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THE CANADIAN GYPSUM INDUSTRY

by

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ABSTRACT

The technology and uses of the mineral gypsum are outlined and theories of the origin of its deposits are mentioned. Known Canadian deposits are described in some detail, and factors affecting their economic development are considered, such as extent, purity, and location with respect to markets.

The report describes mining, milling, and processing methods. The early history of the Canadian gypsum industry is summarized. Present-day operations are described, and statistical data are given of the production, trade and consumption of gypsum and its manufactured products for the period 1948 to 1958. A general statistical summary for 1957-1958 is also included.

A forecast has been attempted of the effect of several factors, including population increase, the use of substitute materials, and dwindling reserves of high-purity gypsum in certain areas, on the growth and development of the Canadian gypsum industry during the next few years.

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INTRODUCTION

Gypsum was quarried as early as 1770 by farmers in Nova Scotia for use as a land fertilizer. However, it was the later development and use of the mineral for the manufacture of plaster and related products that firmly established its position in the Canadian mineral industry.

The production and trade of gypsum and manufactured gypsum products are closely associated with the building construction industry. The increase in construction that accompanies periods of prosperity is reflected in increased demand for gypsum products, which in turn must be met by additional production of crude gypsum. Conversely, gypsum production must necessarily be curtailed during recession years because of limited markets. The expansion of the building construction industry that followed World War II resulted in an increased demand for gypsum for use in the manufacture of plaster and plaster products required by this industry. The continued growth of the building construction industry in both Canada and the United States indicates that demand for Canadian gypsum will probably be maintained at or above the current level.

This report has been prepared in response to continuing requests for information on gypsum. It describes the occurrences, technology and uses of gypsum and briefly outlines the present-day position of gypsum in the Canadian mineral industry.

TECHNOLOGY AND USES OF GYPSUM

Gypsum is a hydrous calcium sulphate mineral. It is represented by the chemical formula $CaSO_4 \cdot 2H_2O$ and may be broken down into its constituents as follows:

$CaSO_4 \cdot 2H_2O$	Water ($2H_2O$) = 20.9%	
	Calcium sulphate ($CaSO_4$) = 79.1%	Lime (CaO) = 32.6%
		Sulphur trioxide (SO_3) = 46.5%

Pure gypsum is colourless to white, but may be pink, grey or brown because of impurities (such as iron, lime, clay, etc). It has a hardness of 2 in the Mohs scale and can be scratched with the fingernail. The specific gravity of pure gypsum is 2.3 to 2.4. Gypsum is slightly soluble in water, soluble in dilute hydrochloric acid, and insoluble in sulphuric acid.

Gypsum quarried commercially usually occurs in massive, finely crystalline, bedded deposits, although vein and lens-like deposits also are known. Common varieties which are of little commercial value include selenite, a transparent or translucent, crystalline gypsum; satin spar, a fibrous variety; and gypsite, fine gypsum usually mixed with sand, clay and other impurities.

Impurities associated with Canadian gypsum deposits include mud and silt, dolomite, limestone, and anhydrite. Various methods of removing these impurities are practised. Mud and silt may be reduced considerably by coarse crushing followed by washing and screening. The mud and silt are removed and discarded as fines. The percentage of dolomite, limestone, or anhydrite is kept to a minimum by selective mining or quarrying. Large pieces may be removed by hand picking, either at the quarry or on a picking belt following primary crushing. Heavy media separation methods are successfully employed at one or two locations in the United States to remove dolomite, limestone, and anhydrite; however, heavy media methods have not as yet been adopted by Canadian producers. These impurities, especially dolomite and limestone, are removed to a considerable degree at several Canadian plants by selective crushing and screening. The crude rock is reduced in a suitable crusher to about 1/8 in. size to free the gypsum. Following this, the fines are removed by air separation. Gypsum, being softer than the contaminating minerals, is reduced more readily and tends to concentrate in the finer fractions. The coarse, impure product may be further upgraded by additional grinding and sizing, or it may be used for the manufacture of products that do not require high-purity gypsum.

When gypsum is heated (calcined) at a comparatively low temperature (225° to 325°F), it loses three-fourths of its water of crystallization. The calcined gypsum, commonly known as plaster of Paris, combines readily with water and sets to form a hard, dense plaster. Gypsum is calcined in standard batch-type kettles or in continuous rotary kilns. Crude gypsum for use in plaster manufacture is reduced to minus 2 in. or finer for calcination in rotary kilns, or to 100 mesh for the kettle type of calciner. The rotary product is further reduced to 100 mesh following calcination.

Plaster of Paris usually sets in 10 to 20 minutes when mixed with water; however, the set may be accelerated or retarded by the addition of various chemicals. Raw (uncalcined) gypsum and set plaster are both powerful accelerators. Other common accelerators are potassium sulphate, alum, and salt. Common retarders include glue, starch, clay, and sugar. Most commercial retarders are prepared from slaughterhouse waste treated with lime and caustic soda.

Vast amounts of calcined gypsum are used by the building construction industry. The calcined gypsum, or plaster of Paris, mixed with water, hydrate of lime, and aggregate (sand, expanded perlite, vermiculite, etc.), is applied over wood, metal, or gypsum lath to form a wall finish in buildings. Calcined gypsum is the main constituent of gypsum board, lath and tile, and of most types of industrial plasters. Gypsum board, lath and sheathing are all formed by introducing a slurry, consisting of plaster of Paris, water, foam, accelerator, etc., between two sheets of absorbent paper where it sets to produce a firm, strong wallboard. Gypsum lath is used in buildings as a base for plaster, whereas gypsum board and sheathing generally are used, without plaster, for sheeting walls and ceilings.

High-purity calcined gypsum is used in dentistry to form plaster casts for plate work, and by the medical profession for surgical casts to support fractures. Finely-ground calcined gypsum is used by the glass industry as a bedding plaster to support large sheets of plate glass during polishing operations. Calcined gypsum also is used as a moulding plaster by the foundry and ceramic industries, for casting machine parts and ceramic pieces.

Crude uncalcined gypsum is used to control the set of Portland cement. The gypsum, which seldom exceeds 5% of the total weight of cement, is interground with the calcined cement clinker. Crude gypsum, reduced to 40 mesh or finer, is used as a filler in paint and paper. It also is used, to a limited extent, as a substitute for salt cake in glass manufacture. Powdered gypsum is used as a soil conditioner to offset the effect of black alkali, to restore impervious or dispersed soils, and as a fertilizer for peanuts and other leguminous crops.

Gypsum and anhydrite (anhydrous calcium sulphate) are potential sources of sulphur compounds. In Europe, gypsum or anhydrite is calcined at high temperatures with coke, silica, and clay to produce sulphur dioxide, sulphur trioxide, and by-product cement. The two gases are then converted into sulphuric acid. To date, gypsum and anhydrite are considered uneconomic sources of sulphur and sulphur dioxide in Canada; however, research into methods of utilizing gypsum and anhydrite might result in the eventual development of a chemical industry based on these minerals.

Hydrated calcium sulphate is produced at several locations in Canada, as a by-product from the manufacture of fertilizers, phosphoric acid, and hydrofluoric acid. This man-made gypsum is a waste product at present.

THEORIES OF THE ORIGIN OF GYPSUM

Two general types of gypsum deposits are known, those of primary and those of secondary origin. Deposits of both types occur in Canada. Many theories, some of which are tabulated below, have been advanced to explain the origin of these deposits.

Type of Deposit		Theory of Origin
Primary deposits	(1)	by deposition from sea water as a result of the evaporation of large inland seas.
	(2)	from sea water by the reaction between sulphate of magnesia and chloride of calcium or carbonate of lime.
	(3)	by the action of sulphuric acid, formed from sulphurous vapours from sulphur springs or volcanoes, on carbonate of lime or carbonate of magnesia.
	(4)	by the action of pyrite on carbonate of lime.
Secondary deposits	(1)	by alteration of original anhydrite (calcium sulphate) through the absorption of atmospheric or ground waters.

