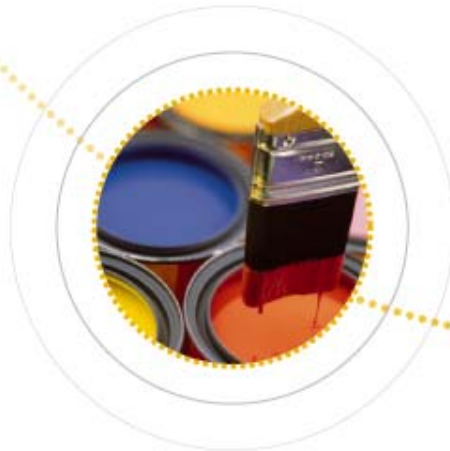


New Advances in Opaque Polymer Technology: Industrial Application Areas



ROHM AND HAAS
Ropaque™



The Original and Best
Hiding Technology

from Rohm and Haas

The future is bright with **Ropaque™**





Ropaque™ Ultra E benefits for Exterior Durability

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Agenda

- **An exposure site as a tool**

- RH Global exterior durability and exposures expertise
- Puget-Théniers
 - A unique site in Europe

- **Methodology for exposures**

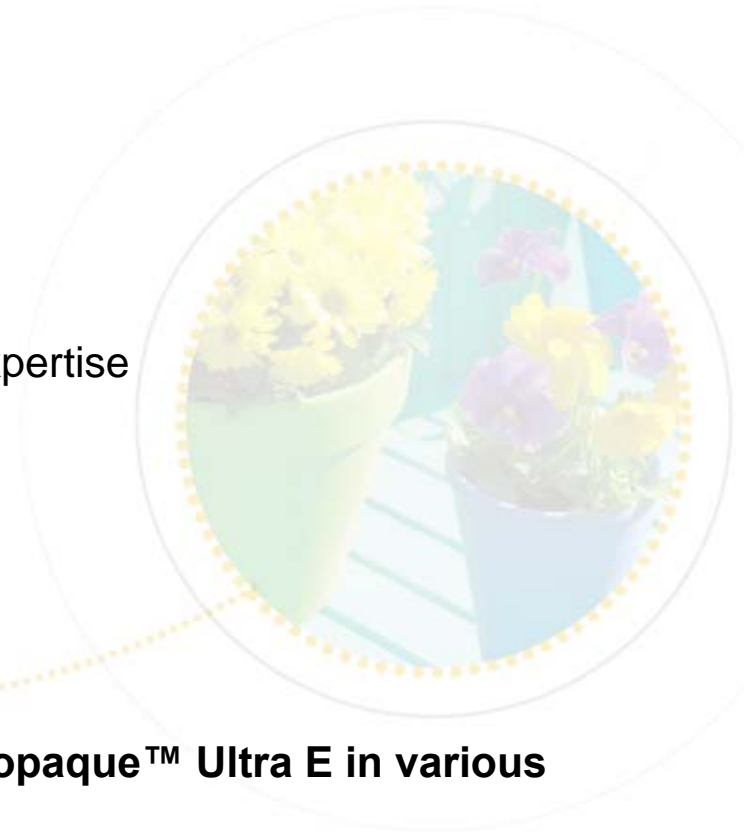
- **Definitions of damages of non-durable paints**

- **Benefits for Ropaque™ Ultra E**

- **Examples of exterior durable paints based on Ropaque™ Ultra E in various applications**

