

COPPER INDUSTRY

STATISTICS FOR 1966 COMPARED WITH OTHER YEARS

ARIZONA, UNITED STATES AND WORLD

COMPILED BY ARIZONA DEPARTMENT OF MINERAL RESOURCES

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## C O P P E R

### PHYSICAL PROPERTIES \*

Symbol - Cu. Atomic Weight - 63.54. Specific Gravity - 8.96

Melting Point - 1981.4°F. Boiling Point - 4700°F

Electrical Resistivity - Microhm-cm. - 1.673

Tensile Strength (H.D. - 60,000 #/sq. in.) (annealed - 30,000)

Crystal Structure - Face-centred cubic. Valence - 1 & 2

Copper ranks next to iron as a metal of commercial importance. It has the best conductivity of any base metal; for example, measured on the ordinary basis of conductivity per unit of cross sectional area, aluminum's conductivity is only 61 per cent of that of copper, but 3.5 times that of iron. Copper is therefore the most important metal in the electrical field. Copper has enough strength for minor structural purposes (such as sheet-metal work, electrical manufactures, etc.), is easily rolled and drawn into wire, has great resistance to weathering, and is of moderate cost compared to competitive materials. In addition to these properties, copper is widely used alloyed with zinc to form brass, which is easily worked, offers good resistance to weathering and most solutions (principal exceptions are certain acids and alkalies), and is fairly strong and elastic; and alloyed with tin to form bronze, of note for its resilience. It has good thermal conductivity, so finds many uses in heat-transfer units, such as cooling fins and water heaters. In addition, a large percentage of copper may be recovered as scrap after it has outlived the usefulness for which it was originally intended. Of the total copper consumed in the United States it has been estimated that about 60 per cent eventually returns to use as copper or copper alloys.

\* U.S.B.M.'s "MATERIALS SURVEY" - September, 1952

## THE COPPER INDUSTRY IN 1966

By: B.H.Gerwin

By way of comparison with the past in hope of gaining assistance in judging possible occurrences in the immediate future, it is interesting to note the rapid expansion in the consumption of new copper in the United States in recent years as reported in the Year Book of the American Bureau of Metal Statistics, namely, 1,448,000 tons in 1963, 1,535,000 tons in 1964, 1,688,000 tons in 1965 and 2,057,400 tons in 1966. The annual per capita consumption in the United States was 22.5 pounds during the war years 1941-1945, 17.3 pounds during the post-war years 1946-1949, 17.9 pounds during the Korean War years 1950-1953, and then dropped back to the then more or less normal 15.5 pounds per capita. In 1965 the American consumption climbed back to approximately 17.5 pounds per capita and in 1966 it scaled to 20.8 pounds per capita. (During the "Prosperous 1920's"-(i.e. 1923 to 1929), it was 12.7 pounds per capita.)

Until 1940 the United States mined more copper than it consumed and was an exporter of copper, except for 1929 and the depression years 1930-32. Beginning with 1941 it became an importer of copper on balance because its mill demands were in excess of its domestic mine production.

In 1966 it imported 393,521 tons of unrefined copper and exported a total of 276,217 tons of copper of which 273,072 tons were refined copper, leaving 118,304 tons of foreign copper processed at American smelters and refineries for ultimate consumption in the United States. In addition the fabricating plants imported 163,524 tons of refined copper from other countries, so that there were available for American consumption a net 281,828 tons of foreign-mined copper in 1966. This availability was superimposed upon an increase in domestic mined production of 77,418 tons of copper in 1966 over 1965 (1,429,152 tons in 1966 vs. 1,351,734 tons in 1965).

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1966 was a year in which the copper industry was beset with a multitude of problems- demand, production, political interventions, price and market development.

### DEMAND

The year opened amid very volatile and unpredictable conditions. The demand both in the United States and abroad appeared to be insatiable. However, while the demand in this country continued high, toward the end of the third quarter of 1966, it became evident that there was a rather sharp falling off in the demand for copper abroad, particularly in Britain and the rest of Europe. The figures presented on the following page compiled from Mineral Industry Surveys issued monthly by the U. S. Department of the Interior, Bureau of Mines (U.S.B.M.), indicate that (1) of the crude copper brought into the United States under bond for refining and re-exportation beginning with the fourth quarter of 1966 and continuing through the second quarter of 1967 (the latest quarter for which figures are available) there



# NEW COPPER ENTERING PRODUCTION PIPE LINE

1966	SHORT TONS				
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total 1966
Ore, Matte and Blister Imported	82,762	86,885	115,842	108,032	393,521
Copper Exported					
Refined - Cathodes, Bars and Shapes					
To Europe	53,706	49,548	49,100	28,302	180,656
To Canada	2,063	2,186	3,455	2,648	10,352
To Latin America	6,326	16,589	16,307	4,803	44,025
To Asia	14,637	11,158	8,557	2,423	36,775
To Other & Not Specified	58	95	329	782	1,264
Total Refined Copper Exported:	76,790	79,576	77,748	38,958	273,072
Ores and Concentrates Exported	1,625	351	23	146	2,145
Total Exports	78,415	79,927	77,771	39,104	275,217
Net Imports of Unrefined Copper	4,347	6,958	38,071	68,928	118,304
Imports of Refined Copper					
From Europe	466	236	1,706	25,685	28,093
From Canada	18,837	22,349	21,842	22,671	85,699
From Latin America	14,894	7,452	2,756	20,892	45,994
From Africa	none	none	none	1,705	1,705
From Other & Not Specified	224	221	none	1,588	2,033
Net Copper Imports*	38,768	37,216	64,375	141,469	281,828
U.S. Mine Production	349,080	368,882	338,640	372,550	1,329,152
Total New Copper into U.S. Pipe Line	387,848	406,098	403,015	514,019	1,610,980

  

1967	1st Qtr		2nd Qtr		Comparison	
	1st Qtr	2nd Qtr	1st Half	2nd Half	1966	1967
Ore, Matte and Blister Imported	86,062	94,439	169,647	180,501	169,647	180,501
Copper Exported						
Refined - Cathodes, Bars and Shapes						
To Europe	36,941	46,754	103,254	83,695	103,254	83,695
To Canada	2,377	1,181	4,249	3,558	4,249	3,558
To Latin America	2,195	2,505	22,915	4,700	22,915	4,700
To Asia	14,967	15,457	25,795	30,424	25,795	30,424
To Other & Not Specified	105	290	153	395	153	395
Total Refined Copper Exported	56,585	66,187	156,366	122,772	156,366	122,772
Ores and Concentrates exported	16	490	1,976	506	1,976	506
Total Exports	56,601	66,677	158,342	123,278	158,342	123,278
Net Imports of Unrefined Copper	29,461	27,762	11,305	57,223	11,305	57,223
Imports of Refined Copper						
From Europe	11,418	5,595	702	17,013	702	17,013
From Canada	22,865	39,497	41,186	62,362	41,186	62,362
From Latin America	18,971	11,017	22,346	29,988	22,346	29,988
From Africa	none	6,934	none	6,934	none	6,934
From Other & Not Specified	39	38	445	77	445	77
Net Copper Imports*	82,754	90,843	75,984	173,597	75,984	173,597
U.S. Mine Production	373,066	388,782	717,962	761,848	717,962	761,848
Total New Copper into U.S. Pipe Line	455,820	479,625	793,946	935,445	793,946	935,445

\* (Imports Minus Exports)

has been a sizeable drop in the tonnage re-exported to Europe and Latin America, and (2) not only are significant tonnages of refined copper that had been going to Europe from Canada, Latin America and Africa now being shipped to the United States, but Europe is reshipping to the United States important tonnages that it had previously imported from Abroad - presumably Africa. The net imports (i.e. imports minus exports) of copper into the United States increased from 75,984 tons during the first half of 1966 to 173,597 tons during the first half of 1967.

With regard to the sustained demand for copper on the part of the fabricators, notwithstanding the delivery to fabricators of 400,000 tons in 1966 from the Government stockpile, pressure for further intake by the fabricators continued. (In December 1966 a Presidential Order announced the release of a further 150,000 tons over January-September 1967 for defense-rated orders to offset increases in required defense-set-asides by domestic producers.)

However, it is not determinable to what extent the continuing demand for refined copper is attributable <sup>to</sup> precautionary measures taken to assure a sufficient inventory ahead of the process because of the recurrent interruptions in delivery of supplies due to strikes at mines, mills, smelters, refineries or transportation media or due to government action - (this is especially applicable to Africa) - or to what extent, if any, the accumulation of a large inventory has been prompted by a possible shut down of the mines that would paralyze almost the entire copper mining industry at one time. Similarly it is difficult to correlate the demand for copper by the primary fabricators with the final consumption of copper, as no statistics are available of inventories in the plants of the end-users of the copper. It is logical to assume that the same causes that prompt the primary fabricators to carry greatly increased inventories prompt the end-users to do likewise.

The following figures taken from (a) the United States Bureau of Mines Mineral Industry Surveys and (b) the reports of the U. S. Copper Association portray the inventory of copper accumulating in the various categories:

	As of		
	<u>Dec. 1965</u>	<u>Dec. 1966</u>	<u>June, 1967</u>
(a) Refined copper at Refineries	35,000	43,000	44,800
(a) Blister, etc. on hand, in transit and in process	246,000	270,000	288,000
(b) Fabricator's Refined Stocks	<u>462,519</u>	<u>558,599</u>	* <u>640,455</u>
Total - Short tons	<u>743,519</u>	<u>871,599</u>	<u>973,255</u>

\* The Fabricators' Refined Stocks of 640,455 tons reported for June 30, 1967 are the largest recorded by the American Bureau of Metal Statistics dating back at least to the end of 1940.

#### PRODUCTION

The greatest contributor to the difficulties weighing upon the consuming segment of the copper industry is the large percentage of the mine production that comes from countries that consume so little copper themselves. These are practically all countries that depend very heavily upon copper income for their foreign exchange

and for a very significant source of income for the balancing of the budget.

Following are (a) production figures compiled from data published by the United States Bureau of Mines, and (b) consumption figures secured from the 1966 Year Book of the American Bureau of Metal Statistics.

	1966 Production (a)		1966 Consumption (b)	
	Tons	%	Tons	%
United States	1,429,152	29.9	2,239,800	39.9
Canada	509,788	10.7	262,600	4.7
Chile	724,364	15.2	(23,000)*	
			43,764	0.4
Peru	194,441	4.1	-	-
Other Western Hemisphere	105,059	2.1	118,311	2.1
Total Western Hemisphere (excluding Cuba)	2,962,804	62.0	2,641,475	47.1
Europe (Free World)	148,002	3.1	2,219,620	39.5
Congo	347,960	7.3	(	
Zambia	687,226	14.4	( 40,300	0.7
Other Africa	221,121	4.6	(	
Asia (excl. Mainland China & North Korea)	296,474	6.2	606,010	10.8
Australia	117,494	2.4	104,748	1.9
Total Free World	4,781,081	100.0	5,612,153 (c)	100.0

\* Semi-fabricated rod exported

(c) Includes secondary

While the United States, Europe and Asia are the major consuming centers, Chile, Zambia, the Congo, and Peru between them produce 41 percent of the Free World's copper and between them control the balance between sufficiency and insufficiency and between steady prices and widely fluctuating prices that unsettle the stability of the entire industry.

In 1966, mine production of copper in the United States established an all-time high of 1,429,152 tons compared with 1,351,734 tons in 1965. Labor troubles resulted in loss of four days' production of one mine in Nevada and in the closing down of operations at a mine in Arizona for almost three weeks. In spite of that loss of production Arizona recovered more copper from its mines in 1966 (739,569 tons) than in any previous year (703,377 tons in 1965). In fact, last year from Arizona's mines there was produced more copper than from the mines of any nation in the Free World except the United States. Arizona's production was 51.7 percent of the total United States production.

Of the 77,418 ton increase in United States copper production, Arizona contributed 36,192 tons, Montana 12,572 tons, New Mexico 9,956 tons, Nevada 7,388 tons and Utah 6,248 tons. The mines which reported substantial increases in production were Duval's Mineral Park, Phelps Dodge's Morenci, Pima's Pima and Magma's San Manuel mines in Arizona, Anaconda in Montana and Kennecott's operations in Nevada and New Mexico. Kennecott's three-year program to expand its Utah Copper

Division production by 100,000 tons per annum was virtually completed by the end of the fourth quarter of 1966 and beginning with October, the Bureau of Mines reported production from Utah amounting to approximately 5,000 tons per month above previous output.

While the domestic copper mining industry suffered a minimum of work stoppages of any duration, the Free World lost about 150,000 tons in strikes in 1966. Strikes of serious proportions resulted in long tie-ups at the Braden, Chuquicamata and El Salvador mines in Chile, and the Toquepala mine in Peru, while recurrent work stoppages of varying durations interfered to a great extent with production by the various mines in Zambia.

