

Overview of USDA HVI Cotton Classification Standards and Qualification Materials



USDA HVI Cotton Classification Standards and Materials for Calibration

Universal HVI Cotton Calibration Standards

- For Strength, Length & Uniformity Index
- 2 categories: Long/Strong & Short/Weak
- Used for HVI calibration of Length, Strength, Uniformity Index measurements only



USDA HVI Cotton Classification Standards and Materials for Calibration

USDA Pima HVI Calibration Cotton Standards

- For Strength, Length & Uniformity Index
- 2 Categories: Long/Strong & Short/Weak
- Used for HVI calibration of Length, Strength, Uniformity Index measurements only



USDA HVI Cotton Classification Standards and Materials for Calibration

Universal HVI Micronaire Cotton Calibration Standards

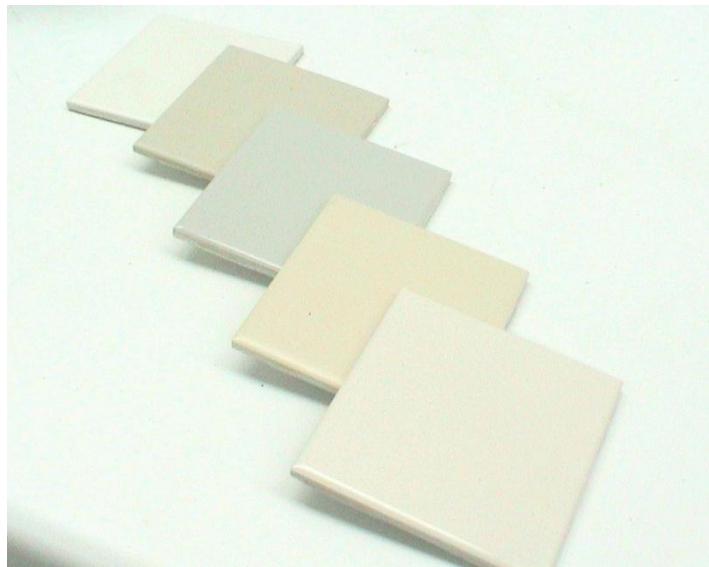
- 2 categories: High (Au) & Low (Gu)
- Used for HVI calibration for Micronaire measurement only



USDA HVI Cotton Classification Standards and Materials for Calibration

HVI Color Calibration Tiles

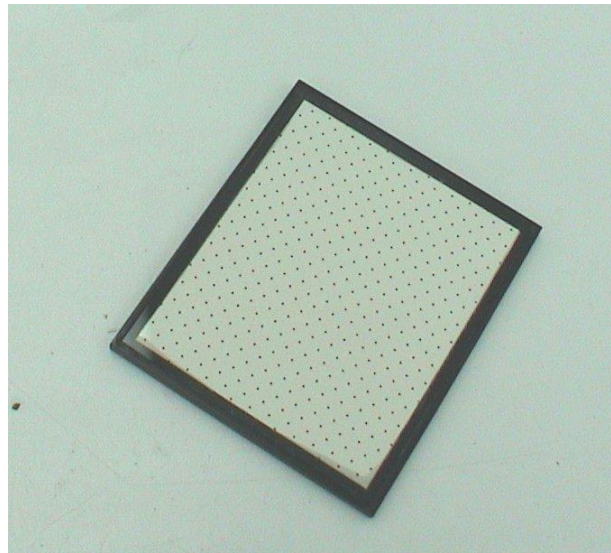
- Instrument specific calibration tool, not a standard
- Set of five tiles
- Used for HVI calibration of color Rd and +b



USDA HVI Cotton Classification Standards and Materials for Calibration

Trash Calibration Tile

- Full patterned tile
- Instrument specific calibration tool, not a standard
- Used for HVI calibration of trash percent area and trash particle count



USDA HVI Cotton Classification Standards and Materials for Annual Qualification

8x8 Evaluation Cottons

- For Strength, Length & Uniformity Index
- 8 categories covering Upland Length/Strength range

- Categories:

8x8 – 31

8x8 – 35

8x8 – 32

8x8 – 36

8x8 – 33

8x8 – 37

8x8 – 34

8x8 – 38



- Used for qualification of HVI testing level for Length, Strength, Uniformity Index on each HVI instrument

USDA HVI Cotton Classification Standards and Materials for Annual Qualification

International Calibration Cotton Standards

- For Micronaire only (6 types covering range)
- Types: Am, Gm, Cm, Im, Dm, Bm
- Used for qualification of HVI testing level for micronaire on each HVI instrument



