

Clays

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HIGHLIGHTS

- Clay is an abundant raw material with a wide variety of uses and properties that is mined in all provinces except Prince Edward Island, New Brunswick, and Manitoba.
- Overall world production of bentonite was approximately 12.0 Mt in 2007, kaolin production was 39.0 Mt, and Fuller's earth production was estimated to be 3.89 Mt.
- Canada's preliminary 2008 figures indicate a clay shipment value of \$184.6 million, exports of \$21.9 million (75 490 t), and imports of \$181.4 million (1.8 Mt).
- Canadian consumption for 2007 was 2.2 Mt for "other" clays, 713 437 t for kaolin, 265 709 t for bentonite, 23 881 t for fire clay, and 3194 t for ball clay, for a total consumption of 3.2 Mt.
- The short-term forecast for bentonite indicates stable demand from the oil drilling sector. The short-term demand for clays used in construction will remain weak due to the economic downturn and its affect on the new housing market.

INTRODUCTION

The clays are a complex group that consists of several mineral commodities, each having different mineralogy, geological occurrence, mining/processing technology, and uses. They are fine-grained minerals of secondary origin and are composed of an alumina silicate structure with additional iron, alkalis, and alkaline earth elements. Clay minerals are classified into two broad groups: **specialty clays**, which include attapulgite, bentonite, Fuller's earth, hectorite, montmorillonite, and sepiolite; and **kaolinitic**

clays, which include ball clay, fire clay (refractory clay), stoneware clay, and kaolinite. These minerals rarely occur in a pure state and, rather, occur with gangue minerals (e.g., quartz, calcite, dolomite, feldspar, gypsum, and iron oxide), which may or may not be deleterious for ceramic applications. (Note: Palygorskite is the internationally recognized mineralogical term for attapulgite, the name more commonly used.)

Clay is an abundant raw material with a wide variety of uses and properties. The commercial value of a clay depends primarily on its physical properties, such as plasticity, strength, shrinkage, vitrification range, refractoriness, fired colour, porosity, and absorption. Many definitions state that a clay is plastic when wet. Most clay materials do have this property, but some clays are not plastic (e.g., halloysite and flint clay).

The clay-based industries are of fundamental importance to all countries. The large-volume clay industries, besides the construction clays, are the kaolin and bentonite industries, although these large tonnages belie the variety of product specifications and special consumer-designed products that are available as a result of research and development in close liaison with customer needs.

It is the physical characteristics of clays, more so than the chemical and structural characteristics, that define this group:

- Clay minerals tend to form microscopic to sub-microscopic crystals.
- They can absorb or lose water from simple humidity changes.
- When mixed with limited amounts of water, clays become plastic and can be molded and formed, such as pottery.
- When water is absorbed, clays will often expand as the water fills the spaces between the stacked silicate layers.
- Due to the absorption of water, the specific gravity of clays is highly variable and is lowered with increased water content.

- The hardness of clays is difficult to determine due to the microscopic nature of the crystals, but actual hardness is usually between 2 and 3, and many clays give a hardness of 1 in field tests.
- Clays tend to form from weathering and secondary sedimentary processes with only a few examples of clays forming in primary igneous or metamorphic environments.
- Clays are rarely found separately and are usually mixed not only with other clays, but also with microscopic crystals of carbonates, feldspars, micas, and quartz.

Although clays are present everywhere in Canada, not all types are evenly distributed. Clays are mined in all provinces except Prince Edward Island, New Brunswick, and Manitoba. No information on findings or exploration projects in the territories and/or Nunavut has yet been reported, although this should not be interpreted as a lack of existence.

The mining and processing of clays depend upon the type of clay. Kaolin production is a highly mechanized operation that requires conversion into clay-water slip or a slurry. The other clay types (e.g., bentonite, Fuller's earth, etc.) are stripped from the ground under controlled conditions to ensure quality control and are processed by simple milling techniques and de-watering to be dried and stockpiled.

Prices for clays in U.S. dollars are provided in the "Prices" section below. It should be understood that the prices indicated serve only as a reference measure. Prices for actual transactions vary, not only according to the various types of clays, but also according to geographic region, and will take into account the quantity purchased, application, quality assurance, exact grade purchased, credit terms, and other parameters.

CONSUMPTION, PRODUCTION, AND TRADE

Overall world production (source: U.S. Geological Survey 2007 review) of bentonite was approximately 12.0 Mt, Fuller's earth production was estimated to be 3.89 Mt, and kaolin production was 39.0 Mt in 2007. The United States continued to be the leading producer of all three varieties of clays.

