

Second Stakeholder Meeting for High Performance Walls

March 14, 2017



Alea German
agerman@davisenergy.com
719-225-1556

Agenda

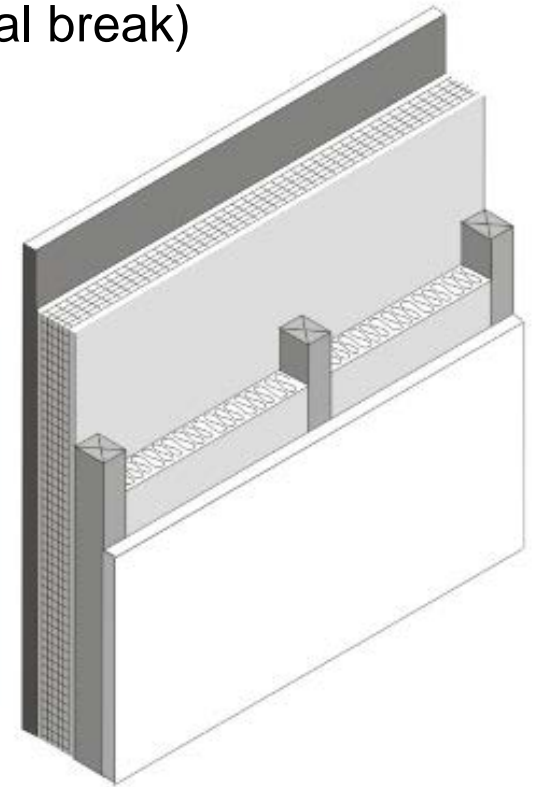
1. Background
2. Proposed Code Changes
3. Technical and Market Barriers
4. Compliance and Enforcement
5. Cost Effectiveness and Energy Impacts
6. Next Steps

1. Background



Introduction to Technology / Building System

- High Performance Wall = improved envelope performance & reduced heating/cooling loads
 - Cavity insulation + continuous insulation (thermal break)
 - Other wall strategies include:
 - Double stud walls
 - Blown-in insulation, spray foam
 - Deeper cavities, 2x8
 - Advanced framing
 - Panelized solutions / SIPs



Relevant Code History

- There are existing requirements in Title 24, Part 6
 - 0.051 U-factor prescriptive requirement except CZ 6/7 (0.065)
 - Added 2016 Cycle

2008 Code	2013 Code	2016 Code
2x4 R-13	2x4 R-15 + R-4	2x6 R-21 + R-4
0.102 U-factor	0.065 U-factor	0.051 U-factor

- Other Relevant Code Requirements
 - 2015 IECC
 - Most of state: 2x4 R-13 + R-5
 - CZ 15: 2x4 R-13
 - CZ 16: 2x6 R-20 + R-5

2. Proposed Code Changes



Proposed Code Change

- Reduce prescriptive wall U-factor to 0.043 in climate zones 1, 11-16.
 - Prescriptive measure
 - Revision to existing requirement
 - Impacts all low-rise residential buildings
 - Applies to additions and alterations (existing exemptions remain)

- *Draft language is provided in the resources section of Adobe Connect and on Title24Stakeholders.com.*

