

## **2009 Transportation Density Study Update**

## PROPOSAL TWENTY

### **2009 Transportation Density Study Update Documentation**

This material documents the study plan and the programs used to develop the results of the 2009 Transportation Density Study Update. It is divided into the following sections:

- Part I: Transportation Density Study Update Survey Methodology
- Part II: Data Collection Instructions
- Part III: Transportation Density Study Update Program Documentation

The density factors are used to estimate the net cube of certain mail sampled in the TRACS highway and rail subsystems. This study was conducted using a methodology similar to the previous study from 2001, sponsored by witness Nash in Docket No. R2005-1 (see Docket No. R2005-1, USPS-T-17; USPS-LR-K-33). The general methodology was also used in special density studies conducted for use in Docket No. MC95-1 and previous "Form 22" density studies.

**PART I**

**TRANSPORTATION DENSITY STUDY UPDATE SURVEY  
METHODOLOGY**

## PROPOSAL TWENTY

### TRANSPORTATION DENSITY STUDY UPDATE DOCUMENTATION

#### 1 PURPOSE

The TRACS highway and rail subsystems employ density factors to estimate the net cubic volume of certain sampled mail from weight measurements. See Docket No. ACR2008, USPS-FY08-36, for details of the TRACS expansion procedures. The primary purpose of the study is to provide reliable estimates of the densities (pounds per cubic feet) applicable to product categories sampled by TRACS, in support of the development of volume-variable transportation costs by product in cost segments 8 (Vehicle Service Drivers) and 14 (Purchased Transportation).

#### 2 RESULTS

The following table presents the estimated density results from the study. The formulas used to calculate the estimated variances and related statistics employ the methodology assuming simple random sampling from the 2001 update, described in Docket No. R2005-1, USPS-LR-K-33. The formulas and Stata code for the calculations are also provided in Part III, below.

Table 2.1: Density estimates by mail category

Mail Category	Density (lbs/ft <sup>3</sup> )	Est. Coefficient of Variation	Est. 95% Confidence Interval		N obs
			Lower Bound	Upper Bound	
FCM Presorted Letters & Cards	17.69	1.1%	17.32	18.07	354
FCM Presorted Flats	23.63	1.2%	23.07	24.19	167
FCM Single Piece Letters & Cards	16.19	0.9%	15.89	16.49	228
FCM Single Piece Flats	22.55	1.3%	21.97	23.13	200
FCM IPPs & Parcels	6.34	2.9%	5.98	6.70	914
Periodicals Flats (Tubbed)	27.78	1.2%	27.12	28.44	70
Standard Reg. & ECR Letters	21.07	1.6%	20.41	21.73	403
Standard Reg. Flats (Tubbed)	27.92	1.3%	27.21	28.62	214
Standard Parcels + NFM's	7.96	8.5%	6.63	9.30	108
PSVC Bound Printed Matter	23.94	10.0%	19.25	28.63	52
PSVC Media and Library Mail	18.48	7.6%	15.73	21.23	237
PSVC Parcel Post	8.40	5.1%	7.57	9.23	202
PSVC Parcel Post NMO	5.98	11.7%	4.61	7.35	84
Free Mail for the Blind	20.28	11.1%	15.86	24.70	31
Periodicals Flats - Bundled	53.20	1.6%	51.58	54.82	333
Standard Regular Flats - Bundled	48.66	1.9%	46.89	50.43	434
Standard ECR Flats - Bundled	54.81	2.0%	52.69	56.94	221
BPM Flats - Bundled	55.61	3.8%	51.51	59.70	52
Priority Mail Flats & Letters	xxx	3.5%	xxx	xxx	340
Priority Mail Parcels	xxx	2.9%	xxx	xxx	1549
Express Mail	xxx	7.7%	xxx	xxx	480
Express Mail Flat Rate Envelope	xxx	9.7%	xxx	xxx	226

## PROPOSAL TWENTY

Express Mail Parcels	xxx	8.6%	xxx	xxx	112
FCM Int'l Flats	23.49	3.3%	21.96	25.02	63
FCM Int'l Letters	16.32	2.1%	15.64	17.00	68
FCM Int'l IPPs/Parcels	10.07	9.3%	8.24	11.90	258
Int'l Priority Airmail Letters	xxx	6.1%	xxx	xxx	22
Int'l Priority Airmail Nonletters	Xxx	11.0%	Xxx	xxx	99
Int'l Surface Airlift Letters	Xxx	8.4%	Xxx	Xxx	10
Int'l Surface Airlift Nonletters	Xxx	11.4%	Xxx	Xxx	121
Express Mail Int'l	xxx	5.7%	Xxx	Xxx	408
Priority Mail International Letters and Flats	Xxx	23.6%	Xxx	Xxx	54
Priority Mail International Parcels	Xxx	6.2%	Xxx	Xxx	154
Priority Mail International Flat Rate Envelope	Xxx	6.8%	Xxx	Xxx	94
M-Bags	xxx	16.8%	xxx	Xxx	10
Foreign Origin Air LC/AO Flats	22.89	3.3%	21.40	24.38	57
Foreign Origin Air LC/AO Letters	17.99	1.7%	17.40	18.59	57
Foreign Origin Air LC/AO Small Packets/Parcels	9.72	5.0%	8.77	10.66	528
Foreign Origin Air CP	Xxx	8.9%	Xxx	Xxx	88
Foreign Origin Express	Xxx	7.8%	xxx	xxx	136
Foreign Origin Surf. LC/AO Flats	25.34	4.7%	23.03	27.66	20
Foreign Origin Surf. LC/AO Letters	17.53	4.5%	16.00	19.06	22
Foreign Origin Surf. CP	Xxx	12.9%	Xxx	xxx	49
Foreign Origin, Priority	xxx	20.2%	xxx	Xxx	38

### 3 Sampling Plan

The universe under study involves all mail of the relevant categories and shapes traveling through the U.S. Postal Service surface transportation systems. The sampling plan included International Service Centers (ISCs), Bulk Mail Centers (BMCs), Processing and Distribution facilities (e.g. P&DCs and P&DFs), and Surface Transportation Centers (STCs).

#### 3.1 Site Selection

The sample of data collection sites employed four first-stage (facility) sampling strata: ISCs, BMCs, "large" P&DCs/P&DFs, "small" P&DCs/P&DFs, and STCs. The measure of facility size was estimated surface cubic foot-miles for all mail categories, from TRACS for FY 2008. Within each stratum, sample sites generally were selected with probability proportional to the size measure. For the ISC stratum, the New York (JFK) ISC was included with certainty, and two other ISCs (Chicago and San Francisco) were randomly selected with uniform probability. In addition, the New Jersey International facility (located at the New Jersey BMC) was included in the study to provide coverage of surface International Mail categories processed there rather than at the JFK ISC. Four reserve P&Ds were selected but not visited. The following facilities took part in the study:

**PROPOSAL TWENTY**

Table 3.1: Sites included in the density study

<b>ISC Tests</b>	<b>STC Tests</b>	<b>BMC Tests</b>	<b>Large P&amp;DC Tests</b>	<b>Small P&amp;DC Tests</b>
New York (JFK) ISC	Capital Metro STC	Cincinnati OH BMC	Detroit MI P&DC	Ashland KY P&DF
Chicago ISC	New Jersey STC	Kansas City KS BMC	Milwaukee WI P&DC	Santa Clarita CA P&DC
San Francisco ISC	Southwest Area STC	San Francisco CA BMC/NDC		
New Jersey Int'l				

For each site, Postal Service management identified a site coordinator responsible for providing the survey teams with access to the facility and a site tour. The survey teams collected data on two consecutive days at each selected facility. Trips were scheduled to cover the workweek to the extent practicable. The data collection trips took place between July and August, 2009.

