# DOCKETED

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# 2019 Building Energy Efficiency Standards Pre-Rulemaking Workshop

# LOADING DOCK SEALS

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# Acknowledgments

California Utilities Statewide Codes and Standards Team

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# Relevant Code History

- There are no requirements in Title 24, Part 6
- Requirement for weather seals in ASHRAE Climate Zones 4-8

# Dock Seal

# Dock Shelter

# Introduction to Dock Seal Technology

- **Dock Seals and Dock Shelters**
  - Dock seals have a foam core designed to provide a sealed fit with a specific truck size
    - **Pros**: Less expensive and creates a good seal
    - **Cons**: Repeated impacts causes wear
  - Dock shelters consist of a fiberglass curtain and are designed to accommodate a wide array of truck heights and sizes
    - **Pros**: Able to adapt to a variety of truck heights and some materials have improved durability
    - **Cons**: Higher first cost and varying performance in sealing
- Dock seal products have energy benefits, but are typically specified for other reasons (privacy, inhibit rain/moisture, and/or pest control)

# Measure Scope

- Possible mandatory requirement for dock seals or shelters in warehouses and other buildings
- Evaluated for each California Climate Zone separately

# Definition of Baseline and Proposed Conditions

*Field Verification*

- Energy savings depends on air leakage reduction with dock seal
  - Air Leakage rate determined through ASTM E783 field test, at two different sites, and two different dock seal conditions
- Parametric energy simulations used to estimate savings

*Energy Modeling*

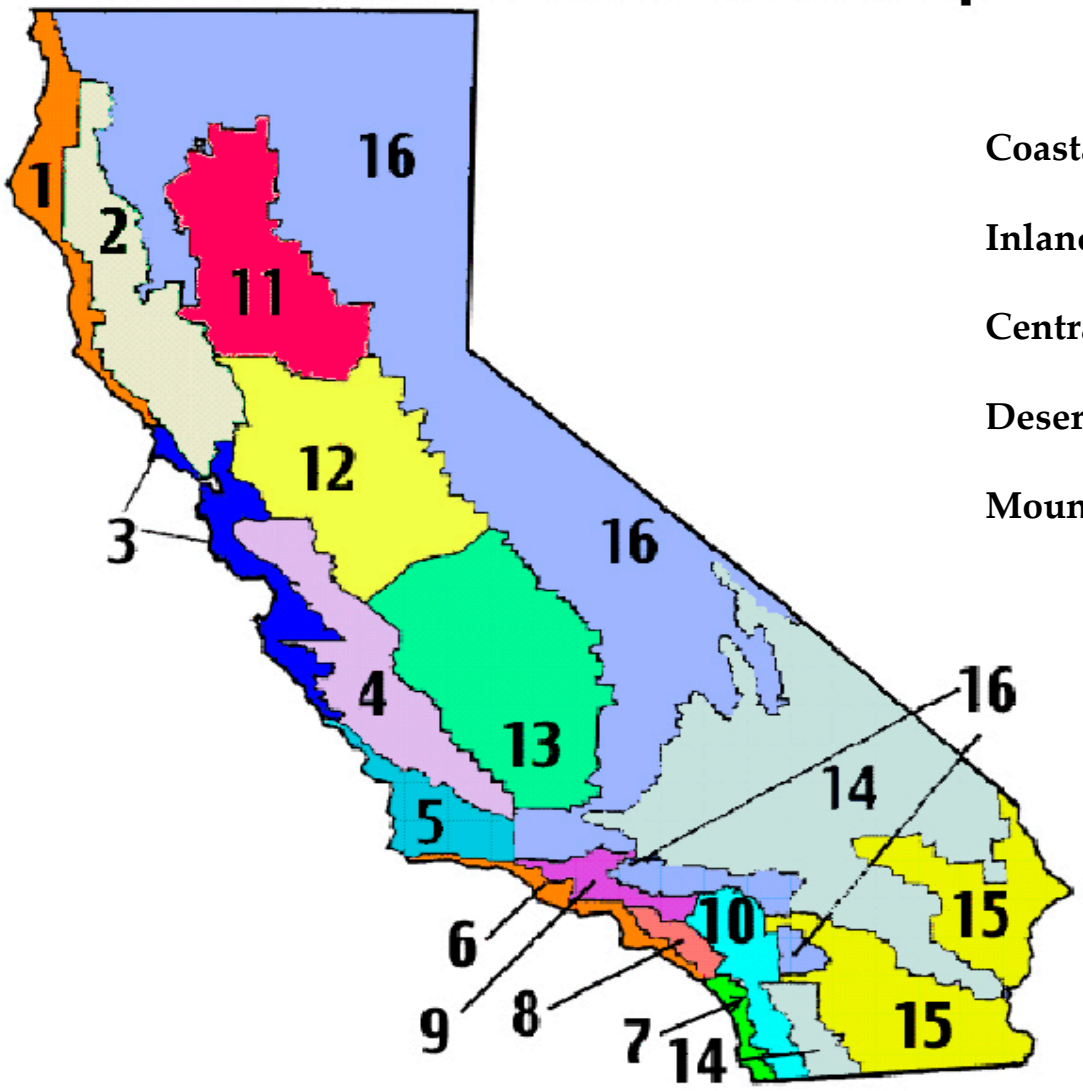
- Warehouse Prototype (49,495 sf) minimally compliant with 2016 Title 24 Standards
- Four 70 sf loading dock doors with baseline infiltration rate of 2250 cfm and proposed infiltration rate (with seal) of 417 cfm*
- Model tested for all 16 CEC climate zones
  - Three loading frequency levels: low (2x daily), medium (5x daily) and high (11x day)
  - Tested heated only and fully conditioned warehouse options
  - Unconditioned warehouses not subject to the requirement