(2) by solution of original gypsum, followed by deposition in veins or along the shores of rivers and other inland waters.

(3) by the erosion of original gypsum, followed by mechanical reaccumulation.

It is generally accepted that most of the larger Canadian deposits have been formed either by deposition from sea water, as primary gypsum, or from the hydration of original anhydrite, as secondary gypsum.

CANADIAN GYPSUM OCCURRENCES

Large massive deposits of gypsum occur in Nova Scotia, Newfoundland and New Brunswick; on the Magdalen Islands of Quebec; and in Ontario, Manitoba, Alberta, and British Columbia. Gypsum occurrences also have been noted in the Northwest Territories. Some of these deposits are impure, others are too far from markets to be economically important, but many are of high purity and well situated with respect to centres of population and/or transportation facilities. Some of the more important gypsiferous areas are briefly described below.

Newfoundland

Large massive gypsum deposits occur in the St. George's Bay area in the southwestern section of Newfoundland. The gypsum, of Carboniferous age, forms part of the Codroy series and is equivalent geologically to the gypsum deposits of Nova Scotia and New Brunswick.

Many of the gypsum deposits in this district cover a considerable lateral area, and some measure up to 100 ft or more in total thickness. Most of the deposits are located at or relatively near the surface. Overburden, where present, usually consists of shale and siltstones and seldom exceeds 15 ft in thickness. The gypsum varies from white to grey in colour, although other colours are known. Many of the deposits consist of fine grained, rather hard gypsum; however, a soft, sugary variety also is common. Most of the gypsum deposits contain, and some are underlain by, anhydrite, suggesting that these deposits resulted from the hydration of originally deposited anhydrite.

Gypsum outcrops at numerous places in the area to the southeast of St. George's Bay between St. George's on the north and Searston on the south. The chief occurrence is at Flat Bay, where a large deposit is currently being worked. Other deposits occur in the Boswarlos-Piccadilly area, at the mouth of Romaines Brook, along the banks of Sheep Brook and Coal Brook, and in the valley of Crabbs River. Numerous zones of gypsum are exposed along the beaches near Ship Cove and at Plaster Cove.

Many other areas in southwestern Newfoundland give evidence, in the form of sink-holes and scattered gypsum outcrops, of being underlain by gypsum. Sink-holes, which are round, cone-like depressions, are characteristic of surface and near-surface gypsum deposits. These holes generally are believed to have originated as a result of the collapse of shallow subterranean caverns. They vary from a few feet to several hundred feet in diameter and from one or two feet to 100 ft or more in depth, and usually are filled with clay, boulders, trees, and other surface debris.

Nova Scotia

Some of the largest gypsum deposits known in Canada occur in Nova Scotia. These deposits are of Carboniferous age and occur in the Windsor group of the upper Mississippian system. They usually occur interbedded with limestone, shale, and clay.

The gypsum is fine-grained and generally white to grey-white in colour, although dark banded and mottled gypsum also is plentiful. Satin spar (fibrous gypsum), alabaster, and selenite are commonly found in many of the deposits. Some of the gypsum formations measure up to 200 ft in total thickness. The gypsum, in most instances, is underlain by thick anhydrite beds and is believed to have been formed as a result of top hydration of the anhydrite. Most deposits are near the surface, and the overburden, consisting of glacial muds and gravel, seldom exceeds 30 ft.

Gypsum occurs throughout the central and northern portions of the province. The main gypsum areas are located in Hants, Cumberland and Antigonish counties on the mainland and in Victoria, Richmond and Inverness counties in Cape Breton Island. Quarrying operations are currently carried on near Windsor, at Walton, and at Milford Station, on the mainland; and at Little Narrows, on Cape Breton Island.

New Brunswick

The gypsum deposits of New Brunswick, of Carboniferous age, mostly occur in the southeastern section of the province. Many occurrences have been noted in the area west of the lower portion of the Petitcodiac River, the most important of which are the Hillsborough deposits. The Hillsborough gypsum is white to grey-white in colour and of good purity. These deposits, varying up to 50 ft or more in thickness, generally overlie beds of crystalline limestone or anhydrite. However, anhydrite also is found intermixed with the gypsum and, in places, occurs above the gypsum. Overburden, consisting of soil and clay, may vary up to 10 ft or more in thickness. Many gypsiferous areas occur in the area lying between Petitcodiac and Sussex. Sink-holes are plentiful and outcrops, although few, sometimes are exposed as ridges that measure up to 30 ft or more in height.

Narrow seams of gypsum occur, interbedded with shale in steep cliffs on the south side of the Tobique River, near the town of Plaster Rock, Victoria county. This gypsum is of the coloured variety, being mottled grey, red and white, and is too impure to be of economic importance.

Gypsum is quarried at Hillsborough for plaster manufacture, and near Havelock for use in the manufacture of cement.

Quebec

The only known occurrences of gypsum in the province of Quebec are on the Magdalen Islands in the Gulf of St. Lawrence. These deposits are similar to those of the Atlantic provinces, in that they occur in the Lower Carboniferous and are associated with limestone.

The largest deposits are located on Grindstone, Alright, Amherst and Entry islands. The gypsum is well exposed along the coasts, but inland it is covered with marl and clay. The gypsum is white to grey in colour and is usually fairly pure. These deposits are not being worked at present. Two gypsum product plants located in Montreal currently obtain their requirements of crude gypsum from quarries in Nova Scotia.

Ontario

Gypsum occurs at a number of locations in Ontario. The main deposits are located in the Grand River area, south and west of Hamilton. Other deposits occur in the Moose River area south of James Bay.

The gypsum of the Grand River area, of Silurian age, occurs in the Salina group and is associated with anhydrite, dolomite and limestone. The deposits are lens-like and measure up to 15 ft in thickness. The lenses vary from a few hundred feet to over half a mile in width and usually occur within 200 ft of the surface. Underground mining operations are currently conducted at Caledonia and Hagersville, near Hamilton. Other deposits occur at depth in the area to the south and east of Hagersville--at Cooks, Lythmore, and Cayuga. A large underground deposit of gypsum was discovered recently near Princeton, east of Woodstock.

The Moose River deposits, believed to be Devonian in age, are located in the area to the south of James Bay. Good exposures occur along the banks of the Moose near Moose River village and along the banks of the Cheepash about 20 miles above the point at which it joins Moose River. Large deposits occur on Gypsum mountain, 12 miles southeast of Moose River village. Many of the gypsum beds are exposed over a 15 ft thickness; however, the total thickness probably is much greater. Overburden, consisting of boulder clay with intermixed sand, limestone and shale, is usually thin but ranges up to 25 ft or more in some areas.

Manitoba

Gypsum occurrences have been noted at numerous locations in the southern section of this province. The most important are at Gypsumville and Amaranth, which are approximately 150 miles north and 80 miles northwest, respectively, of Winnipeg. Gypsum recovery operations are currently carried on at each of these locations.

The Gypsumville deposits, of Devonian and possibly older age, occur as low ridges that rise 20 to 25 ft above the surrounding countryside. Overburden, consisting mostly of glacial till, seldom exceeds 5 ft. The bedded gypsum deposits, which measure 30 ft or more in thickness, usually are underlain by anhydrite. Gypsum from the main quarry is light grey in colour; but a white gypsum is obtained from a second deposit, 5 miles north of the main quarry.

At Amaranth, 40 ft of gypsum occurs at a depth of 95 ft. This gypsum, reported to be of Jurassic age, occurs as two distinct beds. The upper bed, measuring about 30 ft in thickness, is composed of massive white gypsum with small amounts of limestone and dolomite. The lower bed is 10 ft thick and similar in composition. It is separated from the upper bed by a 4 ft seam of anhydrite.

Gypsum has been reported, at depth, east of Dominion City in southern Manitoba, and at Charleswood near Winnipeg. Other deposits have been encountered in drill holes in the area to the north and west of Winnipeg.

