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Technical Report
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Introduction and Topic for Testing:

Evaluation of two T-Shirts received on November 2nd and identified by the client as follows:

Sample Description: T-Shirt

Style Number: 107208

Color(s): Red

Vendor: Atari

Country of Origin: Netherlands

Fiber Content Claimed: 60% Cotton, 40% polyester

Care Method Proposed: Machine Wash Cold with Like Colors, Only Non-Chlorine

Bleach when needed, Tumble Dry Low

The ASTM Performance Specification used for the product is ASTM D4154-14: Standard Performance Specification for Men's and Boys' Knitted and Woven Beachwear and Sports Shirt Fabrics. The six tests performed on product were ASTM D3786: Bursting Strength of Fabric, AATCC 135: Dimensional Stability in Laundering/Dry Cleaning, AATCC 61: Colorfastness to Laundering, ASTM D1230: 45 Degree Flammability Tester, Colorfastness to Bleaches, and AATCC 8: Colorfastness to Crocking. I hypothesize that the T-Shirt will pass ASTM D1230 because in order to be able to be sold, clothing has to be sustainable in an event of a fire, the T-Shirt will pass AATCC 8 because it shouldn't be easy to remove the color of the shirt with just water, and it will pass AATCC 61 because the color shouldn't be able to wash away so easily within the first 1 or 2 washes. I hypothesize that the T-Shirt will fail ASTM D3786 because it will break more quickly being that it is a stretch kind of fabric, the T-Shirt will fail the bleaches test because red is an easy color to wash out with bleach and lastly, it will fail AATCC 135 because as a knitted fabric, it is known to stretch or shrink tremendously to the point of the consumer not being able to wear it anymore.

Summary:

The sample MEETS the following requirements:

- AATCC 135: Dimensional Stability in Laundering/Dry Cleaning
- ASTM D1230: 45 Degree Flammability Tester

- AATCC 8: Colorfastness to Crocking

The sample DOES NOT MEET the following requirements:

- ASTM D3786: Bursting Strength of Fabric
- AATCC 61: Colorfastness to Laundering
- Colorfastness to Bleaches

Test Results and Analysis:

		<u>Results</u>	<u>Client Requirement</u>	<u>Pass/Fail</u>
Dimensional Stability in Laundering				
AATCC 135				
Dimensions reported by percent				
Length	-1.0, -1.5, -1.5	1.3%	3% Max	Pass
Width	-0.5, -0.5, -0.5	.5%	3% Max	Pass

Machine Wash Cold, Normal Cycle, Tumble Dry Low

45 Degree Flammability Tester

ASTM D1230

Width		DNI	Pass	Pass
Length		DNI	Pass	Pass
Length		DNI	Pass	Pass
Length		DNI	Pass	Pass
Length		DNI	Pass	Pass
Length		DNI	Pass	Pass

Colorfastness to Crocking

AATCC 8

Results reported by grade

Dry Procedure		5	4 Min	Pass
Wet Procedure		4	3 Min	Pass

Test Results and Analysis:

	<u>Results</u>	<u>Client Requirement</u>	<u>Pass/Fail</u>
Bursting Strength of Fabric ASTM D3786 Results reported in pounds per square inch			
42, 28, 42, 48, 50	42 lbs	50 lbs min	Fail

<u>Specimen #</u>	<u>Total Pressure</u>	<u>Tare Pressure</u>	<u>Strength</u>
1	60	18	42
2	50	22	28
3	62	20	42
4	66	18	48
5	70	20	50

Colorfastness to Laundering

AATCC 61

Results reported by grade

Color Change	3.5	4 Min	Fail
Color Staining		3 Min	Pass
Acetate	4		
Cotton	3.5		
Nylon	3		
Polyester	3.5		
Acrylic	4		
Wool	3		

Machine Wash Cold, Normal Cycle, Tumble Dry Low

Testing Results and Analysis:

	<u>Results</u>	<u>Client Requirement</u>	<u>Pass/Fail</u>
Colorfastness to Chlorine Bleach			
Results reported by grade			
Color Change	3.5	4 Min	Fail
Colorfastness to Non-Chlorine Bleach			
Results reported by grade			
Color Change	5	4 Min	Pass

Testing Details:

Dimensional Stability in Laundering/Dry Cleaning

Number and Size of Specimen: 3, 15x15in squares

Apparatus and Materials: Washing Machine, Dryer, Detergent, Ballast, Marking Pen, AATCC

