

THE

COPPER

INDUSTRY

STATISTICS FOR 1970 COMPARED WITH OTHER YEARS

ARIZONA, THE UNITED STATES, AND THE WORLD

COMPILED BY THE ARIZONA DEPARTMENT OF MINERAL RESOURCES

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C O N T E N T S

	<u>Page</u>
Copper (Physical Properties)	1
The Copper Industry in 1970	2-8
General	2-3
Copper Industry of the World	3-5
Copper in the United States	5-8
Arizona's Copper Industry	28-30
<u>Statistics</u>	
Salient United States Copper Statistics, 1968-1970	TABLE I 9
U.S. Mine Production by States, 1968-1970	TABLE II 10
Mine Production, Arizona, U.S. and World and U.S. Price, 1874-1970	TABLE III 11-13
Production and Consumption, U.S. and World, 1960-1970	TABLE IV 14
World Mine Production by Countries 1967-1970	TABLE V 15
U.S. New Refined Production, Imports, Exports and Withdrawals, 1965-1970	TABLE VI 16
Imports, by Major Sources, 1968-1970. Totals only, 1965-1967	TABLE VII 17
Exports, by Destination, 1968-1970	TABLE VIII 18
Stocks, Refined and Blister, In and Out of the U.S. 1960-1970	TABLE IX 19
Fabricators' Stocks and Sales Position, 1960-1970	TABLE X 19
Refined Copper Consumed by U.S. Consumer Classes, 1967-1970	TABLE XI 20
U.S. Production and Consumption, 1950-1970	TABLE XII 21
Employment, Earnings and Hours, U.S. and Arizona; Ore and Copper Production per man-hour, 1947-1949 and 1965-1970	TABLE XIII 22-24
Employment Earnings and Hours, U.S. and Arizona, 1947-1970	TABLE XIV 25
U.S. Output of Copper Ore; Amount and Value of Copper, Gold, and Silver Recovered therefrom, 1947-1949 and 1960-1970	TABLE XV 26
<u>ARIZONA ONLY</u>	INDEX 27
Arizona's Copper Mining Output of Copper Ore; Amount and Value of Copper, Gold, and Moly Re- covered therefrom, 1947-1949 and 1961-1970	TABLE XVI 31
Mine Production of Copper, Gold, Silver, Lead and Zinc 1858-1970	TABLE XVII 32
Mine Production of Copper, Gold, Silver, Lead and Zinc in 1970, by classes of Ore	TABLE XVIII 33
Production of Large Copper Mines in 1969 and 1970	TABLE XIX 34-35
Covered Employment and Wages 1947-1970	TABLE XX 36
Employment and Wages in Industries Covered by Social Security, 1947-1949 and 1968-1970	TABLE XXI 37-38
Mineral Production in Arizona in 1970	TABLE XXII 39
Value of Mineral Production, by Counties, 1970	TABLE XXIII 40

C O P P E R

Symbol, Cu. Atomic Weight, 63.54. Specific Gravity, 8.96. Valence, 1 & 2. Melting Point, 1981° F. Boiling Point, 4703° F. Electrical Resistivity, 1.682 Microhms/cm at 20° F. Tensile Strength, H.D. - 60,000 #/sq. in.; annealed - 30,000. Crystallizes in the isometric system.

Copper ranks next to iron as a metal of commercial importance. Its high electrical conductivity, 94 per cent of that of silver, high ductility and availability, make it the most important metal in the electrical field. The conductivity of aluminum is only 61 per cent of that of copper; and that of iron is only 17 per cent. Copper is easily drawn into wires or formed into sheets of desired sizes, including very fine, or thin. It is insoluble in water; soluble in nitric and hot sulphuric acids; slightly soluble in hydrochloric acid and ammonium hydroxide; and has great resistance to weathering. It is widely used in brass, alloyed with zinc; and is alloyed with tin to form bronze. It has excellent thermal conductivity also, and therefore is used extensively in heat exchangers such as car radiators, refrigeration coils and condensers of many types and uses. The long life of copper is illustrated by the large recovery as scrap after it has outlived its original use. In the 5-year period 1965 to 1969, the amounts of secondary copper produced in the United States from scrap copper or copper alloys averaged 99 per cent of the domestic mine output. Copper minerals, more commonly chalcopryrite, chalcocite, bornite, covellite, chrysocolla, malachite, azurite, cuprite and native copper, occur as minor - most frequently very minor - constituents of various kinds of rock in very irregular areas of material which can be economically extracted and processed as "ore". The copper minerals in the ore may be concentrated by hydro-metallurgy and either ore or concentrate may be processed chemically if feasible, or by pyro-metallurgy, or by both, to separate the copper from its minerals. The product may require refining, which may be done by a furnace process but most often is done electrically, thereby producing cathode copper which must be at least 99.9 per cent pure, any silver present being counted as copper. Fire refined copper is used for cast and wrought products and some alloys, and is allowed to be very slightly less pure. The refineries may cast the refined metal into wire bars or other shapes for fabrication or may ship the heavy cathodes without remelting.

The Copper Industry in 1970

General

The World, the United States and the State of Arizona produced more newly mined copper in 1970 than in any previous year, and it was sold at high prices. However, the prices reached a peak in April and by mid-year U.S. dealers were complaining of a dull market. The domestic copper producer's price at mid-year was firm at 60 cents per pound, but the cash price on the London Metal Exchange had dropped from the equivalent of 81.5 cents on April 16th to 62. On August 8th the London price went below the U.S. producer's price for the first time since 1965.

World copper production in 1970 was hampered less than usual by mine strikes and was abetted by about 500,000 tons of scheduled new production capacity. The most serious interruption was at Zambia's largest mine, Mufulira, and was caused by a tragic cave-in in September which took 89 lives. World production of primary and secondary refined copper in the year exceeded consumption by 380,000 tons, according to figures of the American Bureau of Metal Statistics.

The decline in the general economy of the world in 1970 continued into 1971. At the end of 1970, the U.S. producer's price was 53 cents and the world price was around 46.

The year 1970, although profitable for the copper industry, was also troublesome. Nationalization in the important copper producing nations, Zambia, Chile and Peru, plus the start of similar trends in Canada, seriously affected the copper interests of outside nations which financed their mines. Air pollution restrictions created expensive sulphur control and other processing problems. Smelter changes to meet pollution regulations, slowed copper production and forced export of concentrates for processing in countries free from such regulations. Land problems increased and no relief appeared for rising operating costs and capital demands. On top of these problems was that of scheduled increases

in production capacity, estimated to create large surpluses in the next 5 years. The problem of financing was increased by these problems, along with those of the general economy.

The financial demands of the copper industry are very large. American Metal Market, issue of October 20, 1970, reported that J. C. Parkinson gave an estimate at a London forum on non-ferrous metals that "more than six billion dollars in new capital investment will be needed to carry out expansions in copper capacity that are planned over the next five years. That figure, he said, is based on an estimated cost of \$3,000 per ton of new capacity and the cost could raise to \$5,000 per ton by 1980". Sir Ronald Prain, in a chapter on Costs and Economics in the paper, Copper 1 - 1971, places "the cost of creating a ton of annual capacity copper" at "an average of about 2800 dollars per ton, based on producing a ton of refined copper", and applies this to an estimated increase in world capacity over a five year period, of 2,193,000 tons, figures which differ somewhat from Parkinson's but yield his total of \$6 billion.

The historic strength of predictions of copper futures has been frail, but there is little disagreement today about the long term future. James Boyd, in a review of the copper industry in 1970 for the annual survey and outlook issue of E/MJ Magazine, March 1971, stresses that international scope of the copper market and the increasing response of that market to "dynamic changes in the economic and political environment all over the globe. In the process it has become nearly impossible to forecast or even analyze supply and demand balances and their impact on copper prices reliably with any appreciable degree of consistency." However, his statement ends with, "While the outlook for 1971 and beyond is equally hazy to depict in quantitative terms, it is nonetheless bright indeed if any semblance of order can be established in the economic system."

Copper Industry of the World

The World's mine production of copper in 1970 is estimated by the U.S. Bureau of Mines to have been 6,837,000 short tons, 3.4 percent above 1969 and

23.2 percent above 1965. Increases in the previous five years were: 1969, 10%; 1968, 8.3%; 1966, 10.5%; and 1965, 4.8%. 1967 was 4.8 percent below 1966 due to a major strike in the U.S. copper industry from July 1967 to March 1968. The averages of the increases (and decrease) for the 5 years ending with 1970 is 5.5 percent. 1970 mine production outside of the United States is estimated at 5,117,000 tons, only one percent higher than in 1969.

In 1970, all of the ten major copper producing countries of the World except Zambia and Chile exceeded production in any previous year. The United States was the largest producer, followed in order of production by the U.S.S.R., Zambia, Chile, Canada, Republic of the Congo, Peru, Philippines, Republic of South Africa and Australia. These 10 produced 89 percent of the world output. The principal reason for the Zambia decline was the Mufulira cave-in, which halted production of this principal Zambian producer for about two months and seriously curtailed it on into 1971. Chile lost about 17,000 tons due to a strike at Mammoth Chuquicamata and fell over 100,000 tons short of planned 1970 production due to operating difficulties. Complete Nationalization of Chilean Mines after election of Salvador Allende as president, awaited only congressional approval of his powers to effect his plans.

World consumption of refined copper, primary and secondary, in 1970 was 7,863,000 tons, up 1 percent from 1969, according to estimates of the American Bureau of Metal Statistics. It was another record year and 56 percent above the 1960 consumption. However, if the consumption of Japan, which increased 174 percent in the decade, is eliminated, the increase for the rest of the world becomes 48 percent. If the 1970 world increase is assumed to be the result of an average compounded increase, that average is 4.6 percent per year. The following table gives a breakdown of increases of 1970 over 1960 in important areas of the world:

Consumption of Refined Copper a/

Primary and Secondary
(Short Tons)

<u>Area</u>	<u>1960</u>	<u>1970</u>	<u>Percent Increase</u>
World	5,029,594	7,862,900	56.3
Free World	4,189,930	6,286,600	50.0
Europe	2,093,721	2,646,600	26.4
United States <u>b/</u>	1,349,896	2,030,600	50.4
W. Germany	568,682	764,000	34.3
United Kingdom	617,617	604,300	-2.2
Asia <u>c/</u>	422,640	984,000	132.8
Japan	335,115	917,100	173.7
Soviet Sphere <u>d/</u>	839,664	1,576,300	74.1
U.S.S.R.	679,728	1,058,200	55.7

a/ American Bur. Metal Statistics.

b/ U.S. Bur. Mines

c/ Excludes Soviet Sphere

d/ Conjectural Asia included.

The surplus of copper production capacity in the Free World is expected to increase greatly in the period 1971 through 1975. A surplus of around 10 percent or 850,000 tons in 1975 is about average for estimates seen in reports of well known men in the industry. Average annual increases in production capacity in the years 1971 to 1975 of around 7 percent, lower in the last two years than in the first three, appear to be a rough average of published estimates ranging from about 6.8 to 7.5 percent; and continued increase in consumption at the "traditional" 4.5 percent per year average, seems to be a generally favored estimate.

Copper exploration, stimulated by expected demands created by population growth and by high copper prices, has found and is finding large, even huge deposits in various parts of the world, and is still active.

Copper in the United States in 1970

The United States produced 1,719,657 tons of newly mined copper in 1970, another all time record. It was 11.3 percent above the record set in 1969; 43 percent above 1968; and 17 percent above the record year of 1966. Arizona in 1970 again produced more than all of the other states combined, 53.4 percent of

the total. Utah was second with 17.2 percent followed by New Mexico, 9.7%, Montana, 7.0%, and Nevada, 6.2%. Record production also was made by New Mexico and Nevada. Utah's output had been exceeded only by its record made in the wartime year of 1943.

