Report of the

CANADIAN MARKET POTENTIAL FOR INDUSTRIAL PARTICLEBOARD AND PARTICLEBOARD PRODUCTS

October, 1975

Volume I

Industry, Trade and Commerce
Industrie et Commerce

THE CANADIAN MARKET POTENTIAL

FOR

INDUSTRIAL PARTICLEBOARD

AND

PARTICLEBOARD PRODUCTS

V O L U M E I

PREPARED FOR:

DEPARTMENT OF INDUSTRY, TRADE AND COMMERCE

AND

DEPARTMENT OF REGIONAL ECONOMIC EXPANSION, OTTAWA

BY

COLUMBIA ENGINEERING INTERNATIONAL LTD., VANCOUVER

OCTOBER, 1975

The Executive Summary of this report has been published in a separate volume in both the English and French language.

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INTRODUCTION

The widespread interest in the development of new mills and growing reliance of Canadian users of particleboard on imports prompted the Departments of Industry, Trade and Commerce and Regional Economic Expansion to commission a market study with the dual objectives of determining the present and future consumption patterns for urea formaldehyde, resin bonded particleboard in Canada and to lay the groundwork for the development of a healthy and fully competitive domestic particleboard industry.

In March of 1975, the bid submitted by Columbia Engineering International Ltd. was selected from among nine proposals. Columbia was requested to "present detailed data and analyses by region which will identify both national and regional upgrading policy opportunities and become an industry investment planning tool. The long term objective is the development of a fully competitive domestic particleboard industry with a high level of management and marketing expertise".

During the past months, Columbia has conducted a detailed investigation of the Canadian particleboard market and examined, in general, the export opportunities which may be available to the Canadian particleboard industry. The overall competitive position of the Canadian particleboard industry in both domestic and possible export markets was also examined and the criteria for developing an export capability explored.

DEFINITIONS

General

In the early years of the North American particleboard industry, the term "particleboard" was used to identify those panels which were made with random size particles created by simply hammer-milling shavings, chips or hogged mill waste. This type of board was distinguished from a "flakeboard" manufactured from wood flakes. "Flake" describes thin shapes cut from solid wood or slabs, along the grain of the wood, as contrasted to pulp chips which are cut across the grain of the wood by chippers. The distinction between particleboards and flakeboards was applicable in the markets as well.

North American researchers were mainly concerned with the development of "particleboard" as the utilization of mill waste was considered to be the major problem of the forest industry in North America. European researchers and designers concentrated on the development of "flakeboard" and flakeboard manufacturing equipment, as roundwood was the available supply base for any type of reconstituted board manufacture.

Eventually, in North America, the name "particleboard" acquired a generic connotation. Today, it is used to describe all boards which are made by means of a "dry" process using any kind of wood particle, random or engineered, and bonded with either urea formaldehyde or phenol formaldehyde type synthetic resins. The generic term of particleboard in North American usage corresponds to the term "chipboard" as used in the United Kingdom as well as in much of the English speaking world formerly included in the British Empire.

Particleboard: a panel material composed of small discrete pieces of wood which, after the application of an adhesive binder, are compacted by heat and pressure to cure the adhesive and form a rigid panel. Sometimes contracted to "board" (synonymous with panel).

Flakes: cut by a flaker from solid roundwood, along the grain of the wood.

Semi-flakes: manufactured by a ring flaker from pulp type chips which are cut (largely cross grain) by a chipper, from either solid wood or are generated by the chipping facilities of saw mills and plywood plants.

Random particles: derived by hammermilling either hogged waste, chips or shavings.

Fines: as contained in dry shavings or as generated by any form of the above milling machines.

Semi-fibers: made by milling shavings or sawdust by means of refiner (various types) at a relatively low power input.

Fibers: derived from milling green sawdust or chips through a single or double disc refiner at a relatively high power input.

Pressurized fiber: a high quality fiber derived from a range of raw material forms, such as chips, shavings and sawdust, refined through "pressurized" (under steam pressure) refiner units.

Particleboards may be manufactured from any one of these particle types or a number of combinations of these forms. A great variety of blending, forming and pressing systems are available, each resulting in a somewhat different product. The differences in the forming processes are the most significant since they result in either homogeneous, three-layer or graduated type board construction.

The strength properties of particleboard products depend partially on the particle form used but also on the forming and pressing techniques applied. In all cases, higher resin addition levels result in higher strength properties. Strength also increases with increasing board density.

The use of flakes or, to a certain extent, semi-flakes results in the highest strength and stiffness properties at any given density and resin addition level. Flakes impart the most favourable dimensional stability properties, especially linear expansion, to particleboard panels. The use of semi-flakes and certainly that of random particles results in significant deterioration of strength as well as dimensional stability properties.

Fines or semi-fibers are generally used on the surfaces of multi-layer formed or graduated formed panels in order to impart superior surface properties to the product.

The use of fiber, especially that of highly refined fibers (such as through a pressurized refiner), results in high strength properties and excellent edge and machineability characteristics. Fiberboards, however, do not have stiffness (m.o.e.) or dimensional stability characteristics similar to those of flakeboards, especially with regard to linear expansion.

Panels faced with fines tend to have the lowest thickness swell properties as well as the best paintability and printability characteristics.

Boards made from pressurized refined fibers, in the particleboard density range, are generally called medium density fiberboards (MDF).

Particleboards from any of the above mentioned raw materials and particle forms may be manufactured in board densities ranging from 20 to 65 lbs. per cubic foot. The wood species of the raw material used has a marked effect on board properties and appearance, especially as related to wood density vs. board density. The medium density fiberboard process (pressurized refiners) is distinctly different here from the other particleboard processes as it permits the manufacture of low density boards from high density hardwoods at acceptable or even excellent strength and other properties.

Particleboards made from any of the above raw material and processing methods and bonded with urea formaldehyde resins are used in interior applications and in both industrial and construction end uses. An exterior grade product requires the use of not only phenolic (exterior grade) resins but also, at the present state of technology, flakes or at least semi-flakes in order to achieve acceptable dimensional stability properties.

Although some particleboard products are made with phenolic resins using random type particles, semi-flakes or fines, these are not considered to be of truly exterior structural grade.

The structural or exterior grade panels made mainly with flakes or "wafers" (large flakes) are grouped today under the heading of "waferboard" and are not the major subject of the present study.

Particleboards are classified by type of resin binder employed:

(1) Type I - made with phenol - formaldehyde resin. Waferboard is of this type

(1) Type II - made with urea-formaldehyde resin. The report concentrates on this type which is abbreviated to "UF".

The particleboards considered in this study are mat formed only and are defined and described as follows:

Underlayment Particleboard (UL): Particle type: random or simi-flake, possibly fines on face; forming: homogeneous, three-layer or graduated; thickness: usually 3/8" or 5/8"; panel size: 4' x 8'; density range: 38 to 42, possibly 44 lbs/cu. ft.; mostly soft-wood furnish and urea resin binder; used under plastic flooring or kitchen countertops, although some underlayment grade is used industrially.

Mobile Home Decking (MHD): A higher grade of underlayment normally in density ranges from 44 to 46 lbs/cu. ft.; thickness is usually 5/8"; used as a combination of subfloor and underlayment in mobile homes; standard width: 4' and 5'; standard length: 12' and 14'.

Industrial Particleboard (Core Stock): Particle type: usually made with semi-flakes, semi-fibers and fines, could also be flakes; raw material: mostly softwood, some hardwood; density range: usually 42 to 45 lbs/cu. ft., some 50 and 55 lbs and some as high as 60 lbs/cu. ft.; urea resin binder; used mainly as core stock for furniture and cabinetry; low density products (28-30 lbs/cu. ft.) are used as door core; some 1/8" or "thin" board used as wall panelling; wide range of thicknesses but mainly 1/2", 5/8", 3/4", some 7/8" and 1-1/8"; product usually comes in 4' x 8', 4' x 9', 5' x 8', 5' x 9' full sheets, some 8' wide and some 12' long; also supplied in cut-to-size form; some special boards are identified either by species used in their manufacture or by special, fines-surface properties.

(1) CSA Standard 0188 is under review at time of writing and this classification may be modified shortly.

Thin "Mende" Board: Conventional particleboards are manufactured on both multi and single opening presses. The Mende process manufactures continuous panels in 4' to 8' widths by means of a continuous press. Thicknesses range from 1/8" to 1/4". The product is intended to replace thin hardboards and thin plywoods for use as door skins, wall panels, core, or in furniture backs and bottoms. Thin boards may also be made on multi-opening presses for the same applications.

Medium Density Fiberboard (MDF): This product is manufactured by the use of usually pressurized refined fiber, bonded with urea formaldehyde resins. It is made in density ranges of 42 to 50 lbs per cu. ft. Some boards are made as high as 60 lbs/cu. ft. It is sold for the same application as 45 to 55 lbs/cu. ft. industrial particleboards although it is considered to have much improved edge and machining characteristics. It is mainly used to replace hardwood lumber or particleboard edge banded with lumber, or simply used as a panel which does not require additional edge banding or finishing. MDF is sometimes classed as a hardboard. For the purpose of this study and on the basis of the opinion of most observers, it is included in the particleboard family. The MDF consumption and production figures are included in this study in the overall particleboard data.

Waferboard: Structural or exterior grade panels made mainly with flakes or "wafers" (large flakes). These are grouped today under the heading of "waferboard". Waferboards as well as other structural particleboards such as the new oriented strand boards (Strandwood) -- strands are elongated flakes -- oriented fiberboards, standard hardboard products and medium density hardboard siding, all utilize phenolic resins and are meant for structural and/or exterior applications. They are not strictly included in the scope of this study although some comments are made.

GLOSSARY

Construction Users: All on-site building companies who receive raw board at the site and/or cut it up for installation. This generally includes uses such as underlayment, shelving, temporary or permanent site structures or partitions.

Industrial End-Users: Manufacturers who operate a plant(s) where particleboard is consumed in the manufacture of a product.

Prefinishers: Manufacturers who purchase raw U.F. particleboard from outside sources for the purpose of cutting to size and/or finishing it, in one way or another, and subsequently selling to end users. In this study, the prefinishing category also includes Canadian particleboard manufacturers who have prefinishing departments under the same corporation.

