# Cement

***Doug Panagapko***

*The author is with the Minerals and Metals Sector, Natural Resources Canada.*
*Telephone: (613) 992-2667*
*E-mail: dpanagap@nrcan.gc.ca*

## INTRODUCTION

Portland cement was first made by bricklayer Joseph Aspdin in England in 1824 and it is the primary ingredient of concrete. Raw materials for cement manufacture include limestone that is usually quarried locally, alumina sourced from shale or clay or from by-products such as coal fly ash and silica (sand), and iron oxide. Approximately 1.6 tonnes of raw materials is required to produce one tonne of cement (85% limestone and 15% silica, alumina and iron combined). This raw mix is burned in a long rotary kiln at temperatures of 1500°C to produce an intermediate product called clinker (a complex of calcium-aluminum silicates). Fuels used to fire the kiln include pulverized coal, petroleum coke, natural gas, waste oils and tires. Clinker is then ground to a fine powder with about 3-4% gypsum (as a set retarder) and other additives, such as slag or limestone, to produce portland cement. Cement is shipped in powdered form to ready-mix concrete plants where it is combined with coarse and fine aggregates and water to form concrete for use in numerous construction applications.

## CANADIAN INDUSTRY

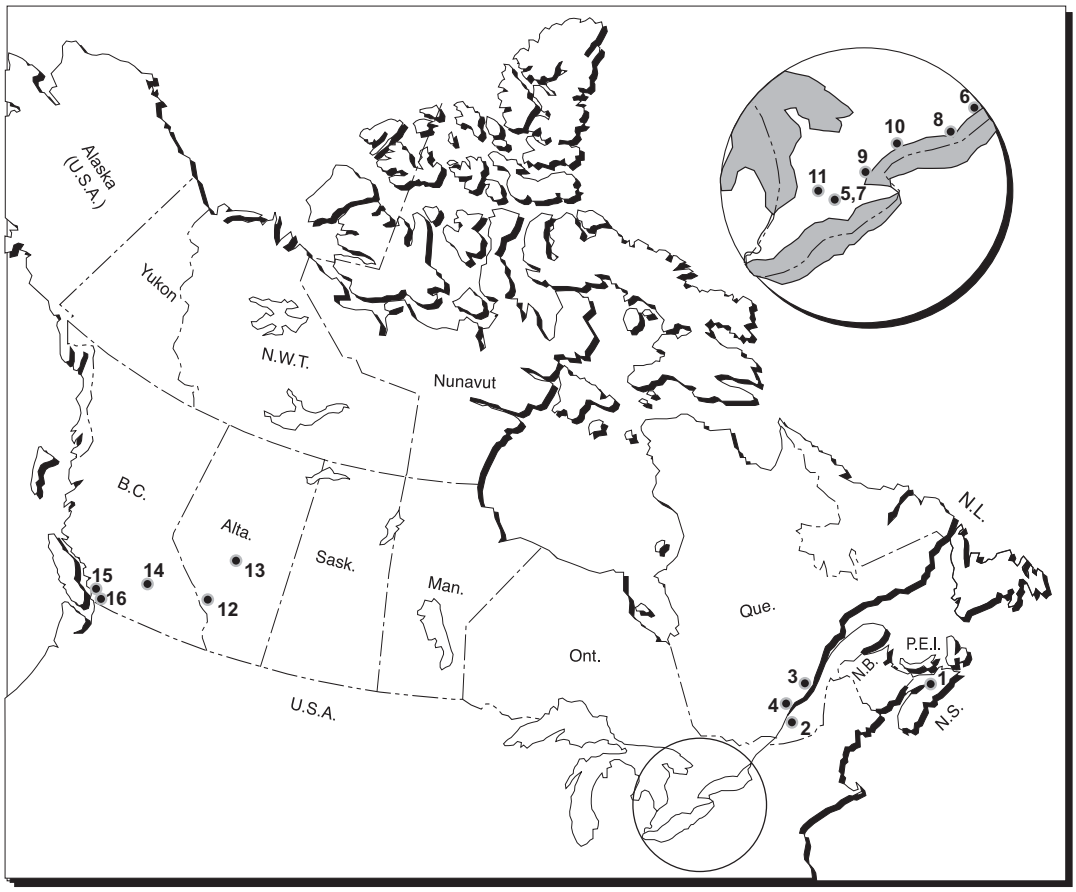
Portland cement is produced at 16 plants in five provinces (Nova Scotia, Quebec, Ontario, Alberta and British Columbia) by seven companies (Figure 1). Cement manufacturers in Canada shipped an estimated 14.88 Mt of portland cement valued at $1.62 billion in 2004, based on preliminary data, compared to shipments of 14.19 Mt valued at $1.49 billion in 2003, based on revised data (Table 1). This represents an increase in shipments of 4.9%. Portland cement production has been on a steady upward trend since 1992 and has increased 14.6% since 2001, as shown in Figure 2. Clinker exports have remained steady, averaging 750 000 t in the last five years. Plant capacity utilization (Figure 2, Table 3) stands at 85%.

Most cement companies are integrated companies in the building products sector and have interests that include cement, concrete and aggregates. Lafarge North America, based in Herndon, Virginia, and 53% owned by Lafarge SA of France, operates seven cement plants located across Canada. Lafarge NA is an integrated building products company and it has operations in the aggregates, concrete and gypsum sectors as well. St. Lawrence Cement Inc. of Montréal, Quebec, operates plants in Quebec and Ontario and is 64% owned by Swiss-based Holcim AG. St. Marys Cement (Canada) Inc., of Toronto, Ontario, produces cement from two plants in Ontario. The company is a subsidiary of Votorantim Cimentos of Sao Paulo, Brazil. It also operates slag granulators at Algoma Steel in Sault Ste. Marie and at the Stelco Lake Erie Works in Nanticoke, Ontario. Essroc Canada Inc., owned by Italcementi Group of Italy, has a cement plant in Picton, Ontario. Lehigh Inland and Lehigh Northwest, owned by Heidelberg Cement Group of Germany, have plants in Alberta and British Columbia, respectively. Other cement plants are owned by Ciment Quebec at St. Basile, Quebec, and by Federal White Cement at Woodstock, Ontario.