**3.2 Sample of Mail**

Like the 2001 update, the 2009 study used quota sampling for its second (container or piece) stages. For each test-day, data collection continued until a predetermined quantity of each eligible type of mail had been located and sampled. The initial data collection trip, to the Milwaukee P&DC, did not use strict quotas, but was intended to determine feasible amounts of mail to be collected in a test-day while covering the needed mail categories. The daily quotas for subsequent trips varied by type of mail and facility type, as shown in Table 3.2, below. A quota for a particular type of mail could be dropped if the facility was determined not to process the given type of mail.

Table 3.2: Quantity of mail for each category to be sampled every day.

		<b>Large Plants*</b>	<b>BMCs</b>
Letter Trays	First Class Single Piece FIM	15	
	First Class Single Piece non-FIM	15	
	First Class Presort	30	
	Standard Regular	25	30
	Standard ECR	10	As Available
Flat Tubs	First Class Single Piece	20	
	First Class Presort	20	
	Periodicals	20	As Available
	Standard Regular	20	10
		As	As
	Standard ECR	Available	Available

## PROPOSAL TWENTY

Bundles	Periodicals	35	10
	Standard Regular	35	35
	Standard ECR	35	15
	BPM	5	10

Sacks/Wheeled Containers	Priority	20 sacks	10 (if site works Priority Mail)
	Package Services Express	10	10 OTRs (subsample contents for 10 pcs) 0

Packages (individual pieces)	Large Priority	10-15	10-15
	Large Package Services	5	10-15
	Media Mail	10	10
	Rare categories:		
	- Library Mail	As available	As available
	- USPS Mail (G-10 Permit)	As available	As available
	- Free Mail	As available	As available

\*Small plant quotas @ 60% of Large P&DC; STC quotas @ Large P&DC for mail categories present

### 3.3 Mail Selection and Data Collection Procedures

The data collectors were allowed to locate the categories and shapes of mail where they were able, both originating and destinating, during any tour of the test day.

To select mail in letter trays or flat tubs, data collectors were instructed to obtain containers which were full, or as nearly full as practicable, and as uniform as possible as to mail category and shape. In contrast to the 2001 study, where data collectors were instructed to add mail to fill partly-full containers as necessary and/or possible, data collectors for the 2009 study took trays and tubs solely as prepared by mailers or Postal Service processing operations. The modified procedure was intended to eliminate data collector practices for packing containers (as opposed to those of mailers or the Postal Service) as a source of variation in the measured densities. Data collectors recorded the mail category, tray or tub type, tare weight of the container, presence and/or tare weight of the container cap or sleeve if present. Unoccupied space in the tray or tub (if any) is measured to permit adjustment of the net cubic volume for the observation.

## PROPOSAL TWENTY

For parcels and bundles, data collectors selected containers of mail and then measured and weighed pieces within the containers. For Priority Mail and Express Mail sacks, data collectors were instructed to measure each piece in the sack. For parcel-shape mail in gaylords (pallet boxes) and wheeled containers, data collectors selected 10 pieces from the container, applying the data collectors' judgment to represent the size distribution of pieces in the containers. Less common categories of mail (e.g. free mail for the blind, outside parcels) were obtained as they were located whether containerized or not.

Recording the "piece density" rather than "load density" is a change in methodology from the 2001 study. Since floor scales were removed from Postal Service processing facilities, it is not possible to implement the previous approach of filling hampers or U-carts with mail and weighing the full containers on the floor scales. In addition to being the feasible method, piece measurements also avoid the potential problem that hand-loaded containers may differ materially from containers produced in mailer and/or Postal Service operations (particularly mechanized operations such as APPS, PSM, and SPBS). Finally, parcel piece densities may be obtained in the future from ongoing TRACS sampling, permitting more frequent density updates without requiring special studies. The addition of measurements for bundles allows the TRACS expansion process to recognize density differences between bundled and tubbed flats, and permits future evaluation of electronic verification system (eVS) data as an alternative source for density data for covered flat-shape mail.

For additional detail on the data collection procedures, refer to the data collection procedure instructions contained in Part II.

### **4 Study Preparation**

Preparation for the 2009 study relied upon Christensen Associates' experience in implementing studies of Postal Service field units and information from the 2001 density update provided in Docket No. R2005-1, USPS-LR-K-33. An early draft data collection instrument was tested at the Madison WI P&DC. Additionally, the survey trip to the Milwaukee WI P&DC was designed as a "live test" to identify issues with the data collection instrument and to refine practices for locating and measuring mail. The data collection teams conducted a subsequent training visit to the Madison P&DC prior to the main group of data collection trips. The ISC trips were headed by Christensen Associates staff with specific expertise with International Mail and knowledge of ISC operations.

**PART II**

**DATA COLLECTION INSTRUCTIONS**

## PROPOSAL TWENTY

### **Overview**

The 2009 density study update employed a Microsoft Excel-based data collection instrument, attached as 'Data Entry.xls.' The data collection instrument used data entry screens tailored to the types of mail collected as part of the study, including trays and tubs, containerized parcels, bundles, and other parcels not associated with a container. The Excel instrument was designed both to provide real-time checking of basic data collection errors, such as failure to enter mail category, container type, and/or tare weight information, and to reduce the need and opportunity for error in converting data from entries on paper forms. The data collection teams were provided with the following document describing survey procedures and the survey instrument.

## 2009 Transportation Density Study

### I. Survey Overview

The primary purpose of the 2009 Density Study is to calculate densities (weight per cube) by class and subclass for use in the Transportation Cost System (TRACS). In TRACS data collection tests, certain sample mail is weighed, but cubic feet are not calculated. The density factors developed from this study will be used in every TRACS test taken to convert sample weights to cubic feet. Therefore, each density test is extremely important.

The survey will be conducted at 13 randomly selected mail processing facilities. These facilities include Processing and Distribution Centers/Facilities (P&DC/Fs), Bulk Mail Centers (BMCs), International Service Centers (ISCs), and Surface Transportation Centers (STCs). Teams of two will be sent to each site. The Team Leader will be responsible for coordinating with the office and the implementation of the survey.

The goal is to collect the following number of samples from each site as described in the Quotas.xls file.

### II. Preparation for Site Visit

#### a. Call Site Coordinator

You will be given the name and contact information for the Site Coordinator at the facility. The Team Leader should call the Site Coordinator to:

- Explain a little about the survey
- Notify them of the dates you are coming – Are there low/unusual volumes that day?
- Set up an initial meeting at the plant
- Get an idea when different classes of mail are staged/processed
- Verify address of facility
- Get parking instructions

#### b. Materials to Bring to Site

Each team should bring the following materials:

1. Authorization letters from Headquarters
2. Two HP Mini netbooks (including extra battery pack)
3. Two scanners
4. Scanner barcodes for resetting scanner
5. 100 pound capacity scale
6. 30 pound capacity scale
7. Two soft tape measures
8. Two calipers
9. Clippers ( for ISCs)

## PROPOSAL TWENTY

10. Zip Ties (for ISCs)
11. Paper survey forms – just in case
12. Clipboard
13. Notepad
14. Stickers for marking sampled containers
15. Flash Drive
16. Make sure both data collectors have logged onto both laptops while still in the office. If you don't, you won't be able to use the computers!

Put a fresh battery in the 100 pound scale and be sure the 30 pound scale is fully charged. Also, the laptops should have full batteries.

