2008 Title 24
Nonresidential CASE
Insulation Proposal

PG&E Codes & Standards Program
CEC Staff Workshop May 18, 2006
Overview of proposal

- Update the 2008 envelope criteria using Life-Cycle Cost Methodology
- Move to a U-factor approach
- Create a separate category for retail
- Climate zone groupings
Changes from Previous Insulation CASE Report

- Updated 2008 TDV Curves with updated present value
- Updated RS Means Cost Values
  - Standing seam roofs have an added second metal deck costs for rigid insulation
  - Screw down roof cost of $1.74 and standing seam roof cost of $2.82.
  - Cost for R-19 cavity insulation from $0.48 to $0.46. The regression analysis for extrapolated values recomputed.
- Construction Assemblies
  - Mass walls from exterior insulation to interior insulation
  - Wood-framed and other roofs use 24 in. O.C. with insulation underneath rather than 16 in. O.C. attic insulation
- Floor insulation levels now included
Description of simulation models

- **Geometry**
  - A 5-zone model
  - Four exterior zones (100 ft X 15 ft)
  - One interior zone (100 ft X 100 ft) Space height 13 ft

- **Fenestration:** The fenestration is set to 30% for daytime and 24-hour occupancy and 10% for retail occupancy.

- **HVAC systems**
  - One packaged single zone (PSZ) system for each zone. Ducted return.
  - Cooling EER 9.5 (COOLING-EIR = 0.2846), fan power at 0.35 W/cfm
  - Integrated air-side economizer
  - Outside air 0.15 cfm/ft²
  - Gas heating
Life-cycle Cost Analysis

- TDV = C0 + C1 \times U\text{-factor}
- LCC = \text{Initial}\_\text{Cost (incremental)} + PV_{TDV} \times TDV

- Cost data from R.S. Means 2005
- 30\% operating and profit markup
- 1.088 California adjustment factor
- Regression analysis for missing values
## Roofs – Wood-framed walls LCC for CZ3

<table>
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<tr>
<th>Cavity R</th>
<th>Sheathing R</th>
<th>U-value</th>
<th>Incremental Cost</th>
<th>TDV total</th>
<th>TDV cost</th>
<th>LCC</th>
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Roofs – Wood-framed walls LCC for CZ3
Figure 1 – Metal Building Roof (Daytime)

Statewide Energy Impacts (ft$^2$-yr): TDV=0.222, kWh=0.010, therm=0.000
Metal building roof

Figure 1 – Metal Building Roof (24-hour)
Statewide Energy Impacts (ft²-yr): TDV=3.761, kWh=0.112, therm=0.016
Metal building roof

Figure 1 – Metal Building Roof Coefficients (cool roofs)
Metal building roof

Figure 1 – Daytime Roof Insulation Cool Roof Sensitivity Analysis for Metal Buildings
Metal building roof

Figure 1 – Economizer Insulation Sensitivity Analysis for Metal Building Roof
Wood-framed and other roofs

Figure 1 – Wood-framed and Other Roof (Daytime)
Statewide Energy Impacts (ft²-yr): TDV=0.838, kWh=0.027, therm=0.002
Wood-framed and other roofs

Figure 1 – Wood-framed and Other Roof (24-hour) Statewide Energy Impacts (ft²-yr): TDV=5.802, kWh=0.168, therm=0.024
Wood-framed and other roofs

Figure 1 – Wood-framed and Other Roof Coefficients
Metal building wall

Figure 1 – Metal Building Wall (Daytime)
Statewide Energy Impacts (ft²-yr): TDV=5.554, kWh=0.262, therm=0.013
Metal building wall

Figure 1 – Metal Building Wall (24-hour)
Statewide Energy Impacts (ft²-yr): TDV=11.138, kWh=0.586, therm=0.040
Metal-framed wall

Figure 1 – Metal-framed Wall (Daytime)
Statewide Energy Impacts (ft\(^2\)-yr): TDV=17.505, kWh=0.821, therm=0.044
Metal-framed wall

Figure 1 – Metal-framed Wall (24-hour)
Statewide Energy Impacts (ft²-yr): TDV=28.985, kWh=1.524, therm=0.103
Mass (7.0 ≤ HC < 15.0) wall

Figure 1 – Mass (7.0 ≤ HC < 15.0) Wall (Daytime)
Statewide Energy Impacts (ft² - yr): TDV=4.311, kWh=0.066, therm=0.016
Mass (7.0 ≤ HC < 15.0) wall

Figure 1 – Mass (7.0 ≤ HC < 15.0) Wall (Retail)

Statewide Energy Impacts (ft²·yr): TDV=12.603, kWh=0.507, therm=0.040
Mass (7.0≤HC<15.0) wall

Figure 1 – Mass (7.0≤HC<15.0) Wall (24-hour)
Statewide Energy Impacts (ft²·yr): TDV=23.344, kWh=0.500, therm=0.118
Mass (15.0≤HC) Wall

Figure 1 – Mass (15.0≤HC) Wall (Daytime)
Statewide Energy Impacts (ft²·yr): TDV=5.286, kWh=0.062, therm=0.022
Figure 1 – Mass (15.0≤HC) Wall (Retail)
Statewide Energy Impacts (ft²-yr): TDV=10.520, kWh=0.365, therm=0.038
Mass (15.0≤HC) Wall

Figure 1 – Mass (15.0≤HC) Wall (24-hour)
Statewide Energy Impacts (ft²·yr): TDV=8.626, kWh=0.198, therm=0.038
Wood-framed and Other Wall

Figure 1 – Wood-framed and Other Wall (Daytime)
Statewide Energy Impacts (ft²·yr): TDV=3.428, kWh=0.159, therm=0.006
Wood-framed and Other Wall

Figure 1 – Wood-framed and Other Wall (24-hour)
Statewide Energy Impacts (\text{ft}^2\text{-yr}): TDV=7.644, kWh=0.394, therm=0.027
Mass Floor

Figure 1 – Mass Floor (Daytime)
Statewide Energy Impacts (ft²·yr): TDV=0.407, kWh=0.260, therm=-0.029
Figure 1 – Mass Floor (Retail)
Statewide Energy Impacts (ft^2·yr): TDV=6.200, kWh=0.472, therm=-0.026
Mass Floor

Figure 1 – Mass Floor (24-hour)
Statewide Energy Impacts (ft²-yr): TDV=7.655, kWh=-0.010, therm=0.050
Mass Floor

Figure 1 – Mass Floor Coefficients
Other Floor

Figure 1 – Other Floor (Daytime)
Statewide Energy Impacts (ft²·yr): TDV=0.218, kWh=0.036, therm=-0.003
Figure 1 – Other Floor (Retail)
Statewide Energy Impacts (ft²-yr): TDV=2.218, kWh=0.151, therm=-0.012
Figure 1 – Other Floor (24-hour)
Statewide Energy Impacts ($ft^2$-yr): TDV=5.188, kWh=0.058, therm=0.029
Other Floor

Figure 1 – Other Floor Coefficients
More Information

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