

Cement

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Shipments of cement in 2001 were estimated to be 12.99 Mt valued at \$1.31 billion, based on preliminary data. This compares to shipments of 12.61 Mt valued at \$1.26 billion in 2000, based on final data (Table 1). Demand for cement in most regions remained firm as the result of an increase of about 5% in gross expenditures on construction and an increase in exports.

CANADIAN INDUSTRY

The Canadian cement industry is diversified and primarily integrated with the construction aggregates and concrete products sectors. Information on the aggregates sector is included in a separate chapter entitled *Mineral Aggregates*.

Clinker-producing and finish-grinding capacities of cement plants are listed in Table 2. Reported kiln capacity in 2000 was about 15.7 Mt with about 15.1 Mt active, according to the most recent figures available. Clinker production is more indicative of ultimate cement production capacity because clinker can be stockpiled for later use or sale. The overall output of the cement industry is best represented by total cement shipments plus clinker exports, as shown in Table 3. The average kiln capacity increased to 580 000 t/y in 2000; the average kiln age based on clinker capacity is reported to be about 20 years, according to the Portland Cement Association.

In the Atlantic region, the Lafarge Canada Inc. (Lafarge) plant in Nova Scotia is now the only cement producer in the region following closure in 2000 of the North Star Cement Limited plant in Corner Brook, Newfoundland and Labrador.

In Quebec, three clinker-producing plants account for about 17% of Canada's output. St. Lawrence Cement

Inc. (SLC), Lafarge, and Ciment Québec Inc. share markets about equally. (SLC continued with a permitting process to build a new 2-Mt/y cement plant near Greenport, New York.)

In Ontario, clinker-producing plants account for about 51% of Canadian capacity. The Blue Circle Canada Inc. clinker/cement plants located in Bowmanville and St. Marys, which were acquired in early 2001 by Lafarge SA of France via Lafarge's purchase of Blue Circle Industries PLC, were sold to Votorantim Group, one of the largest industrial conglomerates in Brazil and its leading producer of cement. This sale was part of a divestment in accordance with rulings by the Canadian Competition Bureau and the U.S. Federal Trade Commission. (The Ontario plants now operate under the name St. Marys Cement Co., as footnoted in Table 2; also, a

Figure 1
Canadian Cement Production, 1988-2001



Sources: Statistics Canada; Portland Cement Association.

P Preliminary.

Note: Cement production includes clinker exports.

former Blue Circle Inc. plant in Detroit, Michigan, operates as St. Marys Cement Inc. (U.S.).

Western Canada's clinker-producing capacity accounts for about 29% of Canada's total clinker capacity. Both the Inland Cement Limited plant and the Tilbury Cement plant currently operate under the name Lehigh, as footnoted in Table 2.

WORLD DEVELOPMENTS

World cement production in 2000 was 1616 Mt, according to estimates by the United States Geological Survey (USGS). China is the world's largest producer (583 Mt), followed by India (95 Mt), the United States (90 Mt), and Japan (81 Mt).

U.S. anti-dumping duties against grey Portland cement and clinker from Mexico remained in effect in 2001.

USE AND TRADE

Cross-border trade of both cement and clinker varies considerably from year to year depending on construction activity. From 1999 to 2001, annual exports of cement to the United States amounted to 3.5-4.5 Mt and accounted for about one third of total Canadian production (shipments) as defined in Table 1. Exports are mainly destined for the southern Great Lakes and the U.S. Pacific northwestern regions. Similarly, Canada's imports of cement amounted to 0.6-0.8 Mt and related mainly to the equivalent regions.

Low-cost marine transportation has influenced world trade considerably. Total U.S. imports of cement (excluding clinker) for use were about 24 Mt in 2001, or 21% of apparent use. Asian sources (China, Korea and Thailand) have been major suppliers since 1998, according to the USGS.

The importance of supplementary cementing materials (SCMs) for a range of uses is well recognized. About 1.1 Mt of fly ash, accounting for about 22% of reported production, were used in 2001, according to a recent survey by NRCan in cooperation with the Canadian Electricity Association and Canadian Industries Recycling Coal Ash (CIRCA), as shown in Table 4. However, fly ash and other SCMs used for their pozzolanic properties are not differentiated in the international system of harmonized codes; hence, their recognition worldwide tends to be diminished. (Also, timely official data relating to the total use of these materials as inputs to the hydraulic cement industry [SIC code 3521, or the equivalent NAICS code 327310], as well as to the concrete products industry [SIC codes 3541, 3542 and 3549, or their equivalent codes 327330 and 327390], are not readily available.)

