

Second Stakeholder Meeting for Quality Insulation Installation (QII)

March 14, 2017



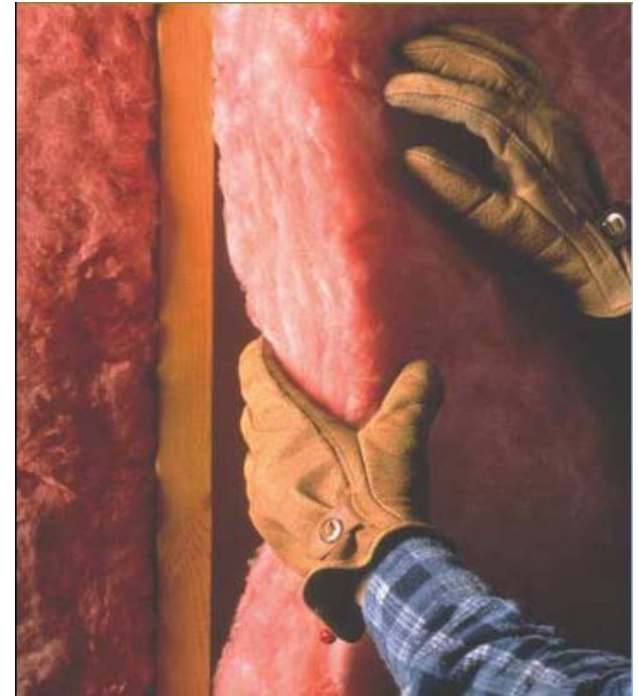
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Agenda

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



What is QII & Why is it Important?

- A Quality Insulation Installation (**QII**) inspection is performed by a certified HERS (Home Energy Rating System) rater
 - Ensures that the envelope is insulated and air sealed properly
 - Applies to both insulation and the air barrier
- Studies show that without QII, insulation quality does not meet manufacturer guidelines

What is QII & Why is it Important?

Bad Job



Good Job



Current Practices / Trends

- QII is well established, but not widespread or consistent
 - CalCERTS registry data (Jan 2015 – April 2016)
 - 24% single family homes
 - 13% multifamily buildings
 - Utility incentive programs under 2013 code
 - 80% single family plans (CAHP)
 - 74% multifamily buildings (CMFNH)
- Required by local ordinances as part of CALGreen Tier 1
- QII compliance became more difficult in 2013
- Compliance challenges for HERS raters

2. Proposed Code Changes



Proposed Code Change

- Change QII from compliance option to prescriptive requirement
 - Single family and low-rise multifamily buildings
 - Applies to new construction and additions ≥ 700 square feet

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

Why Are We Proposing This Code Change

- Support California climate action goals and move towards ZNE buildings
- Cost-effective envelope improvement prior to introducing solar PV
- QII already prerequisite for 2016 CALGreen
- Significant savings opportunity
 - TDV savings of 5.4 – 10.8% depending on climate zone
- Improve compliance with existing standards

3. Technical and Market Barriers



Technical and Market Barriers

- HERS rater challenges with inspection failures
 - Rater relationship with installer and builder can turn adversarial
 - Can lead to lost HERS rater work
 - Possible resolutions
 - More in-field QA/QC of HERS raters (HERS Providers)
 - More in-field training of builders and installers (HERS raters)
 - Certification of insulation installers

Feedback



4. Compliance and Enforcement



Compliance Process



Design Phase

- What happens during design phase?
 - Title 24, Part 6 consultants coordinate with the architects & design team
 - Requirements clearly articulated on building plans/specs

Compliance Process



Permit Application Phase

- What happens in permit application phase?
 - No change from existing practice

Compliance Process



Construction Phase

- What happens in construction phase?
 - Builder ensures that QII included in insulator bid
 - Builder coordinates with subcontractors
 - Additional time scheduled for HERS rater inspections
 - May require additional time for installer training

