

# Zinc

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Canada is an important producer and exporter of zinc and zinc products. Zinc metal production in Canada dates back from the early 1900s when Consolidated Mining and Smelting Company of Canada (which later became Cominco Limited in 1966, followed by Teck Cominco Limited in 2001) started production at a small electrolytic zinc plant at Trail, British Columbia. With a smelting capacity of just over 800 000 t/y from four smelting facilities located across the country, Canada produces some 10% of the total world supply of zinc today.

## HISTORY OF ZINC

Zinc is a relative newcomer to the group of metals discovered and used by society. While the first use of copper pre-dates recorded history and the discovery of tin goes back 5000 years, the first recovery of metallic zinc, however, came much later. The production of metallic zinc was first described in India around 1200 A.D. By 1374, zinc was recognized as a new metal, the eighth to be discovered at that time, and a limited amount of commercial zinc production was under way. Although brass-making had developed much earlier, the zinc in brass was obtained by treating zinc ore to produce zinc vapour, which combined with granulated copper under heat. From India, zinc production was introduced to China sometime around 1600 A.D. and then began to be exported to Europe.

The first full-scale zinc smelting operation outside of Asia started in Bristol, England, in about 1743. By the beginning of the 19th century, zinc production was established on the continent of Europe, notably in Belgium and parts of eastern Europe. In the latter half of the century, large zinc industries developed rapidly in the United States and Germany.

## ZINC IN CANADA

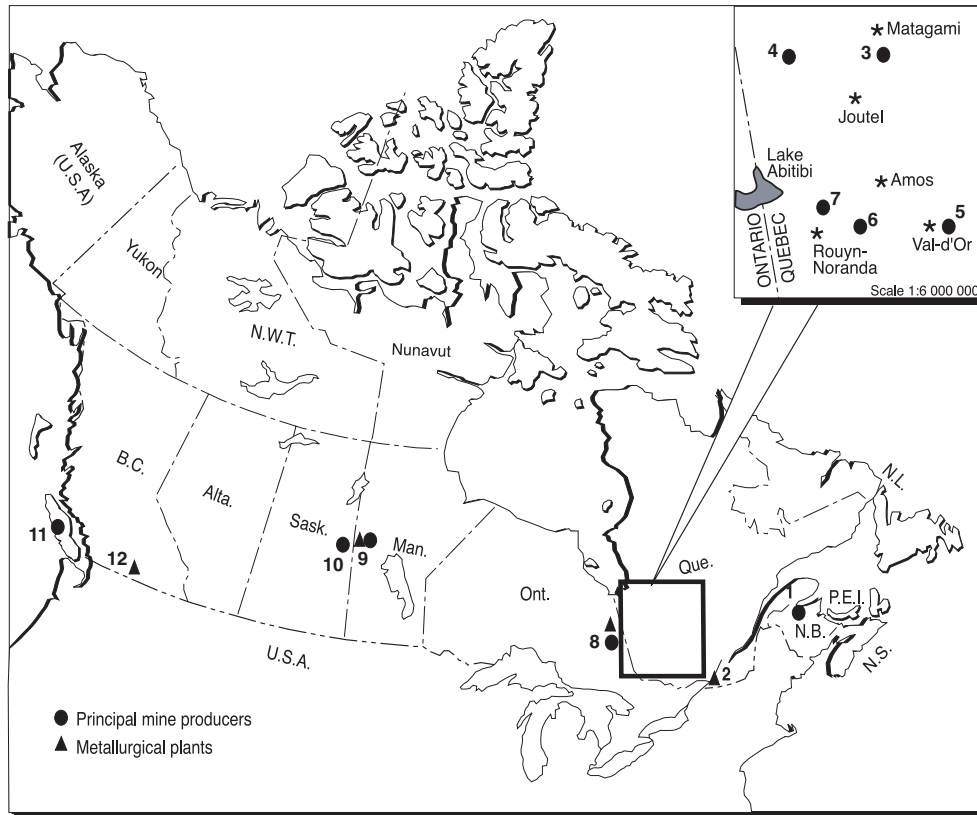
Zinc production in Canada dates back to around the First World War when Consolidated Mining and Smelting Company of Canada began operating a small electrolytic zinc plant at Trail, British Columbia, to help offset a critical wartime shortage of zinc in the United Kingdom. At that time, in fact, Consolidated Mining and Smelting Company and Anaconda Copper Mining Company in Montana were pioneering the production of zinc in North America by the electrolytic method.

The ores used at Trail came from the Sullivan mine near Kimberley, but production was hampered because the complex lead-zinc-iron ore was difficult to treat by existing methods. In 1920, however, the differential flotation method was successfully applied to separate the Sullivan ore into a lead concentrate, a zinc concentrate and an iron by-product. This marked the beginning of significant zinc production in Canada. Today, the Trail operations are the world's largest fully integrated lead and zinc smelting and refining complex. Owned and operated by Teck Cominco Limited of Vancouver, the Trail facility has a zinc production capacity of some 290 000 t/y.

In Manitoba, the discovery of significant zinc and copper ore with important quantities of gold in 1915 led to the development of the Flin Flon-Snow Lake mining camp, smelter complex and dedicated power plant in the late 1920s. Since 1930, Hudson Bay Mining and Smelting Company Limited has owned and operated some 30 mines, which in turn have fed the company's metallurgical complex at Flin Flon. The Flin Flon smelter and refinery complex has undergone significant capital improvements since it first started operations in 1930 with the introduction of zinc pressure leach technology in the early 1990s and a new tank house in 2000 that expanded zinc production capacity to 115 000 t/y.

The Kidd Creek orebody was discovered in 1963 and Texasgulf began open-pit mining the deposit in 1966 near Timmins, Ontario. The Kidd Creek zinc plant started production in 1972. In 1983, Kidd Creek started up a zinc pressure leaching facility plant. Today, Falconbridge Limited owns and operates the Kidd Creek complex with an annual production capacity of 145 000 t.

