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Analysis of International Commodity Shipping Data and the Shipment of NORM to the United States

JE Baciak
JH Ely
JE Schweppe

GA Sandness
SM Robinson

October 2011



Pacific Northwest
NATIONAL LABORATORY

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Abstract

The detection of smuggled special nuclear material (SNM) and radiation dispersion devices (RDDs) into the United States (US) via intermodal cargo container (IMCC) remains a challenge in radiation detection, due in large part to the variability of cargo in an individual container and its impact on shielding sources from detection. Thus, it is important to understand how containerized cargo is shipped to the US, from which countries we receive different shipments, and to understand how naturally-occurring radioactive material (NORM) is shipped and can impact our capabilities to detect sources that may be used in potential weapons of mass destruction terrorism scenarios.

As part of the Spreader Bar Radiation Detector project, PNNL analyzed US import data shipped through US ports collected over the 12 months of 2006 (over 4.5 million containers). Using these data, we extracted a variety of distributions of interest to modelers and developers of active and passive detection systems used to “scan” IMCCs for potential contraband. Analysis of all containers can provide a wealth of information. More importantly, the availability of the data on all containers makes it possible to analyze the database to determine which general commodities are shipped overseas in IMCCs more frequently. This report expands on some of the analysis presented in an earlier report from LLNL, by investigating the foreign port distribution of commodities shipped to the US.

Executive Summary

As part of the Spreader Bar Radiation Detector project, PNNL analyzed US import data collected over the 12 months of 2006 on containers shipped through US ports—over 4.5 million containers. Using these data, we extracted a variety of distributions of interest to modelers and developers of active and passive detection systems used to “scan” IMCCs for potential contraband. This report expands on some of the analysis presented in an earlier report from LLNL by investigating the foreign port distribution of commodities shipped to the US.

The majority of containers shipped to the United States are 40-ft containers (~70%); about 25% are 20-ft; and about 3.6% are 45-ft containers. A small fraction (<1%) of containers are of other, more specialized sizes, and very few ports actually ship these unique size containers (a full distribution for all foreign ports is shown in Appendix A). The primary foreign ports that ship the largest numbers of each container size are shown in the table below. Given that 45-ft containers comprise 1 of out every 27 containers shipped to the US, and considering the foreign ports from which they are shipped, they should not be ignored in screening; further testing and analysis of radiation measurements for national security with this size container is warranted.

Table 1: Summary of Top 10 International Ports for the Three Major Container Sizes Shipped to the US

Rank	Port	20-ft Containers		Port	40-ft Containers		Port	45-ft Containers	
		Number	% of Total		Number	% of Total		Number	% of Total
1	Shanghai	159,507	8.60	Yantian	778,866	15.25	Yantian	75,824	28.94
2	Busan	143,284	7.72	Shanghai	594,462	11.64	Hong Kong	33,541	12.80
3	Kaoshiung	128,149	6.91	Hong Kong	417,513	8.17	Shanghai	26,933	10.28
4	Hong Kong	94,618	5.10	Busan	348,586	6.82	PTO Cortes	17,545	6.70
5	Singapore	71,095	3.83	Kaoshiung	317,897	6.22	San Juan	16,443	6.28
6	Yantian	69,585	3.75	Ningpo	164,551	3.22	Kaoshiung	16,344	6.24
7	Freeport	55,450	2.99	Bremerhaven	154,928	3.03	Singapore	9,018	3.48
8	Antwerp	52,231	2.82	Singapore	146,296	2.86	Rotterdam	6,549	2.50
9	Santos	48,775	2.63	Rotterdam	123,913	2.43	Xiamen	6,115	2.33
10	Qingdao	47,773	2.58	Qingdao	103,273	2.02	STO Tomas	5,613	2.14

Analysis of all containers can provide a wealth of information. Access to the database makes it possible to determine which general commodities are shipped overseas in IMCCs more frequently. Commodities are generally shipped with a 4- or 6-digit HS code that describes the commodity. These codes can be grouped by a collapsed 2-digit HS Code that represents the commodities. One can generalize this

shipping data into approximately 16 categories that span the range of commodities. This was performed by collapsing the two-digit codes into general categories specified by Foreign Trade On-Line Corporation. These data are shown in Table 2 below. It should be noted that HS codes 90-97 are generally referred to as a ‘miscellaneous’ category, but we did not collapse the HS codes in this major category because these commodities represent a large fraction of the total number of containers shipped to the US (particularly 40- and 45-ft containers), and the commodities grouped therein are quite different from one another. The breakdown for all 97 HS codes is shown in Appendix B of this report.

Table 2: Shipping Container Data Arranged by Major HS Code Categories

HS Code Range	Description	20-ft Containers	Percent	40-ft Containers	Percent	45-ft Containers	Percent
00	Household Goods	49,895	2.69	199,852	3.91	12,032	4.59
01-05	Animal and Animal Products	45,524	2.45	104,827	2.05	268	0.10
06-15	Vegetable Products	128,119	6.91	227,331	4.45	964	0.37
16-24	Foodstuffs	182,724	9.85	280,804	5.50	3750	1.43
25-27	Mineral Products	74,358	4.01	16,114	0.32	138	0.05
28-38	Chemical & Allied Industries	163,034	8.79	128,406	2.51	5162	1.97
39-40	Plastics & Rubbers	128,262	6.91	455,844	8.92	13,948	5.32
41-43	Raw Hides, Skins, Leather & Furs	11,085	0.60	83,440	1.63	7767	2.96
44-49	Wood & Wood Products	120,774	6.51	391,535	7.66	10,176	3.88
50-63	Textiles & Clothing	67,524	3.64	382,513	7.49	51,426	19.63
64-67	Footwear & Headgear	15,108	0.81	108,316	2.12	18,999	7.25
68-71	Stone & Glass	238,465	12.85	156,979	3.07	5203	1.99
72-83	Metals	299,302	16.13	316,307	6.19	18,730	7.15
84-85	Machinery & Electrical	174,963	9.43	801,411	15.69	22,395	8.55
86-89	Transportation Products	80,965	4.36	293,234	5.74	12,384	4.73
90	Photograph and Medical Instruments	10,437	0.56	50,093	0.98	4898	1.87
91	Clocks & Watches	684	0.04	4905	0.10	566	0.22
92	Musical Instruments	1566	0.08	8786	0.17	478	0.18
93	Arms & Ammunition	1068	0.06	1109	0.02	8	0.00
94	Furniture	31,576	1.70	816,169	15.98	38,074	14.53
95	Toys, Games & Sports Equipment	25,360	1.37	255,781	5.01	33,013	12.60

HS Code Range	Description	20-ft Containers	Percent	40-ft Containers	Percent	45-ft Containers	Percent
96	Manufactured Articles	3682	0.20	20,819	0.41	1325	0.51
97	Works of Art & Antiques	766	0.04	4113	0.08	268	0.10

This work discusses the example port of Singapore. Of all the international ports, Singapore shipped the sixth-largest volume of containers to the US in 2006, and thus provides an excellent case-study in understanding variability of shipping from major international ports. Table 3 consolidates the commodity data for Singapore, and can be compared with Table 2 to examine major differences in commodities shipped from Singapore with respect to all other international ports. In general, Singapore shipped more vegetable products, clothing, electronics (mostly in the form of televisions and computer parts), plastic and rubber products than a typical foreign port. In 2006, Singapore was also the main port through which uranium ore was shipped to the US. Additionally, Singapore shipped less than the average number of containers with stone and glass materials, base metals, and toys. Further, Singapore shipped a slightly larger percentage (approximately 4%) of 45-ft containers than other ports. A specific breakdown of commodities shipped to the US through Singapore is located in Appendix C.

Table 3: Shipping Container Data for Commodities from Singapore

HS Code Range	Description	20-ft Containers	Percent	40-ft Containers	Percent	45-ft Containers	Percent
00	Household Goods	1513	2.13	6981	4.77	475	5.22
01-05	Animal and Animal Products	1114	1.57	7390	5.05	0	0.00
06-15	Vegetable Products	10,201	14.35	1642	1.12	26	0.29
16-24	Foodstuffs	6756	9.51	2740	1.87	3	0.03
25-27	Mineral Products	2279	3.21	67	0.05	0	0.00
28-38	Chemical & Allied Industries	2833	3.99	1588	1.09	12	0.13
39-40	Plastics & Rubbers	11,823	16.64	10,465	7.15	2014	22.12
41-43	Raw Hides, Skins, Leather & Furs	384	0.54	693	0.47	30	0.33
44-49	Wood & Wood Products	2557	3.60	8244	5.64	198	2.17
50-63	Textiles & Clothing	7140	10.05	32,092	21.94	2740	30.09
64-67	Footwear & Headgear	922	1.30	2564	1.75	338	3.71
68-71	Stone & Glass	5011	7.05	3709	2.54	58	0.64
72-83	Metals	7911	11.13	3822	2.61	187	2.05

HS Code Range	Description	20-ft Containers	Percent	40-ft Containers	Percent	45-ft Containers	Percent
84-85	Machinery & Electrical	7599	10.69	35,195	24.06	855	9.39
86-89	Transportation Products	1388	1.95	2931	2.00	12	0.13
90	Photograph and Medical Instruments	222	0.31	1672	1.14	460	5.05
91	Clocks & Watches	1	0.00	19	0.01	0	0.00
92	Musical Instruments	79	0.11	944	0.65	56	0.62
93	Arms & Ammunition	0	0.00	1	0.00	0	0.00
94	Furniture	808	1.14	20,893	14.28	1511	16.60
95	Toys, Games & Sports Equipment	320	0.45	1910	1.31	129	1.42
96	Manufactured Articles	194	0.27	494	0.34	0	0.00
97	Works of Art & Antiques	16	0.02	208	0.14	1	0.01

While a large amount of NORM is shipped in IMCCs, only a few specific commodities are shipped with enough frequency to present potential issues in screening IMCCs at ports that handle overseas shipping containers. The majority of containers with NORM will contain fertilizers (5,700 containers), granite (59,000 containers), or ceramic (225,000 containers) materials. Fertilizers were generally shipped in either 20- or 40-ft containers with equal frequency. While granite is mostly shipped in 20-ft containers, ceramic materials can be shipped in either 20- or 40-ft containers. The size of container depended on the specific use of the ceramic or porcelain material. General construction ceramics (such as floor and roofing tiles) tend to be shipped in 20-ft containers. Consumer products made from ceramic materials (e.g., tableware, sinks, and toilets) are generally shipped in 40-ft containers. This discrepancy is due in large part to the packaging of the commodity. Consumer products are generally shipped packed in a box loaded with Styrofoam™ or other packing material to protect the product from breakage. Construction ceramic materials are generally shipped in less packing material, many times consisting of only a cardboard or wooden box. Granite is almost always shipped in a 20-ft container, due to its very high density. Thus, signatures from certain commodities containing NORM can be associated with specific container sizes.

Acronyms and Abbreviations

HS Code	Harmonized System Code
IMCC	Intermodal cargo container
NORM/TENORM	(Technologically-enhanced) Naturally occurring radioactive material
PIERS	Port Import Export Reporting Service
RDD	Radiological dispersion device
RPMP	Radiation Portal Monitor Project
SLD	Second Line of Defense
SNM	Special nuclear material
TEU	Twenty-foot equivalent unit
US	United States

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1.0 Introduction

The detection of smuggled special nuclear material (SNM) and radiation dispersion devices (RDDs) into the United States (US) via intermodal cargo container (IMCC) remains a challenge in radiation detection, due in large part to the variability of cargo in an individual container and its impact on shielding sources from detection. Thus, it is important to understand how containerized cargo is shipped to the US, from which countries we receive different shipments, and to understand how naturally-occurring radioactive material (NORM) is shipped and can impact our capabilities to detect sources that may be used in potential weapons of mass destruction terrorism scenarios. To assess the amounts and types of containerized cargo being shipped to the US, PNNL analyzed US import data on cargo shipped through US ports over all 12 months of 2006. Using these data, we extracted a variety of distributions that are of interest to modelers and developers of active and passive detection systems used to “scan” IMCCs for potential contraband.

The data used in this report were obtained from Port Import Export Reporting Service (PIERS) Global Intelligence Solutions, hereinafter referred to as PIERS.¹ The company collects data from more than 15 million bills of lading per year, which translates to more than 20 million shipments, with data as far back as 1950. PIERS processes these data into databases, facts, and figures, which others can then use to better understand the global trade market. With the database we obtained, we were able to better understand the dynamics of what commodities are shipped to the US, from which ports, and in what quantities. Each commodity has a specific Harmonized System (HS) Code—a numerical identifier for the commodity.

Section 2 of this report contains generalized analysis of commodity data obtained from the data set for IMCCs entering the United States. Section 3 provides Singapore as an example case study of a foreign port. This section also demonstrates the importance of understanding that different foreign ports emphasize the shipment of different specific commodities. Section 4 presents an analysis of NORM materials that are shipped from overseas ports to the US, and can serve as a guide in determining which NORM merit greater attention because they can produce false alarms in incoming overseas IMCCs. In addition, the results and analysis in this report can serve as a guide for the development of risk models for the trafficking of nuclear and radiological weapons through international shipping streams.

This report expands on some of the analysis presented in an earlier report from Lawrence Livermore National Laboratory (LLNL) (Descalle et al. 2006). One important difference is that PNNL’s report analyzes the foreign port distribution, rather than the domestic. Another is that the database used in our analysis contained a full year’s worth of commodity data, as opposed to the 14 highest-volume days in a calendar year, as in the LLNL report (Descalle et al. 2006). The longer the period analyzed, the less error daily variations in cargo will create. We also analyze the data based on container weight (in pounds), not twenty-foot equivalent units (TEU). However, this prevents us from examining containers that are partially full or contain multiple commodities, since the database will not indicate the specific size of the container. Thus only approximately 70% of the total commodity volume shipped to the US in 2006 was

¹ Piers Global Intelligence Solutions, 2 Penn Plaza East, 12th Floor, Newark, New Jersey, USA.

analyzed. Despite this, our analysis included over 4.5 million database entries (records) and over 7 million IMCCs.

It should be noted that this report does not include significant analysis of a variety of food items that are sometimes considered NORM due to their ^{40}K signature (e.g., bananas and coffee). Modern cargo screening systems employ algorithms and equipment that can properly screen out these materials, and prevent them from causing unwanted false alarms. The NORM presented here generally contain isotopes of uranium, thorium, and their associated daughter products in sufficient quantities that can potentially cause false alarms in modern systems. The PIERS database we acquired (which had been previously obtained by PNNL) had only about 12 fields out of approximately 75 potential fields that encompass a full PIERS record. Some of the other categories would have been ideal to include for a more complete study of the shipment of IMCCs to the US. These fields include information on container volume, which would have allowed us to separate containers of different heights but the same length, or potentially analyze database entries that utilized a partial container but did not specify a container size.

2.0 Analysis of Containerized Commodities Entering the United States

To analyze commodities entering the United States, we used the PIERS dataset and Microsoft Access to apply queries and filters to the dataset to extract information on the number of containers, weight distribution of containers, foreign port of export, and specific commodity data. All commodity data were from calendar year 2006. All weights were converted to pounds (lb), and for database entries with more than one IMCC, we calculated the pounds per container for that entry. Weight information is rounded to the nearest 100 lb. Thus, there will be some deviation from the actual weight distributions of individual containers since we do not know the actual weights for IMCCs in these data entries. The number of containers in a single database entry varied from 1 to approximately 2000 within the 2006 PIERS dataset.

For all graphs and figures in this report, we separate 20-, 40-, and 45-ft container data and distributions, and indicate the three container sizes with distinct colors. Lines and bars in the figures throughout this report are color coded as shown in Table 4.

Table 4: Container Size Color Coding for Graphs and Figures

Container Length	Color
20 ft	Green
40 ft	Blue
45 ft	Red

Table 5 shows a summary of the top foreign ports for shipping the three primary sizes of containers (20-, 40-, and 45-ft length) to the US. As can be seen, a significant number of ports appear in more than one category of shipping container. These are the major international ports that ship to the US, the majority of which are in Asia (China, Japan, South Korea, and Taiwan). Three of largest-volume shipping ports are from the European Union (Antwerp, Bremerhaven, and Rotterdam), with a couple of indicated ports from the Caribbean and South America (for larger 45-foot containers). The port of Yantian (China) clearly handles the largest number of containers that get shipped to the US (>920,000), totaling approximately 13% of all containers shipped to the US in 2006. It should also be noted that the ports listed in Table 5 handled a majority of the containers shipped to the US, with approximately 47%, 62%, and 82% of 20-, 40-, and 45-ft containers, respectively.

Table 5: Summary of Top 10 International Ports for the Three Major Container Sizes Shipped to the US

Rank	Port	20-ft Containers		Port	40-ft Containers		Port	45-ft Containers	
		Number	% of Total		Number	% of Total		Number	% of Total
1	Shanghai	159,507	8.60	Yantian	778,866	15.25	Yantian	75,824	28.94
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4	Hong Kong	94,618	5.10	Busan	348,586	6.82	PTO Cortes	17,545	6.70
5	Singapore	71,095	3.83	Kaoshiung	317,897	6.22	San Juan	16,443	6.28
6	Yantian	69,585	3.75	Ningpo	164,551	3.22	Kaoshiung	16,344	6.24
7	Freeport	55,450	2.99	Bremerhaven	154,928	3.03	Singapore	9018	3.48
8	Antwerp	52,231	2.82	Singapore	146,296	2.86	Rotterdam	6549	2.50
9	Santos	48,775	2.63	Rotterdam	123,913	2.43	Xiamen	6115	2.33
10	Qingdao	47,773	2.58	Qingdao	103,273	2.02	STO Tomas	5613	2.14

Appendix A contains the full list of international shipping ports and the associated number of containers shipped to the US in 2006. It lists over 450 international ports in alphabetical order. Included in this appendix is a listing for other container sizes, representing approximately 0.25% of all international shipping containers (see Table 6). This category is dominated by 48- and 53-ft containers; however, several other “specialty” container sizes are grouped into this category as well.

Table 6: Total Number of Containers With A Single Commodity Shipped to the US in 2006

Container Size	20-ft	40-ft	45-ft	Other
Total Number of Containers	1,855,004	5,108,122	261,967	17,081
Percent of Total	25.61	70.53	3.62	0.24

Tables 1 and 2 clearly point out that 40-ft containers are the primary IMCC in international shipping, with 20-ft containers being secondary. However, it is interesting to note that 45-ft containers make up a non-negligible 3.6% of containers shipping overseas to the US, and more than 60% of these containers come from Asia. Thus, scenario modeling for the shipment of RDDs, SNM, and other explosives should consider the use of 45-ft IMCCs as a transport mechanism into the US. The use of this container size would impact radiation transport/shielding through the cargo and associated container.

A previous report contained analysis of weight distributions based on twenty-foot equivalent units (TEU), which normalized all container sizes. However, it may be more intuitive to investigate these distributions

based on container size. This is demonstrated in Figure 1, which shows distinct distributions for the three different containers. For 20-ft containers, the distribution is relatively flat below 30,000 lb, but has two peaks centered around 37,000 and 43,000 lb, respectively. The 40-ft container distribution has a large, broad peak below 30,000 lb, with a maximum around 14,000 lb. There is also a peak around 42,000 lb, and a relatively flat distribution from 50,000-57,000 lb. Forty-five-foot containers had a very broad distribution from 5000-45,000 lb/container, with a maximum near 17,500 lb.