Notwithstanding the losses in production due to labor difficulties in South America and Africa and governmental difficulties in Africa, according to the revised figures issued by the Bureau of Mines, the Free World copper production increased from 4,566,400 tons in 1965 to 4,781,081 tons in 1966, a net gain of 214,681 tons. In addition to the 77,418 ton gain in the United States production, the Republic of South Africa added an additional 70,774 tons due almost entirely to the start up of the new Palabora Mining Company mine on February 17, 1966, the increase of 29,828 tons in the production by the Republic of the Congo to an all time high of 347,960 tons, and the added production from the expanded operations in mines in Australia, the Philippines and Japan.

#### POLITICAL INTERVENTIONS

It has previously been pointed out that Chile, Zambia, the Republic of the Congo and Peru are not large consumers of copper - but are large producers of copper. Between them they produce 41 percent of the copper mined in the Free World and copper is a major export and revenue earning product. Each of these countries is exercising greater control over production, marketing and - most important - pricing. Chile's intercession is also encompassing ownership in whole or in part and in operations.

Belonging to the Chilean government are the Paipote smelter and smelting-refining complex just completed at Las Ventanas where the products belonging to the small and medium-sized mine owners are treated. The Chilean government has acquired a 51 percent ownership in the Sociedad Minera El Teniente, S.A. (with Kennecott's Braden Copper Company continuing to own the remaining 49 percent), a 25% interest in the new "Exotica" mine to be developed by Anaconda, a 25% interest in Cerro Corporation's Compania Minera Andina "Rio Blanco" mine, and a 14% interest in Continental Copper & Steel Industries' Cuprera Sagasca, S. A. The Chile Copper Department exercises control over these operations and also exercises control over the marketing and pricing of all Chilean copper production. An important part of the Teniente (Braden) blister formerly refined in Maryland will now be refined in Chile.

Chile and Anaconda further agreed to form another corporation, in which the State will own 49 percent of the stock, to make an exhaustive study of all other properties owned by Anaconda but still unexploited. Should such exploration work warrant operating any such deposit new corporations to exploit each will be formed, with the State owning one-third of the stock. President Frei's announcements stated

that the new copper policy will mean an increase to 1,200,000 tons by 1970 from the 617,000 now produced, while refined copper output will rise to 700,000 from 275,000 tons. (Note: Chilean references are always to metric tons). He stressed that "it will also mean decisive intervention by the Chilean State in the International market for copper".

The mining companies in Zambia did not attain their 1966 production goals by a considerable margin. A series of unofficial strikes, walkouts and slowdowns on the part of expatriate mining personnel and repetitious breakings out of unrest and demonstrations against wage rates on the part of the Zambians Mineworkers Union interfered with production throughout the year. The latter resulted in a settlement of a 22 percent increase in basic wages to 43,000 Zambian workers. (It is interesting that in 1965 Zambia with a record year and a minimum of labor shortage required 43,000 Zambian workers to produce 756,000 tons of copper while in the same year Arizona produced 703,377 tons of copper with a force of 16,142 production workers.)

Even more serious causes of decreases in the production and inability to ship part of the production of Zambia lay in the events succeeding the unilateral declaration by Rhodesia of independence from Great Britain, in November, 1965. British sanctions interfered with the movement of Zambia's copper through Rhodesia to the customary ports of ocean transshipment. First Britain refused to allow payments to be made in hard currency for freight. The Zambian Government refused to meet the Rhodesian Government's demands that payment through Rhodesia to the coast should be made in advance in convertible currency. The Rhodesia Railways are jointly owned by Zambia and Rhodesia - but the major Zambian copper producers during May were compelled to declare "force majeure" following the breakdown in copper shipments through Rhodesia to the coast. Studies are in progress and measures have been taken to ship copper from Zambia through Malawi, Tanzania, the Republic of the Congo and Angola by new or increased use of alternate rail lines from Zambia to ocean ports to reduce to a minimum the tonnage passing through Rhodesia. Shipments are also being made by transport aircraft and by trucks over roads built just because of the transportation confrontations.

Zambia's coal supply comes principally from the Wankie fields in Rhodesia and Rhodesia is allowing its coal to cross into Zambia only to the extent that Zambia is shipping copper through Rhodesia, on a car-for-car basis. This resulted in a serious curtailment of smelter operations due to lack of coal which forced the Zambian Government to reluctantly decide toward the end of June 1966 to make advanced payments for limited shipments of copper through Rhodesia to relieve the situation. The shortage of coal on the Zambian Copperbelt in early November compelled the Zambian mining groups to reduce smelting operations to two-thirds of capacity. In March, 1967 it was announced that agreement in principle had been reached by Zambia and Rhodesia governments on operating Rhodesia Railways as two distinct systems after July 1, 1967. Meanwhile, mining and milling were continued at a normal rate with the result that there has been a considerable accumulation of concentrates. Sir Ronald Prain, Chairman of the Roan Selection Trust has stated that even with existing smelter capacity and full mine production it would not be possible to process the whole of the existing stockpile of concentrates in less than two years even if the group could get ample fuel. Two new coal deposits are being



developed in Zambia and smelter output was increased to 75 percent of capacity in early December and to 90 percent at the end of March, 1967. As long as the smelting capacity is less than concentrate production - the stock of concentrates will continue to grow.

It is very evident that if it were not for the rather sharp drop in the demand for copper from Europe the interference with copper supply from Zambia might have had some very harmful effects upon the world-wide copper situation.

Further trouble developed in the Republic of the Congo (formerly the Belgian Congo). The Congolese Government raised the export tax on copper to 30 percent (it had been 17 percent); gave the government the right to stockpile 10 percent of the mining output; and requested foreign companies to transfer their headquarters to the Congo. Upon the refusal of the Union Miniere du Haut Katanga to move its main offices to the Congo, UMHK's huge mining and processing assets in the Congo were seized by the Congolese Government with Union Miniere replaced by a Congolese company, Generale Congolaise des Minerais. Katanga's selling agents declared "force majeure" on December 23rd.

Mining production accounts for between 60 and 70 percent of the Congo's revenue in terms of export earnings, and, along with Zambia, Chile and others, it wants high production. In sending its five-man delegation to a meeting of foreign producers in Lusaka, Zambia, early in June, Peru warned that it, too, was committed to expanding production by at least 100 percent within five years.

There are many articles appearing regarding the contemplated increased copper production in the Communist block of countries as a result of new copper mine finds being developed. According to press reports, Soviet imports of copper dropped from an annual average of 100,000 metric tons from 1958-1963 to 10,000 metric tons in 1964. Exports continued at 80,000 tons per annum as they were in earlier years. All indications are to the effect that the Soviet nations will not only become self-sufficient, but will ultimately have sizeable exportable tonnages. Since the Soviet Sphere production in 1966 was an estimated 1,075,300 tons, any material increase in their production could result in their becoming net exporters of importance. This would place our competition with government-dictated operations at an increasing disadvantage.

#### PRICE

Control of its copper by some foreign countries and interruption of supply due to strikes throughout the world have caused wide and frequent fluctuations in the price of copper. The important producers have for a number of years endeavored to maintain the price of copper at reasonable levels - consistent with cost of production, fair return to stockholders, and retention of sufficient earnings to reinvest in equipment and research in order to increase production efficiency and treat ores of declining grade. About 85 percent of the Free World's producers have for years been mindful of the probability of losing a significant part of the market to substitute material if the rise in the price of copper reached the point where the substitute material became competitive. The United States producers' price was very stable beginning in 1961 and the Rhodesian (Zambian) producers established their own price in an effort towards stability in 1961. The remaining 15% of the "marginal production" was sold through the LME or through merchants.

As the mounting number of strikes in 1964 in Chile, Peru, Zambia, the United States, Australia and other countries cut into the steady flow of copper from the producer to the consumer prices were bid up on the LME on the marginal copper. Despite efforts from May 1961 on, the large Zambian producers in March 1964 were forced to give ground and yield to the pressure on the part of Chile abetted by Zambia, to increase their selling price of copper.

The Chilean government successively dictated price increases as follows: to 32 cents in March, 1964, 34 cents in August, 1964, 35 cents in October, 1964, 36 cents in May, 1965, 38 cents in October, 1965, 42 cents in February, 1966, 62 cents in April, 1966 and finally to 70 cents in July, 1966.

The Zambian producers raised their price from 32-1/2 cents to 36 cents in May 1965-- and they and Noranda and International Nickel of Canada and the Union Miniere de Haut-Katanga followed with rises paralleling the Chilean dictated prices until Chile raised the price to 62 cents. The American price held at 36 cents.

When Chile forced the price up to 42 cents a pound while the American producer price held at 36 cents, since some American mills were so dependent upon imports from Chile, an agreement was entered into with Chile for the right of an American company to purchase and import 100,000 tons of Chilean copper during 1966 at the United States producers' price level. In consideration of this concession by Chile, the United States agreed to granting Chile a loan of \$10,000,000 for a 40-year period.

When Chile raised its selling price by an unprecedented 20 cents to 62 cents a pound, the Katanga and Zambia companies refused to go along and instead reverted to the LME as the base for their sales price, either a dictated day-to-day adjusted price based on the LME level or the actual LME forward selling price. As the Zambian royalties and export taxes were based upon the LME quotations, it had become a very expensive undertaking by the Zambian producers to pay the royalties and export taxes on the LME basis while their quoted prices - i.e. their selling price - was so much less than the LME. When the Chilean price was 42 cents on April 14, 1966, the LME "Asked" price was £ 765 (95-5/8 cents) - (On April 5, it reached an all-time high of £790=98-3/4 cents). On July 15, 1966, the "asked 3 month price" on the LME was £593 per ton (74-1/8 cents per pound), and the Chile Copper Department raised the price of Chilean copper to 70 cents per pound.

At this point it became evident that, notwithstanding previous inflated demands for copper in the face of reduced shipments from Zambia and Chile on account of strikes and the reduction in copper available for shipment from Zambia because of the efforts of Britain to apply sanctions against Rhodesia, the Free World was demanding more copper than it was consuming. Industrial activity was dropping in the United Kingdom and in West Germany - and other European countries as well - inventories began to rise, and there were frequent reports of copper being brought on the LME for account of United States' interests.

The prices on the LME started skidding and very little Chilean copper was sold at 70 cent price. By August 15th the LME price had dropped to £445 per ton (55-5/8 cents per pound) and Chile's short-lived effort to get 70 cents a pound was abandoned and copper of Chilean origin sold outside of the United States was thereafter sold on the LME basis.

Throughout 1966 the LME price fluctuated frequently and widely. News of walkouts, strikes at production units or on docks and railroads -- or even talks about strikes -- rumors and denials of rumors that Chile was going to raise the price -- preceding rumors and then the actual announcement of release of copper from the United States stockpile as well as the previously described actions by Britain and Zambia -- and measures taken by the Rhodesian government to circumvent the intended harmful economic consequences of sanctions attempted -- all were reflected in the wide fluctuations in a very sensitive market.

Illustrative of the unsettling effect upon the purchaser on the basis of LME of copper for actual consumption (disregarding the effect upon those engaged purely as speculators), is the following month-by-month summary of the fluctuations of the "Cash Price" of copper on the LME market:

PRICE PER LONG TON - (1 long ton = 1/8¢ per lb).

<u>1966</u>	<u>MONTH'S HIGH</u>		<u>MONTH'S LOW</u>	
	<u>Asked</u>	<u>Date</u>	<u>Asked</u>	<u>Date</u>
Jan.	£ 672-1/2	26	£ 566	3
Feb.	697-1/2	2	663	4
Mar.	710	31	647	23
Apr.	790	5	515	27
May	665	27	554	6
June	645	10	594	30
July	598-1/2	12	492	25
Aug.	505	2	356	23
Sep.	457-1/2	30	370	6
Oct.	488	5	441	11
Nov.	495	11	435	30
Dec.	469	28	426-1/2	15
<u>1967</u>				
Jan.	470	5	439	6
Feb.	461	8	421	28
Mar.	423-1/2	1	386	15
Apr.	382	1	347	25
May	435	19	355	3 & 10
June	411-1/2	6	350	26
July	377	25	351-1/2	7
Aug.	389	18	371	10

The United States producers' price remained at 36 cents per pound throughout 1966 with two exceptions involving comparatively limited tonnages; in September, Copper Range Co. and Inspiration Consolidated Copper Corp. raised their refined copper price to 38 cents a pound. Inspiration was hit by a strike in September with the ensuing closing down of its Christmas underground mine and the development in its stead of its high-cost, low grade Christmas open-pit mine. Beginning November 1, Inspiration changed its selling price to a composite of 38 cents a pound on the tonnage derived from its regular source and 47 cents a pound on the copper derived from the Christmas open-pit mine.

