Asbestos in the Construction Industry

*By L. O. MONTPETIT**

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ABSTRACT

The economics of the asbestos mining industry of Canada, and the physical and chemical characteristics of asbestos fibre, as well as exploration, mining, milling and quality control methods, have been described by several authors in the past few years.

The scope of this presentation is to survey the application of asbestos fibres in the major product groups of the construction industry in North America.

Principal categories considered include flooring materials, asbestos-cement pipes and building products, high-temperature insulation, textiles, saturated asbestos felts and asphalt compounds.

During 1962, the asbestos mining industry of Canada produced an estimated 1.3 million tons of chrysotile fibre grades, and production capacity is expanding. The market demand for chrysotile fibre, on this continent, has been in the order of 50 per cent of the production volume.

The asbestos industry is dependent for growth on the construction industry. Product research is active in finding new uses for asbestos fibre; some of the new developments are presented, including the use of short-fibre asbestos grades for extending the life of asphalt pavement. That development could mean a market for an additional half-million tons of asbestos per year.

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Figure 1.—Chrysotile Cross Fibre in Serpentinized Peridotite.

Introduction

CONSIDERABLE information has been published in the C.I.M. *Transactions* detailing the characteristics, the mining and milling, and the quality control of asbestos fibre. The utilization of asbestos in fabricated form has been the subject of a volume of product information disseminated by individual Canadian and U.S. manufacturing companies and by the Quebec Asbestos Information Service in Montreal (see selected Bibliography).

The economic importance and the role of asbestos products in the construction industry will be presented in the following pages.

Acknowledgments and thanks are expressed to members of the Quebec Asbestos Mining Association and to the Canadian Department of Trade and Commerce for the assistance given the writer in obtaining the reference material necessary for this study.

The Asbestos Industry

The world production of asbestos fibre, for the years 1958 to 1962, is given in Table I.

The Canadian production, which is entirely chrysotile fibre, is now supplied by ten firms operating fourteen mines — twelve in Quebec, one in Ontario and another in British Columbia. Canadian capacity is expanding, with several potential producers in the process of development.

TABLE I

World Asbestos Production Data

Year	1958 (tons)	1959 (tons)	1960 (tons)	1961 (tons)	1962 Est. (tons)
World Production	2,055,000	2,270,000	2,440,000	2,770,000	2,830,000
Canada*	925,331	1,050,429	1,118,456	1,173,695	1,223,509*
United States	43,979	45,459	45,223	52,814	60,000
South America	13,253	17,908	19,319	17,500	—
Europe	630,000	690,000	765,000	990,000	—
Asia	96,000	118,000	132,000	131,000	—
Africa	331,088	328,903	344,340	389,974	—
Australasia	16,024	18,515	15,932	17,076	—

Sources: U.S. Department of the Interior; Bureau of Mines Minerals Yearbook; Dominion Bureau of Statistics.
*Exclusive of asbestos sand and gravel.

The Mineral Asbestos

(1) — The name "asbestos" is applied to a group of hydrated silicates. The common characteristic of all these minerals is their naturally fibrous form. A chemical feature common to all types of asbestos is their varying degree of hydration, ranging from 1.5 per cent in amphibole asbestos to 14.5 per cent in chrysotile.

(2) — The following is the mineral classification of the commercially important types of asbestos:

TABLE II

DISTRIBUTION OF CANADIAN ASBESTOS SHIPMENTS

Item	*1958*	*1959*	*1960*	*1961*	*1962 Est.*
Value of Canadian Production	$92,276,743	$107,433,334	$121,400,015	$128,955,700	$132,060,710
Tons of Asbestos Fibre	925,331	1,050,429	1,118,456	1,173,695	1,223,509
Tons of Asbestos Sand	18,449	29,532	51,625	41,695	—
Apparent Canadian Consumption of Asbestos Fibre	38,000 (4.1%)*	40,000 (3.8%)	50,000 (4.4%)	57,000 (4.8%)	63,000 (5.1%)
Export					
Tons Asbestos Fibre	856,630(93.6%)	1,013,923(96.0%)	1,038,493(95.6)	1,116,880(95.2)	1,160,000(94.9)
United States	582,366(62.9%)	629,231(59.9%)	596,838(53.3)	558,033(47.5)	630,000(51.5)
Europe	123,097(13.3%)	179,795(17.1%)	220,327(19.6)	258,776(22.0)	250,000(20.4)
United Kingdom	65,304(7.0%)	69,234(6.5%)	74,816(6.6)	74,516(6.3)	70,000(5.7)
Asia	32,752(3.5%)	66,428(6.5%)	82,730(7.4)	112,219(9.6)	75,000(6.1)
Latin America	35,955(3.8%)	39,568(3.7%)	50,409(4.5)	65,546(5.5)	60,000(4.9)
Others	27,156(2.9%)	29,666(2.8%)	43,373(3.8)	47,790(4.0)	45,000(3.5)

