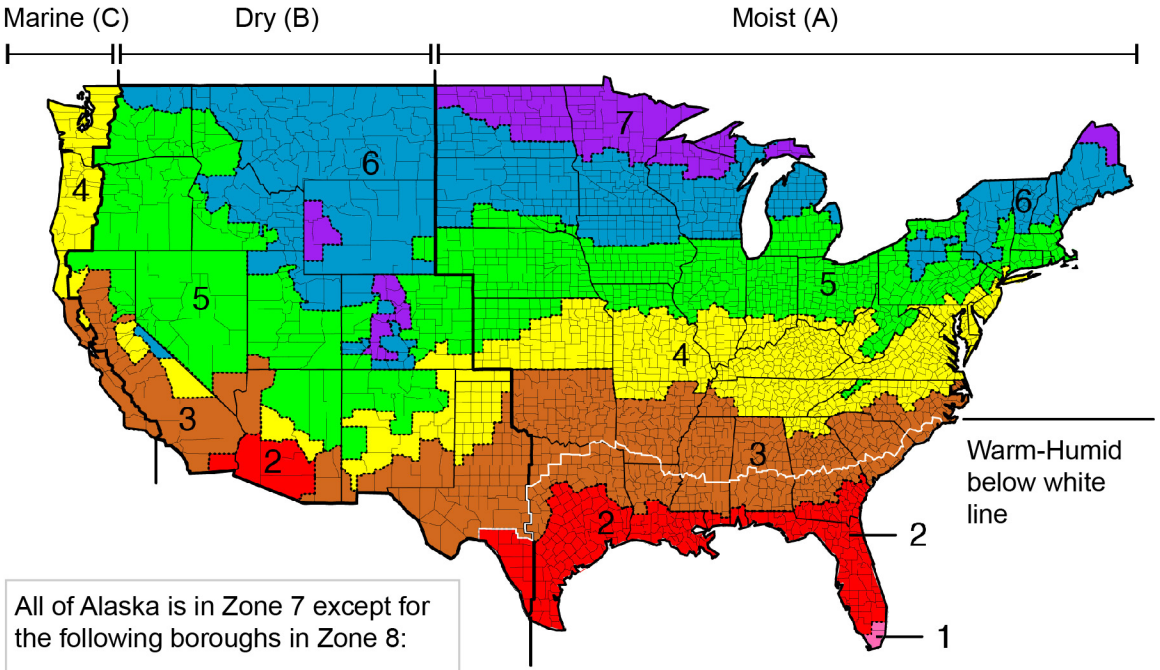
Net Zero - Residential

IECC 5

New Construction - Easy

Retrofit – Not so easy…but doable



All of Alaska is in Zone 7 except for the following boroughs in Zone 8:

Bethel, Northwest Arctic, Dellingham, Southeast Fairbanks, Fairbanks N. Star, Wade Hampton, Nome, Yukon-Koyukuk, North Slope

Zone 1 includes Hawaii, Guam, Puerto Rico, and the Virgin Islands

Conservation – IECC 5

5 – 10 – 20 – 40 – 60 – 1.5

Windows, Slab, Crawl/Basement, Wall, Roof

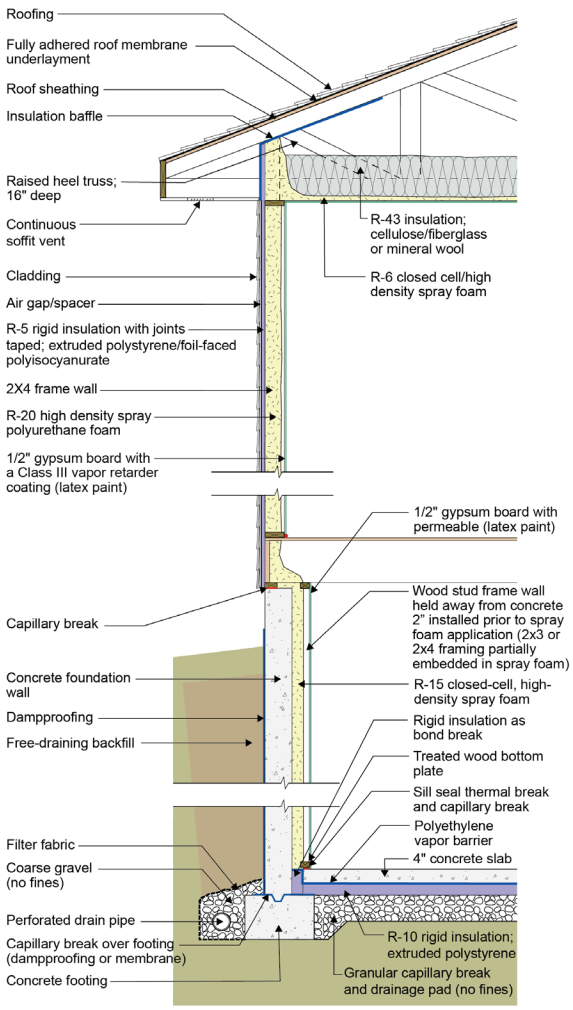
1.5 ach@50 with ERV

….Distributed Thermal Mass….

