

Copper

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Copper prices increased dramatically throughout 1994 due to the combined influences of strong worldwide demand and dwindling stock levels. In particular, there was continued strong growth in demand in the United States and parts of Southeast Asia, as well as a significant recovery in copper demand in Europe. The rise in copper prices was also influenced by the buying activities of investment funds.

With the expectation that economic recoveries in Europe and Japan will gain further momentum and growth will continue in North America, copper prices are forecast to remain strong in 1995.

CANADIAN DEVELOPMENTS

In 1994, Canadian copper production (recoverable copper in concentrate) declined to 626 000 t from 734 000 t in 1993. During 1994, refined copper production decreased to 550 000 t from 562 000 t in 1993.

The reduction in the mine production of copper was largely due to mine closures in British Columbia at the end of 1993, which had resulted from weak metal prices.

British Columbia

During 1994, the new Tatshenshini-Alsek Wilderness Park in the northwestern part of British Columbia was designated as a World Heritage Site. However, at year-end there had been no settlement between the province and the mining companies over compensation for the expropriation of mineral claims. One of the largest and potentially attractive of these properties is the Windy Craggy copper-gold deposit of Geddes Resources Ltd.

At the Tulsequah Chief property of Redfern Resources Ltd. in northwestern British Columbia, the company initiated environmental, geotechnical and

detailed engineering work that will be used for a final mine feasibility study and production permitting. Mineral reserves at Tulsequah Chief are estimated at about 8.5 Mt grading 1.4% copper, 1.1% lead and 6.6% zinc, plus silver and gold.

In January 1995, New Canamin Resources Ltd. and Princeton Mining Corporation announced that they had signed a letter of intent to amalgamate in order to develop the Huckleberry copper deposit, located 86 km south-southwest of Houston. In October 1994, New Canamin received positive results from a feasibility study for a 13 500-t/d operation that would produce about 27 000 t/y of copper in concentrate. New Canamin expects to file an application for a Mine Development Certificate in March 1995. The Huckleberry deposit contains diluted mineable reserves of 91 Mt grading 0.52% copper, 0.064 g/t gold, 0.014% molybdenum, and 2.78 g/t silver.

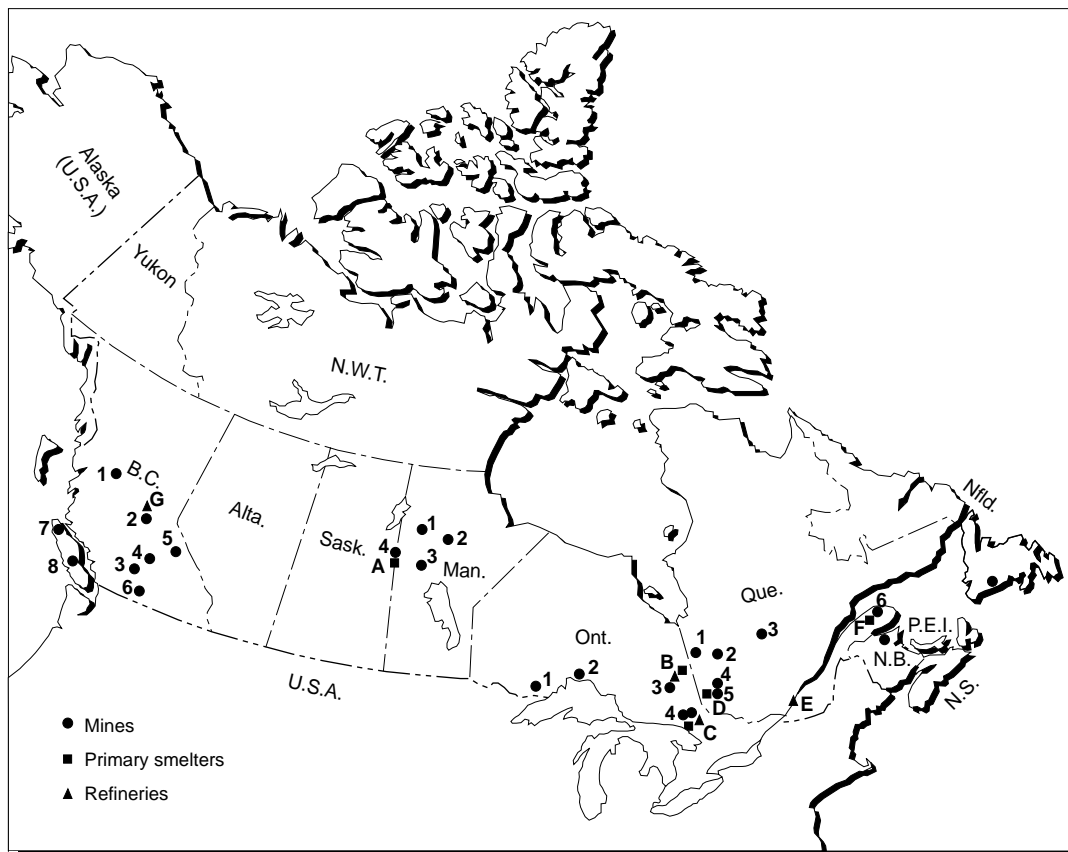
On August 18, 1994, Princeton Mining resumed operations at its Similco copper mine near Princeton. The operation had been closed since November 30, 1993, due to depressed copper prices and high operating costs. In December, the company announced that it had increased its Ingerbelle deposit reserves to 51 Mt. This includes 13 Mt grading 0.32% copper and 0.24 g/t gold, and 38 Mt grading 0.33% copper and 0.24 g/t gold.

On the basis of additional work completed in 1994, Taseko Mines Ltd. announced an increase in the ore grade of its Fish Lake gold-copper prospect located near Williams Lake. Reserve estimates for the deposit now total 675 Mt grading 0.25% copper and 0.48 g/t gold. At an operating rate of 60 000 t/d, Fish Lake would produce about 45 000 t/y of contained copper in concentrate as well as 7400 kg/y of gold and 16 500 kg/y of silver.

Gibraltar Mines Limited resumed operations at its McLeese Lake mine in July and reached full production at the end of September. Low copper prices had forced the company to temporarily close the mine on December 1, 1993.

At the end of August, Gibraltar Mines Limited announced that it would not exercise an option agreement with Imperial Metals Corporation for a 50% interest in the Mount Polley copper-gold deposit located approximately 50 km east of the McLeese

Figure 1
Copper Producers in Canada, 1994



MINES

British Columbia

1. Equity Silver Mines Limited
2. Gibraltar Mines Limited
3. Highland Valley Copper¹
4. Afton Operating Corporation (Ajax mine)
5. Bethlehem Resources Corporation
- Goldneve Resources Inc. (Goldstream mine)
6. Princeton Mining Corporation (Similco)
7. BHP Minerals Canada Ltd.
8. Westmin Resources Limited

Saskatchewan

Hudson Bay Mining and Smelting Co., Limited (Flin Flon)

Manitoba

1. Hudson Bay Mining and Smelting Co., Limited (Ruttan mine)
2. Inco Limited (Thompson mine)
3. Hudson Bay Mining and Smelting Co., Limited (Snow Lake area mines)
4. Hudson Bay Mining and Smelting Co., Limited (Flin Flon area mines)

Ontario

1. Noranda Inc., Geco Division
2. Metall Mining Corporation (Winston Lake mine)
3. Falconbridge Limited (Timmins)
4. Falconbridge Limited (Sudbury area)
- Inco Limited (Sudbury area)

Quebec

1. Les Mines Selbaie
2. Noranda Inc. (Division Matagami Lake)
3. MSV Resources Inc.
Campbell Resources Inc.
4. Agnico-Eagle Mines Limited (La Ronde mine)
LAC Minerals Ltd. (Bousquet mine)
5. Aur Resources, Novicourt, Teck Corp. (Louvicourt mine)
6. Noranda Inc., Division Mines Gaspé

New Brunswick

Brunswick Mining and Smelting Corporation Limited
 Noranda Inc. (Heath Steele mine)

Newfoundland

Royal Oak Mines Inc. (Hope Brook mine)

SMELTERS

- A. Hudson Bay Mining and Smelting Co., Limited (Flin Flon)
- B. Falconbridge Limited (Timmins)
- C. Inco Limited (Sudbury area)
Falconbridge Limited (Sudbury area)
- D. Noranda Inc. (Noranda)
- F. Noranda Inc. (Division Mines Gaspé)

REFINERIES

- B. Falconbridge Limited (Timmins)
- C. Inco Limited (Sudbury area)
- E. Noranda Inc. (Division CCR)
- G. Gibraltar Mines Limited (SX-EW)

¹ Highland Valley Copper is a partnership of Cominco Ltd., Teck Corporation and Rio Algom Limited.

Note: For detailed production and ore grade information, refer to the nonferrous mine production table following the last commodity chapter.

Lake operation. However, later in the year, Bethlehem Resources Corporation and Imperial Metals announced their intention to amalgamate in order to develop the Mount Polley property. Annual production would be about 15 000 t of copper in concentrate and 2500 kg of gold.

Equity Silver Mines Ltd. ceased mining operations at its mine near Houston on January 31, 1994, due to the depletion of ore reserves.

Teck Corporation began work in August to re-open its Afton/Ajax copper mine that had been closed since 1991. The mine achieved full production in late September.

The labour dispute at the Myra Falls copper-zinc mine of Westmin Resources Ltd. was settled in August through binding arbitration. The new collective agreement, which will run until August 1997, includes a new wage schedule that provides wage decreases for most job classifications as well as the elimination of housing and attendance bonuses. By the end of September, most employees at Myra Falls had been recalled to work. The company anticipated that the mine would be operating at 90% of capacity by year-end 1994.