Source: Dominion Bureau of Statistics: Trade and Commerce.
*% = per cent fibre production tonnage

(a) *Serpentine Group* — chrysotile, with minor amounts of antigorite and picrolite.

(b) *Amphibole Group* — crocidolite, amosite, anthophyllite, tremolite, actinolite.

Each type has its own field of activity, but the most important variety is chrysotile (Figure 1). Some 95 per cent of the total world production is comprised of chrysotile asbestos.

(3) — Asbestos fibres can be divided and subdivided to such a fine degree that only the electron microscope will reveal the finest fibres (chrysotile). The basic single fibre is a cylinder, approximately 180 Angstrom units in diameter (710×10^{-9} in.).

(4) — The surface area per unit weight of asbestos is ten times as great as that of organic and inorganic fibres (Figure 2).

(5) — Single asbestos fibres are extremely flexible and have a high modulus of elasticity, comparable to that of steel. The strength is not impaired at temperatures up to 700°F. The low tensile strength of asbestos fabrics is due to the lack of coherence and smoothness of the fibres.

(6) — Amphibole asbestos becomes extremely brittle at 750°F, but chrysotile retains its flexibility.

At 1,800°F, all of the water of crystallization is driven off from chrysotile and the mineral alters to olivine, with pronounced changes in physical properties. However, relatively high tensile strength values are retained at 1,200°F. Organic and inorganic fibres, by comparison, are completely destroyed, or melt, between 200 and 900°F.

Asbestos fibre mechanically breaks down at approximately 1,500°F, and completely disintegrates at 2,770°F. With phenolic resins, asbestos products will provide insulation and retain strength when subjected to temperatures of 5,000°F for periods of 1 to 30 minutes.

(7) — More than 95 per cent of the asbestos used is combined with other materials and, in most cases, asbestos loses its identity in the finished products. Used with other materials, the strong and flexible asbestos fibres interlock to form reinforcing webs. Tests using temperatures as high as 20,000°F have been conducted on various products.

(8) — The main qualities of asbestos are strength and durability. Asbestos will resist: weather, corrosion, fire, heat, acid, vermin, and fungus growth. Asbestos will insulate against: vibration, electricity and sound. Asbestos will bind: fillers, magnesia, cement and rubber. Asbestos will attract: sludge and dust.

Market requirements are based principally on fibre length, but strength, flexibility, colour, chemical composition and cleanliness may have an important bearing on use.

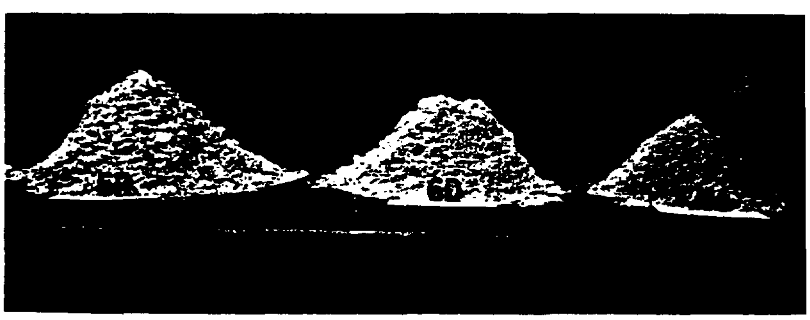

Figure 2.—Fibre Grades.

CANADIAN ASBESTOS PRODUCTION

The distribution of the Canadian asbestos shipments, for the years 1958 to 1962, is given in Table II.

