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SURFACE VEHICLE RECOMMENDED PRACTICE

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(R) TEST METHOD FOR DETERMINING COLD CRACKING OF FLEXIBLE PLASTIC MATERIALS

1. ***Scope***—This SAE Recommended Practice is applicable for determining the cold characteristics of vinyl-coated fabrics and other automotive plastic materials, as applicable. It consists of three different methods for determining low-temperature properties of materials depending on type of material and end use.

2. ***References***—There are no referenced publications specified herein.

3. ***Method A, Mandrel Test***

3.1 Apparatus and Materials

3.1.1 MANDREL—Steel mandrel 152 mm in diameter and 6.35 mm long attached to a suitable stand. Other diameters may be specified depending on the thickness and rigidity of the material to be tested.

3.1.2 OVEN—Air-circulating oven capable of maintaining a temperature of 82 °C ± 2 °C.

3.1.3 COLD BOX—A cold box capable of maintaining a temperature of –34 °C and large enough to permit bending the test specimen while it remains in the box.

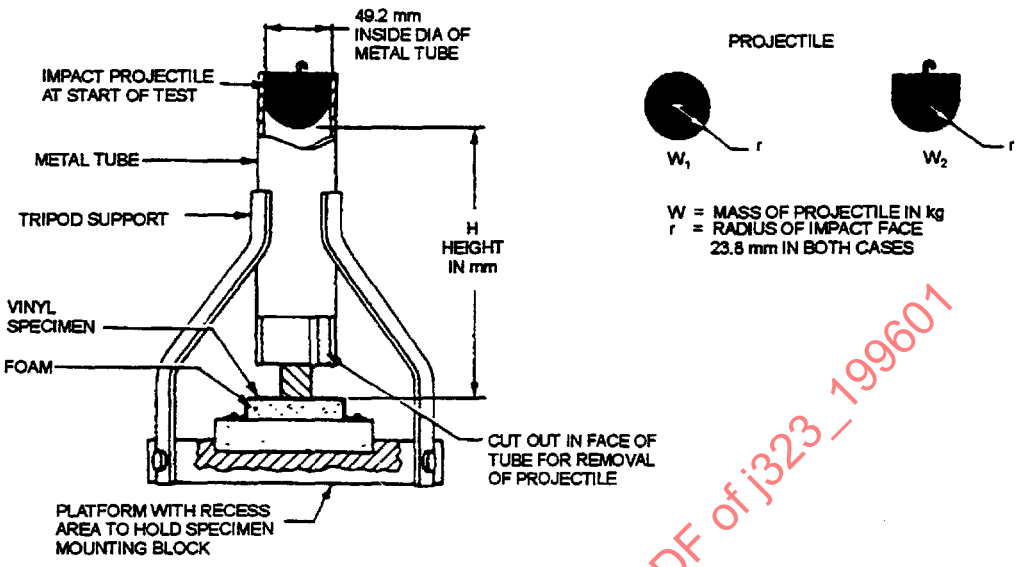
3.1.4 GLOVES—Heavy cloth gloves to prevent heat transfer when handling specimens.

3.2 Procedure—Cut 50 x 200 mm specimens in the machine and across machine direction and condition in the oven at 82 °C for 24 h or as specified. (The dimensions of the specimen may vary for extruded or molded parts.) Remove specimens from the oven and condition at room temperature to maintain equilibrium. Place specimens, gloves, and mandrel with stand in the cold box at –34 °C for 4 h or as specified. Put on gloves and grasp each end of the sample and bend, finish side out, 3.1 radians around the mandrel in approximately 0.5 s with a uniform motion. Remove specimens from cold box and examine visually for evidence of cracks.

4. ***Method B, Impact Test***

4.1 Apparatus and Materials

4.1.1 IMPACT TESTER—Impact tester capable of applying a 10.8 J impact with a spherical ball head having a radius of 23.81 mm. (See Figure 1.)



BOTH H AND W MAY BE VARIED AS LONG AS HW = 10.8 J AND H IS NOT LESS THAN 3.048 mm. DIMENSION r OF PROJECTILE MUST BE 23.8 mm AND IS NOT VARIABLE.