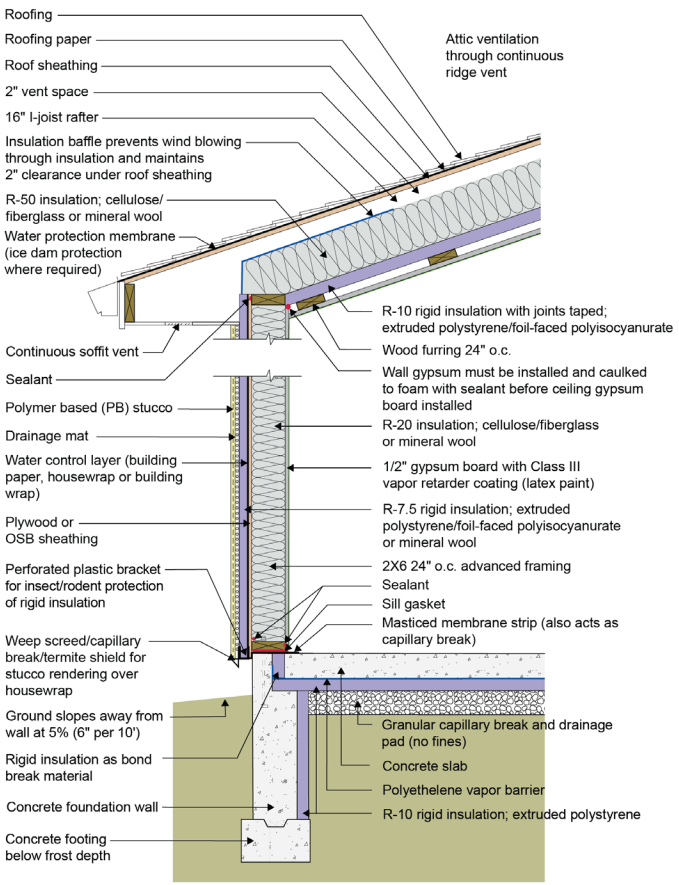
Renewables – IECC 5

2,500 ft2 home - 7.5 kw PV

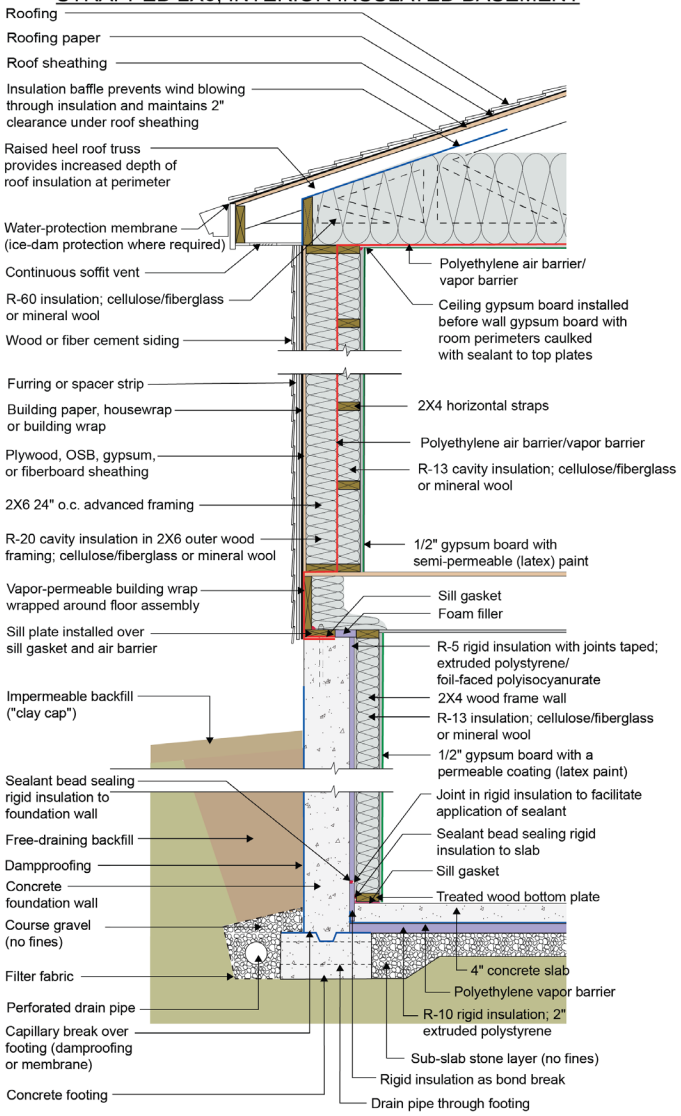
IECC CLIMATE ZONE 5: VENTED ATTIC, 2X4 WALL, INTERIOR INSULATED BASEMENT



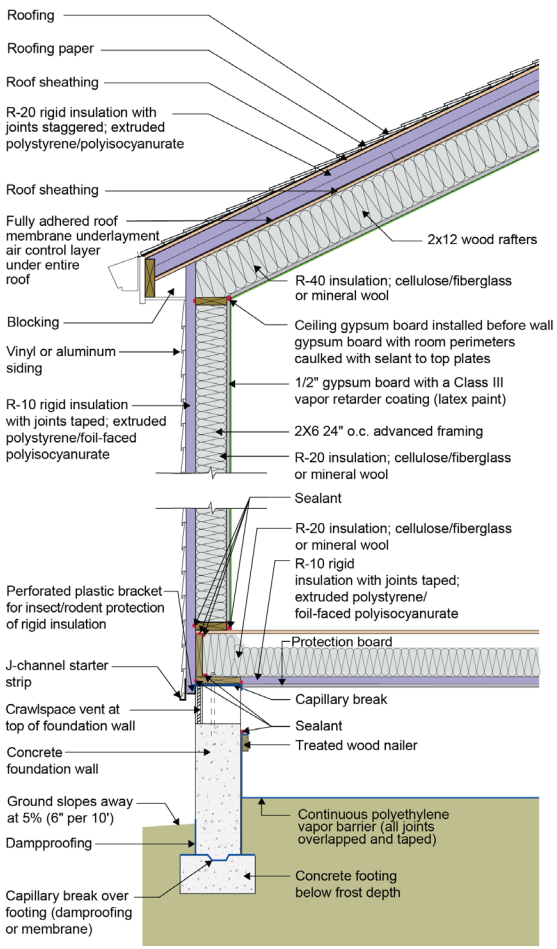
IECC CLIMATE ZONE 5: VENTED CATHEDRAL CEILING, 2X6 WALL, SLAB ON GRADE



IECC CLIMATE ZONE 5: VENTED ATTIC, STRAPPED 2X6, INTERIOR INSULATED BASEMENT



IECC CLIMATE ZONE 5C: UNVENTED ROOF, 2X6 WALL, VENTED CRAWL SPACE



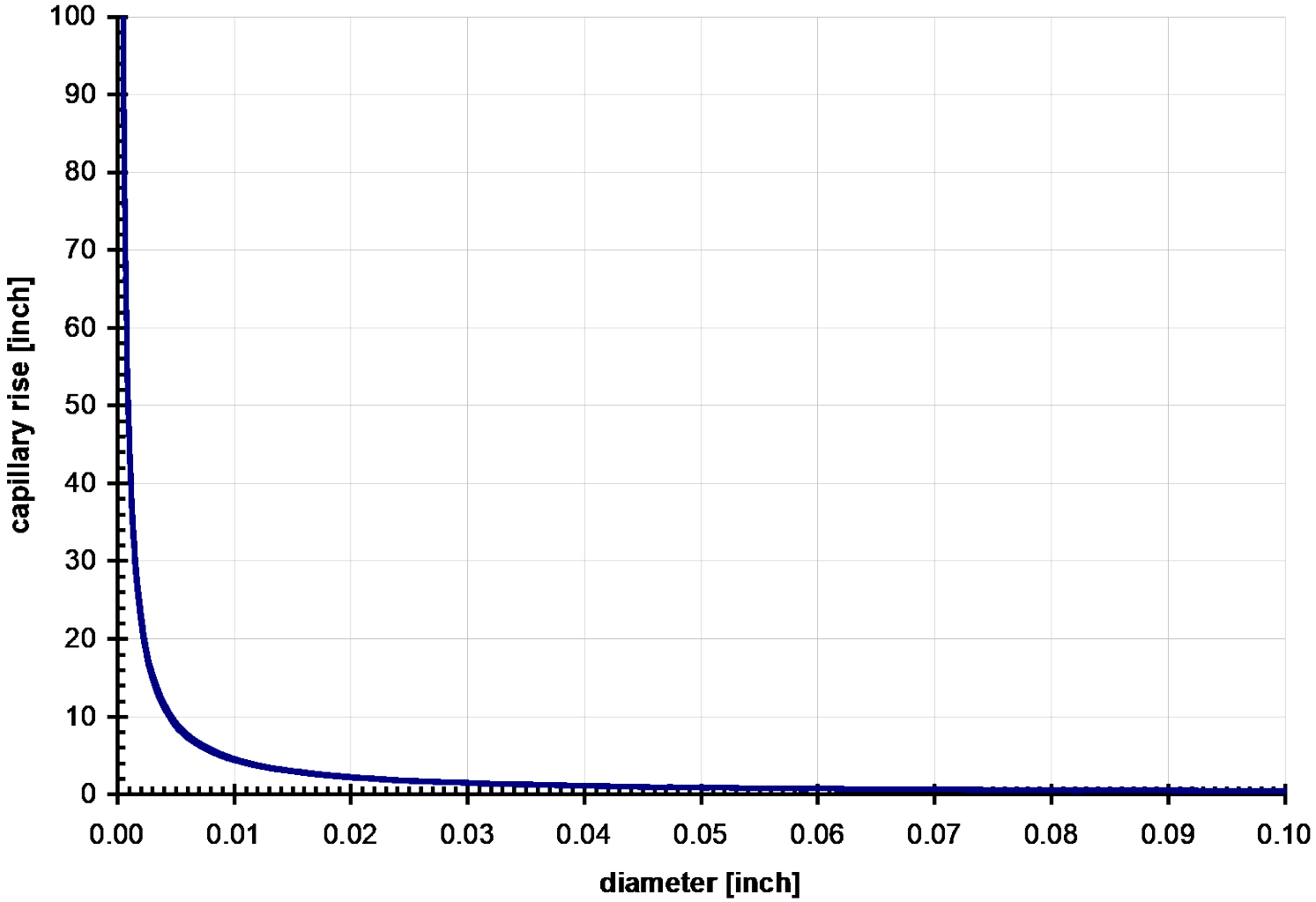
Net Zero Retrofit – Residential Buildings

