

Paper & Paperboard Specific Test Instructions

Odd month testing (January, March, May, July, September, November)

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.

<u>Analysis</u>	<u>Analysis Name</u>
<u>3101</u>	<u>Thickness (Caliper) – Print</u>
<u>3111</u>	<u>Bursting Strength – Print</u>
<u>3113</u>	<u>Tearing Strength – Print</u>
<u>3115-3117</u>	<u>Tensile Strength, Tensile Energy Absorption, Elongation to Break – Print</u>
<u>3121/3123</u>	<u>Air Resistance, Porosity</u>
<u>3131</u>	<u>Roughness, Print Surf Method – 2.5 to 6.0 Microns</u>
<u>3133</u>	<u>Roughness, Sheffield</u>
<u>3135</u>	<u>Grammage (Mass per Unit Area)</u>
<u>3141/3143</u>	<u>Opacity</u>
<u>3145-3146</u>	<u>Brightness</u>
<u>3201/3203/3205</u>	<u>Bending Resistance, Taber Type</u>
<u>3207/3209</u>	<u>Z-Directional Tensile</u>
<u>3211/3213</u>	<u>Internal Bond Strength</u>

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SPECIFIC ANALYSIS INSTRUCTIONS FOR ODD MONTH TESTS (formerly “S” 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 $50 \pm 2\%$ RH and $23 \pm 1^\circ\text{C}$ or $73.4 \pm 1.8^\circ\text{F}$, 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 code. Unless otherwise specified, always **test the side bearing the sample code**. For some analyses, such as linerboard tests, the Sample Code may appear on the exterior packaging instead of being stamped onto the samples.

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)

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3101	CP	Thickness (Caliper) - 3 to 6 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

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3111	BP	Bursting Strength - Printing Papers

Applicable Method: TAPPI Official Test Method T403

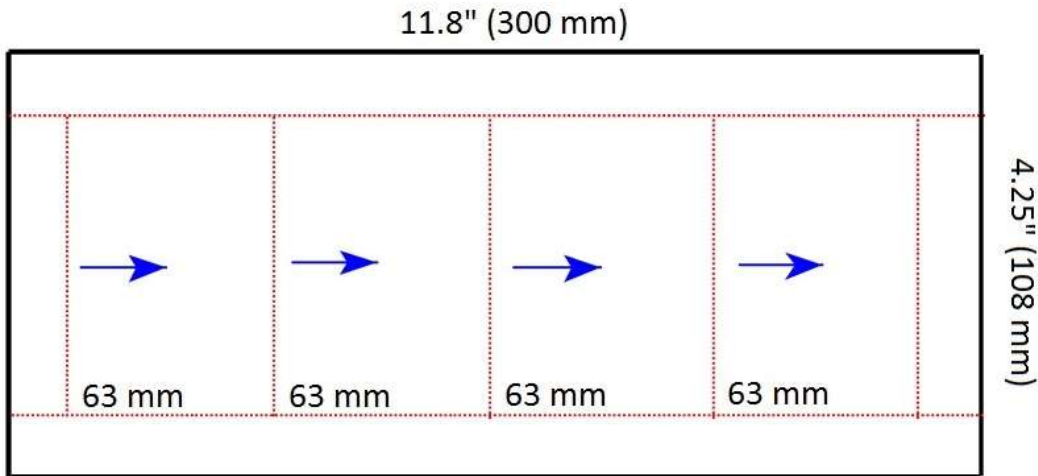
Conduct testing according to TAPPI T403, except keep the stamped side of the sample sheet facing up so that during the test the test piece bulges toward the stamped side. It is not necessary to make tests on both sides of the specimen. Make the test at the center of the test piece. Verify that you have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

Tearing Strength

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3113	RP	Tearing Strength - Printing 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 stamped sides of all plies facing the pendulum sector.