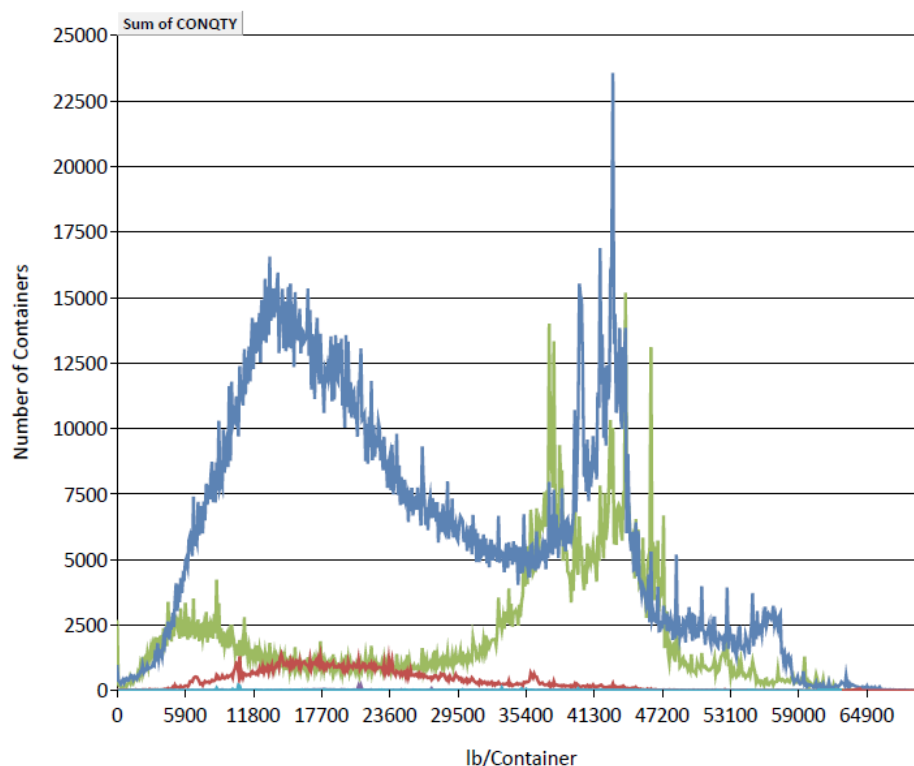
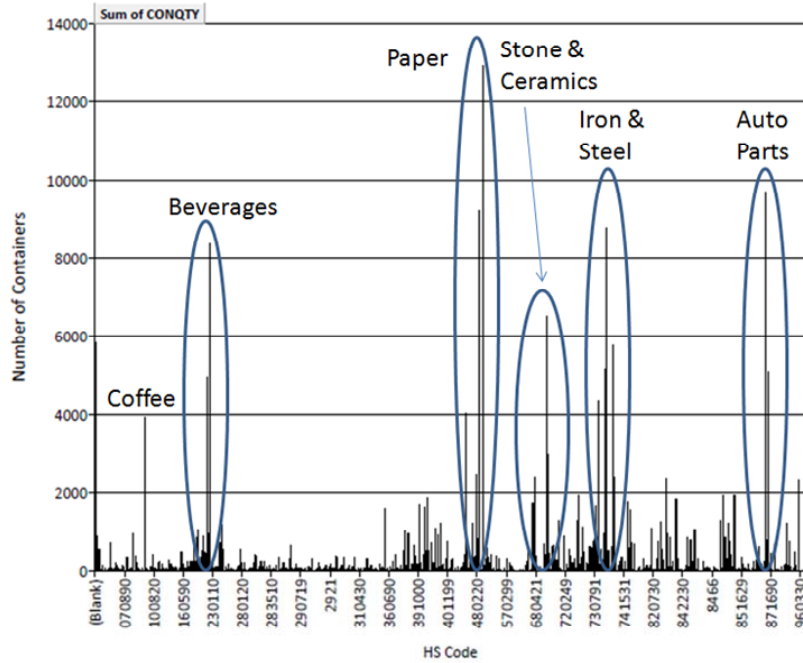


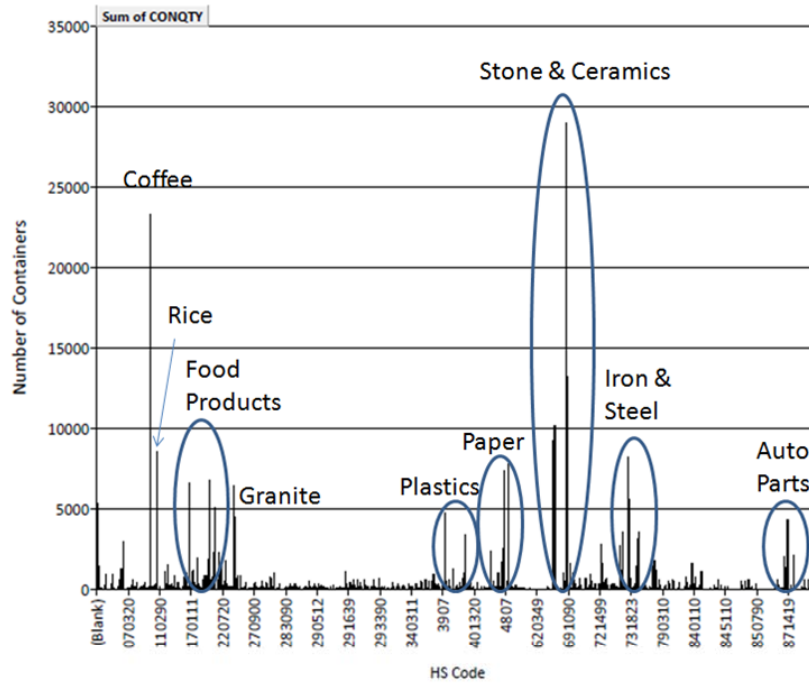
Figure 1. Weight distribution of all containerized commodities entering the United States

We analyzed each distribution to learn which commodities contribute to the distinct features in each distribution. This type of analysis affords an understanding of which commodities primarily ship in which specific container sizes. To perform this analysis, we used Microsoft Access to filter based on a shipping container size and weight range to display the commodity codes and number of containers that contribute to the particular weight range of interest. Figure 2 shows two weight ranges for 20-ft-long containers, while Figure 3 shows three weight-range distributions for 40-ft containers. We indicated major commodities on each of the graphs, based on commodity code descriptions that can be found on many foreign trade organization and company websites (Foreign Trade On-Line Corporation 1999).

Figure 2 demonstrates that, in general, dense materials comprise the major commodities shipped in 20-ft containers. One can also see the variation in commodities as a function of container weight for the bimodal peaks in the 20-ft distribution. For the peak centered around 37,000 lb/container, paper products, articles made of iron or steel, and automobile parts tend to be the major contributing commodities. Stones, ceramics, coffee, and other food products dominated the distribution around 45,000 lbs/container.



(a)

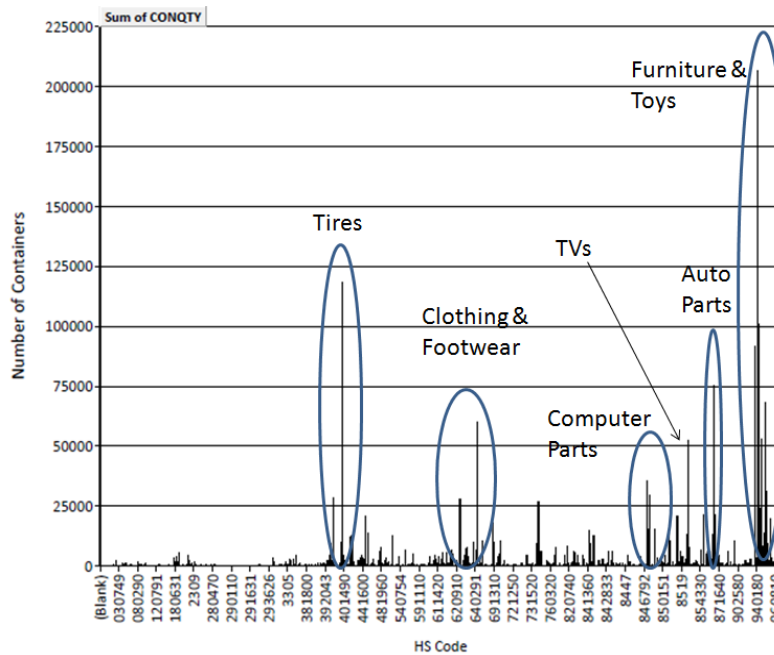


(b)

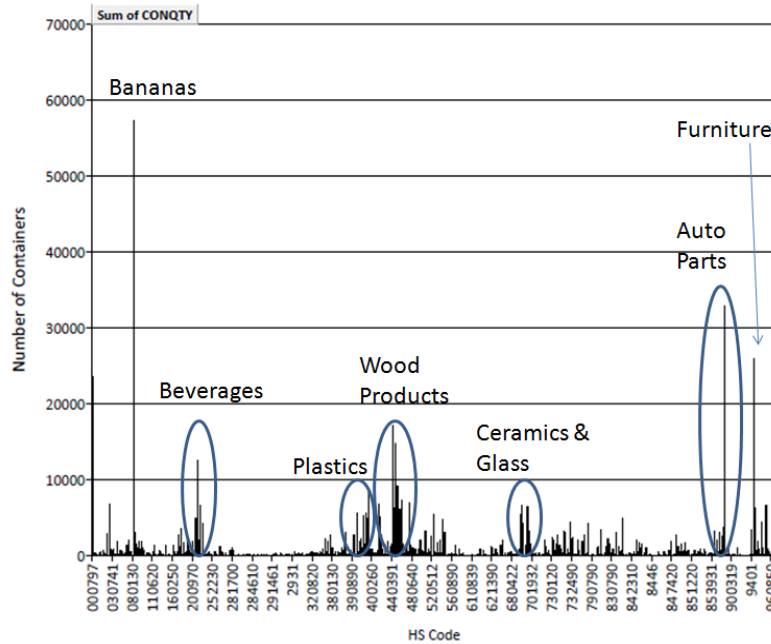
Figure 2: Commodity distributions for 20-ft containers; (a) 35,000-40,000 lb/container and (b) 41,000-50,000 lb/container, with emphasis on several major commodities that contribute to the distribution in the specific weight range

Figure 3 shows the commodity distributions for three ranges for 40-ft container weights. In the weight range of up to 30,000 lb/container, the 40-ft container distribution is dominated by furniture, toys, tires, and clothing. Bananas, wood and paper products, plastics, and automobile parts make up a significant fraction of the commodities in the broad peak centered around 40,000 lbs/container. Finally, in the peak around 56,000 lb/container, the commodity distribution is heavily composed of beverages (more specifically, wine) and wood and paper products.

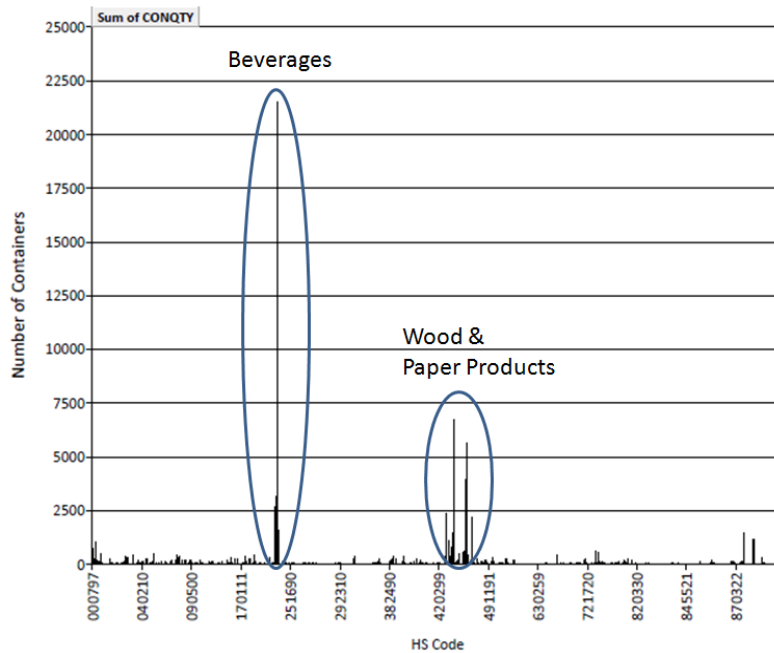
It should be noted that 40-ft containers do tend to ship materials that are bulky, or less dense than 20-ft containers. This is affected by the packaging of the commodities. For example, if a dense object, such as an auto part or bottle of wine, is packed in a box with a significant amount of packing material (e.g., Styrofoam™), its overall density is reduced; in this way these types of “heavy” items in a 40-ft container can be shipped without violating weight limitations (see Table 7 for example weight ranges for different container sizes). A specific example, ceramic materials, is described in Section 4.3.



(a)



(b)



(c)

Figure 3: Commodity distributions for 40-ft containers; (a) 0-30,000 lb/container, (b) 35,000-47,000 lb/container, and (c) 54,000-60,000 lb/container, with emphasis on several of the major commodities that contribute to the distribution in the specific weight range

Table 7: Weight Limitations for Standard Dry IMCC Lengths (Schumacher Cargo Logistics 2011)

Container Length (ft)	Weight Limit Range (lb)
20	47,265 – 54,673
40	55,113 – 63,491
45	60,481 – 61,529

Analysis of all containers can provide a wealth of information, and in turn the database can be analyzed to determine which general commodities are shipped overseas in IMCCs more frequently. Commodities are generally shipped with a 4- or 6-digit HS code that describes the commodity. These codes can be grouped by a collapsed 2-digit HS Code that represents the commodities. One can generalize this shipping data into approximately 16 categories that spans the range of commodities. This was performed by collapsing the two-digit codes into general categories specified by Foreign Trade On-Line Corporation (1999). These data are shown in Table 8 below. The HS codes 90-97 are generally referred to as a ‘miscellaneous’ category; however we chose not to collapse the HS codes in this major category, because these commodities represent a large fraction of the total number of containers shipped to the US (particularly of 40- and 45-ft containers), and the commodities shipped in them are quite different from one another. The breakdown for all 97 HS codes is shown in Appendix B of this report.

Table 8: Shipping Container Data Arranged by Major HS Code Categories

HS Code Range	Description	20-ft Containers	Percent	40-ft Containers	Percent	45-ft Containers	Percent
00	Household Goods	49,895	2.69	199,852	3.91	12,032	4.59
01-05	Animal and Animal Products	45,524	2.45	104,827	2.05	268	0.10
06-15	Vegetable Products	128,119	6.91	227,331	4.45	964	0.37
16-24	Foodstuffs	182,724	9.85	280,804	5.50	3750	1.43
25-27	Mineral Products	74,358	4.01	16,114	0.32	138	0.05
28-38	Chemical & Allied Industries	163,034	8.79	128,406	2.51	5162	1.97
39-40	Plastics & Rubbers	128,262	6.91	455,844	8.92	13,948	5.32
41-43	Raw Hides, Skins, Leather & Furs	11,085	0.60	83,440	1.63	7767	2.96
44-49	Wood & Wood Products	120,774	6.51	391,535	7.66	10,176	3.88
50-63	Textiles & Clothing	67,524	3.64	382,513	7.49	51,426	19.63
64-67	Footwear & Headgear	15,108	0.81	108,316	2.12	18,999	7.25
68-71	Stone & Glass	238,465	12.85	156,979	3.07	5203	1.99

HS Code Range	Description	20-ft Containers	Percent	40-ft Containers	Percent	45-ft Containers	Percent
72-83	Metals	299,302	16.13	316,307	6.19	18,730	7.15
84-85	Machinery & Electrical	174,963	9.43	801,411	15.69	22,395	8.55
86-89	Transportation Products	80,965	4.36	293,234	5.74	12,384	4.73
90	Photograph and Medical Instruments	10,437	0.56	50,093	0.98	4898	1.87
91	Clocks & Watches	684	0.04	4905	0.10	566	0.22
92	Musical Instruments	1566	0.08	8786	0.17	478	0.18
93	Arms & Ammunition	1068	0.06	1109	0.02	8	0.00
94	Furniture	31,576	1.70	816,169	15.98	38,074	14.53
95	Toys, Games & Sports Equipment	25,360	1.37	255,781	5.01	33,013	12.60
96	Manufactured Articles	3682	0.20	20,819	0.41	1,325	0.51
97	Works of Art & Antiques	766	0.04	4,113	0.08	268	0.10

The table above illustrates that different commodities tend to be shipped in different containers. For example, stone and glass materials, metals, or food products are more often shipped in 20-ft containers, while materials such as furniture, machinery and electrical equipment, and plastic and rubber materials (including tires) tend to be shipped in 40-ft containers. Forty-five-foot containers tend to be filled with clothing, furniture, and toys. The table presented here also corroborates the data contained in Figures 2 and 3. From these results, it is easy to conclude that denser materials tend to be shipped in 20-ft containers, but that conclusion would be somewhat misguided. One must also consider the packaging of the commodity, as relatively dense materials may be packaged in such a way as to reduce their effective density significantly, making shipping in a 40-ft container more prudent. An example of this is ceramic materials discussed in Section 4.3 of this report.

3.0 Case Study: Singapore

As an example of the information that can be extracted from the PIERS database concerning specific ports of interest, we analyzed the the shipping/commodity data for IMCCs coming from Singapore as a case study. Singapore is a large international port (sixth in total number of IMCCs shipped to the US) with little significant variation in year-to-year commodity information. Therefore, the case study described on the next several pages can be used as a guide to analysis of other major international shipping ports.

The number of containers coming from Singapore is shown in Table 1. The weight distribution of these containers is shown in Figure 4. The distribution is noticeably different from the summarized container data for all foreign ports shown in Figure 1. For 40-ft containers, there is no broad peak centered around 42,000 lb/container. The bimodal distribution for 20-ft containers is not as apparent for containers shipped from Singapore. There are also two noticeable peaks in the 45-ft container data, whereas the distribution in Figure 1 shows a relatively flat distribution. Many of the differences between the two figures can be attributed to the difference between specific commodities shipped from Singapore and those shipped from other foreign ports. Thus, to better understand shipments from major international ports and to analyze for potential risks, it is important to determine what commodities tend to be shipped from specific ports.

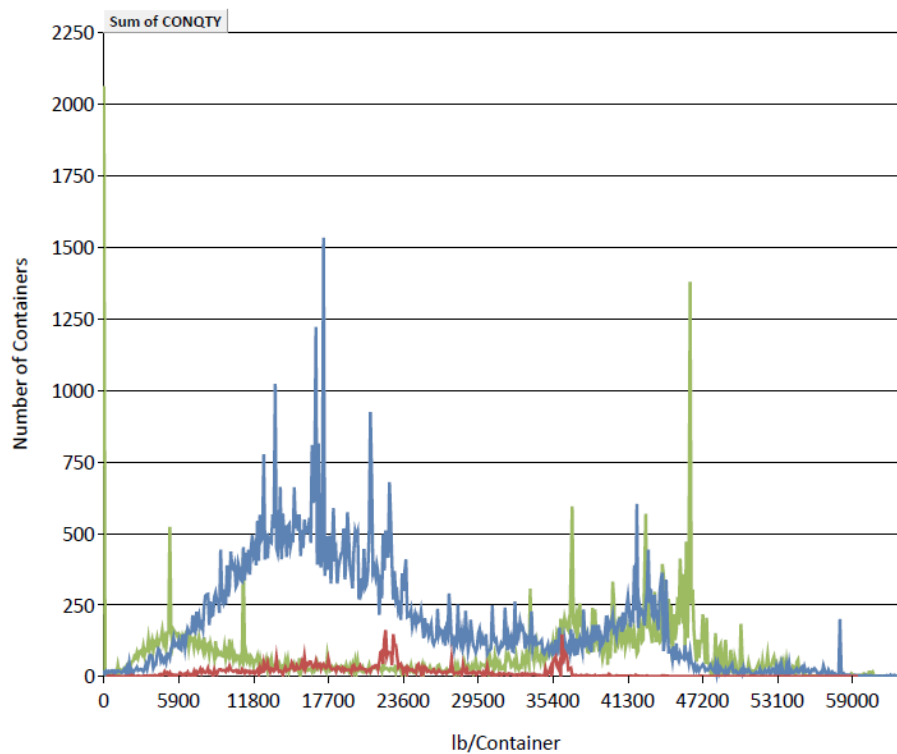
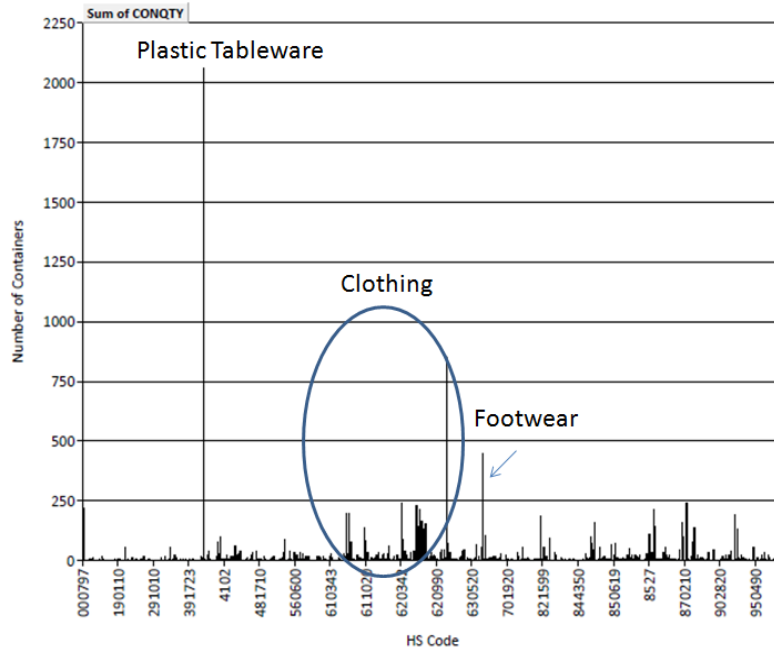


Figure 4: Container weight distribution for containers coming to the US from Singapore

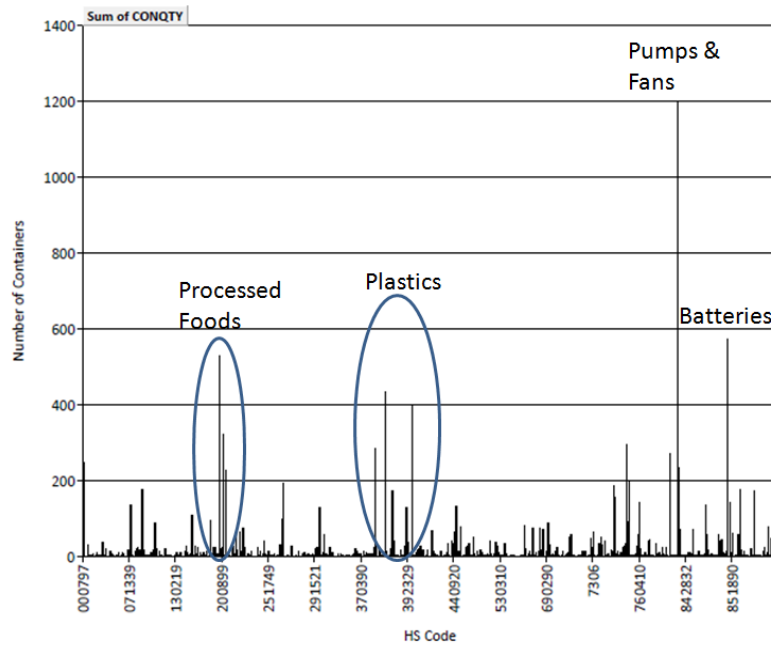
3.1 Products shipped from Singapore

To determine the primary commodities shipped from Singapore, we used a similar process to that presented in Section 2.0. We analyzed broad peaks and features in each distribution, and performed database queries on the resulting subsets to determine the commodities that are shipped within specific container sizes and weight ranges. This allowed us not only to determine major commodities shipped from Singapore, but also to compare the Singapore analysis with the overall shipping data from all international ports. In addition, we analyzed the 45-ft containers from Singapore, in part due to the fact that approximately 4% of containers shipped from Singapore are this size.

