



TITLE 24, PART 6

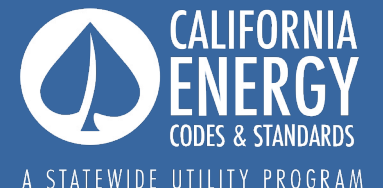
2025 CODE CYCLE

Buried Ducts

Codes and Standards Enhancement (CASE) Proposal
Building Type | System Type

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Utility Sponsored Stakeholder Meeting – Round 2



Agenda

Overview of Code Change Proposal

Summary of Stakeholder Feedback

Cost-effectiveness and Energy Savings

Data Gaps and Additional Feedback Requested

Next Steps





Code Change Proposal

- Code Change Proposal
- Code Change Language
- Compliance, Modeling, & Verification Changes

Proposed Code Change

- Burying ducts in attic insulation is a low-impact, cost-effective way to increase building efficiency in Climate Zones 1-3, 5-7, and 16, where prescriptive attic and duct insulation requirements have not been upgraded for three code cycles.
- The proposed change to prescriptive standards reduces barriers to buried ducts by introducing simpler modeling and verification alternatives than those required under the existing detailed buried duct compliance path.



- Existing effective R-values listed in the Residential ACM Manual tables have been re-evaluated and are significantly improved.

Draft Code Change Language

Buried ducts prescriptive in Climate Zones 1-3, 5-7, and 16

- Require min. R-49 attic insulation in CZs 1-3, 5-7 and R-60 in CZ 16 (increased from R-30/R-38)
- No prescriptive requirement for roof deck insulation in Climate Zone 16
- Add radiant barrier requirement in CZ 1 & 16

Mandatory R-4 roof deck requirement exempted if ducts are buried (CZ 4, 8-15)

Small homes (500 square feet or less) are not required to bury ducts.

- No prescriptive buried duct requirement
- Prescriptive Attic Insulation (increased from R-30/R-38)

Climate Zone	Attic Insulation
1 through 3	R-49
5 through 7	R-38
16	R-60

- Radiant barrier in Climate Zone 1 and 16

Draft code language is available at title24stakeholders.com

Proposed Compliance, Modeling & Verification Changes

- Design must comply with Title 24 Part 11 requirements for duct sizing – must provide duct design with Certificate of Compliance
- Distribution system modeling
 - Bypasses detailed duct design entries, only requires the diameter of the largest duct
 - Updated effective duct R-values based on depth of burial and attic insulation R-value
 - Duct surface area & average effective R-value calculation methods under development
- Verification
 - Would not be necessary to verify each duct segment (as in RA3.1.4.1.5)
 - Verification that all ducts are fully covered with attic insulation can be concurrent with QII
 - No distinction between partially, fully, and deeply buried - duct markers only needed to avoid future damage

Poll

Duct design in accordance with ACCA Manual D is mandatory under Title 24 Part 11 Section 4.507.2. Do you believe that adding that requirement to Part 6 will improve compliance?

Discussion: DO building officials enforce it?

Poll

Do you have concerns about being able to keep duct sizes small enough so they can be fully buried?



Summary of Stakeholder Feedback

- Summary of Feedback Received
- Measure Evolution
- Potential Barriers and Solutions

Summary of Feedback Received

- **General:** Several positive reactions; concerns about code complication
- **Costs:** Expect higher costs for installation and added HERS measures
- **Design:**
 - Ducts frequently designed by the installer
 - Coordination between builders and HVAC designers needed
- **Installation:**
 - Raised heel trusses may be required to accommodate deeper insulation
 - R-49 may require baffles and dams
 - May be easier to lay ducts over trusses than to suspend.
- **Durability & longevity:**
 - Buried duct lifetime
 - Accessibility for repairs and maintenance
 - Settling of insulation
 - Concern about condensation.

Evolution of the Measure

Original proposal:

- Buried ducts would become a prescriptive alternative to roof deck insulation (Option B) in Climate Zones 4 & 8-16
- Prescriptive requirement in Climate Zones 1-3 & 5-7.

Current proposal:

- Prescriptive requirement in Climate Zones 1-3, 5-7 and 16.
- Small home exception for buried ducts.
- Standardize on R-6 ducts and R-49 (or greater) ceiling insulation to simplify compliance & verification
- Mandatory requirement for R-4 roof deck insulation would be eliminated when buried ducts are installed in Climate Zones 4 & 8-15 (radiant barrier required)

Potential Barriers and Solutions

- **Design barriers:** Designer must be cognizant of largest allowable duct diameter based on insulation depth; R-value/inch varies (*feedback?*)
- **Installation barriers:** R-49/60 may require more extensive baffles at eve vents (if not raised heel) or dams where ceiling heights vary (*feedback?*)
- **Durability & Maintenance:**
 - Like ducts in conditioned space, buried ducts are not directly exposed to attic temperatures and should have similar lifetimes (*would you agree with a 30-year life assumption?*)

Poll

Duct location markers will help prevent damage from being stepped on, but need for access after insulation is installed is minimal (agree?)

