Marianne McDermott

From: "Milligan, Douglas E - Merrifield, VA" <douglas.e.milligan@usps.gov>
To: "Marianne McDermott" <marimcd@cox.net>; "Albertson, Mila" <MAlbertson@kellencompany.com>
Sent: Tuesday, November 29, 2005 2:45 PM
Subject: Envelope Testing

Marianne , Mila,

I hope you both had a great Thanksgiving!

We are still running a bit behind on the sample testing. However, we will be receiving the fully prepared 54 aspect ratio samples next week and the colored samples soon afterwards. I've been told that small batch size and number of patterns necessary contributed significantly to the delay and expense. Gratefully, that is all behind us now.

After so many delays, I hesitate to give you a firm date on test completion. However, we will expeditiously run the tests upon sample delivery. Due to the live addresses that are being used, I will not be able to return the prepared samples to you. However, I would like to show you how the samples were prepared, perhaps, at the same time we provide you with the results. We are optimistic that we can do that before the holiday rush.

Please allow me to contact you in the near future to schedule a sample review and present test results.

Regards,

Doug Milligan
USPS Engineering
Image and Recognition Process
(703) 280-7017

Test Report

Effects of Envelope Size, Aspect Ratio, and Color for Greeting Card Association (GCA) Samples

Image Recognition & Processing
USPS Engineering

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Revision History		
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4/24/2006	G. Davis, ESGI D. Milligan, USPS T. Welsh, ESGI	Additional ink and envelope color analysis
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1 Executive Summary

1.1 Background

The Greeting Card Association (GCA) provided a number of empty, unsealed envelopes to the United States Postal Service (USPS), Engineering facility in Merrifield, VA for the purpose of ascertaining compatibility with currently fielded mail processing equipment. Mail pieces similar to the samples are currently assessed a postage surcharge based on long-standing requirements for physical dimensions and color. The GCA asked the USPS to determine whether the samples could be processed efficiently enough to allow reducing or eliminating the surcharge.

1.2 Scope

It should be noted, that this test makes no attempt to assign any cost to any particular failure mode in the processing of mail. Instead, this test identifies extra processing or handling that is required due to an unacceptable increase in processing failures that is directly attributable to characteristics for which a surcharge is currently imposed when compared to mail without those characteristics.

1.3 Objectives

The overall goal of this test was to measure the effects of size, aspect ratio, envelope color, ink color, and stroke width on automated processing of greeting cards. That goal encompassed two specific test objectives: (1) to determine the effects of size and aspect ratio on the equipment's capability to orient and face the mail; and (2) to determine the effects of envelope color across ink color, and stroke width on readability across a range of ink colors and stroke widths. Two test decks, the aspect ratio test deck and the color test deck, were made from the provided samples.

The aspect ratio test deck was made by stuffing, sealing, and stamping the envelopes as if they contained greeting cards prepared by an individual. Many samples in this deck exceeded one or more requirements for maximum height, maximum length, or aspect ratio, making them subject to surcharge.

The color test deck was made from envelopes of 16 colors. Of those 16 colors, only sample set 50 (PMS 680) met the current Domestic Mail Manual (DMM) minimum print reflectance requirements. An additional sample set (52), consisting of white commercial #10 envelopes, was added as a control. Postage was applied to each of the 17 envelope sample sets by a popular Pitney-Bowes postage meter, and a well-formed handwritten address was identically copied in one of five ink colors and one of two stroke widths (line thicknesses).

Each test deck was then run in a manner appropriate to its purpose. The aspect ratio test deck was processed as collection mail by the Rough Culler and Advanced Facer Canceller System (AFCS). By design, the Rough Culler and AFCS removes mail pieces with physical characteristics that cannot be processed or are prone to damage either by the AFCS or by subsequent operations.

1.4 Results

Address readability was acceptable (> 95%) on five of the sixteen color sample sets. Ten sample sets produced acceptable (> 97%) readability rates on fluorescent ID tags. Twelve sample sets produced acceptable (> 98%) readability rates on POSTNET Codes. Eight sample sets produced acceptable (> 99%) cancellation performance. None of the green sample sets and only one of the red sample sets passed that test.

Three sample sets passed all three readability tests and the cancellation performance test, whose threshold of acceptability was 98%. They are sets 42, 48, and 50. They correspond to PMS colors 199, 319, and 680, respectively.

1.5 Recommendations

In regard to size and aspect ratio, the three sample sets that demonstrated acceptable performance and also had aspect ratios outside the legal range of 1.30 to 2.50 were sample sets 5, 6, and 18 at aspect ratios of 2.60, 1.29, and 1.28, respectively (see Table 3).

