



# **PIER Research for the 2008 Standards Update**

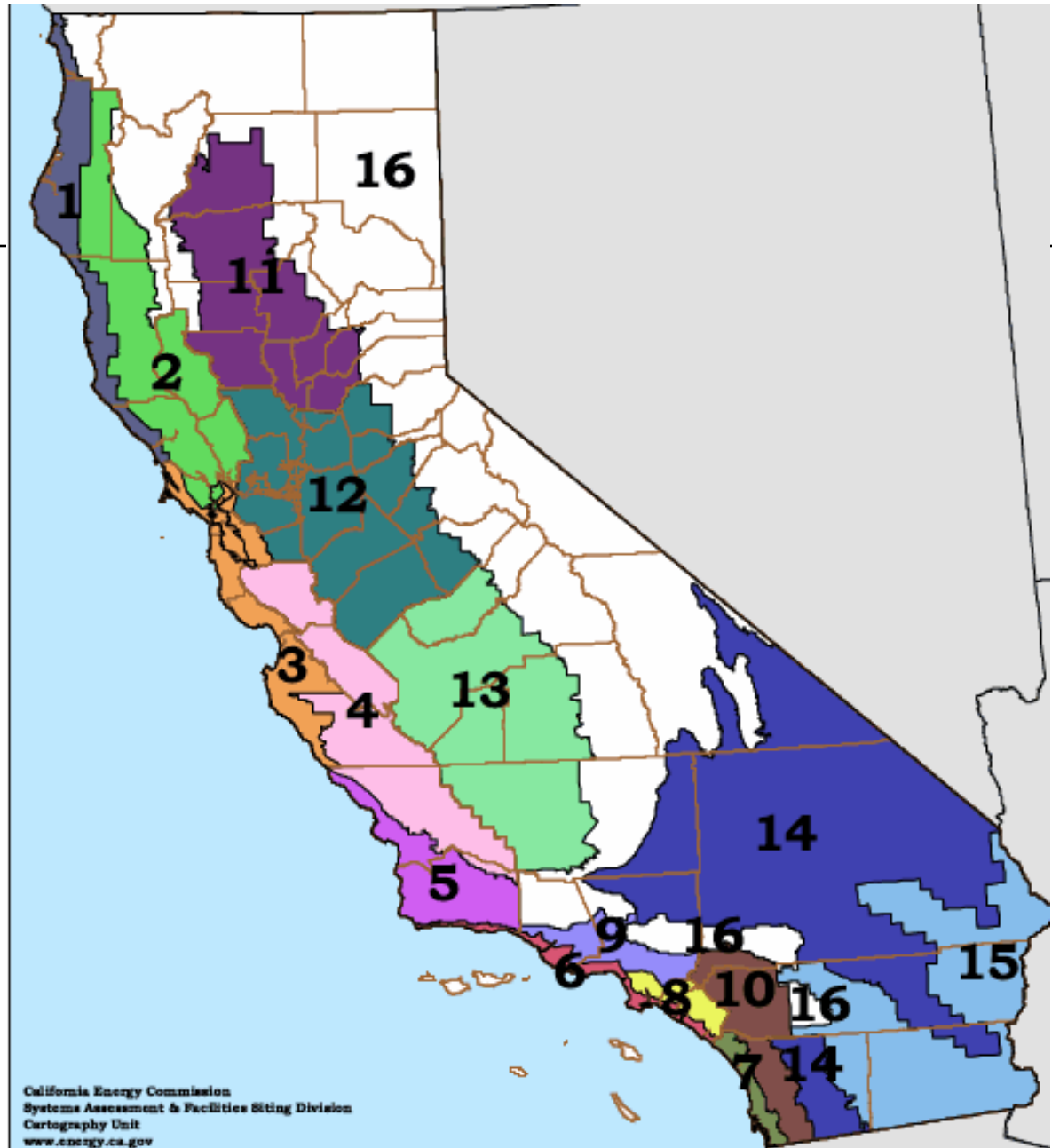
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## Roofing Update

June 8, 2007

Andre Desjarlais, on behalf of the  
California Energy Commission

# Zones





# Low Rise Residential Steep Slope New Construction Prescriptive Requirement

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Climate Zones	Aged Reflectance/Emittance
11, 13, 15	0.25/0.75

Any roofing material that meets the minimum reflectance and emittance or has an SRI of 25 meets the prescriptive standard,

