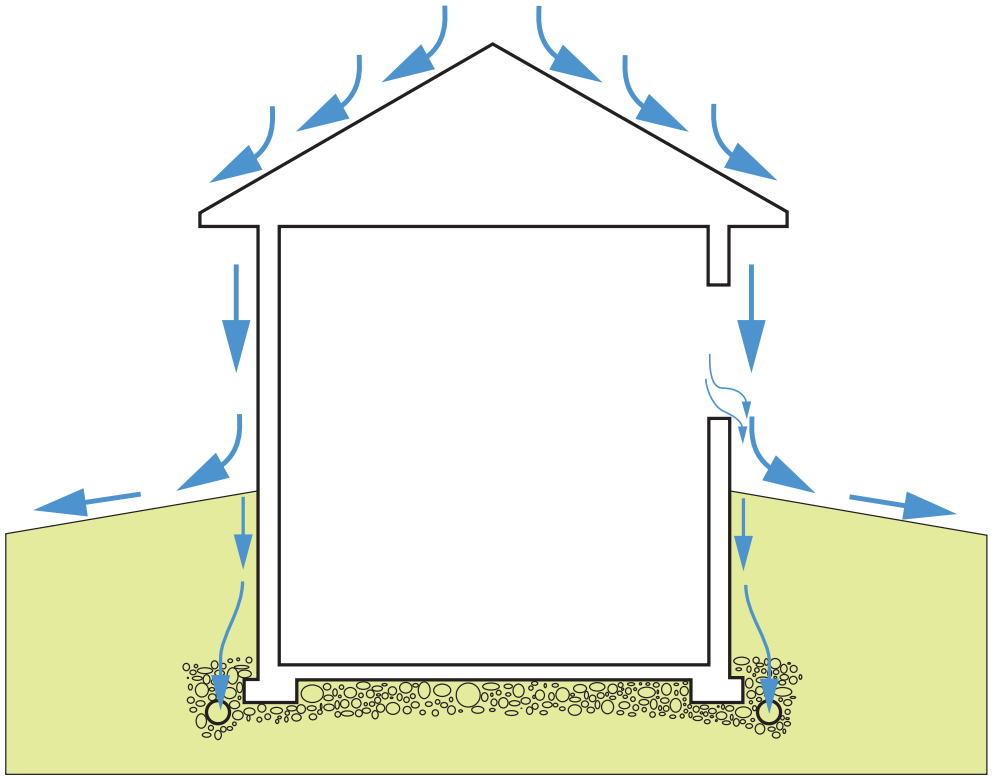
Moisture Movement

how does moisture move?

Water Movement

Water runs downhill due to gravity

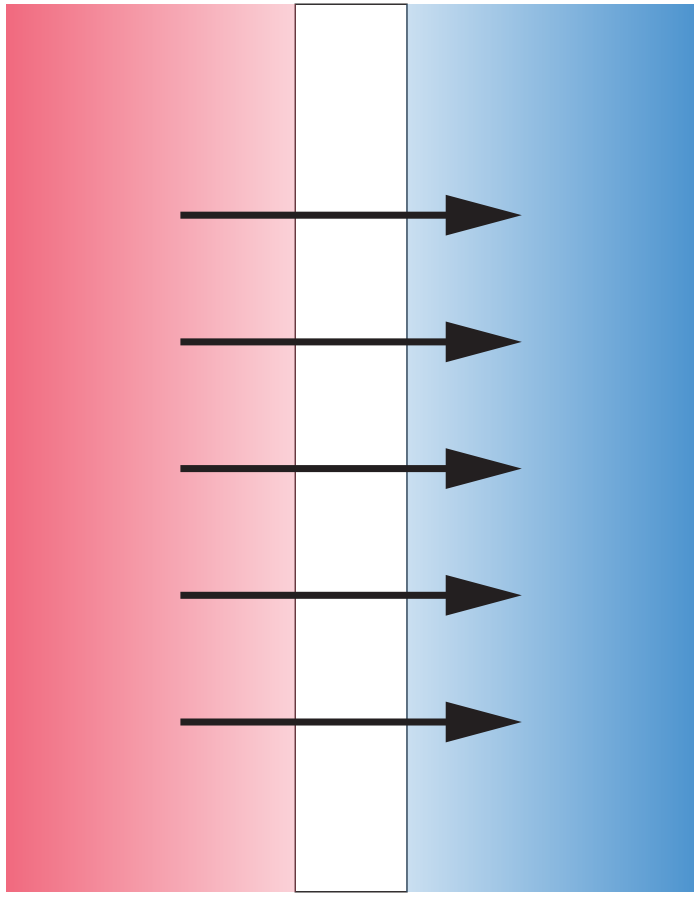


graphic adopted from Whole Building Design Guide

Water Movement

Water runs downhill due to gravity

Air carrying water vapor goes from areas of higher air pressure to areas of lower pressure