At the end of 1994, Westmin reported that it had discovered the possible extension of its Block 43 zone deposit. Proven and probable reserves at Myra Falls total 12.5 Mt grading 2 g/t gold, 46.1 g/t silver, 1.9% copper, and 7.1% zinc.

Manitoba

In November, Hudson Bay Mining & Smelting Co. Ltd. announced that it had discovered a new copper-rich deposit at Photo Lake near Snow Lake. Earlier in the year, Hudson Bay closed both its Stall Lake and Chisel Lake mines in the Snow Lake area due to the exhaustion of ore reserves.

Ontario

As a result of an improvement in nickel prices in particular, both Inco Limited and Falconbridge Limited are expected to increase mine production at their Sudbury area operations in 1995.

Inco confirmed in November that it would bring its McCreeley East deposit into production. The first phase of the project will involve the mining of about 15 Mt of ore grading 4.32% copper and 1.44% nickel, beginning in 1996. Once the mine reaches full production in 1999, output will reach 10 000 t/y of contained nickel and 35 000 t/y of contained copper. Inco also announced in 1994 that it would undertake a \$72 million program to develop its high-grade Victor deposit located east of Sudbury. The property contains two separate zones. The upper zone contains a mineral reserve of about 5.5 Mt grading 0.54% copper and 2.26% nickel, while the lower zone contains

6.3 Mt grading 5.1% copper and 1.9% nickel, plus gold and platinum group metals.

Further underground exploration work by Falconbridge at its Kidd Creek orebody in Timmins has confirmed that the main orebody extends to at least the 3000-m level. While exploration is continuing, it is expected that the discovery of additional reserves will significantly extend the life of the mine operation.

Quebec

The new Louvicourt mine near Val-d'Or, which began production in July 1994, was expected to reach commercial production levels in early 1995 and full output of 4000 t/d by mid-year. During its 12-year operating life, Louvicourt is expected to produce an average of 50 000 t/y of contained copper and 20 000 t/y of zinc, as well as significant amounts of gold and silver. Geological reserves of the deposit total 15.7 Mt grading 3.4% copper, 2.2% zinc, 31 g/t silver and 0.9 g/t gold. Development costs for Louvicourt, which is owned by Aur Resources Inc. (30%), Novicourt Inc. (45%) and Teck Corporation (25%), were \$280 million, some \$40 million below original estimates.

Audrey Resources Inc. expects to begin commercial production at its 1100 Lens project in the first quarter of 1995. Annual output is expected to be about 4400 t of copper and 25 000 t of zinc in concentrate, as well as significant quantities of gold and silver. Audrey Resources is 72.3% owned by Cambior inc.

Cambior announced in January 1995 that its Board of Directors had approved the development of its Grevet zinc-copper deposit near Lebel-sur-Quévillon. The mine, which is expected to begin production in the first quarter of 1996, will produce about 72 000 t/y of zinc and 3300 t/y of copper.

MSV Resources Inc. announced that an exploration program had increased reserves at its Copper Rand and Portage mines in the Chibougamau area. Proven and probable reserves at the two mines now total 4.3 Mt grading 1.7% copper and 3 g/t gold, an amount sufficient to support mining operations for eight years.

Also in the Chibougamau area, MSV Resources and Cache Explorations Inc. plan to develop the Inner Block copper property, which hosts probable and possible reserves of about 1 Mt grading 5.28% copper.

Metall Mining Corporation completed a positive feasibility study for its Troilus gold-copper mine north of Chibougamau and also received the necessary environmental approvals for the project. The company expects that production at the site will begin in the third quarter of 1996. Annual production at Troilus is expected to be about 4800 kg of gold and 3500 t of copper. Mineable reserves at the deposit total 49.2 Mt grading 1.34 g/t gold and 0.11% copper.

Workers at Noranda Inc.'s Les Mines Gaspé copper mine and smelter went on strike on May 30 to back contract demands. The strike was settled after two weeks when workers ratified a new three-year collective agreement.

New Brunswick

Brunswick Mining and Smelting Corporation Limited re-opened the Heath Steele mine in October. The mine had closed in July 1993 due to depressed market prices for lead and zinc.

Newfoundland

In November, Diamond Fields Resources Inc. announced that it had made a significant discovery of nickel, copper and cobalt mineralization at its Voisey Bay property southwest of Nain in northern Labrador. The deposit, which would likely be amenable to open-pit mine development, is located 10 km from tidewater.

Yukon

Thermal Exploration Co. and Western Copper Holdings completed a positive feasibility study on their Carmacks Copper deposit (formerly Williams Creek), which is located approximately 230 km north of Whitehorse. Development plans for this property envisage a solvent extraction/electrowinning (SX/EW) operation that would produce about 15 000 t/y of copper cathode for an 8.5-year mine life. Capital costs are estimated at \$57 million. An environmental review of the project is under way.

Cominco Ltd. announced the discovery of promising polymetallic sulphide mineralization at its Kudze Kayah (Tag) property in the Finlayson Lake area, 200 km northwest of Watson Lake. The company plans to undertake advanced exploration work on the property in 1995. Preliminary reserve estimates total 13 Mt grading 5.5% zinc, 1% copper, 1.3% lead, 125 g/t silver and 1.2 g/t gold.

Pacific Sentinel Gold Corporation is continuing work on its Casino copper-gold-molybdenum property in the southern Yukon. Mineable reserves in the supergene zone of the deposit total 58.5 Mt grading 0.44 g/t gold and 0.43% copper, while mineable reserves in the hypogene zone total 24.3 Mt grading 0.41 g/t gold and 0.31% copper. Preliminary plans for the project envisage an annual output of about 22 550 t of copper and 3700 kg of gold.

WORLD DEVELOPMENTS

World mine production of copper in 1994 was estimated at 9.3 Mt compared to 9.5 Mt in 1993 (Table 3). During 1994, world production of refined

copper decreased slightly to about 11.0 Mt from 11.4 Mt in 1993 (Table 4).

Argentina

In December, International Musto Explorations Limited and its joint-venture partner, MIM Holdings Ltd., completed a feasibility study on their Bajo de la Alumbrera copper-gold property in northwestern Argentina. According to press reports, the project might be expanded to 300 000 t/y of copper in concentrate from the original planned level of 135 000 t/y. The cost of the larger project is estimated at US\$700 million. The deposit contains reserves of 494 Mt grading 0.53% copper and 0.68 g/t gold.

Earlier in the year, Cambior inc. purchased a 40% interest in Pachón S.A. Minera (Pachón), which owns 100% of the El Pachón copper deposit. This property is located in the northern part of the country near the Chilean border. Cambior has an option to acquire an additional 10% of Pachón. El Pachón contains a mineral inventory of 500 Mt grading 0.75% copper.

Chile

Chilean mine production of copper in 1994 totalled 2.2 Mt, an increase of 8.5% over 1993. State-owned companies, including Corporacion Nacional del Cobre (Codelco) and Empresa Nacional de Minería (ENAMI), accounted for 1.13 Mt, or 51%, of total Chilean copper production.

In September, Codelco announced a US\$2.7 billion investment plan, over six years, that would increase the company's annual copper output to about 1.3 Mt of copper at a unit operating cost of US\$60c/lb. This plan is subject to approval by the Chilean government.

The proposal includes expansions at the El Salvador and Andina divisions, the development of oxide ores at Chuquicamata, and the development of the Radomiro Tomic deposit. The latter, which is located 6 km north of the Chuquicamata mine, would produce between 150 000 and 200 000 t/y of copper cathode. Costs for developing this SX/EW operation are estimated at US\$450 million.

In mid-1994, Codelco began production from its Quebrada Teniente deposit at the El Teniente operation. The company also reported that it had brought its low-grade copper sulphides plant on stream at its Chuquicamata division. The plant will produce about 15 000 t/y of copper cathodes using a bacterial leach process. In January 1995, Codelco began production at its new SX/EW plant at the Salvador division. The plant, which is expected to be fully on line by June 1995, will produce about 25 000 t/y of copper cathodes. A future expansion to 50 000 t/y is under consideration.

Minera Escondida Limitada is proceeding with its Phase III expansion that will increase copper mine output to 800 000 t/y in mid-1996. Escondida produced 480 000 t of contained copper in 1994. One of the first phases of the expansion will be the construction of a new 170-km concentrate pipeline between the mine and the coast. In addition, Escondida will build an 80 000-t/y SX/EW plant at the mine to process oxide ores. The entire expansion is expected to cost US\$520 million, which will bring total investment in the Escondida project to US\$1.6 billion.

In November, production began at Escondida's new US\$260 million ammonia leach facility located at Coloso near Antofagasta. The plant, which uses copper concentrate as a raw material, is expected to produce about 80 000 t/y of copper cathode.

At the El Lince mine of Cia Minera Michilla SA, a new SX/EW plant was expected to be brought on stream in September that would double electrowon copper capacity to about 50 000 t/y.

Minera Disputada de Las Condes S.A. expects to complete an expansion and modernization of its Chagres smelter in early 1995. Upon completion of the project, the company expects its production of blister copper to increase from 50 000 t/y to 120 000 t/y, while sulphur dioxide emissions will be significantly reduced.

In October, production began at the La Candelaria project of Phelps Dodge Corporation (80%) and Sumitomo Metal Mining Co. Ltd. (20%). The mine, which will reach full production in the first quarter of 1995, will produce about 120 000 t/y of copper and 2500 kg/y of gold in concentrate. A future expansion is reported to be under consideration.

In June, Cyprus Amax Minerals Company acquired a 51% interest in the El Abra copper deposit in northern Chile from Codelco. Once project financing arrangements are in place, Cyprus Amax plans to begin construction of the project in the first half of 1995 and to commence production by April 1997. This SX/EW operation will produce 225 000 t/y of copper cathode.