# Steep Slope Alterations Prescriptive Requirement

Climate Zones	Aged Reflectance/Emittance	Equivalence To Prescriptive Requirements
10, 11, 12, 13, 14, 15	0.20/0.75	<ol style="list-style-type: none"><li>1. SRI &gt; 19</li><li>2. No Ducts in Attic</li><li>3. R-30 Ceiling Insulation</li><li>4. R-0.85 or greater above roof deck thermal resistance over a vented attic</li><li>5. Ducts sealed and tested to altered existing duct requirement</li><li>6. Radiant barrier</li><li>7. In CTZ 10, 12 and 13, 1/150 Attic ventilation with 30% of vent area high</li></ol>

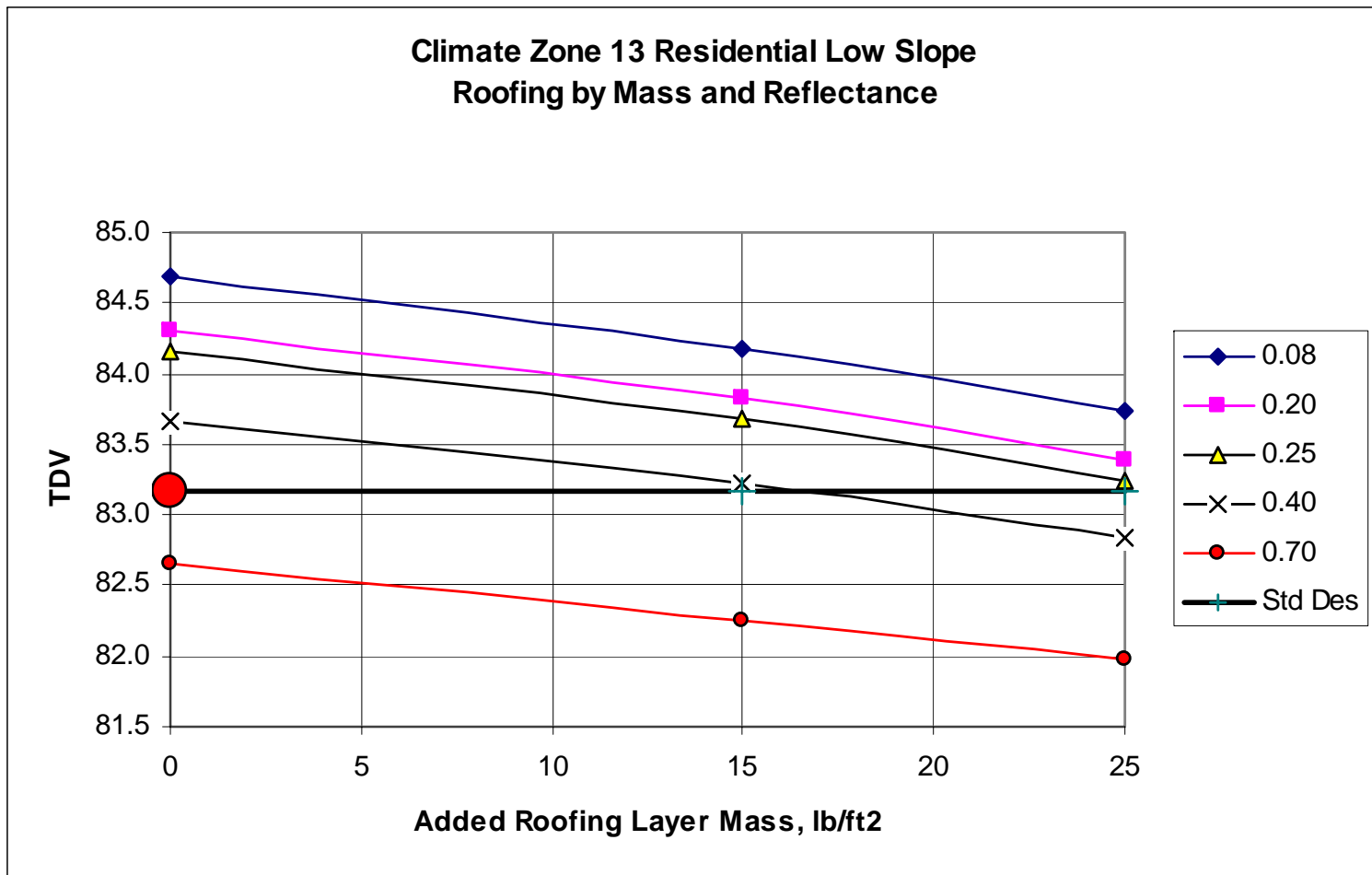


# Low Slope Prescriptive Requirement

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	<b>Climate Zones</b>	<b>Aged Reflectance/Emittance</b>	<b>Equivalence To Prescriptive Requirements</b>
<b>New Construction</b>	<b>13, 15</b>	<b>0.55/0.75</b>	
<b>Alterations</b>	<b>13, 15</b>	<b>0.55/0.75</b>	<ol style="list-style-type: none"><li><b>1. No Ducts in Attic</b></li><li><b>2. In Zone 10, 11, 13 and 14, R-3 or greater roof deck insulation above vented attic</b></li></ol>

