

AIR CONDITIONING AND REFRIGERATION EQUIPMENT
A MANUFACTURING OPPORTUNITY IN ATLANTA

Prepared for

FORWARD ATLANTA
The Atlanta Chamber of Commerce

by

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Foreword

The large volume of air conditioning and refrigeration equipment wholesaled in Atlanta and the Southeast made this industry category a logical subject of analysis as one of the series of special studies undertaken for the Atlanta Chamber of Commerce. This is the seventh in the series of technical reports which focus on such specific manufacturing potentials.

Additional information which may be needed by individual companies interested in evaluating the potential pointed up by the study will be provided on a confidential basis.

Questions or comments on any aspect of the analysis are invited.

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Summary

U. S. manufacturers' shipments of air conditioning and refrigeration equipment increased 21.4% from 1956 to a 1960 total of \$1.2 billion^{1/} and should increase to more than \$1.4 billion by 1965. Manufacturers' sales in 1960 in the seven-state southeast region are estimated to be \$152 million, based on the percentage of the products wholesaled in the area.^{2/} The logical market area for an Atlanta plant would include at least this seven-state area. (See Map 1.)

Manufacturers' sales outweigh production in the region by at least \$90 million. It is clear that the gap between production and sales in the area is large enough to indicate the feasibility of establishing additional production facilities in the region to serve the local market.

In addition to access to the market noted above, Atlanta offers the following advantages for prospective manufacturers of air conditioning and refrigeration equipment:

1. savings in production labor cost which would effect increases in net profit before taxes of at least 23%;
2. savings in freight cost effecting increases in net profit before taxes from 3.7% to 9.6%;
3. plant construction costs of only \$6 per square foot compared to \$7.47 to \$8.57 per square foot in the present major producing areas;
4. excellent transportation-distribution facilities;
5. availability in the vicinity of Atlanta of the primary raw materials required for production; and
6. a \$30 million market in metropolitan Atlanta alone.

^{1/} Current Industrial Reports, Series M35M, Bureau of Census, U. S. Department of Commerce.

^{2/} The area includes Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee.

INTRODUCTION

The air conditioning and refrigeration equipment industry was selected for detailed study as a manufacturing opportunity in Atlanta because of the large volume of the products wholesaled in the Southeast (particularly in Atlanta) and the importance of labor and freight cost as a per cent of the total cost of the products to the customer.

The industry includes firms which only produce or assemble the component parts, such as compressors and condensers, as well as completely integrated manufacturers who do both. The products include household and commercial air conditioners and commercial refrigeration units.

The distribution method varies widely between products. Room air conditioners are channeled through one or more wholesalers to the retailer to the individual consumer. Central air conditioning units may be installed by the local factory office or distributed in package form through large retail outlets such as Sears, Roebuck and Co. Commercial refrigeration units are sold both directly to the user and through distributors.

Competition between manufacturers is pronounced and has resulted in reduction in the delivered price of many products of the industry.

The primary manufacturing opportunities in Atlanta are for the integrated producer (fabrication and assembly) and for an assembly firm. The latter type of manufacture is applicable primarily to room air conditioners. The integrated manufacturer would enjoy the greater savings in production and freight cost because he would use more production labor and would not have to pay the freight cost on the incoming shipments of component parts. However, his investment in plant, machinery and equipment would also be significantly greater than that of the assembly plant.

THE MARKET

National shipments of air conditioning and refrigeration equipment (SIC 3585) increased 21.4% between 1956 and 1960 -- from \$996 million to \$1.2 billion. Table 1 gives a detailed product breakdown of shipments over the five-year period. Based on the least squares trend of these data, shipments in 1965 should amount to approximately \$1.4 billion.^{1/} Thus the market will have increased an estimated 43% from 1956 through 1965. The largest percentage increase should occur in the sale of central air conditioning units.^{2/}

Map 1 indicates the minimum market area which could most economically be served from Atlanta. The hatched section represents the market area within which the freight costs on shipments from Atlanta would be cheaper than from all of the present major producing cities. However, since an Atlanta plant can be expected to manufacture at a significantly lower cost than the present major producing plants (see section on manufacturing in Atlanta), the market area that could be economically served would be much larger. The area to be served would include at least the states of Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee, where sales by wholesalers amounted to \$146.4 million in 1958. Wholesale sales in Atlanta alone were \$30.1 million for the year.