THE CONSTRUCTION INDUSTRY

Described as the largest business in Canada,* making up 20 per cent of the Gross National Product, the construction industry reached a value of over $7 billion in 1962. The Canadian construction industry could handle a business volume of $10 billion. Competition is therefore fierce, and profit margins low.

The construction industry can be subdivided into categories, as has

*Hugh R. Montgomery, president, Canadian Construction Association, in the Montreal *Gazette*.

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TABLE III

ESTIMATED VALUE OF EXPENDITURES, CANADIAN CONSTRUCTION INDUSTRY, 1963

Housing	$2,100,000,000
Commercial	750,000,000
Industrial	500,000,000
Institutional	800,000,000
Marine, Water & Sewage Power and Communications; Oil and Gas Works	2,000,000,000
Roads	1,000,000,000
Total	$7,150,000,000

(Canadian Construction Association)

been done in Table III, which shows the estimated Canadian volume of expenditures for 1963.

In the United States, the construction market was estimated by F. W. Dodge Corporation at $42 billion for the year 1962. This was up 11 per cent from 1961, and represents the largest market ever presented to any fabricating industry.

Housing accounts for $18.3 billion, with a decline in expenditures on single homes but an increase in expenditures on apartment buildings. Commercial, industrial and institutional construction, combined, shows an expenditure of $13.2 billion; engineering shows $10.5 billion.

U.S. IMPORTS OF CANADIAN FIBRE

Taking the year 1961 as an example, the tonnage of Canadian asbestos fibre imported by the United States was in the proportions shown in Table IV.

It is estimated, in the U.S. Bureau of Mines *Yearbook*, that the chrysotile fibre consumed in the United States was used mainly in asbestos-cement, asbestos paper and asbestos asphalt building materials. Therefore, the Canadian asbestos industry and the North American asbestos products industry are dependent for growth on industrial, commercial and residential construction.

TABLE IV

U.S. IMPORTS — 1961

Canadian Fibre Grades	*Tons*	*Per Cent*	*Average Value/Ton*
Crude	437	0.7	$800
Spinning	16,903	2.9	360
Shingle	86,070	15.0	180
Paper	40,409	7.1	120
Shorts	426,234	74.7	60
Total	570,053		$ 90

Source: U.S. Bureau of Mines Mineral Yearbook.

The tonnage of Canadian asbestos fibre imported by the United States has shown a substantial increase during 1962; the tonnage exported to European countries continued at a high level.

ASBESTOS PRODUCTS MANUFACTURED IN CANADA

Quoting from *Foreign Trade*,** "the Canadian asbestos industry has been built upon export markets, and about 95 per cent of total output goes to foreign countries. . . .

Seventeen Canadian firms specialize in the manufacture of asbestos products. . . .

It is significant that the volume of production has almost reached domestic demand."

Table V, using figures available for 1959 and 1960, shows the distribution of the asbestos products manufactured in Canada.

ASBESTOS PRODUCTS INDUSTRY

Much has been written on the multitude of uses for asbestos, but little information is available on the quantities required for several of these uses.

**R. P. Mulvihill, Department of Trade and Commerce, Ottawa.

TABLE V

ASBESTOS PRODUCTS MANUFACTURED IN CANADA

	1959	*1949*	*1939*
Production (Millions of Dollars)	30.8	10.3	1.8
Plus Imports	4.0	2.6	1.1
Total	34.8	12.9	2.9
Less Exports	0.7	0.4	0.5
Apparent Consumption	34.1	12.5	2.4

Product Group	*Value, 1959*	*Value, 1960 (estimate)*
Asbestos Cement & other products	$19,800,000	$18,600,000
Textiles	4,300,000	4,600,000
Brake Linings	4,400,000	4,350,000
Boiler and Pipe Coverings	800,000	720,000
Packings	800,000	420,000
Pipeline Felt	600,000	600,000
Gaskets	100,000	60,000
	30,800,000	29,350,000

(Dominion Bureau of Statistics.)

Table VI gives an indication of the major industry groups using asbestos in their products. These 1958 figures come from the Industry Statistics Section of the U.S. Bureau of the Census.

