Ford Motor Company

FORD LABORATORY TEST METHOD BI 107-01

CHIP RESISTANCE TEST FOR PAINTED PANELS

Application

This method is used to determine the chip resistance of painted panels and body parts and painted plastic panels and parts.

Apparatus Required

Gravelometer

The gravelometer (see Figure 1) consists of an elongated box with a hopper and nozzle system on one end and a slot for the insertion of a test panel on the other end. Steel shot is poured into the hopper where a stream of air propels the shot onto the test panel.

The nozzle-system consists, beginning from the main line air supply side of a 200 mm, 12.7 mm air inlet pipe with an inner diameter of 11.5 mm, a tee-piece to fix a pressure gage with a range of 0 to 1.6 bars, a 150 mm, 12.7 mm air inlet pipe with an inner diameter of 11.5 mm, and a nozzle which is exactly described in Figure 2.

To guarantee a laminar air stream during the test, all pipes have to be polished on the inner surface. From the inlet to the outlet of the air the inner diameter of the pipe system must be exactly 11.5 mm. The joint from the main line air pressure to the pipe has to be made by a 2 m, 25 mm metal hose.

The test air pressure will be adjusted by a ball cock. This cock is fixed behind the main line air pressure gage. This gage has a range of 0 to 16 bars, and it is used to control the static pressure at closed cock. During the test the flow pressure must be controlled by this gage all the time. A second gage of a range from 0 to 6 bars must be fixed immediately behind the ball cock. By this gage it is possible to control the pressure which is reduced only by the position of the cock.

All gages should be calibrated every six months. It is recommended to have a primary pressure of 7 bars. It is not permitted to deviate from the dimensions of these specified components.

Date	Action	Revisions
2001 03 14	Revised	Editorial – no technical change A. Cockman
1999 02 01		

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Source: Messrs. Erichsen
AM Iserback
14 D-58675 Hemer
Germany
Tel: 492-372-6431

Pearson-Panke Equipment Ltd.
1-3 Halegrove Gardens
London NW7 3LR
Tel: 181-959-3232
Fax: 181-959-5613

T.J. Bell Inc.
1340 E. House Ave.
Akron, OH 44310
Tel: (888) 393-4975
Fax: (330) 633-1977

Steel Shot

13.6 kg of SAE 780 shot with the following additional requirements:

Size: 100 % to pass through a No. 7 screen (2.8 mm)
100 % to be retained on a No. 10 screen (2.0 mm)

Shape: To be as near 100 % round as possible

Hardness: 90 % to be RC 42-48

Source: Messrs. Nolten
4200 Oberhausen
Europahaus
Germany

Barton Abrasives, Ltd.
George Henry Road
Great Bridge
Tipton, West Midlands DY4 7BS
England

Steel Test Panels

Steel body skin panels 100 x 300 x 0.1 mm (or suitable length for insertion into gravelometer), prepared according to the applicable Engineering Materials Standard.

Evaluation Standards

Ten black and white photographs as shown in Figure 3 through 12.

Source: Central Laboratory
Ford-Werke AG
D50725 Koln
West Germany

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Calibration of the Gravelometer

For calibration of a gravelometer a master nozzle and specially prepared calibration panels are required. These panels prepared with three different test enamels which give after shot: rating 10, rating worse than 1 with particular chipping of enamel, and rating worse than 1 with complete chipping, the panels can be obtained from a Global Paint Engineering Laboratory. The GPE Laboratory, Cologne is in possession of the master nozzle which can be obtained on request for the calibration exercise.

The calibration panels will be tested per Steps 2 through 5 of the procedure as outlined below in the gravelometer to be calibrated. After the procedure replace the complete nozzle system with the master nozzle and repeat the test.

If the corresponding panels of both series are equivalent in appearance, the gravelometer may be considered standardized.

Note: If it is not possible to achieve equivalent appearance in spite of pressure adjustments according to Step 4 of the procedure, the procedure system must have a defect or the inner surfaces of the nozzle system are worn out and the failed part must be replaced.

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

1. Prepare the test panels with the paint to be tested as specified by the applicable Engineering Material Standard. Test results are extremely sensitive to total paint film thickness. Thickness determination shall be made on each part tested per FLTM BI 117-01 and recorded.

2. After aging mask off 7.5 cm on each end of the panel and insert the part into the gravelometer as shown in Figure 1. There should be 10 - 15 mm of the upper edge showing above the top of the holder.

3. Pour 13.6 kg of shot retained on the No. 10 screen into the hopper with the plug in place.

4. Main line air supply should be at 7 bars prior to and 4.8 - 5.0 bars during the test. Open the line valve and adjust so that air flow through flowmeter indicates a volume of 2.26 m^3/minute (0.038m^3/s). Note the open line pressure at the indicating gage. This pressure should be 0.5 bar.