USDA HVI Cotton Classification Standards and Materials for Annual Qualification

Universal HVI Cotton Color Standards

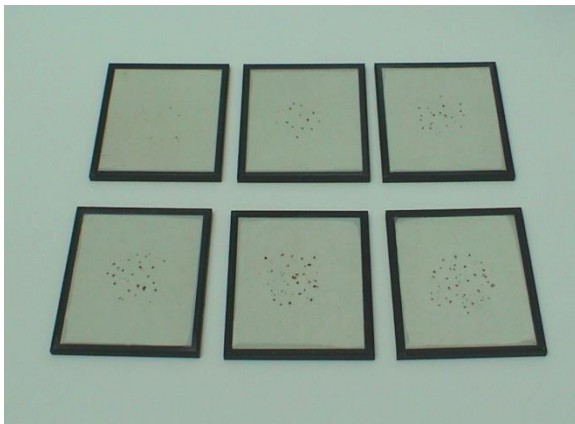
- For Rd/+b Color
- 12 cotton samples representing broad color range with standard reference values for Rd/+b
- Used for qualification of HVI testing level for Rd and +b on each HVI instrument



USDA HVI Cotton Classification Standards and Materials for Annual Qualification

USDA HVI Trash Standards

- For trash percent area and trash particle count
- 12 images of cotton samples under glass representing broad trash range with standard reference values percent area and particle count
- Used for qualification of testing level for percent area and particle count on each HVI instrument



Production of HVI Classification Standards and Qualification Materials



Production of Standards



Prepared Annually:

200+ Sets of Color Tiles

200+ Trash Tiles

100+ Color Check Boxes

50+ HVI Trash Standards



20,000+ kg of Cotton
for Calibrating HVI Length,
Strength, Uniformity and
Micronaire Prepared Annually



Production of HVI Cotton Standards

- All USDA HVI cotton calibration standards traceable to USDA master reference cottons
- Bales selected based upon USDA classification data for potential calibration standard
- Values established through intense testing processes



Production of HVI Cotton Standards

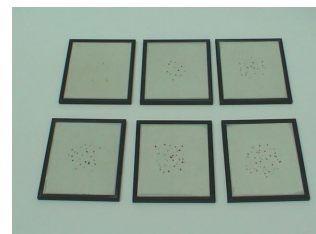
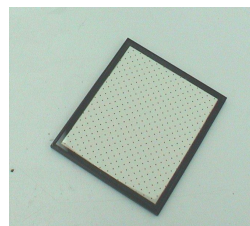
Value Establishment Process

- Selected bales tested by minimum of 6 HVI instruments in multiple labs
- Minimum of 120 test repetitions for each bale to establish values
- Bale results must meet strict level and variability guidelines to be approved as a standard



Production of HVI Color/Trash Materials

- USDA HVI color and trash standards traceable to USDA master reference cottons.
- USDA color and trash calibration materials traceable to USDA master reference cottons.
- Values established using master colorimeter/ master trashmeter



Production of HVI Color/Trash Materials

Value Establishment Process

- Each tile/ cotton tested for 4 repetitions at 4 orientations
- Measurements for each tile/cotton must meet allowable variability tolerances
- Values established based on the average of the 4 measurements
- Established values are verified



Utilization of Testing Tolerances



Understanding the Nature of HVI Data

Important Points:

- HVI data is statistical in nature
- Even the best HVI data has an accepted level of variability (error)
- Statistical tolerances are required in all areas of HVI data handling and use
 - Examples where tolerances are used on HVI data:
 - Calibration, Qualification, QA, Round Testing, Marketing, Mill laydowns, etc.

Utilization of Testing Tolerances

- What is a testing tolerance?
 - Range of acceptable error
- Why are tolerances needed?
 - Inherent variability of cotton
 - Inherent variability of instrument
- Tolerances vary for testing functions based on the number of test repetitions

Utilization of Testing Tolerances

- USDA maintains multiple levels of testing tolerances.
 - Calibration
 - Annual Qualification
 - Retests

Utilization of Testing Tolerances

Calibration Tolerances

- Purpose:
 - Establish accurate instrument testing level
- Most restrictive testing tolerance
- Calibration verification based on 12 comb repetitions for length, strength, uniformity index

USDA Testing Tolerances

Calibration

– Micronaire	0.10
– Strength	0.50
– Length	0.007
– Uniformity	0.70
– Color Rd	0.40
– Color +b	0.40
– Trash Area	0.05
– Trash Particle Count	5.00

