Designation: F 1454 – 99 (Reapproved 2003)

Standard Practice for Comparing Correctable Film Ribbons[1]

This standard is issued under the fixed designation F 1454; 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 practice provides information and techniques for evaluating performance qualities of a correctable film ribbon. It can be used to evaluate typewriter ribbons for general office use.

1.2 The values stated in either SI or inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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]

D 685 Practice for Conditioning Paper and Paper Products for Testing

D 882 Test Methods for Tensile Properties of Thin Plastic Sheeting

D 3460 Specification for White Watermarked, Unwatermarked Bond, Mimeograph, Duplicator, and Zerographic Cut-Sized Office Papers

F 497 Practice for Use of the Electric and Electronic Typewriter as a Test Instrument

F 1050 Test Method for Determining Winding Torque and Tension of Typewriter Ribbons

F 1125 Terminology of Image Quality in Impact Printing Systems

F 1174 Practice for Using a Personal Computer as a Test Instrument

F 1443 Practice for Using 0.008-in. (0.023-mm) Aperture Reflectometers as Test Instruments for Measuring Visual Image Quality of Business Copy Images

3. Terminology

3.1 *Definitions*—For terms that are used in this practice, see Terminology F 1125.

4. Summary of Practice

4.1 This practice covers testing for physical properties of correctable film ribbons, performance testing of correctable film ribbons under actual and simulated conditions on typewriters, and using the results to determine a comparative rating. All sample ribbons and supplies should be conditioned and tested under identical conditions in order to obtain comparative results.

4.2 All sample ribbons may be tested and compared with known control ribbons, a previous set of data, or an established standard.

5. Significance and Use

5.1 This practice should be used to evaluate performance qualities of correctable film ribbons on a comparative basis under actual and simulated conditions.

5.2 This practice is suitable for comparative service evaluation, research, and development. It may also be used for manufacturing quality control.

5.3 Users may choose any one test, a series of tests, or all tests, depending on their needs and interests in determining the different characteristics of correctable film ribbons.

6. General Considerations

6.1 The following statements address some concerns about quality of the product. Although a complete list is not provided, the user must make the final determination of performance criteria factors and level at which each factor impacts the particular analysis.

6.2 *Visual Inspection*—Inspect the ribbon for a smooth, uniform coating (on the appropriate film base) free of folds, wrinkles, splices, blisters, uncoated areas, cracks, contamination, and other detrimental defects that would make the ribbon unfit for its intended purpose. Examine for a smoothly slit straight edge and proper winding without ragged and nicked edges.

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[1] This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.02 on Inked Ribbons and Carbon Paper.

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[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.

6.3 *Ribbon Winding*— Examine and report telescoping or layer slippage that may have occurred in handling of the wound and assembled ribbon cartridges.

6.4 *Ribbon Cassette*— Design and performance of a ribbon cassette may be compared to a control product or other established standard. Inspect the cassette for dirt, oil, or any other type of debris that may cause functional or aesthetic problems.

7. Apparatus and Materials

7.1 *Electronic Typewriter or Printer*, capable of being set up in accordance with Practice F 497.

7.2 *Microdensitometer or Reflectance Meter*, equipped with a 0.008-in. (0.203-mm) aperture and grid pattern in accordance with Practice F 1443.

7.3 *Environmental Chamber*, capable of maintaining 120 ± 2.0°F (49 ± 0.16°C) for 48 h at a relative humidity of 50 ± 2 %.

7.4 *Type Font*, capable of producing a printed image with a stroke width exceeding 0.008 in. (0.203 mm).

7.5 *Paper*, which may be the grade normally used in the facility conducting the test or the grade conforming with Specification D 3460, Grade 1 or 4, Type I Bond, Basis 20 or 24 lb (9 or 11 kg).

8. Conditioning

8.1 The test specimen, equipment, and paper should be conditioned in accordance with Practice D 685.

9. Test Methods

9.1 *Weight*—From positions approximately 50 ft (15 m) apart on the ribbon spool, cut five 1 m ± 1-mm lengths. Determine weight of each to 0.001 g and report the average.

9.2 *Base Thickness*— Using the five samples from the ribbon weight test, remove the entire coating with a suitable solvent, air dry, and measure the thickness in two places for each sample. Report the average thickness to 0.0001 in. (0.0025 mm) or better.

9.3 *Tensile Properties*:

9.3.1 This test is in accordance with Test Methods D 882, using the following conditions:

9.3.1.1 *Sample Dimensions*—6.0 in. (152 mm) long.