### III. Site Visit

Set up a meeting with site coordinator/managers to explain what we are trying to collect. Find out when various classes of mail will be available for sampling. Plan your schedule accordingly. Make sure to find out the dispatch time for Express Mail.

### IV. Survey Forms

The following section provides detailed instructions on how to properly complete the survey forms. The file 'Data Entry.xls' on your computers contains the Visual Basic data entry screens.

Note: Don't enter test data into this version. If you want to test the software, make a copy of the spreadsheet.

Note2: SAVE OFTEN. There are red 'Save Workbook' buttons on almost all data entry screens. Try to save at least every 15 minutes to avoid any major data losses.

The sheet "menu" contains a button to start the data entry software. The following screen should come up:

## PROPOSAL TWENTY

2009 Density Study Data Entry Screen

Site: CAPITAL METRO STC

Data Collectors: Joe and Marlies

Date: 7/20/2009

Enter Flat Tubs or Letter Trays

Enter Containers (Mostly Sacks)

Enter Bundles

Enter Packages

Save Workbook

Exit

Enter the Site, Data Collectors, and Date. You should only have to do this once for each site and day.

### Enter Flat Tubs or Letter Trays

Here are a few rules for sampling flat tubs and letter trays:

1. The study aims to measure trayed mail densities based on full trays as prepared by mailers and/or the Postal Service. So obtain full trays when possible.
2. If the only available trays/tubs are less than 100 percent full, try to obtain trays that are as nearly full as possible (i.e. 1-3 inches of empty space either when letter-shape pieces are stood on end or measuring from the top of the mail to the bottom of the handles on flat tubs). The software will accept up to 10" of empty space, but generally trays that empty should be avoided.
3. Many flat tubs will contain mixed classes. Select tubs that have most pieces with the same class/subclass of mail.
4. Don't select more than 2 or 3 trays/tubs from the same mailing.
5. Mark selected containers with stickers so that they are not recorded twice.
6. Try to get a variety of tray types (e.g. MM trays, EMM trays, half trays) for each mail category in the quota.

The following is the letter trays and flat tubs entry screen:

## PROPOSAL TWENTY

Barcode | | 1

ZIP	CIN	CIN Description (Class/Shape)	Proc	Mailer	Serial #

Class: Class Identified in CIN Lookup

Shape: Shape Identified in CIN Lookup \*\*\* Shape of top or front piece in tub/tray \*\*\*

Gross Weight: Pounds [ ] Ounces [ ]

Tare Weight of Container: Pounds [ ] Ounces [ ]

Tare Weight of Cover (if applicable): Pounds [ ] Ounces [ ]

Container Type: [ ]

Space not used (in whole inches) [ ] For flat tubs - Record inches below (+) or above (-) bottom of handle. For letter trays, record horizontal empty space.

Notes: [ ]

Notes: [ ]

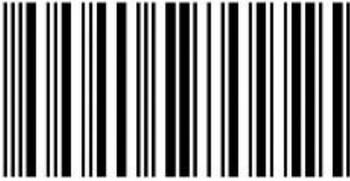
Save Tub/Tray EXIT Save Workbook

**Barcode** - If the tray or tub has a label that contains a 10 digit or 24 digit barcode, scan the barcode into the 'barcode' field. Some trays have a new "Intelligent Mail Tray Label" with both barcode types. If the tray/tub label has both barcode types, scan the longer 24 digit barcode. This can be easily done by pointing the scanner below the 24 digit barcode and moving the aim point slowly up while holding the trigger. (You will be able to see the illuminated area the scanner is trying to read.) Reading longer barcodes may also require holding the scanner further back from the tray to The scanner will beep when it captures the barcode and the numerical equivalent will be entered into the barcode field.

The barcode should be converted and fill in the cells shaded in pink. However, the Content Identification Number (CIN) lookup will resolve to "NA" for CINs used for USPS-prepared trays. If the CIN does look up to a mail category and is consistent with the tray contents, leave the "class" field as "Class Identified in CIN Lookup" (the default). If there is no barcode, enter the container destination ZIP Code if available, otherwise enter "00000".

## PROPOSAL TWENTY

Here is an example of a tray/tub label with both types of barcodes:

	05/09/08 10/24-DIGIT SAMPLE 9-DIGIT AADC NORTHERN VA FCM LTR AADC BC MAILER NAME, CITY, ST 499711410 <b>AUTO</b> <b>220</b> 2200024501 220002451 499711410 123458
	MAILER AREA

Scan the longer barcode below the shorter one.

**Class** - This only needs to be filled in if the scanned barcode yields a "N/A" in the 'Cin Description (Class/Shape)' field or if the tray label indicates a class inconsistent with the tray contents. If the class of mail is not included as a selection, select 'Other product (specify in remarks)' and make a note in the 'Notes' field. If the class is international at a non-ISC facility, then note the type in 'Notes' field. Note that the list of tray/tub classes will be completely different for ISC facilities. If the CIN does not look up, enter the human-readable CIN (in the example "FCM LTR AADC BC") in a "Notes" field. Once you have entered the value for a non-lookup CIN, it is not necessary to re-enter the CIN for other trays/tubs with the same CIN. Note that you may enter common classes with one keystroke (F for FCM Single Piece non-FIM, S for Standard Regular, P for Periodicals, E for ECR) and tab for additional values.

**Shape** - This only needs to be filled in if the scanned barcode yields a "N/A" in the 'Cin Description (Class/Shape)' field or if the tray label reports the wrong shape. If the shape of the pieces is not included as a selection, select 'Other (specify in notes)' and make a note in the 'Notes' field. You may type the first letter to enter the shapes (Letter, Flat, Parcel, Cards).

**Gross Weight** - Weigh the container and enter the results in pounds using the 30 pound scale. If tray or tub weighs more than 30 pounds, use the 100 pound scale. Be sure that the scale is set to pounds only, and include the weight to the right of the decimal point in the pounds field.

**Tare Weight of Container** – Enter the tare weight of the container. This is usually printed on one end of the tray or tub. Be aware that the tare weight may be in pounds or ounces (though in most cases, tray tare weights are given in decimal pounds). Make sure to record in the correct field. If there is no tare weight printed on the tray/tub, try to obtain and weigh an empty container that is identical to the one sampled in order to establish a tare weight. If none can be found, make a note in one of the 'Notes' fields.

## PROPOSAL TWENTY

**Tare Weight of Cover (If Applicable)** - If the container has a cover or sleeve, enter the tare weight printed on the cover or sleeve. This is usually printed somewhere on the cover. If there isn't a tare weight, write 'Cover' in one of the notes fields.

This is most commonly the case for capped flat tubs. Be aware that the tare weight may be pounds or ounces. Make sure to record in the correct field.

**Container Type** - Choose a Container Type from the menu. The choices are:

- MM Letter Tray (Plastic)
- Blue Lettering MM Tray
- EMM Letter Tray (Black or Red Lettering)
- Cardboard Letter Tray - Full (2')
- Cardboard Letter Tray - Half (1')
- Half MM Letter Tray (Plastic)
- Red Plastic Letter Tray
- Other Letter Tray (specify in remarks)
- Flat Tub (Plastic, 1.94 lb. tare)
- Other Tub (specify in remarks)

You may type the first letter to obtain the most common types (e.g. M for MM tray, E for EMM Tray, C for Cardboard tray, H for Half MM tray, F for Flat Tub).