Discussion: Other barriers, problems, or solutions?

Poll

Larger duct diameters may require more attic insulation to ensure full burial. Is the need for coordination between HVAC designers, builders and/or insulation contractors problematic?

Cost Effectiveness and Energy Savings

Methodology and Assumptions

- Energy Savings Methodology and Results
- Cost Impacts Methodology and Results
 - Incremental costs
 - Energy cost savings



Incremental Per Unit Cost

Over 30 Year Period of Analysis

Incremental First Cost	
R-49 vs. R-30 Insulation	\$0.44 per ft ² ceiling area
R-49 vs. R-38 Insulation	\$0.28 per ft ² ceiling area
R-60 vs. R-38 Insulation	\$0.55 per ft ² ceiling area
Duct Design & Burial	-\$0.652 per ft ² duct surface area
R-6 vs. R-8 Ducts	Estimated 15% savings
Radiant Barrier	\$0.10 per ft ² roof area
Roof Deck Insulation	-\$0.75 per ft ² roof area
HERS Verification	\$300 per home

Cost data from various sources

Looking for cost feedback on:

- Duct design & burial
- HERS verification

Total incremental costs vary by climate zone and prototype, total costs shown for each case shown in next 2 slides

Cost Effectiveness: 2100/2700 Weighted Prototype

Climate Zone	Benefits <i>Life Cycle Energy Cost Savings + Other PV Savings (2026 PV\$)</i>	Costs <i>Total Incremental PV Costs (2026 PV\$)</i>	Benefit-to-Cost Ratio
1	\$3,982	\$648	6.15
2	\$2,642	\$440	6.00
3	\$1,469	\$721	2.04
4	n/a	n/a	n/a
5	\$2,203	\$721	3.05
6	\$925	\$721	1.28
7	\$991	\$721	1.37
8	n/a	n/a	n/a
9	n/a	n/a	n/a
10	n/a	n/a	n/a
11	n/a	n/a	n/a
12	n/a	n/a	n/a
13	n/a	n/a	n/a
14	n/a	n/a	n/a
15	n/a	n/a	n/a
16	\$1,299	-\$996	infinite

Cost Effectiveness: 500 Small Home Prototype

Small homes 500 square feet or less are not required to bury ducts but would require:

- R-38 attic insulation in CZs 5-7
- R-49 attic insulation in CZs 1-3 and a radiant barrier in CZ1 only
- R-60 attic insulation and radiant barrier in CZ 16

Climate Zone	Benefits <i>Life Cycle Energy Cost Savings + Other PV Savings (2026 PV\$)</i>	Costs <i>Total Incremental PV Costs (2026 PV\$)</i>	Benefit-to-Cost Ratio
1	\$235	\$127	1.85
2	\$120	\$67	1.79
3	\$115	\$106	1.08
4	n/a	n/a	n/a
5	\$40	\$40	1.01
6	\$35	\$40	0.89
7	\$50	\$40	1.26
8	n/a	n/a	n/a
9	n/a	n/a	n/a
10	n/a	n/a	n/a
11	n/a	n/a	n/a
12	n/a	n/a	n/a
13	n/a	n/a	n/a
14	n/a	n/a	n/a
15	n/a	n/a	n/a
16	-\$305	-\$271	0.89



Data Gaps and Additional Feedback Requested

- Additional Data Needs
- Feedback Requested

Data Gaps

- Only 11 CF3R's were identified for buried ducts in the CalCERTS 2022 registry.
- Any data on the incremental cost of designing for and installing fully buried ducts in new construction would improve the CASE team's very limited sources.
- Feedback on the effectiveness of proposed simplified compliance and verification methods and any other ways to address barriers would be valuable for this effort.





Discussion and Next Steps

We want to hear from you!

- Provide **any last comments or feedback** on this presentation now verbally or over the GoTo Webinar Questions Pane
- More information on pre-rulemaking for the 2025 Energy Code at <https://www.energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/2025-building-energy-efficiency>

Comments on this measure are due by May 31, 2021. Please send comments to info@title24stakeholders.com and copy CASE Authors (see contact info on following slide).

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