United States mine production includes copper recovered from copper ores, from ores in which other metals predominate, and from precipitates from leaching of dumps or rock in place. The tonnage of copper ores mined in 1970 was 257,729,000 short tons and it yielded 88 percent of the domestic mine production of copper, or 1,512,500 tons, or 11.7 pounds of copper per ton of copper ore. Arizona led in ore tonnage, followed by Utah, New Mexico, Nevada (3 states with combined average recovery of 12 pounds per ton), Montana (11 lbs/tons), Michigan (17.7 lbs/ton) and others. Open pit copper mines were the source of 87 percent of the copper ores. 356,000 tons of copper precipitates yielded 344,000,000 pounds of copper.

Domestic production of secondary copper consisted of 521,137 tons recovered from scrap as unalloyed copper, and 726,465 tons recovered in alloys, making a total of 1,247,602 tons in 1970. The total amounts to 73 percent of the year's domestic mine output of copper, compared with 89 percent in 1969. Sixty percent of the 1970 secondary copper was credited to "new scrap" and 40 percent to "old scrap." "New scrap" consists of cuttings, from new copper material or alloys, which are re-melted and re-cast into usable forms.

1970 U.S. mine production plus secondary copper recovered as unalloyed metal, a total of 2,240,794 tons, was 210,000 tons greater than the 1970 U.S. consumption of refined copper. In 1969 the like production total was 83,000 tons less than the like. U.S. production of secondary unalloyed copper was 74 percent greater in 1970 than the 300,000 tons produced in 1960.

The United States imported 390,400 tons of primary copper in 1970, of which 82 percent came from Chile, Peru and Canada. Africa and the Philippines

accounted for 13 percent. The total was 4 percent below 1969 and the lowest in the 20 previous years. 1970 exports of primary copper amounted to 291,000 tons, 41 percent more than in 1969. Over two thirds of the copper in ores, concentrates, and matte went to Japan. Italy, the United Kingdom, Brazil, the Netherlands and West Germany took 45 percent of the refined copper. The United States continued to be a net importer of copper, but the amount 99,000 tons, was the lowest in nine years.

Suspension of the U.S. duty on imports of copper, 1.1 cent per pound in 1969, was extended beyond June 30, 1970, to July 1, 1972. The suspension does not apply when the price of copper is under 36 cents per pound; and if the price, delivered Connecticut Valley, drops below 24 cents for one calendar month, a duty of 1.8 cents is to be reimposed.

Producer's stocks of refined copper, blister copper, and materials in the process of refining, totaled 470,000 tons at the end of 1970 according to the U.S. Bureau of Mines. This was 42 percent more than at the end of 1969. Refined copper stocks outside the United States totaled 318,562 tons at the end of 1970, according to the Copper Institute. This was 36 percent above 1969, but only 3 percent above the average of the 1960's.

The United States consumption of refined copper in 1970 was 2,030,600 tons, almost 15 percent less than in 1969, and 14 percent less than the record 2,360,000 tons in 1966. Wire mills in 1970 used 60 percent of the domestic total and their consumption of 1,339,000 tons was 10 percent more than in 1969 and 62 percent greater than in 1960. Brass mills used 661,000 tons, 32 percent of the total, 16 percent lower than in 1969, and 36 percent above 1960.

The average number employed in U.S. copper mining in 1970 was 37,000, an all time high, 10 percent above 1969 and 31 percent above 1960. The aggregate man-hours worked by production workers increased 2 million from 1969 to 1970's total of 34 million. The average numbers of tons of ore and pounds of copper

produced per man-hour of production workers in 1970, 3.76 and 49.13 respectively, compare with 1947-19 averages of 1.47 and 28.21. Average yearly earnings of the production workers were \$9,135 in 1970, 4 percent higher than in 1969, and 2.81 times the average for the 1947-49 period. The increase from the 1947-49 period in tons of copper ore produced per man-hour, was 155 percent, and in pounds of copper produced per man-hour, was 74 percent. The 1970 earnings increase was 26 percent more than the increase in ore production per man-hour. Since credit must be given to the great and costly advances in equipment and technology of the industry, the wage increase substantially exceeded that of labor productivity.

1970 was another exceptional year for U. S. copper. The producer's price rose from 52 to 56 cents per pound on January 1st and to 60 in April as strong demand continued. It held at 60 until October 24th, almost three months after the foreign price, which started falling from 81.5 in April, fell below 60. The producers dropped to 56 then to 53 on December 1st, where it held until January 15, 1971. The foreign price was 46.91 at the end of 1970.

Exploration for copper in the United States continued to be very active in 1970, as Anaconda and Kennecott turned more attention there, as nationalization of their large Chilean mines progressed; and as others, attracted by high prices and U. S. Bureau of Mines prediction of U. S. need of nearly 6.3 million tons of newly mined copper by the year 2000, sought new ore deposits.

TABLE I

SALIENT COPPER STATISTICS 1/

<u>Mine Production</u>	Short Tons		
	1968	1969	1970
Arizona	627,961	801,363	917,918
United States	1,204,621	1,544,579	1,719,657
World	6,012,100	6,612,276	6,837,448
<u>Primary Refined Stocks at U.S. Refineries <u>a/</u></u>			
Beginning of Year	27,000	48,000	39,000
End of Year	48,000	39,000	130,000
<u>Primary Refined Prod. of U.S. Refineries</u>			
From Domestic Ores	1,160,925	1,468,889	1,521,183
From Foreign Ores, Matte, etc. <u>a/</u>	276,461	273,926	243,911
Total	1,437,386	1,742,815	1,765,094
<u>Secondary Copper Produced from Scrap</u>			
Recovered as Unalloyed Copper	433,041	514,593	521,137
Recovered in Alloys <u>b/</u>	785,299	860,900	726,465
Total Secondary Copper	1,218,340	1,375,493	1,247,602
<u>Imports:</u>			
Copper in Ores, Concentrates, Matte	27,559	39,048	33,841
Copper in Blister	270,718	237,949	224,416
Refined Copper <u>a/</u>	400,278	131,171	132,143
Total Imports	698,555	408,168	390,400
<u>Exports:</u>			
Copper in Ores, Concs., Matte, Blister	80,739	5,517	69,343
Refined Copper <u>a/</u>	240,745	200,269	221,211
Total Exports	321,484	205,786	290,554
<u>Excess of Imports Over Exports</u>	377,071	202,382	99,846
<u>Consumption:</u>			
New Refined (Apparent Consumption)	1,575,919	1,682,717	1,585,026
Total Refined (Actual Consumption)	1,880,300	2,142,218	2,043,303
<u>U.S. Mine Production</u>			
Per Cent of Apparent Consumption	76.4	91.8	108.5
<u>Average Price of Copper <u>c/</u></u>	41.847¢ <u>d/</u>	47.534¢	57.7 <u>e/</u>

1/ U.S. Bureau of Mines; American Bureau Metal Statistics.

a/ May include some from scrap.

b/ Includes copper in chemicals: 1968 - 4,757; 1969 - 3,824; and 1970 - 2,525.

c/ "Electrolytic copper, domestic refineries, on Atlantic Seaboard".

Source: E/MJ.

d/ Based on last 9 mos. of 1968. Calculated average suspended Jan. thru March.

e/ Based on known production and selling rates.

TABLE II

MINE PRODUCTION OF RECOVERABLE COPPER IN THE UNITED STATES 1/

(In short tons)

STATE	1968	1969	1970	Rank in 1970
Arizona	627,961	801,363	917,918	(1)
California	1,182	1,129	2,308	(13)
Colorado	3,451	3,598	3,749	(9)
Idaho	3,525	3,332	3,612	(10)
Maine	898	1,320	2,703	(11)
Michigan	74,805	75,226	67,543	(6)
Missouri	5,494	12,664	12,134	(8)
Montana	69,480	103,314	120,412	(4)
Nevada	77,213	104,924	106,688	(5)
New Mexico	90,769	119,956	166,278	(3)
Pennsylvania	4,850	3,382	2,539	(12)
Tennessee	14,196	15,353	15,535	(7)
Utah	228,245	296,699	295,738	(2)
Other States <u>2/</u>	<u>3,428</u>	<u>3,621</u>	<u>2,500</u>	
TOTALS	1,204,621	1,544,579	1,719,657	

1/ Source: U.S. Bureau of Mines2/ Includes: Alaska ('68), Oklahoma, Oregon, Washington, and Wyoming.

TABLE III

MINE PRODUCTION OF COPPER IN
ARIZONA, THE UNITED STATES, AND THE WORLD

DOMESTIC PRICE OF COPPER a/

1874 - 1970

Period	ARIZONA			UNITED STATES			WORLD
	Short Tons	% of U.S. Prod.	% of World Prod.	Short Tons	% of World Prod.	Price- ¢ Per Pound	Short Tons
1874-							
1911	1,758,000	22.0	9.3	7,989,735 <u>b/</u>	49.1	14.40 <u>c/</u>	16,260,000
1912	182,519	29.2	16.2	624,547	55.5	16.341	1,125,656
1913	203,962	33.0	18.6	617,755	56.2	15.269	1,099,366
1914 <u>1/</u>	196,509	34.2	19.0	574,216	55.5	13.602	1,034,487
1915 <u>1/</u>	229,986	30.9	19.6	744,036	63.4	17.275	1,173,150
1916 <u>1/</u>	360,917	36.0	23.2	1,002,938	64.6	27.202	1,553,498
1917 <u>1/</u>	356,083	37.6	22.2	947,717	59.1	27.180	1,602,914
1918 <u>1/</u>	382,428	40.0	24.2	955,011	60.5	24.628	1,579,246
1919	269,050	44.4	24.6	606,167	55.3	18.691	1,095,697
1920	279,128	45.6	26.4	612,275	58.0	17.456	1,056,014
1921 <u>2/</u>	92,517	39.7	15.1	233,095	38.0	12.502	613,987
1912-							
1921	2,553,099	36.9	21.4	6,917,757	58.0	20.649	11,934,015
1922	200,022	41.5	21.4	482,292	48.2	13.382	935,374
1923	309,464	41.9	22.8	738,870	54.5	14.421	1,355,327
1924	338,876	42.2	23.0	803,083	54.5	13.024	1,472,712
1925	356,678	42.5	22.6	839,059	53.2	14.042	1,576,998
1926	361,648	41.9	22.7	862,638	54.0	13.795	1,596,147
1927	341,095	41.3	20.5	824,980	49.5	12.920	1,666,694
1928	366,138	40.5	19.2	904,898	47.5	14.570	1,903,672
1929	415,314	41.6	19.3	997,555	46.4	18.107	2,150,587
1930 <u>3/</u>	288,095	40.9	16.2	705,074	39.7	12.982	1,775,805
1931 <u>3/</u>	200,672	37.9	13.0	528,875	34.2	8.116	1,545,425
1922-							
1931	3,178,002	41.3	19.8	7,687,324	48.1	13.902	15,978,741

Source: Mineral Resources of the U.S., U.S. Geological Survey (Years 1882-1923), U.S. Bur. Mines (Years 1923-1931); Minerals Yearbooks and other reports, U.S. Bur. Mines (Years 1932-1969); Ariz. Bur. Mines Bull. 140 (1936).

a/ Annual average prices as reported by E/MJ. Decade averages are calculated from reported annual tonnages and values.

b/ Smelter production from domestic ores.

c/ Average price for Arizona copper only, calculated from total of values reported or estimated by sources, amounting to \$506,283,000.

