

Continuous Insulation

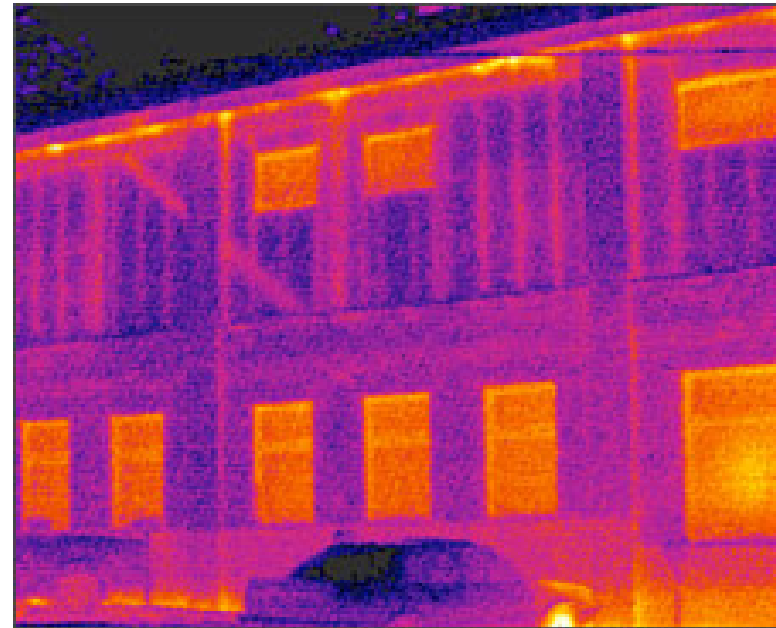
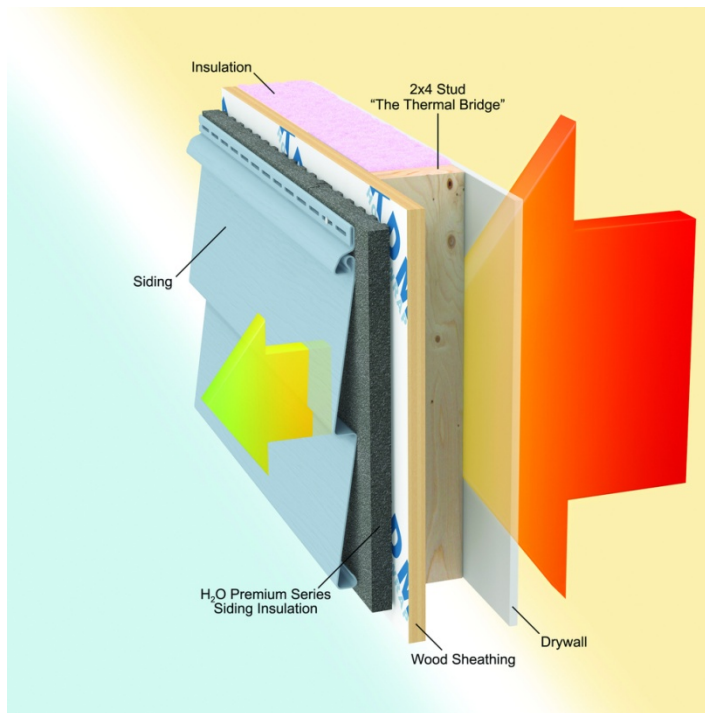
October 1, 2016

Tom Calzavara

2016 ICAA Convention
DENVER
& Trade Show 9.28.16–10.1.16
DENVER MARRIOTT CITY CENTER

Thermal Bridging

An element in a building assembly with relatively higher thermal conductivity than the surrounding materials, which allows heat to bypass thermal insulation.



<http://www.wbdg.org>

Continuous Insulation (CI)

From ASHRAE 90.1-2013

- *Continuous Insulation (CI)*: insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings.