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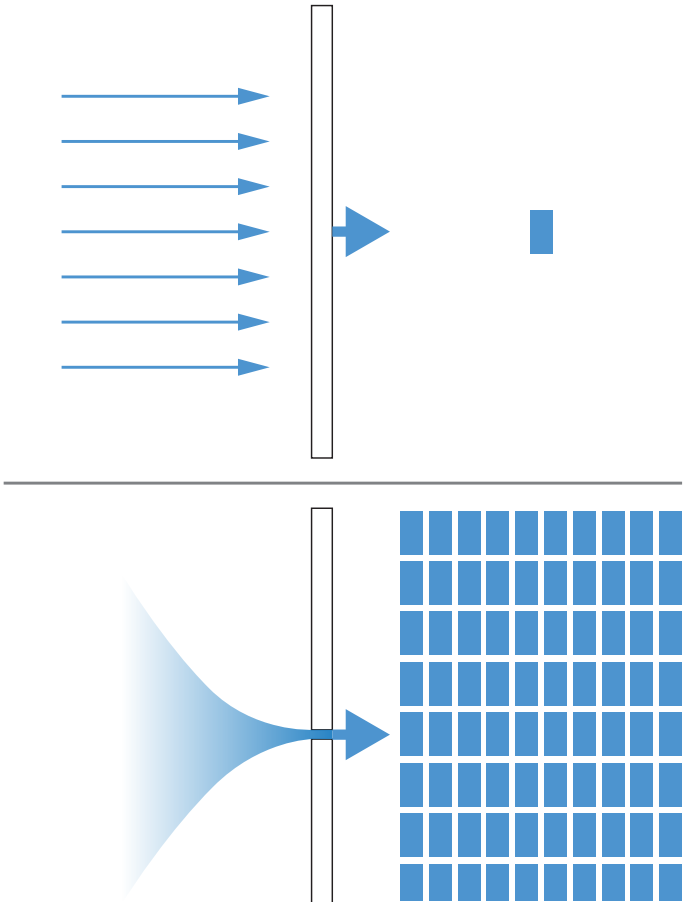
Air traveling through 1" opening in a 4x8 sheet of gypsum will produce 90x more moisture than normal vapor diffusion through the same sheet of gypsum

...in Boston assuming 70 degree indoor setpoint and 40% RH



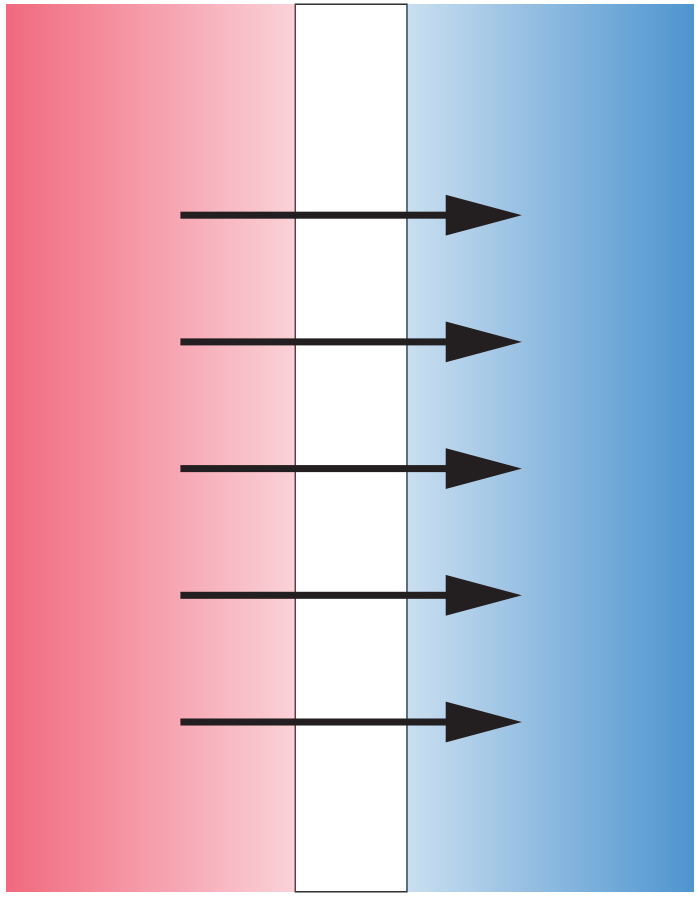
graphic adopted from Building Science Corp