**Figure 1**  
**Zinc Producers in Canada, 2003**



Numbers refer to locations on map above.

**ZINC-PRODUCING MINES**

- |                    |   |
|--------------------|---|
| 1. Brunswick       | Noranda Inc.                                |
| 3. Bell Allard     | Noranda Inc.                                |
| 4. Selbaie         | Les Mines Selbaie                           |
| 5. Louvicourt      | Aur Resources Inc./Novicourt Inc.           |
| 6. LaRonde         | Agnico Eagle Mines Limited                  |
| 7. Bouchard-Hébert | Breakwater Resources Ltd.                   |
| 8. Kidd Creek      | Falconbridge Limited                        |
| 9. Callinan        | Hudson Bay Mining and Smelting Co., Limited |
| Trout Lake         | Hudson Bay Mining and Smelting Co., Limited |
| Chisel North       | Hudson Bay Mining and Smelting Co., Limited |
| 777                | Hudson Bay Mining and Smelting Co., Limited |
| 10. Konuto Lake    | Hudson Bay Mining and Smelting Co., Limited |
| 11. Myra Falls     | Boliden Limited                             |

**WEB SITE**

- [www.noranda.com](http://www.noranda.com)
- [www.noranda.com](http://www.noranda.com)
- [www.bhpbilliton.com](http://www.bhpbilliton.com)
- [www.aurresources.com](http://www.aurresources.com)
- [www.agnico-eagle.com](http://www.agnico-eagle.com)
- [www.breakwater.ca](http://www.breakwater.ca)
- [www.falconbridge.com](http://www.falconbridge.com)
- [www.angloamerican.co.uk](http://www.angloamerican.co.uk)
- [www.angloamerican.co.uk](http://www.angloamerican.co.uk)
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- [www.angloamerican.co.uk](http://www.angloamerican.co.uk)
- [www.boliden.ca](http://www.boliden.ca)

**ZINC METALLURGICAL PLANTS**

- |                |   |
|----------------|---|
| 2. Valleyfield | Canadian Electrolytic Zinc Limited          |
| 8. Kidd Creek  | Falconbridge Limited                        |
| 9. Flin Flon   | Hudson Bay Mining and Smelting Co., Limited |
| 12. Trail      | Teck Cominco Limited                        |

- [www.noranda.com](http://www.noranda.com)
- [www.falconbridge.com](http://www.falconbridge.com)
- [www.angloamerican.co.uk](http://www.angloamerican.co.uk)
- [www.teckcominco.com](http://www.teckcominco.com)

With the discovery of significant zinc-bearing ores in northern Quebec and Ontario in the late 1950s and early 1960s, Noranda Inc. began looking at options to build an electrolytic zinc plant. Construction began at Vallyfield, Quebec, just west of Montréal, in 1962 and Canadian Electrolytic Zinc (CEZ), a subsidiary of Noranda, was brought into production in 1963. Plant capacity has increased steadily from its original 64 000 t/y at the time of opening to 260 000 t/y today.

Zinc mines have been found in every province and territory with the exception of Alberta and Prince Edward Island. Operations in 2003 are listed in Figure 1.

## USES

The greatest use for zinc is as a coating for iron and steel products to make them resistant to rust and corrosion. The application of a zinc coating, known as galvanizing, is accomplished electrolytically or by hot-dip methods. Galvanizing accounts for about 47% of the worldwide use of zinc.

The most commonly galvanized products are sheet and strip steel, tube and pipe, and wire and wire rope. The automobile industry is the largest user of galvanized steel. The desire to reduce weight and improve fuel efficiency has led to increased use of galvanized steel by the automotive industry to protect the thinner gauges of steel from corrosion. Both hot-dipped and electro-galvanized steel are used, the thicker coating of hot-dipped steel giving more corrosion protection to unexposed surfaces and the thinner coating of electro-galvanized steel providing a smoother finish for exposed painted surfaces.

Galvanized sheet and strip steel are also widely used by the construction industry for roofing and siding, and for heating and ventilation ducts, as well as for many other applications. Nails and other building materials are often hot-dip galvanized. Zinc and zinc-aluminum thermally sprayed coatings are used for the long-term corrosion protection of large steel structures such as bridges and hydroelectric transmission towers.

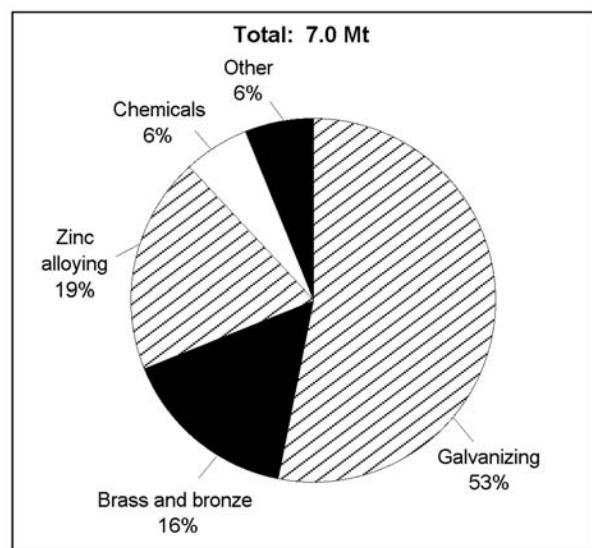
Another important use of zinc is in the manufacture of a vast range of die-cast products. Because it has a relatively low melting point and is very fluid, zinc is easy to pour when melted. Therefore, it is well suited to rapid assembly-line die-casting, particularly to produce small and intricate shapes.

A major use of die castings is in the automobile industry as trim pieces, grills, door and window handles, carburetors, pumps, and other components. However, with the trend toward lighter, more energy-efficient cars, zinc demand for this purpose has declined in recent years. Other familiar zinc die castings include small electrical

appliances, business machines, and other light equipment, tools and toys.