Canadian clay production (Table 1) shows a preliminary shipments value of \$184.6 million in 2008, down 10.0% from the revised 2007 value of \$205.0 million.

The major uses/consumption of clays reported (Table 3) for Canada in 2008 were: "other" clays at 2.2 Mt (with an estimated 54.9% used in the clay products and structural industry and 42.7% used by the cement/construction industry);

kaolin (China clay) at 713 437 t (92.9% used in the pulp, paper, and paper products industry); bentonite at 265 709 t (79.3% used in the iron ore pelletizing industry and 8.6% used by the foundry industry); fire clay at 23 881 t (main usage now confidential); and ball clay at 3194 t (47.5% used by the ceramics and structural industries, and 32.2% used in the refractory brick, mixes industries). Table 2 shows bentonite imports (tonnage and value) and consumption (tonnage only) from 1988 to 2007. Although preliminary consumption of bentonite seems to have decreased in 2007, the import tonnage and value seem to have increased.

In 2008, Canada exported 75 490 t of clay valued at \$21.9 million, an increase of 27 932 t (58.7%) from 2007. This increase is related to the significant demand from the United States for kaolin, from Belgium and Germany for bentonite, and from Germany for "other" clays. "Other" clays represent 79.1% of Canada's total exports, while bentonite, kaolin, and fire clay represent 15.7%, 4.8%, and 0.4% of total exports, respectively. It is noted that in 2008 there were no exports reported for the decolourizing earths and Fuller's earth categories. Canada's major export destinations have been the United States for kaolin, Germany and Belgium for bentonite, and Denmark and the United States for fire clay. With respect to the "other" clays category, Germany, the United States, the Netherlands, and Belgium are the core export markets.

In 2008, Canada's imports of clays totaled over 1.8 Mt valued at \$181.4 million, an increase of 68 340 t (4.0%) from 2007. The value of kaolin imports dominated in 2008 (52.1% of total imports valued at \$94.4 million), followed by bentonite (22.2%), "other" clays (15.0%), activated clays (9.8%), and fire clay (0.9%). There was no reporting in 2008 for imports of decolourizing earths and Fuller's earth. Imports by tonnage provided a similar 2008 standing with kaolin leading (55.5% of total imports, or almost 1.0 Mt), followed by bentonite (24.9%), "other" clays (17.5%), activated clay (1.6%), fire clay (0.5%), and decolourizing earths and Fuller's earth (nil). The United States maintained its position as the major supplier of bentonite, fire clay, and "other" clays to Canada, with Brazil leading for kaolin and Greece leading for activated clay.

CANADIAN CLAY DEPOSITS AND USES

For a detailed description of Canadian clay deposits and uses, refer to the 2007 review on clays available on the Internet at www.nrcan-rncan.gc.ca/mms/smm/busi-indu/cmy-amc/com-eng.htm.

CANADIAN CLAY-PRODUCING MINES

Newfoundland and Labrador

Trinity Brick Products (1972) Ltd. located in St. John's extracts shale for the production of bricks.

Prince Edward Island

There is no production of clay in the province.

Nova Scotia

Shaw Brick (a member of The Shaw Group Limited) extracts clay from pits at Lantz, Milford, and Shubenacadie, all in Hants County, and shale from quarries located in Hardwood Lands, Hants County; and New Glasgow, Pictou County. These materials are used in the company's plant in Lantz for the manufacture of bricks and other clay products.

New Brunswick

There is no production of clays in the province.

Quebec

Briques Hanson Ltée, previously known as Briqueterie St-Laurent (a division of Hanson Building Materials America), is located in the city of La Prairie and mines shale from a quarry to produce bricks.

Exploration Orbite V.S.P.A. inc., which owns 100% of the mining rights of the Grande-Vallée property (an alumina clay deposit representing a surface area of approximately 2300 ha located 32 km northeast of Murdochville in the Gaspé Peninsula), is soon to be a fully integrated future producer from which ultra-pure and specialty alumina will be extracted and manufactured. An exclusive sole commercialization agreement was signed with Amalgamet Canada Limited, a subsidiary of Amalgamated Metal Corporation PLC of London, United Kingdom, for the sale of its high-purity alumina.

