COOL WALLS U.S. NATURAL EXPOSURE PROGRAM: PRELIMINARY ANALYSIS OF 3-YEAR RESULTS

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Scope and goals of the Cool Walls California & U.S. exposure programs

• Evaluate radiative performance of wall products
• Cover main types of wall materials and coatings typically used in residential and commercial construction
• Include low-, medium-, and high-albedo products
• Include both conventional and advanced/innovative materials (e.g., containing cool pigments, dirt-resistant formulations or self-cleaning functionalities)
• Include both commercial and experimental products
• Cover main California climate zones – later extended to three U.S. CRRC exposure sites in Arizona, Florida and Ohio
• Exposure duration: 2 years in California program; 5 years in national program
The 55 materials exposed in the US program encompass a wide variety of types, substrates, and technologies.

Field-applied paints
- Substrates:
  - Wood
  - Fiber cement
  - Concrete
- Conventional paints
- Dirt-resistant paints
- Cool colors
- Commercial products
- Experimental products
- Initial SR: 0.06 to 0.88

Architectural fabrics
- Self-cleaning
- Photocatalytic
- Commercial products
- Initial SR: 0.74

Factory-coated metals
- Substrates:
  - Steel
- Fluoropolymer coatings
- Cool colors
- Commercial products
- Initial SR: 0.28 to 0.73

Sandwich panels
- Fluoropolymer coatings
- Commercial products
- Initial SR: 0.51 to 0.71

Retroreflective & reflective films
- Traffic safety films
- Mirror-like films
- [not yet characterized]
Wall materials in the U.S. program were naturally weathered in Arizona, Florida, and Ohio (3rd of 5 years)

### New River, Arizona
- Desert environment/climate
- Hot summers, mild/cool winters
- Dry, low humidity
- High levels of solar radiation
- Low levels of urban pollution

### Miami, Florida
- Subtropical environment/climate
- Hot summers, mild/warm winters
- Wet, high humidity
- High levels of solar radiation

### Medina, Ohio
- Northern temperate environment/climate
- Warm summers, cold winters
- Humid, no defined dry season
- Lower levels of solar radiation (relatively)
- Some urban pollution
Exposure began in Aug 2016, and we recently completed the third-year collection.

<table>
<thead>
<tr>
<th>Site</th>
<th>1 yr</th>
<th>2 yr</th>
<th>3 yr</th>
<th>4 yr</th>
<th>5 yr</th>
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<tbody>
<tr>
<td>New River, AZ</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>Aug ’20</td>
<td>Aug ’21</td>
</tr>
<tr>
<td>Miami, FL</td>
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<tr>
<td>Medina, OH</td>
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<td>✓</td>
<td>✓</td>
<td>Aug ’20</td>
<td>Aug ’21</td>
</tr>
</tbody>
</table>

Rack rows are staggered to prevent washdown contamination from rain/moisture.

This 5-year study w/ annual collections focuses on long-term changes in wall albedo.
At the 3-year mark, a majority of the materials have exhibited little albedo change.

- Average albedo loss across all 3 sites: 2 points ($\Delta SR = 0.02$)
- At year 3, we continue to see the same trends as identified in year 2:
  - Most materials tested exhibited trivial albedo change
  - The more significant instances of albedo loss were observed in white field-applied paints (FL, OH; soiling) and vinyl siding (AZ; yellowing)

Note: The data shown here have not yet been quality-checked.
At the 3-year mark, the average albedo loss of materials tested in AZ is 0.01.

At the 3-year mark in Arizona, 50 of 51 materials exhibited albedo losses of less than 5 points (ΔSR < 0.05).

Note: The data shown here have not yet been quality-checked.
At the 3-year mark, the average albedo loss of materials tested in FL is 0.02

At the 3-year mark in Florida, 47 of 51 materials exhibited albedo losses of less than 5 points ($\Delta SR < 0.05$)

Note: The data shown here have not yet been quality-checked.
At the 3-year mark, the average albedo loss of materials tested in OH is 0.02.

At the 3-year mark in Ohio:

- 44 of 51 materials exhibited albedo losses of less than 5 points ($\Delta SR < 0.05$)
- All 51 materials exhibited albedo losses of less than 8 points ($\Delta SR < 0.08$)

Soiling accumulation (OH) on a white semi-gloss exterior paint (left), and a white matte exterior paint (right)

Note: The data shown here have not yet been quality-checked.
Next steps

• **CA program:** Continue with additional in-depth analyses of the current dataset.

• **U.S. program:** Continue retrieving specimens and analyzing results over next 2 years.

• Meet separately with each partner to report in full detail results obtained with their products in both the CA and U.S. exposure programs.

• **Report** to CEC aggregated results that preserve confidentiality of each product/manufacturer, unless explicitly waived.

• **Ultimate goal:** contribute to development of infrastructure that facilitates adoption of cool walls in U.S. construction.