Another important use of zinc is in the manufacture of brass, which is essentially an alloy of copper and zinc, with the proportion of zinc ranging from 5 to 40%. The zinc brasses have good physical, electrical and thermal properties and are corrosion resistant. They are used in plumbing, heat exchange equipment, and a wide range of decorative hardware, to name a few applications. Rolled zinc metal is a basic component in dry-cell batteries, and zinc oxide is used as a catalyst in the manufacture of rubber and as a pigment in white paint. It is also used in agricultural products, cosmetics and medicinal products.

**Figure 2**  
**Western World Zinc Markets, 2002**



Source: International Lead and Zinc Study Group.

## NATURAL OCCURRENCE

Zinc is never found as the free metal, but is found in association with a number of other elements to form a number of important ores of zinc such as sphalerite (zincblende, zinc sulphide, ZnS), smithsonite (zinc carbonate, ZnCO<sub>3</sub>), zincspar (also zinc carbonate, ZnCO<sub>3</sub>), and marmatite (zinc sulphide, ZnS, containing some iron sulphide, FeS). Like all metals, zinc is a natural component of the Earth's crust and is therefore present in varying concentrations in rock, soil, water and air.

In Canada, zinc deposits fall into four main categories: sedimentary exhalative (SEDEX); massive sulphide, Mississippi Valley-type (MVT); volcanogenic massive sulphide (VMS); and skarn deposits. As the name suggests, SEDEX deposits comprise layers of massive sulphide

minerals interbedded with sedimentary rocks and tend to be associated with large deposits of lead and zinc. Examples of such deposits include the Sullivan mine in British Columbia. MVT deposits are named after large-scale lead and zinc deposits found in the region in the United States along the Mississippi River where they were first discovered. MVT deposits are characterized by a simple mineralogy that includes pyrite (iron sulphide), galena (lead sulphide), and sphalerite (zinc sulphide) hosted in undeformed calcium and magnesium-rich carbonate rocks (limestones). Examples of this type of deposit are found at the Polaris mine and Nanisivik mine in Nunavut, both of which closed in late 2002.

VMS deposits can be classified into sub-categories depending on their mineralogy: copper-zinc, copper-zinc-lead, and Besshi-type. As found with SEDEX deposits, VMS deposits are formed through the exhalation of hydrothermal fluids on the sea floor. In the case of VMS, the host rocks are submarine igneous rocks rather than sedimentary rocks. The largest example of a VMS-type deposit in Canada is the Kidd Creek copper-zinc mine near Timmins, Ontario. Other examples include the Flin Flon copper-zinc deposits in north-central Manitoba. Many of these types of deposits can also contain significant quantities of gold, such as those deposits in the Abitibi region of northwestern Quebec. While the copper-zinc deposits are found typically associated with greenstone (mafic) volcanic host rocks such as basalts, the zinc-lead-copper deposits are associated with more felsic to intermediate volcanic rocks such as rhyolite and dacite. Examples of these types of deposits include the mines in the Bathurst region of New Brunswick. Skarn deposits are formed at or near the contact between a typically carbonate-rich host rock with an igneous intrusion. Variations in the type of igneous intrusion result in variations in the mineralization that follows. An example of a lead-zinc skarn is the Sa Dena Hes deposit near Watson Lake, Yukon.

## HEALTH AND THE ENVIRONMENT

Zinc plays an important role as a micro-nutrient in the development and health of a variety of plants and animals. In humans, zinc plays an important role in the function of more than 200 enzymes, in the stabilization of DNA and the expression of genes, and in the transfer of nervous signals.

The human body contains 2-3 g of zinc. The recommended daily zinc intake is 12 mg/day for adult women and 15 mg/day for adult men. Daily intake is not only dependent on food, but also on sex, age and general health status. Growing infants, children, adolescents, women in pregnancy, and the elderly have a higher zinc requirement.

Food is the primary source of zinc for humans with only a small part coming from drinking water. The major sources of zinc in the diet are red meat, poultry, fish, seafood, whole cereals and dairy products.

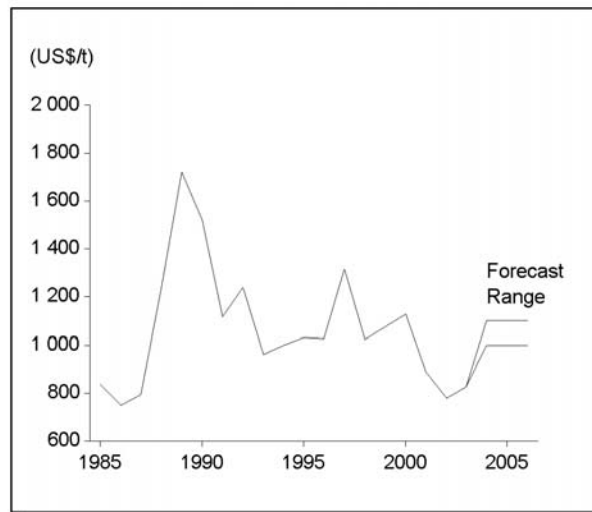
## PRICE OUTLOOK

Cash settlement prices on the London Metal Exchange (LME) flirted with the US\$800/t price range for most of the year and then started a strong rally in August that resulted in prices reaching the US\$1000/t range by year-end for the first time since the end of 2000. The average zinc price for 2003 reached US\$828/t, up 6% from \$778/t in 2002.

While consumer stocks fell by about 5000 t during the year, stocks on the LME continued their upward climb from 651 000 t in early January to over 740 000 t by the end of the year. While the total supply of refined zinc metal in the West exceeded total demand by 118 000 t in 2003, the International Lead and Zinc Study Group expects the zinc market to move into a deficit of about 70 000 t in 2004.

Prices will reflect the shortfall in supply in the market and are expected to average between \$1000 and \$1100/t in 2004.

**Figure 3**  
Zinc Prices, 1985-2006



Source: International Lead and Zinc Study Group.