Based on 1958 wholesale sales in the seven-state area, the value of manufacturers' sales in the region in 1960 is estimated at \$152 million.^{3/}

Sales of air conditioning and refrigeration equipment in the seven-state area exceed production in the region by \$90 to \$100 million annually. It is obvious from this wide gap between consumption and production that the regional market is sufficiently large to support greatly enlarged production facilities in the area. Even with this large and expanding local market, however, the establishment of additional regional plants can be fully

^{1/} Least squares estimating equation: $Y_c = 1,018,093.8 + 58,544.5X$
(origin: 1958)

^{2/} See Bulletin ER 61-22, Business and Defense Services Administration, U. S. Department of Commerce, December, 1961.

^{3/} Manufacturers' sales in the Southeast are based on wholesale sales in the seven-state area expressed as a percent of U. S. wholesale sales in the industry (12.615% in this case).

Table 1
U. S. Manufacturers' Shipments of Air Conditioning and Refrigeration Machinery, 1956-1960
(Thousands of Dollars)

	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>	<u>1960</u>
<u>Condensing Units</u> ^{1/}					
Air Cooled	\$ 54,072	\$ 45,977	\$ 43,639	\$ 47,633	\$ 47,406
Water Cooled	<u>26,222</u>	<u>23,080</u>	<u>18,415</u>	<u>16,679</u>	<u>16,194</u>
Total	80,294	69,057	62,054	64,312	63,600
<u>Compressors and Compressor Units</u> ^{2/}					
All Refrigerants (except NH ₃)	161,251	144,100	134,243	183,352	201,388
Ammonia Refrigerants	<u>5,467</u>	<u>5,103</u>	<u>5,666</u>	<u>6,137</u>	<u>6,114</u>
Total	166,718	149,203	139,909	189,489	207,502
<u>Heat Transfer Equipment</u>					
Evaporative Condensers	10,203	9,632	7,822	9,294	10,670
Central Station Air Conditioning Units	40,576	42,291	42,324	44,594	47,854
Unit Coolers (refrigerated)	16,350	15,253	14,086	16,945	16,207
Others	<u>75,959</u>	<u>63,531</u>	<u>57,501</u>	<u>69,389</u>	<u>76,920</u>
Total	143,008	130,707	121,733	140,222	151,651
<u>Package Air Conditioning Equipment</u>					
Room Air Conditioners	291,534	266,788	257,466	278,942	244,209
<u>Unitary Air Conditioners</u> ^{3/}					
Air Conditioners (except window)	131,784	105,279	74,585	82,216	80,920
Year-round Air Conditioners	11,293	7,974	12,622	15,281	16,769
Heat Pumps (except air conditioners)	5,595	10,706	18,847	28,846	30,479
Split Systems - Total	<u>54,792</u>	<u>56,885</u>	<u>68,165</u>	<u>104,419</u>	<u>123,780</u>
Sub-Total	203,464	180,844	174,219	230,762	251,948
Total	494,998	447,632	431,685	509,704	496,157
<u>Other Air Conditioners and Refrigerants</u>					
Centrifugal Liquid Chilling Package	29,105	34,077	32,043	36,195	37,924
Absorption and Adsorption Systems	-	-	12,743	11,935	15,593
Mobile Vehicle Refrigeration Systems	-	-	15,911	18,084	33,996
Ice-Making Machines	18,112	17,364	17,913	22,983	28,961
Package Liquid Chillers	12,754	15,661	15,769	22,958	25,111
Mechanical Dehumidifiers	9,571	12,297	12,753	17,919	19,061
Mechanical Drinking Water Coolers	24,997	23,126	20,390	24,337	24,301
Factory Assembled Cooling Towers	16,561	15,169	14,441	15,316	17,991
Mechanical Air Conditioning Systems - Autos.	-	-	-	-	<u>87,391</u>
Total	111,100	117,694	141,963	169,727	290,351
GRAND TOTAL	\$ 996,118	\$ 914,293	\$ 897,344	\$ 1,073,454	\$ 1,209,261

