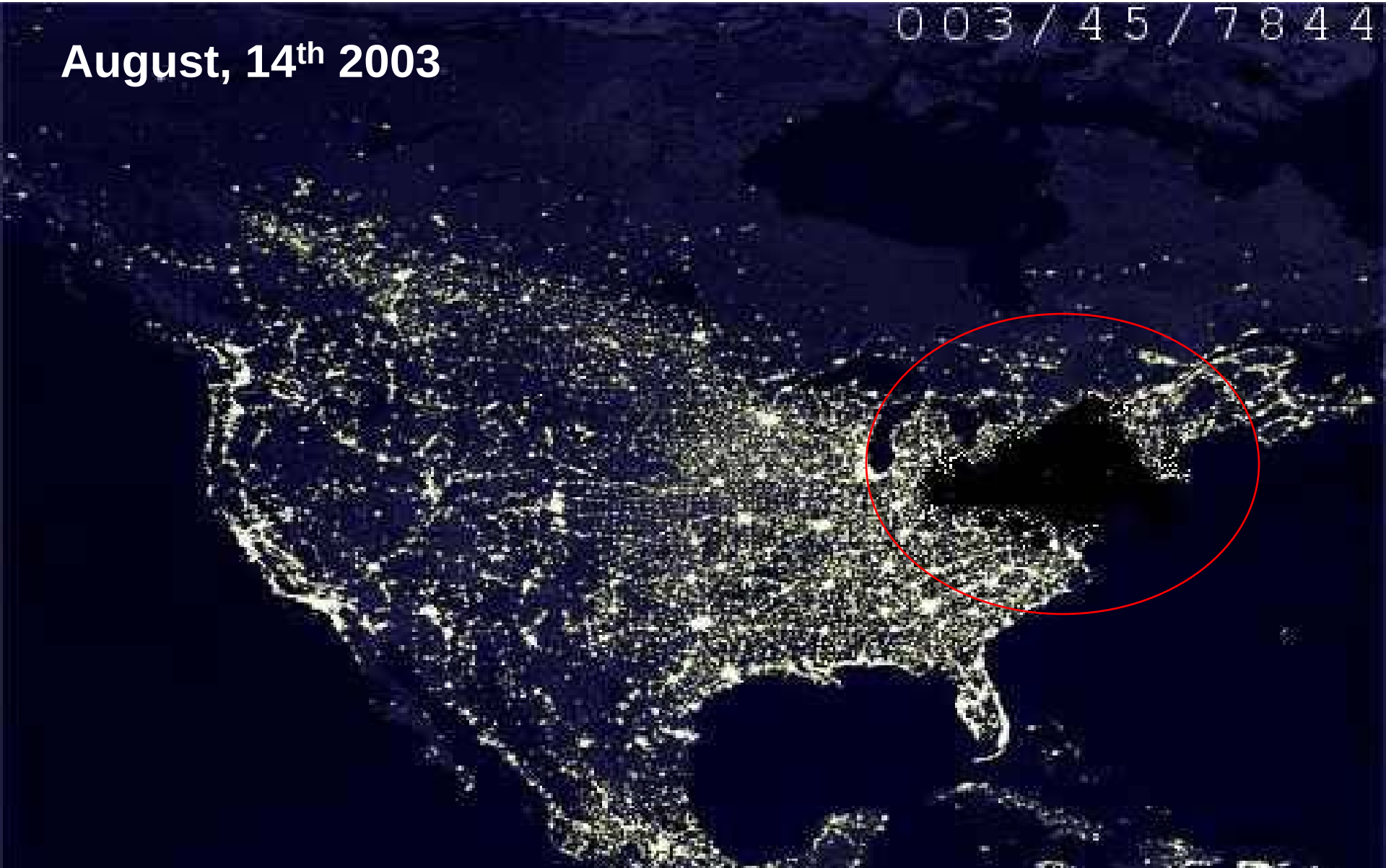
Cool Roofing & Title 24

Why Are We Here…?

- Cool Roofing is a timely topic…
- Many resources being put into understanding the issues…
- But, also a time “ripe” for misunderstanding …

So, let’s first of all get on the same page…

A $6 Billion Black Out



Alphabet Soup…

Energy Star

Title 24

CRRC

LEED

…what does it all mean?

So What Is Cool Roofing…?

Depends on who you ask…

- a membrane or surfacing that has high reflectivity
- a membrane or surfacing with high reflectivity and emissivity
- a roofing system that reduces the amount of energy used by the facility – cumulatively

So What's Cool Roofing?