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

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3115	NP	Tensile Breaking Properties - Printing Papers

Applicable Method: TAPPI Official Test Method T494

Refer to TAPPI T494, for measurement of test 3115 Tensile Breaking Strength, subtest 3116 Tensile Energy Absorption (TEA) and subtest 3117 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.

Air Resistance, Porosity

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3121	PP	Air Resistance, Gurley Oil Type
3123	PP	Porosity, Sheffield Type

Applicable Method: TAPPI Official Test Method T460 – For Gurley Oil Type
TAPPI Official Test Method T547 – For Sheffield Type

For **Analysis 3121**, Air Resistance, Gurley type for Printing Papers, follow TAPPI Test Method T460. Test at the center of the test piece with the marked side of the test piece up.

For **Analysis 3123**, Porosity, Sheffield type, follow TAPPI Test Method T547. **Use the 0.422 in.** ($\frac{3}{4}$ in. diameter) orifice and test at the center of the test piece with the marked side down. If any other orifice is used, convert readings to this standard area and report the diameter of the orifice used. Report test values to the nearest Sheffield unit.

Roughness, Print Surf Method

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3131	PH	Roughness, Print Surf Method - 2.5 to 6.0 microns

Applicable Method: TAPPI Official Test Method T555

Follow TAPPI Official Test Method T555. It is recommended labs use the soft backing plate with 10 kg-f/cm² clamping pressure. Please indicate on the data entry form if a different backing or clamping pressure is used. Test the center of the marked side of each sample sheet.

Roughness, Sheffield

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3133	SR	Roughness, Sheffield

Applicable Method: TAPPI Official Test Method T538

Perform testing according to TAPPI T538. Make all measurements in the center of the specimen on the marked side. Avoid any wrinkled or damaged portions of specimens. Report data to the nearest Sheffield unit. If testing with the traditional variable-area flowmeter type of construction, use the following range recommendations: 0 - 56 SU use Sheffield tube #1, 56 - 170 SU use Sheffield tube #2, and 170+ SU use Sheffield tube #3. These ranges are not applicable to electronic flowmeter instruments.

Grammage

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3135	GM	Grammage (Mass per Unit Area)

Applicable Method: TAPPI Official Test Method T410

From the sample (10 sheets, each 13 x 20 ins.), cut sufficient paper with the cutting device to provide a total test area of at least 800 in² (5000 cm²). Divide into 3 to 10 equal areas (weighing units) as appropriate for the weighing device to be used: e.g., 5 pairs of 8.5 x 11 in. sheets for a total area of 935 in² (6032 cm²). Observing the requirements of T410, measure and weigh each of the 3 to 10 weighing units. Calculate the grammage of each unit in grams per square meter (g/m²). Report grammage values for each weighing unit to the nearest 0.1 g/m².

NOTE: Condition and test the samples in the TAPPI standard atmosphere of 50 ± 2% RH and 23± 1°C. **Do not** determine "as received" grammage.

Opacity

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3141	VR	Opacity, TAPPI T425, 89% Backing - Fine Papers
3143	VP	Opacity, TAPPI T519, Paper Backing - Fine Papers

Applicable Method: TAPPI Official Test Method T425
- Integrating cube type instruments and 89% white backing
TAPPI Official Test Method T519
- Sphere integrating instruments J (illuminant C) & paper backing

Make one test at the center of the marked side of each sample sheet. For **Analysis 3141** use 89% backing tile; for **Analysis 3143** use the other specimen sheets as backing. Report opacity values to the nearest 0.1%.

Brightness

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3145-3146	BF	Brightness - Directional, Fluorescently Brightened Papers

Applicable Method: Analysis 3145/3146: TAPPI Official Test Method T452

Make one test per specimen at the center of the marked side of each sheet. 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.

For Analyses 3145-3146, please refer to Appendix C of the method. Laboratories must use an instrument with fluorescence separation capability and be able to calibrate the instrument with a fluorescent paper standard as mandated by Appendix C. Report brightness (“fluorescence included”) measurements for the five specimens in the data entry form **labeled Analysis 3145**, then calculate and report the fluorescent component of brightness (Section C.5) in the data entry form **labeled Analysis 3146**.

