

# Cement

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**S**hipments of cement in 1999 were estimated to be 12.6 Mt valued at \$1.23 billion, based on preliminary data. This compares to shipments of 12.1 Mt valued at \$1.15 billion in 1998, based on final data (Table 1). Demand for cement in the Atlantic region, Quebec and Ontario increased in 1999; however, demand decreased in the Prairie region and in British Columbia, according to the Portland Cement Association. Overall construction activity in Canada was stronger, mainly affected by more than a 9% increase in the value of residential construction, according to Statistics Canada.

## **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 on Mineral Aggregates.

Clinker-producing and finish-grinding capacities of cement plants are listed in Table 2. Reported kiln capacity in 1998 was about 14.1 Mt with about 13.6 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 has increased from about 300 000 t/y in 1980 to more than 500 000 t/y in 1998; the average kiln age based on clinker capacity is reported to be about 21 years, according to the Portland Cement Association.

In Atlantic Canada, two cement plants obtain raw materials from on site or nearby. These plants account for about 4% of Canada's total clinker-producing capacity. Nova Scotia and Newfoundland are the only producers of cement in the region.

In Quebec, three clinker-producing plants account for about 19% of Canada's output. St. Lawrence Cement Inc. (SLC) is the dominant manufacturer of cement and a leading producer of concrete and aggregates in eastern Canada.

In Ontario, clinker-producing plants account for about 50% of Canadian capacity. Blue Circle Canada Inc., SLC and Lafarge Canada Inc. are the largest producers. (SLC continued with the permitting process to build a new 2-Mt/y cement plant near Greenport, New York.)

ESSROC Canada Inc., part of the Italcementi Group of Companies, completed part of its three-year investment plan in North America and increased cement production capacity at its Picton, Ontario, plant.

In western Canada, which accounts for about 27% of the country's clinker-producing capacity, changes in plant capacities have been highlighted in Table 2. Relatively recent developments in this region are described in the Cement chapter of the 1998 edition of the *Canadian Minerals Yearbook*.

## **WORLD DEVELOPMENTS**

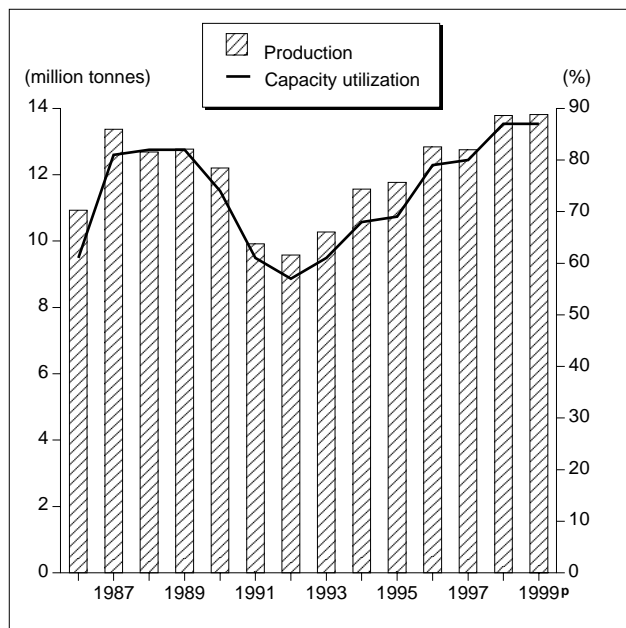
Multinational companies with widespread production and distribution networks continued to become more dominant in world cement markets. Following an acquisition by Cimenteries CBR/Heidelberg of the controlling interest in Scancem AB, which is jointly owned by Swedish and Belgian interests, CBR/Heidelberg is now reported to be the third largest cement producer in the world.

World cement production in 1998 was 1520 Mt, according to estimates by the U.S. Geological Survey. China is the world's largest producer (514 Mt), followed by the United States (86 Mt), India (85 Mt) and Japan (81 Mt).

In the United States, Florida Rock Industries completed its new 700 000-t/y plant in Florida.

U.S. antidumping duties against grey Portland cement and clinker from Japan, Mexico and Venezuela remained in effect in 1999.

**Figure 1**  
**Canadian Cement Production, 1986-99**



Sources: Statistics Canada; Portland Cement Association.

<sup>P</sup>Preliminary.

Note: Cement production includes clinker exports.