Table 2 shows cement plants that were in operation in 2004, as well as clinker and finish-grinding capacities, according to data from the Portland Cement Association. Overall clinker capacity increased 1.6% while grinding capacity decreased 2.6%. Primary-stage clinker production is more indicative of ultimate cement production capacity because this is the most capital/energy-intensive stage and clinker can be stockpiled for later use or shipped off-site to grinding-only plants. Total clinker capacity in Canada is estimated at 16.23 Mt/y. Of this total, 562 000 t of capacity is inactive (two wet kilns at St. Lawrence Cement in Mississauga, Ontario). Total estimated grinding capacity is 17.55 Mt/y.

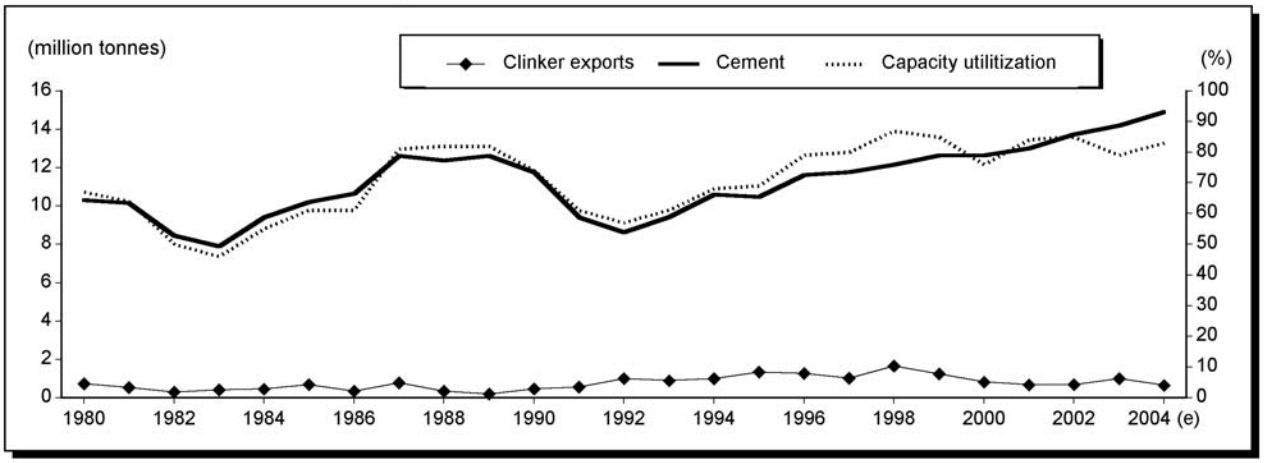
Atlantic Canada has one operating cement plant, located at Brookfield, Nova Scotia, owned by Lafarge Canada Inc. In Quebec, total clinker capacity at three plants is 2.73 Mt/y. The three cement plants, two in the Montréal area and one near Québec City, account for about 21% of Canada's total output. There are six plants in southern Ontario between Kingston and St. Marys that account for

## Figure 1
## Cement Producers in Canada, 2004




1. Lafarge Canada Inc., Brookfield, N.S.
2. Lafarge Canada Inc., Saint-Constant, Que.
3. Ciment Québec Inc., Saint-Basile, Que.
4. St. Lawrence Cement Inc., Joliette, Que.
5. Lafarge Canada Inc., Woodstock, Ont.
6. Lafarge Canada Inc., Bath, Ont.
7. Federal White Cement Ltd., Woodstock, Ont.
8. Essroc Canada Inc., Picton, Ont.
9. St. Lawrence Cement Inc., Mississauga, Ont.
10. St. Marys Cement (Canada) Inc., Bowmanville, Ont.
11. St. Marys Cement (Canada) Inc., St. Marys, Ont.
12. Lafarge Canada Inc., Exshaw, Alta.
13. Lehigh Inland Cement Limited, Edmonton, Alta.
14. Lafarge Canada Inc., Kamloops, B.C.
15. Lafarge Canada Inc., Richmond, B.C.
16. Lehigh Northwest Cement Limited, Delta, B.C.

**Figure 2**
**Canadian Cement Production, 1980-2004**




Source: Natural Resources Canada.
(e) Estimated.

46% of Canada's total portland cement production. One plant at Woodstock, Ontario, manufactures white architectural cement. In 2004, the Votorantim plant in St Marys installed a new finishing mill and made process modifications to the kiln to accept either pulverized coal or pet coke. St Marys Cement is planning to substantially increase the permitted depth of its Bowmanville quarry, allowing an additional 30 years of limestone reserves to be accessed. There are five cement plants in western Canada (in Alberta and British Columbia).

Cement production and shipments are directly related to construction activity levels in Canada and parts of the United States. Table 5 shows the value of construction in Canada by type, according to data provided by Statistics Canada. When comparing activity in 2004 to 2003, there was an overall increase of 11.8% to $146.4 billion for all types of construction, with residential and non-residential building construction increasing 10.8%. Statistics Canada also reports on the value of building permits. In 2004, building permits completed in Canada increased from $50.77 billion to $55.57 billion, an increase of 9.5%.