Ontario

The brick industry currently extracts most of its raw material from the Queenston Formation shale. The two major producers are Brampton Brick Limited and Hanson Brick Ltd. Other producers include Century Brick Limited, George Coultis & Sons Ltd., Norwich Brick and Tile, and Paisley Bricks and Tile Co.

Canada Brick Co. became, in 2003, part of Hanson Building Materials America, the largest brick manufacturer in Canada and one of the largest brick manufacturers in North America.

Manitoba

There is no production of clays in the province at this time.

Saskatchewan

The most important commercial clays mined in Saskatchewan include kaolinite, montmorillonite (i.e., bentonite), and illite clays.

Clays and clay products are produced by three major companies. Estevan Brick (1995) Ltd. has quarries at Estevan, Rockglen, Flintoft, and Readlyn for the manufacture of face brick. Canadian Clay Products Inc. quarries sodium bentonite near Truax, 60 km southwest of Regina, and processes it at its plant at Wilcox to produce swelling bentonite products. In early 2009, the Wilcox facility was significantly damaged by fire and production will be curtailed for a six-month period. Cindercrete Products Ltd. produces lightweight clay aggregates for its ready-mix concrete plant in Saskatoon.

Current production from these producers is mainly for face brick for Canadian and U.S. markets and stoneware clay for the Canadian market. Saskatchewan's bentonite production is sold mainly in western Canada. The bentonite is produced by quarrying and is processed by drying, adding soda ash, grinding, and bagging. Much of Saskatchewan's bentonite production is used as fertilizer carrier, animal feed binding, reservoir sealing, and a foundry sand binder. Future opportunities for swelling bentonite include its use as a pesticide carrier, as an agent in water and effluent purification, and in the production of pet litter.

Plainsman Clay Limited of Alberta mines its own pottery clay in Saskatchewan for processing at Medicine Hat, Alberta.

Clayburn Industries Ltd. (a subsidiary of I-XL Industries Ltd. of Alberta) in Abbotsford, British Columbia, mines clay seasonally in Saskatchewan and operates a manufacturing plant in Medicine Hat, Alberta.

Whitemud Resources Inc. of Calgary, Alberta, has completed the commissioning of its \$50 million Gollier Creek processing facility in Wood Mountain, Saskatchewan, and is producing metakaolin. Metakaolin is superheated kaolin, which is a white-coloured clay used in manufacturing paint, plastics and ceramics, and as a filler and coater in paper. In metakaolin form, the silvery powder is added to cement to increase the strength and durability of concrete and its impermeability to water and other chemical agents. The major markets are the oil patch and construction industries in Canada and the United States.

Alberta

Plainsman Clay Limited mines clay (i.e., Helmer kaolin) specifically from sites in Manitoba, Saskatchewan, Alberta, Montana, and Idaho for pottery and plastic stoneware, and processes the mined clay at Medicine Hat, Alberta.

I-XL Industries Ltd. of Medicine Hat is the largest producer of fired clay products in western Canada. Clays are quarried at modern open-pit mining sites (i.e., Cyprus Hills of Alberta and Saskatchewan) and are stockpiled at I-XL plants (e.g., Clayburn Industries Ltd.). Two different processes are used to form the clay into bricks.

British Columbia

Sumas Shale Ltd. is scheduled to produce 500 000 t of shale, clay, conglomerate, and sandstone from its Sumas shale quarries. The clay with the highest alumina content is sold to Clayburn Industries Ltd. Lower-grade clay, sandstone, and conglomerate are used for feed at Clayburn, Lafarge Canada Inc., and Tilbury Cement Ltd.

Sumas Clay Products Ltd. produces small quantities of ornamental and specialty facing bricks from fire clay at its historic plant near Abbotsford.

Clayburn Industries Ltd. of Abbotsford processes fire clay from Sumas Mountain into a variety of refractory bricks and castable products that are exported worldwide. The company imports ball clay for the manufacture of some of its refractory products. Clayburn also produces residential clay (common bricks).

Pacific Bentonite Ltd. is extracting high-alumina material from its Decora deposit located in the Hat Creek area. Although the material is used mainly in cement production, the company is aggressively developing new markets.