1/, 2/, 3/ See page 13

TABLE III (Continued)

Period	ARIZONA			UNITED STATES			WORLD
	Short Tons	% of U.S. Prod.	% of World Prod.	Short Tons	% of World Prod.	Price- ¢ Per Pound	Short Tons
1932 <u>3/</u>	91,246	38.3	8.0	238,111	20.9	5.555	1,138,676
1933 <u>3/</u>	57,021	29.9	4.9	190,643	16.4	7.025	1,159,000
1934 <u>3/</u>	89,041	37.5	6.3	237,401	16.8	8.428	1,415,353
1935 <u>3/</u>	139,015	36.0	8.4	386,491	23.5	8.649	1,647,939
1936 <u>3/</u>	211,275	34.4	11.1	614,516	32.4	9.474	1,899,263
1937	288,475	34.3	11.2	841,998	32.8	13.167	2,567,916
1938 <u>4/</u>	210,797	37.8	9.3	557,763	24.5	10.000	2,274,045
1939 <u>5/</u>	262,117	36.0	10.6	728,320	29.4	10.965	2,481,277
1940 <u>5/</u>	281,169	32.0	10.5	878,086	32.7	11.296	2,688,510
1941 <u>5/</u>	326,317	34.1	11.2	958,149	33.0	11.797	2,903,458
1932- 1941	1,956,473	34.7	9.7	5,631,478	27.9	10.564	20,175,437
1942 <u>5/</u>	393,387	36.4	12.9	1,080,061	35.5	11.775	3,039,041
1943 <u>5/</u>	403,181	37.0	13.2	1,090,818	35.6	11.775	3,064,394
1944 <u>5/</u>	358,303	36.8	12.5	972,549	33.9	11.775	2,866,000
1945	287,203	37.2	12.0	772,894	32.2	11.775	2,400,000
1946	289,223	47.5	14.1	608,737	29.6	13.820	2,056,000
1947	366,218	43.2	14.6	847,563	33.9	20.958	2,500,000
1948 <u>6/</u>	375,121	44.9	14.4	834,813	32.1	22.038	2,600,000
1949 <u>6/</u>	359,010	47.7	14.4	752,750	30.1	19.202	2,500,000
1950 <u>7/</u>	403,301	44.4	14.4	909,343	32.5	21.235	2,760,000
1951 <u>7/</u>	415,870	44.8	14.3	928,330	32.0	24.200	2,900,000
1942- 1951	3,650,817	41.5	13.7	8,797,858	33.0	17.103	26,685,435
1952 <u>7/</u>	395,719	42.8	13.1	925,359	30.6	24.200	3,020,000
1953 <u>7/</u>	393,525	42.5	12.9	926,448	30.4	28.798	3,050,000
1954 <u>8/</u>	377,927	45.2	12.2	835,472	27.0	29.694	3,100,000
1955	454,105	45.5	13.3	998,570	29.2	37.491	3,420,000
1956	505,908	45.7	13.4	1,104,156	29.1	41.818	3,790,000
1957 <u>9/</u>	515,854	47.5	13.3	1,086,859	27.9	29.576	3,890,000
1958 <u>9/</u>	485,839	49.6	12.9	979,329	25.9	25.764	3,780,000
1959 <u>10/</u>	430,297	52.2	10.7	824,846	20.4	31.182	4,040,000
1960	538,605	49.9	11.6	1,080,169	23.2	32.053	4,650,000
1961	587,053	50.4	12.1	1,165,155	24.0	29.921	4,850,000
1952- 1961	4,684,832	47.2	12.5	9,926,363	26.4	31.353	37,590,000

3/, 4/, 5/, 6/, 7/, 8/, 9/, 10/ see page 13

TABLE III (Continued)

Period	Arizona			United States			World
	Short Tons	% of U.S. Prod.	% of World Prod.	Short Tons	% of World Prod.	Price ¢ Per Pound	Short Tons
1962	644,242	52.4	12.7	1,228,421	24.2	30.600	5,085,000
1963	660,977	54.5	13.0	1,213,166	23.8	30.600	5,088,000
1964	690,988	55.4	13.0	1,246,780	23.5	31.960	5,297,000
1965	703,377	52.0	12.7	1,351,734	24.4	35.017	5,549,000
1966	739,569	51.7	12.8	1,429,152	24.6	36.170	5,800,000
1967 <u>11/</u>	501,741	52.6	9.0	879,540,64	17.2	38.226*	5,552,000
1968 <u>11/</u>	627,961	52.1	10.4	1,204,621	20.0	41.847**	6,012,000
1969 <u>12/</u>	801,363	51.9	12.1	1,544,579	23.4	47.534	6,612,000
1970 <u>13/</u>	917,918	53.4	13.4	1,719,657	25.2	57.700	6,837,000
1962-							
1970	6,288,136	52.9	12.1	11,892,174	22.9	39.935	51,832,000
1874-							
1970	24,069,000	40.9	13.3	58,843,000	32.6		180,456,000

* Based on first 8 months of 1967

** Based on the last 9 months of 1968.

1/ World War I 1914 --1918.

2/ Post World War I Recession (1921). Lasted about one year.

3/ Depression began in 1930; was at its worst in 1933; gradually improved to 1937.

4/ Recession in 1938. Recovery in 1939 caused by War demand.

5/ World War II began in 1939; highest copper consumption in 1944.

6/ In 1948 and early 1949, copper was being produced in the U.S. at the rate of 68,000 short tons per month, imports ran 40,000 tons per month of blister and refined copper, exports ran 12,000 tons per month, and the price of copper averaged 22.5 cents.

In March 1949, Congress suspended the copper import tax, and in the ensuing months domestic demand fell drastically while imports continued at practically the same rate. The price dropped to 16½ cents. Many mines were forced to close. Production dropped to 56,000 tons from a high of 78,000.

7/ Korean War 1950-53.

8/ Curtailment early in the year (1954), and a series of strikes in August and September caused a loss in production of over 100,000 tons. Consumption in the U.S. was reduced but the reduction was offset by an appreciable rise in consumption in other countries, chiefly in Europe. Result: a short supply of copper at the end of the year.

9/ Recession 1957-58. Import tax restored 7/1/58 after 7 year suspension.

10/ First U.S. troops killed in Vietnam in mid-1959. Record copper production rate first half of 1959 but 75% of U.S. output halted in August by strikes which lasted into 1960.

11/ A major Copper Strike started in the U.S. on July 16, 1967, and ended in March 1968. A loss of 855,000 tons of copper production is estimated as a result of the strike.

12/ 1969, Highest annual production in U.S. history.

13/ 1970, Highest annual production in U.S. history and supply catches up with demand.

TABLE IV

MINE PRODUCTION OF COPPER - UNITED STATES AND WORLD

UNITED STATES PRODUCTION OF SECONDARY (UNALLOYED) COPPER

WORLD PRODUCTION AND CONSUMPTION OF REFINED COPPER
(Primary and Secondary)
(Short Tons)

Year	MINE PRODUCTION 1/				SECONDARY a/ PRODUCTION
	United States b/	Rest of 4/ Free World	Soviet Sphere e/	World 2/	United States 1/
1960	1,080,169	2,883,731	686,100	4,650,000	300,259
1961	1,165,155	2,911,145	773,700	4,850,000	290,805
1962	1,228,421	2,961,479	895,100	5,085,000	301,374
1963	1,213,166	3,037,175	837,659	5,088,000	314,643
1964	1,246,780	3,153,145	897,075	5,297,000	366,197
1965	1,351,734	3,233,897	963,369	5,549,000	462,811
1966	1,429,152	3,350,221	1,020,627	5,800,000	509,084
1967	954,064	3,527,000	1,070,932	5,552,000	423,054
1968	1,204,621	3,654,000	1,153,000	6,012,000	433,041
1969	1,544,579	3,833,000	1,244,000	6,612,000	514,593
1970	1,719,657	3,826,000	1,291,000 c/	6,837,000	521,137

Year	CONSUMPTION 5/				PRODUCTION 5/
	United States 1/	Rest of 4/ Free World	Soviet e/ Sphere 3/	World 3/	World 3/
1960	1,349,896	2,840,034	839,664	5,029,594	4,720,591
1961	1,462,830	3,033,270	1,038,300	5,534,400	5,671,700
1962	1,599,676	2,922,024	1,091,200	5,612,900	5,793,900
1963	1,744,273	3,061,327	1,147,500	5,953,100	5,917,600
1964	1,825,281	3,525,119	1,174,000	6,524,400	6,391,500
1965	2,004,623	3,504,677	1,231,300	6,740,600	6,787,000
1966	2,359,954	3,414,846	1,300,700	7,075,500	7,011,100
1967	1,935,592	3,443,008	1,344,800	6,723,400	6,598,300
1968	1,880,300	3,823,000	1,422,000	7,125,300	7,337,600
1969	2,142,218	4,346,882	1,510,100	7,799,200	7,918,700
1970	2,030,600	4,256,000	1,576,300	7,862,900	8,245,600

1/ U.S. Bur. Mines. a/ Recovered as unalloyed copper. b/ Recoverable content.
e/ Estimated. c/ Soviet Sphere 1970 estimated by taking the Am. Bur. Metal
Stats. increase in Soviet Sphere production over 1969 and adding the figure
to the 1969 U.S. Bur. of Mines estimate.

2/ Ore content, except when reported as recoverable or content of concentrate
or other product

3/ American Bureau of Metal Statistics

4/ Determined by difference

5/ Refined copper - primary and secondary

TABLE V

WORLD MINE PRODUCTION OF COPPER
BY CONTINENTS AND PRINCIPAL COUNTRIES 1/ 6/

	Thousand Short Tons			
	1967 <u>2/</u> <u>6/</u>	1968 <u>2/</u> <u>6/</u>	1969 <u>2/</u> <u>6/</u>	1970 <u>3/</u>
NORTH AMERICA:				
U.S.A. <u>4/</u>	954	1,205	1,545	1,720 <u>a/</u>
Canada <u>4/</u>	613	633	551	674
Mexico	62	67	73	67
Others	13	15	7	16
Total	1,642	1,920	2,176	2,477
SOUTH AMERICA:				
Chile	732	735	769	747
Peru <u>4/</u>	212	234	227	234
Others	10	12	14	14
Total	954	981	1,010	995
EUROPE:				
U.S.S.R. <u>e</u> <u>5/</u>	880	937	992	990
Yugoslavia	70	78	98	100
Bulgaria	39	41	42	40
Finland	32	33	37	34
Poland	<u>e</u> 18	29	53	55
Others	89	101	114	110
Total	1,128	1,219	1,336	1,329
ASIA:				
China, mainland <u>e</u>	88	99	110	100
Cyprus <u>e</u>	17	19	22	21
Japan	131	132	133	131
Philippines	95	122	145	177
Turkey	35	32	30	30
Others	34	36	37	27
Total	400	440	477	486
AFRICA:				
Zambia	730	733	825	765
Congo (Kinshasa)	352	358	399	425
South Africa, Republic of <u>e</u>	165	161	163	165
Others	78	79	83	74
Total	1,325	1,331	1,470	1,429
OCEANIA:				
Australia	103	120	143	152
Fiji (exports)	---	<u>e</u> 1	<u>7/</u>	---
Total	103	121	143	152
TOTAL <u>3/</u>				6,868
TOTALS <u>6/</u>	5,552	6,012	6,612	6,837 <u>b/</u>

1/ Ore content except as indicated, or where content of concentrate or other product of processing is part or all of that which is available. 2/ Source: U.S. Bur. Mines. e Estimate. 3/ Source: Am. Bur. Met. Stats. Not included are outputs of 12 countries which are included in the 1967-8-9 figures. ABMS estimates 34,400 tons for the 12 in 1970. 3a/, 3b/ U.S. Bur. Mines figures. 4/ Recoverable content. 5/ USSR's Asian output included with its European. 6/ Totals do not include unavailable tonnages produced by Angola, Congo (Brazzaville), Cuba, Hungary, Kenya and Malaysia. 7/ Less than 500 tons.

