

# TegaTegoSeal™ versus Premium Competitive Brands

## Under the Arwood Accelerated Weathering Test for Exterior Wood Coatings

Testing was conducted by Q-Lab Florida and sponsored by a third-party not affiliated with Qivalent Corporation. Qivalent had no input nor involvement in the test nor in sample preparation, but received authorization to inspect tested specimens and publish results.

### What is TegaTegoSeal™?

TegaTegoSeal™ represents chemical-grafting technology (TegaTeknology™) incorporating monomers, prepolymers and a proprietary graft-initiator/catalyst system. Unlike competing coatings and treatments that rely on weak-force “mechanical” (impermanent and leachable) substrate attachment, TegaTegoSeal’s chemical-grafting system achieves nanotech-scale interaction and durable “strong-force” **covalent bonding** causing permanent substrate modification. We know of no other product that emulates TegaTegoSeal’s performance. TegaTegoSeal™ may be the “**Greenest**” commercial wood coating system available: water-based, durable, environmentally-safe with unrivaled wood (natural resource) preservation attributes. During the coating process the grafting and polymerization reactions proceed to completion; VOC’s are consumed in the reaction dynamics!

### The Arwood Test

The Arwood Test was developed as “...*an artificial weathering method to assess the durability of exterior wood coatings in a short period of time...*” The Arwood Test is a very aggressive 168-hour cycle-group including high-temperature and high-humidity followed by repetitive sub-cycles of even higher-temperature under intense UV-light exposure, then by temperature shock and erosion via water impingement. This 168-hour cycle-group is repeated 12 times over a 12-week period totaling 2016 hours of exposure. A summary of the Arwood Test parameters is displayed on page two, and a comprehensive article may be found online at [www.qivalent.com/filz/Arwood.pdf](http://www.qivalent.com/filz/Arwood.pdf).

A major challenge for accelerated wood coating tests is consistency, selectivity and uniform preparation of specimens. The above referenced article emphasizes “... *precise specifications for: The wood substrate (e.g. growth ring angles)*” and recommends “*defect-free pine*” substrates. As displayed in accompanying pictures, the white pine test specimens and preparation did not follow basic procedural protocol. The wood substrate specimens varied widely in quality, density, and growth-ring orientation. TegaTegoSealed specimens were among the poorest quality substrates including knots, cracks and “face-grain” orientation (... the poorest coating absorption orientation). Poor substrate screening compromised scientifically preferred “consistency for competitive comparison,” but it highlighted some of TegaTegoSeal’s superior performance attributes transferable to non-ideal, real-world applications.

### The Results

The following pages illustrate TegaTegoSeal’s performance versus premium competitive coatings. Two of the most destructive wood coating degradation mechanisms include UV and moisture absorption-desorption. TegaTegoSeal™ demonstrated superior retention of color stability and water repellency. TegaTegoSeal™ was the **ONLY** coating system that **retained effective water repellency** following 2016 hours of Arwood exposure due to TegaTeknology’s **permanent substrate modification**. Indeed, even where there was water-impingement erosion on TegaTegoSealed specimens, deep nanotechnology substrate modification maintained full water-repellency protection; TegaTegoSeal’s monomers and prepolymers are much smaller versus larger “color” molecules and penetrate even deeper into and bond to the substrate. TegaTegoSeal’s performance superiority is compelling!

*Are YOU ready for TegaTeknology™?*



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| Arwood Accelerated Weathering Test Cycle for Wood Coatings  |              |              |          |                              |
|---|--------------|--------------|----------|------------------------------|
| Step  | Function     | Temperature  | Duration | Remark                       |
| 1   | Condensation | 45°C (113°F) | 24 hr    | 100% Humidity                |
| 2   | Subcycles    |              | 48X      |                              |
| 2a  | UV           | 60°C (140°F) | 2.5 hr   | UVA-340nm Wavelength         |
| 2b  | Water Spray  |              | 0.5 hr   | 6-7 liters/min, UV Light Off |
| 3   | Go to Step 1 |              |          |                              |
| Total (1 Cycle) = 168 hours; Repetition of Cycle = 12X (i.e. 12 weeks); Total Exposure = 2016 hours |              |              |          |                              |



## Arwood Test Data “Subjective” Evaluation Legend

Q-Lab Weathering Research Service

### LEGEND

Q-Lab exposure reports use standard rating scales, primarily ASTM or ISO. This legend provides basic information on the rating scales used in your report.

