



Designation: E1135 – 19 (Reapproved 2024)

Standard Test Method for Comparing the Brightness of Fluorescent Penetrants¹

This standard is issued under the fixed designation E1135; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method describes the techniques for comparing the brightness of the penetrants used in the fluorescent dye penetrant process. This comparison is performed under controlled conditions that eliminate most of the variables present in actual penetrant examination. Thus, the brightness factor is isolated and is measured independently of the other factors which affect the performance of a penetrant system.

1.2 The brightness of a penetrant indication is affected by the developer with which it is used. This test method, however, measures the brightness of a penetrant on a convenient filter paper substrate which serves as a substitute for the developer.

1.3 The brightness measurement obtained is color-corrected to approximate the color response of the average human eye. Since most examinations are done by human eyes, this number has more practical value than a measurement in units of energy emitted. Also, the comparisons are expressed as a percentage of some chosen standard penetrant because no absolute system of measurement exists at this time.

1.4 The measurements made by this standard compare the brightness of a candidate penetrant to that of a standard penetrant when tested according to the technique. There is no known correlation between the results obtained and the brightness of actual flaw indications obtained using the penetrant in inspection.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.03 on Liquid Penetrant and Magnetic Particle Methods.

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2. Referenced Documents

2.1 *ASTM Standards:*²

E1316 Terminology for Nondestructive Examinations

3. Terminology

3.1 *Definitions:*

3.1.1 Definitions of terms applicable to this test method may be found in Terminology E1316.

4. Summary of Test Method

4.1 Simulated indications are prepared by impregnating filter paper with a specified quantity of the penetrant under test. The samples and similarly prepared standards are then measured in a fluorometer equipped to excite the penetrant with near ultraviolet (UV-A) light and respond to color approximately as does the human eye under the conditions encountered during a normal examination. The fluorometer must be equipped with a special sample holder to accept the samples employed.

4.2 The sample test results are not indicative of the total system performance but are convenient as a lot acceptance test, and to monitor the condition of in-use penetrant compared to an unused sample. A known amount of penetrant is diluted with a specified amount of a volatile solvent, pieces of filter paper are soaked in the mixture, the papers are dried under specified conditions at room temperature, placed in the sample holder, and measured with the fluorometer.

5. Significance and Use

5.1 The principle use of this procedure is for the comparison of the brightness between batches of fluorescent penetrants compared to a specified standard, as a batch quality control test.

5.2 The procedure is also utilized in monitoring the brightness of an in-use penetrant against the brightness of the unused sample of the same material.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



FIG. 1 Sample Drying Racks and Holders

5.3 The significance of the results are not absolute values but rather relative comparisons at a point in time, by a particular laboratory or operator on the specified fluorometer.

6. Apparatus

6.1 *Filter Paper*, a good quality chromatography paper such as Whatman #3 mm chromatography paper or Whatman #4. Sample papers should be prepared by cutting them from the chromatography paper to fit on the fluorometer sample holder. Sample papers prepared in advance should be placed in a desiccator for storage.

6.2 *Pipets*, 1 mL capacity.

6.3 *Volumetric Flasks*, glass with stopper, 25 mL.

6.4 *Beaker*, glass, 50 mL.

6.5 *Paper Drying Holders*—See Fig. 1. “Crocodile” type clips or equivalent and a fixture to hang clips.

6.6 *Volatile Solvent*, Acetone, Methanol, Methyl Ethyl Ketone, Methylene Chloride, or Isopropanol; technical grades (free of any fluorescence) are sufficient for this procedure.

6.6.1 Solvent used must dissolve both the test sample and the standard, completely evaporate in 10 min at room temperature, and not degrade the filter paper.

6.7 *Desiccator*, large enough to hold precut sample papers (6.1).

6.8 *Silica Gel*, for use as desiccant.

6.9 *S-291 Fluorometer*³

7. Sample Preparation

7.1 *Sample Preparation*—A set of four papers of the standard material and four papers of the test material must be prepared; mark papers accordingly with pencil.

7.1.1 Pipet 1.0 mL of chosen standard penetrant into a 25 mL stoppered volumetric flask. Pipet 1.0 mL of test penetrant into a 25 mL stoppered volumetric flask.

7.1.2 Fill flasks to line with chosen solvent, stopper, and mix.

7.1.3 Pour standard penetrant solvent mixture into a 50 mL beaker and test sample mixture into another 50 mL beaker.

7.1.4 Using forceps, dip four papers one at a time, into beaker, withdraw by drawing across the lip of the beaker to remove excess liquid, and clip into paper drying holder. Clip shall cover as small an area of paper as possible. All papers should be oriented in the same direction vertical or horizontal, and not in contact with anything other than the drying clip. Do not delay this preparation, as the liquid in the beaker may evaporate increasing the concentration.

7.1.5 Allow papers to air dry for 8 min to 12 min at room temperature. See Fig. 1 for samples of paper drying holders or racks.

8. Procedure for the Model S-291

8.1 *S-291*—See Fig. 2. Typical set up for brightness test, showing S-291, sample holder, solvent, cut papers, beakers, brightness standard, test samples, and paper drying rack.

8.2 Turn on the instrument and allow a 10 min to 15 min warm up.

8.3 Under UVA, compare the papers treated with the standard penetrant and choose one of the brightest to set up the instrument.

8.4 Place the chosen paper in the sample holder, and insert the holder into the sample port of the photofluorometer.

8.5 Adjust the meter response to 80 by turning the “CAL” adjustment knob.

8.6 Remove the sample holder, and replace the fluorescent paper with an untreated blank paper and re-insert into the instrument.

8.7 Adjust the meter response to zero (0) by turning the “Zero” adjustment knob.

8.8 Remove the sample holder and replace the blank paper with the fluorescent setup paper and re-insert the sample holder into the instrument. Repeat steps 8.5, 8.6, and 8.7 twice to stabilize the instrument readings. Skip 8.8 the second time.

8.9 Remove the blank paper and begin recording paper values, alternating between standard papers and sample papers to minimize effect of any instrument drift that might occur.

9. Calculation

9.1 Calculate the fluorescence of the test material as a

³ The sole source of the S-291 known to the committee is NDT Italiana SAS of Viale Monza, Italy. If one is aware of alternative suppliers or instruments for this application it is requested that this information be provided to ASTM Headquarters.