Self-Finishers: Industrial end users who purchase raw particleboard for cutting and/or prefinishing in their own plants as an integral part of manufacturing an end product, e.g., a kitchen cabinet manufacturer.

Standard Industrial Classification (S.I.C.): The system employed by Statistics Canada of classifying Canadian industry into groups manufacturing approximately the same range of goods, in order to compile industry statistics. The S.I.C. categories employed in this study include:

252 - Veneer and Plywood Mills
2541 - Sash, Door & Other Millwork Plants
2543 - Manufacturers of Prefabricated Buildings (Wood Frame Construction)
3242 - Non-Commercial Trailer Manufacturers
2544 - Kitchen Cabinet Manufacturers
258 - Coffin & Casket Industry
2619 - Household Furniture Manufacturers

264 - Office Furniture Manufacturers
266 - Misc. Furniture, Counter Top & Fixtures Manufacturers
404 - Building Construction

Urea Formaldehyde (U.F.) : the chemical name for the resin (glue) used in manufacturing Type II particleboard as described in C.S.A. 0188 (for interior applications).

Phenol Formaldehyde (P.F.): the chemical name for the resin (glue used in manufacturing Type I particleboard as described in C.S.A. 0188 (for exterior applications).

Volumes: expressed as a square footage times a standard thickness basis. In Canada the standard basis is 5/8", in the United States the standard basis is 3/4". Square footage abbreviations used in this report are

Msf - Thousand square feet
MMsf - Million square feet
Bsf - Billion square feet

Modulus of Elasticity (m.o.e.): is a measure of resistance to deflection under an applied load. It is an indication of the stiffness of a panel.

Modulus of Rupture (m.o.r.): is a measure of load necessary to break a panel.

Internal Bond (I.B.): measures the force two faces of a panel will withstand before pulling apart. It is a measure of the strength of the bond between individual particles within the panel.

Linear Expansion: measures the change in dimension in the plane of a board in response to a specified change in relative humidity.

Screw-Holding: represents the force needed to pull out a 1½" long, No. 10 type A sheet metal screw under specified conditions of test.

Raw Board (Unfinished Board): particleboard (panels or cut to size pieces) which has had no finish of any type applied to the surfaces.

PARTICLEBOARD STANDARDS

Both the Canadian and the American Particleboard Associations, as well as the applicable government agencies in both countries, have developed a number of standards for various grades of particleboard. These standards are meaningful mainly for boards used in construction, such as underlayment or structural, exterior grade products. In the industrial end uses, however, numerous varieties of particleboards with a wide range of properties are used. The actual properties required will depend to a great extent on the demands of each individual customer. In addition, each particleboard manufacturer tries to sell a somewhat different and distinctive product and attempts to capitalize on the properties of his product which result from either the use of a given species or a certain process and technology. For these reasons, the specific standards of either the government authorities or the particleboard associations are not considered to be relevant to the present study and are therefore not reproduced here.

C O N C L U S I O N S

AND

R E C O M M E N D A T I O N S

CONCLUSIONS AND RECOMMENDATIONS

1. The Canadian wood products markets consumed 404 MMsf, 5/8" basis, of U.F. resin bonded raw particleboard in 1974. Nearly 50% of this demand was supplied by board imported from the United States. In the same year, Canadian plants shipped slightly over 270 MMsf 5/8", well below their rated capacity level of about 360 to 380 MMsf 5/8", partly because of labour and financial problems and partly because they were not able to meet the stiff price competition from U. S. imports. About 15% of the 1974 Canadian production, or 65 MMsf 5/8", was exported to the United Kingdom.

2. The demand for U.F. bonded particleboard in Canada is expected to grow to about 680 MMsf 5/8" by 1980 and to about 1,000 MMsf 5/8" by 1985.

3. The Canadian particleboard manufacturing capacity will be nearly 600 MMsf 5/8" by 1976, due to the construction of two new plants and the modifications of some existing plants. Domestic demand is estimated at 440 MMsf 5/8" in 1976. The new plants, however, are not expected to be in full production for that entire year so that imports from the United States will continue to make up a significant part of the Canadian particleboard supply, at least up to 1977.

4. Four to five new large plants will be required to supply the domestic demand by 1985. The potential markets for such plants are not restricted to Canada. A market of similar size, or in the order of 1,000 MMsf 5/8" per annum is located in the north-central and north-eastern U. S. Eastern Canadian plants should be highly competitive in these U. S. markets on a delivered cost basis, provided that all available means are explored and implemented to establish basic cost competitiveness. Such export-cost competitive capability is thought to be an essential feature in maintaining a strong position in the domestic markets as well.

   For the long term, exports to Europe and possibly Japan are a good possibility.

5. The basic criteria for establishing such export-cost capability are: adequate plant size (100 MMsf 5/8" per annum or more), low wood cost and suitable location. The existing smaller Canadian plants are unlikely to develop such export capability (unless expanded) and, in fact, may suffer if the construction of large, export oriented plants is encouraged. These small plants, however, do have an opportunity to engage in prefinishing and remanufacturing operations, thereby upgrading their product and plant profitability.

Government support may be required to obtain financing for the modifications of some existing plants and/or the installation of secondary manufacturing facilities.

6. Canada appears to have an abundant supply of softwood mill waste, presently not utilized, which is highly suitable for the manufacture of particleboard. Demands on this wood supply are, however, developing from other sources, namely pulp and fuel. The feasibility of developing an export oriented Canadian particleboard industry will therefore depend on the comparative economic and social benefits to be derived from the various potential end uses of this raw material. For this reason, it is recommended that governments initiate investigations aimed at determining the actual amounts of suitable raw material uncommitted and available at the present, the potential demand on this raw material from various sources, as well as their best long term utilization.

7. In the course of the study, Columbia encountered a number of difficulties in the accumulation and the evaluation of the available data. Therefore, and in order to facilitate future survey work and the "tracking" of the Canadian particleboard industry, it is recommended that consideration be given to certain modifications of the record keeping procedure as follows.

(a) The Canadian industry keeps its production and consumption records on a 5/8" thickness basis. A 3/4" thickness base is used in the United States, while Europe as well as other continents uses the cubic meter basis measurement.

It is recommended that the Canadian industry change its record keeping to either the 3/4" or the cubic meter base. In view of the large volume of present and future trade with the United States, the 3/4" base would appear to be more practical, at least until both countries adopt the metric system.

The differing standards in Canada and the United States tend to confuse the counting of imports and exports. Furthermore, the Canadian industry tends to interpret U. S. cost and price information on a 5/8" rather than the actual given 3/4" base. As a result, it is at a disadvantage in assessing the true cost, price and volume relations between the Canadian and the U. S. industry.

(b) It is recommended that Canadian urea bonded particle-board production figures be published separately from waferboard production figures by Statistics Canada. (It is understood that separate figures will be published starting in January of 1976.)

SECTION I

HISTORICAL BACKGROUND

GENERAL

Particleboard originated in Europe, prior to World War II, mainly in Germany and Switzerland. It experienced a vigorous development and growth during the Fifties and Sixties in response to the need for a high quality wood panel for the furniture industry and miscellaneous cabinet work applications.

The limited western European Timber resources did not permit the manufacture of lumber and/or plywood, certainly not in the required quantity and quality. Particleboard answered the need, not only in terms of product type and quality but also as the fullest possible utilization of the available forest resource.

The European particleboard industry grew from a negligible production level in 1945 to about six million tons per year by 1965, with West Germany leading the way in production as well as in process and machinery developments. By 1973, the consumption of particleboard in Europe stood at about thirteen million tons per year (18 MM cubic meters).

Particleboard was introduced to North America as early as 1948, partly by licensed European processes and also by indigenous developments.

North America had abundant high quality softwood and hardwood timber resources and, therefore, produced sufficient lumber, veneer and plywood. The need here was not for a composition wood product but, rather, for the utilization and/or economically viable disposal of the wood waste generated by the large capacity softwood lumber and plywood mills. As a result, the European particleboard technology, based largely on the use of roundwood, did not take hold in North America. Instead, the large U.S. West Coast lumber mills learned to use their non-chippable wood wastes, mainly kiln dried shavings, in the manufacture of an acceptable quality particleboard.

There was a further significant difference.

In Europe, the relatively small forested areas close to the large market concentrations led to the establishment of relatively small capacity plants (about 50 to 100 tons per day, in the 1950's and early 1960's). In North America, the large concentration of wood wastes generated by West Coast operations, the distance of these operations from the eastern U.S. market concentrations, the commodity type product and high outputs in the softwood lumber and plywood industry led to the construction of large, high capacity particleboard plants (200 to 500 tons per day) in the early 1960's.

In the United States, because of the abundant, low cost supply of high quality softwood plywood, particleboard production grew at a much slower rate than in Europe. Nevertheless, by 1965, U.S. production was in the order of 800 thousand tons per year. Nearly 65% of this production was located on the U.S. West Coast, mainly in Oregon.

During the second half of the 1960's, the U.S. softwood lumber and plywood industries made a major move into the southern pine regions (U.S. Southeast & South Midwest) and simultaneously developed particleboard as a means to utilize the wood waste generated by these new large mills.

By 1973, the U.S. production of particleboard stood at 3.9 Bsf 3/4" or over 5 million tons, with almost half the productive capacity still located on the West Coast but with the other half already located in the South.

At first, the U.S. markets accepted particleboard somewhat grudgingly. The main stream of the established furniture industry, geared to the use of hardwood lumber and veneers, accepted particleboard only as a core in a 5-ply (cross banded) construction. The new and more venturesome dinette table and institutional case goods manufacturers however, adapted to particleboard at an accelerated rate, partly because of its adequate performance as a core base for high pressure laminate surface materials and partly because of its lower price. These and other applications as a core base for high pressure laminates (sink tops, vanities, etc) constituted the early successes of particleboard in North American industrial applications. The substantial penetration into the main end use for furniture took place during the late 1960's consequent to improved particleboard quality and the marked decrease in the quality and availability of softwood, hardwood veneers and lumber.