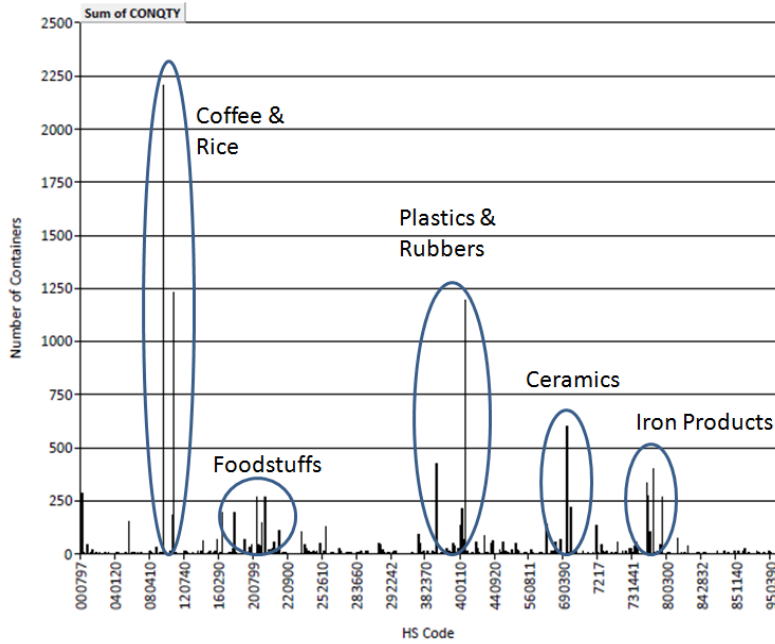
We used Microsoft Access to perform similar analysis and graphical representation of the Singapore data to the worldwide data shown in Section 2. Figure 5 shows the commodity distribution for 20-ft containers, with the three graphs depicting the three central features in the overall distribution, 0-15,000, 30,000-42,000, and 42,000-50,000 lbs/container, respectively. Figure 6 shows the commodity distribution for 40-ft containers, with the two graphs representing 0-30,000, 35,000-47,000, and 50,000-60,000 lbs/container. Figure 7 shows the commodity distribution for all 45-ft containers coming from Singapore.



(a)

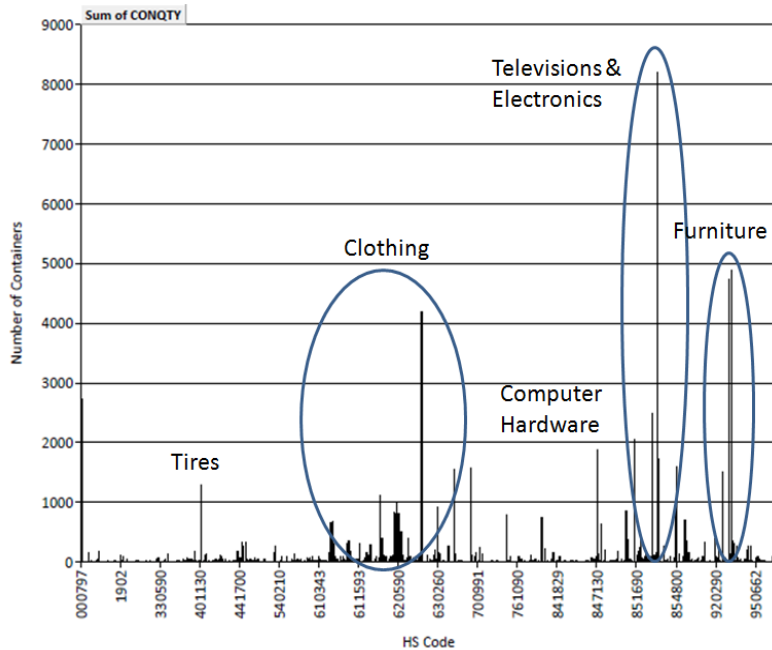


(b)

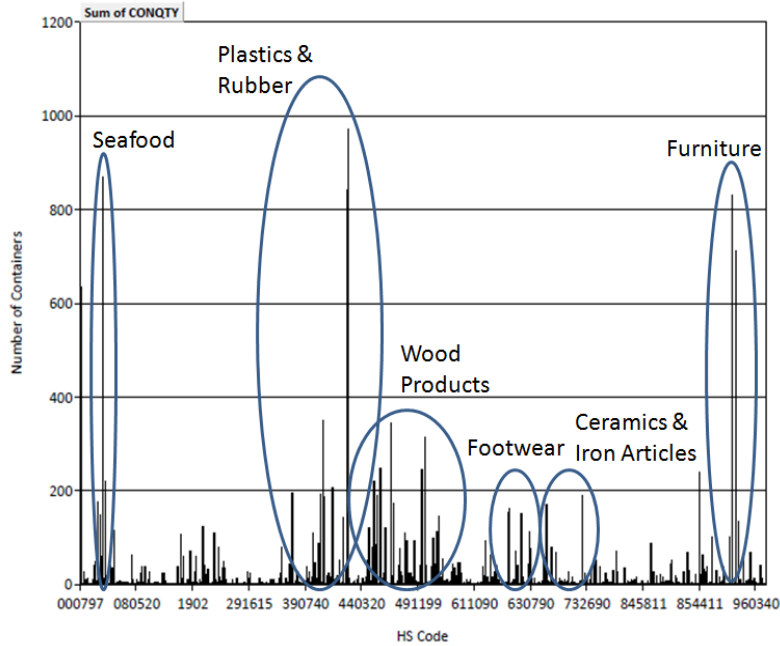


(c)

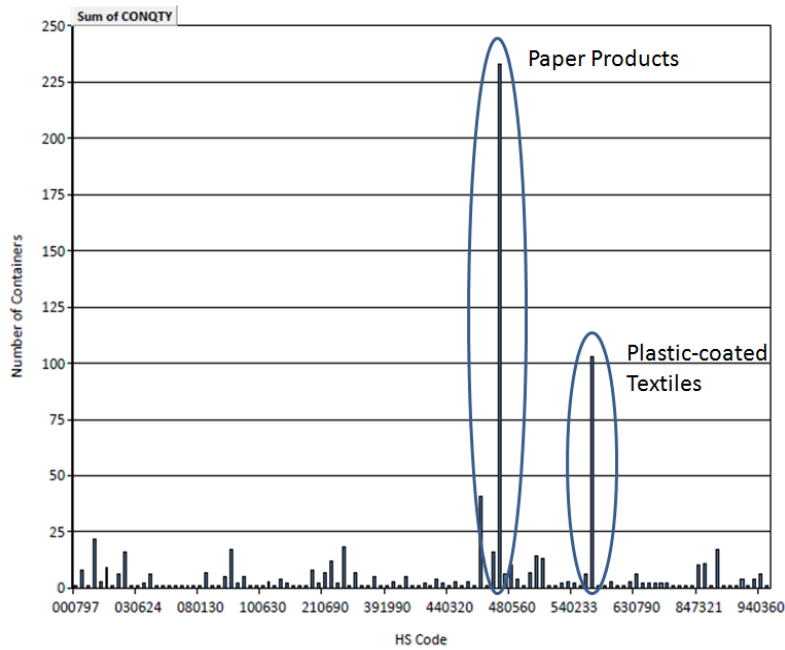
Figure 5: Commodity distributions for 20-ft containers from Singapore; (a) 0-15,000 lb/container, (b) 30,000-42,000 lb/container and (b) 42,000-50,000 lb/container, emphasizing several of the major commodities that contribute to the distribution in the specific weight range.



(a)



(b)



(c)

Figure 6: Commodity distributions for 40-ft containers from Singapore; (a) 0-30,000 lb/container, (b) 35,000-47,000 lb/container and (b) 50,000-60,000 lb/container, emphasizing several of the major commodities that contribute to the distribution in the specific weight range.

As these figures demonstrate, the shipments from Singapore vary significantly from the global distribution, indicating that one cannot assume an “average” commodity distribution from a single foreign port. For 20-ft containers from Singapore, the lower weight density is primarily dominated by clothing and footwear, with some electronics and machinery. A significant number of this size of IMCCs contain plastic tableware. Further investigation in the database revealed that all of these containers were in a single entry, and the indicated commodity weight was 0. Human error associated with the manifests/database can create significant errors in the analysis of commodities and shipments to the US, which can pose a significant challenge to isolate and correct. This particular entry was one example of the errors that can exist in these PIERS databases.

The higher weight distribution of 20-ft containers shows that plastics and rubber products and food products show some similarity to the global distribution, although there are some differences with specific commodities such as pumps, fans and batteries from Singapore within the 30,000-42,000 lb/container weight range. The highest 20-ft container weight range also shows significant amounts of ceramic and iron products coming from Singapore.

Forty-foot containers from Singapore show a wide commodity variation depending on the chosen weight range. Containers less than 30,000 lb tend to ship clothing (low density), furniture (bulky), and televisions and electronics (packaged with significant packing material to reduce overall density). The broad peak distribution (35,000-47,000 lb/container) reveals a significant amount of seafood, furniture, plastic, and wood products shipped to the US. At higher weights (50,000-60,000 lbs), 40-ft IMCCs primarily contained paper products and plastic-coated textiles.

The 45-ft container distribution in Figure 7 shows that only a few specific commodities are shipped in this size of IMCC from Singapore. These include tires, a wide variety of clothing and footwear, medical equipment, and furniture.

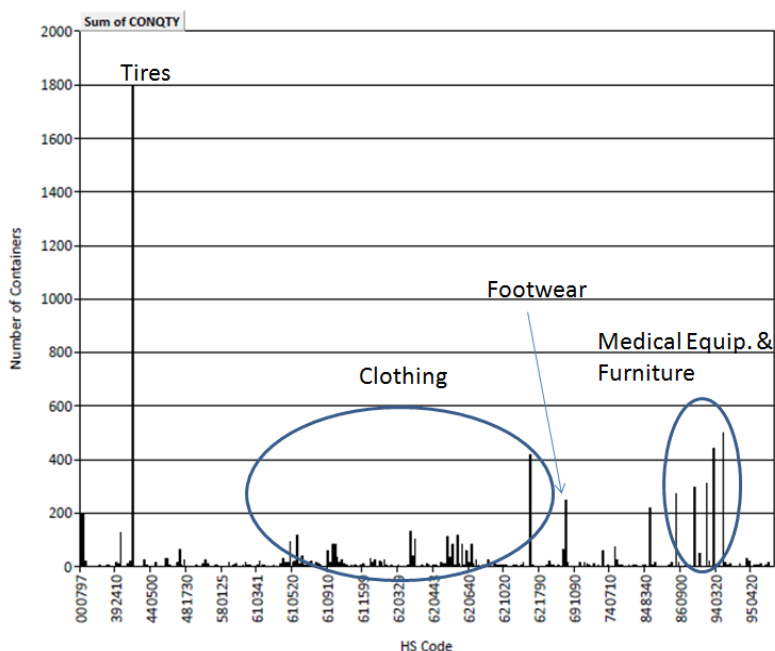


Figure 7: Commodity distribution for 45-ft containers from Singapore, with emphasis on several of the major commodities that contribute to the distribution

Table 9 shows a full summary of all containers shipped from Singapore based on major class categories defined by the HS code system (we separate the miscellaneous category into 2-digit HS codes for clarity). This table clearly distinguishes the major categories of commodities shipped from Singapore and compares them with shipments from all international ports. Singapore ships comparatively more vegetable products, plastics and rubber products, and clothing in 20-ft IMCCS than the rest of the international ports. Forty-foot containers shipped more clothing and electrical and machinery products (namely, televisions) from Singapore than an “average” international port. Plastics and rubber products, textiles, and medical equipment were more often shipped in 45-ft IMCCS from Singapore than from other international ports. While furniture still makes up a significant fraction of containers coming from Singapore, the respective fraction of each container size is reasonably close to the percentage from all international ports as indicated in Table 5. The breakdown for all 97 HS codes for IMCCs shipping from Singapore is shown in Appendix C of this report.

Table 9: Shipping Container Data Arranged by Major HS Code

Categories for Commodities from Singapore							
HS Code Range	Description	20-ft Containers	Percent	40-ft Containers	Percent	45-ft Containers	Percent
00	Household Goods	1513	2.13	6981	4.77	475	5.22
01-05	Animal and Animal Products	1114	1.57	7390	5.05	0	0.00
06-15	Vegetable Products	10,201	14.35	1642	1.12	26	0.29
16-24	Foodstuffs	6756	9.51	2740	1.87	3	0.03
25-27	Mineral Products	2279	3.21	67	0.05	0	0.00
28-38	Chemical & Allied Industries	2833	3.99	1588	1.09	12	0.13
39-40	Plastics & Rubbers	11,823	16.64	10,465	7.15	2014	22.12
41-43	Raw Hides, Skins, Leather & Furs	384	0.54	693	0.47	30	0.33
44-49	Wood & Wood Products	2557	3.60	8244	5.64	198	2.17
50-63	Textiles & Clothing	7140	10.05	32,092	21.94	2740	30.09
64-67	Footwear & Headgear	922	1.30	2564	1.75	338	3.71
68-71	Stone & Glass	5011	7.05	3709	2.54	58	0.64
72-83	Metals	7911	11.13	3822	2.61	187	2.05
84-85	Machinery & Electrical	7599	10.69	35,195	24.06	855	9.39
86-89	Transportation Products	1388	1.95	2931	2.00	12	0.13
90	Photograph and Medical Instruments	222	0.31	1672	1.14	460	5.05
91	Clocks & Watches	1	0.00	19	0.01	0	0.00
92	Musical Instruments	79	0.11	944	0.65	56	0.62
93	Arms & Ammunition	0	0.00	1	0.00	0	0.00
94	Furniture	808	1.14	20,893	14.28	1511	16.60
95	Toys, Games & Sports Equipment	320	0.45	1910	1.31	129	1.42
96	Manufactured Articles	194	0.27	494	0.34	0	0.00
97	Works of Art & Antiques	16	0.02	208	0.14	1	0.01

4.0 Analysis of NORM Commodities Entering the United States

NORM consists primarily of materials containing uranium, thorium, and potassium and their associated decay/daughter products. In the detection of nuclear contraband, NORM can create significant false alarm rates and cause delays in shipping from domestic ports. False alarms at shipping ports impact the US economy through shipping delays and spoilage of food products. In order to better understand the shipment of containers with NORM, we analyzed the 2006 PIERS database get an overview of shipment of NORM to the US, and analyzed specific NORM to learn how and from where these materials are shipped. It should be noted that we excluded a number of food products from our analysis (such as bananas and coffee) since their primary NORM is ^{40}K , which is easily screened by portal monitors and does not pose a significant false-alarm risk. Contained in this section is a breakdown of NORM materials that often contain sufficient levels of thorium, uranium, and their associated decay products, to create false alarms.

4.1 Cat Litter

For domestic portal systems, one of the largest contributors to radiological false alarms is cat litter; specifically, clay-based cat litter. Thus, it is important to inspect international shipping data to determine the extent to which cat litter may play a role in false alarms at ports of entry. The Harmonized System codes have no specific code for cat litter. The majority of cat litter used in the US is of the clumping variety, the main component of which is a specific type of clay material-bentonite-which has an identifiable HS code. A summary of all of the database entries for bentonite can be seen in Table 10.

Table 10: Commodity Shipping Results for Bentonite (Common Mineral for Clumping Cat Litter)

HS Code	Description	20-ft Containers	40-ft Containers	Other Containers
250810	Bentonite	6	20	0

Thus, little to no cat litter that is shipped overseas to the United States should be a NORM false-alarm concern at international seaports (other HS codes were investigated as possible substitutes for cat litter). This makes sense as the US and Canada are major producers of cat litter (which may help explain why there is no specific HS code for cat litter). As a comparison, more than 4 million metric tons of cat litter is produced in the US every year, while the US consumes approximately 3 millions metric tons (according to the United State Geological Survey and an article by Mark Klaiman in Pet Product News (June 2008)). Other NORM and TENORM materials, however, are a far more significant concern in the overseas transport of goods to the US from international seaports, as detailed in the following subsections.

4.2 Fertilizers

The amount of radioactive material in fertilizers is dependent upon the composition of the fertilizer, which is often specified in terms of percentage of nitrogen, phosphorus, and potassium. The phosphorous component of fertilizers is derived from phosphate rock. Since the latter, depending on its source, can be associated with uranium, and to a lesser extent, thorium deposits, the fertilizer's phosphorous content can impact detectors much like minute levels of the various members of the uranium series. The analysis in *Radiation Exposure of the U.S. Population from Consumer Products and Miscellaneous Sources* (National Council on Radiation Protection and Measurements 1987) indicates that the raw phosphate materials (such as ammonium phosphate, superphosphate, diammonium phosphate, and phosphoric acid) incorporated into fertilizer can contain a wide range of isotopic concentrations of several radionuclides, which are summarized in Table 11. Thus, it is important to understand how much fertilizer is shipped to the US, and from which ports we typically receive shipments containing fertilizer. In the production of fertilizers, the raw phosphate materials mentioned above are blended with low-phosphate materials. As a result of this blending, the concentrations of ^{238}U , ^{230}Th , ^{226}Ra and ^{232}Th in the final product are considerably lower (10 to 50%) than the concentrations in Table 11. The potassium component is usually derived from potash. Generally, the higher the level of potassium in the fertilizer, the higher the concentration of ^{40}K .

Table 11: Activity Concentrations of Radioisotopes Commonly Found in Phosphate Materials

Radioisotope	Activity Concentration (pCi/g)
^{238}U	22 – 140
^{230}Th	5.4 – 430
^{226}Ra	0.7 – 24
^{232}Th	0.14 – 4.6

To analyze the shipment of fertilizers, we collected information pertaining to HS code 31 (2-digit HS code for fertilizers), and all associated 4- and 6-digit codes. The number of containers shipped in 2006 was 5763, almost equally split between 20- and 40-ft containers. The distribution for international ports from which fertilizers were shipped to the US in 2006 is shown in Figure 8. The database indicated that the largest shipments of fertilizers come from Israel, which compares well with a previous study (Descalle et al. 2006). In addition, a large number of European ports also shipped these materials to the US, as well as several Caribbean ports. A small number of Asian ports shipped fertilizer, although Yokohama (Japan) shipped the largest number of 20-ft containers with fertilizer.

