

# COPPER

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In 2000, mine production of recoverable copper in the United States continued its downward slide that began in 1998, falling by more than 150,000 metric tons (t) to the lowest level since 1988. In addition to mine closures and cutbacks carried forward from midyear 1999, high energy costs coupled with low copper prices led to unanticipated cutbacks and closures. Some rationalization of capacity occurred following consolidation of ownership at the end of 1999. Three companies, Phelps Dodge Corp., ASARCO Inc. (owned by Mexico's Grupo Mexico S.A. de C.V.), and Kennecott Utah Copper Corp. (owned by Rio Tinto plc of the United Kingdom), accounted for more than 95% of U.S. copper mine production.

While the United States maintained its position as the world's second largest mine producer of copper, accounting for about 11% of world production, its share of global production continued to decline from its 19% share in 1994. Chile, where mine production increased by 5% in 2000, and by 85% since 1995, was the largest mine producer and accounted for 35% of world production. World mine production grew by about 3.5% in 2000 and by 30% since 1995. The world reserves and reserve base for copper were estimated to be 340 million metric tons (Mt) and 650 Mt, respectively. The United States had about 13% each of reserves and reserve base. In the 1998 National Mineral Resource Assessment conducted by the U.S. Geological Survey (U.S. Geological Survey, 2000), the estimated copper

contained in undiscovered resources in the United States ranged from greater than 170 Mt at a 90% probability to greater than 440 Mt at a 10% probability. The mean estimate of copper in undiscovered deposits was 290 Mt. According to the assessment, more than two-thirds of the copper was thought to be contained in undiscovered porphyry copper deposits. Other major deposit types were sediment-hosted and volcanogenic massive sulfide deposits. About 50% of the undiscovered resource was believed to be in Great Basin and Southern Basin and Range regions (portions of Arizona, California, Nevada, New Mexico, and Utah). The identified copper resource was estimated to be 260 Mt. Coupled with past production of about 91 Mt, the total discovered copper resource in the United States was estimated to be 350 Mt.

U.S. copper smelter and refinery production also continued to fall and were down by 23% and 16%, respectively, from 1999 production levels, and 42% and 33%, respectively, from production in 1998. Owing to the combined impact of mine cutbacks and low prices, three of seven primary smelters had closed in 1999. Primary refined production declined owing to a downstream shortage of anode for refining. With the three smelters remaining closed in 2000, the United States became a net exporter of copper in concentrates. Contraction of the secondary copper industry continued with the closure in May of one of the Nation's two remaining secondary smelters and its

## Copper in the 20th Century

At the beginning of the 20th century, following patenting of the electric lightbulb and initial development of electric power distribution infrastructure late in the 19th century, the United States was experiencing a prolonged period of expansion in copper use for electrical generation, distribution, and industrial applications. U.S. mine production rose from 27,000 metric tons in 1880 to 275,000 tons in 1900 and 490,000 tons in 1910. Most of the copper produced came from high-grade vein deposits that predominantly yielded ore for direct shipping to smelters (80 smelters operated in 1907). By 1900, Montana and Arizona had emerged as the leading producing States, accounting for 45% and 20% of domestic production, respectively. The United States was by far the world's largest producer in 1900, accounting for 55% of world production and exporting about 160,000 tons of refined copper and consuming about 160,000 tons.

The United States retained its position as the largest producer and consumer of copper through most of the century. Domestic copper mine production peaked in 1997 at 1.94 million tons. Froth flotation and large-scale open pit mining methods introduced during the first decade of the century had revolutionized copper mining, and production was derived

increasingly from low-grade porphyry copper deposits. Industrialization, rural electrification, and growing infrastructure all contributed to the growth in copper demand. Electrical applications accounted for an increasing share of domestic consumption (about 75% in 2000).

By the start of the 21st century, however, the United States had relinquished its role as the world's largest copper producer to Chile (35% of global production). U.S. mine production in 2000 fell to about 1.4 million tons and accounted for only about 11% of world production. Technology advances made in the 1980s resulted in one-third of U.S. mine output in 2000 coming from the leaching and solvent extraction-electrowinning of acid soluble ores. The combined impact of environmental regulation and industry restructuring left only four smelters operating. The United States remained the world's largest user of refined copper (about 3 million tons, 20% of world total) and was dependant on imports for about one-third of its refined copper supply. Copper recovered from old scrap (500,000 tons in 1997) also fell victim to industry consolidation and offshore processing and declined to only 350,000 tons in 2000.

captive electrolytic refinery. Electrowon production, which accounted for a record 36% of primary refined production and 38% of mine production, declined by about 5%. Though it retained its position as the second largest refiner and third largest smelter, the U.S. share of world smelter and refinery production fell to 9% and 12%, both down from 15% in 1998. In 1998, the United States had been the largest smelter and refiner of copper.

Twenty-seven mines operating in 7 States, down from 33 in 1999, reported recoverable quantities of copper in 2000. Fourteen mines located in Arizona, Utah, New Mexico, and Montana, in descending order, accounted for more than 99% of production. The remaining 13 mines were either small leach operations or byproduct producers of copper. Despite the decline in production, capacity utilization at domestic mines rose, as capacity was adjusted downward to reflect the long-term closure of mines that were not expected to reopen without significant capital investment.

During the year, 4 primary and 2 secondary smelters, 6 electrolytic and 3 fire refineries, and 14 solvent extraction-electrowinning (SX-EW) facilities operated in the United States. By yearend, however, one secondary smelter and associated electrolytic refinery had closed. Following closure of three primary smelters in 1999, which were not anticipated to reopen in the short term, smelter capacity for 2000 was revised downward from 1.75 million metric tons per year (Mt/yr) in 1999 to 1.18 Mt/yr. Consequently, smelter capacity utilization rose from 74% in 1999 to 85% in 2000. Capacity at refineries declined by about 200,000 metric tons per year (t/yr) to 2.4 Mt/yr and the utilization rate fell to 74%. The conversion of old scrap to alloys and refined copper, declined by 47,000 t (12%), contributed 334,000 t of copper to the market, and accounted for 11% of apparent industrial demand. Lower copper prices in 2000 and closure of a secondary copper smelter led to the continued downward trend in recovery.

Copper was consumed as refined copper and as direct melt scrap at about 35 brass mills, 13 wire-rod mills, and 600 foundries, chemical plants, and miscellaneous operations. According to data compiled by the Copper Development Association Inc. (CDA) (Copper Development Association, Inc., 2001, p. 18), mill and foundry product shipments to the U.S. market, including net imports of mill products, continued their upward trend, rising by 170,000 t (4%) to 4.33 Mt, and were 43% higher than shipments in 1990.

The net import reliance for refined copper, as a percentage of apparent consumption, rose sharply to a record-high 37% (from 14% in 1998) following cutbacks in domestic production and growth in demand. Peru emerged as the largest source of refined copper, and, along with Canada and Chile, accounted for about 80% of refined imports. Canada remained the largest U.S. source for unwrought copper, accounting for 27% of total imports of unwrought copper. China (including Hong Kong), owing to a large growth in U.S. scrap exports, became the largest recipient for unwrought exports, accounting for 58% of refined exports and 38% (copper content) of total exports.

### **Legislation and Government Programs**

On January 26, 2000, as authorized by the Coin Act of 1997, the U.S. Mint began releasing its new Golden dollar coin to replace the Susan B. Anthony dollar coin that had been

introduced in 1979. In its report to Congress, the Mint outlined details of a promotional campaign aimed at helping the public build a strong awareness for the coins. According to the Mint, about 700 million Golden Dollars were placed in circulation during 2000, 7 times initial expectations. The new coins also generated an \$800 million profit for the Mint (U.S. Mint, 2001). At a coin weight of 8.1 grams and overall composition of 88.5% copper, 6% zinc, 3.5% manganese, and 2% nickel, the 700 million coins contained about 5,000 t of copper.

In January, the U.S. Department of Labor, Division of Trade Adjustment and Assistance, rejected a petition by the United Steel Workers of America seeking transitional adjustment assistance for workers producing copper rod at the Pauline, KS, plant of Superior-Essex Inc. In rejecting the petition, the department found that criterion 3 (the subject firm increased imports of like products from Canada or Mexico) and criterion 4 (the firm shifted production to Canada or Mexico) of the act had not been met. The Division of Trade Adjustment and Assistance concluded that copper rod production at Pauline had been shifted to other domestic plants of the subject firm and that Superior-Essex had neither increased its imports from Mexico or Canada nor shifted production to those countries (U.S. Department of Labor, 2000).

In June, the U.S. Environmental Protection Agency (EPA) proposed a change to its proposed national emissions standards for hazardous air pollutants (NESHAP) for primary smelters (smelting furnaces, slag cleaning furnaces, and batch converters). In April 1998, under section 112 of the Clean Air Act, which directs EPA to establish NESHAPs to control emissions from major stationary sources, EPA had proposed an equipment-based standard. The new proposed rule for the control of process emissions would establish a numerical emissions standard for particulate matter of 23 milligrams of total particulate matter per dry standard cubic meter (0.010 grains per dry standard cubic foot). In EPA's judgment, the proposed standard reflects "a level of total particulate matter emissions that can be achieved consistently by a properly operated and maintained sulfuric acid plant used to control process offgas from primary smelting and converting operations." The proposed standard also specifies that a furnace will be in violation of the standard if leak detector alarms installed on baghouses indicate higher than allowable emissions more than 5% of the operating time over a 6-month period. Copper smelting was 1 of 170 categories selected for regulation under the Clean Air Act (U.S. Environmental Protection Agency, 2000b).

In November, in response to an industry petition, EPA issued a final rule exempting the need for a residue tolerance test, in accordance with the Federal Food, Drug, and Cosmetic Act (as amended by the Food Quality Protection Act of 1996), when copper sulfate pentahydrate is used as a fungicide on raw agricultural commodities after harvest. This regulation eliminates the need to establish a maximum permissible level for residues of copper sulfate pentahydrate. While use of copper compounds has been exempted from tolerance tests when applied to growing crops, they had not been exempted when applied to crops at the time of or after harvest. Copper compounds are already exempted from testing when used on harvested fish, meat, poultry, eggs, and irrigated crops. In granting its exception, EPA noted relevant scientific data indicating that it is unlikely that excessive amounts of copper

ion from this use would be ingested, that copper is ubiquitous in nature and naturally occurring in ingested water and plants, is an essential nutritional element in animals (including humans) and plants, not readily absorbed when ingested, and that most of absorbed copper is excreted (U.S. Environmental Protection Agency, 2000a).

## Production

Mine production capacity was adjusted downward by about 250,000 t/yr to about 1.75 Mt/yr, reflecting the sustained closure of BHP Copper Co. mines and reduced capacity at several other mines that had shifted mining strategies or plans. Phelps Dodge closed its Metcalf concentrator at its Morenci Mine in Arizona during August in anticipation of switching to an all leach operation in 2001. In response to lower average prices, mine closures, and higher than anticipated utility rates, production declined by about 160,000, t and capacity utilization rose slightly to about 84%. With the exception of its small Arizona leach SX-EW operations at San Manuel, Pinto Valley, and Miami, BHP's mines remained shuttered.

Primary smelter production declined by 21% following the closure of three of the seven primary domestic smelters during 1999 and was down by 42% from that in 1998. Smelter capacity was revised downward to reflect the indefinite closure of these smelters. Secondary smelter production continued its downward trend, declining by 31%. In May, Southwire Co. closed its secondary smelter and associated electrolytic refinery, in Carrollton, GA. Southwire continued to operate its rod mill housed within its Copper Division Southwire (CDS). Sixteen months prior, as part of a restructuring plan aimed at lowering its costs, Southwire had unsuccessfully placed its Carrollton copper smelter/refinery operations on the market. Southwire cited economic factors, including the continued cost of compliance with environmental regulations in the metro-Atlanta area, for the closure of copper smelting operations. CDS was constructed in 1972, at a time when primary producers exerted greater control over copper prices. As part of the closure justification, Southwire cited the advent of worldwide commodity prices and their own "strong buying position" as leverage in meeting future raw material needs (Southwire Co., 2000). Closure of CDS secondary copper facilities, which have a capacity to produce 140,000 t/yr of refined copper, had a significant impact on the U.S. scrap copper market. Southwire processed a mixture of imported blister and copper scrap at its smelter to produce anode for electrolytic refining. Southwire was one of two remaining secondary smelters in the United States, two other smelters having closed in the preceding 3 years. Southwire closed its other secondary copper smelter in Gaston, SC, at the end of 1994, also citing the high cost of environmental compliance as the reason for closure.