Lac Minerals Ltd. purchased a 33% stake in Refinadora de Metales SA (Refimet), the operator of a 95 000-t/y copper smelter near Antofagasta. Lac itself reported that it was proceeding with an expansion of its El Indio gold-copper mine that would increase its copper output to about 40 000 t/y. Lac was taken over in the second half of 1994 by American Barrick Corporation (name subsequently changed to Barrick Gold Corporation).

The Quebrada Blanca SX/EW mine began production in August and was expected to be fully on stream in January 1995. The US\$335 million Quebrada Blanca project is owned 38% by Cominco, 29% by Teck, 10% by Empresa Nacional de Minería (ENAMI), 9% by Cominco Resources International Limited, and 14%

by Sociedad Minera Pudahuel Ltda. y Cia. C.P.A. (SMP). Copper oxide reserves at Quebrada Blanca, which total 89 Mt grading 1.3% copper, are sufficient to sustain the operation for at least 14 years. Copper cathode output will be about 75 000 t/y.

Placer Dome Inc. and Outokumpu Copper Resources B.V. continued development work on their Zaldivar SX/EW project in northern Chile. The US\$600 million mine, which will produce about 125 000 t/y of copper cathode, is expected to begin production in May 1995. Mineable ore reserves have been calculated at 246 Mt grading 1.02% copper, plus an additional dump leach reserve of 70 Mt grading 0.41% copper. Development costs are estimated at about US\$600 million.

Rio Algom Ltd. began production at its Cerro Colorado SX/EW mine project in early 1994 and reached its design capacity of 40 000 t/y of copper cathode by the end of the third quarter. The company is proceeding with an expansion of the operation to increase output to 60 000 t/y. This US\$49 million expansion is expected to come on stream at the end of 1995.

At the Collahuasi deposit of Falconbridge, Shell Chile SA and Minera Mantos Minorco Limitada (a joint venture between Minorco SA and Empresa Minera de Mantos Blancos), a feasibility study is expected to be completed by March 1995. The project, which would produce up to 350 000 t/y of copper in concentrate and 50 000 t/y of copper cathode, is expected to cost US\$1.4 billion. Construction at Collahuasi is expected to start in the second quarter of 1996 with production likely to begin in early 1999. The Collahuasi deposit contains ore reserves of 1.6 billion t grading 1.1% copper.

At the Ivan copper property near Antofagasta, Minera Rayrock Inc. began production in the third quarter of 1994. The US\$31 million operation is expected to produce about 10 000 t/y of copper cathode.

Elsewhere in Chile, Compania Minera Mamina (a subsidiary of Inco) announced that it had signed an agreement with Codelco to proceed with phase two of an exploration program on the latter's Mamina copper project. Meanwhile, Princeton Mining Corporation is continuing exploration work on its Elenita copper property.

In November, Gibraltar Mines Limited completed the purchase of the Lomas Bayas property from Empresa Minera de Mantos Blancos. The deposit contains an estimated geologic resource of 90 Mt grading 0.68% copper. Potential production would be about 45 000 t/y of copper cathode, while capital costs for the project are estimated at US\$94 million.

Canada Tungsten Inc. (70%) and Compania Minera del Pacifico SA (30%) announced that they will

develop the Andacollo copper property. The US\$69 million project is expected to come on stream in the second half of 1997. Production at the Andacollo mine will be about 20 000 t/y of copper cathode.

ENAMI is proceeding with the modernization of its Las Ventanas smelter to reduce sulphur dioxide and particulate emissions. While the modernization will result in a small reduction in smelting capacity, the company plans to increase its refining capacity by 57 000 t/y to 270 000 t/y by 1996. A further 57 000-t/y expansion is also under consideration. The company was also reported to be considering a modernization program for its Paipote smelter.

At the end of January 1995, workers at ENAMI's Las Ventanas smelter voted to go on strike to back contract demands.

Peru

Cyprus Minerals Co. completed the US\$31 million purchase of the Cerro Verde copper mine from state-owned Minero Peru S.A. As part of the purchase agreement, Cyprus will also invest up to \$475 million for the expansion and modernization of the operation. The first phase of this investment, which will cost about US\$130 million, will be to expand SX/EW output and upgrade mine equipment.

Magma Copper was the successful bidder for Empresa Minera Especial Tintaya S.A., Peru's second largest copper producer. The purchase price was reported to be US\$214 million plus a commitment by Magma to spend a minimum of \$85 million on capital expenditures during the next five-year period.

Southern Peru Copper Corporation (SPCC) was the sole bidder for Minero Peru's 180 000-t/y Ilo copper refinery. SPCC's offer of US\$68.5 million was subsequently approved by the Peruvian government. During 1994, SPCC reported that its new 35 000-t/y SX/EW plant at its Toquepala mine would begin production in the fourth quarter of 1995.

Brazil

Companhia Vale do Rio Doce (CVRD) and Anglo American Corporation were reported to be considering the development of the Salobo copper project, located at Carajas in northern Brazil. The Salobo mine would likely produce about 150 000 t/y of copper in concentrate. A final decision on the project was expected by the end of 1994.

Panama

In November, Teck and Adrian Resources Ltd. reached an agreement whereby the former would fund a feasibility study on the Petaquilla copper project in return for a 26% interest in the property. The

other shareholder in this project is Metall Mining Corporation with a 48% interest. Mineable reserves at the Petaquilla and Botija deposits are estimated at 495 Mt grading 0.53% copper and 0.124 g/t gold.

Mexico

Early in 1994, Cominco Resources International sold its Mariquita copper deposit in Sonora to Minera Maria (owned 49% by Cominco Resources International). Preliminary plans for the deposit are for an SX/EW operation that would produce about 15 000 t/y of copper cathode. The Mariquita deposit contains estimated ore reserves of 43 Mt grading 0.46% copper. It is expected that a production decision will be made in early 1995.

United States

Kennecott Corporation expects to complete its new 280 000-t/y smelter/refinery project in April 1995. When the US\$800 million project is completed, the company will close its existing 150 000-t/y Garfield smelter.

Cyprus Amax Minerals Company plans to spend about US\$300 million on a number of projects that will bring the company's cash production costs for copper to under US60¢/lb. This includes \$83 million for its copper refinery at the Miami operation, a \$20 million expansion at the Bagdad mine, as well as \$75 million for a fleet expansion and \$13 million for an SX/EW expansion at the Sierrita complex. The company also announced that it was considering a \$60 million investment for an SX/EW operation at Casa Grande, Arizona. This operation would produce approximately 36 000 t/y of copper cathode.

Magma Copper Co. announced in October that it had begun construction on its Robinson mining project near Ely, Nevada. The operation, which will commence production in the first quarter of 1996, is expected to eventually produce about 120 000 t/y of contained copper and 3400 kg/y of gold. Magma also plans to extend the life of its Kalamazoo mine to the year 2009 at a cost of US\$140 million, and will begin in-situ leaching operations of its Florence orebody in 1998. The latter project is expected to produce over 30 000 t/y of copper cathode.

Asarco Incorporated announced in October that it had commenced work on underground development at its Mission mine that will increase production by about 13 000 t/y when completed in 1996.

Sumitomo Metal Mining Co., Ltd. and Phelps Dodge announced that they would develop the Southside ore deposit and also upgrade SX/EW equipment at their Morenci operation in Arizona. It is expected that the US\$200 million project will be completed by the end of 1995 and that production of copper cathode will increase by 68 000 t/y to 227 000 t/y.

In December, Azco Mining Inc. reported that financing was in place for its Sanchez copper project in southeast Arizona and that construction would begin in early 1995. This SX/EW operation is expected to produce about 25 000 t/y of copper cathode.

Southern Copper Corp. announced that it would double the size of its Oracle Ridge copper mine and mill, which are located near San Manuel, Arizona. The mine currently produces about 10 000 t/y of copper in concentrate.

Metall Mining Corporation announced that it would proceed with engineering studies for smelter modifications at its Copper Range operation in White Pine, Michigan. However, a final decision on the US\$200 million project will not be made until the company decides whether it will proceed with low-cost solution mining at Copper Range. The smelter modifications, which will also increase capacity from 75 000 t/y to 135 000 t/y, will allow the plant to meet air emission regulations. In October it was reported that the company had made provision for a US\$4.8 million penalty for violations of air emission regulations at the smelter.

Metall announced in November that operations at the Copper Range smelter would be suspended in February 1995. According to the company, this will shorten the construction period and reduce capital and operating costs if the smelter modifications proceed. During the smelter closure, Metall reached an agreement with Hudson Bay Mining and Smelting Co. Ltd. to have its Copper Range concentrate smelted at the Flin Flon smelter in Manitoba.

Cambior is awaiting environmental permits for its Carlota copper deposit in the Miami-Globe region of Arizona. Assuming that the permitting process proceeds smoothly, the company expects that construction on this project could begin in July 1995. The mine, which would have a capacity of over 25 000 t/y of copper, is expected to cost about US\$80 million.

In December, Great Lakes Minerals Inc. and Brookline Minerals Inc. announced that they had established a joint venture to develop the former's 543-S copper property in Michigan. Annual production will be about 11 000 t of contained copper.

Early in 1995, it was reported that Southwire Co. would close its 90 000-t/y secondary copper smelter located at Gaston, South Carolina.

Australia

Western Mining Corporation expects to complete an expansion of its Olympic Dam mine in mid-1995 that will increase copper production to 84 000 t/y. The company is also conducting a feasibility study for a further expansion that would increase copper production to 150 000 t/y by the year 2000.

The Northparkes copper-gold mine of North Broken Hill Peko Ltd. commenced production in August. When fully on stream, the mine is expected to produce about 65 000 t/y of copper in concentrates as well as 2200 kg/y of gold.