TABLE VI

NEW (PRIMARY) REFINED COPPER PRODUCED IN, IMPORTED BY, AND EXPORTED BY
THE UNITED STATES, AND WITHDRAWN FROM SUPPLY ON DOMESTIC ACCOUNT

1965 - 1970

		Short Tons					
		1965	1966	1967	1968	1969	1970
Produced from U. S. Ores		1,335,660	1,353,087	846,551	1,160,925	1,468,889	1,521,183
Produced from Foreign Ores		<u>376,133</u>	<u>357,897</u>	<u>286,431</u>	<u>276,461</u>	<u>273,926</u>	<u>243,911</u>
Total New Refined Copper		1,711,793	1,710,984	1,132,982	1,437,386	1,742,815	1,765,094
Imports <u>1/</u>		137,443	164,328	330,571	400,278	131,171	123,143
Stocks at beginning of period <u>1/</u>		<u>37,000</u>	<u>35,000</u>	<u>43,000</u>	<u>27,000</u>	<u>48,000</u>	<u>39,000</u>
Total Available Supply		<u>1,886,236</u>	<u>1,910,312</u>	<u>1,506,553</u>	<u>1,864,664</u>	<u>1,921,986</u>	<u>1,936,237</u>
Exports <u>1/</u>		324,965	273,071	159,353	240,745	200,269	221,211
Stocks at end of period <u>1/</u>		<u>35,000</u>	<u>43,000</u>	<u>27,000</u>	<u>48,000</u>	<u>39,000</u>	<u>130,000</u>
Total		<u>359,965</u>	<u>316,071</u>	<u>186,353</u>	<u>288,745</u>	<u>239,269</u>	<u>351,211</u>
Withdrawn on Domestic Acc. (Apparent) <u>2/</u>		<u>1,526,271</u>	<u>1,594,241</u>	<u>1,320,200</u>	<u>1,575,919</u>	<u>1,682,717</u>	<u>1,585,026</u>
Reported Actual Consumption <u>3/</u>		<u>2,004,623</u>	<u>2,359,954</u>	<u>1,935,592</u>	<u>1,880,300</u>	<u>2,142,218</u>	<u>2,043,303</u>

Source : U.S. Bureau of Mines.

1/ May include some copper refined from scrap.

2/ Includes deliveries to Government stockpiles. Figure is of new copper, in so far as could be determined.

3/ Reported by consumer. Includes refined copper from secondary as well as the primary sources.

TABLE VII

IMPORTS OF PRIMARY COPPER INTO THE UNITED STATES

By Major Countries, 1968 - 1970

Totals only, 1965 - 1967

Source	Copper Content (short tons)		
	1968	1969	1970
<u>Ore, Concentrates, Matte</u>			
Canada	7,214	9,181	4,442
Chile	-----	-----	-----
Mexico	219	89	135
Peru	4,637	9,664	8,949
Phillippines	14,544	18,269	18,700
Australia	942	1,662	1,336
Other Countries	3	183	279
Total ore etc.	<u>27,559</u>	<u>39,048</u>	<u>33,841</u>
<u>Blister Copper</u>			
Mexico	5,067	2,816	2,504
Chile	136,320	100,768	97,952
Peru	89,033	107,385	94,868
South Africa, Republic of	38,243	25,160	28,946
Other Countries	2,055	1,820	146
Total Blister	<u>270,718</u>	<u>237,949</u>	<u>224,416</u>
<u>Refined Cathodes and Shapes</u>			
Canada	135,115	84,941	91,814
Chile	42,860	21,470	16,928
West Germany	55,263	2,574	(a)
Japan	(a)	(a)	13,132
Peru	18,525	4,372	6,209
United Kingdom	22,572	3,950	59
Zambia	22,898	999	1,102
Other Countries	103,045	12,865	2,899
Total Refined	<u>400,278</u>	<u>131,171</u>	<u>132,143</u>
Total Primary Copper Imports	698,555	408,168	390,400
Less: Primary Copper Exports (Ore, conct's., matte, blister & refined)	<u>321,484</u>	<u>205,786</u>	<u>290,554</u>
<u>Net Imports</u>	<u>377,071</u>	<u>202,382</u>	<u>99,846</u>
	<u>1965</u>	<u>1966</u>	<u>1967</u>
Primary Copper Imports	506,936	565,118	632,864
Less: Primary Copper Exports	<u>340,475</u>	<u>275,220</u>	<u>219,045</u>
<u>Net Imports</u>	<u>166,461</u>	<u>289,898</u>	<u>413,819</u>

Source: U.S. Bureau of Mines.

(a) Not listed separately.

TABLE VIII
EXPORTS OF PRIMARY COPPER FROM THE UNITED STATES
(Copper Content - Short Tons)

<u>Destination</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>
Argentina	273	191	693
Belgium - Luxembourg	25,339	3,962	10,507
Brazil	31,335	17,065	24,688
Canada	15,801	21,533	14,904
Chile	8,647	3	(1)
France	30,403	17,055	18,623
Germany, West	38,269	28,717	29,047
India	15,216	13,010	14,687
Italy	39,048	38,013	39,089
Japan	32,772	14,969	54,659
Korea, Republic	(a)	(a)	4,497
Mexico	1,523	18	2,642
Netherlands	9,294	8,372	20,562
Peru	4,569	3	2
Phillippines	(a)	(a)	1,810
Spain	10,890	2,705	4,901
Sweden	3,831	4,605	3,973
Switzerland	2,313	2,350	2,431
Taiwan	(a)	(a)	1,122
United Kingdom	39,090	24,436	25,168
Yugoslavia	5,073	2,713	14,593
<u>Other Countries</u>	<u>7,798</u>	<u>6,069</u>	<u>1,956</u>
Ore, Concts., Matte, Blister	80,739	5,517	69,343
<u>Refined Ingots, Bars, Etc.</u>	<u>240,745</u>	<u>200,269</u>	<u>221,211</u>
Total Exports of Primary Copper	321,484	205,786	290,554

Source: U.S. Bureau of Mines. (a) Not listed separately. (1) Less than $\frac{1}{2}$ ton.

**STOCKS OF COPPER AS REPORTED BY THE
U.S. BUREAU OF MINES AND THE COPPER INSTITUTE**

End of	REFINED			
	<u>In U.S.A.</u> U.S.B.M. <u>1/</u>	<u>Copper Inst. 2/</u>	<u>Outside U.S.A.</u> Copper Inst.	<u>In U.S.A.</u> U.S.B.M.
1960	49,000	79,755	332,479	236,000
1961	71,000	117,441	358,856	246,000
1962	52,000	76,934	394,143	252,000
1963	37,000	45,594	277,303	246,000
1964	35,000	60,811	327,723	270,000
1965	43,000	65,707	293,167	220,000
1966	27,000	55,350	272,202	272,000
1967	48,000	56,609	316,090	291,000
1968	39,000	45,943	234,739	340,000
1969	130,000	160,623	318,562	
1970				

1/ Stocks at primary U.S. smelters and refineries.

2/ Stocks at refineries, on consignment at end of year, include refined copper from whatever source.

3/ Blister and materials in process of refining, as reported by the U.S.B.M. Includes copper in transit from U.S. smelters to U.S. refineries.

TABLE X

COPPER FABRICATORS' STOCKS AND SALES POSITION

(Copper Content in Short Tons)

End of	<u>1/</u> Stocks	Unfilled Purchase Contracts	Total Supplies	Less <u>2/</u> Working Stocks	Less Unfilled Sales Contracts	Available for Sale or Deficit(-)
1960	456,094	75,222	531,316	370,055	126,260	35,001
1961	461,252	89,745	550,997	361,286	144,344	45,367
1962	465,592	81,297	546,889	385,239	138,089	23,561
1963	474,875	100,357	575,232	382,692	163,558	28,982
1964	429,989	107,244	537,233	381,677	225,366	-69,810
1965	462,519	129,349	591,868	395,396	288,681	-92,209
1966	558,599	134,732	693,331	407,345	361,559	-75,573
1967	479,572	98,716	578,288	415,765	269,474	-106,951
1968	514,553	128,919	643,472	420,186	273,469	-50,183
1969	502,300	99,232	601,532	412,734	256,299	-67,501
1970	515,096	86,925	602,021	438,925	156,007	7,089

Source: The United States Copper Association.

1/ Primary fabricated shapes, metal in process, and small amounts held for fabricators.

2/ Estimated copper required for normal operations.

TABLE XI

REFINED COPPER CONSUMED IN THE UNITED STATES 1966 - 1970

BY CLASS OF CONSUMER ^{1/}

(In short tons)

Consumer	Cathodes	Wire Bars	Ingots & Ingots Bars	Cakes and Slabs	Billets	Other	Total
<u>1967:</u>							
Wire Mills	6,058	1,226,370	6,964	-----	-----	844	1,240,236
Brass Mills	152,310	28,090	115,640	153,146	200,906	282	650,374
Chemical Plants	-----	-----	1,386	-----	-----	1,014	2,400
2nd'y Smelt.	4,908	-----	3,816	-----	-----	254	8,978
Miscellaneous ^{2/}	3,557	173	21,331	^{3/}	1,119	7,424	33,604
Total	166,833	1,254,633	149,137	153,146	202,025	9,818	1,935,592
<u>1968:</u>							
Wire Mills	16,632	1,164,933	6,716	-----	-----	993	1,189,274
Brass Mills	141,836	26,610	140,658	122,367	220,504	475	652,450
Chemical Plants	-----	-----	520	-----	-----	1,123	1,643
2nd'y Smelt.	3,583	-----	2,583	-----	-----	188	6,354
Miscellaneous ^{2/}	2,460	134	19,150	^{3/}	1,083	7,752	30,579
Total	164,511	1,191,677	169,627	122,367	221,587	10,531	1,880,300
<u>1969:</u>							
Wire Mills	50,631	1,237,939	^{4/}	^{4/}	-----	7,746	1,296,316
Brass Mills	183,644	31,847	152,529	172,264	256,714	128	797,126
Chemical Plants	-----	-----	471	-----	-----	2,624	3,095
2nd'y Smelt.	3,866	-----	3,025	-----	-----	67	6,958
Miscellaneous ^{2/}	3,008	1,014	23,777	238	1,659	9,027	38,723
Total	241,149	1,270,800	179,802	172,502	258,373	19,592	2,142,218
<u>1970:</u>							
Wire Mills	85,925	1,245,470	^{4/}	-----	-----	7,345	1,338,740
Brass Mills	154,174	27,862	120,880	156,770	200,785	112	660,583
Chemical Plants	-----	-----	578	-----	-----	1,663	2,241
2nd'y Smelt.	3,286	-----	3,749	-----	-----	7	7,042
Miscellaneous ^{2/}	3,601	2,431	20,514	282	1,262	6,607	34,697
Total	246,986	1,275,763	145,721	157,052	202,047	15,734	2,043,303

^{1/} U.S. Bureau of Mines.^{2/} Foundries and miscellaneous manufacturers including iron and steel plants, primary smelters producing alloys other than copper, consumers of copper powder and copper shot.^{3/} Included with "Billets" to avoid disclosing individual company confidential data.^{4/} Included with "Wire Mills, Other," to avoid disclosing individual company data.