The early penetration of particleboard into the house construction industry was as floor underlayment. Here, particleboard suffered a number of failures and setbacks but recovered to establish a strong position, again, as softwood plywood grades and availability deteriorated. Undoubtedly, the variety of panel sizes offered by particleboard manufacturers -- as compared to the rigid 4' x 8' softwood plywood size -- helped to establish particleboard in a great number of industrial as well as housing construction applications (i.e., cut to size panels, 4' x 12' mobile home decking). The advent of thin plastic and printed surfacing techniques (i.e., vinyl, direct print, thin veneer) also helped particleboard to demonstrate the usefulness of its better surface characteristics (as against softwood plywood). The major motivating force in the growth of particleboard, however, was still the cost factor: either in the price of the product, per se, or due to the cost savings resulting from its use in the remanufacturing operations, or both.

UNITED STATES DEVELOPMENT

One of the first particleboard plants to be installed in the United States was the Novaply plant at Anderson, California. The U.S. Plywood Corporation, the owner of this plant, obtained the exclusive license for this process from one of the Swiss originators of particleboard, the Fahrni Institute. At the same time, however, a number of small North American designed experimental plants were installed, mainly in the eastern United States. These included Plaswood in New Hampshire and Arkansas and Wabash Screen & Door and Swain Industries in the Midwest. In addition, the Rock Island Lumber Company in Rock Island, Illinois erected a plant to produce specialized high density particleboard for school desk top application.

In the early 1950's a number of additional U.S. plants were built designed for waste wood utilization. These included Wynwood in Texas, Granite Board in New Hampshire, as well as Brownsville, Forest Industries and Weyerhaeuser Corporation in Oregon. By the middle of the decade, however, influenced by European experience and practice, but developed by U.S. designers, several plants were built on the basis of roundwood utilization. The major units were Gray Products in Virginia, plants in Black Mountain, North Carolina and Chatanooga, Tennessee, Columbia Forest Products in Everett, Washington, Pope & Talbot in Oakridge, Oregon and the Formica Corporation's plant at Farmville, North Carolina. All these plants were of relatively small size (capacity 50 to 60 tons per day) with the exception of the Formica plant which was designed for a capacity of over 150 tons per day.

At the same time, the U.S. Plywood Corporation built its second plant, based on the Swiss Novaply process, in South Boston, Virginia, designed for a capacity of 100 to 120 tons per day.

All the plants mentioned above utilized mainly North American equipment, with the exception of the U.S. Plywood plant at South Boston.

The influence of the European technology culminated in the construction and installation of an entirely German-designed and equipped plant at Arcata, California owned and operated by the Roddis Plywood Corporation. This plant was still designed for the use of roundwood, in spite of its West Coast location and was rated for a capacity in excess of 150 tons per day.

The financial performance of these early plants was, on the whole, unimpressive. It became clear, however, that the plans using mill waste were generating higher earnings than those using roundwood, in spite of the fact that the products of the waste wood using plants were of lower quality, in terms of strict laboratory test standards, than the products turned out by the roundwood utilizing units. As a result, some of the plants which were originally designed for roundwood changed over to the use of mill waste, where available, showing the way for a distinctly North American particleboard development.

In 1960, Duraflake build a relatively large plant at Albany, Oregon with a capacity close to 200 tons per day, based entirely on the utilization of kiln dried Douglas Fir and white fir shavings, generated by self-owned lumber mills. This plant managed to manufacture a relatively high quality industrial grade board from a raw material that was previously not considered to be suitable for these purposes.

The financial success of Duraflake encouraged others on the U.S. West Coast to install similar plants. In 1963, Roseburg Lumber Company installed a large plant, 400 to 500 tons per day capacity, again based mostly on self-generated mill waste and several other companies followed in short order. All of these plants were designed in North America with mainly North American equipment. Only some milling units and the forming section were purchased from Germany.

In 1962, a plant similar to the Arcata unit was built at Crossett, Arkansas. The Crossett company was acquired by the Georgia-Pacific Corporation around 1964 and was then modified from roundwood to mill waste use. The financial turnaround of this unit encouraged Georgia-Pacific to install several large particleboard plants between 1965 and 1972, adjacent to their plywood and saw mill operations, all based on the utilization of self-owned or purchased mill waste, mainly shavings and dry plywood trim, but also some sawdust.

By 1965, over 80% of the American output was manufactured from shavings and other mill waste, growing to over 90% by 1970 and, as a result, the "shavings" type particleboard became the standard of the North American particleboard industry, both in the underlayment and in the industrial grades.

Most of the plants built during 1965 to 1970 were large units with an output capacity in excess of 300 tons per day or 100 MMsf 5/8" per year and, throughout the years, established enviable operating, marketing and financial records.

About the same time, Allied Chemical Corporation with Miller-Hofft of Richmond, Virginia, developed the medium density fiberboard process which was eventually to produce a high quality industrial grade board having excellent edge and machining properties superior to those of the standard, or any, type particleboards. The process was highly suitable for the utilization of high density hardwoods which constitute a large part of the forest resource of the eastern United States.

The significance of the MDF process in the United States was that it permitted the manufacture of high quality industrial grade panels from a raw material source located close to the large eastern industrial markets. The somewhat inferior properties of the industrial grade particleboards made from southern pine or hardwood mill waste, as against boards made from West Coast softwood species, coupled with rapidly increasing freight rates from the West Coast to the East, gave the development of MDF further encouragement.

A plant of this type was erected in 1966 by Allied Chemical at Deposit, New York. After some early failures, the plant was purchased by the Ceolotex Corporation and, eventually, succeeded in servicing high quality, premium priced industrial markets.

Several plants of this type were constructed in the late 1960's and early 1970's, mainly in the East but, after 1972, on the West Coast as well. The West Coast plants were based essentially on the use of softwood mill waste as opposed to the eastern plants which were operating mainly on hardwood roundwood or chips.

At the present, MDF is sold at a substantial premium over particleboard price levels and the demand for this product still appears to be strong, in spite of the general market weakness in 1974/75.

Although some observers class medium density fiberboard as hardboard, along with standard hardboards, and most MDF plants belong to the Hardboard rather than the Particleboard Association, for the purposes of this study and from the point of view of most observers, medium density fiberboard is part of the particleboard family, as the product is used in similar applications.

In 1972, the continuous "Mende" press process was introduced in Germany for the manufacture of thin (1/8" to 1/4" thick) particleboard. The idea and the product found quick response in the United States. Seven units were purchased by the Georgia-Pacific Corporation in the years 1972 and 1973 and a few other companies followed suit.

The European thin boards were manufactured mainly from roundwood and flakes, while the American plants were, again, based on the utilization of mill waste. As it turned out, the mill waste raw material did not impart sufficient strength to the thin particleboard, as made on the Mende process, to satisfy certain demands in the wall panelling applications. At the present, it would appear that at least some roundwood and flake content will be necessary to achieve adequate properties in such thin particleboard panel products.

It is interesting to note that 1974 witnessed the first drop in the consumption and production of particleboard in the United States. In the same year, several new plants came on stream. These plants were built during the 1972/73 period in the expectation of a continued rapid market growth. The interruption of this market growth resulted in a substantial over-capacity in the U. S. particleboard industry and a severe drop in particleboard prices in the second half of 1974, which extended into 1975.

CANADIAN DEVELOPMENT

The development of the Canadian particleboard industry parallels that of the United States in some respects but differs in others.

To the best recollection of anybody in the industry, Canadian Plaswood was the first plant in Canada. This plant was built for the use of waste wood in New Brunswick (capacity about 20 tons per day) and had considerable difficulties in selling its product in the eastern Canadian markets. The plant eventually burned down in the mid 1950's and was never rebuilt. There were two additional plants built at this time: Fibrply in Newfoundland with German technology and management and an extrusion plant in Rimouski, Quebec. The Rimouski plant also burnt down in the late 1950's as did the Fibrply plant. Only the Fibrply plant was rebuilt.

Interestingly, one of the largest forest industry companies in Canada -- Abitibi -- made an early entry into the particleboard industry around 1954. Their plant was built at Sturgeon Falls, Ontario and was based on the utilization of Aspen roundwood. This plant made a good quality product but was not successful financially and was eventually shut down in 1969.

During the period 1955 to 1960, two additional plants were built in western Canada, both based on the utilization of roundwood. The first was Columbia Forest Products' plant in Sprague, Manitoba and the second was the Powell River Company's plant in New Westminister, B.C. The Abitibi plant and the two western plants were designed for a capacity of about 60 to 80 tons per day.

All of these plants had serious troubles in marketing their products and in achieving adequate earnings. The Sprague plant partially burned in 1964/65, was rebuilt and then burned again and was permanently shut down in 1972. The Powell River plant was also shut down after the company merged with MacMillan Bloedel. The plant was eventually moved across the Fraser River and was reconstructed on a site adjacent to the MacMillan Bloedel plywood/saw mill and shingle operation. It was then changed to the utilization of mill waste (mainly cedar shingle hay and cedar sawdust). This plant has been operating successfully since 1963 and has been lately expanded to a capacity slightly in excess of 200 tons per day (55 to 60 MMsf per year). The shingle mill has been shut down and the raw material in this plant now includes a substantial amount of hemlock sawdust.

In the early Sixties, three plants were constructed in eastern Canada -- all based on the utilization of roundwood. These were Jamar at Timmins, Ontario, Rexwood at New Liskeard, Ontario and Flakeboard at Milltown, New Brunswick. The Jamar plant eventually burned down and was not rebuilt.

The Rexwood plant has been operating successfully and added a second line in the same location, about 1967/68.

The Flakeboard plant at Milltown was expanded and modified several times and is presently operating with an 8' x 32' single opening press and a 5' wide continuous Mende press unit.

These three plants were all built with European equipment and were all based on European technology.

In 1965, Sogefor Ltée. constructed a plant at Lac-des-Iles, Quebec again with European equipment and technology and based on the utilization of Aspen roundwood. The plant was substantially modified in 1968/69.