And some include…

- "green roofs" (garden roofs)
- roofs with photovoltaic cells
- roofs with water cooling systems

A Definition We Can Agree On…

- Generally today we define “Cool Roofing” as…
  - “a membrane / surfacing with high reflectivity and emissivity”
    - Emissivity 0.75 or higher
    - Reflectivity 0.65 or higher

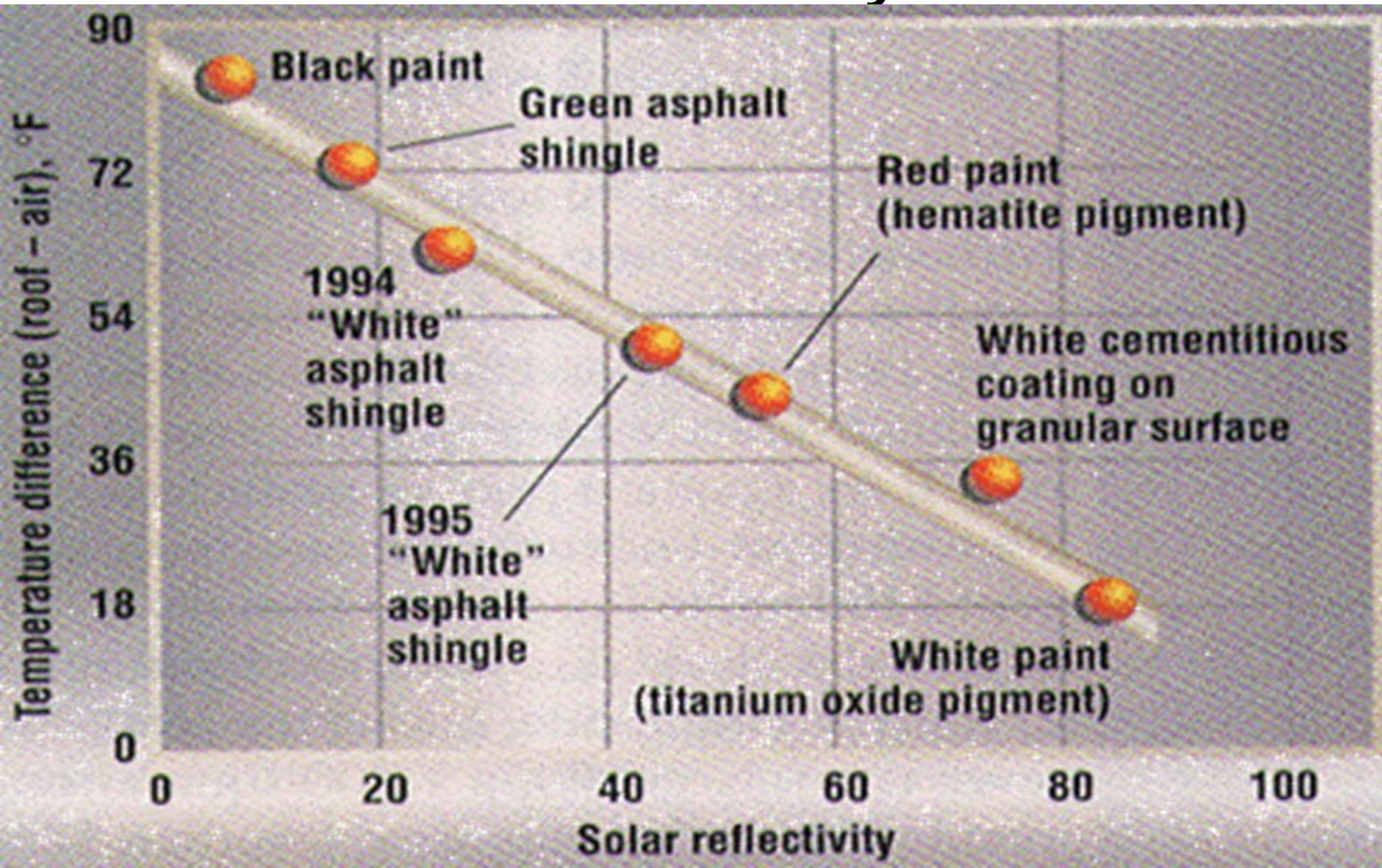
Define Reflectivity…

"The fraction of solar energy reflected by a surface, expressed as a percent, between 0 and 1"

- White is good – generally between 0.65 and 0.80
- Black is usually not good – generally around 0.05-0.10
- Colors can be good…there are colored sheets that meet Energy Star requirements

