Grease resistance of flexible packaging materials  
*(Proposed Reaffirmation of Classical Method T 507 cm-09)*  
*(No changes from previous draft)*

1. **Scope**

   1.1 This method describes an accelerated test designed to measure the transudation of oily or greasy constituents of products to flexible packages, such as those made from greaseproof, glassine, vegetable parchment, or other grease resistant papers and plastic coatings.

   1.2 This method is intended as a supplement for TAPPI T 454 “Turpentine Test for Grease Resistance of Paper” (see Additional Information 9.2 and 9.3).

2. **Significance**

   2.1 In addition to providing standardized conditions suitable for comparison testing, the method may be used to select materials that show promise for an intended use. The selection, however, should be preliminary to, and
not a substitute for, tests with prototype packages made with the material and containing the actual commodity of interest.

2.2 It has also been found useful for measuring the effects of folding or creasing the barrier material.

3. **Apparatus**

3.1 *Bedplate*, consisting of a smooth, flat, rigid material of sufficient area to support an assembly or assemblies of specimens within an oven.

3.2 *Pressure block*, consisting of a smooth metal plate measuring 102 ± 2 mm (4.0 in.) square and weighing 408 ± 8 g (0.9 lb).

3.3 *Creasing roller*, weighing 2040 ± 45 g (4.5 lb) with a rubber cover approximately 6 mm (0.25 in.) thick and having a Durometer hardness of 75 ± 5. The approximate dimensions are 95 mm (3.75 in.) diameter and 45 mm (1.75 in.) wide. The handle supplied with the roller is so attached that when operated no additional pressure is applied.

3.4 *Test reagent carrier*, of new white blotting paper as specified in TAPPI T 205 “Forming Handsheets for Physical Tests of Pulp” cut 76 ± 2 mm (3 in.) square.

3.5 *Stain absorbers*, of the same blotting paper as in 3.4, cut approximately 100 mm (4 in.) square.

3.6 *Separators*, of aluminum foil, approximately 0.01 mm (0.0005 in.) thick, cut into approximately 100-mm (4-in.) squares.

3.7 *Pipet*, calibrated to deliver 1.0 mL of the test liquid.

3.8 *Oven*, having a temperature of 60 ± 2°C (140°F) and of sufficient size to accommodate the assemblies without impairing air circulation.

3.9 *Magnifier*, at least 5×, having a reticle of various sizes of circles with a metric scale graduated to 0.2 mm (0.01 in.) or less.

4. **Reagents**

4.1 *Oleic acid*, USP (to simulate animal fat), colored and water free.

4.2 *Vegetable oil*, colored and water free.

4.3 *Mineral oil*, lightweight, colored, and water free.

4.4 *Possible test oils*, any other designated oil or fat.

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1Names of suppliers of testing equipment and materials for this method may be found on the Test Equipment Suppliers list, available as part of the CD or printed set of Standards, or on the TAPPI website general Standards page.
4.5 Prepare the test reagents by mixing 100 mL of the chosen oil or fat and 1 g of oil-soluble red dye. Stopper the container, shake well, filter through a filter paper and store in an airtight bottle. Congealed fats may require warming to give them enough fluidity to permit the dyeing and filtering operation.

5. Sampling and test specimens

From each test unit obtained in accordance with TAPPI T 400 “Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, or Related Product,” cut at least five 100-mm (4-in.) square specimens for each of the required tests, i.e., side exposed to product, flat and creased, or wire and felt sides, flat and creased. CAUTION: Avoid placing the fingers in the area to be tested.

6. Procedure

NOTE 1: To test the effect of creasing, condition the specimens in an atmosphere in accordance with TAPPI T 402 “Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products” and crease according to TAPPI T 512 “Creasing of Flexible Packaging Material Paper Specimens for Testing.” This involves making two diagonal creases on a specimen as follows: gently fold the specimen along a diagonal, place it on a hard, smooth surface and place the creasing roller on one end of the fold and at right angles to it. Roll it along the fold in 5 ± 2 s to form a crease. Unfold the specimen, then lightly refold it along the other diagonal, but with the reverse side folded in, and crease it with the roller. Finally, unfold the test specimen.

