Designation: F767 – 98 (Reapproved 2013)

Standard Test Method for Image Stability of Chemical Carbonless Paper to Light[1]

This standard is issued under the fixed designation F767; 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 covers the determination of the image stability of chemical carbonless paper by exposure to fluorescent light for a controlled time period. Stability to light is determined by visual comparison between exposed and unexposed samples.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, and Related Product (Withdrawn 2010)[3]

F221 Terminology Relating to Carbon Paper and Inked Ribbon Products and Images Made Therefrom

F497 Practice for Use of the Electric and Electronic Typewriter as a Test Instrument

F549 Terminology Relating to Carbonless Copy Products

3. Summary of Test Method

3.1 Carbonless paper to be tested and previously tested control paper are selected and prepared for imaging. The test samples and control shall be imaged during the same time period with the same imaging device and pressure settings. Images are produced either on the coated front (CF) surface of CF paper or on the CF surface of the coated front and back (CFB) paper. A portion of the image area for each test sample and control is exposed to fluorescent light for a controlled period of time. Image stability to light is determined by visual comparison of exposed and unexposed imaged areas of the same sample to exposed and unexposed imaged areas of a control paper. Comparisons are made by establishing an image-stability ranking order.

4. Significance and Use

4.1 This test method is a comparative test for determining the relative image stability of chemical carbonless paper samples.

4.2 The light source used simulates that of an office environment, while accelerating image fade.

5. Interferences

5.1 Test results will depend upon image intensity and the imaging method. The greater the pressure of the imaging device, the greater the amount of reactive material transferred, and the greater the intensity of the image. Fade resistance is generally increased when the intensity is high. Also, all carbonless papers do not exhibit the same reactive material transfer efficiency with different imaging devices. Therefore, the imaging device used should ideally be the same as that on which the paper that is used in the final application. If this is not possible, a commercial office electric typewriter set in accordance with Practice F497 (maximum impact pressure without embossing) should be used.

5.2 The image produced on carbonless paper is a result of the interaction of the coated back (CB) and coated front (CF) surfaces. The light stability of the image is thus a function of both coatings. Although the images on the CF surface are exposed to light with this method, what is actually being tested is the light stability of the CB-CF combination. Therefore a CB paper is tested in combination with a CF paper, and vice versa; a coated front and back (CFB) paper is tested separately with a CB paper and a CF paper to evaluate both surfaces.

5.3 Only the images from the same combinations of coated papers should be compared (CB-CF; CB-CFB; CFB-CF; CFB-CFB) since one side of most chemical carbonless papers is affected by light more than the other.

[1] This test method is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.06 on Carbonless and Thermal Imaging Products.

Current edition approved April 1, 2013. Published April 2013. Originally approved in 1982. Last previous edition approved in 2008 as F767 – 98 (2008). DOI: 10.1520/F0767-98R13.

[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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

5.4 Any variation in light intensity or in the ambient conditions of temperature or humidity, or both, could affect the results. Observe the manufacturer's recommendations for lamp life.

5.5 Testing differences between test facilities using replacement lamps may result in ranking differences due to differences in spectral output.

6. Apparatus

6.1 *Commercial Office Typewriter,* set in accordance with Practice F497, or other imaging device as explained in 5.1.

6.2 *Light-Exposure Cabinet,* constructed as follows (see Fig. 1):

6.2.1 *Cabinet,* built from ½-in. (13-mm) plywood. It should have exterior dimensions of 21-in. (533 mm) width by 11¾-in. (298-mm) height by 13-in. (330-mm) depth. The front panel should be hinged to provide a door for inserting and removing test specimens. A 21-in. (533-mm) width by 3½-in. (89-mm) height by 11¾-in. (298-mm) depth cabinet base is recommended to provide easy door movement on a flat table. The interior of the cabinet should be painted with a flat white paint.

6.2.2 *Unshielded Fluorescent Light Fixtures,* three 120-V, 60-Hz, with rapid start ballasts should be installed in the top of the cabinet interior. The fixtures should be equipped with F15T12 cool white fluorescent tubes. Mount the fixtures and tubes parallel to and across the 21-in. (533-mm) dimension of the cabinet, and center 3¾ in. (95 mm) apart. The rear fixture should be ¾ in. (19 mm) from the rear of the cabinet, and the front fixture 1 in. (25 mm) from the front of the cabinet.

6.2.3 *Single-Pole Single-Throw Switch,* 10-A, 120-V, installed outside the right side of the cabinet and wired to the lamp fixtures.

6.2.4 *Blower,* 120-V, 60-Hz, rated at 15 c ft^3/min (free air) minimum mounted outside the left side of the cabinet to provide cooling to prevent heat buildup from the lamps. Cut a hole the size of the blower outlet through the cabinet panel to allow air into the cabinet interior. Mount the blower at the center of the panel.