#### Inspection and Reporting Standards

Commonly used standard methods for determining degradation effects.

| Effect             | Standard               |
|--------------------|------------------------|
| Adhesion           | ASTM D3359, ISO 2409   |
| Blistering         | ASTM D714, ISO 4628-2  |
| Chalking           | ASTM D4214, ISO 4628-7 |
| Checking           | ASTM D660, ISO 4628-4  |
| Color (visual)     | ASTM D1729, ISO 3678   |
| Corrosion          | ASTM D1654, ISO 4628-8 |
| Cracking           | ASTM D661              |
| Dirt               | ASTM D3274             |
| Erosion            | ASTM D662              |
| Flaking            | ASTM D772, ISO 4628-5  |
| Instrumental Gloss | ASTM D523, ISO 2813    |
| Mildew Growth      | ASTM D3274             |
| Surface Rust       | ASTM D610, ISO 4628-3  |

#### Numerical Scales

Numerical scales are used to depict the degree of effect being reported.

| No | Quality   | Change      | ISO |
|----|-----------|-------------|-----|
| 10 | Excellent | No Effect   | 0   |
| 9  | ----      | Very Slight | 1   |
| 8  | Very Good | Slight      | 2   |
| 6  | Good      | Moderate    | 3   |
| 4  | Fair      | Pronounced  | 4   |
| 2  | Poor      | Severe      | 5   |
| 0  | Very Poor | Very Severe | --  |

The numerical scales are used for a wide variety of defects included in the report such as; general appearance, chalk, dirt, mildew, color, etc. Odd numbers are used when the degree is obviously intermediate.

#### Visual Color Change

Subjective appearance evaluation under standard illumination with 10 to 0 scale. Added to the color rating to indicate direction of change.

|    |               |  |
|----|---------------|--|
| F  | Fading        | All visual color reports will include the amount and type of color change. |
| D  | Darkening     |  |
| BL | Bleaching     |  |
| Y  | Yellowing     |  |
| DC | Discoloration | Ex: 8F = Slight Fading   |

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#### Specialized Scales

For factors which do not fit the typical degree rating scale.

##### a. Checking/Cracking (ASTM D660, ISO 4628-4)

Report includes degree, type, and depth of defect noted

| Effect        | Type                    | Depth      |
|---------------|-------------------------|------------|
| 10 None       | A Irregular             | a Checking |
| 8 Slight      | B Line & short parallel | b Cracking |
| 6 Moderate    | C Switch                |            |
| 4 Pronounced  | D Crow Foot             |            |
| 2 Severe      | E Mosaic                |            |
| 0 Very Severe | F Shrinkage             |            |
|               | G Short Random          |            |
|               | H Sigmoid               |            |

Example: 6Da = Moderate Crow Foot Checking

##### b. Blistering (ASTM D714, ISO 4628-2)

Rating for blistering is a size/frequency composite.

| No | Descriptive | Size   | Rating | Density      |
|----|-------------|--------|--------|--------------|
| 10 | None        | 0      | 0      | None         |
| 8  | Pinpoint    | 0-1 mm | F      | Few          |
| 6  | Small       | 1-2 mm | M      | Medium       |
| 4  | Medium      | 2-3 mm | MD     | Medium Dense |
| 2  | Large       | 3-5 mm | D      | Dense        |
| 0  | Very Large  | > 5 mm | VD     | Very Dense   |

Example: 4D = Medium size, dense frequency

##### c. Scribe Rust and Corrosion (ASTM D1654, ISO 4628-8)

Rust creepage from a scribe line is reported using scales derived from the distance that the rust has spread from the scribe line. This can be referenced back to either inches or millimetres.