Absorbent Products Ltd. produces domestic and industrial absorbents, principally from its Red Lake Fuller's earth deposit near Kamloops. In the Princeton area, the company is mining bentonite from the Bud property. The products are for agriculture, cat litter, industrial absorbents, carriers for herbicides and pesticides, and binders for feeds. The company also produces a Fuller's earth that is described by the B.C. Ministry of Energy, Mines and Petroleum Resources as a diatomaceous earth deposit since it is mainly diatomaceous earth. This material is sold as a non-swelling (conventional) cat litter throughout Canada and the United States. In addition, the company produces a sodium bentonite (clumping) cat litter from its Princeton deposit that is sold throughout Canada and the United States. Its agricultural products are sold throughout Canada, the United States, and Europe.

Ironwood Clay Company Inc. is the largest producer of cosmetic/medical clay in British Columbia. It mines seasonally from the De Cosmos Lagoon on the Hunter Island deposits.

Similar clay material for cosmetic/medical applications is extracted from Carrie Cove Clay of Comox Valley and is marketed and sold by Carrie Cove Cosmetics.

Glacial Marine Clay Inc. is producing a clay for specialized hydroponics applications. The market for specialized hydroponics clays is large.

PRICES

Prices for actual transactions vary accordingly to geographic region and will take into account the quantity purchased, application, quality assurance, exact grade purchased, credit terms, and other parameters. Due to the unavailability of prices for Canada's clay industry, all of the following prices are provided as a comparative example in U.S. currency and reflect the U.S. industry (source: USGS 2007 review).

Ball Clay

The average value for ball clay reported by U.S. producers was US\$45.71/t. The average value for exported and imported ball clay was US\$68/t.

Bentonite

The average value reported by U.S. producers for non-swelling bentonite was US\$50.68/t. The average value for swelling bentonite was US\$52.39/t. The average value for all bentonite was US\$52.28/t. The average value of imported bentonite by the United States was US\$217/t while the average value of U.S. exports was US\$110/t.

The price for ex-work, Wyoming and crude, bulk, rail cars, was US\$36-\$82/t; for foundry grade, bagged, rail cars, was US\$55-\$80/t; and for API-grade, bagged, rail cars, was US\$55-\$80/t. The price for bentonite, India, crushed, dried, loose in bulk, was US\$43-\$53/t for API grade, US\$32-\$40/t for cat litter grade, and US\$59-\$76/t for foundry grade (*Industrial Minerals*, 2007).

Common Clay and Shale

The average value of all common clay and shale produced in the United States was US\$10.50/t. The average value of clay and shale used in lightweight aggregate was US\$26.72/t. Average prices for lightweight aggregate produced from clay and shale range from US\$30 to \$70/t for most applications. (Note: The so-called structural clays group for making bricks, pipes, and tiles for the construction industry creates a conflict since the common clays and shales often used for these products may contain high proportions of non-clay minerals such as quartz and mica.)

Fire Clay

The average value for fire clay reported by U.S. producers was US\$42.16/t. The average value of fire clay imports into

the United States was US\$292/t and the average value of exports was US\$112/t.

Fuller's Earth

The average value of attapulgite-type Fuller's earth was US\$148.98/t in 2007, and the average value of montmorillonite-type Fuller's earth was US\$91.70/t. The average value of all Fuller's earth was estimated to be US\$96.89/t. The average value of exported Fuller's earth was US\$281/t.

Kaolin

The average value of kaolin was US\$1334.97/t for all kaolin grades while airfloat was US\$72.54/t, refractory-grade (high temperature calcined) was US\$38.55/t, pigment-grade (low-temperature calcined) was US\$289.04/t, all types of calcined was US\$201.44/t, delaminated was US\$131.58/t, unprocessed was US\$14.59/t, and water washed was US\$135.58/t. The average value of imported kaolin was US\$250/t and the average value of exported kaolin was US\$186/t.

The kaolin price for ex-work, Georgia, filler, bulk, was US\$80-\$100/t; for coating, bulk, US\$85-\$185/t; for sanitaryware-grade, bagged, US\$65-\$75/t; for tableware-grade, bagged, US\$125/t; and for calcined, bulk, US\$320-\$375/t (*Industrial Minerals*, 2007).

OUTLOOK

Short-term forecasts project stable demand for bentonite due to continued demand in the oil drilling sector.

Reduced new housing starts and tight credit will affect sales of construction-oriented markets for clay-based pro-

ducts such as adhesives, clay brick, drain tile, portland cement, ceramic tile, lightweight aggregate, paint, fibre-glass, roofing granules, sanitaryware, and sewer pipes.

The absorbent markets, particularly pet waste absorbents, will certainly sustain less damage (e.g., bentonite, Fuller's earth raw material). The use of oil absorbents may decline because heavy industries have slowed production as a result of the economic downturn.