Primary and secondary refinery production declined by 16% and 9%, respectively. The aforementioned smelter closures led to downstream shortages of anode for refining. Electrowon production declined by only about 3% and accounted for a record 36% of primary refined production. The Warrenton fire refinery, which had closed in March 1999, was reopened under different management, mitigating some of the lost secondary refinery capacity.

**Company Reviews.**—Following acquisition of the assets of Cyprus Amax Minerals Co. at yearend 1999, Phelps Dodge

Corp. reported record copper production of 1.32 Mt, including minority participants share of 235,000 t, from its worldwide operations. U.S. production amounted to 850,000 t. In the United States, production and costs were adversely affected by unusually heavy precipitation during the fourth quarter of the year and high energy costs, including electricity, diesel fuel, and natural gas. According to Phelps Dodge, its domestic electricity costs during the fourth quarter averaged \$0.11 per kilowatthour, more than three times their 5-year average cost, and total energy costs rose by \$0.08 per pound of copper production, a 65% increase over the comparative 1999 period. Total energy costs increased copper unit costs in 2000 by approximately \$0.04 per pound compared with unit costs in 1999. Beginning in the spring of 2000, the impact of a power supply/demand imbalance in California, drought in the Pacific Northwest, and higher natural gas prices caused a shortage of electricity and higher spot market electricity costs. Approximately 27% of Phelps Dodge's electricity requirements in 2000 was purchased on the spot market (Phelps Dodge Corp., 2001a, p. 15-16; 2001b, p. 3).

At its Morenci Mine, production of copper in concentrate declined from 177,000 t to 120,000 t following placement of the Metcalf concentrator on standby in June. In September 1999, Phelps Dodge had announced its intent to reduce production costs by converting all Morenci production to mine-for-leach by early 2001 and permanently shut both the Metcalf and Morenci concentrators. The \$220 million conversion proceeded throughout 2000 and was completed during the first quarter of 2001. New facilities included an expanded crushing and conveying system, mobile stackers to disperse the ore on leach piles, expanded solvent extraction facilities, and construction of a new electrowinning tankhouse. Electrowon production in 2000 of 258,000 t was unchanged from that of 1999 (Phelps Dodge Corp., 2001a, p. 3-9).

At its Miami, AZ, leach operations acquired with the purchase of Cyprus Amax, a new mine plan was instituted in June that suspended stripping in a higher cost section of the mine and allowed redistribution of equipment to other Phelps Dodge operations. Production in 2000 of 54,000 t of cathode was not impacted by the mine plan change, though production in 2001 and 2002 was expected to fall by 16,000 t and 39,000 t, respectively. At its newly acquired Bagdad Mine in Arizona, Phelps Dodge reported production of 101,000 t of copper in concentrate and 10,700 t of electrowon copper. Electrowon production at its Tyrone, NM, mine was essentially unchanged at 72,000 t (Phelps Dodge Corp., 2001a, p. 3-9).

In March, Phelps Dodge ended speculation on the fate of its newly acquired Sierrita Mine in Arizona when it announced that it intended to invest \$13 million to upgrade the mine (\$2.9 million), the crushing and conveying system (\$2.5 million), the solvent extraction circuit (\$1.3 million), as well as other upgrades and land purchases (\$3.0 million) (Platt's Metals Week, 2000c). Production in 2000 amounted to 87,000 t of copper in concentrate and 24,000 t of electrowon copper (Phelps Dodge Corp., 2001a, p. 8).

At its Hidalgo, NM, smelter, closed in September 1999, Phelps Dodge announced its intention to reconfigure the smelter to produce sulfuric acid for its leaching operations. While Phelps Dodge had a near-term surplus of concentrate, the company announced at midyear that it intended to stop exporting surplus concentrates and to stockpile them in anticipation of conversion of Morenci to all leach operation,

resulting in a future concentrate shortfall. Prior to closure of the Hidalgo smelter, Phelps Dodge had been a net importer of copper concentrates from its South American operations (Phelps Dodge Corp., 2000). In 2000, Phelps Dodge smelters produced 449,000 t of copper. As a result of the upstream curtailment in smelting, Phelps Dodge's refineries in El Paso, TX, and Miami, AZ, operated at only 72% of their combined capacity, producing 427,000 t of copper cathode (Phelps Dodge Corp., 2001a, p. 9).

In July, Asarco, a wholly owned subsidiary of Mexico's Grupo Mexico S.A. de C.V., announced plans to consolidate all corporate functions in Phoenix, AZ, by yearend. Following acquisition by Grupo in November 1999, Asarco had already transferred many of its corporate functions from New York City to Arizona (ASARCO Inc., 2000a). Grupo reported that operating and cost savings from the integration of Asarco and Southern Peru Copper Corp. following acquisition in 1999 amounted to more than \$171 million. Asarco's share of mine production declined from 293,000 t in 1999 to 261,000 t in 2000 (Grupo Mexico S.A. de C.V., 2001b).

At Asarco's Ray Operations in Hayden, AZ, production of copper in concentrate and electrowon cathode declined to 99,300 t and 38,800 t, respectively, down from 144,000 t and 40,000 t, respectively, in 1999. The Ray mining unit consists of a 227,000-metric-ton-per-day (t/d) open pit mine with a 27,000-t/d concentrator (Ray) and a 23,500-t/d concentrator (Hayden), a 13,600-t/d silicate leaching system, a low-grade sulfide dump leaching system, and a SX-EW operation. The Hayden oxygen flash smelter, with an annual capacity of 650,000 t/yr of concentrates, produced 191,000 t of copper anode. Asarco's El Paso smelter remained on standby throughout the year, and production at its Silver Bell Mine and SX-EW operation in Arizona declined by about 2,000 t to 18,300 t (Grupo Mexico S.A. de C.V., 2001a, p. 10-13).

In November, Asarco initiated a new mine plan at its Mission Mine Unit in Arizona. Under the plan, ore production was reduced from 56,000 t/d to 37,000 t/d, while total material mined was increased by 25%, thus increasing the stripping ratio and extending the reserve life at the mine from 14 to 22 years. The new plan was expected to boost average ore grades, increase recovery rates, and reduce unit production costs. Annual production of copper in concentrate was expected to decline by 22,000 t (ASARCO Inc., 2000b).

Montana Resources Inc. (49% owned by Asarco) suspended milling operations at its Continental Mine in Montana on June 30, citing "a dramatic escalation in power prices" as the reason for the shutdown. Stripping operations continued after the mill closed, and the company had anticipated resuming operations by yearend when it had expected utility rates to abate after the peak summer demand (Platt's Metal's Week, 2000b). At yearend, however, the mine remained closed and was not anticipated to reopen in the near term.

Despite numerous setbacks and limited interest by investment companies, Summo Minerals Corp. continued predevelopment work on its Lisbon Valley Copper Project, San Juan County, UT. The company resumed a drilling program early in the year in the Centennial SE Extension deposit and updated reserve calculations for a revised "final feasibility study," approved in September, for submission to banks for solicitation of financing. The plan design is for an open pit, heap-leach, SX-EW project producing 18,000 t/yr of cathode during a minimum 8.5-year

period at anticipated cash and full operating costs of below \$0.50 and \$0.75 per pound of copper, respectively. Reserves were estimated at 333 Mt of ore grading an average 0.54% copper with a stripping ratio of 2.25 (Summo Minerals Corp., 2000a; 2000b).

At Kennecott Utah Copper Corp.'s Bingham Canyon Mine, production of copper increased by 5.9% to 296,000 t, and gold output rose 44% to 529,000 ounces compared with production in 1999. A 4% increase in ore milled, combined with a 4% and 44% increase, respectively, in copper and gold grades, accounted for the production growth. Copper ore grades had fallen from 0.62% copper in 1998 to 0.55% in 1999 and recovered, beginning midyear, to an annual average of 0.57% in 2000, still below the expected life-of-the-mine average. Kennecott anticipated that large-scale underground mining would extend mine life by 15 years when open pit reserves are exhausted around 2015. Refinery output increased nominally to 269,000 t with the smelter reportedly operating in excess of rated capacity (Rio Tinto plc, 2001, p. 37).

Nord Resources Corp. was seeking financing to return the Johnson Camp copper mine to full production. Nord acquired Johnson Camp in June 1999. In the first 6 months of 2000, the company incurred losses related to the planned redevelopment of the mine but operated on a close to break-even basis after that (Nord Resources Corp., 2000b). The Johnson Camp Copper Mine, 105 kilometers east of Tucson, AZ, is currently being operated on a maintenance basis. Since 1975, the mine has produced more than 68,000 t of cathode copper from open pit mining, heap leaching, and SX-EW processing of oxide ores. Although significant reserves remain, mining operations ceased in 1997. Heap leaching continues and the mine is producing 1 to 2 million pounds of copper annually. A detailed feasibility study to restart the Johnson Camp Mine demonstrated that the mine could produce 8,900 t per year of copper cathode for 11 years at an average cash cost of \$0.63 per pound. Startup costs would total \$13.5 million, including \$7.9 million of capital investment and \$5.6 million of working capital and other costs. Current reserves are placed at 3.2 Mt grading 0.417% copper (Nord Resources Corp., 2000a).

## Consumption

Reported consumption of refined copper by domestic manufacturers continued its upward trend, rising by 1.6%, to 3.03 Mt. In addition to refined copper, domestic manufacturers directly consumed (melted or processed into chemicals) 1.3 Mt of copper-base scrap containing about 1 Mt of recoverable copper. An additional 75,000 t of copper was recovered in the consumption of aluminum-, nickel-, and zinc-base scrap.

Consumption of refined copper at wire-rod mills increased nominally and accounted for about 74% of domestic consumption of refined copper. For the third consecutive year, consumption growth at wire-rod mills was moderated by increased imports of wire rod, principally from Canada and Mexico, from which imports rose by 45,000 t to 225,000 t in 2000. Total imports rose by 63,000 t. Capacity utilization at domestic mills remained high following closure of two wire-rod mills in 1999. According to industry reports, despite increased imports, the U.S. wire-rod market was tight and at midyear experienced supply shortages. Wire-rod inventories in June fell to their lowest levels in recent years. An extended maintenance

shut down at Grupo Minero Mexico S.A.'s Mexican wire-rod mill led to a 20% cutback in shipments in June, and production difficulties were also reported at Southwire Co., which had closed its secondary smelter and electrolytic refinery at the end of May (Platt's Metals Week, 2000d). In response to limited U.S. capacity and expectations of continued demand growth, Alcatel, a French-owned communications company with wire-rod mills in Canada, France, and Germany, announced plans to construct a 200,000-t/yr wire-rod mill in the southeastern United States. Commissioning was anticipated in 2 to 3 years (Platt's Metals Week, 2000a).

At brass mills, which were the second largest consumers of refined copper, consumption of refined copper rose by about 5%, while consumption of copper-base scrap rose by less than 2%, reflecting the continued impact of relatively low copper prices that reduced the cost of using refined copper and reduced the availability of scrap for processing. Brass mills still remained the largest consumers of scrap, accounting for about two-thirds of the total copper recoverable from scrap.