There is a marginal benefit to the acceptance of mail just outside the current aspect ratio requirement when compared to the combined effort to: (1) change widely published requirements; (2) obsolete, revise, and redistribute templates and gauges; and (3) revise training materials and current mail acceptance procedures. Therefore, no changes or exceptions are recommended to the current size and aspect ratio requirements.

A waiver to the currently imposed non-automation compatible surcharge should be granted for letter size mail with a matte finish, meeting all other DMM requirements for automation-compatible, first class mail, and not having red fluorescence in excess of 4 PMU, for mail envelopes in PMS colors 199, and 319, that do not meet the current minimum envelope reflectance requirements of 50% red and 45% green. This waiver should be granted only if ERM-II measured reflectance values are above, or no more than 2% below, the measured values of the samples received from GCA and identified in Table 9 below. Sample set 50 (PMS 680) met the current Domestic Mail Manual (DMM) minimum print reflectance requirements. Therefore, no waiver is necessary for PMS 680.

2 Scope

2.1 Identification

This document contains the results from the testing of envelopes having specific physical dimensions, envelope colors, ink colors, and stroke width.

2.2 Document Overview

This document contains a narrative and pictorial description of testing for the effects of physical dimensions, and contains a statistical analysis of testing for the effects of envelope and ink color. The data are presented as photographs, tables, and charts; plus narratives containing facts to aid their interpretation.

3 Test Design

3.1 Test Deck Construction

3.1.1 Overview

Two test decks were made. One deck was constructed for size and aspect ratio testing. The second deck was created for testing envelope color, ink color, and stroke width (line thickness).

3.1.2 Size and Aspect Ratio Deck

The aspect ratio test deck consisted of 7640 mail pieces that varied in size from 3x4 to 8-7/8x12-1/2, and in aspect ratios from 1 to 2.6. Table 1 provides a list of sizes and aspect ratios.

3.1.3 Color Deck

The color test deck consisted of 4507 pieces, varied by 16 envelope colors. Within each envelope color, the ink color and line thickness (or *stroke width*) of the address was varied. The available ink colors were black, blue, green, purple, and red; they were evenly distributed within each envelope color except for in cases of obvious conflicts (e.g. green ink on green envelope). Two stroke widths were used and were evenly distributed within each combination of envelope and ink color. Table 2 provides the breakdown of envelope sizes, aspect ratios, and colors; and references the PANTONE Matching System (PMS). The color test deck was used for two purposes: to measure readability; and to measure cancellation performance.

Figure 1 shows samples of all 16 colors that were tested.

Figure 1. Color Test Pieces

3.1.4 Test Piece Identification

In order to facilitate the tracking of color test pieces to expected results, i.e. truth data, a special label was generated and applied to each piece. The label identified the test piece, envelope color, ink color, stroke width, and expected delivery point code. See Figure 2 and Figure 3 for illustrations of a typical color test piece and a typical white piece used for control.

Sample	Envelope Size	Aspect Ratio	Legal Size	Legal Ratio	Quantity
1	3 X 4	1.33	NO	YES	200
2	3-1/16 X 3-1/16	1.00	NO	NO	224
3	3-5/8 X 6-1/2	1.79	YES	YES	200
4	3-3/4 X 6-3/4	1.80	YES	YES	200
5	3-3/4 X 9-3/4	2.60	YES	NO	196
6	3-7/8 X 5	1.29	YES	NO	200
7	4 X 5-3/8	1.34	YES	YES	199
8	4 X 8	2.00	YES	YES	228
9	4 X 9-3/8	2.34	YES	YES	198
10	4-1/8 X 6-1/4	1.52	YES	YES	200
11	4-1/4 X 6-1/8	1.44	YES	YES	202
12	4-1/4 X 9-1/4	2.18	YES	YES	199
13	4-1/4 X 9-1/2	2.24	YES	YES	195
14	4-3/8 X 6-3/4	1.54	YES	YES	196
15	4-1/2 X 8	2.00	YES	YES	330
16	5 X 5	1.00	YES	NO	250
17	5 x 7-1/2	1.50	YES	YES	194
18	5-3/8 X 6-7/8	1.28	YES	NO	198
19	5-3/8 X 8	1.49	YES	YES	197
20	5-1/2 X 5-1/2	1.00	YES	NO	199
21	5-5/8 X 5-5/8	1.00	YES	NO	250
22	5-3/4 X 5-3/4	1.00	YES	NO	250
23	6 X 6	1.00	YES	NO	250
24	6-1/4 X 6-1/4	1.00	NO	NO	200
25	6-1/4 X 8-3/4	1.40	NO	YES	203
26	6-1/8 X 9-1/4	1.51	YES	YES	198
27	6-1/2 X 6-1/2	1.00	NO	NO	250
28	6-1/2 X 10	1.54	NO	YES	200
29	6-3/4 X 6-3/4	1.00	NO	NO	262
30	7 X 7	1.00	NO	NO	249
31	7-1/4 X 7-1/4	1.00	NO	NO	225
32	7-1/2 X 7-1/2	1.00	NO	NO	250
33	8-1/4 X 8-1/4	1.00	NO	NO	250
34	8-1/2 X 15-1/2	1.82	NO	YES	200
35	8-7/8 X 12-1/2	1.41	NO	YES	198