Placer Pacific Limited announced it was proceeding with the development of its Osborne copper-gold property in northwest Queensland. The US\$115 million project, which will produce about 22 000 t/y of copper and 900 kg/y of gold, is expected to begin production in mid-1995.

MIM and Savage Resources Ltd. completed a feasibility study on their Ernest Henry copper-gold deposit in North Queensland. The study envisages an open-pit mine that would produce about 90 000 t/y of copper in concentrate and 3700 kg/y of gold. A final decision on the project will be made once all government approvals are received, land tenure is secured, and financing arrangements have been completed.

The Mt. Lyell mine in Tasmania closed in December. However, the new owner of the operation, Gold Mines of Australia Ltd., announced plans to resume mining activity in 1996. While mining will initially be at 1.5 Mt/y of ore, the company intends to increase this to 3.5 Mt/y. At that rate, annual production would total about 30 000 t of copper. Gold Mines of Australia also reported that China National Non-Ferrous Metal Industry Corp. (CNNC) will take the mine's output once production resumes.

Southern Copper Limited announced that it would close its Port Kembla smelter in January 1995. The closure was blamed on a number of factors including poor financial performance of the facility and lower treatment charges. The company stated that the plant would remain closed until a new partner was found to share the cost of required environmental improvements and also to allow the plant to produce at a higher and more economic operating rate.

Philippines

In December, a power blackout caused by Typhoon Axel resulted in a two-week shut-down at the copper smelter of Philippine Associated Smelting & Refining Corp. Also in December, Maricalum Mining Corporation announced that it would invest approximately US\$35 million to rehabilitate its copper mine in the Philippines.

Indonesia

Freeport-McMoRan Copper & Gold Inc. expects to complete a mine and mill expansion at its Grasberg copper-gold orebody to 115 000 t/d during the second half of 1995. Once the expansion is completed, the Grasberg mine will produce 500 000 t/y of copper in concentrate plus 46 650 kg/y of gold. At the end of 1994, Freeport-McMoRan reported that its ore

reserves had increased to 1.13 billion t grading 1.3% copper, 1.4 g/t gold and 4 g/t silver.

At the beginning of 1994, Metallgesellschaft AG announced that the proposed Gresik copper smelter project would be delayed due to the company's financial difficulties. However, in January 1995, Mitsubishi Materials Corp. announced that it would build and operate a smelter/refinery complex at Gresik. Production is now expected to begin in 1998. The smelter, which will have a capacity of 200 000 t/y of copper, will be owned 70% by Mitsubishi, 20% by Freeport-McMoRan, and 10% by Fluor Daniel Inc. Freeport-McMoRan will supply all of the smelter's concentrate requirements.

Japan

Due to lower treatment and refining charges and the significant appreciation of the yen, Japanese smelter output in 1994 was reduced by about 10% from 1993 levels.

People's Republic of China

Chinese production of refined copper in 1994 was reported at 684 000 t compared to 691 000 t in 1993. As a result of Chinese government policies to dampen the pace of economic growth in that country, it was expected that copper consumption in 1994 would decline from the 1993 level of about 940 000 t. This reduction in copper demand will likely result in a significant drop in refined copper imports.

The Chinese government expects that copper consumption will increase to 1.3 Mt in the year 2000 and rise to 1.7 Mt in 2010. With domestic mine production expected to total 700 000 t in the year 2000 and 900 000 t in 2010, imports are expected to increase to between 600 000 and 700 000 t in 2000 and to 1 Mt in 2010.

A number of smelter/refinery projects are currently under way in China with several others under consideration. In December it was reported that the Chinese government had approved the expansion of the Guixi smelter to 200 000 t/y by 1997. In January 1995, it was reported that China National Nonferrous Metals Import & Export Corp. would participate in a 100 000-t/y copper smelter in Jiangsu province. The cost of this project was estimated at US\$450 million.

Thailand

Early in 1994 it was announced that the 150 000-t/y Rayong Copper smelter/refinery project was being cancelled.

India

Hindustan Copper Limited plans to increase the capacity of its Khetri copper smelter from 31 000 t/y

to 100 000 t/y by 1998. The project is expected to cost US\$125 million. The company is also considering a \$300 million underground mining project at Malankhand in Madhya Pradesh.

The Metdist Group and Mitsubishi Materials Corp. will participate in a US\$500 million smelter/refinery project at Pipavav in the state of Gujarat. The plant will have a capacity of 150 000 t/y of copper cathode and will also produce 450 000 t/y of sulphuric acid. It is expected that production will begin in 1998.

Outokumpu Engineering Contractors Oy will supply Outokumpu flash smelting technology to Indo Gulf Fertilizers & Chemicals Corporation Ltd. for a new 100 000-t/y copper smelter. The plant and accompanying refinery, which will be built in Gujarat on India's west coast, is expected to begin production in mid-1997.

In addition to the three smelters mentioned above, other projects include a 50 000-t/y secondary smelter and refinery involving Swil Ltd. and a 100 000-t/y plant that is being proposed by Sterlite Industries (India) Limited.

Pakistan

According to press reports, the Saindak mine/smelter project of Pakistan's Resource Development Corporation and the Metallurgical Construction Corporation of China was expected to begin commercial production in May 1995. Annual production will be about 15 000 t of copper and 1400 kg of gold.

Iran

In September it was reported that a Chinese company was about to begin construction of a new 80 000-t/y copper smelter in the southeast province of Kerman. The plant will take about four years to complete.

Saudi Arabia

Even Resources Ltd. will undertake a feasibility study for the Jabal Sayid copper project, located 340 km northeast of Jeddah. The deposit contains an estimated reserve of 90 Mt grading 1.54% copper. Copper production would be 210 000 t/y. Ownership of the deposit is split between Even Resources (40%) and Alujain Corp. (60%).

Also in Saudi Arabia, Arabian Shield Development Co. is proceeding with the development of its 50%-owned Al Masane zinc-copper deposit in the southwest part of the country. The mine, which is expected to begin production by mid-1996, will produce about 30 000 t/y of zinc and 8500 t/y of copper, as well as gold and silver.

A Japanese consortium and Alujain Corp. were reported to have completed a feasibility study and

implementation plan for the construction of a 150 000-t/y greenfield smelter project at Yanbu. The plant, which will be operational in early 1998, is expected to cost US\$500 million.

Turkey

The new Cayeli mine project, owned 49% by Metall Mining Corporation, began production in the third quarter of 1994 and was expected to reach full production by the end of the year. The Cayeli mine will produce about 23 000 t/y of copper and 35 000 t/y of zinc in concentrate. Also in Turkey, Cominco Resources International is continuing with exploration work at its Cerattepe project. A copper zone at the Cerattepe property hosts a reserve of 1.2 Mt grading 10% copper. A decision on the future of the project is expected in 1995.

Russia

According to press reports, Udokan Mining Co., a joint venture between Russian interests and Chita Minerals Ltd. (ownership of Chita Minerals includes Quaker Coal Co. Inc. of the United States and China National Nonferrous Metals Co.) has undertaken a feasibility study on the large Udokan copper deposit in Siberia. The Udokan deposit hosts proven and probable reserves of 915 Mt grading 1.5% copper and an additional 420 Mt of indicated/inferred reserves grading 1.4% copper.

In December 1994, there were reports that nickel and copper output at Norilsk was seriously affected by an accident at a power station in late November. Despite this problem, Norilsk officials expected that overall copper output for 1994 would increase to well over 250 000 t.

Finland

In the first half of 1994, Outokumpu Oy reported that it would increase blister copper capacity at its Harjavalta smelter from 100 000 t/y to 160 000 t/y, while copper cathode capacity would increase from 70 000 t/y to 125 000 t/y.

Germany

Metall Mining Corporation paid \$152 million to re-acquire a 35% interest in the Norddeutsche Affinerie AG copper smelter from its former parent, Metallgesellschaft AG. The smelter has a capacity of 350 000 t/y of blister copper.

Belgium

Union Minière SA announced that it will build a new copper refinery in Olen at a cost of approximately US\$89 million. The plant, which will have a capacity of about 200 000 t/y, will replace the company's existing refinery at the same site.

Spain

Freeport-McMoRan Copper & Gold Inc. is proceeding with an expansion of its copper smelter at Huelva that will increase the capacity of the plant to 180 000 t/y by 1995 and to 270 000 t/y in 1996. Refining capacity at the operation will also increase from 135 000 t/y to 215 000 t/y.

Zambia

Copper output in Zambia during 1994 was expected to decline to about 360 000 t due to a variety of technical problems. Faced with serious financial problems, Zambia Consolidated Copper Mines Ltd. (ZCCM) announced during the year that it would undertake a cost-cutting program throughout its operations.

In order to facilitate the development of new copper projects that are needed to maintain Zambian copper production levels, there was continuing speculation that the government would move to reduce its 60% interest in ZCCM.

The largest of ZCCM's potential mine developments is the Konkola Deep Mining Project, which would provide access to a resource of 340 Mt grading 3.8% copper. Konkola, which is expected to cost US\$545 million, would produce about 180 000 t/y of copper and 600 t/y of cobalt.

Zaire

The copper industry in Zaire continued to suffer from political instability and a lack of investment. Copper output in 1994 was expected to be about 40 000 t. By comparison, Zaire produced 465 000 t of copper in 1988.

During 1994, there were reports that the Government of Zaire was considering plans to privatize Gecamines, the state mining corporation.

International Copper Study Group

In 1994, the International Copper Study Group (ICSG) held two meetings in Lisbon, Portugal. No new members joined the ICSG in 1994, but several nations indicated to the Study Group that they intended to join in the near future. In early 1995, the Government of Mexico advised the ICSG that its Senate had approved Mexico's membership in the organization.