According to data compiled by the CDA (2001, p. 18), the supply of copper and copper-alloy products to the U.S. market by fabricators (wire mills, brass mills, foundries, and powder producers), including net imports, rose by about 4% to 4.3 Mt, up from the revised total of 4.16 Mt in 1999, and contained an estimated 3.9 Mt of copper. About 71% of these shipments was as unalloyed copper products. Wire mill products accounted for about 49% of total shipments to the domestic market; brass mill products, 47%; and foundry and powder products, 4%. In building construction, the largest end-use sector, shipments were essentially unchanged and accounted for about 39% of the market, down from 41% the previous year. Building construction included products used for building wire, plumbing and heating, air conditioning and commercial refrigeration, builders hardware, and architectural applications. Shipments for electric/electronic products and consumer/general products rose by 9% and 11%, respectively, and accounted for 28% and 11% of the market, respectively. Shipments for transportation equipment, 11%, and industrial machinery, 11%, rose slightly.

In May, Cerro Copper Products Co. announced that it had broken ground on a new "flagship" tube manufacturing and distribution center in Cedar City, UT. The tube mill was expected to be commissioned in 2001. The facility is part of a 3-year, \$125 million expansion program. In addition to employing a unique, Cerro-developed process to produce both plumbing and air conditioning tube, the mill will be the only tube mill in the western United States (Cerro Copper Products, 2000). According to the Copper Development Association Inc. data (2001, p. 17), though down slightly in 2000, plumbing and commercial tube shipments to the U.S. market have risen 14% since 1995.

## Prices and Stocks

Despite growing global inventories, copper prices in January continued the upward trend begun in mid-1999 and rose to their highest level in almost 2 years. The Commodity Exchange (COMEX) spot price averaged \$0.85 per pound in January. With global inventories held on the commodity exchanges continuing to rise in February, prices began to weaken. Despite a sharp reversal in the upward trend in global inventories beginning in March, prices remained lower, the COMEX price

averaging only \$0.80 per pound in the March to June period. According to data compiled by the International Copper Study Group (2001a, p. 6), monthend inventories of refined copper on the global exchanges (LME, COMEX, and Shanghai Futures Exchange) peaked in February at 990,000 t before beginning a sustained slide that lasted through November when monthend inventories fell to 495,000 t. Prices began to respond to the decline in global stocks in May, and the average monthly COMEX price climbed to \$0.91 per pound in September. Prices weakened and fluctuated during the fourth quarter of the year, the COMEX price averaging \$0.86 per pound and finishing the year at \$0.85 per pound. At yearend, inventories of copper held on the metals exchanges totaled 530,000 t, and total reported inventories, as reported by the International Copper Study Group (ICSG), decreased to 1.31 Mt, down from 1.62 Mt in 1999. At the prevailing rate of consumption, global inventories at yearend represented only about 31 days of supply, down from 41 days in 1999.

## Trade

Net imports of refined copper rose sharply for the fifth consecutive year to 962,000 t, compared with 812,000 t in 1999. General imports of refined copper (1,025,000 t) were 30,000 t lower than imports for consumption as bonded material was removed from U.S.-located London Metal Exchange Ltd. (LME) warehouses. Beginning in March, LME inventories declined steadily and at yearend totaled 204,000 t, down from 412,000 t at yearend 1999. Exports of refined copper rose to 94,000 t, up from 25,000 t in 1999, and accounted for some of the drawdown in LME inventories.

Reduced domestic capacities led to shifts in the trade pattern for several copper products. Continuing the trend begun during the second half of 1999 following the closure of three primary smelters, the United States reverted to being a net exporter of copper in concentrates during 2000. The United States exported 175,000 t of copper in concentrate while having only negligible imports. Prior to 1998, the United States had been a long-term net exporter of concentrates. Reduced secondary processing capacity led to a surge in scrap exports; combined scrap exports of 486,000 t for 2000 exceeded exports of 315,000 t in 1999. China, including Hong Kong, was the largest recipient, accounting for 223,000 t, 46%, of total scrap exports. Owing to reduced capacity at domestic wire-rod mills, growth in industrial demand for wire rod was met by increased imports. Wire-rod imports (as reported by the U.S. Census Bureau and adjusted by the U.S. Geological Survey) rose to 247,000 t, up from 197,000 t in 1999 and 108,000 t in 1998.

According to U.S. Census Bureau data compiled by the Copper and Brass Fabricators Council Inc. (2001, p. 1-9), the United States imported 394,000 t of copper and copper-alloy semifabricated products, excluding wire-rod mill products, and exported 158,000 t. Net imports rose to 236,000 t, up from 139,000 t in 1999 and 86,000 t in 1998. Canada and Mexico accounted for 75% of semifabricated copper exports and 30% of imports.

Each year during the anniversary month of the publication of an antidumping or countervailing duty order, finding, or suspension of investigation, interested parties may request that the Department of Commerce conduct a review of the prevailing ruling. Numerous copper products for which antidumping or

countervailing duties have been imposed were subject to review in 2000. In May, the International Trade Administration (ITA) ruled that revocation of antidumping duty orders against brass sheet and strip from the Republic of Korea, the Netherlands, and Sweden was not likely to lead to recurrence or continuation of material injury to the domestic industry and that it was revoking the duties effective January 1, 2000 (U.S. Department of Commerce, 2000b). Conversely, the ITA ruled to maintain antidumping and countervailing duty orders for brass sheet and strip from Brazil, Canada, France, Germany, Italy, and Japan (U.S. Department of Commerce, 2000a).

## World Review

The global production oversupply for refined copper that developed at midyear 1997, and continued into 1999, began to shift during the first quarter of 2000. According to data compiled by the ICSG, reported world inventories of refined copper by the end of June had declined 220,000 t from those held at yearend 1999, and by yearend 2000 were down by 310,000 t to 1.3 Mt. At the prevailing rate of consumption, yearend world inventories represented a 31-day supply of refined copper, down from about 42 days at the end of 1999. Inventories held in LME warehouses declined by 433,000 t, overshadowing increases in reported consumer and Shanghai Futures Exchange inventories. The transition from production surplus in 1999 to production deficit in 2000 reflects a slowdown in refined production growth and an almost 8% growth in world refined copper consumption to 15.3 Mt. While consumption grew only about 2% in North America to 3.74 Mt, consumption by European Union countries grew by about 7% to 4.1 Mt, and Asian countries by about 11% to 6.1 Mt. Growth was particularly strong in China, where usage grew by about 25% to 1.88 Mt (International Copper Study Group, 2001a).

In 2000, despite the decline in U.S. capacity, estimated world mine capacity rose by 470,000 t/yr, or 3.4%, to 14.4 Mt/yr, extending the strong growth trend that began in 1995. Chile, Indonesia, and Kazakhstan accounted for most of the capacity expansion, their capacities having grown by 270,000 t/yr, 145,000 t/yr, and 90,000 t/yr, respectively. Capacity also increased significantly in Australia (33,000 t/yr) and China (30,000 t/yr). World smelter capacity, which had trended upward over the preceding 5 years, declined by about 150,000 t/yr. Indefinite closures of U.S. smelters were partially offset by expanded capacity in Australia (110,000 t/yr), where the Mount Isa smelter reached full capacity and the new Port Kembla smelter was commissioned during the year. In Korea, incremental expansions of the Onsan smelters boosted capacity by about 40,000 t/yr; in Bulgaria, expansion of the UM Pirdop smelter increased capacity by 45,000 t/yr; and in China, installation of an Isasmelt furnace at the Yunnan smelter boosted capacity by about 50,000 t (International Copper Study Group, 2001c, p.1-56). According to CRU International Ltd. (2001, p. 54-55), the supply of copper concentrates for smelting exceeded demand by about 230,000 t/yr of contained copper, and contract treatment (smelting) and refining charges assessed by smelters averaged about \$0.18 per pound of recoverable copper, essentially unchanged from that in 1999.

World refinery capacity rose by about 140,000 t/yr, less than 1%, principally owing to expansion of electrowinning capacity in Chile. The decline in U.S. electrolytic refining capacity was

offset by increased capacity in Australia, where the Port Kembla refinery was commissioned (60,000 t/yr expanding to 120,000 t/yr) and the Olympic Dam refinery was expanded by about 50,000 t/yr. In Indonesia, capacity increased by about 30,000 t/yr at the Gresik refinery, commissioned in 1999 (International Copper Study Group, 2000c, p. 57-98).

## Outlook

U.S. mine production is expected to decline by about 100,000 t in 2001 as the full impact of 2000 mine plan changes is realized and new cost saving programs are implemented. Production is expected to decline by an additional 40,000 t in 2002. The Morenci Mine in Arizona already closed its remaining concentrator and converted to an all leach operation during the first quarter 2001, reducing its total output but increasing production of electrowon copper. At Miami, suspension of stripping in 2000 was expected to reduce output in 2001 and 2002 by 16,000 t and 38,000 t, respectively. The mine plan implemented by Asarco at its Mission Mine at yearend should further reduce production in 2001 by about 20,000 t. In June 2001, Kennecott announced that it would suspend operations from its higher cost North concentrator, reducing ore throughput by about 18% (Kennecott Utah Copper Corp., 2001). Following cutbacks in concentrate output, the three primary smelters closed in 1999 are expected to remain shuttered.

Primary refined production in 2001 is expected to decline only slightly owing to a decrease in net exports of concentrate and increased electrowon production. Secondary refined production is expected to fall following the May closure of Southwire Co.'s secondary smelter.

Domestic consumption of refined copper during the first 6 months of 2001 was down by about 10% from the same period in 2000. In addition to a more than 100,000 t decline in copper consumption at wire-rod mills, weakness in the wire-rod market was indicated by a 20,000-t decline in net imports of wire rod for the first 6 months of the year. Economic slowdown during the second half of 2001 was expected to keep demand at or below first half levels.

At the Annual General Session of the ICSG, held in June 2001, in Lisbon, Portugal, a consensus view of the world balance of copper supply and use for refined copper was developed by Government and industry delegates. According to the consensus, world production of refined copper from both primary and secondary sources in 2001 (adjusted to reflect primary feed shortages and disruptions to operations) is projected to increase by about 500,000 t (3.4%), while world refined copper use is expected to decline by about 100,000 t (less than 1%). This forecast follows a 10-year period of sustained demand growth. Consequently, the production deficit that developed in 2000 was expected to be reversed, and a small surplus of about 130,000 t of refined copper was anticipated. At the prevailing rate of use, this surplus represents only about a 3-day supply of copper. Projections by the ICSG for 2002 indicate that refined production, adjusted to reflect feed shortages and disruptions, will increase by only about 0.5% and will not keep pace with the projected 3.7% growth in demand. As a result, a production deficit is expected for 2002 (International Copper Study Group, 2001b).