In addition to purchases at the producers' price and the various LME prices, consumers purchased copper on the Commodity Exchange, from Metal Merchants and from custom smelters and refiners who treated ores and scrap copper offered them through dealers. The Metal Merchants and others may have represented some smaller mining concerns in arranging for the processing of their output by custom smelters on a toll basis and the sale of their copper when it was returned by the custom refiners. Purchases from metal merchants and from smelters are usually on an individually arranged basis - and the price is an "offered and accepted" basis.

The release of 400,000 tons of copper in 1966 from the stockpile (with another 150,000 tons to be delivered in 1967) has served to (a) supply fabricators with copper when they became hardship cases due to lack of supply which may have interfered with operations, (b) supply fabricators with copper they might have needed to fill defense-rated orders, (c) keep the price of copper from advancing and thus causing a further inflationary trend, and (d) provide further cash income to the Government. The release of the tonnage has been a move consistent with the Government's pressure to hold down the price of copper thus preventing producers and fabricators from satisfying their claims for increased prices due to increased costs of production.

While fabricators have been accumulating all tonnages available at prices above those paid the American producers, it has been done with the double purpose of assuring themselves of an adequate supply of copper during the frequently interrupted delivery schedules of the suppliers - and more especially in the knowledge that the labor contracts of the great majority of the producers of large mined tonnages would expire in July to September, 1967.

It is estimated that about 85 percent of the aggregate going into the fabricating plants has been purchased at the producers 36-38 cent price that prevailed since May, 1965 and only 15 percent has been purchased from the outside sources enumerated above.

#### ACTIONS OF THE UNITED STATES

Bulletin 927 of the Office of Export Control Department of Commerce announced a revision of export licensing provisions on January 20, 1966, as a result of the increasing scarcity of copper and copper products. A virtual embargo was established on exports of copper ore and concentrates, matte, blister and other unrefined copper of domestic origin. Quotas were established on all other categories of copper products under validated license control. Not subject to export control is refined copper produced from unrefined copper brought into the United States in bond for processing and export.

To further the availability of sufficient copper for American fabricators, on June 23rd, the President signed a bill suspending the duty on imported copper retroactive to February 9, 1966 and effective to June 30, 1968. When in effect the tax was 1.7 cents per pound.

On May 9, 1966 the General Services Administration News Release 3251 announced plans to accelerate its efforts to expand domestic copper production and asked

companies interested in the program to notify the agency immediately of their interest in expanding copper ore production and/or refining capacity over and above the present levels in a short period of time.

In February 1966, the Business and Defense Services Administration of the Department of Commerce established a 10 percent set-aside of domestic refined copper at producers' level for defense rated orders. The set-aside was established for acceptance of rated orders beginning March 1, 1966, with deliveries beginning April 1. Set-asides at producers' level were revised upward to 13 percent for the third quarter and to 18 percent for the fourth quarter. Set-asides for the first quarter of 1967 were increased to 26 percent of each producers' average monthly production in 1965 and those for the second quarter were to be raised to 29 percent of the monthly average 1965 production.

Constant urging and proffered assistance to industry on the part of various governmental agencies have been and are intended to encourage expansion of production and bringing-in of new mines. The Government also has turned to the National stockpile. Originally the requirements of strategic copper for the National stockpile called for 1,000 tons for a 5-year war. (Actually the stockpile contained 1,142,000 tons in 1962). This requirement was later reduced to 775,000 tons for a 3-year war. In January (1967) after a supply-demand study, the Office of Emergency Planning concluded that the United States did not need a stockpile of copper following any possible nuclear attack. Stockpile requirements for conventional war remained unchanged at 775,000 short tons. Allocation of copper to the Mint and recently authorized releases of copper to fabricators will reduce the amount of copper in the stockpile to approximately 260,000 tons. Therefore - as soon as the stress created by the excessive copper demand is relieved, approximately 515,000 tons of copper would have to be repurchased by the Government to restore the stockpile to the requirement established by law.

### MARKET DEVELOPMENTS

Historically, there have been cyclical periods of acute shortages in copper supply followed by periods of overabundance. During periods of shortage, world-wide exploration for new copper deposits is stimulated and capacities at currently operating mines are expanded. 1966 was a year of such expansion and development.

1966 also was typical of a year of change from shortage to surplus. Exploration teams were reporting new finds and new operations were starting up, or being planned in a number of countries, including some that are not now producing copper. Names recently appearing in the technical magazines under these categories are Bougainville, North Borneo, Fiji, New Caledonia, Malaysia, West Irian, Upper Volta, Mauritania, Uganda, Kenya, Malawi, Angola, Eire and others.

In the United States, new production is expected from Minnesota, Puerto Rico, Maine and Oklahoma. Large increases in production have been, and are now, or shortly will be coming in from Arizona, Montana, Michigan, New Mexico and Utah.



Estimates made in 1966 by a number of executives of mining companies of copper mining capacities by 1970-1972 range from 6,296,500 tons to 7,000,000 tons. The 1967 estimate made by the Arizona Department of Mineral Resources amounted to 7,004,000 tons by 1972.

It was the consensus of mining company executives expressing an opinion in the first half of 1967 that production either was already in balance with consumption or would be before the end of 1967 - dependent, of course, upon the strike situation in the United States after July 1, 1967. It was their almost unanimous opinion that with a normal rate of expected increase in consumption, the projected capacity expectation for 1970-1972 would be much greater than demand.

As previously pointed out, in past periods the over-capacity cycle has been followed by curtailment of production with resultant reduction in the labor force. Such curtailment is very costly to the copper industry, including its employees. According to the June 15, 1967 issue of "Fortune" the median investment per employee in the mining industry is \$100,210 per employee, the highest for any of the listed industries. According to data published by the Arizona Employment Security Commission for June, 1967, (revised) the average weekly earnings for productive workers in the Arizona copper mining industry was \$150.23. An assumed addendum of 15% for fringe benefits was not included in the weekly pay envelope.

In the periods of shortage there are substitutions of other materials for copper which may become permanent. They are caused not only by a sustained high price for copper but also, and perhaps more so, by the undependability of the copper supply and the unpredictability of the price. It is of prime importance to the producer to maintain an assured supply and a price that will prevail over a sufficiently long period to enable the fabricator to accurately estimate his rate of operations and his cost of the copper required to fill his orders. In order to maintain an assured supply, the producers must have sufficient capacity to take care of interruptions due to strikes or other causes.

The detrimental effects of a short supply of copper were demonstrated in 1966 when the merchants and foreign governments concerned profited by a shortage which was accentuated by the fabricators paying high prices for the needed tonnage, or for excess stocks because of fear of higher prices.

As soon as it becomes evident that world wide supply has come into balance with demand, it becomes apparent that fabricators have been protecting themselves by carrying larger inventories than were actually essential at the time, and fabricators' orders are either cancelled or request is made that deliveries be postponed. The foreign governments dictating prices then seek to establish a fixed price (which they calculate to be a "fair" price) higher than the falling LME price, which would better sustain income to spend on government projects. The realization that supply is about to exceed demand is shortly followed by consideration of the propriety of cutting production -- which means the laying off of workers.

With copper production and marketing now being directly controlled by foreign governments, the competition of United States producing companies can no longer

be considered as competition with foreign producing companies - the competition is with foreign governments, who, if necessary to procure for themselves the maximum national income, will dictate lower prices for the copper - probably prices that American producers will not be able to meet. It would be impossible to compete in a free market against a foreign government if it dictated quantities and prices without regard to the status of its miners, let alone the status of the American miner.

Therefore, since tariffs may not protect the higher-cost domestic production, it may become necessary in order to adequately sustain our vital domestic industry and not lower the standards of its personnel to impose quotas or other import controls whenever the mining industry is threatened.

Bearing in mind that much of the contemplated increase in production has been dictated by governmental determination because of the need for revenue and will not be available for a few years, while the producers are pressing for immediate production increases to satisfy the present needs of the copper consumers, it is the general opinion of the industry that there will be an excess of productive capacity over consumers' demand beginning possibly in 1967, which will amount to a considerable tonnage by 1970-1972.

Therefore the International Copper Research Association, which was formed a few years ago to engage in studies that would result in the use of more copper for more purposes, changed its operating procedure in 1966 so that more attention is being given to stimulating the expanded use of copper.

The following statement by Dr. Charles H. Moore, its Executive Vice President, appears in the Year Book of the American Bureau of Metal Statistics for the year 1966:

"The year 1966 saw a continuation of the shortage of copper supply, brought about by interruptions in production for a variety of reasons. Publicity in the trade and general news media about the threat to the industry from substitute materials has increased. At the same time a number of reports were released by copper producers of extensive investments in new mines, refineries and mills. Thus, while current shortages have almost completely occupied the attention of the copper consumers, the producers began to implement their plans for new production which will increase the world supply of copper by almost 50% by 1970.

"This situation has required INCRA to modify its operating procedure. During 1966, we concentrated on establishing a research framework in a number of massive market areas. The products generated from these research efforts will begin to appear before the time that the new production, to be generated by the increased mining and refining capacity, will reach the market place. Our main research systems are as follows:

#### Automobile Radiator Research

"Six interrelated research projects covering new methods of producing radiator tubing, new copper alloys for radiator fin stock, new solders capable of reaching temperatures never before achieved in radiators, and entirely new concepts in

radiator design have been underway since 1965.

"If these efforts bear out their early promise, we would expect to reduce the cost of the present copper and brass radiators by approximately 20% while increasing efficiency so that they can operate at the higher temperatures and pressures now projected for automobiles of the future. In May 1967, representatives of the world's radiator and automotive manufacturers will analyze the INCRA program. Their recommendations will guide our continuing research.

#### Protective Coatings Research

"INCRA in the past has concentrated its efforts on protective coating developments designed to reduce and ultimately, eliminate the tarnish problem in architectural copper metals. At the same time, we searched for a method which would make possible the development of thinner, more economical coatings with insulating properties for electric wire and strip. A mechanism which now makes it feasible to pursue the development of coatings for this massive copper consuming industry is the new technique of 'electro-coating', which offers technical and economic advantages over current methods of applying insulation to wire and strip. The research projects now under way in this area are expected to yield electrically insulating coatings far thinner than any now available without sacrificing electrical properties.

"Research is under way on architectural coatings capable of useful service for 25 years, or longer. Such coatings would not only give good tarnish protection but, being laminated to the copper surface, should be able to withstand fabrication of the metal, as well.

#### Agricultural Products Research

"A large potential tonnage use of copper compounds is seen in the broad field of agriculture. During 1966, research was conducted in fungicidal compounds, as well as additives to animal feed. A 'spray-dry Bordeaux' was developed which shows promise of overcoming the preparation and plant injury problems presently associated with Bordeaux mixture. Field tests will be conducted in the United States, and in a number of other countries during 1967.

#### New Alloys Research

"Copper-containing steels are being developed in two projects: one designed to yield a steel for the fastener industry and the other for specialty steels in high duty performance. In a third project, research on eliminating the hot shortness in copper-containing steels is under way. New die materials for die casting copper based alloys are being developed. Two die materials were developed which have thus far produced over 36,000 parts of a brass shower head escutcheon. (The steel dies commonly used are incapable of producing more than 7,000 pieces of the same part.) Full scale high speed production runs will be made on these two materials during 1967.

"Our broad research in the fields of complex copper alloys, both wrought and cast,

continues in a number of countries. Some new alloys with commercial possibilities may emerge from these studies in 1967."

Also cooperating with the copper producers is the Copper Development Association, Inc. supported by over 60 American fabricating companies, which is concerned with the improvement of old products and the introduction of new products that would result in expanded use of copper and copper-alloy items.

The following summary of the Copper Development Association, Inc. activities is taken from the Year Book of the American Bureau of Metal Statistics for the year 1966.

"Total copper consumption in the United States for 1966 increased by 14 per cent over 1965. This 1966 consumption of copper by the copper and brass industry consisted of 2,398,300 tons of refined copper, and 888,900 tons in the form of scrap. This compared with 2,033,400 tons of refined copper and 850,300 tons of scrap in the previous year.

"The copper and brass fabricating industry, in conjunction with the copper producers, is engaged in an industry-wide product and market development program. Spearheading this development is Copper Development Association Inc., organized in 1963 with ten members, a total which has since grown to more than 60 supporting member companies. Significant advancement has been made by CDA in a relatively short time through its emphasis on application engineering and prototype development leading to the creation of new business opportunities for customer industries.

