Collaborative Testing Services, Inc

Paper & Paperboard Specific Test Instructions

Even month testing (February, April, June, August, October, December)

Please review the following information before testing

Participants in a multiple property test will notice that the results for each property are reported with a separate data entry form. It is not required that participants report results for all properties in multiple property tests.

Please submit **all** data entry forms using the online portal: (http://www.cts-portal.com/). If you are not reporting data for a test or property, leave the data entry form blank.

General Testing Instructions

Analysis	Analysis Name
3501	Thickness (Caliper) – Packaging
3511	Bursting Strength – Packaging
3513	Tearing Strength – Packaging
3515-3517	Tensile Strength, Tensile Energy Absorption, Elongation to Break – Packaging
3531	Roughness, Print Surf Method – 0.5 to 4.0 Microns
3545/3547	Brightness
3549/3551	Color and Color Difference
3553/3555	Specular Gloss
3601	Folding Endurance, MIT
3603	Bending Resistance, Gurley Type
3611-3612	Coefficient of Friction
3613	Air Moisture in Paper
3615	Sizing, Hercules Type

GENERAL TESTING INSTRUCTIONS FOR EVEN MONTH TESTS

The following pages give specific instructions and the appropriate test method for each analysis. Perform each test in accordance with the referenced test method except where it is modified or augmented in these instructions. If you deviate from the test method or these instructions, please carefully describe the deviation in the data entry form that you return for that analysis.

The samples were **pre-conditioned** according to TAPPI T402, "Standard conditioning and testing atmospheres for paper, board, pulp, hand sheets and related products," and sealed before shipment (to 35% RH, 21˚C). **Condition** and test the samples in your laboratory at the standard conditions of 50 ± 2% RH and 23 ± 1ºC or 73.4 ± 1.8ºF, as listed in TAPPI T402. If your lab can not test according to TAPPI standard conditions, then test the samples **immediately** after removing them from the sealed package. Indicate that the samples were not conditioned on the data entry form.

For most sample packs, the Sample Code for this round, is printed on gold or green sample divider sheets. Please keep all following sheets facing up and **MARK** them with the same Sample Code in the upper right corner. Unless otherwise specified, always **test the side bearing the Sample Code**.

Measure or cut all of the test pieces in the same direction (keep the long edge of the sample parallel to the test direction of the cut test specimen), as specified in these instructions.

Make only one test on each specimen in the sample; do not make multiple tests on a specimen or average multiple readings on a specimen unless specified in these instructions. Record only the number of replicates provided for on each data entry form.

Always keep copies of completed data entry forms for your records. Retain copies of computer print outs and/or calculation worksheets with the data entry forms to check for transcription and calculation errors. For non-destructive tests, it is also advisable to keep the sample until analysis results are received. For destructive tests, it may be possible to retain the unused portion of each specimen. In most cases, the retained sample can be used for additional testing in the event of questionable results. Extreme care must be taken to protect the sample from environmental effects which could affect the measured properties.

Since the analysis technique employed by CTS is bivariate, measures performance on two samples simultaneously, it is important to use the **same instrument and procedure** throughout a test.

Thickness (Caliper) – Packaging Papers

Analysis	Pack Code	Title
3501	**CK**	**Thickness (Caliper) - 6 to 15 mils**

Applicable Method: TAPPI Official Test Method T411

For each sample sheet, record the test determination as the average of 5 observations made in non-overlapping, regular intervals in the cross direction (short direction) of each sheet. Verify that you have indicated a valid unit for caliper data (the default unit is mils) on your data entry forms.

Bursting Strength – Packaging Papers

Analysis	Pack Code	Title
3511	**BK**	**Bursting Strength - Packaging Papers**

Applicable Method: TAPPI Official Test Method T403

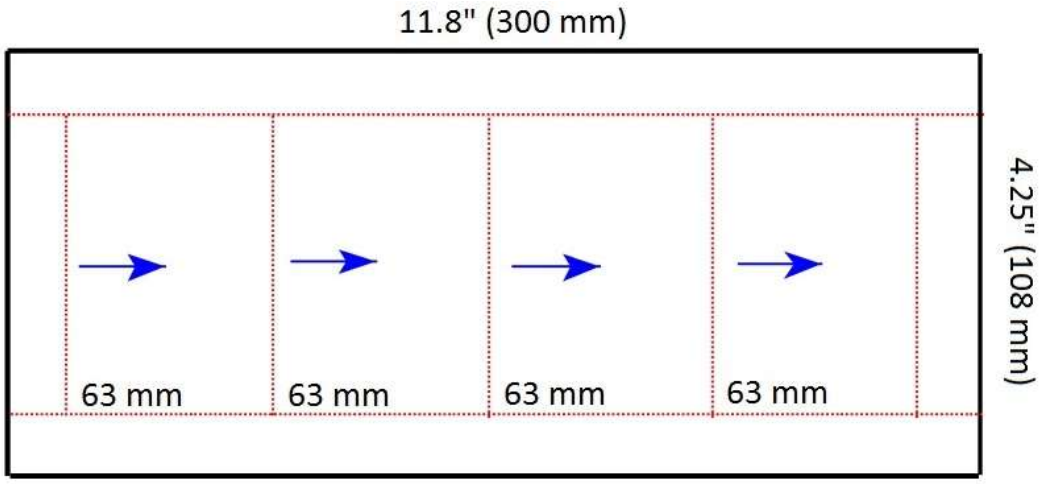
Conduct testing according to TAPPI T403, except keep the side of the sample sheet that was marked with the Sample Code facing up, so that during the test, the test piece bulges toward the marked side. It is not necessary to make tests on both sides of the specimen. Make the test at the center of the test piece. Verify that you have indicated a valid unit for bursting strength data *(the default unit is psi)* on your data entry form.