In 1970, Levesque Plywood at Hearst, Ontario and Parta Industries at Grand Forks, B.C. built plants based mainly on utilization of mill waste. A year later a large plant was constructed at Chatham, New Brunswick by the Airscrew Weyroc Corporation of the United Kingdom primarily for U.K. markets. All of these plants were based on European technology and, although somewhat influenced by North American developments, utilized mainly European equipment. The Airscrew Weyroc plant was designed for the use of roundwood although it eventually used nearly 70% mill waste.

The years 1974/75 saw the construction of a small plant by New Ontario Dynamics in New Liskeard, Ontario; a large plant constructed by Great Lakes Paper Company at Thunder Bay, Ontario, designed primarily for the manufacture of waferboard but also for some U.F. particleboard. Two additional plants, Domtar at Huntsville, Ontario and Pluswood Corporation at Atikokan, Ontario are expected to be completed by 1976.

The largest Canadian plant operating at the present is the plant at Chatham, New Brunswick which was acquired in 1975 by Northwood Limited. It has a rated capacity well in excess of 120 MMsf 5/8" per year. All the other Canadian plants, either operating or under construction, have an output capacity of 55 to 60 MMsf 5/8" per year or less.

Although the acceptance and growth of particleboard in Canada was somewhat similar to that in the United States, there were two major differences. First, market acceptance in most applications lagged behind U.S. acceptance by about three to five years. Secondly, the center of gravity of the Canadian particleboard manufacturing industry was always in the East as against the largely West Coast orientation of the U.S. industry, at least up to 1970. Furthermore, the development of this eastern Canadian particleboard manufacturing was more strongly influenced by European technology, economic thought and strategy than by the U.S. manufacturing and marketing practices.

The first of the above occurrences was caused mainly by the much larger forest resource of Canada as related to Canadian domestic consumption and as compared to the United States. As a result, the easy availability of conventional softwood and plywood products lasted longer in Canada and the *need* for particleboard was less acute. This, in turn, delayed the development of the Canadian industry although this is not considered to be of significant long term consequence.

The second occurrence had a number of causes. The most important of these are: the isolation of British Columbia, where saw mill residues are concentrated, from both eastern Canadian and U. S. industrial markets; the relatively small size of the eastern Canadian markets vs. the United States; the small size of lumber mills in eastern Canada (in the period 1950 - 1960) and, therefore, little or no waste concentration; the fairly intense isolation of the eastern Canadian lumber industry from the West (U. S. and Canada) and U. S. South; and, last but not least, the predominantly pulp orientation of the large eastern Canadian forest industry firms -- at least up to 1970.

Whatever the cause, the consequences are far reaching and, to some extent, disturbing:

- whereas about 90% of the U. S. particleboard capacity is utilizing low cost mill waste, most eastern Canadian plants use roundwood at both higher purchased cost and higher conversion cost;

- all Canadian plants (with only one exception) have an output capacity of about 50 to 60 MMsf 5/8" per year (about 160 tons per day) or less, while over 50% of the U. S. output is made in plants at a capacity of 100 MMsf 5/8" per annum (about 400 tons per day) or more;

- as a result, large U. S. plants can deliver to eastern Canada, in spite of high freight and duty charges, at a lower cost than most eastern Canadian plants and have, in effect, dictated eastern Canadian particleboard prices, whenever they choose or are forced to export, due to soft domestic markets;

- although Canadian productive capacity was consistently in excess of Canadian demand (with the exception of relatively short periods), the domestic capacity was largely under-utilized and/or unable to attain its potential while U.S. imports were continuing their steady growth in the Canadian markets.

Table I-1 shows the growth record of the U.S. and the Canadian particleboard industries from 1964 to the present. U.S. consumption generally equals U.S. production, except for 1974 when relatively large volumes were exported to Canada.

The Canadian figures give imports in addition to domestic production (for domestic use) and apparent consumption. The figures are based on the information released by Statistics Canada and show the growing reliance of Canadian markets on U.S. board.

This growing reliance of the Canadian particleboard market on imports, in the face of the under-utilized domestic plant capacity was the main reason for the initiation of the present study. The figures presented in Table I-1 formed the basis and the starting point of the investigations carried out by Columbia and presented in the following sections of this report.

TABLE I.1

COMPARISON OF CANADIAN vs. U. S. PARTICLEBOARD CONSUMPTION FOR THE YEARS 1964-74

YEAR	U. S. A.		CANADA				
	Production[1] MMsf 3/4"	Consumption[2] MMsf 3/4"	Domestic Shipments[3] MMsf 5/8"	Imports[4] MMsf 5/8"	Consumption MMsf 5/8"	Consumption MMsf 3/4"	Can. Consumption as a % of U.S. Consumption
1964	639	630	68	2	70	58	9.1%
1965	803	800	78	3	81	68	8.5%
1966	1001	950	92	5	97	81	8.5%
1967	1125	1050	95	10	105	88	8.4%
1968	1440	1450	105	14	119	99	6.8%
1969	1736	1700	122	32	154	128	7.5%
1970	1813	1780	126	27	153	128	7.2%
1971	2404	2340	187	48	235	196	8.4%
1972	3282	3250	206	82	288	240	7.4%
1973	3913	3820	230	134	364	303	7.9%
1974	3494	3200	210	162	372	310	9.7%

Source: U. S. A. 1 - U.S. Department of Commerce modified by CEI estimates
2 - CEI estimates

CANADA 3 - DITC estimates
4 - Statistics Canada Catalogue 65-007 (Class 33895 only)

1975 Plant Capacity:

U. S. A.: 5.4 Bsf 3/4" (Includes MDF)

CANADA: 430.0 MMsf 5/8" (Excludes Waferboard)

Canadian Waferboard

The history of the Canadian particleboard industry would not be complete without mentioning the events with regard to the development of waferboard in this country.

Waferboard was originally developed in the United States by Jim D'Arcy Clarke, mainly at Washington State University's Wood Products Laboratory in Pullman, Washington. Mr. Clarke designed a complete plant around the idea of manufacturing an exterior grade utility board by the use of large flakes which he called "wafers". The product was distinct from particleboard which, at that time, was made with either flakes (roundwood) or random particles (mill waste) because it was designed for exterior use and therefore was bonded with phenolic resins. Industrial particleboard, on the other hand, used urea formaldehyde resins for its bonding and was meant for interior use.

In 1955, a plant was built on the basis of Mr. Clarke's design at Sand Point, Idaho by the Pack River Lumber Company, based partly on the utilization of roundwood but eventually using saw mill edgings and slabs. This solid waste was generated by Pack River's lumber mills in the area and was of the mixed western softwood species.

In 1955/56 there was a great amount of softwood plywood available in the western U.S. and the new product did not find ready acceptance in the markets. Some of the board was sold for decorative purposes but the market in this end use was not sufficiently large to support the Sand Point plant. The plant continued to operate throughout the years on a highly curtailed basis but its production was by no means continuous and the market penetration of the product was negligible.

In the early 1960's, a company was formed under the name of Wizewood Limited for the purpose of constructing a plant, based on Mr. Clarke's basic design, at Hudson Bay, Saskatchewan. The raw material for this plant was Aspen roundwood which was plentiful and at low cost in this northern Saskatchewan area.

Again, the product had initial difficulties in penetrating the markets. Early production problems also limited output. As a result, the original company could not survive and was taken over by the Saskatchewan Government. By this time, the product had made a reasonable penetration into the Prairie farm building construction and general utility board markets. Eventually, in the late 1960's, the plant was sold to MacMillan Bloedel Ltd. and has had a highly successful production, marketing and financial record since that time. The product was accepted by the general construction and retail markets in both western and eastern Canada and competed favourably with western softwood plywood in these markets, partly because of a basic manufacturing cost advantage and partly because of the freight advantage it enjoyed in the Prairies and the eastern markets against West Coast plywood.

The success of Aspenite, the trade name of the MacMillan Bloedel product, encouraged others to construct similar plants. Waferboard Corporation Ltd. in Timmins, Ontario constructed a plant about 1970, followed by Weldwood of Canada at Longlac, Ontario in 1973/74. Two additional plants were completed at Thunder Bay, Ontario in 1975; one by Great Lakes Paper Company and the other by MacMillan Bloedel Ltd., while the Alberta Aspen Board mill at Slave Lake, Alberta has just begun production.

Waferboard, although originating in the United States, is a distinctly Canadian development and is probably the only reconstituted wood product which has managed to penetrate the general construction end use and the utility board markets in North America or elsewhere.

Urea bonded particleboard gradually replaced sanded grade plywood in the North American industrial markets (furniture and cabinetry) over the past fifteen years, mainly because of the growing scarcity and cost of sufficiently high grade softwood veneers, suitable for the manufacture of such sanded grade plywood products. At the present, even lower grade veneer or timber, suitable for the peeling of lower grade veneer, is getting scarce. The North American markets for sheathing grade and structural grade plywood products are expected to continue their growth. Every research laboratory and plywood manufacturer in the U. S. is considering some type of reconstituted wood panel board or composite board (particleboard in combination with veneer) to supplement the existing and future supply of softwood plywood type products. Canada is well ahead of the United States and Europe in this field, as the kind of structural board everybody has in mind is likely to be similar to or a not too different variation of the present day waferboard product and technology.

An examination of the waferboard markets and technology was not strictly within the scope of the present study. At the request of the Department of Industry, Trade and Commerce, however, the report does include a review of the waferboard industry in Canada: its present state and its future potential.

S E C T I O N I I

THE CANADIAN CONSUMPTION

OF

U. F. BONDED PARTICLEBOARD

IN

1974

GENERAL

The major objective of the study was to crosscheck the presently available consumption figures published by Statistics Canada, by determining as accurately as possible the actual volume of U.F. bonded particleboard consumed in Canada in 1974 and obtaining a breakdown of this volume consumption by region and by end user industry. In addition, it was also deemed to be desirable to explore the requirements of end users as to board quality, panel size and thickness, service and other factors, in order to provide a general guide for the marketing of particleboard products in Canada and a general direction for the future growth of the Canadian particleboard manufacturing industry. Accordingly, the largest part of the work was expended on collecting data from the various end users, evaluating the information received and organizing it into meaningful tables.