FIGURE 1—IMPACT APPARATUS

4.1.2 BASE—A 102 x 102 x 19 mm thick wood base with an 89 x 89 mm square marked off in the center for stapling specimen and a 76 x 76 mm square marked off for positioning urethane foam pad.[1]

4.1.3 OVEN—Air-circulating oven capable of maintaining a temperature of 82 °C ± 2 °C.

1 Unless otherwise specified, the foam base shall be either a urethane foam or a latex foam material.

The urethane material shall have the following load deflection characteristics: a load deflection at 25% of RT shall be 3.0 to 4.1 kPa and a load deflection of 8 to 18% at –29 °C when tested with a load of 2.59 kPa ± 0.07 kPa.

The latex material shall have the following load deflection characteristics: a load of 25% at RT shall be 2.482 to 3.103 kPa and a deflection of 37 to 47% at –29 °C when tested with a load of 2.59 kPa ± 0.07 kPa.

The specimen used for checking the –29 °C cold deflection property shall be 100 x 100 mm and preconditioned for a minimum of 12 h at –29 °C prior to testing.

NOTE—The wood and urethane foam base described previously was established primarily for vinyl-coated fabrics. Other plastic materials may require modifications in the base depending on the flexibility of the material to be tested.

4.2 Procedure—Cut a 100 x 100 mm specimen and age in the oven at 82 °C for 7 days (or as specified). Place a 75 x 75 x 19 mm thick urethane pad in the center of the wood base and attach the aged specimen to the base by stapling 6 mm from the edge of the specimen as indicated in Figure 2 (staples should be 7.9 mm minimum length). Place the specimen in the cold chamber at –29 °C for a minimum of 12 h (or as specified by the contractual parties). While still at –29 °C, the center of the test material shall be impacted with a force of 10.8 J. The height of the impactor shall be as specified between the user and supplier. Remove the specimen from the cold box and examine for cracks.