Source: Current Industrial Reports, Bureau of Census, U. S. Department of Commerce

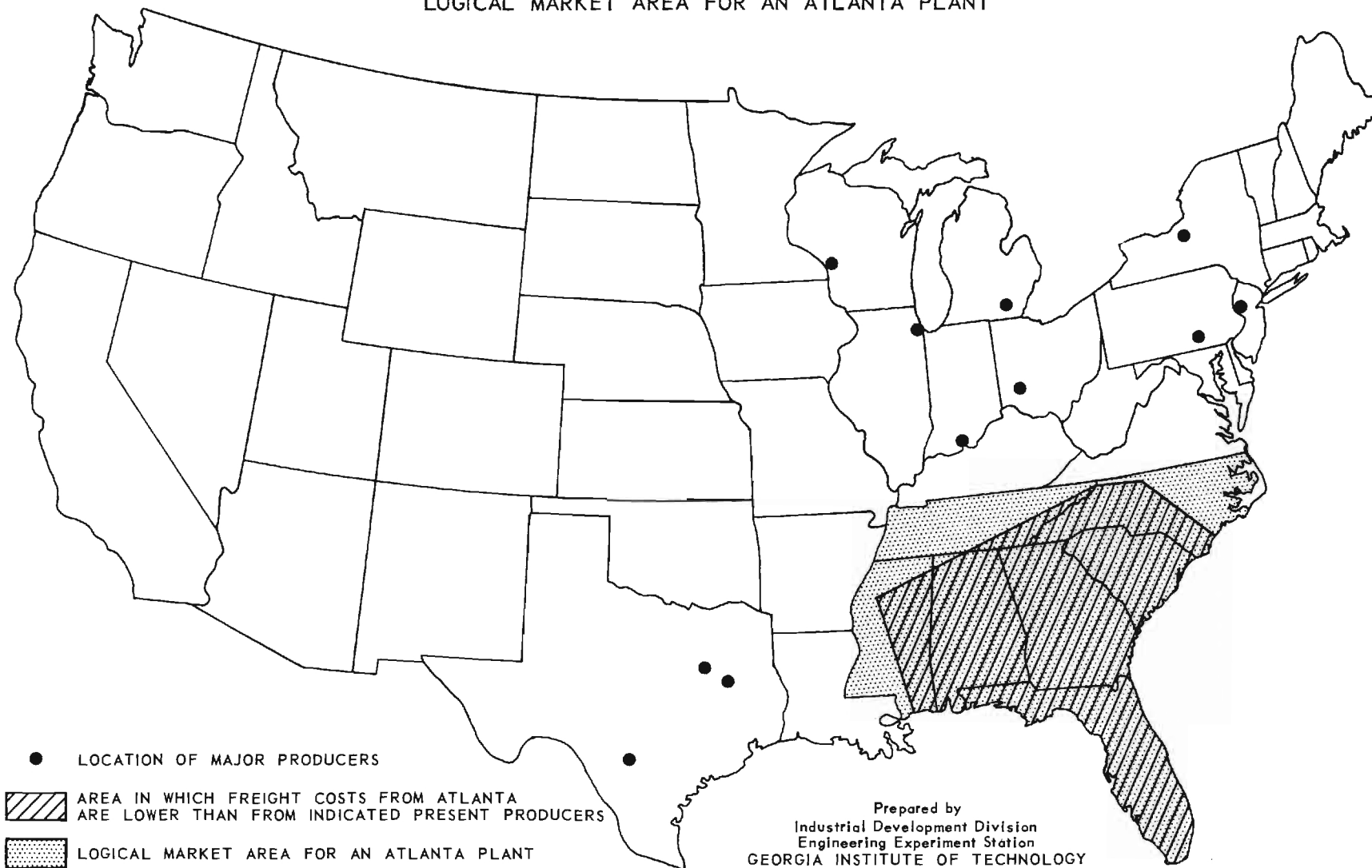
^{1/} Excludes units for household and ammonia refrigerants.