9.3.1.2 *Cross Head Speed*— 20.00 in. (508 mm)/min.

9.3.1.3 *Chart Speed*— 5.00 in. (127 mm)/min.

9.3.1.4 *Jaw Separation*— 2.00 in. (51 mm).

9.3.2 Report the following:

9.3.2.1 Ribbon/leader/trailer tensile strength at yield,

9.3.2.2 Ribbon/leader/trailer tensile strength at break, and

9.3.2.3 Ribbon/leader/trailer percent elongation at yield and break.

9.4 *Ribbon Dimensions*:

9.4.1 Measure the ribbon width, length, and pancake diameter by means of tape measure and calipers.

9.4.2 Measure the leader/trailer width and length by means of tape measure and calipers.

9.5 *Visual Reflectance of Image*:

9.5.1 *Apparatus*:

9.5.1.1 *Typewriter or Printer*, to be used as a test instrument set to manufacturer's specifications.

9.5.1.2 *Model 082 Clearwave Optical Character Tester*[3] or equivalent equipment, set to visual reflectance.

9.5.1.3 *Type Font*, of style and size desired, set at medium impression.

9.5.1.4 *Typing Paper*, of the style and type desired.

9.5.1.5 *Test Conditions*— 50 ± 2 % relative humidity and 73 ± 2°F (23± 0.16°C).

9.5.2 *Procedure*:

9.5.2.1 Turn on the Clearview Model 082 or equivalent instrument, and allow it to stabilize for at least ½ h. Zero the machine in accordance with the manufacturer's instructions. Place calibration chip $BaSO_4$ over viewing aperture port and adjust calibration to 100 %.

9.5.2.2 Using the capital "I," type 50 characters in a row, randomly select five of the "I"s, and determine an average reading for each character by the following method. Measure reflectance along the center of the vertical portion of the "I" at four equidistant points. These points should include both top and bottom cross bars of the character and two equidistant points in between.

9.5.2.3 When measuring visual reflectance, ensure that the center circle of the instrument is centered in the vertical portion of the character. If the circle is misaligned, the measurement will be erroneous.

9.5.2.4 Record the data points and determine the averages.

9.6 *Edge Definition*:

9.6.1 *Apparatus*:

9.6.1.1 *Model 082 Clearview Optical Character Tester*, or equivalent equipment, set to visual reflectance.

9.6.1.2 *Test Conditions*— 50 ± 2 % relative humidity and 73 ± 2°F (23 ± 0.16°C).

9.6.2 *Procedure*:

9.6.2.1 Using the 50 capital "I"s from the visual reflectance test, view them using Practice F 1443. Measure the peak-to-valley distance on the left-hand side of the character. Count one defect for each character having any peak-to-valley distance exceeding 0.004 in. (0.102 mm) in the vertical portion of the character.

9.6.2.2 Record the data.

9.7 *Line Spread*:

9.7.1 *Apparatus*:

9.7.1.1 *Model 082 Clearview Optical Character Tester*, or equivalent equipment, set to visual reflectance.

9.7.1.2 *Test Conditions*— 50 ± 2 % relative humidity and 73 ± 2°F (23± 0.16°C).

9.7.2 *Procedure*—Using the capital "I"s from the visual reflectance test, determine the average print character width from the vertical portion of the character by using Practice F 1443. Measure five of the "I"s and compute the average print character width. Measure the actual character (font width) of the "I" from the type font. Compute and record line spread, as a function of average print character width minus actual character width, divided by actual character width, times 100 %.

$$\text{(average print character width)} - \qquad (1)$$

[3] Formely manufactured by Moore, this tester is currently available from Clearwave, Inc., 8701 Buffalo Ave., Niagara Falls, NY 14304.

$$\text{Line spread} = \frac{\text{(actual character width)}}{\text{actual character width}} \times 100\ \%$$

9.8 *Fill-Ins*:

9.8.1 *Apparatus*:

9.8.1.1 *Typewriter or Printer*, to be used as a test instrument set to manufacturer's specifications.

9.8.1.2 *Type Font*, of the style and size desired, set at medium impression.

9.8.1.3 *Model 082 Clearview Optical Character Tester*, or equivalent equipment, set to visual reflectance.

9.8.1.4 *Typing Paper*, of style and type desired.

9.8.1.5 *Test Conditions*— 50 ± 2 % relative humidity and 73 ± 2°F (23 ± 0.16°C).