The industries covered in the above groups used only 78 per cent of the asbestos fibre consumed in the U.S. in 1958. The plastics group, except for the manufacturers of floor tiles, is not included. It can be assumed that the asbestos products produced in North America have reached a value in the range of $700 million per year.

ASBESTOS-CEMENT BUILDING MATERIALS

The weather- and fire-resisting properties of both cement and asbestos, along with their adaptability to mass manufacturing processes, led to their combined use in a great variety of building materials. The asbestos fibres serve as a reinforcing medium for the cement. Depending on the product, the proportion, by weight, of asbestos to cement may vary from 15 to 90 per cent. The principal cement products are:

(1) — Large sheets for siding, or small sheets for clapboards and shingles. Asbestos-cement has been widely used for exterior cladding for commercial and residential buildings.

(2) — The new decorative products, as a result of a thermally fused

TABLE VI

INDUSTRIES USING ASBESTOS IN THEIR PRODUCTS

Product Group	*1958 Value of Products Shipped in the U.S.*
Asbestos-Cement Building Materials	$70,409,000
Asbestos-Cement Pipe, Conduit & Ducts	69,750,000
Floor Tile:	
Asphalt — Asbestos	77,348,000
— Vinyl	66,591,000
Heat Insulations	34,567,000
Asbestos Gaskets	25,938,000
Asbestos Textiles	23,232,000
Asbestos Packings	16,574,000
Asphalt and Tar Saturated Felts	13,213,000
Millboard	2,000,000
Sub-Total	$399,622,000
Friction Materials	89,844,000
Total	$489,466,000

(U.S. Bureau of the Census).

acrylic finish, are now available in any colour. They offer a longer life expectancy than competing materials.

(3) — Designers of commercial and industrial buildings have found that, for *curtain-wall* or panelling use, prefinished asbestos materials offer a wide range of decorative possibilities — with the added incentives of reduced initial construction costs and lower maintenance, heating and cooling costs.

(4) — New asbestos-cement products, including:

(a). The "sandwich" panel, composed of asbestos sheet faces and an insulating core of corrugated asbestos paper, insulating board or foam plastic. These sandwich panels, used for interior walls, provide 90 per cent more insulation than walls of average construction and reduce the weight to about one-third.

(b). Asbestos roof deck, constructed of deeply corrugated sheets and capable of spanning supports up to twelve feet across.

(c). Canal bulkhead retaining walls, used to line canals in reclaimed land areas and prevent the loose soil from eroding. This application, now used in Florida and other southern States, requires stronger asbestos-cement corrugated sheets.

(d). Asbestos forms for bridge and similar construction work where the form is left in place, on completion of pouring, to blend with the standard cement finish. There is then no deterioration through rotting or rusting.

(e). Separators and baffles in municipal and industrial water treatment plants. The inorganic structure of asbestos sheets prevents the formation of microorganisms which would interfere with the treatment process.

(f). Asbestos-cement monolithic boards can also be obtained with permanent integral colours for such uses as chalkboards, laboratory table tops, decorative panels or electrical switchboards.

Pipes, Conduits and Ducts

Asbestos-cement piping is used extensively for fresh- and sea-water mains, gas mains, sewerage lines, cable conduits and venting flues, and in many industrial applications. This type of piping, because of its resistance to corrosion and electrolytic action, its light weight and ease of application, and its excellent strength properties, has superseded both metal and ceramic piping in many fields.

In the making of asbestos-cement pipe, Portland cement and additions of 15 to 20 per cent asbestos and other ingredients are agitated in water. The solids are drawn from the slurry on a fabric belt and deposited in successive layers on a rotating mandril. The pipe is dried and cured under steam pressure. As the time required for manufacture is governed largely by the drying period, the use of asbestos with free and rapid filterability is vital.

Floor Tiles

Asbestos fillers make up about 50 per cent of the material in plastic floor tile. Therefore, the growth of the resilient floor covering industry over the past few decades has resulted in a major use for short asbestos fibres.

The usual procedure in the manufacturing of "asphalt" tiles is to combine plasticized resin with filler and to add pigments. After complete hot mixing, the mixes are fed through calenders to produce smooth sheets of specified thickness. These sheets are then cut to proper size prior to cooling and hardening.