^{2/} Ibid.

^{3/} Excludes evaporative coils.

MAP 1

LOGICAL MARKET AREA FOR AN ATLANTA PLANT



justified only if potential plant locations in the Southeast offer competitive advantages over plants now located outside the area. Atlanta offers six such advantages.

ADVANTAGES OF MANUFACTURING IN ATLANTA FOR THE LOCAL MARKET

The principal cost advantages of an Atlanta location for a manufacturer of air conditioning and refrigeration equipment are those involving freight and labor costs. Other assets include excellent transportation-distribution facilities, proximity to raw material sources, a sizable market in the Atlanta area alone, and a lower cost of plant construction.

Production Labor Cost

According to the 1958 Census of Manufactures production wages amounted to 34.3% of the value added by manufacture in this industry. Obviously production wages are a significant item of cost for the industry. Average wage rates for selected geographical areas of the industry in 1958 were as follows:^{1/}

Michigan	\$2.61 per hour
New Jersey	\$2.40 per hour
Wisconsin	\$2.40 per hour
Ohio	\$2.38 per hour
New York	\$2.35 per hour
U. S. average	\$2.27 per hour

The comparable Atlanta rate for the industry now is approximately \$1.80 to \$2.00 per hour. (The higher figure is used for purposes of computation in this report in order to give a conservative estimate of the savings involved.) Based on these wage rates, the production labor cost for \$1 million in shipments of selected products for a manufacturer in Atlanta and in each of the major producing areas is shown in Table 2.

^{1/} The average rates for 1962 are undoubtedly higher than the 1958 rates. However, since the magnitude of increase is not known, the 1958 rates for the selected states are used for computations. This adds to the conservative nature of the estimates of labor cost savings since these rates are compared with current rates in the Atlanta area.

Table 2
Production Labor Cost for Shipments
of \$1 Million of Each Selected Product^{1/}

<u>Product</u>	<u>Michigan</u>	<u>New Jersey</u>	<u>Wisconsin</u>	<u>Ohio</u>	<u>New York</u>	<u>Atlanta</u>
Heat transfer equipment	\$149,600	\$137,500	\$137,500	\$136,400	\$134,700	\$114,600
Commercial refrigeration equipment	207,800	191,100	191,100	189,500	187,100	159,300
Condensing units	143,700	132,100	132,100	131,000	129,400	110,100
Other refrigeration equipment and air conditioning	185,800	170,800	170,800	169,400	167,300	142,400

^{1/} Figures calculated from 1958 Census of Manufactures by using following formula: $\text{Production Labor Cost} = \frac{\$1 \text{ Million Shipments}}{\text{Shipments/man hours (by state)}} \times \text{Average Wage Rate (by state)}$

The importance of the difference in annual production labor costs indicated in Table 2 can be seen by comparing the difference with the net profits of major producers of the equipment. The average net profit before taxes of major producers in 1961 amounted to 10.0% of net sales.^{2/} If a New York manufacturer had sold \$1 million worth of each category of equipment covered in the table, his net profit before taxes would have been approximately \$400,000. From Table 2, the labor cost of manufacturing the items in Atlanta would have been \$92,100 less than in New York. The savings of the Atlanta plant would amount to a 23.0% increase in net profit before taxes for the company. Since

^{2/} This percentage was obtained by comparing net profit before taxes with net sales (Moody's Industrials, 1962) of companies producing primarily air conditioning and refrigeration equipment.

labor costs in New York are less than in Michigan, New Jersey, Wisconsin, and Ohio, as indicated in Table 2, the percentage increase in net profits of companies located in these states would be even greater.