Alberta

Gypsum occurrences have been noted in two of the National Parks of Alberta. In Wood Buffalo Park, in the northeastern section of the province, Middle Devonian gypsum is exposed along the banks of the Peace River, between Peace Point and Little Rapids. These deposits average 10 to 15 ft in thickness, although they do vary up to 50 ft or more at some locations. The gypsum usually is overlain by limestone and dolomite, but in places the overlying rock has been eroded leaving the gypsum exposed or covered by only a few feet of glacial till. Gypsum also is found along the banks of the Slave and Salt rivers, north and west of Fort Fitzgerald. In Jasper Park, granular white gypsum of Triassic age outcrops in the area to the north of Brûlé Lake. Gypsum occurs at depth at McMurray, in northeastern Alberta, where 130 ft of interbedded gypsum and anhydrite have been discovered at 500 ft.

No gypsum quarrying operations are carried on in this province at present, but gypsum from Manitoba and neighbouring British Columbia is processed in plants at Calgary.

British Columbia

The gypsum deposits of British Columbia occur in two main areas. The larger and more important deposits occur in the Stanford mountain range in the southeastern section of the province. Smaller deposits are found in the Falkland area, 180 miles northeast of Vancouver.

The deposits of the Stanford range, of Middle Devonian age, vary from 100 to 600 ft or more in thickness. The gypsum is fine grained, light grey in colour, and usually occurs interbedded with limestone and shale. The two most important deposits are located 4 miles northeast of Windermere and 8 miles northeast of Canal Flats, respectively. Gypsum quarrying operations are currently carried on at the Windermere deposit. Several other deposits have been noted in the area to the south and east of Cranbrook, in southern British Columbia.

The Falkland gypsum, which is of Permian age, occurs as a series of lenses or pockets in mountain-side deposits. The gypsum is fine grained and varies from white to grey or brown in colour. The deposits are usually underlain by pale blue anhydrite. Gypsum also has been noted near Spatsum, 75 miles west of Falkland, where it occurs in a hill-side deposit above the west bank of the Thompson river.

Northwest Territories

Gypsum has been noted in many of the Palaeozoic and Proterozoic rocks of the Northwest Territories. It occurs, as narrow seams, along the north shore of Great Slave Lake in the vicinity of Gypsum Point, and along the banks of the Mackenzie and Great Bear rivers near Fort Norman. Other occurrences are found along the banks of Slave River north of Fort Smith, and on several of the Arctic islands.

ECONOMIC CONSIDERATIONS

Crude gypsum and manufactured gypsum products are relatively low-priced commodities. The development of a particular gypsum occurrence must therefore be considered in the light of several economic factors in order to ensure success.

The gypsum deposit under consideration should lend itself to low-cost mining. The thickness of the gypsum bed, its depth below the surface, and the nature and amount of overburden all have a direct bearing on the cost of mining or quarrying. An exposed, surface gypsum deposit can be quarried more economically than one covered with 10 or 15 ft of overburden, especially if the overburden is a consolidated material such as clay or shale. Underground mining is usually more expensive than surface quarrying; however, it might be more economic to mine a thick seam of pure gypsum located 100 or 200 ft below the surface, rather than attempt to obtain gypsum from a narrow, impure seam located at the surface or perhaps covered by a considerable thickness of overburden. The extent of the deposit should be determined by a detailed diamond drilling program. All drill cores should be carefully logged and analysed so that accurate grade and ore reserve estimates can be made.

The location of the gypsum deposit with respect to markets and transportation facilities should receive careful consideration.

Several known Canadian deposits are too far from present markets to warrant development. Ideally, both the gypsum quarry and the gypsum-products plant should be located near a favourable market area. However, if the deposit is some distance from markets it might be more advantageous to establish the finished product plant near the market area rather than at the quarry site, since transportation costs of gypsum products are generally higher than those of crude gypsum. Crude gypsum can be shipped economically over a considerable distance by water, but relatively high land transportation costs usually prohibit the shipment of large tonnages over great distances by rail. Manufactured gypsum products, while sometimes shipped considerable distances, generally have a limited marketing area because of fragility or other characteristics which necessitate careful packaging and handling.

Other factors, such as the availability of power, labour supply, and adequate markets are important and should be investigated carefully before proceeding with the development of a particular gypsum occurrence.

MINING, MILLING, AND PROCESSING

Gypsum is obtained from surface or near-surface deposits by quarrying. Gypsum deposits that occur at depth are developed by underground mining.

Most surface deposits are covered by varying amounts of overburden, which must be removed before the gypsum can be quarried. Overburden that exceeds 15 or 20 ft in thickness is commonly removed by large drag-lines, whereas lesser thicknesses are removed by combined shovel-truck or tractor-scraper operations and bulldozing.

Gypsum quarries are developed by benching. The benches usually are 50 ft or more in width, while the quarry faces may range from 20 ft to 30 ft or more in height. The usual practice is to drill the face vertically, although some operators prefer horizontal holes. A combination of the two drilling methods is sometimes used to good advantage. Standard drilling machines include jackhammer, auger, wagon and churn drills. The blast holes are loaded with low-strength dynamite and are detonated electrically. Power shovels are used to load the broken rock into trucks or railway cars, for transfer to the crushing plant.

Underground gypsum deposits are mined by standard room and pillar methods, with 20 to 25 ft rooms and 15 to 20 ft pillars. The width or depth of gypsum mined is dependent on the thickness and purity of the seam. At Hagersville, in southern Ontario, a 4 ft seam is mined; at Caledonia, near Hagersville, the seam is 9 ft; and at Amaranth, in Manitoba, both a 10 ft and a 20 ft seam of gypsum are mined.

Underground, mobile mechanical loaders are generally used to load broken gypsum into mine cars or rubber-tired shuttle cars; however, direct loading slushers are employed at one Canadian operation. The gypsum is transported to the shaft or, in some mines, to an underground crusher for primary breaking. It is raised to the surface in skips, or in mine cars fastened in the cage, and discharged into a surge bin or feed hopper. Conveyor belts are used to transfer the gypsum to the surface when entrance to the mine is by an inclined shaft.

Crude gypsum from the quarry or mine, which may measure up to 36 in. in size, is reduced to about 6 in. by primary crushers prior to being shipped to gypsum processing plants. Equipment used for this purpose includes jaw and gyratory crushers as well as single, sledging-roll crushers.

Upon arrival at the gypsum processing plant, the gypsum is further reduced to about 2 in. by single-roll crushers or by hammer mills. It then is dried at 125° to 150°F in oil- or gas-fired rotary driers and reduced to 100 mesh by hammer mills or roller mills, or a combination of the two, prior to calcination. Some companies prefer to calcine a coarser, minus 20 or minus 48 mesh product and to grind to 100 mesh following calcination. Roller mills, ball mills, and tube mills commonly are employed to grind calcined gypsum. Buhr mills and disc pulverizers are also used.

Gypsum is calcined in standard kettles, or in rotary kilns similar to those used for cement manufacture. The kettle process, which is the more common, is a batch-type operation, whereas calcination is continuous in rotary kiln operations.

The gypsum kettle is peculiar to the gypsum industry. It consists of a vertical cylinder, 8 to 15 ft in diameter and from 8 to 12 ft high, made of boiler plate and set in a shell of brickwork. The gypsum, loaded from above, is agitated constantly, during calcination, by horizontal rabble arms attached to a vertical, gear-driven shaft located in the centre of the kettle. Drag chains attached to the lower rabble arms prevent the gypsum from sticking to the bottom. The kettle is fired from below by coal, oil, or gas. The hot gases circulate around the inner shell of the kettle and through horizontal flues, 8 to 14 in. in diameter, which pass through the kettle between the rabble arms. The charge varies from 10 to 20 tons, depending on the kettle size. Calcination is conducted over a 2 to 3 hr period, while the temperature of the kettle is gradually increased. The maximum temperature reached seldom exceeds 350°F; however, the average temperature of calcination usually ranges from 250° to 300°F. When calcining is complete, the calcined gypsum is discharged into storage bins, or 'hot pits', where it is allowed to remain for a 1/2 hr period. It is then transferred, by drag chain conveyor, bucket elevator, and screw or belt conveyor, to the plaster plant for further processing.