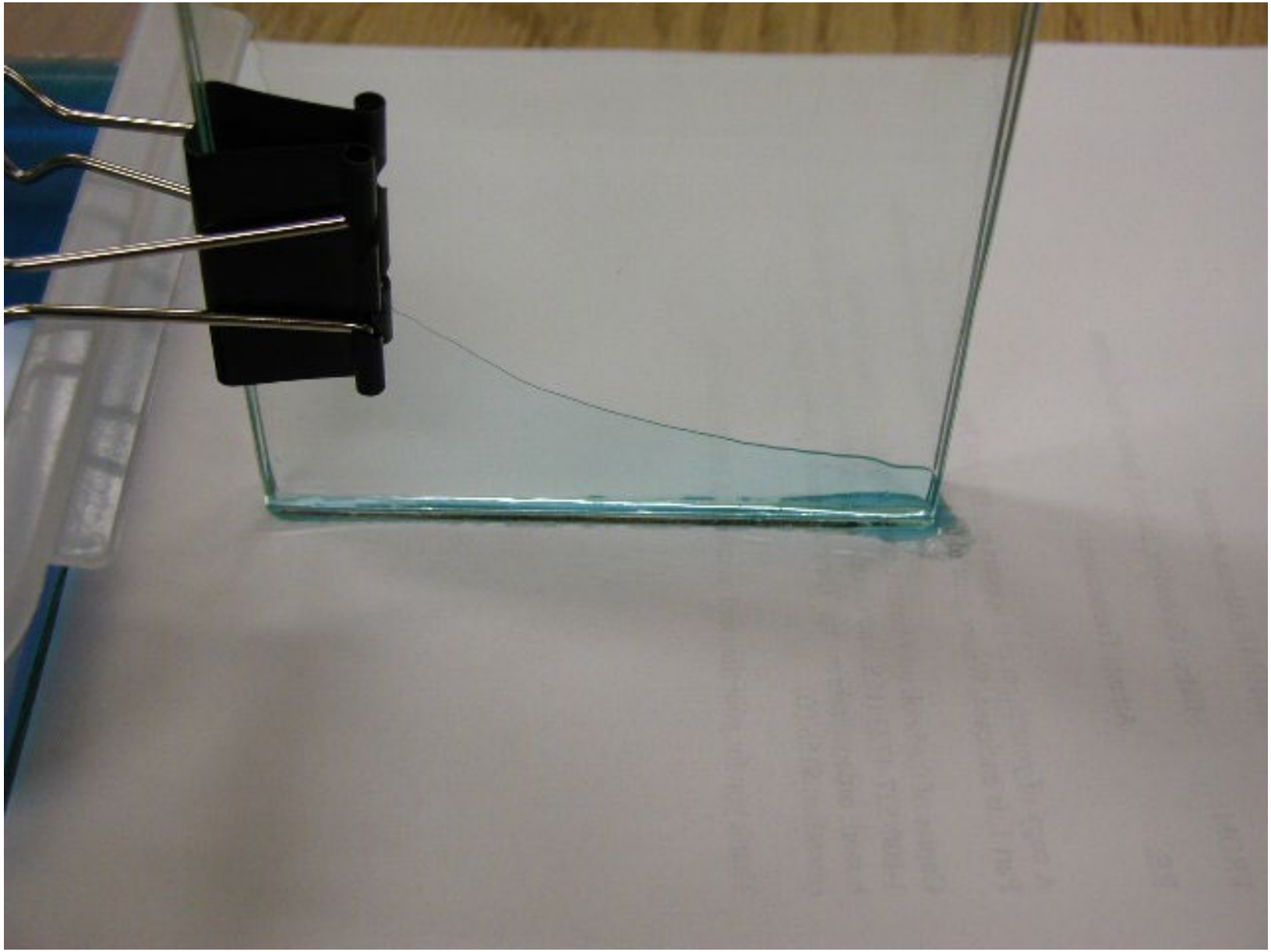
Energy Flow

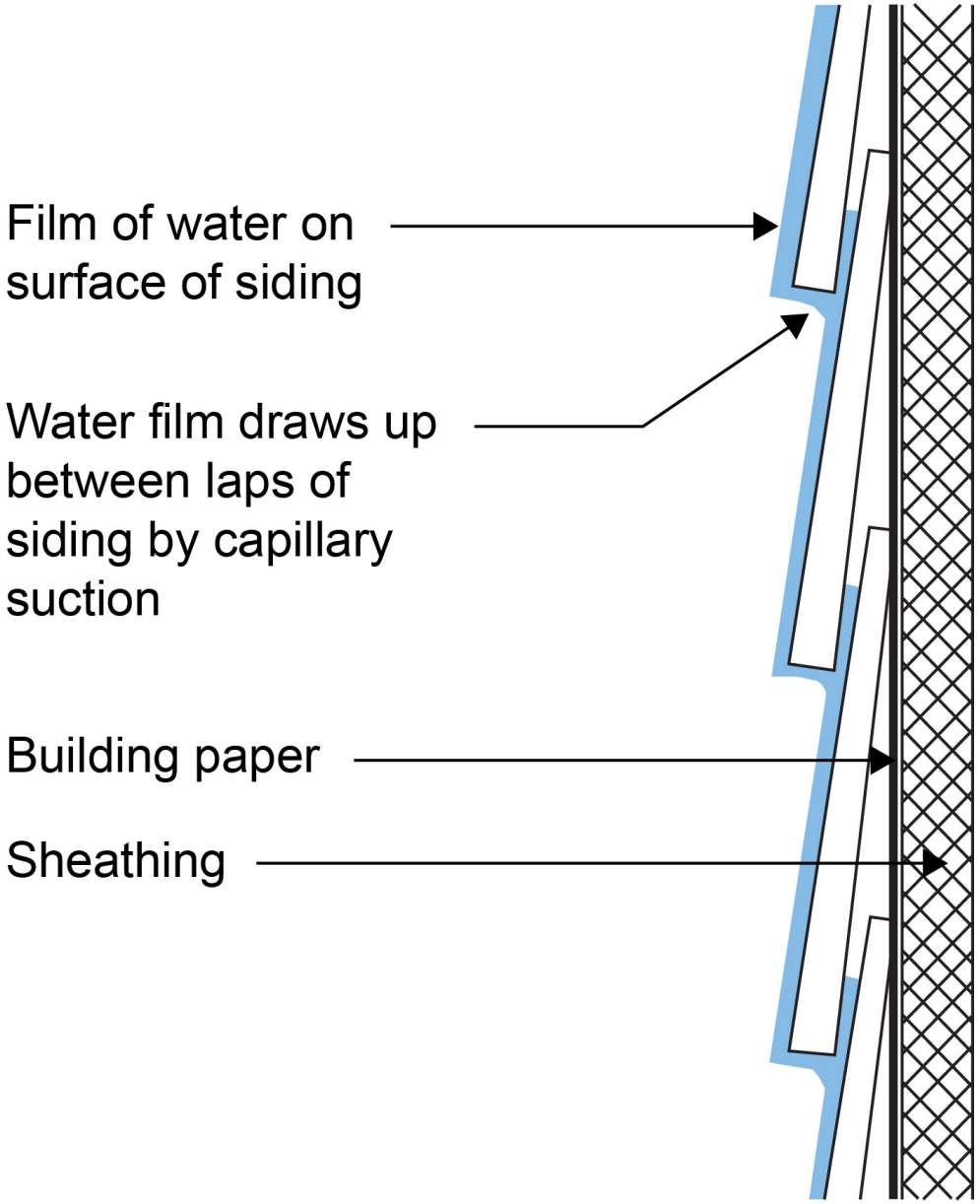
There is no such thing as a free thermodynamic lunch….

Capillarity

Capillary rise versus diameter





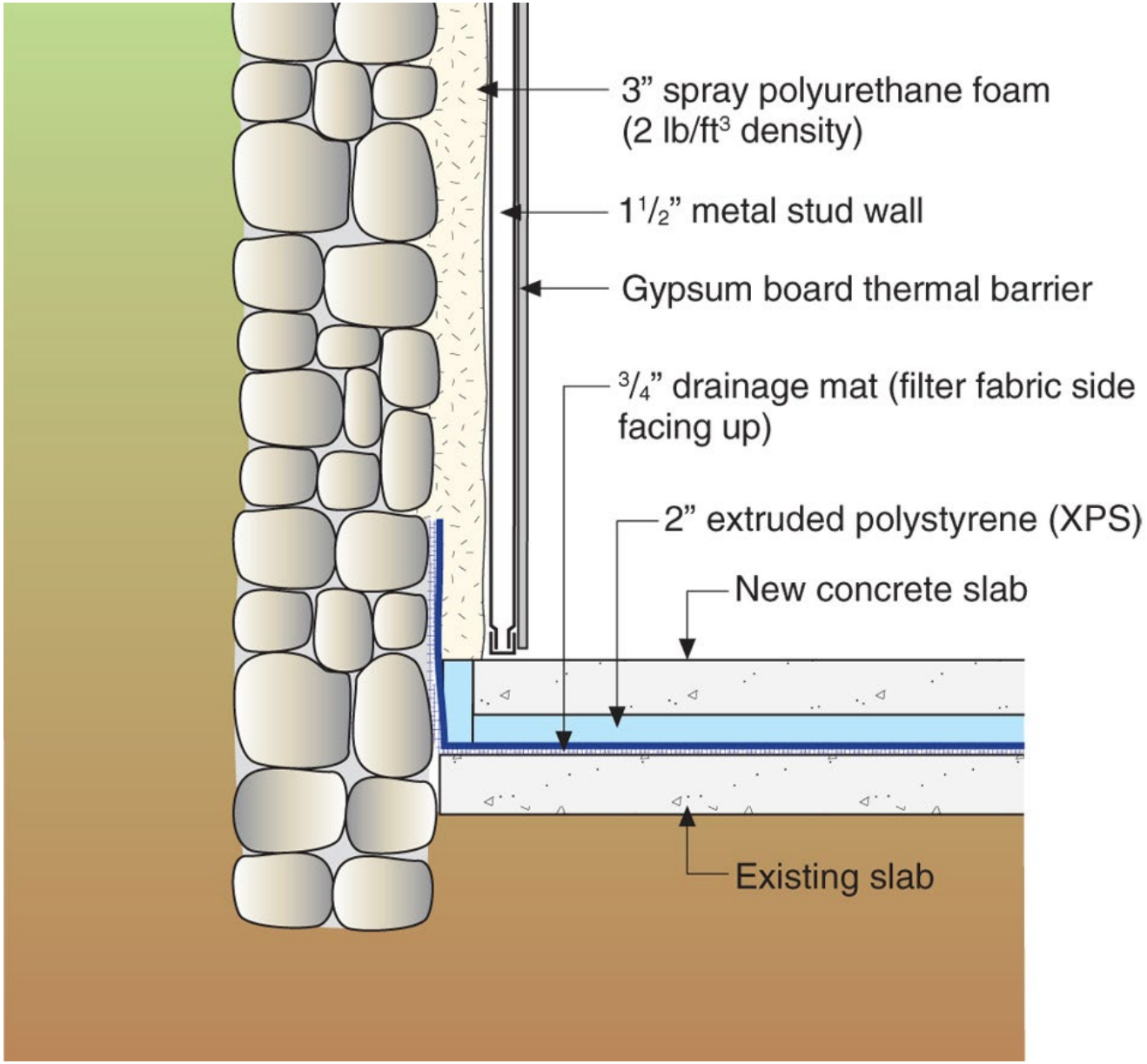

Film of water on surface of siding
Water film draws up between laps of siding by capillary suction
Building paper
Sheathing