Tearing Strength – Packaging Papers

Analysis	Pack Code	Title
3513	**RK**	**Tearing Strength - Packaging Papers**

Applicable Method: TAPPI Official Test Method T414

Cut the plies with the 63 mm dimension parallel to the long direction of the sheet (see diagram). The length of plies, parallel to short direction of the sheet, should be determined by instrument jaws (see T414 Note 3). The tear line will be along the center of the sheet in the 63 mm direction, as indicated by the arrows in the diagram. Test with the sides marked with the Sample Code facing the pendulum sector for all plies.



Verify that you have indicated a valid unit for tearing strength data *(the default unit is gf)* on your data entry forms.

For the 1600-gf instrument:

Refer to the label on the pack cover sheet for the number of plies to test per specimen. To calculate the tearing force needed to tear a single ply, multiply the scale reading by the factor indicated on the pack.

NOTE: If an instrument with a direct-reading scale is used (e.g., digital read-out), report the scale reading directly if the instrument has been preset for the number of plies tested.

For multiple pendulum instruments:

Indicate, in the spaces provided on the data entry form, the instrument capacity used and the number of plies tested. Use one of the equations from Section 8.6 of the test method to calculate the tearing force required to tear a single ply.

Tensile Strength, Tensile Energy Absorption, Elongation to Break

Analysis	Pack Code	Title
3515	**NK**	**Tensile Breaking Properties - Packaging Papers**

Applicable Method: TAPPI Official Test Method T494

Refer to TAPPI T494, for measurement of test 3515 Tensile Breaking Strength, subtest 3516 Tensile Energy Absorption (TEA) and subtest 3517 Stretch (%Elongation). Cut the test piece from the center of the sample sheet with its length parallel to the long direction of the sheet, to yield a machine direction tensile specimen. Verify that you have indicated a valid unit for the data *(the default unit is kN/m)* on your data entry form.

Roughness, Print Surf Method

Analysis	Pack Code	Title
3531	**PS**	**Roughness, Print Surf Method - 0.5 to 4.0 microns**

Applicable Method: TAPPI Official Test Method T555

Follow TAPPI Official Test Method T555. It is recommended labs use the soft backing plate with10 kg-f/cm^2 clamping pressure. Please indicate on the data entry form if a different backing or clamping pressure is used. Test the center of the side marked with the Sample Code of each sample sheet.

Brightness

Analysis	Pack Code	Title
3545	**BR**	Brightness - Directional
3547	**BR**	Brightness - Diffuse

Applicable Method: Analysis 3545: TAPPI Official Test Method T452
Analysis 3547: TAPPI Official Test Method T525

Make one test per specimen at the center of the side marked with the Sample Code. Back the specimen with the remaining sample sheets. Report brightness values to the nearest 0.1%.

Perform directional brightness tests with the center line of the light beam in the plane perpendicular to the pad of sheets and parallel to the long direction of the pad. Make only one machine direction measurement per sample. Do not make cross direction measurements, rotate the pad or average multiple readings.

Color & Color Difference

Analysis	Pack Code	Title
3549	**CA**	**Color & Color Difference, Near White Papers (Hunter L,a,b Illuminant C, 2° Observer)**
3551	**CA**	**Color & Color Difference, Near White Papers (Hunter L,a,b Illuminant D65, 10° Observer)**

Applicable Method: TAPPI Official Test Method T524 – For directional geometry instruments
TAPPI Official Test Method T527 – For diffuse geometry instruments

Handle all specimen by outside edges only. When measuring, the side marked with the Sample Code should be facing the light source of the instrument. Position center of specimen on aperture opening (when light beam direction can be determined, position specimens with light beam parallel to long direction of test piece). Specimens should be kept **flat** while measured. The sheets may be cut, if necessary, to fit a smaller sample holder. **Back each paper specimen with the other seven (7) sheets when making measurements. Make one measurement on each of any five (5) of the eight (8) paper specimens for**

each sample. For each measured tristimulus value, report the sum of the five specimens.

Test and report your values in the indicated color space for the specific analysis. See the table below for the correct reporting units for each analysis.