METHODOLOGY

The Plan

At the outset, it was decided to collect industry information by two basic methods:

(a) mailed questionnaires
(b) personal interviews

It was recognized that the chances of receiving a high percentage of replies from the mailed questionnaire were rather slim. In spite of past experience, it was decided to proceed with this method, in the hope of obtaining a representative sample of the industry, suitable for analysis by computer -- at least as to quantitative volume consumption and volume distribution by region and end user industry. The personal interviews were then to be used to obtain qualitative data and general industry trends.

The preliminary plan for mailed questionnaires and interviews, as proposed by Columbia at the outset, is shown in Table II-1. At the start, a complete list of industrial end users was obtained from Dun and Bradstreet. The breakdown of these end users by region and by S.I.C. category is given in Table II-2.

A breakdown of the same industrial users by S.I.C. category and gross sales volume is given in Table II-3.

TABLE II-1

PRELIMINARY MAILED QUESTIONNAIRES & PERSONAL INTERVIEWS DISTRIBUTION

Types of Firms:	Estimated Number		Questionnaire Distribution		Interview Distribution	
	Total	By Size	No.	% of Total	No.	% of Questionnaire
Industrial	4,600	*L 200 *M 800 *S 3,000	200 600 600	100 75 20	100 120 30	50 20 5
Major Wholesale Companies	20	L 8 S 12	8 12	100 100	8 12	100 100
Major Wholesale Outlets	400		200	50	20	10
Retailers	4,600	L 10 M 20 S 4,550	10 20 450	100 100 10	10 20 -	100 100 -
Contractors	15,539		1,500	10	30	2
Total:			3,600		350	

*Note: Size Classification
L - Large - Actual or potential use of over 1MMsf/annum (5/8")
M - Medium- Actual or potential use of .5 to 1.0MMsf/annum (5/8")
S - Small - Actual or potential use of less than .5MMsf/annum (5/8")

TABLE II-2 - SUMMARY OF THE PROBABLE SIGNIFICANT END USER INDUSTRIAL FIRMS IN CANADA

SIC#	Category	B. C.	Prairies	Ontario	Quebec	Mari-times	Total
252	Veneer & Plywood-Prefinishers	11	4	20	26	2	63
2541	Sash, Door & Millwork	125	75	243	438	88	969
2543	Prefabricated Housing	46	27	30	35	15	153
3242	Mobile Homes	4	16	10	18	2	50
2544	Kitchen Cabinets	55	37	137	75	11	315
2619	Household Furniture	87	95	268	268	19	737
264	Office Furniture	10	20	52	39	2	123
266	Misc. Furniture & Fixtures	21	28	124	67	3	243
	TOTAL	359	302	884	966	142	2,653

Source: Dun & Bradstreet of Canada, Limited

TABLE II-3 - SUMMARY OF THE PROBABLE SIGNIFICANT END USER INDUSTRIAL FIRMS IN CANADA DISTRIBUTION BY S.I.C. CATEGORY AND BY GROSS SALES ($000)

S.I.C.#	Up to $ 99	$100 to $499	$500 to $999	$1,000 to $4,999	$5,000 to $9,999	$10,000 to $49,999	Over $50,000	Not Stated	TOTAL
252	5	10	5	18	4	8	1	12	63
2541	395	295	70	91	7	8	-	103	969
2543	12	20	25	42	6	3	1	44	153
3242	2	10	3	10	2	4	1	18	50
2544	140	90	14	13	1	-	-	57	315
2619	287	192	53	80	16	5	-	104	737
264	28	48	14	15	1	1	-	16	123
266	67	86	24	32	3	-	-	31	243
TOTAL	936	751	208	301	40	29	3	385	2,653

Source: Dun & Bradstreet of Canada, Limited

These tables indicate that the total relevant end user industries number 2,640 across Canada, against the 4,600 estimated in the original total. Furthermore, those having a sales volume of over $1,000,000 number less than 400.

It was therefore decided that the original interview pattern as proposed was nearly satisfactory and would give an ample coverage of the industry. The final (original) interview profile is given in Table II-4.

The major industrial users of particleboard were known to the interviewers and the largest part of the time was to be spent with those firms. A complete list of industrial end users was obtained from Dun & Bradstreet to be utilized for spot checking industrial firms which were not known users of particleboard.

The Dun & Bradstreet computer printout showed 915 wholesale distributing outlets, of which only 20 could be classed as "major" or "medium", retail outlets numbered 3,092, and there were 13,248 contractors.

It was decided therefore to interview all major and medium sized wholesale distributors and leave the spot selection of minor distributors, retailers and contractors to the individual interviewers judgment.

The distribution of the questionnaires was selected by the Dun and Bradstreet computer in the manner shown in Table II-5.

TABLE II-4 - INTERVIEW PLAN - DISTRIBUTION BY REGION

	B. C.	PRAIRIES	ONTARIO	QUEBEC	MARITIMES	TOTAL
Industrial	17	16	100	100	17	250
Wholesale	3	3	16	16	3	41
Retail	2	2	12	12	2	30
Contractors	2	2	12	12	2	30
TOTAL	24	23	140	140	24	351

TABLE II-5 - QUESTIONNAIRE PLAN - DISTRIBUTION BY REGION

	B. C.	PRAIRIES	ONTARIO	QUEBEC	ATLANTIC PROVINCES	TOTAL
Industrial	94	93	560	560	93	1,400
Wholesale	9	9	52	52	8	130
Retail	31	29	176	176	29	441
Contractors	132	130	757	756	117	1,892
TOTAL	266	261	1,545	1,544	247	3,863

TABLE II-6 - FINAL INTERVIEW PATTERN BY REGION

	B. C.	PRAIRIES	ONTARIO	QUEBEC	ATLANTIC	TOTAL
Industrial	92	59	125	170	17	463
Wholesale	14	15	19	20	3	71
Retail	8	12	32	20	2	74
Contractor	13	10	61	64	2	150
TOTAL	127	96	237	274	24	758

As mentioned earlier, the quantitative data obtained mainly by mailed questionnaire were to be organized and analyzed by computer. Qualitative information and trends were to be obtained by evaluating the field reports of the interviewers.

Execution

As feared, the response to the questionnaire was very poor. Out of the 1,400 industrial questionnaires mailed out, only 212 were returned. The return from the wholesale, retail and contractor section was less than ten per cent. In addition, a great number of questionnaires returned were incomplete.

Part of the poor response was probably due to the interruption in the mail service which occurred during the months of April, May and June of this year.

Possibly, the questionnaire was too complex and discouraged people from answering it. In the interviews it was found that most firms either did not readily have or could not easily obtain the information in the form requested and therefore probably discarded the questionnaire.

The information requested was actually obtainable in some other form but it took a great deal of probing and evaluation on the part of the interviewer to put it into a form which was meaningful for the study.

The returned questionnaires covered only a small part of the total consumption -- about 75 MMsf 5/8" basis per annum. Since the responding firms were not identified by name and most neglected to give their Standard Industrial Classification number and gross sales volumes, it was difficult to deduce from this information industry totals, breakdowns of to generalize as to industry trends.

Columbia did attempt a computer run using this information, but results could not be considered reliable or significant.

By mid-June 1975 almost 300 interviews were completed, indicating a volume usage of nearly 380 MMsf (5/8") in 1974, as well as significant information as to regional, industrial and board type breakdowns. Furthermore, an interviewing team visited all major Canadian particleboard plants and obtained the production figures of these plants for 1974. It was obvious that Canadian production (less exports) plus imports as reported by Statistics Canada was at least 20 MMsf 5/8" short of the volume reported by the interviewers. In addition, in Columbia's judgment, at this point the interviews did not cover more than 80% of the actual total consumption in 1974.

Either the figures given by Statistics Canada were incorrect or some double counting occurred during the interviews. This could easily happen as the raw board used by the veneer and plywood or "prefinishing" (SIC 252) category is resold to actual industrial end users as prefinished board but may be reported erroneously as raw board by the end user or, possibly, the interviewer.

Consequently, it was decided to revise the earlier interview plan to include all industrial firms in the relevant S.I.C. categories (as per the Dun and Bradstreet list) having gross sales over one million dollars and to check firms with gross sales between $500,000 and $1,000,000. A recheck of the industrial firms already interviewed was also undertaken.

The profile of the actual interviews (personal or phone) conducted with end users and totalling 758, as against the originally planned number of 350, is shown in Table II-6.

All major wholesale distributors were reinterviewed.

As the relatively small number of completed interviews with retailers and contractors did not yield significant data, it was judged to be unnecessary and redundant to attempt to make further contacts with retailers and contractors. The information received from wholesale distributors was better suited for evaluation as to the volumes and types sold to the construction industry and handled through the retail distribution trade.

By the time each interviewer collected and tabulated the data and such data was crosschecked for possible double counting (such as one firm reporting for several subsidiaries or plants in various locations, some of which may have been picked up by another interviewer), all information was in a form suitable for evaluation by inspection and further analysis by computer was deemed to be unnecessary.

VOLUME OF RAW BOARD CONSUMED IN 1974

1974 CONSUMPTION PROFILE OF RAW U.F. PARTICLEBOARD

Table II-7 presents the findings of the survey as to the raw U.F. bonded particleboard volume consumption in Canada for 1974 and the distribution of the volume by region and by end user industry categories.

With regard to accuracy, it is Columbia's judgment that the total volume figures are accurate within ±5%.

The industry and regional breakdown details are considered to be accurate in some cases within ±10%, in others within ±15%.

If anything, the total volume could be underestimated. On the other hand, an overestimate may be possible as some end users may have given a rate of purchase which applied to their "fiscal" year of July 1973 to July 1974 and did not take into account the sharp drop towards the end of 1974. It is considered to be unlikely, however, that this would account for more than five percent of the total as the recheck interviews were conducted and evaluated with this possibility in mind.

The industrial figures are based on the assumption that about 98% of the total volume by end use was actually located. In other words, 325 MMsf 5/8" was actually located and about 5 MMsf was taken as used by smaller industrial firms not contacted. The distribution of this error was assumed to be the same for all industrial S.I.C. categories and regions. As a result, the individual detail figures could be in greater error, as mentioned earlier. The individual detail figures should still be within an accuracy of ±15%.