TABLE 1  
SALIENT COPPER STATISTICS 1/

(Metric tons unless otherwise specified)

	1996	1997	1998	1999	2000	
<b>United States:</b>						
<b>Mine production:</b>						
Ore concentrated	thousand metric tons	274,000	284,000	268,000	236,000	202,000
Average yield of copper 2/	percent	0.47 r/	0.46	0.46	0.42 r/	0.44
<b>Recoverable copper:</b>						
Arizona		1,240,000	1,250,000	1,190,000	1,050,000	928,000
Michigan, Montana, Utah		339,000	337,000	337,000	313,000	W
New Mexico		256,000	259,000	252,000	197,000	195,000
Other States		85,600	96,500	78,900	37,400	321,000
Total		1,920,000	1,940,000	1,860,000	1,600,000	1,440,000
Total value	millions	\$4,610	\$4,570	\$3,220	\$2,680	\$2,810
<b>Smelter production:</b>						
From domestic and foreign ores		1,300,000	1,440,000	1,490,000	1,090,000	(3/)
From scrap (new and old)		339,000	285,000	232,000	205,000	(3/)
Total		1,640,000	1,720,000	1,720,000	1,290,000	1,000,000
Byproduct sulfuric acid, sulfur content	thousand metric tons	1,240	1,430	1,420	1,130	830
<b>Refinery production, primary materials:</b>						
Electrolytic from domestic ores		1,290,000	1,370,000	1,290,000	1,110,000	865,000
Electrolytic from foreign materials		147,000	113,000	238,000	196,000	163,000
Electrowon		574,000	586,000	609,000	586,000	557,000
Total		2,010,000	2,070,000	2,140,000	1,890,000	1,590,000
<b>Refinery production, secondary materials (scrap):</b>						
Electrolytic		193,000	233,000	202,000	156,000	(3/)
Fire refined		152,000	163,000	147,000	73,700	(3/)
Total		345,000	396,000	349,000	230,000	208,000
Grand total		2,350,000	2,470,000	2,490,000	2,120,000	1,790,000
<b>Secondary copper produced:</b>						
Recovered from new scrap		891,000	967,000	956,000	949,000 r/	952,000
Recovered from old scrap		428,000	498,000	466,000	381,000	363,000
Total		1,320,000	1,460,000	1,420,000	1,330,000	1,310,000
Copper sulfate production		43,400	48,400	44,000 r/	52,700	55,500
<b>Exports:</b>						
Refined		169,000	92,900	86,200	25,200	93,600
Unmanufactured 4/		748,000	628,000	412,000	395,000	650,000
<b>Imports:</b>						
Refined		543,000	632,000	683,000	837,000	1,060,000
Unmanufactured 4/		961,000	999,000	1,190,000	1,280,000	1,350,000
<b>Copper stocks, December 31:</b>						
Blister and in-process material		173,000	180,000	160,000	138,000	122,000
<b>Refined copper:</b>						
Refineries		32,200	59,700	44,200	9,830	14,800
Wire rod mills		32,100	24,600	37,300	32,500 r/	28,600
Brass mills		14,000	14,300	20,800	23,800 r/	23,600
Other industry		2,700	3,390	3,870	3,870 r/	4,680
New York Commodity Exchange (COMEX)		26,600	83,000	85,200	83,100	58,700
London Metal Exchange (LME), U.S. warehouses		38,300	129,000	341,000	412,000	204,000
Total		146,000	314,000	532,000	565,000 r/	334,000
<b>Consumption:</b>						
Refined copper, reported		2,610,000	2,790,000	2,890,000	2,980,000 r/	3,030,000
Apparent consumption, primary refined and old scrap 5/		2,830,000	2,940,000 r/	3,030,000 r/	3,130,000	3,110,000
<b>Price:</b>						
Producer, weighted average	cents per pound	109.04	106.95	78.64	75.91	88.16
COMEX, first position	do.	105.87	103.58	75.08	72.11	83.97
LME, Grade A cash	do.	104.05	103.25	75.01	71.33	82.24
<b>World, production:</b>						
Mine	thousand metric tons	11,000	11,400	12,100 r/	12,700 r/	13,200 e/
Smelter	do.	10,800	11,200 r/	11,400	11,700 r/	11,900 e/
Refinery	do.	12,700	13,500	14,200 r/	14,600 r/	15,000 e/

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Other States."

1/ Data are rounded to no more than three significant digits, except prices; may not add to totals shown.

2/ Yield calculations are for concentrated ore only.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes copper content of alloy scrap.

5/ In 1998, 1999, and 2000, apparent consumption is calculated using General imports of 725,000 tons, 915,000 tons, and 1,020,000 tons respectively.



TABLE 2  
LEADING COPPER-PRODUCING MINES IN THE UNITED STATES IN 2000, IN ORDER OF OUTPUT 1/

Rank	Mine	County and State	Operator	Source of copper	Capacity (thousand metric tons)
1	Morenci	Greenlee, AZ	Phelps Dodge Corp.	Copper ore, concentrated and leached	450
2	Bingham Canyon	Salt Lake, UT	Kennecott Utah Copper Corp.	Copper-molybdenum ore, concentrated	310
3	Ray	Pinal, AZ	ASARCO Inc.	Copper ore, concentrated and leached	150
4	Chino	Grant, NM	Phelps Dodge Corp.	Copper-molybdenum ore, concentrated and leached	125
5	Bagdad	Yavapai, AZ	do.	do.	115
6	Sierrita	Pima, AZ	do.	do.	120
7	Mission Complex	do.	ASARCO Inc.	Copper ore, concentrated	110
8	Tyrone	Grant, NM	Burro Chief Copper Co.	Copper ore, leached	75
9	Miami (Inspiration)	Gila, AZ	Phelps Dodge Corp.	do.	75
10	Continental	Silver Bow, MT	Montana Resources Inc.	Copper-molybdenum ore, concentrated	50
11	Silver Bell	Pima, AZ	ASARCO Inc.	Copper ore, leached	21
12	San Manuel	Pinal, AZ	BHP Copper Co.	do.	25
13	Miami	Gila, AZ	do.	do.	12
14	Pinto Valley	do.	do.	do.	10

1/ The mines in this list accounted for 99% of the U.S. mine production in 2000.

TABLE 3  
MINE PRODUCTION OF COPPER-BEARING ORES AND RECOVERABLE COPPER CONTENT OF ORES  
PRODUCED IN THE UNITED STATES, BY SOURCE AND TREATMENT PROCESS 1/

(Metric tons)

Source and treatment process	1999		2000	
	Gross weight	Recoverable copper	Gross weight	Recoverable copper
Mined copper ore:				
Concentrated	236,000,000	1,000,000	202,000,000 2/	879,000
Leached	NA	586,000	NA	557,000
Total	NA	1,590,000	NA	1,440,000
Copper precipitates shipped: leached from tailings, dumps, and in-place material	7,850 r/	6,230	3,910	2,810
Other copper-bearing ores 3/	6,550,000	7,220	9,880,000	5,310
Grand total	XX	1,600,000	XX	1,440,000

r/ Revised. NA Not available. XX Not applicable.

1/ Data rounded to three significant digits; may not add to totals shown.

2/ In 2000, 17,243 kilograms of gold and 285 metric tons of silver were recovered from concentrated ore. The average value of gold and silver per metric ton of ore concentrated was \$0.72.

3/ Includes gold ore, lead ore, silver ore, silver-copper ore, zinc ore, and ore shipped directly to smelter.

TABLE 4  
CONSUMPTION OF COPPER AND BRASS MATERIALS IN THE UNITED STATES, BY ITEM 1/

(Metric tons)

Item	Brass mills	Wire rod mills	Foundries, chemical plants, miscellaneous users	Smelters, refiners, ingot makers	Total
1999:					
Copper scrap	1,010,000 r/	W	79,900	535,000 r/ 2/	1,630,000
Refined copper 3/	691,000	2,230,000	52,200 r/	4,480	2,980,000 r/
Hardeners and master alloys	703	--	2,100	--	2,800
Brass ingots	--	--	124,000 r/	--	124,000 r/
Slab zinc	55,800	--	(4/)	(4/)	78,200 r/
2000:					
Copper scrap	1,030,000	W	83,000	482,000 2/	1,600,000
Refined copper 3/	723,000	2,240,000	59,800	4,590	3,030,000
Hardeners and master alloys	621	--	2,260	--	2,880
Brass ingots	--	--	122,000	--	122,000
Slab zinc	57,500	--	(4/)	(4/)	82,800

See footnotes at end of table.

TABLE 4--Continued  
CONSUMPTION OF COPPER AND BRASS MATERIALS IN THE UNITED STATES, BY ITEM 1/

r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Smelters, refiners, ingot makers." -- Zero.  
1/ Data are rounded to no more than three significant digits; may not add to totals shown.  
2/ Includes item indicated by symbol W.  
3/ Detailed information on consumption of refined copper can be found in table 5.  
4/ Withheld to avoid disclosing company proprietary data; included in "Total."

TABLE 5  
CONSUMPTION OF REFINED COPPER SHAPES IN THE UNITED STATES, BY CLASS OF CONSUMER 1/

(Metric tons)

Class of consumer	Cathodes	Ingots and ingot bars	Cakes and slabs	Wirebar, billets, other	Total
1999:					
Wire rod mills	2,220,000	--	--	16,800	2,230,000
Brass mills	492,000	18,300	79,300	102,000	691,000
Chemical plants	--	--	--	1,220	1,220
Ingot makers	W	W	W	4,480 2/	4,480
Foundries	3,460	6,100 r/	--	11,600	21,200 r/
Miscellaneous 3/	W	W	W	29,800 2/	29,800
Total	2,710,000	24,400 r/	79,300	166,000	2,980,000 r/
2000:					
Wire rod mills	2,220,000	--	--	18,700	2,240,000
Brass mills	501,000	18,300	101,000	103,000	723,000
Chemical plants	--	--	--	1,200	1,200
Ingot makers	W	W	W	4,590 2/	4,590
Foundries	3,810	5,530	--	16,700	26,000
Miscellaneous 3/	W	W	W	32,600 2/	32,600
Total	2,730,000	23,800	101,000	176,000	3,030,000

r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Wirebar, billets, other." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes items indicated by symbol W.

3/ Includes consumers of copper powder and copper shot, iron and steel plants, primary smelters producing alloys other than copper, and other manufacturers.

TABLE 6  
COPPER RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,  
BY KIND OF SCRAP AND FORM OF RECOVERY 1/

(Metric tons)

	1999	2000
Kind of scrap:		
New scrap:		
Copper-base	903,000	906,000
Aluminum-base	46,200 r/	45,500
Nickel-base	94	18
Total	949,000 r/	952,000
Old scrap:		
Copper-base	349,000	334,000
Aluminum-base	31,200 r/	28,400
Nickel-base	44	170
Zinc-base	31	32
Total	381,000	363,000
Grand total	1,330,000	1,310,000
Form of recovery:		
As unalloyed copper:		
At electrolytic plants	156,000	128,000
At other plants	81,800	88,400
Total	238,000	217,000
Form of recovery:		
In brass and bronze	1,000,000	1,010,000
In alloy iron and steel	599 r/	549
In aluminum alloys	78,200 r/	74,900

See footnotes at end of table.

TABLE 6--Continued  
COPPER RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,  
BY KIND OF SCRAP AND FORM OF RECOVERY 1/

(Metric tons)

	1999	2000
Form of recovery--Continued:		
In chemical compounds	11,800 2/	11,700
Total	1,090,000	1,100,000
Grand total	1,330,000	1,310,000

r/ Revised.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ 1999 data reflects expanded coverage to include copper sulfate and other copper chemical producers.

TABLE 7  
COPPER RECOVERED AS REFINED COPPER AND IN ALLOYS AND OTHER FORMS  
FROM COPPER-BASE SCRAP PROCESSED IN THE UNITED STATES, BY TYPE OF OPERATION 1/

(Metric tons)

Type of operation	From new scrap		From old scrap		Total	
	1999	2000	1999	2000	1999	2000
Ingot makers	34,700	29,900	94,700	90,700	129,000	121,000
Refineries 2/	48,800	39,000	181,000	169,000	230,000	208,000
Brass and wire rod mills	804,000	822,000	25,900	22,200	830,000	844,000
Foundries and manufacturers	11,400	10,800	40,000	44,500	51,400	55,400
Chemical plants 3/	3,940	3,880	7,840	7,840	11,800	11,700
Total	903,000	906,000	349,000	334,000	1,250,000	1,240,000

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Electrolytically refined and fire-refined scrap based on source of material at smelter level.

3/ 1999 data reflects expanded coverage to include copper sulfate and other copper chemical producers.