## NOTE TO READERS

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 64. (2) Information in this review was current as of May 14, 2004. (3) This and other reviews, including previous editions, are available on the Internet at [www.nrcan.gc.ca/mms/cmy/com\\_e.html](http://www.nrcan.gc.ca/mms/cmy/com_e.html).

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## TARIFFS

Item No.	Description	Canada			United States	EU	Japan
		MFN	GPT	USA	Canada	Conventional Rate (1)	WTO (2)
2603.00	Copper ores and concentrates						
2603.00.00.30	Zinc content	Free	Free	Free	Free	Free	Free
2607.00	Lead ores and concentrates						
2607.00.00.30	Zinc content	Free	Free	Free	Free	Free	Free
2608.00	Zinc ores and concentrates						
2608.00.00.30	Zinc content	Free	Free	Free	Free	Free	Free
2616.10	Silver ores and concentrates						
2616.10.00.30	Zinc content	Free	Free	Free	Free	Free	Free
26.20	Ash and residues (other than from the manufacture of iron or steel) containing arsenic, metals or their compounds; containing mainly zinc						
2620.11	Hard zinc spelter	Free	Free	Free	Free	Free	Free
2817.00	Zinc oxide; zinc peroxide	Free-5.5%	Free	Free	Free	5.5%	4.3%
28.33	Sulphates; alums; peroxosulphates (persulphates)						
2833.26	Of zinc	Free	Free	Free	Free	5.5%	3.9%
79.01	Unwrought zinc						
	Zinc, not alloyed:						
7901.11	Containing by weight 99.99% or more of zinc	Free	Free	Free	Free	2.5%	Free-4.30 yen/kg
7901.12	Containing by weight less than 99.99% of zinc	Free	Free	Free	Free	2.5%	Free-4.30 yen/kg
7901.20	Zinc alloys:						
7901.20.00.10	Containing by weight 90% or more but less than 97.5% of zinc	Free	Free	Free	Free	2.5%	Free-4.20 yen/kg
7901.20.00.20	Containing by weight less than 90% of zinc	Free	Free	Free	Free	2.5%	Free-4.20 yen/kg
7902.00	Zinc waste and scrap	Free	Free	Free	Free	Free	Free
79.03	Zinc dust, powders and flakes						
7903.10	Zinc dust	Free	Free	Free	Free	2.5%	3%
7903.90	Other	Free	Free	Free	Free	2.5%	3%
7904.00	Zinc bars, rods, profiles and wires	Free	Free	Free	Free	5%	3%
7905.00	Zinc plates, sheets, strip and foil	Free	Free	Free	Free	5%	3%
7906.00	Zinc tubes, pipes, and tube or pipe fittings (for example, couplings, elbows, sleeves)	3%	Free	Free	Free	5%	3%
7907.00	Other articles of zinc						
7907.00.10	Anodes for electroplating	Free	Free	Free	Free	5%	3%
7907.00.20	Discs or slugs, containing by weight 90% or more of zinc; gutters, roof capping, skylight frames and other fabricated building components	3%	Free	Free	Free	5%	3%
7907.00.90	Other	3%	3%	Free	Free	5%	3%

Sources: Canadian Customs Tariff, effective January 2004, Canada Border Services Agency; Harmonized Tariff Schedule of the United States, 2004; Official Journal of the European Union (October 30, 2003 Edition); Customs Tariff Schedules of Japan, 2003.

(1) The customs duties applicable to imported goods originating in countries that are Contracting Parties to the General Agreement on Tariffs and Trade or with which the European Community has concluded agreements containing the most-favoured-nation tariff clause shall be the conventional duties shown in column 3 of the Schedule of Duties. (2) WTO rate is shown; lower tariff rates may apply circumstantially.

Note: Where there is a tariff "range," a complete match of the HS code was not available; therefore, the high and low for the product in question are shown.

**TABLE 1. CANADA, ZINC PRODUCTION AND TRADE, 2001-03, AND USE, 2000-2002**

Item No.	2001		2002		2003		
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)	
<b>PRODUCTION</b>							
	All forms (1)						
	New Brunswick	313 089	441 142	256 563	313 519	277 522	318 872
	Quebec	252 143	355 269	236 995	289 607	253 124	290 839
	Ontario	77 776	109 586	100 775	123 146	73 782	84 776
	Manitoba	91 782	129 321	96 813	118 306	84 166	96 706
	Saskatchewan	2 047	2 884	5 172	6 320	5 368	6 168
	British Columbia	108 855	153 377	67 982	83 074	50 076	57 537
	Nunavut	166 356	234 396	159 632	195 070	–	–
	Total	1 012 048	1 425 974	923 931	1 129 043	744 037	854 898
	Mine output (2)	1 064 744	..	916 220	..	786 730	..
	Refined (3)	661 172	..	793 410	..	758 680	..
<b>EXPORTS</b>							
2608.00.30	Zinc content in zinc ores and concentrates						
	Spain	67 622	53 142	61 395	40 572	65 345	39 687
	Belgium	111 688	87 732	103 377	65 917	54 759	30 735
	Japan	15 458	12 820	50 805	50 205	34 588	24 736
	Finland	55 279	54 054	44 715	40 497	26 395	15 828
	Norway	25 844	26 704	18 448	14 148	13 317	8 217
	Germany	24 365	24 100	57 649	62 121	10 619	6 712
	Poland	9 148	6 305	5 391	3 054	10 493	6 476
	Other countries	109 761	101 558	67 561	55 748	33 072	21 822
	Total	419 165	366 415	409 341	332 262	248 588	154 213
2620.11	Ash and residues containing hard zinc spelter						
	United States	161	119	439	318	295	196
2620.19	Ash and residues containing mainly zinc, n.e.s.						
	United States	7 728	5 942	10 884	7 762	10 790	6 976
	India	256	195	139	90	174	148
	Malaysia	–	–	–	–	80	35
	Japan	21	23	41	34	–	–
	Taiwan	–	–	40	40	–	–
	Total	8 005	6 160	11 104	7 926	11 044	7 159
2817.00	Zinc oxide; zinc peroxide						
	United States	47 548	71 160	44 782	60 902	47 297	58 384
	Belgium	20	22	740	793	453	424
	Brazil	212	277	395	546	259	359
	France	281	365	502	536	243	303
	Norway	531	762	–	–	162	235
	Hong Kong	59	128	168	286	130	209
	Netherlands	103	121	20	27	144	178
	Other countries	1056	1244	267	412	406	550
	Total	49 810	74 079	46 874	63 502	49 094	60 642
2833.26	Zinc sulphate						
	United States	208	216	2 127	2 180	5 295	4 718

