

Understanding the Standards Used in Cotton Classification

The Universal Cotton Standards ensure that cotton classification is performed consistently for all cotton samples from year to year and from place to place. Fair marketing and optimized utilization of cotton fibers on a global basis require highly standardized cotton classification. The Universal Cotton Standards ensure this high level of standardization by providing physical reference standards for manual classification and calibration standards for instrument classification.

The USDA, AMS, Cotton & Tobacco (C&T) Program works with the U.S. and international cotton industries to ensure that the Universal Cotton Standards are providing the required global benchmark for cotton classification. When a new standard or revisions to an existing standard becomes necessary, the C&T Program works through the Universal Cotton Standards Agreement to solicit broad U.S. and international cotton industry support to implement changes.

USDA's official color and leaf grade standards for American Upland cotton have been recognized as Universal Cotton Standards since 1924. Since 1923, the USDA has solicited industry support for changes to the standards through the Universal Cotton Standards Agreement. Currently, 22 cotton associations from 21 countries are signatory to the agreement ensuring that the standards are truly international. In addition to signatory representatives from international cotton industry organizations, the agreement also includes delegates from the U.S. including cotton farmers, cotton ginner, cotton merchants, cotton cooperatives and cotton spinners.

The growing acceptance of instrument cotton classification has resulted in the adoption of many calibration standards as Universal Cotton Standards. In 1995, the adoption of instrument calibration standards as Universal Cotton Standards was initiated with the adoption of High Volume Instrument (HVI) length/strength/UI calibration cottons. In 2002, calibration cotton standards for micronaire were adopted followed by the adoption of Rd/+b color standards in 2005. In 2013, cotton standards for trash percent area and particle count were adopted. In addition to the instrument based Universal Cotton Standards, 15 manual color and leaf grade standards for Upland Cotton continue to be produced.

Classification measurements for UHM Length, Length Uniformity Index, Strength, Micronaire, Color (Rd and +b), Color Grade, Trash (Percent Area and Particle Count), and Leaf Grade are performed by HVI. Classification of Extraneous Matter is made by the manual cotton classer. Outside of USDA cotton classification, color and leaf grade are often determined by manual classer.

The cotton standards and other materials used for classing cotton are listed below:

(1) Color Grade of American Upland Cotton - Color Grade describes the color of cotton lint. There are standards for 25 color grades of upland cotton and five categories of "below grade" color. Fifteen of these grades are represented in physical form by boxes of cotton representing the full range of each standard, while the remaining 10 grades and five below grade categories are descriptions based on the physical color grade standards.

(2) **Leaf Grade of American Upland Cotton** - Leaf grade describes the leaf or trash content in the cotton. There are seven leaf grades designated as leaf grade "1" through "7", and all are represented by physical standards. In addition, there is a descriptive "below grade" (leaf grade 8) designation.

The current reserve set of the Universal Standards for Color and Leaf Grades of American Upland Cotton is sealed and deposited in a vault in Memphis, Tennessee. Copies of these standards, containing six samples or biscuits, known as practical forms, are prepared and sold for \$125 f.o.b. Memphis, Tennessee, or \$130 for domestic ground delivery. The utmost care is taken to keep the range of color and leaf in all copies of each grade standard as nearly the same as possible. The standards for the seven White color grades contain the leaf content of the respective leaf grades. For example, the standard for Good Middling White (11) color contains the standard leaf content for Leaf Grade "1", and the standard for Low Middling White contains the standard leaf content of Leaf Grade "5".

The color of cotton deepens with age more in the high grades than in the low grades. The color of the cotton in the standards may differ considerably as time goes by, especially when the standards are stored under extreme conditions of temperature and/or relative humidity. Because of this natural propensity for change, copies of the grade standards must be freshly prepared annually and are effective for one year beginning each July 1.

(3) **Grades of American Pima Cotton** - There are six official grades (Grades "1" through "6") for American Pima cotton, all represented by physical standards (the American Pima Grade Standards are not recognized as Universal Cotton Standards). In addition, there is a descriptive "below grade" designation. Copies of the American Pima Grade Standards are sold for \$160 f.o.b. Memphis, Tennessee or \$165, including domestic ground delivery.