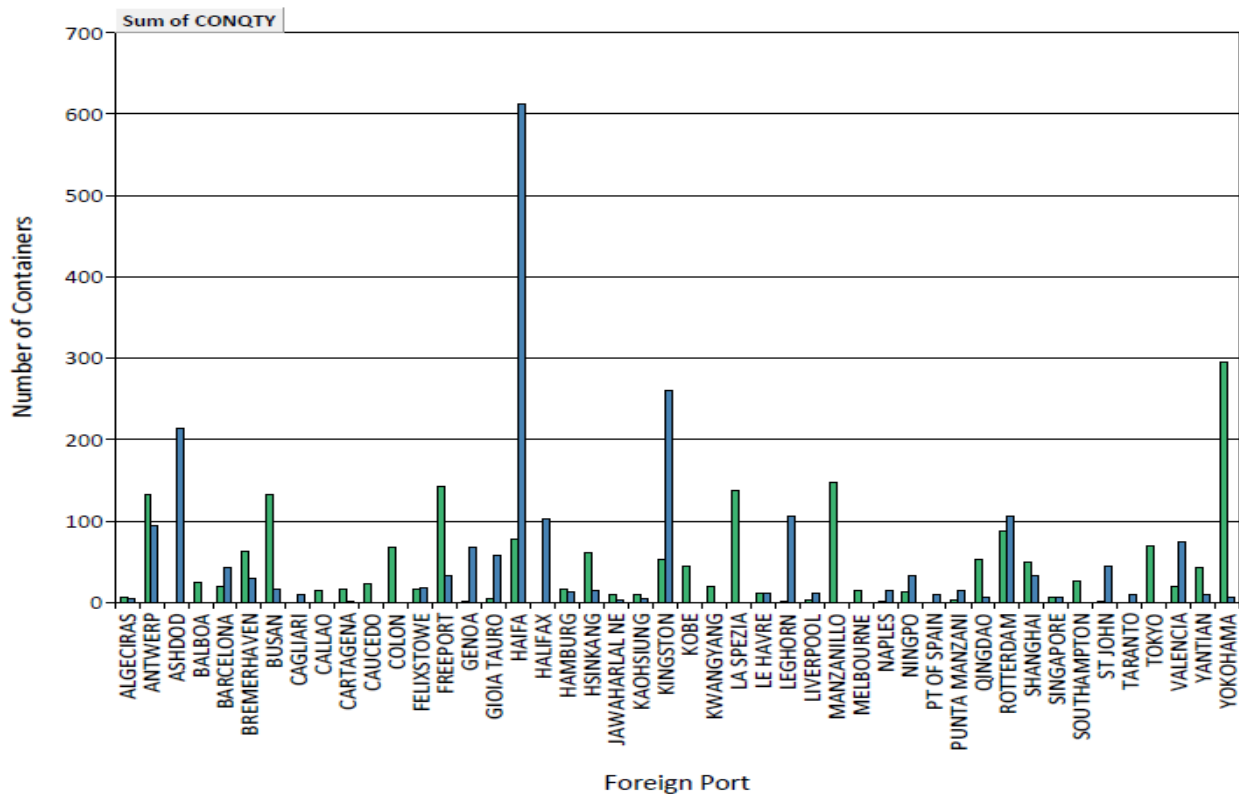


Figure 8: Foreign ports that ship fertilizer to the US. This includes fertilizers of all compositions, including pure nitrogen-based fertilizers, which do not present a NORM challenge. This distribution also included mixed nitrogen, phosphorous, and potassium fertilizers. Note: Only ports that ship more than nine containers per year are included in the above distribution.

4.3 Ceramics

Ordinary ceramics often contain elevated levels of naturally-occurring radionuclides such as ^{40}K and the various members of the uranium and thorium decay series. Sometimes the higher readings are due to uranium in the glaze; other times they are due to elevated concentrations of naturally-occurring radioisotopes in the clays used to produce the ceramic and porcelain material. Ceramics can be particularly radioactive if some compound of uranium (e.g., uranium oxide, sodium uranate) has been used to impart color (e.g., orange-red, green, yellow, black) to the glaze. It is widely known that uranium was used in the glaze of orange-red Fiesta dinnerware, but uranium glazes have also been used in other types of ceramics such as wall and floor tiles, pottery, laboratory ceramics, etc. The glazes are useful not only to provide color, but also to seal the ceramic.

To analyze the shipment of ceramic materials, we collected information pertaining to HS code 69 (ceramics), and all associated 4- and 6-digit codes. The number of containers shipped in 2006 was over 225,000 and is one of the largest quantities of all commodities shipped to the US (as can be seen in Appendix B). Ceramic materials happened to account for the second largest quantity of 20-ft containers shipped to the US. Approximately 62% of containers filled with ceramics are 20 ft long, 38% are 40 ft

long, and the remainder are 45 ft long or another length. The weight distribution of containers with ceramic materials that were shipped to the US in 2006 is shown in Figure 9.

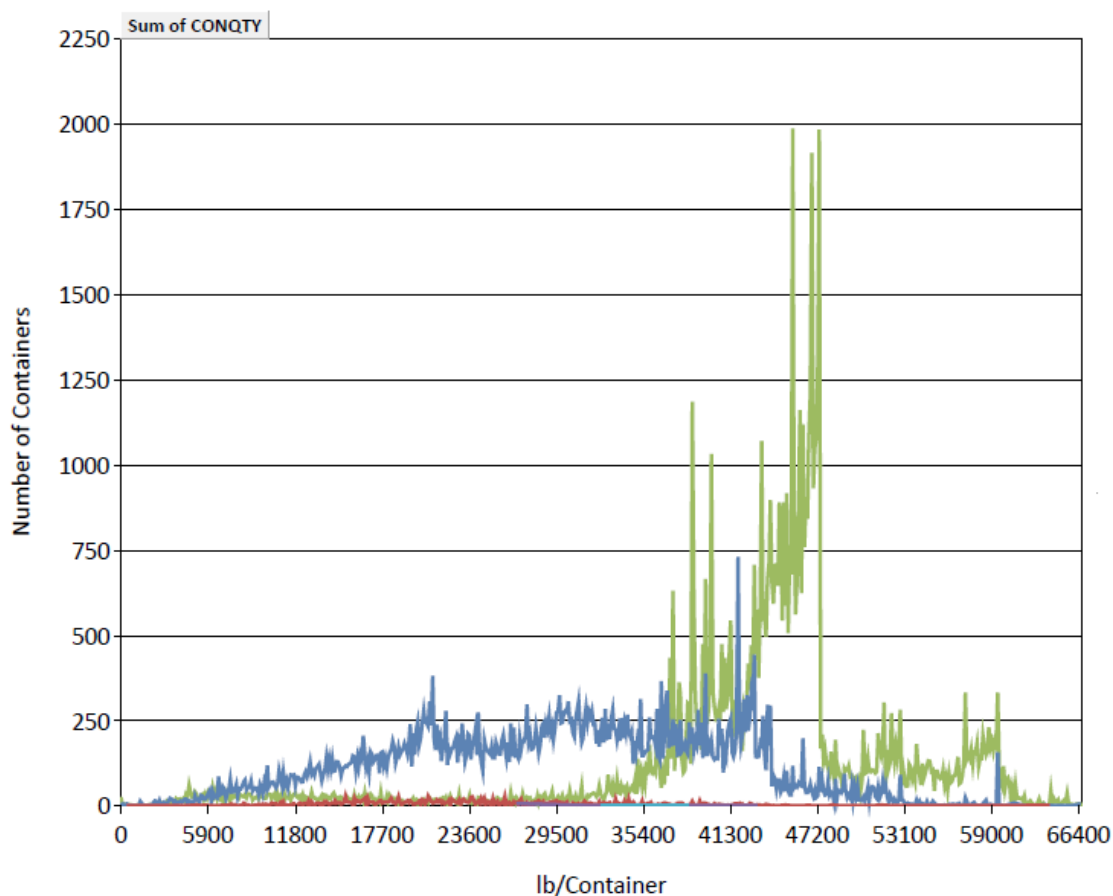


Figure 9: Global container weight distribution for all ceramic products

The weight distribution has some unique features. For example, the 40-ft container weight distribution slowly rises from about 5000 to 20,000 lb, and is relatively flat up to about 44,000 lb. Very few 20-ft containers weighing less than 35,000 lb were shipped in 2006, and the distribution rises sharply until approximately 47,000 lb/container, at which point the number of containers with a higher mass falls dramatically to about 100, and stays relatively flat until 60,000 lb/container. Such unique weight distributions for the different sizes of containers invited further analysis, yielding interesting results concerning the distribution of container sizes.

We performed a separate analysis to determine the foreign ports from which the three container sizes were shipped (including the approximately 3200 45-ft containers that shipped ceramic products). Figures 10, 11, and 12 show the foreign port distribution for ceramic materials shipped to the US in 20-, 40-, and 45-ft containers, respectively. The figures show that different sizes of containers came from different international ports. For example, a majority of 20-ft containers came from Europe and South America. 40-ft containers almost exclusively came from Asian ports, mostly Chinese or Korean ports. Forty-five-

foot containers originated mostly in China, with Yantian shipping over 40% of all containers of this size. This compares well with Table 1, where the port of Yantian shipped nearly 30% of all 45-ft containers coming to the US in 2006.

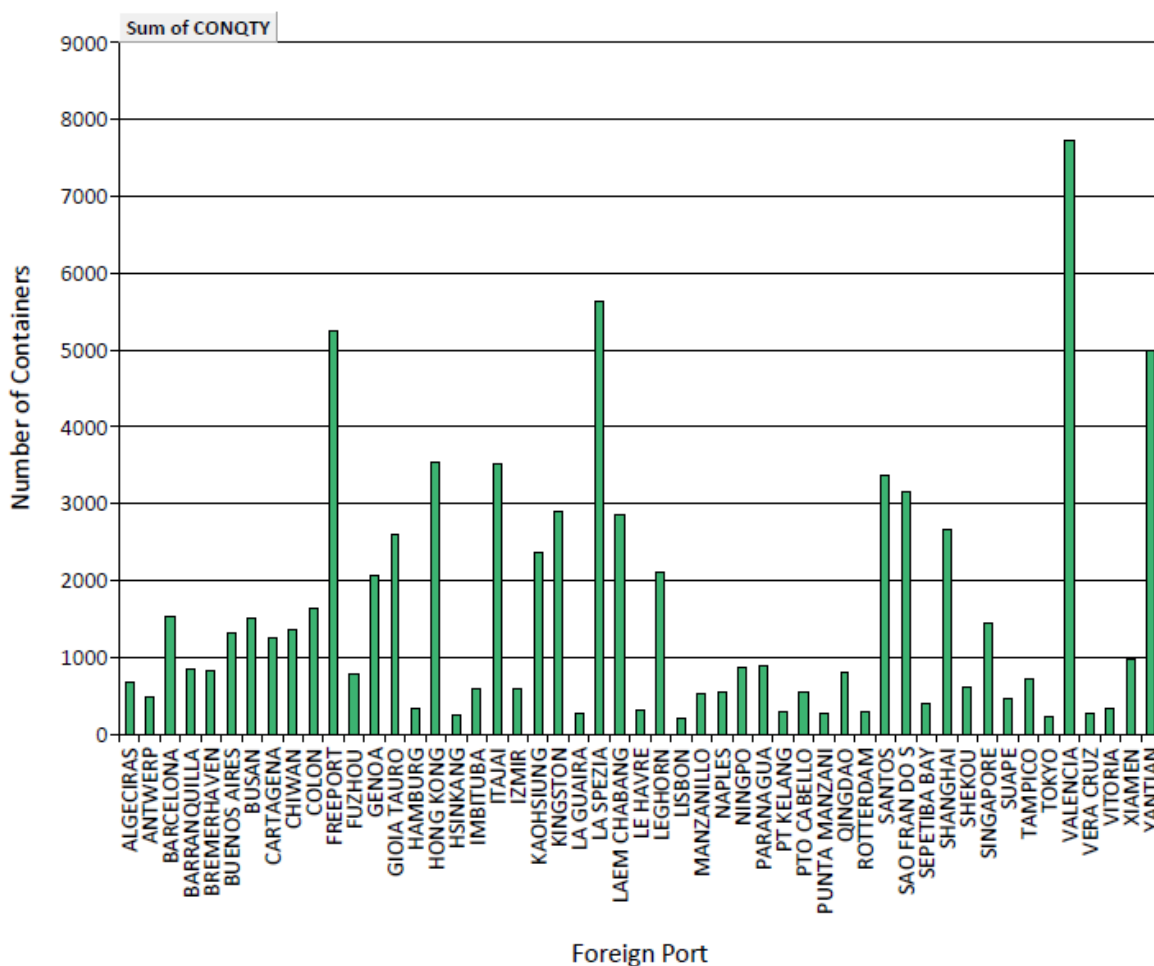


Figure 10: Foreign ports that ship ceramic products to the US in 20-ft containers. Note: Only ports with shipments in excess of 100 containers are shown.

We then expanded the analysis of ceramic shipments to the US to determine how different ceramic commodities were shipped to the US. Appendix D shows the consolidated container data for ceramic materials shipped to the US, expanded by the 4- and 6-digit HS code. The table shows that for HS codes less than 6909, the commodity tends to be shipped in 20-ft containers, while higher HS code numbers are shipped in 40-ft containers. Examination of the code descriptions revealed that the lower-valued HS codes are designated for ceramic items such as floor tiles, roof tiles, bricks and other refractory ceramic goods (“construction ceramics”). Higher-numbered HS codes are designated for ceramic items such as tableware, sinks, tubs, and the like, or “consumer ceramics.” Thus, it can be deduced that much of the consumer ceramic products was imported from Asian ports (mostly China) and that imported construction

ceramics had a more world-wide distribution, with many containers coming from Europe, Central and South America, as well as Asia.

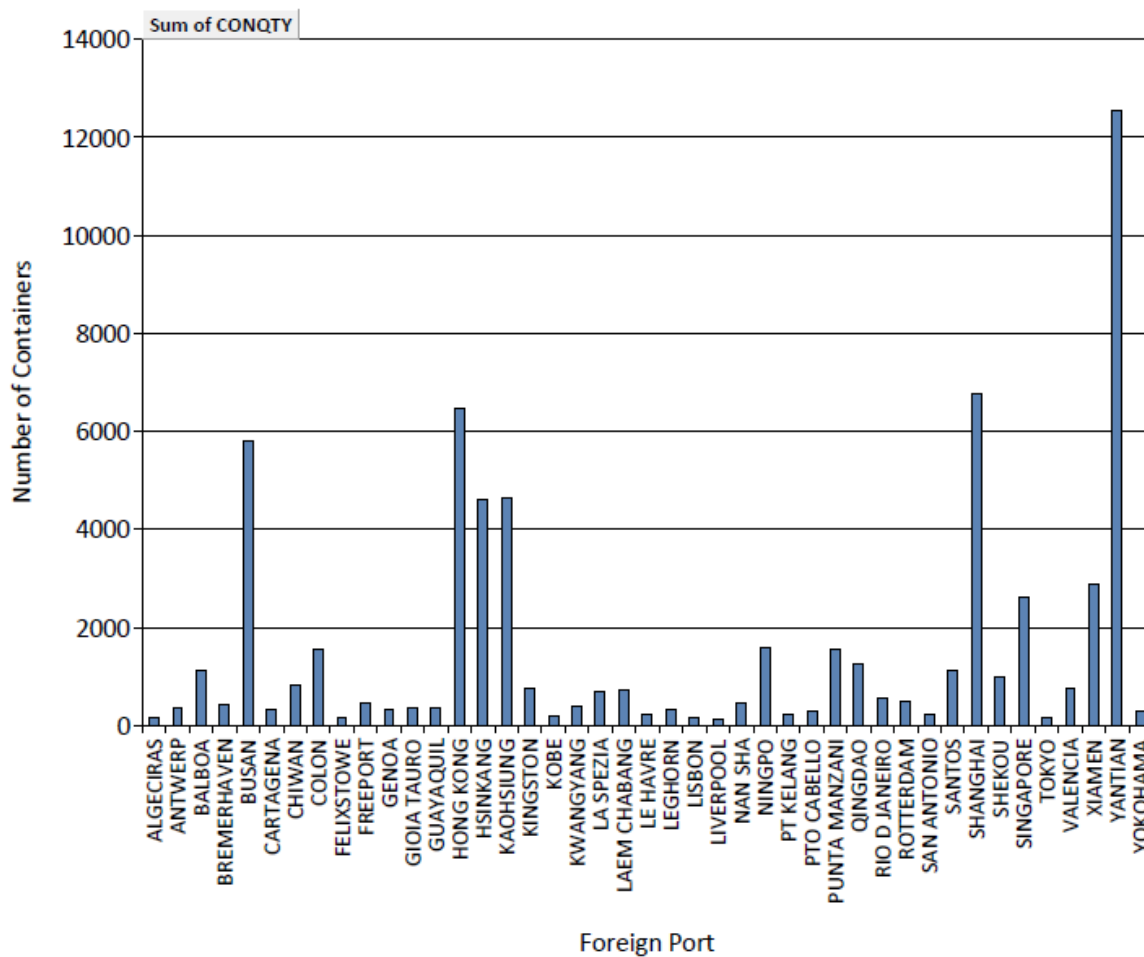


Figure 11: Foreign ports that ship ceramic products to the US in 40-ft containers. Note: Only ports shipping more than 100 containers are shown.

Figure 13 provides the weight distributions for construction and consumer ceramic goods, which shows that construction ceramics were responsible for the peak in the distribution for 20-ft containers from 35,000-47,000 lb/container, along with the higher weights for both 20- and 40-ft containers. Consumer ceramics showed a flat weight distribution not only for 40-ft containers, but also for 20- and 45-ft containers. The sharp decrease for 40-ft containers that shipped consumer ceramics may be due to the fact that many of these products are packed in Styrofoam™-filled boxes and this could be the maximum volume of these boxes that can be shipped in the 40-ft container. Construction ceramics are often shipped without foam packaging, in less dense cardboard, such that more of the actual product can be shipped in a single container, and these materials reach the container’s maximum shipping weight prior to reaching its volumetric limit.