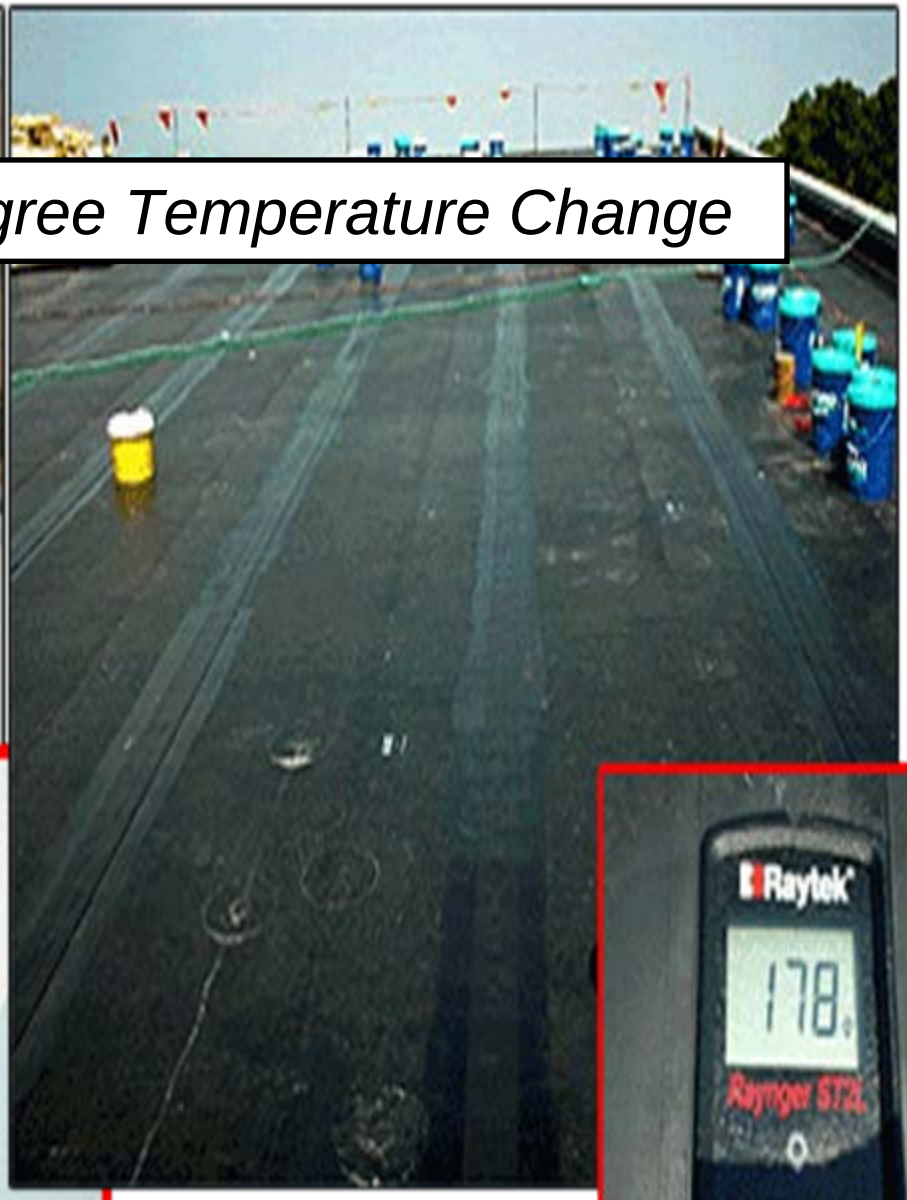
Note: White granules – generally between 0.25 and 0.28

Reflectivity



The Difference…

Adjacent Buildings – 84 Degree Temperature Change



How Cool is a Cool Roof?

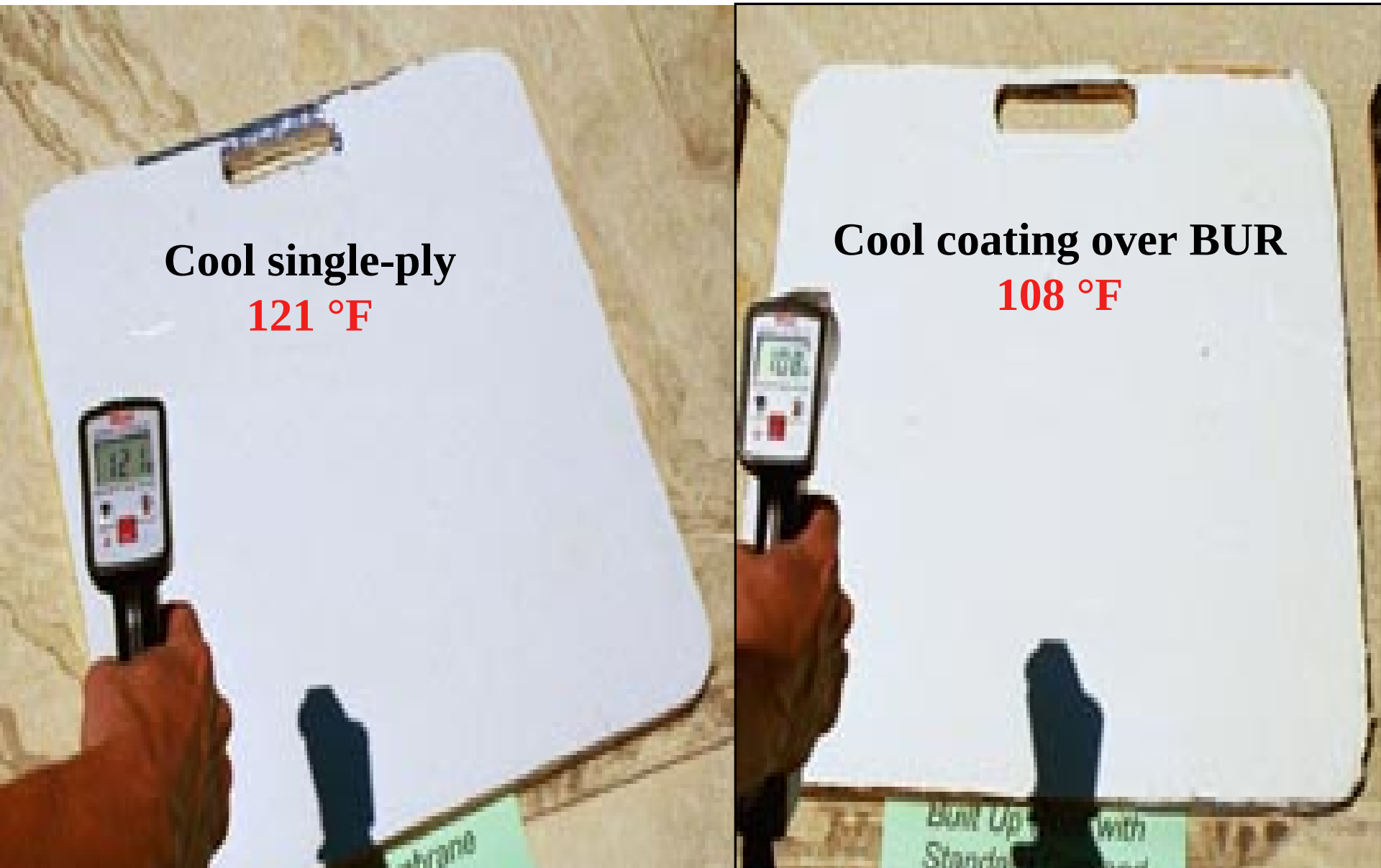
Sacramento, CA July 12, 2000
89 ºF Noon Breeze