Compliance Process



Inspection Phase

- What happens in permitting phase?
 - On all projects
 - Installer submits CF2R
 - HERS rater submits CF3R

Compliance and Enforcement Barriers

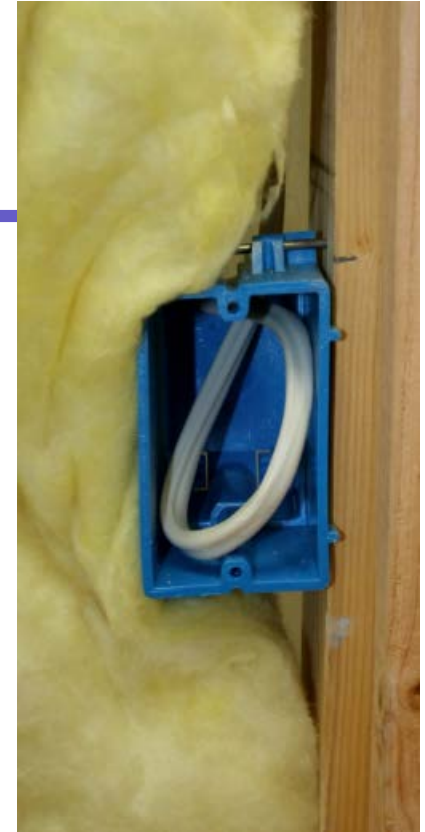
- Training
 - Many installers not familiar or comfortable with QII procedures
 - Lack of installer training and worker turnover a challenge
 - Possible resolutions include
 - Onsite training – turnover a challenge
 - Make HVAC/electrical/plumbing trades aware of impacts
 - Manufacturers engage direction with installers on training



Feedback



5. Cost Effectiveness and Energy Impacts



Definition of Baseline and Proposed Conditions

- **Baseline Conditions**

- Minimally compliant with 2016 Standards
- Single Family: Blended prototype based on 2,100 square foot and 2,700 square foot residential prototypes
- MF: 6,960 square foot, 8-unit, 2-story prototype
- 2019 TDV values
- Ventilation loads adjusted for 2016 ASHRAE 62.2 ventilation rates

- **Proposed Conditions**

- Same assumptions as baseline
- QII credit
- Insulation Construction Quality = Improved

Cost Effectiveness Analysis

Incremental Costs

- Single Family Incremental First Cost
 - Installation Labor (\$88)
 - HERS Verification (\$308) based on 1-in-2 sampling
 - **Total Single Family Incremental Cost over 30-year period of analysis (\$396)**
- Multifamily (8-unit) Incremental First Cost
 - Installation Labor (\$352)
 - HERS Verification (\$477) based on 1-in-4 sampling
 - **Total Multifamily Incremental Cost over 30-year period of analysis (\$829)**
- *No Incremental Maintenance Costs*

Cost Effectiveness Analysis

Incremental Cost Savings (Benefits)

- Energy Cost Savings over 30-year period of analysis
 - **Total Energy Cost Savings = range of \$277 to \$2,179 depending on climate zone**
 - *Energy cost savings explained in more detail in Appendix slides.*
- **Total Incremental Cost Savings (Benefit) over 30-year period of analysis = \$139,807,657**

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

Climate Zone	Benefit to Cost
1	5.47
2	3.89
3	2.65
4	3.41
5	2.65
6	1.89
7	1.03
8	2.54
9	3.25
10	3.56
11	5.88
12	5.45
13	6.05
14	6.04
15	6.44
16	5.71

Cost Effective in **All** Climate Zones

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

Feedback



6. Next Steps



Next Steps

- Please send any additional feedback by March 24 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.

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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.