The figures in the construction sector are based on data received mainly from wholesalers and producers.

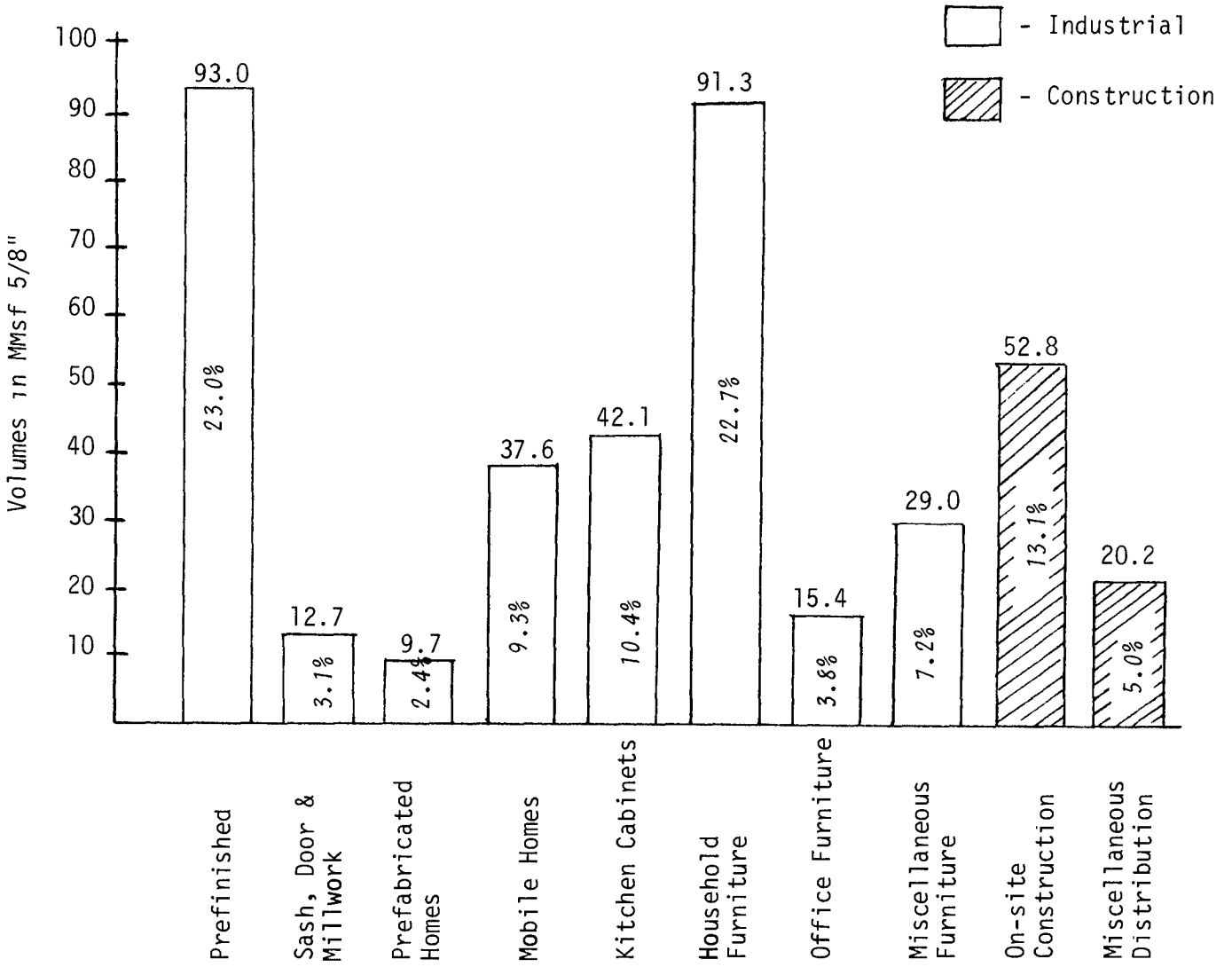
TABLE II-7 - PROFILE OF THE 1974 CONSUMPTION OF U.F. PARTICLEBOARD IN CANADA - Volumes in MMsf 5/8"

SIC#	DESCRIPTION	B.C.	PRAIRIES	ONT.	QUE.	ATLANTIC PROVINCES	TOTALS VOLUME	TOTALS %
	INDUSTRIAL:							
252	Veneer, Plywood-Prefinishers	5.4	-	50.8	28.2	8.6	93.0	*23.0*
2541	Sash, Door & Millwork	1.7	1.5	6.4	3.1	-	12.7	*3.1*
2543	Prefabricated Buildings	3.9	3.7	0.3	1.8	-	9.7	*2.4*
3242	Mobile Homes	5.9	12.3	9.5	8.6	1.3	37.6	*9.3*
2544	Kitchen Cabinets	8.1	0.8	24.7	7.6	0.9	42.1	*10.4*
258	Caskets & Coffins	-	-	-	0.2	-	0.2	-
2619	Household Furniture	0.8	6.1	35.1	49.2	0.1	91.3	*22.7*
264	Office Furniture	-	0.1	6.2	9.1	-	15.4	*3.8*
266	Miscellaneous Furniture	0.8	4.1	20.6	3.5	-	29.0	*7.2*
	Total Industrial Consumption MMsf 5/8" Basis	26.6	28.6	153.6	111.3	10.9	331.0	*81.9*
	%	*8.0*	*8.7*	*46.4*	*33.6*	*3.3*	*100.0*	
	CONSTRUCTION & DISTRIBUTION:							
404	U.L. & Wall Panelling [1]	10.5	12.0	13.0	14.0	3.3	52.8	*13.1*
	Miscellaneous Distribution	3.5	4.0	5.5	4.5	2.7	20.2	*5.0*
	Total Construction Consumption MMsf 5/8" Basis	14.0	16.0	18.5	18.5	6.0	73.0	*18.1*
	%	*19.2*	*22.0*	*25.4*	*25.4*	*8.0*	*100.0*	
	TOTAL CONSUMPTION MMsf 5/8" Basis	40.6	44.6	172.1	129.8	16.9	404.0	*100.0*
	%	*10.1*	*11.0*	*42.6*	*32.1*	*4.2*	*100.0*	*100.0*

[1] Not including waferboard

Source: CEI Research

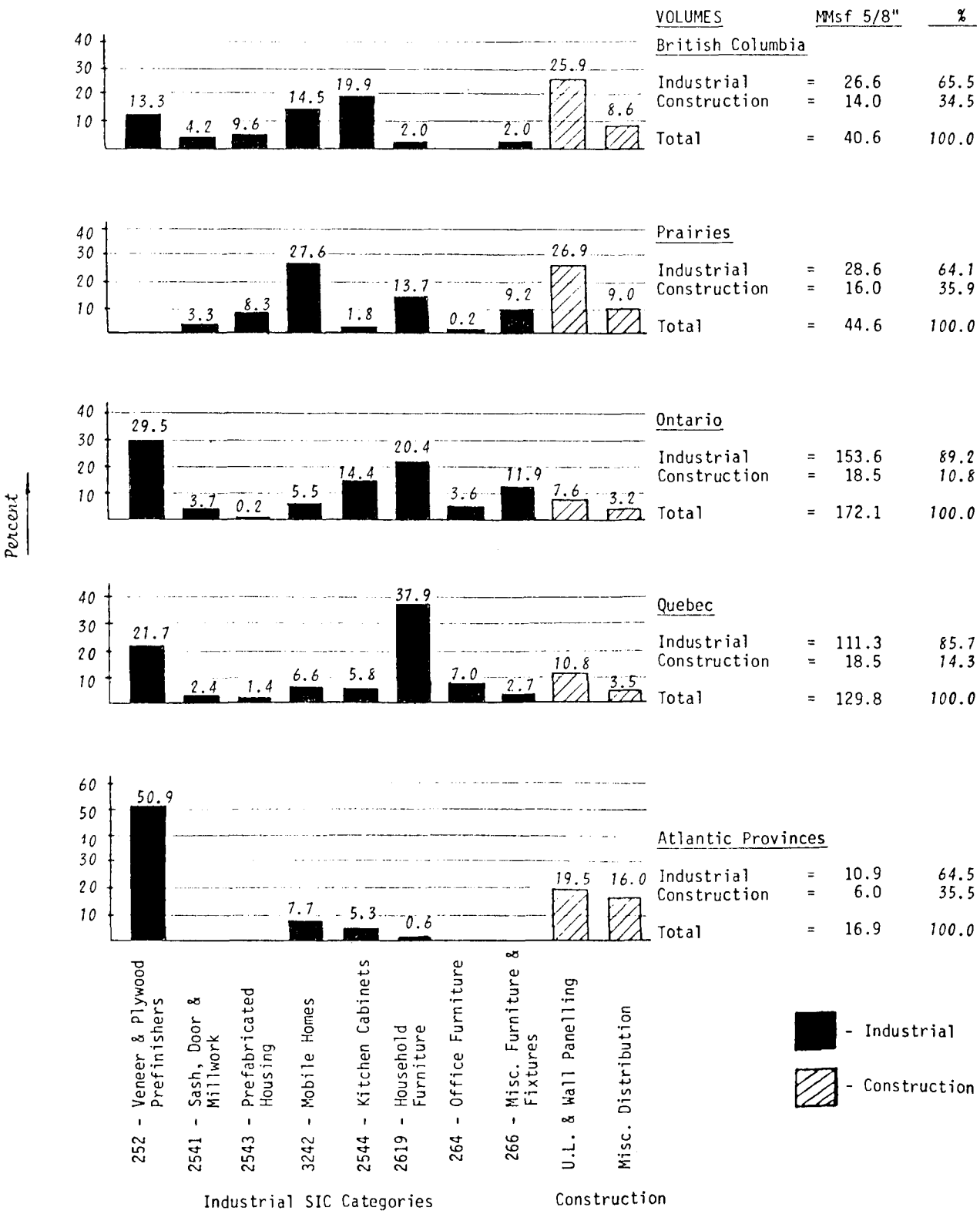
FIGURE II-1- VOLUME & PERCENTAGE DISTRIBUTION BY END USER CATEGORY OF CONSUMPTION OF UREA BONDED PARTICLEBOARD IN CANADA - 1974