TABLE 8  
PRODUCTION OF SECONDARY COPPER AND COPPER-ALLOY PRODUCTS  
IN THE UNITED STATES, BY ITEM PRODUCED FROM SCRAP 1/

(Metric tons)

Item produced from scrap	1999	2000
Unalloyed copper products:		
Electrolytically refined copper	156,000	128,000
Fire-refined copper	73,700	80,000
Copper powder	7,420	7,510
Copper castings	647	839
Total	238,000	217,000
Alloyed copper products:		
Brass and bronze ingots:		
Tin bronzes	15,800 r/	14,600
Leaded red brass and semired brass	97,300 r/	93,500
High leaded tin bronze	13,000	12,700
Yellow brass	6,010	5,650
Manganese bronze	7,060 r/	6,240
Aluminum bronze	6,870	7,030
Nickel silver	2,050	2,260
Silicon bronze and brass	4,530	4,680
Copper-base hardeners and master alloys	13,200 r/	13,800
Miscellaneous	169 r/	3,500
Total	166,000 r/	164,000
Brass mill and wire-rod mill products	1,030,000	1,060,000
Brass and bronze castings	43,400	45,600
Brass powder	214	198
Copper in chemical products	11,800 2/	11,700
Grand total	1,490,000 r/	1,490,000

r/ Revised.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ 1999 data reflects expanded coverage to include copper sulfate and other copper chemical products.

TABLE 9  
COMPOSITION OF SECONDARY COPPER-ALLOY PRODUCTION IN THE UNITED STATES 1/

(Metric tons)

	Copper	Tin	Lead	Zinc	Nickel	Aluminum	Total
<b>Brass and bronze ingot production: 2/</b>							
1999 r/	137,000	4,850	7,900	15,700	267	19	166,000
2000	136,000	5,240	8,430	14,400	252	14	164,000
<b>Secondary metal content of brass mill products:</b>							
1999	830,000	950	7,840	188,000	W	W	1,030,000
2000	844,000	1,650	7,450	199,000	W	W	1,060,000
<b>Secondary metal content of brass and bronze castings:</b>							
1999	39,100	708	1,100	2,260	112	119	43,400
2000	42,200	633	837	1,700	85	98	45,600

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes about 97% from scrap and 3% from other than scrap in 1999 (revised) and about 96% from scrap and 4% from other than scrap in 2000.

TABLE 10  
CONSUMPTION AND YEAREND STOCKS OF COPPER-BASE SCRAP 1/

(Metric tons, gross weight)

Scrap type and processor	1999		2000	
	Consumption	Stocks	Consumption	Stocks
<b>No. 1 wire and heavy:</b>				
Smelters, refiners, ingot makers	106,000	2,360 r/	86,000	2,260
Brass and wire-rod mills	431,000	(2/)	438,000	(2/)
Foundries and miscellaneous manufacturers	41,200	2,520	45,500	2,650
<b>No. 2 mixed heavy and light:</b>				
Smelters, refiners, ingot makers	137,000	6,020 r/	133,000	2,120
Brass and wire-rod mills	21,200	(2/)	13,800	(2/)
Foundries and miscellaneous manufacturers	3,230	226	3,320	193
<b>Total unalloyed scrap:</b>				
Smelters, refiners, ingot makers	243,000	8,380 r/	219,000	4,370
Brass and wire-rod mills	452,000	20,300	452,000	17,600
Foundries and miscellaneous manufacturers	44,500	2,740 r/	48,800	2,840
<b>Red brass: 3/</b>				
Smelters, refiners, ingot makers	50,200	2,150 r/	52,700	2,120
Brass mills	10,400	(2/)	9,330	(2/)
Foundries and miscellaneous manufacturers	10,600	(2/)	12,400	(2/)
<b>Leaded yellow brass:</b>				
Smelters, refiners, ingot makers	20,600	1,110 r/	16,500	1,210
Brass mills	400,000	(2/)	396,000	(2/)
Foundries and miscellaneous manufacturers	1,740	(2/)	1,680	(2/)
<b>Yellow and low brass, all plants</b>				
Cartridge cases and brass, all plants	76,600	1,160 r/	105,000	713
Auto radiators:	79,400	(2/)	72,600	(2/)
Smelters, refiners, ingot makers	53,400	2,130 r/	48,300	1,610
Foundries and miscellaneous manufacturers	4,650	(2/)	2,750	(2/)
<b>Bronzes:</b>				
Smelters, refiners ingot makers	16,100	886 r/	11,100	1,130
Brass mills and miscellaneous manufacturers	10,600	(2/)	11,800	(2/)
<b>Nickel-copper alloys, all plants</b>				
Low grade and residues:	23,000	369 r/	28,100	314
Smelters, refiners, miscellaneous manufacturers	111,000	13,100 r/	88,600	7,670
<b>Other alloy scrap: 4/</b>				
Smelters, refiners, ingot makers	12,100	839 r/	11,300	324
Brass mills and miscellaneous manufacturers	6,740	(2/)	7,600	(2/)
<b>Total alloyed scrap:</b>				
Smelters, refiners, ingot makers	258,000	21,200 r/	221,000	15,300
Brass mills	593,000	35,500	620,000	39,500
Foundries and miscellaneous manufacturers	35,500	3,030 r/	34,200	2,360
<b>Total scrap:</b>				
Smelters, refiners, ingot makers	501,000	29,600 r/	440,000	19,600
Brass and wire-rod mills	1,050,000	55,700	1,070,000	57,200
Foundries and miscellaneous manufacturers	79,900	5,770 r/	83,000	5,210

See footnotes at end of table.

TABLE 10--Continued  
CONSUMPTION AND YEAREND STOCKS OF COPPER-BASE SCRAP 1/

r/ Revised.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Individual breakdown is not available; included in "Total unalloyed scrap," "Total alloyed scrap," and "Total scrap."

3/ Includes cocks and faucets, commercial bronze, composition turnings, gilding metal, railroad car boxes, and silicon bronze.

4/ Includes aluminum bronze, beryllium copper, and refinery brass.

TABLE 11  
CONSUMPTION OF PURCHASED COPPER-BASE SCRAP 1/ 2/

(Metric tons, gross weight)

Type of operation	From new scrap		From old scrap		Total	
	1999	2000	1999	2000	1999	2000
Ingot makers	46,300	44,000	132,000	125,000	178,000	169,000
Smelters and refineries	71,100	58,800	252,000	212,000	323,000	271,000
Brass and wire-rod mills	1,020,000	1,050,000	26,800	23,000	1,050,000	1,070,000
Foundries and miscellaneous manufacturers	27,200	26,200	52,700	56,800	79,900	83,000
Total	1,160,000	1,180,000	464,000	417,000	1,630,000	1,600,000

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Consumption at brass and wire-rod mills assumed equal to receipts.

TABLE 12  
FOUNDRIES AND MISCELLANEOUS MANUFACTURERS  
CONSUMPTION OF BRASS INGOT, REFINED COPPER AND  
COPPER SCRAP IN THE UNITED STATES 1/

(Metric tons)

Ingot type or material consumed	1999	2000
Tin bronzes	33,200	29,900
Leaded red brass and semired brass	70,100 r/	71,000
Yellow, leaded, low brass 2/	8,520 r/	8,510
Manganese bronze	4,720	4,590
Nickel silver 3/	2,710	3,480
Aluminum bronze	4,140	4,650
Hardeners and master alloys 4/	2,100	2,260
Lead free alloys 5/	141 r/	145
Total brass ingot	126,000 r/	125,000
Refined copper	52,200 r/	59,800
Copper scrap	79,900	83,000

r/ Revised.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes brass and silicon bronze.

3/ Includes brass, copper nickel, and nickel bronze.

4/ Includes special alloys.

5/ Includes copper-bismuth and copper-bismuth-selenium alloys.

TABLE 13  
AVERAGE PRICES FOR COPPER SCRAP AND ALLOY-INGOT, BY TYPE

(Cents per pound)

Year	Brass mills No. 1 scrap	Refiners No. 2 scrap	Dealers' buying (New York)		Alloy-ingot (New York) 1/	
			No. 2 scrap	Red brass turnings and borings	No. 115 brass (85-5-5-5)	Yellow brass (405)
1999	70.88	57.53	42.97	37.74	138.50	135.25
2000	80.67	64.99	51.43	39.95	138.50	135.25

1/ List price quotes effective July 1996.

Source: American Metal Market.

TABLE 14  
U.S. EXPORTS OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY 1/

Country	Ore and concentrate		Matte, ash, precipitates		Refined		Unalloyed copper scrap		Blister and anodes		Total	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1999	63,100 r/	\$72,500 r/	26,700	\$34,700	25,200	\$42,100	128,000	\$166,000	30,800	\$54,400	274,000	\$369,000
2000:												
Belgium	--	--	48	78	--	--	731	5,320	397	532	1,180	5,930
Brazil	3,090	5,270	3	9	15	22	97	106	33	68	3,240	5,480
Canada	45,000	68,500	13,100	10,500	5,990	12,000	45,300	50,900	10,400	13,300	120,000	155,000
China	8,500	11,000	10	95	52,700	99,400	124,000	101,000	61	120	185,000	212,000
Finland	4,680	7,990	--	--	19	47	--	--	--	--	4,690	8,030
Germany	6,100	10,200	--	--	123	281	2,070	5,270	383	758	8,670	16,500
Hong Kong	111	135	3	4	1,750	3,310	6,900	6,870	2,330	5,320	11,100	15,600
Italy	7	25	5	7	97	145	147	463	510	1,100	766	1,740
Japan	483	1,290	56	551	74	110	15,900	38,900	1,990	4,680	18,500	45,500
Korea, Republic of	1,180	8,080	10	24	538	880	20,600	31,500	589	1,380	22,900	41,900
Mexico	31,500	22,900	17,900	22,500	2,980	5,460	2,760	7,350	1,680	2,650	56,800	60,900
Philippines	4,300	6,920	--	--	4	6	28	31	89	261	4,420	7,220
Singapore	115	297	--	--	7,220	14,600	979	1,050	953	2,280	9,270	18,300
Taiwan	65	79	93	315	20,400	36,700	5,080	7,530	2,230	5,180	27,900	49,900
United Kingdom	600	673	40	88	33	50	113	253	439	976	1,230	2,040
Other	1,200	2,530	90	223	1,640	3,190	2,840	3,530	1,250	2,930	7,020	12,400
Total	107,000	146,000	31,300	34,300	93,600	176,000	228,000	260,000	23,300	41,600	483,000	658,000

r/ Revised. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 15  
U.S. EXPORTS OF COPPER SEMIMANUFACTURES, BY COUNTRY 1/

Country	Pipes and tubing		Plates, sheets, foil, bars		Bare wire, including wire rod 2/		Wire and cable, stranded		Copper sulfate	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1999	26,100	\$78,900	42,200	\$159,000	46,300	\$118,000	25,000	\$94,500	10,600 r/	\$23,000 r/
2000:										
Australia	23	121	4	90	5	41	76	1,090	261	643
Belgium	178	1,120	33	197	45	188	109	1,220	--	--
Brazil	26	162	12	227	78	2,260	1,700	12,200	76	216
Canada	9,920	31,200	24,700	89,400	16,700	42,200	4,190	12,900	777	1,590
China	215	656	1,360	3,680	21	285	504	937	833	1,840
Colombia	103	390	12	50	7	42	486	2,640	--	--
Denmark	44	234	18	86	11	89	22	280	382	917
Dominican Republic	27	55	22	71	1,280	3,010	238	776	--	--
France	811	4,320	90	939	69	990	119	3,090	90	210
Germany	19	105	1,400	7,130	65	1,170	209	9,420	31	142
Hong Kong	61	106	1,010	5,010	341	2,960	207	1,510	325	633
India	313	1,120	26	284	1	17	45	322	--	--
Indonesia	--	--	--	--	--	--	14	84	179	433
Israel	305	945	17	658	31	518	86	531	--	--
Italy	2,390	7,130	98	579	2	28	28	599	183	486
Japan	22	119	5,470	10,000	82	530	184	2,060	826	1,990
Korea, Republic of	187	915	1,330	6,210	27	260	261	2,870	2,060	4,540
Mexico	11,800	32,700	3,740	14,400	53,000	143,000	17,800	77,700	59	195
Netherlands	447	2,510	43	284	4	81	14	228	19	44
Philippines	31	103	239	1,720	--	--	28	251	15	47
Saudi Arabia	249	849	51	100	39	183	842	2,290	--	--
Singapore	12	54	179	886	145	878	568	3,420	236	560
Spain	112	369	11	169	9	86	31	273	125	332
Sweden	--	--	9	405	8	117	27	664	1,650	4,370
Taiwan	53	244	1,200	5,460	244	967	41	519	611	1,450
United Kingdom	290	1,550	328	3,440	97	658	166	2,570	1,120	2,830
Venezuela	87	293	6	41	343	828	478	2,220	62	780
Other	1,080	3,430	1,010	5,690	2,230	7,240	2,920	14,400	364	892
Total	28,800	90,800	42,400	157,000	74,900	208,000	31,400	157,000	10,300	25,100

r/ Revised. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Total exports of wire rod in 1999 were 28,400 tons valued at \$58,800,000 and in 2000 were 44,100 tons valued at \$98,000,000.