Two plants--one at Humbermouth, Newfoundland, and the other at Hagersville, Ontario--calcine in rotary kilns. The gypsum is reduced to minus 2 in. or finer and fed into the intake end of the slowly revolving kiln. The temperature at the intake end usually averages 250°F, while that at the discharge end is about 300°F. Retention time varies but generally is 35 to 40 min. The calcined gypsum is reduced to 100 mesh, usually by a roller mill, following discharge from the kiln, and is then transferred to the plaster mill or board plant.

Calcined gypsum for wall plaster is reground in tube mills to produce a flake-like grain preferred by the plaster trade. Various additives, including retarder, organic and inorganic fibres, expanded perlite or vermiculite, are then mixed with the plaster, and the whole is packaged for shipment.

Plaster used in the manufacture of gypsum lath and board is not reground. Land plaster (ground gypsum used to accelerate the set), starch, foam, and other ingredients are added to the calcined gypsum, which is then mixed with water to form a slurry for incorporation in gypsum wallboard or lath.

Wet mixing usually is performed in standard pin or ball mixers. 'Soak belts' sometimes are used to ensure that the ingredients are thoroughly wet before mixing. The 'soak belt', usually about 30 ft in length, consists of a rubber conveyor belt with its edges raised to contain the plaster slurry. The slurry from the 'soak belt' is discharged into the pin or ball mixer, where it receives a final mixing.

Slurry from the mixer is introduced between two layers of absorbent paper which feed into a standard board-forming unit. This unit consists of two large forming rolls with auxiliary equipment for scoring, turning, and gluing the edges of the paper. The board-forming unit is easily adapted to the manufacture of gypsum lath and other types of gypsum board. The plaster board issuing from the forming rolls is supported and carried along by a conveyor system consisting of a continuous rubber belt followed by a series of metal roller conveyors. Most Canadian plants support the gypsum board over a 300 ft belt length, followed by a 100 to 150 ft length of roller conveyors. Belt speeds average 50 fpm.

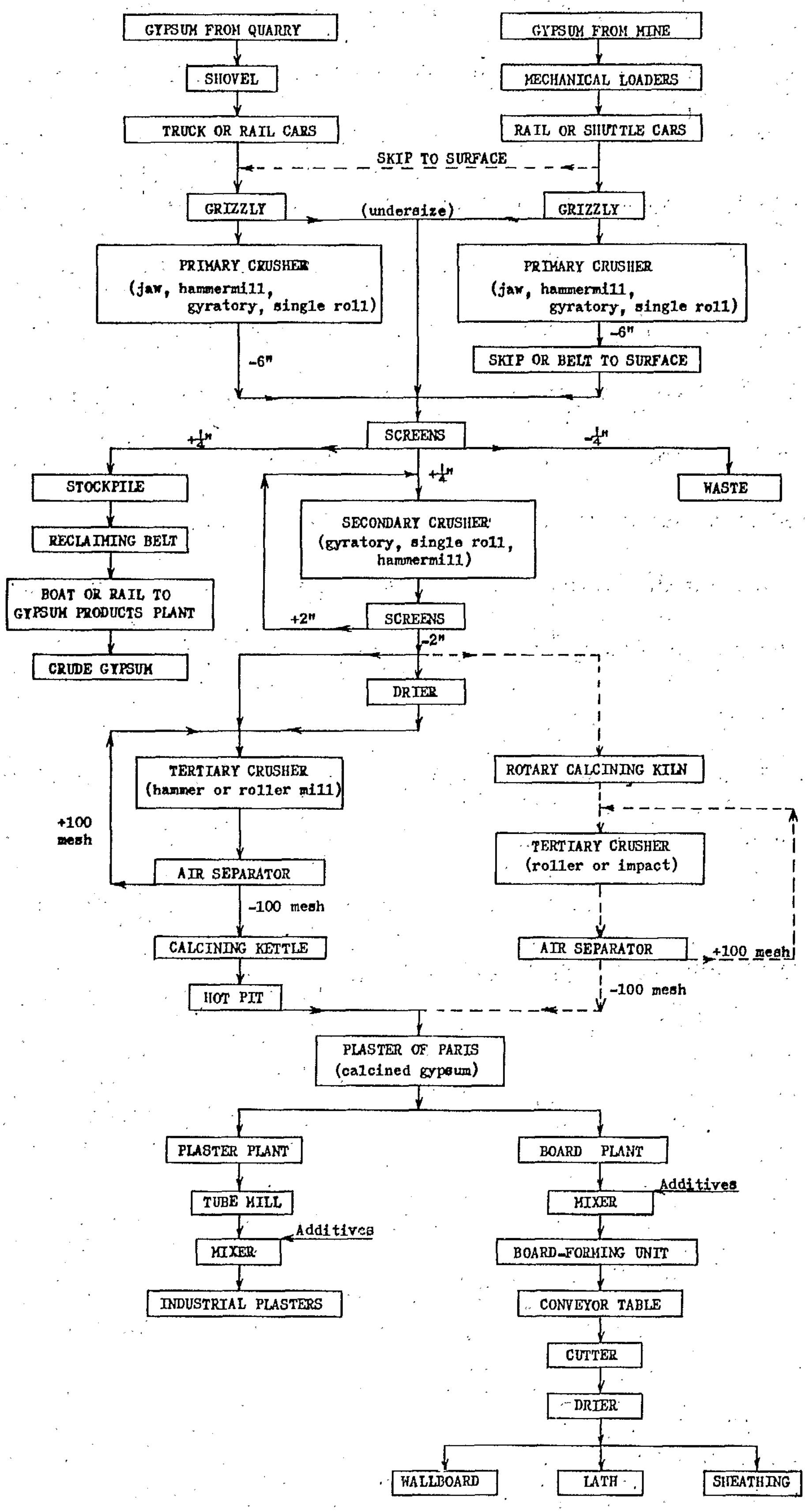
The plaster core sets as the board is carried along by the conveyor system. It is then cut into 6-, 8-, 10-, or 12-ft lengths by a rotary cutter. The individual boards are introduced into a tunnel drier by a mechanical, roller-conveyor loading tipple. The drier contains 6, 8, 10 or more decks of roller conveyors extending throughout its entire length. These conveyors are chain-driven and carry the board toward the discharge end of the drier. The boards are dried by hot air from an oil-, coal- or gas-fired furnace, or by steam pipes located above and below each set of roller conveyors. The drier usually measures 300 ft or more in length. The temperature at the intake end is between 300° and 350°F, while the discharge end temperature is maintained at about 200°F. About 45 min are required for each board to travel through the drier. The ends of the boards are ground as they leave the drier, following which the boards are packaged and transferred to a central warehouse.

The flow sheet (Figure 1) on page 22 traces the main steps followed in mining and processing gypsum. The operations outlined therein are typical of most Canadian plants, although there may be slight variations within individual plants.

FIGURE 1

TYPICAL FLOW SHEET FOR GYPSUM:

QUARRY OR MINE TO FINISHED PRODUCTS



THE CANADIAN GYPSUM INDUSTRY

Early History

Historical records reveal that the Canadian gypsum mining industry had its beginning during the latter part of the eighteenth century. Most of the mining activity was confined to Nova Scotia, where gypsum was quarried as early as 1770 for use as a fertilizer and for export to the United States. Several companies were formed in the early nineteenth century for the purpose of quarrying gypsum from Nova Scotia deposits for export. There were a few early attempts to manufacture gypsum products in Canada, but most of these met with failure as manufactured gypsum products could be imported from the United States more cheaply than they could be produced locally. A calcining plant, established in 1888 at Windsor, Nova Scotia, is the only products plant in operation in this province today.