##### d. Surface Area (ASTM D610, ISO 4628-8)

Where the effect covers the surface of the test specimen, a 10 to zero scale is used to report the percentage of area covered.

|    |       |   |      |   |      |
|----|-------|---|------|---|------|
| 10 | None  | 7 | 0.3% | 3 | 17%  |
| 9  | 0.03% | 6 | 1%   | 2 | 33%  |
| 8  | 0.1%  | 5 | 3%   | 1 | 50%  |
|    |       | 4 | 10%  | 0 | >50% |

##### e. Instrumental Gloss

O = Original P = Present Δ = Difference



## Final Arwood Test Report After 2016 Hours Exposure

**Date: March 7, 2007**

**REPORT NO: 4**

**TYPE: Accelerated Weathering**

**Duration: 2016 hours**

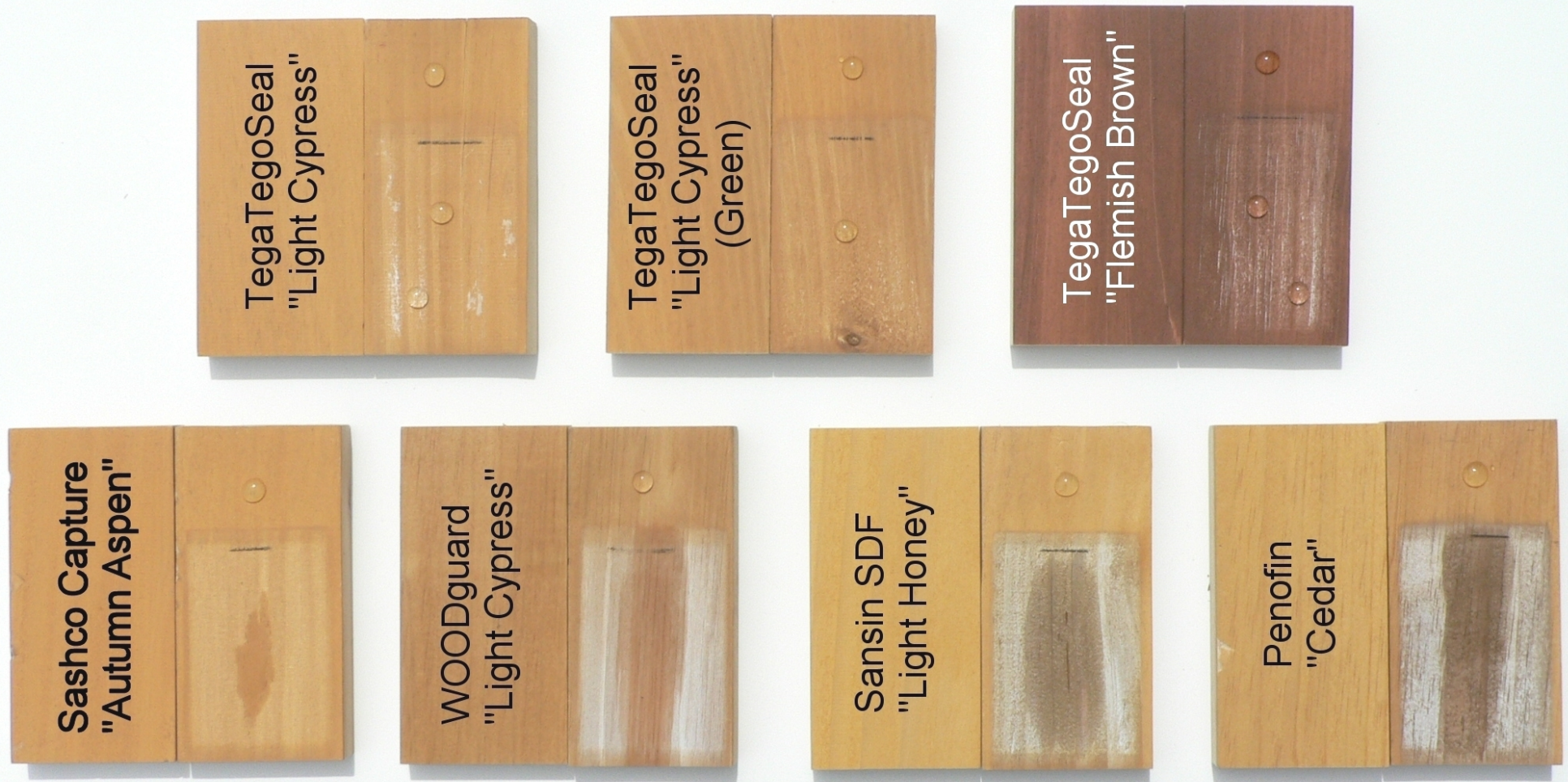
**Date Initial Exposure: December 5, 2006**