Air Barrier

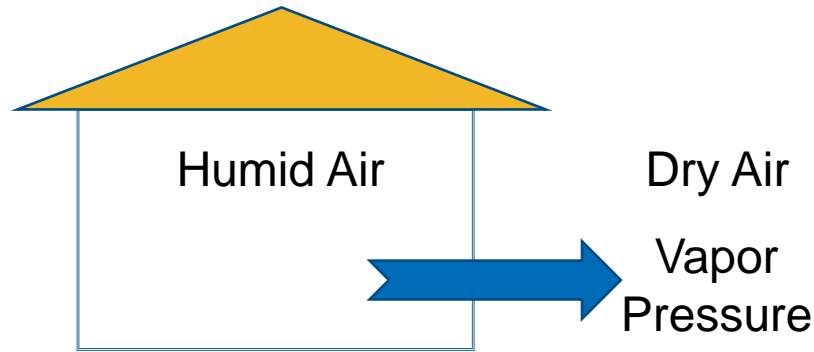
International Energy Conservation Code

Air Barrier.

- Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope.
- And air barrier may be a single material or a combination of materials.



Vapor Retarders



International Energy Conservation Code

- Class I: ≤ 0.1 perm (impermeable/vapor barrier)
- Class II: 0.1 to 1.0 perm (semi-impermeable)
- Class III: 1.0 perm to 10 perms (semi-permeable)

Fire Code

- IBC Chapter 26
 - 2603.5.2 – Thermal barrier (e.g. 15 minute barrier)
 - Foam needs to be covered by a thermal barrier unless tested in accordance with NFPA 286
 - 2603.5.3 – Potential heat
 - NFPA 259
 - 2603.5.4 - Flame spread index, smoke developed index
 - ASTM E84 or UL 723
 - 2603.5.5 – Vertical and lateral fire propagation.
 - NFPA 285



Types of Continuous Insulation



Rigid foam boards



Closed Cell Spray
Foam



Mineral wool

CI Applications

Function	EPS	XPS	Polyiso	Ext. ccSPF	Mineral Wool
R-value (1")	~4/inch	5/inch	≥6/inch	≥7/inch	≥4/inch
Air barrier	None per ABAA	w/ tape	w/ tape	✓	None per ABAA
Vapor retarder (1")	2-6 perm	1.2 perm	<0.02 perm	1.1 perm	110 perm
Fire	NFPA 285, ASTM E84	NFPA 285, ASTM E84	NFPA 285, ASTM E84	NFPA 285, ASTM E84	✓
Drainage plane	w/ tape	w/ tape	w/ tape	✓	No
Below grade	✓	✓	✓	✓	✓
Wind	Look for manufacture assembly test data			No	No

CI Applications

WRB and Air Barrier

- Combined with tapes, sealants and flashings
- Air Barrier Association of America Certification

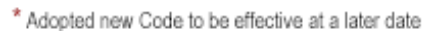


Specifications

- Division 07 "thermal" insulation
- Division 09 "acoustic" insulation
- Specifications rarely call out "Continuous Insulation"
- Detail the specific "Continuous Insulation" conditions on drawings
- Section numbers are typically same for commercial and residential