- **Exterior house paints**
- **Masonry**

- **Conclusions**



RandH Global exterior durability and exposures expertise



RandH has 12 exposure sites in the world

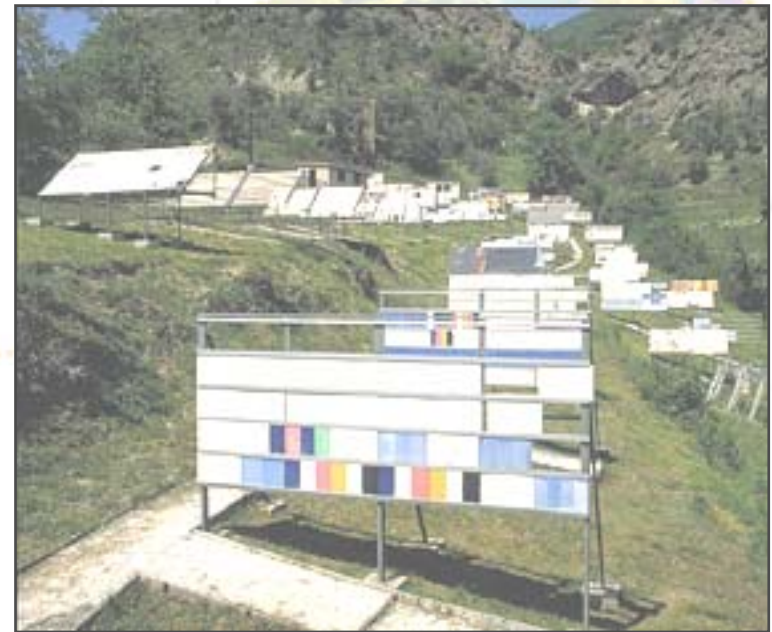
- Australia - Geelong (hot, humid summer/cold winter)
- Brazil - Jacarei
- China - Shanghai (industrial, humidity, DPUR)
- France - Puget-Theniers
- Japan - Tokyo
- Mexico - Apizaco (high altitude hot summer / cold winter)
- Sweden - Landskrona (mild humid summer/ cold winter)
- USA
 - Charlotte
 - Chicago
 - Glen St. Mary (hot, humid, mildew)
 - Los Angeles
 - Springhouse

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Puget-Thénières - A unique site in Europe

Puget-Thénières

- South of France, 70 km from Nice, in the Alps mountain (500 meters altitude)
- No sea influence, no industrial pollution
- Weather conditions:
 - Direct and intense sunlight UV light 2000 hours/Year
 - Temperature variations; large thermal span with numerous freeze- thaw cycles (100).
 - Humidity
- Accredited by European committee of normalization
- Specimen put in place at South 45° exposure direction to accelerate the natural weathering



***Assessment of relevant weather influences
by a factor 2 to 2.5***

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Methodology for outdoor exposures

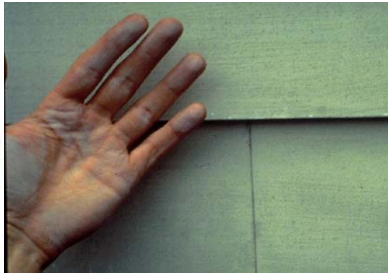
Specific constraints contribute to affect durability of exterior paints;

- Weather
- Application procedure
- Substrate

Rigorous Methodology is guarantee for objectivity and bias

- Choice of formulations (optimisation, PVC, VS,...)
- Preparation of panels (Sealers, primers,...)
- Outdoor exposure conditions (Orientation)
- Initial measurements, observations, photos,...
- Readings and visual rates

Damages of non-durable exterior paint



Chalking: white powdery material appearing on coating's surface

Cause: Breakdown of binder from sunlight exposing pigments and extenders.



Gloss Retention:
a loss of gloss.

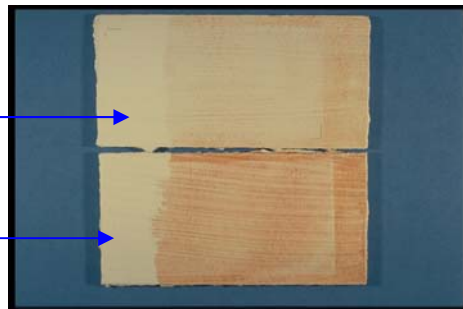
Cause: Breakdown of binder from sunlight leaving a rough surface.



Tint Retention: fading of colour in areas exposure to light.

Cause: Breakdown of Colorants from interactions of paint ingredients and sunlight.