TECHNOLOGY

Energy conservation programs by the Canadian cement industry have reduced the energy consumption per unit of production by about 30% since 1974. Although the number of kilns has decreased, their individual capacities have increased and the more efficient dry-process plants now account for more than 95% of total active clinker capacity. The fuel mix has changed considerably away from natural gas and petroleum products toward coal and/or coke. In 2000, of 16 clinker-producing plants, 12 reported using coal and/or coke as their primary fuel. Seven plants reported using waste as an alternative or supplemental fuel, according to the Canadian Portland Cement Association (CPCA). In 2000, the Canadian cement industry consumed, on average, 4482 megajoules per tonne of production. The types of fuel consumed, including waste fuels, are highlighted in Table 2.

Suitable waste materials are an attractive alternative fuel because pyro-processing accounts for more than 80% of total energy needs, or 30-40% of total production costs. In the context of sustainable development of non-renewable fossil fuels, it is apparent that improved waste management involving combustion technology is leading to greater conservation.

Natural Resources Canada (NRCan) continued to seek ideas, advice and financial support for the new International Centre for Sustainable Development of Cement and Concrete (ICON). Although this centre draws on some current initiatives and the expertise of the Canada Centre for Mineral and Energy Technology (CANMET), it is dependent upon new partnerships with industry, academic institutions and other governments for strengthening global efforts relevant to the sustainable development of cement and concrete.

An awareness of the importance of high-volume fly ash concrete is growing; for example, the Greater Vancouver Regional District has established a new web site for EcoSmartTM concrete (high-volume fly ash concrete) in order to provide a forum for information about the benefits, costs and challenges associated with this type of concrete (www.gvrd.bc.ca/services/air/air2000/Ecosmart/html). The EcoSmart Concrete Project also involves studying promising new techniques in intergrinding (blended cement) and precast (pre-manufactured) concrete. Some of these technical initiatives involve collaboration with CANMET and the Electric Power Research Institute (EPRI) of Palo Alto, California.

In late July and early August 2001, the Committee for the Organization of CANMET/ACI Conferences, the National Research Council's Institute for Research in Construction, and others sponsored the Seventh CANMET/ACI International Conference on

Fly Ash, Silica Fume, Slag and Natural Pozzolans in Concrete, held in Madras, India, and the Fifth CANMET/ACI/International Conference on Recent Advances in Concrete Technology, held in Singapore. The Three-Day International Symposium on Sustainable Development and Concrete Technology to have been held in mid-September 2001 in San Francisco was cancelled.

In 2003, the Committee for the Organization of CANMET/ACI Conferences, the National Research Council's Institute for Research in Construction, and others are planning three international conferences relating to cement and concrete. These are: 1) the Sixth CANMET/ACI International Conference on Durability of Concrete to be held in Thessaloniki, Greece, on June 1-7, 2003; 2) the Sixth CANMET/ACI International Conference on Recent Advances in Concrete Technology to be held in Bucharest, Romania, on June 8-11, 2003; and 3) the Seventh CANMET/ACI International Conference on Superplasticizers and Other Chemical Admixtures in Concrete to be held in Berlin, Germany, on October 20-24, 2003.

Research efforts to develop new superplasticizers for use in conjunction with SCMs for high-performance concrete have increased in recent years. As a result of this, a publication entitled *Superplasticizers: Properties and Applications in Concrete*, by Ramachandran, Malhotra, Jolicoeur and Spiratos, was compiled to integrate the chemistry and applications concerned. This publication, which includes 14 chapters and more than 400 pages, can be obtained from the Materials Technology Laboratory (MTL) of NRCan's CANMET by contacting Alan Bowles by telephone at (613) 995-8814 or by e-mail at abowles@nrcan.gc.ca.

NRCan, mainly in collaboration with the Canadian Industry Program for Energy Conservation (CIPEC), continued to develop long-term strategies related to major energy-consuming sectors.

OUTLOOK

Cement shipments in 2002 are expected to be higher based on continued strength in the housing sector, relatively low interest rates, and growth in exports to the United States. Expenditures continued under the Infrastructure Canada Program involving federal, provincial/territorial and municipal governments. This program is expected to contribute about \$6 billion relating to both building and engineering infrastructure during the six-year period, including 2005.

