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
2nd Law of Thermodynamics

In an isolated system, a process can occur only if it increases the total entropy of the system

Rudolf Clausius
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
Water Control Layer
Air Control Layer
Vapor Control Layer
Thermal Control Layer

Cladding
Control layers
Structure
Commercial Enclosure: Simple Layers

- Structure
- Rain/Air/Vapor
- Insulation
- Finish
Brick veneer/stone veneer
Drained cavity
Spray-applied closed-cell high-density foam (2 lb/ft³) water control layer (also air control layer, vapor control layer and thermal control layer)
Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)
Uninsulated steel stud cavity
Gypsum board
Latex paint or vapor semi-permeable textured wall finish

Brick veneer/stone veneer
Drained cavity
Spray-applied closed-cell high-density foam (2 lb/ft³) water control layer (also air control layer, vapor control layer and thermal control layer)
Non paper-faced exterior gypsum sheathing, plywood or oriented strand board (OSB)
Insulated wood stud cavity
Gypsum board
Latex paint or vapor semi-permeable textured wall finish
Upturned leg
Base sloped to exterior
Drip edge

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January 26, 2016

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Rain Screen
Beer Screen?
Rockwool

1x3 furring @ 24” o.c.
#10 screws @ 16” o.c. vertically
Result: 20 psf cladding weight with < 2/100” deflection
Second layer of z-ties should be installed perpendicular to the first layer. Orientation of the two layers will depend on the requirements of the cladding attachment system.

First layer of z-ties embedded in the insulation layer should be installed horizontally. The exterior leg should be turned down to promote drainage to the exterior.
Outside

Dewpoint (50% RH, 70°F)

Location of condensation and frost

Inside

70°F

0°F

Exterior sheathing
Simple linearized energy-temperature relation for water
From Straube & Burnett, 2005