LT 2949 + OP



Dirt Pick-up: a darkening of coating's surface from accumulation of dirt.

Cause: Airborne dirt sticks to soft coating surface- sandy rain falls/wind.

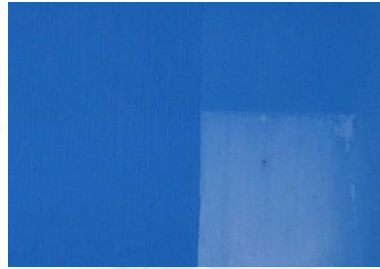
LT 2949

Damages of non durable exterior paint



Cracking: Loss of Flexibility

Cause: improper choice of paint, insufficient flexibility for an unstable substrate.



Efflorescence: salt build up on coating's surface.

Cause: Improper cleaning and priming of substrate. Reaction of cations migrated through the coating with air.



Blistering : water penetration/permeability

Cause: early blisters form when paint is applied during or shortly before rain or



Mildew: microscopic organisms that grow faster at high temperature and high moisture conditions

Cause: discolour the wood (eg mould)

Benefits of Ropaque™ Ultra E for exterior durability

- **Better Dirt Pick Up Resistance**

- Film hardness is improved (less tacky, more resistant to dirt sticking)
- The smoother particle surface of OP relative to pigments and extenders offers less surface area for dirt to attach to the surface

- **Improved Tint retention and Chalking**

- Reducing levels of TiO₂
- Higher binder demand extenders

- **Brighter color and increased whiteness**

- Reducing the level of extenders
- Replacing extenders by an organic particle which only refract light leads to better colors brightness and whiteness

- **Better mud-cracking resistance**

- Reduction of film porosity as OP has a low binder demand

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Exposure series with Ropaque™ Ultra E
in various segments