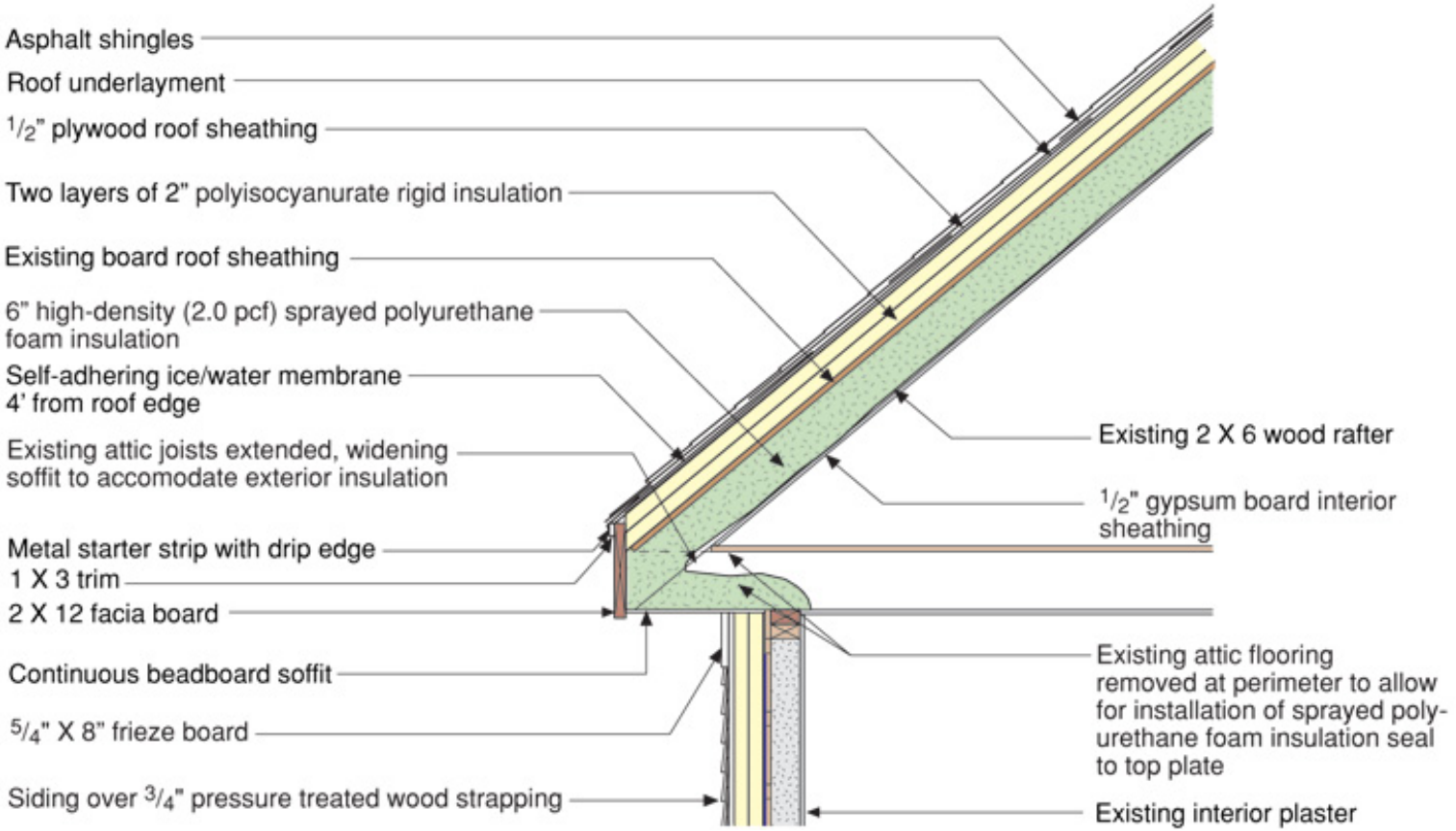
Attic Venting


015

Net Zero Retrofit…


Styrofoam
Styrofoam
Styrofoam
Styrofoam


3” spray polyurethane foam
(2 lb/ft3 density)
1 1/2” metal stud wall
Gypsum board thermal barrier
3/4” drainage mat (filter fabric side facing up)
2” extruded polystyrene (XPS)
New concrete slab
Existing slab


Asphalt shingles
Roof underlayment
1/2" plywood roof sheathing
Two layers of 2" polyisocyanurate rigid insulation
Existing board roof sheathing
6" high-density (2.0 pcf) sprayed polyurethane foam insulation
Self-adhering ice/water membrane 4' from roof edge