EPDM
single-ply
173 °F

BUR topped
with aggregate
159 °F

BUR topped
with capsheet
158 °F

Same Roof - 37 ° Cooler…



Define Emissivity…

"Emittance is a measure of how well the surface gets rid of the heat it has absorbed. The higher the number indicating emittance, the better emitter that surface is. So high 0.75 emittance indicates the material does not hold heat."

- Think of a metal hammer and its black rubber handle…the metal will keep the heat much longer than the darker handle, so the metal has a lower emittance than the dark handle.

So Who Defines What the Values Should Be?

- It depends on where your roof is and what standard / code is being applied…
  - DoE…Energy Star program
  - California Energy Commission…Title 24
  - Austin Texas.

    Austin Texas. Has implemented amendments and has specific requirements as of January 2008.

City of Austin Energy Code Amendment

- **502.7 Reflective Roofing.** Roof surfaces with an incline of two inches or less of rise per each 12 inches of horizontal run shall incorporate a roof material having a minimum reflectance of 0.70 or a minimum solar reflective index (SRI) of 78. Roof surfaces with an incline greater than two inches of rise per each 12 inches of horizontal run shall incorporate a roof material having a minimum reflectance of 0.35 or a minimum SRI of 29.
- The reflectance measurement will correspond to ASTM E903-96 (*Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres*), ASTM 1918-97 (*Standard Test Method for Measuring Solar Reflectance of Horizontal and Low Sloped Surfaces in the Field*), or ASTM 1549-04 (*Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer*).
- **Exception:** Vegetated roofs or roof top pools

The Alphabet Soup of Cool Roofing…

- DoE – Department of Energy… who oversees and sets Energy Star standards
- CEC – California Energy Commission… they regulate Title 24
- CRRC – Cool Roof Rating Council… they offer a listing service, regardless of results
- ORNL – Oak Ridge Nat'l Lab
- LBL – Lawrence Berkley Nat'l Lab

What Are The “Rules”..?

- First, remember…the rules are set by different interests

- Energy Star
- CEC (California Energy Commission) – Title 24
- **City of Austin**, City of Chicago, City of Houston, etc.

What About the CRRC?