Shrinkage Gauge

Conditioning Requirements: 70° +/- 2°F, 65% +/- 2% humidity for 4 hours

Procedure:

1. Mark straight grain on fabric before cutting
2. Lay specimen on flat surface after cutting
3. Use gauge to draw 3 sets of bench marks *1st and 3rd bench mark should be 2in from edges and 2nd bench mark should be 5in apart from 1st bench mark
4. Turn fabric and repeat step 3
5. Wash specimen using care instructions
6. Add ballast and start machine
7. 3 cycles of both washing and drying
8. Condition specimen for 4 hours in open air shelving *can be ironed if extremely wrinkled

9. Condition after ironing
10. Lay specimen on flat surface
11. Use gauge and place red line on bench mark and roll gauge across fabric
12. Check percentage on red number line (left=negative, right=positive)
13. Record percentage for both directions

Calculation and Report Information:

Calculate and record average percentage for both directions. Indicate shrinkage with a – and growth with a +. Specify the use of test method AATCC 135, report each dimensional change to nearest .5% and the average to nearest .10%. Specify the washing procedure and how many cycles while also specifying if the fabric was ironed.

45 Degree Flammability Tester

Number and Size of Specimen: 6, 2x6in specimens (2 in both directions, 4 more in direction in which burned more)

Apparatus and Materials: Flammability Tester, timer, Brushing Device, Dry cleaning Machine, Laboratory Drying Oven, Desiccator, Anhydrous Silica Gel, Butane, AATCC 1993 Standard Reference Detergent, Perchloroethylene, Dry cleaning Detergent, Cotton Sewing Thread

Conditioning Requirements: replaced with oven dry to remove moisture

Procedure:

1. Mark direction of specimen
2. Place specimen in holder with bottom edge aligning with top plate's edge
3. Clamp holders with metal clips
4. Dry specimens in oven for 30 mins at 221°F or 105°C
5. Remove from oven and place in dessicator for 15 mins
6. Turn on flammability tester
7. Set timer to 0
8. Instructor will turn on butane and flame
9. Remove specimen from dessicator and place on rack in tester
10. Loop thread into hooks on specimen holder
11. Move rack towards flame (close enough to ignite)
12. Gently balance weight on thread and place above stop timer

13. Close for and press start *timer will stop if fabric burns and thread breaks

14. Open doors after all flames cease

Calculation and Report Information:

Report time that thread break, specify the classification of specimen, specify the method that was used with the description of fabric. Specify if fabric was tested as received, record average time in seconds or DNI, lastly specify classification.

Colorfastness to Crocking

Number and size: 1, 2x5.1in or larger

Apparatus and Materials: Electronic AATCC Crockmeter, AATCC Gray Scale for staining or AATCC Chromatic Transference Scale, White AATCC textile blotting paper, Specimen holder (metal plate), and 2 2x2 white crock test cloths (dry and wet).

Conditioning Requirements: Place in conditioning room at a constant temperature and humidity for a minimum of 4 hours

Procedure:

1. Turn on Crockmeter
2. Secure specimen with metal plate *make sure specimen covers the frame
3. Place dry crock square over plastic finger and secure with metal clip *make sure loops don't go below the finger
4. Release pin holding the crocking arm on the left of the machine and gently lower arm onto specimen
5. Press start
6. Hit reset button (RST) to shut off alarm
7. Replaced pin to hold arm
8. Remove crock square for evaluation
9. Weigh square and record weight in grams (g)
10. Wet square in distilled water
11. Use blotting paper if needed
12. Use formula $\text{Original Weight} \times .65 = \text{Water Weight Needed}$ and $\text{Water Weight} + \text{Original Weight} = \text{Total Weight}$
13. Repeat steps 3-7 after appropriate weight is acquired

14. Remove square and dry in conditioning room

Evaluation and Reporting Info:

Evaluate crock squares in light box using light D65. Use scales to rate both dry and wet crock squares. Have more than 1 rater to evaluate squares. Specify the test method used with the description of specimen tested. Report individual and average ratings for both squares and lastly, specify scales used.