"CDA projects are underway on five major market fronts: transportation, building construction, consumer products, industrial machinery and equipment, and electrical and electronic products. An exhibition sports car, the Mercer-Cobra, serves as an applications laboratory demonstrating the integrated use of copper, brass and bronze for the automobile industry. This prototype automobile features several major functional and styling innovations. These include copper disc brakes, bronze wheel covers, copper-iron hydraulic brake-line tubing, and decorative trim - inside and out.

"CDA's model 'Copper Award Home' exhibit demonstrates new applications for the industry's products in the residential market. In the consumer products market, a 'Copper Corner' merchandising program at leading department stores has spurred wider acceptance of copper and brass products at the retail level. Prototypes of new consumer products have been created to stimulate the thinking of the industry's customers in the housewares and related manufacturing fields."

TABLE I

## SALIENT U. S. COPPER STATISTICS

YEARS 1964, 1965 and 1966

Compiled By Arizona Department of Mineral Resources from U.S.B.M. Reports  
and Year Book, Amer. Bureau of Metal Statistics 1966, p.35-36

	1964	1965	1966
Arizona Mine Production - Tons Copper . . .	690,988	703,377	739,569
U. S. Mine Production - Tons Copper . . .	1,246,780	1,351,734	1,429,152
World Mine Production - Tons Copper . . .r/	5,345,000	r/ 5,590,000	P 5,855,000
Refined Stocks - Beginning of Period . . .	52,000	37,000	35,000
Refined Stocks - End of Period . . .	37,000	35,000	43,000
Refinery Production (From Domestic Ores) . .	1,259,852	1,335,660	1,353,087
Refinery Production (From Foreign Ores). . .	396,543	376,133	357,897
Secondary Copper Recovered from Scrap as Unalloyed Copper . . .	366,197	462,811	509,084
IMPORTS:			
Copper from Ore, Matte, Regulus . . .	52,012	36,919	45,186
Blister Copper . . .	389,577	332,558	348,335
Refined Copper . . .	137,707	137,406	163,524
Total Imports - Crude & Refined . . .	579,296	506,883	557,045
EXPORTS:			
Copper in Ores, etc. . . .	5,415	15,536	2,145
Refined Copper . . .	316,230	324,962	273,072
Total Exports - Crude & Refined . . .	321,645	340,498	275,217
EXCESS IMPORTS OVER EXPORTS . . .	257,651	166,385	281,828
CONSUMPTION:			
New Refined (Apparent Consumption) . . .r/	1,495,000	1,526,000	1,593,000
Total Refined (Actual) . . .	1,825,281	2,004,623	2,359,954
U.S. Mine Prod. % of Appar. Consumption. .r/	83.14	88.6	89.7
Average E & M J Price of Copper . . .	31.960¢	35.017¢	36.170¢

P - Preliminary

r/- Revised



TABLE II

## MINE PRODUCTION OF RECOVERABLE COPPER IN THE UNITED STATES

1964 - 1966, BY STATES, IN SHORT TONS

STATE	1964	1965	1966	RANK
Alaska . . . .	11	32	- -	
Arizona . . . .	690,988	703,377	739,569	(1)
California . . .	1,035	1,165	1,078	
Colorado . . . .	4,653	3,828	4,237	
Idaho . . . .	4,666	5,140	4,961	
Michigan . . . .	69,040	71,749	73,449	(6)
Missouri . . . .	2,059	2,331	3,913	
Montana . . . .	103,806	115,489	128,061	(3)
Nevada . . . .	67,272	71,332	78,720	(5)
New Mexico . . .	86,104	98,658	108,614	(4)
Oregon . . . .	15	- - -	- - -	
Pennsylvania . .	3,614	4,354	3,178	
South Dakota . .	- - -	- - -	- - -	
Tennessee . . . .	13,889	14,823	15,410	
Utah . . . .	199,588	259,138	265,383	(2)
Washington . . .	35	30	34	
Wyoming . . . .	5	6	- - -	
Other States . . .		282	2,545	
TOTAL . . . .	1,246,780	1,351,734	1,429,152	

TABLE III

## ARIZONA, UNITED STATES, AND WORLD MINE PRODUCTION OF COPPER, In Short Tons

## E. &amp; M. J. DOMESTIC PRICE OF COPPER

By Years 1912 - 1966 Incl.

		ARIZONA		UNITED STATES		WORLD	E.&M.J
Year	Tons	% of U. S. Prod.	% of World Prod.	Tons	% of World Prod.	Tons	Price Per Pound
Beginning of Records 1874 thru							
1911	1,757,554	@	14.403¢ per Lb. = \$506,283,002*				
1912	182,519	29.2	16.2	624,547	55.5	1,125,656	16.341¢
1913	203,962	33.0	18.6	617,755	56.2	1,099,366	15.269
1914 1/	196,509	34.2	19.0	574,216	55.5	1,034,487	13.602
1915 1/	229,986	30.9	19.6	744,036	63.4	1,173,150	17.275
1916 1/	360,917	36.0	23.2	1,002,938	64.6	1,553,498	27.202
1917 1/	356,083	37.6	22.2	947,717	59.1	1,602,914	27.180
1918 1/	382,428	40.0	24.2	955,011	60.5	1,579,246	24.628
1919	269,050	44.4	24.6	606,167	55.3	1,095,697	18.691
1920	279,128	45.6	26.4	612,275	58.0	1,056,014	17.456
1921 2/	92,517	39.7	15.1	233,095	38.0	613,987	12.502
1912 to 1921	2,553,099	36.9	21.4	6,917,757	58.0	11,934,015	20.497¢
1922	200,022	41.5	21.4	482,292	48.2	935,374	13.382¢
1923	309,464	41.9	22.8	738,870	54.5	1,355,327	14.421
1924	338,876	42.2	23.0	803,083	54.5	1,472,712	13.024
1925	356,678	42.5	22.6	839,059	53.2	1,576,998	14.042
1926	361,648	41.9	22.7	862,638	54.0	1,596,147	13.795
1927	341,095	41.3	20.5	824,980	49.5	1,666,694	12.920
1928	366,138	40.5	19.2	904,898	47.5	1,903,672	14.570
1929	415,314	41.6	19.3	997,555	46.4	2,150,587	18.107
1930 3/	288,095	40.9	16.2	705,074	39.7	1,775,805	12.982
1931 3/	200,672	37.9	13.0	528,875	34.2	1,545,425	8.116
1922 to 1931	3,178,002	41.3	19.8	7,687,324	48.1	15,978,741	13.867¢

Source: U.S. Geological Survey: Mineral Resources; U.S.B.M. Minerals Yearbooks.

\* Arizona Metal Production 1936, Elsing and Heineman, Ariz. Bureau of Mines.

(continued)

TABLE III (Continued)

Year	Tons	ARIZONA		UNITED STATES		WORLD	E. & M. J
		% of U. S. Prod.	% of World Prod.	Tons	% of World Prod.	Tons	Price Per Pound
1932 <u>3/</u>	91,246	38.3	8.0	238,111	20.9	1,138,676	5.555¢
1933 <u>3/</u>	57,021	29.9	4.9	190,643	16.4	1,159,000	7.025
1934 <u>3/</u>	89,041	37.5	6.3	237,401	16.8	1,415,353	8.428
1935 <u>3/</u>	139,015	36.0	8.4	386,491	23.5	1,647,939	8.649
1936 <u>3/</u>	211,275	34.4	11.1	614,516	32.4	1,899,263	9.474
1937	288,475	34.3	11.2	841,998	32.8	2,567,916	13.167
1938 <u>4/</u>	210,797	37.8	9.3	557,763	24.5	2,274,045	10.000
1939 <u>5/</u>	262,117	36.0	10.6	728,320	29.4	2,481,277	10.965
1940 <u>5/</u>	281,169	32.0	10.5	878,086	32.7	2,688,510	11.296
1941 <u>5/</u>	326,317	34.1	11.2	958,149	33.0	2,903,458	11.797
1932 to 1941	1,956,473	34.7	9.7	5,631,478	27.9	20,175,437	10.566¢
1942 <u>5/</u>	393,387	36.4	12.9	1,080,061	35.5	3,039,041	11.775¢
1943 <u>5/</u>	403,181	37.0	13.2	1,090,818	35.6	3,064,394	11.775
1944 <u>5/</u>	358,303	36.8	12.5	972,549	33.9	2,866,000	11.775
1945	287,203	37.2	12.0	772,894	32.2	2,400,000	11.775
1946	289,223	47.5	14.1	608,737	29.6	2,056,000	13.820
1947	366,218	43.2	14.6	847,563	33.9	2,500,000	20.958
1948 <u>6/</u>	375,121	44.9	14.4	834,813	32.1	2,600,000	22.038
1949 <u>6/</u>	359,010	47.7	14.4	752,750	30.1	2,500,000	19.202
1950	403,301	44.4	14.4	909,343	32.5	2,760,000	21.235
1951	415,870	44.8	14.3	928,330	32.0	2,900,000	24.200
1942 to 1951	3,650,817	41.5	13.7	8,797,858	33.0	26,685,435	16.699¢

(Continued)

TABLE III (Continued)

Year	ARIZONA			UNITED STATES		WORLD	E. & M. J.
	Tons	% of U. S. Prod.	% of World Prod.	Tons	% of World Prod.	Tons	Price Per Pound
1952	395,719	42.8	13.1	925,359	30.6	3,020,000	24.200¢
1953	393,525	42.5	12.9	926,448	30.4	3,050,000	28,798
1954 <u>7/</u>	377,927	45.2	12.2	835,472	27.0	3,100,000	29.694
1955	454,105	45.5	13.3	998,570	29.2	3,420,000	37.491
1956	505,908	45.7	13.4	1,104,156	29.1	3,790,000	41.818
1957	515,854	47.5	13.3	1,086,141	27.9	3,890,000	29.576
1958	485,839	49.6	12.9	979,329	25.9	3,780,000	25.764
1959	430,297	52.2	10.7	824,846	20.5	4,020,000	31.182
1960	538,605	49.9	11.7	1,080,169	23.5	4,590,000	32.053
1961	587,053	50.4	12.1	1,165,155	24.0	4,850,000	29.921
1952 to 1961	4,684,832	47.2	12.5	9,925,645	26.5	37,510,000	31.238¢
1962	644,242	52.4	12.7	1,228,421	24.1	5,090,000	30.600¢
1963	660,977	54.5	12.7	1,213,166	23.3	5,210,000	30.600
1964	690,988	55.4	12.9	1,246,780	23.3	5,340,000	31.960
1965	703,377	52.0	12.6	1,351,734	24.1	5,600,000	35.017
1966 <u>8/</u>	739,569	51.7	12.6	<u>8/</u> 1,429,152	24.4	<u>8/</u> 5,855,000	36.170
1962 to 1966	3,439,153	53.2	12.7	6,469,253	23.9	27,095,000	32.992¢
1874 to 1966	ARIZONA ONLY 21,221,597 Tons at 21.825¢ per pound = \$9,263,193,900						

(continued)

TABLE III      Continued

NOTES: 1/ World War I 1914 - 1918.

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

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

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

5/ World War II began in 1939; copper consumption reached its height in 1944.

6/ In the year 1948 and the early months of 1949, copper was being produced in the United States at the rate of 68,000 short tons per month, imports were at the rate of 18,000 tons of blister copper and 22,000 tons of refined copper, and exports were at the rate of 12,000 tons per month. The price of copper averaged 22.5 cts. during this period, varying from 21-3/8 to 23-3/8 cts.

In March 1949 the copper import tax was suspended, and during the months following the suspension, domestic demand fell drastically, and for four months net domestic consumption of copper was at or below the level of domestic production, even though the latter was severely curtailed. During this period, imports continued at practically the same rate. The price of copper dropped from 23-3/8 cts. to 16-1/2 cts. per pound. Many mines were forced to close down, and the large low-cost producers curtailed production. The average monthly production dropped from a high of 78,000 to a low of 56,000 tons.

7/ Curtailment early in the year, and a series of strikes in August and September caused a loss in production of over 100,000 tons. Reduced consumption in the U. S. was offset by an appreciable rise in the use of copper outside of this country, chiefly Europe. Result: a short supply of copper at the end of the year.

8/ Highest annual production in history.