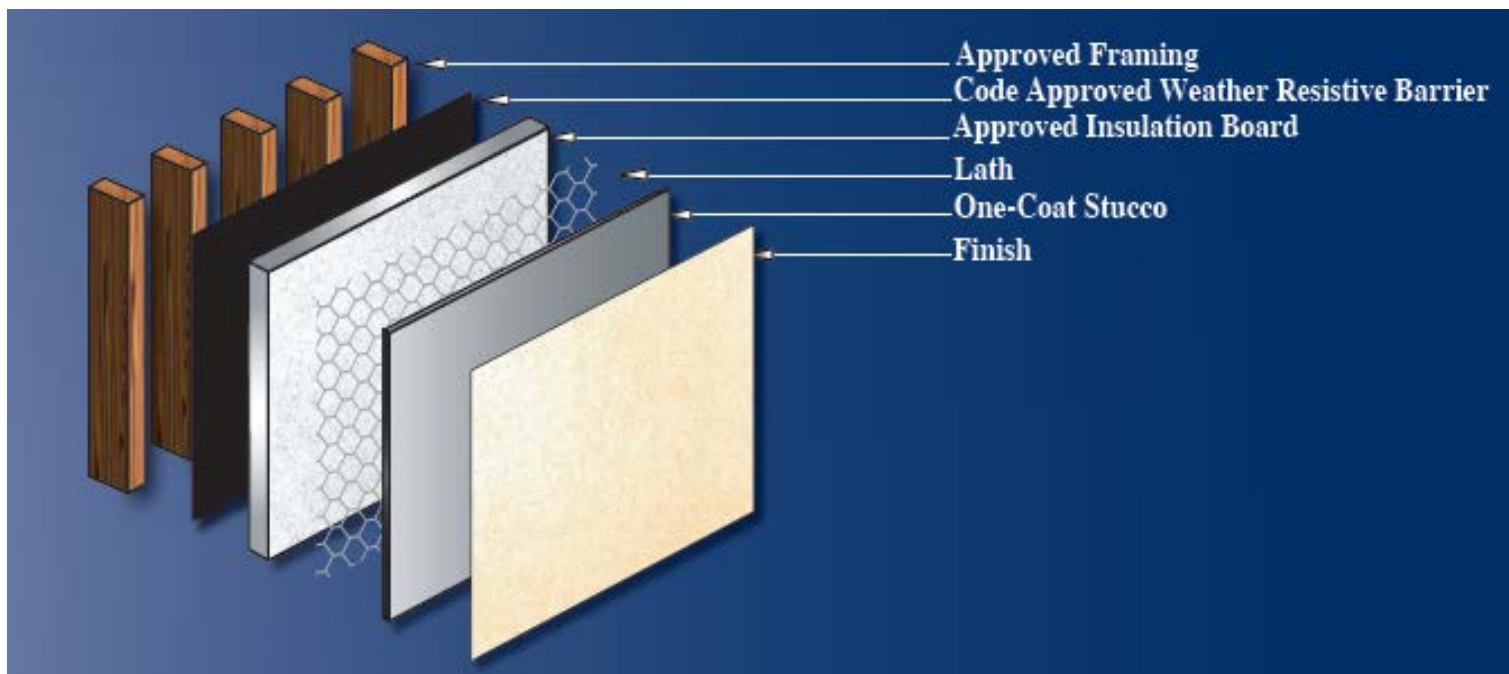
Why Are We Proposing This Code Change

- Support ZNE goals
- Cost-effective envelope improvement prior to introducing solar PV
 - 2016 PV credit going away
- Leverage current market transformation activities related to 2016 code
- Prescriptive measures provide builders with flexible means of compliance

