SPECIFIC ANALYSIS INSTRUCTIONS FOR GENERAL "G" 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 on the data sheet that you return for that analysis.

The samples were **pre-conditioned** according to TAPPI T402, "Standard conditioning and testing atmospheres for paper, board, pulp, handsheets 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 ± 1°C or 73.4°F ± 1.8°F, as listed in TAPPI T402. Please note that the samples for Analysis 382, Moisture Content, should not be conditioned. If your lab cannot 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 sheet.

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 sheet.

Always keep copies of completed data sheets for your records. Retain copies of computer print outs and/or calculation worksheets with the data sheets 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.

Color & Color Difference

Analysis	Pack Code	Title
350	**GA**	**Color & Color Difference, Near White Papers (Hunter L,a,b, Illuminant C, 2° Observer)**
351	**GA**	**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 specimens by outside edges only. When measuring the specimens, the side of the sheet with the sample code should be facing the light source of the instrument. Position center of specimens 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
350	**Hunter L a b**	**Hunter L a b**
351	**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.

Thickness (Caliper)

Analysis	Pack Code	Title
360	**GV**	**Thickness (Caliper) - 2 to 8 mils**
361	**GY**	**Thickness (Caliper) - 9 to 20 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 sheets.

Coefficient of Friction

Analysis	Pack Code	Title
364	**GD**	**Coefficient of Static Friction, Printing Papers (Horizontal Plane Method)**
365	**GD**	**Coefficient of Kinetic Friction, Printing Papers (Horizontal 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 specimens facing upwards. Note: the stamped 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 sheet if a different size sled is used.

For Coefficient of Static Friction, 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, 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.

Air Resistance, Porosity

Analysis	Pack Code	Title
370	**GE**	**Air Resistance, Gurley Oil Type**
372	**GE**	**Porosity, Sheffield Type**

Applicable Method: Analysis 370: TAPPI Official Test Method T460
Analysis 372: TAPPI Provisional Test Method T547

For Analysis 370, Air Resistance, Gurley type for Printing Papers, test at the center of the test piece with the marked side of the test piece up.

For Analysis 372, Porosity, Sheffield type, follow TAPPI Test Method T547. **Use the 0.422 in (¾ inch 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

Analysis	Pack Code	Title
376	GJ	Roughness, Print Surf Method - 0.5 to 4.0 microns
377	GK	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 kgf/cm^2 clamping pressure. Please indicate on the data sheet if a different backing or clamping pressure is used. Test the center of the marked side of each sample sheet.

Roughness, Sheffield

Analysis	Pack Code	Title
378	GL	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.

Moisture in Paper

Analysis	Pack Code	Title
382	**GM**	**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 manufacture'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 sheet, report the 2 to 10 test values for each sample, recording each value to the nearest 0.1% moisture.

Opacity

Analysis	Pack Code	Title
384	**GN**	**Opacity, TAPPI T425, 89% Backing - Fine Papers**
386	**GP**	**Opacity, TAPPI T519, Paper Backing - Fine Papers & Newsprint**

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 384 use 89%backing tile; for Analysis 386 use the other specimen sheets as backing. Report opacity values to the nearest 0.1%.

Brightness

Analysis	Pack Code	Title
390	**GR**	**Brightness - Directional**
391/394	**GZ**	**Brightness - Directional, Fluorescently Brightened Papers**
392	**GR**	**Brightness - Diffuse**

Applicable Method: Analysis 390 & 391/394: TAPPI Official Test Method T452
Analysis 392: TAPPI Official Test Method T525

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 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 391/394, 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 on the data sheet labeled Analysis 391, then calculate and report the fluorescent component of brightness (Section C.5) on the data sheet labeled Analysis 394.

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 on the data sheet for Analysis 391,** 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 on the data sheet **for Analysis 394,** Fluorescent Component of Directional Brightness.

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

Specular Gloss

Analysis	Pack Code	Title
395	**GT**	**Specular Gloss, 75°, High Range**
396	**GU**	**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 marked side of each sample sheet, 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 (up stream / downstream gloss) and average the two readings to obtain the test value.

Grammage

Analysis	Pack Code	Title
398	**GW**	**Grammage (Mass per Unit Area)**

Applicable Method: TAPPI Official Test Method T410

From the sample (10 sheets, each 13 x 20 inches), cut sufficient paper with the cutting device to provide a total test area of at least 800 in^2 (5000 cm^2). 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 inch sheets for a total area of 935 in^2 (6032 cm^2).

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/m^2). Report grammage values for each weighing unit to the nearest 0.1 g/m^2.

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.

Sizing, Hercules Type

Analysis	Pack Code	Title
399	**GX**	**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 Naphtol Green B dye and 1% Formic acid in water. Please note on the data sheet if a different type of ink was used. It is extremely important that the temperature of the ink be maintained at 73°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.