

NDE PROCEDURE	P & B TESTING, INC. Destructive and Nondestructive Testing	PROCEDURE: PB-3000
		REVISION: A1
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		Issue Date: 12/30/99
SUBJECT: LIQUID PENETRANT TESTING		

1.0 PURPOSE

1.1 To provide a general procedure to be used by P & B TESTING, Inc. for the testing of ferromagnetic and non-ferromagnetic materials for surface discontinuities by means of Liquid Penetrant Examination.

2.0 APPLICATION

2.1 This procedure applies to all persons involved in the Liquid Penetrant Examination of materials by P & B TESTING, Inc.

3.0 REFERENCE SPECIFICATIONS

3.1 ASTM E165, latest revision.

3.2 ASNT SNT-TC-1A, latest revision.

4.0 PERSONNEL

4.1 Personnel shall be qualified in accordance with P & B TESTING, INC. Procedure PB-4000, and ASNT SNT-TC-1A, to maintain a minimum of Level II.

5.0 MATERIAL

5.1 Penetrant

5.1.1 Sensitivity of the penetrant materials shall be in the area of medium to high sensitivity depending upon the type of material and surface condition of the material to be examined.

5.1.2 Penetrant selection such as color contrast, fluorescent, water-washable, post emulsifying or solvent removable shall be based upon the location of the part, size of part and surface condition of part.

5.1.3 Unless otherwise specified by the customer any proven brand name penetrant is acceptable for this procedure.

5.1.4 Intermixing penetrant materials from different families or manufacturers is prohibited.

5.2 Developer

5.2.1 Can be of the aqueous or non-aqueous type, wet dip, spray or the dry powder type.

5.2.2 Unless otherwise specified by the customer any proven brand name developer is acceptable for this procedure.

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5.3 Cleaner/Remover

5.3.1 Cleaning agents which may be used are detergents, organic solvents, descaling solutions and paint removers.

5.4 All penetrants, developers and cleaning solutions used shall not exceed a sulphur content of 1%, by weight or halogen content of 1%, by weight.

6.0 SURFACE PREPARATION

6.1 The surface(s) to be examined and all adjacent areas within at least one (1) inch shall be dry and free from dust, grease, paint, welding slag or spatter or other foreign matter which could mask imperfections or interfere with the testing.

6.2 The surface to be tested should be "smooth" and free from coarse machining or grinding marks which could trap dye and/or hinder the cleaning operations.

6.3 After pre-cleaning of parts with cleaning agents listed in section 5.3.1, parts shall be allowed to air dry for a minimum of 2 minutes, before the application of penetrant.

7.0 PROCEDURE

7.1 Temperature of Parts: During inspection the surface temperature shall be between 60 deg. F and 120 deg. F.

7.2 Penetrant may be applied by dipping, brushing or spraying. Care is to be taken to insure no pools of penetrant forms on the part.

7.2.1 The penetrant or dwell time shall be at least five (5) minutes for castings or welds and at least ten (10) minutes for forgings, plates, tubular products or fittings but not more than one (1) hour.

7.2.1.1 If penetrant dwell time exceeds (1) hour or during an lengthy dwell time the penetrant characteristics are affected as evidenced by difficulty in removing excess penetrant, the penetrant shall be reapplied for the original dwell time.

7.2.2 After the required penetration dwell time, excess penetrant remaining on the surface shall be removed by the methods for each type penetrant as detailed below.

NOTE: Care should be taken not to wash penetrant from any wide, shallow discontinuities which may be present.

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7.2.2.1 Excess water-washable penetrant shall be removed with a water spray not to exceed 40 psi and a temperature not higher than 110 deg. F.

7.2.2.2 Excess post emulsifying penetrant shall, after emulsification, be washed with a water spray not to exceed 50 psi or 100 deg. F.

NOTE: Emulsification times are to be as recommended by the manufacturer.

7.2.2.3 Excess solvent removable penetrant shall be removed by wiping with an absorbent cloth or paper. Remaining penetrant will be removed by wiping with an absorbent cloth or paper which has been lightly moistened with cleaner.

NOTE: Under no circumstances will spraying or flushing of solvent directly on the surface be acceptable.

7.3 Surfaces which have been water-washed that require either a dry or non-aqueous developer shall be dried by blotting or by using circulating warm air provided the surface of the part is not raised above 125 deg. F.