**Note: Please refer to the attached legend for explanation of numerical ratings used in this report.**

| Specimen Number                      | Gen App | Erosion |   |  | Visual Color | Chalk | Check | Crack | Blister | Flake | Comments                      |
|--------------------------------------|---------|---------|---|--|--------------|-------|-------|-------|---------|-------|-------------------------------|
|                                      |         |         |   |  |              |       |       |       |         |       |                               |
| <b>TegaTegoSeal</b>                  |         |         |   |  |              |       |       |       |         |       |                               |
| Light Cypress <sup>(1)</sup>         | 7       |         | 7 |  | 8 D          | 10    | 10    | 6Bb   | 10      | 10    |                               |
| Light Cypress (Green) <sup>(3)</sup> | 7       |         | 9 |  | 7 D          | 10    | 10    | 9Bb   | 10      | 10    | Roughness of texture          |
| Flemish Brown <sup>(3)</sup>         | 6       |         | 5 |  | 6 DC         | 10    | 10    | 8Bb   | 10      | 10    | Discoloration and uneven fade |
| <b>Sashco Capture</b>                |         |         |   |  |              |       |       |       |         |       |                               |
| Autumn Aspen <sup>(1)</sup>          | 6       |         | 9 |  | 6 F          | 10    | 10    | 7Bb   | 10      | 10    |                               |
| <b>Woodguard</b>                     |         |         |   |  |              |       |       |       |         |       |                               |
| Light Cypress <sup>(2)</sup>         | 2       |         | 2 |  | 2 DC         | 10    | 10    | 5Bb   | 10      | 10    | Discoloration and fade        |
| <b>Sansin SDF</b>                    |         |         |   |  |              |       |       |       |         |       |                               |
| Light Honey <sup>(1)</sup>           | 3       |         | 4 |  | 3 DC         | 10    | 10    | 9Bb   | 10      | 10    | Darkening and discoloration   |
| <b>Penofin</b>                       |         |         |   |  |              |       |       |       |         |       |                               |
| Cedar <sup>(3)</sup>                 | 1       |         | 4 |  | 1 DC         | 10    | 10    | 8Bb   | 10      | 10    | Darkening and discoloration   |
|                                      |         |         |   |  |              |       |       |       |         |       |                               |

Arwood Test Specimen "Pair Sets" with unexposed "Reference" specimens on the left and exposed specimens on the right. Test specimens are nominally 150mm x 75mm x 15mm (5-7/8" x 2-7/8" x 1/2"). The treatment brand and tint color moniker is graphically overwritten on the respective "Reference" specimen. The actual "exposed area" represents approximately the lower 2/3<sup>rd</sup> section with the balance "masked" so that the upper 1/3<sup>rd</sup> remains protected and in "Reference" condition.

Dollops of distilled water were placed on specimens as shown in both exposed and unexposed areas. For the TegaTegoSeal "Light Cypress" and "Flemish Brown" specimens two dollops of water were placed on the exposed areas ... one where there was little or no evidence of "erosion" and one where there was incipient "erosion." The picture was taken within (less than) one minute from time of water placement, and it is apparent that all exposed specimens **except those treated with TegaTegoSeal** were essentially "sponge-like" to water absorption.



These pictures were taken ten minutes apart at an oblique angle to provide an enhanced perspective of water-dollop geometry. All treatments displayed effective water repellence on sections that had **not** been Arwood-cycle-exposed. **Only TegaTegoSeal-treated** specimens (... and remarkably including areas demonstrating incipient surface erosion) displayed exceptional water repellence. The Sashco Capture specimen (lower left) demonstrated slight water-repellence retention in the top picture but full water absorption by the tenth minute. The WOODguard, Sansin and Penofin specimens demonstrated "sponge-like" water absorbance.