6.1 First apply 1.0 mL of the test reagent uniformly to each of the smaller blotters so as to substantially saturate them. Congealed fats may require warming to give them enough fluidity to permit pipeting and application. Then build a stack of components from bottom to top as follows:

6.1.1 Bedplate
6.1.2 Foil separator
6.1.3 Stain absorber, smooth side up (large blotter identified for the adjacent specimen and side).
6.1.4 Test specimen (uncreased) with side to be tested facing up.
6.1.5 Saturated blotter
6.1.6 Foil separator
6.1.7 Stain absorber, smooth side up.
6.1.8 Specimen (creased), with side to be tested facing up.
6.1.9 Saturated blotter
6.1.10 Foil separator

6.2 Repeat steps 6.1.1 through 6.1.8 to make a pile with up to 10 specimens, then cover with the pressure block to ensure their intimate contact. Immediately place the assemblies in the oven for 4 h at 60 ± 3°C (140°F).
NOTE 2: A shorter time, i.e., one-half hour, or longer time (8 to 24 h) may be desirable for unusual materials, but in general a shorter or longer period does not substantially change the ranking of the variety of greases and barriers. The three suggested oils rank most specimens in substantially the same order. They cover the three basic types of oils and greases packaged, and due to their similar ranking, enabled the substitution of the packaged grease or oil with similar results.

6.3 At the end of the test period, remove the assembly and examine the stain absorbers. For each absorber determine the area and the number of stained spots. This may be done conveniently with the magnifier specified. If the reticle has only a linear scale, refer to appropriate mathematical tables in a handbook for direct conversion of the average circle diameters to the corresponding areas.

7. Report

7.1 Report the test result for each test condition, on each side, creased or uncreased as required, as:

7.1.1 The average total area of the stain spots in square millimeters.
7.1.2 The average number of spots observed.

8. Precision

On the basis of studies made in accordance with TAPPI T 1200 “Interlaboratory Evaluation of Test Methods” and calculated according to TAPPI T 1206 “Precision Statement for Test Methods,” the average of five determinations are expected to agree within the amounts shown in the table (95% probability limits). Repeatability and reproducibility figures are based on areas of stain.

<table>
<thead>
<tr>
<th></th>
<th>Uncreased</th>
<th>Creased</th>
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</thead>
<tbody>
<tr>
<td>Repeatability</td>
<td>95%</td>
<td>97%</td>
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<tr>
<td>Reproducibility</td>
<td>320%</td>
<td>295%</td>
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</tbody>
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9. Keywords

Paper, Packaging materials, Flexible packaging, Grease resistance, Greaseproof papers, Glassine papers, Parchment papers

10. Additional information

10.1 Effective date of issue: To be assigned.
10.2 This method, formerly T 507 os-79, has been reclassified as a Classical Method. Such procedures are no longer in common use or have been superceded by advanced technology; they are technically sound, have a history of use, and contain a body of literature references that make their preservation valuable.

10.3 This procedure supplements T 454 where the penetration of the turpentine does not necessarily correspond to the behavior of the commonly packaged commodities containing vegetable and mineral fats, oils, and greases.

10.4 Limitations to the procedure of T 454 are: (a) the use of turpentine instead of dyed fats or greases; (b) if T 454 is modified to use fats and oils instead of turpentine, the endpoint may take more than a normal 8-h working day but less than 24 h; (c) the specimens are distributed periodically by repeated examinations; (d) the procedure is not recommended for evaluating fluorchemically treated papers.

10.5 Plastic films that pucker because of the 60°C testing temperature may require a lower temperature that will not cause puckering (37°C or ambient).

10.6 Related methods: ASTM F-119; MIL B 12lb; Canadian TM 312, CPPA F.6; Packaging Institute 3626 P-62; National Flexible Packaging Association TR 14.

Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Standards Department.