Vinyl tile is similar to "asphalt" tile, but is generally more flexible. Vinyl tile gets smoother as it wears, takes a lasting polish and is resistant to marring.

A recent addition to the vinyl floor-covering family is the use of a synthetic-rubber asbestos backing sheet with a fused vinyl surface layer. The asbestos sheet replaces the traditional paper or rag felt backing that has been used for many years in linoleum. The use of asbestos, in this case, allows the flooring to be used in areas where there would be attack from the moisture and chemicals in concrete. A much longer life and durability feature this type of flooring.

Heat Insulations

The heat insulators are used to conserve fuel, to eliminate the overheating of areas or to protect other products from fire.

Asbestos has found its place in heat insulation because of its incombustibility over a wide temperature range. Actually, the mineral asbestos is not an exceptional non-conductor of heat; its insulating value comes from the fact that it can be fabricated into various forms that result in a structure of sealed air chambers. It is the "dead" air spaces that give the products their insulating value.

(1) — Some insulations involve a mixture of asbestos and clay applied in a wet mass to the surface being insulated. Such mixtures are easily moulded to the contours of the equipment, and the wet mass dries in place.

(2) — Laminated insulations are made by building up several plies of formed asbestos paper, using silicates as the adhesive. They can be used for the insulation of surfaces at temperatures up to 700°F.

(3) — Asbestos papers are formed on multi-cylinder machines. The prepared slurry, made up of Canadian classification groups 5, 6 and 7 chrysotile asbestos fibres and binders, is pumped into a series of vats containing rotating cylinders covered by a wire mesh. The stock contains approximately one-half per cent fibre. The stock is deposited, by gravity, on a wire mesh, and is transferred to woolen felts. The wet paper stock is then dewatered, pressed between sets of pressure rolls, and carried over steam-heated dryers and calenders to be given a smooth surface. It may also be creped or corrugated.

(4) — Asbestos corrugated paper is made by crimping ordinary asbestos paper and pressing it into permanent corrugated shapes. The depth of corrugation is approximately one-quarter inch. Bonding together alternate layers of corrugated and flat asbestos felts will form the type of insulation known as "asbestos air cell," which provides for large volumes of dead air space. To form sandwich structures, the sheets of the corrugated paper are covered with flat asbestos cement sheets, using sodium silicates as the adhesive.

(5) — Asbestos boards, up to one-half inch thick, are produced on a type of paper machine in which the wet web of paper stock is accumulated on a metal cylinder as it leaves the felt. In this way, several plies of paper are built up on the accumulator roll. They are then cut off, resulting in a wet board that is equal in length to the circumference of the roll. Asbestos board serves as heat insulation under service temperatures of up to 1,000°F. It is used as linings for stoves, ovens and kilns, as table pads and mats, and for plain and metallic gaskets.

(6) — Asbestos felts, saturated with tar or asphalt, serve as corrosion protection for underground pipelines. Asbestos felts and papers impregnated with asphalt are also used on the roofs of buildings and homes, where resistance to outdoor weathering, as well as insulation, is important.

(7) — Moulded light-weight asbestos insulation, with calcined calcium silicate, has an exceedingly low thermal conductivity. This is because its structure contains minute air cells formed by the interlocking crystals. The product can withstand temperatures of up to 1,900°F.

Electrical Insulation

Electrical insulation is used to protect the surface of conductors from such adverse conditions as moisture and chemicals, and to fill spaces where corona discharges are liable to occur. Untreated paper can contain moisture, as it has the characteristic of absorbing moisture from the air. It is usually treated with a silicone varnish or lacquer in order to eliminate the moisture problem.

In the manufacture of asbestos paper, there is always a continued interest in the development and production of open asbestos fibres. By opening the fibres, the undesirable magnetite, which is entrapped, can be removed. Papers made from highly purified asbestos, used for electrical insulation, greatly extend the life of electrical equipment by permitting the units to operate at higher temperatures.

Sound Insulation

Insulators for sound generating units, containing a small percentage of binder, have been produced. In order to reduce the cost and the time required for installing sheet asbestos, methods have been devised to spray asbestos on walls and ceilings. Fibre up to ½ inch in length is used.