Feedback

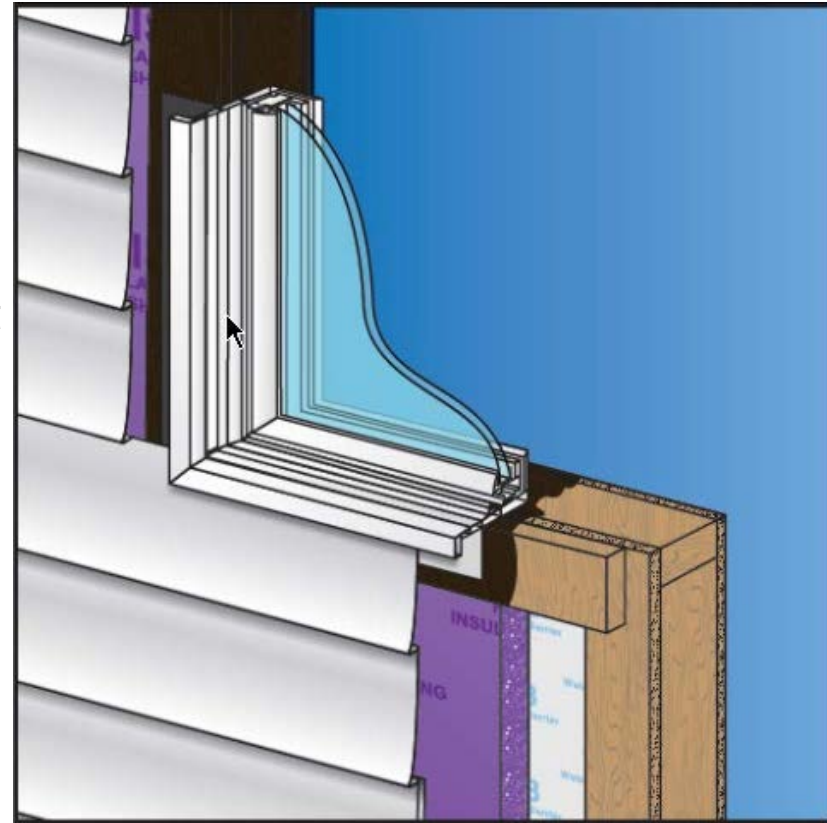


3. Technical and Market Barriers



Technical and Market Barriers

- Window & door waterproofing
 - Change to current practice with >1” foam
 - Possible resolutions include
 - Installer training
 - Flexibility to choose what they are most comfortable with
 - Many strategies exist



Source: FMA/AAMA/WDMA 500-16

Technical and Market Barriers

- Fastening
 - Pneumatic solutions for >1” foam limited
 - 2” to 2-1/2” staples currently used w/ 1” foam
 - Possible resolutions include
 - Hand nailing
 - Screw guns
 - New products
 - 3”+ staple gun / cap nailer



Feedback



4. Compliance and Enforcement



Compliance Process



Design Phase

- What happens during design phase?
 - Architects/designers develop details for drawings
 - Energy consultant recommends measures & ensures team is aware of requirements

Compliance Process



Permit Application Phase

- What happens in permit application phase?
 - Plans reviewer verifies drawings match Title-24, part 6 report

Compliance Process



Construction Phase

- What happens in construction phase?
 - Builder coordinates with subcontractors
 - May need to account for additional installation time
 - Builder ensures that measure is implemented properly

Compliance Process

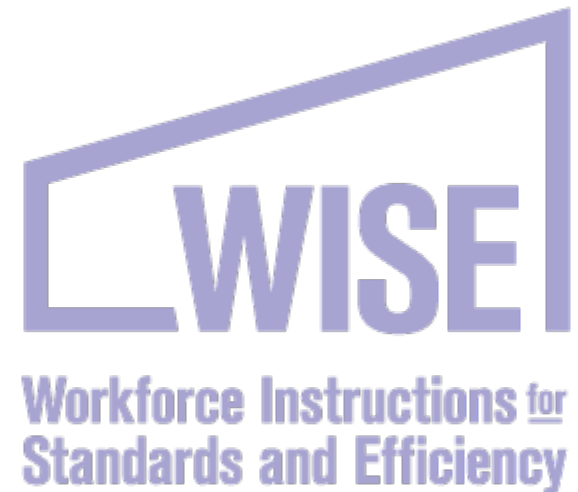


Inspection Phase

- What happens in permitting phase?
 - If QII applied, HERS rater inspects insulation
 - Building inspector conducts final field inspections

Compliance and Enforcement Barriers

- Training
 - Many builders/installers not familiar or comfortable with high performance walls
 - Possible resolutions include
 - Continue market transformation efforts
 - Manufacturers engage in training installers directly
 - New product development



5. Cost Effectiveness and Energy Impacts



Definition of Baseline and Proposed Conditions

- **Baseline Conditions**

- Minimally compliant with 2016 Standards
 - 0.051 U-factor wall (R-21 + 1" R-4)
- All climates zones except 6/7
- 2,100 square foot and 2,700 square foot single family prototypes
- 6,960 square foot 8-unit multifamily prototype
- 2019 TDV
- Ventilation loads adjusted for 2016 ASHRAE 62.2 ventilation rates