## WORLD OVERVIEW

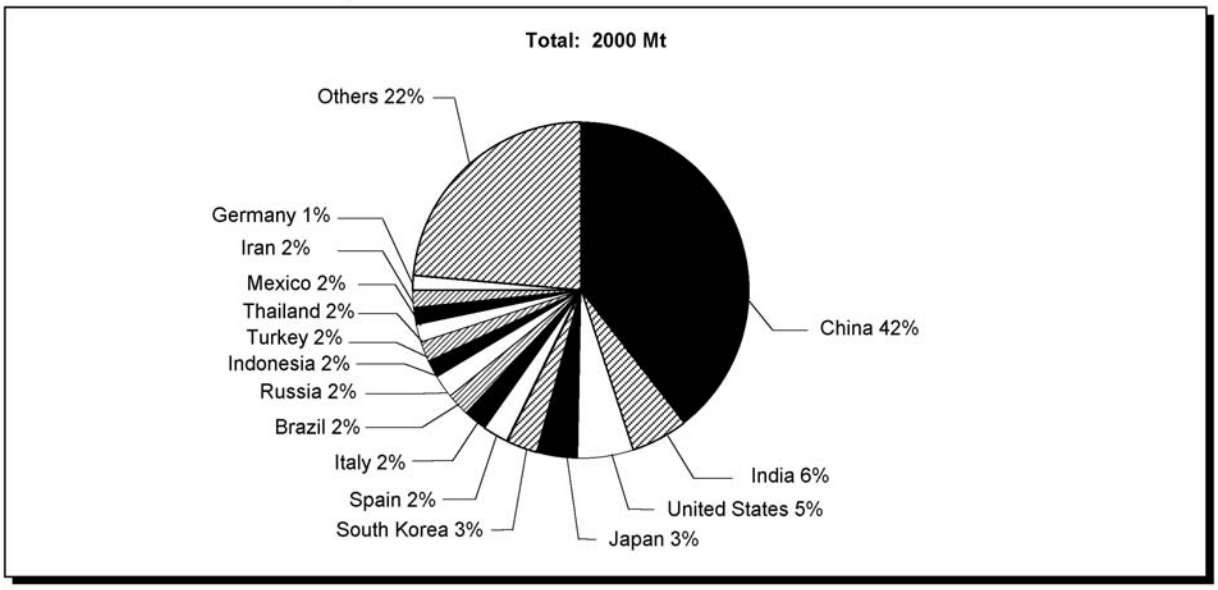
World cement production in 2004 is estimated at 2000 Mt, an increase of 2.5% over the 2003 value of 1950 Mt, according to U.S. Geological Survey reports (Table 6, Figure 3). The top five producing countries are: China (850 Mt, 42% of total), India (110 Mt, 6%), the United States (96.5 Mt, 5.1%), Japan (69 Mt, 3%) and South Korea (60 Mt, 3%). The United States produced about 90 Mt of portland cement and 5 Mt of masonry cement in 2004 from 114 plants (source: USGS). Clinker capacity in the United States is estimated at 92.1 Mt/y and total finish grinding capacity is estimated at 117 Mt/y.

The catastrophic tsunami that occurred in Southeast Asia in December 2004 affected some cement capacity and will certainly have a longer-term effect on demand for cement in the area. A 1.3-Mt- capacity cement plant owned by Lafarge SA in Banda Aceh, Indonesia, was severely damaged by the tsunami and at least 200 workers were killed. Cement is being supplied to the region from plants in Malaysia while the company begins the rebuilding process.

Lafarge North America decided not to purchase the U.S. cement assets of Blue Circle North America that it currently manages. The assets include 5 cement plants, 14 cement terminals and a slag grinding facility. Lafarge will continue to manage these facilities for Lafarge SA under an existing management agreement.

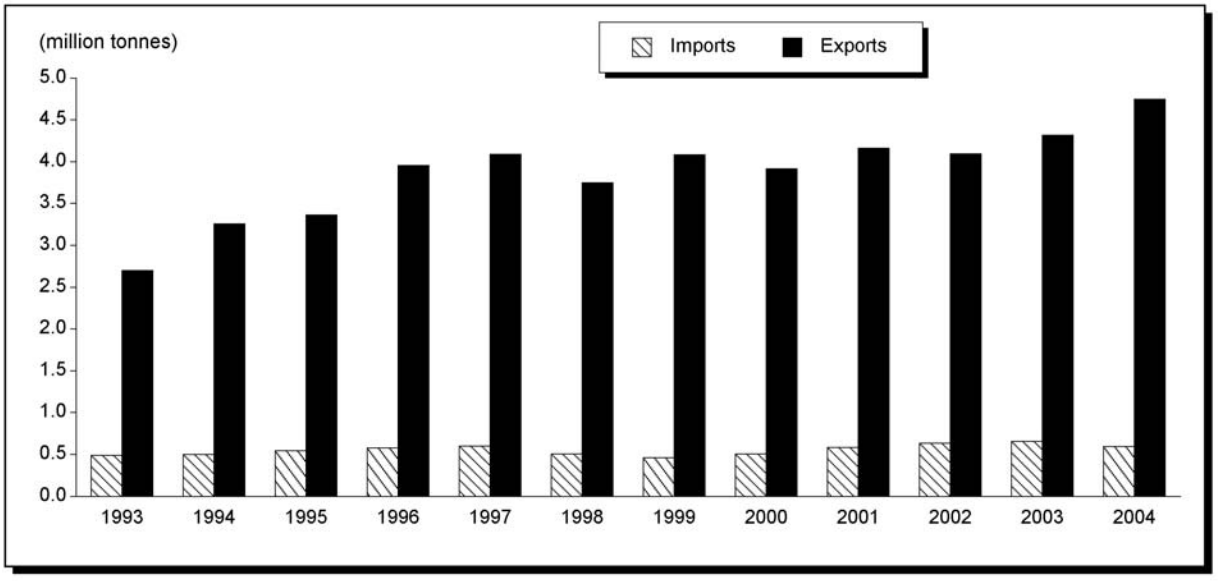
Mexican cement producer Cemex has signed an agreement with Votorantim Cimentos of Brazil whereby Votorantim agreed to purchase two Cemex plants located in Charlevoix, Michigan, and Dixon, Illinois, representing a total of 2 Mt of capacity. Meanwhile, late in the year, Cemex announced its intention to purchase RMC Group PLC of Britain for US$5.8 billion in cash and assumed debt. After the purchase, Cemex will be the third largest cement producer, the fourth largest aggregate producer, and the largest ready-mix concrete producer in the world.

**Figure 3**
**World Cement Production, 2004**




Source: U.S. Geological Survey.

**Figure 4**
**Canadian Portland Cement Trade, 1993-2004**




Source: Natural Resources Canada.

## USE AND TRADE

Portland cement is used in the manufacture of concrete, which comprises the raw material for numerous building and engineering construction applications, including buildings, roads and bridges. A typical mix design for a concrete highway would contain about 360 kg of cementitious materials and about 1700 kg of coarse and fine aggregates per cubic metre of concrete. Trade data for portland cement, clinker, and cement products can be found in Table 1. Figure 4 shows the trend for finished cement imports and exports for 1993-2004. Cement exports increased 10% in the past year and currently stand at 4.74 Mt, while imports decreased 8.8% to 596 500 t. Figure 5 shows clinker imports and exports for the same period. With the exception of 2003, clinker exports have averaged 660 000 t since 2001, while less than 100 000 t of clinker are imported each year. Exports of white architectural cement increased 26% in 2004 to 308 185 t.