5. Pull the plug allowing the shot to fall into the air stream. When the panel has been abraded with the full 13.6 kg of shot, shut off the valve, remove the panel, rinse in warm water and blot dry.

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Evaluation

Compare the test panel with the standards in Figures 3 through 12 and report the number of the closest comparison panel or evaluate as required by the applicable Engineering Materials Specification.

Chemicals, materials, parts, and equipment referenced in this document must be used and handled properly. Each party is responsible for determining proper use and handling in its facilities.

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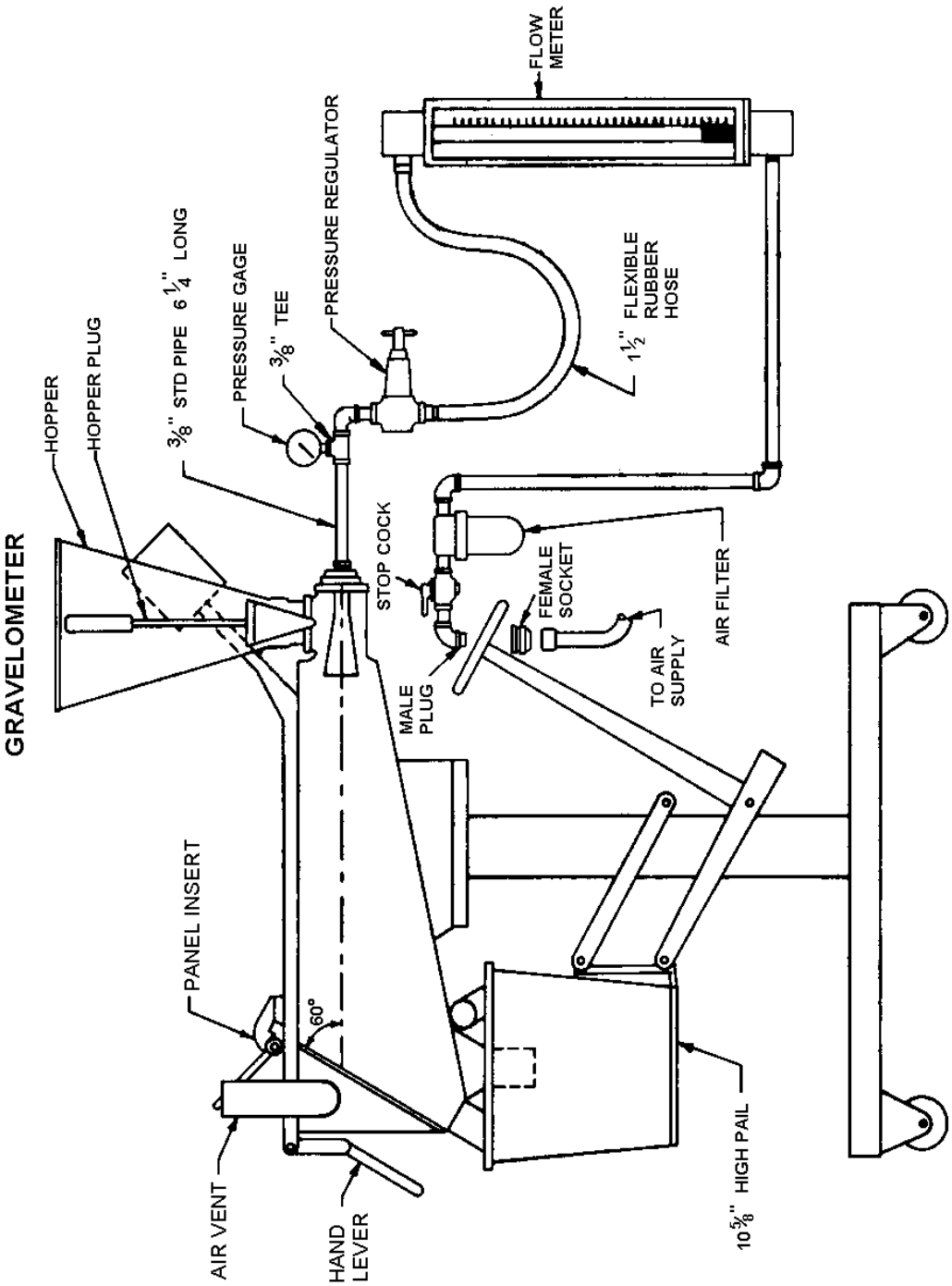

Figure 1

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