

## APPENDIX A

### CHEMICALS AND ALLIED PRODUCTS

**SIC, STCC, and NAICS.** Standard Industrial Classification (SIC) codes, developed initially by the U.S. Department of Commerce and now maintained and updated by the Office of Management and Budget (OMB), provide commodity/product detail at the 2,3, and 4 digit levels. Products included in SIC 28 are designated “Chemical And Allied Products.”

The Standard Transportation Commodity Classification (STCC) system was developed by the Association of American Railroads (AAR), is maintained by them, and provides product detail out to 7 digits. At the 2,3, or 4-digit level, most STCC product categories are similar or even identical to SIC code categories. For example, at the 3 digit level for the SIC 28 and STCC 28 commodity groupings, the product categories show close similarity:

Appendix Figure A1: SIC and STCC Product Descriptions

Number	SIC 28 Description	STCC 28 Description
SIC, STCC 28	Chemicals And Allied Products	Chemicals Or Allied Products
SIC, STCC 281	Industrial Inorganic Chemicals	Industrial Inorganic or Organic chemicals
SIC, STCC 282	Plastics Materials And Synthetics	Plastic Materials or Synthetic Fibers, Resins, or Rubber
SIC, STCC 283	Drugs	Drugs
SIC, STCC 284	Soap, Cleaners, And Toilet Goods	Soap or Other Detergents, Cleaning Preparations, Cosmetics, Perfumes
SIC, STCC 285	Paints and Allied Products	Paints, Enamels, Lacquers, Shellacs, or Varnishes
SIC, STCC 286	Industrial Organic Chemicals	Gum or Wood Chemicals
SIC, STCC 287	Agricultural Chemicals	Agricultural Chemicals
SIC, STCC 289	Miscellaneous Chemical Products	Miscellaneous Chemical Products

Although most Department of Commerce data gathering and reporting activities use SIC codes, the Department's Bureau of Census 1993 Commodity Flow Survey (CFS) used the STCC system, obtaining product detail at the 5-digit level.

The North American Industry Classification System (NAICS), developed by the U.S., Canada, and Mexico, has begun replacing the SIC code system, with a US. NAICS manual expected to be published some time in 1998. While having many product categories and designations similar to SIC codes, the NAICS will still differ from SIC codes in a number of ways. "Chemical manufacturing" will replace much of the existing "Chemicals and Allied Products," and have a NAICS code of 325. One of the most important changes incorporated into the NAICS is the provision of product detail at the 6 digit level (v. SIC's 4 digit system).

**Report's Use of Term, "Chemicals or Allied Products."** The chemical products data used in this report and also displayed in Appendix Table A1 are based on both the Standard Industrial Classification (SIC) code 28, "Chemicals And Allied Products," and the Standard Transportation Commodity Classification (STCC) 28, "Chemicals *Or* Allied Products." For consistency purposes and to conform with prevailing government use of the term, this report refers to the broad category of non-petroleum products as "Chemicals And Allied Products," or just *SIC* 28.

**Appendix Table A1.** Appendix Table A1 covers Chemicals And Allied Products and is based primarily on the 1993 Commodity Flow Survey (CFS). As discussed in the assumptions page that follows herein, the pounds/tons reported by shippers fit the shipment size categories designated by the CFS and correspond to products included in STCC 28, the railroad industry designation "Chemicals or Allied Products." The total ton figure available from the CFS represents 1993 traffic, and this number has been increased in Table A1 to reflect 1995 data from the Chemical Manufacturers Association (CMA).