Most plastic letter trays look like this:



Plastic tray types will usually differ by length, depth, and/or color of lettering. The type of tray (MM vs. EMM) is usually printed on one of the ends of the tray (along with the tare weight). Cardboard trays look similar except that they are made out of cardboard instead of plastic. The Red Plastic Letter Tray is a plastic tray that is actually red in color. These are usually used for mail to be delivered within the facility's delivery area.

Flat tubs look like this:



Most flat tubs are plastic, but you may see a cardboard tub, which should be entered as an 'Other Tub'.

You may type the first letter to select the most common types (e.g. M for MM tray, E for EMM Tray, C for 2' Cardboard tray, H for Half MM tray, F for Flat Tub). If not, just use the up or down arrow key to select the appropriate container type. If you do not believe the container is one of the choices, choose 'Other Letter Tray' or 'Other Tub' and make

## PROPOSAL TWENTY

a note in the notes field – include the dimensions (Length x Width x Height) of the container.

Space not used (in inches) – Always pull full trays and tubs whenever possible. There will be times where full trays or tubs cannot be found, due to lack of mail. Try to choose the most full available containers. If the mail must be compressed to make horizontal space in a letter tray or to be below the bottom of the handle of a flat tub, then consider the tray/tub to be full.

If tubs are not filled to the handles, measure the vertical space between the bottom of the handle opening and the top of the mail on the higher side. If there is mail higher than the bottom of the handles, measure the space between the mail and the bottom of the handles and enter as a negative value. If letter trays are not completely full, gently tilt the tray to allow the mail to stand on end and measure the horizontal empty space in the bottom of the tray. (If the tray is sleeved, measure through the handle opening. Always round DOWN (absolute value) to the nearest inch. For example, if the measured empty space is 1.75 inches, enter 1 inch. If the measured space is less than an inch, consider the container full.

Notes – Enter any relevant notes.

Save Tub/Tray - Entering Save will save the information and will reset the screen so the next container can be entered.

Exit – Closes this data entry screen. Before closing, it will ask if you want to save container.

Save Workbook - Saves workbook. Save often!

### Enter Containers (mostly sacks)

For sacks, you will be recording some information about the sack itself and then use the 'Piece' screen to record information about the individual pieces. All pieces within the sack should be recorded if possible.

If you see any, try to sample at least some Priority Mail Open and Distribute (PMOD) sacks.

Be sure to arrive at the Express Mail rack at least 45 minutes before dispatch. This will give you time to sample 5 to 10 sacks before the mad rush.

For other containers (including rolling stock or gaylords containing Priority Mail or Package Services, and International mail containers), we will be taking a sub sample of the pieces in the container. The idea would be, as possible, to either (a) unload the container, count the number of pieces, and draw a skip through the contents to get about 10 pieces, or (b) take 10 pieces "off the top" (but with an eye to representing different types of pieces visible in the container) and recording them. If you can use method (a), then record the skip accordingly and if you use (b) record the skip as 1. Don't record any domestic Standard or Periodicals sacks.

## PROPOSAL TWENTY

The following is the container entry screen:

Mail Container Data Entry (Mostly Priority, Express, & Intl sacks)

Barcode

ZIP	CIN	CIN Description (Class/Shape)	Proc	Mailer	Serial #

Class: Class Identified in CIN Lookup

Gross Container Weight: Pounds Ounces

Container Tare Weight: Pounds Ounces

Height of Mail in Container (Inches)

Girth of Mail in Container (Inches)

Girth of Container (Inches) - #2 \*\*\* Only need if Sack more than 12" tall and non-uniform\*\*\*

Container Type

Destinating Facility:

Notes:

Enter Piece Information Exit Save Workbook Random

**Barcode** - If the container has a label that contains a 10 digit or 24 digit barcode, scan the barcode into the 'barcode' field. Usually only sacks will have a label with a barcode. If the container label has both barcode types, scan the longer 24 digit barcode. This can be easily done by point the scanner below the 24 digit barcode and moving slowing up while holding the trigger. The barcode should be converted and fill in the cells shaded in pink. You should be sure that the actual mail in the tray or tub matches what is reported on the label or in the converted CIN description. If the label is wrong, mark the appropriate class in the 'Class' field. If the container does not have a barcode, enter the destination ZIP Code if available (if there is a range, enter the first ZIP Code); otherwise enter "00000".

**Class** - This only needs to be filled in if the scanned barcode yields a "N/A" in the 'Cin Description (Class/Shape)' field or if the tray label reports the wrong class. If the class of mail is not included as a selection, select 'Other product (specify in remarks)' and make a note in the 'Notes' field. If the class is international at a non-ISC facility, then note the type in 'Notes' field. Note that the list of classes will be completely different for ISC facilities.

**Gross Container Weight** - Weigh the container and enter the results in pounds. Only sacks will need to be weighed. Do not weigh other container types.

**Container Tare Weight** - If the container has a tare weight, please enter. Most sacks have the tare weight printed somewhere on the side. Other types of containers may not have the tare weight printed on them. Be aware that the tare weight may be in pounds or ounces. Make sure to record in the correct field.

## PROPOSAL TWENTY

Height of Mail in Container (Inches) - This only needs to be recorded for Priority and International sacks. Do not record for Express sacks unless more than half full. Measure the height from the base of the sack to the top of the mail inside the sack (should be sitting on the top piece). Exclude the height of the tie-out.

Girth of mail in Container (Inches) - This only needs to be recorded for Priority and International sacks. Do not record for Express sacks unless more than half full. Measure the circumference of the sack in the middle of the sack if the girth is uniform or if the sack height is less than 12 inches. If the sack has visibly non-uniform girth, measure approximately 1/4 of the way from the bottom of the sack.

Girth of Container (Inches) - #2 - Record a second girth if the sack is more than 12 inches tall and non-uniform in girth. This girth should be approximately 1/4 of the way from the top of sack. Again, this is only needed for Priority and International sacks.

Container Type - Choose a Container Type from the menu. The choices are:

- Sack
- Hamper
- BMC/OTR
- APC
- Pallet
- Wiretainer
- Gaylord
- Other

You should be able to just type one letter and it will fill it in for you. If you do not believe the container is one of the choices, choose 'Other' and make a note in the notes field.

Destinating Facility – Record the destinating facility of the container. This should appear in the label on the container. Be sure to enter the entire label line where the destinating facility appears. Examples are 'SCF Milwaukee WI' or 'DIS Phoenix AZ'.

Notes – Enter any relevant notes.

**Enter Piece Information** - Entering will save the container information and open the screen for entering the pieces inside the container:

Record all pieces of mail in sacks whenever possible. If a sack contains items (trays, tubs, another sack, etc.) that are not pieces of mail, record information on the item as if it was a piece, but use a note field to describe the item type.

For large containers, such as a hamper or BMC/OTR, take a subsample of the container based on the amount of time you have to sample the container.

**PROPOSAL TWENTY**

The following is the individual pieces entry screen:

Priority/Express Individual Piece Information

Barcode or Dest 5D ZIP  Container Count

Skip Factor  Piece Count

	Pounds	Ounces	
Piece Weight	<input type="text"/>	<input type="text"/>	Gross Cont lbs - tare lbs <input type="text" value="22.4"/>
Length (inches)	<input type="text"/>		Pounds of Pieces so Far <input type="text" value="0"/>
Height or Girth (inches)	<input type="text"/>		*** For rolls, record girth. For all other pieces, record height ***
Thickness (inches)	<input type="text"/>		*** For rolls, leave thickness blank ****

Pre-paid/flat rate USPS Packaging

Commercial Rates

Class

Notes

Notes

Save Piece Exit

Barcode or Dest 5D ZIP - If the piece has a barcode containing the destination 5-digit ZIP Code in the indicia or address block, scan into this field. The scanner should successfully scan any 1-dimensional barcode. If a piece has multiple barcodes, try to scan the eZIP delivery confirmation barcode first. Next try the POSTNET and if that is not available, scan the indicia barcode.