For 1995, the Group elected Gordon Peeling of Canada as Chairman. The ICSG will hold two meetings in 1995. The first will be held in Lisbon in late June, and the second will take place in Santiago, Chile, at the end of November.

CONSUMPTION AND USES

World copper consumption in 1994 increased to about 11.7 Mt from about 11.2 Mt in 1993 (this includes refined copper from both primary and secondary material). In 1994, about 3 Mt of copper scrap was used directly by consumers. Altogether, 4.5 Mt of copper scrap was recovered in 1994. Canadian refined copper consumption in 1994 was estimated to have increased to 200 000 t from 186 000 t in 1993.

Table 8 presents preliminary end-use data for 1992 and 1993 for the United States, collected by the Copper Development Association Inc. (detailed copper consumption statistics are not officially collected in Canada).

NEW MARKETS

In Canada, copper tube and fittings are now being used in houses and other buildings to carry natural gas. The growth of this market has been dramatic, with copper quickly becoming the preferred material, replacing steel pipe. In the fire sprinkler industry, the growth of copper usage has not been as dramatic, but good progress is being made in competition with steel pipe and certain plastics. Both markets are being heavily promoted by the Canadian Copper and Brass Development Association (CCBDA) with the financial support of the International Copper Association, Ltd.

The CCBDA is also actively involved in the promotion of electrical wire and cable with particular emphasis on the use of larger conductors to improve energy efficiency. Other areas receiving attention include brass forgings for engineered components and a study on the potential market for copper-based materials in applications to control zebra mussels. The CCBDA and the Copper Development Association of the United States have also jointly undertaken major North American initiatives on the promotion of architectural applications as well as plumbing tube and fittings.

In the automotive industry, the use of additional electronics offers significant growth potential for copper wire. While copper use in original-equipment automobile radiators has declined due to the market penetration of aluminum radiators, copper and brass radiators have an important share of the replacement market. However, with the development of new solders and new processing methods for coating and core baking, as well as a new brazed structure, it is possible that copper can regain a large share of the original-equipment market in view of its superior heat exchange efficiency.

Despite a number of technological advances in the communications and telecommunications sectors in recent years that promised to reduce copper con-

sumption, including fibre optics, multiplexing and gauge reduction, the decline of copper usage in this sector has slowed. In this regard, the higher costs associated with these alternate technologies provide copper with a competitive advantage in certain applications, particularly for distribution. Recent technological breakthroughs for copper enable more information to be transmitted than previously possible.

Copper continues to be the preferred metal for electrical wiring applications in building construction. As houses increase in size and incorporate more labour-saving electrical devices, the use of copper in household wiring applications could increase by up to 40%.

TRADE ISSUES

During the Uruguay Round of Multilateral Trade Negotiations, an agreement was reached whereby Japan agreed to reduce its copper tariff to 3% ad valorem over a five-year period. At the time of the agreement, Japan's general tariff rate was 15 000 yen/t, or about 8% of the prevailing copper price.

HEALTH AND THE ENVIRONMENT

Copper is an essential element for all forms of aerobic life and most forms of anaerobic life. While copper may be toxic at elevated levels, copper deficiency in soils can have a serious impact on crop yields and animal health.

In plants, copper is an essential element of several proteins, mostly enzymes, which have varied but important metabolic functions. In certain regions, copper may have to be applied to soils to achieve minimum copper requirements.

In animal health, copper is an essential element in a number of critical enzymes. For humans, it is estimated that the daily minimum copper intake need for adults is between 1.6 and 2.0 mg. The World Health Organization has established a recommended dietary allowance of 2.0-3.0 mg/d of copper.

Many regulatory agencies have chosen 1 part per million (ppm) as the maximum desirable concentration of copper in drinking water. It signifies more of an aesthetic limit than a health limit; water containing more than 1 ppm can stain laundry, and persons with a keen sense of taste may perceive a metallic flavour in the water.

Copper tube used for the distribution of potable water supplies inhibits bacterial growth. In addition to the suppression of bacteria in a water system, copper also discourages biofilm formation under which bacteria can survive.

STOCKS

Combined copper stocks on the London Metal Exchange (LME) and the Commodities Exchange, Inc. (COMEX) declined to 326 000 t in 1994 from 667 000 t at the end 1993. At year-end, copper stocks at producers, consumers and merchants totalled 987 000 t compared to 1 364 000 t at the end of 1993. Figure 1 shows both total copper stocks and prices for the period 1986-94.

PRICES

Copper prices on the LME averaged about US\$2310/t (\$1.05/lb) in 1994 compared to US\$1910/t (\$0.87/lb) in the previous year (Figure 2).

In the fourth quarter of 1994, Canadian producers sold refined copper in the United States at COMEX plus a premium of US3.2¢/lb, in Canada at the Canadian dollar equivalent of COMEX plus 4.4¢/lb, and in Europe at LME plus US\$12/t.

On January 30, 1995, the COMEX division of the New York Mercantile Exchange (NYMEX) will extend its copper futures and options trading hours from 0810 to 1435. Proponents of the change believe that the extension of the trading day will improve liquidity and possibly increase volume on the

COMEX contract. There has been speculation that this extension is a defensive measure against the plan by the LME to open copper warehouses in the United States. In this regard, the LME has sanctioned New York/New Jersey, Chicago, St. Louis and Los Angeles/Long Beach as delivery points from April 1, 1995.

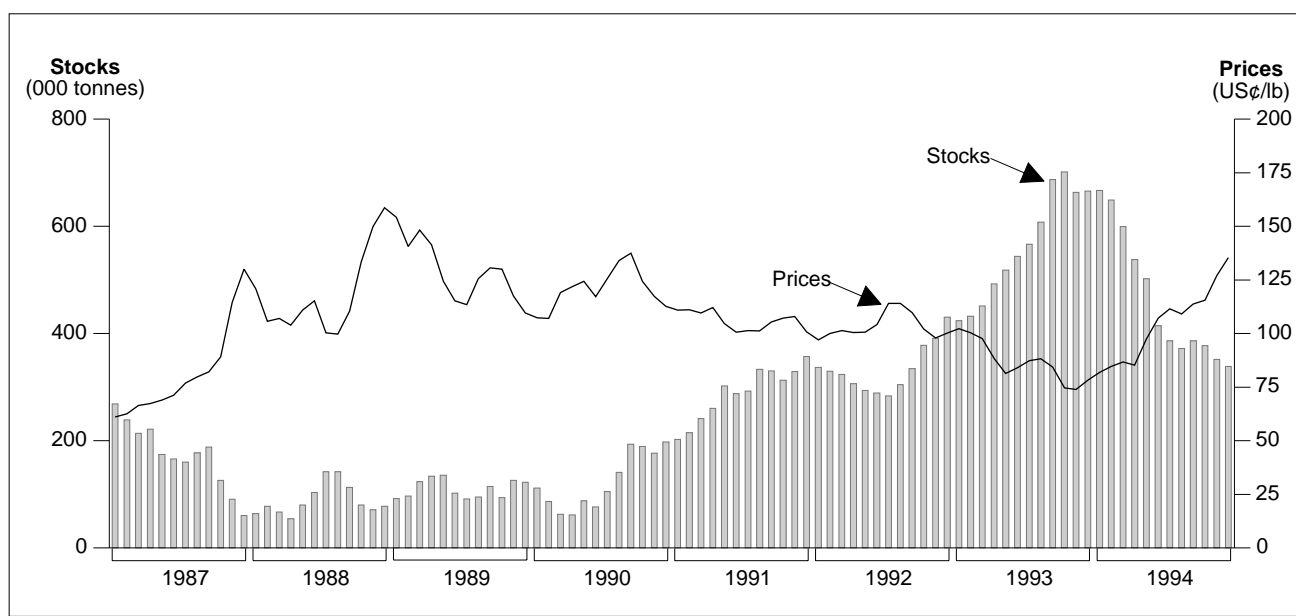
TREATMENT AND REFINING CHARGES

Treatment and refining charges (TC/RCS) for copper concentrates declined further in 1994 due to a tightening of copper concentrate supplies. From a level of almost US40¢/lb combined at the beginning of 1992, spot rates were reported to have fallen to below 15¢/lb combined in mid-1994. While no benchmark price for 1995 TC/RCS had emerged at the time of writing, several important contracts were reported to have been negotiated in the range of US18¢-19¢/lb. The Japan Smelter Pool benchmark rate for TC/RCS in 1994 was reported to have been about US22¢/lb compared to US27¢/lb for 1993.

OUTLOOK

Although world refined copper production is expected to increase by over 6% in 1995, copper consumption is likely to remain strong in the United States and to

Figure 2
Copper Prices¹ and Exchange² Stocks, 1987-94



Source: Natural Resources Canada.

¹ Average monthly LME cash prices.

² Combined LME and COMEX stocks at beginning of the month.

Figure 3
Daily London Metal Exchange Copper Prices, 1994
 Grade A



Source: Reuters.

experience significant growth in Europe and Japan. As a result, copper prices in 1995 can be expected to trade within a range of between US\$2500 and US\$2800/t (US\$1.13 and \$1.27/lb).

While copper consumption should remain strong in 1996, it is likely that further growth of supply, particularly from new Chilean developments, will begin to exert downward pressure on copper prices. However, by the end of the decade, prices are expected to rise significantly due to a forecast slowdown in the growth of world copper production, accompanied by very strong growth in demand. In the longer term, it is expected that copper prices will average between US\$2400 and US\$2900/t (US\$1.09 and \$1.32/lb).