TABLE 1 (cont'd)

Item No.	2001		2002		2003		
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)	
<b>EXPORTS (cont'd)</b>							
7901.11	Zinc, not alloyed, unwrought, containing by weight 99.99% or more of zinc						
	United States	304 103	474 988	374 128	507 762	343 563	420 089
	Taiwan	2 772	6 435	7 089	8 673	17 913	21 124
	Philippines	420	566	4 867	6 331	5 158	6 286
	Hong Kong	3 830	5 578	3 734	4 838	4 931	5 964
	Malaysia	1 171	1 605	5 392	7 082	4 792	5 739
	Indonesia	3 920	6 164	2 674	3 630	1 979	2 439
	Singapore	1 469	2 379	1 331	1 833	1 226	1 518
	Other countries	10584	14831	5635	6995	613	781
	<b>Total</b>	<b>328 269</b>	<b>512 546</b>	<b>404 850</b>	<b>547 144</b>	<b>380 175</b>	<b>463 940</b>
7901.12	Zinc, not alloyed, unwrought, containing by weight less than 99.99% of zinc						
	United States	146 162	226 649	165 910	221 224	178 583	221 128
	Taiwan	308	579	3 868	5 133	8 787	10 693
	Hong Kong	6 550	11 451	8 985	13 238	6 878	9 339
	Malaysia	457	672	2 335	3 294	4 842	6 504
	Japan	4 493	6 914	2 194	2 972	3 631	4 596
	Indonesia	4 702	7 598	4 526	6 125	3 645	4 506
	China	42	62	564	838	1 188	1 683
	Philippines	1 793	2 924	2 753	3 652	1 118	1 445
	Singapore	416	611	1 124	1 528	693	879
	Thailand	227	396	618	886	348	488
	Sri Lanka	567	939	481	670	248	327
	Other countries	1198	4443	42	59	417	520
	<b>Total</b>	<b>166 915</b>	<b>263 238</b>	<b>193 400</b>	<b>259 619</b>	<b>210 378</b>	<b>262 108</b>
7901.20	Zinc alloys, unwrought						
	United States	1 823	2 709	501	866	574	833
	Brazil	–	–	–	–	16	61
	Singapore	–	–	–	–	20	28
	Trinidad and Tobago	–	–	2	5	9	18
	France	–	–	–	–	9	17
	India	–	–	–	–	1	2
	<b>Total</b>	<b>1 823</b>	<b>2 709</b>	<b>503</b>	<b>871</b>	<b>629</b>	<b>959</b>
7902.00	Zinc waste and scrap						
	United States	37 446	16 844	28 935	13 178	8 089	6 628
	China	71	78	611	670	4 807	5 530
	Hong Kong	2 025	2 100	562	622	280	242
	India	234	201	123	88	346	220
	Other countries	574	505	40	19	488	115
	<b>Total</b>	<b>40 350</b>	<b>19 728</b>	<b>30 271</b>	<b>14 577</b>	<b>14 010</b>	<b>12 735</b>
7903.10	Zinc dust						
	United States	6 086	13 769	6 224	13 112	5 918	11 313
	Germany	–	–	39	96	14	30
	Spain	–	–	13	30	14	26
	Chile	17	25	–	–	–	–
	Trinidad and Tobago	2	6	5	8	–	–
	<b>Total</b>	<b>6 105</b>	<b>13 800</b>	<b>6 281</b>	<b>13 246</b>	<b>5 946</b>	<b>11 369</b>