TABLE XII

UNITED STATES PRODUCTION AND CONSUMPTION OF COPPER

In Short Tons

Year	Production			Consumption	Total Production As % of Consumption
	Mine 1/	Secondary 2/	Total	Total 3/	
1950	909,343	260,704	1,170,047	1,424,434	82.2
1951	928,330	186,462	1,114,792	1,416,865	78.7
1952	925,359	173,904	1,099,263	1,479,732	74.3
1953	926,448	242,855	1,169,303	1,494,215	78.3
1954	835,472	212,241	1,047,713	1,254,729	83.5
1955	998,570	246,928	1,245,498	1,502,004	82.9
1956	1,104,156	273,060	1,377,216	1,521,389	90.5
1957	1,086,141	248,015	1,334,156	1,347,815	99.0
1958	979,329	255,121	1,234,450	1,250,677	98.7
1959	824,846	261,588	1,086,434	1,463,031	74.3
Total	9,517,994	2,360,878	11,878,872	14,154,891	
Average 1950-59	951,799	236,088	1,187,887	1,415,489	83.9
1960	1,080,169	300,259	1,380,428	1,349,896	102.3
1961	1,165,155	290,805	1,455,960	1,462,830	99.5
1962	1,228,421	301,374	1,529,795	1,599,676	95.6
1963	1,213,166	314,643	1,527,809	1,744,273	87.6
1964	1,246,780	366,197	1,612,977	1,825,281	88.4
1965	1,351,734	462,811	1,814,545	2,004,623	90.5
1966	1,429,152	509,084	1,938,236	2,359,954	82.1
1967	954,064	423,054	1,377,118	1,935,592	71.1
1968	1,204,621	433,041	1,637,662	1,880,300	87.1
1969	1,544,579	514,593	2,059,172	2,142,218	96.1
Total	12,417,841	3,915,861	16,333,702	18,304,643	
Average 1960-69	1,241,784	391,586	1,633,370	1,830,464	89.2
1970	1,719,657	521,137	2,240,794	2,043,303	109.7

Source: U.S. Bureau of Mines.

1/ Recoverable copper.

2/ Copper recovered as unalloyed copper.

3/ Refined copper in cathodes, wire bars, etc.; reported by consumers.

TABLE XIII

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING

IN THE UNITED STATES AND ARIZONA

1965-1970 and Base Period 1947-1949

Period	All Employees		Production Workers							
	Ave. No.		Ave. No.		Ave. Weekly		Ave. Weekly		Ave. Hourly	
	(Thousands)		(Thousands)		Earnings		Hours		Earnings	
	1/ Ariz.	2/ U.S.	3/ Ariz.	4/ U.S.	5/ Ariz.	U.S.	6/ Ariz.	U.S.	7/ Ariz.	U.S.
1947-49	10.7	26.9	8.7 ^a	24.2	\$ 64.06	\$ 62.58	44.8	44.7	\$1.43	\$1.40
1965	14.2	30.0	11.7	24.7	146.25	136.71	45.0	43.4	3.25	3.15
1966	15.2	31.9	12.4	26.2	150.06	140.07	45.2	43.5	3.32	3.22
1967	12.2	25.4	9.0	19.1	141.43	140.18	42.6	43.0	3.32	3.26
7 Mos.	15.7	33.2	12.4	27.3	149.41	142.76	44.6	43.5	3.35	3.28
5 Mos.	7.3	14.4	3.8	7.5	130.05	127.95	39.9	40.4	3.27	3.16
1968	13.8	28.1	11.1	21.3	149.21	161.68	43.0	47.0	3.47	3.44
3 Mos.	7.5	14.9	4.3	8.3	118.17	129.06	36.7	40.2	3.22	3.21
9 Mos.	15.8	32.5	13.0	25.6	160.11	165.28	45.1	47.8	3.55	3.46
1969	17.0	33.7	13.9	26.9	166.50	169.00	44.4	46.3	3.75	3.65
1970	18.8	37.0	14.9	29.5	173.01	175.67	43.8	44.7	3.95	3.93
1965-70	15.2	31.0	12.2	24.6	154.41	153.89	44.0	44.7	3.51	3.44

	Production Workers				Copper Ore ^{10/} Shipped or Treated	
	Ave. Earnings per		Aggregate Man-hours		(Thousand Short Tons)	
	Man per Year ^{8/}		(Thousands) ^{9/}			
	Ariz.	U.S.	Ariz.	U.S.	Ariz.	U.S.
1965	\$7,605	\$7,109	27,378	55,743	92,860	173,286
1966	7,803	7,284	29,145	59,264	101,558	186,966
1967	7,354	7,284	19,937	42,708	74,289	127,066
1968	7,759	8,407	24,820	52,057	101,294	170,054
1969	8,658	8,788	32,092	64,764	127,849	223,752
1970	8,997	9,135	33,936	68,570	150,241	257,729
Average						
1965-70	8,029	8,002	27,885	57,184	108,015	189,809
Average						
1947-49	3,331	3,254	20,268	56,250	38,083	82,875

(continued next page)

TABLE XIII (continued)

	Copper in Copper Ore <u>12/</u> (Recoverable Content) (Thousand pounds)		Production Workers			
	Ariz.	U.S.	Copper Ore Mined per Man-hour (Tons)		Recoverable Copper Mined per Man-hour (Pounds)	
	Ariz.	U.S.	Ariz.	U.S.	Ariz.	U.S.
1965	1,398,092(a)	2,595,610	3.392	3.109	51.066	46.563
1966	1,474,447(b)	2,805,136	3.485	3.155	50.590	47.333
1967	1,000,572	1,866,087	3.726	2.975	50.187	43.694
1968	1,252,919	2,349,046	4.081	3.267	50.480	45.124
1969	1,593,544	3,021,590	3.984	3.455	49.656	46.655
1970	1,826,734	3,368,957	4.427	3.759	53.829	49.132
Average						
1965-70	1,424,385	2,667,738	3.874	3.319	51.081	46.651
Average						
1947-49	723,354	1,587,038	1.878	1.473	35.689	28.214

1/ These estimates of "All Employees," made by the Employment Security Commission of Arizona, in cooperation with the U.S. Bureau of Labor Statistics, include all full and part time wage and salary workers who were employed in copper mining in any part of the pay periods which included the 12th of each month of the year. See note 2, Table XX for explanation of differences between numbers of "Covered Employees" in Arizona Copper Mining in that table and those in this Table XIII for "All Employees", for the respective years.

2/ Estimates of "All Employees" in the United States industry division, "Mining-Copper Ores," which excludes copper smelting. The estimates have been made by the U.S. Bureau of Labor Statistics with the cooperation of the 50 states, and are based upon monthly samplings similar to those in 1/ above, adjusted periodically to census benchmarks.

3/ Estimates of production (non-supervisory) workers in Arizona Copper Mining, based upon samplings as in Note 1/.

3/a/ Estimate for 1947-49 is based upon assumption of the same ratio of "production" to "all" employees as that for the year 1949. The numbers of "All Employees" for the years 1947 to 1949 varied less than 2 per cent from the average of 10,700 for the three years.

4/ Estimates of "Production or Non-supervisory Workers" in U.S. "Mining-Copper Ores," made as in 3/ above.

5/ Figures for "Average Weekly Earnings" are products of the figures for "Average Weekly Hours" and "Average Hourly Earnings" for the respective years.

6/ The gross number of hours worked by production (non-supervisory) and related workers in a monthly sample period divided by the average number of the same workers in the corresponding period, provides the basis for the estimate of "average weekly hours" for the month. Averages for a year or period of months are arithmetical averages of the estimates for the months involved.

(continued next page)

TABLE XIII (continued)

- 7/ Gross payroll aggregates, exclusive of irregular bonuses and other pay not earned in a sample pay period, are divided by gross man-hour aggregates of production and related workers for the period in order to determine average hourly earnings. Average hourly earnings for a year or period of months are arithmetical averages of monthly estimates based on the results of the respective sample periods.
- 8/ "Average Weekly Earnings" times 52 weeks.
- 9/ Number of production workers times "Average Weekly Hours" times 52.
- 10/ Copper ore mined and shipped or treated by concentration, smelting or leaching.
- 11/ Recoverable copper from copper ore (Note 10/) and from copper precipitates from dump and in-place leaching.
- (a) Exclusive of some precipitates from Nevada, California, and Utah.
 - (b) Exclusive of some precipitates from Nevada and California.
- 12/ Copper from precipitates is held to be largely a by-product of copper ores, similar to the gold, silver, molybdenum, and other metals recovered from copper ores. In previous years, copper from precipitates has not been included in our tables similar to this one. For years prior to 1968, our tables have had added to the recoverable copper from ores a figure for "equivalent copper" computed by dividing the combined value of the by-product gold and silver recovered from the ore, by the average price per pound of copper. The rapid increase in value of the annual recovery of molybdenum has made it rather pointless to continue this somewhat equivocal figure for "equivalent copper" without including the moly. In recent years copper precipitates have yielded value greater than that of the other by-products combined. They require some labor from "Production Workers," and the inclusion of copper from precipitates as reported by the Bureau of Mines has some justification although its labor requirement is minor. The inclusion removes most if not all of the justification for a figure of "equivalent copper" - even with molybdenum added in its calculation.

TABLE XIV

EMPLOYMENT, WEEKLY EARNINGS, WEEKLY HOURS, HOURLY EARNINGS,

IN COPPER MINING IN ARIZONA AND THE UNITED STATES

1947 - 1970

Year	All Employees		Production Workers							
	Ave. No. (Thousands)		Ave. No. (Thousands)		Ave. Weekly Earnings		Ave. Weekly Hours		Ave. Hourly Earnings	
	1/ Ariz.	2/ U.S.	3/ Ariz.	4/ U.S.	5/ Ariz.	U.S.	6/ Ariz.	U.S.	7/ Ariz.	U.S.
1947	10.7	27.5		24.7	\$ 59.40	\$ 59.02		45.4		\$1.30
1948	10.9	27.3		24.7	65.99	65.49		45.8		1.43
1949	10.5	25.9		23.2	66.45	63.34	44.3	42.8	1.50	1.48
Average										
1947-49	10.7	26.9	8.7a/	24.2	64.06	62.58	44.8	44.7	1.43	1.40
1950	9.5	25.8		22.9	75.80	71.44	46.5	45.5	1.63	1.57
1951	10.1	25.9		22.7	83.00	77.52	47.7	46.7	1.74	1.66
1952	10.7	26.5		23.0	90.24	85.01	47.0	46.2	1.92	1.84
1953	11.4	28.6		24.6	96.20	90.94	46.7	46.4	2.06	1.96
1954	11.7	27.9		23.9	96.49	86.63	45.3	43.1	2.13	2.01
1955	11.8	28.9		24.5	104.81	95.00	47.0	44.6	2.23	2.13
1956	13.4	33.3		28.4	111.86	99.23	47.0	44.1	2.38	2.25
1957	14.0	32.3		27.1	106.68	96.88	43.9	41.4	2.43	2.34
1958	13.5	27.7		22.7	95.52	94.17	39.8	39.4	2.40	2.39
1959	11.1	23.3		18.5	106.68	105.90	42.5	42.7	2.51	2.48
1960	13.0	28.3		22.6	116.24	116.77	43.7	44.4	2.66	2.63
1961	13.3	29.0		23.8	126.62	119.03	44.9	43.6	2.82	2.73
1962	13.6	28.5		23.4	129.36	120.70	44.3	42.8	2.92	2.82
1963	13.3	27.7		22.7	133.80	124.56	44.6	43.1	3.00	2.89
1964	13.3	27.1		22.1	140.85	130.42	45.0	42.9	3.13	3.04
1965	14.2	30.0	11.7	24.7	146.25	136.71	45.0	43.4	3.25	3.15
1966	15.2	31.9	12.4	26.2	150.06	140.07	45.2	43.5	3.32	3.22
1967	12.2	25.4	9.0	19.1	141.43	140.18	42.6	43.0	3.32	3.26
1968	13.8	28.1	11.1	21.3	149.21	161.68	43.0	47.0	3.47	3.44
1969	17.0	33.7	13.9	26.9	166.50	169.00	44.4	46.3	3.75	3.65
1970	18.8	37.0	14.9	29.5	173.01	175.67	43.8	44.7	3.95	3.93