Source: U.S. Census Bureau.

TABLE 16  
U.S. IMPORTS FOR CONSUMPTION OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY 1/

Country	Ore and concentrate		Matte, ash, precipitates		Blister and anode		Refined		Unalloyed scrap		Total	
	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)	Quantity (metric tons)	Value 2/ (thousands)
1999	143,000	\$83,700	1,730	\$1,580	193,000	\$461,000	837,000	\$1,360,000	34,400	\$45,600	1,210,000	\$1,950,000
2000:												
Brazil	--	--	--	--	--	--	2,510	3,650	--	--	2,510	3,650
Bulgaria	--	--	--	--	4,040	10,300	56	105	--	--	4,100	10,400
Canada	--	--	20	62	53,500	158,000	268,000	512,000	9,130	14,500	330,000	685,000
Chile	--	--	1	16	76,200	143,000	258,000	453,000	275	476	334,000	596,000
China	--	--	2	4	--	--	1,410	2,450	--	--	1,410	2,450
Costa Rica	--	--	--	--	--	--	--	--	947	1,050	947	1,050
Dominican Republic	--	--	--	--	--	--	--	--	1,480	1,780	1,480	1,780
Finland	--	--	--	--	2,180	4,570	178	471	--	--	2,360	5,050
Germany	--	--	(3/)	3	18	44	3,700	8,260	283	345	4,000	8,650
Guatemala	--	--	--	--	--	--	--	--	536	624	536	624
Honduras	--	--	--	--	--	--	--	--	402	492	402	492
Italy	--	--	--	--	2,180	4,100	(3/)	6	251	1,590	2,430	5,690
Japan	--	--	--	--	--	--	5,010	11,700	124	879	5,130	12,600
Kazakhstan	--	--	--	--	--	--	54,900	101,000	--	--	54,900	101,000
Mexico	--	--	757	453	19,500	62,900	80,400	149,000	15,100	18,400	116,000	230,000
Namibia	--	--	--	--	2,750	5,880	--	--	--	--	2,750	5,880
Peru	--	--	--	--	5,960	11,200	311,000	580,000	277	609	317,000	592,000
Poland	--	--	--	--	--	--	10,200	20,100	--	--	10,200	20,100
Russia	--	--	--	--	117	203	58,900	115,000	1	14	59,000	115,000
Spain	--	--	--	--	5,670	11,100	--	--	--	--	5,670	11,100
Turkey	--	--	--	--	11,000	20,300	1,100	1,780	--	--	12,000	22,100
Venezuela	--	--	--	--	--	--	--	--	418	462	418	462
Other	53	12	903	2,240	1,680	3,030	1,050	2,110	1,590	2,120	5,220	7,250
Total	53	12	1,680	2,780	185,000	435,000	1,060,000	1,960,000	30,900	43,400	1,270,000	2,440,000

-- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ C.i.f. value at U.S. port.

3/ Less than 1/2 unit.

Source: U.S. Census Bureau.



TABLE 17  
U.S. IMPORTS FOR CONSUMPTION OF COPPER SEMIMANUFACTURES, BY COUNTRY 1/

Country	Pipes and tubing		Plates, sheets, foil, bars		Bare wire, including wire rod 2/		Wire and cable, stranded		Copper sulfate	
	Quantity (metric tons)	Value 3/ (thousands)	Quantity (metric tons)	Value 3/ (thousands)	Quantity (metric tons)	Value 3/ (thousands)	Quantity (metric tons)	Value 3/ (thousands)	Quantity (metric tons)	Value 3/ (thousands)
1999	434	\$2,280	79,500 r/	\$257,000 r/	197,000 r/	\$354,000 r/	9,430	\$37,700	26,700	\$21,200
2000:										
Australia	(4/)	9	67	135	--	--	--	--	300	4,890
Belgium	--	--	1,200	3,370	217	920	--	--	--	--
Brazil	--	--	2,040	4,550	13,300	36,200	1	5	--	--
Canada	368	2,120	14,700	46,300	116,000	240,000	1,050	3,210	--	--
Chile	2	7	4,850	12,100	501	1,040	--	--	--	--
Costa Rica	--	--	--	--	72	175	592	1,480	--	--
Finland	3	15	4,020	14,200	549	2,100	4	28	--	--
France	--	--	2,980	7,820	586	5,730	119	1,070	254	653
Germany	5	48	26,100	78,100	663	3,540	381	2,510	304	688
Hong Kong	--	--	9	80	3	6	5	54	288	358
India	6	43	176	187	(4/)	2	38	1,180	--	--
Israel	--	--	--	--	946	3,980	2,740	16,400	--	--
Italy	--	--	6,600	17,100	6	54	--	--	--	--
Japan	5	293	12,900	56,100	1,630	8,110	69	922	8	105
Korea, Republic of	14	29	2,040	4,480	7,980	26,900	12	87	54	85
Luxembourg	--	--	3,440	24,300	--	--	--	--	--	--
Malaysia	278	937	1,060	7,100	3	46	--	--	--	--
Mexico	(4/)	11	18,900	38,800	110,000	204,000	(4/)	13	1,290	2,970
Norway	--	--	(4/)	13	--	--	--	--	54	115
Peru	--	--	2,270	5,580	231	537	69	142	--	--
Poland	--	--	38	67	9	60	628	1,820	--	--
Sweden	--	--	11,500	38,800	15	97	--	--	--	--
Turkey	--	--	125	309	6,090	20,100	1,780	6,400	--	--
United Kingdom	4	87	2,000	8,650	3,200	7,200	32	189	2	46
Other	334	1,150	3,120	12,400	3,440	9,060	109	614	--	--
Total	1,020	4,750	120,000	381,000	266,000	570,000	7,620	36,100	2,550	9,910

r/ Revised. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Total imports of wire rod in 1999 were 193,000 tons valued at \$330,000,000 and in 2000 were 247,000 tons valued at \$502,000,000. Imports data adjusted by USGS to correct misclassification of imports from Mexico.

3/ C.i.f. value at U.S. port.

4/ Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 18  
U.S. EXPORTS OF COPPER SCRAP, BY COUNTRY 1/

Country	Unalloyed copper scrap				Copper-alloy scrap			
	1999		2000		1999		2000	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	1,540	\$13,500	731	\$5,320	361	\$1,160	1,280	\$1,730
Canada	31,800	32,900	45,300	50,900	35,700	42,300	41,400	56,700
China	51,300	47,400	124,000	101,000	34,800	26,400	86,100	65,700
Germany	1,120	3,950	2,070	5,270	2,120	3,520	5,610	9,920
Hong Kong	9,390	10,700	6,900	6,870	4,040	4,720	6,240	6,700
India	2,580	2,430	933	963	26,100	24,100	24,000	19,400
Japan	10,500	28,300	15,900	38,900	9,690	13,200	16,200	24,700
Korea, Republic of	7,630	12,100	20,600	31,500	34,800	41,100	39,700	54,800
Mexico	1,610	2,310	2,760	7,350	20,700	19,400	14,700	14,600
Singapore	1,960	1,900	979	1,050	213	219	2,440	2,920
Spain	2,760	526	589	272	2,670	1,610	5,460	1,400
Taiwan	4,120	6,590	5,080	7,530	7,510	10,100	6,190	7,620
United Arab Emirates	203	221	28	31	1,400	2,340	266	316
United Kingdom	555	1,060	113	253	1,700	2,370	713	553
Other	1,250 r/	1,940 r/	1,560	2,860	5,040 r/	7,590 r/	7,480	9,400
Total	128,000	166,000	228,000	260,000	187,000	200,000	258,000	276,000

r/ Revised.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 19  
U.S. IMPORTS FOR CONSUMPTION OF COPPER SCRAP, BY COUNTRY 1/

Country or territory	Unalloyed copper scrap		Copper-alloy scrap		
	Quantity (metric tons)	Value 2/ (thousands)	Gross weight (metric tons)	Copper content e/ 3/ (metric tons)	Value 2/ (thousands)
1999	34,400	\$45,600	102,000	73,300	\$122,000 r/
2000:					
Canada	9,130	14,500	54,400	39,200	72,100
Chile	275	476	958	690	1,530
Colombia	146	165	2,670	1,920	4,060
Costa Rica	947	1,050	876	630	999
Dominican Republic	1,480	1,780	1,530	1,100	1,620
Guatemala	536	624	1,730	1,250	2,680
Honduras	402	492	776	559	628
Italy	251	1,590	--	--	--
Jamaica	278	465	936	674	738
Japan	124	879	37	27	69
Malaysia	--	--	827	596	1,650
Mexico	15,100	18,400	29,400	21,200	32,400
Spain	--	--	4,100	2,950	2,930
Taiwan	17	22	1,150	829	1,460
United Kingdom	11	32	2,550	1,840	4,340
Venezuela	418	462	1,760	1,270	1,640
Other	1,700	2,400	9,140	6,580	13,700
Total	30,900	43,400	113,000	81,200	143,000

e/ Estimated. r/ Revised. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ C.i.f. value at U.S. port.

3/ Content is estimated by USGS to be 72% of gross weight.

Source: U.S. Census Bureau.

