



TECHNICAL C&A INFORMATION

UV/EB Coating Viscosity Measurement v1.0

Testing Considerations

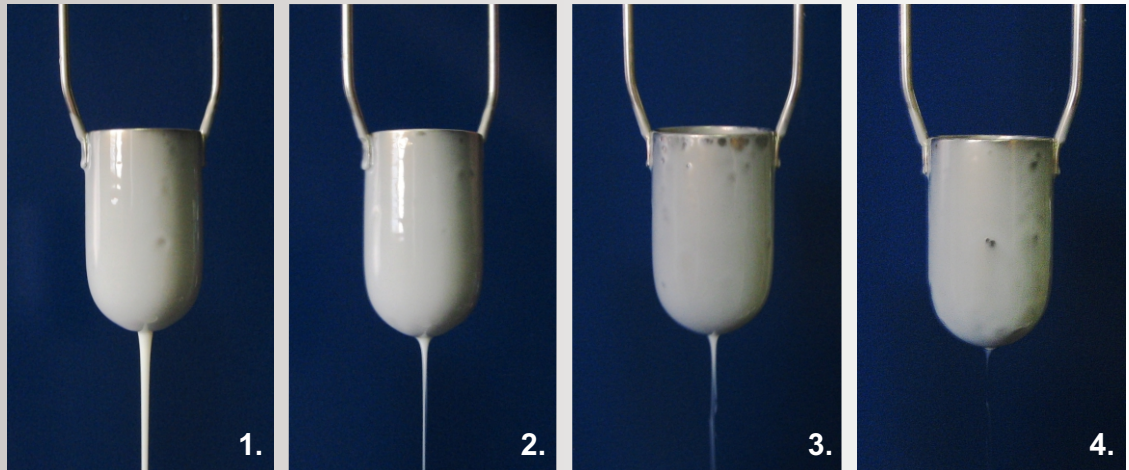
Scope	This test is used to measure the viscosity of a UV/EB coating product to correlate the actual coating viscosity at a given temperature to the manufactured viscosity for compliance. Viscosity can influence the coating performance in regards to pumping/circulation, transfer, hold-out and flow-out/leveling.
Test Measurement Instruments	<ul style="list-style-type: none"> - Mixing tool - Thermometer/Pyrometer - Timer - Zahn #3 cup; Zahn #2 cup can be used for low-viscosity/'F' designation coating product - Writing tools - CAC Temperature/Viscosity Index Chart
Mixing	<p>All coating products should be mixed thoroughly prior to testing to ensure that the product is homogenous as separation can occur. This includes new/unused and partial/used coating containers. The use of an adequate mixing tool is necessary to sufficiently blend the ingredients into a homogenous state. The act of moving the coating container from a storage area to press-side is not proper mixing. In order to properly mix, remove the container lid and mix the coating product thoroughly using the mixing tool. An uneven discoloration on the coating surface is an indication that the coating is not sufficiently mixed. The following tools are recommended for mixing:</p> <ul style="list-style-type: none"> - Paddle; least recommended - Drill with mixing-blade attachment; mixing-blade intended for paint or grout is suitable - Drum-mixer
Temperature	<p>Measuring coating temperature is a necessary part of a viscosity test, as viscosity and temperature values will be used to correlate the actual viscosity to the desired/manufactured viscosity. Coating temperature should be measured using a calibrated temperature tool AFTER the coating product has been mixed. Whenever possible, acclimate the coating product to pressroom conditions prior to viscosity testing. The following tools are recommended for measuring coating temperature:</p> <ul style="list-style-type: none"> - Probe/stem thermometer - Infrared handheld pyrometer
Zahn Measurement Cup	Identify and ensure the appropriate Zahn #3 cup is being used for testing; Zahn #2 cup can be used for 'F' designation coating product. The condition of the Zahn cup is crucial to ensure an accurate viscosity measurement. The inside of the cup and drain-hole must be clean and free of any contaminants, cured/dried coating and mechanical defects. Never use a mechanical device to clean the inside/drain-hole of the cup. For cleaning of residual UV coating, wipe the cup thoroughly with a UV Cleaner or IPA using a soft cloth and dry. Always clean the cup immediately after use and dry before storage.
Timing	Proper timing is necessary when checking viscosity to ensure that an accurate measurement is recorded. Starting and stopping the timer at the correct points during the measurement is critical. Timing should start when the top of the cup breaks the surface of the coating liquid. The stream draining from the cup drain-hole should be observed and timing should stop when the coating stream breaks completely at