TABLE IV

MINE PRODUCTION RECOVERABLE COPPER - PRODUCTION SECONDARY UNALLOYED COPPER  
REPORTED IN U.S.A.  
AND WORLD CONSUMPTION OF REFINED COPPER  
(PPrimary and Secondary)

Year	MINE PRODUCTION RECOVERABLE <sup>1/</sup>				SECONDARY COPPER PRODUCTION
	United States	Rest of Free World	*Soviet Sphere	TOTAL WORLD	United States <sup>1/</sup>
1957	1,086,859	2,298,441	<u>e/</u> 504,700	3,890,000	248,015
1958	979,329	2,255,171	<u>e/</u> 545,500	3,780,000	255,121
1959	824,846	2,614,654	<u>e/</u> 580,500	4,020,000	261,588
1960	1,080,169	2,886,331	<u>e/</u> 683,500	4,650,000	300,259
1961	1,165,155	2,896,145	<u>e/</u> 778,700	4,840,000	290,805
1962	1,228,421	2,964,279	892,300	<u>r/</u> 5,085,000	301,374
1963	1,213,166	3,042,234	944,600	<u>r/</u> 5,200,000	314,643
1964	1,246,780	3,151,120	947,100	<u>r/</u> 5,345,000	366,197
1965	1,351,734	3,218,166	1,020,100	<u>r/</u> 5,590,000	<u>2/</u> 445,209
1966	1,429,152	3,353,348	1,072,500	5,855,000	<u>2/</u> 490,743

WORLD CONSUMPTION OF REFINED COPPER					
Year	United States <sup>1/</sup>	Remainder of Free World (By diff.)	Soviet Sphere <sup>4/</sup>	World <sup>4/</sup>	ABM YEAR BOOK Source
1957	1,277,900	2,176,841	511,500	3,966,241	1963 p13
1958	1,179,400	2,337,389	557,800	4,074,589	" "
1959	1,463,031	2,415,341	821,296	4,699,668	1964 p15
1960	1,349,896	2,840,034	839,664	5,029,594	" "
1961	1,462,830	3,033,284	1,038,240	5,534,354	" "
1962	1,599,700	2,922,000	1,091,200	5,612,900	1966 p15
1963	1,744,300	3,061,300	1,147,500	5,953,100	" "
1964	1,825,300	3,536,700	1,185,000	6,547,000	" "
1965	<u>3/</u> 2,004,623	3,491,877	1,186,200	6,682,700	" "
1966	<u>3/</u> 2,359,954	3,381,246	1,186,800	6,928,000	" "

<sup>1/</sup> U.S.B.M. Yearbooks

<sup>2/</sup> U.S.B.M. Mineral Industry Survey Jan. 1967 p.3.

<sup>3/</sup> U.S.B.M. Mineral Industry Survey May 1967 p.2.

<sup>4/</sup> American Bureau of Metal Statistics, Years as indicated.

e/ Estimated

\* U.S.S.R., Bulgaria, Poland, China Mainland, No. Korea, E. Germany, Cuba.

(Albania, producing only 2,800 tons Cu annually, was disregarded because of its questional orientation with respect to the "Free World".)

TABLE V

## WORLD MINE PRODUCTION OF RECOVERABLE COPPER

BY CONTINENTS AND PRINCIPAL COUNTRIES IN THOUSANDS SHORT TONS

Years 1963, 1964, 1965, and 1966

	1963	1964	1965	1966
<u>NORTH AMERICA:</u>				
U.S.A.	1,213	1,247	1,352	1,429
Canada	458	487	517	510
Mexico	62	58	76	82
Other	21	22	27	20
	1,754	1,814	1,972	2,041
<u>SOUTH AMERICA:</u>				
Chile	663	685	642	724
Peru	196	194	196	194
Other	5	10	9	10
	864	889	847	928
<u>EUROPE:</u>				
U.S.S.R.	770	770	830	880
Yugoslavia	68	70	69	69
Others	176	160	163	156
	1,014	1,000	1,062	1,105
<u>ASIA:</u>				
China	99	99	99	99
Cyprus	29	19	22	28
Japan	118	117	118	123
Philippines	70	67	70	81
Turkey	28	38	36	40
Others	31	33	35	37
	375	373	380	408
<u>AFRICA:</u>				
No. Rhodesia (Zambia)	648	697	767	687
Belg. Congo	298	305	318	348
U. of So. Africa	61	66	67	137
Others	75	80	85	83
	1,082	1,148	1,237	1,255
<u>AUSTRALIA:</u>				
	128	117	102	117
TOTAL WORLD	5,220	5,340	5,600	5,854

Source; U.S.B.M.

TABLE VI

## NEW (PRIMARY) REFINED COPPER WITHDRAWN FROM SUPPLY ON DOMESTIC ACCOUNT

Years 1961 - 1966

Unit: Short Tons

	Year 1961	Year 1962	Year 1963
Ref. Prod. of New Cu from U.S. Ores	1,181,015	1,214,146	1,219,342
Ref. Prod. of New Cu from Foreign Ores	369,124	379,584	377,009
Total Ref. Prod. of New Copper	1,550,139	1,611,730	1,596,351
Imports of Refined Copper	66,855	98,820	119,165
Stocks at beginning of period	98,000	49,000	71,000
Total Available Supply	1,714,994	1,759,550	1,786,516
Exports of Refined Copper	432,253	336,525	311,479
Stocks at end of period	49,000	71,000	52,000
TOTAL	481,253	407,525	363,479
Withdrawn on Domes. Acc.(Apparent Cons.)	1,234,000	1,352,000	1,423,000
Reported Actual Consumption	1,462,830	1,599,676	1,744,273

	Year 1964	Year 1965	Year 1966
Ref. Prod. of New Cu from U.S. Ores	1,259,852	1,335,660	1,353,087
Ref. Prod. of New Cu from Foreign Ores	396,543	376,133	357,897
Total Ref. Prod. of New Copper	1,656,395	1,711,793	1,710,984
Imports of Refined Copper	137,707	137,443	162,602
Stocks at beginning of period	52,000	37,000	35,000
Total Available Supply	1,846,102	1,886,236	1,908,586
Exports of Refined Copper	316,230	324,965	273,071
Stocks at end of period	37,000	35,000	43,000
TOTAL	353,230	359,965	316,071
Withdrawn on Domestic Acc.(Apparent Cons.)	1,493,000	1,526,000	1,593,000
Reported Actual Consumption	1,825,281	2,004,623	2,359,954

Source: U.S.B.M. and Mineral Survey, May 1967.

TABLE VII

## IMPORTS OF COPPER INTO UNITED STATES

1964, 1965 and 19661962 and 1963

	1964	1965	1966
Ore Matte-Regulus (Copper Content)	52,012	36,919	45,186
Canada	25,029	6,408	8,680
Chile	2,078	3,191	1,231
Mexico	1,027	106	99
Peru	8,244	10,316	7,849
Philippines	9,487	12,532	21,036
Republic of South Africa	3,605	1,661	559
Australia	1,015	696	1,201
Other Countries	1,527	2,009	4,531
Blister Copper (Copper Content)	389,577	332,558	348,335
Mexico	12,386	6,733	8,321
Chile	251,092	187,843	185,326
Peru	75,664	82,421	92,536
Republic of South Africa	39,161	44,331	51,418
Other Countries	11,274	11,230	10,734
Refined Cathodes and Shapes	137,707	137,406	163,524
Canada	84,877	72,580	85,699
Chile	917	15,623	22,560
United Kingdom	2,513	308	13,651
Zambia, Malawi and Mozambique	11,979	3,190	1,705
Other Countries	36,021	45,705	39,909
TOTAL IMPORTS	579,296	506,883	557,045
TOTAL EXPORTS	321,645	340,498	275,217
EXCESS IMPORTS	257,651	166,385	281,828
YEARS	1962	1963	
TOTAL IMPORTS	474,052	536,560	
TOTAL EXPORTS	338,442	312,687	
EXCESS IMPORTS	135,610	223,873	

Sources: (a) U.S.B.M.

(b) Amer. Met. Market, Aug. 3, 1967 p12

TABLE VIII

## EXPORT OF COPPER FROM THE UNITED STATES

1964, 1965 and 1966

	1964	1965	1966
Ore, Concls. & Matte	5,415	15,536	2,145
Refined Ingots, Bars, Etc.	316,230	324,962	273,072
Argentina	5,738	6,794	4,855
Australia	5,101	6,405	21
Belgium	1,001	1,240	1,463
Brazil	3,912	6,039	39,170
Canada	7,908	6,158	10,352
Denmark	1,826	2,302	1,165
Finland	76	572	56
France	34,610	38,598	34,332
Germany, West	58,804	34,279	31,466
Greece	- - -	146	- - -
India	47,219	51,045	11,718
Italy	55,454	51,734	52,160
Japan	20,621	22,052	24,444
Netherlands	5,394	9,834	5,021
Norway	4,261	3,795	3,691
Sweden	3,868	4,921	4,456
Switzerland	3,397	4,184	2,742
Taiwan	128	56	- - -
United Arab Republic	- - -	- - -	- - -
United Kingdom	54,929	68,952	39,123
Yugoslavia	- - -	- - -	- - -
Other Countries	1,983	5,856	6,837
Total Exports (Crude Refined)	321,645	340,498	275,217

Source: Amer. Bur. Met. Statistics, 1966 p.36-37



TABLE IX

STOCKS OF REFINED COPPER REPORTED BY  
U. S. B. M. AND COPPER INSTITUTE \*

STOCKS END OF PERIOD	IN U.S.A.		OUTSIDE U.S.A.
	U.S.B.M.	Copper Institute	Copper Institute
Year 1954	25,000	47,108	181,529
Year 1955	34,000	61,554	159,777
Year 1956	78,000	120,645	233,775
Year 1957	109,000	181,024	277,316
Year 1958	48,000	80,722	178,152
Year 1959	18,000	64,763	228,243
Year 1960	98,000	139,272	288,510
Year 1961	49,000	79,755	332,479
Year 1962	71,000	117,441	358,856
Year 1963	52,000	76,934	394,143
Year 1964	37,000	45,594	277,303
Year 1965	35,000	60,811	327,723
Year 1966	43,000	65,707	293,167

\* Inventory data of the Bureau of Mines and Copper Institute always differ owing to somewhat different bases. After Jan. 1, 1947, differences were due chiefly to the method of handling metal in process of refining (included as "refined" by Copper Institute and as "unrefined" by the U.S.B.M.), and to other minor variations in interpretation until May, 1951. Then the Institute's inventory data began to include tonnages delivered to U. S. consumers at foreign ports. Bureau of Mines figures are on the basis of metal physically held at primary smelting and refining plants in the U. S. In the Bureau's classification cathodes to be used chiefly for casting into shapes are considered stocks in process and not refined stocks.

TABLE X

STOCKS OF REFINED COPPER, BLISTER, AND MATERIALS IN PROCESS  
REPORTED BY UNITED STATES BUREAU OF MINES  
IN SHORT TONS

END OF PERIOD	REFINED	BLISTER & MATERIALS IN PROCESS OF REFINING 1/	TOTAL
Year 1954	25,000	189,000	214,000
Year 1955	34,000	201,000	235,000
Year 1956	78,000	261,000	339,000
Year 1957	109,000	274,000	383,000
Year 1958	48,000	257,000	305,000
Year 1959	18,000	253,000	271,000
Year 1960	98,000	261,000	359,000
Year 1961	49,000	236,000	285,000
Year 1962	71,000	246,000	317,000
Year 1963	52,000	252,000	304,000
Year 1964	37,000	246,000	283,000
Year 1965	35,000	246,000	281,000
Year 1966	43,000	270,000	313,000

1/ Includes copper in transit from smelter in the U. S. to refineries therein.

TABLE XI

## REFINED COPPER CONSUMED IN U. S. 1963-1966

## BY CLASSES OF CONSUMERS

Unit: Short Tons

Class of Consumer	Cathodes	Wire bars	Ingots and ingot bars	Cakes and Slabs	Billets	Other	Total
<u>1963:</u>							
Wire mills	- - -	1,024,093	11,271	- - -	- - -	798	1,036,162
Brass mills	145,271	44,250	87,832	186,876	209,576	102	673,907
Chemical plants	- - -	- - -	726	- - -	- - -	512	1,238
Secondary smelt.	1,906	- - -	1,731	11	- - -	4	3,652
Foundries	3,575	118	7,584	12	413	1,450	13,152
Miscellaneous 1/	1,163	- - -	9,114	23	572	5,290	16,162
Total	151,915	1,068,461	118,258	186,922	210,561	8,156	1,744,273
<u>1964:</u>							
Wire mills	- - -	1,086,215	10,424	- - -	- - -	879	1,097,518
Brass mills	129,944	44,756	111,506	184,434	219,651	115	690,406
Chemical plants	- - -	- - -	1,621	- - -	- - -	550	2,171
Secondary smelt.	2,291	- - -	2,308	9	- - -	113	4,721
Foundries	3,792	61	9,654	- - -	310	1,122	14,939
Miscellaneous 1/	1,023	38	7,565	(2)	700	3/ 6,200	15,526
Total	137,050	1,131,070	143,078	184,443	220,661	8,979	1,825,281
<u>1965:</u>							
Wire mills	100	1,212,234	10,286	- - -	- - -	812	1,223,432
Brass mills	121,815	35,312	156,107	195,742	230,816	114	739,906
Chemical plants	- - -	- - -	1,701	- - -	- - -	723	2,424
Secondary smelt.	3,506	- - -	2,670	2	- - -	279	6,457
Foundries	2,918	70	11,806	- - -	448	1,266	16,508
Miscellaneous 1/	1,126	26	7,047	(2)	719	3/ 6,978	15,896
Total	129,465	1,247,642	189,617	195,744	231,983	10,172	2,004,623
<u>1966:</u>							
Wire mills	2,455	1,349,895	10,812	- - -	22	882	1,364,066
Brass mills	178,811	39,570	211,856	234,320	265,563	- -	930,120
Chemical plants	- - -	- - -	- - -	- - -	- - -	- -	4/
Secondary smelt.	8,227	- - -	8,735	111	276	307	17,656
Foundries &	- - -	- - -	- - -	- - -	- - -	-	4/
Miscellaneous 1/	- - -	- - -	- - -	- - -	- - -	-	4/
Total	189,493	1,389,465	231,403	234,431	265,861	1,189	4/ 2,335,842

SOURCE: U.S.B.M.