Water Movement

Water runs downhill due to gravity

Air carrying water vapor goes from areas of higher air pressure to areas of lower pressure

Water vapor diffuses from warm to cold driven by thermal difference



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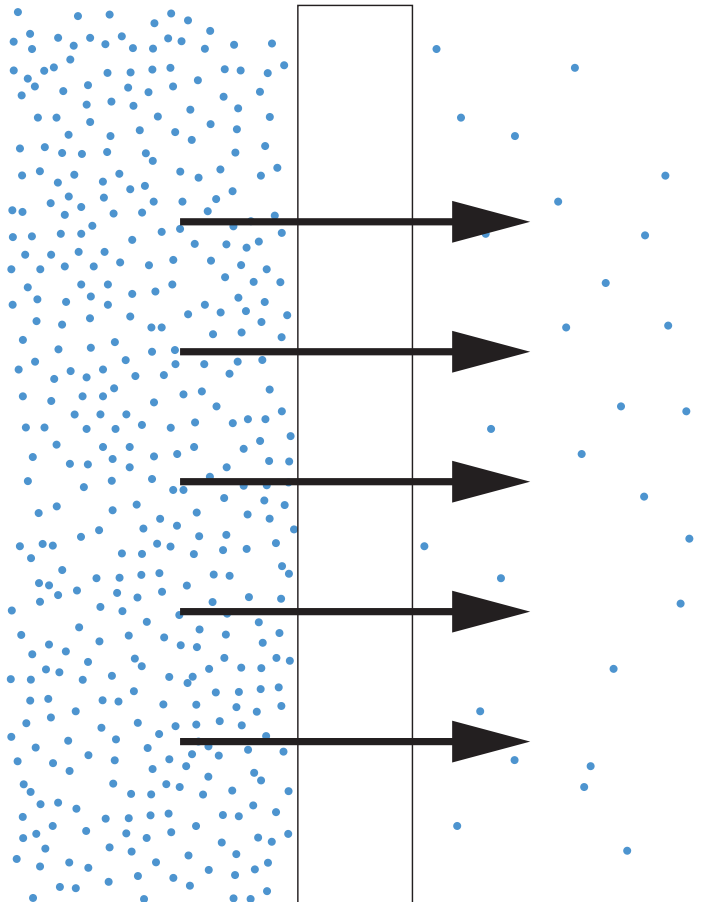
Water vapor diffuses from more to less concentration



Water Movement

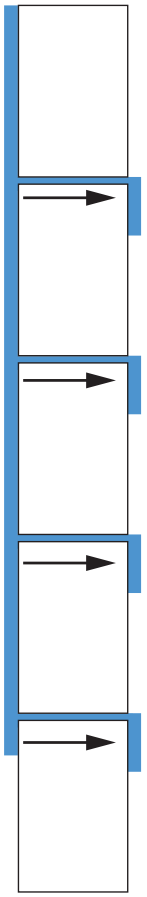
Water runs downhill due to gravity

Air carrying water vapor goes from areas of higher air pressure to areas of lower pressure

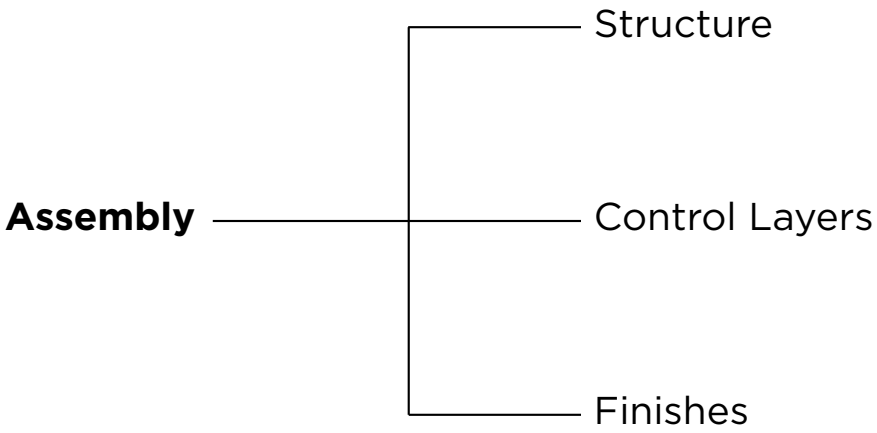
Water vapor diffuses from warm to cold driven by thermal difference