# Low Slope Ballasted Roof





# Steep Slope New Construction LCC

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First cost premium of 0.25 aged reflectance shingle is \$0.35/ft<sup>2</sup>

CTZ	0.25 Aged Reflectance Shingle Life Cycle Cost Savings, \$/ft <sup>2</sup> Roof
11	0.35
13	0.40
15	0.57

Based on TDV savings for 0.25 reflectance shingle compared to a 0.08 reflectance shingle in a prescriptive 1761 prototype.



## Steep Slope Alterations LCC

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First cost premium of 0.20 aged reflectance shingle is \$0.31/ft<sup>2</sup>

<b>CTZ</b>	<b>0.20 Aged Reflectance Life Cycle Cost Savings, \$/ft<sup>2</sup> Roof</b>
<b>10</b>	<b>1.45</b>
<b>11</b>	<b>1.45</b>
<b>12</b>	<b>1.16</b>
<b>13</b>	<b>1.64</b>
<b>14</b>	<b>1.46</b>
<b>15</b>	<b>2.18</b>

Based on TDV savings for 0.20 reflectance shingle compared to a 0.08 reflectance shingle in a 1761 prototype with 1983 vintage features.



## Low Slope New Construction LCC

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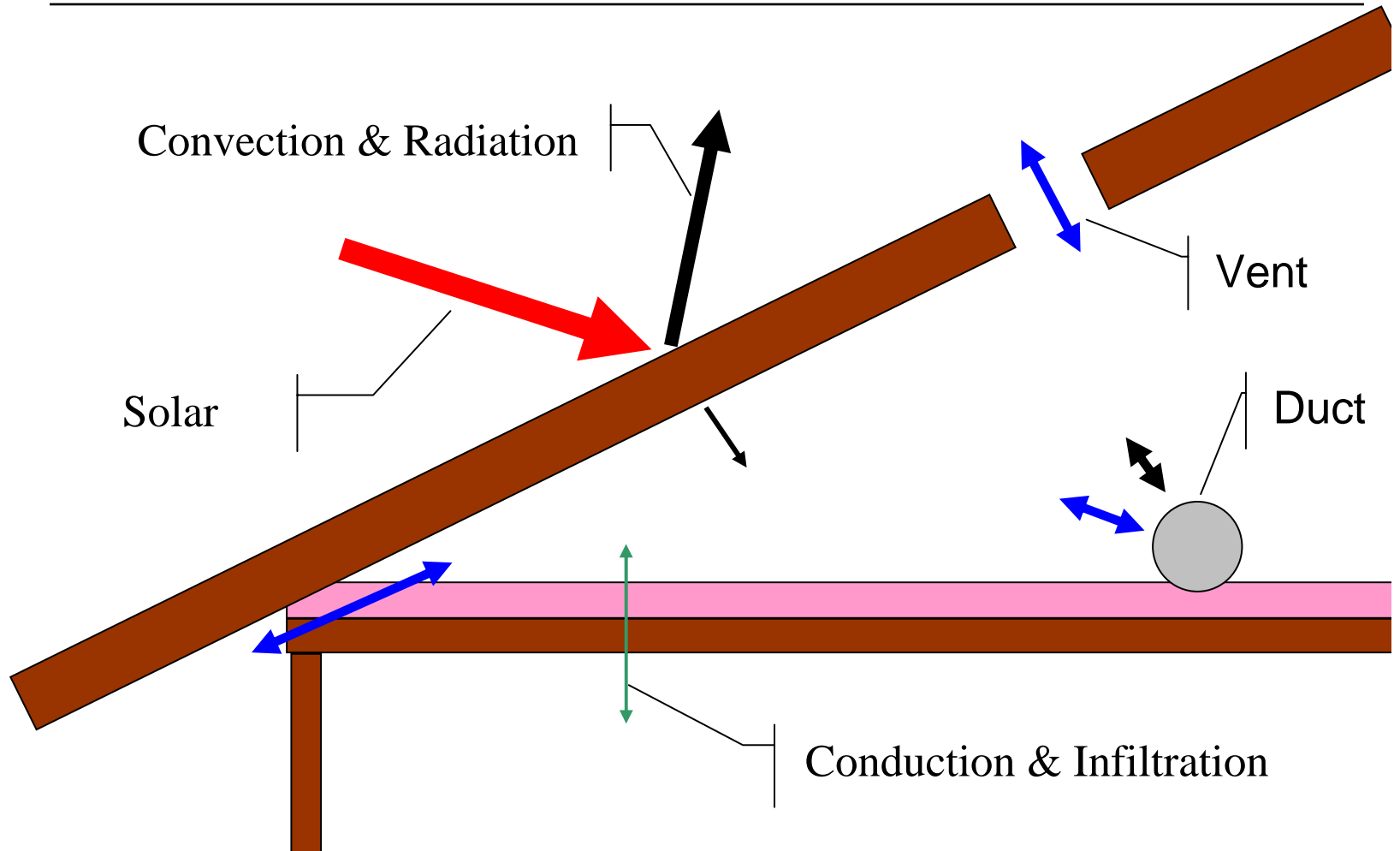
First cost premium of 0.55 aged reflectance roof is \$0.50/ft<sup>2</sup>