- 1/ Includes iron and steel plants, primary smelters producing alloys other than copper, consumers of copper powder and copper shot, and misc. manufacturers.
- 2/ Included with "Other" to avoid disclosing individual company confidential data.
- 3/ Includes "Cakes and slabs" to avoid disclosing individual company confidential data.
- 4/ Consumption by chemical plants, foundries, and miscellaneous plants not included. Estimate of 24,000 tons included in total (2,335,842) for 1966.

TABLE XII

## U. S. PRODUCTION AND CONSUMPTION OF COPPER

YEAR	MINE PRODUCTION	SECONDARY PRODUCTION*	TOTAL PRODUCTION	TOTAL ACTUAL CONSUMPTION	TOTAL PRODUCTION AS % OF CONSUMPTION
1947	847,563	303,092	1,150,655	1,463,294	78.6
1948	834,813	284,026	1,118,839	1,420,584	78.8
1949	752,750	250,089	1,002,839	1,129,686	88.8
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
Totals					
1947-56	9,062,804	2,433,361	11,496,165	14,106,932	
10 Yr. Avg.	906,280	243,336	1,149,617	1,410,693	81.5
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
1960	1,080,169	300,259	1,380,428	1,349,896	102.3
1961	1,165,155	279,511	1,444,666	1,462,830	98.8
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
Totals					
1957-66	11,604,893	3,298,603	14,903,496	16,408,056	
10 Yr. Avg.	1,160,489	329,860	1,490,350	1,640,806	90.8

Source: U.S.B.M.

\* Unalloyed Copper.

TABLE XIII

ESTIMATED ANNUAL COPPER PRODUCTIVE CAPACITY  
(Estimated by Arizona Department of Mineral Resources)

	<u>Tons Future Annual Capacity 1970-72</u>	
<u>ARIZONA:</u>		
P. D. Morenci	156,000	
New Cornelia	70,000	
Lavender Pit	34,000	
Copper Queen	27,000	
Ray	100,000	
Miami	35,000	
Inspiration	113,000	
Magma (San Manuel)	104,000	
Magma (Superior)	21,000	
Silver Bell	24,000	
Mission	85,000	
Pima	55,000	
Bagdad	29,000	
Duval (Esperanza	31,000	
Duval (Mineral Park)	25,000	
Twin Buttes	46,000	
Miscellaneous	22,000	977,000
<hr/>		
<u>OTHER STATES: (Including Puerto Rico)</u>		
Michigan	188,000	
Minnesota	47,000	
Montana	245,000	
Nevada	90,000	
New Mexico	195,000	
Utah	325,000	
Puerto Rico	84,000	
Other States	75,000	1,249,000
<u>TOTAL UNITED STATES:</u>		<u>2,226,000</u>
<hr/>		
<u>OTHER FREE COUNTRIES:</u>		
Canada	765,000	
Chili	1,320,000	
Peru	280,000	
Remainder of Latin America	129,000	
Free Europe	264,000	
Asia	464,000	
Australia	156,000	
Africa	1,400,000	4,778,000
<u>TOTAL FREE WORLD:</u>		<u>7,004,000</u>
<hr/>		
<u>SOVIET SPHERE:</u>		<u>1,200,000</u>
<hr/>		
<u>GRAND TOTAL:</u>		<u>8,204,000</u>

TABLE XIV

COPPER MINING EMPLOYMENT, WAGES AND HOURS IN U. S. AND ARIZONA

Base Period (1947-1949) Compared with Three-Year Period (1964-1966)

	<u>"A"</u>		<u>"B"</u>		<u>"C"</u>		<u>"D"</u>	
	Number		Weekly		Weekly		Hourly	
	Of all Employees		Earnings		Hours		Earnings	
	ARIZONA *	U.S.*	ARIZONA	U.S.	ARIZONA	U.S.	ARIZONA	U.S.
Base Period								
1947-49 Avg.	10,700	27,100	64.20	\$ 63.11	44.83	44.10	\$1.432	\$1.431
Last 3 Yrs.								
1964	13,275	27,000	140.97	130.42	45.00	42.90	3.133	3.040
1965	14,200	29,900	146.11	136.71	45.01	43.40	3.246	3.150
1966	15,000	32,350	150.06	142.26	45.20	43.45	3.320	3.219
1964-65 Avg.	14,158	29,750	\$145.71	\$136.46	45.07	43.25	3.233	3.136

	<u>"E"</u>		<u>"F"</u>		<u>Per Man</u>	
	Annual Man Hours		Annual Earnings		Annual Earnings	
	"A" x "C" x 52		"E" x "D"		"F" ÷ "A"	
	ARIZONA	U.S.	ARIZONA	U.S.	ARIZONA	U.S.
Base Period						
1947-49 Avg.	24,943,412	62,145,720	\$ 35,718,966	\$ 88,930,525	\$3,338	\$3,282
Last 3 Yrs.						
1964	31,063,500	60,231,600	97,321,946	183,104,064	7,331	6,782
1965	33,235,384	67,478,320	107,882,089	212,556,708	7,597	7,109
1966	35,256,000	66,907,776	117,049,920	215,376,144	7,803	6,658
1964-66 Avg.	33,181,259	64,872,565	\$107,275,004	\$203,678,972	7,577	6,846

Source: "Employment Earnings," U. S. Dept. of Labor, U.S.B.M. Mineral Yearbooks, "Arizona's Current Employment Development", Arizona Employment Security Commission.

(continued)

\* U. S. figures are reported for "All Employees".  
 Arizona figures are reported for "Production Workers".



TABLE XIV (Continued)

	"G" Tons Copper Ores		"H" Pounds Equiv.* Copper Produced From Copper Ores	
	ARIZONA	U. S.	ARIZONA	U. S.
Base Period 1947-49 Avg.	38,082,754	82,875,491	748,056,267	1,625,975,640
Last 3 Yrs.				
1964	86,132,039	155,200,464	1,313,779,000	2,372,611,000
1965	92,859,535	173,286,198	1,341,593,000	2,533,750,000
1966	101,558,298	186,966,042	1,391,815,300	2,600,121,200
1964-66 Avg.	93,516,624	171,817,568	1,349,062,400	2,502,160,666

\* Includes value of gold and silver recovered from copper ore, converted into pounds copper at average price. Precipitates are not included.

	Tons Copper Ore Produced Per Man-Hour "G" ÷ "E"		Lbs. Equiv. Copper Produced Per Man-Hour "H" ÷ "E"		Earnings Per Man-Hour "D"	
	ARIZONA	U. S.	ARIZONA	U. S.	ARIZONA	U. S.
Base Period 1947-49 Avg.	1.5268	1.3336	29.9901	26.1639	\$ 1.432	\$ 1.431
1964-66 Avg.	2.8184	2.6485	40.657	38.5703	3.233	3.136
% Incr. in 17 Years	84.60	98.60	35.57	47.42	125.76	119.15
Per Year	4.98	5.80	2.09	2.79	7.40	7.01

TABLE XV

SUMMARY OF ESTIMATED<sup>1/</sup> COPPER MINING EMPLOYMENT, WEEKLY EARNINGS,  
WEEKLY HOURS, HOURLY EARNINGS, IN ARIZONA AND UNITED STATES,  
BY YEARS 1947 to 1966 INCLUSIVE

	NO. OF EMPLOYEES		WEEKLY EARNINGS		WEEKLY HOURS		HOURLY EARNINGS	
	Arizona*	U.S.*	Arizona	U.S.	Arizona	U.S.	Arizona	U.S.
1947	10,700	25,700	\$ 59.40	59.27	45.0	44.8	\$ 1.32	\$ 1.32
1948	10,900	27,800	65.99	65.81	45.2	45.2	1.46	1.46
1949	10,500	27,300	66.98	63.96	44.3	42.3	1.512	1.512
1947-49								
Avg.	10,700	27,100	\$ 64.20	\$63.11	44.83	44.1	\$ 1.432	\$ 1.431
1950	9,500	25,800	75.80	72.05	46.5	45.0	1.63	1.601
1951	10,100	25,900	83.01	78.37	47.7	46.1	1.74	1.70
1952	10,700	26,500	90.31	85.73	47.06	45.6	1.92	1.88
1953	11,400	28,600	96.03	91.60	46.73	45.8	2.055	2.00
1954	11,900	27,400	96.60	87.33	45.31	42.6	2.132	2.05
1955	11,800	27,200	104.90	95.70	47.0	44.1	2.232	2.17
1956	13,300	34,400	112.07	100.95	47.1	43.7	2.377	2.31
1957	14,000	32,500	106.22	98.23	43.8	41.1	2.425	2.39
1958	13,500	28,400	95.40	94.62	39.8	39.1	2.399	2.42
1959	11,100	22,400	108.15	106.25	42.8	42.5	2.526	2.50
1960	12,733	29,600	116.83	114.75	43.69	43.3	2.674	2.65
1961	13,117	27,000	126.29	119.03	44.8	43.6	2.817	2.73
1962	13,350	28,500	129.29	120.98	44.3	42.9	2.920	2.82
1963	13,393	27,800	133.81	124.48	44.6	43.1	3.003	2.89
1964	13,275	27,000	140.97	130.42	45.0	42.9	3.113	3.04
1965	14,200	29,900	146.11	136.71	45.0	43.4	3.127	3.15
1966	15,000	26,600	150.06	140.07	45.2	43.5	3.32	3.22

Source: "Employment and Earnings" - U. S. Department of Labor.

"Arizona's Current Employment Developments" - Arizona Employment Security Commission.

<sup>1/</sup> These estimates include all full and part-time wage and salary workers who worked or received pay during the pay period ending nearest the 15th of the month.

\* U. S. figures are reported for "All Employees".

Arizona figures are reported for "Production Workers".

TABLE XVI

UNITED STATES COPPER MINING - OUTPUT IN TONS COPPER ORE,  
VALUE OF COPPER, GOLD, SILVER PRODUCED

	Tons Copper Ore Annual Rate	Gold Ounces & Value	Silver Ounces & Value	Copper Pounds & Value	Lbs. Cu Recov. Per Ton & Copper Price	Value of Copper, Gold & Silver)	Lbs. Copper Equiv. to Total Val. Cu, Gold & Silver
1947-1949	82,875,491	479,589	7,785,382	1,511,500,640	18.2 lbs.		
		\$16,785,615	\$7,045,770	\$ 314,664,195	20.818¢	\$338,495,580	1,625,795,640
1951	95,494,214	564,471	8,362,150	1,709,655,673	17.9 lbs.		
		\$19,756,485	\$7,567,746	\$ 413,736,679	24.2¢	\$441,060,910	1,822,566,000
1959	103,715,843	367,455	6,838,927	1,533,867,852	14.8 lbs.		
		\$12,860,925	\$6,189,229	\$ 478,566,785	31.2¢	\$497,616,939	1,594,926,200
1960	134,994,082	539,249	9,469,133	1,970,387,781	14.6 lbs.		
		\$18,873,715	\$8,569,565	\$ 630,524,096	32.0¢	\$657,967,376	2,056,147,800
1961	142,721,793	532,215	10,385,661	2,145,224,433	15.0 lbs.		
		\$18,627,525	\$9,601,544	\$ 641,422,000	29.9¢	\$669,651,000	2,239,636,000
1962	150,216,710	483,243	10,944,522	2,239,326,000	14.9 lbs.		
		\$16,913,505	\$11,874,806	\$ 689,712,408	30.8¢	\$718,500,719	2,332,794,000
1963	146,449,540	438,537	10,309,897	2,178,498,800	14.9 lbs.		
		\$15,348,795	\$13,187,595	\$ 670,977,630	30.8¢	\$699,514,020	2,271,150,000
1964	155,200,464	430,630	11,470,890	2,280,880,781	14.7 lbs.		
		\$15,072,050	\$14,831,861	\$ 743,567,141	32.6¢	\$773,471,052	2,372,611,000
1965	173,286,198	567,531	12,801,638	2,430,879,000	14.0 lbs.		
		\$19,863,585	\$16,552,518	\$ 860,531,166	35.4¢	\$896,947,269	2,533,750,000
1966	186,966,042	547,327	13,230,411	2,499,863,100	13.37 lbs.		
		\$19,156,445	\$17,106,921	\$ 904,200,483	36.17¢	\$940,463,849	2,600,121,200

Source: United States Bureau of Mines.