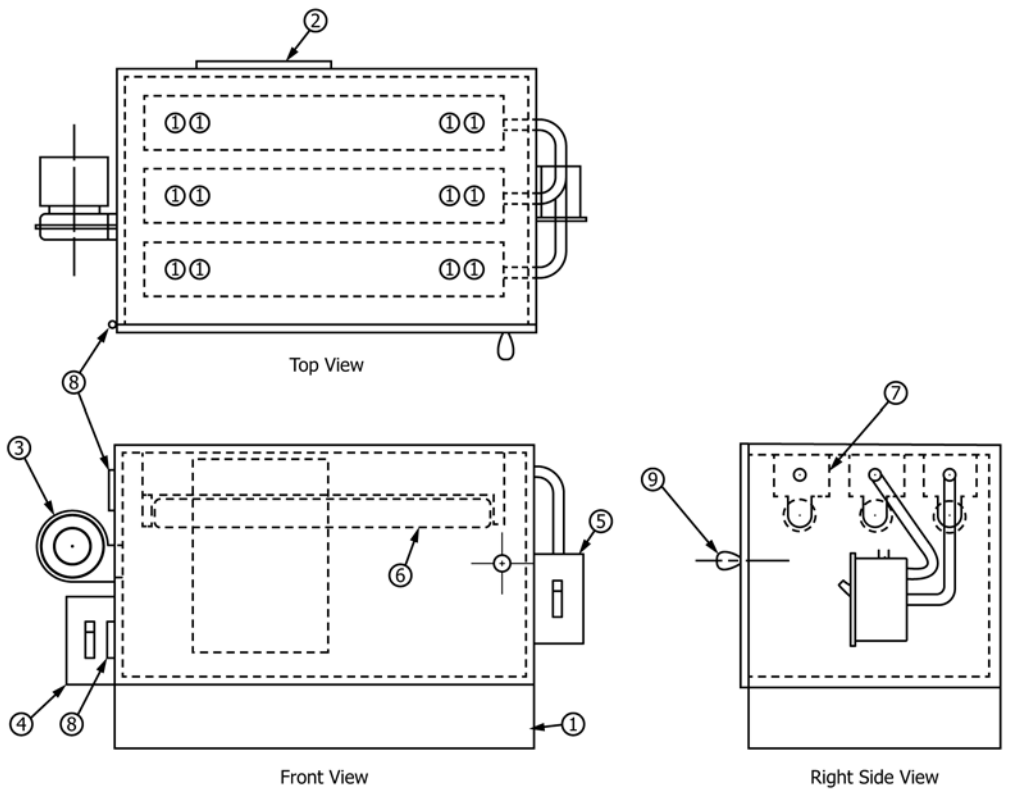
6.2.5 *Single-Pole Single-Throw Switch,* 10-A, 120-V, mounted directly under the blower.

6.2.6 *Exhaust Vent,* 6 by 10-in. (152 by 254-mm), constructed on the left side of the rear panel.

6.2.7 All electrical accessories should be wired to a 120-V a-c service cord with ground. A15-A, 120-V slow-blow fuse should be installed in line with the service cord.

7. Materials

7.1 *Sheets of Paperboard,* 8½ by 11-in. (216 by 279-mm), made from recycled paper stock and commonly referred to as



1. Base
2. Exhaust vent
3. Shaded pole blower
4. Fan switch
5. Light switch
6. F15T12 cool white fluorescent tube
7. Unshielded fluorescent fixtures
8. Door hinges
9. Door knob

FIG. 1 Light Exposure Cabinet

"chipboard." Plain 20 point chipboard with an approximate basis weight of (376 g/m^2) is recommended. Sheets of other completely opaque materials that are poor heat conductors and do not interact with the CF and CB coatings may be substituted for chipboard.

7.2 Previously tested carbonless papers to serve as controls and test references.

8. Sampling

8.1 Sample the carbonless paper to be tested in accordance with Practice D585.

9. Test Specimens

9.1 The test specimens shall be 8½ by 11-in. (216 by 279-mm) sheets of the CF, CB, and CFB carbonless papers. The 11-in. dimension should be parallel to the machine direction of the paper.

9.2 For each CF test sheet, select an 8½ by 11-in. (216 by 279-mm) sheet of CB carbonless. The CB sheet used should, if possible, be the same as that manifolded with the CF test sheet in its final application. If this is not possible, use the CB sheet recommended by the CF paper manufacturer. Similarly for each CB test sheet, select a CF sheet under the same conditions as above.

9.3 Each CFB test sheet requires a CF and a CB sheet. When imaging from the CB surface of the CFB test sheet, place a CF sheet underneath the CB surface with the CF surface of the CF sheet in contact with the CB surface of the CFB test sheet. When imaging onto the CF surface of the CFB test sheet, place a CB sheet on top of the CFB test sheet with the CB surface of the CB sheet in contact with the CF surface of the CFB test sheet. The types of CF and CB sheets used with the CFB test sheet follow the same conditions as noted in 9.2.

10. Procedure

10.1 *Testing CF Sheets:*

10.1.1 Manifold one CF sheet with a CB sheet with the CF and CB surfaces in contact with each other. The CF sheet should be on the bottom. Handle sheets by their edges only, since finger prints may affect image development.