The gypsum deposits of New Brunswick were quarried, as early as 1816, by farmers who used this gypsum for fertilizer. The deposits in the Hillsborough area, noted for their purity, have been quarried for many years. In 1854 a crushing and calcining plant was erected near Hillsborough to process gypsum for local use. Calcined gypsum, gypsum wallboard, and other gypsum products have been produced at Hillsborough almost continuously since that date.

The beginning of the gypsum industry in Ontario dates back to the early nineteenth century, when gypsum was discovered near the town of Paris. Gypsum from this area was used by farmers as fertilizer for their clover crops. In 1822 the first gypsum mine was opened and in 1846 a calcining plant was erected near Paris. Various plants and mines have been operated in this area in the past, but at present only two, one at Hagersville and the other at Caledonia, are operated.

Active development of the gypsum deposits in the Gypsumville district of Manitoba commenced in 1901. Development of the Amaranth deposits was not undertaken until 1929. Gypsum recovery operations are currently carried on at each of these locations. The crude gypsum is transported to plants in Winnipeg, where it is used in the manufacture of plaster and plaster products.

The gypsum deposits in southern British Columbia have been known for many years. The year 1911 marked the beginning of gypsum operations in this province, when 780 tons of gypsum were shipped to Vancouver from a quarry at Falkland, which is 44 miles east of Kamloops. The Falkland quarry was operated continuously until 1956, when it was closed because of insufficient reserves of suitable gypsum. A gypsum processing plant built at Port Mann in the early twentieth century continues to operate at the present time. Crude gypsum for this plant, formerly supplied by the Falkland quarry, is now obtained from Mexico. Development work on the Windermere gypsum deposits was started in 1947, and production from this area began in 1949. Many new deposits have been located in recent years in this area, but only the Windermere deposit is currently operated.

Early exploration of the gypsum deposits of the St. George's Bay area of southwestern Newfoundland was undertaken in 1926.

Active development of these deposits did not take place until 1952, when a plant was erected at Humbermouth to process gypsum from this area. This plant manufactures plaster and wallboard for use in Newfoundland and at various points in eastern Canada.

Current Operations

Seven companies were actively engaged in the production and/or processing of crude gypsum in Canada at the close of 1958. These companies mined or quarried gypsum at 14 separate locations. Most of the 1958 production of gypsum was exported to the United States; the remainder was used domestically in the manufacture of plaster at 12 plants and of wallboard at 10 plants. The locations of the quarries, mines and processing plants currently operated in Canada are shown on the map of Figure 2, page 27.

A brief description of gypsum operations within each of the eight provinces in which gypsum is quarried, mined or processed follows:-

Newfoundland:

Atlantic Gypsum Limited, a subsidiary of Bellrock Gypsum Industries of London, England, produces gypsum plaster, wallboard and lath at Humbermouth in southwestern Newfoundland. Crude gypsum for this operation is obtained from company-operated quarries near Flat Bay Station, 62 miles by rail southwest of Humbermouth. The gypsum is trucked 1 1/2 miles from the quarry to a railway siding, for rail transportation to Humbermouth. At Humbermouth the gypsum is crushed, calcined in a rotary kiln, and ground to form commercial plaster. Gypsum wallboard and lath are manufactured in an adjoining plant.

Nova Scotia:

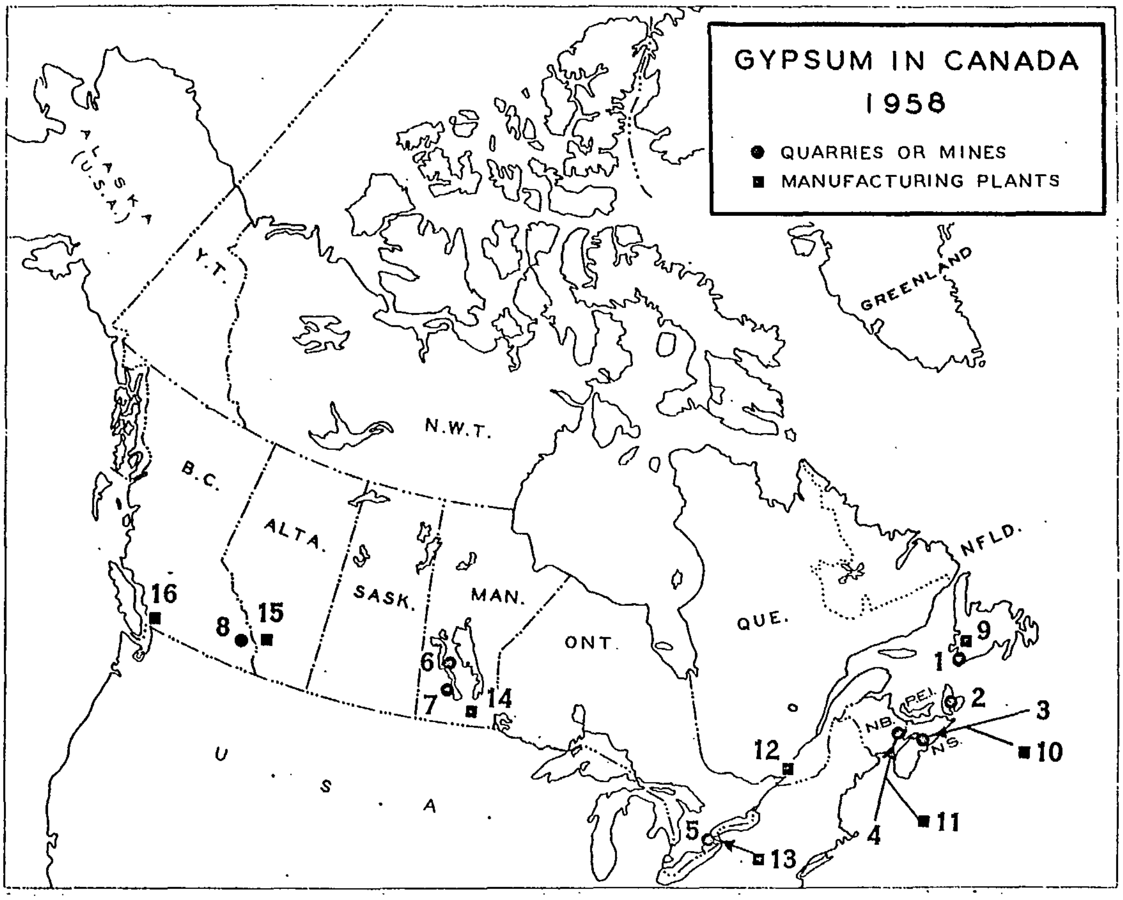
Nova Scotia, the chief producer of crude gypsum in Canada, annually accounts for over 75% of the total production. Most of the gypsum is exported to the United States; the remainder is used in the manufacture of gypsum products at Windsor, Nova Scotia, and Montreal, Quebec. The Windsor plant supplies part of Nova Scotia's requirements of plaster; however, some plaster and all of the wall-board and lath consumed in this province are obtained from neighbouring New Brunswick, Newfoundland, and the United States.

Canadian Gypsum Company, Limited, a subsidiary of United States Gypsum Company of Chicago, Illinois, quarries gypsum for export at Wentworth and Miller's Creek, near Windsor. The crude gypsum is crushed, screened, and loaded for rail shipment to Hantsport, on the Avon River. Upon arrival at Hantsport the gypsum is placed in a large storage shed to await shipment by boat to various gypsum products plants located along the eastern seaboard of the United States.