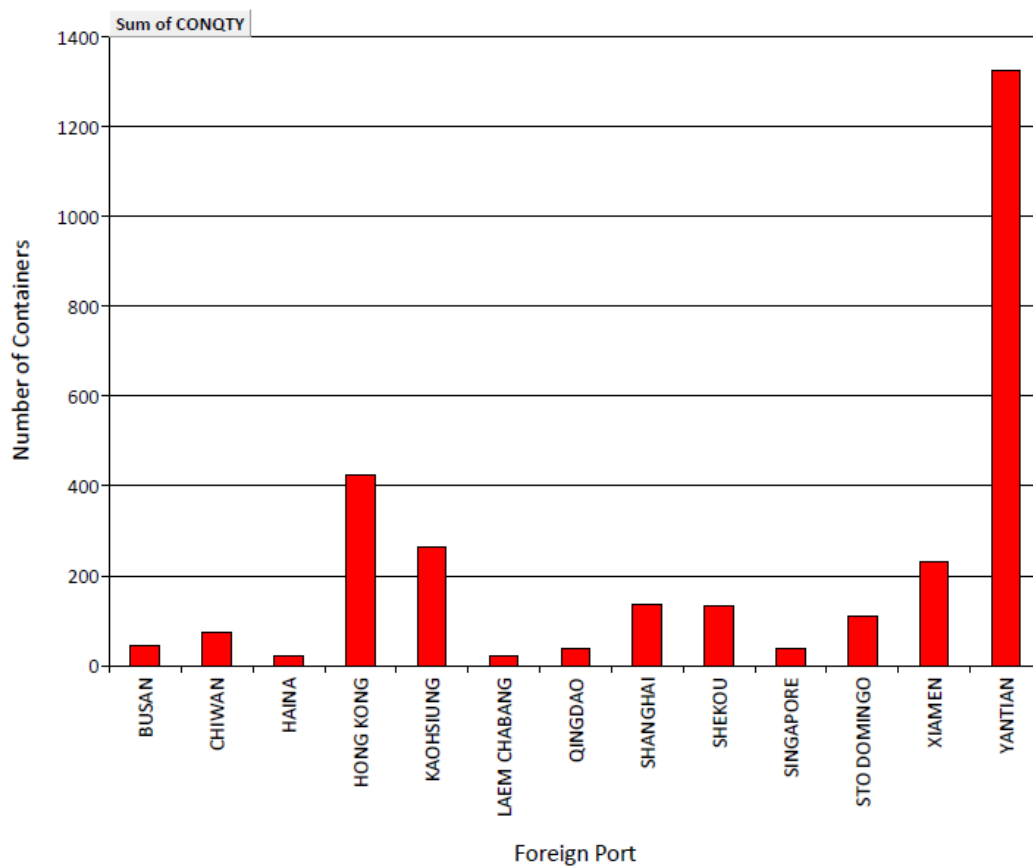
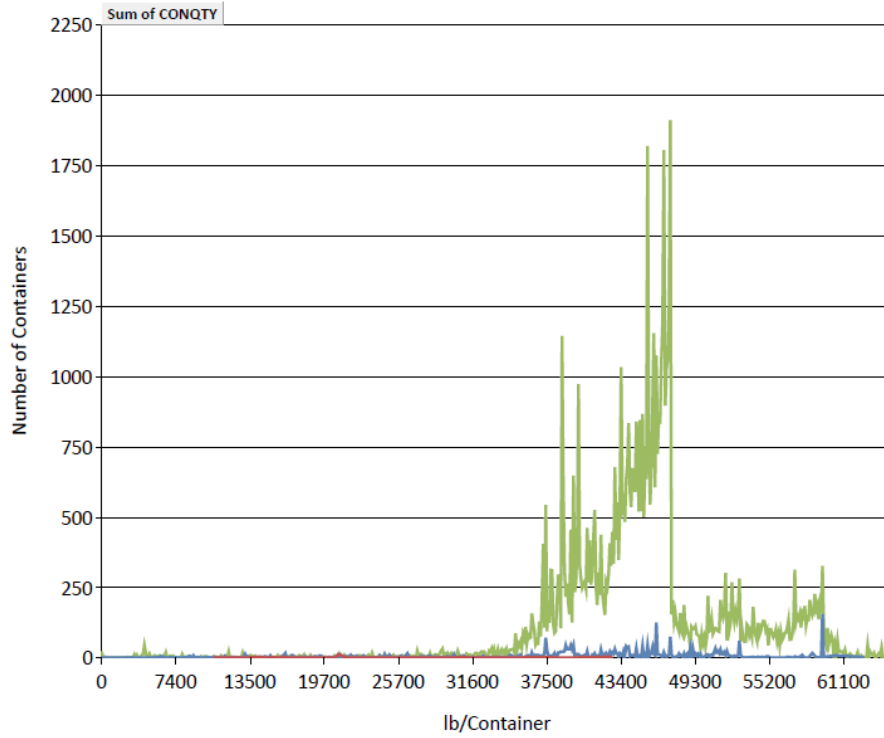
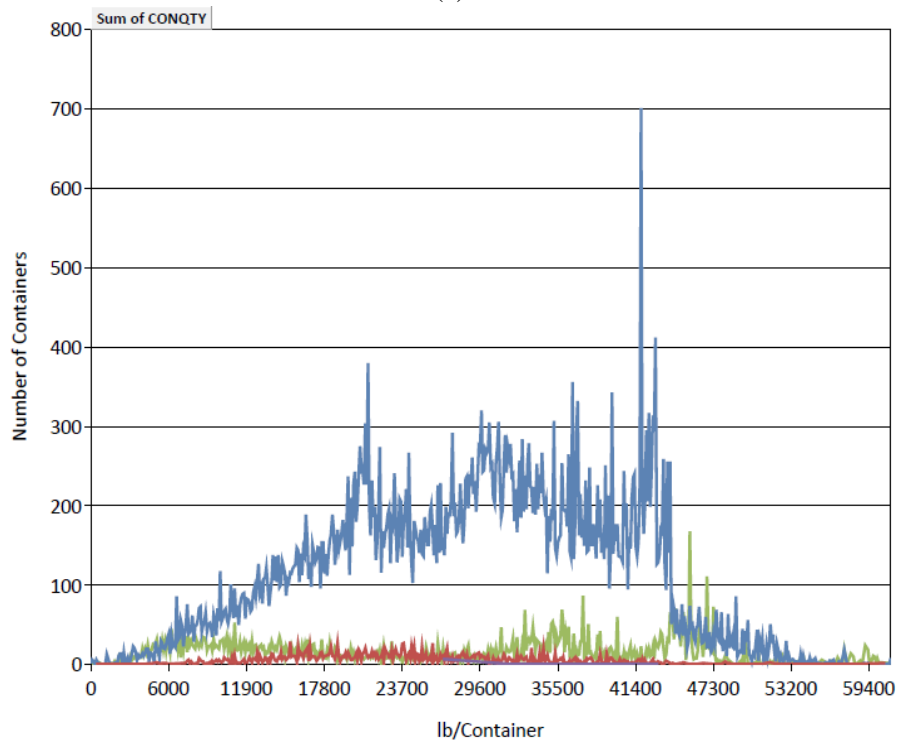


Figure 12: Foreign ports that ship ceramic products to the US in 45-ft containers. Note: Only ports with shipments in excess of 20 containers are shown.



(a)



(b)

Figure 13: Container weight distribution for (a) “construction” ceramic goods, and (b) “consumer” ceramic goods

4.4 Granite

Any naturally formed rock material has the potential to contain varying amounts of naturally occurring radiation. Natural radioactive elements like uranium, radium, and thorium can be present in a wide number of minerals that appear as crystals in granite from around the world. It is not unusual for materials such as granite to have some amount of radioactivity. Depending on the composition of the molten rock from which they formed, some pieces of granite can exhibit more radioactivity than others. Table 12 supplies typical activity concentration ranges for isotopes commonly found in granite (National Council on Radiation Protection and Measurements 1987), although values can greatly deviate from this range depending on the specific type of granite and specific locations within a slab of granite.

Table 12: Activity Concentrations of Radioisotopes Commonly Found in Granite

Radioisotope	Activity Concentration (pCi/g)
U-238	0.34 – 3.4
Th-230 & Th-232	0.54 – 3.2
K-40	~2.7

To analyze the shipment of ceramic materials, we collected information pertaining to four HS codes that are referenced for granite shipments: 251611, 251612, 680223, and 680293. The number of containers shipped in 2006 was 59,427. Approximately 96% of containers filled with granite were 20-foot long, 4% were 40-foot long, and just 20 containers were 45-foot long. The weight distribution of granite-filled containers that were shipped to the US in 2006 is shown in Figure 14. The majority of containers are in the 37,000-47,000-lb range, with a tail up to approximately 63,000 lb for 20-ft containers. The large oscillations in the weight distribution are due to how the original database is assembled. A single record in the database can contain information for more than one container (the 2006 database used in this report had up to 2000 containers in a single record). The weight information was then averaged over the number of containers in the record, and rounded to the nearest 100 lb. The combination of averaging over the record and rounding led to the large number of spikes in the data. The best method to smooth out these oscillations would be to use a larger bin structure for weight (i.e., instead of rounding to the nearest 100 lb/container, round to the nearest 500 lb/container).

We also investigated the foreign port distribution for granite-filled containers. The results are shown in Figure 15 and Figure 16 for 20- and 40-ft containers, respectively. Twenty-foot containers, the primary container used in shipping granite, were shipped from a larger variety of foreign ports, across all global regions. The port of Freeport (Bahamas) appears to ship the largest number of 20-ft (and as a group, 20- and 40-ft) containers to the US. This can be misleading as Freeport is not necessarily the originating port. Freeport is in a free-trade zone (operated by the Grand Bahama Port Authority), and this port actually handles containers from other international ports that are ultimately destined for the eastern seaboard of the US. Other countries that ship a large number of 20-ft granite-filled containers include Brazil, and China. This makes sense as Brazil and East Asia are major origination points of granite slabs that are imported to the US for home/building construction purposes. It is interesting to note that 40-ft containers

are primarily shipped by Chinese ports and Busan (South Korea), and that the weight carried by these containers is within the same range as 20-ft containers.

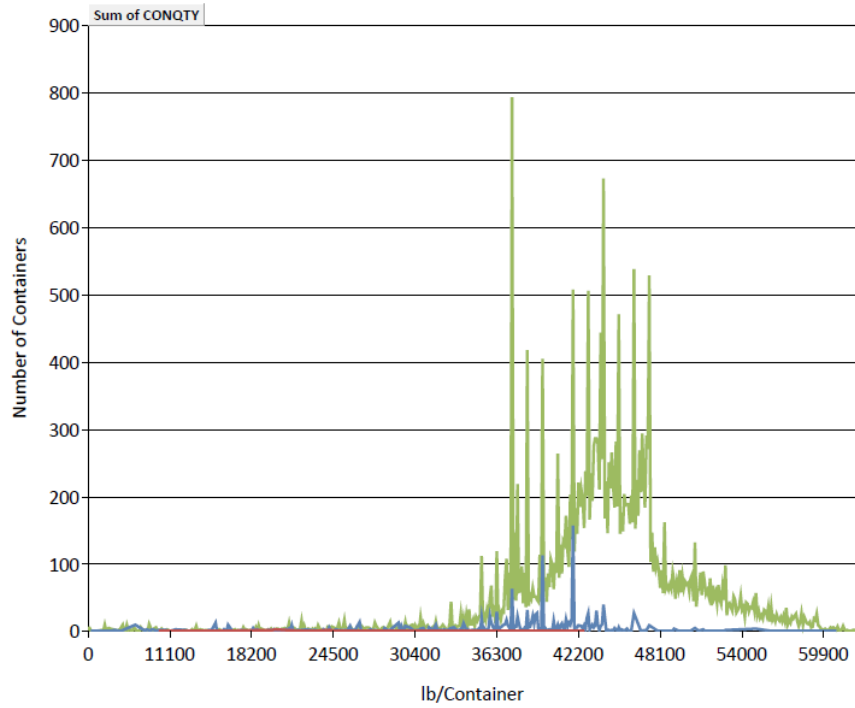


Figure 14: Container weight distribution for granite materials

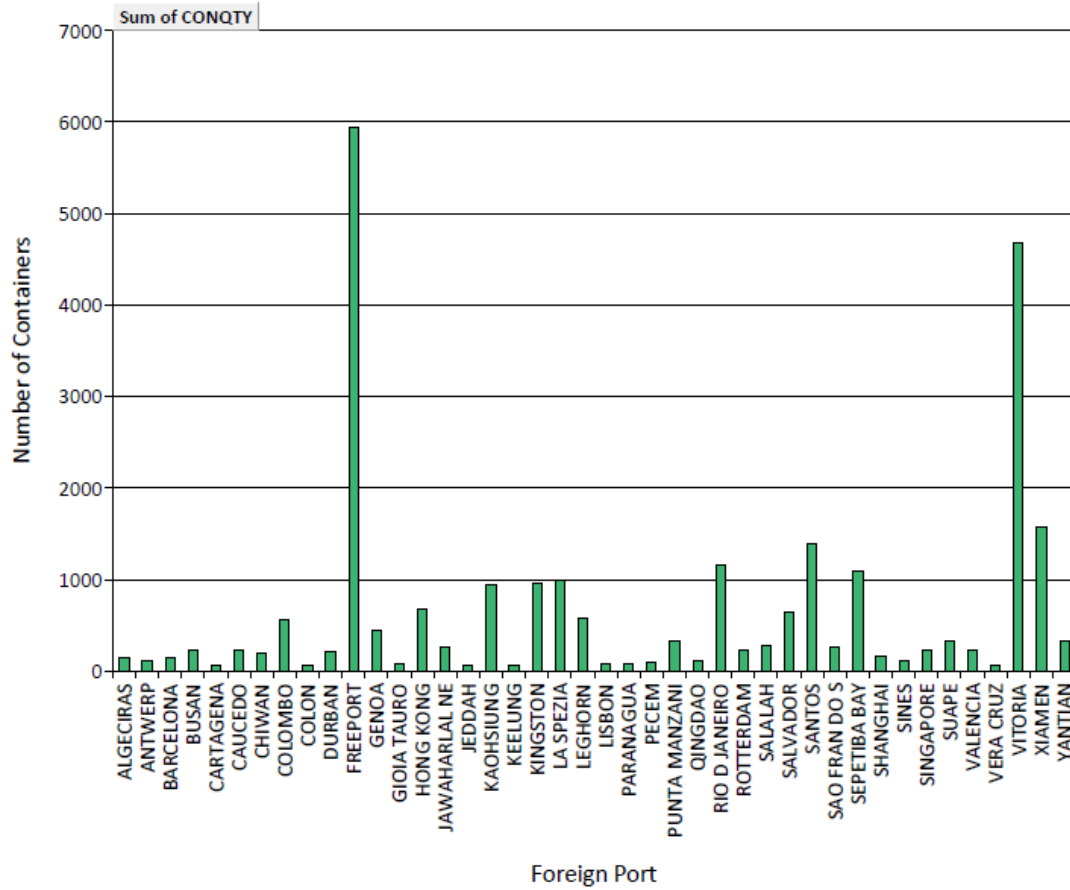


Figure 15: Foreign port distribution of granite materials shipped in 20-ft containers. Only ports that shipped more than 50 containers in 2006 are shown.

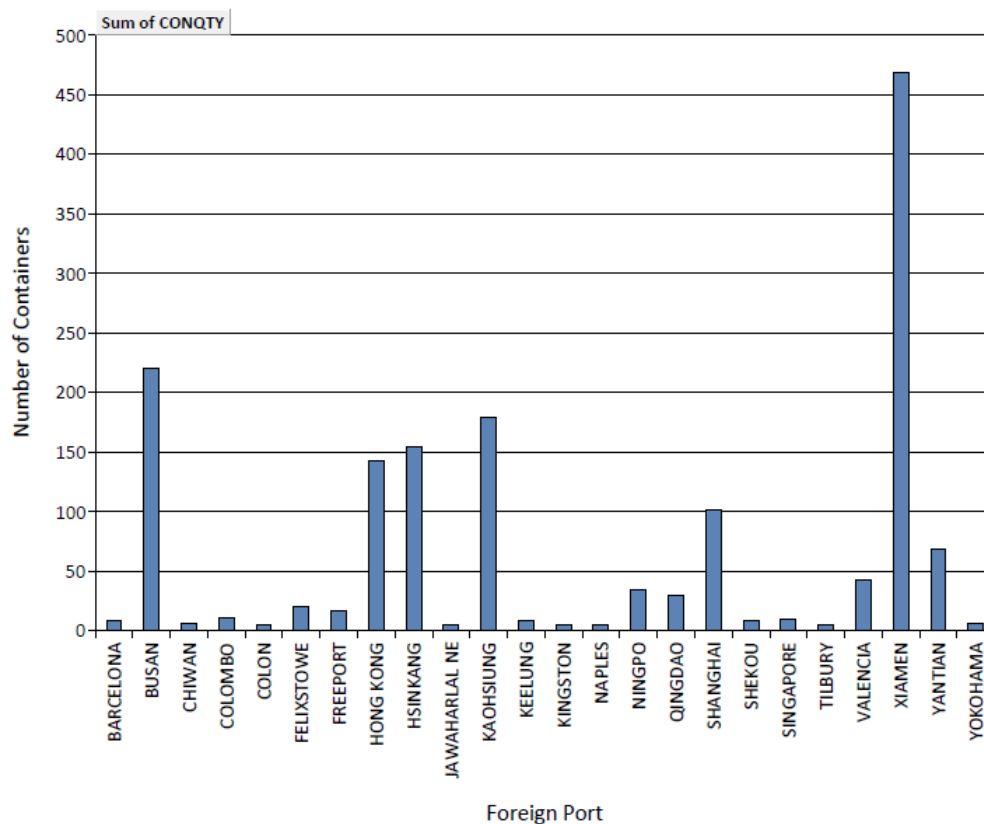


Figure 16: Foreign port distribution of granite materials shipped in 40-ft containers. Only ports that shipped upwards of five containers in 2006 are shown.

4.5 Radiological Materials

It is important to recognize the places from which the US may receive overseas shipments of radiological materials (HS Code 2844), even though these may not be naturally-occurring nor represent a false-alarm challenge as NORM can. These materials consist of natural, enriched, and depleted uranium, plutonium, thorium, and other radioisotopes. Residues, alloys, and mixtures are included in this category. In addition, highly radioactive spent-fuel elements of nuclear reactors are also included as part of this 4-digit HS code. In 2006, 565 containers of such materials were shipped.

Approximately 70% of these containers filled with radioactive materials were 20-feet long, 30% were 40-feet long, and just 3 containers were 45-feet long. Seventy-six percent of the containers were labeled with HS Code 284440, which presents radioisotopes other than uranium, plutonium, or thorium. The average weight in these shipping containers was approximately 30,000 lb, and it is assumed that a significant fraction of this weight can be attributed to shielding for radiation protection. As Figure 17 reveals, a majority of the containers come through European (and Russia's Asian) ports, with Antwerp, Liverpool and St. Petersburg being the largest shippers of radioactive materials to the US.

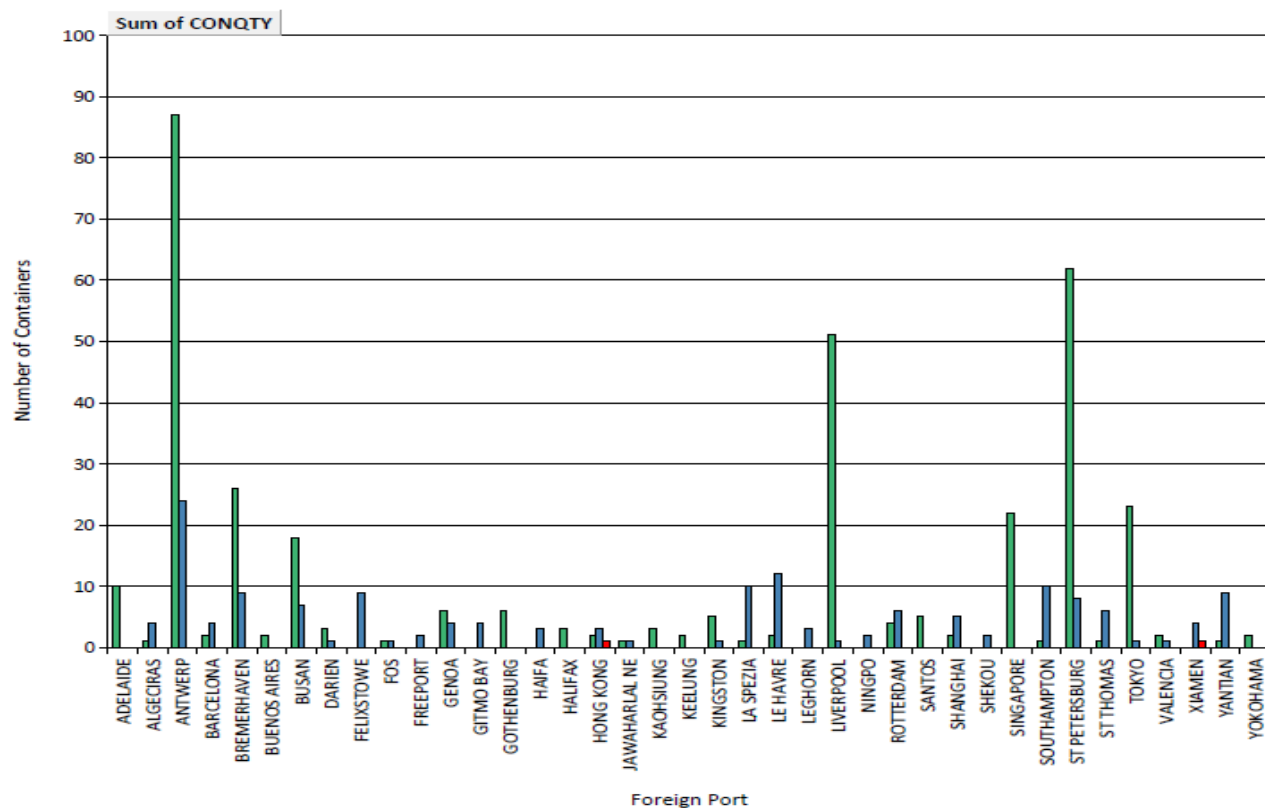


Figure 17: Foreign port distribution for containers with radiological materials (including spent fuel)

4.5.1 Uranium Ore

Another commodity of particular interest is uranium ore, which has its own separate HS code (261210). In 2006, 161 20-ft containers were shipped to the US, with an average weight of 47,900 lb/container. Figure 18 illustrates that most of these containers came from Singapore, with an additional 19 containers originating from Australian ports. It should be noted that only two US ports received uranium ore in 2006: Philadelphia and New Orleans. Further, only seven cargo ship voyages carried the containers.