1/, 2/, 3/, 3/a, 4/, 5/, 6/, 7/ See respective footnotes for Table XIII, pages 23, 24

TABLE XV

UNITED STATES COPPER MINING - OUTPUT OF COPPER ORE; AMOUNT AND VALUE OF
COPPER, GOLD, AND SILVER RECOVERED THEREFROM 1/

Year	Copper Ore Tons	Gold Troy Ounces Value	Silver Troy Ounces Value <u>8/</u>	Copper <u>2/</u> Pounds Value	Lbs./Ore Ton Ave. ¢/lb. <u>3/</u>	Value of Copper, Gold and Silver
1947- 1949	82,875,491	479,589 \$16,785,615	7,785,382 \$ 5,660,284	1,511,500,640 \$ 314,664,195	18.2 20.818	\$ 337,110,094
1961	142,721,798	532,215 \$18,627,525	10,385,661 \$ 9,601,544	7,145,224,433 \$ 641,872,603	15.0 29.921	\$ 670,101,672
1962	150,216,710	483,243 \$16,913,505	10,944,522 \$11,874,806	2,239,326,000 \$ 685,233,756	14.9 30.600	\$ 714,022,067
1963	146,449,540	438,537 \$15,348,795	10,309,897 \$13,187,595	2,178,498,800 \$ 666,620,633	14.9 30.600	\$ 695,157,023
1964	155,200,464	430,630 \$15,072,050	11,470,890 \$14,831,861	2,280,880,781 \$ 688,734,761	14.7 31.960	\$ 718,638,672
1965	173,286,198	567,531 \$19,863,585	12,801,638 \$16,552,518	2,430,879,000 \$ 851,220,899	14.0 35.017	\$ 887,637,002
1966	186,966,042	547,327 \$19,156,445	13,230,411 \$17,106,921	2,499,863,100 \$ 904,200,483	13.37 36.170	\$ 940,463,849
1967	127,066,097	321,398 \$11,248,930	8,351,423 \$12,942,033	1,608,078,200 \$ 614,703,973	12.66 38.226 <u>4/</u>	\$ 638,894,936
1968	170,054,065	405,863 \$15,934,200 <u>7/</u>	9,532,341 \$20,443,000 <u>8/</u>	2,055,156,700 \$ 860,021,400	12.09 41.847 <u>5/</u>	\$ 896,398,600
1969	223,751,510	579,297 <u>6/</u> \$24,440,500 <u>7/</u>	13,581,516 <u>6/</u> \$24,320,000 <u>8/</u>	2,691,376,400 \$1,279,318,900	12.03 47.534	\$1,328,079,400
1970	257,729,000	552,140 <u>6/</u> \$21,080,600 <u>7/</u>	15,728,600 <u>6/</u> \$27,852,500 <u>8/</u>	3,025,021,000 \$1,745,437,000	11.74 57.700	\$1,794,370,000

1/ U.S. Bur. Mines. 2/ Doesn't include precipitate copper from dump and in-place leaching. 3/ E/MJ average price, domestic, f.o.b. refinery. 4/ Based on first 8 months of 1967. 5/ Based on last 9 months of 1968. 6/ Does not include gold or silver recovered from vat or heap leaching of copper ores. 7/ At average domestic gold prices in "Metal Statistics, 1971": year 1968, \$39.26 per oz.; 1969, \$42.19; 1970, \$36.39. 8/ At average E/MJ N.Y. market price for silver .999 fine.

ARIZONA SECTION

CONTENTS

	<u>Page</u>
Arizona's Copper Industry	28-30
Arizona's Copper Mining Output of Copper Ore; Amount and Value of Copper, Gold, Silver, and Moly Recovered therefrom, 1947-1949 and 1961- 1970	TABLE XVI 31
Mine Production of Copper, Gold, Silver, Lead and Zinc 1858-1970	TABLE XVII 32
Mine Production of Copper, Gold, Silver, Lead and Zinc in 1970, by classes or Ore	TABLE XVIII 33
Production of Large Copper Mines in 1969 and 1970	TABLE XIX 34-35
Covered Employment and Wages 1947-1970	TABLE XX 36
Employment and Wages in Industries Covered by Social Security, 1947-1949 and 1968-1970	TABLE XXI 37-38
Mineral Production in Arizona in 1970	TABLE XXII 39
Value of Mineral Production, by counties, 1970	TABLE XXIII 40

ARIZONA'S COPPER MINING

Arizona's mines produced 917,918 tons of recoverable copper in 1970, more than ever before, and more than all of the other states combined. Her increase over 1969 of 116,555 tons was two-thirds of the Nation's increase of 175,078 tons. Her 1970 production was 35 percent above the 1966 record year and 14.5 percent above the 1969. The value of the 1970 production, \$1,059,277,000 was 39 percent above 1969, due partly to the higher prices previously mentioned.

Mines operated by five companies produced 71 percent of Arizona's copper output. They (with numbers of their producing mines and percentages of the State's output) are: Phelps Dodge (4, 28%); Magma Copper (2, 12%); Kennecott (1, 12%); Anaconda (1, 10%); and Duval (3, 9%). Asarco, Pima Mining, Inspiration, Miami Copper, and Bagdad, accounted for 27 percent; and the remaining 2 percent was mostly accounted for by Big Hole Mining, Cyprus Mines, El Paso Natural Gas, Mc-Alester Fuel and Ranchers Exploration and Development companies.

Only an average of 11.3 pounds of copper were recovered per ton of the 150 million tons of copper ore mined in 1970. This is the lowest for any previous year and compares with 11.6 pounds in 1969, 14.1 in 1965, and 15.0 in 1960. Improvements in equipment and technology, plus increased recovery of molybdenum, especially from newer mines, and higher prices, allowed the lower grade ores to be mined.

The gross value of Arizona's 1970 copper output was 90.8 percent of that of all minerals produced in the State. The copper ores were the source of: 93.3 percent of the State's copper production (0.5% came from other ores and 7.2% from copper precipitates from dump and in-place leaching of copper bearing materials); all of the state's molybdenum output valued at \$26.7 million; 98 percent of the gold, valued at \$3.9 million; and 97 percent of the silver, valued at 12.6 million. The combined value of the copper, moly, gold and silver recovered from the copper ores was \$1,020,839,000, or 87.5 percent of the value of all minerals produced

by the state.

The ten larger companies which produced 98 percent of Arizona's production, operated 16 large open pits and 3 large underground mines. Among the 25 leading copper mines in the Nation were Arizona's Morenci Mine of Phelps Dodge, 2nd to the first place Utah Copper Mine of Kennecott; Kennecott's Ray Mine, 3rd; Magma's San Manuel, the largest underground mine, 4th; Anaconda's Twin Buttes mine, 6th; Pima Mining's Pima Mine, 9th; Phelps Dodge's New Cornelia and Copper Queen-Lavender Pit Mines, 10th and 11th; Inspiration, 13th; Asarco's Mission, 14th; Duval's Sierrita, Mineral Park, and Esperanza, 18th, 19th and 21st; Miami's Copper Cities, 20th; Asarco's Silver Bell, 22nd; Magma's Superior, 23rd; and Bagdad, 24th; 16 of the 25. The ore from the 16 pits of the ten larger companies yielded 10.3 pounds of copper per ton. That from the 3 underground mines yielded 16.5 pounds per ton. The pits produced 83 percent of the copper recovered from ores. Eleven of the mines produced a total of 133,827,731 pounds of precipitate copper from dump or in-place leaching, including 5,158,961 pounds of cathode copper recovered by Bagdad's new \$5 million solvent extraction electrowinning plant. Ore and copper production of the major Arizona copper mines in 1969 and 70 are given in Table XIX of this report.

The Twin Buttes Mine of Anaconda had its first full year of production in 1970 and exceeded its earlier expectation of 60,000 tons of copper per year by 46 percent, due principally to high grade of ore mined. Duval's new Sierrita property was dedicated in June and produced about half of planned annual output in the year. Its plans for expansion to 84,000 ore tons per day were announced. Pima Mining produced slightly more copper in 1970 and announced plans for expansion of capacity of its Pima mine to 53,000 ore tons per day and 160 million pounds per year of copper in concentrates compared with about 130 million in 1970. Most of the other mines of the major companies showed small declines in production, except Kennecott, which increased its copper production 23 percent.

Production in Arizona was slowed by an Asarco declaration in May of force

majeure and reduction of up to 15 percent in its intake of concentrate shipments to its smelters at El Paso, Texas, Hayden, Arizona and Tacoma, Washington, because of changes required by new statutory limitations on sulphur emissions. In its October issue, E/MJ reported Kennecott's shipping 45,000 tons of concentrates from inventory at Hayden to Germany and Japan; and Phelps Dodge's shipment of 15,000 tons to Morenci concentrates, accumulated during smelter changes, to Japan. Other export shipments were caused by Asarco's force majeure. All of the companies operating the 8 copper smelters in the State, struggled to comply with new emission regulations, at no small cost. Industry research sought new, feasible hydro-metallurgical processes or pyro-metallurgical methods which gave any promise of meeting drastic regulations calling for elimination from smelter discharge into the outdoor atmosphere of 90 percent of the sulphur input to their smelters. Prospective costs of new emission control facilities and of their continuing operation and maintenance, were staggering, especially so because of uncertainty of their success in meeting sulphur limitations.

During the year, Hecla Mining Co. continued its development of the Lakeshore mine; Magma pursued its extensive expansion projects at Superior and San Manuel; and Phelps Dodge deferred development of the Metcalf property in favor of less expensive expansion of its Tyrone mine in New Mexico to compensate for phase-out of production from its Lavender Pit, and continued underground work to get to the orebody at its property near Safford.

Copper exploration continued to be active in the State and several sizable, low-grade copper discoveries were announced by corporations before being adequately explored and determined to be feasible for development. Problems of public land withdrawals from mining, and of proposed or actual changes in laws and regulations affecting mining, continued to be troublesome.

1970 was a profitable year for Arizona copper, but producers were not happy with their outlook for the near future.