The following are examples of barcodes that should be scanned:

POSTNET (usually found in the address block or indicia):



Basic (usually found in the indicia)

PROPOSAL TWENTY



Concatenated Delivery Confirmation (usually part of mailing label and begins with 'ZIP - e/')

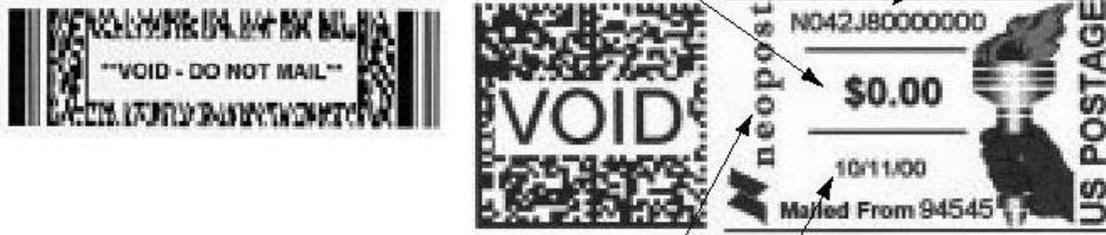


Do NOT scan a regular Postal-applied Delivery Confirmation barcode such as this:



## PROPOSAL TWENTY

Do NOT scan IBI or computerized-postage barcodes found in the indicia such as these:



**Skip Factor** – For sacks, all pieces should be sampled so the skip factor should remain at one. If taking a subsample of the pieces in the container, make sure to fill in the appropriate skip factor. The skip factor can also be used if the container has a number of identical pieces. Identical pieces are those pieces coming from the same mailer, have the exact same dimensions (length, height, and thickness), and the exact same weight. In this circumstance, enter the total number of pieces in the Skip Factor field, and fill out the rest of the fields for one of these pieces.

**Piece Weight** – Weigh the piece and record the weight in pounds.

**Length (inches)** – Record the piece length (the longest side). If the piece is an odd shape record the length of the straightest side

**Height or Girth (in inches)** – Record the piece height or the girth if the piece is non-rectangular.

**Thickness (inches)** – Record the piece thickness if the piece is rectangular. If you've put a girth in the 'Height or Girth' field, then leave blank. For pieces with small bumps where it doesn't seem appropriate to measure girth, try to get an average thickness.

**Pre-paid/flat rate USPS Packaging** - If the piece is in USPS packaging and paid a flat rate, choose the packaging from the list. Otherwise, choose 'N/A'.

**Commercial Rates** - If 'Commercial Rate' or 'Commercial Rate Plus' found in the indicia, select accordingly. Select 'Permit Imprint' if the indicia is PI but 'Commercial Rate' or 'Commercial Rate Plus' markings are not found. Otherwise, select 'N/A'.

**Class** - Choose the subclass for the sampled piece from the menu. You should be able to just type one letter and it will fill it in for you. If you do not believe the class is one of the choices, choose 'Other (specify in notes)' and make a note in the notes field. Determining class may be tricky. If the piece has no other markings and the postage is less than \$4.95, the piece is probably First Class. Use the notes fields to record identifying characteristics (e.g. markings, postage) for pieces that are hard to identify as to class.

**Notes** – Enter any relevant notes about the piece.

**Save Piece** - Entering will save the information and will reset the screen so the next piece can be entered.

**Exit** – Closes this screen. You will be asked if you want to save the current piece before existing.

**Save Workbook** - Saves workbook. Save often!

## PROPOSAL TWENTY

Random - Produces a random number that may be useful when trying to pick which sacks to sample from a rack.

### Enter Bundles

This screen is used to record bundles. These should consist mainly of Periodical and Standard Mail. You may also find a few Package Services bundles. For both Periodicals and Standard Mail, sample only a couple bundles for a given publication. For example, you find an entire pallet of bundles of Sports Illustrated. Only sample two or three bundles from this pallet. Try to get a diverse sample of titles, bundle sizes, number of copies, etc.

The following is the bundles entry screen:

The screenshot shows a software window titled "Bundles" with a light pink background. At the top right, there is a "Bundle Count" field with the value "1". Below this are several input fields and dropdown menus: "Class" (a dropdown menu), "Shape" (a dropdown menu with a note "\*\*\* shape of pieces in bundle \*\*\*"), "Number of Pieces in Bundle" (a text input field), "Bundle Weight" (two input fields labeled "Pounds" and "Ounces"), "Length (inches)" (a text input field), "Height or Girth (inches)" (a text input field with a note "\*\*\* For rolls, record girth. For all other bundles, record height \*\*\*"), and "Thickness (inches)" (a text input field with a note "\*\*\* For rolls, leave thickness blank \*\*\*\*"). Below these are three text input fields: "Publication (if Periodicals)", "Notes", and another "Notes" field. At the bottom of the window are three buttons: "Save Package", "Exit", and "Save Workbook".

Class – Choose the class from the list. If the class does not appear in the list, chose 'Other (specify in notes)' and specify in notes.

Shape – Choose from Card, Letter, Flat, Parcel, and other (specify in notes).

Number of Pieces in Bundle – Record the number of pieces in the bundle.

Bundle Weight – Weigh the bundle and record the pounds and ounces.

Length (inches) – Record the piece length (the longest side). If the piece is an odd shape record the length of the straightest side.

Height or Girth (in inches) – Record the piece height. Bundles should not need a girth.

# PROPOSAL TWENTY

- Thickness (inches) – Record the bundle thickness. Use the calipers for this measurement.
- Publication (if Periodicals) - For Periodicals, record the publication. If there are multiple publications in the bundle, record the publication of the top piece. Put a note in the notes field that the bundle is mixed Periodicals.
- The bundle could also be a mix of Periodicals and Standard. Put a note in the notes field that the bundle is mixed Periodicals and Standard. If the top piece is Periodicals, record the publication.
- Notes – Enter any relevant notes about the bundle.
- Save Bundle - Entering will save the information and will reset the screen so the next bundle can be entered.
- Exit – Closes this screen. Before closing, asks if you would like to save the current bundle
- Save Workbook - Saves workbook. Save often!

## Enter Packages

This screen should be used to record non-machinable outsides (NMOs) and other miscellaneous packages. Most Package Services pieces should be recorded using the container/piece screen combination.

The following is the entry screen for packages:

Barcode or Dest 5D ZIP - If the piece has a barcode containing the destination 5-digit ZIP Code in the indicia or address block, scan into this field. The scanner should

## PROPOSAL TWENTY

successfully scan any 2-dimensional barcode. If a piece has multiple barcodes, try to scan the eZIP delivery confirmation barcode first. See 'Piece' screen for examples of barcodes. If no barcode, record the destinating 5-digit ZIP.

**Class** – Choose the class from the list. If the class does not appear in the list, chose 'Other (specify in notes)' and specify in notes.

**Shape** – Choose from Card, Letter, Flat, Parcel, and other (specify in notes).

**Package Weight** – Weigh the bundle and record the pounds.

**Length (inches)** – Record the piece length (the longest side). If the piece is an odd shape record the length of the straightest side.