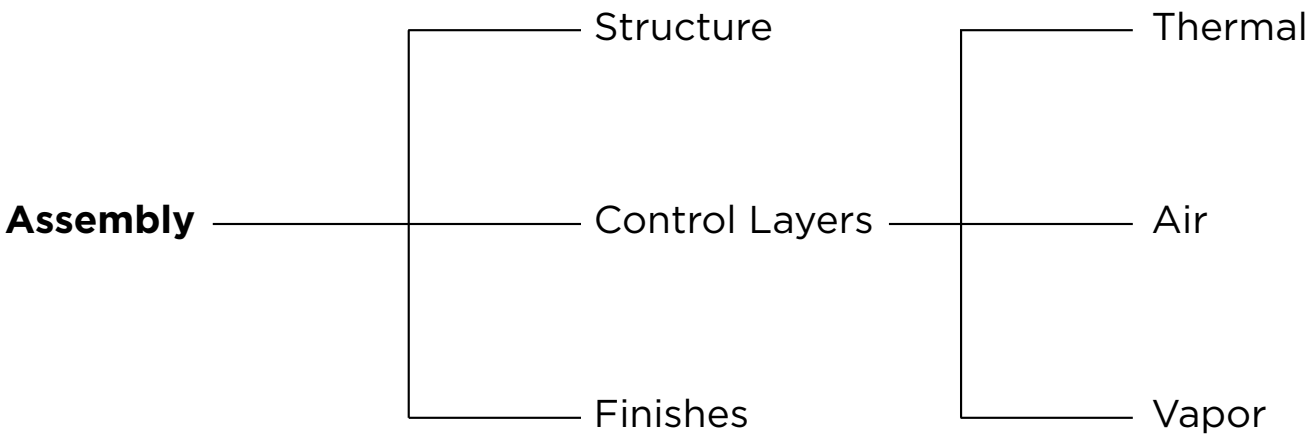
Water vapor diffuses from more to less concentration

Water moves through porous materials through capillary action



what is an assembly?


Assembly
Structure
Control Layers
Finishes


Assembly
Structure
Control Layers
Finishes
Thermal
Air
Vapor

Control Layers		R-value/in	GWP [A1-A3] kgCO2e/1m² RSI
Thermal	Unfaced fiberglass batts (high density)	3.6	0.67
	Fiberglass wool dense-packed	4.0	1.61
	Fiberglass wool loose-fill	2.7	1.29
	Cellulose dense-packed	3.6	1.37
	Cellulose loose-fill	3.4	0.49
	Mineral wool board	4.0	4.06
	Closed-cell spray foam (HFO)	6.6	3.47
	Open-cell spray foam	4.1	1.42
	Polyisocyanurate	6.5	2.32
	EPS	4.7	3.47
	XPS	5.0	20.17

Source: BEAM Estimator

Control Layers

Air

Plywood

Membrane

Tape

Control Layers

Air

Plywood

Membrane

Tape

BRICK AND CMU ARE *NOT* AIR CONTROL

Control Layers

Vapor		**Permeance**	**Example**
	Class I (Vapor Barrier)	<0.1 perm	sheet polyethylene, sheet metal, foil-faced polyiso
	Class II	>0.1 perm; <1.0 perm	oil-based paints, unfaced XPS, kraft-faced fiberglass
	Class III	>1.0 perm; <10 perm	OSB, plywood, latex or enamel paint, closed-cell spray foam
	Permeable	>10 perm	drywall, Tyvek, open-cell spray foam, brick

Barriers

Vapor	Permeance	Example
Class I (Vapor Barrier)	<0.1 perm	sheet polyethylene, sheet metal, foil-faced polyiso
Class II	0.1 perm; 1.0 perm	oil-based paints, unfaced XPS, kraft-faced fiberglass
Class III	>1.0 perm; <10 perm	OSB, plywood, latex or enamel paint, closed-cell spray foam
Permeable	>10 perm	drywall, Tyvek, open-cell spray foam, brick

BRICK, CMU, AND TYVEK ARE *NOT* VAPOR CONTROL