7.3.1 Aqueous developer may be applied to either a wet or dry surface and shall be dried by circulating warm air.

7.3.2 When using the solvent removable method the surface(s) may be dried by normal evaporation, blotting, wiping or forced air.

7.4 Dry developer may be applied by soft brush, powder bulb or a powder gun. Other methods may be used provided the powder is dusted evenly over the entire surface.

NOTE: With color contrast penetrant a wet developer only must be used. Fluorescent penetrants may be developed with either wet or dry developers.

7.4.1 Wet developer (water solutions or suspensions) shall be applied by dipping, brushing or spraying a thin coating on the surface of the part.

7.4.1.1 Solvent suspensions shall be applied by spraying whenever possible. If necessary, solvents suspensions can be applied by brushing.

7.4.1.2 Drying time may be decreased by using warm circulating air so long as the surface temperature of the part is not raised above 125-F degrees.

7.5 Maximum time intervals for the developer application after penetrant removal shall be immediately after the excess penetrant has been removed from the part surface, prior to drying in the case of aqueous developers, and immediately after the part has been dried for all other developer forms.

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8.0 EXAMINATION

8.1 The surface of the part(s) shall be examined immediately after application of the developer so as to detect the nature of indications which may bleed out profusely.

8.1.1 Final examinations shall be made after allowing the penetrant to bleed out from seven (7) to thirty (30) minutes.

8.1.2 Larger parts which cannot be completely examined within the required time shall have only portions examined at one time.

8.2 When using color contrast penetrant discontinuities are indicated by bleed out of what is normally a deep red color which stains the uniform white coating of developer.

8.2.1 Excessive cleaning may cause indications to have a light pine color.

8.2.2 Inadequate cleaning may leave an excessive background which could mask indications.

8.2.3 Proper illumination of the part surface is required to insure detection of all discontinuities.

8.3 When fluorescent penetrant is used the examination shall be conducted in a darkened area using filtered "black light" the intensity of which shall be checked at least once every eight (8) hours or when the location is changed.

8.3.1 The black light shall be checked by using a meter which is sensitive to light in the ultraviolet spectrum, at the work surface. Centered on 3650 A, two (2) readings shall be taken, the first without the filter and the second with the filter covering the sensing element of the meter. The second reading is deducted from the first and the difference shall be a minimum of 1000 W/CM².

NOTE: Not less than five (5) minutes shall be allowed for the bulb to warm up before taking these readings.

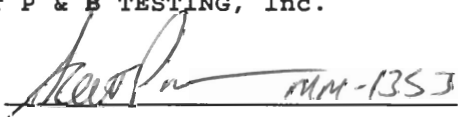
9.0 EVALUATION OF INDICATIONS

9.1 Mechanical discontinuities at the surface shall be indicated by bleeding out of the penetrant however localized imperfections may occur due to machining marks, surface conditions or an incomplete bond between base metal and cladding may produce similar indications which are not relevant to the detection of unacceptable discontinuities.

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- 9.2 Any indication in excess of the acceptance criteria, which is believed to be non-relevant, shall be regarded as a defect and shall be re-examined to verify whether or not actual defects are present. Surface conditioning may precede the re-examination.
- 9.3 Relevant indications are these which result from unacceptable mechanical discontinuities. Linear indications are those indications in which the length is more than three times the width. Rounded indications are indications which are circular or elliptical with the length less than three times the width.
- 10.0 ACCEPTANCE CRITERIA
- 10.1 Acceptance criteria shall be provided by the customer and become an appendix to this procedure.
- 11.0 POST CLEANING
- 11.1 After inspection of parts are complete, parts will be cleaned with solvents or detergents to insure complete removal of penetrant material.
- 12.0 REPORTS
- 12.1 After completion of the liquid penetrant examination the inspector shall completely fill out the Liquid Penetrant Examination Report (See Exhibit 1).
- 12.2 Reports shall be retained in accordance with the customers requirements but not less than five (5) years.
- 13.0 CONCURRENCE
- 13.1 This NDE Procedure has been reviewed and is hereby released for contract inspection.

For P & B TESTING, Inc.

By:  MM-1353 Date: 12/30/99

Scott P. Powers, SNT Level III