Asbestos Textiles

The individual fibre bundles are opened in willowing machines, combed into a parallel arrangement to form a web, and separated into ribbons and strands of rovings. Yarns, produced by spinning the asbestos rovings, serve as the basic components for the fabrication of the many woven and braided asbestos textile products.

These products serve both the electrical insulation industry and the construction industry. They are used in fire-smothering blankets, flameproof draperies, pipe jackets and boiler insulation.

Resinated asbestos textiles are used as insulation in rockets and missiles.

Asbestos Gaskets

The most common use of gaskets is in the joining of flanges on pipelines. Asbestos fibre forms all, or part of, the material from which many types of gaskets are fabricated. Asbestos gaskets are used at service temperatures of up to 850°F, and where resistance to acids and chemicals is required.

Other Asbestos Products

Asbestos also finds a limited use in certain types of abrasive products:

- — in adhesives, to give bulk and provide resistance to heat;
- — to toughen asphalt compounds;
- — in lubricants, to regulate melting temperatures and rate of flow, and to prevent scoring in bearings;
- — in fireproof paints and in asphalt paints, where it is applied hot to build up thicker and mechanically stronger asphalt coatings;
- — in caulking or sealing compounds, to produce soft, pliable or rigid sealers;
- — combined with lead sheets for anti-vibration pads under the steelwork of large, modern buildings.

Asbestos in Plastics

Asbestos is an important component in a wide range of plastic products, although the product may not be identified as one that contains asbestos.

In the plastics grouping, there are usually three major divisions: cold-moulded, thermoplastic and thermosetting plastics. The advantages of using asbestos as the filler include reduced moulding costs, controlled flow of the material under pressure, and increased fire and heat resistance. Asbestos is used in thermoplastic and thermosetting plastics to impart toughness, increase hardness and retard the burning rate.

Asbestos in Asphalt Roads

Quoting from *Roads and Engineering Construction*, May, 1960. N. W. Hendry, Canadian Johns-Manville Co., Limited. — "Extensive laboratory tests on asphalt paving mixtures have indicated that considerable improvements in field performances can be expected by the addition of short asbestos fibres. As a result of these tests, numerous test strips will be laid in various parts of the country to study the performance of varied design mixes under actual vehicular traffic."

One such test strip was installed in 1953 on the haulage road from the open-pit asbestos mine at Asbestos, Quebec. Whereas the standard pavement had to be resurfaced, the asbestos-asphalt strip gave virtually maintenance-free service. Some sixty test strips have now been laid in the United States and Canada.

Basically, the results indicate that the addition of 2 to 3 per cent of short asbestos fibre filler achieves the following benefits: a 100 per cent increase in long-term plastic deformation over a wide temperature range, the prevention of bleeding of asphalt to the surface, an increase in impact strength, and resistance to cracking due to weathering (Figure 3).

Adding from 2 to 3 per cent asbestos fibre to standard mixes will increase the laid cost of asphalt paving by approximately 4 per cent.

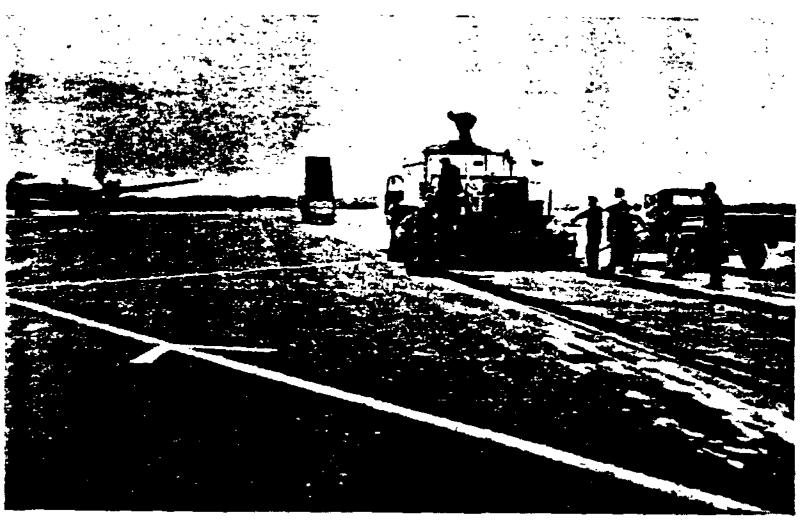

Figure 3.—Asbestos-bearing asphalt paving on an airport runway.