Utilization of Testing Tolerances

Annual Qualification Tolerances

- Purpose:
 - Evaluates precision and accuracy based on multiple reference cottons with established values and low standard deviations
- Based on 8 repetitions per standard cotton/qualification material

USDA Testing Tolerances

Annual Qualification

	Mean	Standard Deviation
• Micronaire	0.11	0.1
• Strength	1.30	1.00
• Length	0.015	0.012
• Uniformity	0.90	0.80
• Color Rd	1.0	0.70
• Color +b	0.5	0.30

Utilization of Testing Tolerances

Retest Tolerances

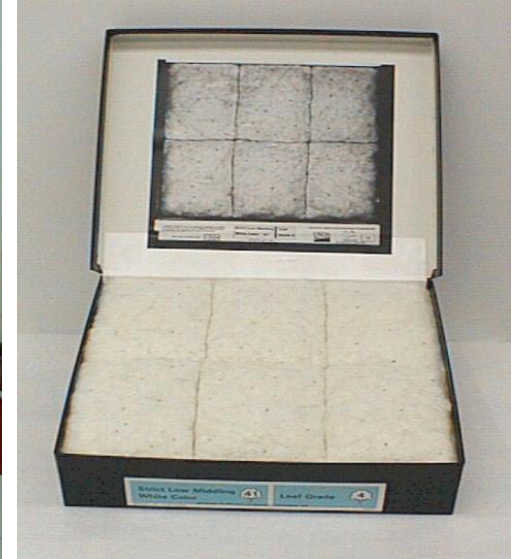
- Purpose:
 - Evaluates range of data between two sides of individual cotton samples
- Based on comparison of data collected for each side of the sample (i.e. comb to comb data comparison)

HVI Testing Tolerances

Retests

– Strength	5.0
– Length	0.075
– Uniformity	5.0
– Color Rd	7.0
– Color +b	2.0
– Trash Area	0.50
– Trash Particle Count	50

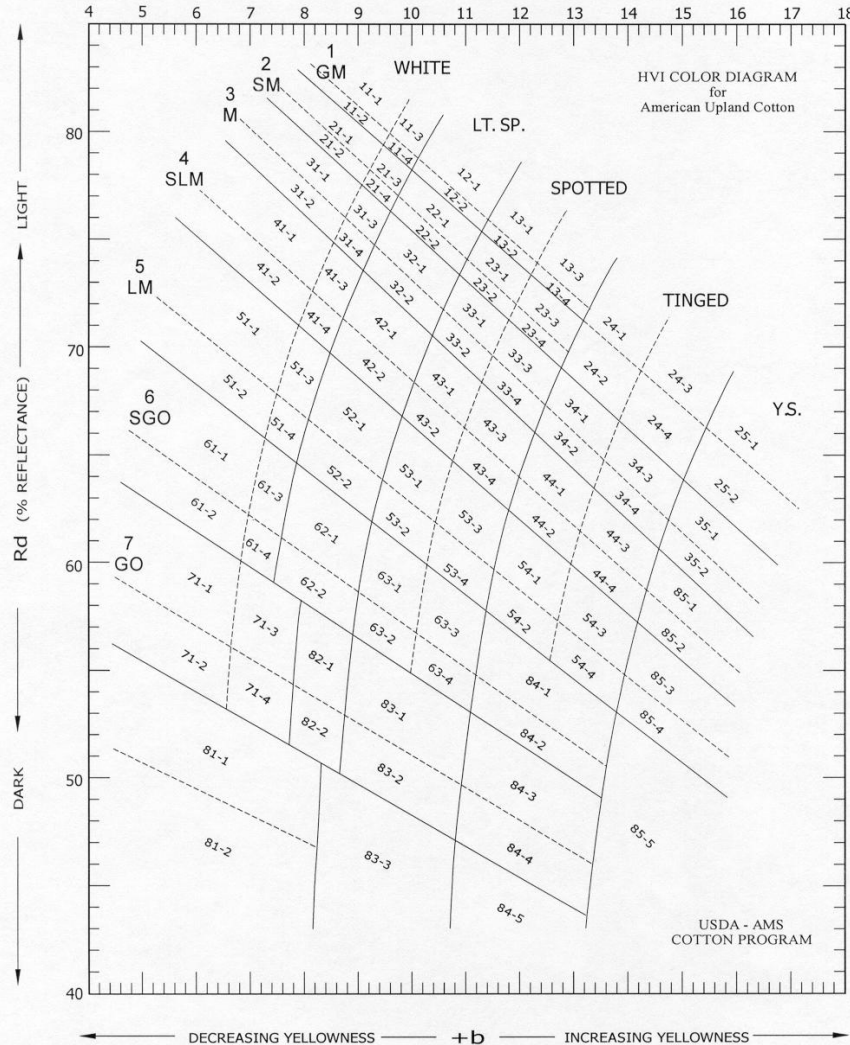
Overview of USDA Physical Classification Standards