## CONSUMPTION AND TRADE

Cross-border trade of both cement and clinker with the United States varies considerably from year to year depending on demand. Annual exports of cement to the United States amount to 3-4 Mt and account for about one third of total Canadian production (shipments), as defined in Table 1. Exports are mainly destined for the southern Great Lakes region and the northwestern Pacific region. Similarly, Canada's imports of cement amount to about 0.5 Mt and relate mainly to the equivalent cross-border regions.

Low-cost marine transportation has influenced world trade considerably. Total U.S. imports of cement (excluding clinker) for consumption were about 25 Mt in 1999, or 23% of apparent consumption. Combined imports of cement from Europe, Latin America and Asia account for the largest share, although Canada remains the largest individual source. The importance of supplementary cementing materials (SCMs) for a range of uses is increasingly being recognized. For example, about 850 000 t of fly ash, accounting for about 17% of production, were used in 1999 according to a recent NRCan-coordinated survey in cooperation with the Canadian Electricity Association (Table 4).

## TECHNOLOGY

Energy conservation programs by the Canadian cement industry have reduced the energy consumption per unit of production by about 26% since 1974. Although the number of kilns has decreased, their individual capacities have increased and the more efficient dry-process plants will account for more than 95% of total clinker capacity when Lafarge Canada's Richmond plant is fully on stream in the year 2000. The fuel mix has changed considerably away from natural gas and petroleum products toward coal and/or coke. In 1998, of 17 clinker-producing plants, 10 reported using coal and/or coke as their primary fuel. Eight plants reported using waste as an alternative or supplemental fuel, according to the Canadian Portland Cement Association (CPCA). Waste was used at one plant as a primary fuel. In 1998, the Canadian cement industry consumed, on average, 4607 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, it is apparent that improved waste management involving combustion technology is leading to greater conservation of non-renewable fossil fuels.

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 will draw on some current initiatives and the expertise of the Canada Centre for Mineral and Energy Technology (CANMET), it will be 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 emphasis on advanced concrete programs that contribute to infrastructure durability, waste reduction and energy saving continued.

Based on an agreement with the Electric Power Research Institute (EPRI) of Palo Alto, California, CANMET is involved in a multi-year, cost-shared contract on blended cements. Past cooperative research into supplementary cementing materials (SCMs) has led to the production and use of a ground granulated blast furnace slag for use as a cementitious material in concrete.

In April 1999, the Committee for the Organization of CANMET/ACI Conferences, as well as others, sponsored a two-day CANMET/ACI International Symposium on Concrete Technology for Sustainable Development in Vancouver. In 2000, this committee will

sponsor two international conferences: the Fifth CANMET/ACI International Conference on Durability of Concrete, June 4-9, 2000, in Barcelona, Spain, and the Sixth CANMET/ACI International Conference on Superplasticizers and Other Chemical Admixtures in Concrete, October 10-13, 2000, in Nice, France. In 2001 this committee will sponsor three international conferences: the Seventh CANMET/ACI International Conference on Fly Ash, Silica Fume, Slag and Natural Pozzolans in Concrete, to be held July 22-27, 2001, in Madras, India; the Fifth CANMET/ACI International Conference on Recent Advances in Concrete Technology, July 29-August 1, 2001, in Singapore; and the Three-Day International Symposium on Sustainable Development and Concrete Technology, September 16-19, 2001, in San Francisco.

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 new 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](mailto:abowles@nrcan.gc.ca).

Lafarge Corporation, which processes slag at four blast furnaces in Canada, as well as in Florida, has entered into an agreement with Ispat Inland Inc. of Indiana to manage the production and sale of blast furnace slag. This cementitious (non-Portland cement) product is increasingly being used in ready-mixed concrete, concrete road pavements, and as a lightweight aggregate. Under certain market conditions, investments related to this product have proven to be cost-effective relative to the high capital costs related to new Portland cement capacity. (Similarly, SLC has entered into partnerships in both Canada and the United States to produce slag granules, as noted in the Cement chapter of the 1998 edition of the *Canadian Minerals Yearbook*.)

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, including cement and lime.

## OUTLOOK

Cement shipments in 2000 are expected to increase, based mainly on relatively low interest rates, continued recent strength in both residential and non-residential building construction, and a stable demand for exports.

Housing starts were about 150 000 in 1999, according to the Canada Mortgage and Housing Corporation. By way of comparison, housing starts were 149 000 in 1997 and 137 000 in 1998. With real economic growth in both Canada and the United States forecast to continue, the outlook remains positive for the office and industrial building sectors. (Additional information can be obtained on the Internet at <http://www.cmhc-schl.gc.ca/cmhc.html>.)