An important new market for short asbestos fibre (grade 7M) may therefore be opening up, and this could mean a market for an additional half million tons of asbestos per year.

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Executive Assistant to Minister of Mines and Technical Surveys

MR. ORVAL J. T. TROY, the new executive assistant to Mines and Technical Surveys Minister William Benidickson, has had wide experience in public affairs and public relations. A recent resident of Halifax, Mr. Troy has been active in Nova Scotia's political, legal, public relations, military, and trade promotion organizations.

Born 39 years ago in Woodstock, N.B., Mr. Troy served in the R.C.A.F. as a bombing officer during World War II, being overseas from 1943 to 1945. Leaving active service in 1945 with the rank of flying officer, Mr. Troy entered Dalhousie Law School in Halifax and obtained his bachelor-of-law degree in 1951.

He then practiced law for several years before being appointed executive secretary, and later director, of the Nova Scotia Liberal Association, a post he held until being called to Ottawa early this summer. He is past president of the Halifax Press Club and chairman of the public relations and special events committee of the Halifax-Dartmouth United Appeal. He is also a member of the Nova Scotia Barristers' Society, of the Halifax Board of Trade and of the Atlantic Provinces Economic Council.

Mr. Troy is married and has two children.

6th International Mineral Processing Congress

THE Sixth International Mineral Processing Congress was held at Cannes, France, from May 26 to June 2. The Congress proceedings were followed, from June 3 to June 9, by study tours of mineral processing plants. The choice of a number of tours through several European countries and North Africa was available to Congress delegates.

Approximately 850 delegates, representing fifty countries, were present at the Congress. A total of fifty papers were presented — two on laboratory techniques, four on comminution, two on classification, nine on hydrometallurgy, six on gravity concentration, six on magnetizing roasting and magnetic separation, six on flotation procedure, and five on control and automation. Two of the papers were by Canadians: *Ethylene Glycol Leach Process for Producing High-Purity Tungstic Acid,* presented by F. A. FORWARD; and *Development of a Process for the Concentration of Oka Pyrochlore,* presented by H. L. NOBLITT. All technical meetings were held in the auditorium of the Palais des Festivals, located on the Boulevard de la Croisette overlooking the famous Cannes beach. The official languages of the Congress were English, French, German and Russian. Simultaneous translation of all papers was provided, each delegate being issued with a small earphone-equipped transistor radio in order to pick up the language of his choice.

If the study tour through the south and west of France can be taken as representative, the tours were well organized to give delegates ample time for sightseeing as well as for plant visits. Operations visited on this tour were: The bauxite leaching plant of the Compagnie Pechiney, Gardanne Works, located near Aix-en-Provence; the fluorite flotation plant of the Societé Camifluor, near Perpignon; the uranium leaching plant of the Societé Industrielle des Minerais de l'Ouest, near Nantes; and the magnetite concentration plant of the Societé des Mines de fer de Segré, located near Tours. During the tour, there were opportunities to visit the Cathedral at Aix-en-Provence, Les Baux, the district where bauxite was first discovered and for which this mineral is named, several of the famous Chateaux de Loire and the impressive Cathedral of Chartres.

Canada was represented at the Congress by J. Convey, L. E. Djingheuzian, R. A. Elliott, F. A. Forward, K. V. Lindell, A. R. MacPherson, H. L. Noblitt, P. Pelletier and M. J. Tamplin.

Building Science Seminar

THE first announcement of a Building Science Seminar, scheduled to take place in Ottawa on February 13 and 14, 1964, was recently made by the Division of Building Research of the National Research Council. The Seminar will be held at the Building Research Centre. The two days will be devoted to a series of lectures by D.B.R./N.R.C. senior staff members on fundamentals of the design of building enclosures, with special reference to buildings which are to be humidified in cold weather. Further details and information about applications for attendance will be issued later in the year. This preliminary announcement is being made at this time so that those interested may reserve the above dates for attendance at the Seminar.