**TABLE 1 (cont'd)**

Item No.	2001		2002		2003		
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)	
<b>EXPORTS (cont'd)</b>							
7903.90	Zinc powders and flakes						
	United States	8 016	19 463	10 863	24 423	9 094	18 133
	Belgium	236	314	282	346	428	496
	South Korea	83	110	83	99	45	51
	New Zealand	173	268	—	—	—	—
	Spain	215	274	14	17	—	—
	Other countries	56	137	170	370	9	27
	<b>Total</b>	<b>8 779</b>	<b>20 566</b>	<b>11 412</b>	<b>25 255</b>	<b>9 576</b>	<b>18 707</b>
7904.00	Zinc bars, rods, profiles and wire						
	United States	190	1 058	160	1 079	278	1 394
	Other countries	2	6	7	20	107	259
	<b>Total</b>	<b>192</b>	<b>1 064</b>	<b>167</b>	<b>1 099</b>	<b>385</b>	<b>1 653</b>
7905.00	Zinc plates, sheets, strip and foil						
	United States	6	64	46	203	89	257
	South Korea	—	—	10	46	13	53
	Germany	—	—	8	30	3	7
	France	32	174	—	—	—	—
	<b>Total</b>	<b>38</b>	<b>238</b>	<b>64</b>	<b>279</b>	<b>105</b>	<b>317</b>
7906.00	Zinc tubes, pipes and tube or pipe fittings (for example, couplings, elbows, sleeves)						
	United States	1 097	8 509	831	5 244	876	5 157
	Other countries	—	—	5	17	3	39
	<b>Total</b>	<b>1 097</b>	<b>8 509</b>	<b>836</b>	<b>5 261</b>	<b>879</b>	<b>5 196</b>
7907.00	Other articles of zinc						
	United States	2 597	22 977	2 925	25 786	2 799	22 894
	United Kingdom	30	93	4	22	22	170
	Spain	—	—	134	820	52	132
	Other countries	88	339	146	373	36	243
	<b>Total</b>	<b>2 715</b>	<b>23 409</b>	<b>3 209</b>	<b>27 001</b>	<b>2 909</b>	<b>23 439</b>
	<b>Total exports</b>	<b>1 033 632</b>	<b>1 312 796</b>	<b>1 120 878</b>	<b>1 300 540</b>	<b>939 308</b>	<b>1 027 351</b>
<b>IMPORTS</b>							
2607.00.00.30	Zinc content in lead ores and concentrates						
	United States	5 031	4 904	2 637	2 882	2 496	2 020
	Peru	—	—	—	—	3 294	1 540
	<b>Total</b>	<b>5 031</b>	<b>4 904</b>	<b>2 637</b>	<b>2 882</b>	<b>5 790</b>	<b>3 560</b>
2608.00.00.30	Zinc content in zinc ores and concentrates						
	United States	114 521	66 569	186 962	80 351	219 852	123 895
	Peru	12 222	10 246	75 514	34 763	113 607	45 086
	Mexico	9 298	11 652	13 576	12 543	42 557	19 170
	Chile	4 424	3 066	—	—	—	—
	Australia	—	—	—	—	20 547	15 476
	Poland	—	—	—	—	—	—
	Kazakhstan	—	—	—	—	—	—
	United Kingdom	—	—	1	1	—	—
	<b>Total</b>	<b>140 465</b>	<b>91 534</b>	<b>276 053</b>	<b>127 658</b>	<b>396 563</b>	<b>203 627</b>



TABLE 1 (cont'd)

Item No.		2001		2002		2003	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>IMPORTS (cont'd)</b>							
2616.10.00.30	Zinc content in silver ores and concentrates						
	Peru	5 422	4 434	–	–	–	–
	United States	3 092	2 060	–	–	–	–
	Total	8 514	6 494	–	–	–	–
2620.19	Ash and residues containing mainly zinc, n.e.s.						
	United States	572	338	355	329	529	443
	Other countries	–	–	182	178	7	3
	Total	572	338	537	507	536	446
2817.00	Zinc oxide; zinc peroxide						
	United States	7 820	11 568	7 213	9 744	6 594	8 031
	Mexico	2 826	2 939	2 204	2 304	2 788	2 573
	China	668	764	1 085	1 124	800	766
	Other countries	2	3	4	5	10	14
	Total	11 316	15 274	10 506	13 177	10 192	11 384
2833.26	Zinc sulphate						
	United States	2 573	2 142	2 267	1 812	1 877	1 349
	China	2 790	1 729	1 897	1 057	1 732	809
	Singapore	–	–	25	16	610	353
	Belgium	38	35	18	15	56	37
	Germany	413	242	54	33	64	33
	Thailand	80	92	68	76	75	27
	Peru	283	143	21	10	–	–
	Other countries	68	42	91	70	99	53
	Total	6 245	4 425	4 441	3 089	4 513	2 661
7901.11	Zinc, not alloyed, unwrought, containing by weight 99.99% or more of zinc						
	Russia	3 966	5 823	3 525	4 933	2 982	4 936
	United States	542	851	487	739	402	597
	Peru	1 603	2 300	567	734	245	362
	Other countries	10	16	448	598	117	154
	Total	6 121	8 990	5 027	7 004	3 746	6 049
7901.12	Zinc, not alloyed, unwrought, containing by weight less than 99.99% of zinc						
	United States	325	479	91	124	61	77
	Other countries	22	30	–	–	–	–
	Total	347	509	91	124	61	77
7901.20	Zinc alloys, unwrought						
	United States	4 833	9 538	4 349	7 449	4 532	7 455
	Other countries	11	24	4	8	1	1
	Total	4 844	9 562	4 353	7 457	4 533	7 456
7902.00	Zinc waste and scrap						
	United States	300	241	331	306	244	259
	Cuba	2	3	12	9	–	–
	Total	302	244	343	315	244	259

TABLE 1 (cont'd)

Item No.		2001		2002		2003	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>IMPORTS (cont'd)</b>							
7903.10	Zinc dust						
	Belgium	4 944	8 958	5 480	9 253	5 387	8 452
	United States	448	1 018	643	1 390	825	1 657
	India	–	–	47	83	390	603
	France	–	–	–	–	104	172
	Other countries	144	412	–	1	21	31
	Total	5 536	10 388	6 170	10 727	6 727	10 915
7903.90	Zinc powders and flakes						
	United States	428	723	513	696	1 042	1 465
	Other countries	–	–	23	33	21	27
	Total	428	723	536	729	1 063	1 492
7904.00	Zinc bars, rods, profiles and wire						
	United States	1 734	3 444	660	1 956	686	1 634
	China	62	107	62	207	215	678
	India	–	–	32	94	93	249
	Finland	16	47	18	52	71	192
	Mexico	737	1 441	1	5	–	–
	Other countries	69	236	130	193	11	36
	Total	2 618	5 275	903	2 507	1 076	2 789
7905.00	Zinc plates, sheets, strip and foil						
	Germany	496	2 026	398	1 659	456	1 984
	United States	698	1 925	619	1 975	661	1 859
	France	439	2 033	140	701	117	517
	Peru	41	139	52	123	74	200
	Other countries	17	63	1	1	4	19
	Total	1 691	6 186	1 210	4 459	1 312	4 579
7906.00	Zinc tubes, pipes and tube or pipe fittings (for example, couplings, elbows, sleeves)						
	United States	766	5 400	669	4 186	326	2 201
	Mexico	257	1 491	177	1 122	218	1 422
	India	95	1 053	59	493	140	1 051
	Taiwan	15	133	25	167	29	90
	China	2	19	6	40	21	76
	Germany	10	76	13	46	9	59
	Other countries	4	50	23	159	7	51
	Total	1 149	8 222	972	6 213	750	4 950
7907.00	Other articles of zinc						
	United States	2 309	8 809	2 706	11 015	2 186	9 285
	Taiwan	545	2 350	694	2 630	887	3 147
	China	808	3 129	911	3 448	831	2 962
	Mexico	724	2 879	253	1 097	119	460
	Other countries	499	1 977	768	2 552	519	1 955
	Total	4 885	19 144	5 332	20 742	4 542	17 809
	Total imports	200 064	192 212	319 113	207 592	441 648	278 053