The following instructions are a synopsis of the referenced procedure:

1. Calibrate the instrument. The calibration should include at least 1 fluorescent standard.
2. Measure the brightness of the specimen with the instrument configuration used for calibration.
3. **Report the brightness measurements in the data entry form for Analysis 3145**,
Directional
Brightness of Fluorescent Samples.
4. Move the UV-absorbing component of the brightness filter from the reflected beam to the incident beam.
5. Measure the brightness of the specimen again, in this UV-excluded configuration.
6. Subtract the UV-excluded measurement from the original brightness measurement to obtain the fluorescent component of brightness.
7. **Report the fluorescent component** of brightness to 0.1% Brightness for each specimen in the data entry form **for Analysis 3146**, Fluorescent Component of Directional Brightness.

Example: Brightness = 93.1 and
UV-excluded brightness = 87.3 the
Fluorescent component is 5.8

Bending Resistance, Taber Type

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3201	TP	Bending Resistance, Taber Type - 0 to 10 Taber Units
3203	TC	Bending Resistance, Taber Type - 10 to 100 Taber Units
3205	TR	Bending Resistance, Taber Type - 50 to 500 Taber Units (Recycled Paperboard)

Applicable Method: TAPPI Official Test Method T489 (For 10 to 100 range & 50 to 500 range)
TAPPI Official Test Method T566 (For 0 to 10 range)

Verify that you have indicated a valid unit for bending resistance data (*the default unit is g-cm*) on your data entry form.

For the 0 to 10-unit range, cut the test specimen from the center of the sample sheet to 1.5" by 1.5" and test the direction of the specimen that is parallel to the long direction of the sheet. **DO NOT** average machine direction and cross direction readings, as specified in TAPPI Official Test Method T566. Mount the rollers up, use the 10-unit compensator weight, and multiply the average of the two readings by 0.1.

For the 10 to 100-unit range and the 50 to 500-unit range, follow TAPPI Official Test Method T489. Cut the test specimen from the center of the sample sheet to 1.5" wide by 2.75" long with its length parallel to the long direction of the sheet. The rollers should be mounted down. For the 50 to 500-unit range, add the 500-unit calibrated weight and multiply the average of the two readings by 5.

Z-Directional Tensile

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3207	ZR	Z-Directional Tensile (Recycled Paperboard)
3209	ZP	Z-Directional Tensile

Applicable Method: TAPPI Official Test Method T541

Place the double coated, pressure-sensitive tape through the center of both sides of the sample sheet, being careful not to touch the test area. (Do not remove the protective liner from the tape until ready to perform the test). Cut the test specimen from the center of the taped area to 2" by 2" before testing.

It is suggested that the following tape be used for the test: **3M 404, 2" wide, double coated**. Please note on the data entry form if a different tape is used. Verify that you have indicated a valid unit for z-directional tensile data (*the default unit is psi*) on your data entry forms.

Internal Bond Strength

<u>Analysis</u>	<u>Pack Code</u>	<u>Title</u>
3211	SM	Internal Bond Strength, Modified Scott Bond Mechanics
3213	SB	Internal Bond Strength, Scott Bond Mechanics

Applicable Method: TAPPI Official Test Method T569
- Calibrate the instrument to low range scale.

For both analyses, 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 2.5 cm (1 in.) wide and 16.5 cm (6.5 in.) long. Please indicate the type of tape that is used for this test.

It is recommended that the sample and tape be clamped together two seconds using a pressure of 100 psi. For each test piece, average the five readings; discard readings of samples that do not completely separate. Report the average of the five readings as one determination on your data sheet. Verify that you have indicated a valid unit for internal bond strength data (*the default unit is 1000th of ft-lb*) on your data entry forms.