For the period 1995 to 2005, copper consumption is expected to grow at an annual average rate of between 2.5% and 3.0%. It is expected that the largest increases in copper consumption will be in the construction, transportation, and electrical and electronics industries. It is also expected that a large share of the forecast growth in demand will occur in the Asian markets, particularly in China and India. While per capita copper consumption in developed nations varies between 8 and 11 kg/y, per capita consumption in China is just 0.8 kg/y while the figure for India is only 0.2 kg/y.

While the development of a serious shortage of world copper smelting capacity had been a distinct possibility in 1993, the threat dissipated in 1994 with the announcement of a number of capacity enhancement projects at existing smelting facilities. During the

next 10-year period, the construction of several new greenfield smelter projects, as well as additional expansions to existing plants, should provide sufficient worldwide smelting capacity.

Within the entire supply chain for copper, one potential bottleneck facing the industry is a possible shortage of refining capacity by the end of the decade. However, the re-activation of currently idled capacity, as well as possible expansions of existing plants, could reduce or eliminate this problem.

The new Louvicourt deposit in Quebec will provide a significant boost to Canadian mine production of copper. However, it is expected that Canadian output will still continue to decline in the medium term as new capacity will be unable to match anticipated mine closures.

Despite encouraging exploration results in Canada in recent years, it is unlikely these will result in a recovery in output by the end of the decade. However, the overall decline in Canadian mine output could be reversed in the next decade if a number of promising deposits come on stream. These include: Mount Polley, South Kemess, Tulsequah Chief, and Huckleberry in British Columbia; Kudz Ze Kayah and Carmacks Copper in the Yukon; and Voisey Bay in Newfoundland.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 60. (2) Information in this review was current as of January 31, 1995.

TARIFFS

Item No.	Description	Canada			United States	E.U.	Japan ¹
		MFN	GPT	USA	Canada	MFN	GATT
2603.00	Copper ores and concentrates						
2603.00.00.10	Copper content	Free	Free	Free	Free	Free	Free
2825.50	Copper oxides and hydroxides	Free	Free	Free	Free	3.2%	7.2%
28.33	Sulphates; alums; peroxosulphates (persulphates)						
	Sodium sulphates:						
2833.25	Of copper						
2833.25.10	Cupric sulphate	6.5%	Free	Free	Free	3.2%	5.8%
2833.25.90	Other copper sulphates	8.5%	6%	Free	Free	3.2%	5.8%
74.01	Copper mattes; cement copper (precipitated copper)						
7401.10	Copper mattes	Free	Free	Free	Free	Free	Free
7401.20	Cement copper (precipitated copper)	Free	Free	Free	Free	Free	Free
7402.00	Unrefined copper; copper anodes for electrolytic refining	Free	Free	Free	Free	Free	7.3%
74.03	Refined copper and copper alloys, unwrought						
	Refined copper:						
7403.11	Cathodes and sections of cathodes	Free	Free	Free	Free	Free	21 yen/kg
7403.12	Wire-bars	3.7%	Free	Free	Free	Free	21 yen/kg
7403.13	Billets	Free	Free	Free	Free	Free	21 yen/kg
7403.19	Other:						
7403.19.10	Ingots, ingot-bars and slabs	Free	Free	Free	Free	Free	21 yen/kg
7403.19.90	Other	8.8%	6.5%	Free	Free	Free	21 yen/kg
	Copper alloys:						
	Copper-zinc base alloys (brass)						
7403.21.10	Ingots, ingot-bars, slabs and billets	3.7%	Free	Free	Free	Free	21 yen/kg
7403.21.90	Other	8.8%	6.5%	Free	Free	Free	21 yen/kg
7403.22	Copper-tin base alloys (bronze)	8.8%	6.5%	Free	Free	Free	21 yen/kg
7403.23	Copper-nickel base alloys (cupro-nickel) or copper-nickel-zinc base alloys (nickel silver)						
7403.23.10	Ingots, ingot-bars, slabs and billets	Free	Free	Free	Free	Free	21 yen/kg
7403.23.90	Other	8.8%	6.5%	Free	Free	Free	21 yen/kg
7403.29	Other copper alloys (other than master alloys of heading no. 74.05)						
7403.29.10	Copper beryllium or copper phosphor alloys	3.7%	Free	Free	Free	Free	21 yen/kg
7403.29.90	Other	8.8%	6.5%	Free	Free	Free	21 yen/kg
7404.00	Copper waste and scrap						
	Not alloyed:						
7404.00.11	Spent anodes; waste and scrap with a copper content of less than 94% by weight	Free	Free	Free	Free	Free	Free
7404.00.19	Other	Free	Free	Free	Free	Free	Free
	Copper-zinc base alloys (brass):						
7404.00.21	With a copper content of less than 94% by weight	3.7%	Free	Free	Free	Free	Free
7404.00.29	Other	3.7%	Free	Free	Free	Free	Free
	Other:						
7404.00.91	With a copper content of less than 94% by weight	8.8%	6.5%	Free	Free	Free	Free
7404.00.99	Other	8.8%	6.5%	Free	Free	Free	Free
7405.00	Master alloys of copper	8.8%	6.5%	Free	Free	Free	6.0%
74.06	Copper powders and flakes	3.7-9.3%	Free-7%	1.2-3.1%	0.9-1.6%	1.4-6.2%	7.2%
74.07	Copper bars, rods and profiles	3.7-8.8%	Free-6.5%	Free-3%	Free-1.8%	6%	5.8-7.2%
74.08	Copper wire	3.7-8.8%	Free-6.5%	Free-3%	Free-1.3%	6%	5.8-7.2%
74.09	Copper plates, sheets and strip, of a thickness exceeding 0.15 mm	3.7-8.8%	Free-6.5%	Free-3%	Free-1.5% ^a	6%	5.8-6.5%
74.10	Copper foil (whether or not printed or backed with paper, paperboard, plastics or similar backing materials) of a thickness (excluding any backing) not exceeding 0.15 mm	3.7-8.8%	Free-6.5%	Free-3%	Free-0.3% ^a	6.5%	6-6.5%
74.11	Copper tubes and pipes	Free-8.8%	Free-6.5%	Free-3%	Free-1.5% ^a	6%	6.5-8.2%

TARIFFS

Item No.	Description	Canada			United States	E.U.	Japan ¹
		MFN	GPT	USA	Canada	MFN	GATT
74.12	Copper tube or pipe fittings (for example, couplings, elbows, sleeves)	8.8%	6.5%	3%	0.9-3.3% ^a	6.5%	5.8%
7413.00	Stranded wire, cables, plaited bands and the like, of copper, not electrically insulated	8.8%	6.5%	3%	1.4-1.7% ^a	Free-6.5%	7.2%
74.14	Cloth (including endless bands), grill and netting, of copper wire; expanded metal of copper	8.8%	6.5%	3%	1.4-3%	6.5%	4.9-5.8%
74.15	Nails, tacks, drawing pins, staples (other than those of heading no. 83.05) and similar articles, of copper or of iron or steel with heads of copper; screws, bolts, nuts, screw hooks, rivets, cotters, cotter-pins, washers (including spring washers) and similar articles, of copper	8.8%	6.5%	3%	0.4-1.8% ^a	4.9-6.5%	5.8%
7416.00	Copper springs	8.8%	6.5%	Free	Free	6.5%	5.8%
7417.00	Cooking or heating apparatus of a kind used for domestic purposes, non-electric and parts thereof, of copper	10.6%	8%	3.7%	1.2%	6.5%	5.8%
74.18	Table, kitchen or other household articles and parts thereof, of copper, pot scourers and scouring or polishing pads, gloves and the like, of copper; sanitary ware and parts thereof, of copper	8.8%	6.5%	3%	1.1-1.4%	4.9%	5.1%
74.19	Other articles of copper	Free-13.9%	Free-10%	Free-4.5%	1.5-2.5% ^a	4.9%	5.8-10%

Sources: Customs Tariff, effective January 1995, Revenue Canada; Harmonized Tariff Schedule of the United States 1995; The Bulletin International des Douanes," Journal Number 14 (16th edition), European Economic Community, 1992-1993, "Conventional" column; 1st Supplement to Journal No. 14 (16th edition), European Economic Community, 1993-1994, "Conventional" column; Customs Tariff Schedules of Japan, 1994.

^a Lower tariff rates may apply circumstantially.

¹ GATT rate is shown; lower tariff rates may apply circumstantially.