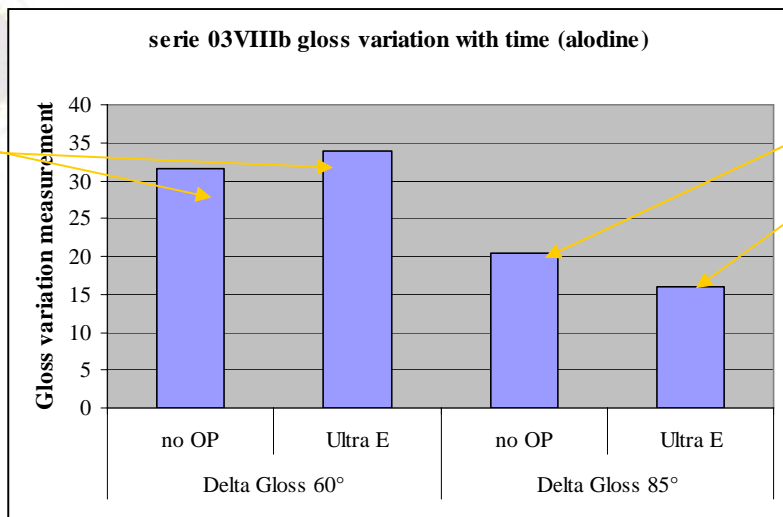
The future is bright with Ropaque™

Benefits of Ropaque™ Ultra E for exterior durability

Exterior House Paint based on Primal™ HG-98

Paint with OP : 36% total PVC, 35% VS, 15% PVC TiO₂, 9% PVC Ropaque™ Ultra E

no
 difference



The lower the
 less the better:
 the gloss
 variation

➔ **Better gloss retention at 85°
 and no difference at 60°**



Same visual evolution with time

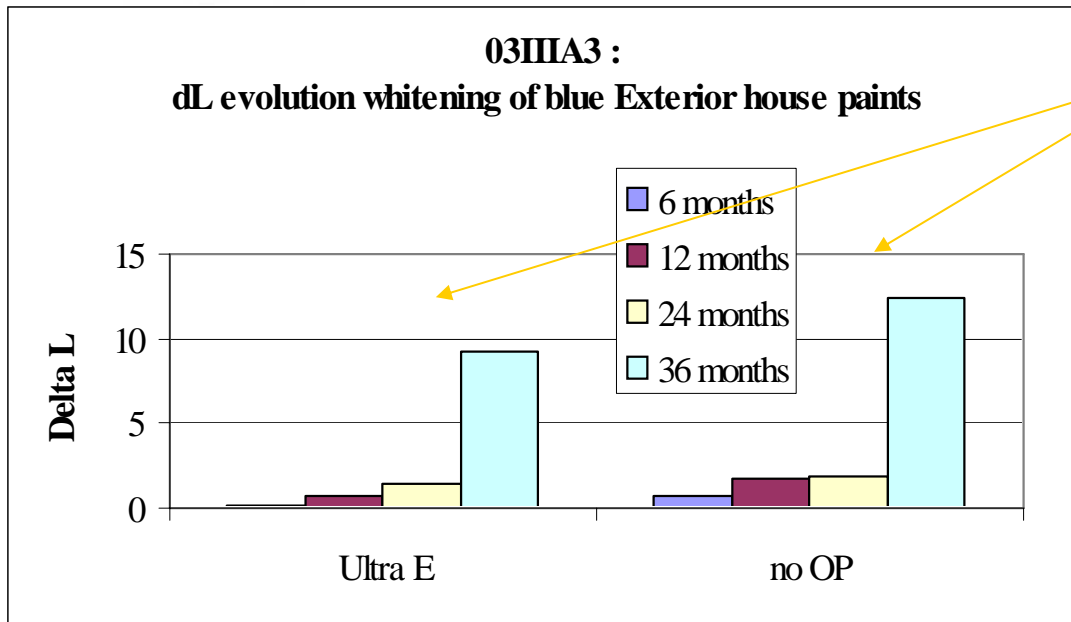
➔ **6.2% costs savings**

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Benefits of Ropaque™ Ultra E for exterior durability

Exterior House Paint based on Primal™ AC-337

Paint with OP : 36% total PVC, 35% VS, 15% PVC TiO₂, 9% PVC Ropaque™ Ultra E



The lower, the less important the whitening:
Ropaque™ Ultra E significantly better

➔ **With Ropaque™ Ultra E significant hydrophobicity increase**

With Ropaque:
Better color retention
Lower whitening
Lower chalking

➔ **6.5% costs savings**

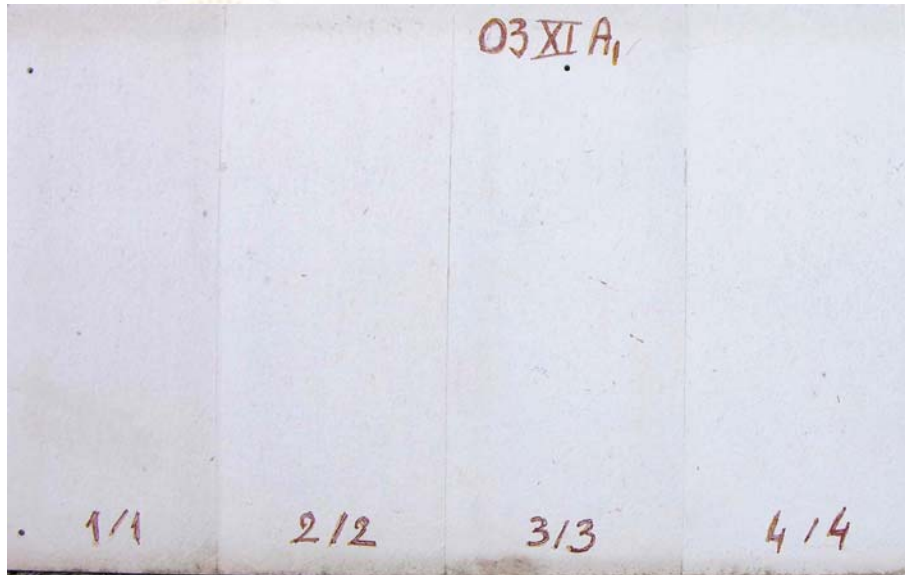


Ultra E

No OP

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Benefits of Ropaque™ Ultra E for exterior durability in Masonry coatings based on Primal™ SF-016