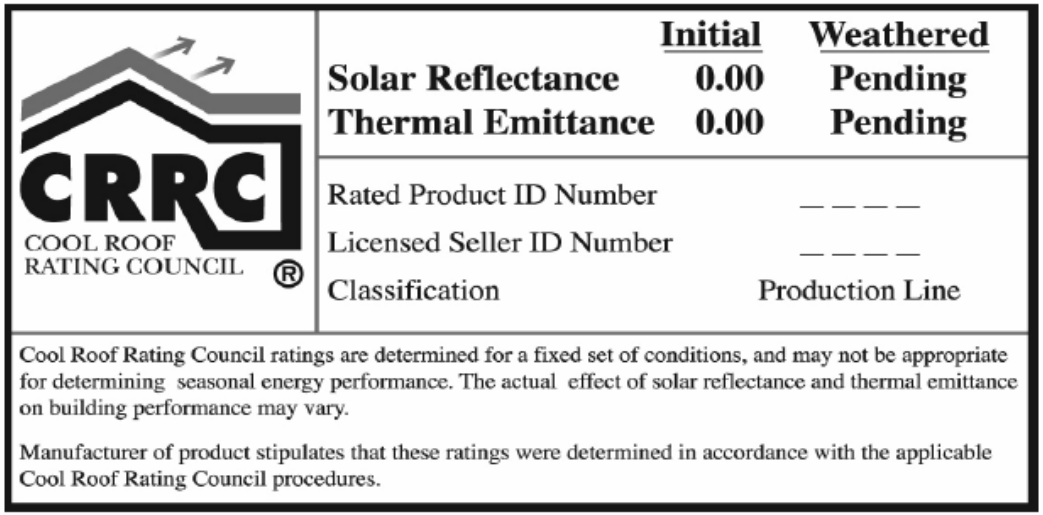
- The Cool Roof Rating Council… is an independent council that applies testing standards and provides a 3rd party certification program for reflectivity and emittance

- They DO NOT set the “bar”

CRRC…

- Do NOT set requirements
- ANY product can be labeled
- Provide a 3rd party certification & labeling for code and regulators to use

Label looks like this:



CRRC & Reflectivity

- **A product can have ANY reflectivity value and have a CRRC label!**
- A CRRC label – does not imply a performance level, it just reports WHAT the value is.
- CRRC Label – required for products in CA for Title 24 compliance… but pay attention, a label doesn't mean the product meets Title 24

Types Of Reflective Roofing

- Thermoplastic Poly Olefins (TPO)
- Poly Vinyl Chloride (PVC)
- Reflective Surface modified Bitumen (Energy Cap, Cool Cap)
- Liquid Applied Elastomerics (Roof Coatings applied to steep or low slope roof systems)
- Shingles (Cool Colors)
- Metal (some)

Highly Reflective TPO

TPO / PVC Advantages:

- Decades of performance history
- Highly reflective surface
- 20-Year system warranties available
- Heat welded seams: very strong
- Resistant to most chemicals.
- Reflectivity .76, Emissivity .90

Reflective Steep Slope Asphalt Cool Colors

- Revolutionary Shingles
  - Saves Energy… up to 200% more heat reflected from UV reflective granule coating
  - Utility Company Discounts… California utilities offer discounts today for energy savings including cool roofing cool colors
  - Solar reflectivity 0.26-0.27, Emmissivity 0.92, SRI 28-29

- What's In It For Property Owners
  - Federal Tax Credits… may receive up to $500 or 10% for energy savings roofs: check with your local accountants
  - Reduction In Energy Used… by up to 8%!!

TPO

Reflective Restoration Coatings

EPDM Reflectivity Restoration

So Why Care About Cool Roofing?

- **Potential for Energy Savings**… if the cooling benefit exceeds the heating loss
- **Urban Heat Island Effect**… in a moment, we'll explain
- Possibility of Saving **Costs on Insulation**… some offset the amount of insulation used
- **Reducing Peak Energy Demands**… on overtaxed utilities
- **Cost of Energy**… somewhat pricey and can be unstable

Reduce Energy Usage…

- Reflective Roofs “reflect” the solar load on the roof surface…
- Reduce the temperature loading on the building as a whole

Why? Remember a white surface on a hot summer day can be up to 70°F cooler than a black surface.

Reduce Energy Usage…

- How MUCH can be saved?
- Go to: www.ornl.gov/sci/roofs+walls/facts/CoolCalcEnergy.htm for an energy calculator to estimate the potential annual savings based on specifics of your building

Average Savings…

- From Oak Ridge National Labs website, for Kansas City, average savings per year with R-20 insulation:
    - $ 0.038/sq.ft. cooling; none for heating - to go to a white roof (70% reflectivity) from black
    - $ 0.011/sq.ft. cooling; none for heating - to go to a white granule roof (25% reflectivity) from black
    - so…to go from a white granule roof to a white coating or membrane yields $ 0.027/sq.ft.