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 consumption of cement is forecast to be about 1.9 billion t and 2.1 billion t in 2005 and 2010, respectively, according to a recent report by Ocean Shipping Consultants Ltd. Of the overall forecasted 550-Mt increase, and accepting the 1999 base-year world estimate of 1.56 billion t by the U.S. Geological Survey, 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 pozzolans for certain concrete applications is expected to become more important in modern cement and concrete practices.

*Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 65. (2) Information in this review was current as of February 1, 2000. (3) This and other reviews, including previous editions, are available on the Internet at [http://www.nrcan.gc.ca/mms/cmy/index\\_e.html](http://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
2523.21	Portland cement: 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 2000, Canada Customs and Revenue Agency; Harmonized Tariff Schedule of the United States, 2000.

TABLE 1. CANADA, CEMENT PRODUCTION AND TRADE, 1997-99

Item No.	1997		1998		1999p	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>PRODUCTION<sup>1</sup> (all forms)</b>						
Newfoundland	x	x	x	x	x	x
Nova Scotia	x	x	x	x	x	x
Quebec	2 610 187	209 200	2 700 103	221 344	2 758 000	229 897
Ontario	5 247 620	446 497	5 190 592	460 179	5 529 891	510 532
Alberta	x	x	x	x	x	x
British Columbia	1 822 108	175 373	1 728 277	172 015	1 679 085	171 637
Total	11 736 272	1 062 708	12 124 058	1 147 757	12 604 000	1 232 058
<b>IMPORTS<sup>2</sup></b>						
2523.10	Cement clinker					
Lebanon	-	-	10 995	479	190 365	8 841
Spain	-	-	-	-	23 693	1 126
Mexico	58 195	3 316	78 802	3 711	7 991	355
United States	15	1	288	24	331	14
Thailand	-	-	76 507	4 743	-	-
Bermuda	27 096	1 807	20 811	1 018	-	-
Belgium	25 730	1 712	-	-	-	-
Total	111 036	6 836	187 403	9 975	222 380	10 336
2523.21	Portland cement, white, whether or not artificially coloured					
Mexico	-	-	2 690	493	38 784	3 736
United States	9 096	1 484	13 157	2 529	13 403	2 716
Bermuda	-	-	-	-	19 380	877
Denmark	72	19	132	36	3 059	421
Other countries	117	15	597	96	6	1
Total	9 285	1 518	16 576	3 154	74 632	7 751
2523.29	Portland cement, n.e.s.					
United States	588 974	44 030	495 375	39 944	455 483	36 972
Croatia	-	-	-	-	781	61
Mexico	-	-	753	75	578	45
France	977	109	2 123	170	242	25
Lebanon	-	-	5 450	597	-	-
Colombia	2 423	249	2 757	300	-	-
United Kingdom	6 915	368	43	5	-	-
Other countries	1 057	67	174	10	58	4
Total	600 346	44 823	506 675	41 101	457 142	37 107
2523.30	Aluminous cement					
United States	10 936	6 523	13 602	8 086	13 640	7 982
Croatia	-	-	-	-	185	91
France	139	76	270	156	3	3
Other countries	3	...	3	1	43	22
Total	11 078	6 599	13 875	8 243	13 871	8 098
2523.90	Hydraulic cement, n.e.s.					
United States	29 876r	5 055	45 607	5 872	57 713	6 841
China	1	...	634	72	14 374	1 515
United Kingdom	2 412	583	3 636	715	2 360	494
Japan	275	79	334	92	693	159
France	61	14	210	52	564	110
Belgium	3 425	698	9 770	2 279	5	1
Colombia	1 638	164	773	77	-	-
Other countries	188	48	331	70	308	66
Total	37 876r	6 641	61 295	9 229	76 017	9 186
6810.11	Building blocks and bricks of cement, concrete or artificial stone					
United States	..	1 600	..	2 801	..	3 632
Brazil	-	-	..	61	..	126
Other countries	..	324	..	50	..	38
Total	..	1 924	..	2 912	..	3 796

TABLE 1 (cont'd)

