

POLYMERIC MATERIALS - LOW TEMPERATURE FLEXIBILITY**Application**

This method is used to establish the low temperature flexibility of interior trim materials such as supported and unsupported vinyl's, genuine and simulated leathers, and rubber components such as hoses, fabric-reinforced and unreinforced diaphragms, weatherseals and other applications where the ability to flex at the minimum operating temperature without cracking is required.

Scope

This procedure is used to evaluate the effects of low temperature on flexible polymeric materials when bent 180 ° around a mandrel into a loop configuration while at low temperature. It may be performed on materials "as-received" and/or after any aging or preconditioning requirements indicated on the applicable Engineering Material Specification and Drawings. The bending of hoses is carried out on a specific fixture designed to overcome the problems of the very high effort required to bend some hoses manually. It also gives better control over the bending process and eliminates localized kinking of the hose.

Apparatus Required**Mandrels**

Of varying diameters and sufficient rigidity and a suitable support to facilitate rapid flexing of the material while in the cold chamber.

Hose-Bending Fixture

Refer to Figure 1. The fixture shall be capable of taking a wide range of interchangeable mandrels and shall be securely supported when placed in the cold chamber so that it does not move or topple during the bending of the hose.

Cold Chamber

Capable of maintaining a constant and uniform temperature of ± 2 °C of the temperature specified in the applicable Engineering Material Specification or Drawing. It should be top-opening to minimize the increase in internal temperature when accessed and be large enough to accommodate fixturing as well as providing room to work.

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2001 09 17	Revised	Editorial – no technical change A. Cockman
1996 05 31		

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Portable Temperature Probe and Indicator

Precision of ± 0.5 C; L.E.D. or L.C.D. temperature indicator with a lead wire of sufficient length to permit location of the indicator outside of the cold chamber.

Note: The probe is necessary only when the oven is not equipped with a precision temperature indicator.

Gloves

To permit handling of hot or cold parts and/or fixtures.

Conditioning and Test Conditions

All test values indicated herein are based on material conditioned in a controlled atmosphere of 23 ± 2 °C and 50 ± 5 % relative humidity for not less than 24 h prior to testing and tested under the same conditions unless otherwise specified.

Procedure

A. Materials and Parts (Other Than Hoses):

1. For thin sheet materials, prepare a 50 x 200 mm specimen; for soft materials (e.g. foams, cellular rubber), prepare a 25 x 200 mm specimen; for a thicker slab or for calendared materials, prepare a 12 x 200 mm specimen; for extruded products, cut a specimen of sufficient length to facilitate flexing about a mandrel.
2. Precondition the material according to the applicable Engineering Material Specification or Drawing for the prescribed time and temperature in a controlled environment.
3. Select a steel mandrel that is 10 times the material thickness (or 10 x the nominal outside dimensions if an extruded product) unless otherwise specified.
4. Place the test specimen, mandrel, and gloves in the cold chamber at the specified temperature and maintain for 24 h.

Note: Suspend the specimens so that there will be free circulation of air while conditioning in the oven or cold chamber. If the temperature control is in doubt, locate a temperature probe next to the specimen with a read-out instrument external to the chamber.

5. At the end of the exposure period, open the chamber and, using gloves, hold the specimen on the extreme ends and bend 180° as rapidly as possible around the mandrel while it is still in the chamber. To minimize temperature fluctuations in the chamber, avoid breathing into the chamber during the test.