CTZ	0.55 Aged Reflectance Life Cycle Cost Savings, \$/ft <sup>2</sup> Roof
10	0.36
11	0.39
13	0.50
14	0.34
15	0.68

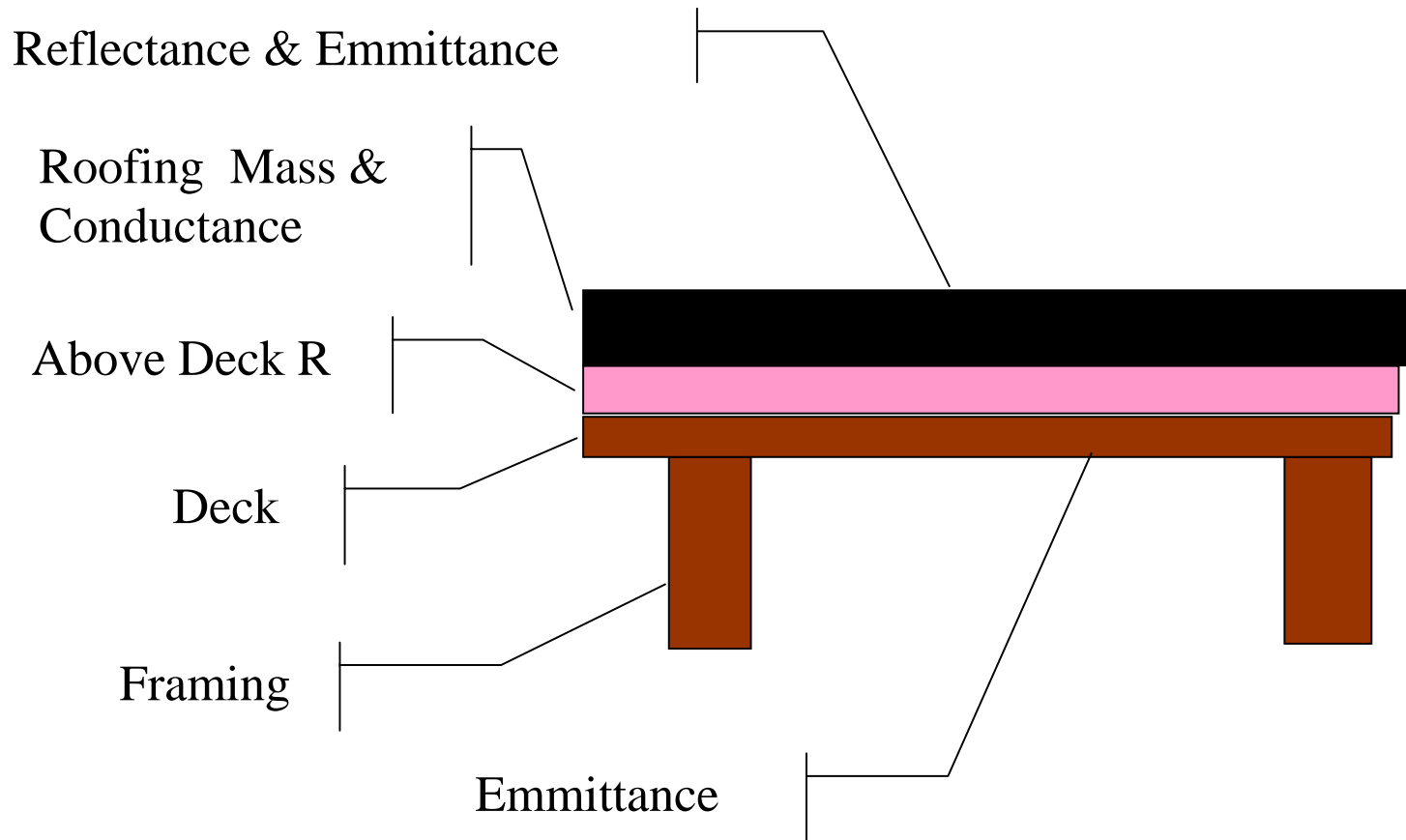
Based on TDV savings for 0.55 reflectance flat roof compared to a 0.10 reflectance in a prescriptive 1761 prototype.