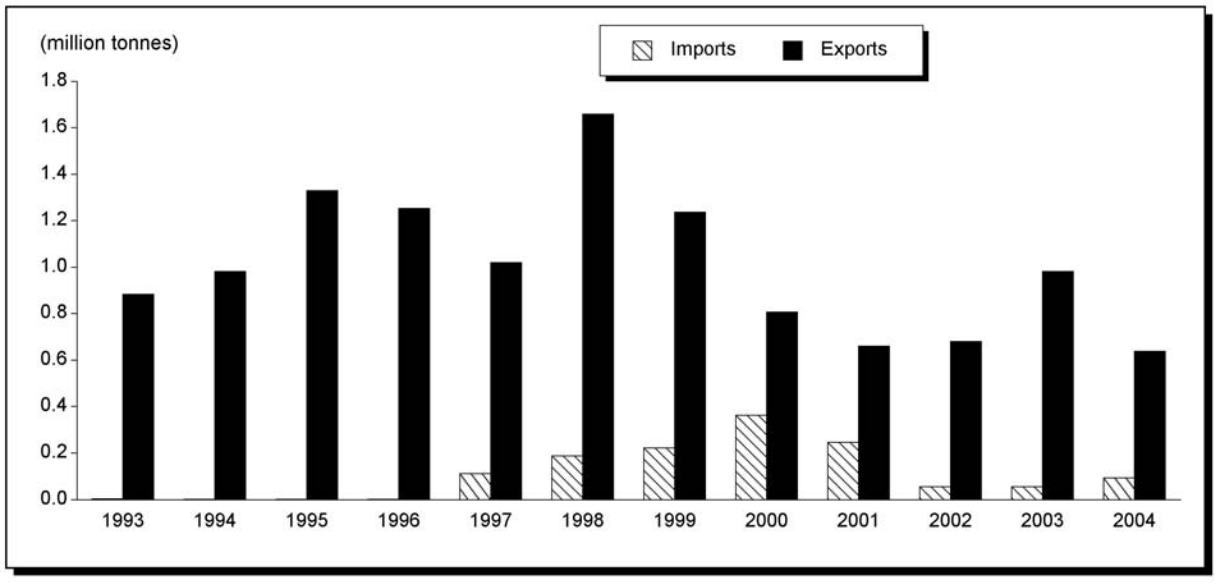
The majority of Canadian cement exports are destined for the United States. For the current year, 23% of U.S. domestic consumption came from imports, an increase of 3% from the previous year. The United States sourced about 21% of its imported cement from Canada. Other key countries that export to the United States include China (11.6% of imports), Thailand (10.1%), Venezuela (9.1%) and Greece (7.2%).

## TECHNOLOGY NEWS

The 8th International Science and Technology Conference on Gypsum and Fly Ash took place in Toronto in June 2004. This two-day event, presented by Process Research ORTECH Inc., brought together individuals and companies involved in the utilization of fly ash and synthetic gypsum in the cement and concrete industries. Numerous papers were presented on the subject of applications for the increased use of fly ash in concrete in the effort to produce durable concrete while reducing greenhouse gas emissions associated with cement manufacture. Applications using high-volume fly ash that were discussed at the meeting include self-compacting concrete, flowable fill, and cast masonry products. Of particular interest are the research efforts towards the beneficiation of higher-carbon fly ashes. These ashes are produced in thermal electricity plants that have applied other emission controls such as low-$NO_x$ burners. With increased regulation on cement plant emissions, these and other technologies will become important process steps in the production of a useable fly ash product.

St. Lawrence Cement Inc. has participated in tests of a new cementitious product derived from spent potliners from aluminum smelters. The product, called CalSiFrit™, has similar characteristics to slag cement and an estimated 100 000 t of the material will be used starting in 2005 in

**Figure 5**
**Canadian Cement Clinker Trade, 1993-2004**




Source: Natural Resources Canada.

special blended cements produced by St. Lawrence in Quebec. The research on this new supplementary cementitious material was conducted with Alcoa Canada Primary Metals and Nova Pb Inc. in collaboration with the University of Sherbrooke.

In the area of alternative fuels use, St. Lawrence Cement reported that its Joliette, Quebec, plant achieved a thermal substitution rate of 31% in 2004 using AFR (alternative fuels and raw materials, primarily tires and biomass waste) as part of its strategy to reduce the demand on virgin fuels. It has recently doubled its granular feed capacity and is now authorized to co-process additional materials.

On March 12, 2004, the Government of Canada announced the start of mandatory reporting of greenhouse gas (GHG) emissions by major emitters. Facilities that emit more than 100 000 t of GHG per year must report these emissions by June 1, 2005, to Statistics Canada. The federal, provincial and territorial governments are collaborating to define a process for a single domestic emissions reporting system in order to minimize the reporting burden on industry.

The use of supplementary cementitious materials (SCM) in cement and concrete continues to increase in Canada. SCM include coal fly ash, ground granulated blast furnace slag and silica fume. These additives act to improve the workability of concrete, reduce water requirements, and impart enhanced strength, durability and chemical-resistance properties. Table 4 contains data on the production and use of coal combustion products, including fly ash, in Canada. In 2004, coal-fired generating plants in Canada produced 4.679 Mt of fly ash, compared to 4.685 Mt the previous year. Including flue gas desulphurization gypsum (FGD or synthetic gypsum), there were 6.785 Mt of coal combustion products produced in 2004, compared to 7.239 Mt in 2003. Total use percentages were 33% in 2004, compared to 23% the previous year. Essentially 100% of FGD gypsum is used in the marketplace for wallboard manufacture and as a cement additive, whereas 31% of fly ash is used by industry. An increase was also noted in the utilization of bottom ash.

EcoSmart™ Foundation Inc., which manages the Eco-Smart Concrete Project, aims to minimize the GHG signature of concrete through optimizing the replacement of portland cement in the concrete mix by SCM. It is advised by a national committee comprising members from federal government departments, the cement and concrete industries, and engineering and architectural firms. The Foundation's web site (www.ecosmart.ca) lists numerous case studies of green building projects where high volumes of SCM have been used. A good example of the use of high volumes of SCM in construction is the Little Mountain Reservoir project in Vancouver, British Columbia. For the project, about 27 000 $m^3$ of concrete was used averaging 45% replacement of portland cement with fly ash. The Eco-Smart™ web site also provides an excellent searchable knowledge base for information on SCM and concrete.