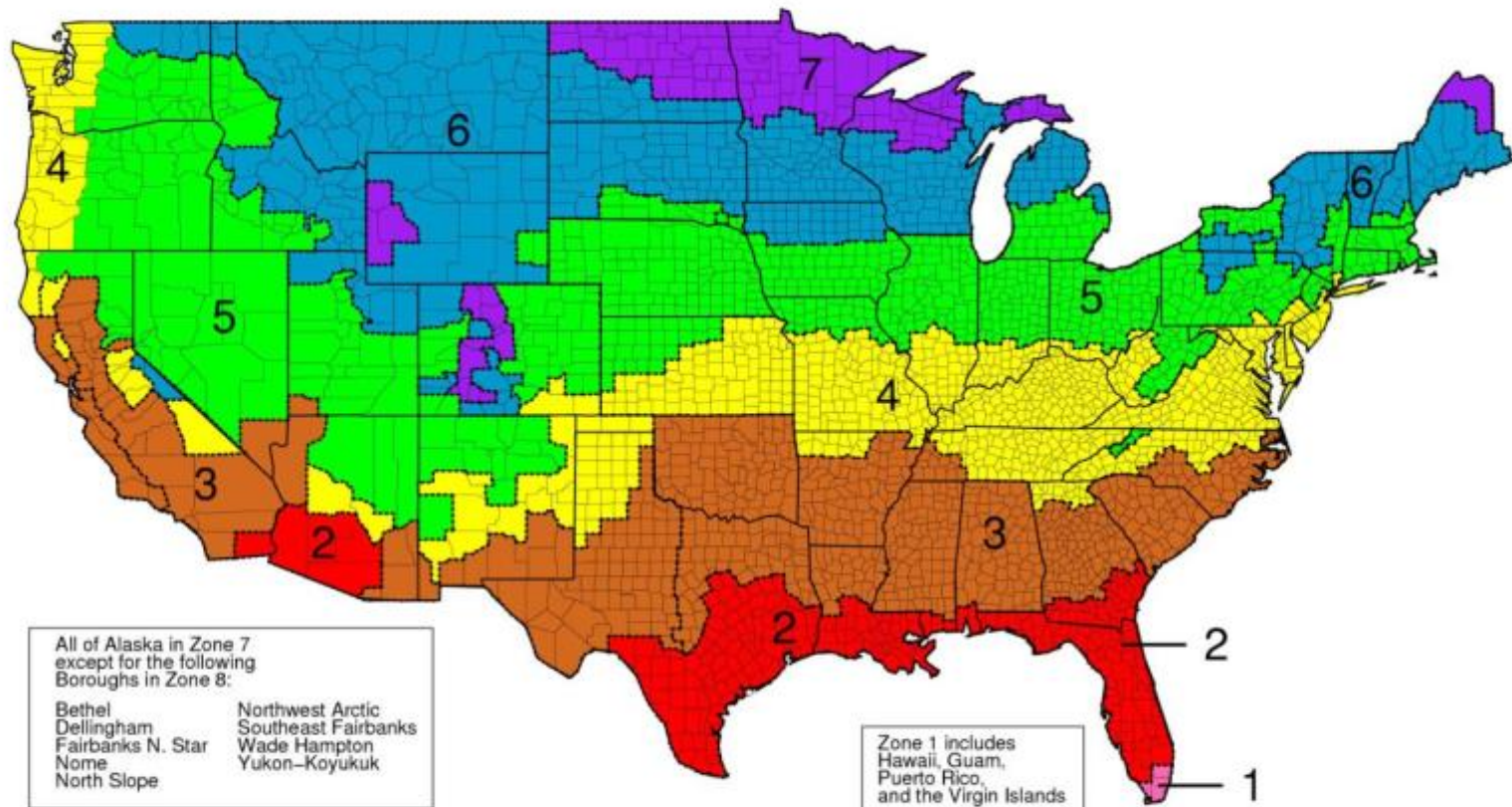
Legend:

- American Samoa
- Guam
- N. Mariana Islands
- Puerto Rico *
- U.S. Virgin Islands