## A R I Z O N A

### ARIZONA'S PART IN THE ECONOMY OF THE COPPER INDUSTRY

Ever since 1910, from the mines of Arizona there has been produced each year more copper than from any other state. Each year during the past six years, Arizona's mines have yielded more copper than all the other states in the nation put together.

In the last 10 years, Arizona's copper production has been increased from 515,854 tons in 1957 to 739,569 tons in 1966, or 43 percent. During this period, the mine production of the United States increased from 1,086,859 tons to 1,429,152 or 31 percent.

The total tonnage of mine source material increased from 60,214,343 tons in 1957 to 102,151,704 tons in 1966, or 70 percent. The tonnage of copper ore included in this source material in 1957 amounted to 59,571,834 tons containing 473,920 tons of recoverable copper whereas in 1966 there were accounted for 101,558,298 tons containing 679,741 tons of recoverable copper, increases of 70 percent and 43 percent respectively.

The recoverable copper content of the copper ores dropped from 15.9 pounds to 13.4 pounds of copper per ton of ore - or a 15.7 percent drop in grade. That there has been such an increase in the copper production of Arizona in the face of the increasing leanness of the ore now being treated as compared with 1957, may be ascribed to three factors: (1) the tonnage of precipitate copper increased by 52.9 percent to 57,483 tons; (2) new mines brought into production during the past ten years, namely Duval's Esperanza mine in 1957 and Mineral Park mine in 1964; Asarco's Mission Unit in 1961; Inspiration's Christmas mine in 1962 and Ranchers Exploration and Development's Bluebird mine beginning in 1964; and (3) expanded production from Kennecott's Ray Mines Division in 1958, 1962 and 1965; from Bagdad beginning in 1963 and again in 1965; from San Manuel in 1960 and again in 1964 and 1966; from Phelps Dodge's Morenci mine in 1966; and from Pima in 1966.

Arizona is the greatest producer of copper in the United States and the United States is the greatest producer of copper in the Free World. Much of this country's other needed metals are recovered as by-products of Arizona's copper mines - and the income from Arizona's copper mines is of utmost importance to Arizona.

It is of greatest concern to Arizona therefore, about the steps taken by the various governmental agencies in working with countries abroad that are large producers of copper to cooperate in not producing copper in excess of the Free World's ability to use the production and in not permitting foreign copper to be brought into the United States in excess of our fabricators' need for copper above the amount produced from the American mines and from secondary material generated within this country.

Schedules detailing items of interest to the Arizona copper mining coterie are appended hereto as follows:

CONTENTS OF ARIZONA SUPPLEMENT

The Mineral Industry of Arizona in 1966.	U.S.B.M. Area Report	Insert
Arizona Copper Mining Output in Tons Copper Ore, Value of Copper Gold, Silver Produced from Copper Ore by Years 1947-1966		TABLE XVII
Arizona Mine Production of Copper, Lead, Zinc, Gold and Silver 1858-1966. Estimated Value of Metals and Non-Metallics Produced in Arizona		TABLE XVIII
Mine Production of Gold, Silver, Copper, Lead and Zinc in Arizona in 1966, by Class of Ore or Other Source Materials, in Terms of Recoverable Metals		TABLE XIX
Copper Production Record of Large Arizona Copper Mines, Years 1965-1966		TABLE XX
Summary of Total <u>Covered</u> Employment and Wages in Arizona Copper Mining - By Years 1947-1966 Inclusive		TABLE XXI
Average Number of Covered Employees, Total Wages, Average Annual Wage, and Average Weekly Wage, Base Period 1947-1949, Years 1964, 1965, and 1966, Arizona Industries Covered by Social Security		TABLE XXII
Mineral Production in Arizona in 1966		TABLE XXIII





# MINERAL INDUSTRY SURVEYS

U. S. DEPARTMENT OF THE INTERIOR  
BUREAU OF MINES



Stewart L. Udall, Secretary

Dr. Walter R. Hibbard, Jr., Director

Robert W. Geehan, Area Director  
Area V Mineral Resource Office  
Building 20, Federal Center  
Denver, Colorado 80225

Area Report

## THE MINERAL INDUSTRY OF ARIZONA, 1966

Producing more copper than the other 49 States combined, mine owners and operators continued to increase copper production capacity at operations in the State. Chiefly because of the increased copper production, the total value of mine output, according to the Bureau of Mines, United States Department of the Interior, was \$620.5 million, \$40.4 million (7 percent) higher than in 1965. Active development continued at The Anaconda Company Twin Buttes project, south of Tucson. Kennecott Copper Corp. and Pima Mining Co. announced plans to expand production.

The metals group of mineral commodities accounted for \$574.8 million (92.6 percent) of the total value of mineral production. Continuing the upward growth begun in 1960, production of primary copper from mines in Arizona reached 740,000 tons, 36,000 tons more than that produced in 1965. Demand for copper by both the military and private sectors of the economy remained high throughout the year; deliveries to fabricators were augmented by shipments from stockpile. Fifty-two percent of the total domestic primary production and 19 percent of the Free World production came from mines in the State. Output from 16 large mines, 12 open-pit and 4 underground properties, accounted for 721,000 tons; 79 percent was derived from open-pit and 21 percent from underground mines. Except for the strike from September 20 to October 10 at the Christmas mine, no serious work stoppages occurred at the major mines during the year.

Sand and gravel output was ranked second in value of the mineral commodities produced in the State and accounted for 3 percent of total value of mineral output. Output values of cement, diatomite, lime, mica, and perlite increased. The greatest declines in value among the State nonmetallic mineral industries were \$146,000 in gypsum production and \$80,000 in stone. The drop in gypsum production occurred primarily because of a lower demand for calcined gypsum products; the lower value of stone output resulted mostly from a decline in the output of basalt, crushed granite, and crushed sandstone used in highway construction.

Prepared by Leonard P. Larson, Mining Engineer, and William C. Henkes, Petroleum Engineer, under the supervision of Donald H. Mullen, Project Coordinator, Area V Mineral Resource Office, in cooperation with the Arizona Bureau of Mines, for release August 21, 1967.

TABLE XVII

ARIZONA COPPER MINING - OUTPUT IN TONS COPPER ORE  
VALUE OF COPPER, GOLD, SILVER PRODUCED

Year	Tons Copper Ore Annual Rate	Gold Ounces & Value	Silver Ounces & Value	Copper * Pounds & Value	Lbs. Cu Recov Per Ton & Copper Price	Value of Copper, Gold & Silver	Lbs. Copper Equiv. To Total Val. Cu, Gold & Silver
1947 to 1949	38,082,754	79,612 \$2,786,420	2,603,485 \$2,356,154	723,353,767 \$150,588,843	19.0 Lbs/ton 20.818¢	\$155,731,417	748,056,267
1951	42,784,388	83,521 \$2,923,235	3,087,865 \$2,794,518	775,609,514 \$187,697,501	18.1 Lbs/ton 24.2¢	\$193,415,254	799,236,600
1960	66,032,439	115,602 \$4,046,070	3,689,622 \$3,339,108	993,370,700 \$317,878,624	15.0 Lbs/ton 32.0¢	\$325,263,802	1,016,449,300
1961	71,918,991	129,184 \$4,521,440	4,380,458 \$4,049,690	1,092,360,900 \$326,845,395	14.6 Lbs/ton 29.9¢	\$335,416,435	1,121,007,000
1962	78,868,147	117,362 \$4,107,670	4,571,370 \$4,959,936	1,200,945,700 \$369,891,276	15.2 Lbs/ton 30.8¢	\$378,958,882	1,230,386,000
1963	80,615,132	121,177 \$4,241,195	4,494,239 \$5,748,132	1,217,337,700 \$372,505,336	15.1 Lbs/ton 30.6¢	\$382,494,463	1,249,982,000
1964	86,132,039	133,983 \$4,689,405	4,915,362 \$6,355,563	1,279,898,700 \$417,246,976	14.9 Lbs/ton 32.6¢	\$428,291,944	1,313,779,000
1965	92,859,535	133,830 \$4,684,050	5,352,850 \$6,921,225	1,308,809,700 \$463,318,634	14.1 Lbs/ton 35.4¢	\$474,923,919	1,341,593,000
1966	101,558,298	127,431 \$4,460,035	5,595,644 \$7,235,168	1,359,481,200 \$491,724,350	13.39 Lbs/ton 36.17¢	\$503,419,603	1,391,815,300

Source: U. S. Bureau of Mines

\* Does not include precipitate copper.

TABLE XVIII

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

1858 - 1966 Incl. - In Terms of Recoverable Metals

	COPPER		LEAD		ZINC	
	Short Tons	Value (thousands)	Short Tons	Value (thousands)	Short Tons	Value (thousands)
1874 - 1965	20,482,028	\$ 8,826,411	639,619	\$ 125,667	985,039	\$ 239,082
1966	739,569	535,004	5,211	1,575	15,985	4,636
TOTAL 1874 - 1966	21,221,597	\$ 9,361,415	644,830	\$ 127,242	1,001,024	\$ 243,718
Avg. Price	22.056¢		9.866¢		12.173¢	

  

	GOLD		SILVER		TOTAL VALUE
	Ounces	Value (thousands)	Ounces	Value (thousands)	
1858 - 1965	13,321,041	\$ 353,732	387,165,809	\$ 310,482	\$9,855,374,000
1966	142,528	4,988	6,339,000	8,196	554,399,000
TOTAL 1858 - 1966	13,463,569	\$ 358,720	393,504,809	\$ 318,678	\$10,409,773,000
Avg. Price	\$26.6438		\$0.809845		

  

Estimated Value of Other Metals and Non-metallics Production in Arizona through 1965	\$ 681,936,000
Estimated Value of Other Metals and Non-metallics Production in Arizona in 1966	66,081,000
Estimated Value of Other Metals and Non-metallics Production in Arizona through 1966	748,017,000
GRAND TOTAL ESTIMATED VALUE OF ARIZONA'S MINERAL PRODUCTION THROUGH 1966	\$11,157,790,000

Source: U.S.B.M.

TABLE XIX

MINE PRODUCTION OF GOLD, SILVER, COPPER, LEAD AND ZINC IN ARIZONA, 1966, BY CLASSES  
OF ORE OR OTHER SOURCE MATERIALS, IN TERMS OF RECOVERABLE METALS

Source	Number of Mines <sup>1/</sup>	Material sold or treated (short tons)	Gold (troy Ounces)	Silver (troy Ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Lode ore:							
Dry gold	2	21	2/ 32	2/ 35	300	-----	-----
Dry gold-silver	4	103,572	213	6,936	1,702,800	-----	-----
Dry silver	15	19,576	39	72,227	104,000	3,100	-----
TOTAL	21	123,169	284	79,198	1,807,100	3,100	-----
Copper	45	101,558,298	127,431	5,595,644	1,359,481,200	5,400	2,586,000
Copper-zinc and uranium <sup>2/</sup>	3/ 4	4/ 19,426	75	28,335	2,065,500	10,600	2,214,500
Lead	7	556	16	4,720	9,100	90,700	7,500
Lead-zinc	4	320,674	13,627	589,841	564,500	10,136,800	26,641,500
Zinc	2	1,623	4	4,812	58,400	67,100	519,000
TOTAL	61	101,900,577	141,153	6,223,352	1,362,178,700	10,310,600	31,968,500
Other "lode" material:							
Gold tailings	1	5	2	-----	-----	-----	-----
Gold-silver tailings and silver tailings <sup>2/</sup>	3	42,813	1,058	34,070	86,700	-----	-----
Copper cleanup	(5/)	474	30	684	99,700	-----	-----
Copper precipitates	19	82,684	-----	-----	114,965,800	-----	-----
Lead assay office cleanup	(5/)	2	-----	-----	-----	2,000	-----
Lead tailings	2	1,350	1	1,392	-----	106,300	1,500
TOTAL	25	127,328	1,091	36,146	115,152,200	108,300	1,500
TOTAL "lode" material	92	102,151,704	142,528	6,338,696	1,479,138,000	10,422,000	31,970,000
Placer	1	-----	(2/)	(2/)	-----	-----	-----
TOTAL all sources	93	102,151,704	142,528	6,338,696	1,479,138,000	10,422,000	31,970,000

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

<sup>2/</sup> Combined to avoid disclosing individual company confidential data. <sup>3/</sup> Copper-zinc mines only.