Natural Resources Canada, through CANMET, has participated in a CIDA-funded technology transfer project entitled "Implementation of High-Volume Fly Ash in India" since 2002. As part of the project activities, 13 seminars were conducted in 11 Indian cities with over 2200 participants. Short-course training was given to over 100 Indian technical personnel and focus group meetings were conducted with over 300 state and central government authorities. A number of technology adaptation laboratory studies were undertaken across India, with related publications, and 13 successful demonstration projects were completed. Three Indian government departments released circulars mandating the increased use of fly ash in concrete structures. As the environmental, technical and economic benefits of this technology were demonstrated, the Indian construction industry has shown a strong buy-in. At the request of NRCan, CIDA has extended the project until December 31, 2005, and the collaboration between Indian partners and CANMET is expected to continue after the project is terminated.

## PRICES

The average value for portland cement in 2004 was $109/t, based on total production figures. The actual realized price for cement f.o.b. plant varies from region to region and depends on the type of cement produced. These prices are negotiated between the cement companies and their customers and are not published. Lafarge North America reported that average cement selling prices were 2% higher in Canada compared with 2003. The U.S. Geological Survey reports that the average mill net value of portland cement in 2004 was an estimated US$85/tonne. Cement prices in the United States averaged 3% higher in 2004 and resulted from the implementation of two price increases during the year. Continued cement shortages in many regions of the United States have caused construction delays and have forced increases in the cost of new homes.

## OUTLOOK

The Canadian and U.S. economies continue to gain strength and interest rates have not risen significantly, allowing for a projection of 2005 cement production in Canada to increase by 2.5% to about 15.25 Mt. Some of this production would be destined for export to satisfy strong demand in the U.S. northeast. As a measure of construction growth potential, the key driver of the cement industry, housing starts increased by 6.8% overall in 2004 to 233 400 units, compared to 218 400 units in 2003 (source: Statistics Canada). Increases were noted in

Quebec (16.3%) and British Columbia (6.8%), while there was no change in starts for Ontario or Alberta. The Canada Mortgage and Housing Corporation expects housing starts in 2005 to be about 9% lower (to around 210 200 units) due to a general cooling off of the housing market across the country. With a predicted downward trend in housing starts, growth in cement production is somewhat predicated on increased exports to the strong U.S. markets.

According to the Portland Cement Association, the U.S. construction industry should see sustained growth in 2005, in the order of 2.5%, including a strong performance in the non-residential and public construction sectors. Cement intensities, defined as the amount of cement used per dollar of construction expenditure, have increased dramatically in recent years. This trend is expected to continue, although at a slower rate. The increase in cement intensity has been attributed to a number of factors. Increases in the average family home size and changes to building codes have contributed to a higher use of concrete in single-family-home construction. With higher steel prices, concrete as a building material has been more able to compete with steel in commercial and industrial construction. Given recent trends, U.S. cement consumption should reach 125 Mt in 2005 while production will be about 98 Mt. The 27-Mt shortfall will be partly addressed by imports from Canada, expected to be about 5 Mt of portland cement and about 700 000 t of clinker.

Demand for cement in China is expected to top one billion tonnes per year by 2008, representing 44% of global demand, according to studies by the Freedonia Group. The demand will be driven by healthy growth in residential and infrastructure projects. The effect of strong demand in China may divert cement from other exporting countries in the area (Thailand and Indonesia) and cause further shortages of cement in the United States.

*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 June 30, 2005. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/com_e.html.*

## NOTE TO READERS

**The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.**

**TARIFFS**

| Item No. | Description | Canada | | | United States | EU | Japan |
|---|---|---|---|---|---|---|---|
| | | MFN | GPT | USA | Canada | Conventional Rate (1) | WTO (2) |
| 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 | 1.7% | 2.2% |
| | Portland cement: | | | | | | |
| 2523.21 | White cement, whether or not artificially coloured | Free | Free | Free | Free | 1.7% | 2.2% |
| 2523.29 | Other | Free | Free | Free | Free | 1.7% | 2.2% |
| 2523.30 | Aluminous cement | Free | Free | Free | Free | 1.7% | 2.2% |
| 2523.90 | Other hydraulic cements | Free | Free | Free | Free | 1.7% | 2.2% |
| 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 | 1.7% | Free |
| 6810.19 | Other | 5% | Free | Free | Free | 1.7% | Free |
| 6810.91 | Prefabricated structural components for building or civil engineering | 5% | Free | Free | Free | 1.7% | Free |
| 6810.99 | Other | | | | | | |
| 6810.99.10 | Pipes | 5% | Free | Free | Free | 1.7% | Free |
| 6810.99.90 | Other | 5% | Free | Free | Free | 1.7% | Free |

Sources: Canadian *Customs Tariff*, effective January 2005, Canada Border Services Agency; *Harmonized Tariff Schedule of the United States,* 2005; *Official Journal of the European Union* (October 30, 2004 Edition); *Customs Tariff Schedules of Japan, 2004*.
(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.