# Performance Path

## UZM Attic Simulation Model



# Roof Deck Components and Inputs





# New Construction Steep Slope Performance Path Standard Design

<b>Climate Zones</b>	<b>Roofing Weight</b>	<b>Aged Reflectance/ Emittance</b>
<b>11, 13, 15</b>	<b>Asphalt Shingles</b>	<b>0.25/0.90</b>
<b>All other Zones</b>	<b>If proposed is &lt; 5 lb./ft<sup>2</sup>, asphalt shingles</b>	<b>0.08/0.90</b>
	<b>If proposed is 5 lb./ft<sup>2</sup> or greater, direct nailed concrete tile</b>	<b>0.15/0.90</b>



# Alterations Steep Slope Performance Path Standard Design

<b>Climate Zones</b>	<b>Roofing Weight</b>	<b>Aged Reflectance/ Emittance</b>
<b>10, 11, 12, 13, 14, 15</b>	<b>Asphalt Shingles</b>	<b>0.20/0.90</b>
<b>All other Zones</b>	<b>If proposed is &lt; 5 lb./ft<sup>2</sup>, asphalt shingles</b>	<b>0.08/0.90</b>
	<b>If proposed is 5 lb./ft<sup>2</sup> or greater, direct nailed concrete tile</b>	<b>0.15/0.90</b>



# Low Slope Performance Path Standard Design

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<b>Climate Zones</b>	<b>Roofing Weight</b>	<b>Aged Reflectance/ Emittance</b>
<b>13, 15</b>	<b>Built up roof</b>	<b>0.55/0.90</b>
<b>All other Zones</b>	<b>Built up roof</b>	<b>0.10/0.90</b>

# Light Weight Standard Design Roof

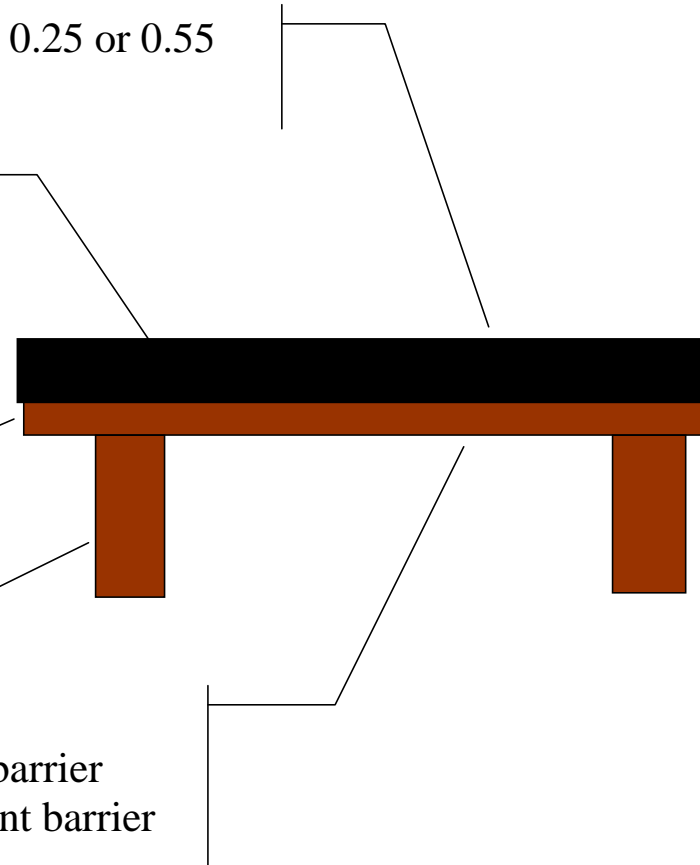
Reflectance = 0.08, 0.10, 0.20, 0.25 or 0.55  
Emmittance = 0.9