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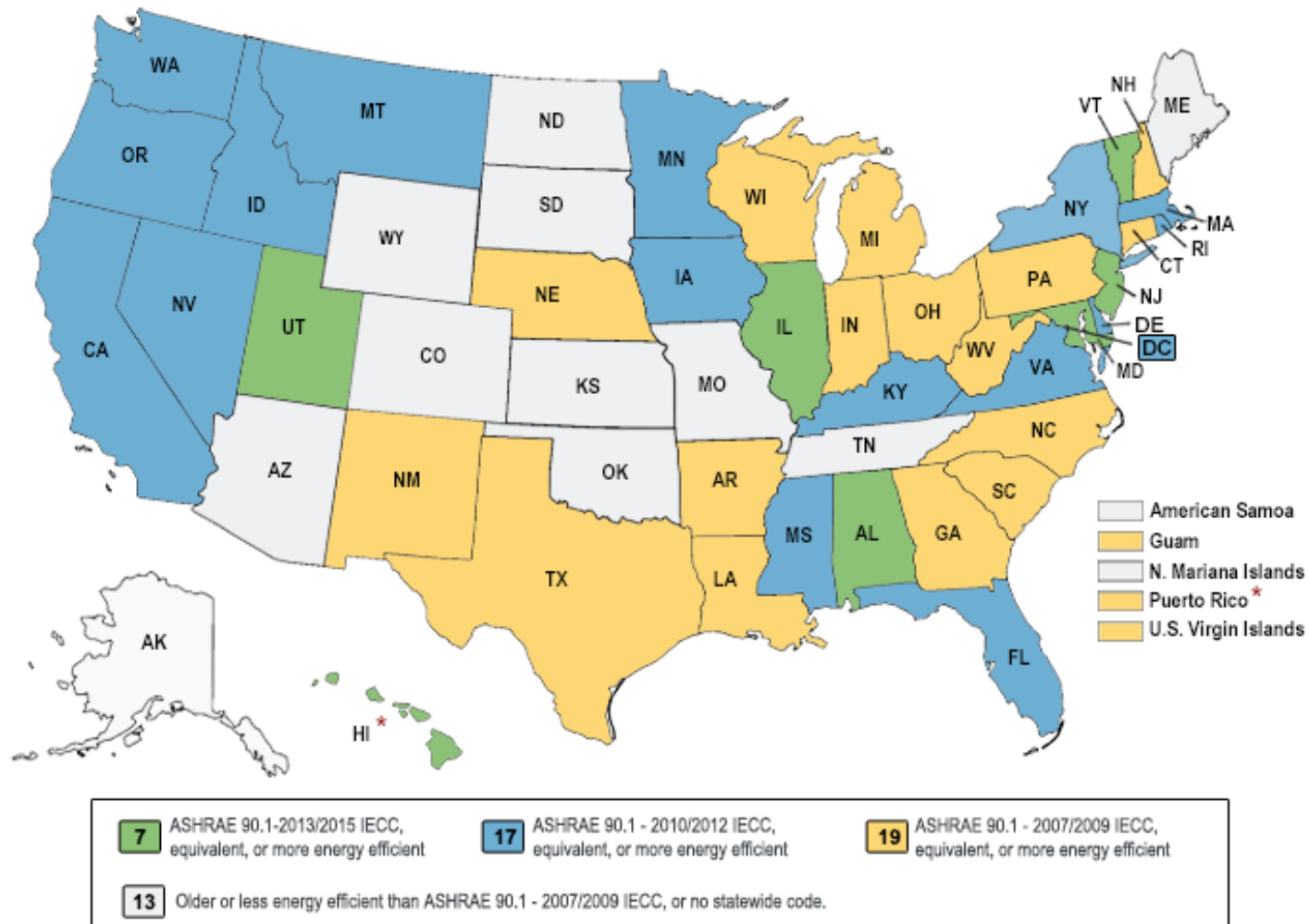
Code Climate Zones



Residential Code Progression

Climate Zone	Wood frame walls		
	2006	2009	2012/2015
1	13	13	13
2	13	13	13
3	13	13	20 or 13+5
4	13	13	20 or 13+5
5	19 or 13+5	20 or 13+5	20 or 13+5
6	19 or 13+5	20 or 13+5	20+5 or 13+10
7	21	21	20+5 or 13+10
8	21	21	20+5 or 13+10