**TABLE 1. CANADA, CEMENT PRODUCTION AND TRADE, 2002-04**

| Item No. | | 2002 | | 2003 | | 2004 (p) | |
|---|---|---|---|---|---|---|---|
| | | (tonnes) | ($000) | (tonnes) | ($000) | (tonnes) | ($000) |
| **PRODUCTION** (1) (all forms) | | | | | | | |
| | Nova Scotia | x | x | x | x | x | x |
| | Quebec | 3 062 347 | 303 334 | 2 902 712 | 306 221 | 3 089 844 | 347 684 |
| | Ontario | 6 267 145 | 613 484 | 6 391 691 | 621 647 | 6 792 623 | 658 920 |
| | Alberta | x | x | x | x | x | x |
| | British Columbia | 2 153 000 | 239 364 | 2 500 283 | 261 132 | 2 389 425 | 274 385 |
| | Total | 13 709 934 | 1 437 349 | 14 190 386 | 1 496 767 | 14 884 147 | 1 623 442 |
| **EXPORTS** | | | | | | | |
| 2523.10 | Cement clinker | | | | | | |
| | United States | 680 487 | 60 290 | 980 743 | 70 291 | 638 611 | 40 436 |
| | Other countries | 60 | 4 | 20 | 1 | 78 | 5 |
| | Total | 680 547 | 60 294 | 980 763 | 70 292 | 638 689 | 40 441 |
| 2523.21 | Portland cement, white, whether or not artificially coloured | | | | | | |
| | United States | 219 387 | 44 306 | 243 175 | 43 204 | 307 683 | 47 440 |
| | Other countries | 18 | 11 | 475 | 58 | 502 | 51 |
| | Total | 219 405 | 44 317 | 243 650 | 43 262 | 308 185 | 47 491 |
| 2523.29 | Portland cement, n.e.s. | | | | | | |
| | United States | 4 093 040 | 358 212 | 4 316 205 | 333 979 | 4 739 062 | 327 638 |
| | United Arab Emirates | – | – | 12 | 5 | 4 304 | 411 |
| | Saint Pierre and Miquelon | – | – | 1 293 | 184 | 1 085 | 165 |
| | China | 269 | 55 | 583 | 95 | 1 207 | 123 |
| | Other countries | 250 | 82 | 576 | 125 | 1 452 | 82 |
| | Total | 4 093 559 | 358 349 | 5 318 669 | 334 388 | 4 747 110 | 328 419 |
| 2523.30 | Aluminous cement | | | | | | |
| | Colombia | – | – | – | – | 89 | 5 |
| | Saint Pierre and Miquelon | – | – | 50 | 1 | – | – |
| | Total | – | – | 50 | 1 | 89 | 5 |
| 2523.90 | Hydraulic cement, n.e.s. | | | | | | |
| | United States | 131 862 | 18 919 | 72 591 | 10 135 | 61 705 | 8 040 |
| | Jamaica | 150 | 131 | 408 | 280 | 721 | 324 |
| | South Korea | 114 | 63 | – | – | 128 | 56 |
| | Czech Republic | 164 | 114 | 174 | 79 | 105 | 47 |
| | Russia | 43 | 34 | 128 | 89 | 104 | 47 |
| | Australia | 7 | 8 | 22 | 11 | 77 | 45 |
| | China | 132 | 98 | 63 | 31 | 95 | 41 |
| | Germany | – | – | 80 | 21 | 105 | 40 |
| | Japan | 52 | 47 | 18 | 12 | 46 | 22 |
| | Other countries | 2 872 | 564 | 255 | 136 | 940 | 155 |
| | Total | 135 396 | 19 978 | 73 739 | 10 794 | 64 026 | 8 817 |
| | | **(n.a.)** | **($000)** | **(n.a.)** | **($000)** | **(n.a.)** | **($000)** |
| 6810.11 | Building blocks and bricks of cement, concrete or artificial stone | | | | | | |
| | United States | .. | 74 237 | .. | 85 174 | .. | 102 235 |
| | South Africa | .. | 13 | .. | 65 | .. | 780 |
| | Japan | .. | 183 | .. | 284 | .. | 648 |
| | Other countries | – | 20 | – | 72 | – | 573 |
| | Total | .. | 74 453 | .. | 85 595 | .. | 104 236 |
| 6810.19 | Tiles, flagstones and similar articles of cement/concrete or artificial stone | | | | | | |
| | United States | .. | 59 121 | .. | 27 918 | .. | 25 795 |
| | Japan | .. | 47 | .. | 491 | .. | 988 |
| | Other countries | – | 786 | – | 800 | – | 303 |
| | Total | .. | 59 954 | .. | 29 209 | .. | 27 086 |
| 6810.91 | Prefabricated structural components of buildings, etc., of cement/concrete, etc. | | | | | | |
| | United States | .. | 119 768 | .. | 99 042 | .. | 75 334 |
| | Japan | .. | 165 | .. | 106 | .. | 307 |
| | Other countries | – | 249 | – | 473 | – | 568 |
| | Total | .. | 120 182 | .. | 99 621 | .. | 76 209 |

**TABLE 1** (cont'd)

| Item No. | | 2002 | | 2003 | | 2004 (p) | |
|---|---|---|---|---|---|---|---|
| | | (tonnes) | ($000) | (tonnes) | ($000) | (tonnes) | ($000) |
| **EXPORTS** (cont'd) | | | | | | | |
| 6810.99 | Articles of cement, of concrete or of artificial stone, n.e.s. | | | | | | |
| | United States | .. | 80 951 | .. | 78 414 | .. | 93 772 |
| | Italy | .. | 7 | .. | 263 | .. | 695 |
| | Greece | – | – | .. | 278 | .. | 649 |
| | Other countries | – | 424 | – | 634 | – | 1 443 |
| | Total | .. | 81 382 | – | 79 589 | .. | 96 559 |
| | Total exports | .. | 818 909 | .. | 752 751 | .. | 729 263 |
| **IMPORTS** (2) | | | | | | | |
| 2523.10 | Cement clinker | | | | | | |
| | Turkey | 44 610 | 1 784 | 18 915 | 1 414 | 90 507 | 5 112 |
| | United States | 9 293 | 377 | 5 729 | 259 | 1 705 | 76 |
| | Brazil | – | – | 6 776 | 106 | 2 200 | 43 |
| | Venezuela | – | – | 23 134 | 1 349 | – | – |
| | Other countries | 424 | 16 | – | – | 1 | – |
| | Total | 54 327 | 2 177 | 54 554 | 3 128 | 94 413 | 5 231 |
| 2523.21 | Portland cement, white, whether or not artificially coloured | | | | | | |
| | Egypt | – | – | – | – | 35 900 | 1 553 |
| | United States | 11 928 | 1 332 | 9 408 | 1 474 | 11 210 | 1 418 |
| | Other countries | 429 | 104 | 472 | 86 | 889 | 168 |
| | Total | 12 357 | 1 436 | 9 880 | 1 560 | 47 999 | 3 139 |
| 2523.29 | Portland cement, n.e.s. | | | | | | |
| | United States | 603 703 | 50 748 | 608 411 | 46 390 | 558 481 | 43 330 |
| | Thailand | 3 464 | 369 | 43 931 | 4 794 | 36 739 | 4 075 |
| | Croatia | 1 131 | 90 | 267 | 29 | 146 | 48 |
| | Costa Rica | – | – | – | – | 368 | 40 |
| | France | 387 | 22 | 629 | 40 | 291 | 36 |
| | United Kingdom | 705 | 56 | 180 | 15 | 303 | 23 |
| | Other countries | 22 461 | 2 187 | 609 | 54 | 225 | 20 |
| | Total | 631 851 | 53 472 | 654 027 | 51 322 | 596 553 | 47 572 |
| 2523.30 | Aluminous cement | | | | | | |
| | United States | 11 087 | 7 513 | 12 549 | 7 938 | 12 860 | 7 482 |
| | Croatia | 2 387 | 1 599 | 2 615 | 1 578 | 2 662 | 1 455 |
| | Netherlands | 439 | 279 | 233 | 168 | 306 | 251 |
| | Other countries | 130 | 65 | 89 | 46 | 189 | 112 |
| | Total | 14 043 | 9 456 | 15 486 | 9 730 | 16 017 | 9 300 |
| 2523.90 | Hydraulic cement, n.e.s. | | | | | | |
| | United States | 70 691 | 8 419 | 82 763 | 10 325 | 55 136 | 8 332 |
| | United Kingdom | 3 301 | 527 | 1 909 | 448 | 1 892 | 572 |
| | Croatia | 1 864 | 414 | 1 454 | 277 | 1 031 | 429 |
| | Denmark | 282 | 57 | 234 | 70 | 474 | 204 |
| | France | 645 | 65 | 165 | 49 | 451 | 147 |
| | Germany | 99 | 30 | 456 | 136 | 472 | 144 |
| | Japan | 118 | 29 | 1 355 | 275 | 123 | 96 |
| | Other countries | 47 712 | 3 384 | 2 427 | 365 | 293 | 43 |
| | Total | 124 712 | 12 925 | 90 763 | 11 945 | 59 872 | 9 967 |
| | | **(n.a.)** | **($000)** | **(n.a.)** | **($000)** | **(n.a.)** | **($000)** |
| 6810.11 | Building blocks and bricks of cement, concrete or artificial stone | | | | | | |
| | United States | .. | 2 937 | .. | 3 895 | .. | 6 862 |
| | Other countries | – | 32 | – | 94 | – | 29 |
| | Total | .. | 2 982 | .. | 3 959 | .. | 6 891 |
| 6810.19 | Tiles, flagstones and similar articles of cement/concrete or artificial stone | | | | | | |
| | United States | .. | 20 827 | .. | 22 440 | .. | 27 174 |
| | Italy | .. | 1 322 | .. | 1 184 | .. | 1 119 |
| | China | .. | 183 | .. | 244 | .. | 771 |
| | Mexico | .. | 534 | .. | 260 | .. | 155 |
| | Czech Republic | .. | 171 | .. | 239 | .. | 100 |
| | Israel | .. | 44 | .. | 443 | .. | 100 |
| | Other countries | .. | 819 | .. | 873 | .. | 358 |
| | Total | .. | 23 900 | .. | 25 683 | .. | 29 777 |