Housing starts were about 163 000 in 2001, according to the Canada Mortgage and Housing Corporation. By way of comparison, housing starts were about 150 000 in 1999 and 152 000 in 2000. (Additional information relating to residential construction can

be obtained on the Internet at www.cmhc-schl.gc.ca/cmhc.html.) Non-residential construction and industrial construction permits are expected to be weaker in 2002 based on trends early in the year.

Energy management in the cement industry will continue to concentrate on gains in efficiency based on timely switching among the available choices of common fuels. However, most longer-term cost savings are expected to result from the partial substitution of fossil fuels by waste-derived fuels. For example, in selected regions, in the case of Refuse Derived Fuel (RDF), about 70% (by volume) of municipal solid waste from post-recycled curbside garbage could be extracted for use by the cement industry. This would reduce by about two thirds the volume of material for disposal as landfill. Under certain circumstances using RDF, reductions in requirements for traditional fuels have been predicted to be as high as 20-25%.

World production and use of cement in 2001 was 1.7 billion t, according to the U.S. Geological Survey (USGS). These amounts are forecast to be about 1.9 billion t and 2.1 billion t in 2005 and 2010, respectively, according to a report by Ocean Shipping Consultants Ltd. Of the overall forecasted 500-Mt increase, accepting the 1999 base-year amount of 1.6 billion t by the USGS, Asia is expected to account for more than 60%, Africa and the Middle East for 13%, and Central and South America for about 10%.

The use of supplementary cementing materials incorporating fly ash, silica fume or other pozzolanic materials such as ground, granulated slags as a partial replacement for energy-intensive Portland cement is expected to become more important in modern cement and concrete practices. An estimated 35-40 Mt of these products are currently used as a raw material or as partial replacement for Portland cement in North America and western Europe.

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 February 1, 2002. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

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TARIFFS

Item No.	Description	Canada			United States
		MFN	GPT	USA	Canada
25.23	Portland cement, aluminous cement, slag cement, supersulphate cement and similar hydraulic cements, whether or not coloured or in the form of clinkers				
2523.10	Cement clinkers	Free	Free	Free	Free
	Portland cement:				
2523.21	White cement, whether or not artificially coloured	Free	Free	Free	Free
2523.29	Other	Free	Free	Free	Free
2523.30	Aluminous cement	Free	Free	Free	Free
2523.90	Other hydraulic cements	Free	Free	Free	Free
68.10	Articles of cement, of concrete or of artificial stone, whether or not reinforced Tiles, flagstones, bricks and similar articles:				
6810.11	Building blocks and bricks	3%	Free	Free	Free
6810.19	Other	5%	Free	Free	Free
6810.91	Prefabricated structural components for building or civil engineering	5%	Free	Free	Free
6810.99	Other				
6810.99.10	Pipes	5%	Free	Free	Free
6810.99.90	Other	5%	Free	Free	Free

Sources: *Customs Tariff*, effective January 2002, Canada Customs and Revenue Agency; *Harmonized Tariff Schedule of the United States*, 2002.

