STRESS CRACKING TEST FOR PLASTICS

Application

This procedure is used to determine the resistance of thermoplastic materials to stress cracking when they are used in direct contact with other materials, such as oil, grease, cleaners, flexible PVC and elastomers.

All amorphous materials (such as PC, PC/ABS ABS, SMA, ASA, PPO, PMMA) should be evaluated for potential incompatibility with other materials that they may come in contact with. For example, polycarbonate should be tested with grease used on fasteners; vinyl should be tested for compatibility with the substrate material they are covering. If in doubt, contact the Design and Release Engineer for a specific list of agents.

Apparatus Required

Mechanical Convection Oven

Conforming to ASTM E145 Type IIA normal oven or equivalent and capable of maintaining the specified temperature within +/- 1 °C.

Test Fixtures

Construct a mandrel from chemically inert materials such as wood or aluminum with the radius needed to achieve the required percent strain. The samples should be attached to the mandrel in a manner which will not interfere with the test results.

Source: Automate Industries Inc.
1906 Brinston
Troy, MI 48083
Phone: 248-740-7022
www.automateindustries.com

Stereo Microscope

20X magnification

AATCC Crockmeter Cloth (style 3)

80 x 84 thread count, combed cotton, desized, bleached (no optical brightener or finishing material present).

Source: Test Fabrics, Inc.
P.O. Box 26
415 Delaware Ave.
West Pittston, PA 18643
Phone: (717) 603-0432
www.testfabrics.com

Date	Action	Revisions	Rev. 05
2017 07 07	Revised	See Summary of Revisions	L. Schmalz, NA
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Procedure

1. Prepare Type 1A and 1B bars per ISO 527-2 or as agreed upon by the Ford Materials Engineer. A minimum of four tensile bars shall be prepared. In the instance of material suspected of exhibiting anisotropy, specimens should be obtained parallel and perpendicular to the "material flow" and should be identified as such.

2. Care should be taken to assure that the test fixtures are carefully cleaned prior to each test to avoid possible contamination from previous tests. Assemble the tensile bars in the test fixtures to achieve the 1% strain level (or as specified in the engineering document). The back of the samples should fully contact the test fixture to achieve the desired strain level.

4. Examine the samples throughout the gauge length for cracks using 20X on the stereo microscope (after application of stress, but prior to application of the chemical agent). This is to establish the initial strained condition.

5. Apply the chemical agent (within 2 hrs. of assembling the test bar onto the test fixture) to a minimum of three tensile bars. (Do not apply the chemical agent to one bar that will serve as the “control”).
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Liquid Chemical Agent (oil or cleaners)	2 pieces of cotton crock cloth should be placed on top of each other in the strained area of the test bar, and saturated with approximately 1 ml of the agent. Replenish every 24 hours with new crock cloth.
High Viscosity Chemical Agents (grease)	0.2 grams applied to the strained area of the test bar.
Flexible Chemical Agents (PVC or elastomer sheets)	Overlaid on the strained area of the test bar.

6. Expose the samples for 72 hours at 80 +/- 2°C. Expose the control sample in a separate oven in order to avoid contamination.

7. At the end of the test period, remove the chemical agent by wiping with a soft cloth or scraping. DO NOT USE A SOLVENT.

8. Allow the strained sample to condition for 1 h at 23 +/- 2°C and 50 +/- 5% relative humidity.

9. Using a stereo microscope, examine the strained sample for cracking and crazing at 20X magnification while the sample is still in the test fixture.

10. Report the chemical agent, amount, application frequency and the presence of cracking or crazing.

Bend Radii Required to Produce 1% Strain for 4.00 mm Thickness

Sample Thickness (mm)	% Strain	Radius (mm)
4.0	1	198

For other sample thicknesses, the following formula may be used to determine the correct radius:

$$R = \frac{T}{2} \times \left[\frac{100}{E} - 1\right]$$

Where R = radius
T = test sample thickness
E = % strain

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