# Proposal Summary

**2022 California Energy Code (Title 24, Part 6)**

## High Performance Envelope – Thermal Bridging

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Prepared by: Benny Zank, Energy Solutions

## Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on October 24, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by November 7, 2019.

## Measure Description

Thermal bridging occurs when conductive elements penetrate a building's thermal insulation and allow heat to bypass the insulating layer. This reduces the overall effectiveness of the insulation and decreases the efficiency of the building's thermal envelope by allowing additional heat to escape the building. The current requirements only prescribe U-factors for an assembly (e.g., wall, roof, etc.). These assembly U-factors do not account for thermal bridges that occur at the intersection of two assemblies, such as a wall and a roof. Thermal bridging for poorly designed details at the intersection of assembly can result in overall assembly U-factors that are as much as 50 percent higher than the requirement. Thus, the U-factor requirement for assemblies alone is not enough to capture the impact of thermal bridges because assemblies meeting the requirements may not achieve that level of performance in the field. This submeasure will prescribe detailing of the thermal envelope at major thermal bridges, thereby increasing the efficiency of the envelope and resulting in energy savings. The goal is to mitigate heat transfer through major thermal bridges in a building including wall-roof intersections, wall-intermediate floor intersections, wall-fenestration intersections, and wall-exterior projections, including balconies and overhangs. This submeasure will build upon (though not necessarily replicate) the ASHRAE 90.1 proposal (addendum AV to ASHRAE 90.1-2016).

## Draft Code Language

The Statewide CASE Team is currently in the process of developing draft code language. This will not be available for the October 24th stakeholder meeting.

Examples of language in other codes that may be drawn from:

Canadian National Energy Code for Buildings:

Adapted from Section 3.1.1.7. The only changes are the removal of references to other sections of the code.

1) In calculating the overall thermal transmittance of assemblies, the effect of thermal bridging shall be considered for:

A. closely spaced repetitive structural members, such as studs and joists, and ancillary members, such as lintels, sills, and plates
B. major structural elements that penetrate or intersect the building envelope
C. junctions between the follow building envelope materials, components, and assemblies:
    i. Glazing assemblies,
    ii. Spandrels,
    iii. Parapets,
    iv. Roof-to-wall junctions,
    v. Corners, and
    vi. Edges of walls or floors
D. Secondary structural members

2) In calculating the overall thermal transmittance of assemblies, the thermal bridging effect of major structural members, such as columns and spandrel beams, that are parallel to the plane of the building envelope and partly penetrate that building envelope assembly need not be taken into account, provided they do not increase the overall thermal transmittance at the projected area of the member to more than twice that permitted.

3) In calculating the overall thermal transmittance of assemblies, pipes, ducts, equipment with through-the-wall venting, packaged terminal air conditioners or heat pumps, shelf angles, anchors and ties and associated fasteners, and other minor structural members that must completely penetrate the building envelope to perform their intended function need not be taken into account.

4) In calculating the overall thermal transmittance of major structural penetrations, such as balcony slabs, beams, girders, columns, and ornamentation or appendages that must completely penetrate the building envelope to perform their intended function need not be taken into account, provided that the sum of the cross-sectional areas at such major structural penetrations is limited to a maximum of 2% of the above-ground building envelope area.

5) Where a component of the building envelope is protected by an enclosed unconditioned space, such as a sun porch, enclosed veranda or vestibule, the unconditioned enclosure may be considered to have an overall thermal transmittance of 6.25 $W/(m^2*K)$.

6) roof assemblies shall be considered to include all related structural framing.

7) wall assemblies inclined less than 60° from the horizontal shall be considered as roof assemblies, and roof assemblies inclined 60° or more from the horizontal shall be considered as wall assemblies.

8) wall assemblies shall be considered to include all related structural framing and perimeter areas of intersecting interior walls but shall not include the perimeter areas where floor or roof slabs interrupt the wall's construction.

Adapted from Section 3.2.2.2. The only changes are the removal of references to other sections of the code.

1)the overall thermal transmittance of above-ground opaque building assemblies shall be not more than that shown in Table 3.2.2.2. for the building or part thereof enclosed by the opaque building assembly, for the applicable heating degree-day category taken at 65 Fahrenheit.

2)the overall thermal transmittance of above-ground opaque building assemblies in semi-heated buildings shall be not more than that shown in Table 3.2.2.2. for the building or part thereof enclosed by the opaque building assembly, for the applicable heating degree-day category taken at 65 Fahrenheit.

**Table 3.2.2.2.**
**Overall Thermal Transmittance of Above-ground Opaque Building Assemblies**
Forming Part of Sentences 3.2.2.2.(1) and (2)

| Above-ground *Opaque Building Assembly* | Heating Degree-Days of *Building* Location,(1) in Celsius Degree-Days | | | | | |
|---|---|---|---|---|---|---|
| | Zone 4:(2) < 3000 | Zone 5:(2) 3000 to 3999 | Zone 6:(2) 4000 to 4999 | Zone 7A:(2) 5000 to 5999 | Zone 7B:(2) 6000 to 6999 | Zone 8:(2) ≥ 7000 |
| | Maximum *Overall Thermal Transmittance*, W/(m²·K) | | | | | |
| Walls | 0.315 | 0.278 | 0.247 | 0.210 | 0.210 | 0.183 |
| Roofs | 0.193 | 0.156 | 0.156 | 0.138 | 0.138 | 0.121 |
| Floors | 0.227 | 0.183 | 0.183 | 0.162 | 0.162 | 0.142 |

3)The overall thermal transmittance of portions of a foundation wall that are above ground, where the top of a foundation wall is less than 0.4 m above the adjoining ground level, shall be not more than that shown in Table […].

4) Where radiant heating cables or heating or cooling pipes or membranes are embedded in the surface of an above-ground opaque building assembly, this assembly shall have an overall thermal transmittance no greater than 80% of that required by 1).

Example language adapted from ASHRAE Addendum AV

To the extent that linear thermal bridges and point thermal bridges exist at locations on the building envelope as described, they shall comply with the requirements of either:

a. Section […]

b. Section […], provided that the total length of all balconies or floor overhangs does not exceed the maximum allowed in Section […] Exception […]

Alternatives to individual requirements provided shall be permitted in accordance with Appendix […]. Details for linear thermal bridges and point thermal bridges shall be clearly identified or otherwise noted on construction documents.