**TABLE 1** (cont'd)

| Item No. | | 2002 | | 2003 | | 2004 (p) | |
|---|---|---|---|---|---|---|---|
| | | (n.a.) | ($000) | (n.a.) | ($000) | (n.a.) | ($000) |
| **IMPORTS** (cont'd) | | | | | | | |
| 6810.91 | Prefabricated structural components of buildings, etc., of cement/concrete, etc. | | | | | | |
| | United States | . . | 4 745 | . . | 3 904 | . . | 3 531 |
| | Other countries | – | 664 | – | 111 | – | 1 373 |
| | Total | . . | 5 409 | . . | 4 015 | . . | 4 904 |
| 6810.99 | Articles of cement, of concrete or of artificial stone, n.e.s. | | | | | | |
| | United States | . . | 15 423 | . . | 18 449 | . . | 20 516 |
| | China | . . | 6 497 | . . | 7 325 | . . | 8 962 |
| | Italy | . . | 56 | . . | 254 | . . | 3 060 |
| | Mexico | . . | 1 747 | . . | 1 908 | . . | 2 247 |
| | Spain | . . | 253 | . . | 923 | . . | 1 615 |
| | Belgium | . . | 1 | . . | 977 | . . | 1 258 |
| | Other countries | – | 1 397 | – | 3 207 | – | 1 719 |
| | Total | . . | 25 374 | . . | 33 083 | . . | 39 377 |
| | Total imports | . . | 137 131 | . . | 144 425 | . . | 156 158 |

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . Not available; n.e.s. Not elsewhere specified; (p) Preliminary; 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, GRINDING AND CLINKER CAPACITIES, 2003**

| Company | Plant | Kiln Type | Fuel | No. of Kilns | Grinding Capacity | Clinker Capacity |
|---|---|---|---|---|---|---|
| | | | | | (000 t/y) | |
| **ATLANTIC REGION** | | | | | | |
| Lafarge Canada Inc. | Brookfield, N.S. | D | C,OA | 2 | 616 | 520 |
| Subtotal, Atlantic region | | | | 2 | 616 | 520 |
| **QUEBEC** | | | | | | |
| Lafarge Canada Inc. | Saint-Constant | D | KA,GA | 2 | 1 157 | 956 |
| Ciment Québec Inc. (50% Essroc Group; 50% private) | Saint-Basile | Dc | C,OGA | 1 | 1 571 | 879 |
| St. Lawrence Cement Inc. (Holcim (AG) (1) | Joliette | D | CK,A | 4 | 1 475 | 900 |
| Subtotal, Quebec region | | | | 7 | 4 203 | 2 735 |
| **ONTARIO** | | | | | | |
| Lafarge Canada Inc. | Woodstock | W | CK,G | 2 | 814 | 547 |
| | Bath | D | CK,G | 1 | 876 | 946 |
| Federal White Cement Ltd. | Woodstock | Dx | OG, K | 2 | 477 | 998 |
| ESSROC Canada Inc. (Italcementi Group) | Picton | D,Dx | CK,G | 2 | 792 | 1 116 |
| St. Lawrence Cement Inc. (Holcim AG) | Mississauga | W,Dc | CA | 3 | 2 210 | (a) 1 942 |
| St. Marys Cement (Canada) Inc. | Bowmanville | Dc | CK | 1 | 1 377 | 1 966 |
| (Votorantim Cimentos) | St. Marys | Dx | K,C | 1 | 685 | 653 |
| Subtotal, Ontario region | | | | 12 | 7 231 | 8 168 |
| **PRAIRIE REGION** | | | | | | |
| Lafarge Canada Inc. | Exshaw, Alta. | D,Dc | CG | 2 | 1 422 | 1 297 |
| Lehigh Inland Cement Limited (Heidelberg Cement Group) | Edmonton, Alta. | Dc | CK | 1 | 1 380 | 1 050 |
| Subtotal, Prairie region | | | | 3 | 2 802 | 2 347 |
| **BRITISH COLUMBIA** | | | | | | |
| Lafarge Canada Inc. | Kamloops | D | CK,G | 1 | 324 | 209 |
| | Richmond | Dc | C,G | 1 | 1 319 | 1 059 |
| Lehigh Northwest Cement Limited (Heidelberg Cement Group) | Delta | Dx | C,GA | 1 | 1 054 | 1 196 |
| Subtotal, B.C. region | | | | 3 | 2 697 | 2 464 |
| Total Canada (7 companies, based on ownership) | | | | 27 | 17 549 | 16 234 |

Source: Portland Cement Association; Market and Economic Research Department.
(a) Two kilns inactive.
Fuel: C Coal; O Oil; G Gas; K Coke, A Waste.
Kiln type: W Wet; D Dry; X Preheater; C Precalciner.