TABLE 20  
COPPER: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1996	1997	1998	1999	2000 e/
Albania e/	2,500	220	3,200	900	900
Argentina	-- e/	30,421	170,273	210,126 r/	145,197 3/
Armenia e/	9,100	9,000	9,200	9,600	7,231 3/
Australia:					
By concentration or cementation	503,100	507,400	552,000	655,900 r/	751,300
Leaching (electrowon)	44,200	50,600	55,000	83,100	77,700
Total	547,300	558,000	607,000	739,000 r/	829,000 3/
Bolivia	92	182	48	252 r/	110 3/
Botswana 4/	25,275	22,840	25,043	37,604 r/	38,420 3/
Brazil (concentrate)	46,203	39,952	34,446 r/	31,371 r/	31,786 3/
Bulgaria	89,000	93,000	88,000	76,000 r/	75,000
Burma:					
By concentration or cementation	4,841	2,927	--	97 r/	100
Leaching (electrowon)	--	--	6,700 e/	26,736	26,711 3/
Total	4,841	2,927	6,700 e/	26,833	26,811 3/
Canada:					
By concentration or cementation	685,900	656,800	703,966	620,085 r/	634,162 3/
Leaching (electrowon)	2,500	2,700	1,800	--	-- 3/
Total	688,400	659,500	705,766	620,085 r/	634,162 3/
Chile: 5/					
By concentration or cementation	2,480,100	2,511,000	2,578,800	3,029,100 r/	3,229,800 3/
Leaching (electrowon)	635,700	881,000	1,108,000	1,362,100 r/	1,372,600 3/
Total	3,115,800	3,392,000	3,686,800	4,391,200 r/	4,602,400 3/
China e/	439,000	496,000	486,000	520,000 r/	590,000
Colombia e/	2,222 3/	1,800	1,400	1,400	1,400
Congo (Kinshasa): 6/					
By concentration or cementation e/	6,200	--	--	--	--
Leaching (electrowon)	43,800	39,651 r/	34,994 r/	32,000 r/ e/	21,000
Total	50,000 e/	39,651 r/	34,994 r/	32,000 r/ e/	21,000
Cuba e/	2,000	1,000	1,000	1,000	1,000
Cyprus: Leaching (electrowon)	1,688	3,900	7,800	11,300 r/ e/	11,300
Ecuador e/	100	100	100	100	100
Finland e/	9,261 3/	8,500	9,000	10,500 r/	11,600 3/
Georgia	5,100	4,100	6,000 e/	8,000	8,000
Honduras	(7/)	(7/)	(7/)	(7/)	--
India	47,800	37,200 e/	39,900	34,100 r/ e/	35,500 3/
Indonesia 6/	507,484	529,121	780,780	766,027 r/	1,012,054 3/
Iran: e/					
By concentration or cementation	108,000 r/	108,000 r/	128,300 r/ 3/	131,000 r/ 3/	131,000
Leaching (electrowon)	1,500 r/	9,500 r/	14,000 r/	14,000	14,000
Total	109,000 r/	118,000 r/	142,000 r/	145,000 r/	145,000
Japan	1,145	932	1,070	1,038	1,211 3/
Kazakhstan	250,000 e/	316,166	337,600	374,000 e/	430,000
Korea, North e/	16,000	16,000	14,000	14,000	14,000
Korea, Republic of	3	-- e/	41	--	-- 3/
Macedonia	8,484	13,000	9,100	10,200 r/	10,000
Malaysia	20,219	18,821	13,907	4,600 r/	-- 3/
Mexico:					
By concentration or cementation	295,303	342,319	335,822	330,232 r/	319,766 3/
Leaching (electrowon)	45,407	48,217	48,819	50,952	44,800 3/
Total	340,710	390,536	384,641	381,184 r/	364,566 3/
Mongolia	123,039	124,400	125,400	126,700	124,800 3/
Morocco	14,600 r/	15,400	8,200 r/	7,700 r/	7,100 3/
Namibia	14,845	17,879	6,500	--	5,070
Norway	7,400	6,671	2,698 r/ 3/	-- e/	--
Papua New Guinea	186,665 r/	111,515 r/	152,200 r/	187,921 r/	200,900 3/
Peru:					
By concentration or cementation	396,060	406,760	381,501	421,470 r/	426,614 3/
Leaching (electrowon)	88,171	99,738	101,837	114,917	127,310 3/
Total	484,231	506,498	483,338	536,387 r/	553,924 3/
Philippines	61,600	48,600 r/	45,400 r/	37,600 r/	32,000
Poland	421,900	414,800	436,200	464,000 r/	456,200 3/
Portugal	109,935	106,479	114,637	99,500 e/	76,200

See footnotes at end of table.

TABLE 20--Continued  
COPPER: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1996	1997	1998	1999	2000 e/
Romania 8/	24,434	23,190	19,065 r/	16,455 r/	16,079 3/
Russia	523,000	505,000 e/	500,000	530,000 e/	570,000
Saudi Arabia	834	703	782 r/	821 r/	830
Serbia and Montenegro	69,500	73,600	70,900	51,700	41,000
Slovakia e/	386	314	155 r/	124 r/	--
South Africa	152,595	153,058	166,000	144,263	137,092 3/
Spain	37,510	37,883	37,000	1,740 r/	23,300 3/
Sweden	71,660	86,640	73,685 r/	71,200 r/	75,600 3/
Turkey 8/	33,792 r/	36,400 r/	40,000 r/ e/	73,051 r/	76,253 3/
United States: 6/					
By concentration or cementation	1,350,000	1,350,000	1,250,000	1,010,000 r/	887,000 3/
Leaching (electrowon)	574,000	586,000	609,000	586,000	557,000 3/
Total	1,920,000	1,940,000	1,860,000	1,600,000	1,440,000 3/
Uzbekistan	65,000 e/	73,000	65,000	60,000 e/	65,000
Zambia: 9/					
By concentration or cementation (smelted)	276,000	288,900	258,000	213,000 r/	186,200 3/
Leaching (electrowon)	58,000 e/	64,000	57,000	57,000 e/	55,000 3/
Total	334,000	352,900	315,000	270,000 r/ e/	241,200 3/
Zimbabwe: e/					
By concentration or cementation	6,000 r/	3,900	3,600	3,491 r/ 3/	2,104 3/
Leaching (electrowon)	3,200	2,900	2,400	1,020 r/ 3/	--
Total	9,200 r/	6,800	6,000	4,511 r/ 3/	2,104 3/
Grand total	11,000,000	11,400,000	12,100,000 r/	12,700,000 r/	13,200,000

e/ Estimated. r/ Revised. -- Zero.

1/ World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

2/ Data represent copper content by analysis of concentrates produced except where otherwise noted. Table includes data available through July 20, 2001.

3/ Reported figure.

4/ Copper content of pelletized nickel-copper matte produced in smelter.

5/ Reported by Comision Chilena del Cobre. Includes recoverable copper content of nonduplicative mine and metal products produced from domestic ores and concentrates and leach production for electrowinning.

6/ Recoverable content.

7/ Less than 1/2 unit.

8/ Excludes copper content of pyrite.

9/ Data are for fiscal years beginning April 1 of year stated. Zambian-mined copper reported recovered during smelting and electrowinning.

TABLE 21  
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1996	1997	1998	1999	2000 e/
Albania, primary	1,424	--	1,632 r/	1,281 r/	1,300
Australia, primary	261,300	208,400	236,000	334,000 e/	393,000 3/
Austria, secondary e/	65,400	73,000	54,800	77,573 r/ 3/	78,000
Belgium:					
Primary	35,000	38,000	20,700	25,000 e/	20,000
Secondary	153,800	139,000	138,400	143,300	144,700 3/
Total	188,800	177,000	159,100	168,300	164,700 3/
Botswana 4/	20,980 r/	19,820 r/	22,124 r/	20,960 r/	20,977 3/
Brazil, primary	172,075	177,060	167,205	193,014 r/	195,000
Bulgaria:					
Primary	99,398	109,630	114,500	107,000 r/	160,600
Secondary e/	5,000	5,000	5,000	5,000	5,000
Total e/	104,398	114,630	119,500	112,000 r/	166,000
Canada:					
Primary	529,349	529,524	553,100	550,200 r/	543,600 3/
Secondary	83,344	96,957	71,300	66,800 r/	60,100 3/
Total	612,693	626,481	624,400	617,000 r/	603,700 3/

See footnotes at end of table.

TABLE 21--Continued  
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country 3/	1996	1997	1998	1999	2000 e/
Chile, primary	1,355,600	1,389,600	1,403,100	1,474,000	1,456,500 3/
China: e/					
Primary	616,000	789,000	839,000	837,000 r/	990,000
Secondary	220,000	180,000	170,000	190,000	200,000
Total	836,000	969,000	1,010,000	1,027,000 r/	1,190,000
Congo (Kinshasa), primary: e/					
Electrowon	43,800	40,100	40,000	32,000 r/	21,000
Other	6,000	--	--	--	--
Total	49,800	40,100	40,000	32,000 r/	21,000
Finland:					
Primary	178,675 r/	159,000 r/	156,000 r/	149,600 r/	155,400 3/
Secondary e/	-- r/	2,000	2,000	2,000	2,000
Total e/	178,675 r/ 3/	161,000 r/	158,000 r/	151,600 r/	157,400
France, secondary e/	2,300	2,400	2,000	1,000 r/	--
Germany:					
Primary	296,800	273,000	258,600	266,400	275,000
Secondary e/	88,600	76,000	80,000 3/	60,000	75,000
Total e/	385,000	349,000	338,600 3/	326,000	350,000
Hungary, secondary e/	100	100	--	--	--
India, primary	45,300	51,000	107,600	224,400	225,600 3/
Indonesia	--	--	--	126,739	173,726 3/
Iran: e/ 5/					
Primary	93,100 r/	93,000 r/	144,000 r/	150,000 r/	150,000
Secondary	6,000	6,100	6,000	4,000 r/	4,000
Total	99,100 r/	99,100 r/	150,000 r/	154,000 r/	154,000
Japan:					
Primary	1,122,571	1,214,172	1,171,657	1,256,276	1,331,352 3/
Secondary	110,856	136,274	131,979	133,188	149,282 3/
Total	1,233,427	1,350,446	1,303,636	1,389,464	1,480,634 3/
Kazakhstan	245,000	315,960	335,000 e/	384,234	400,000
Korea, North: e/					
Primary	24,000	24,000	23,000	20,000	20,000
Secondary	5,000	5,000	4,500	5,000	5,000
Total	29,000	29,000	27,500	25,000	25,000
Korea, Republic of	150,000	160,000	293,000	370,000	410,000
Mexico:					
Primary	280,462	348,290	378,302	352,700	323,000
Secondary e/	21,800	4,000	4,000	5,000	5,000
Total	302,262	352,290	382,302	357,700	328,000
Namibia, primary	16,659	24,997 r/	8,014 r/	-- e/	13,488 3/
Norway, primary	28,526 r/	32,639 r/	31,658 r/	33,262	27,000
Oman, primary	24,663	22,800	24,400 r/	16,818 r/	23,790 3/
Peru, primary	345,119 r/	323,382 r/	356,189 r/	350,399 r/	340,447 3/
Philippines, primary	201,661	206,160	198,088	148,000 r/	140,000
Poland:					
Primary	399,800	415,000 e/	422,243	486,384 r/	507,846 3/
Secondary e/	15,000	15,000	10,000	10,000 r/	10,000
Total	415,000 e/	430,500 e/	432,000	468,000	518,000
Romania:					
Primary	32,622	25,024	18,708	24,013 r/	16,500
Secondary e/	1,000	1,000	1,000	2,000	2,000
Total e/	33,600	26,000	19,700	26,000 r/	18,500
Russia: e/					
Primary	550,000	535,000	510,000	540,000	580,000
Secondary	20,000	35,000	40,000	158,000	200,000
Total	570,000	570,000	550,000	698,000	780,000 3/
Serbia and Montenegro:					
Primary e/	59,940 3/	60,000	40,000 r/	54,000	86,000
Secondary	65,287	60,000 e/	55,000 r/	49,780 r/	4,000
Total	125,227	120,000 e/	95,000 r/	103,780 r/	90,000 3/

See footnotes at end of table.

TABLE 21--Continued  
COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country 3/	1996	1997	1998	1999	2000 e/
Slovakia, primary e/	14,000	10,000	10,000	10,000	10,000
South Africa, primary	148,400	163,600	152,300	149,300 r/	126,128 3/
Spain:					
Primary	248,500	288,900	291,400	305,000 e/	264,800 3/
Secondary	22,400	23,800	23,800	25,000 e/	65,000
Total	270,900	312,700	315,200	330,000 e/	329,800
Sweden: e/					
Primary	100,000 3/	95,000 r/	90,000 r/	85,000 r/	95,000
Secondary	26,000 r/ 3/3/	33,000 r/	35,000 r/	30,000 r/	35,000
Total	126,000 r/ 3/	128,000 r/	125,000	115,000 r/	130,000
Turkey 6/	38,600 e/	32,491	35,000	37,000	37,000
United States:					
Primary	1,300,000	1,440,000	1,490,000	1,090,000	W
Secondary	339,000	285,000	232,000	205,000	W
Total	1,640,000	1,720,000	1,720,000	1,290,000	1,000,000 3/
Uzbekistan: e/					
Primary	75,000	80,000	89,900	72,000	75,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	80,000	85,000	94,900	77,000	80,000
Zambia, primary: 7/					
Electrowon	73,900	61,140	51,736	25,000 e/	25,000
Other	250,300	220,327	206,871	184,000 e/	169,500
Total	324,200	281,467	258,607	209,000 e/	194,500
Zimbabwe, primary e/ 8/	18,000 r/	18,000 r/	10,000 r/	10,000 r/	10,000
Grand total:	10,800,000 r/	11,200,000 r/	11,400,000	11,700,000 r/	11,900,000
Of which:					
Primary:					
Electrowon	118,000	101,000	91,700	57,000 r/	46,000
Other	8,930,000 r/	9,360,000 r/	9,520,000 r/	9,500,000 r/	8,730,000 9/
Secondary	1,260,000 r/	1,180,000	1,070,000	1,180,000 r/	1,050,000 9/
Undifferentiated	455,000 r/	528,000 r/	685,000 r/	939,000 r/	2,040,000 9/

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data; included in total. -- Zero.

