



Standard Practice for Coating/Adhesive Weight Determination¹

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1. Scope

1.1 This practice covers a procedure for determining the amount of coating applied to a substrate, (for example, film, paper, nonwoven). The amount of coating is expressed as a weight per given area, (for example, g/m^2 , lb/ream).

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the 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

E171/E171M Practice for Conditioning and Testing Flexible Barrier Packaging

3. Terminology

3.1 *coating*—a material applied to enhance the characteristics of the base substrates. For this practice, the coating must be soluble in the chosen solvent.

3.2 *ream*—500 sheets of 609.6 by 914.4 mm (24 by 36 in.) equal to 278.7 m^2 (3000 ft^2).

NOTE 1—Other ream sizes may be in use. If using a ream size other than 278.7 m^2 (3000 ft^2), the conversion factor K (located in the appendix) must be recalculated if reporting results as lb/ream.

¹ This practice is under the jurisdiction of ASTM Committee F02 on Flexible Barrier Packaging and is the direct responsibility of Subcommittee F02.20 on Physical Properties.

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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.

4. Summary of Practice

4.1 Representative samples of coated material are weighed, coating is removed using a solvent appropriate for the coating, samples are dried and weighed again. The differential obtained is the coating weight.

4.2 Typical methodology is as follows:

4.2.1 Cut representative samples using a cutting device and a template of known unit area “A” mm^2 (in.^2), for example, 203.2 by 50.8 mm (8 by 2 in.) template.

4.2.2 Weigh each sample on the analytical balance to the nearest 0.0001 g and record the value “ W_1 .” Samples may be folded and placed on to the analytical balance.

NOTE 2—If sample is conditioned weigh immediately.

4.2.3 Using solvent in which the coating is soluble and the substrate is insoluble, remove coating from substrate. Typical methods are wiping with solvent saturated cloth, immersing samples in solvent to soften, then wiping with cloth or brush, if needed, or immersing sample, agitating to soften, then wiping with cloth or brush. For specific recommendations contact the coated substrate supplier.

NOTE 3—Accumulated coating in solvent, cloth or brush can reduce the ability to clean sample properly and may affect test results.

4.2.4 Thoroughly dry the substrate with a drying appliance. A timer should be used to ensure consistency in immersion, cleaning and drying time. Drying of hygroscopic materials should be consistent with conditioning parameters.

4.2.5 Re-weigh each sample on the analytical balance to the nearest 0.0001 g and record the value “ W_2 .”

4.2.6 Calculate and report the adhesive coat weight using the following equation:

$$\text{Adhesive Coat Weight} = \left(\frac{K (W_1 - W_2)}{AP} \right) \quad (1)$$

where:

W_1 = weight of coated substrate, g,

W_2 = weight of uncoated substrate, g,

A = area of substrate, mm^2 (in.^2),

P = fraction of substrate that is coated ($P = 1$ except for zone coated materials), and

K = constant (see below).

4.2.7 When coat weight is expressed in g/m^2 :

$$K = 1 \times 10^6 \text{ mm}^2/\text{m}^2 \quad (2)$$

4.2.8 When coat weight is expressed in lb/ream:

$$K = 952.4 \left(\frac{\text{in.}^2 \cdot \text{lb}}{\text{ream} \cdot \text{g}} \right) \quad (3)$$

NOTE 4—For explanation of how K is determined, see [Appendix X1](#).

5. Significance and Use

5.1 Coating weight is an indicator of certain functional characteristics of coated substrates (for example, sealability, peelability, appearance). The methodology described in this practice is a means of determining coat weight.

5.2 This practice does not address acceptability criteria. These need to be jointly determined by the user and producer of the product.

5.3 The methodology described in this practice includes operator assessment of effective coating removal. This is a subjective assessment and requires operator training for consistent results.

5.4 This practice is applicable to coated substrates in which only the coating is soluble in the chosen solvent. The solvent used is critical to the success of the coating removal process. The coated substrate manufacturer must provide guidance in choice of solvent.

6. Apparatus

6.1 *Analytical Balance*, capable of reading to 0.0001 g is recommended. Balances of different degrees of precision may be used if the result meets the required level of accuracy.

6.2 *Solvent*—The chemical composition of the coating and the substrate determine the solvent to use. The coating must be readily soluble in the solvent while the substrate remains insoluble. Consult with your supplier for guidance on the solvent selection.

6.3 *Fume Hood*, is desirable.

6.4 *Container*, appropriate for holding solvent.

6.5 *Clean Soft Cloth, Brush, or Other Tool*, for removing softened coating from the substrate surface.

6.6 *Solvent-resistant Gloves*.

6.7 *Appliance*, for drying substrate.

6.8 *Timer*, for reference.

6.9 *Cutting Device*, for example, a safety cutter or utility knife with retractable blade.

6.10 *Template Die*, of known area for cutting standard size coated web samples. Template should be part of a regular calibration check to prevent loss in wear.

7. Hazards

7.1 Solvents may be toxic. When using solvents, work in a fume hood. Wear gloves when handling. Solvents may be flammable. Do not allow solvent to touch hot surfaces and ensure vapors are vented away. See solvent Material Safety Data Sheet for additional information.

8. Sampling

8.1 The number of samples tested should be adequate to be predictive of coating weight.

8.2 Caution should be taken when eliminating samples with defects as this can bias results.

9. Conditioning

9.1 Conditioning of the samples to be tested will depend upon the material under evaluation. Hygroscopic substrates such as paper should be dried immediately before testing. Typical drying parameters are 5 min at 54 to 60°C (130 to 140°F).

9.2 Refer to Practice [E171/E171M](#) for standard conditioning practices.

10. Report

10.1 Apparatus used including degree of precision of analytical balance.

10.2 Lot number and source of material, date, time, location, operator of test, and complete identification of materials being tested.

10.3 Any conditioning of the materials.

10.4 Any and all deviations from standard methodology.

10.5 Number and identification of samples tested and coat weight values. Data may be reported as individual or average values.

10.6 Type of solvent used, cleaning time and technique for removal of coating.

10.7 Drying time, temperature and method used for drying.

11. Keywords

11.1 adhesive weight; coat weight; flexible package; medical package

APPENDIX
(Nonmandatory Information)
X1. Determination of K

X1.1 Determination of K when reporting weight measurement in g/m^2 :

X1.1.1 The adhesive coat weight is to be reported in g/m^2 . However the formula $\frac{W_1 - W_2}{AP}$ will yield units of g/mm^2 : the weights, W_1 and W_2 , are in units of grams, the area is in units of square millimeters, and the P is unitless. K is used to convert from units of g/mm^2 to units of g/m^2 .

$$K = \left(\frac{1000 \text{ mm}}{\text{m}} \right)^2 = 1 \cdot 10^6 \frac{\text{mm}^2}{\text{m}^2} \quad (\text{X1.1})$$

X1.2 Determination of K when reporting weight measurement in lb/ream:

X1.2.1 The adhesive coat weight is to be reported in lb/ream. However the formula $\frac{W_1 - W_2}{AP}$ will yield units of g/in.^2 : the weights, W_1 and W_2 , are in units of grams, the area is in units of square inches, and P is unitless. K is used to convert from units of g/in.^2 to units of lb/ream. Therefore:

$$K = \left(\frac{\text{lb}}{453.59 \text{ g}} \right) \left(\frac{432000 \text{ in.}^2}{\text{ream}} \right) = 952.4 \text{ in.}^2 \cdot \frac{\text{lb}}{\text{g} \cdot \text{ream}} \quad (\text{X1.2})$$

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