Table 1. Envelope Dimensions and Aspect Ratios

Sample	Envelope Size	Aspect Ratio	Color	Quantity
36	5-3/4 X 8-1/4	1.43	Green PMS 3278	251
37	5-3/4 X 8-1/4	1.43	Green PMS 347	278
38	5-3/4 X 8-1/4	1.43	Green PMS 348	261
39	5-1/4 X 7-1/8	1.36	Green PMS 355	261
40	5-3/4 X 8-1/4	1.43	Green PMS 356	245
41	5-3/4 X 8-1/8	1.41	Red PMS 186	259
42	5-1/4 X 7-1/4	1.38	Red PMS 199	301
43	5-1/8 X 7-1/4	1.41	Red PMS 1935	267
44	5-3/4 X 8-1/4	1.43	Blue PMS 278	270
45	5-3/4 X 8-1/4	1.43	Blue PMS 279	265
46	5-1/8 X 7-1/8	1.39	Blue PMS 291	201
47	5-1/4 X 7-1/4	1.38	Blue PMS 306	257
48	5-1/2 X 8-3/4	1.59	Blue PMS 319	200
49	5-1/8 X 7-1/4	1.41	Blue PMS 659	288
50	5-1/4 X 7-1/4	1.38	Purple PMS 680	250
51	5-1/4 X 7-1/4	1.38	Orange PMS 1505	253
52	4-1/8 X 9-1/2	2.30	White	400