<sup>4/</sup> Excludes uranium-ore tonnage. <sup>5/</sup> From properties not classed as mines.

Source: U.S.B.M.

TABLE XX

COPPER PRODUCTION RECORD OF LARGE ARIZONA COPPER MINESYEARS 1965 and 1966

	1965		1966	
	Tons Copper Ore Mined	Pounds Copper Recovered	Tons Copper Ore Mined	Pounds Copper Recovered
PHELPS DODGE:				
Morenci	19,089,442	253,570,494	19,324,691	257,452,904
Precipitate Copper		1,560,762		24,903,460
New Cornelia	10,655,051	141,810,145	10,486,937	136,592,823
Lavender Pit	5,660,900	61,005,266	6,107,436	62,062,976
Precipitate Copper		10,367,700		7,395,000
Copper Queen	766,352	61,480,968	721,209	53,125,217
Precipitate Copper		416,000		802,150
Sub-Total	36,171,745	530,211,335	36,640,273	542,334,530
KENNECOTT - Ray	8,673,018	125,621,177	8,829,440	122,562,071
Precipitate Copper		18,684,626		21,017,359
Sub-Total	8,673,018	144,305,803	8,829,440	143,579,430
MIAMI:- Miami				
Copper Cities	3,200,202	34,950,395	4,353,896	43,286,852
Copper Cities Dump Leach		4,258,791		5,168,968
Castle Dome		4,059,881		4,121,736
Sub-Total	3,200,202	61,175,049	4,353,896	69,746,045
INSPIRATION:				
Precipitate Copper	5,799,040	99,189,629	6,446,836	90,901,965
Christmas Div.	715,671	17,281,732	934,813	16,390,738
Precipitate Copper		-		-
Sub-Total	6,514,711	124,153,059	7,381,649	114,223,993
MAGMA:				
San Manuel	13,504,024	187,533,728	14,391,335	202,779,403
Precipitate Copper	-	-	-	-
Superior	439,911	38,904,231	431,913	39,262,051
Precipitate Copper	-	-	-	-
Sub-Total	13,943,935	226,437,959	14,823,248	242,041,454

Continued-



COPPER PRODUCTION RECORD OF LARGE ARIZONA COPPER MINES (Continued)

YEARS 1965 and 1966

	1965		1966	
	Tons Copper Ore Mined	Pounds Copper Recovered	Tons Copper Ore Mined	Pounds Copper Recovered
A. S. & R. CO:				
Silver Bell	3,178,300	37,394,157	3,576,600	42,540,315
Precipitate Copper		4,580,088		5,065,888
Mission Unit	6,610,700	109,469,399	5,968,600	93,167,629
Precipitate Copper		-0-		-0-
Sub-Total	9,789,000	151,443,644	9,545,200	140,773,832
PIMA MINING CO:				
Pima	2,646,024	35,953,478	6,024,014	78,630,738
Precipitate Copper		-0-		-0-
Sub-Total	2,646,024	35,953,478	6,024,014	78,630,738
BAGDAD COPPER CORP:				
From Leach	2,017,101	24,718,435	2,091,899	27,257,133
		15,832,998		13,023,567
Sub-Total	2,017,101	40,551,433	2,091,899	40,280,700
DUVAL:				
Esperanza	4,065,811	39,034,714	4,384,278	40,819,919
Precipitate Copper		4,348,005		5,908,897
Mineral Park	4,600,426	36,618,689	5,559,094	46,294,180
Precipitate Copper		1,483,888		4,836,610
Sub-Total	8,666,237	81,485,296	9,943,372	97,859,606
TOTALS	91,621,973	1,395,717,056	99,632,991	1,469,470,328
Other Copper Producers	1,386,700	11,037,000	2,027,891	9,668,000
GRAND TOTAL	93,008,673	1,406,754,000	101,660,882	1,479,138,000

Source: U.S.B.M. & Company Reports

TABLE XXI

SUMMARY OF TOTAL COVERED EMPLOYMENT & WAGES IN ARIZONA COPPER MINING  
1947 - 1966 INCLUSIVE

COPPER MINING	No. Covered Employees	Covered Wages	Average Annual Wage	Tons Copper Ores	Average Weekly Wage
1947	11,340	\$ 36,365,277	\$ 3,207	37,810,448	\$ 61.67
1948	11,493	41,318,524	3,595	39,072,204	69.13
1949	11,001	40,612,224	3,692	37,365,611	71.00
1950	10,181	41,994,321	4,125	41,757,273	79.33
1951	10,754	47,825,698	4,447	42,784,388	85.52
1952	11,365	54,950,235	4,835	44,472,522	93.14
1953	12,068	62,742,982	5,199	45,187,838	99.98
1954	12,502	65,518,853	5,241	43,072,894	100.79
1955	12,399	71,293,263	5,750	52,189,728	110.58
1956	14,008	83,568,996	5,966	60,468,580	114.73
1957	14,652	85,125,320	5,809	59,571,834	111.71
1958	14,100	74,726,972	5,300	56,255,809	101.93
1959	11,568	72,095,130	6,232	53,121,545	119.85
1960	13,764	90,312,848	6,562	66,032,439	126.19
1961	14,275	97,271,286	6,814	71,918,991	131.04
1962	14,408	101,920,108	7,074	78,868,147	136.04
1963	14,303	104,291,588	7,292	80,615,132	140.23
1964	14,720	113,792,031	7,730	86,132,039	148.65
1965	15,239	122,163,124	8,016	92,859,535	154.16
1966	16,999	137,187,611	8,070	101,558,298	155.19

Source: Arizona Employment Security Commission (and Letter 6/16/67),  
United States Bureau of Mines.

TABLE XXII

AVERAGE NUMBER OF COVERED EMPLOYEES, TOTAL WAGES, AVERAGE ANNUAL WAGE AND  
AVERAGE WEEKLY WAGE

Base Period 1947-1949 and Years 1964, 1965, and 1966

## ARIZONA INDUSTRIES COVERED BY SOCIAL SECURITY

	Average No. of <u>1/</u> Employees	Total Wages	Average Annual Wage	Average Weekly Wage
Base Period 1947-1949				
Copper Mining Only <u>2/</u>	11,278	\$ 39,432,008	\$3,496	\$67.23
Copper Smelting <u>3/</u>	1,500	5,175,000	3,450	66.35
All Mining & Smelting	12,778	\$ 44,607,008	\$3,491	\$67.13
Other Mining & Quarrying	1,592	4,913,010	3,085	59.33
All Mining, Quarrying & Smelting	14,370	49,520,018	3,446	66.27
Manufacturing (Excl. Smelting)	12,639	36,910,624	2,920	56.15
Construction	10,844	35,424,826	3,267	62.83
Trans. & Utilities (Excl. R.R.s)	10,530	29,948,944	2,844	54.69
Wholesale - Retail Trade	36,213	91,916,860	2,538	48.81
Services Misc. (Incl. Agri.)	18,643	43,103,526	2,312	44.46
TOTALS AND AVERAGES	103,239	\$286,824,798	\$2,778	\$53.42
YEAR 1964				
Copper Mining Only <u>2/</u>	14,720	\$113,792,031	\$7,730	\$148.65
Copper Smelting <u>3/</u>	1,790	12,428,972	6,944	133.53
All Copper Mining & Smelting	16,510	\$126,221,003	\$7,645	\$147.02
Other Mining & Quarrying	1,560	9,421,262	6,039	116.14
All Mining, Quarrying & Smelting	18,070	\$135,642,265	\$7,506	\$144.35

(Continued)

Source: Arizona Employment Security Commission.

- 1/ This number includes all covered employees on payroll, and is not restricted to production workers only, on which the average hourly and weekly earnings report.
- 2/ This number includes all copper mining and milling employees and some copper smelting employees not reported under Manufacturing by the Employment Security Commission.
- 3/ Smelting Employment has been segregated from Manufacturing as reported by the Employment Security Commission.

TABLE XXII continued

	Average No. of <u>1</u> / Employees	Total Wages	Average Annual Wage	Average Weekly Wage
<u>YEAR 1965</u>				
Copper Mining Only <u>2</u> /	15,239	\$122,163,124	\$8,016	\$154.16
Copper Smelting <u>3</u> /	1,808	12,892,848	7,131	137.13
All Copper Mining & Smelting	17,047	\$135,055,972	\$7,922	\$152.35
Other Mining & Quarrying	1,438	9,109,659	6,335	121.83
All Mining, Quarrying & Smelting	18,485	144,165,631	7,799	149.99
Manufacturing (Excl. Smelting)	62,574	408,893,517	6,535	125.67
Construction	22,892	163,351,181	7,136	137.23
Trans. & Utilities (Excl. R.R.s)	21,165	137,827,200	6,513	125.25
Wholesale - Retail Trade	91,128	398,693,547	4,375	84.14
Services Misc. (Incl. Agri.)	65,695	298,848,828	4,549	87.48
TOTALS AND AVERAGES	281,939	\$1,551,779,904	\$5,504	\$105.85

<u>YEAR 1966</u>				
Copper Mining Only <u>2</u> /	16,069	\$ 130,130,488	\$8,098	\$155.73
Copper Smelting <u>3</u> /	949	7,057,123	7,436	143.00
All Copper Mining & Smelting	17,018	137,187,611	8,061	155.02
Other Mining & Quarrying	1,524	10,251,832	6,727	129.37
All Mining, Quarrying & Smelting	18,542	147,439,443	7,952	152.92
Manufacturing (Excl. Smelting)	77,191	524,679,641	6,797	130.71
Construction	24,113	189,448,964	7,857	151.10
Trans. & Utilities (Excl. R.R.s)	22,248	151,780,720	6,822	131.19
Wholesale - Retail Trade	95,490	433,319,691	4,538	87.27
Services Misc. (Incl. Agri.)	68,702	322,389,754	4,693	90.25
TOTALS AND AVERAGES	306,286	\$1,769,058,213	\$5.776	\$111.08

TABLE XXIII

## MINERAL PRODUCTION IN ARIZONA IN 1966 1/

	Quantity	Value (thousands)
Asbestos -----short tons	W	W
Clays 2/ -----thousand short tons	89	\$121
Copper (recoverable content of ores, etc.)--short tons	739,569	535,004
Diatomite -----do--	1,353	36
Gem stones-----	NA	120
Gold (recoverable content of ores, etc.)---troy ounces	142,528	4,988
Gypsum----- thousand short tons	75	394
Iron ore (usable)-----thousand long tons, gross weight	W	W
Lead (recoverable content of ores, etc.)---short tons	5,211	1,575
Lime -----thousand short tons	218	3,721
Mercury ----- 76-pound flasks	363	160
Molybdenum (content of concentrate)---thousand pounds	10,161	17,812
Natural gas (marketed)-----million cubic feet	p/ 2,900	p/ 351
Petroleum (crude)-----thousand 42-gallon barrels	132	370
Pumice ----- thousand short tons	1,103	1,674
Sand and gravel-----do--	18,730	20,448
Silver (recoverable content of ores, etc.) thousand troy ounces	6,339	8,196
Stone----- thousand short tons	2,271	4,091
Tungsten concentrate (60-percent WO <sub>3</sub> basis) short tons	2	5
Uranium ore -----do--	64,195	1,978
Vanadium -----do--	W	453
Zinc (recoverable content of ores, etc.)-----do--	15,985	4,636
Value of items that cannot be disclosed: Cement, clay (bentonite), feldspar, helium, mica (scrap), perlite, pyrites, and values indicated by symbol W -----	XX	3/ 14,347
TOTAL-----	XX	620,480

Source: U.S.B.M. Area Report for Arizona, 1966.

p/ Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."

XX Not applicable.

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

2/ Excludes bentonite; included with "Value of items that cannot be disclosed."

3/ Value of metals and mineral fuels, \$2,242,000; value of nonmetals, \$12,105,000.

## COPPER INDUSTRY

Statistics for 1966 Compared with Other Years, Arizona, United States  
and World

Compiled by: Arizona Department of Mineral Resources

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### ERRATA (Underlined)

<u>Page</u>	<u>Line</u>	<u>Should read in part</u>
2	1 - third paragraph	. . . exported a total of 27 <u>5</u> ,217
6	1 - fifth paragraph	. . . smelter and <u>the</u> smelting-refining
	5 - sixth paragraph	. . . President's Fre <u>i</u> 's announcements
12	5 - third paragraph	. . . called for 1,000, <u>000</u> tons