**Appendix Table A1: CHEMICALS & ALLIED PRODUCTS (SIC 28) SHIPMENTS**

	Col 1	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10
	<b>Weight Category (pounds)</b>	<b>Average Pounds Per Shipment *</b>	<b>SIC 28 Annual Tons (000s)</b>	<b>Percent of Total Tons</b>	<b>Annual Pounds (000s)</b>	<b>Annual Shipments (000s)</b>	<b>Daily Shipments (midpoint) **</b>	<b>Daily Shipments (upper ) ***</b>	<b>Daily Shipments (10 lb. shp)</b>	<b>Percent Of Shipments For Col. 7</b>
1	< 50	25	1,094	0.2%	2,188,000	87,520	239,781	119,890	599,452	45.6%
2	50 - 99	75	857	0.2%	1,714,000	22,853	62,612	47,433	62,612	11.9%
3	100 - 499	300	5,242	1.0%	10,484,000	34,947	95,744	57,562	95,744	18.2%
4	500 - 749	625	2,838	0.5%	5,676,000	9,082	24,881	20,762	24,881	4.7%
5	750 - 999	875	2,053	0.4%	4,106,000	4,693	12,856	11,261	12,856	2.4%
6	<b>Subtotal &lt; 1,000</b>		<b>12,084</b>	<b>2.2%</b>	<b>24,168,000</b>	<b>159,094</b>	<b>435,874</b>	<b>256,908</b>	<b>795,546</b>	<b>82.9%</b>
7	1,000 - 9,999	5,500	44,145	8.1%	88,290,000	16,054	43,984	24,191	43,984	8.4%
8	10,000 - 49,999	30,000	205,206	37.6%	410,412,000	13,681	37,481	22,489	37,481	7.1%
9	50,000 - 99,999	75,000	52,695	9.7%	105,390,000	1,405	3,850	2,887	3,850	0.7%
10	> 100,000	330,103	231,276	42.4%	462,552,000	1,401	3,839	3,839	3,839	0.7%
11	<b>Subtotal 1,000 &amp; &gt;</b>		<b>533,322</b>	<b>97.8%</b>	<b>1,066,644,000</b>	<b>32,541</b>	<b>89,154</b>	<b>53,407</b>	<b>89,154</b>	<b>17.0%</b>
12	<b>TOTAL</b>		<b>545,406</b>	<b>100%</b>	<b>1,090,812,000</b>	<b>191,635</b>	<b>525,029</b>	<b>310,315</b>	<b>884,700</b>	<b>100%</b>
13										
14	<b>CMA 1995 tonnage</b>		<b>642,000</b>				<b>618,014</b>			
15	If 95% is Hazmat						587,113			
16	If 80% is Hazmat						<b>494,411</b>			
17	If 65% is Hazmat						401,709			

\* Assumes that different size (weight) shipments are evenly distributed throughout each weight category; therefore, average equals midpoint (rounded).

\*\* Based on Column 2 shipment sizes, i.e., midpoint weights from each size category.

\*\*\* Upper bound from each of the size categories displayed in Column 1.

NOTE: For >100,000 lb. category, 3,723 daily shipments assumed to go by rail in 90 ton/carload shipments; 82 shipments assumed to go by water in 2,207 ton shipments; balance is 34 pipeline shipments (daily) at 3,750 tons per shipment. Same assumptions reflected in Columns 6-9.

NOTE: Truck shipment, tonnage, and movement data are derived from this table and Table A2 and are presented in Tables 1 and 2 of text and in Appendix Table D1. The first five weight categories are assumed to include air plus ground package and LTL shipments; air is derived from Appendix E and equals 43,750 daily shipments. Total truck share is the balance in the first five weight categories, plus all shipments in weight category lines 7-9. Figures in lines 14-17 are factored up to reflect CMA's estimated 1995 traffic levels. Line 16 figure reflects assumption that 80% of all products are hazmat. The truck shipments for weight categories 1-5 are each assumed to "move" twice (LTL, small package); shipments in weight categories lines 8-9 move once (TL); those in category line 7 are assumed to be half LTL and half TL, with LTL moving twice and TL once.

NOTE: Figures in Column 3, lines 1-12, reflect tonnage amounts displayed in 1993 Commodity Flow Survey Data, US Summary, p. 91.