**TegaTegoSeal™ “Light Cypress”**

**Time Zero**



**Time Zero + 10 minutes  
No discernible change  
... even in area with incipient erosion**



**TegaTegoSeal™ “Light Cypress” (Green)**

**Time Zero**

**Time Zero + 10 minutes  
No discernible change**



**TegaTegoSeal™ “Flemish Brown”**

**Time Zero**

**Time Zero + 10 minutes**  
**No discernible change**  
**... even in area with incipient erosion**



**Sashco Capture "Autumn Aspen"**

**Time Zero**  
**Slight (but minimal) water repellency retained**



**Time Zero + 10 minutes**  
**Minimal water repellence retention**  
**confirmed by full absorption of water dollop**



**WOODguard "Light Cypress"**

**Time Zero**  
**"Sponge-like" water absorption**



**Time Zero + 10 minutes**  
**Water absorption to such a degree that**  
**desorption (drying-out) already apparent**



**Sansin SDF “Light Honey”**

**Time Zero**  
**“Sponge-like” water absorption**

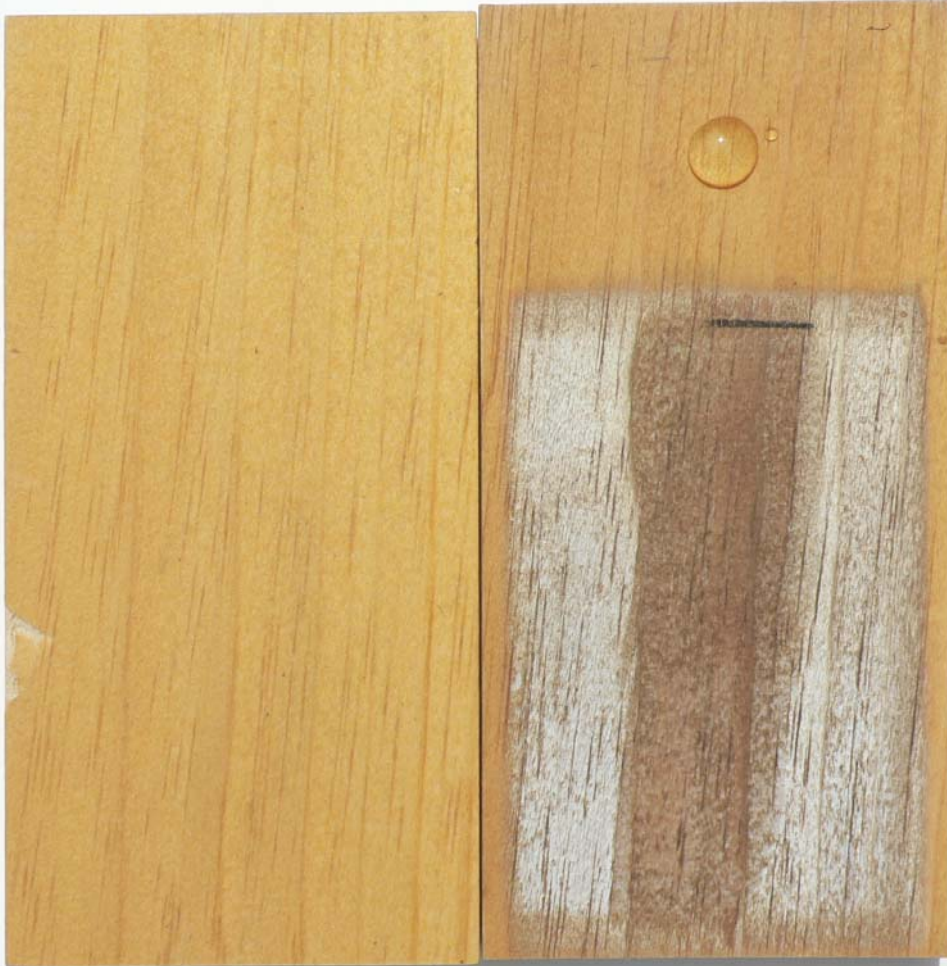


**Time Zero + 10 minutes**  
**Water absorption to such a degree that**  
**desorption (drying-out) already apparent**



**Penofin "Cedar"**

**Time Zero**  
**"Sponge-like" water absorption**



**Time Zero + 10 minutes**  
**Water absorption to such a degree that**  
**desorption (drying-out) already apparent**