Ropaque™ Ultra E level

Total PVC



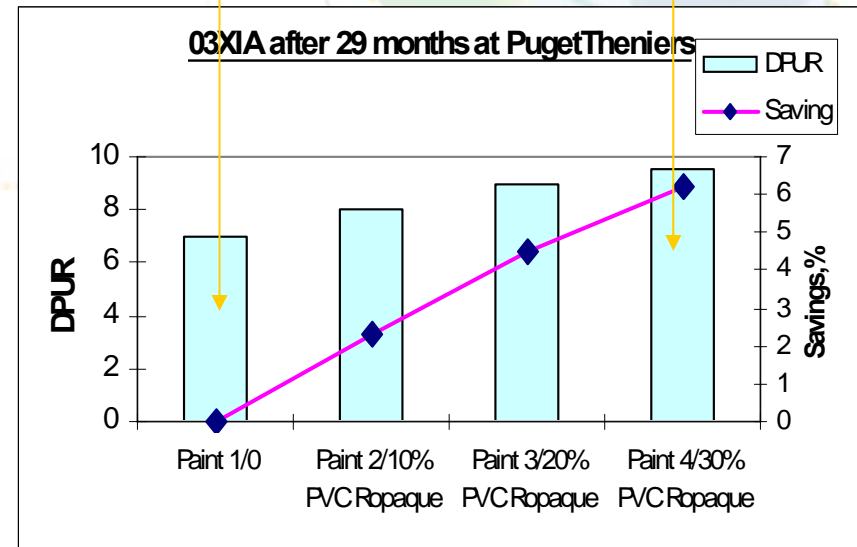
Strengths:

Dirt pick up resistance

Savings (from 2.3 to 6.2%)

The lower the more important the dirt pick up resistance

The higher the more important the saving



Benefits of Ropaque™ Ultra E for exterior durability in Masonry coatings based on Primal™ SF-016

optimization of Ropaque™ content //effect of extenders



**Paint 4 with OP: 55% total PVC,
40% VS,
17% PVC TiO2
30% PVC Ropaque™ Ultra E
8% PVC Extender**

**Paint 5 without OP: 55% total PVC,
40% VS,
17% PVC TiO2
38% PVC Extender**



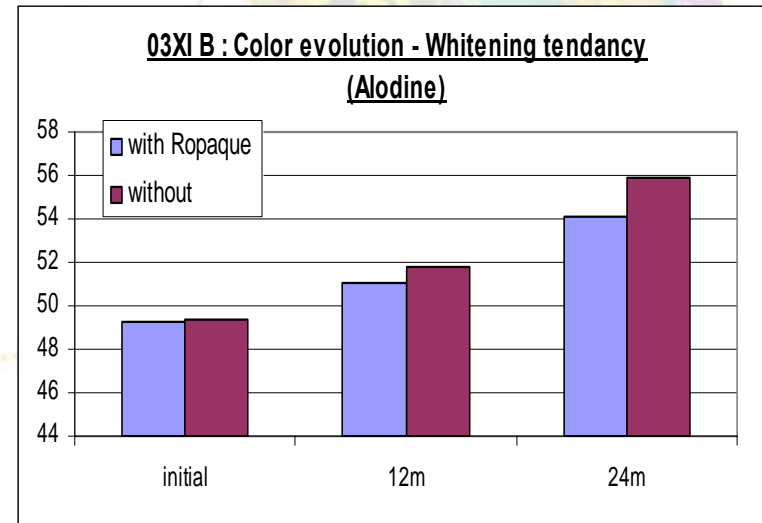
Strengths:

**Replacing extenders by an organic particle
which only refract light leads to better
colors brightness and whiteness**

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Benefits of Ropaque™ Ultra E for exterior durability