TABLE XVI
ARIZONA COPPER MINING - OUTPUT OF COPPER ORE; AMOUNT AND VALUE OF
COPPER, GOLD, SILVER AND MOLYBDENUM RECOVERED THEREFROM 1/

Year	Copper Ore Tons	Gold Troy Ounces Value	Silver Troy Ounces Value	Molybdenum 2/ Lbs. 1/ Thous- Value) ands	Copper 3/ Pounds Value	Lbs./Ore Ton Ave./clb.	Value of Copper, Gold, Silver & Molybdenum
1947 -	38,082,754	79,612	2,603,485	474	723,353,767	19.0	\$
1949		\$2,786,420	\$1,892,838	349 5/	\$ 150,588,843	20.818	\$155,617,101
1961	71,918,001	129,184	4,380,458	4,878	1,092,360,900	14.6	
		\$4,521,440	\$4,049,690	\$6,232	\$ 326,845,305	29.921	\$341,648,435
1962	78,868,147	117,362	4,571,370	4,412	1,200,945,700	15.2	
		\$4,107,670	\$4,959,936	\$5,864	\$ 367,489,384	30.600	\$382,420,990
1963	80,615,132	121,177	4,494,239	5,553	1,217,337,700	15.1	
		\$4,241,195	\$5,743,132	\$7,584	\$ 372,505,336	30.600	\$390,073,663
1964	86,132,039	133,983	4,915,362	6,296	1,279,898,700	14.9	
		\$4,689,405	\$6,355,563	\$9,532	\$ 409,055,625	31.960	\$429,632,593
1965	92,859,535	133,830	5,352,850	9,399	1,308,809,700	14.1	
		\$4,684,050	\$6,921,235	\$15,880	\$ 458,305,893	35.017	\$485,791,178
1966	101,558,298	127,431	5,595,644	10,161	1,359,481,200	13.39	
		\$4,460,085	\$7,235,168	\$17,812	\$,491,724,350	36.170	\$521,231,603
1967	74,289,203	66,933	3,996,587	9,261	901,853,500	12.14	
		\$2,342,655	\$6,193,431	\$15,385	\$ 344,742,519	38.226	\$368,663,605
1968	101,293,963	89,419	4,697,394	12,127	1,146,313,600	11.32	
		\$3,510,600 7/	\$10,074,000	\$19,207	\$ 479,697,900	41.847	\$512,489,500
1969	127,848,828	108,718 6/	5,899,843 6/	12,699	1,477,520,000	11.56	
		\$4,586,800	\$10,564,700	\$20,947	\$ 702,324,400	47.534	\$738,422,900
1970	150,240,842	107,292 6/	7,130,261 6/	15,672	1,694,294,000	11.28	
		\$3,904,400 7/	\$12,626,400	\$26,700	\$ 977,608,000	57.700	\$1,020,838,800

1/ U.S. Bureau of Mines.

2/ Molybdenum content of recovered concentrate.

3/ Does not include precipitate copper from dump and in-place leaching.

4/ E/MJ average prices, domestic, f.o.b. refinery.

5/ Calculated from values of molybdenum concentrates shipped from U. S. Mines.

6/ Does not include gold or silver recovered from vat or heap leaching of copper ores.

7/ At average gold prices; See note 7/, Table XV.

8/ At average E/MJ N. Y. market price for .999 fine silver.

TABLE XVII

ARIZONA MINE PRODUCTION OF COPPER, LEAD, ZINC, GOLD AND SILVER

1858 - 1970 Inclusive - In Terms of Recoverable Metals

	COPPER		LEAD		ZINC	
	<u>Short Tons</u>	<u>Value (thousands)</u>	<u>Short Tons</u>	<u>Value (thousands)</u>	<u>Short Tons</u>	<u>Value (thousands)</u>
1874 - 1969	23,152,662	\$11,032,412	651,522	\$129,093	1,029,834	\$251,793
1970	917,918	1,059,277	285	89	9,618	2,947
Total 1874 - 1970	24,070,580	\$12,091,689	651,807	\$129,182	1,039,452	\$254,740

	GOLD		SILVER		COPPER, LEAD, ZINC, GOLD and SILVER
	<u>Ounces</u>	<u>Value (thousands)</u>	<u>Ounces</u>	<u>Value (thousands)</u>	<u>Combined Value</u>
1858 - 1969	13,751,290	\$ 369,922	409,191,809	\$ 427,420	\$12,130,640,000
1970	109,853	3,998	7,330,417	12,981	1,079,292,000
Total 1858 - 1970	13,861,143	\$373,920	416,522,226	\$ 360,401	\$13,209,932,000

Est. Value of Other Metals & Non-Metallics Produced thru 1969

\$967,860,000

Value of Other Metals & Non-Metallics Produced in 1970

87,375,000

Est. Value of Other Metals & Non-Metals Produced thru 1970

1,055,235,000

Grand Total Estimated Value of Arizona Mineral Production thru 1970

\$14,265,167,000

Source: U.S. Bur. Mines; U. S. Geological Survey; Ariz. Bur. Mines

TABLE XVIII

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD, AND ZINC IN ARIZONA IN 1970, BY CLASSES OF ORE OR OTHER SOURCE MATERIALS, IN TERMS OF RECOVERABLE METALS

Source	Number of mines <u>1/</u>	Material sold or treated (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Dry gold	1	144	65	85	<u>2/</u>	-	-
Dry gold-silver	6	60,682	451	12,753	479	1	-
Dry silver	8	28,917	55	82,109	1	1	-
Total	15	89,743	571	94,947	480	2	-
Copper	51	150,240,842	107,292	7,130,261	847,147	2	50
Copper-Zinc	3	130,953	249	58,408	3,760	210	9,402
Lead	5	360	1	2,277	<u>2/</u>	31	2
Lead-Zinc & Zinc <u>3/</u>	3	2,460	2	1,025	9	37	163
Total	64	150,374,615	107,544	7,191,971	850,916	280	9,618
Other lode material:							
Gold-silver & silver tailings	2	62,646	839	31,503	104	-	-
Copper cleanup	<u>4/</u>	701	-	1,964	164	-	-
Copper precipitates	14	87,856	-	-	66,220	-	-
Copper tailings & lead tailings	2	20,700	899	10,032	32	3	<u>2/</u>
Total	18	171,903	1,738	43,499	66,521	3	<u>2/</u>
Grand Total	82	150,636,261	109,853	7,330,417	917,918	285	9,618

1/ Detail will not necessarily add to totals because some mines produce more than one class of material.

2/ Less than 1/2 unit.

3/ Combined to avoid disclosing individual company data.

4/ From properties not classed as mines.

Source: U.S. Bureau of Mines

TABLE XIX

COPPER PRODUCTION RECORD OF LARGE ARIZONA COPPER MINES

YEARS 1969 and 1970

<u>Company</u> <u>Mine</u>	<u>1969</u>		<u>1970</u>	
	<u>Tons</u> <u>Copper Ore</u> <u>Mined</u>	<u>Pounds</u> <u>Copper</u> <u>Recovered</u>	<u>Tons</u> <u>Copper Ore</u> <u>Mined</u>	<u>Pounds</u> <u>Copper</u> <u>Recovered</u>
<u>ANACONDA:</u>				
Twin Buttes	<u>3,014,557</u>	<u>22,280,200</u>	<u>8,763,095</u>	<u>175,751,527</u>
<u>ASARCO:</u>				
Silver Bell	3,874,100	40,076,810	3,787,700	38,385,030
Precipitate Copper		5,226,103		5,614,013
Mission	7,939,500	97,322,040	8,038,900	92,742,767
San Xavier - Si. flux	<u>69,684</u>	<u>1,050,694</u>	<u>63,831</u>	<u>801,801</u>
Total	<u>11,883,284</u>	<u>143,675,647</u>	<u>11,890,431</u>	<u>137,543,611</u>
<u>BAGDAD:</u>				
Bagdad	2,030,112	20,467,794	2,028,265	22,111,515
Precipitate Copper		14,780,613		7,281,397
Cathode Copper				<u>5,158,961</u>
Total	<u>2,030,112</u>	<u>35,248,407</u>	<u>2,028,265</u>	<u>34,551,873</u>
<u>CITIES SERVICE - MIAMI COPPER OPERATIONS</u>				
Copper Cities	4,644,525	39,785,236	4,970,196	47,456,074
" " Precipitate		3,799,103		4,490,916
Miami - Precipitate		13,755,800		14,965,326
Castle Dome - Precipitate		<u>1,831,291</u>		<u>933,400</u>
Total	<u>4,644,525</u>	<u>59,171,430</u>	<u>4,970,196</u>	<u>67,845,716</u>
<u>DUVAL:</u>				
Esperanza	5,487,589	41,273,230	5,513,508	41,144,966
Precipitate Copper		3,618,615		4,428,343
Mineral Park	6,030,700	51,219,897	5,951,896	46,699,924
Precipitate Copper		6,221,380		7,709,843
Sierrita	<u>1,034,473</u>		<u>14,383,870</u>	<u>66,983,947</u>
Total	<u>12,552,762</u>	<u>102,333,122</u>	<u>25,849,274</u>	<u>166,967,023</u>
<u>KENNECOTT:</u>				
Ray	11,653,549	151,638,421	12,648,564	179,598,170
Precipitate Copper		<u>29,967,592</u>		<u>43,971,010</u>
Total	<u>11,653,549</u>	<u>181,606,013</u>	<u>12,648,564</u>	<u>223,569,180</u>

(continued next page)

TABLE XIX (Continued)

COPPER PRODUCTION RECORD OF LARGE ARIZONA COPPER MINES

Company Mine	1969		1970	
	Tons Copper Ore Mined	Pounds Copper Recovered	Tons Copper Ore Mined	Pounds Copper Recovered
<u>INSPIRATION:</u>				
Inspiration	8,854,746	93,766,370	9,376,513	81,147,159
Precipitate Copper		9,747,204		20,076,947
Christmas Division	1,918,641	21,301,261	1,829,122	17,343,153
Ox Hide Mine	4,060,037	7,242,991	3,833,018	13,298,157
Total	14,833,424	132,057,826	15,038,653	131,865,416
<u>MAGMA:</u>				
San Manuel	15,280,816	191,443,365	15,446,474	189,979,096
Superior	422,629	35,236,396	443,212	34,582,325
Total	15,703,445	226,679,761	15,889,686	224,561,421
<u>PHELPS DODGE:</u>				
Morenci	19,270,608	250,900,610	19,172,647	241,926,875
Precipitate Copper		22,753,650		16,949,491
New Cornelia	10,736,239	135,584,362	10,562,182	126,190,446
Lavender Pit	5,550,147	58,535,646	4,849,619	52,024,209
Precipitate Copper		6,520,000		7,407,045
Copper Queen	781,959	58,628,154	829,150	63,168,074
Precipitate Copper		481,502		*
Total	36,338,953	533,403,924	35,413,598	507,666,140
<u>PIMA MINING:</u>				
Pima	14,104,752	131,222,891	14,597,803	132,493,708
TOTAL - Large Co.'s	126,759,363	1,567,679,221	147,089,565	1,802,815,615
Other Copper Ores	1,089,637	25,864,779	3,151,435	23,918,385
GRAND TOTAL <u>1/</u>	127,849,000	1,593,544,000	150,241,000	1,826,734,000

Source: Company reports.

* Included with Lavender Pit precipitate copper.

1/ U.S. Bur. Mines figures - used to compute those for "Other Copper Ores."
The figures for copper recovered include that from copper precipitates.