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Testing Considerations - *continued*

Timing (continued)

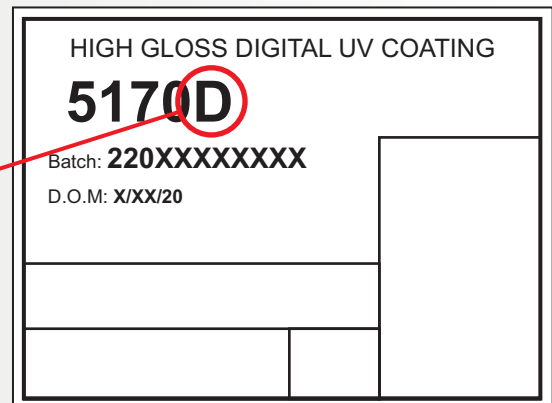
the base of the cup (**image 4**) indicating that the cup is empty. Interruptions in the coating stream (**image 3**) several inches from the cup bottom does not indicate that the timing should be stopped as coating continues to drain from the cup. If the stream from the cup appears irregular with starvation and surges, or becomes interrupted at the base of the cup, this should be considered an invalid test and the measurement should be repeated until a valid test is performed. When in doubt, conduct multiple tests.



Manufactured Viscosity Designation

Located on the container of every product manufactured by Coatings and Adhesives Corporation is a label which features important product information including an indicated **viscosity designation**. The viscosity designation is a letter located at the end of the product number as demonstrated in the below image. This letter designates the desired/manufactured viscosity of the coating product and should be used to correlate the actual viscosity measurement with the intended manufactured viscosity. CAC manufactures UV/EB coating products with the following Zahn #3 cup viscosity designations:

CAC manufacturers UV/EB coatings with the following viscosity designations:	
A:	35-45 seconds
B:	30-35 seconds
BC:	25-30 seconds
C:	20-25 seconds
D:	15-20 seconds
DE:	12-15 seconds
E:	10-15 seconds
F:	8-12 seconds
*All viscosity designations are created at a coating temperature of 77°F.	