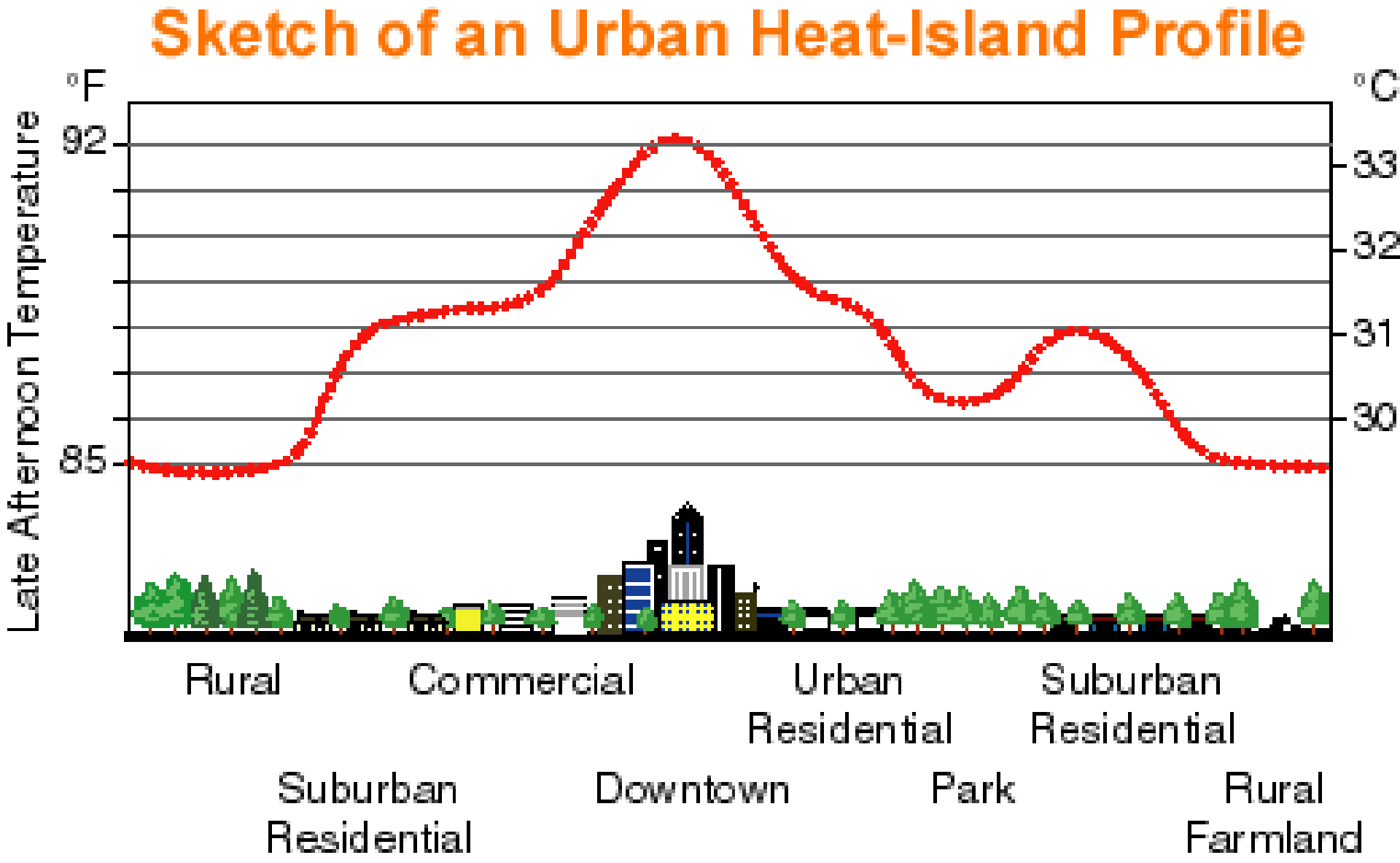
(based on average fuel and efficiency selections, electric for cooling and natural gas for heating)

Urban Heat Islands…

- The Concept… large concentrations of buildings and paved surfaces increase the ambient temperature in urban areas

- Why the Concern? Energy Usage and Air Quality

Our Cities Don’t Cool Down…



Insulation $avings…

- Some Energy Codes will allow a trade-off between “cool roofing” and required R-value of insulation

- Upside – cost of insulation
- Downside – less insulation in place when your cool roof isn’t helping your energy use, e.g. in the winter