**Appendix Table A2: ADDITIONAL CHEMICAL SHIPMENT AND TONNAGE DATA**

<b>TRUCK SHIPMENTS FOR WEIGHT CATEGORIES UNDER 1,000 lbs.: tons, number, and type</b>		
25 lbs. category	239,781-35,000*growth*.8*25lbs/2000 = tons of LTL	2,353 tons
	239,781-35,000*growth*.8 = no. of LTL shipments	188,271 shipments
75 lbs. category	62,612-2,188*growth*.8*75lbs/2000 = tons of LTL	2,135 tons
	62,612-2,188*growth*.8 = no. of LTL shipments	56,943 shipments
300 lbs. category	95,744-2,188*growth*.8*300lbs/2000 = tons of LTL	13,225 tons
	95,744-2,188*growth*.8 = no. of LTL shipments	88,166 shipments
625 lbs. category	24,881-2,188*growth*.8*625lbs/2000 = tons of LTL	6,683 tons
	24,881-2,188*growth*.8 = no. of LTL shipments	21,386 shipments
875 lbs. category	12,856-2,188*growth*.8*875lbs/2000 = tons of LTL	4,398 tons
	12,856-2,188*growth*.8 = no. of LTL shipments	10,053 shipments
<b>Total Truck &lt; 1,000 pounds, all of which are LTL, Tons =</b>		<b>28,795 tons</b>
<b>Total Truck &lt; 1,000 pounds, all of which are LTL, Shipments =</b>		<b>364,818 shipments</b>
<b>TRUCK SHIPMENTS FOR WEIGHT CATEGORIES OVER 1,000 lbs.: tons, number, and type</b>		
5,500 lbs. category	43,984*growth*.8 *5,500/2000 = tons	113,987 tons
	43,984*growth*.8 = shipments	41,450 shipments
30,000 lbs. category	37,481*growth*.8 *30,000/2000 = tons of TL	529,823 tons
	37,481*growth*.8 = no. of TL shipments	35,322 shipments
75,000 lbs. category	3,850*growth*.8 *5,500/2000 = tons	136,057 tons
	3,850*growth*.8 = shipments	3,628 shipments
<b>Total Truck &gt; 1,000 pounds</b>		<b>779,867 tons</b>
<b>Total Truck &gt; 1,000 pounds</b>		<b>80,400 shipments</b>
LTL Component > 1,000 pounds @ half the 5,500 lb. category *		56,994 tons
LTL Component > 1,000 pounds @ half the 5,500 lb. category *		20,725 shipments
TL Component > 1,000 pounds @ half 5,500 lb. category + others *		722,874 tons
TL Component > 1,000 pounds @ half 5,500 lb. category + others *		59,675 shipments
<b>TOTAL TRUCK TONS: 28,975 + 779,867</b>		<b>808,662 tons</b>
<b>TOTAL TRUCK SHIPMENTS: 364,818 + 80,400</b>		<b>445,218 shipments</b>
TOTAL LTL TONS:	28,795 + 56,994	85,789 tons
TOTAL LTL SHIPMENTS:	364,818 + 20,725	385,543 shipments
TOTAL TL TONS:	56,994 + 529,823 + 136,057	722,874 tons
TOTAL TL SHIPMENTS:	20,725 + 35,322 + 3,628	59,675 shipments

**Appendix Table A2: ADDITIONAL CHEMICAL SHIPMENT AND TONNAGE DATA (Cont.)**

SUMMARY CATEGORIES	
Rail + water + pipeline ship, all in > 100,000 lb. category = $3,723 + 82 + 34 =$	3,839 shipments
Total Truck Shipments =	445,218 shipments
Truck + W + R + P Shipments = $3,839 + 445,218 =$	449,057 shipments
Air Hazmat Shipments, @ 43,750 from Appendix E =	43,750 shipment
<b>TOTAL SHIPMENTS</b>	<b>492,807 shipments</b>

\* Half of traffic in category assumed to be LTL; other half TL partial load, single movement shipments.