Existing attic joists extended, widening soffit to accomodate exterior insulation
Metal starter strip with drip edge
1 X 3 trim
2 X 12 facia board
Continuous beadboard soffit
5/4" X 8" frieze board
Siding over 3/4" pressure treated wood strapping
Existing 2 X 6 wood rafter
1/2" gypsum board interior sheathing
Existing attic flooring removed at perimeter to allow for installation of sprayed polyurethane foam insulation seal to top plate
Existing interior plaster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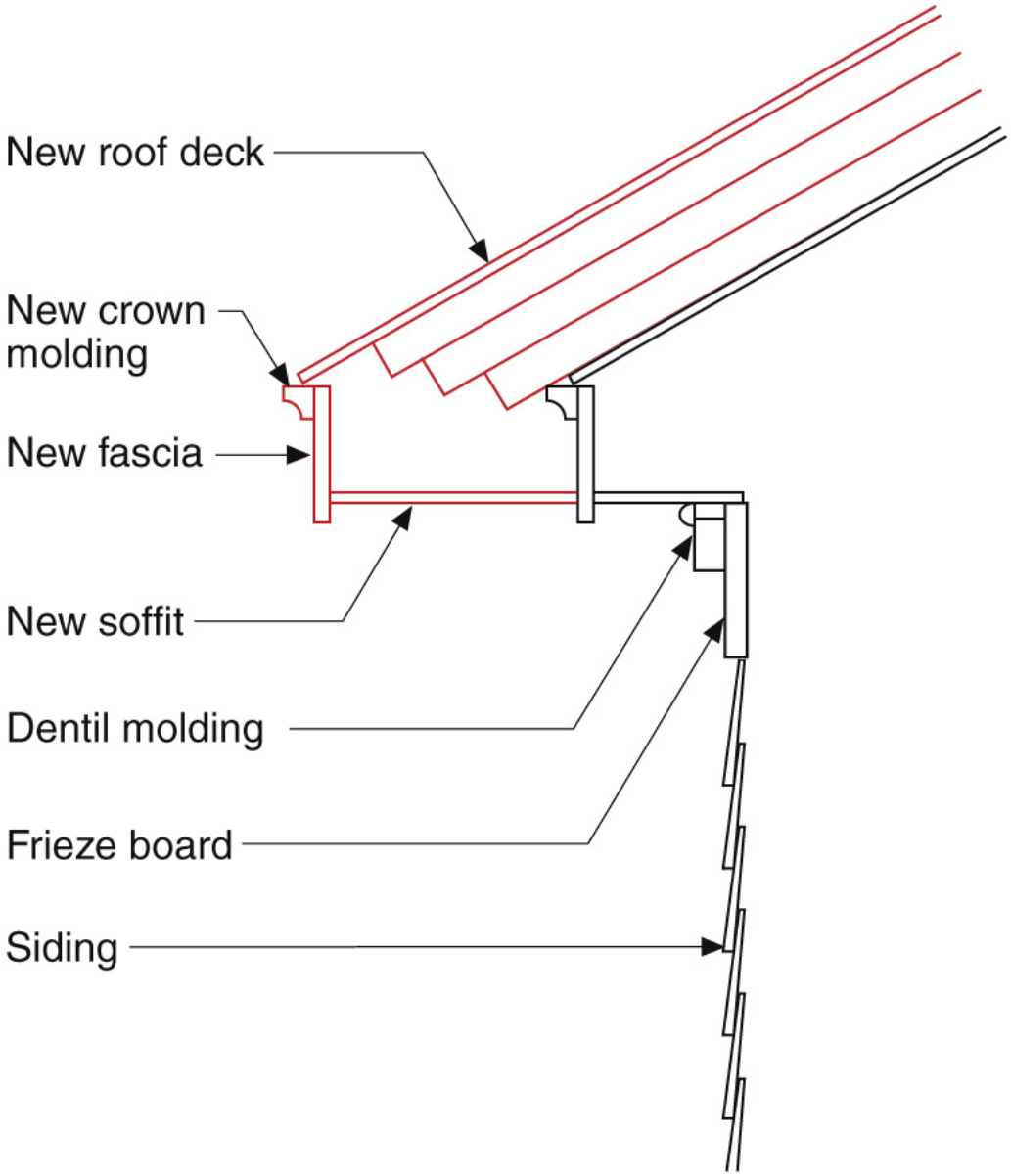
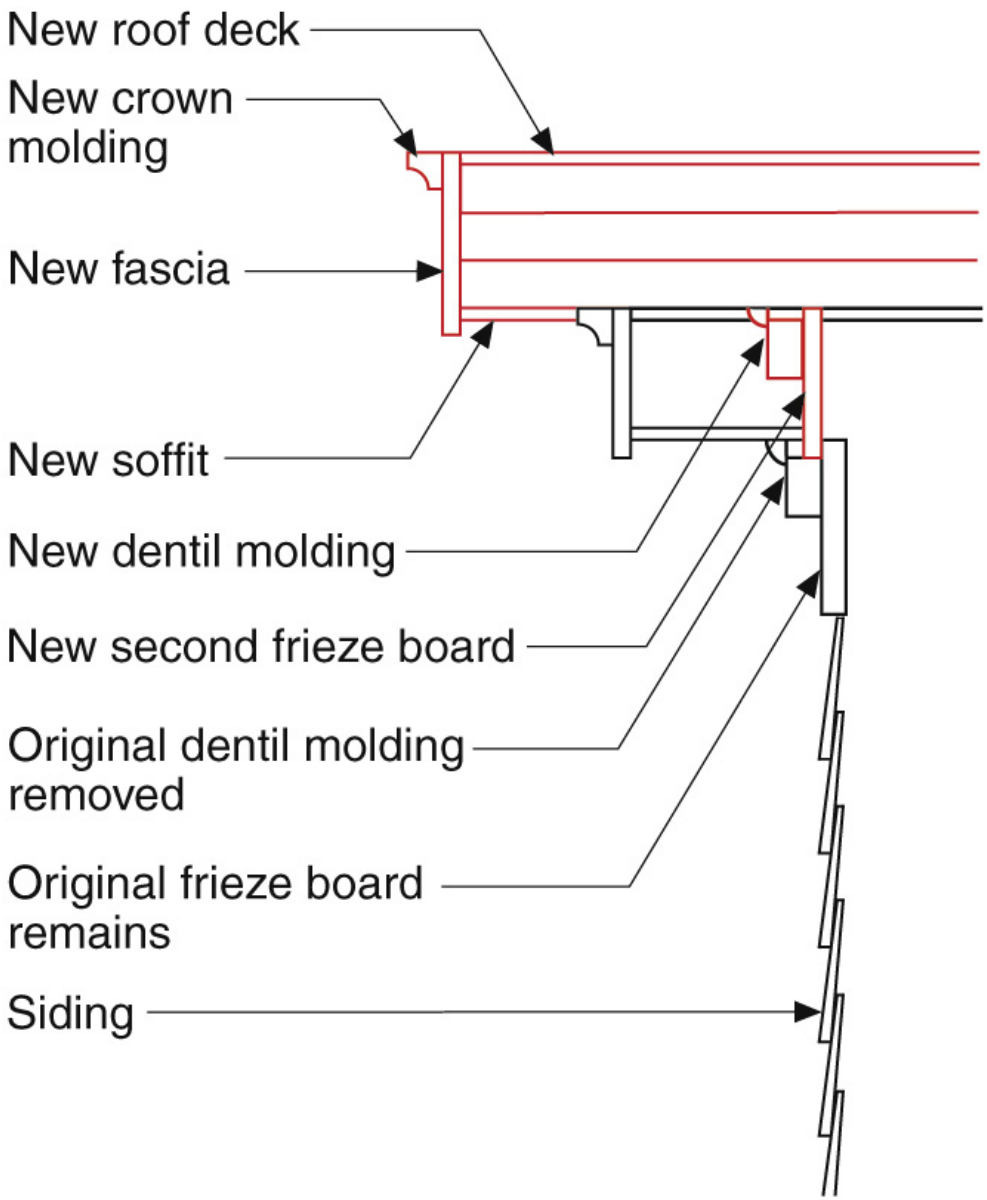
Tyve
HomeWrap