**Height or Girth (in inches)** – Record the piece height or the girth if the piece is non-rectangular.

**Thickness (inches)** – Record the piece thickness if the piece is rectangular. If you've put a girth in the 'Height or Girth' field, then leave blank. Use the calipers for this measurement.

**Notes** – Enter any relevant notes about the package.

**Save Package** - Entering will save the information and will reset the screen so the next bundle can be entered.

**Exit** – Closes this screen. Before closing, asks if you would like to save the current bundle

**Save Workbook** - Saves workbook. Save often!

**PART III**

**TRANSPORTATION DENSITY STUDY UPDATE  
PROGRAM DOCUMENTATION**

## Program and Workbook Documentation

### 1. Data Collection Instrument—Data Entry.xls

#### 1.1. Purpose and Content

The Microsoft Excel workbook 'Data Entry.xls' was used to collect on-site data for the FY 2009 transportation density study. This version is mainly used for sampling domestic mail. A separate workbook, 'Data Entry-intl.xls' was used at International facilities, with only difference being that International subclasses were added. Using data entry screens created by a Visual Basic macro, data are collected for various container types and pieces, and aggregated into corresponding worksheets within this workbook. This document describes the data collected.

#### 1.2. Predecessor Documents

This instrument was created specifically for this survey. It was based in part on the data collection forms used in the 2001 density study update, described in Docket No. R2005-1, USPS-T-17; USPS-LR-K-33.

#### 1.3. Methodology

To begin the data entry process, simply click on the blue 'Start Data Entry' button in the 'menu' worksheet. This takes the data collector to the first data entry screen. The data entry instructions for this workbook can be found in Part II, above. Below is a list of the data checks that are built into each screen:

##### Flat Tub and Letter Tray Screen

- Fields with pull down menus (Class, Shape, and Container Type) must use a value from the list.
- Gross weight of container must be between 5 and 80 pounds
- Tare weight needs to be between 0 and 4 pounds
- Tare weight of cover must be between 0 and 4 pounds
- All ounce fields (gross, tare, and cover) must have values between 0 and 16
- The 'Space not used (in whole inches)' field must have a value less than 10.

##### Container Screen

- Fields with pull down menus (Class and Container Type) must use a value from the list.
- For sacks, the Gross Container Weight must be non-blank and under 100 pounds.
- For sacks, the Tare Weight must be between 0 and 5 pounds.
- The Tare Weight must be positive.

## PROPOSAL TWENTY

- All ounce fields (gross and tare) must have values between 0 and 16
- The 'Destination Facility' field must be non-blank.

### Piece Screen

- Fields with pull down menus (Pre-Paid/flat rate USPS Packagaing, Commercial Rates, and Class) must use a value from the list.
- 'Barcode or Dest 5D ZIP', Skip Factor, and Piece Weight, Length, and 'Height or Girth' must be non-blank and non-zero.
- Pounds must be between 0 and 80.
- Ounce field must have values between 0 and 16.
- Length must be between 0 and 110 inches.
- Height or Girth must be between 0 and 60 inches.
- Thickness must be between 0 and 40 inches. If a girth is measured instead of a height, thickness is not measured.

### Bundle Screen

- Fields with pull down menus (Class and Shape) must use a value from the list.
- Number of Pieces in Bundle must be between 0 and 400.
- Bundle Weight must be between 0 and 70.
- Ounce field must have values between 0 and 16.
- Length must be between 0 and 110 inches.
- Height or Girth must be between 0 and 60 inches.
- Thickness must be between 0 and 40 inches. If a girth is measured instead of a height, thickness is not measured.
- For Periodicals, 'Publication (if Periodicals)' field must be non-blank.

### Package Screen

- Fields with pull down menus (Class and Shape) must use a value from the list.
- 'Barcode or Dest 5D ZIP', Package Weight, Length, and 'Height or Girth' must be non-blank and non-zero.
- Pounds must be between 0 and 70.
- Ounce field must have values between 0 and 16.
- Length must be between 0 and 110 inches.
- Height or Girth must be between 0 and 60 inches.
- Thickness must be between 0 and 40 inches. If a girth is measured instead of a height, thickness is not measured.

Each data entry screen has a corresponding worksheet where the macro records the data after an observation is completely entered. The following section describes the data fields recorded into each of these worksheets.

### **1.4. Output**

## PROPOSAL TWENTY

1.4.1. Letter Trays/Flat Tubs: All observations concerning letter trays and flat tubs are entered in the Letter Trays/Flat Tubs screen. The data are recorded in the worksheet named 'Trays'. The following is a description of the variables.

- a. # - Observation number
- b. Site – Data collection site
- c. Data Collectors – Person(s) conducting the survey
- d. Date – Collection date
- e. Barcode – Scanned barcode found on tray or tub
- f. 5D ZIP – 5-digit destination ZIP code usually determined from the scanned barcode.
- g. CIN – Content Identification Number, usually determined from the scanned barcode. This describes the contents of the tray or tub.
- h. CIN Description – Descriptive value of the CIN from the scanned barcode. It has a value of “N/A” for unknown CINs and is left blank when a barcode is not scanned.
- i. Proc Code – Processing Code determined from the scanned barcode. This identifies the system or facility that generated the container label. . If there is no scanned barcode, this field will be empty.
- j. Mailer – Mailer ID identifying the mailer or business that prepared the tray or tub. If there is no scanned barcode, the field will be empty.
- k. Serial # - Serial Number determined from the scanned barcode. This is an eight-digit number to uniquely identify the tray or tub. If there is no scanned barcode, the field will be empty.
- l. Class – Class of mail in the tray or tub. Only needs to be entered when the CIN description equals “N/A” or is blank.
- m. Shape – Shape of mail in the tray or tub. Only needs to be entered when the CIN description equals “N/A” or is blank.
- n. Gross LBs – Gross weight of the tray or tub in pounds.
- o. Gross OZ – Gross weight of the tray or tub in ounces
- p. Tare lbs – Tare weight of the empty tray or tub in pounds.
- q. Tare oz – Tare weight of the empty tray or tub in ounces
- r. Cover lbs – Weight of the tray/tub cover/sleeve in pounds, if applicable. This field can be blank because not all trays and tubs have a cover or sleeve.
- s. Cover oz – Weight of the tray/tub cover/sleeve in ounces, if applicable.
- t. Con Type – Type of tray or tub.
- u. Inches Not Used – For letter trays, the number of inches of empty space between the end of the mail and end of the tray, rounded down to the nearest inch. For flat tubs, the number of inches of empty space between the top of the mail and the bottom of the handle opening, rounded down to the nearest inch. If mail is above the top of the handle, it is the negative value of the number of inches between the top of the mail and the top of the handle, rounded down to the nearest inch
- v. Notes – Any notes of relevance to the observation

## PROPOSAL TWENTY

1.4.2. Containers: All observations concerning containers, especially sacks are entered in the Containers screen. The observations entered in this screen are recorded in the worksheet named 'Containers'. The following is a description of the variables.