Item No.	1997		1998		1999P	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>IMPORTS (cont'd)</b>						
6810.19	Tiles, flagstones and similar articles of cement/concrete or artificial stone					
	United States	.. 15 490	..	17 620	..	15 118
	Italy	.. 1 142	..	1 356	..	966
	Spain	.. 89	..	128	..	109
	Portugal	.. -	..	132	..	91
	Netherlands	.. 21	..	..	..	63
	Mexico	.. 50	..	14	..	29
	United Kingdom	.. -	..	11	..	25
	Malta	.. 403	..	175	..	19
	India	.. 264	..	77	..	-
	Other countries	.. 192	..	148	..	84
	Total	.. 17 651	..	19 661	..	16 504
6810.20	Pipes of cement or concrete					
		-	-	-	-	-
6810.91	Prefabricated structural components of buildings, etc., of cement/concrete, etc.					
	United States	.. 2 470	..	6 909	..	3 176
	United Kingdom	.. 962	..	899	..	503
	Other countries	.. 134	..	116	..	14
	Total	.. 3 566	..	7 924	..	3 693
6810.99	Articles of cement, of concrete or of artificial stone, n.e.s.					
	United States	.. 14 354	..	16 695	..	17 003
	China	.. 1 271 <sup>r</sup>	..	4 015	..	3 875
	United Kingdom	.. 647	..	1 103	..	746
	Mexico	.. 178	..	333	..	607
	Malaysia	.. 8	..	9	..	480
	Philippines	.. 83	..	228	..	264
	Italy	.. 251 <sup>r</sup>	..	87	..	222
	Hong Kong	.. 50	..	215	..	187
	South Korea	.. 22	..	9	..	150
	Germany	.. 86	..	100	..	71
	Taiwan	.. 8 <sup>r</sup>	..	11	..	71
	Other countries	.. 92	..	94	..	150
	Total	.. 17 050 <sup>r</sup>	..	22 899	..	23 826
<b>EXPORTS</b>						
2523.10	Cement clinker					
	United States	1 019 308	72 025	1 657 808	93 004	1 212 528
	Total	1 019 308	72 025	1 657 808	93 004	1 212 528
2523.21	Portland cement, white, whether or not artificially coloured					
	United States	215 058	25 062	481 690	51 239	210 066
	St. Pierre and Miquelon	92	17	122	23	62
	Liberia	-	-	-	-	4
	Other countries	-	-	75	27	40
	Total	215 150	25 079	481 887	51 289	210 172
2523.29	Portland cement, n.e.s.					
	United States	4 086 333	290 508	3 745 080	258 042	4 057 022
	South Korea	-	-	-	-	316
	Iceland	-	-	-	-	200
	Other countries	511	88	381	75	52
	Total	4 086 844	290 596	3 745 461	258 117	4 057 590
2523.30	Aluminous cement					
	Total	-	-	-	-	-
2523.90	Hydraulic cement, n.e.s.					
	United States	28 644	7 098	72 106	12 533	22 742
	Chile	-	-	123	71	105
	Jamaica	-	-	-	-	74
	Singapore	77	33	93	67	17
	Other countries	353	216	90	87	56
	Total	29 074	7 347	72 412	12 758	22 994
						3 767

TABLE 1 (cont'd)

Item No.	1997		1998		1999 <sup>p</sup>	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
<b>EXPORTS (cont'd)</b>						
6810.11	Building blocks and bricks of cement, concrete or artificial stone					
	United States	.. 24 538	.. 35 964	.. 53 908		
	Japan	.. 257	.. 178	.. 234		
	Ukraine	.. 87	.. 156	.. 50		
	Australia	.. 70	.. 11	.. 42		
	Taiwan	.. -	.. 257	.. -		
	Other countries	.. 91	.. 78	.. 78		
	Total	.. 25 043	.. 36 644	.. 54 312		
6810.19	Tiles, flagstones and similar articles of cement/concrete or artificial stone					
	United States	.. 16 188	.. 23 226	.. 33 420		
	Turkey	.. -	.. -	.. 2 501		
	Japan	.. 954	.. 2 484	.. 1 888		
	Australia	.. 58	.. -	.. 1 275		
	Other countries	.. 217	.. 36	.. 110		
	Total	.. 17 417	.. 25 746	.. 39 194		
6810.20	Pipes of cement or concrete					
		.. -	.. -	.. -		
6810.91	Prefabricated structural components of buildings, etc., of cement/concrete, etc.					
	United States	.. 60 334	.. 68 593	.. 115 800		
	France	.. -	.. -	.. 207		
	Saint Kitts and Nevis	.. -	.. -	.. 45		
	Bermuda	.. -	.. 46	.. 38		
	Guatemala	.. -	.. 538	.. -		
	United Kingdom	.. 444	.. 84	.. -		
	Other countries	.. 218	.. 105	.. 38		
	Total	.. 60 996	.. 69 366	.. 116 128		
6810.99	Articles of cement, of concrete or of artificial stone, n.e.s.					
	United States	.. 41 816	.. 45 217	.. 48 597		
	United Kingdom	.. 3 259	.. 1 975	.. 1 726		
	France	.. -	.. 37	.. 528		
	Jordan	.. -	.. -	.. 45		
	Japan	.. 216	.. 63	.. 43		
	Italy	.. 14	.. 250	.. -		
	Malaysia	.. 256	.. -	.. -		
	Other countries	.. 129	.. 476	.. 21		
	Total	.. 45 690	.. 48 018	.. 50 960		