9.8.2 *Procedure*—Type one row of 50 characters using the percent symbol, thus yielding 100 circles. Count the number of complete or partial fill-ins, and calculate the percent of fill-ins based on those of the 100 circles that are filled in, and record the data.

9.9 *Extraneous Inks and Spatter*:

9.9.1 *Apparatus*:

9.9.1.1 *Typewriter or Printer*, to be used as a test instrument set to manufacturer's specifications.

9.9.1.2 *Type Font*, of style and size desired, set at maximum impression.

9.9.1.3 *Model 082 Clearview Optical Character Tester*, or equivalent equipment, set to visual reflectance.

9.9.1.4 *Typing Paper*, of style and type desired.

9.9.1.5 *Test Conditions*— 50 ± 2 % relative humidity and 73 ± 2°F (23 ± 0.16°C).

9.9.2 *Procedure*—Type four rows of 25 lower case "h"s, double spaced at maximum hammer pressure, and count with the small area densitometer the number of spots 0.004 by 0.004 in. (0.102 by 0.102 mm) or larger that appear within the character field that are not part of a character. The character field is defined as the rectangle formed by linking the outermost edges of the "h"s.

9.10 *Voids and Broken Characters*:

9.10.1 *Apparatus*:

9.10.1.1 *Typewriter or Printer*, to be used as a test instrument set to manufacturer's specifications.

9.10.1.2 *Type Font*, of style and size desired, set at medium impression.

9.10.1.3 *Model 082 Clearview Optical Character Tester*, or equivalent equipment, set to visual reflectance.

9.10.1.4 *Typing Paper*, of style and type desired.

9.10.1.5 *Test Conditions*— 50 ± 2 % relative humidity and 73 ± 2°F (23 ± 0.16°C).

9.10.2 *Procedure*:

9.10.2.1 Type four rows of 25 capital "M"s double spaced. Count the number of voids within the characters, using the Clearview Optical Character Tester or equivalent instrument.

9.10.2.2 A void is a break or open space, measuring 0.004 by 0.004 in. (0.102 by 0.102 mm) or greater, in a part of a typed character that is normally filled in. Count only one void per character. Report the number of voids as a percent of the total number of characters.

9.11 *Lift-Off Reflectance*:

9.11.1 *Apparatus*:

9.11.1.1 *Typewriter or Printer*, to be used as a test instrument set to manufacturer's specifications.

9.11.1.2 *Type Font*, of style and size desired, set at medium impression.

9.11.1.3 *Model 082 Clearview Optical Character Tester*, or equivalent equipment, set to visual reflectance.

9.11.1.4 *Typing Paper*, of style and type desired.

9.11.1.5 *Test Conditions*— 50 ± 2 % relative humidity and 73 ± 2°F (23 ± 0.16°C).

9.11.1.6 *Correction Tape*, of a type designed for the machine by the respective ribbon manufacturer.

9.11.2 *Procedure*:

9.11.2.1 Type ten lower case "o"s, and correct nine of them using the automatic correction system of the typewriter and appropriate correction tape. Randomly select five of the corrected letters to measure.

9.11.2.2 Using the Clearview 082 Optical Character Tester, calibrate the system as in 9.5.2.1.

9.11.2.3 Measure reflectance of the corrected "o"s in four areas spaced 90° apart around the "o" (see Fig. 1).

9.11.2.4 The averaged result of the 20 readings should be compared to control ribbon results or other established data. Ignore any misregistrations.

9.12 *Accelerated Aging*:

9.12.1 *Apparatus*:

9.12.1.1 *Typewriter or Printer*, to be used as a test instrument set to manufacturer's specifications.

9.12.1.2 *Type Font*, of style and size desired, set at medium impression.

9.12.1.3 *Model 082 Clearview Optical Character Tester*, or equivalent equipment, set to visual reflectance.

9.12.1.4 *Typing Paper*, of style and type desired.

9.12.1.5 *Environmental Chamber*, capable of maintaining 120± 5°F (49 ± 0.18°C) and 50 ± 5 % relative humidity for 24 h.

9.12.2 *Procedure*—Select a sample of test and control ribbons, and place these ribbons in the chamber at the stated conditions for 24 h. Remove them and allow them to recondition to laboratory conditions for at least 5 h. Recheck the caliper, tensile/yield strength, and ribbon weight, and compare these values to the test results that were achieved before heating. Also conduct a functional print test on the ribbons (see 9.5-9.11 and 9.13) to determine whether there is any degradation in print quality.