Source: C.E.I. Research

FIGURE II-2

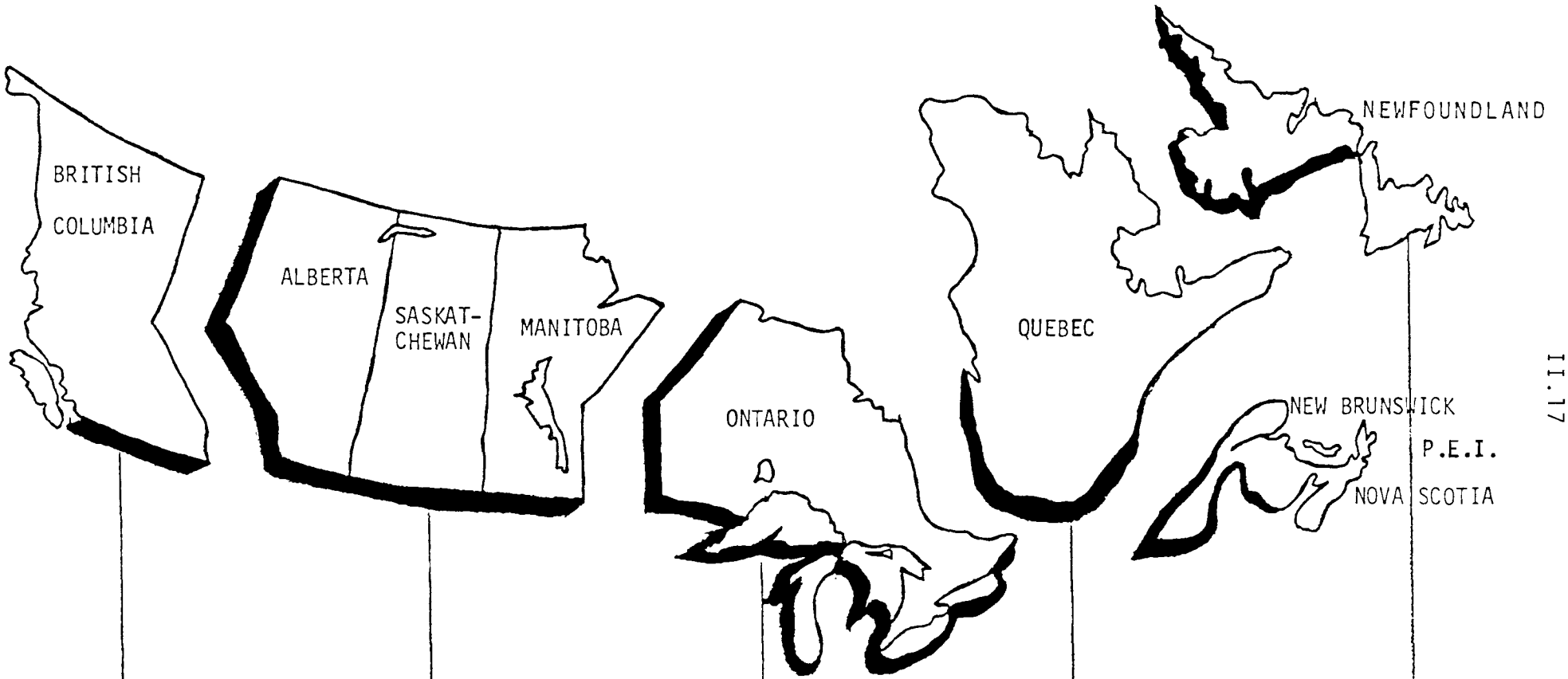
PERCENTAGE DISTRIBUTION BY END USER CATEGORY OF THE 1974 CONSUMPTION OF U.F. PARTICLEBOARD IN THE FIVE CANADIAN REGIONS



VOLUMES	MMsf 5/8"	%
British Columbia		
Industrial	= 26.6	65.5
Construction	= 14.0	34.5
Total	= 40.6	100.0
Prairies		
Industrial	= 28.6	64.1
Construction	= 16.0	35.9
Total	= 44.6	100.0
Ontario		
Industrial	= 153.6	89.2
Construction	= 18.5	10.8
Total	= 172.1	100.0
Quebec		
Industrial	= 111.3	85.7
Construction	= 18.5	14.3
Total	= 129.8	100.0
Atlantic Provinces		
Industrial	= 10.9	64.5
Construction	= 6.0	35.5
Total	= 16.9	100.0

Source: CEI Research

FIGURE II-3 - THE REGIONAL DISTRIBUTION OF THE 1974 CONSUMPTION OF U. F. PARTICLEBOARD
Volumes in MMsf 5/8"



BRITISH COLUMBIA	
Consumed:	
Industrial	26.6
Construction	14.0
TOTAL	40.6

PRAIRIES	
Consumed:	
Industrial	28.6
Construction	16.0
	44.6

ONTARIO	
Consumed:	
Industrial	153.6
Construction	18.5
	172.1

QUEBEC	
Consumed:	
Industrial	111.3
Construction	18.5
	129.8

ATLANTIC PROVINCES	
Consumed:	
Industrial	10.9
Construction	6.0
	16.9

Source: CEI Research

It may be noted here (as well as further on in the report) that, in addition to the raw board usage of 404 MMsf 5/8", about 15 to 17 MMsf prefinished, overlayed board was imported into Canada. It may be stated, therefore, that the total actual demand for raw board in 1974 was in excess of 420 MMsf 5/8" -- assuming that all finished board used in Canada was finished in Canada.

The profile of particleboard consumption is also illustrated in Figures II-1, II-2 and II-3.

Supply vs. Consumption

Based on the information obtained in the field, Columbia feels certain that the total raw board consumption in 1974 was in the order of 400 MMsf 5/8", or more. The total Canadian supply of raw U.F. board, however, was given by the Department of Industry, Trade and Commerce (D.I.T.C.) at about 372 MMsf 5/8", on the basis of information given by Statistics Canada and D.I.T.C.'s own estimates.

Statistics Canada includes the production of waferboard in the total particleboard production reports. The net U.F. particleboard production (or shipments) figure is derived by subtracting waferboard shipments from the totals as given by Statistics Canada. Furthermore, exports also had to be estimated by D.I.T.C. in order to arrive at the volumes available to domestic markets.

Columbia checked the production and export figures of Canadian plants producing U.F. bonded particleboard and concluded that, in 1974, the shipments from domestic plants to domestic end users was in the order of 210 MMsf 5/8". A similar amount was estimated by D.I.T.C. Imports, however, must have been 30 to 45 MMsf 5/8" in excess of the import figure of 162 MMsf 5/8", as given by Statistics Canada, to make up the 404 MMsf 5/8" consumption as determined by the study.

Table II-8 shows a comparison of the 1974 domestic shipment and import and export figures as estimated by D.I.T.C. and by Columbia.

TABLE II-8 - STATISTICS CANADA & D.I.T.C. FIGURES COMPARED WITH C.E.I. ESTIMATES OF THE PARTICLEBOARD SHIPMENTS, EXPORT AND IMPORT FIGURES FOR 1974

Period	STATISTICS CANADA PUBLISHED INFORMATION AND D.I.T.C. ESTIMATES						C.E.I. ESTIMATES				
	Total U.F. Particleboard & Waferboard Shipments[1]	Estimated Waferboard Shipments[2]	Estimated Exports[2]	Net Domestic U.F. Particleboard Shipments[3]	Imports[4]	Total U.F. Particleboard Supply	Total U.F. Particleboard Shipments[5]	Estimated Exports[5]	Net Domestic U.F. Particleboard Shipments[6]	Estimated Imports[7]	Total U.F. Particleboard Supply
JAN. To JUNE	194.3				101.0		158.8	45.0	113.8	105.0	218.8
JULY To DEC.	149.1				60.7		115.6	20.0	95.6	89.6	185.2
TOTAL FOR YEAR	343.4	70.0	63.4	210.0	161.7	371.7	274.4	65.0	209.4	194.6	404.0

Notes:
1. Statistics Canada, Catalogue 36-003
2. D.I.T.C. Estimates
3. Total Shipments less Waferboard less Exports
4. Statistics Canada, Catalogue 65-007
5. Based on C.E.I. Discussions with Producing Plants
6. Total U.F. Particleboard Shipments less Estimated Exports
7. C.E.I. Estimates

Both D.I.T.C. and Columbia found that domestic shipments did drop off during the second half of the year; so did imports, according to Statistics Canada. While Columbia could not prove out the distribution of imports over the year, it is convinced that the total raw U.F. board imports for the year must be in the order of 190 to 195 MMsf 5/8". In all probability, the import figures (of Statistics Canada) for the second half of the year are substantially understated.

With regard to domestic production, it is evident that the total shipments of about 275 MMsf 5/8" (210 MMsf domestic shipments plus about 65 MMsf 5/8" exports) account for only 72% of the total rated capacity of the Canadian plants in 1974 (about 380 MMsf 5/8"). Some Canadian plants had production interruptions during 1974 -- some because of strikes, some because of financial problems. Some curtailed production due to an inability to meet the price competition from imports, especially during the second half of the year. The Weyroc plant (now Northwood) at Chatham, N.B., could have replaced some imports after it essentially stopped exporting but, for various reasons, was not in a position to take advantage of this opportunity. At any rate, Canadian plants produced only about 50% of the actual Canadian demand in 1974, running at much less than rated capacity.

The reasons for the foregoing will be discussed later on in this report (section IV).

It is to be noted here that the difference between the "production" and "shipment" figures as given by Statistics Canada requires some clarification. The cumulative difference is probably too great to be accounted for by rejects plus inventory. It is possible that the "finished" board shipments of particleboard plants are not included in the total shipment figures. At any rate, for the purposes of the present study, Columbia counted all "raw" board shipments, whether it was shipped to outsiders or to the plants' own finishing operation. The in-plant finishing operations were regarded as "prefinishers" and the raw board used by them as consumed by the S.I.C. 252 end user category.