1/ World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

2/ This table includes total production of copper metal at the unrefined stage, including low-grade cathode produced by electrowinning methods. The smelter feed may be derived from ore, concentrates, copper precipitate or matte (primary), and/or scrap (secondary). To the extent possible, primary and secondary output of each country is shown separately. In some cases, total smelter production is officially reported, but the distribution between primary and secondary has been estimated. Table includes data available through July 20, 2001.

3/ Reported figure.

4/ Copper content of nickel-copper matte exported to Norway for refining.

5/ Data are for year beginning March 21 of year stated. Secondary production is estimated to be about 5% of total.

6/ Secondary production is estimated to be about 5% to 10% of total.

7/ For fiscal year beginning April 1 of year stated. Electrowon is total electrowon production reported less the quantity reported as "finished production, leach cathodes."

8/ Includes impure cathodes produced by electrowinning in nickel processing.

9/ U.S. production undifferentiated in 2000.

TABLE 22  
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1996	1997	1998	1999	2000 e/
Albania, primary	1,544 r/	-- r/	1,150 r/	342 r/	350
Argentina, secondary e/	16,000	16,000	16,000	16,000	16,000
Australia, primary	311,400	270,100	285,900	412,000 r/	487,000

See footnotes at end of table.

TABLE 22--Continued  
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1996	1997	1998	1999	2000 e/
Austria: e/					
Primary	1,000	2,000	2,000	2,000	2,000
Secondary	57,000	65,000	76,000	75,000	77,000
Total	58,000	67,000	78,000	77,000	79,000 3/
Belgium: 4/					
Primary	191,000	190,000	185,000	201,000 e/	236,100 3/
Secondary	163,000	183,000	183,000	187,000 e/	187,000
Total	354,000	373,000	368,000	388,000 e/	423,000
Brazil, primary	172,075	177,060	167,200	193,011 r/	185,345 3/
Bulgaria:					
Primary	17,301	29,530	31,400 r/	16,000 r/ e/	25,500
Secondary e/	5,000	5,000	5,000	5,000	5,000
Total	22,301	34,530	36,400 r/	21,000 r/	30,500 3/
Burma, electrowon	--	--	6,700 e/	26,736	26,711 3/
Canada:					
Electrowon	2,500	2,700	1,800	--	--
Primary	475,000	458,400	488,100	480,400 r/	490,100 3/
Secondary	81,700	99,300	72,600	68,200 r/	61,300 3/
Total	559,200	560,400	562,500	548,600 r/	551,400 3/
Chile:					
Electrowon	635,700	881,000	1,108,000	1,361,300	1,372,600 3/
Primary	1,112,500	1,235,600	1,226,900	1,304,300	1,295,700 3/
Total	1,748,200	2,116,600	2,334,900	2,665,600	2,668,300 3/
China: e/					
Primary	692,000	801,000	870,000	836,000 r/	1,060,000
Secondary	428,000	379,000	341,000	338,000 r/	340,000
Total	1,120,000	1,180,000	1,210,000	1,170,000 r/	1,400,000
Congo (Kinshasa), primary 5/	40,147 r/	37,658 r/	38,236 r/	31,225 r/	20,500
Cyprus, electrowon	1,499 r/	4,435 r/	4,936 r/	5,004 r/	5,197 3/
Egypt, secondary e/	4,600	5,000 r/	6,000 r/	6,000 r/	5,000
Finland: e/					
Primary	101,000 r/	100,000	108,000 r/	100,000 r/	100,000
Secondary	10,000	16,000	15,000	15,000	14,000
Total	111,000 r/	116,000	123,000 r/	115,000 r/	114,000
France: e/					
Primary	10,500	--	--	--	--
Secondary	28,600	35,600	22,400	1,800	1,500
Total	39,100	35,600	22,400	1,800	1,500
Germany:					
Primary	316,000 e/	297,900	322,800	271,000 e/	335,000
Secondary	355,000 e/	375,800	373,000	425,000 e/	375,000
Total	671,000 e/	673,700	695,800	696,000 e/	710,000
Hungary, secondary e/	11,000	12,000 r/	12,000 r/	12,000 r/	12,000
India:					
Primary, electrolytic	29,100	30,200	100,000	200,000 e/	234,000
Secondary e/	10,200	6,000	7,000	8,000	9,000
Total e/	39,300	36,200	107,000	208,000	243,000
Indonesia, primary	--	--	--	126,700	173,800 3/
Iran: 6/					
Electrowon	1,500	9,500	14,000	14,000 e/	14,000
Primary 7/	99,100	103,300	129,000 r/	131,700 r/	130,000
Total	100,600	112,800	143,000 r/	146,000 r/ e/	144,000
Italy:					
Primary	25,000	5,600	--	--	--
Secondary	60,800	80,100	29,100 e/	28,000 e/	70,000
Total	85,800	85,700	29,100 e/	28,000 e/	70,000
Japan:					
Primary	1,140,502	1,157,299	1,149,266	1,215,248	1,290,091 3/
Secondary	110,871	121,400	128,086	126,301	147,260 3/
Total	1,251,373	1,278,699	1,277,352	1,341,549	1,437,351 3/

See footnotes at end of table.

TABLE 22--Continued  
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1996	1997	1998	1999	2000 e/
Kazakhstan, primary	267,100	301,100	324,900	361,889	394,722 3/
Korea, North: e/					
Primary	23,000	23,000	23,000	20,000	20,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	28,000	28,000	28,000	25,000	25,000
Korea, Republic of:					
Primary	246,305	265,426	373,205	450,444	470,537 3/
Secondary e/	2,000	2,000	2,000	4,000	4,000
Total e/	248,000	267,000	375,000	454,000	475,000
Mexico:					
Primary:					
Electrowon	45,407	48,217	48,819	50,952	47,800
Other	180,100	234,000 e/	383,181	361,000 r/	340,400 3/
Secondary	16,493	14,783	15,000 e/	14,000 e/	15,000
Total	242,000	297,000	447,000	425,952 r/	403,000
Mongolia, electrowon	--	2,751	2,319	1,545 r/	1,450
Norway, primary 7/	28,526	32,639 r/	31,658 r/	33,262 r/	27,000
Oman, primary	24,150 r/	23,600 r/	22,700 r/	17,171 r/	24,281 3/
Peru:					
Electrowon	88,172	99,738 r/	101,837	114,927 r/	127,310 3/
Primary	249,890	284,347 r/	309,594 r/	318,914	324,416 3/
Total	338,062	384,085 r/	411,431 r/	433,841 r/	451,726 3/
Philippines, primary	155,774	146,630	152,400	147,982 r/	135,000
Poland:					
Primary	404,700 r/	420,600 r/	426,537 r/	448,300	466,002 3/
Secondary e/	20,000	20,000	20,300	22,200 3/	20,000
Total	424,700 r/	440,600 r/	446,837 r/	470,500	486,002 3/
Romania:					
Primary	29,305	22,912	21,028	24,983 r/	13,803 3/
Secondary e/	5,000	4,000	2,000	4,000	4,000
Total	34,305	26,912	23,028	28,983 r/	17,803 3/
Russia:					
Primary	543,000	535,000	543,000	600,000	640,000
Secondary	57,000	65,000	77,000	150,000	200,000
Total	600,000	600,000	620,000	750,000	840,000
Serbia and Montenegro:					
Primary	59,940	70,534	49,346 r/	48,002 r/	45,602 3/
Secondary	44,060	43,000	45,000 e/	1,900 r/ e/	40,000
Total	104,000	113,534	94,346 r/	49,902 r/	85,600
Slovakia, primary and secondary e/	28,000	31,400 r/	24,100	21,000	20,000
South Africa, primary 7/	123,000	130,200	125,600	116,400 r/	100,500
Spain: e/					
Primary	210,000	229,000 r/	239,600 r/ 3/	250,756 r/ 3/	250,800 3/
Secondary	54,000	63,300	64,730 r/	65,000 r/	65,000
Total	264,000	292,000	304,330 r/ 3/	315,756 r/ 3/	315,800 3/
Sweden: e/					
Primary	100,000	105,000	100,000	95,000	105,000
Secondary	25,000	23,000 3/	25,000	20,000	25,000
Total	125,000 3/	128,000 3/	125,000	115,000	130,000
Taiwan, secondary e/	6,000	4,000	4,000	4,000	4,000
Turkey:					
Primary	80,700	102,100	82,800	69,000 e/	62,000
Secondary	20,000	9,300	9,000	9,000 e/	10,000
Total	100,700	111,400	91,800	78,000 e/	72,000
United Kingdom:					
Primary	12,869	9,100	8,000	5,000 e/	1,000
Secondary	43,746	51,300	44,000	45,000 e/	49,000
Total	56,615	60,400	52,000	50,000 e/	50,000

See footnotes at end of table.



TABLE 22--Continued  
COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country	1996	1997	1998	1999	2000 e/
United States:					
Primary:					
Electrowon	574,000	586,000	609,000	586,000	557,000 3/
Other	1,430,000	1,480,000	1,530,000	1,300,000	1,030,000 3/
Secondary	345,000	396,000	349,000	230,000	208,000 3/
Total	2,350,000	2,470,000	2,490,000	2,120,000	1,790,000 3/
Uzbekistan: e/					
Primary	95,000	105,000	89,930 3/	72,000	75,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	100,000	110,000	94,930	77,000	80,000
Zambia, primary: 8/					
Electrowon	58,000	63,736	80,709	57,000 e/	55,000
Other	276,000	268,553	248,820	176,000 e/	170,000
Total	334,000	332,289	329,529	233,000 e/	225,000
Zimbabwe: e/					
Electrowon	3,200	2,900	2,400	1,020 r/	--
Primary	10,900	4,990	2,940	7,000 r/	7,200
Secondary	6,000	--	--	--	--
Total	20,100	7,890	5,340	8,020 r/	7,200
Total, primary	10,700,000	11,400,000	12,200,000	12,700,000 r/	13,000,000
Total, secondary	1,980,000	2,090,000	1,940,000 r/	1,880,000	1,960,000
Total, primary and secondary, undifferentiated	39,000	43,400 r/	36,100 r/	33,000 r/	32,000
Grand total	12,700,000	13,500,000	14,200,000 r/	14,600,000 r/	15,000,000

e/ Estimated. r/ Revised. -- Zero.

1/ World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

2/ This table includes total production of refined copper, whether produced by pyrometallurgical or electrolytic refining methods and whether derived from primary unrefined copper or from scrap. Copper cathode derived from electrowinning processing is also included. Table includes data available through July 20, 2001.

3/ Reported figure.

4/ Includes reprocessed leach cathode from Congo (Kinshasa).

5/ Excludes leach cathode exported for processing in Belgium.

6/ Data are for Iranian years beginning March 21 of that stated.

7/ May include secondary.

8/ Data are for fiscal year beginning April 1 of that stated. Electrowon covers only presumably high-grade electrowon cathodes reported as "finished production leach cathodes." Other, in addition to electrowon cathodes, includes a smaller amount of "finished product shapes" presumably cast from electro-refined cathodes, or any blister-anodes and low-anodes and low-grade electrowon cathodes that were furnace- or fire-refined.