National Gypsum Company of Buffalo, New York, obtains gypsum from quarries at Walton, in Hants county, and at Milford Station, which is about 30 miles north of Halifax. Gypsum from the Walton quarries is trucked to Walton, where it is crushed and stored for shipment to the United States. Gypsum from the Milford Station operation is crushed and sized at the quarry site and loaded for rail transportation to storage and shipping facilities at Wright's Cove,

FIGURE 2

GYPSUM IN CANADA, 1958 - QUARRIES, MINES, AND MANUFACTURING PLANTS



Legend:

Quarries or Mines

1. Atlantic Gypsum Limited, Flat Bay Station
2. Little Narrows Gypsum Company Limited, Little Narrows
3. Canadian Gypsum Company, Limited, Wentworth and Miller's Creek
   National Gypsum (Canada) Limited, Milford Station and Walton
   Gypsum, Lime and Alabastine Limited, Brooklyn
4. Canadian Gypsum Company, Limited, Hillsborough
   Canada Cement Company Limited, Havelock
5. Canadian Gypsum Company, Limited, Hagersville
   Gypsum, Lime and Alabastine Limited, Caledonia
6. Gypsum, Lime and Alabastine Limited, Gypsumville
7. Western Gypsum Products Limited, Amaranth
8. Western Gypsum Products Limited, Windermere

Manufacturing Plants

9. Atlantic Gypsum Limited, Humbermouth
10. Gypsum, Lime and Alabastine Limited, Windsor
11. Canadian Gypsum Company, Limited, Hillsborough
12. Canadian Gypsum Company, Limited, Montreal
    Gypsum, Lime and Alabastine Limited, Montreal
13. Canadian Gypsum Company, Limited, Hagersville
    Gypsum, Lime and Alabastine Limited, Caledonia
14. Gypsum, Lime and Alabastine Limited, Winnipeg
    Western Gypsum Products Limited, Winnipeg
15. Gypsum, Lime and Alabastine Limited, Calgary
    Western Gypsum Products Limited, Calgary
16. Gypsum, Lime and Alabastine Limited, Port Mann
    Western Gypsum Products Limited, Vancouver (under construction)

north of Dartmouth. Most of the production from the Milford Station quarry is exported to the United States. Shipments also are made by boat from Wright's Cove, or by rail from the quarry site, to a gypsum-products plant in Montreal, Quebec.

Little Narrows Gypsum Company Limited, a subsidiary of United States Gypsum Company, quarries gypsum from deposits near Little Narrows, Cape Breton Island. Crude, sized gypsum is shipped by boat to markets in the United States, and to Montreal, for use in the manufacture of gypsum plaster and wallboard.

Gypsum, Lime and Alabastine Limited, a subsidiary of Dominion Tar and Chemical Company, Limited, Montreal, Quebec, operates the only calcining plant in Nova Scotia, at Windsor. Gypsum from quarries near Brooklyn, east of Windsor, is trucked to this plant, where it is crushed, ground and calcined to form plaster of Paris for use by the plastering trade. Special moulding and dental plasters also are made at the Windsor plant. This company recently acquired a gypsum deposit near Nappan. The Nappan deposit will supply gypsum to a company-owned gypsum products plant in Montreal.

New Brunswick:

Canadian Gypsum Company, Limited obtains gypsum from deposits near Hillsborough, south of Moncton, for plaster and wall-board manufacture at Hillsborough.

Two methods of extracting gypsum are practised: quarrying, and underground mining from adits. The adit method is used where the overburden is too thick to permit of economic quarrying.

Adits generally are driven into a gypsum face from the floor of existing quarries; they measure 20 ft in height, 20 to 25 ft in width, and, when completed, 500 ft or more in length. The crude gypsum is transported by rail about 2 miles to Hillsborough, where it is crushed and processed to form plaster and wallboard for use by the building construction industry.

Canada Cement Company, Limited, quarries gypsum from deposits south of Havelock, for use in the manufacture of Portland cement at Havelock.

Quebec:

There are no gypsum mines or quarries in operation in Quebec at the present time. At Montreal, however, crude gypsum is processed at two plants to form plaster, wallboard and other products. A third plant, also at Montreal, manufactures a pre-cast panel for use by the building construction industry.

Gypsum plaster, wallboard and lath are manufactured by Gypsum, Lime and Alabastine Limited and by Canadian Gypsum Company, Limited, at plants in Montreal East. The former company obtains crude gypsum from quarries at Milford Station, Nova Scotia, while the latter obtains gypsum from quarries at Little Narrows, Nova Scotia.

Atlantic Gypsum Limited produces pre-cast gypsum building panels in Montreal East, using plaster from its mill at Humbermouth, Newfoundland. These panels, developed by Bellrock Gypsum Industries, of London, England, are designed for use in interior partitions that support only moderate loads. A tar-impregnated panel for exterior walls also is made.

Ontario:

The entire production of crude gypsum in Ontario is obtained from two mines, one at Hagersville and the other at Caledonia, south of Hamilton.

The Hagersville mine is operated by Canadian Gypsum Company, Limited. The crude gypsum is obtained from a 4 ft seam, 90 ft below the surface, by the room-and-pillar method of mining. The gypsum is raised to the surface through a vertical shaft. At the surface it is discharged into hoppers which feed an adjacent crushing and processing plant, where, after crushing, it is calcined in a large rotary kiln and processed into plaster, wallboard, lath, and other products.

Gypsum, Lime and Alabastine Limited operates the Caledonia mine. The gypsum at Caledonia occurs as a 9 ft seam 75 ft below the surface. Access to the mine is by an inclined shaft. The gypsum is mined by standard room-and-pillar methods, crushed, and raised to the surface by conveyor belt. It is then trucked to a nearby processing plant, where it is used to manufacture plaster, wallboard, and other products.

Manitoba:

Gypsum is obtained at two locations in Manitoba, namely at Amaranth, 80 miles northwest of Winnipeg, and at Gypsumville, 150 miles north of Winnipeg.

The Amaranth gypsum deposit is operated by Western Gypsum Products Limited, a subsidiary of British Plaster Board

(Holdings) Limited, of London, England. Here the gypsum occurs in a 40 to 45 ft zone, located 95 ft beneath the surface. This gypsum zone consists of an upper 27 to 30 ft gypsum seam separated from a lower 8 to 10 ft seam by a 3 to 5 ft band of anhydrite. It is reached by a 2-compartment shaft. Mining is by a unique room-and-pillar method which enables the gypsum to be recovered with little anhydrite contamination. The bottom, 8 to 10 ft seam of gypsum is first removed by standard mining methods. The overlying anhydrite seam is then drilled, blasted down, and levelled off to form a floor from which the upper gypsum seam is mined. Following this the upper gypsum is removed in two 10-ft lifts by underhand mining. A 7 to 10 ft thickness of gypsum is left in place to provide a secure, solid roof. The crude gypsum is crushed, raised to the surface, and transported by rail to Winnipeg, where it is used for the manufacture of plaster, wallboard and lath at a company-owned plant.

The Gypsumville deposits are quarried by Gypsum, Lime and Alabastine Limited. Two quarries are operated: the main quarry, about one mile northwest of Gypsumville; and the White Elephant quarry, which is 5 miles north of the main quarry. Gypsum from the latter quarry is hauled over a winter road to the main quarry, whence it is shipped by rail to Winnipeg along with gypsum from the main quarry. At Winnipeg, the crude gypsum is processed in a company-owned plant to form plaster, wallboard and lath.

Alberta:

Western Gypsum Products Limited and Gypsum, Lime and Alabastine Limited operate gypsum product plants in Calgary.

Western Gypsum Products Limited produces plaster and standard sizes of wallboard and lath, using gypsum obtained from a company-owned quarry near Windermere, British Columbia.

Gypsum, Lime and Alabastine Limited produces only plaster at its Calgary plant at present; however, a plant for the manufacture of wallboard and lath is under construction. Crude gypsum for the plaster plant is obtained from company quarries at Gypsumville, Manitoba.

British Columbia:

Gypsum is quarried at Windermere, in southeastern British Columbia, by Western Gypsum Products Limited. The gypsum is crushed and sized at the quarry site and trucked 9 miles to a rail siding at Athalmer. At Athalmer, the gypsum is stockpiled, or is loaded into rail cars for shipment to consumers.