Bursting Strength of Fabric

Number and size: 10, 5x5in squares

Apparatus and Materials: Inflated Diaphragm Bursting Tester, Clamp, and pressure gauge

Conditioning Requirements: Should be conditioned and remain in conditioning room

Procedure:

1. Turn on equipment by moving silver switch up and air pressure by moving fellow lever towards ceiling
2. Center specimen under clamp and pull clamp down using the valve on top of the machine
3. Make sure gauge needles are at zero
4. Pull black nob to the left to start machine
5. Once fabric breaks, pull lever to center to stop machine
6. Record tare pressure (red needle) and total pressure (black needle)
7. Open lever next to nob and push nob to the right to reset machine
8. Once nob is back in the center close lever
9. Zero gauge by turning nob counterclockwise
10. Release clamp by pushing up valve and remove specimen

Evaluation and Reporting Info:

Bursting pressure is calculated by using Total Pressure – Tare Pressure and should be calculated for each specimen. Use PSI as the unit of measure for evaluation. Specify test method with the description of the specimen, specify the type of bursting tester, lastly record individual and average results.

Colorfastness to Laundering

Number and size: 1, 2x6in specimen

Apparatus and Materials: Launderometer, stainless steel lever locked canister, stainless steel balls, AATCC standard reference detergent, distilled water and detergent, multi-fiber cloth square, AATCC Color Change and Staining Scale, Strainer

Conditioning Requirements: condition for 1 hour prior to testing

Procedure:

1. Attach fiber cloth to specimen *all strips should be touching the fabric
2. Put 150mL of solution and 50 steel balls in canister along with specimen and cloth
3. Make sure to set laundrometer to 120°F
4. Close and lock canister
5. Place and lock canister in laundrometer
6. Make sure runtime is at zero and heater is on
7. Press start
8. After cycle, take out canister and open canister
9. Pour materials into strainer and rinse in distilled water
10. Squeeze specimen to remove excess
11. Air dry in conditioning room

Evaluation and Reporting Info:

After drying, evaluate specimen in light box using light D65 and use AATCC Gray Scale for Color Change and original specimen to compare to tested specimen. Use AATCC Gray Scale for Staining and original multi-fiber cloth to compare to tested cloth. Specify test method used with the description of specimen tested. Specify test solution and detergent used as well as scales and machines used. Lastly, report grade for color change and staining.

Colorfastness to Bleaches

Number and size: 1, 2x2in for non-chlorine bleach and 1, 2x4 for chlorine bleach

Apparatus and Materials: Weighing dish, chlorine bleach solution (15mL of chlorine and 60 mL of water), non-chlorine bleach, pipette, timer, distilled water, AATCC color change, light

Conditioning Requirements: 70 °F +/- 2°F and 65% +/- 2% humidity for 4 hours

Procedure:

1. Place each specimen in a weighing dish
2. Place one drop of non-chlorine bleach on non-chlorine specimen with pipette
3. Place one drop of chlorine bleach on chlorine specimen using pipette
4. After specimen is saturated, start timer for 1 minute
5. After the 1 minute, rinse specimen with distilled water and recondition in conditioning room

Evaluation and Reporting Info:

Evaluate specimens with Gray Scale for Color Change in light box on D65 light setting. Specify test method and describe specimen tested. Report type of bleach used and record average rating for both specimens.

Conclusion

In conclusion, 6 tests were performed on the T-Shirt to determine if the fabric is suitable to be sold. The T-Shirt passed 3 out of the 6 tests and 2 were from what I hypothesized to be true. The results I hypothesized it will pass and actually did pass were ASTM D1230: 45 Degree Flammability Tester and AATCC 8: Colorfastness to Crocking. I thought it would pass because they are being sold and are required to pass certain tests. I didn't think it will fail AATCC 61 because the color should sustain a regular wash cycle without having the color fade within the 1st one or two washes. What I hypothesized would fail and actually did fail were ASTM D3786 and Colorfastness to Bleaches. I believed the T-Shirt would fail these tests because of the way the color is and how stretchy the fabric is. What I hypothesize would fail but actually passed is AATCC 135. I thought it would fail because I thought it would grow in size due to the stretch of the fabric. 4 out of the 6 tests I hypothesized would either pass or fail did as such. To make the specimen pass the test it fails, it is suggested to find a way to make fabrics sustainable to ripping and use a dye that won't bleed as much so that the shirt don't lose it's color.

Keys

Explanation of Colorfastness Results:

Grade 5	Negligible or no change or staining
Grade 4	Slightly changed or stained
Grade 3	Noticeably changed or stained
Grade 2	Considerably changed or stained
Grade 1	Much changed or stained
DNI	Did Not Ignite

Grade rating determined through use of AATCC Gray Scales for Color Change and Staining for all tests in need of scale usage.