Table 2. Envelope Colors

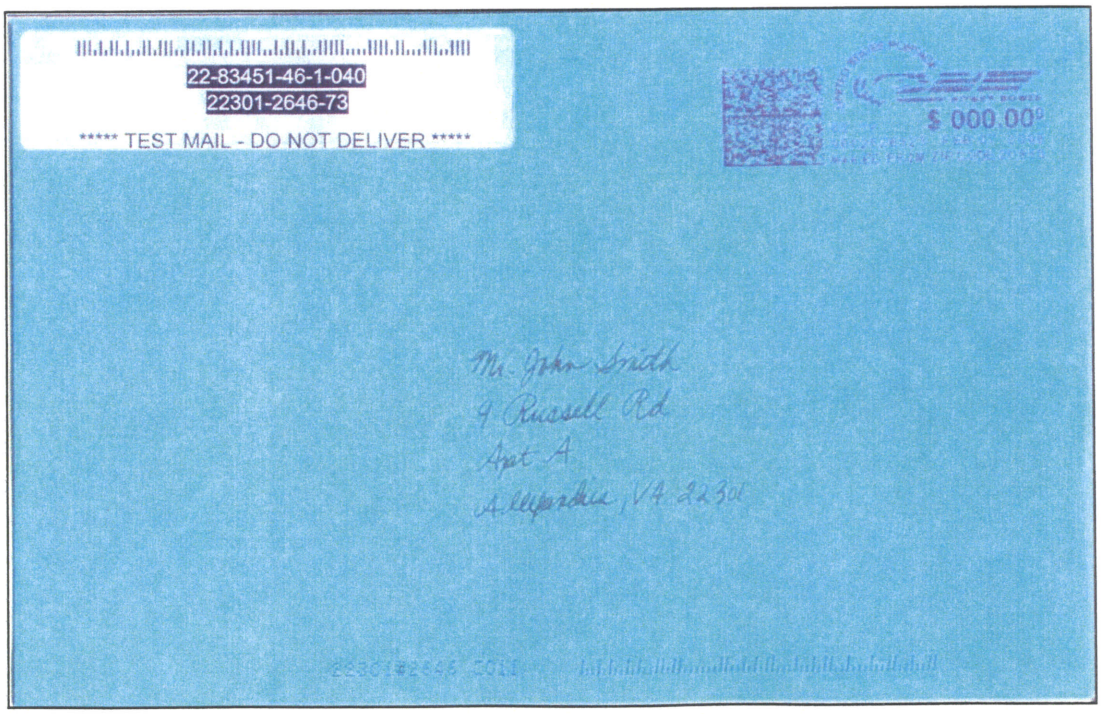

Figure 2. Example of a Color Test Piece

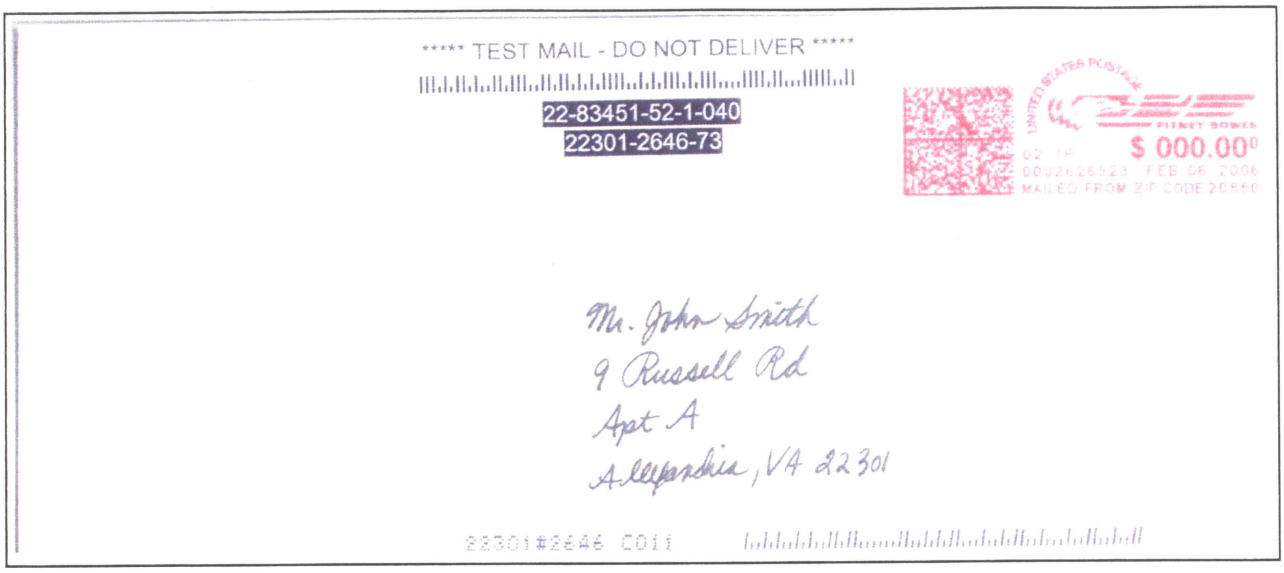

Figure 3. Typical Control Test Piece

4 Size and Aspect Ratio Testing: The Aspect Ratio Test Deck

Size and aspect ratio testing consisted of:

- feeding the aspect ratio test deck into an AFCS
- noting any obvious physical failures
- counting the number of pieces that were rejected for mechanical or cancellation failure

The equipment utilized for this test was located within the USPS Engineering Facility at Merrifield, VA and had been very recently refurbished to field equipment specifications. The ink jet cancellation equipment on this machine is currently deployed at the Northern Virginia P&DC and many other sites across the nation.

Figure 4 through Figure 13 provide a pictorial depiction of size and aspect ratio testing for three mail piece samples, as documented in Table 1. The samples depicted in the photographs are #22, #23 and #24. The process that is depicted in Figure 4 through Figure 13 is typical of the testing and subsequent analysis of results for the other samples.

Figure 4 shows a group of three fully prepared square envelope samples prior to the commencement of this portion of the test. The actual sample quantities and processing results for the aspect ratio samples are provided in Table 3.

Figure 4. Size/Aspect Ratio Samples #22 (5-3/4"), #23 (6"), #24 (6-1/4")

Figure 5 shows the samples intermingled and deposited into the AFCS's Rough Cull Input Hopper in a manner consistent with the standard operating procedure employed at USPS Processing and Distribution Centers for the processing of collection mail.

Figure 5. Induction of Samples at the AFCS Rough Cull Input Hopper

Figure 6 shows a number of envelopes that have successfully bypassed an oversize, over-thickness culling operation. All of the samples reached this point and continued on to be processed as letter mail.