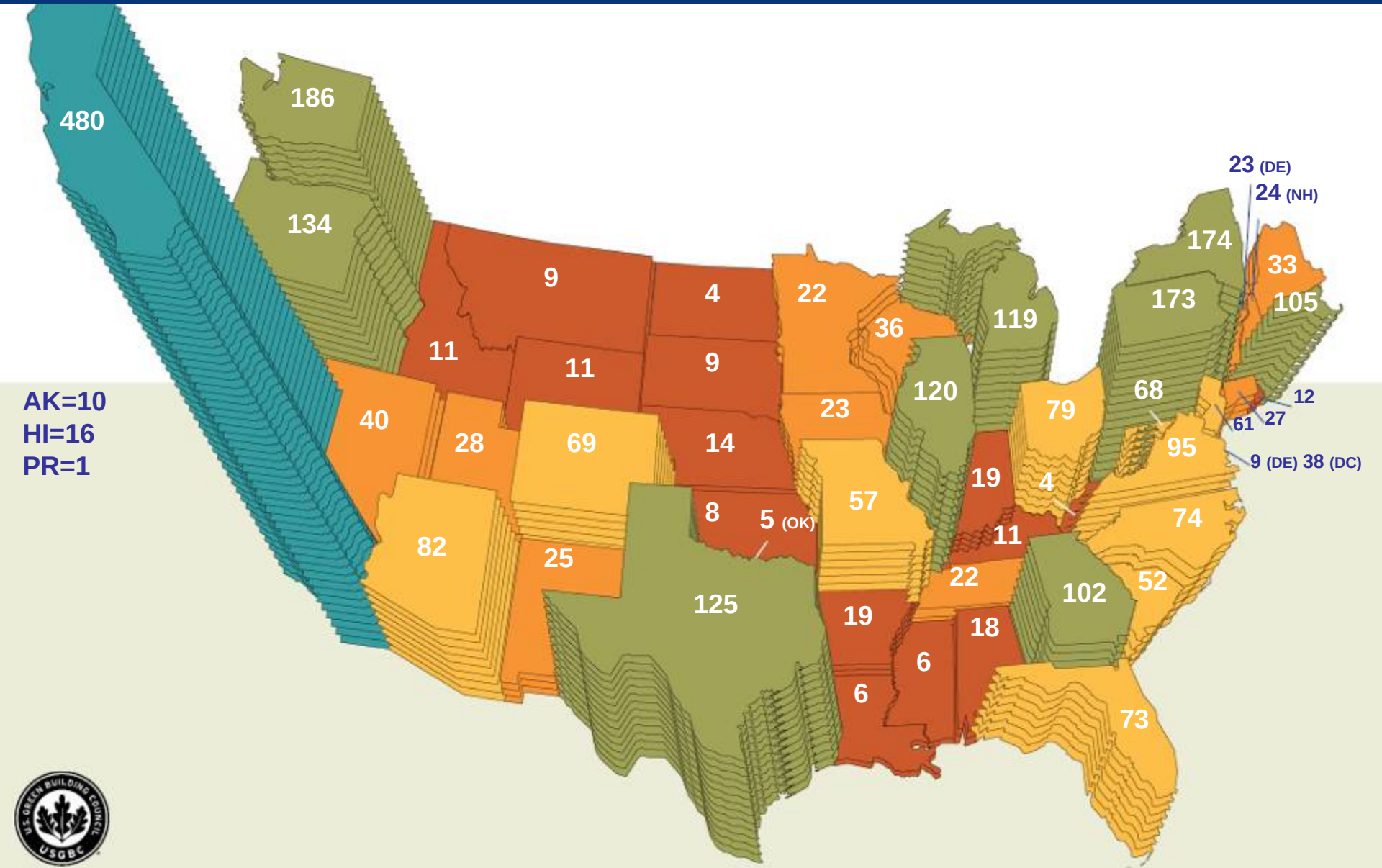
What is LEED…?

Leadership in **E**nergy & **E**nvironmental **D**esign

LEED™

- System for certifying design & construction of the greenest buildings in the world.
- Site planning, water management, material use, air quality etc…

2006 LEED New Construction



Levels of LEED Certification

- **Green Buildings worldwide are certified with a consensus-based rating system**

- **USGBC has four levels of LEED based on points**

LEED For Roofing Systems

Roofing … can find points in 3 categories

- Sustainable site (14 points)
- Energy and atmosphere (17 points)
- Materials and resources (13 points)

LEED Points

LEED™

Typical points issued:

- 1 point if 20% of materials (overall) come from within 500 miles (green roof plants)
- 1 point is using recycled materials that total at least 5% of total project cost
- Innovation and design process (5 available points)
- Indoor environmental quality (15 available points)

1 point if at least 75% of roof surface is COOL or GREEN

Austin Energy Green Building Commercial Rating.

additional point for Material with:
Solar Reflectance greater than 0.75 or SRI greater than 85 for roofs with slope **≤2:12**

Roofs sloped **>2:12** with Solar Reflectance of 0.45 or greater or SRI of 35.
Points offered for 10-20% recycled content and,
For Texas Sourced Material,

and 12 points for energy use efficiency**.**

Reduce Peak Energy Demand…

- Consider Cost of Energy… during peak demand
  - when the energy grid is stressed, kWh costs increase
  - times of air conditioning place most stress on energy grid
- Cost of Energy… regardless, costs are increasing