- a. # - Observation number
- b. Site – Data collection site
- c. Data Collectors – Person(s) conducting the survey
- d. Date – Collection date
- e. Barcode – Scanned barcode found on the container, sacks only.
- f. 5D ZIP – 5-digit destination ZIP code usually determined from the scanned barcode.
- g. CIN – Content Identification Number, usually determined from the scanned barcode. This describes the contents of the sack. If there is no scanned barcode, it should be left blank.
- h. CIN Description – Descriptive value of the CIN from the scanned barcode. It has a value of "N/A" for unknown CINs and is blank when a barcode is not scanned.
- i. Proc Code – Processing Code determined from the scanned barcode. This identifies the system or facility that generated the container label. If there is no scanned barcode, it will be blank.
- j. Mailer – Mailer ID identifying the mailer or business that prepared the sack. If there is no scanned barcode, it will be blank.
- k. Serial # - Serial Number determined from the scanned barcode. This is an eight-digit number to uniquely identify the sack. If there is no scanned barcode, it will be blank.
- l. Class – Class of mail in the container.
- m. Gross LBs – Gross weight of the container in pounds. This is entered for sacks only.
- n. Gross OZ – Gross weight of the container in ounces. This is entered for sacks only.
- o. Tare lbs – Tare weight of the empty container in pounds. This is entered for sacks only.
- p. Tare oz – Tare weight of the empty container in ounces. This is entered for sacks only.
- q. Height – the height of the container in inches. This is entered for sacks only.
- r. Girth #1 – First girth measurement of the container in inches (sacks only)
- s. Girth #2 – Second girth measurement of the container in inches, if necessary (sacks only)
- t. Con Type – Type of container.
- u. Dest Facility – Destination facility for the observed container, usually obtained from the container label.
- v. Notes – Any notes of relevance to the observation

## PROPOSAL TWENTY

1.4.3. Pieces from Containers: For each sampled container from the previous screen, pieces are also sampled. Piece information is recorded in the worksheet named 'Pieces'. The following is a description of the variables.

- a. Cont # - Container number corresponding to the specific sampled container in the 'Containers' worksheet.
- b. Piece # - Sampled piece number.
- c. Site – Data collection site.
- d. Data Collectors – Person(s) conducting the survey.
- e. Date – Collection date.
- f. Barcode or ZIP – Scanned barcode found on the piece.
- g. Skip Factor – The skip factor used to sample pieces in the container.
- h. Gross LBs – Gross weight of the piece in pounds
- i. Gross OZ – Gross weight of the piece in ounces.
- j. Length – Measure of the longest side of the piece in inches
- k. Height or Girth – The height or girth of the piece in inches. Girth is measured when the piece is non-rectangular.
- l. Thickness – Measure of how thick the piece is, in inches
- m. USPS Packaging – Type of USPS packaging used to mail the piece. If no USPS packaging is used, "N/A" is entered
- n. Commercial? – Type of special discounted postage such as Permit Imprint or Commercial Based Pricing. If none, "N/A" is entered.
- o. Class – Mail class of the piece.
- p. Notes – Any notes of relevance to the observation

1.4.4. Bundles: All observations concerning bundles are entered in the Bundles screen. The observations entered in this screen are recorded in the worksheet named 'Bundles'. The following is a description of the variables.

- a. Item # - Observation number
- b. Site – Data collection site
- c. Data Collectors – Person(s) conducting the survey
- d. Date – Collection date
- e. Class – Mail class of the pieces in the bundle.
- f. Shape – Shape of the pieces in the bundle
- g. # of Pcs – Number of pieces/copies in the bundle
- h. Gross LBs – Gross weight of the bundle in pounds.
- i. Gross OZ – Gross weight of the bundle in ounces. If the weight is more than 16 ounces, the software asks the weight to be re-entered.
- j. Length – Measure of the longest side of the bundle in inches.
- k. Height or Girth – The height of the bundle in inches.
- l. Thickness – Measure of how thick the bundle is, in inches
- m. Pub – If the bundle contains Periodicals, the title of the Periodical.
- n. Notes – Any notes of relevance to the observation.

1.4.5. Packages: All observations concerning loose or oversized parcels and packages are entered in the Packages screen. The observations entered in this

## PROPOSAL TWENTY

screen are recorded in the worksheet named 'Packages'. The following is a description of the variables.

- a. Item # - Observation number.
- b. Site – Data collection site.
- c. Data Collectors – Person(s) conducting the survey.
- d. Date – Collection date.
- e. Barcode or ZIP – Scanned barcode found on the piece. If no scanned barcode, the 5-digit destination ZIP code is entered.
- f. Class – Mail class of the piece.
- g. Shape – Shape of the piece.
- h. Gross LBs – Gross weight of the piece in pounds.
- i. Gross OZ – Gross weight of the piece in ounces.
- j. Length – Measure of the longest side of the piece in inches.
- k. Height or Girth – The height or girth of the piece in inches. Girth is measured when the piece is non-rectangular.
- l. Thickness – Measure of how thick the piece is, in inches.
- m. Notes – Any notes of relevance to the observation.

1.4.6. Other Worksheets: There are several additional worksheets that do not contain entered observations. These worksheets are used to provide the macro various information.

- a. Maps – various maps used to provide pull-down choices for specific variables in the various entry screens. Examples include class of mail, container type, and shape.
- b. Cin – All possible Container Identification Numbers and their descriptions. Used to enter values in the CIN Description field in various entry screens.
- c. Scratch – Starting values for certain variables in various screens. This allows the same value be entered for certain variables, such as site or data collectors, that do not change for each observation. This also helps maintain a continuous observation count through starts and stops of data collection.

## 2. Compilation of Field Survey Data

The survey data from each site are extracted from the output worksheets of the 'Data Entry.xls' workbook and combined to form worksheets based on the source data entry screen and/or other mail characteristics. The data are simply stacked using the copy and paste functions in Microsoft Excel. The following data manipulations are also performed at this stage:

- a. For trays and tubs, the mail category may be identified by the data collector's entry of through the Contents Identification Number (CIN) in the tray barcode. Where the CIN is used to identify the mail, the class and shape fields are left blank by the data collector. The class and shape are

- filled in based on the CIN information where needed. If the data collector entered the class and/or shape, the data collector's mail identification is retained as originally entered regardless of the CIN.
- b. Pieces from sampled containers are combined with pieces of the same mail category recorded on the data entry screen for individual packages. Since the data outputs are slightly different, as described in sections 1.4.3 and 1.4.5, above, the data columns are properly aligned where necessary.
  - c. Milwaukee was the first site visited, and minor revisions were made to the data entry software to address issues that arose in the course of the Milwaukee data collection. The main revisions were to the options for recording classes of mail and container types. The Milwaukee data were edited for consistency with the variable choices in the final version of Data Entry.xls.
  - d. For letter trays, gross cubic volumes and cube adjustment factors are matched to letter tray types using a lookup function. For letter trays and flat tubs, the net cube (i.e., adjusted for empty space) is calculated.

### **3. Calculation of Density and Variance by Mail Category**

#### **3.1. Purpose and Content**

A number of Stata ".do" command files compute the density estimates by mail category and the associated coefficients of variation using the formulas in Section 4, below. Electronic versions of the files and associated output logs are provided with this material.

#### **3.2. Predecessor Documents**

The Stata ".do" files follow the basic logic of the SAS program "density.sas" from Docket No. R2005-1, USPS-T-17; USPS-LR-K-33.

#### **3.3. Methodology**

The ".do" files are compatible with and were run using StataSE 10. The files have the following program structure:

- a. Lines of housekeeping code to set the Stata workspace, file locations, log the output, and read the data from a comma-separated value (.csv) spreadsheet file.
- b. Data transformations and editing steps where necessary. Specific procedures by mail category are detailed below.
- c. Calculation of cubic volume (in cubic feet) for pieces with measured dimensions. If the observation contains length, width, and height

- (thickness) measurements, the volume is calculated as the product of the three measurements (in inches) divided by 1728. For observations where the data collector recorded length and girth, the volume is calculated assuming the piece to be a cylindrical roll or tube with the specified length and girth.
- d. Calculation of density as weight divided by cubic volume (adjusted cubic volume for letter trays and flat tubs).
  - e. A macro loop (or loops as necessary) calculates the category-level densities and variances. The Stata 'summarize' command generates the sums and variances of the weight and cubic volume, and the 'correlate' command generates the covariance between weight and volume. The density, variance, standard error, and coefficient of variation are computed and reported in the log file.