**TABLE 3. CANADA, CEMENT PLANTS, KILNS AND CAPACITY UTILIZATION, 1980-2004**

| | Clinker-Producing Plants | Kilns (a) | Approximate Cement Grinding Capacity | Portland and Masonry Cement Production (1) | Clinker Exports (2) | Approximate Total Production (3) | Capacity Utilization |
|---|---|---|---|---|---|---|---|
| | (no.) | (no.) | (t/y) | (tonnes) | (tonnes) | (tonnes) | (%) |
| 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 | 73 |
| 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 | 16 | 27 | 16 190 000 | 12 985 521 | 660 913 | 13 646 434 | 84 |
| 2002 | 16 | 27 | 16 190 000 | 13 709 934 | 680 547 | 14 390 481 | 85 |
| 2003 | 16 | 27 | 18 022 000 | 14 190 386 | 980 763 | 15 171 149 | 79 |
| 2004 (e) | 16 | 27 | 17 550 000 | 14 884 147 | 638 689 | 15 522 836 | 85 |

Sources: Statistics Canada; Portland Cement Association.
(e) Estimated; (r) Revised.
(a) May include up to three inactive kilns beginning in 1992.
(1) Producers' shipments and amounts used by producers, including cement ground from imported clinker. (2) Based on Trade of Canada harmonized system code HS 2523.10. (3) Producers' shipments plus clinker exports.

**TABLE 4. CANADA, PRODUCTION (1) AND USE (2) OF COAL COMBUSTION PRODUCTS (CCPs), 2004**

| | Fly Ash | Bottom Ash | FGD Gypsum | Other (3) | Total CCPs |
|---|---|---|---|---|---|
| | | | (000 tonnes) | | |
| **PRODUCTION** | | | | | |
| Produced | 4 679 | 1 582 | x | x | 6 785 |
| Disposed/stored | 3 655 | x | – | x | 5 034 |
| Removed from disposal | x | 95 | – | – | x |
| **USE (DOMESTIC)** | | | | | |
| Cement | 625 | x | x | – | 922 |
| Concrete/grout | 593 | – | – | – | 593 |
| Mining applications | x | – | – | – | x |
| Roadbase/subbase | x | x | – | – | 215 |
| Wallboard | – | – | x | – | x |
| Other (4) | x | x | x | – | 233 |
| Total use | 1 431 | x | x | – | 2 264 |
| Individual use percentage | 31 | 30 | 102 | – | 33 |

Source: Natural Resources Canada.
– Nil; x Confidential.
(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.
Note: Numbers may not add to totals due to rounding.

**TABLE 5. CANADA, VALUE OF CONSTRUCTION BY TYPE, 1997-2004**

| | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|---|---|
| | | | | ($ billions) | | | | |
| **BUILDING CONSTRUCTION** | | | | | | | | |
| Residential investment | 36.5 | 36.0 | 38.8 | 40.8 | 43.6 | 55.1 | 61.4 | 70.4 |
| Non-residential building investment | 22.5 | 22.4 | 24.2 | 25.3 | 26.3 | 24.8 | 27.4 | 28.0 |
| Total building construction | 59.0 | 58.4 | 63.0 | 66.1 | 69.9 | 79.9 | 88.8 | 98.4 |
| **ENGINEERING CONSTRUCTION** | | | | | | | | |
| Mining and oil and gas extraction | 18.2 | 16.7 | 15.4 | 19.3 | 21.1 | 19.1 | 19.4 | 23.6 |
| Transportation and warehousing | 2.2 | 5.0 | 5.0 | 4.1 | 3.4 | 3.2 | 2.7 | 2.4 |
| Other engineering | 14.7 | 14.5 | 16.6 | 18.3 | 18.9 | 19.1 | 20.2 | 22.0 |
| Total engineering construction | 35.1 | 36.2 | 37.0 | 41.7 | 43.4 | 41.4 | 42.3 | 48.0 |
| Total all components | 94.1 | 94.6 | 100.0 | 107.8 | 113.3 | 121.3 | 131.1 | 146.4 |

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, 2001-04**

| | 2001 | 2002 | 2003 | 2004 (e) |
|---|---|---|---|---|
| | | (000 tonnes) | | |
| Canada | 12 986 | 13 700 | 14 190 | 14 884 |
| Brazil | 39 500 | 39 500 | 38 000 | 38 000 |
| China | 626 500 | 705 000 | 813 000 | 850 000 |
| Egypt | 24 500 | 23 000 | 29 100 | 35 000 |
| France | 19 840 | 20 000 | 20 000 | 19 000 |
| Germany | 28 034 | 30 000 | 30 000 | 28 000 |
| India | 100 000 | 100 000 | 110 000 | 110 000 |
| Indonesia | 31 100 | 33 000 | 35 000 | 30 000 |
| Iran | 26 650 | 30 000 | 30 000 | 30 000 |
| Italy | 39 804 | 40 000 | 38 000 | 38 000 |
| Japan | 76 550 | 71 800 | 71 000 | 69 000 |
| Mexico | 29 966 | 31 100 | 32 000 | 35 000 |
| Russia | 35 100 | 37 700 | 41 000 | 46 000 |
| South Korea | 52 012 | 55 500 | 59 200 | 60 000 |
| Spain | 40 512 | 42 500 | 42 000 | 40 000 |
| Thailand | 27 913 | 31 700 | 32 500 | 35 000 |
| Turkey | 30 120 | 32 600 | 33 000 | 34 000 |
| United States | 90 450 | 91 300 | 94 300 | 96 500 |
| Other countries | 439 611 | 371 600 | 387 710 | 391 616 |
| Total world | 1 700 158 | 1 800 000 | 1 950 000 | 2 000 000 |

Sources: Natural Resources Canada; U.S. Geological Survey.
(e) Estimated.