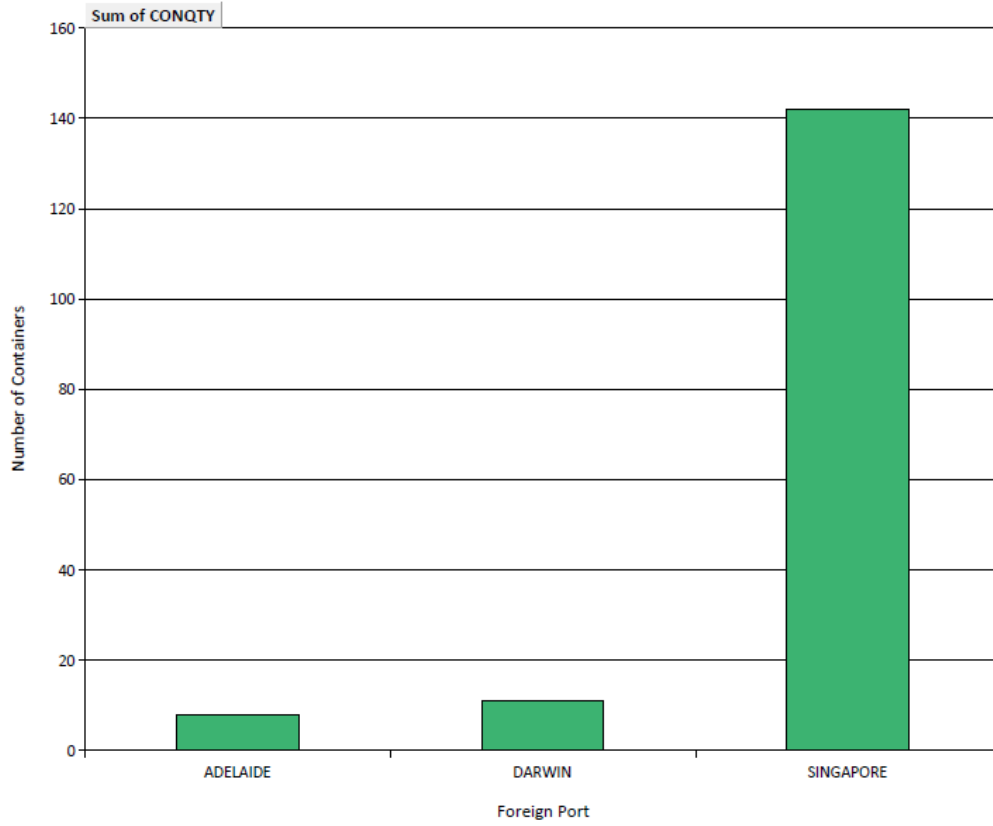


Figure 18: Foreign port distribution of containers with uranium ore

5.0 Summary and Conclusions

Each container size has a unique weight distribution for all commodities. In general, bulkier commodities such as furniture, clothing, fruits and vegetables are shipped in 40-ft containers, while dense items such as rock products, bulk metals, and beverages are shipped in 20-ft containers. The majority of containers shipped to the United States are 40-ft containers (~70%), about 25% are 20-ft, and about 4% are 45-ft containers. A small fraction (<1%) of containers are of other, specialized sizes, and very few ports actually ship these uniquely-sized containers. Given that 45-ft containers comprise 1 of out every 27 containers shipped to the US, and bearing in mind the foreign ports from which they are shipped, they should not be ignored in screening. Further testing and analysis of radiation measurements for national security with this size container is warranted.

A great deal of information can be obtained from the PIERS database, in particular enabling the analysis of shipping through specific international ports. Analyzing this data affords us an excellent tool for understanding shipping and developing a better understanding of the risks associated with potential cargo-borne nuclear and radiological threats within the Second Line of Defense (SLD) and Radiation Portal Monitor Project (RPMP) framework. This report analyzed Singapore as an example port. Of all the international ports, Singapore shipped the sixth-largest volume of containers to the US in 2006. In general, Singapore shipped more vegetable products, clothing, electronics (mostly in the form of televisions and computer parts), plastic and rubber products than a typical foreign port. In 2006, Singapore was also the main port through which uranium ore was shipped to the US. Additionally, Singapore shipped less than the average amount of stone and glass materials, base metals, and toys. Singapore also shipped a slightly larger percentage (approximately 4%) than average of 45-ft containers.

While a large number of NORMs are shipped in IMCCs, only a few specific commodities are shipped with enough frequency to present potential issues in screening IMCCs at ports. The majority of containers with NORM will hold fertilizers, granite, or ceramic materials (either general ceramic or porcelain). Fertilizers were generally shipping in either 20- or 40-ft containers with equal frequency. While granite is mostly shipped in 20-ft containers, ceramic materials can be shipped in either 20- or 40-ft containers. The size of container depended on the specific use of the ceramic or porcelain material. General construction ceramics (such as floor and roof tiles) tend to be shipped in 20-ft containers. Consumer products made from ceramic materials (e.g., tableware, sinks, and toilets) are generally shipped in 40-ft containers. This notable divergence is due in large part to the differential packaging of the ceramic commodities. Consumer products are usually shipped packed with significant quantities of Styrofoam™ or other packing material to protect the product from breakage, reducing its overall density, whereas construction ceramic materials are commonly shipped with much less protective material, many times consisting of only a cardboard or wood box, changing its effective density very little. Granite is almost always shipped in a 20-ft container, owing to its very high density. Uranium ore, sent exclusively in 20-ft containers, is primarily shipped from Singapore. Other radioactive materials are *mostly* shipped in 20-ft containers and originate from European ports.

In future studies with the PIERS databases, analysis would be improved by the use of more of the entry fields than the set available for this report. Unfortunately, the omission of several key fields in the dataset prevented the proper analysis of commodities that were listed with “unknown” or “less than container” sizes (representing commodities that used a partial container with multiple commodities). Had there been a greater number of data entries, it might have been possible to infer the container sizes for these

commodities. The data analyzed and conclusions drawn in this report are based on shipping information from 2006 (and only for the database entries in which the container size was known, accounting for 70% of the total amount of commodities shipped to the US). In view of the dynamic changes that can occur within international shipping, there is value in performing a similar analysis with a more recent database, in order to better assess year-to-year and port-to-port variations in support of SLD and RPMP objectives. By analyzing multiple years worth of commodity information, improved results and conclusions about shipments from overseas ports can be drawn.

6.0 References

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Appendix A: List of All International Ports and Number of Containers Shipped to the United States

This appendix lists the international shipping ports and the number of containers shipped from each to the US in 2006. Containers sized 20, 40, and 45 ft are listed separately. Other containers sizes (e.g., 48 ft, 53 ft, etc.) are listed in a combined Other category.