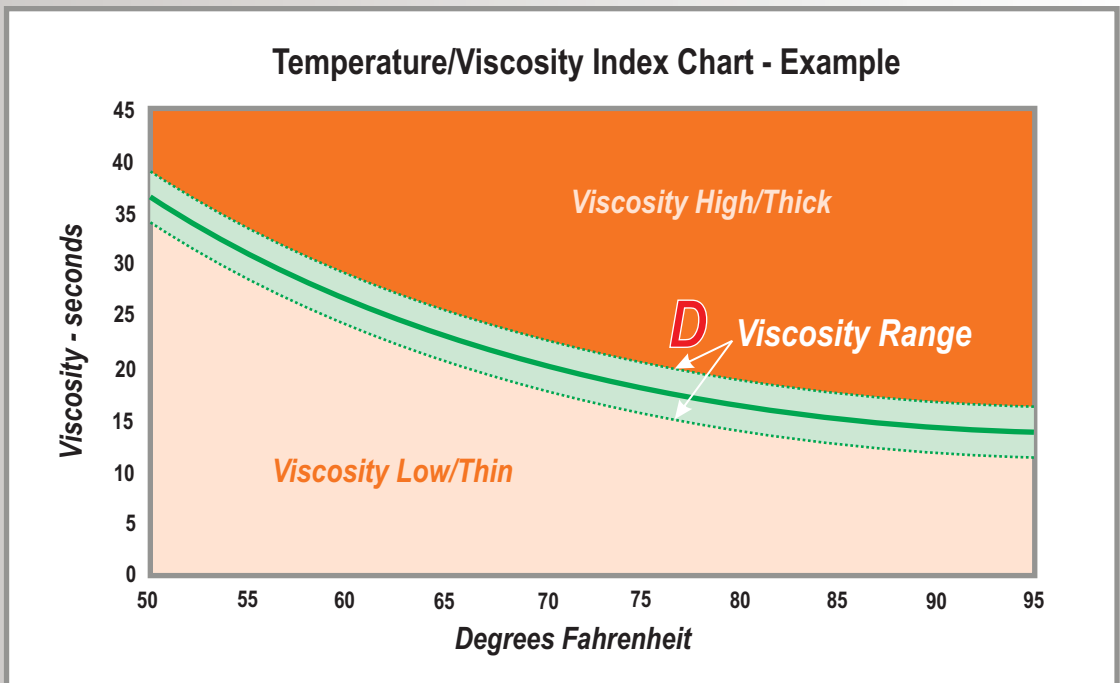
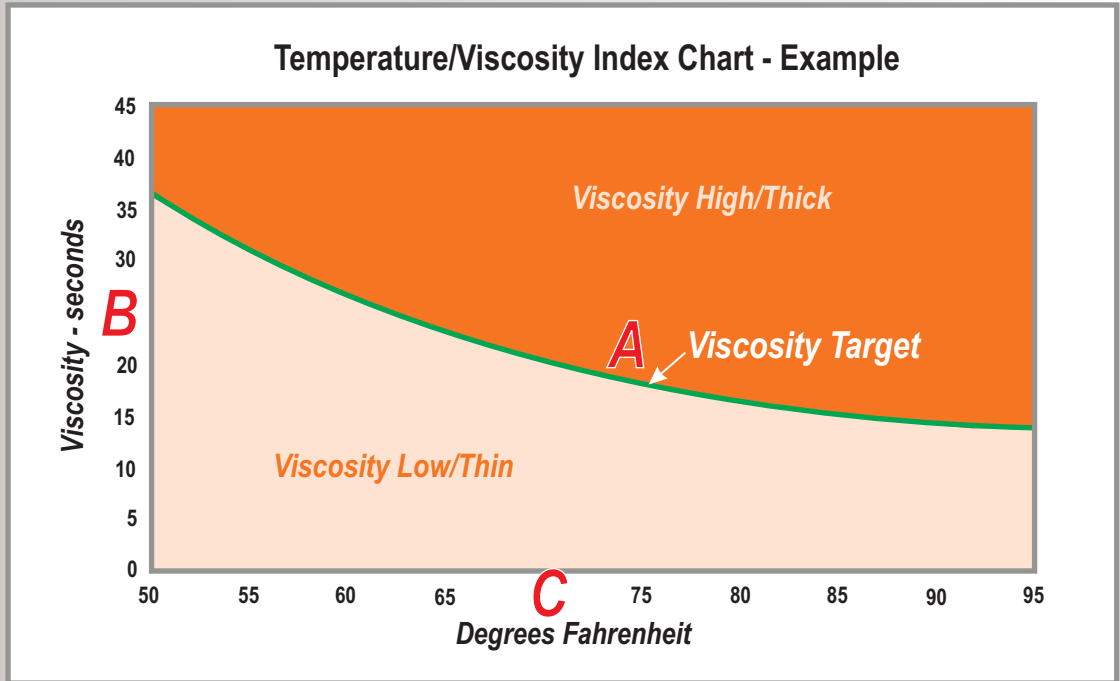
Temperature/ Viscosity Index Chart