TABLE 1. CANADA, COPPER PRODUCTION AND TRADE, 1993 AND 1994P

Item No.	1993		1994P		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
SHIPMENTS¹					
Newfoundland	231	586	600	1 861	
Prince Edward Island	-	-	-	-	
Nova Scotia	-	-	-	-	
New Brunswick	11 190	28 335	7 566	23 464	
Quebec	78 973	199 974	65 597	203 425	
Ontario	277 461	702 581	225 066	697 958	
Manitoba	56 502	143 074	40 863	126 721	
Saskatchewan	-	-	-	-	
Alberta	-	-	-	-	
British Columbia	285 293	722 412	243 579	755 371	
Yukon	-	-	-	-	
Northwest Territories	-	-	-	-	
Total	709 650	1 796 963	583 271	1 808 800	
Refinery output	561 580	..	527 542	..	
EXPORTS					
2603.00.10	Copper ores and concentrates				
	Copper content				
	Japan	200 541	351 651	140 690	294 173
	United States	1 963	3 115	19 932	58 291
	Philippines	22 824	38 807	20 207	36 111
	Spain	19 277	35 460	11 758	23 371
	Mexico	8 975	19 071	12 302	21 490
	Other countries	45 739	81 800	13 459	28 901
	Total	299 319	529 904	218 347	462 337
2604.00.10, 2607.00.10, 2608.00.10 2616.10.10	Other ores and concentrates				
	Copper content				
	Total	-	-	-	-
2825.50	Copper oxides and hydroxides				
	Hong Kong	-	-	2	9
	United States	-	-	1	1
	Total	-	-	3	11
2833.25	Copper sulphates				
	United States	1 087	1 119	3 610	3 720
	Other countries
	Total	1 088	1 119	3 610	3 720
7401.10	Copper mattes				
	Norway	19 560	52 211	18 537	41 770
	United Kingdom	960	2 098	668	1 566
	Singapore	-	-	1	2
	Total	20 521	54 310	19 205	43 339
7403.11 to 7403.19	Refined copper and copper alloys, unwrought				
	United States	244 029	615 330	270 060	842 350
	United Kingdom	55 366	140 267	37 932	127 341
	Italy	29 428	74 375	35 299	108 085
	Colombia	7 158	27 364	11 939	48 910
	Sweden	12 221	30 835	8 025	27 725
	Other countries	60 162	153 748	25 312	79 992
	Total	408 364	1 041 919	388 568	1 234 403

TABLE 1 (cont'd)

Item No.		1993		1994p	
		(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS (cont'd)					
7403.21 to 7403.29	Other copper alloys				
	United States	212	579	193	745
	Taiwan	1	11	3	40
	South Korea	23	62	2	38
	Germany	—	—	6	27
	Saudi Arabia	—	—	6	24
	Other countries	122	310	10	60
	Total	357	962	219	934
7404.00	Copper waste and scrap				
	United States	102 180	214 298	97 727	232 321
	People's Republic of China	3 828	3 898	3 840	5 052
	Italy	341	520	1 847	4 103
	South Korea	2 920	5 343	2 077	3 876
	Japan	1 424	2 577	1 317	2 831
	Other countries	4 984	7 134	3 729	4 749
	Total	115 677	233 770	110 537	252 932
7405.00	Master alloys of copper				
	United States	—	—	1	9
	Trinidad and Tobago	2	8	—	—
	Total	2	8	1	9
7406.10, 7406.20	Copper powders and flakes				
	Taiwan	64	588	64	612
	United States	43	428	36	412
	Indonesia	8	48	24	235
	Venezuela	12	124	16	164
	Hong Kong	10	110	14	154
	South Korea	15	207	18	145
	Thailand	60	233	15	118
	Other countries	31	234	24	213
	Total	243	1 972	210	2 053
7407.10 to 7407.29	Copper and copper alloy rods and profiles				
	United States	6 059	23 180	8 293	37 793
	Ireland	240	645	307	1 175
	Colombia	535	1 815	142	578
	Jamaica	—	—	41	139
	Other countries	5	25	...	21
	Total	6 838	25 665	8 783	39 706
7408.11 to 7408.29	Copper and copper alloy wire				
	United States	16 962	45 990	25 378	85 183
	Colombia	40	134	398	1 637
	Saudi Arabia	—	—	11	147
	Italy	22	106
	Chile	13	87	11	92
	Other countries	15	104	24	148
	Total	17 030	46 315	25 843	87 313

TABLE 1 (cont'd)

Item No.	1993		1994p		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
EXPORTS (cont'd)					
7409.11 to 7410.22	Copper and copper alloy plates, sheets, strip and foil				
	United States	8 554	35 418	12 754	59 861
	United Kingdom	205	835	446	1 807
	Saudi Arabia	552	2 459	404	1 778
	Taiwan	198	835	126	470
	Tunisia	—	—	20	183
	Other countries	119	590	153	769
	Total	9 627	40 137	13 902	64 868
7411.10 to 7411.29	Copper and copper alloy tubes and pipes				
	United States	8 729	44 215	12 085	65 625
	Israel	958	3 760	301	1 191
	New Zealand	—	—	18	87
	St. Pierre and Miquelon	3	13	7	47
	Singapore	2	5	7	40
	Other countries	139	596	15	87
	Total	9 831	48 589	12 434	67 077
7412.10, 7412.20	Copper and copper alloy tube and pipe fittings				
	United States	..	15 075	..	17 670
	Germany	..	7 099	..	5 966
	Spain	..	3 095	..	3 263
	United Kingdom	..	1 947	..	1 807
	Other countries	..	2 071	..	1 899
	Total	..	29 287	..	30 605
7413.00	Stranded wire, cables, plaited bands and the like, of copper, not electrically insulated				
	United States	153	1 819	208	877
	France	—	—	35	169
	Singapore	—	—	15	78
	Nigeria	—	—	13	70
	Other countries	90	1 507	10	66
	Total	243	3 326	280	1 260
7414.10, 7414.90 7415.10 to 7415.39 7419.10 to 7419.99	Copper, other items of				
	United States	..	13 371	..	13 405
	Hong Kong	..	262	..	1 003
	United Kingdom	..	227	..	125
	Israel	..	90	..	100
	Japan	..	45	..	72
	Other countries	..	1 041	..	195
	Total	..	15 036	..	14 900
IMPORTS²					
2603.00.00.10	Copper ores and concentrates				
	Copper content				
	United States	76 806	152 099	132 713	260 582
	Portugal	19 817	31 308	20 100	41 394
	Chile	7 215	15 127	12 900	35 365
	Indonesia	5 116	12 885	5 983	17 628
	Peru	—	—	3 679	8 200
	Other countries	23 297	33 286	5 507	8 771
	Total	132 252	244 705	180 882	371 940

TABLE 1 (cont'd)

Item No.	1993		1994 ^p		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
IMPORTS (cont'd)					
2604.00.00.10,	Other ores and concentrates				
2607.00.00.10,	Copper content				
2608.00.00.10,	United States	631	947	949	1 844
2616.10.00.10	Peru	207	569	135	185
	Bolivia	22	58	—	—
	Total	860	1 575	1 083	2 029
2825.50	Copper oxides and hydroxides				
		921	2 960	928	2 913
2833.25	Copper sulphates				
		3 021	2 852	4 302	4 066
7401.10	Copper mattes				
		121	313	210	545
7403.11 to 7403.19	Refined copper and copper alloys, unwrought				
	Refined copper				
	Total	21 155	59 455	19 594	60 951
7403.21 to 7403.29	Refined copper and copper alloys, unwrought				
	Other copper alloys				
	Total	2 452	7 743	2 704	9 422
7404.00	Waste and scrap, copper or copper alloy				
	United States	52 949	62 494	96 905	170 806
	Netherlands	33	68	531	1 291
	Sweden	—	—	459	1 270
	Cuba	—	—	91	146
	Haiti	23	35	44	100
	Other countries	664	1 137	422	359
	Total	53 668	63 734	98 452	173 972
7405.00	Master alloys of copper				
		22	96	67	300
7406.10, 7406.20	Copper powders and flakes				
	Total	1 472	7 301	1 807	9 156
7407.10 to 7407.29	Bars, rods and profiles of refined copper				
	United States	32 058	97 192	31 483	106 381
	Poland	1 174	2 833	1 394	3 580
	Germany	273	1 158	953	3 246
	United Kingdom	140	767	276	1 416
	Turkey	—	—	545	1 411
	Other countries	1 417	4 497	1 414	4 526
	Total	35 062	106 447	36 064	120 560
7408.11 to 7408.29	Copper and copper alloy wire				
	Total	11 476	41 021	16 543	64 648
7409.11 to 7409.90, 7410.11 to 7410.22	Copper and copper alloy plates, sheets, strip and foil				
	Total	19 098	89 239	26 398	141 985

TABLE 1 (cont'd)

Item No.		1993		1994 ^p	
		(tonnes)	(\$000)	(tonnes)	(\$000)
IMPORTS (cont'd)					
7411.10	Pipes and tubes, refined copper	6 608	29 599	9 309	40 350
7411.21	Pipes and tubes, copper-zinc base alloy	3 287	19 648	3 899	25 227
7411.22	Pipes and tubes, copper-nickel base alloy or copper-nickel-zinc base alloy	179	1 288	306	2 109
7411.29	Plates and tubes, copper alloy, n.e.s.	472	2 413	414	2 241
7412.10	Fittings, pipe or tube, of refined copper	527	5 856	492	5 695
7412.20	Fittings, pipe or tube, copper alloy	3 163	33 004	3 722	43 217
7413.00	Stranded wire, cable, plaited bands and the like, of copper, not electrically insulated	4 890	21 726	4 504	20 174
7414.10	Copper wire for machinery, endless bands	..	3	..	3
7414.90	Cloth, grill and netting of copper wire and expanded metal of copper	68	398	98	621
7415.10	Nails, tacks, drawing pins, staples and similar articles of copper or of iron or steel with copper heads	74	460	95	643
7415.21	Washers, copper, including spring washers	..	1 242	221	1 318
7415.29	Articles of copper, not threaded, n.e.s., similar to those of headings 7415.10 and 7415.21	..	1 395	306	1 685
7415.31	Screws, copper, for wood	..	70	17	96
7415.32	Screws, bolts and nuts of copper, excluding wood screws	..	2 909	604	3 870
7415.39	Articles of copper, threaded, n.e.s., similar to bolts, nuts and screws	..	1 815	468	2 900
7416.00	Copper springs	..	129	..	214
7419.10	Chain and parts thereof of copper	..	470	..	598
7419.91	Articles of copper, not further worked than cast, moulded, stamped or forged	330	2 065	497	3 893
7419.99	Articles of copper, n.e.s.	..	33 467	..	46 149

Sources: Natural Resources Canada; Statistics Canada.

– Nil; .. Not available or not applicable; . . . Amount too small to be expressed; n.e.s. Not elsewhere specified; ^p Preliminary.