Universal Grade Standards

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HVI COLOR GRADES FOR AMERICAN UPLAND COTTON



15 physical standards
10 descriptive grades
5 below grade



Universal Grade Standards

7 of the 15 physical grade standards serve as standards for both color and leaf



Universal Color & Leaf Grade Standards

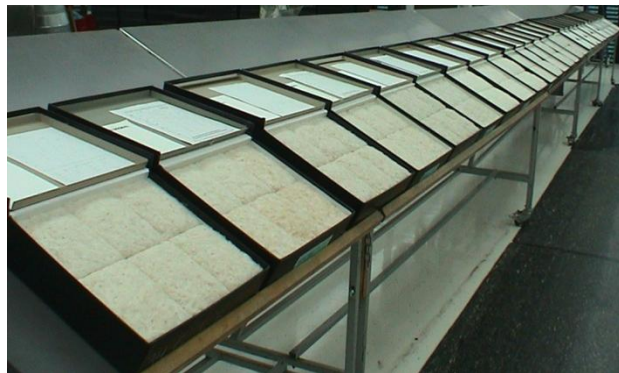
	White	Light Spotted	Spotted	Tinged	Yellow Stained
Good Middling	11* +	12	13	--	--
Strict Middling	21* +	22	23*	24	25
Middling	31* +	32	33*	34*	35
Strict Low Middling	41* +	42	43*	44*	--
Low Middling	51* +	52	53*	54*	--
Strict Good Ordinary	61* +	62	63*	--	--
Good Ordinary	71* +	--	--	--	--
Below Grade	81	82	83	84	85

- * Physical Standards for color grade. All others are descriptive.
- + Physical Standards for leaf grade.