In Masonry paint based on Primal™ SF-016 - a reformulation



The lower L value the less the whitening



Strengths with Ropaque;
Better color retention, lower whitening
Lower chalking, savings 6.2%

With 15%PVC Ropaque™ Ultra E
 50% total PVC
 15% PVC TiO2

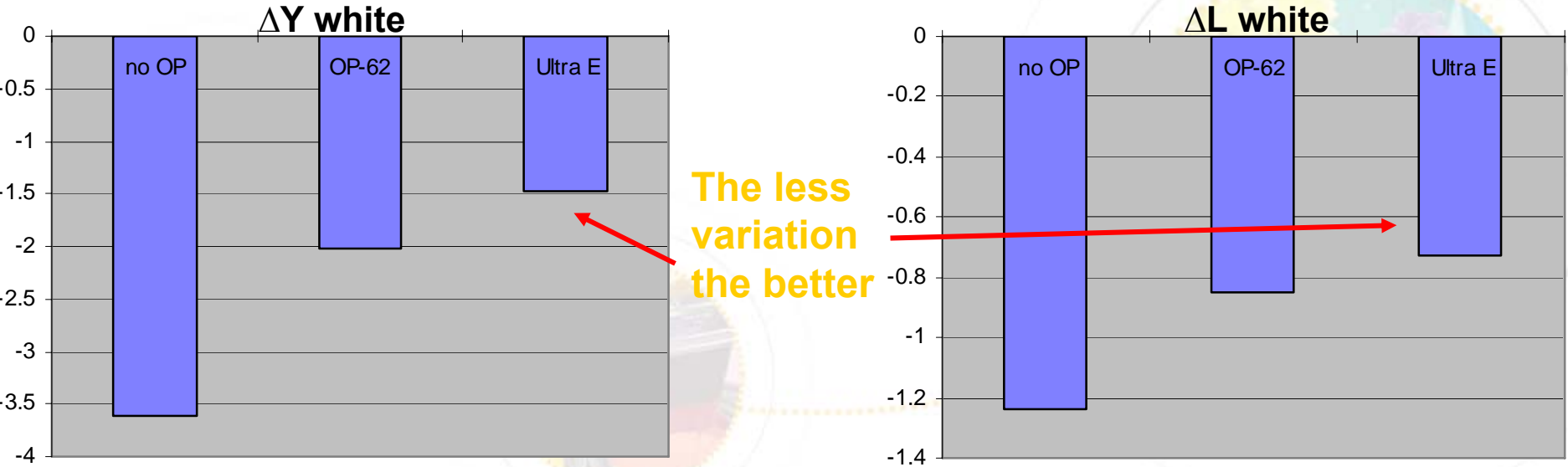
Without OP
 45% total PVC
 20% PVC TiO2

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Benefits of Ropaque™ Ultra E for exterior durability from APR

Sheen Paint based on Primal™ PR-1045 (similar to AC-337)

Paint with OP: 38% total PVC, 37% VS, 17.6% PVC TiO₂, 9% PVC Ropaque™ Ultra E



ΔY and ΔL results show less darkening and/or dirt pick-up for paints with Ropaque Ultra E. The whitest coating after 18 months was the Ropaque Ultra E containing paint.