The **Temperature/Viscosity Index Chart** is used to correlate the actual measured viscosity of the coating product with the desired/manufactured viscosity by using the measured values for temperature and viscosity. The chart contains a curve (**A**) which represents the desired/manufactured coating viscosity at a relative temperature. Since coating viscosity changes with temperature, the curve will represent a higher viscosity at lower temperatures and lower viscosity at higher temperatures. The vertical axis (**B**) represents the actual coating viscosity measurement in time/seconds and the horizontal axis (**C**) represents the actual/measured coating temperature. Using the actual viscosity and temperature values,

Testing Considerations - *continued*

**Temperature/
Viscosity Index
Chart**
(continued)

compare the actual coating viscosity to the desired/manufactured viscosity and determine if the actual coating viscosity is: within range, too high, or too low. The range (D) is typically +/-2 seconds from the target viscosity curve, creating an overall range of 5 seconds. If the actual coating viscosity is within the specified product target range, the coating is considered to be at an acceptable viscosity.



Viscosity Measurement

Measurement Procedure

- 1.) Remove coating container lid and thoroughly mix the coating to be tested.
- 2.) Measure the temperature of the coating using a thermometer/pyrometer and record.
- 3.) Inspect the Zahn #3 cup to be used for contamination of dried coating within the cup and drain-hole. Make certain cup and drain-hole are clean. Do not use any mechanical devices to clean the cup or drain-hole as scratches can alter the accuracy of the cup.
- 4.) Immerse the Zahn cup into the coating until it fills completely; the top of the cup should be below the surface of the coating.
- 5.) Make sure the coating inside of the Zahn cup does not contain foam. Air-bubbles in the coating will cause the measurement to be inaccurate.
- 6.) Slowly lift the Zahn cup from the coating, starting your timer as soon as the top of the cup breaks the surface of the coating. Hold the cup steady and perpendicular with no ambient air-flow effecting/disrupting the stream.
- 7.) Stop the timer when the coating stream breaks at the BASE of the cup.
- 8.) Record the time of the viscosity measurement in seconds. Repeat test if necessary to verify results.
- 9.) Clean the Zahn cup immediately with UV cleaner or IPA completely with a soft cloth prior to storing.

Viscosity Verification, Temperature/Viscosity Index Chart

- 1.) Select the appropriate CAC Temperature/Viscosity Index Chart by product viscosity letter designation and Zahn Cup number.
- 2.) Using the measured viscosity and temperature results, plot on the chart the actual coating viscosity.
- 3.) Compare the actual viscosity results with the target product viscosity curve, and determine if the actual viscosity is within the compliant range, or is "High/Thick" or "Low/Thin".

Heating Coating

In cases where run-ability/performance issues are encountered due to the coating being cold resulting in a higher-than-desired working viscosity, the temperature of the coating can be increased yielding a more suitable operating viscosity. Coating temperature can be increased by using the following:

- In-line heating element for the coating circuit
- Heated intermediate coating sump
- Drum heater/warmer