# They Do Take a Beating

# Incremental Costs

- Incremental First Cost
  - First Cost ($1,400-$2,400 per door installed)
  - **Total Incremental First Cost ($9,600) for 4 loading dock doors per 49,495 sf model**
  - Assumes highest first cost for dock shelter
- Incremental Maintenance Costs over 15-year period of analysis
  - Estimated Expected Useful Life at 7.5 years
  - Total Incremental Maintenance Cost (estimated at $7,680) – complete seal replacement at end of EUL, adjusted by discount rate

# California Climate Zone Map




**Coastal - 1, 3, 5, 6, 7, 8**

**Inland - 2, 4, 9, 10**

**Central Valley - 11, 12, 13**

**Desert - 14, 15**

**Mountains -16**

# Annual Energy Savings and Cost Effectiveness: Low Dock Use Case

| Climate Zone | Save Low ($/sf) | NPV Low ($/sf) | BCR Low |
|---|---|---|---|
| 1 | 0.443 | $ 0.09 | 1.27 |
| 2 | 0.162 | $ (0.19) | 0.46 |
| 3 | 0.304 | $ (0.05) | 0.87 |
| 4 | 0.150 | $ (0.20) | 0.43 |
| 5 | 0.240 | $ (0.11) | 0.69 |
| 6 | 0.138 | $ (0.21) | 0.40 |
| 7 | 0.109 | $ (0.24) | 0.31 |
| 8 | 0.074 | $ (0.27) | 0.21 |
| 9 | 0.097 | $ (0.25) | 0.28 |
| 10 | 0.092 | $ (0.26) | 0.26 |
| 11 | 0.310 | $ (0.04) | 0.89 |
| 12 | 0.200 | $ (0.15) | 0.57 |
| 13 | 0.126 | $ (0.22) | 0.36 |
| 14 | 0.315 | $ (0.03) | 0.90 |
| 15 | 0.075 | $ (0.27) | 0.21 |
| 16 | 0.614 | $ 0.26 | 1.76 |

# Annual Energy Savings and Cost Effectiveness: Medium Dock Use Case

| Climate Zone | Sav High ($/sf) | NPV High | BCR |
|---|---|---|---|
| 1 | 0.995 | $ 0.65 | 2.85 |
| **2** | **0.362** | **$ 0.01** | **1.04** |
| 3 | 0.692 | $ 0.34 | 1.98 |
| **4** | **0.362** | **$ 0.01** | **1.04** |
| 5 | 0.579 | $ 0.23 | 1.66 |
| 6 | 0.286 | $ (0.06) | 0.82 |
| 7 | 0.251 | $ (0.10) | 0.72 |
| 8 | 0.174 | $ (0.18) | 0.50 |
| 9 | 0.219 | $ (0.13) | 0.63 |
| 10 | 0.227 | $ (0.12) | 0.65 |
| 11 | 0.655 | $ 0.31 | 1.87 |
| **12** | **0.429** | **$ 0.08** | **1.23** |
| 13 | 0.319 | $ (0.03) | 0.91 |
| 14 | 0.683 | $ 0.33 | 1.96 |
| 15 | 0.168 | $ (0.18) | 0.48 |
| 16 | 1.044 | $ 0.69 | 2.99 |

# Annual Energy Savings and Cost Effectiveness: Higher Dock Use Case

| Climate Zone | Sav High ($/sf) | NPV High | BCR |
|---|---|---|---|
| 1 | 0.995 | $ 0.65 | 2.85 |
| **2** | **0.362** | **$ 0.01** | **1.04** |
| 3 | 0.692 | $ 0.34 | 1.98 |
| **4** | **0.362** | **$ 0.01** | **1.04** |
| 5 | 0.579 | $ 0.23 | 1.66 |
| 6 | 0.286 | $ (0.06) | 0.82 |
| 7 | 0.251 | $ (0.10) | 0.72 |
| 8 | 0.174 | $ (0.18) | 0.50 |
| 9 | 0.219 | $ (0.13) | 0.63 |
| 10 | 0.227 | $ (0.12) | 0.65 |
| 11 | 0.655 | $ 0.31 | 1.87 |
| **12** | **0.429** | **$ 0.08** | **1.23** |
| 13 | 0.319 | $ (0.03) | 0.91 |
| 14 | 0.683 | $ 0.33 | 1.96 |
| 15 | 0.168 | $ (0.18) | 0.48 |
| 16 | 1.044 | $ 0.69 | 2.99 |

# Proposed Code Change

**SECTION 100.1 – DEFINITIONS AND RULES OF CONSTRUCTION**

*add definitions for Loading Dock Door, Dock Seal, and Dock Shelter.*

**SECTION 110.7 – MANDATORY REQUIREMENTS TO LIMIT AIR LEAKAGE**

All joints, penetrations and other openings in the building envelope that are potential sources of air leakage shall be caulked, gasketed, weather stripped, or otherwise sealed to limit infiltration and exfiltration.

Newly Constructed Loading Dock Seal Requirement. Exterior loading dock doors that are adjacent to conditioned or indirectly conditioned spaces shall have dock seals or dock shelters installed. This requirement shall apply to newly constructed buildings in climate zones ---- and to added loading dock doors in existing buildings in climate zones ----.

# KEY WEB-LINK

**2019 Title 24 Utility-Sponsored Stakeholder**
http://title24stakeholders.com/

**Building Energy Efficiency Program**
http://www.energy.ca.gov/title24/

**Comments to be submitted to**
https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=17-BSTD-01.

# Contact Information

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# Questions?