Relevant Code History

- There are currently no code requirements in Title 24, Part 6 for QII
 - Performance compliance option since 2005
 - Standard Design assumes insulation and draft stopping defects
- Pre-requisite for Tiers in CALGreen (Title 24, Part 11)

Table 4: Modeling Rules for Standard Insulation Installation Quality

Component	Modification
Walls, Floors, Attic Roofs, Cathedral Ceilings	Multiply the cavity insulation R-value/inch by 0.7
Ceilings below attic	Multiply the blown and batt insulation R-value/inch by 0.96-0.00347*R
Ceilings below attic	Add a heat flow from the conditioned zone to the attic of 0.015 times the area of the ceiling below attic times (the conditioned zone temperature - attic temperature) whenever the attic is colder than the conditioned space

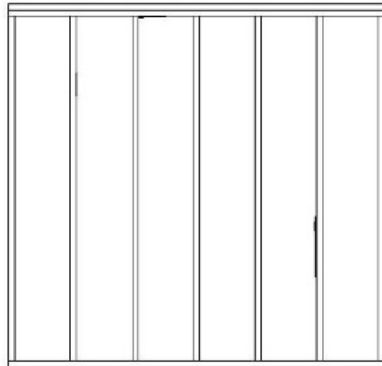
Relevant Code History

- QII inspection procedures updated in 2013 code with more stringent inspection procedures
 - Tighter restrictions on missing insulation / gaps
 - Include air sealing / air barrier inspection procedures
 - Separated requirements for batt, blown, spray foam and rigid
 - More clarity on special situations

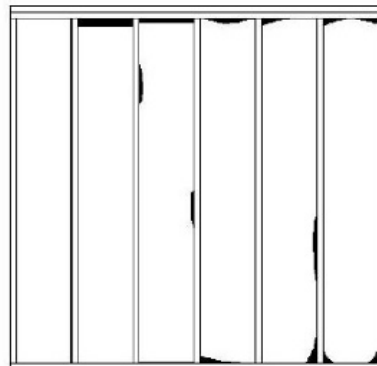


Relevant Code History

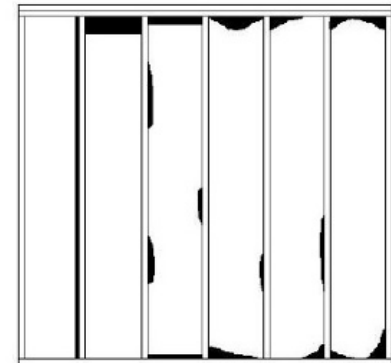
- Other Relevant Code Requirements
 - 2015 IECC has some components
 - Continuous air barrier
 - Cavity insulation in contact with air barrier
 - ENERGY STAR Thermal Bypass Checklist
 - LEED, DOE's Zero Energy Ready Homes
 - RESNET Home Energy Rating Standards
 - Insulation Grades 1, 2 & 3



Grade I



Grade II



Grade III

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

Climate Zone	TDV Energy Savings (TDV kBtu/yr)	30 Year TDV Energy Cost Savings (\$2020)
1	11,034	\$1,909
2	6,566	\$1,136
3	3,661	\$633
4	5,678	\$982
5	4,411	\$763
6	2,472	\$428
7	1,600	\$277
8	3,409	\$590
9	3,801	\$657
10	6,632	\$1,147
11	11,975	\$2,072
12	10,648	\$1,842
13	12,597	\$2,179
14	11,259	\$1,948
15	12,584	\$2,177
16	9,498	\$1,643

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

Climate Zone	Annual Electricity Savings (kWh/yr)	Annual Natural Gas Savings (therms/yr)	Peak Electric Demand Reduction (kW)
1	40	48	0.00
2	24	23	0.02
3	10	15	0.00
4	22	16	0.04
5	12	19	0.00
6	8	8	0.01
7	5	6	0.01
8	22	5	0.05
9	32	6	0.06
10	61	12	0.10
11	126	26	0.12
12	62	24	0.13
13	143	22	0.15
14	107	24	0.12
15	259	4	0.20
16	43	37	0.03