New roof deck
New crown molding
New fascia
New soffit
Dentil molding
Frieze board
Siding


New roof deck
New crown molding
New fascia
New soffit
New dentil molding
New second frieze board
Original dentil molding removed
Original frieze board remains
Siding


DOW
BRAND

Transition From A Hydrocarbon Based Economy to a Carbohydrate Based Economy

Wood is good…. it grows on trees…

Wood Is A Battery For Energy From The Sun

Carbon + Water + Sunlight = Wood

(photosynthesis)

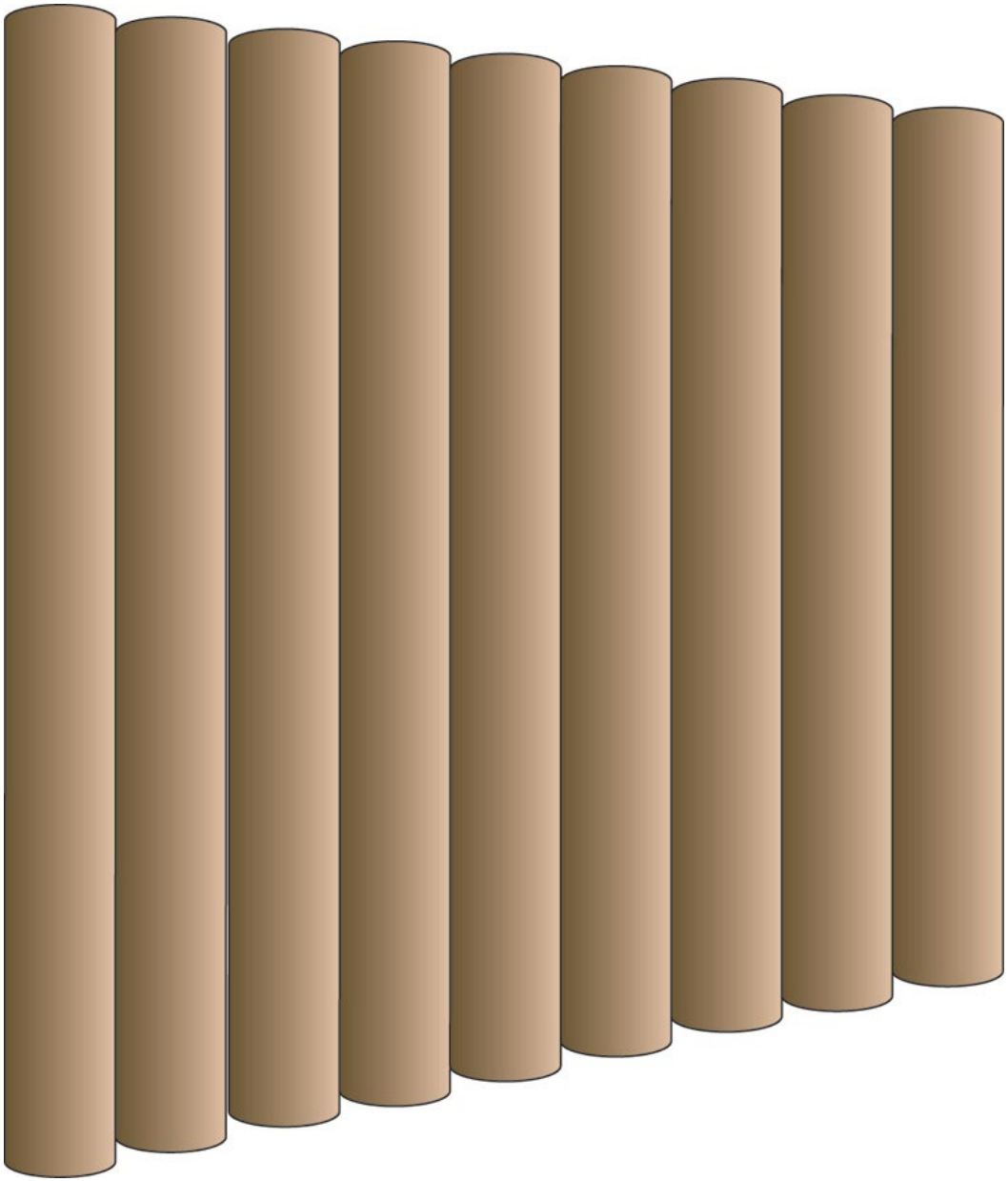
Wood Is a Pretty Good Building Material

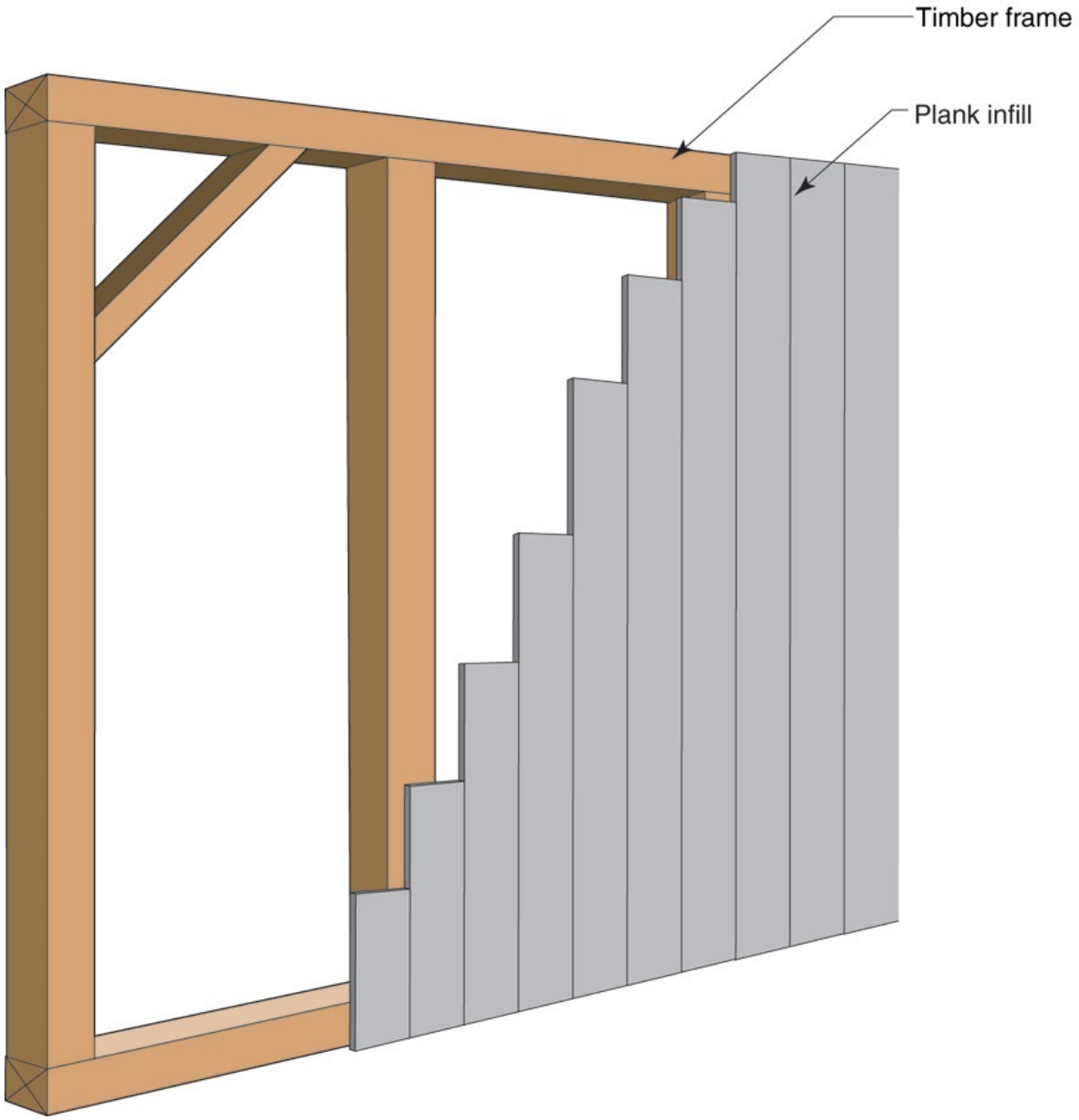
When We Are Done It Turns Back To Carbon and Water and Releases The Energy

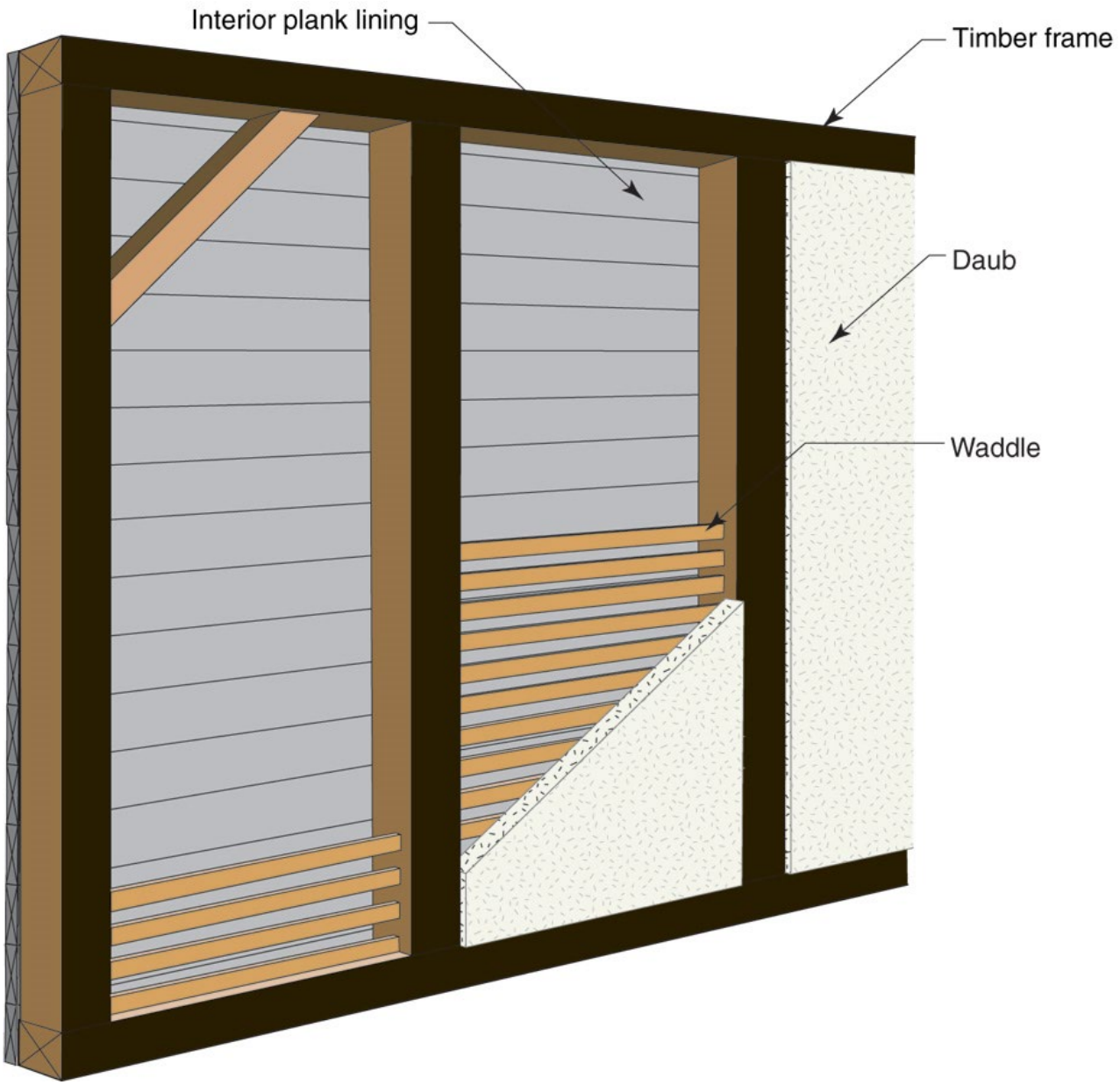
Plants Do A Better Job Of Converting Solar Energy Than Rocks