No OP

OP-62

Ultra E

**Ropaque Ultra E improves
whiteness and DPUR**

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4% costs savings

Benefits of Ropaque™ for exterior durability

With Ropaque™: improved performances
Same cost as the reference

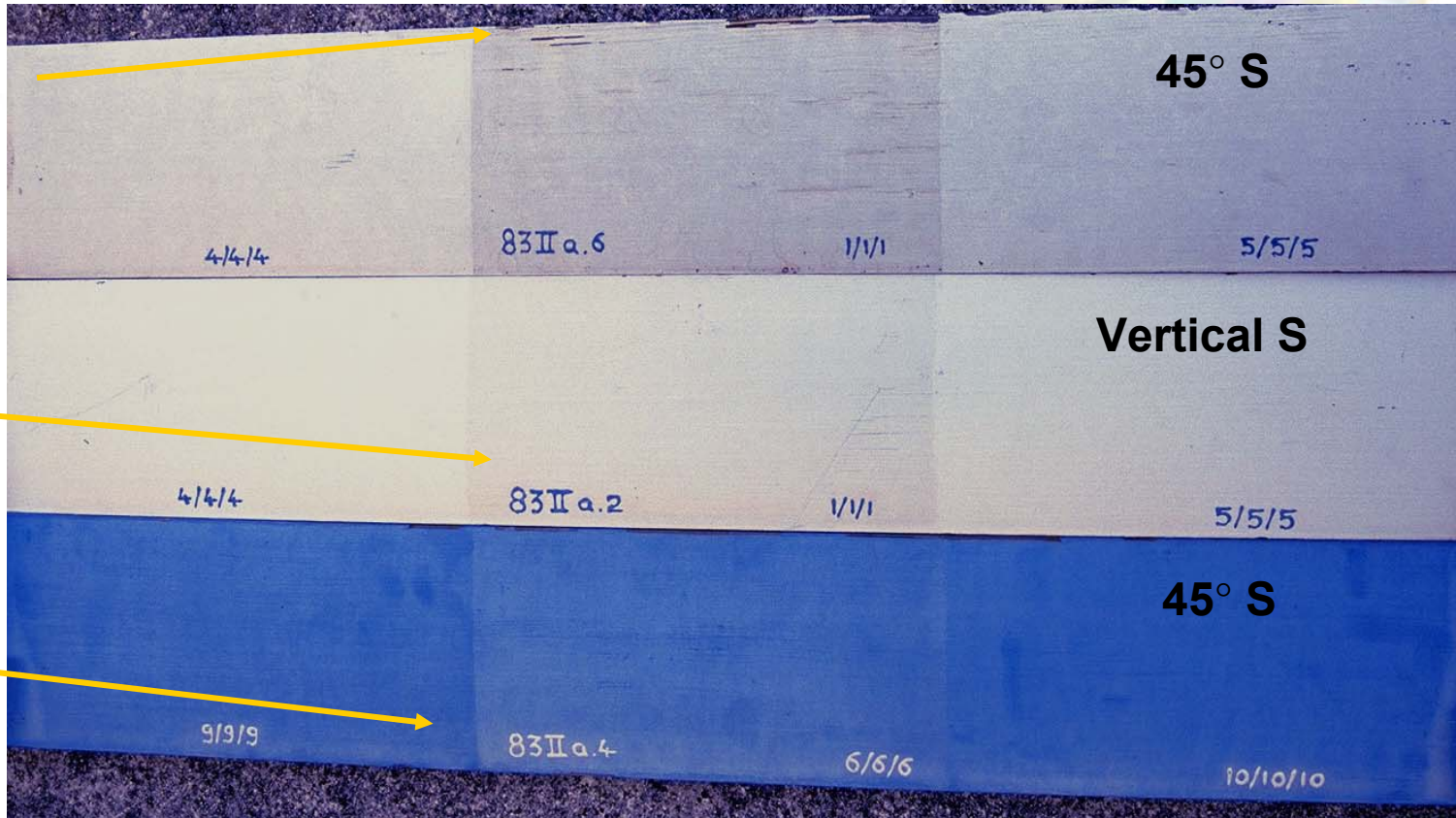
Without Ropaque™

With Ropaque™: costs savings
3% costs savings

More cracking
Without OP

Increased dirt pick up
without OP

Poor tint
Retention
without OP



10 Year Exposure

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Conclusions

- **Using Ropaque™ Ultra E in all exterior coatings always offers key benefits as:**
 - Hydrophobicity
 - Dirt Pick Up Resistance
 - Resistance to mildew
 - Chalking resistance
 - Significant costs savings proved
- **Future exposures series with Ropaque™ Ultra E**
- **Bundle approach with new generation of binders**