(4) **Fiber Length, Length Uniformity Index, and Fiber Strength** - The C & T Program uses High Volume Instruments (HVIs) for the classification of all Upland and American Pima cotton. There are Universal HVI Calibration Standards for American Upland cotton for calibrating length, length uniformity index, and strength. The present official standards for fiber or staple length provide for various lengths in terms of inches and fractions of an inch ranging from 13/16 inches upward, generally in graduations of one thirty-seconds of an inch. The upper half mean length of fiber is measured by the HVI system in hundredths of an inch and length is converted to thirty-seconds of an inch. Length uniformity index is the ratio between the mean length and the upper half mean length expressed as a percentage. Fiber strength is measured in grams per tex and represents the force in grams to break a bundle of fibers one tex unit in size. Both the Universal HVI Calibration Standards for Upland cotton and the USDA HVI Calibration Cottons for American Pima cotton are available, in 5-pound boxes, for \$95 f.o.b. Memphis, Tennessee or \$100 including domestic ground delivery. Two such cottons, which span a range in length and strength, are required for instrument calibration.

(5) **Micronaire** - Official cotton standards for micronaire or fiber fineness and maturity are described as the measure of such qualities provided by air flow instrument tests that measure the air permeability of a constant mass of fibers compressed to a fixed volume. Micronaire (mike) readings are expressed in units to the nearest one tenth, (e.g. 3.1, 3.2, 3.3, 3.4); however, common practice within the industry is to drop the decimal point when reporting mike readings (e.g. 31, 32, 33, 34). Mike readings of American Upland cotton range from 2.4 to 6.0. About 75 percent of the cotton crop falls in the 3.5 to 4.9 range.

- There are two Universal HVI Micronaire Calibration Cotton Standards that represent the low (~2.6) and high (~5.5) range of the cotton testing range. There are also six International Calibration Cotton (ICC) Standards for Micronaire Only that span the range of micronaire scale from ~2.6 to ~5.5. The price for a 1-pound roll of the Universal and ICC micronaire calibration cotton standards is \$28 f.o.b. Memphis, or \$31 with domestic ground delivery.

(6) **Trash** - The trash measurement is made by the HVI trashmeter which measures the percentage area and particle count of trash on the sample's surface. A trashmeter calibration tile and cotton images under glass (images of cotton samples mounted under glass) are available for calibration and verification of the trash measurements. The cost of the trash tile is \$30 f.o.b. Memphis, Tennessee or \$33 with domestic ground delivery. The cost of each Cotton Image Under Glass is \$40 f.o.b. Memphis, Tennessee (\$240 for a set of six images) or \$44 including domestic ground delivery (\$264 for a set of six images). The range of trash levels usually encountered is included in a set of six Cotton Images Under Glass.

(7) **Color** - The HVI colorimeter measures reflectance (Rd) and yellowness (+b). The Rd indicates the sample's degree of grayness and +b indicates how much yellow color is in the sample. Ceramic color calibration tiles for the HVI colorimeter are distributed by the Cotton & Tobacco Program. The cost for a five tile set is \$125 f.o.b. Memphis, Tennessee or \$130 including domestic ground delivery.

(8) **Other Standards** - There are also Universal Standards for descriptions of laboratory atmospheric conditions and conditioning practices and procedures. In addition, a brochure entitled "Guidelines for HVI Testing" has been prepared that contains standardized procedures for HVI testing which will enable users of HVI systems to achieve a common test results level for each measured property.

Programs for Checking HVI Measurements - An HVI Check Test Program is conducted to ensure a standard level of testing. Two samples are sent to participants each month for testing. The returned data are summarized and each participant receives a report comparing their results to established values for the samples. The annual cost of the HVI check test program is \$168 for domestic participants and \$324 international participants.

The Commercial Standardization of Instrument Testing of Cotton (CSITC) Round Test is also recommended. The CSITC Round Test is conducted under the auspices of the International Cotton Advisory Committee (ICAC). Participants are provided with four cotton samples on a quarterly basis. Annual cost of this program is currently \$1000 per year. Contact CSITCsecretariat@icac.org or go to www.csitc.org for more information.

Summary - USDA's cotton standards are used exclusively within the U.S. and are broadly accepted in the foreign marketing of Upland-type cotton. The standards provide a sound base for establishing market values that gain acceptance with each year's crop. International trading disputes are settled by utilizing USDA's Universal Cotton Standards. The check test programs contribute to the growing confidence in USDA's cotton standards and also ensure a common level of test results for all users.