Asphalt shingle  
or built up roof

15/16" OSB

2/4 @ 24" OC

Emmittance :  
0.05 if radiant barrier  
0.90 if no radiant barrier





## Production Builder House Tile Roof Reflectance = 0.18

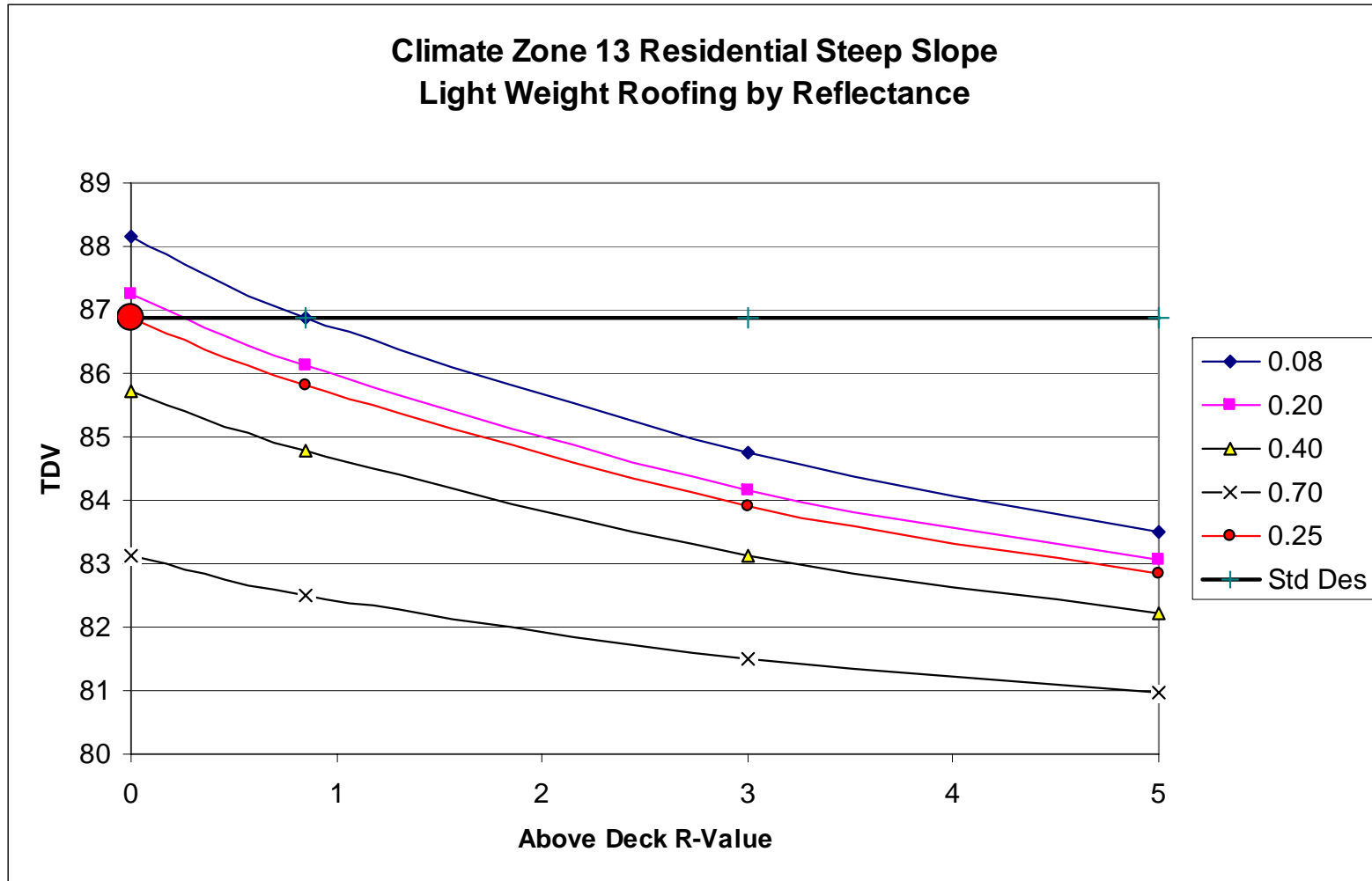
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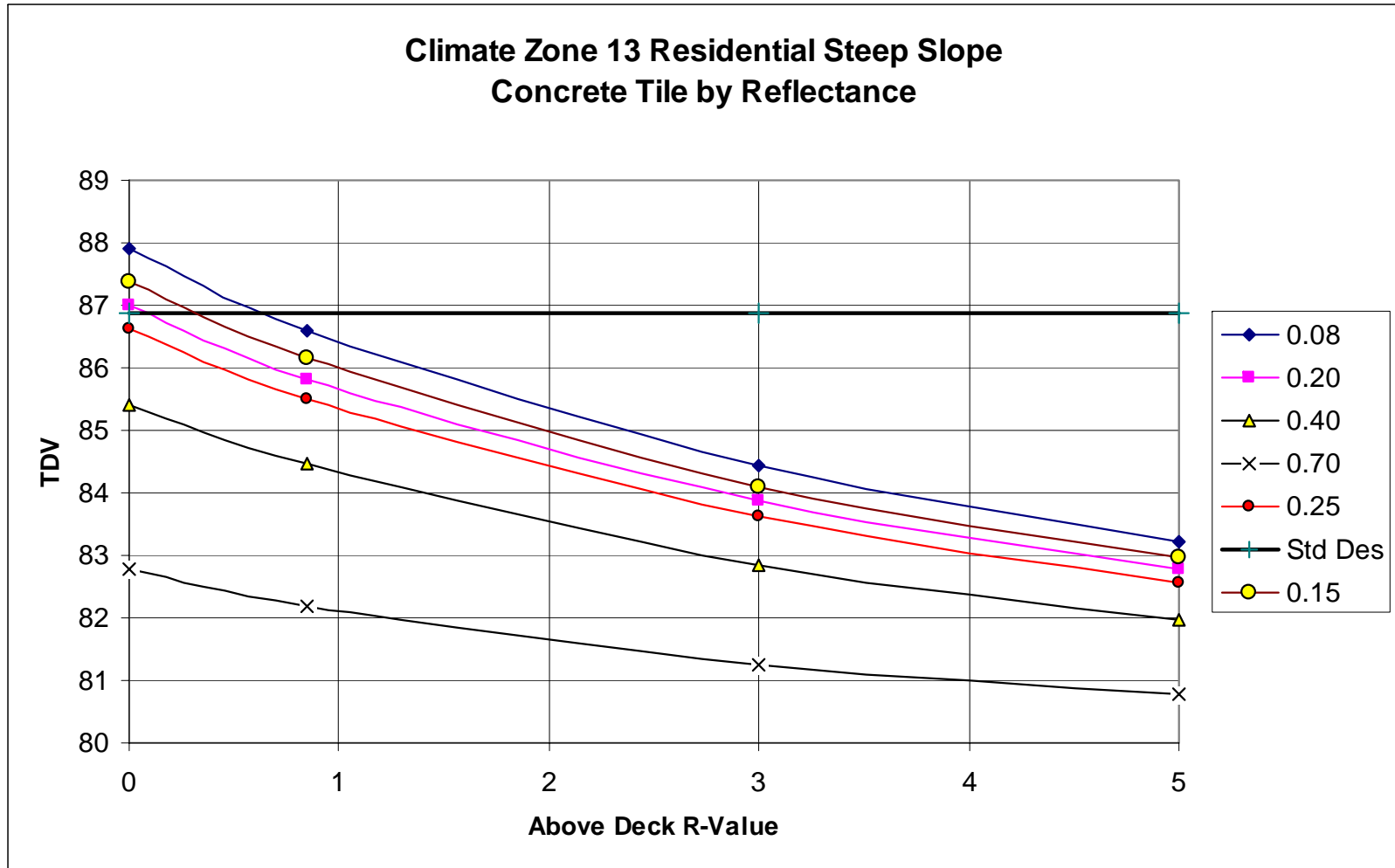
May 17, 2007