**TABLE 1 (cont'd)**

	2000 (a)			2001			2002		
	Primary	Recycled	Total	Primary	Recycled	Total	Primary	Recycled	Total
	(tonnes)								
<b>QUANTITY USED (4) (5)</b>									
Zinc used for or in the manufacture of:									
Copper alloys (brass, bronze, etc.)	x	x	2 847	x	x	2 412	x	x	624
Galvanizing: electro	x	x	2 335	x	x	2 018	x	x	1 719
hot dip	x	x	73 568	x	x	72 676	x	x	74 823
Zinc die-cast alloys	x	x	31 105	x	x	(r) 26 665	x	x	34 429
Other products (including rolled and ribbon zinc, zinc oxides, electroplating)	x	x	38 057	x	x	40 819	x	x	38 313
<b>Total</b>	<b>136 544</b>	<b>11 369</b>	<b>147 913</b>	<b>143 431</b>	<b>(r) 1 159</b>	<b>(r) 144 590</b>	<b>147 895</b>	<b>2 013</b>	<b>149 908</b>
User stocks, year-end	7 834	938	8 772	9 814	375	10 189	10 484	274	10 758

Sources: Natural Resources Canada; Statistics Canada.

– Nil; . . Not available; n.e.s. Not elsewhere specified; x Confidential.

(a) Increase in number of companies being surveyed.

(1) New refined zinc produced from domestic primary materials (concentrates, slags, residues, etc.) plus estimated recoverable zinc in ores and concentrates shipped for export. (2) Zinc content of ores and concentrates produced. (3) Refined zinc produced from domestic and imported ores. (4) Consumer survey does not represent 100% of Canadian use and is therefore consistently less than apparent use. (5) Due to confidentiality in some end-use categories, a breakdown of primary and recycled sources is not provided in order to be consistent.

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

**TABLE 2. CANADA, ZINC PRODUCTION AND EXPORTS, (1) 1975, 1980 AND 1986-2003**

	Production		Exports		
	All Forms (2)	Refined (3)	In Ores and Concentrates	Refined	Total
	(tonnes)				
1975	1 055 151	426 902	705 088	247 474	952 562
1980	883 697	591 565	434 178	471 949	906 127
1986	988 173	570 981	450 249	427 176	877 425
1987	1 157 936	609 909	613 185	441 227	1 054 412
1988	1 370 000	703 206	816 885	551 521	1 368 406
1989	1 272 854	669 677	614 223	495 061	1 109 284
1990	1 179 372	591 786	716 185	452 251	1 168 436
1991	1 083 008	660 552	566 815	520 508	1 087 323
1992	1 195 736	671 702	678 172	509 744	1 187 916
1993	990 727	659 881	455 953	493 264	949 217
1994	976 309	690 965	450 320	551 168	1 001 488
1995	1 094 703	720 346	609 575	533 179	1 142 754
1996	1 162 720	716 467	670 789	581 604	1 252 393
1997	1 026 864	703 798	489 697	546 964	1 036 661
1998	991 584	745 131	425 341	576 926	1 002 267
1999	963 321	776 927	327 662	610 793	938 455
2000	935 713	779 892	318 752	602 626	921 378
2001	1 012 048	661 172	419 164	495 184	914 348
2002	923 931	793 475	409 343	598 250	1 007 594
2003 (p)	744 037	761 199	248 588	590 555	839 143

Sources: Natural Resources Canada; Statistics Canada.

(p) Preliminary.

(1) Beginning in 1988, exports are based on the new Harmonized System and may not be in complete accordance with previous method of reporting. Ores and concentrates include HS classes 2608.00.30, 2603.00.30, 2607.00.30 and 2616.10.30. Refined production includes HS classes 7901.11 and 7901.12. (2) New refined zinc produced from domestic primary materials (concentrates, slags, residues, etc.) plus estimated recoverable zinc in ores and concentrates shipped for export. (3) Refined zinc produced from domestic and imported ores.

**TABLE 3. WESTERN WORLD PRIMARY ZINC STATISTICS, 1999-2003**

	1999	2000	2001	2002	2003 (p)
	(000 tonnes)				
Mine production (zinc content)	5 897	6 323	6 618	6 469	6 727
Metal production	5 832	6 140	6 282	6 661	6 660
Metal used	6 827	7 142	6 896	7 117	7 125

Source: International Lead and Zinc Study Group.  
(p) Preliminary.

**TABLE 4. WORLD MINE PRODUCTION OF ZINC, 1999-2003**

	1999	2000	2001	2002	2003 (p)
	(000 tonnes)				
<b>EUROPE</b>					
Finland	20	16	20	35	39
Ireland	200	263	298	253	419
Poland	155	157	153	152	136
Russia	161	163	164	162	159
Spain	154	204	161	70	15
Sweden	175	177	159	149	188
Others	82	83	98	85	43
Subtotal	947	1 063	1 053	906	999
<b>AFRICA</b>					
Morocco	112	105	89	91	92
Namibia	35	40	37	41	108
South Africa	70	63	61	64	40
Others	51	48	49	46	41
Subtotal	268	256	236	242	281
<b>OCEANIA</b>					
Australia	1 110	1 379	1 476	1 444	1 444
<b>AMERICAS</b>					
Bolivia	145	151	145	142	144
Brazil	96	100	111	133	142
Canada	1 021	1 002	1 065	916	788
Mexico	363	393	429	446	475
Peru	900	910	1 056	1 219	1 369
United States	852	852	842	784	768
Others	106	109	121	119	106
Subtotal	3 483	3 517	3 769	3 759	3 792
<b>ASIA</b>					
China	1 476	1 780	1 572	1 624	2 027
India	185	208	222	234	305
Iran	98	102	105	121	111
Japan	64	64	45	43	45
Kazakhstan	283	322	320	376	389
North Korea	37	34	28	32	42
Thailand	24	27	24	25	37
Turkey	57	48	36	43	40
Others	34	38	48	51	53
Subtotal	2 258	2 623	2 400	2 549	3 049
Total world	8 065	8 839	8 934	8 900	9 566

Source: International Lead and Zinc Study Group.  
(p) Preliminary.