Figure 7 shows the orientation section of the AFCS. It is within this section that mail meeting the aspect ratio requirement is oriented so that either the top or bottom of the mail piece is adjacent to the bottom of the feed channel. Square samples exit this section incorrectly on their right or left edge as often as they exit correctly oriented. Note the two green samples exiting this section with the stamp incorrectly positioned in the upper left corner because the sample is traveling on its left edge.

Figure 8 shows another series of samples with incorrect stamp placement approaching the feed stacker. The two light colored samples on the left were placed incorrectly in the feed stacker and subsequently inducted into the indicia detection section of the AFCS with the left edge of the sample down. The sample was then inverted in the indicia detection section so its right edge was down and the opposite face of the sample was scanned. In both cases, this resulted in failure to find the indicia and subsequently sort the sample to either a "stamp leading" or "stamp trailing" output stacker.

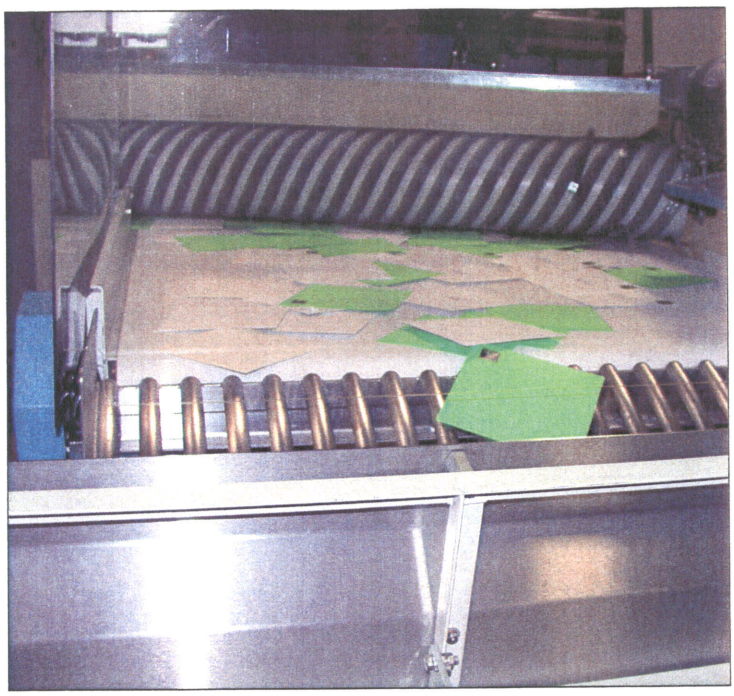

Figure 6. Acceptance of Sample as Automation Compatible Letter Mail

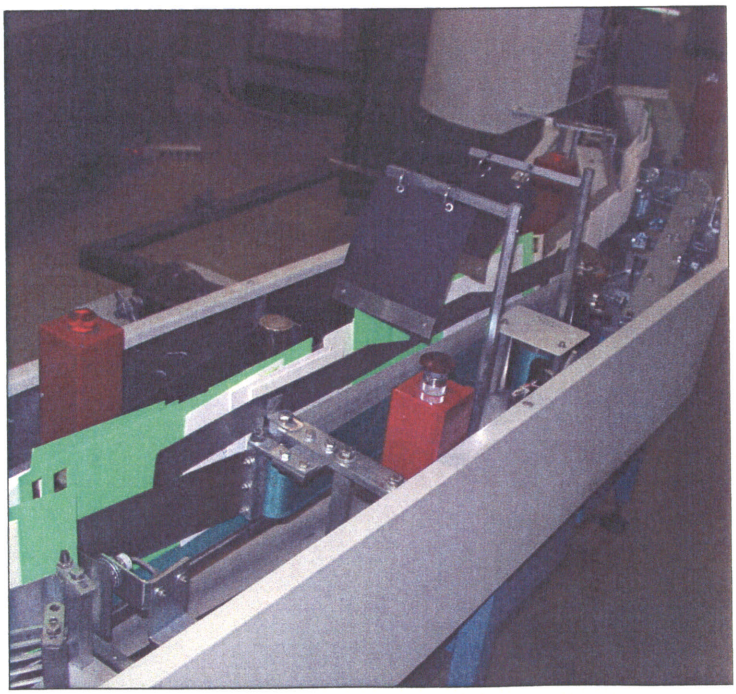

Figure 7. Orientation Failure of Square Samples