TABLE 1. CANADA, CEMENT PRODUCTION AND TRADE, 1999-2001

Item No.	1999		2000		2001 (p)	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
PRODUCTION (1) (all forms)						
Newfoundland and Labrador	x	x	x	x	—	—
Nova Scotia	x	x	x	x	x	x
Quebec	2 842 667	237 306	2 830 381	240 549	2 888 331	248 858
Ontario	5 548 561	511 200	5 344 406	507 182	5 695 905	546 349
Alberta	(r) x	(r) x	x	x	x	x
British Columbia	1 643 184	168 090	1 919 187	201 443	2 111 380	232 581
Total	(r) 12 624 924	(r) 1 230 972	12 611 954	1 258 697	12 985 521	1 312 450
IMPORTS (2)						
2523.10	Cement clinker					
Turkey	—	—	163 339	6 848	245 399	8 679
Cyprus	—	—	—	—	1 500	95
United States	331	14	624	25	39	2
Spain	23 693	1 126	62 522	2 868	—	—
Lebanon	190 365	8 841	—	—	—	—
Mexico	7 991	355	5 539	247	—	—
Switzerland	—	—	34 629	2 088	—	—
United Arab Emirates	—	—	95 951	5 086	—	—
Total	222 380	10 336	362 604	17 162	246 938	8 776
2523.21	Portland cement, white, whether or not artificially coloured					
United States	13 403	2 716	14 059	3 049	10 092	1 447
Denmark	3 059	421	5 157	715	3 165	469
Netherlands	—	—	—	—	291	42
Mexico	38 784	3 736	1 141	216	20	6
Bermuda	19 380	877	—	—	—	—
Other countries	6	1	81	14	150	33
Total	74 632	7 751	20 438	3 994	13 718	1 997
2523.29	Portland cement, n.e.s.					
United States	455 956	37 001	506 007	42 177	554 710	47 040
Venezuela	—	—	—	—	13 097	1 338
Mexico	578	45	593	54	12 586	1 324
United Kingdom	—	—	570	55	1 013	65
France	244	25	2	...	654	53
Croatia	781	61	—	—	138	13
Canada	—	—	—	—	105	8
Other countries	58	4	145	12	30	2
Total	457 617	37 136	507 317	42 298	582 333	49 843
2523.30	Aluminous cement					
United States	13 662	7 999	12 581	7 700	9 670	6 485
Croatia	185	91	1 689	1 014	2 501	1 635
Other countries	46	25	1	...	5	1
Total	13 893	8 115	14 271	8 714	12 176	8 121
2523.90	Hydraulic cement, n.e.s.					
United States	57 737	6 844	56 784	6 368	69 549	7 711
Turkey	—	—	—	—	41 825	3 150
China	14 374	1 515	19 927	2 071	20 588	2 189
Belgium	5	1	17 867	1 987	11 851	1 149
United Kingdom	2 360	494	3 098	597	3 029	703
Croatia	148	35	692	131	1 270	254
Germany	6	...	161	43	521	154
India	—	—	—	—	652	114
Switzerland	—	—	30	4	642	64
Bahrain	—	—	—	—	144	33
Thailand	—	—	—	—	274	29
France	564	110	447	77	52	13
Sweden	—	—	152	48	57	10
Japan	693	159	356	108	13	4
South Africa	—	—	199	44	—	—
Costa Rica	—	—	140	31	—	—
Other countries	153	31	60	15	157	35
Total	76 040	9 189	99 913	11 524	150 624	15 612
6810.11	Building blocks and bricks of cement, concrete or artificial stone					
United States	..	3 632	..	2 931	..	2 914
Brazil	..	126	..	219	..	372
Other countries	..	38	..	48	..	66
Total	..	3 796	..	3 198	..	3 352

TABLE 1 (cont'd)

Item No.	1999		2000		2001 (p)	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
IMPORTS (cont'd)						
6810.19	Tiles, flagstones and similar articles of cement/concrete or artificial stone					
	United States	.. 15 119	..	17 020	..	19 216
	Italy	.. 978	..	1 105	..	1 441
	Mexico	.. 29	..	24	..	704
	Spain	.. 109	..	205	..	140
	Portugal	.. 91	..	139	..	133
	China	.. 15	..	41	..	52
	Belgium	.. -	..	-	..	31
	Other countries	.. 176	..	128	..	30
	Total	.. 16 517	..	18 662	..	21 747
6810.91	Prefabricated structural components of buildings, etc., of cement/concrete, etc.					
	United States	.. 3 177	..	2 507	..	4 566
	Netherlands	.. 6	..	-	..	52
	United Kingdom	.. 503	..	-	..	-
	Other countries	.. 8	..	1	..	1
	Total	.. 3 694	..	2 508	..	4 619
6810.99	Articles of cement, of concrete or of artificial stone, n.e.s.					
	United States	.. (r) 17 207	..	19 840	..	17 547
	China	.. (r) 3 814	..	6 099	..	6 420
	Mexico	.. 607	..	933	..	649
	Belgium	.. -	..	687	..	632
	United Kingdom	.. 742	..	788	..	392
	Spain	.. 28	..	54	..	299
	Germany	.. 71	..	208	..	148
	Italy	.. 222	..	164	..	115
	Philippines	.. 264	..	64	..	71
	Canada	.. 17	..	43	..	48
	France	.. 6	..	5	..	43
	Taiwan	.. 70	..	55	..	43
	Indonesia	.. 6	..	75	..	43
	Thailand	.. 13	..	12	..	32
	South Africa	.. 25	..	18	..	31
	Hong Kong	.. 187	..	28	..	11
	South Korea	.. (r) 148	..	224	..	2
	Malaysia	.. 480	..	348	..	2
	Other countries	.. (r) 51	..	90	..	44
	Total	.. (r) 23 958	..	29 735	..	26 572
EXPORTS						
2523.10	Cement clinker					
	United States	1 236 860	87 794	805 870	64 224	660 913
	Total	1 236 860	87 794	805 870	64 224	660 913
2523.21	Portland cement, white, whether or not artificially coloured					
	United States	179 837	32 251	180 730	32 480	212 937
	Other countries	106	34	29	42	-
	Total	179 943	32 285	180 759	32 522	212 937
2523.29	Portland cement, n.e.s.					
	United States	4 083 662	313 797	3 915 840	310 692	4 160 240
	Singapore	-	-	-	-	18
	Sierra Leone	-	-	-	-	10
	Iceland	200	23	-	-	-
	South Korea	316	24	-	-	-
	Other countries	52	13	30	30	-
	Total	4 084 230	313 857	3 915 870	310 722	4 160 268