Freight Cost

There are opportunities for considerable savings in freight cost for an Atlanta plant serving the Southeast. Table 3 indicates the total annual freight cost on \$4 million in shipments of room air conditioners from major producing cities and Atlanta to principal wholesaling cities in the Southeast. The shipments were apportioned to the indicated cities in this area according to the volume of air conditioning and refrigeration equipment wholesaled in the cities in 1958.

As indicated in Table 3, the total freight charges on the \$4 million in shipments from a plant in Syracuse, New York, to eight southeastern wholesaling centers amounts to \$65,606, whereas the total charges from a plant in Atlanta to the same cities amounts to only \$28,769, or \$36,837 less than from Syracuse. If the net profit before taxes on the shipments from Syracuse amounts to approximately \$400,000 (10.0% of sales), the freight savings of an Atlanta plant serving the Southeast would amount to a 9.2% increase in net profit before taxes.

Plants in the Evansville, Indiana, vicinity have the lowest total freight costs on shipments into the Southeast of any major producing area indicated in Table 3. However, on shipments of \$4 million to the cities indicated, an Atlanta plant would enjoy savings in freight cost of \$14,791 over the Evansville plants. Assuming that the net profit before taxes averages 10.0% of sales at the Evansville plants (the same as the New York plant), a manufacturer in that area could increase his net profit before taxes 3.7% from freight savings alone by producing the machinery in the Atlanta area.

Although Table 3 covers only room air conditioners, similar freight savings would be possible on shipments of central air conditioners, commercial refrigerators, compressors and other products in the industry. (See Appendix Table 1.) Based on the savings available on shipments of air conditioners alone, an increase in net profit before taxes of from 3.3% to 9.6% can be obtained by producing in Atlanta for the southeastern market.

Table 3

Freight Cost for \$4 Million Shipments of Room Air Conditioners from Principal Producing Areas and Atlanta
to Major Southeast Wholesaling Centers

To:	Value of Shipment	Shipping Wgt. ^{1/}	FROM:								
			Evansville Ind.	Chicago Ill.	Adrian Mich.	Syracuse N. Y.	Dayton Ohio	York Pa.	Trenton N. J.	LaCrosse Wisc.	Atlanta Ga.
Atlanta, Ga.	\$1,180,000	1,089,455	\$10,895	\$15,470	\$14,708	\$18,521	\$12,638	\$15,252	\$16,233	\$18,194	\$3,650
Birmingham, Ala.	312,000	288,059	2,621	3,831	3,889	4,897	3,342	4,292	4,580	4,523	1,829
Charlotte, N. C.	512,000	472,713	5,814	7,327	6,618	6,854	5,909	5,152	5,578	8,462	3,734
Jacksonville, Fla.	272,000	251,129	3,390	4,445	4,219	4,520	3,867	3,817	3,993	4,972	2,160
Memphis, Tenn.	480,000	443,168	3,590	5,096	5,673	7,534	5,141	7,357	7,755	6,204	4,254
Miami, Fla.	840,000	775,544	12,952	17,364	15,666	16,597	14,580	14,348	14,890	17,993	9,617
Nashville, Tenn.	156,000	144,030	886	1,527	1,613	2,218	1,368	2,146	2,319	1,944	1,167
Orlando, Fla.	248,000	228,970	3,412	4,328	4,122	4,465	3,801	3,732	3,892	4,831	2,358
Total Freight - \$4 Million Shipments			\$43,560	\$59,388	\$56,508	\$65,606	\$50,654	\$56,096	\$59,240	\$67,123	\$28,769

^{1/} Based on an average manufacturer's value per shipping pound
of \$1.08311 per pound.