OTHER NOTES:

--The 1993 to 1995 growth factor, based on CMA figures, is assumed to be 642 million / 545 million = 1.178

--Separately derived rail + water + pipeline shipments =  $3,723 + 82 + 34 = 3,839$

--Air shipments are assumed distributed among first five weight categories as follows:

43,750 total daily air shipments =  $35,000 + 2188 + 2188 + 2188 + 2188$

--Truck shipments, unadjusted for growth and hazmat percentage, =  $494,411 - 43,750 \text{ air} - 3,723 - 82 - 34 = 446,822$

## Appendix Table A1: ASSUMPTIONS

- 1) Column 1 shipment weight categories and Column 3 tons for those categories come directly from the 1993 Commodity Flow Survey, United States, Table 8, p. 91.
- 2) Column 2 average-pounds-per-shipment figures, i.e., shipment sizes, are derived by assuming that all shipments within a given size category are evenly distributed. Thus, the average weight is the midpoint in each category (rounded). For the over 100,000 pound category, a figure of 330,103 pounds or 165 tons is used. As stated in the Table A 1 notes, this figure is comprised of 3,723 rail shipments averaging 90 tons; 82 shipments by water averaging 2,207 tons; and 34 pipeline shipments averaging 3,750 tons (rounding of shipment and tonnage components).
- 3) Column 5 figures represent the Column 3 ton figures each multiplied by 2,000 pounds.
- 4) Column 6 figures result from dividing Column 5 figures by the respective Column 2 shipment size. Column 6 figures are annual estimates for the number of shipments in each weight category.
- 5) Column 7 figures result from dividing Column 6 figures by 365 days. The Column 7 heading reference to midpoint is a reminder that the figures are based on Column 2 shipment sizes which are assumed to be midpoints within the size categories.
- 6) Column 8 figures are variations on the Column 7 figures and have been derived by using the upper bound in every shipment size category, e.g., 50 lbs., 99 lbs., etc.
- 7) Column 9 figures are similar to Column 7 figures except that the 599,452 daily shipment entry (first line) is based on an assumption that all shipments under 50 pounds average 10 pounds, instead of the midpoint figure of 25 pounds. This adjustment changes the under-1,000 subtotal and the column total.

This analysis assumes that 80% of all STCC tonnage is hazardous materials. The 1987 U.S. DOT-Volpe Center study (Domenic J. Maio, Tai-Kuo Liu) estimated that 96% of all SIC 28 tonnage carried by trucks – based on the Census Bureau 1977 Commodity

Transportation Survey—was hazardous materials. In Appendix Table A1, the first 8 shipment weight categories are dominated by freight that is transported by truck. While a similar 96% hazmat figure is plausible for these truck shipment categories, an overall 80% figure has been assumed to keep the estimate conservative and thereby accommodate potential differences in the data not yet identified. Closer examination of the data, including analysis of the 1997 CFS, could show an actual number that differs from 80%. To indicate what a hazmat percentage of either 95% or 60% would do to the total daily shipment estimate, the results of these two are displayed in Column 7, lines 15 and 17.

The Chemical Manufacturers Association (CMA) estimate for SIC 28 tons shipped in 1995 is 642,000,000 annual tons. If the same shipment size distributions that apply to the 1993 CFS tonnage of 545,406,000 tons are applied to the 1995 CMA tonnage, the result would be a daily total of 618,014 shipments. With an assumption that 80% of all those shipments involve hazardous materials, the daily hazmat figure is 494,411 shipments. Indexed calibration, shown in Table A2, yields a slightly different number of 492,807 daily shipments, which is the figure appearing in Table 2 and Appendix Table D1. In the report text and Table 1, this figure has been rounded to 500,000 daily shipments.