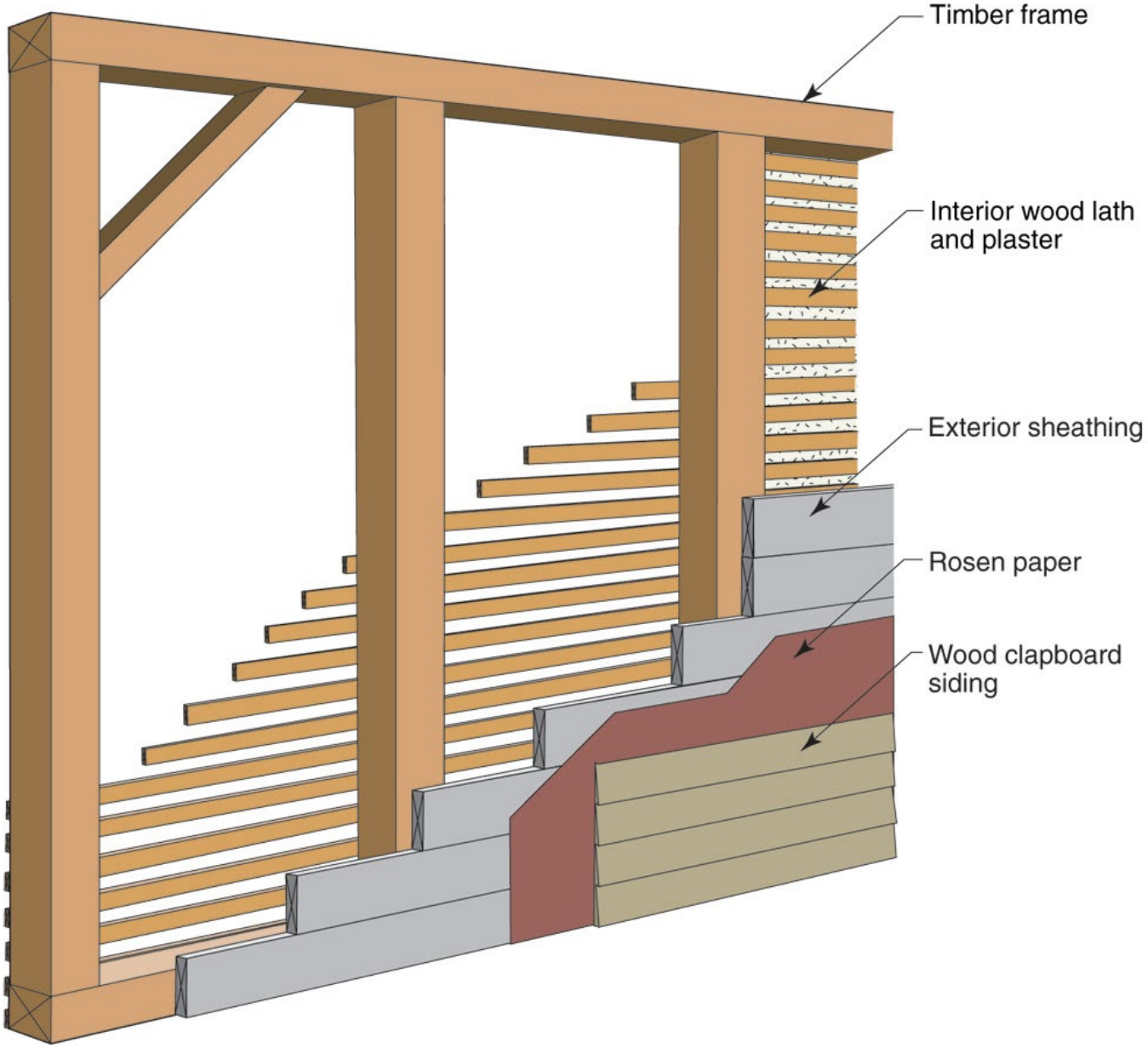
Let The Plants Do It

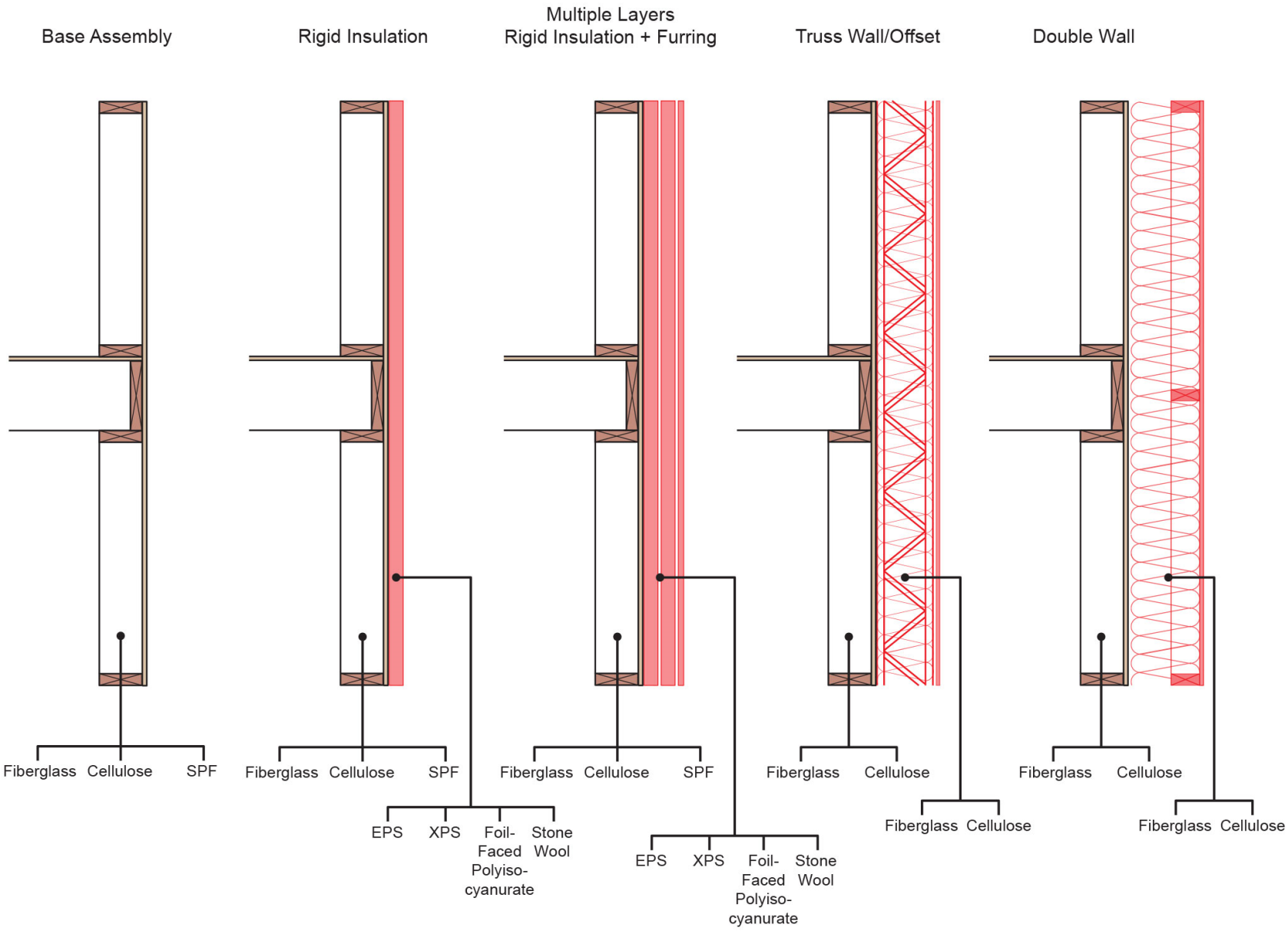
Wood Wall Evolution

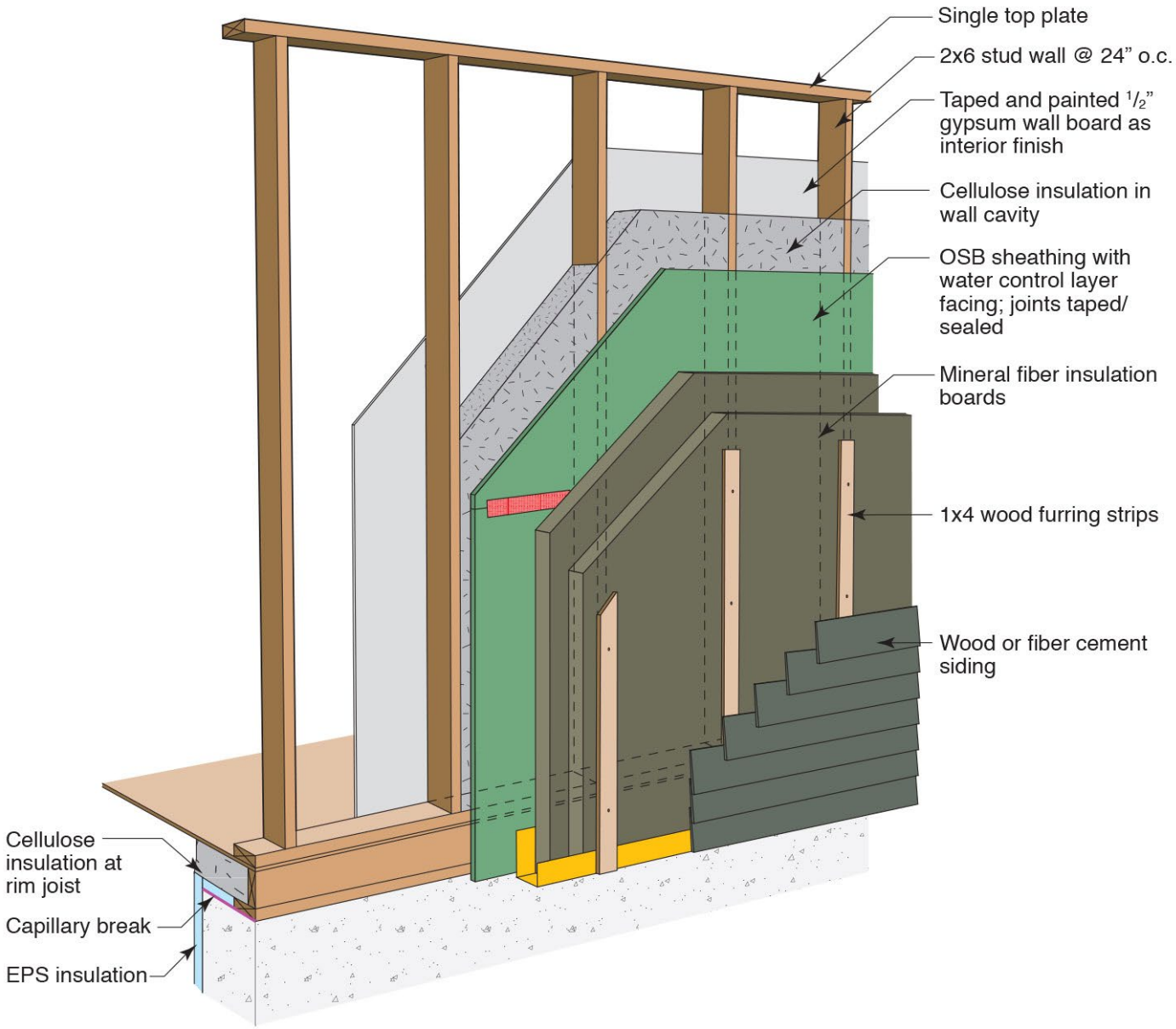


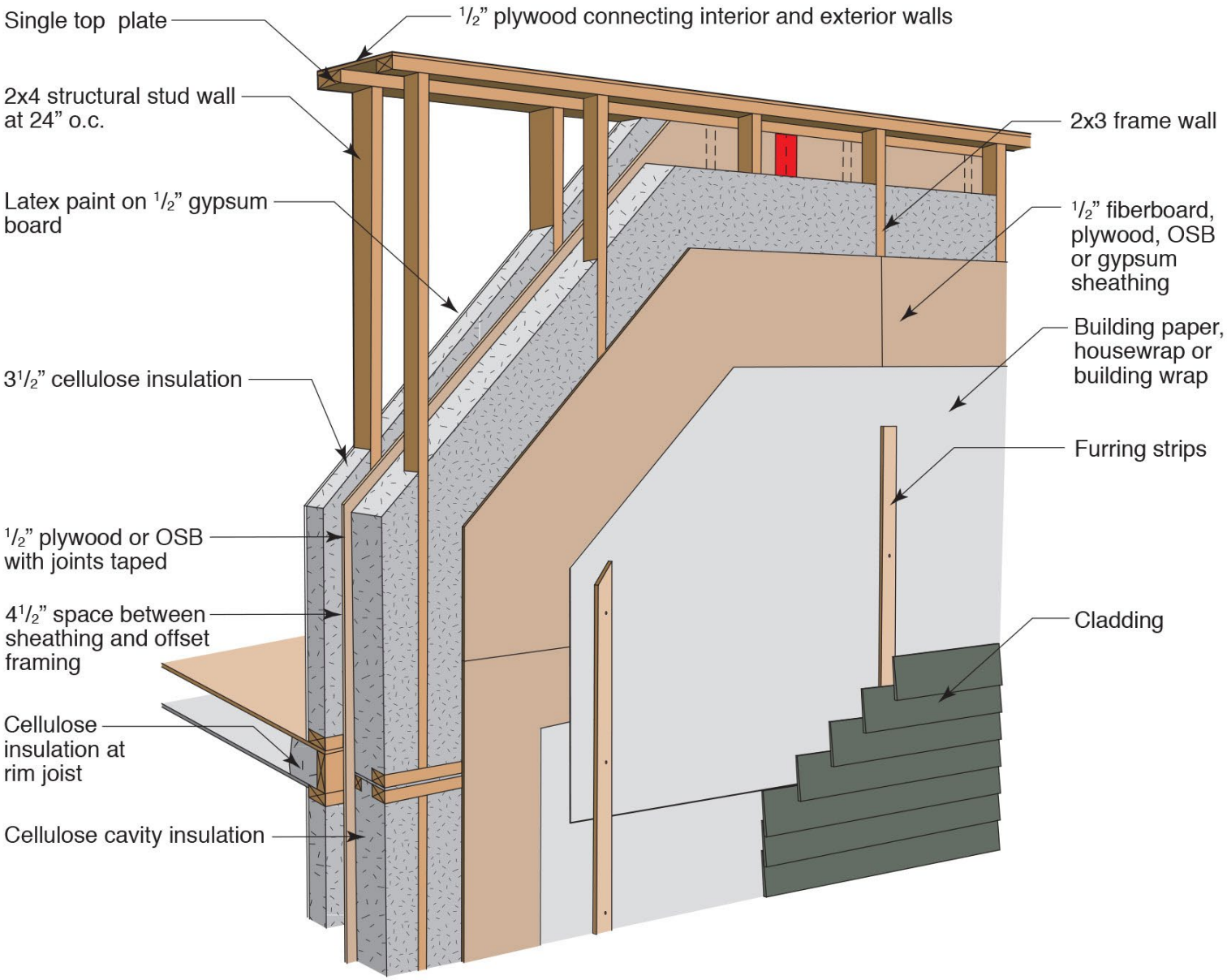

Timber frame
Plank infill

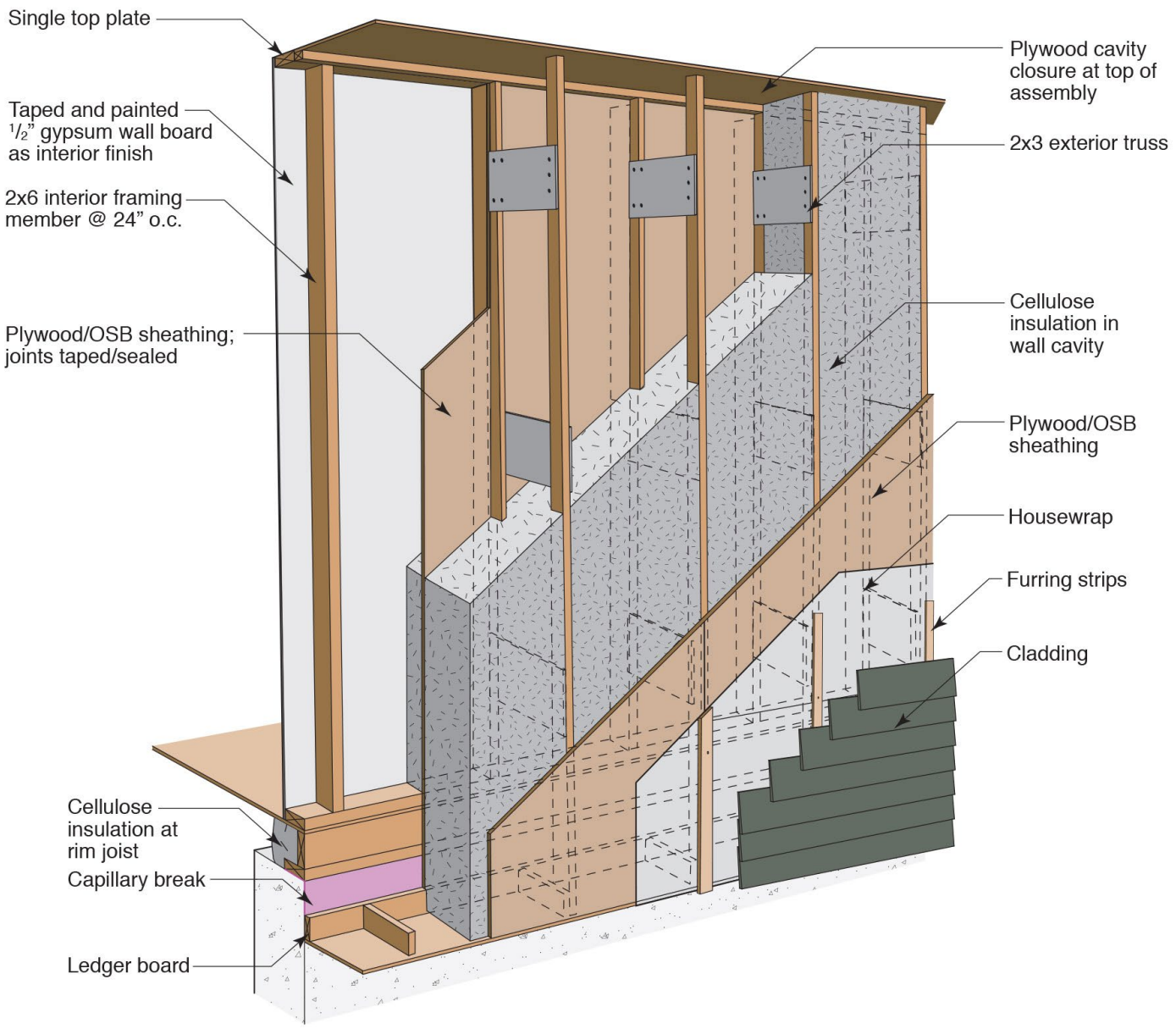

Interior plank lining
Timber frame
Daub
Waddle


Timber frame
Interior wood lath and plaster
Exterior sheathing
Rosen paper
Wood clapboard siding


Base Assembly
Rigid Insulation
Multiple Layers
Rigid Insulation + Furring
Truss Wall/Offset
Double Wall
Fiberglass
Cellulose
SPF
EPS
XPS
Foil-Faced Polyiso-cyanurate
Stone Wool


Single top plate
2x6 stud wall @ 24" o.c.
Taped and painted 1/2" gypsum wall board as interior finish
Cellulose insulation in wall cavity
OSB sheathing with water control layer facing; joints taped/ sealed
Mineral fiber insulation boards
1x4 wood furring strips
Wood or fiber cement siding
Cellulose insulation at rim joist
Capillary break
EPS insulation


Single top plate
½" plywood connecting interior and exterior walls
2x4 structural stud wall at 24" o.c.
2x3 frame wall
Latex paint on ½" gypsum board
½" fiberboard, plywood, OSB or gypsum sheathing
Building paper, housewrap or building wrap
3½" cellulose insulation
Furring strips
½" plywood or OSB with joints taped
4½" space between sheathing and offset framing
Cladding
Cellulose insulation at rim joist
Cellulose cavity insulation


Single top plate
Taped and painted ½" gypsum wall board as interior finish
2x6 interior framing member @ 24" o.c.
Plywood/OSB sheathing; joints taped/sealed
Cellulose insulation at rim joist
Capillary break
Ledger board
Plywood cavity closure at top of assembly
2x3 exterior truss
Cellulose insulation in wall cavity
Plywood/OSB sheathing
Housewrap
Furring strips
Cladding

Wood Building Evolution


DAVCHT CRANE

Production Housing


Styrofoam


BROCKPORT
ENGINEERED
PANEL SYSTEMS