1 Anode copper recovered in Canada from domestic concentrates plus exports of payable copper in concentrate and matte.

2 Imports from "other countries" may include re-imports from Canada.

Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, COPPER PRODUCTION, TRADE¹ AND CONSUMPTION, 1975, 1980, AND 1985-94

	Production		Exports			Imports Refined	Consumption ³ Refined
	Shipments ²	Refinery Output	Concentrates and Matte	Refined	Total		
	(tonnes)						
1975	733 826	529 197	314 518	320 705	635 223	10 908	196 106
1980	716 363	505 238	286 076	335 022	621 098	13 466	208 590
1985	738 637	499 626	320 619	280 033	600 652	19 131	222 466
1986	698 527	493 445	341 390	306 822	648 212	20 901	225 586
1987	794 149	491 124	381 126	288 800	669 926	16 583	231 288
1988	758 478	528 723	348 404	268 680	617 084	4 659	236 280
1989	704 432	515 216	348 739	321 690	670 429	4 408	218 571
1990	771 433	515 835	374 875	335 941	710 816	2 611	184 497
1991	780 362	538 339	348 080	377 985	726 065	2 321	185 055
1992	761 694	539 302	346 842 ^r	385 761	732 603 ^r	8 916	175 737
1993	709 650	561 580	319 840	408 364	728 204	21 155	185 565
1994 ^p	583 271	527 542	237 553	388 568	626 121	19 594	199 531

Sources: Natural Resources Canada; Statistics Canada.

^p Preliminary; ^r Revised.

¹ Beginning in 1988, Exports and Imports are based on the new Harmonized System and may not be in complete accordance with previous method of reporting. ² From 1975 to 1988, anode copper recovered in Canada from domestic concentrate plus exports of payable copper in concentrates and matte. Starting in 1989 to date, recoverable copper in concentrate shipped. ³ Producers' domestic shipments of refined copper plus imports of refined shapes.

TABLE 3. WORLD MINE PRODUCTION OF COPPER, 1993 AND 1994

	1993	1994 ^p
	(000 t)	
Australia	402	430
Canada	734	626
Chile	2 055	2 209
China	346	346
Indonesia	310	334
Kazakhstan	265	265
Mexico	304	291
Papua New Guinea	204	203
Peru	349	336
Poland	383	378
Russia	565	450
South Africa	189	185
United States	1 801	1 796
Zambia	396	377
Other	1 150	1 110
Total	9 453	9 336

Source: International Copper Study Group.

^p Preliminary.

TABLE 4. WORLD REFINERY PRODUCTION OF COPPER, 1993 AND 1994

	1993	1994 ^p
	(000 t)	
Australia	309	337
Belgium	336	305
Brazil	198	183
Canada	562	550
Chile	1 268	1 270
China	691	684
Germany	632	592
Japan	1 189	1 119
Kazakhstan	340	340
Mexico	181	183
Peru	260	247
Philippines	166	152
Poland	404	405
Republic of Korea	220	221
Russia	625	500
Spain	179	188
United States	2 253	2 217
Zambia	412	375
Other	1 137	1 158
Total	11 362	11 026

Source: International Copper Study Group.
^p Preliminary.

TABLE 5. WORLD REFINED COPPER CONSUMPTION, 1993 AND 1994

	1993	1994 ^e
	(000 t)	
Belgium	320	372
Brazil	203	181
Canada	186	200
China	942	745
France	474	490
Germany	921	969
India	140	165
Italy	490	468
Japan	1 385	1 375
Republic of Korea	400	479
Russia	522	450
Spain	162	178
Taiwan	477	547
United Kingdom	325	375
United States	2 368	2 675
Other	1 899	2 009
Total	11 198	11 678

Source: International Copper Study Group.
^e Estimated.

TABLE 6. COPPER AND COPPER-NICKEL SMELTERS IN CANADA, 1994

Company and Location	Product	Rated Annual Capacity	Remarks
		(tonnes of concentrates)	
Falconbridge Limited Falconbridge, Ontario	Copper-nickel matte	600 000	Copper-nickel concentrate processed in fluid bed roasters and an electric furnace; 1800-t/d sulphuric acid plant treats roaster gases. Matte from the smelter is refined in Norway.
Inco Limited Sudbury, Ontario	Molten "blister" copper, nickel sulphide and nickel sinter for the company's refineries; nickel oxide sinter for market, soluble nickel oxide for market	1 000 000 ^a	Oxygen flash-smelting of copper sulphide concentrate. Copper converters produce blister copper. Oxygen flash furnace for smelting of nickel-copper concentrate, converters for production of nickel-copper Bessemer matte. Production of matte followed by matte treatment, flotation, separation of copper and nickel sulphides, then by roasting to make nickel oxides for refining and marketing. Oxygen flash conversion of copper sulphide to semi-blister followed by pyrorefining to blister copper.
Falconbridge Limited Timmins, Ontario	Molten "blister" copper	440 000	Mitsubishi-type smelting, separation and converting furnaces, acid plant and oxygen plant to treat continuous copper concentrate feed stream to yield molten 99%-pure copper. Hazelett continuous cast anodes.
Noranda Inc. Horne smelter Noranda, Quebec	Copper anodes	770 000 ^b	One continuous Noranda process reactor, five converters and acid plant. Treats concentrates from Noranda's mining operations in Quebec and Ontario as well as custom concentrates and scrap.
Noranda Inc. Gaspé smelter Murdochville, Quebec	Copper anodes	221 500 ^b	Green charge reverberatory furnace, two converters, rotary anode furnace and an acid plant. Treats Gaspé and custom concentrates and scrap.
Hudson Bay Mining and Smelting Co., Limited (HBMS) Flin Flon, Manitoba	Copper anodes	325 000	Five roasting furnaces, one reverberatory furnace and two converters. Company treats its own copper concentrate as well as custom copper concentrates. Project to replace concentrate roasting and calcine smelting with Noranda continuous converter technology has been postponed.

Source: Data provided by each company.

^a Nickel-copper concentrate and copper concentrate. ^b Concentrate and copper scrap.

TABLE 7. COPPER REFINERIES IN CANADA, 1994

Company and Location	Rated Annual Capacity	Remarks
	(tonnes)	
Noranda Inc. Division CCR East Montréal, Quebec	350 000	Refines anodes from Noranda's Horne and Gaspé smelters, from the Flin Flon smelter, and also from purchased scrap and blister. Precious metals, selenium and tellurium recovered from slimes.
Inco Limited Copper Cliff, Ontario	175 000	Casts and refines anodes from molten converter copper from the Copper Cliff smelter; also refines purchased scrap. Gold, silver, selenium and tellurium cake recovered from anode slimes. Recovers and electrowins copper from Copper Cliff nickel refinery residue.
Falconbridge Limited Timmins, Ontario	104 000	Refines anodes from the Kidd Creek smelter.
Gibraltar Mines Limited McLeese Lake, British Columbia	5 000	Dissolved copper-in-solution from heap leaching operations is treated in a solvent extraction plant and then electrowinned to produce copper cathode.

Source: All data provided by the companies.

TABLE 8. SUPPLY OF WIRE MILL, BRASS MILL, FOUNDRY AND POWDER PRODUCTS, AND THEIR CONSUMPTION IN END-USE MARKETS, 1992 AND 1993

United States	1992		1993 ^p	
	(000 t)	(% of total)	(000 t)	(% of total)
SUPPLY				
Domestic mill products				
Building wire	499	16.7	543	17.6
Magnet wire	245	8.2	258	8.3
Telecommunication wire and cable	222	7.4	195	6.3
Power cable	124	4.1	119	3.8
Automotive wire and cable	102	3.4	111	3.6
Other wire and cable	279	9.3	289	9.3
Strip, sheet, plate and foil	424	14.1	454	14.7
Rod and bar	437	14.6	433	14.0
Tube and pipe	420	14.0	437	14.1
Mechanical wire	31	1.0	30	1.0
Foundry products	181	6.1	203	6.6
Powder products	18	0.6	19	0.6
Total, domestic mill products	2 982	99.7	3 091	100.0
Imported mill products	8	0.3	0	0
Total supply	2 990	100.0	3 091	100.0
USES				
Building construction	1 228	41.1	1 299	42.0
Electrical/electronic products	747	25.0	740	23.9
Industrial machinery/equipment	401	13.4	400	12.9
Transportation equipment	340	11.4	377	12.2
Consumer and general products	274	9.2	274	8.9
Total	2 990	100.0	3 091	100.0

Source: Copper Development Association Inc.

^p Preliminary.

Note: Percentages may not add due to rounding.

**TABLE 9. YEARLY AVERAGE
COPPER PRICES¹**

Year	LME
	(current US¢/lb)
1980	99.3
1981	79.5
1982	67.2
1983	72.2
1984	62.6
1985	64.9
1986	62.3
1987	80.1
1988	118.0
1989	129.0
1990	121.1
1991	106.2
1992	103.7
1993	86.8
1994	104.7

Sources: *Metals Week*; Reuters.¹ Settlement price for highest grade of copper sold.**TABLE 10. MONTHLY AVERAGE COPPER PRICES,
1993 AND 1994**

	LME ¹		COMEX ²	
	1993	1994	1993	1994
	(current US¢/lb)			
January	102.3	81.9	100.6	83.7
February	100.3	84.6	98.3	87.1
March	97.6	86.8	95.8	89.8
April	88.4	85.3	87.0	87.9
May	81.4	97.5	80.4	100.3
June	84.0	107.2	83.0	108.6
July	87.4	111.5	85.9	111.7
August	88.3	109.1	85.1	109.4
September	84.4	113.7	80.4	120.5
October	74.6	115.6	73.8	118.9
November	73.9	127.1	74.1	130.0
December	78.2	135.4	79.2	136.9

Source: International Copper Study Group.

¹ LME cash price for Grade A copper. ² COMEX First Position Grade A price.