Commercial Code Adoptions



As of July 2016

IECC Commercial – not Group R

Climate Zone	Mass Walls			Metal-framed Walls			Wood-framed Walls		
	2006	2009	2012/2015	2006	2009	2012/2015	2006	2009	2012/2015
1	0	0	5.7ci	13	13	13+5	13	13	13+3.8 or 20
2	0	5.7ci	5.7ci	13	13	13+5	13	13	13+3.8 or 20
3	5.7ci	7.6ci	7.6ci	13	13+3.8	13+7.5	13	13	13+3.8 or 20
4	5.7ci	9.5ci	9.5ci	13	13+7.5	13+7.5	13	13	13+3.8 or 20
5	7.6ci	11.4ci	11.4ci	13+3.8	13+7.5	13+7.5	13	13+3.8	13+3.8 or 20
6	9.5ci	13.3ci	13.3ci	13+3.8	13+7.5	13+7.5	13	13+7.5	13+7.5 or 20+3.8
7	11.4ci	15.2ci	15.2ci	13+7.5	13+7.5	13+7.5	13	13+7.5	13+7.5 or 20+3.8
8	13.3ci	25ci	25ci	13+7.5	13+7.5	13+7.5	13+7.5	13+15.6	13+15.6 or 20+10

ASHRAE 90.1 Not Residential

Climate Zone	Mass Walls			Metal-framed Walls			Wood-framed Walls		
	2007	2010	2013	2007	2010	2013	2007	2010	2013
1	0	0	0	13	13	13	13	13	13
2	5.7ci	5.7ci	5.7ci	13	13	13+3.8	13	13	13
3	7.6ci	7.6ci	7.6ci	13+3.8	13+3.8	13+5	13	13	13
4	9.5ci	9.5ci	9.5ci	13+7.5	13+7.5	13+7.5	13	13	13+3.8 or 20
5	11.4ci	11.4ci	11.4ci	13+7.5	13+7.5	13+10	13+3.8	13+3.8	13+7.5 or 19+5
6	13.3ci	13.3ci	13.3ci	13+7.5	13+7.5	13+12. 5	13+7.5	13+7.5	13+7.5 or 19+5
7	15.2ci	15.2ci	15.2ci	13+7.5	13+7.5	13+12. 5	13+7.5	13+7.5	13+7.5 or 19+5
8	15.2ci	15.2ci	19ci	13+7.5	13+15. 6	13+18. 8	13+15. 6	13+15. 6	13+18. 8

Note that there has been very little increase in cavity insulation.
Almost all the increases have been CI.

Continuous Insulation Benefits

- Prevents thermal bridging
- Reduces condensation risks
- Increases durability
- Provides air barrier & drainage plane (foam plastics)

Opportunities to Consider

- How many more sqft of insulation could you be installing if you did the outside and inside of a building?
- Who is the expert on installing insulation
 - Bricklayers?
 - Carpenters?
 - Insulator?
- Do you do commercial work?
- Can you install insulation on the outside of the building?
- Does your crews have working CI installation knowledge?

Questions?

Interior Vapor Retarders

TABLE 1405.3.1
CLASS III VAPOR RETARDERS

Climate Zone	Wood frame walls		
	2006	2009	2012/2015
1	13	13	13
2	13	13	13
3	13	13	20 or 13+5
4	13	13	20 or 13+5
5	19 or 13+5	20 or 13+5	20 or 13+5
6	19 or 13+5	20 or 13+5	20+5 or 13+10
7	21	21	20+5 or 13+10
8	21	21	20+5 or 13+10

ZONE	CLASS III VAPOR RETARDERS PERMITTED FOR: ^a
Marine 4	Vented cladding over wood structural panels Vented cladding over fiberboard Vented cladding over gypsum Insulated sheathing with R -value $\geq R2.5$ over 2×4 wall Insulated sheathing with R -value $\geq R3.75$ over 2×6 wall
5	Vented cladding over wood structural panels Vented cladding over fiberboard Vented cladding over gypsum Insulated sheathing with R -value $\geq R5$ over 2×4 wall Insulated sheathing with R -value $\geq R7.5$ over 2×6 wall
6	Vented cladding over fiberboard Vented cladding over gypsum Insulated sheathing with R -value $\geq R7.5$ over 2×4 wall Insulated sheathing with R -value $\geq R11.25$ over 2×6 wall
7 and 8	Insulated sheathing with R -value $\geq R10$ over 2×4 wall Insulated sheathing with R -value $\geq R15$ over 2×6 wall