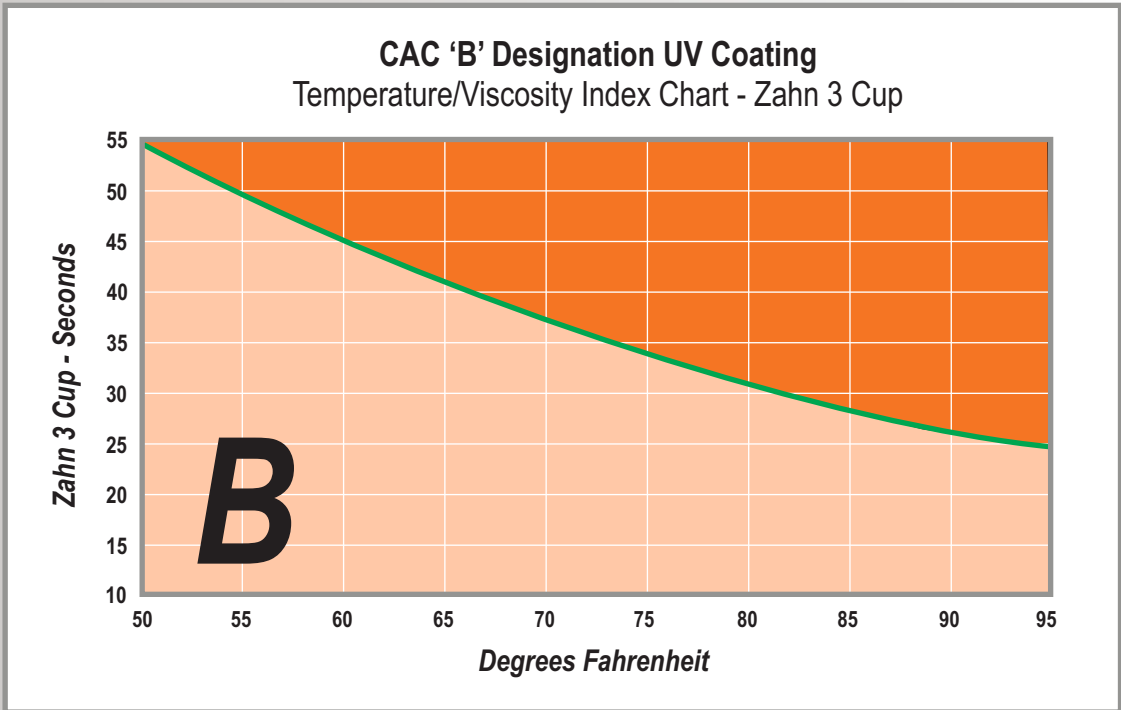
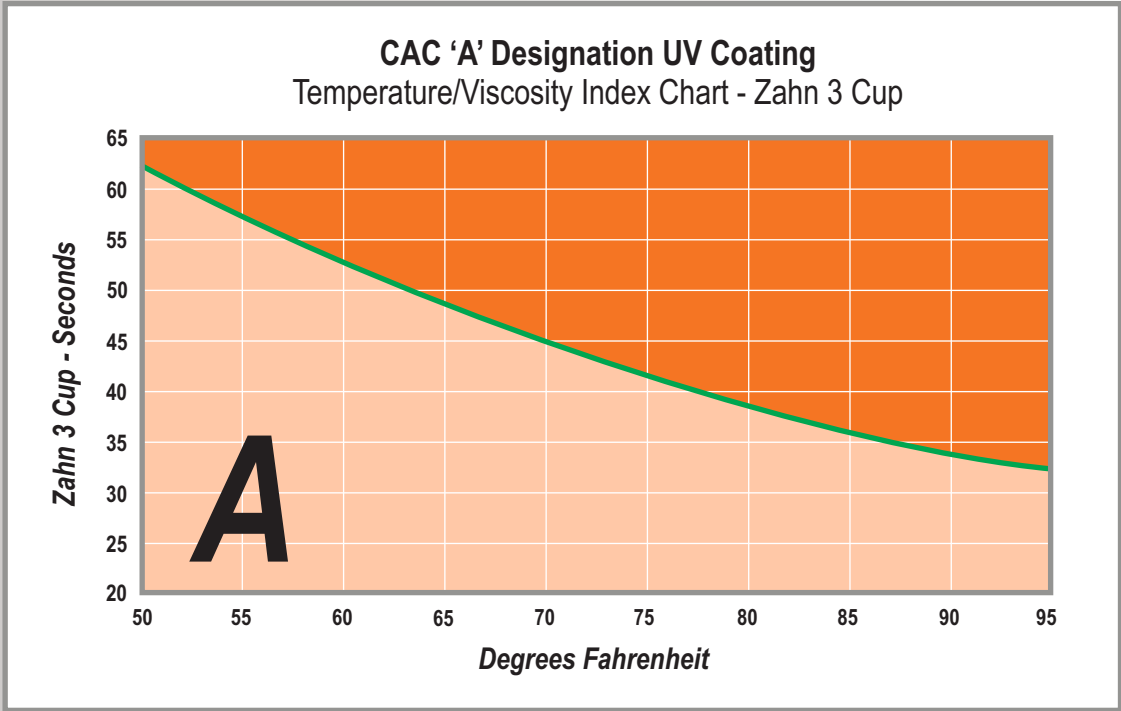
Below is a resource for coating heating systems to accommodate pail/drum/tote sized containers:

- Powerblanket; www.powerblanket.com

For optimum performance, a coating temperature >80F is recommended, but not to exceed 100F.

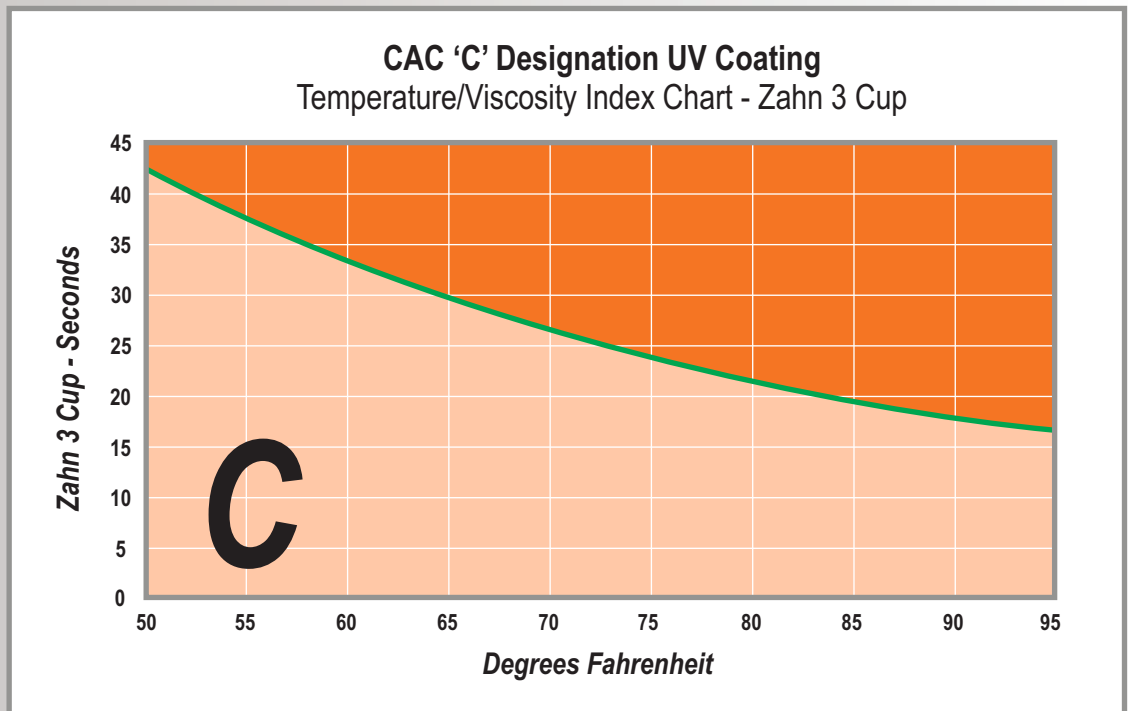
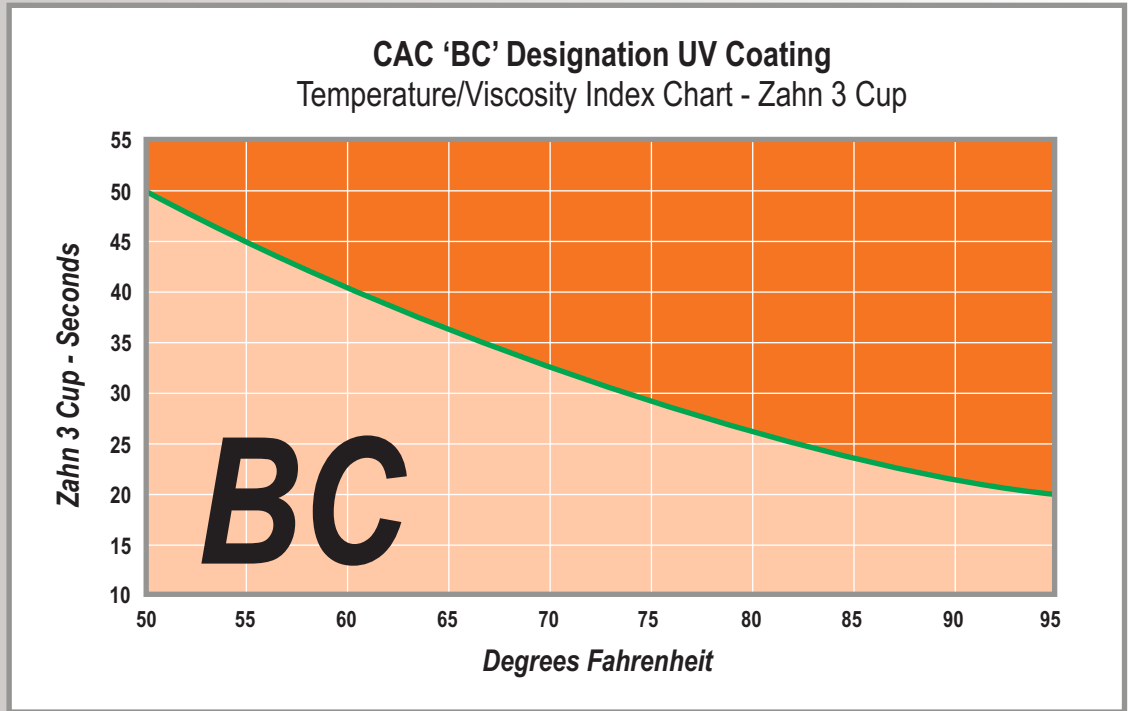
Temperature/Viscosity Index Charts