Crude gypsum from the Windermere quarry is used at Calgary, Alberta, for the manufacture of plaster, lath and wallboard at a plant owned by Western Gypsum Products Limited. Gypsum from Windermere also is used in Portland cement manufacture at plants in Alberta and British Columbia. Western Gypsum Products Limited currently is constructing a gypsum products plant at Vancouver. Crude gypsum for this plant probably will be obtained from the Windermere quarry.

Gypsum, Lime and Alabastine Limited produces plaster, wall-board and lath at a plant at Port Mann, using gypsum from San Marcos Island, Mexico. This plant was formerly supplied with gypsum from a company-operated quarry near Falkland, British Columbia; however, quarrying operations were suspended at Falkland in 1956 because of insufficient reserves of suitable gypsum.

PRODUCTION AND TRADE

The Canadian production of gypsum increased steadily from the earliest recorded figure of 67,830 short tons in 1874 to 636,370 short tons in 1913. Production dropped off during World War I, 1914 to 1918, but gradually increased during the postwar period to a high of 1,246,368 short tons in 1928. The depression years 1929 to 1937 saw a marked curtailment of crude gypsum production; however, increased prosperity resulted in a gradual recovery, and production rose to a high of 1,593,406 short tons in 1941. Production dropped off again during World War II, 1939 to 1945, but recovery was rapid and production rose during the postwar period to an all-time high of 4,895,811 short tons in 1956. The Canadian production of crude gypsum in 1958 was 3,964,129 short tons, valued at $5,189,159.

Canada for many years has exported to the United States 70 to 80% of her total annual output of crude gypsum. In 1958 total exports of crude gypsum amounted to 2,898,230 short tons, valued at $4,871,440.

Very little crude gypsum was imported prior to 1956. In that year, a firm in British Columbia began importing gypsum from San Marcos Island, Mexico, for use in a gypsum products plant at Port Mann, 10 miles east of Vancouver. The 1958 imports of crude gypsum amounted to 108,038 short tons, valued at $609,106.

The production of gypsum wallboard, lath and plaster has been expanding during the past 10 years, to keep pace with increased activity in the building construction industry. The Canadian production of wallboard and lath rose from 390,708,522 sq ft in 1948 to 770,453,051 sq ft in 1958. This represented an increase of 97% for the 10-year period. Wallboard production rose only 58%; however, increased use of gypsum lath as a base for plaster resulted in a production rise in lath of over 158% during this period. The total value of the Canadian production of gypsum wallboard, gypsum lath, and other gypsum products was $35,719,283 in 1958.

Imports of manufactured gypsum products vary considerably from year to year. In 1948, 9,953 short tons of manufactured gypsum products, valued at $201,806, were imported by Canada, whereas in 1958, 56,099 short tons, valued at $1,520,907, were imported.

Exports of manufactured gypsum products represent only a very minor part of the total Canadian production. Small tonnages occasionally are shipped to the United States by plants located near the international border.

The Canadian production, consumption, exports and imports of crude gypsum and manufactured gypsum products for the 10-year period ending in 1958 are listed in Tables 1 to 4. Table 5 summarizes the production and trade statistics for 1957 and 1958.

TABLE 1

Canadian Production, Exports and Imports of Crude Gypsum, 1948-1958

Year	Production(1)		Exports(2)		Imports(3)	
	Short Tons	$	Short Tons	$	Short Tons	$
1948	3, 216, 809	5, 548, 245	2, 628, 807	2, 738, 463	1, 031	21, 577
1949	3, 014, 249	5, 423, 690	2, 544, 782	2, 641, 495	566	20, 309
1950	3, 666, 336	6, 707, 506	2, 970, 076	3, 064, 628	848	24, 346
1951	3, 802, 692	5, 880, 853	3, 028, 506	3, 133, 841	1, 700	24, 347
1952	3, 590, 783	6, 538, 074	2, 763, 829	2, 855, 510	649	19, 402
1953	3, 841, 457	7, 399, 884	2, 770, 077	3, 797, 133	547	17, 410
1954	3, 950, 422	7, 094, 671	2, 831, 116	4, 211, 191	4, 958	51, 227
1955	4, 667, 901	8, 037, 153	3, 039, 289	4, 933, 967	16, 104	123, 856
1956	4, 895, 811	7, 260, 236	3, 840, 869	6, 992, 634	70, 436	302, 639
1957	4, 577, 492	7, 745, 105	3, 410, 707	5, 906, 372	92, 139	359, 615
1958	3, 964, 129	5, 189, 159	2, 898, 230	4, 871, 440	108, 038	609, 106

(1) Represents tonnage and value of crude, plus calcined gypsum up to and including 1950. The calcined material averages 10% of the total tonnage for these years. Beyond 1950 the tonnage and value of crude gypsum alone are given.

(2) Mostly to the United States. Includes crude and calcined. Calcined represents only a very small percentage of total.

(3) Includes crude and ground, but not calcined.

TABLE 2

Consumption of Crude Gypsum in Canada, 1948-1958(1)

Year	Portland Cement	Gypsum Products		Total
		Crude	Calcined(2)	
1948	119, 821	61, 991	362, 555	544, 367
1949	137, 785	96, 447	366, 077	600, 309
1950	137, 170	113, 100	406, 031	656, 301
1951	146, 603	610, 477	21, 231	778, 311
1952	161, 210	630, 940	-	792, 150
1953	199, 743	772, 331	-	972, 074
1954	210, 373	767, 068	-	977, 441
1955	219, 461	1, 022, 893	-	1, 242, 354
1956	234, 545	936, 624	-	1, 171, 169
1957	287, 786	831, 910	-	1, 119, 696
1958	293, 514	971, 982	-	1, 265, 496

(1) Short tons.

(2) No quantity for calcined gypsum was reported after 1951.

TABLE 3

Production of Gypsum Products in Canada, 1948-1958

Year	Gypsum Wallboard		Gypsum Lath		Other Gypsum Products (1)	
	Square Feet	$	Square Feet	$	$	Total $
1948	237, 700, 167	7, 213, 425	153, 008, 355	3, 667, 540	3, 305, 749	14, 186, 714
1949	230, 561, 517	7, 330, 859	173, 994, 976	4, 409, 562	3, 959, 342	15, 699, 763
1950	230, 684, 144	7, 578, 826	214, 714, 308	5, 855, 077	4, 445, 605	17, 879, 508
1951	232, 312, 775	7, 876, 750	228, 645, 066	6, 553, 202	4, 456, 055	18, 886, 007
1952	225, 409, 932	7, 869, 907	202, 987, 638	6, 004, 908	4, 480, 997	18, 355, 812
1953	251, 784, 173	9, 195, 011	269, 225, 013	8, 152, 601	5, 318, 794	22, 666, 406
1954	261, 116, 324	9, 814, 071	325, 792, 296	9, 604, 434	6, 330, 899	25, 749, 404
1955	303, 551, 960	11, 745, 957	396, 675, 440	11, 612, 443	8, 110, 639	31, 469, 039
1956	301, 731, 334	11, 779, 191	372, 261, 631	11, 168, 044	8, 325, 420	31, 272, 655
1957	304, 591, 116	12, 003, 760	322, 401, 967	9, 744, 059	7, 879, 406	29, 627, 225
1958	375, 003, 665	14, 897, 820	395, 449, 386	12, 001, 022	8, 820, 441	35, 719, 283

(1) Includes gypsum plasters, tile, block, etc.

TABLE 4

Imports of Gypsum Products (1) into Canada, 1948-1958

Year	Gypsum Wallboard and Lath		Other Gypsum Products (3)		Total $
	Square Feet(2)	$	Short Tons	$	
1948	-	-	9, 953	201, 806	201, 806
1949	-	-	8, 731	186, 310	186, 310
1950	-	-	22, 439	414, 246	414, 246
1951	15, 946, 563	588, 979	15, 678	330, 036	919, 015
1952	10, 033, 332	318, 121	12, 667	269, 190	587, 311
1953	31, 602, 828	939, 073	22, 031	466, 262	1, 405, 335
1954	10, 532, 755	330, 325	19, 182	418, 374	748, 699
1955	1, 848, 128	67, 170	25, 936	595, 532	662, 702
1956	421, 673	15, 465	22, 794	562, 490	577, 955
1957	4, 647, 616	160, 536	17, 424	458, 438	618, 974
1958	24, 177, 000	786, 928	31, 922	733, 979	1, 520, 907

(1) Mostly from United States.