Analysis	Data must be reported in this Color Space	Data will be analyzed and reported in this Color Space
3549	Hunter L a b	Hunter L a b
3551	Hunter L a b	Hunter L a b

Note: TAPPI Official Test Methods T524 and T527 do not cover the use of Illuminant D65, 10°Observer.

Specular Gloss

Analysis	Pack Code	Title
3553	GH	Specular Gloss, 75°, High Range
3555	GL	Specular Gloss, 75°, Low Range

Applicable Method: TAPPI Official Test Method T480

Follow TAPPI Official Test Method T480, except test at the center of the side marked with the Sample Code, with the center line of the light beam in the plane perpendicular to the sheet and parallel to its long direction. Rotate the sheet in its plane 180° so that the light beam travels in the opposite direction across the sheet (upstream / downstream gloss) and average the two readings to obtain the test value.

Folding Endurance

Analysis	Pack Code	Title
3601	MT	Folding Endurance, MIT Type

Applicable Method: TAPPI Official Test Method T511

Cut the test piece from the center of the sample sheet with its length parallel to the long direction of the sheet. The test piece shall be 15 ± 0.02 mm wide and 150 mm long. Place only **one** test specimen at a time in the instrument. Be careful not to touch the test area.

It is extremely important that the sample be kept cool for this test. Use the exhaust fan (Section 4.5 of T511) or other means to prevent the motor from heating the test piece. Report the results as the number of double folds.

Bending Resistance, Gurley Type

Analysis	Pack Code	Title
3603	**BG**	**Bending Resistance, Gurley**

Applicable Method: TAPPI Official Test Method T543

Cut the test piece from the center of the sample sheet with its length parallel to the long direction of the sheet. The test piece shall be 2.0 inches (50.8 mm) wide and 2.5 inches (63.5 mm) long.

Convert your readings to Gurley units (milligrams of stiffness for a standard 1" x 3" sample) using the manufacturer supplied conversion factors or Table 1 of the test method.

For digital instruments, preset the test variables and use the pushbutton command to automatically convert the readings to milligrams of stiffness.

Coefficient of Friction

Analysis	Pack Code	Title
3611	**CF**	**Coefficient of Static Friction, Printing Papers (Horiz. Plane Method)**
3612	**CF**	**Coefficient of Kinetic Friction, Printing Papers (Horiz. Plane Method)**

Applicable Method: TAPPI Official Test Method T549

Cut two specimens from each sheet: one 100 x 215 mm (4 x 8.5 in.) and the other 75 x 130 mm (3 x 5 in.), so that the long edge of each specimen is parallel to the long direction of the sheet. Test the five specimen pairs (each pair being from the same sheet) with the stamped sides of the specimen facing upwards.

Note: The marked side of the sled piece will be in contact with the sled. This should yield a felt side to wire side orientation for the COF measure. It is recommended that a 63.5 x 63.5 mm (2.5 x 2.5 in.), 200-gram sled be used as specified in the test method. Please note on the data entry form if a different size sled is used.

For Coefficient of **Static Friction (3611)**, record the force required to initiate motion, and use the equation from Section 9.1 of the test method to calculate for each pair the coefficient of static friction.

For Coefficient of **Kinetic Friction (3612)**, record the average force reading during uniform sliding over a distance of 5 in. (130 mm).

Note: If 5 in. is not obtainable, use a sliding distance as close to 5 in. as possible and report this distance on the data sheet. Use the equation from Section 9.2 of the test method to calculate for each pair the coefficient of kinetic friction.

Moisture in Paper

Analysis	Pack Code	Title
3613	**MC**	**Moisture in Paper**

Applicable Method: TAPPI Official Test Method T412

Follow TAPPI Official Test Method T412 for determining the "as received" moisture of the samples; do not condition the samples prior to testing. Refer to manufacturer's instructions if not testing with drying oven technique. Each sample supplied has sufficient paper to provide two large specimens of approximately 50 grams each or several smaller specimens, such as:

- 2 replications for specimens heavier than 30 g each
- 5 replications for specimens lighter than 5 g each
- 10 replications for equipment using single sheets

In the spaces provided on the data entry form, report the 2 to 10 test values for each sample, recording each value to the nearest 0.1% moisture.

Sizing, Hercules Type

Analysis	Pack Code	Title
3615	**HS**	**Sizing, Hercules Type**

Applicable Method: TAPPI Official Test Method T530

Conduct testing according to TAPPI T530. Use a test ink composed of a **1.25% solution of Naphthol Green B dye and 1% Formic acid in water**. Please note on the data entry form if a different type of ink was used. It is extremely important that the temperature of the ink be maintained at73°F (23°C) throughout all of the testing. Set the Reflectance Endpoint at 80%.

Place the specimen in the holder with the machine direction (the long direction of the paper) parallel to the handle of the holder. Apply the ink to the felt side of the paper. Take one reading on each specimen and record the reading in whole seconds. Be sure to bring the sample holder back to ambient temperature between each sample measurement.