Pre-Painted Steel Roofing…

The KOOL® Choice

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The Problem in the Market

- Variety of “cool” roofs
- Variety of performance
- Variety of service lives and degradation
  - Environmental impacts at landfill
Roofs in Malaysia

- Low slope roof receives 350 Wh/m² at midday.
- Typical roof receives 40-75% of solar radiation striking a building surfaces.
  - Solar gain through the roof:
    - 75% for single story terraced home
    - 50% for double story terraced home
    - 40% for five-story block flats dwellings

Roof insulation is an important strategy for energy efficiency.
Max surface temperature 25° C (77° F)

Saturated weight up to 120 lb/ft²
1. **Moist food source**
   Spore lands on a moist surface
   Enzymes use surface moisture to dissolve food

2. **Spore germinates, producing filaments (hyphae)**
   Hyphae extend both reach and area of all nutrients on the surface. Fungal metabolism generates more surface moisture to accelerate growth.

3. **Hyphae grow thickly, digging into the surface and forming a protective mat (mycelium)** that keeps the surface moist even if surrounding air is dry.

4. **The mold grows conidia, which generate and release spores to the air.**
KOOL® Metal Roofing

Reduce cooling energy use 15-25%
Help reduce peak demand
Improve indoor comfort
Help mitigate “urban heat island” effect
Extends life of roof and coatings
Pigments are inorganic ceramic colored powders incorporated into paint and applied onto metal substrates, imparting a wide range of colored effects.
Metal Roof Benefits

- Sustainable
- High Recycled Content
- 100% recyclable
- Reduce landfill waste
- Design Flexibility
- Retained properties
- Reduced roof maintenance
- Long service life
Durability of Painted Metal Roofing

Source: ORNL
Aged Retention of Solar Reflectance

PVDF painted metal retains 95% of initial TSR, even after 30 years exposure

Source: Cool Metal Roofing Coalition
Energy Star Roof Products Program

Initiated by EPA in 1998
Energy efficient logo
Exterior roof surface is the product
Involves roofing manufacturers and suppliers
Numerous paint systems approved
Evaluating environmental design and performance of Buildings

Non-Residential New Construction and Existing Buildings

Administered by MGBC
Case Study in California

Evaluated with and without pigment coatings, over three years
Cool pigmented colors reduce air-conditioner power by about 10% of base.
Case Study in Florida

26° latitude
Typical Residential Construction in Florida

25% drop in cooling capacity

Figure E-1. Vented Attic Thermal Processes
Effect of Roofing Material on Attic Temperatures

- Black shingle
- White metal
- White tile
- Outdoor air temp
White painted metal roofing saved 23% in cooling energy.
Radiant Barrier
Above Sheathing Ventilation
Dark roofing surfaces, parking lots, roads
Less vegetation and shade
Higher ambient air temperature

Urban areas can be 6-12° F warmer
Higher air conditioning loads to cool buildings and poor air quality
Urban Heat Island of Kuala Lampur on Friday 24 December 2004

Courtesy of Dr. Ilham S. M. Elsayed, Asst. Prof. Dr. Eng. Built Environment, College of Design, College of Architecture and Planning, University of Dammam, Saudi Arabia
Global Cooling Effect from Cool Roofs

- LBNL/DOE studied largest cities (1% landmass)
- Assumed that roofs reflectance can cost effectively be increased 0.25
- Saw 5°F decrease in ambient temp locally
- Global cooling less than 0.02°F
  - Represents 3-month delay in warming based on current emissions
  - 10 billion metric tons of CO₂
Metal Roof Integrated Solar Technologies
Most buildings need electricity most when sun is shining

Synchronized with HVAC use

Matched for heaviest computer use

Leveraging land that is already being used

Utilizing existing transmission systems
Photovoltaics on Metal Roofing

• System types
  – Thin Film
    • Amorphous Silicon (a-Si)
    • Cadmium Telluride (CdTe)
    • Copper Indium Selenide (CIS)
    • Copper Indium/Gallium Diselenide (CIGS)
    • Light-absorbing dyes (Dye Sensitized Solar Cells DSSC)
Thin film PV is flexible and durable
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    • Light-absorbing dyes (Dye Sensitized Solar Cells DSSC)
  – Mono and Poly-Crystalline

• Metal roof accommodates necessary attachment hardware
  – No holes
Estimated Service Life

- Metal = 50+ years
- BUR* = 19.8 years
- APP* = 16.1 years
- SBS* = 17.7 years
- Other* = 12-20 years
- Solar = 30 years

Metal BIPV offers 24%–43% savings over installing PV over conventional roofs

* Source: Carl Cash Survey, Simpson, Gumpertz & Heger, 2005
Penetrations on Conventional Roof System
Over 10,000 points of attachment
Summary

- Cool Metal Roofing is durable, retains properties and saves cooling energy
  - PVDF coatings excel in retention of color and solar properties
- Metal roofing is light weight and offers design flexibility and aesthetics
- Insulation performance is enhanced when used with cool metal roofing
- Many ways to lower cooling load with metal roof system components and installation techniques
- Cool metal roofing systems help to mitigate urban heat island effects
- Metal roofing is an excellent platform for rooftop integrated PV systems
Thank You!
Questions?