Temperature/
Viscosity Index
Charts



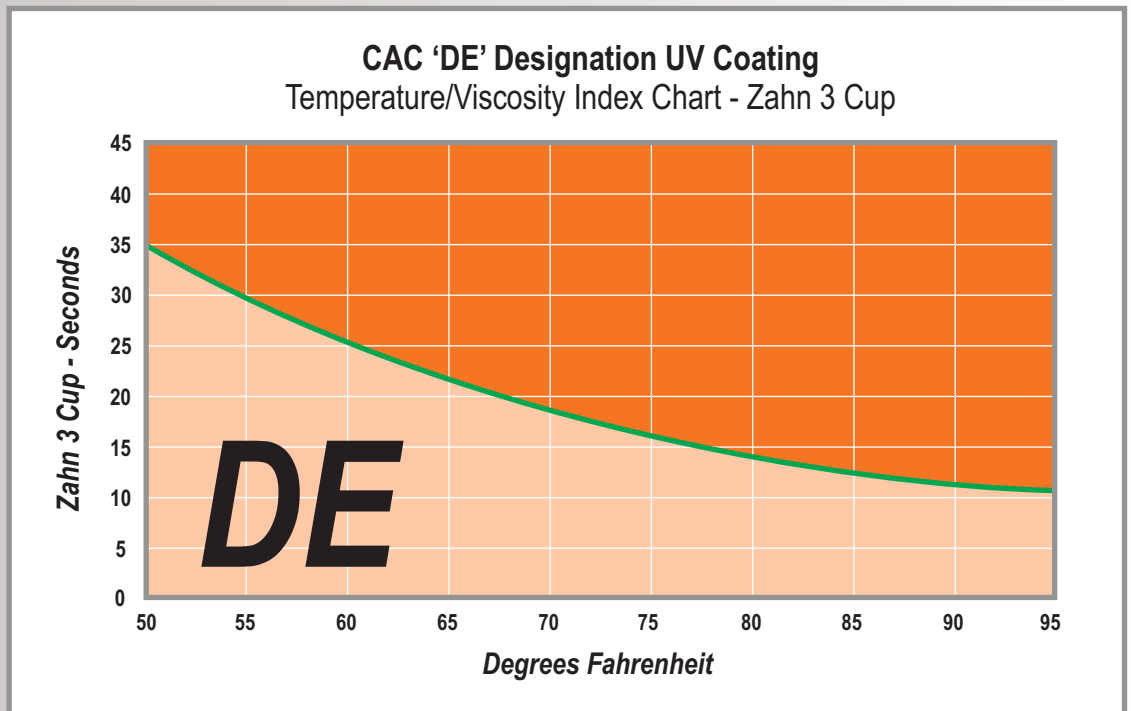
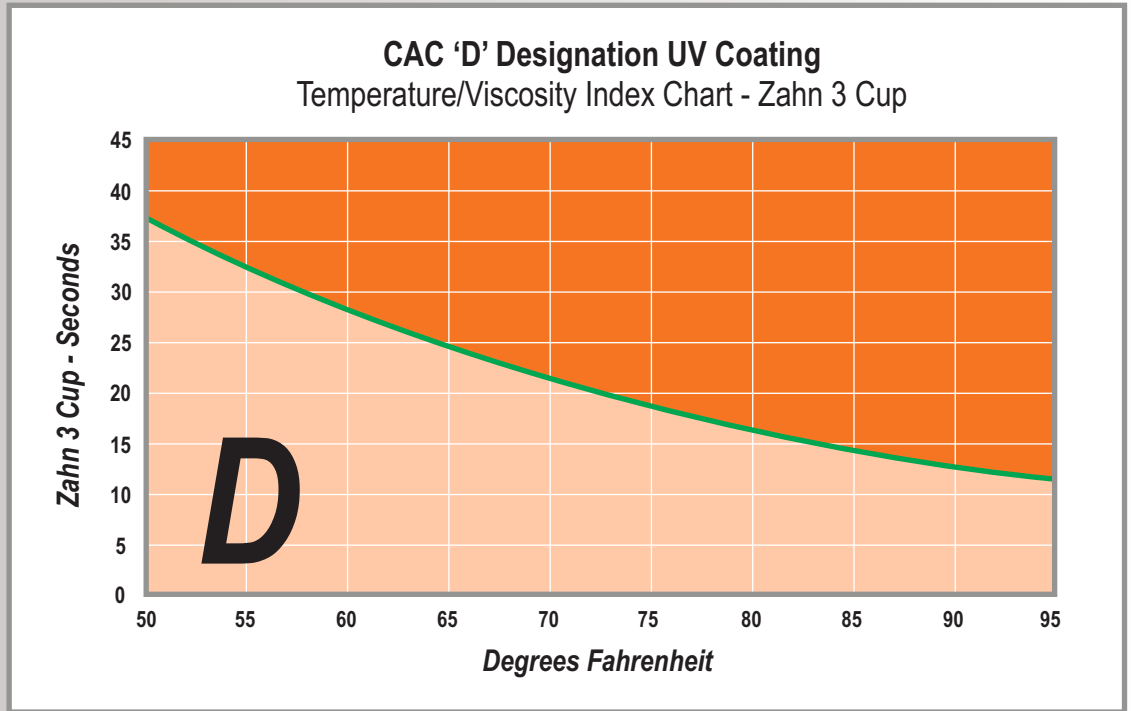
Temperature/Viscosity Index Charts - continued

Temperature/
Viscosity Index
Charts
(continued)



Temperature/Viscosity Index Charts - *continued*

Temperature/
Viscosity Index
Charts
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Temperature/Viscosity Index Charts - continued

Temperature/
Viscosity Index
Charts
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