Cost of Plant Construction

According to Dodge Construction Statistics, the cost per square foot of non-residential construction in the Southeast (Region III) in 1960 was only 70% of the cost per square foot in the New York-New Jersey-Eastern Pennsylvania area (Region II). Similarly, the cost per square foot in the Southeast was only 77.5% of the cost in the Ohio-Western Pennsylvania-West Virginia area (Region IV), and 80.3% of the cost in the Wisconsin-Michigan-Illinois-Indiana area (Region V). A leading Atlanta contractor has quoted a price of \$6 per square foot for constructing a standard industrial building in Atlanta. Applying the above percentages to the \$6 figure, the estimated cost of construction of the same building in the other areas is as follows:

New York-New Jersey-Eastern Pennsylvania Area	= \$8.57 per square foot
Ohio-Western Pennsylvania-West Virginia Area	= \$7.74 per square foot
Wisconsin-Michigan-Illinois-Indiana Area	= \$7.47 per square foot

A standard industrial building with 100,000 square feet of floor space in Atlanta would cost approximately \$600,000, whereas the same building in New York and New Jersey would cost \$857,000; in Ohio, \$774,000; in Wisconsin and Michigan, \$747,000. Specific support for these figures comes from a recent case in which bids were solicited in Atlanta and New Jersey on buildings from the same plans. The bid in Atlanta was \$60,000; in New Jersey it was \$95,000.

Transportation-Distribution Facilities

Atlanta is the major distribution point in the Southeast for air conditioning and refrigeration equipment. It is also the largest distribution center for practically all other products wholesaled in the area. The city has a higher volume of freight traffic than any other area in the South. To effectively transport these products the city has the service of seven railroads, over 75 motor freight carriers, and six air freight carriers.

In addition, passenger transportation facilities into and out of Atlanta are excellent. There are more direct airline flights from Atlanta to major cities than from any other city in the South. Atlanta's Municipal Air Terminal serves 54 cities nonstop. It ranks third in the nation in

number of commercial aircraft departures. Flying time to Chicago is one and a half hours; it is only a few minutes more to New York.

Proximity to Raw Material Sources

Of the metallic raw materials used in the production of items in this industry, the following were the most important in terms of the per cent of expenditure for all metal materials consumed:

Carbon and alloy steel mill shapes and forms	33.4%
Copper and copper base alloy	25.3%
Castings and forgings	18.2%
Aluminum and aluminum alloy mill shapes and forms	15.2%
Stainless steel mill shapes and forms	8.0%

In addition, expenditures for fractional and integral horsepower electric motors in the industry were significant. Of all these products only the integral horsepower motors and stainless steel are not available in the Alabama-Georgia-Tennessee area.

Carbon and alloy steel is made in the Atlanta area and hence any freight costs to an Atlanta user would be negligible. Since aluminum and aluminum alloy and copper and copper alloy products are delivered freight allowed, freight costs on these products would not be a consideration. In addition, any current-carrying devices needed in the production process are delivered freight allowed.

Therefore, an Atlanta plant would be well located for the procurement of the materials required for production of air conditioning and refrigeration equipment.

* * *

The combination of competitive advantages available in Atlanta makes it a logical location for a manufacturing plant to serve the Southeast.

APPENDIX TABLE 1

Carload Rail Rates

Air Coolers, Heaters, Humidifiers, Dehumidifiers or Washers and Blowers or Fans Combined,^{1/} with or without Air Filters
(24,000 pound carloads in cents per cwt.)