Wilcox - 2008

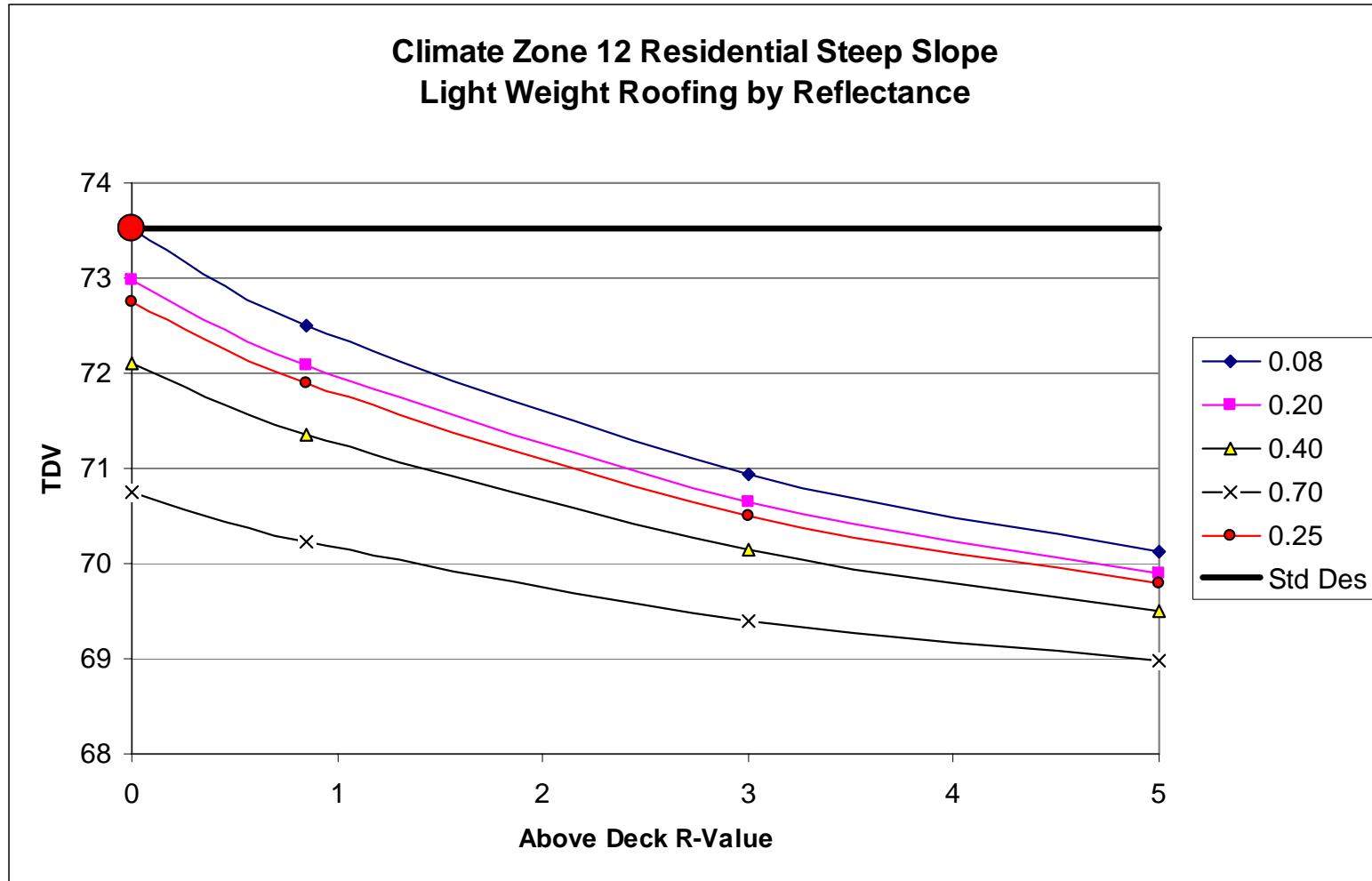
# Low Rise Residential Steep Slope New Construction Example Parametric



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