A slackening in demand for steel may result in slightly decreased sales of bentonite for pelletizing iron ore and decreased demand for bentonite and Fuller's earth for foundry applications.

The leading markets for kaolin – paper coating and filling – continue to be affected by a downturn in the paper production industry.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 58. (2) Information in this review was current as of April 2009. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan-mcan.gc.ca/mms-smm/busi-indu/cmy-amc/com-eng.htm.

NOTE TO READERS

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TARIFFS

Item No.	Description	Canada			United States	EU	Japan
		MFN	GPT	USA	Canada	Conventional Rate (1)	WTO (2)
25.07	Kaolin and other kaolinic clays, whether or not calcined	Free	Free	Free	Free	Free	Free
25.08	Other clays (not including expanded clays of heading 68.06), andalusite, kyanite and sillimanite, whether or not calcined; mullite; chamotte or dinas earths						
2508.10	Bentonite	Free	Free	Free	Free	Free	Free
2508.30	Fire clay	Free	Free	Free	Free	Free	Free
2508.40	Other clays	Free	Free	Free	Free	Free	Free
3802.90.00.10	Activated carbon; activated natural mineral products; animal black, including spent animal black; other: activated clay	Free	Free	Free	Free	5.7%	2.5%

Sources: Canadian Customs Tariff, effective January 2009, Canada Border Services Agency; Harmonized Tariff Schedule of the United States, 2009; Official Journal of the European Union (Tariff Information), September 19, 2008 edition; Customs Tariff Schedules of Japan, 2009.

(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, CLAY PRODUCTION AND TRADE, 2006-08

	2006		2007		2008 (p)	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
PRODUCTION (Shipments) (1)						
Nova Scotia	x	x	x	x	x	x
Quebec	x	x	x	x	x	x
Ontario	x	181 622	x	162 186	x	146 022
Saskatchewan	x	x	x	x	x	x
Alberta	x	x	x	x	x	x
British Columbia	x	x	x	x	x	x
Total	x	223 779	x	205 041	x	184 639
EXPORTS						
2507.00	Kaolin and other kaolinic clays, whether or not calcinated					
United States	984	252	712	235	3 634	974
Other countries	11	5	43	13	8	...
Total	995	257	755	248	3 642	974
2508.10	Bentonite					
Belgium	698	225	875	466	4 420	2 982
Germany	66	39	1 004	676	4 523	1 506
United States	520	201	649	209	591	226
France	356	187	2 054	1 458	449	200
Netherlands	-	-	-	-	495	167
Finland	126	50	254	114	321	163
Latvia	-	-	-	-	291	120
Sweden	25	8	-	-	250	104
Other countries	821	489	321	192	518	230
Total	2 612	1 199	5 157	3 115	11 858	5 698
2508.20	Decolourizing earths and Fuller's earth					
Belgium	334	104	-	-	-	-
Other countries	153	49	-	-	-	-
Total	487	153	-	-	-	-
2508.30	Fire clay					
United States	256	112	176	86	73	54
Denmark	-	-	50	18	88	35
Brazil	41	19	51	27	45	31
Other countries	4	3	49	18	102	39
Total	301	134	326	149	308	159
2508.40	Other clays (excluding expanded clays of no. 68.06)					
Germany	20 520	7 997	15 879	6 228	44 459	8 354
Netherlands	828	306	12 725	5 844	3 314	1 701
Sweden	798	292	1 082	432	886	1 273
Belgium	1 529	534	3 377	2 091	1 929	707
United States	2 407	465	2 616	656	3 438	664
Denmark	1 296	362	1 031	295	1 196	443
France	24 203	8 092	674	336	795	326
Switzerland	583	217	865	338	713	298
Norway	585	250	632	311	588	224
Finland	248	87	545	185	513	209
Latvia	419	159	541	208	457	195
Portugal	87	32	178	70	271	115
Indonesia	-	-	24	13	128	107
Other countries	1 054	431	1 151	505	995	421
Total	54 557	19 224	41 320	17 512	59 682	15 037
Total exports	58 952	20 967	47 558	21 024	75 490	21 868

TABLE 1 (cont'd)