TO	FROM								
	Evansville Ind.	Chicago Ill.	Adrian Mich.	Syracuse N. Y.	Dayton O.	York Pa.	Trenton N. J.	LaCrosse Wisc.	Atlanta Ga.
Atlanta, Ga.	100	142	135	170	116	140	149	167	33 1/2
Birmingham, Ala.	91	133	135	170	116	149	159	157	63 1/2
Charlotte, N. C.	123	155	140	145	125	109	118	179	79
Jacksonville, Fla.	135	177	168	180	154	152	159	198	86
Memphis, Tenn.	81	115	128	170	116	166	175	140	96
Miami, Fla.	167	211	202	214	188	185	192	232	124
Nashville, Tenn.	61 1/2	106	112	154	95	149	161	135	81
Orlando, Fla.	149	189	180	195	166	163	170	211	103

Cooling Rooms, Cooling Boxes or Refrigerators, other than Household Type,
or Parts,^{1/} with or without Cooling or Freezing Apparatus
(cents per cwt.)

TO:	Evansville Ind.		Chicago Ill.		Adrian Mich.		Syracuse N. Y.		Dayton O.		York Pa.		Trenton N. J.		LaCrosse Wisc.	Atlanta Ga.
	18M	22M	18M	22M	18M	22M	18M	22M	18M	22M	18M	22M	18M	22M	18M	18M
Atlanta, Ga.	148	-	194	187	187	177	237	224	162	152	194	183	208	196	226	48 1/2
Birmingham, Ala.	134	-	182	174	187	177	237	224	162	152	208	196	222	208	213	94
Charlotte, N. C.	182	-	211	203	194	183	201	190	174	164	152	143	164	155	243	117
Jacksonville, Fla.	201	-	240	232	234	221	251	237	214	202	211	199	222	208	270	128
Memphis, Tenn.	120	-	157	151	177	168	237	224	162	152	231	218	244	230	190	142
Miami, Fla.	248	-	288	277	280	265	297	281	261	246	257	243	268	253	316	184
Nashville, Tenn.	91	-	145	139	155	146	214	202	131	124	208	196	224	211	183	120
Orlando, Fla.	222	-	257	248	251	237	271	255	231	218	227	214	237	224	287	152

Condensers or Condenser Parts,^{1/} Compressors, Air Gas or Liquid with or without
Air Tanks and/or Air Compressor Parts, Loose or in Packages
(cents per cwt.)

TO:	Evansville Ind.		Chicago Ill.		Adrian Mich.		Syracuse N. Y.		Dayton O.		York Pa.		Trenton N. J.		LaCrosse Wisc.	Atlanta Ga.
	<u>22M</u>	<u>EX</u>	<u>24M</u>	<u>30M</u>	<u>24M</u>	<u>30M</u>	<u>24M</u>	<u>30M</u>	<u>24M</u>	<u>30M</u>	<u>24M</u>	<u>30M</u>	<u>24M</u>	<u>30M</u>	<u>24M</u>	<u>24M</u> ^{2/}
Atlanta, Ga.	128	96	163	142	157	138	199	174	135	119	163	142	173	152	214	32.75
Birmingham, Ala.	117	88	152	133	157	138	199	174	135	119	173	152	185	162	202	62.17
Charlotte, N. C.	157	118	177	155	163	142	168	147	146	128	127	111	138	121	230	77.29
Jacksonville, Fla.	174	131	202	177	196	172	210	184	179	157	177	155	185	162	255	84.21
Memphis, Tenn.	104	78	132	115	149	130	199	174	135	119	196	172	204	179	180	94.00
Miami, Fla.	215	161	241	211	235	205	249	218	219	191	216	189	224	196	298	121.42
Nashville, Tenn.	79	58½	121	106	130	114	179	157	110	97	173	152	187	164	173	79.29
Orlando, Fla.	191	144	216	189	210	184	227	198	193	169	190	167	199	174	271	100.83

^{1/} Not otherwise indexed by name in the Uniform Classification.

^{2/} Effective rate for 24,000 lbs.

Legend:

EX - Applicable on excess weight over 22,000 lbs. when loaded in same car.

18M - 18,000 lbs.

22M - 22,000 lbs.

24M - 24,000 lbs.

30M - 30,000 lbs.