**TABLE 5. WORLD ZINC METAL PRODUCTION, (1) 1999-2003**

	1999	2000	2001	2002	2003 (p)
	(000 tonnes)				
<b>EUROPE</b>					
Belgium	232	264	256	239	244
Finland	225	223	249	235	266
France	318	318	329	334	253
Germany	361	357	357	378	388
Italy	145	170	179	176	123
Netherlands	221	217	206	203	223
Norway	144	138	145	145	143
Poland	179	173	175	159	148
Russia	232	242	250	257	253
Spain	383	391	443	512	530
Others	252	277	295	270	158
Subtotal	2 692	2 770	2 884	2 905	2 729
<b>AFRICA</b>					
Algeria	27	26	26	34	32
Namibia	–	–	–	–	47
South Africa	108	103	109	111	114
Zambia	–	–	–	2	1
Subtotal	135	129	135	147	194
<b>AMERICAS</b>					
Argentina	40	36	40	39	39
Brazil	187	192	193	255	255
Canada	777	780	661	793	761
Mexico	219	235	304	302	324
Peru	191	200	190	170	202
United States	372	371	329	344	353
Subtotal	1 785	1 814	1 717	1 904	1 934
<b>ASIA</b>					
China	1 703	1 957	2 038	2 155	2 292
India	189	204	234	248	280
Japan	633	654	644	640	651
Kazakhstan	243	262	277	286	298
South Korea	430	477	508	608	645
Thailand	95	101	105	105	108
Others	119	119	130	147	176
Subtotal	3 412	3 774	3 936	4 189	4 450
<b>OCEANIA</b>					
Australia	344	494	556	567	553
Total world	8 369	8 981	9 227	9 712	9 860

Source: International Lead and Zinc Study Group.

– Nil; (p) Preliminary.

(1) Total production by smelters and refineries of zinc in marketable form or used directly for alloying, including production on toll in the reporting country, regardless of the type of source material from which it is produced, i.e., whether ores, concentrates, residues, slag or scrap. Remelted zinc and zinc dusts are excluded.

**TABLE 6. ZINC USE, (1) BY COUNTRY AND BY REGION, 1999-2003**

	1999	2000	2001	2002	2003 (p)
	(000 tonnes)				
<b>EUROPE</b>					
Belgium	367	383	374	352	350
France	300	311	327	290	300
Germany	561	532	543	526	539
Italy	336	385	348	374	348
Russia	120	137	150	153	189
Spain	190	203	228	226	237
United Kingdom	220	210	191	185	188
Others	621	655	656	660	648
Subtotal	2 715	2 816	2 817	2 766	2 799
<b>AFRICA</b>					
South Africa	87	92	89	95	97
Others	70	78	79	82	87
Subtotal	157	170	168	177	184
<b>OCEANIA</b>					
Australia	210	217	222	249	254
New Zealand	15	14	16	17	13
Subtotal	226	231	237	266	267
<b>AMERICAS</b>					
Brazil	179	188	198	216	212
Canada	169	175	180	192	185
Mexico	200	212	210	225	236
United States	1 342	1 348	1 179	1 222	1 154
Others	168	177	169	173	164
Subtotal	2 058	2 101	1 936	2 028	1 951
<b>ASIA</b>					
China	1 200	1 350	1 500	1 750	2 045
India	254	270	286	310	332
Japan	634	676	633	603	619
South Korea	389	438	401	476	471
Taiwan	273	294	276	302	330
Others	590	637	663	710	734
Subtotal	3 340	3 679	3 759	4 151	4 531
Total world	8 496	8 997	8 918	9 387	9 731

Source: International Lead and Zinc Study Group.

(p) Preliminary.

(1) Total refined zinc use, including zinc used directly for the production of zinc alloys, regardless of the type of source material from which it is produced, i.e., ores, concentrates, residues, slags or scrap. Remelted zinc and zinc dusts are excluded.

**TABLE 7. CANADA, ZINC METAL CAPACITY, 2003**

Company and Location	Annual Rated Capacity
	(000 tonnes of slab zinc)
<b>PRIMARY</b>	
Canadian Electrolytic Zinc Limited Valleyfield, Quebec	267
Falconbridge Limited Timmins, Ontario	150
Hudson Bay Mining and Smelting Co., Limited Flin Flon, Manitoba	115
Teck Cominco Limited Trail, British Columbia	290
Total primary, Canada	822

Source: Natural Resources Canada.

**TABLE 8. MONTHLY AVERAGE ZINC  
PRICES, 2002 AND 2003**

	LME Special High Grade Settlement
	(US\$/t)
<b>2002</b>	
January	793.2
February	771.3
March	819.3
April	808.2
May	769.6
June	767.1
July	794.8
August	747.6
September	756.2
October	754.7
November	765.3
December	797.8
Yearly average	778.6
<b>2003</b>	
January	781.4
February	785.2
March	790.9
April	754.7
May	775.6
June	790.6
July	827.5
August	817.9
September	818.2
October	898.0
November	914.5
December	977.8
Yearly average	828.4

Source: International Lead and Zinc Study Group.