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
AABENRAA	9	0.0005	88	0.0017		0.0000		0.000
AALESUND		0.0000	10	0.0002	2	0.0008		0.000
AARHUS	37	0.0020	15	0.0003		0.0000		0.000
ABIDJAN	1104	0.0595	242	0.0047		0.0000		0.000
ACAJUTLA	905	0.0488	2959	0.0579	446	0.1703		0.000
ADELAIDE	253	0.0136	38	0.0007		0.0000		0.000
AGANA	605	0.0326	1241	0.0243	285	0.1088		0.000
ALEXANDRIA	661	0.0356	2135	0.0418	4	0.0015	1	0.006
ALGECIRAS	18,750	1.0108	22,051	0.4317	92	0.0351		0.000
ALGIERS		0.0000	1	0.0000		0.0000		0.000
ALICANTE	31	0.0017	2	0.0000		0.0000		0.000
ALTAMIRA	1	0.0001		0.0000		0.0000		0.000
AMSTERDAM	115	0.0062	204	0.0040		0.0000		0.000
ANCONA	9	0.0005	44	0.0009		0.0000		0.000
ANDROS ISL	55	0.0030	1	0.0000		0.0000		0.000
ANTALYA	3	0.0002	1	0.0000		0.0000		0.000
ANTOFAGASTA	12	0.0006	3	0.0001		0.0000		0.000
ANTWERP	52,231	2.8157	103,003	2.0165	187	0.0714	1	0.006
APIA	89	0.0048	21	0.0004		0.0000		0.000
ARAWAK CAY	4	0.0002	5	0.0001		0.0000		0.000
ARGENTIA	2	0.0001	186	0.0036		0.0000		0.000
ARICA	70	0.0038	84	0.0016		0.0000		0.000
ASCENSION		0.0000	50	0.0010		0.0000		0.000
ASHDOD	256	0.0138	1170	0.0229		0.0000		0.000
AUCKLAND	10,908	0.5880	6757	0.1323		0.0000		0.000
BAHAMAS		0.0000	4	0.0001		0.0000		0.000
BAHRAIN	14	0.0008	4	0.0001		0.0000		0.000
BALBOA	7968	0.4295	22,035	0.4314	566	0.2161		0.000
BANDAR ABBAS	16	0.0009	8	0.0002		0.0000		0.000
BANDJARMASIN		0.0000	1	0.0000		0.0000		0.000
BANGKOK	89	0.0048	265	0.0052	1	0.0004		0.000
BARAHONA	1	0.0001		0.0000		0.0000		0.000
BARCELONA	14,077	0.7589	16,016	0.3135	9	0.0034		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
BARRANQUILLA	1706	0.0920	1490	0.0292	27	0.0103		0.000
BASSETERRE	41	0.0022	20	0.0004		0.0000		0.000
BEIHAI	28	0.0015	53	0.0010		0.0000		0.000
BEIJIAO		0.0000	3	0.0001		0.0000		0.000
BEIRA		0.0000	1	0.0000		0.0000		0.000
BEIRUT		0.0000	3	0.0001		0.0000		0.000
BELAWAN DELI	30	0.0016	84	0.0016		0.0000		0.000
BELEM	3	0.0002	6	0.0001		0.0000		0.000
BELFAST		0.0000	9	0.0002		0.0000		0.000
BELIZE CITY		0.0000	24	0.0005		0.0000		0.000
BERMUDA		0.0000	259	0.0051		0.0000		0.000
BILBAO	33	0.0018	109	0.0021		0.0000		0.000
BIN QASIM	1	0.0001	3	0.0001		0.0000		0.000
BINTULU		0.0000	16	0.0003		0.0000		0.000
BOCA CHICA	90	0.0049	114	0.0022	1	0.0004		0.000
BOMBAY	3998	0.2155	2203	0.0431		0.0000		0.000
BONAIRE	24	0.0013	8	0.0002		0.0000		0.000
BRAKE		0.0000	9	0.0002		0.0000		0.000
BREMEN	15	0.0008	268	0.0052		0.0000		0.000
BREMERHAVEN	44,844	2.4175	154,928	3.0330	2043	0.7799	4	0.023
BRIDGETOWN	536	0.0289	96	0.0019		0.0000		0.000
BRISBANE	2131	0.1149	1212	0.0237		0.0000		0.000
BRISTOL		0.0000	1	0.0000		0.0000		0.000
BUENAVENTURA	242	0.0130	233	0.0046		0.0000		0.000
BUENOS AIRES	12,259	0.6609	15,870	0.3107		0.0000		0.000
BUKHTA SEVERN		0.0000	18	0.0004		0.0000		0.000
BUKPYUNG	1	0.0001		0.0000		0.0000		0.000
BURGAS		0.0000	2	0.0000		0.0000		0.000
BUSAN	143,284	7.7242	348,586	6.8242	4292	1.6384		0.000
CADIZ	4	0.0002	11	0.0002		0.0000		0.000
CAGAYAN	1	0.0001		0.0000		0.0000		0.000
CAGLIARI	989	0.0533	732	0.0143	2	0.0008		0.000
CAICOS ISL	20	0.0011		0.0000		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
CALAIS	150	0.0081		0.0000		0.0000		0.000
CALCUTTA	2	0.0001	2	0.0000	1	0.0004		0.000
CALDERA	144	0.0078	4655	0.0911		0.0000		0.000
CALLAO	2849	0.1536	2328	0.0456	2	0.0008		0.000
CAP HAITIEN	12	0.0006		0.0000		0.0000		0.000
CAPE TOWN	2913	0.1570	3603	0.0705		0.0000		0.000
CARTAGENA	11,203	0.6039	9815	0.1921	9	0.0034		0.000
CASABLANCA		0.0000	1	0.0000		0.0000		0.000
CASTRIES	1	0.0001		0.0000		0.0000		0.000
CAT CAYS		0.0000	1	0.0000		0.0000		0.000
CATANIA	9	0.0005		0.0000		0.0000		0.000
CAUCEDO	3100	0.1671	3235	0.0633		0.0000		0.000
CEBU	1	0.0001	140	0.0027		0.0000		0.000
CHANG SHA	6	0.0003	10	0.0002		0.0000		0.000
CHENNAI	97	0.0052	4	0.0001		0.0000		0.000
CHERIBON	2	0.0001		0.0000		0.0000		0.000
CHILE		0.0000	26	0.0005		0.0000		0.000
CHIN WANG TAO	1	0.0001	1	0.0000		0.0000		0.000
CHINA P	11	0.0006	30	0.0006		0.0000		0.000
CHITTAGONG	37	0.0020	93	0.0018		0.0000		0.000
CHIWAN	13,271	0.7154	76,538	1.4984	4742	1.8102	1139	6.668
CHOFU	11	0.0006	1	0.0000		0.0000		0.000
CHRISTCHURCH		0.0000	1	0.0000		0.0000		0.000
CHRISTIANSTED	1664	0.0897	1137	0.0223	2	0.0008	8	0.047
COCHIN	345	0.0186	7	0.0001	1	0.0004		0.000
COLOMBO	24,704	1.3317	20,122	0.3939	624	0.2382		0.000
COLON	24,999	1.3477	45,675	0.8942	632	0.2413		0.000
CONAKRY	4	0.0002	3	0.0001		0.0000		0.000
CONSTANZA	33	0.0018	202	0.0040		0.0000		0.000
COQUIMBO	29	0.0016	434	0.0085		0.0000		0.000
CORINTO	247	0.0133	468	0.0092		0.0000		0.000
CORONEL	6	0.0003	1016	0.0199		0.0000		0.000
CRISTOBAL	17	0.0009		0.0000		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
CURACAO	2	0.0001		0.0000		0.0000		0.000
DA NANG	13	0.0007	32	0.0006		0.0000		0.000
DADRI		0.0000	1	0.0000		0.0000		0.000
DAKAR	6	0.0003	15	0.0003		0.0000		0.000
DAMIETTA	924	0.0498	3430	0.0671		0.0000		0.000
DAMMAN	442	0.0238	156	0.0031		0.0000		0.000
DAR ES SALAAM	1	0.0001		0.0000		0.0000		0.000
DARIEN	9994	0.5388	19,896	0.3895	282	0.1076		0.000
DARWIN	71	0.0038		0.0000		0.0000		0.000
DAVAO		0.0000	15	0.0003		0.0000		0.000
DJIBOUTI	29	0.0016	75	0.0015	5	0.0019	2	0.012
DOMINICAN REP	1	0.0001		0.0000		0.0000		0.000
DOUALA	128	0.0069	25	0.0005		0.0000		0.000
DOVER	16	0.0009	30	0.0006		0.0000		0.000
DUBAI	228	0.0123	95	0.0019		0.0000		0.000
DUBLIN		0.0000	3	0.0001		0.0000		0.000
DUNKIRK	117	0.0063	433	0.0085		0.0000		0.000
DURBAN	7699	0.4150	9494	0.1859		0.0000		0.000
EL BLUFF		0.0000	37	0.0007		0.0000		0.000
EL DEKHEILA		0.0000	1	0.0000		0.0000		0.000
EL FERROL		0.0000	18	0.0004		0.0000		0.000
ENSENADA	371	0.0200	1885	0.0369	12	0.0046		0.000
ESMARALDAS	1	0.0001		0.0000		0.0000		0.000
FANGCHENG	6	0.0003	5	0.0001		0.0000		0.000
FARIDABAD	9	0.0005	20	0.0004		0.0000	1	0.006
FELIXSTOWE	7478	0.4031	21,218	0.4154	1255	0.4791		0.000
FOGO		0.0000	1	0.0000		0.0000		0.000
FORTALEZA	334	0.0180	350	0.0069		0.0000		0.000
FOS	3766	0.2030	8786	0.1720		0.0000		0.000
FOSHAN		0.0000	6	0.0001		0.0000		0.000
FREDRIKSTAD		0.0000	1	0.0000		0.0000		0.000
FREEPORT	55,450	2.9892	62,541	1.2243	79	0.0302		0.000
FREMANTLE	5	0.0003		0.0000		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
FRONTERA	1	0.0001		0.0000		0.0000		0.000
FT DE FRANCE	28	0.0015	15	0.0003		0.0000		0.000
FUZHOU	1279	0.0689	2280	0.0446	58	0.0221		0.000
GDANSK	164	0.0088	1	0.0000		0.0000		0.000
GDYNIA	4	0.0002	9	0.0002		0.0000		0.000
GEMLIK	404	0.0218	1064	0.0208		0.0000		0.000
GENOA	19,120	1.0307	21,772	0.4262		0.0000		0.000
GEORGETOWN	202	0.0109	215	0.0042		0.0000		0.000
GIOIA TAURO	16,055	0.8655	26,485	0.5185	231	0.0882		0.000
GITMO BAY	24	0.0013	215	0.0042		0.0000		0.000
GLADSTONE		0.0000	2	0.0000		0.0000		0.000
GOLD RVR	1	0.0001		0.0000		0.0000		0.000
GOTHENBURG	1168	0.0630	5561	0.1089		0.0000		0.000
GOVERNORS HBR		0.0000	1	0.0000		0.0000		0.000
GRAND TURK	35	0.0019	1	0.0000		0.0000		0.000
GRANGEMOUTH	1	0.0001		0.0000		0.0000		0.000
GUANGDONG	33	0.0018	183	0.0036		0.0000		0.000
GUANGZHOU	89	0.0048	233	0.0046		0.0000		0.000
GUANTA	8	0.0004	15	0.0003		0.0000		0.000
GUARANAQ	11	0.0006		0.0000		0.0000		0.000
GUAYAQUIL	1007	0.0543	24,341	0.4765	10	0.0038		0.000
GULF OF MEX	11	0.0006		0.0000		0.0000		0.000
HAIFA	9369	0.5051	27,512	0.5386	13	0.0050		0.000
HAIKOU	2	0.0001	16	0.0003		0.0000		0.000
HAINA	293	0.0158	1009	0.0198	219	0.0836		0.000
HAIPHONG	16	0.0009	22	0.0004		0.0000		0.000
HAKATA		0.0000	85	0.0017		0.0000		0.000
HAKODATE	11	0.0006		0.0000		0.0000		0.000
HALDIA	3	0.0002		0.0000		0.0000		0.000
HALIFAX	2891	0.1558	9793	0.1917	50	0.0191		0.000
HAMBURG	10,318	0.5562	26,339	0.5156	52	0.0198		0.000
HAMILTON	364	0.0196		0.0000	8	0.0031	4	0.023
HANKOW	34	0.0018	30	0.0006		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
HARBURG		0.0000	5	0.0001		0.0000		0.000
HELGVUVIK	5	0.0003	105	0.0021		0.0000		0.000
HELSINGBORG		0.0000	2	0.0000		0.0000		0.000
HELSINKI	3	0.0002		0.0000		0.0000		0.000
HO CHI MINH	31	0.0017	260	0.0051	41	0.0157	14	0.082
HONDAGUA	1	0.0001	2	0.0000		0.0000		0.000
HONG KONG	94,618	5.1007	417,513	8.1735	33,541	12.8035	54	0.316
HSINKANG	29,998	1.6171	64,137	1.2556	916	0.3497	1	0.006
HUANGPU	165	0.0089	1641	0.0321		0.0000		0.000
ILLYICHEVSK	38	0.0020	22	0.0004		0.0000		0.000
IMBITUBA	980	0.0528	226	0.0044		0.0000		0.000
INDIA	2	0.0001	2	0.0000		0.0000		0.000
IQUITOS	2	0.0001	14	0.0003		0.0000		0.000
ISTANBUL	634	0.0342	2185	0.0428		0.0000		0.000
ITAGUAI	37	0.0020	5	0.0001		0.0000		0.000
ITAJAI	7828	0.4220	13,911	0.2723		0.0000		0.000
IZMIR	4842	0.2610	5795	0.1134	13	0.0050		0.000
JAKARTA	7	0.0004	45	0.0009	2	0.0008		0.000
JAWAHARLAL NE	28,480	1.5353	32,162	0.6296	111	0.0424		0.000
JEBEL ALI	11,457	0.6176	3830	0.0750	65	0.0248		0.000
JEDDAH	981	0.0529	1971	0.0386	9	0.0034		0.000
JIANGMEN	1	0.0001	34	0.0007		0.0000		0.000
JIANGYIN	246	0.0133	39	0.0008		0.0000		0.000
JIUZHOU	5	0.0003	35	0.0007		0.0000		0.000
JOHORE BAHRU	64	0.0035	322	0.0063	1	0.0004		0.000
KAARSTO	19	0.0010		0.0000		0.0000		0.000
KANDLA	29	0.0016		0.0000		0.0000		0.000
KAOHSIUNG	128,149	6.9083	317,897	6.2234	16,344	6.2390		0.000
KARACHI	64	0.0035	150	0.0029		0.0000		0.000
KARATSU	1	0.0001		0.0000		0.0000		0.000
KEELUNG	4381	0.2362	15,622	0.3058	852	0.3252		0.000
KIMBE	1	0.0001		0.0000		0.0000		0.000
KINGSTON	25,240	1.3606	43,533	0.8522	306	0.1168		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
KOBE	22,857	1.2322	34,198	0.6695	173	0.0660		0.000
KOPER	2	0.0001	28	0.0005		0.0000		0.000
KOTA KINABALU		0.0000	12	0.0002		0.0000		0.000
KRISTIANSAND		0.0000	5	0.0001		0.0000		0.000
KUCHING	4	0.0002		0.0000		0.0000		0.000
KUMPORT	1	0.0001		0.0000		0.0000		0.000
KUWAIT	638	0.0344		0.0000		0.0000		0.000
KWANGYANG	10,815	0.5830	46,142	0.9033	652	0.2489		0.000
KWINANA		0.0000	2	0.0000		0.0000		0.000
LA GUAIRA	463	0.0250	347	0.0068		0.0000		0.000
LA ROMANA		0.0000	15	0.0003		0.0000		0.000
LA SPEZIA	35,785	1.9291	38,039	0.7447	39	0.0149		0.000
LAE	1	0.0001		0.0000		0.0000		0.000
LAEM CHABANG	28,489	1.5358	34,447	0.6744	3611	1.3784		0.000
LAGOS		0.0000	6	0.0001		0.0000		0.000
LATAKIA		0.0000	1	0.0000		0.0000		0.000
LAZARO CARDEN	50	0.0027	448	0.0088		0.0000		0.000
LE HAVRE	13945	0.7518	34,099	0.6675	44	0.0168		0.000
LE VERDON	1	0.0001		0.0000		0.0000		0.000
LEGHORN	17,134	0.9237	18,789	0.3678		0.0000		0.000
LEIXOES	21	0.0011	15	0.0003		0.0000		0.000
LIANYUNGANG	125	0.0067	294	0.0058		0.0000		0.000
LIMASSOL	1	0.0001	2	0.0000		0.0000		0.000
LIMON		0.0000	1	0.0000		0.0000		0.000
LINDEN	2	0.0001		0.0000		0.0000		0.000
LIRQUEN	14	0.0008	656	0.0128		0.0000		0.000
LISBON	2442	0.1316	5366	0.1050		0.0000		0.000
LIVERPOOL	4867	0.2624	14,569	0.2852		0.0000		0.000
LOBITO	71	0.0038		0.0000		0.0000		0.000
LUANDA	1	0.0001	1	0.0000		0.0000		0.000
LUBA	29	0.0016		0.0000		0.0000		0.000
MADRAS	117	0.0063	37	0.0007		0.0000		0.000
MADRID		0.0000	3	0.0001		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
MALABO	7	0.0004	1	0.0000		0.0000		0.000
MALAGA	66	0.0036	43	0.0008	2	0.0008		0.000
MALAYSIA	14	0.0008	84	0.0016		0.0000		0.000
MANAUS	2	0.0001	1	0.0000		0.0000		0.000
MANILA	59	0.0032	237	0.0046	2	0.0008		0.000
MANZANILLO	7808	0.4209	23,285	0.4558		0.0000		0.000
MARACAIBO		0.0000		0.0000	1	0.0004		0.000
MARSAXLOKK	1517	0.0818	652	0.0128		0.0000		0.000
MARSEILLE	181	0.0098	903	0.0177		0.0000		0.000
MELBOURNE	21,047	1.1346	7645	0.1497		0.0000		0.000
MERCIN		0.0000	1	0.0000		0.0000		0.000
MERSIN	126	0.0068	920	0.0180		0.0000		0.000
MOIN	69	0.0037	5953	0.1165	43	0.0164		0.000
MOJI		0.0000	3	0.0001		0.0000		0.000
MOMBASA	48	0.0026		0.0000		0.0000		0.000
MONFALCONE	13	0.0007	2	0.0000		0.0000		0.000
MONROVIA	880	0.0474		0.0000		0.0000		0.000
MONTEVIDEO	463	0.0250	3713	0.0727		0.0000		0.000
MONTOIR		0.0000	1	0.0000		0.0000		0.000
MONTREAL	98	0.0053	115	0.0023		0.0000		0.000
MORMUGAO	2	0.0001		0.0000		0.0000		0.000
MUARA	1	0.0001		0.0000		0.0000		0.000
MUMBAI	35	0.0019	50	0.0010		0.0000		0.000
MUNDRA	3768	0.2031	4178	0.0818	44	0.0168		0.000
NAGOYA	14,329	0.7725	59,875	1.1722	51	0.0195	2	0.012
NAHA	25	0.0013	246	0.0048	1	0.0004		0.000
NAKANOSEKI	18	0.0010	1	0.0000		0.0000		0.000
NAN HAI	1	0.0001	6	0.0001		0.0000		0.000
NAN SHA	249	0.0134	2937	0.0575	5	0.0019		0.000
NANJING	16	0.0009	127	0.0025	3	0.0011		0.000
NANTUNG	64	0.0035	93	0.0018	60	0.0229		0.000
NAPIER	1015	0.0547	539	0.0106		0.0000		0.000
NAPLES	3246	0.1750	13,043	0.2553		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
NASSAU	812	0.0438	1022	0.0200	31	0.0118		0.000
NEW DELHI	3	0.0002		0.0000		0.0000		0.000
NEW MANGALORE	33	0.0018		0.0000		0.0000		0.000
NEW PLYMOUTH	633	0.0341	169	0.0033		0.0000		0.000
NEW WESTMINST	16	0.0009		0.0000		0.0000		0.000
NHAVA SHEVA	48	0.0026	32	0.0006		0.0000		0.000
NINGPO	35,895	1.9350	164,551	3.2214	5562	2.1232		0.000
NJARDVIK	10	0.0005	379	0.0074		0.0000		0.000
NOUMEA	216	0.0116	1	0.0000		0.0000		0.000
ODDA	1	0.0001		0.0000		0.0000		0.000
ONOMICHI	1	0.0001		0.0000		0.0000		0.000
OPORTO	9	0.0005	3	0.0001		0.0000		0.000
ORANJESTAD	29	0.0016	52	0.0010		0.0000		0.000
OSAKA	6941	0.3742	13,692	0.2680		0.0000		0.000
PAGO PAGO	7574	0.4083	194	0.0038		0.0000		0.000
PAITA	21	0.0011	1180	0.0231		0.0000		0.000
PALERMO	115	0.0062	99	0.0019		0.0000		0.000
PALUA	9	0.0005		0.0000		0.0000		0.000
PANAMA CITY	7	0.0004	202	0.0040		0.0000		0.000
PANDJANG	14	0.0008	33	0.0006	1	0.0004		0.000
PAPEETE	215	0.0116	39	0.0008		0.0000		0.000
PAPUA	1	0.0001		0.0000		0.0000		0.000
PARADIP		0.0000	1	0.0000		0.0000		0.000
PARAMARIBO	115	0.0062	11	0.0002		0.0000		0.000
PARANAGUA	3574	0.1927	7038	0.1378	2	0.0008		0.000
PARANAM	268	0.0144		0.0000		0.0000		0.000
PARNAIBA		0.0000	1	0.0000		0.0000		0.000
PASIR GUDANG	2	0.0001	27	0.0005		0.0000		0.000
PECEM	1946	0.1049	1280	0.0251		0.0000		0.000
PENANG	89	0.0048	355	0.0069		0.0000		0.000
PHILIPSBURG	17	0.0009	18	0.0004		0.0000		0.000
PIPAVAV	63	0.0034	57	0.0011		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
PIRAEUS	463	0.0250	2966	0.0581		0.0000		0.000
PLYMOUTH	9	0.0005	2	0.0000		0.0000		0.000
PNT A PIERRE	1	0.0001	8	0.0002		0.0000		0.000
PNT A PITRE	14	0.0008	209	0.0041		0.0000		0.000
PNT LISAS	269	0.0145	239	0.0047		0.0000		0.000
PNT NOIRE	2	0.0001	4	0.0001		0.0000		0.000
PORTLAND		0.0000	10	0.0002		0.0000		0.000
PORTSMOUTH	20	0.0011	12	0.0002		0.0000		0.000
POTI	2	0.0001		0.0000		0.0000		0.000
PROGRESO	62	0.0033	12,940	0.2533		0.0000		0.000
PROVIDENCIALE	303	0.0163	43	0.0008	1	0.0004		0.000
PT AU PRINCE	78	0.0042	416	0.0081	1747	0.6669	5	0.029
PT CHALMERS	5152	0.2777	1423	0.0279		0.0000		0.000
PT COURBET	1	0.0001		0.0000		0.0000		0.000
PT ELIZABETH	1015	0.0547	1611	0.0315		0.0000		0.000
PT GENTIL	4	0.0002		0.0000		0.0000		0.000
PT HARCOURT	29	0.0016	2	0.0000		0.0000		0.000
PT KELANG	2788	0.1503	12,047	0.2358	90	0.0344		0.000
PT LIMON	749	0.0404	29,692	0.5813	2828	1.0795	81	0.474
PT LOUIS	16	0.0009	19	0.0004		0.0000		0.000
PT OF SPAIN	347	0.0187	606	0.0119		0.0000		0.000
PT PURCELL		0.0000	2	0.0000		0.0000		0.000
PT QASIM	665	0.0358	890	0.0174		0.0000		0.000
PT RHOADES	120	0.0065		0.0000		0.0000		0.000
PT SAID	1562	0.0842	1375	0.0269	1	0.0004		0.000
PTO BARRIOS	391	0.0211	11,956	0.2341	257	0.0981		0.000
PTO BOLIVAR		0.0000	115	0.0023		0.0000		0.000
PTO CABELLO	2793	0.1506	7854	0.1538	66	0.0252		0.000
PTO CABEZAS	2	0.0001		0.0000		0.0000		0.000
PTO CASTILLA		0.0000	17,294	0.3386		0.0000		0.000
PTO CORTES	2105	0.1135	15,440	0.3023	17,545	6.6974	518	3.033
PTO PLATA	382	0.0206	2171	0.0425	1079	0.4119		0.000
PULUM BUKUM		0.0000	1	0.0000		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
PUNTA ARENAS	4	0.0002	1	0.0000		0.0000		0.000
PUNTA MANZANI	16,594	0.8946	34,130	0.6682	713	0.2722		0.000
QINGDAO	47,773	2.5754	103,273	2.0217	3906	1.4910	231	1.352
QUETZAL	1669	0.0900	4130	0.0809	226	0.0863		0.000
QUEZALTENANGO	237	0.0128	658	0.0129		0.0000		0.000
QUI NHON	2	0.0001	9	0.0002		0.0000		0.000
RAMA		0.0000	1	0.0000		0.0000		0.000
RANGOON	1	0.0001	1	0.0000		0.0000		0.000
RECIFE	4	0.0002	50	0.0010		0.0000		0.000
REYKJAVIK	239	0.0129	1290	0.0253	1	0.0004		0.000
RICHARDS BAY	6	0.0003		0.0000		0.0000		0.000
RIO D JANEIRO	10,609	0.5719	2196	0.0430		0.0000		0.000
RIO GRD DO SU	4248	0.2290	9355	0.1831		0.0000		0.000
ROADTOWN	1	0.0001		0.0000		0.0000		0.000
RONGQI		0.0000	5	0.0001		0.0000		0.000
ROSARITO	2	0.0001		0.0000		0.0000		0.000
ROSEAU	40	0.0022	5	0.0001		0.0000		0.000
ROSTOCK		0.0000	1	0.0000		0.0000		0.000
ROTTERDAM	38,443	2.0724	123,913	2.4258	6549	2.4999		0.000
S PEDRO D MAC		0.0000	1	0.0000		0.0000		0.000
SAIGON	145	0.0078	1412	0.0276	10	0.0038		0.000
SAIPAN		0.0000	1	0.0000		0.0000		0.000
SALALAH	12,127	0.6537	30,459	0.5963	639	0.2439		0.000
SALVADOR	3352	0.1807	7489	0.1466		0.0000		0.000
SAMARINDA		0.0000	8	0.0002		0.0000		0.000
SAN ANDRES		0.0000	50	0.0010		0.0000		0.000
SAN ANTONIO	5590	0.3013	13,033	0.2551		0.0000		0.000
SAN CRISTOBAL		0.0000	1	0.0000		0.0000		0.000
SAN JOSE		0.0000	1	0.0000		0.0000		0.000
SAN JUAN	8207	0.4424	28,206	0.5522	16,443	6.2767	12507	73.222
SAN PEDRO		0.0000	168	0.0033		0.0000		0.000
SAN PEDRO SUL	4	0.0002	5	0.0001		0.0000		0.000
SAN VICENTE	503	0.0271	11,398	0.2231	1	0.0004		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
SANDY PNT	45	0.0024	102	0.0020		0.0000		0.000
SANTA MARTA	6	0.0003	7069	0.1384		0.0000		0.000
SANTIAGO	8	0.0004	110	0.0022		0.0000		0.000
SANTOS	48,775	2.6294	35,853	0.7019	1	0.0004		0.000
SAO FRAN DO S	12,752	0.6874	11,847	0.2319		0.0000		0.000
SEMARANG	36	0.0019	399	0.0078	2	0.0008		0.000
SENDAI	435	0.0235	5674	0.1111		0.0000		0.000
SEPETIBA BAY	6709	0.3617	3508	0.0687		0.0000		0.000
SHANGHAI	159,507	8.5987	594,462	11.6376	26,933	10.2811	173	1.013
SHANTOU	2	0.0001	27	0.0005		0.0000		0.000
SHEKOU	6996	0.3771	75,028	1.4688	4429	1.6907		0.000
SHELBURNE	1	0.0001	15	0.0003		0.0000		0.000
SHENZHEN	1	0.0001		0.0000		0.0000		0.000
SHIMIZU	912	0.0492	10,457	0.2047	1	0.0004		0.000
SHUAIBA	3	0.0002	3	0.0001		0.0000		0.000
SIALKOT	1	0.0001	2	0.0000		0.0000		0.000
SIHANOUKVILLE	20	0.0011	38	0.0007	7	0.0027		0.000
SINES	1572	0.0847	2970	0.0581		0.0000		0.000
SINGAPORE	71,095	3.8326	146,296	2.8640	9108	3.4768		0.000
SLITE		0.0000	1	0.0000		0.0000		0.000
SONGKHLA	32	0.0017	58	0.0011		0.0000		0.000
SOUTHAMPTON	3439	0.1854	8453	0.1655	68	0.0260		0.000
SOYO	35	0.0019		0.0000		0.0000		0.000
ST CROIX	1	0.0001	4	0.0001		0.0000	1	0.006
ST GEORGE	22	0.0012	3	0.0001		0.0000		0.000
ST JOHN	1282	0.0691	7290	0.1427	2	0.0008		0.000
ST JOHNS	64	0.0035	9	0.0002		0.0000		0.000
ST LUCIA	34	0.0018	16	0.0003		0.0000		0.000
ST MAARTEN	75	0.0040	46	0.0009	1	0.0004		0.000
ST NICOLAS	53	0.0029	7	0.0001		0.0000		0.000
ST PETERSBURG	68	0.0037	40	0.0008		0.0000		0.000
ST PIERRE		0.0000	2	0.0000		0.0000		0.000
ST THOMAS	399	0.0215	1034	0.0202	30	0.0115	30	0.176

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
STO DOMINGO	749	0.0404	2181	0.0427	1462	0.5581	2	0.012
STO TOMAS	2488	0.1341	9414	0.1843	5613	2.1426	219	1.282
STOCKHOLM	5	0.0003	7	0.0001		0.0000		0.000
SUAPE	2208	0.1190	4124	0.0807		0.0000		0.000
SUPE	1	0.0001		0.0000		0.0000		0.000
SURABAYA	172	0.0093	427	0.0084		0.0000		0.000
SUVA	4299	0.2318	179	0.0035		0.0000		0.000
SWEDEN	11	0.0006		0.0000		0.0000		0.000
SYDNEY	5891	0.3176	2910	0.0570		0.0000		0.000
SZCZECIN	1	0.0001		0.0000		0.0000		0.000
T J PANDAN	2	0.0001		0.0000		0.0000		0.000
T J PELEPAS	7857	0.4236	22,501	0.4405	556	0.2122		0.000
T J PRIOK	350	0.0189	463	0.0091	3	0.0011		0.000
TAICHUNG	3	0.0002	27	0.0005		0.0000		0.000
TAIPEI		0.0000	1	0.0000		0.0000		0.000
TAIWAN		0.0000	1	0.0000		0.0000		0.000
TAKORADI	46	0.0025	528	0.0103		0.0000		0.000
TALCAHUANO		0.0000	1	0.0000		0.0000		0.000
TAMPICO	3701	0.1995	6015	0.1178		0.0000		0.000
TANJONG	11	0.0006	8	0.0002		0.0000		0.000
TARANTO	425	0.0229	329	0.0064		0.0000		0.000
TAURANGA	15,569	0.8393	7513	0.1471		0.0000		0.000
TEGUCIGALPA		0.0000	1	0.0000		0.0000		0.000
TEMA	32	0.0017	253	0.0050		0.0000		0.000
TERCEIRA ISL	15	0.0008	36	0.0007	1	0.0004		0.000
THAMESPORT	3102	0.1672	6600	0.1292	25	0.0095	1	0.006
THESSALONIKI	1	0.0001	57	0.0011		0.0000		0.000
TIANJIN	3688	0.1988	5579	0.1092	107	0.0408		0.000
TIJUANA		0.0000	1	0.0000		0.0000		0.000
TILBURY	676	0.0364	914	0.0179	16	0.0061		0.000
TIMARU	1269	0.0684	897	0.0176		0.0000		0.000
TINIAN		0.0000	1	0.0000		0.0000		0.000
TOAMASINA		0.0000	1	0.0000		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
TOKYO	26,682	1.4384	84,271	1.6497	555	0.2119		0.000
TORONTO		0.0000	53	0.0010		0.0000		0.000
TRAPANI	1	0.0001		0.0000		0.0000		0.000
TRENTO	9	0.0005	20	0.0004		0.0000		0.000
TRIESTE	10	0.0005	5	0.0001		0.0000		0.000
TUBARAO	2	0.0001		0.0000		0.0000		0.000
TUNIS		0.0000	2	0.0000		0.0000		0.000
TURBO		0.0000	239	0.0047		0.0000		0.000
TURKEY	1	0.0001	15	0.0003		0.0000		0.000
TUTICORIN	503	0.0271	338	0.0066		0.0000		0.000
UDDEVALLA	2	0.0001	7	0.0001		0.0000		0.000
VALENCIA	32,985	1.7782	20,080	0.3931	25	0.0095		0.000
VALLETTA	20	0.0011	12	0.0002		0.0000		0.000
VALPARAISO	497	0.0268	1707	0.0334		0.0000		0.000
VANCOUVER	264	0.0142	924	0.0181		0.0000		0.000
VANUATU	56	0.0030		0.0000		0.0000		0.000
VARNA	2	0.0001	18	0.0004		0.0000		0.000
VENICE	8	0.0004	21	0.0004		0.0000		0.000
VERA CRUZ	4173	0.2250	4266	0.0835	1	0.0004		0.000
VIEUX FORT	8	0.0004	6	0.0001		0.0000		0.000
VIGO	1	0.0001	1	0.0000		0.0000		0.000
VIIPURI	1	0.0001	4	0.0001		0.0000		0.000
VISHAKHAPATNA	7	0.0004		0.0000		0.0000		0.000
VITORIA	10,642	0.5737	301	0.0059		0.0000		0.000
WILLEMSTAD	15	0.0008	2	0.0000		0.0000		0.000
WUHU		0.0000	2	0.0000		0.0000		0.000
XIAMEN	14,644	0.7894	86,427	1.6920	6115	2.3343	42	0.246
YANGZHOU	5	0.0003	19	0.0004		0.0000		0.000
YANTAI	112	0.0060	452	0.0088		0.0000		0.000
YANTIAN	69,585	3.7512	778,866	15.2476	75,824	28.9441	2040	11.943
YOKKAICHI	34	0.0018		0.0000		0.0000		0.000
YOKOHAMA	13,991	0.7542	42,993	0.8417	187	0.0714		0.000
YOSU	16	0.0009		0.0000		0.0000		0.000

Foreign Port	20-ft Containers	Percent of Total	40-ft Containers	Percent of Total	45-ft Containers	Percent of Total	Other	Percent of Total
YUCATAN	2	0.0001	44	0.0009		0.0000		0.000
ZEEBRUGGE	2	0.0001	21	0.0004	21	0.0080		0.000
ZHANGJIAGANG	127	0.0068	80	0.0016		0.0000		0.000
ZHONGSHAN	12	0.0006	120	0.0023		0.0000		0.000
ZHUHAI	1	0.0001	9	0.0002		0.0000		0.000

Appendix B: List of Shipping Container Distribution Based on 2-Digit Harmonized System Commodity Codes

This appendix contains the list of the 2-digit harmonized system commodity codes and their associated number of containers shipped to the US in 2006. Containers sized 20, 40, and 45 ft are listed separately. Other containers sizes (e.g., 48 ft, 53 ft, etc.) are listed in a combined Other category. Included is a brief description for each 2-digit commodity code.