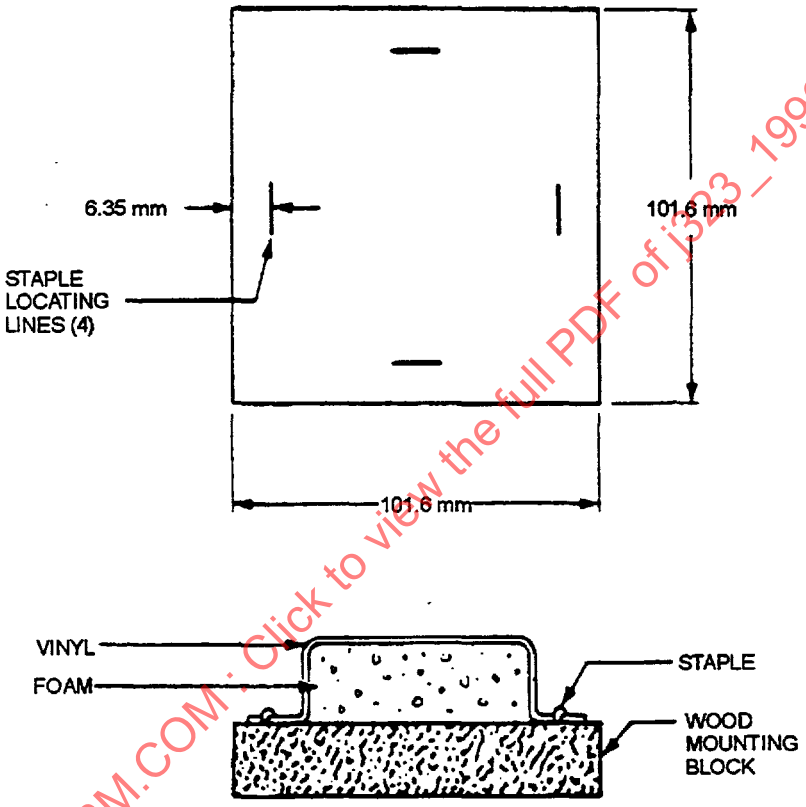


FIGURE 2—SPECIMEN AND SPECIMEN ON BASE

5. Method C, Dynamic Flex Test

5.1 Apparatus

5.1.1 COLD BOX—A cold box capable of maintaining a temperature of –29 °C and large enough to hold flexing equipment.

5.1.2 OVEN—Air-circulating oven capable of maintaining a temperature of 82 °C ± 2 °C.

5.1.3 FLEXING EQUIPMENT—Dynamic flex equipment with reciprocating motion (Figure 3).

5.2 Procedure—Cut four specimens 75 x 50 mm, two specimens having the long dimension in the warp direction and the remaining two having the long dimension in the filling direction. Condition two specimens (warp and filling directions) for 7 days at 82 °C ± 2 °C in an air-circulating oven followed by 4 h at –29 °C. Condition the remaining two specimens at –29 °C for 4 h. Clamp the two ends of the unaged specimens in the cold flex apparatus with the vinyl side facing out. Flex at –29 °C for 700 cycles at 90 cycles/min. Remove and examine for cracks. Flex the two aged specimens for 600 cycles. Remove and examine for cracks.

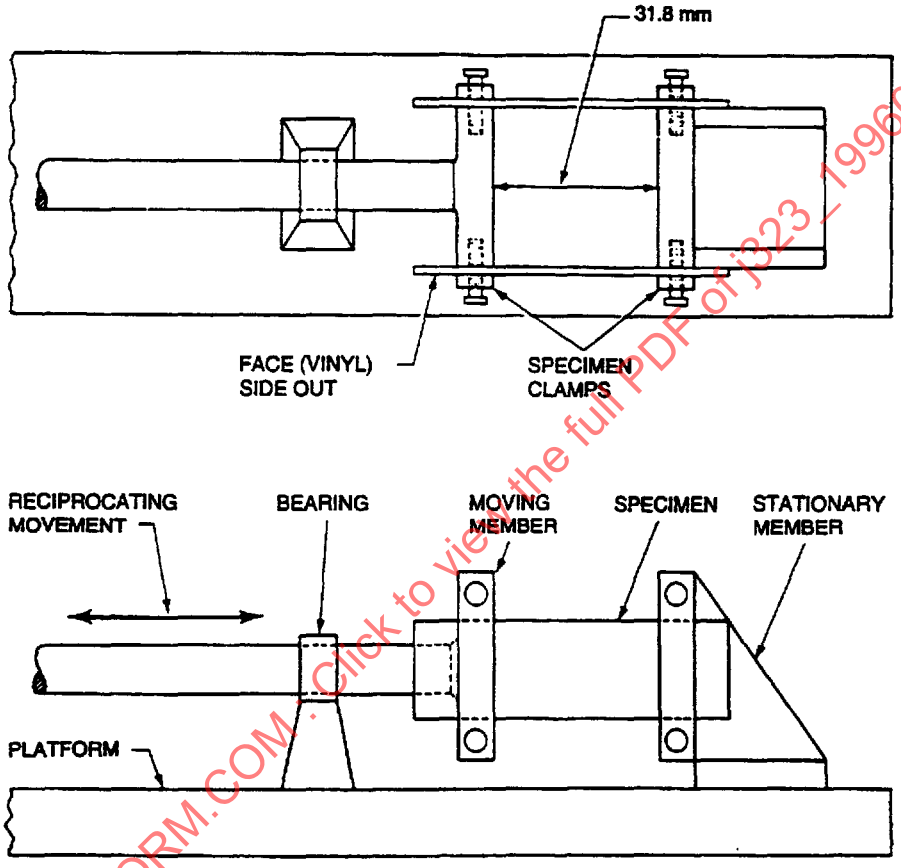


FIGURE 3—BASIC DETAILS OF COLD FOLD TEST APPARATUS

6. Notes

6.1 Marginal Indicia—The (R) is for the convenience of the user in locating areas where technical changes have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

PREPARED BY THE SAE TEXTILES AND FLEXIBLE PLASTICS COMMITTEE