Features specific to certain products' Stata programs are listed below.

### 3.3.1. Ltrtrays\_density.do

The program Ltrtrays\_density.do computes densities for First-Class Single Piece letters and cards, First-Class presort letters and cards, and Standard Mail letters packaged in letter trays. Program-specific calculations are:

- a. The program replaces missing values of the cover weight (variable 'coverlbs') with zero to ensure that net weight is not missing for non-sleeved trays.
- b. The program applies a standard tare weight of 0.79 pounds for the red plastic letter tray type.
- c. The program eliminates an anomalous observation with an inappropriate tare weight for a red plastic letter tray.
- d. The program drops trays with more than six inches of unused space as inadequately full.
- e. The program recalculates the net weight of the mail as gross weight less the tray tare weight and the cover weight.

### 3.3.2. Flttubs\_density.do

The program Flttubs\_density.do computes densities for First-Class Single Piece flats, First-Class presort flats, Periodicals flats, and Standard Mail flats packaged in flat tubs. The program-specific calculation is a "drop" statement which eliminates three records of over and/or under-full tubs. Tub with more than four inches of unused space are dropped as less than half full (to the handles), and tubs with more than three inches of used space above the handles are considered overfull (i.e. filled above the rim of the tub).

### 3.3.3. BPM\_density.do

The program BPM\_density.do calculates the density and variance statistics for Bound Printed Matter parcels. It contains no program-specific code additions.

### 3.3.4. FCM\_density.do

The program FCM\_density.do calculates the density and variance statistics for First-Class Mail parcels. There are two items of program-specific code: the program drops an observed bundle of non-parcel-shape pieces, and drops observations identified as First-Class Mail but exceeding 0.875 lb.

### 3.3.5. Free\_density.do

The program Free\_density.do calculates the density and variance statistics for free mail for the blind. It contains no program-specific code additions.

### 3.3.6. Media\_density.do

The program Media\_density.do calculates the density and variance statistics for Media Mail (including Library Mail) parcels. It contains no program-specific code additions.

### 3.3.7. PP\_density.do

The program Media\_density.do calculates the density and variance statistics for Parcel Post (including Parcel Select) parcels. This program computes densities and variances for four Parcel Post categories: machinable parcel post under 10 pounds, machinable parcel post over 10 pounds, and pieces with nonmachinable characteristics. Pieces are classified as nonmachinable if they exceed the maximum dimensions in DMM 401 1.5.1 or are a roll or tube-shape piece. The program arranges the recorded mailpiece dimension data to facilitate the calculations.

### 3.3.8. Std\_density.do

The program Media\_density.do calculates the density and variance statistics for Standard Mail parcels (including NFMs). It contains no program-specific code additions.

### 3.3.9. Bundle\_density.do

The program Bundle\_density.do calculates the density and variance statistics for bundles of flat-shape Presorted Standard, Standard ECR, Periodicals, and

## PROPOSAL TWENTY

Bound Printed Matter pieces. The program computes the average piece thickness using the recorded bundle thickness and bundle piece count, and excludes observations where the piece thickness exceeds 0.75 inches, i.e. exceeding flat-shape thickness limits under DMM 101 2.1. It also excludes an observation where the piece height was misrecorded as 1.5 inch.

### 3.3.10. Express\_density.do

The program Express\_density.do calculates the density and variance statistics for several categories of Express Mail. The program generates densities for several weight increments for weight-rated pieces and for Express Mail Flat Rate Envelopes. It also computes densities for parcel and non-parcel shape pieces, as well as an aggregate density for all sampled Express Mail pieces.

### 3.3.11. Priority\_density.do

The program Priority\_density.do calculates the density and variance statistics for several categories of Priority Mail. The program generates densities for several weight increments for weight-rated pieces and for Priority Mail Flat Rate Envelopes. It also computes densities for parcel and non-parcel shape pieces, as well as an aggregate density for all sampled Priority Mail pieces.

### 3.3.12. Ltrtrays\_intl\_density.do

The program Ltrtrays\_intl\_density.do calculates the density and variance statistics for categories of International Mail prepared in letter trays: First-Class Mail International, International Priority Airmail, International Surface Airlift, foreign-origin air LC/AO and foreign-origin surface LC/AO. The program includes code to assign gross tray cube and empty-space adjustment factors to observations, to calculate net cube and net weight for each observation, to assign of abbreviated product names for use as the macro loop iterator, and to drop observations of insufficiently full trays as in the Ltrtrays\_density.do program.

### 3.3.13. Flttubs\_intl\_density.do

The program Flttubs\_intl\_density.do calculates the density and variance statistics for categories of International Mail prepared in flat tubs: First-Class Mail International, International Priority Airmail, International Surface Airlift, foreign-origin air LC/AO and foreign-origin surface LC/AO. The program includes code to assign gross tub cube and empty-space adjustment factors to observations, to calculate net cube and net weight for each observation, to assign of abbreviated product names for use as the macro loop iterator, and to drop observations of insufficiently full tubs as in the Flttubs\_density.do program.

3.3.14. Pcls\_intl\_density.do

The program Pcls\_intl\_density.do calculates the density and variance statistics for several categories of International Mail not prepared in letter trays or flat tubs. The categories are: First-Class Mail International, International Priority Airmail, International Surface Airlift, foreign-origin air LC/AO, foreign-origin surface LC/AO, foreign origin air CP, foreign origin surface CP, Express Mail International, Priority Mail International, foreign-origin Express, foreign origin Priority, and M-Bags. The program includes code to assign abbreviated product names for use in the density calculation macro iterator, to calculate gross weight for certain observations with weight entered in pounds and ounces instead of decimal pounds, and to separate U.S.-origin and foreign-origin Priority observations by shape.

**4. Density and Variance Calculations**

The following are the formulas used for the density and associated variance calculations. These formulas, which assume a simple random sampling model, are identical to those used in the 2001 Density Update presented in Docket No. R2005-1, USPS-LR-K-33.

(1) Density Estimate: 
$$\bar{R} = \frac{\sum_{i=1}^n Y_i}{\sum_{i=1}^n X_i}$$

(2) Approximate variance of the density ratio estimator, based on Taylor series:

$$\hat{V}(\bar{R}) = \frac{1}{n \bar{X}^2} (s_Y^2 + \bar{R}^2 s_X^2 - 2 \bar{R} s_{XY})$$

where:

$$s_Y^2 = \frac{\sum_{i=1}^n (Y_i - \bar{Y})^2}{(n - 1)}$$

$$s_X^2 = \frac{\sum_{i=1}^n (X_i - \bar{X})^2}{(n - 1)}$$

$$s_{XY} = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{(n - 1)}$$

$R$  – Density (pounds per cubic foot), for a mail category.

$Y_i$  – Net weight for an observation in a mail category.

$X_i$  – Effective (net) cube for an observation in a mail category.

$i$  – Test index denoting observations for the mail category, in  $\{1, \dots, n\}$ .

$n$  – Number of observations for a mail category.

$\bar{R}$  – Estimated density for a mail category.

$\bar{Y}$  – Mean net weight for all observations in a mail category.

$\bar{X}$  – Mean effective cube for all observations in a mail category.

$\hat{V}(\bar{R})$  – Estimated variance of the density  $\bar{R}$ .