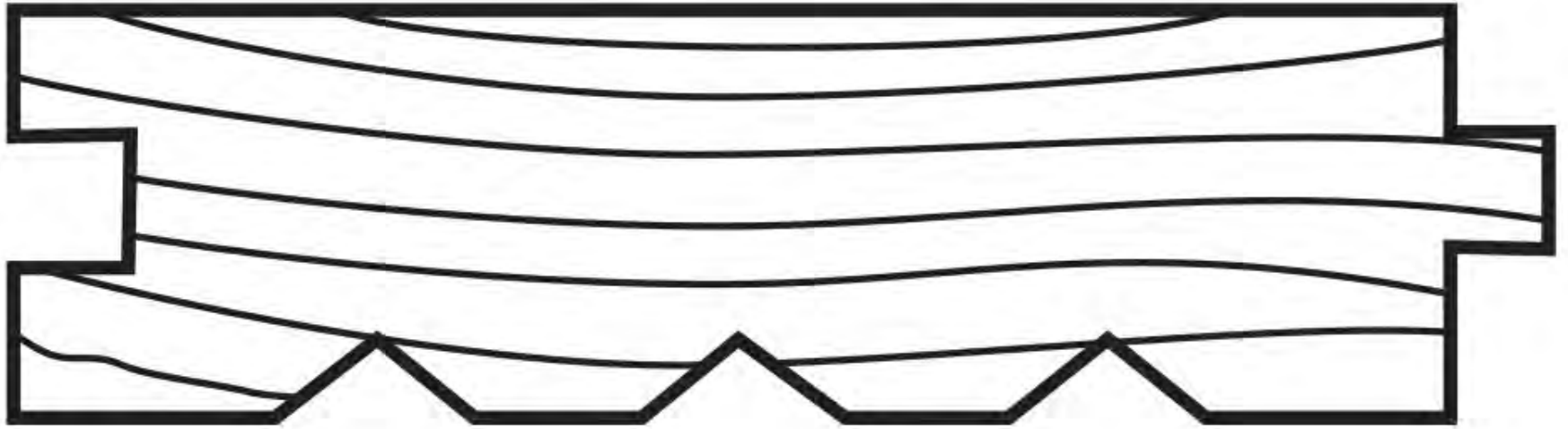


**Plain**

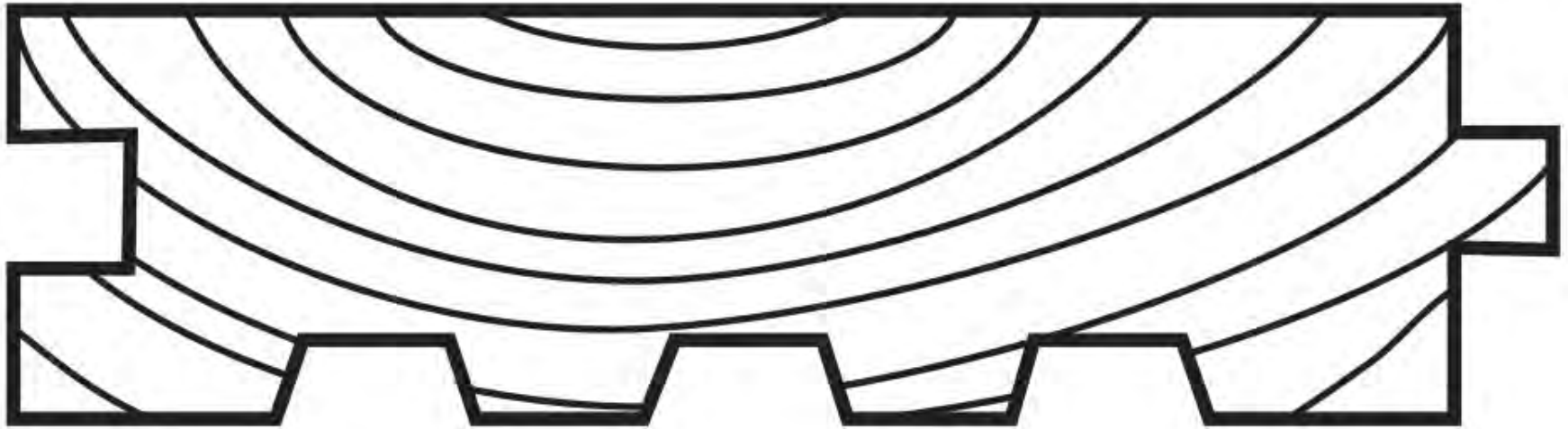


# Hollow Back





# Scratch Back



# Hollow or Scratch Back