Sources: Natural Resources Canada; Statistics Canada.

- Nil; . . Not available; n.e.s. Not elsewhere specified; <sup>p</sup> Preliminary; <sup>x</sup> 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 1998**

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)						
<b>ATLANTIC REGION</b>						
Lafarge Canada Inc.	Brookfield, N.S.	D	C, Wa	2	610	476
North Star Cement Limited	Corner Brook, Nfld.	Dx	O, Wa	1	245	158
Subtotal, Atlantic region				3	855	634
<b>QUEBEC</b>						
Lafarge Canada Inc.	St. Constant	D	Wa, C, O, G	2	1 160	950
Ciment Québec Inc.	St. Basile	Dc	C, O, G, Wa	1	995	759
St. Lawrence Cement Inc.	Joliette	D	C, Wa	4	1 475	900
Subtotal, Quebec region				7	3 630	2 609
<b>ONTARIO</b>						
Lafarge Canada Inc.	Woodstock	W	C, G	2	775	509
	Bath	D	C	1	1 090	987
Federal White Cement Ltd.	Woodstock	Dx	O	1	200	184
ESSROC Canada Inc.	Picton	D, Dx	C, G	2	746	1 229
St. Lawrence Cement Inc.	Mississauga	W, Dc	C, O, Wa	3	2 009	1 759 <sup>a</sup>
Blue Circle Canada Inc.	Bowmanville	Dc	C	1	1 213	1 622
	St. Marys	Dx	C, G, Wa	1	626	743
Subtotal, Ontario region				11	6 659	7 033
<b>PRAIRIE REGION</b>						
Lafarge Canada Inc.	Exshaw, Alta.	D, Dc	G	2	1 388	1 075
Inland Cement Limited (Cimenteries CBR/Heidelberger)	Edmonton, Alta.	Dc	G	1	1 380	930
Subtotal, Prairie region				3	2 768	2 005
<b>BRITISH COLUMBIA</b>						
Lafarge Canada Inc.	Kamloops	D	C, G	1	259	205
	Richmond	W	G, Wa	2	616	488
Tilbury Cement Limited (Cimenteries CBR/Heidelberger)	Delta	Dx	C, G, Wa	1	1 050	1 155
Subtotal, B.C. region				4	1 925	1 848
Total Canada (9 companies)				28	15 837	14 129

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

<sup>a</sup> Two kilns inactive.

Note: Total active kiln capacity including white cement is approximately 13.6 Mt/y.



**TABLE 3. CANADA, CEMENT PLANTS, KILNS AND CAPACITY UTILIZATION, 1980-99**

	Clinker-Producing Plants	Kilns	Approximate Cement Grinding Capacity	Portland and Masonry Cement Production <sup>1</sup>	Clinker Exports	Approximate Total Production <sup>2</sup>	Capacity Utilization
			(t/y)	(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 <sup>a</sup>	16 800 000	8 593 399	988 348	9 581 747	57
1993	18	34 <sup>a</sup>	16 800 000	9 393 581	882 935	10 276 516	61
1994	18	34 <sup>a</sup>	17 021 000 <sup>r</sup>	10 584 414	981 024	11 565 438	68
1995	18	34 <sup>a</sup>	16 157 000 <sup>r</sup>	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 <sup>p</sup>	17	28	15 840 000	12 604 000	1 212 528	13 816 528	87

Sources: Statistics Canada; Portland Cement Association.