	2006		2007		2008 (p)		
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)	
IMPORTS (2)							
2507.00	Kaolin and other kaolinic clays, whether or not calcinated						
	Brazil	199 825	20 781	358 287	35 701	582 203	46 918
	United States	758 690	78 799	531 554	63 624	383 268	46 044
	United Kingdom	36 684	5 967	74 755	9 901	7 633	1 152
	Czech Republic	39	17	118	40	254	129
	Other countries	506	104	774	185	442	201
	Total	995 744	105 668	965 488	109 451	973 800	94 444
2508.10	Bentonite						
	United States	446 792	35 177	493 266	35 250	370 269	33 587
	Greece	43 034	3 033	43 686	4 404	65 890	6 134
	China	123	29	283	40	131	120
	Other countries	724	325	1 319	354	1 165	416
	Total	490 673	38 564	538 554	40 048	437 455	40 257
2508.20	Decolourizing earths and Fuller's earth						
	Mexico	299	107	–	–	–	–
	United Kingdom	168	106	–	–	–	–
	United States	10 437	2 525	–	–	–	–
	Other countries	24	15	–	–	–	–
	Total	10 928	2 753	–	–	–	–
2508.30	Fire clay						
	United States	10 105	1 622	6 696	1 267	7 813	1 423
	Guyana	18	6	359	116	702	234
	Other countries	175	64	142	45	195	57
	Total	10 298	1 692	7 197	1 428	8 710	1 714
2508.40	Other clays (excluding expanded clays of no. 68.06)						
	United States	200 265	18 889	158 788	17 769	306 436	26 118
	Italy	1	3	1	5	18	266
	France	479	358	53	94	67	183
	United Kingdom	140	40	278	168	199	136
	China	233	46	260	89	132	120
	Mexico	45	30	263	161	189	118
	Germany	49	60	9	38	12	114
	Other countries	153	128	117	133	549	214
	Total	201 365	19 554	159 769	18 457	307 602	27 269
3802.90.00.10	Activated clay						
	Greece	8 862	10 988	3 421	6 467	15 039	11 347
	United States	12 545	9 164	13 074	7 969	13 175	6 370
	Other countries	1 056	342	15	24	77	44
	Total	22 463	20 494	16 510	14 460	28 291	17 761
	Total imports	1 731 471	188 725	1 687 518	183 844	1 755 858	181 445

Sources: Natural Resources Canada; Statistics Canada.

– Nil; . . . Amount too small to be expressed; (p) Preliminary; x Confidential.

(1) Production values for bentonite and diatomite have been included. (2) Imports from "other countries" may include re-imports from Canada.

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

TABLE 2. CANADA, BENTONITE IMPORTS AND USE, (1) 1988-2007

Year	Imports (tonnes)	Imports (\$000)	Use (2) (tonnes)
1988	335 012	14 420	264 033
1989	294 280	15 070	274 987
1990	252 395	12 259	252 333
1991	268 609	11 712	248 725
1992	255 810	14 568	238 867
1993	295 356	20 684	230 006
1994	330 221	27 270	255 171
1995	343 826	25 983	263 294
1996	381 043	26 723	255 475
1997	372 103	29 760	279 602
1998	325 620	29 738	286 329
1999	336 909	28 990	256 566
2000	325 574	34 515	296 266
2001	254 242	29 021	267 449
2002	238 413	27 121	284 123
2003	273 389	34 681	276 630
2004	373 209	36 607	280 035
2005 (r)	383 675	31 999	293 138
2006 (r)	490 673	38 565	271 832
2007 (r)	538 554	40 050	265 709

Sources: Natural Resources Canada; Statistics Canada.

(r) Revised.

(1) As reported by consumers. (2) Does not include activated clays and earths or Fuller's earth.