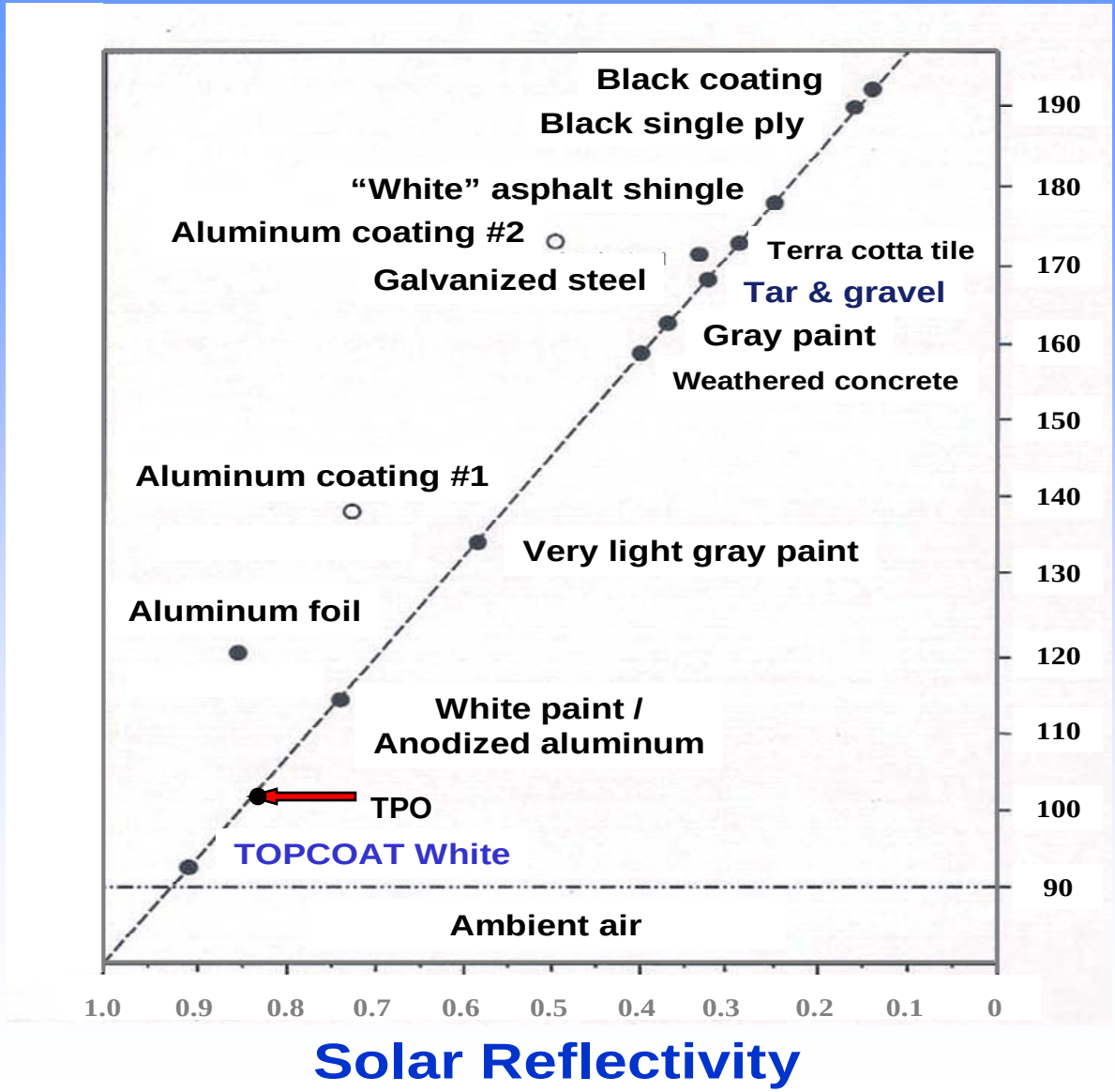
Energy Star – Key Criteria

- Low Slope Roofs must have an initial solar reflectance of >= 0.65. After 3 years, the solar reflectance must be >= 0.50.
- **Steep Slope roofs** must have an initial solar reflectance of >= 0.25. After 3 years, the solar reflectance must be >= 0.15.
- **Austin Code Requirements**. Initial solar reflectance of 0.7 or higher or SRI of 78 or higher.

A Few Things To Remember

- Aged values – allowed to clean the membrane before testing
- Products Listed with Energy Star – and labeled
- Low Slope – up to 2”/12”
- Steep Slope – above 2”/12”

Roof Top Temperatures



Some Resources…

- *Cool Roofing…Cutting Through the Glare Symposium,* proceedings available from RCIF (roof consultants institute foundation)
- Much information at both CEC and DOE websites
- CRRC
- Austin Energy

Help is On The Web…

www.GAFCOOLROOFCENTRAL.com

- Easy to use
- Calculate savings
- Rebate eligibility
- Industry links
- Valuable resource

More Tools

- NRCA's SpecRight Website with EnergyWise roof calculator @ http://www.specright.net/
- Both DOE and Energy Star Energy Calculators @ http://roofcalc.cadmusdev.com/ and http://www.ornl.gov/sci/roofs+walls/facts/CoolCalcEnergy.htm for low slope roofs

Recap the Benefits

- Savings from downsizing mechanical equipment
- Tax credits and incentives
- Lower energy / water costs
- Increased property value
- Reduced Urban Heat Island effect

WHAT Can You Do With This Information?

- Offer your customers better information on their options
- Offer your customers information regarding potential energy savings
- Differentiate your company by being able to educate your customers

Thank You

Visit **GAF** at **www.GAF.com**
Call **GAF** Technical at **800-Roof-411**
Contact **CARE** at **CARE@GAF.com**
Call the **CARE** Hotline at **866-671-2273**