TABLE 1 (cont'd)

Item No.	1999		2000		2001 (p)	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS (cont'd)						
2523.30	Aluminous cement	—	—	—	—	—
2523.90	Hydraulic cement, n.e.s.					
	United States	22 742	3 594	4 404	2 074	87 759
	Hong Kong	26	10	20	37	365
	Singapore	17	12	23	23	136
	Jamaica	74	62	427	217	57
	Japan	22	7	16	9	55
	France	—	—	—	—	92
	Italy	—	—	—	—	102
	Chile	105	68	—	—	—
	Germany	—	—	161	41	—
	Other countries	8	14	139	113	118
	Total	22 994	3 767	5 190	2 514	88 684
6810.11	Building blocks and bricks of cement, concrete or artificial stone					
	United States	..	53 908	..	64 997	..
	South Africa	—	—	—	—	..
	Italy	..	24	..	34	..
	France	—	—	..	74	..
	Bermuda	—	—	—	—	..
	Japan	..	234	..	102	..
	Ukraine	..	73	..	217	..
	Other countries	..	96	..	28	..
	Total	..	54 335	..	65 452	..
6810.19	Tiles, flagstones and similar articles of cement/concrete or artificial stone					
	United States	..	33 415	..	55 021	..
	Turkey	..	2 501	..	1 871	..
	Japan	..	1 888	..	606	..
	Antigua and Barbuda	—	—	—	—	..
	Cuba	..	11	..	119	..
	France	—	—	..	34	..
	Belgium	—	—	..	131	..
	Australia	..	1 275	—	—	..
	Other countries	..	99	..	34	..
	Total	..	39 189	..	57 816	..
6810.91	Prefabricated structural components of buildings, etc., of cement/concrete, etc.					
	United States	..	115 800	..	96 852	..
	United Kingdom	—	—	..	802	..
	Bermuda	..	38	..	44	..
	Romania	—	—	—	—	..
	Cuba	—	—	..	28	..
	France	..	207	..	252	..
	Australia	—	—	..	179	..
	Venezuela	—	—	..	192	..
	Other countries	..	83	..	34	..
	Total	..	116 128	..	98 383	..
6810.99	Articles of cement, of concrete or of artificial stone, n.e.s.					
	United States	..	48 593	..	71 139	..
	Cuba	—	—	..	1 208	..
	France	..	528	..	515	..
	Bermuda	—	—	..	223	..
	Japan	..	43	..	83	..
	South Korea	—	—	..	99	..
	Mexico	—	—	—	—	..
	Norway	—	—	—	—	..
	United Kingdom	..	1 726	..	275	..
	Belgium	..	16	..	279	..
	Other countries	..	50	..	181	..
	Total	..	50 956	..	74 002	..

Sources: Natural Resources Canada; Statistics Canada.

— Nil; .. Not available; . . . Amount too small to be expressed; n.a. Not applicable; n.e.s. Not elsewhere specified; (p) Preliminary (r) Revised; x Confidential.

(1) Producers' shipments plus quantities used by producers; (2) Includes re-imports.