10.1.2 In 10.1.3 through 10.1.4 an imaging device other than a typewriter may be used, as explained in 5.1.

10.1.3 Place the manifold set in an electric typewriter with the 11-in. (279-mm) dimension perpendicular to the rollers. Type a line of the character # across the full 8½-in. (216-mm) width of the set. Using the manual return with no line feed, return to the first character. Type an X over each #.

10.1.4 Using the manual line feed (on single spacing), move down to the next line and repeat 10.1.3. Continue until at least seven lines have been typed. The depth of the 8 ^{1} ⁄$_2$-in. (216-mm) wide imaged area should be 1 in. (25-mm) minimum.

10.1.5 Remove the manifold set from the typewriter. Separate the CF sheet from the CB sheet and store the CF sheet in a dark drawer with the imaged side up. Time for image development prior to light exposure should be the same for all samples which are to be compared. Allow 24 h for complete image development.

10.1.6 Repeat 10.1.1 through 10.1.5 for each carbonless paper to be tested, including the control. Label each as to manufacturer, lot number, roll number, basis weight, grade, and coating.

10.2 *Preparing Samples for Light Exposures:*

10.2.1 Cut an 8 ½ by 3-in. (216 by 76-mm) grain short sample from an imaged CF sheet with the imaged area running full width across the 8 ½-in. dimension and located in the center of the 3-in. dimension.

10.2.2 Staple the sample to an 8 ½ by 3-in. (216 by 76-mm) sheet of chipboard. Expose the imaged surface.

10.2.3 Staple a 4-¼ by 3-in. (108 by 76-mm) piece of chipboard over one half of the sample, exposing the test area. The chipboard will shield one half of the sample from light, providing visual observation of image fade during and upon completion of the testing.

10.2.4 Repeat 10.2.1 – 10.2.3 for each imaged CF sheet, both samples and control.

10.3 *Light Exposure:*

10.3.1 Turn on cabinet lights and blower a minimum of 2 h prior to introduction of the samples. If new lamps have been installed, a longer time of several days is suggested.

10.3.2 Place the samples and control in the light exposure cabinet with the imaged side up exposed to the light source. Do not overlap or place specimens on top of one another. A maximum of five specimens (four test samples and the control) may be placed in the cabinet with the 8-½-in. (216-mm) dimension running front to rear.

10.3.3 Expose the specimens to cabinet light for 144 ± 2 h continuously. Rotate the specimens daily so that each specimen is located on the left, center, and right for an equal time during the 144 h.

10.3.4 At the end of the exposure period, remove the specimens from the light exposure cabinet.

10.4 *Testing CB Sheets:*

10.4.1 Repeat 10.1.1 – 10.3.4.

10.5 *Testing CFB Sheets-CF Surface:*

10.5.1 Manifold one CB sheet with a CFB sheet, with the CB sheet on top and its surface in contact with the CF surface of the CFB sheet. Place a sheet of 12-lb Bond paper next to the CB surface of the CFB paper, as CB material may transfer onto the typewriter rollers. Handle sheets by their edges only, since fingerprints may affect image development.

10.5.2 Repeat 10.1.2 – 10.1.4.

10.5.3 Remove the manifold set from the typewriter. Separate the CFB sheet and store it in a dark drawer with the imaged side up. Allow 24 h for complete image development.

10.5.4 Repeat 10.1.6 – 10.3.4.

10.6 *Testing CFB Sheet-CB Surface:*

10.6.1 Manifold one CF sheet with a CFB sheet with the CF sheet on the bottom and its surface of the CF sheet in contact with the CB surface of the CFB sheet. Handle sheets by their edges only since fingerprints may affect image development.

10.6.2 Repeat 10.1.2 – 10.3.4.

11. Interpretation of Results

11.1 Compare visually the exposed and unexposed area of the control to a previously tested control of the same combinations of papers. This comparison ensures that the test was run properly. If obvious differences exist, check the operation of the cabinet, the operation of the imaging device, and other aspects of the test. When the difficulty has been found and eliminated, rerun the test.

11.2 Compare the exposed and unexposed areas of each specimen. Note changes in image intensity, image color, image sharpness, and background color.

11.3 Compare each specimen to the control. Note the changes in stability of each sample and rate them to the control as demonstrated in 11.2. (If the test objective is to compare different specimens, note the changes in stability of each sample compared to each other.)

12. Report

12.1 Report significant changes found in 11.2 for each sample tested.

12.2 Report on the stability of each sample compared to the control as found in 11.3. Samples can also be compared with each other.

12.3 Establish a ranking order based on the evaluations of 11.3 with the control or among themselves, if required.

13. Precision and Bias

13.1 Determination of ranking order is repeatable within a laboratory and reproducible between laboratories. The test is a comparative test, is subjective, and no quantitative data are intended.

14. Keywords

14.1 carbonless copy paper; carbonless paper; chemical carbonless paper; image stability; light stability