9.13 *Smudge (Abrasion)*:

9.13.1 *Apparatus*:

9.13.1.1 *Typewriter or Printer*, to be used as a test instrument set to manufacturer's specifications.

9.13.1.2 *Type Font*, of style and size desired, set at medium hammer pressure.

9.13.1.3 *Model 082 Clearview Optical Character Tester or Microdensitometer*, set to visual reflectance.

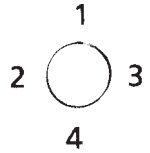

FIG. 1 Measuring Reflectance of the Corrected "o's"

9.13.1.4 *Typing Paper*, of style and type desired.

9.13.1.5 *Sutherland Ink Rub Tester*[4]—U.S. Patent No. 2,734,375.

9.13.1.6 *Buehler Polishing Cloth No. 4C-7228.*

9.13.2 *Procedure*:

9.13.2.1 Type six rows of "I"s with 30 characters in each row.

9.13.2.2 Place the section of paper with the typed "I"s facing up onto the metal base plate of the rub tester. The section should be held firmly in place directly under the center swing of the weighted arm.

9.13.2.3 Tape two 1 by 2-in. (25 by 51-mm) pieces of ⅛ in. (3.18-mm) polyurethane foam to each end of the bottom of the 4-lb (1.8-kg) weight of the rub tester. Adhere two 1 by 2-in. (25 by 51-mm) pieces of Buehler Polishing cloth No. 4C-7228. Carefully place the weight onto the section of paper with the polishing cloth, resting on the type impressions.

9.13.2.4 Lock weight into radius arm, set timer to run for ten cycles, run the tester, and remove the weight.

9.13.2.5 Adjust the Clearwave 082 on the paper to 100 %, then measure and record the reflectance of the space between the first and second "I" on each of the second and third rows from the top left-hand and top right-hand corners. Position the detection head so that the aperture opening is between the "I"s.

9.13.2.6 Report average of four measurements. See Fig. 2 for a sample test pattern.

9.14 *Winding Tension*— In accordance with Test Method F 1050.

[4] Available from James River Corp., Mechanical Services Dept., 243 E. Paterson St., Kalamazoo, MI 49007.

FIG. 2 Sample Test Pattern

10. Rating Procedure

10.1 Table 1 provides rating procedures for physical and visual properties.

11. Report

11.1 Report the results on a comparative basis to that of a standard reference product or other product. Include the results of Table 1 or those portions deemed necessary by the tester.

12. Precision and Bias

12.1 *Repeatability*— The test methods described provide a repeatable ranking order of results or relationships to a control product within a laboratory using the same typewriter.

12.2 *Repeatability*— Different facilities may not reproduce the same results because of differences in equipment, actions, and conditions.

12.3 *Bias*—Bias cannot be determined because there is no accepted reference material for these tests.

TABLE 1 Rating Procedure

Physical Properties		
Property—Ribbon	Test Method	Rating
Ribbon weight, g/area	see 9.1	compare to control
Ribbon base thickness, mils	see 9.2	
Tensile strength at yield	see 9.3	
Tensile strength at break	see 9.3	
Elongation, min %	see 9.3	
Ribbon width	see 9.4	
Ribbon length	see 9.4	
Character count	see 9.4	
Pancake diameter	see 9.4	
Ink formulation	from supplier	
Film base material	from supplier	
Property—Leader/Trailer	Test Method	Rating
Weight, g/area	see 9.1	compare to control
Thickness, mils	see 9.2	
Tensile strength at yield	see 9.3	
Tensile strength at break	see 9.3	
Elongation, min %	see 9.3	
Width	see 9.4	
Length	see 9.4	
Film base material	from supplier	
Adhesive	from supplier	
Color	from supplier	
Property—Cartridge	Test Method	Rating
Winding tension	F 1050	compare to control
Material	from supplier	
Spool color	from supplier	
Image Properties		
Property	Test Method	Rating
Visual reflectance, %	see 9.5	compare to control
Edge definition errors, %	see 9.6	
Line spread, %	see 9.6	
Fill-ins, %	see 9.8	
Extraneous inks and spatter, %	see 9.9	
Voids and broken characters, %	see 9.10	
Lift-off reflectance, %	see 9.11	
Accelerated aging	see 9.12	comparable to nonaged ribbons
Smudge	see 9.13	compare to control

13. Keywords

13.1 correctable film ribbons; image quality; reflectance; ribbon cassette