TABLE XX

"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

1947 - 1970 INCLUSIVE

Copper Mining	Average No. Covered Employees <u>1/</u>	Total Wages <u>2/</u>	Average Annual Wage	Average Weekly Wage	Tons Copper Ores <u>3/</u>
1947	11,340	\$ 36,365,277	\$ 3,207	\$ 61.67	37,810,448
1948	11,493	41,318,524	3,595	69.13	39,072,204
1949	11,001	40,612,224	3,692	71.00	37,365,611
1950	10,181	41,994,321	4,125	79.33	41,757,273
1951	10,754	47,825,698	4,447	85.52	42,784,388
1952	11,365	54,950,235	4,835	93.14	44,472,522
1953	12,068	62,742,982	5,199	99.98	45,187,838
1954	12,502	65,518,853	5,241	100.79	43,072,894
1955	12,399	71,293,263	5,750	110.58	52,189,728
1956	14,008	83,568,996	5,966	114.73	60,468,580
1957	14,652	85,125,320	5,809	111.71	59,571,834
1958	14,100	74,726,972	5,300	101.93	56,255,809
1959	11,568	72,095,130	6,232	119.85	53,121,545
1960	13,764	90,312,848	6,562	126.19	66,032,439
1961	14,275	97,271,286	6,814	131.04	71,918,991
1962	14,408	101,920,108	7,074	136.04	78,868,147
1963	14,303	104,291,588	7,292	140.23	80,615,132
1964	14,720	113,792,031	7,730	148.65	86,132,039
1965	15,239	122,163,124	8,016	154.16	92,859,535
1966 <u>1/</u>	17,018	137,187,611	8,061	155.02	101,558,298
1967	13,426	108,427,206	8,076	155.31	74,289,203
1968	15,734	136,089,579	8,649	166.33	101,293,963
1969	19,459	173,183,018	8,900	171.15	127,848,828
1970	21,479	201,665,064	9,389	180.56	150,241,000

1/ "Covered Employment" by law includes all employees of employers of three or more persons. Therefore, the figures for "All Employees" in Tables XIII and XIV should be somewhat higher than those for "Covered Employees" in this table provided the same industries were involved. However, this table includes some smelter workers which the other two do not. Prior to 1966 the average numbers in this table included roughly 500 to 1000 Arizona copper smelter workers, the rest of the smelter employees being included under "Manufacturing." Beginning in 1966, all covered smelter workers are included in the average in this column. Figures are from the Unemployment Compensation Division, Employment Security Commission of Arizona.

2/ "Total Wages in Covered Industry," "Mining-copper."

3/ Short tons of "Lode ore: copper" reported by the U.S. Bur. of Mines.

TABLE XXI

ARIZONA INDUSTRIES COVERED BY SOCIAL SECURITY
AVERAGE NUMBER OF COVERED EMPLOYEES, TOTAL WAGES, AVERAGE ANNUAL WAGE
AND AVERAGE WEEKLY WAGE

Period 1947-1949 and Years 1968, 1969 and 1970

<u>Industry</u>	<u>Average No. of 1/ Employees</u>	<u>Total Wages</u>	<u>Average Annual Wage</u>	<u>Average Weekly Wage</u>
<u>Period 1947-1949</u>				
Copper Mining 4a/	10,700	\$ 37,438,008	\$3,499	\$ 67.27
Copper Smelting 4b/	2,078	7,169,000	3,450	66.35
Total Copper Min'g & Smelting	12,778	44,607,008	\$3,491	\$ 67.13
Other Mining & Quarrying	1,592	4,913,010	3,085	59.33
All Min'g, Quarry'g & Smelting	14,370	\$ 49,520,018	\$3,446	\$ 66.27
Mfg., Ex. Copper Smelting 4b/	12,639	36,910,624	2,920	56.15
Construction	10,844	35,424,826	3,267	62.83
Transp., Utilities, etc. 5/	10,530	29,948,944	2,844	54.69
Wholesale - Retail Trade	36,213	91,916,860	2,538	48.81
Services, and Miscellaneous	18,643	43,103,526	2,312	44.46
TOTALS AND AVERAGES	103,239	\$ 286,824,798	\$2,778	\$ 53.42
<u>YEAR 1968</u>				
Copper Mining 2/	14,176	\$ 123,243,529	\$8,694	\$166.19
Copper Smelting 3/	1,558	12,846,050	8,245	158.56
Total Copper Min'g & Smelting	15,734	\$ 136,089,579	\$8,649	\$166.33
Other Mining & Quarrying	1,179	8,693,338	7,373	141.79
All Min'g, Quarry'g & Smelting	16,913	\$ 144,782,917	\$8,560	\$164.62
Mfg., Ex. Copper Smelting	83,555	625,968,789	7,492	144.08
Construction	26,680	224,007,626	8,396	161.46
Transp., Utilities, etc. 5/	23,851	178,990,171	7,505	144.33
Wholesale - Retail Trade	102,655	510,816,657	4,976	95.69
Services, and Miscellaneous	76,600	400,111,753	5,223	100.44
TOTALS AND AVERAGES	330,254	\$2,084,677,913	\$6,312	\$121.38

Source: Arizona Employment Security Commission.

1/ Includes all covered employees. Figures relating to copper mining and smelting, and manufacturing, are adjusted as described in the following footnotes.

2/ The first number includes all covered employees in copper mining and milling and probably those in one smelter. The figure therefore is higher than that for "All Employees" in "Copper Mining" in Arizona in column 1, Table XIII.

(continued next page)

TABLE XXI (Continued)

YEAR 1969

<u>Industry</u>	<u>Average No. of 1/ Employees</u>	<u>Total Wages</u>	<u>Average Annual Wage</u>	<u>Average Weekly Wage</u>
Copper Mining 2/	17,473	\$ 156,278,772	\$8,923	\$171.60
Copper Smelting 3/	1,986	16,904,246	8,512	163.69
Total Copper Min'g & Smelting	19,459	\$ 173,183,018	\$8,900	\$171.15
Other Mining & Quarrying	1,524	12,095,708	7,937	152.63
All Min'g, Quarry'g & Smelting	20,983	\$ 185,278,726	\$8,830	\$169.81
Mfg., Ex. Copper Smelting	92,370	723,505,497	7,833	150.63
Construction	33,303	307,238,608	9,226	177.42
Transp., Utilities, etc. 5/	25,544	203,764,145	7,977	153.40
Wholesale - Retail Trade	112,775	592,249,783	5,252	101.00
Services, and Miscellaneous	85,118	477,274,188	5,607	107.83
TOTALS AND AVERAGES	370,092	\$2,489,310,947	\$6,726	\$129.35

YEAR 1970

Copper Mining 2/	19,340	\$ 182,501,779	\$9,436	\$181.47
Copper Smelting 3/	2,139	19,163,285	8,959	172.29
Total Copper Min'g & Smelting	21,479	\$ 201,665,064	\$9,389	\$180.55
Other Mining & Quarrying	1,802	16,351,472	9,074	174.50
All Min'g, Quarry'g & Smelting	23,281	\$ 218,016,536	\$9,364	\$180.08
Mfg., Ex. Copper Smelting	89,040	747,878,179	8,411	161.74
Construction	37,047	361,894,121	9,769	187.86
Transp., Utilities, etc. 5/	27,478	235,905,293	8,585	165.10
Wholesale - Retail Trade	123,139	679,612,363	5,519	106.14
Services, and Miscellaneous	91,411	560,822,791	6,135	117.98
TOTALS AND AVERAGES	391,396	\$ 2,804,129,283	\$7,164	\$137.78

3/ According to correspondence from the Employment Security Commission of Arizona, these figures include all covered smelter employees excepting those included in "Copper Mining." A majority of copper smelting employees customarily are reported under "Manufacturing" and the rest under "Copper Mining."

4a/ The 1947-49 figure of 10,700 for "All Employees" in "Copper Mining" is used for Copper Mining here, because an average figure of 11,278 computed from ESC reports for this category, obviously includes smelter employees which are assumed to amount to at least the difference of 578. Where the same mine and connected plants are concerned, "Covered Employees" by definition should be less than "All Employees."

4b/ The 1947-49 figures for "Copper Smelting" wages include the 578 employees at average wages for an average 1500 Copper Smelting employees included under Manufacturing in published ESC reports for the period. Average figures for Copper Mining and Manufacturing wages for the period, are adjusted accordingly.

5/ Transportation exclusive of railroads, communications, and public utilities.

TABLE XXII
MINERAL PRODUCTION IN ARIZONA IN 1970 1/

<u>MINERAL</u>	<u>Quantity</u>	<u>Value</u> (thousands)
Clays-----thousand short tons	199	\$454
Copper <u>2/</u> ----- short tons	917,918	1,059,277
Diatomite-----do-----	W	W
Gem stone-----	NA	155
Gold <u>2/</u> -----troy ounces	109,853	3,998
Gypsum----- thousand short tons	98	358
Helium grade A-----million cubic feet	62	1,186
Iron Ore (usable) thousand long tons, gross weight	W	W
Lead <u>2/</u> -----short tons	285	89
Lime-----thousand short tons	309	4,523
Mercury-----76-pound flasks	-----	-----
Molybdenum (concentrate content)thousand pounds	15,672	26,700
Natural Gas (marketed)----- million cubic feet	1,101	188
Petroleum (crude) ---thousand 42-gallon barrels	1,784	5,281
Pumice ----- thousand short tons	824	627
Sand and gravel-----do-----	17,822	19,804
Silver <u>2/</u> ----- thousand troy ounces	7,330	12,981
Stone----- thousand short tons	3,511	7,094
Tungsten concentrate (60 percent WO ₃ basis)-----short tons	W	W
Uranium (recoverable U3O ₈)-----thousand pounds	-----	-----
Zinc <u>2/</u> -----short tons	9,618	2,947
Value of items that cannot be disclosed: Asbestos, cement, coal, feldspar, mica(scrap) perlite, pyrites and values indicated by symbol W	XX	21,105
 Total	 XX	 \$1,166,707

NA Not available.

XX Not applicable.

W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed".

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Recoverable content of ores, etc.

Source: U. S. Bureau of Mines

TABLE XXIII

VALUE OF MINERAL PRODUCTION IN ARIZONA IN 1970, BY COUNTIES

(Thousands of dollars)

<u>County</u>	<u>1970</u>	<u>Minerals produced, in order of value</u>
Apache-----	\$7,231	Petroleum, helium, clays, natural gas, pumice, sand and gravel, stone.
Cochise-----	78,297	Copper, lime, stone, silver, gold, sand and gravel, lead, zinc.
Coconino-----	2,290	Sand and gravel, pumice, stone, copper, silver, gold.
Gila-----	124,653	Copper, molybdenum, asbestos, stone, lime, silver, sand and gravel, gold, clays.
Graham-----	W	Sand and gravel, zinc, lead, copper, pumice, silver, gold.
Greenlee-----	151,043	Copper, silver, lime, stone, gold, sand and gravel.
Maricopa-----	7,253	Sand and gravel, lime, stone, clays, copper, silver, mica, gold.
Mohave-----	40,762	Copper, molybdenum, silver, zinc, sand and gravel, stone, lead, feldspar, gold, tungsten.
Navajo-----	W	Sand and gravel, coal, iron ore, pumice, stone.
Pima-----	422,298	Copper, molybdenum, cement, silver, sand and gravel, stone, gold, clay, zinc, mica, lead.
Pinal-----	285,166	Copper, molybdenum, silver, sand and gravel, gold, stone, perlite, lime, gypsum, diatomite, pyrites, pumice.
Santa Cruz-----	W	Sand and gravel, stone, tungsten, copper, lead, silver, zinc, gold.
Yavapai-----	41,698	Copper, cement, zinc, stone, sand and gravel, molybdenum, lime, silver, gypsum, clays, gold, lead, iron ore, pumice.
Yuma-----	W	Sand and gravel, copper, stone, lead, silver, gold, zinc.
Undistributed <u>1/</u>	6,071	
Total-----	\$1,166,767	

1/ Includes gem stones that cannot be assigned to specific counties and values indicated by symbol W.

Source: U. S. Bureau of Mines