- **Proposed Conditions**

- Same assumptions as base case
- 0.043 U-factor exterior walls
 - R-21 + 1.5" R-7.5

Cost Effectiveness Analysis – Incremental Costs

- Single Family Incremental First Cost (2,340 ft² blended prototype)
 - Rigid insulation (\$408)
 - Window/door waterproofing (\$355)
 - Fasteners (\$153)
 - Weep screed (\$19)
 - **Total Single Family Incremental Cost over 30-year period of analysis (\$934)**
- Multifamily Incremental First Cost (8-unit 6,960 ft² prototype)
 - Rigid insulation (\$941)
 - Window/door waterproofing (\$1,052)
 - Fasteners (\$353)
 - Weep screed (\$38)
 - **Total Multifamily Incremental Cost over 30-year period of analysis (\$2,384)**
- *No Incremental Maintenance Costs*

Cost Effectiveness Analysis

Incremental Cost Savings (Benefits)

- Energy Cost Savings over 30-year period of analysis per average dwelling unit (single family and multifamily combined)
 - **Total Energy Cost Savings = range of \$853 to \$1,053 depending on climate zone**
 - *Energy cost savings explained in more detail in following slides.*
- **Total Incremental Cost Savings (Benefit) over 30-year period of analysis = \$39,960,731**

Benefit-to-Cost Ratio Per Average Dwelling Unit (SF & MF combined)

Climate Zone	Benefit to Cost
1	1.02
2	0.83
3	0.51
4	0.61
5	0.51
6	<i>n/a</i>
7	<i>n/a</i>
8	0.39
9	0.55
10	0.67
11	1.21
12	1.07
13	1.13
14	1.17
15	1.30
16	1.23

Cost Effective in **Seven** Climate Zones

If Benefit-to-Cost Ratio is over 1,
measure is cost effective.

Annual Energy Savings Per Average Dwelling Unit (SF & MF combined)

Climate Zone	TDV Energy Savings (TDV kBtu/yr)	30 Year TDV Energy Cost Savings (\$2020)
1	4,928	\$853
2	<i>n/a</i>	<i>n/a</i>
3	<i>n/a</i>	<i>n/a</i>
4	<i>n/a</i>	<i>n/a</i>
5	<i>n/a</i>	<i>n/a</i>
6	<i>n/a</i>	<i>n/a</i>
7	<i>n/a</i>	<i>n/a</i>
8	<i>n/a</i>	<i>n/a</i>
9	<i>n/a</i>	<i>n/a</i>
10	<i>n/a</i>	<i>n/a</i>
11	5,871	\$1,016
12	4,991	\$863
13	5,576	\$965
14	5,248	\$908
15	6,087	\$1,053
16	4,971	\$860

Annual Energy Savings Per Average Dwelling Unit (SF & MF combined)

Climate Zone	Annual Electricity Savings (kWh/yr)	Annual Natural Gas Savings (kWh/yr)	Peak Electric Demand Reduction (kW)
1	17	21	0.00
2	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
3	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
4	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
5	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
6	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
7	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
8	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
9	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
10	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>
11	55	13	0.05
12	27	12	0.05
13	59	12	0.06
14	47	12	0.05
15	129	2	0.09
16	19	20	0.01

Feedback



6. Next Steps

Next Steps

- Please send any additional feedback to:
 - CASE Author (see contact info at end of this presentation)
 - Info@title24stakeholders.com
- Keep an eye on Title24Stakeholders.com for:
 - Presentations from today's meeting
 - Draft Code Change Language
 - Notes from today's meeting
 - Draft CASE Report (will be posted in April)

Thank you.

Alea German

agerman@davisenergy.com

719-225-1556



Appendix

References

- Title24Stakeholders.com
- EnergyCodeAce.com
 - See [Reference Ace](#) for 2016 Standards, Appendices, and Compliance Manuals
- [California Energy Commission 2019 Standards Webpage](#)
- Draft language is provided in the resources section of Adobe Connect and on Title24Stakeholders.com.