<sup>p</sup> Preliminary; <sup>r</sup> Revised.<sup>a</sup> Includes inactive kilns.<sup>1</sup> Producers' shipments and amounts used by producers. <sup>2</sup> Cement shipments plus clinker exports.**TABLE 4. CANADA, PRODUCTION AND USE OF COAL COMBUSTION PRODUCTS (CCPs), 1999<sup>1,2</sup>**

	Fly Ash	Bottom Ash	FGD Gypsum	Other <sup>3</sup>	Total CCPs
	(000 tonnes)				
<b>PRODUCTION</b>					
Produced	5 100	1 845	357	129	7 431
Removed from disposal	1	26	—	—	27
Stored on site	4 245	1 537	22	129	5 934
<b>USE (DOMESTIC)</b>					
Agriculture	—	—	—	—	—
Blasting grit/roofing granules	—	—	—	—	—
Cement	334	135	—	—	469
Concrete/grout	350	—	—	—	350
Flowable fill <sup>4</sup>	—	—	—	—	—
Mineral filler	—	—	—	—	—
Mining applications	126	—	—	—	126
Roadbase/subbase	11	107	—	—	118
Snow and ice control	—	—	—	—	—
Structural fills	—	—	—	—	—
Wallboard	—	—	500	—	500
Other <sup>4</sup>	29	—	—	—	29
Total use	850	242	500	—	1592
Individual use percentage	17%	13%	140%	—	n.a.
Cumulative use percentage	17%	15.7%	21.8%	—	21.4%

Sources: Natural Resources Canada; Canadian Electricity Association.

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

<sup>1</sup> Production of coal combustion products (CCPs) includes both dry and ponded categories. <sup>2</sup> Use (domestic) includes amounts imported (assumed HS codes 2621.00 relating to fly ash, and 2520.10 relating to gypsum). <sup>3</sup> Cfb (circulating fluidized bed) fly ash and bottom ash. <sup>4</sup> Relates to uses such as waste stabilization, oil well reclamation/cementing agent, microspheres and roofing tiles.

**TABLE 5. CANADA, VALUE OF CONSTRUCTION BY TYPE, 1994-97**

	1994	1995	1996	1997
	(\$ millions)			
<b>BUILDING CONSTRUCTION</b>				
Residential	34 922	29 186	32 575	37 407
Industrial	3 006	3 243	4 236	4 057
Commercial	6 251	6 265	6 936	7 210
Institutional	4 931	4 982	4 955	4 792
Other	1 948	2 095	2 293	2 349
Total building	51 058	45 770	50 995	55 815
<b>ENGINEERING CONSTRUCTION</b>				
Marine	492	445	449	454
Transportation	6 032	6 436	6 158	5 758
Waterworks	904	1 140	1 360	1 672
Sewage, dams, sanitary systems	1 501	1 585	1 390	1 449
Electric power	3 965	3 441	2 935	2 412
Communications	1 446	1 298	1 880	2 064
Gas and oil facilities	13 721	13 474	12 891	17 187
Other	2 325	2 803	2 491	2 869
Total engineering	30 386	30 621	29 554	33 865
Total construction	81 444	76 391	80 549	89 680

Sources: Natural Resources Canada; Statistics Canada, catalogue no. 61-223-XIB, *Capital Expenditures by Type of Asset* (additional information is also available on the Internet at <http://www.statcan.ca/english/Pgdb/Economy/Manufacturing/manuf18.htm> or <http://www.cmhc-schl.gc.ca/MkInfo/store/#nho>).

Notes: Numbers may not add to totals due to rounding. Expenditures include value of new construction as well as major renovation work purchased.

**TABLE 6. WORLD PRODUCTION OF CEMENT, 1998 AND 1999<sup>e</sup>**

	1998	1999 <sup>e</sup>
	(000 tonnes)	
Canada	12 124	12 600
Brazil	43 000 <sup>e</sup>	43 000
China	513 500	520 000
Germany	36 610	37 000
India	85 000 <sup>e</sup>	87 000
Italy	35 000 <sup>e</sup>	35 000
Japan	81 328	80 000
Korea, South	46 791	55 000
Russia	26 726	27 000
Spain	27 943	28 000
Thailand	30 000 <sup>e</sup>	34 000
Turkey	38 200	37 000
United States	85 612	87 300
Other countries	467 985	485 500
Total world	1 529 819	1 568 400

Sources: Natural Resources Canada; U.S. Geological Survey, January 2000.

<sup>e</sup> Estimated.