Grade Standards Production Process

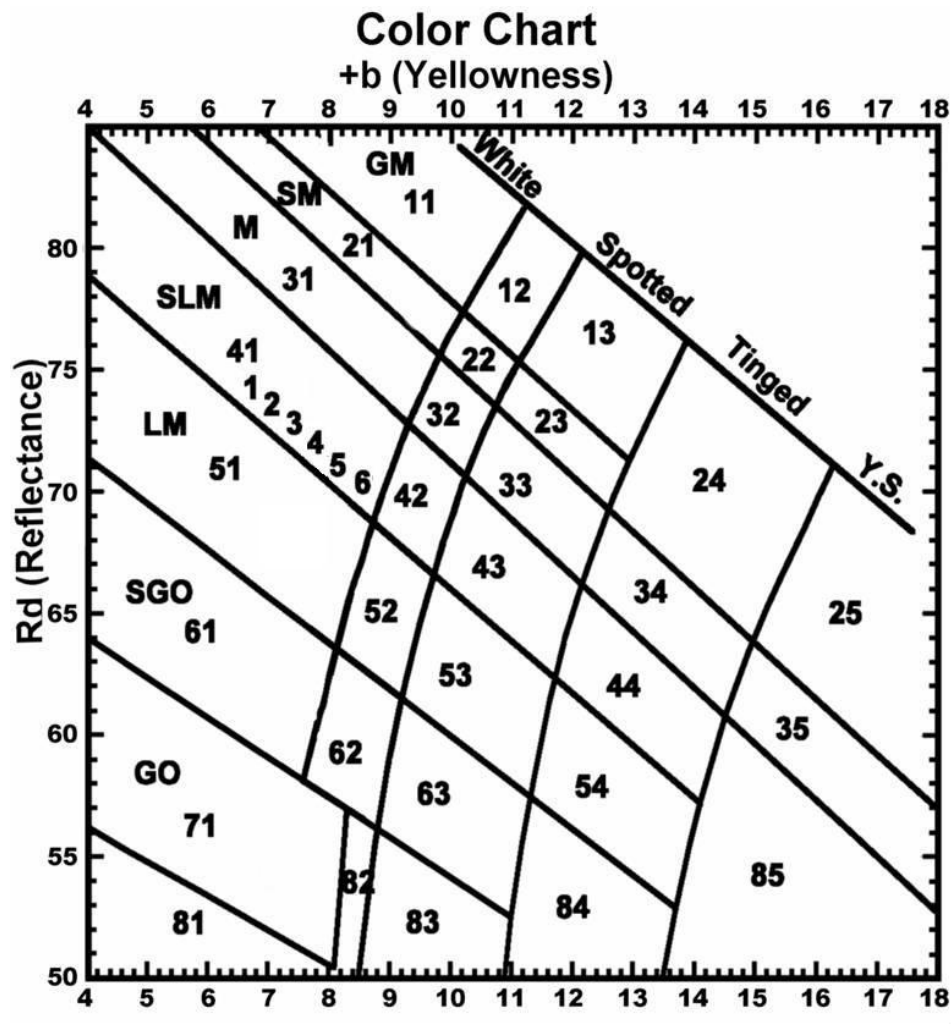
General Information

- Physical Grade Standards are valid from July 1 through June 30 of each year
 - Cotton changes color over time, the color accuracy of the cottons in grade standards diminishes with age
 - Inevitable loss of integrity with repeated use
- USDA, AMS, Cotton Division produces ~ 3000 Universal Upland and ~ 240 Pima boxes each year in to supply the demands of the domestic and international cotton industry.



Grade Standards Production Process

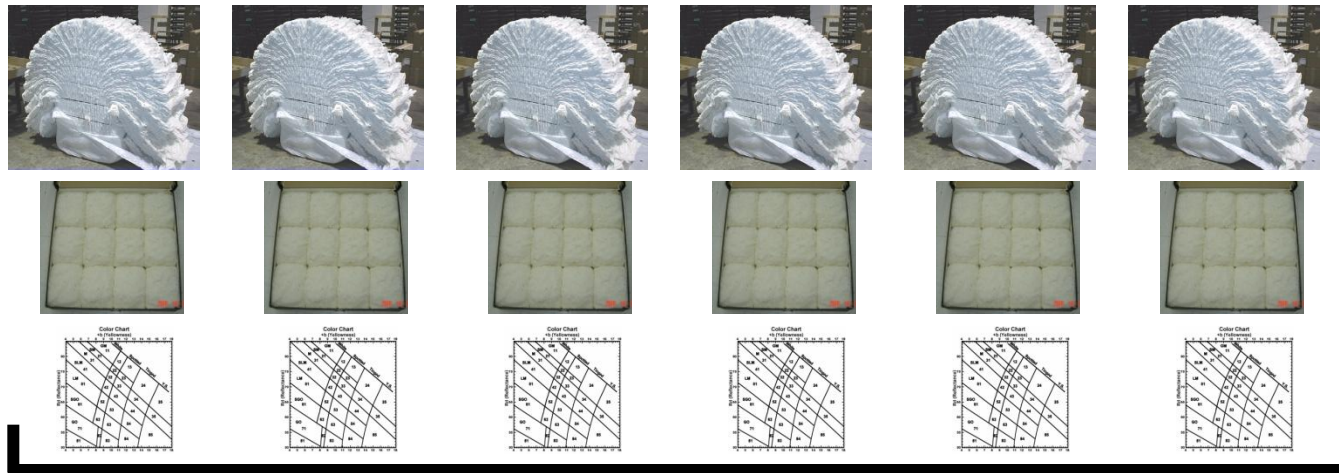
Standard represents bottom range of color



Grade Standards Production Process

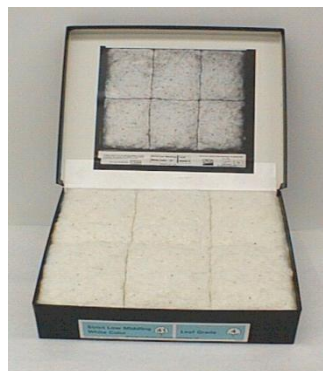
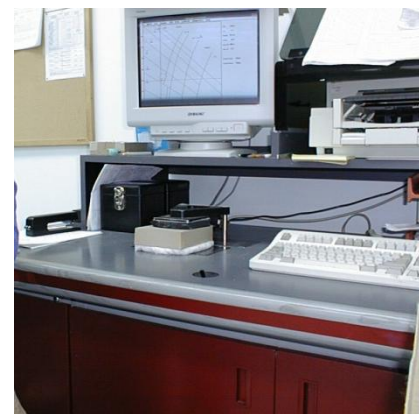
Assembling the Practical Forms

- Select up to 6 bales per grade standard
- Selections based on appearance and color chart readings



Grade Standards Production Process

Production of Practical Forms



Interpretation of Universal Grade Standards

Leaf grading

- Official level is only represented in the white grade standards
- Each “biscuit” within the leaf standard represents the maximum amount of leaf contained within the grade



Interpretation of Universal Grade Standards

Color Grade

- Standard represents the bottom range of color within each grade