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

TABLE 2. CEMENT PLANTS, APPROXIMATE ANNUAL GRINDING CAPACITY, END OF 2000

Company	Plant	Wet (W) Dry (D) Preheater (x) Precalciner (c)	Fuel (Coal, Oil, Gas, Waste)	No. of Kilns	Grinding Capacity	Clinker Capacity
					(000 t/y)	
ATLANTIC REGION						
Lafarge Canada Inc.	Brookfield, N.S.	D	C,Wa	2	536	485
Subtotal, Atlantic region				2	536	485
QUEBEC						
Lafarge Canada Inc.	St. Constant	D	Wa,C,O,G	2	1 129	950
Ciment Québec Inc. (Essroc Corp.)	St. Basile	Dc	C,O,G,Wa	1	1 571	776
St. Lawrence Cement Inc. (Holcim AG) (1)	Joliette	D	C,Wa	4	1 475	900
Subtotal, Quebec region				7	4 175	2 626
ONTARIO						
Lafarge Canada Inc.	Woodstock	W	C,G	2	775	549
	Bath	Dx	C	1	1 190	1 072
Federal White Cement Ltd.	Woodstock	Dx	O,G	2	460	820
Essroc Canada Inc. (Italcementi)	Picton	D,Dx	C,G	2	688	1 129
St. Lawrence Cement Inc. (Holcim AG) (1)	Mississauga	W,Dc	C,O,Wa	3	2 009	(a) 1 883
Blue Circle Canada Inc. (2)	Bowmanville	Dc	C	1	1 464	1 844
	St. Marys	Dx	C,Wa	1	685	738
Subtotal, Ontario region				12	7 271	8 035
PRAIRIE REGION						
Lafarge Canada Inc.	Exshaw, Alta.	D,Dc	G	2	1 459	1 194
Inland Cement Limited (3) (Heidelberg Cement)	Edmonton, Alta.	Dc	G	1	1 380	961
Subtotal, Prairie region				3	2 839	2 155
BRITISH COLUMBIA						
Lafarge Canada Inc.	Kamloops	D	C,G	1	344	194
	Richmond	Dc	C,G	1	1 390	1 034
Tilbury Cement Limited (4) (Heidelberg Cement)	Delta	Dx	C,O,G,Wa	1	1 050	1 134
Subtotal, B.C. region				3	2 784	2 362
Total Canada (7 companies, based on ownership)				27	17 605	15 663

Source: Market and Economic Research Department, Portland Cement Association.

(a) Two kilns inactive.

(1) Name changed in 2001 from Holderbank Financiere Glaris (Switzerland) AG. (2) Name changed to St. Marys Cement Co. in 2001, with ownership by Votorantim Group, Brazil. (3) Name changed in February 2002 to Lehigh Inland. (4) Name changed in February 2002 to Lehigh Northwest.

Note: Total active kiln capacity including white cement is approximately 15.1 Mt/y.

TABLE 3. CANADA, CEMENT PLANTS, KILNS AND CAPACITY UTILIZATION, 1980-2001

	Clinker-Producing Plants	Kilns (a)	Approximate Cement Grinding Capacity	Portland and Masonry Cement Production (1)	Clinker Exports	Approximate Total Production (2)	Capacity Utilization
			(t/yr)	(t)	(t)	(t)	(%)
1980	23	47	16 363 000	10 274 000	726 087	11 000 087	67
1981	23	48	16 771 000	10 145 000	524 006	10 669 006	64
1982	23	48	16 771 000	8 418 000	290 329	8 708 329	50
1983	23	49	17 900 000	7 870 878	404 793	8 275 671	46
1984	23	49	17 900 000	9 387 466	440 297	9 827 763	55
1985	23	49	17 900 000	10 192 442	676 596	10 869 038	61
1986	23	49	17 900 000	10 611 223	324 000	10 935 223	61
1987	20	40	16 600 000	12 603 164	767 338	13 370 502	81
1988	20	40	15 506 000	12 349 873	331 796	12 681 669	82
1989	20	38	15 546 000	12 590 637	178 491	12 769 128	82
1990	20	38	16 439 000	11 745 152	460 075	12 205 227	74
1991	20	34	16 262 000	9 372 219	544 870	9 917 089	61
1992	18	34	16 800 000	8 593 399	988 348	9 581 747	57
1993	18	34	16 800 000	9 393 581	882 935	10 276 516	61
1994	18	34	(r) 17 021 000	10 584 414	981 024	11 565 438	68
1995	18	34	(r) 16 157 000	10 440 329	1 329 548	11 769 877	69
1996	18	32	16 252 000	11 587 365	1 252 863	12 840 228	79
1997	17	30	15 856 000	11 736 272	1 019 308	12 755 580	80
1998	17	28	15 837 000	12 124 058	1 657 808	13 781 866	87
1999	17	27	16 269 000	12 634 440	1 236 860	13 871 300	85
2000	16	27	17 605 000	12 611 954	805 870	13 417 824	76
2001 (p)	16	27	17 605 000	12 986 000	660 900	13 646 900	78

Sources: Statistics Canada; Portland Cement Association.