TABLE 3. CANADA, REPORTED USE (1) OF CLAYS, BY INDUSTRY, 2005-07

	2005	2006 (r)	2007
	(tonnes)		
China clay (kaolin)			
Pulp and paper, and paper products	702 277	691 474	662 852
Rubber products	10 514	8 826	x
Ceramic products	6 225	3 248	x
Paint and varnish	8 356	9 268	9 951
Other products (2)	27 240	28 955	30 474
Total	754 612	741 771	713 437
Ball clay			
Clay products, ceramics and structural	6 368	5 269	1 517
Refractory brick, mixes	1 044	1 084	1 028
Other products (3)	803	808	649
Total	8 215	7 161	3 194
Fire clay			
Refractory brick, mixes	x	x	x
Foundries	259	142	89
Other products (4)	x	x	x
Total	27 055	28 091	23 881
Bentonite, quantity used (available data) (5)			
Iron ore pelletizing	213 977	212 668	210 782
Paper, pulp and paper products	7 813	10 461	8 000
Well drilling (6)	x	x	x
Refractory brick, mixes	x	x	x
Foundries	31 293	24 353	22 789
Other products (7)	16 803	2 747	2 720
Total	293 138	271 832	265 709
Other clay			
Abrasives, natural	x	x	x
Adhesives	x	x	x
Asphalt roofing products	x	x	-
Clay products, structural	1 149 464	993 075	1 209 337
Cement (construction)	1 035 747	1 057 731	939 541
Clay products, ceramics	x	x	x
Organic chemicals	x	x	x
Agricultural chemicals	-	-	-
Other chemicals	x	x	x
Animal feeds	-	-	-
Fertilizers	x	x	-
Foundry	111	84	x
Food products	x	x	x
Gypsum products	x	x	x
Medicinal and pharmaceutical	x	x	x
Paint and varnish	1 950	1 207	688
Paper, pulp and paper, paper products	92 428	29 067	27 523
Refined petroleum products	x	x	x
Refractory brick, mix	x	x	x
Rubber products	x	x	x
Other primary smelting and refining, nonferrous	x	x	x
Sugar processing	-	-	-
Well drilling	-	-	-
Wire and cable	x	x	x
Total	2 299 269	2 110 489	2 202 514
Total Canada	3 382 299	3 159 344	3 208 735

Source: Natural Resources Canada.

- Nil; (r) Revised; x Confidential.

(1) Reported from NRCAN survey on the use of nonmetallic minerals by Canadian manufacturing plants.

(2) Includes chemicals, glass fibre wool, asphalt roofing products, gypsum products, packaging, and other miscellaneous products. (3) Includes gypsum products, fertilizers, and other miscellaneous products.

(4) Includes structural clay products, nonferrous smelting and refining, and other miscellaneous products.

(5) Does not include activated clays and earths or Fuller's earth. (6) Well drilling is included in "other products" for 1999 to 2004 due to confidentiality. (7) Includes animal feeds, cat litter, structural clay products, fertilizers, paint and varnish, mortar mixes, and other miscellaneous minor uses.

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

TABLE 4. MAJOR CANADIAN MANUFACTURERS OF STRUCTURAL CLAY PRODUCTS, BY PROVINCE

Company	Plant Location	Products	Raw Material	Size (1) and Remarks
NOVA SCOTIA				
The Shaw Group Ltd.	Lantz	Brick, block, and tile	Common clay, ball clay	(B)
QUEBEC				
Briques Hanson ltée (formerly St. Lawrence Brick Div., Briqueterie Saint-Laurent)	La Prairie	Building and facing brick	Shale	(B)
ONTARIO				
Brampton Brick Ltd.	Brampton	Building brick	Shale	(D)
Hanson Brick Ltd. (formerly Canada Brick Co.)				(E)
Burlington Division	Burlington	Building brick	Shale	
Streetsville Division	Streetsville	Building brick	Shale	
Ottawa Division	Ottawa	Building brick	Shale	
Century Brick Limited (formerly Hamilton Brick)	Etobicoke	Building brick	Shale	(B)
Paisley Bricks and Tile Co.	Paisley	Building brick	Shale	(A)
SASKATCHEWAN				
Canadian Clay Products Inc.	Wilcox	Bentonite	Sodium bentonite	(A)
Whitemud Resources Ltd.	Wood Mountain	Metakaolin	Kaolin	(B)
ALBERTA				
I-XL Industries Ltd.	Medicine Hat	Brick, block, and flue liners	Common clay	(B)
Plainsman Clays Ltd.	Medicine Hat	Processed clay	Common clay	(A)
BRITISH COLUMBIA				
Clayburn Industries Ltd.	Abbotsford	Refractory brick, mortar, and monolithics	Imported ball clay, pyrophyllite	(D)
Sumas Clay Products Ltd.	Abbotsford	Brick, drain tile, and flue liners	Common clay	(A)
Absorbent Products Ltd. (Western Industrial Clay Products Ltd.) Calcium bentonite and diatomite operations	Kamloops	Absorbent products	Calcium bentonite and diatomite	(B)

Sources: Natural Resources Canada; company web sites.

(1) Size keys: (A) up to 25 employees; (B) 25-49 employees; (C) 50-99 employees; (D) 100-199 employees; (E) 200-499 employees.