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers	Other
0	Household Goods	49,895	199,852	12,032	1546
1	Live Animals	13	104	74	0
2	Meat & Edible Meat Offal	25,379	15,986	36	0
3	Fish & Crustaceans	7994	77,222	25	0
4	Dairy, Eggs, Honey & Edible Products	11,271	9276	86	19
5	Products of Animal Origin	867	2239	47	0
6	Live Trees & Other Plants	401	5719	138	0
7	Edible Vegetables	7965	37,402	147	7
8	Edible Fruits & Nuts, Peel of Citrus/Melons	14,100	136,467	54	0
9	Coffee, Tea, Mate & Spices	58,653	17,140	60	6
10	Cereals	19,659	2228	470	5
11	Milling Industry Products	5207	8536	4	0
12	Oil Seeds, Miscellaneous Grains, Medicinal Plants & Straw	8653	9075	45	1
13	Lac, Gum, Resins, etc.	5923	1488	1	0
14	Vegetable Paitling Materials	158	968	24	0
15	Animal or Vegetable Fats, Oils & Waxes	7400	8308	21	0
16	Edible Preparations of Meat, Fish Crustaceans, etc.	19,455	6769	18	1
17	Sugars & Sugar Confectionery	9486	11,262	309	29
18	Cocoa & Cocoa Preparations	8056	11,245	10	3
19	Preparations of Cereal, Flour, Starch, or Milk	3878	28,856	344	232
20	Preparations of Vegetables, Fruits, Nuts, etc.	71,182	30,497	303	9
21	Miscellaneous Edible Preparations	13,184	21,418	1362	303
22	Beverages, Spirits & Vinegar	53,850	155,516	991	114
23	Residues from Food Industries & Animal Feed	3329	3551	21	13
24	Tobacco & Manufactured Tobacco Substitues	304	11,690	392	94
25	Salt, Sulphur, Earth & Stone, Lime & Cement	62,985	9039	68	3
26	Ores Slag & Ash	5258	689	5	0
27	Mineral Fuels, Oils, Waxes & Bituminous Substitues	6115	6386	65	2

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers	Other
28	Inorganic Chemicals, Organic/Inorganic Compounds of Precious Metals, Isotopes	49,603	21,757	61	4
29	Organic Chemicals	63,957	24,759	39	22
30	Pharmaceutical Products	1087	9206	2961	635
31	Fertilizers	3082	2681	0	0
32	Tanning or Dyeing Extracts, Dyes, Pigments, Paints & Varnishes, Putty & Inks	9497	8944	68	10
33	Oils & Resinoids, Perfumery, Cosmetic or Toilet Preparations	5316	13,167	1016	429
34	Soaps, Waxes, Scouring Products, Candles, Modeling Pastes, Dental Waxes	4781	12,547	338	13
35	Albuminoidal Substitutes, Starches, Glues, Enzymes	6028	6245	52	1
36	Explosives, Matches, Pyrotechnic Products	195	8044	11	2
37	Photographic or Cinematographic Goods	973	7535	12	1
38	Miscellaneous Chemical Products	18,515	13,521	604	109
39	Plastics & Articles Thereof	93,919	233,330	7143	1132
40	Rubbers & Articles Thereof	34,343	222,514	6805	1045
41	Raw Hides, Skins & Leather	1029	2240	62	3
42	Articles or Leather, Saddlery & Harness, Travel Goods, Handbags, Articles of Gut	9991	80,695	7676	36
43	Furskins & Artificial Fur	65	505	29	0
44	Wood & Articles of Wood, Wood Charcoal	37,405	241,219	4850	995
45	Cork & Articles of Cork	180	1510	13	0
46	Manufactures of Straw, Esparto, or Other Plaiting Materials, Basketware & Wickerwork	2717	19,492	1758	35
47	Pulp of Wood, Waste & Scrap of Paper	2226	5387	49	161
48	Paper & Paperboard, Articles of Paper Pulp	72,959	110,147	3171	192
49	Printed Books, Newspapers, Pictures, Manuscripts, Typescripts & Plans	5287	13,780	335	16
50	Silk, Including Yarns & Woven Fabrics Thereof	42	79	4	0
51	Wool & Fine or Coarse Animal Hair, Including Yarns & Woven Fabrics Thereof	482	1031	26	0
52	Cotton, including Yarns & Woven Fabrics	6062	34,300	1395	112

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers	Other
	Thereof				
53	Vegetable Textile Fibers NESOI, Yarns & Woven etc.	1269	3958	16	0
54	Man-Made Filaments, Including Yarns & Woven etc.	2667	17,837	340	0
55	Man-Made Staple Fibers, Including Yarns etc.	491	19,326	42	0
56	Wadding, Felt & Nonwovens, Special Yarns, Twine, Cordage, Ropes, Cables & Articles	1251	14,019	377	2
57	Carpets & Other Textile Floor Coverings	3182	14,939	609	0
58	Special Woven Fabrics, Tufted Textiles, Lace	708	3321	534	0
59	Impregnated, Coated, Covered, or Laminated Textile Products, Textile Products for Industrial Use	2206	5632	47	2
60	Knitted or Crocheted Fabrics	569	2950	209	0
61	Articles of Apparel & Clothing Accessories - Knitted or Crocheted	9790	49,978	9260	60
62	Articles of Apparel & Clothing Accessories - Not Knitted or Crocheted	28,517	137,033	33,458	1265
63	Made-Up Textile Articles NESOI, Needlecraft Set, Worn Clothing, Rags	10,288	78,110	5109	43
64	Footwear, Gaiters & the Like	11,521	83,181	16,303	451
65	Headgear & Other Parts	1735	7357	695	1
66	Umbrellas, Sun Umbrellas, Walking-Sticks, Whips, Riding-Crops & Parts	1053	3431	144	0
67	Prepared Feathers, Human Hair & Articles Thereof, Artificial Flowers	799	14347	1857	1
68	Articles of Stone, Plaster, Cement, Asbestos, Mica, or Similar Materials	73,199	12,457	173	5
69	Ceramic Products	143,535	81,997	3138	12
70	Glass & Glassware	21,191	60,693	1645	66
71	Pearls, Stones, Precious Metals, Imitation Jewellery, Coins	540	1832	247	8
72	Iron & Steel	50,033	19,320	361	21
73	Articles of Iron or Steel	162,247	161,258	11,397	235
74	Copper & Articles Thereof	8723	11461	203	109

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers	Other
75	Nickel & Articles Thereof	1370	250	5	0
76	Aluminum & Articles Thereof	24,911	38,678	3021	909
77	Not Applicable				
78	Lead & Articles Thereof	1663	76	0	0
79	Zinc & Articles Thereof	811	596	16	0
80	Tin & Articles Thereof	1707	2034	119	2
81	Base Metals NESOI, Cermets, Articles, etc.	6447	3558	661	207
82	Tools, Spoons & Forks of Base Metal	15,628	36,107	1582	12
83	Miscellaneous Articles of Base Metal	25,762	42,969	1365	23
84	Nuclear Reactors, Boilers, Machinery & Mechanical Appliances, Computers	111,030	425,957	10,876	518
85	Electrical Machinery & Equipment & Parts, Telecommunications Equipment, Sound Recorders, Televisions	63,933	375,454	11,519	596
86	Railway or Tramway Locomotives, Rolling Stock, Track Fixtures & Fittings, Signals	8436	6741	2679	1027
87	Vehicles Other Than Railway or Tramway Rolling Stock	71,218	282,245	9583	936
88	Aircraft, Spacecraft & Parts Thereof	570	2118	97	2
89	Ships, Boats & Floating Structures	741	2130	25	0
90	Optical, Photographic, Cinematographic, Measuring, Checking, Precision, Medical or Surgical Instruments & Accessories	10,437	50,093	4898	1573
91	Clocks, Watches & Parts Thereof	684	4905	566	5
92	Musical Instruments, Parts & Accessories	1566	8786	478	1
93	Arms & Ammunition, Parts & Accessories	1068	1109	8	1
94	Furniture, Bedding, Cushions, Lamps & Lighting Fittings NESOI, Illuminated Signs, Nameplates & the Like, Prefabricated Buildings	31,576	816,169	38,074	174
95	Toys, Games & Sports Equipment, Parts & Accessories	25,360	255,781	33,013	1322
96	Miscellaneous Manufactured Articles	3682	20,819	1325	142
97	Works of Art, Collectors' Pieces, Antiques	766	4113	268	1

Appendix C: List of Shipping Container Distribution Based on 2-Digit Harmonized System Commodity Codes for IMCCs from Singapore

This appendix includes the list of the 2-digit Harmonized System commodity codes and their associated number of containers shipped from Singapore to the US in 2006. Containers sized 20, 40, and 45 ft are listed separately. Incorporated is a brief description for each 2-digit commodity code.

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers
0	Household Goods	1513	6981	475
1	Live Animals	0	0	0
2	Meat & Edible Meat Offal	232	222	0
3	Fish & Crustaceans	637	7146	0
4	Dairy, Eggs, Honey & Edible Products	243	11	0
5	Products of Animal Origin	2	11	0
6	Live Trees & Other Plants	16	294	21
7	Edible Vegetables	97	104	0
8	Edible Fruits & Nuts, Peel of Citrus/Melons	1036	404	3
9	Coffee, Tea, Mate & Spices	5081	384	1
10	Cereals	3048	9	0
11	Milling Industry Products	84	22	0
12	Oil Seeds, Miscellaneous Grains, Medicinal Plants & Straw	131	195	0
13	Lac, Gum, Resins, etc.	107	29	0
14	Vegetable Paiting Materials	12	32	1
15	Animal or Vegetable Fats, Oils & Waxes	589	169	0
16	Edible Preparations of Meat, Fish Crustaceans, etc.	1273	384	0
17	Sugars & Sugar Confectionery	65	52	0
18	Cocoa & Cocoa Preparations	736	259	0
19	Preparations of Cereal, Flour, Starch, or Milk	74	598	0
20	Preparations of Vegetables, Fruits, Nuts, etc.	3602	390	0
21	Miscellaneous Edible Preparations	731	339	3
22	Beverages, Spirits & Vinegar	209	217	0
23	Residues from Food Industries & Animal Feed	61	398	0
24	Tobacco & Manufactured Tobacco Substitues	5	103	0
25	Salt, Sulphur, Earth & Stone, Lime & Cement	1890	44	0
26	Ores Slag & Ash	196	0	0

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers
27	Mineral Fuels, Oils, Waxes & Bituminous Substitutes	193	23	0
28	Inorganic Chemicals, Organic/Inorganic Compounds of Precious Metals, Isotopes	722	158	0
29	Organic Chemicals	1251	311	0
30	Pharmaceutical Products	52	68	3
31	Fertilizers	6	9	0
32	Tanning or Dyeing Extracts, Dyes, Pigments, Paints & Varnishes, Putty & Inks	67	92	3
33	Oils & Resinoids, Perfumery, Cosmetic or Toilet Preparations	181	138	0
34	Soaps, Waxes, Scouring Products, Candles, Modeling Pastes, Dental Waxes	124	243	6
35	Albuminoidal Substitutes, Starches, Glues, Enzymes	42	24	0
36	Explosives, Matches, Pyrotechnic Products	2	13	0
37	Photographic or Cinematographic Goods	13	164	0
38	Miscellaneous Chemical Products	373	368	0
39	Plastics & Articles Thereof	6675	3070	182
40	Rubbers & Articles Thereof	5148	7395	1832
41	Raw Hides, Skins & Leather	15	14	1
42	Articles or Leather, Saddlery & Harness, Travel Goods, Handbags, Articles of Gut	358	666	29
43	Furskins & Artificial Fur	11	13	0
44	Wood & Articles of Wood, Wood Charcoal	1476	3411	161
45	Cork & Articles of Cork	1	1	0
46	Manufactures of Straw, Esparto, or Other Plaiting Materials, Basketware & Wickerwork	68	382	28
47	Pulp of Wood, Waste & Scrap of Paper	6	129	0
48	Paper & Paperboard, Articles of Paper Pulp	618	4044	8

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers
49	Printed Books, Newspapers, Pictures, Manuscripts, Typescripts & Plans	388	277	1
50	Silk, Including Yarns & Woven Fabrics Thereof	3	1	0
51	Wool & Fine or Coarse Animal Hair, Including Yarns & Woven Fabrics Thereof	37	16	0
52	Cotton, including Yarns & Woven Fabrics Thereof	314	2040	37
53	Vegetable Textile Fibers NESOI, Yarns & Woven etc.	83	255	0
54	Man-Made Filaments, Including Yarns & Woven etc.	117	753	12
55	Man-Made Staple Fibers, Including Yarns etc.	7	213	0
56	Wadding, Felt & Nonwovens, Special Yarns, Twine, Cordage, Ropes, Cables & Articles	76	234	5
57	Carpets & Other Textile Floor Coverings	219	695	7
58	Special Woven Fabrics, Tufted Textiles, Lace	34	96	3
59	Impregnated, Coated, Covered, or Laminated Textile Products, Textile Products for Industrial Use	30	199	0
60	Knitted or Crocheted Fabrics	40	253	16
61	Articles of Apparel & Clothing Accessories - Knitted or Crocheted	1416	5640	918
62	Articles of Apparel & Clothing Accessories - Not Knitted or Crocheted	4126	18,060	1698
63	Made-Up Textile Articles NESOI, Needlecraft Set, Worn Clothing, Rags	638	3637	44
64	Footwear, Gaiters & the Like	761	2260	317
65	Headgear & Other Parts	112	166	20
66	Umbrellas, Sun Umbrellas, Walking-Sticks, Whips, Riding-Crops & Parts	3	46	0

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers
67	Prepared Feathers, Human Hair & Articles Thereof, Artificial Flowers	46	92	1
68	Articles of Stone, Plaster, Cement, Asbestos, Mica, or Similar Materials	2869	36	0
69	Ceramic Products	1972	2854	39
70	Glass & Glassware	165	814	19
71	Pearls, Stones, Precious Metals, Imitation Jewellery, Coins	5	5	0
72	Iron & Steel	626	99	1
73	Articles of Iron or Steel	3971	1636	68
74	Copper & Articles Thereof	21	35	1
75	Nickel & Articles Thereof	57	0	0
76	Aluminum & Articles Thereof	1584	360	101
77	Not Applicable			
78	Lead & Articles Thereof	0	0	0
79	Zinc & Articles Thereof	8	0	0
80	Tin & Articles Thereof	25	5	0
81	Base Metals NESOI, Cermets, Articles, etc.	132	3	0
82	Tools, Spoons & Forks of Base Metal	391	221	0
83	Miscellaneous Articles of Base Metal	1096	1463	16
84	Nuclear Reactors, Boilers, Machinery & Mechanical Appliances, Computers	3861	7820	21
85	Electrical Machinery & Equipment & Parts, Telecommunications Equipment, Sound Recorders, Televisions	3738	27,375	834
86	Railway or Tramway Locomotives, Rolling Stock, Track Fixtures & Fittings, Signals	149	103	2
87	Vehicles Other Than Railway or Tramway Rolling Stock	1208	2748	9
88	Aircraft, Spacecraft & Parts Thereof	12	34	0

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers
89	Ships, Boats & Floating Structures	19	46	1
90	Optical, Photographic, Cinematographic, Measuring, Checking, Precision, Medical or Surgical Instruments & Accessories	222	1672	460
91	Clocks, Watches & Parts Thereof	1	19	0
92	Musical Instruments, Parts & Accessories	79	944	56
93	Arms & Ammunition, Parts & Accessories	0	1	0
94	Furniture, Bedding, Cushions, Lamps & Lighting Fittings NESOI, Illuminated Signs, Nameplates & the Like, Prefabricated Buildings	808	20,893	1511
95	Toys, Games & Sports Equipment, Parts & Accessories	320	1910	129
96	Miscellaneous Manufactured Articles	194	494	0
97	Works of Art, Collectors' Pieces, Antiques	16	208	1

Appendix D: List of Ceramic Materials Shipped to the United States

This appendix includes the list of the 4- and 6-digit Harmonized System commodity codes and their associated number of containers for ceramic commodities shipped to the US in 2006. Containers sized 20, 40, and 45 ft are listed separately. Incorporated is a brief description for each commodity code.

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers
690100	Bricks, blocks, tiles and other ceramic goods of siliceous fossil meals (for example, kieselguhr, tripolite or diatomite) or of similar siliceous earths		33	
6902	Refractory bricks & other refr ceramic const art nesoi (not elsewhere specified or included)		1	
690210	Refractory bricks, blocks, tiles , Containing by weight, singly or together, more than 50 percent of the elements magnesium, calcium, or chromium, expressed as MgO, CaO or Cr2O3	242	28	
690220	Refractory bricks, blocks, tiles Containing by weight more than 50 percent of alumina (Al2O3), of silica (SiO2) or of a mixture or compound of these products	31	5	
690290	Other Refractory bricks, blocks, tiles	2468	354	1
6903	Refractory ceramic goods, retorts, tubes etc nesoi	2	1	
690310	Refractory ceramic goods, Containing by weight more than 50 percent of graphite or other forms of carbon or of a mixture of these products	12	4	
690320	Refractory ceramic goods, Containing by weight more than 50 percent of alumina (Al2O3) or of a mixture or compound of alumina and of silica (SiO2)	105	11	
690390	Other refractory ceramic goods , Containing by weight more than 50 percent of alumina (Al2O3) or of a mixture or compound of alumina and of silica (SiO2)	1194	299	8
690410	Ceramic Building bricks	32	24	
690490	Ceramic Flooring Blocks, Support or Filler Tiles and the Like	24		
6905	Roofing tiles, chimney pots, cowls, chimney liners etc		1	
690510	Ceramic Roofing tiles	1510	688	
690600	Ceramic pipes, conduits, guttering and pipe fittings	3		
690790	Unglazed Ceramic Flags flagstone tile	46,818	1466	12
6908	Glazed ceramic flags & paving, hearth tiles, etc	1		
690810	Glazed Ceramic Tiles, Cubes and Similar Articles	561	171	27
690890	Glazed Ceramic Flags flagstone tile	21,556	566	
6909	Ceramic lab etc wares, aggregate tubs etc & packing art	2	2	

HS Code	Description	20-ft Containers	40-ft Containers	45-ft Containers
690911	Ceramic wares for laboratory, chemical or other technical uses , Of porcelain or china	20	1	
690919	Other Ceramic wares for laboratory, chemical or other technical uses	15	17	
691010	Ceramic sinks, washbasins, washbasin pedestals, baths, similar sanitary fixtures, Of porcelain or china	9	610	
691090	Other sanitary fixtures	1133	23,592	355
6911	Ceramic tableware etc. of porcelain or china	1		
691110	Tableware and kitchenware, of porcelain or china	495	1136	31
691190	Other Household Articles and Toilet Articles, of porcelain or china	2	48	2
6912	Ceramic tableware, kitchenware etc, earthenware etc		2	2
691200	Ceramic tableware, kitchenware, other household articles and toilet articles, other than of porcelain or china: Tableware and kitchenware	1947	16,313	881
6913	Statuettes and other ornamental ceramic articles	51	418	65
691310	Statuettes and other ornamental ceramic articles, Of porcelain or china	175	1323	134
691390	Other Statuettes and other ornamental ceramic articles	310	4248	462
6914	Ceramic articles nesoi	31		
691410	Other ceramic articles, Of porcelain or china	1390	4073	298
691490	Other ceramic articles	3910	14,427	701



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