(2) Calculated from weight in lb on the basis of 2000 lb per 1000 sq ft.

(3) Includes gypsum plaster, tile and block, as well as wallboard and lath, up to and including 1950. Beyond 1950, wallboard and lath are reported separately.

TABLE 5

Summary of Canadian Production and Trade in Gypsum and Gypsum Products, 1957-1958

	1958		1957	
	Short Tons	$	Short Tons	$
Production (shipments)				
Crude gypsum				
Nova Scotia	3, 149, 719	3, 259, 423	3, 842, 027	6, 005, 640
Ontario	425, 743	1, 059, 590	379, 621	853, 199
Manitoba	176, 123	343, 266	183, 708	458, 368
New Brunswick	105, 749	170, 876	93, 249	163, 146
British Columbia	70, 498	211, 494	49, 422	142, 952
Newfoundland	36, 307	144, 510	29, 465	121, 800
Total	3, 964, 129	5, 189, 159	4, 577, 492	7, 745, 105
	Square Feet	$	Square Feet	$
Gypsum wallboard	375, 003, 665	14, 897, 820	304, 591, 116	12, 003, 760
Gypsum lath	395, 449, 386	12, 001, 022	322, 401, 967	9, 744, 059
Other gypsum products(1)		8, 820, 441		7, 879, 406
Total		35, 719, 283		29, 627, 225
	Short Tons	$	Short Tons	$
Exports				
Crude gypsum				
United States	2, 898, 230	4, 871, 440	3, 410, 684	5, 905, 051
Plaster of Paris, wall plaster				
New Zealand	16	361	5	156
United States	-	-	18	1, 165
Total	16	361	23	1, 321
Total Exports . .	2, 898, 246	4, 871, 801	3, 410, 707	5, 906, 372
	Short Tons	$	Short Tons	$
Imports				
Crude gypsum				
Mexico	107, 500	597, 165	91, 856	348, 723
United States	486	9, 378	248	9, 790
United Kingdom	52	2, 563	35	1, 102
Total	108, 038	609, 106	92, 139	359, 615
Plaster of Paris, wall plaster				
United States	31, 611	726, 836	17, 401	456, 459
United Kingdom	159	1, 697	5	210
West Germany	137	4, 669	6	120
Other countries	15	777	12	1, 649
Total	31, 922	733, 979	17, 424	458, 438
	Square Feet(2)	$	Square Feet(2)	$
Wallboard and lath				
United States	24, 177, 000	786, 928	4, 647, 616	160, 536
Total Imports . .		2, 130, 013		978, 589

(1) Includes gypsum plasters, tile, block, etc.
(2) Calculated from weight in lb on the basis of 2000 lb per 1000 sq ft.

OUTLOOK

The gypsum mining and processing industries are closely related to the building construction industry, since gypsum is important chiefly because it may be processed to form materials which are well suited for certain structural and decorative purposes. The use of gypsum as a retarder in Portland cement further adds to its importance in construction.

The building construction industry, which during the past several years has enjoyed a remarkable expansion, should continue to prosper as population increases and additional housing is required. The demand for gypsum and gypsum products for use by this industry should, therefore, continue at a high level. Substitute materials for interior finishing, such as ceiling tile, plywood panels and other types of panelling, undoubtedly will have some effect on the amount of gypsum wallboard and plaster used in certain types of dwellings. However, plaster and gypsum wallboard finishes will continue to be popular, because these gypsum products are relatively inexpensive. Local markets for gypsum products will develop as sparsely settled areas become more densely populated. These markets will be supplied by construction of new gypsum processing facilities. Increased markets in areas currently served by existing plants could lead to further expansion of production in these areas.

This continued demand for gypsum products will necessarily be met by a steady, high level of production of crude gypsum. The

Nova Scotia deposits, already developed on a large scale, undoubtedly will continue to be the main source of supply of crude gypsum for product plants located in Montreal and along the Eastern seaboard of the United States. The Newfoundland deposits, although not now developed for export, are well situated with respect to the United States and overseas markets. The possibility of supplying Newfoundland gypsum to these markets is currently being considered. The Magdalen Islands, centrally located in the Gulf of St. Lawrence and containing large reserves of gypsum, might also serve as a source of supply of crude gypsum for these markets at some future date.

Dwindling reserves of high-purity gypsum in certain areas, together with high freight rates, will stimulate research into the development of new and improved methods of upgrading low-quality material. This in turn will tend to encourage the development of local, known deposits of low-grade gypsum. Nevertheless, it will eventually become necessary to go farther afield to obtain adequate supplies of crude gypsum. The Moose River deposits of northern Ontario will become more attractive as the gypsum deposits of southern Ontario are gradually depleted and as population continues to increase in the area to the south of James Bay and north of Sudbury and Sault Ste. Marie.

Because of a lack of suitable local gypsum deposits, several of the gypsum product plants in western Canada undoubtedly will continue to obtain crude rock from distant points. However, further exploration of some of the more favourable areas, especially in southwestern Alberta and southern British Columbia, could add to the known deposits in this region. The Peace River deposits occurring in Wood Buffalo Park in northern Alberta are too far from markets and existing transportation facilities to be economically important at present; however, these deposits contain large reserves of good quality gypsum.

To summarize: The production of crude gypsum in Canada will probably continue at a high level to keep pace with industrial demand for products made from this mineral. Domestic consumption of crude gypsum can be expected to continue at a high level while United States markets probably will continue to absorb large tonnages of Canadian gypsum.

The gypsum products industry can be expected to expand as population increases and as new products are developed. Additional plants will be built, and older plants enlarged, to meet the demand for gypsum products for use in construction. The overall picture is very assuring. The present demand for gypsum indicates that this mineral will continue to rank as one of the major industrial minerals of Canada.

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REFERENCES

1. Cole, L.H., Gypsum in Canada: Its Occurrence, Exploitation and Technology. Canada, Department of Mines, Mines Branch Report 245 (1913), 256 pp.

2. Camsell, C., Salt and Gypsum Deposits of the Region between Peace and Slave Rivers, Northern Alberta. Geological Survey of Canada, Summary Report 1916, pp. 134-141.

3. Dyer, W. S., Geology of the Gypsum Deposits of Southwestern Ontario. Ontario Department of Mines, Annual Report, 1925, Vol. 34, Pt. II, pp. 35-58.

4. Cole, L. H., The Gypsum Industry of Canada. Canada, Department of Mines, Mines Branch Report 714 (1930), 164 pp.

5. Mudd, Seeley W., Industrial Minerals and Rocks (2nd Ed., 1949, A.I.M.E., New York), pp. 436-447.

6. Ladoo, R.B., and Myers, W.M., Nonmetallic Minerals (2nd Ed., 1951, McGraw-Hill Book Co., Inc., New York), pp. 259-271.

7. Baird, D. M., Gypsum Deposits of Southwestern Newfoundland. Trans. CIMM, Vol. 54 (1951), pp. 85-94.

8. Goodman, N. R., The Geology of Nova Scotia Gypsum. Bull. CIMM, Vol. 47 (1954), No. 502, pp. 75-80.

9. Henderson, G. H. L., Geology of the Stanford Range of the Rocky Mountains. B. C. Department of Mines, Bull. No. 35, 1954, pp. 53-65.

10. Hume, C. B., Mining of Nova Scotia Gypsum. Trans. CIMM, Vol. 57 (1954), pp. 169-181.

11. Carr, G. F., The Industrial Minerals of Newfoundland. Canada, Department of Mines and Technical Surveys, Mines Branch Report 855 (1957), pp. 75-82.

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