(p) Preliminary; (r) Revised.

(a) Includes two inactive kilns beginning in 1992.

(1) Producers' shipments and amounts used by producers. (2) Cement shipments/production plus clinker exports.

TABLE 4. CANADA, PRODUCTION AND USE OF COAL COMBUSTION PRODUCTS (CCPs), 2001^(1,2)

	Fly Ash	Bottom Ash	FGD Gypsum	Other (3)	Total CCPs
(000 tonnes)					
PRODUCTION					
Produced	4 815	1 592	382	111	6 900
Disposed/stored	3 881	1 535	–	111	5 526
Removed from disposal	97	123	–	–	220
USE (DOMESTIC)					
Cement	420	202	–	–	622
Concrete/grout	408	–	–	–	408
Mining applications	145	–	–	–	145
Roadbase/subbase	8	46	–	–	54
Wallboard	–	–	530	–	530
Other (4)	71	12	–	–	84
Total use	1 052	261	530	–	1 843
Individual use percentage	22	16	139	–	n.a.
Cumulative use percentage	22	20	27	27	27

Sources: Compiled by Natural Resources Canada in cooperation with the Canadian Electricity Association and Canadian Industries Recycling Coal Ash (CIRCA).

– Nil; n.a. Not applicable; FGD Flue-gas desulphurization.

(1) Reported production of coal combustion products (CCPs) may include both dry and ponded categories. (2) Use (domestic), as reported, includes amounts imported (assumed HS codes 2621.00 relating to fly ash and HS 2520.10 relating to gypsum). (3) Cfb (circulating fluidized bed) fly ash and bottom ash. (4) Includes waste stabilization and specialty uses such as mineral filler and flowable fill.

TABLE 5. CANADA, VALUE OF CONSTRUCTION BY TYPE, 1996-2001

	1996	1997	1998	1999	2000	2001
	(\$ billions)					
BUILDING CONSTRUCTION						
Residential investment	32.3	36.5	36.0	38.8	40.8	43.6
Non-residential building investment	19.6	22.5	22.4	24.2	25.3	26.3
Total building construction	51.9	59.0	58.4	63.0	66.1	69.9
ENGINEERING CONSTRUCTION						
Mining and oil and gas extraction	13.9	18.2	16.7	15.4	19.3	21.1
Transportation and warehousing	2.0	2.2	5.0	5.0	4.1	3.4
Other engineering	15.2	14.7	14.5	16.6	18.3	18.9
Total engineering construction	31.1	35.1	36.2	37.0	41.7	43.4
Total all components	83.0	94.1	94.6	100.0	107.8	113.3

Sources: Natural Resources Canada; Statistics Canada, CANSIM II (Table 026-0013 – Residential Values, by Type of Investment and Related Table 031-0002 – Flows and Stocks of Fixed Non-Residential Capital, by North American Industry Classification System). (More information can be obtained on the Internet at the CANSIM II site at www.statcan.ca/english/ads/cansimII.)

Notes: Numbers may not add to totals due to rounding. Residential construction includes value of new construction, renovations and acquisition costs.

TABLE 6. WORLD PRODUCTION OF CEMENT, 2000 AND 2001^(e)

	2000	2001(e)
	(000 tonnes)	
Canada	12 612	13 000
Brazil	39 208	40 000
China	583 190	595 000
Germany	38 000	40 000
India	95 000	100 000
Italy	36 000	36 000
Japan	81 300	82 000
South Korea	51 255	52 000
Russia	32 400	35 000
Spain	30 000	30 000
Thailand	32 000	32 000
Turkey	35 825	36 000
United States	89 150	91 100
Other countries	459 497	469 500
Total world	1 615 797	1 651 600

Sources: Natural Resources Canada; U.S. Geological Survey, January 2002.

(e) Estimated.