With regard to imports, Columbia interviewed 9 major U.S. West Coast particleboard producers and accounted for 140 to 150 MMsf 5/8" of board exported to Canada in 1974. It is quite probable that other U.S. plants not contacted exported an additional 40 to 50 MMsf 5/8" to Canada in the same year.

It is suggested that there are a number of possible sources of error in the counting of imports. Each could account for the whole or a large part of the indicated shortage in the import figures for 1974 as given by Statistics Canada. These are as follows:

1. All U.S. plants contacted reported their export volumes on a 3/4" basis, which is the standard in the United States. It is conceivable, therefore, that the 160 MMsf 5/8" of imports as reported by Statistics Canada were mostly on a 3/4" basis; 160 MMsf 3/4" equals about 192 MMsf 5/8" which would take care of the discrepancy. The dollar value figures given by Statistics Canada indicate an FOB mill list price of about $92/Msf 5/8" as an average over the last eight months in 1974. Since most of the board imported originated on the U.S. West Coast and was of the underlayment grade (some specially cut in 49" x 97" size for Canadian industrial use), the above price should correspond closely with the 5/8" underlayment price as given by "Random Lengths" reports. Over the same period, however, the average price for 5/8" underlayment FOB West Coast was $52/Msf 5/8". Furthermore, it is a known fact that a large quantity of volume sales during this period were closed well below the listed price level.

   Even if it is assumed that 20% of the import volume was in the higher priced specialty items at an average value of $200/Msf 5/8" FOB mill, the average of the remainder would still be at about $75 per Msf which is about the then prevailing price on a 3/4" basis rather than on a 5/8" basis.

   These figures would appear to support the argument that at least a large part of the 160 MMsf import volume was on a 3/4" basis rather than on a 5/8" basis.

2. Another source of error could be the mobile home decking product and application. Practically all mobile home decking used in Canada was, and is, imported -- some 36 to 38 MMsf 5/8" in 1974. The product is called (in the trade) MHD or mobile home decking, or simply decking. It may enter Canada under a different identification and may not be included in the particleboard import figures. At any rate, some mobile home people did not think they were using particleboard when, in actual fact, they were.

3. A further possible error could be in the MDF board and/or thin (Mende) wall panelling product area. Columbia's survey includes these products in the general particleboard classification. About 6 to 8MMsf, 5/8"basis, of MDF and about 1 to 2 MMsf, 5/8" basis, thin (Mende) board was imported and used in Canada in 1974. It is possible that MDF board is included in the hardboard figures as most MDF producers in the United States belong to the hardboard rather than the particleboard association. Thin (Mende) board may come in under a wall panel classification, thus missing the particleboard count.

4. The prefinished board (overlayed with vinyl, low or high pressure laminates, etc.) would certainly enter Canada under an identification other than particleboard. The 15 to 17 MMsf 5/8" imported finished particleboard, therefore, is unlikely to be included in the particleboard import figures.

At any rate, the results of Columbia's survey show that the volume usage of particleboard in 1974 exceeded the indicated supply by about 32 MMsf 5/8". While attempting to reconcile these differences, the study team found that the counting system presently adopted is susceptible to error. In 1974, the error appears to be in the import section. The definition of domestic "production" and domestic "shipments" is also unclear. Columbia recommends therefore that consideration be given by the proper authorities towards the implementation of certain changes in record keeping, thus reducing possible sources of error. In this regard, the following suggestions are offered:

- The separate recording of U.F. particleboard production, i.e., excluding waferboard.

- Particleboard plants which have a prefinishing operation could be placed in S.I.C. 252 or some new "prefinishing" category, as well as in the particleboard manufacturing section.

- Consideration should be given to changing the Canadian standard to 3/4" ratherthan 5/8", to conform to U.S. standards, thereby eliminating a great deal of confusion in the trade figures between the two countries. (Columbia will present arguments in favour of a change of this nature in later chapters).

- An update and clarification should be made in the definition of particleboard, mobile home decking, MDF and Mende board as well as prefinished particleboard panels entering Canada.

It is Columbia's judgment that the changes suggested above would greatly reduce the errors in future record keeping and counting and would produce an easier, clearer presentation of the performance patterns of the industry.

* * *

Columbia's estimate of the probable distribution of the raw U.F. board supply in 1974 is shown in Table II-9 and in Figure II-4.

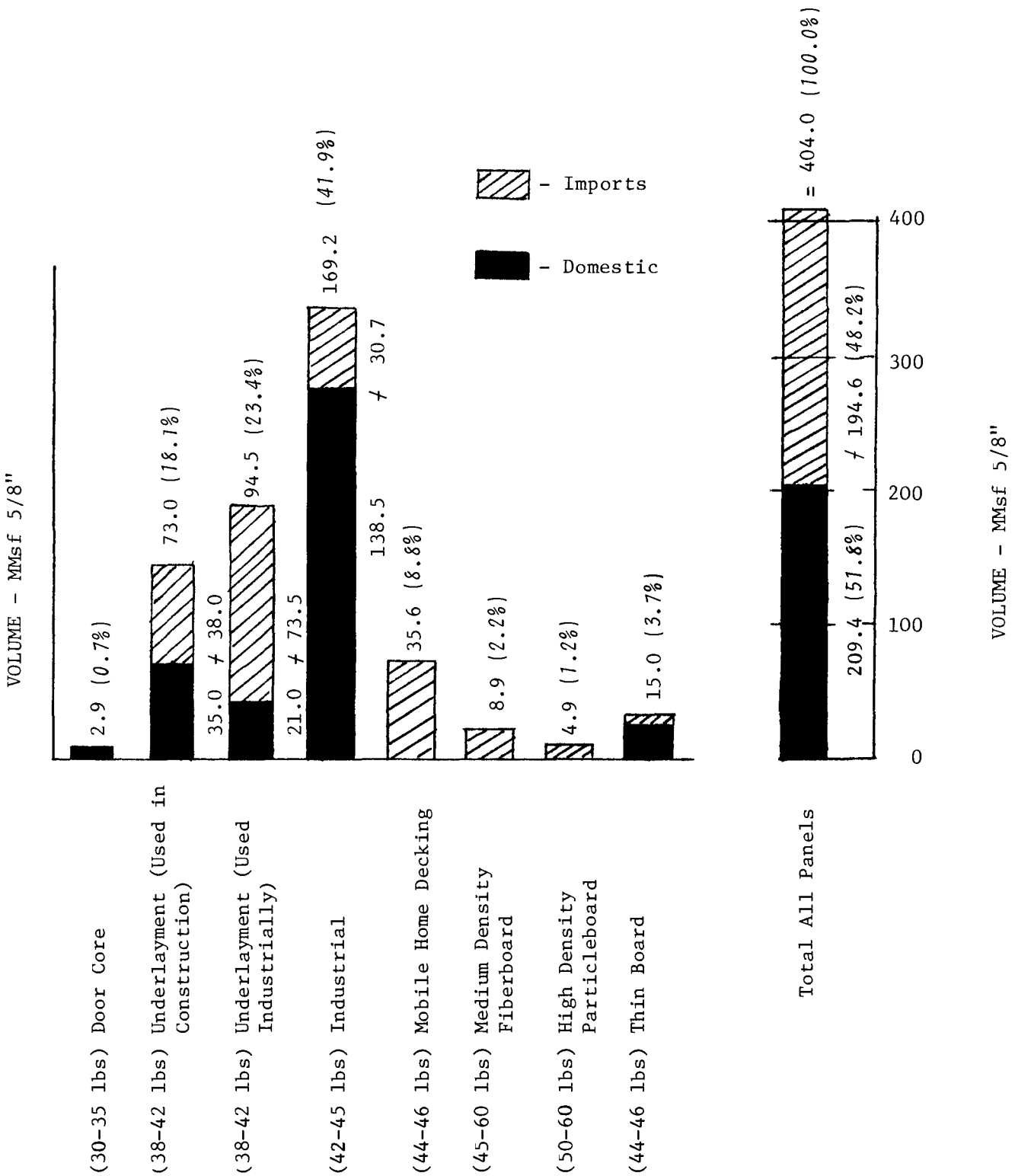
It is significant to note that close to *80%* of the underlayment grade board used industrially; over *50%* of the U.L. grade board used in a flooring application and all the mobile home decking used comes from imports. Eighty per cent of the thin board and *100%* of the high density board and MDF board is also imported.

TABLE II-9 - ESTIMATED MAKEUP OF THE 1974 CANADIAN RAW U.F. PARTICLEBOARD SUPPLY

PANEL SOURCE:	DOMESTIC			IMPORTED			TOTALS		
PANEL TYPE	VOL.	ROW % →	↓ COL. %	VOL.	ROW % →	↓ COL. %	VOL.	ROW % →	↓ COL. %
Door Core	2.9	*100.0*	*1.4*	-	-	-	2.9	*100.0*	*0.7*
Underlayment (Used in Construction)	35.0	*47.9*	*16.7*	38.0	*52.0*	*19.5*	73.0	*100.0*	*18.1*
Underlayment (Used Industrially)	21.0	*22.2*	*10.0*	73.5	*77.8*	*37.8*	94.5	*100.0*	*23.4*
Industrial	138.5	*81.9*	*66.2*	30.7	*18.1*	*15.8*	169.2	*100.0*	*41.9*
Mobile Home Decking	-	-	-	35.6	*100.0*	*18.3*	35.6	*100.0*	*8.8*
Medium Density Fiberboard	-	-	-	8.9	*100.0*	*4.6*	8.9	*100.0*	*2.2*
High Density Particleboard	-	-	-	4.9	*100.0*	*2.5*	4.9	*100.0*	*1.2*
Thin Board	12.0	*80.0*	*5.7*	3.0	*20.0*	*1.5*	15.0	*100.0*	*3.7*
TOTALS	209.4	*51.8*	*100.0*	194.6	*48.2*	*100.0*	404.0	*100.0*	*100.0*

Source: CEI Research

FIGURE II-4 - PROFILES OF THE 1974 RAW U.F. PARTICLEBOARD SUPPLY - DISTRIBUTION BY PANEL TYPE & SOURCE



Source: CEI Research

The foregoing figures suggest serious shortcomings in the Canadian particleboard industry.

Comparisons With United States Consumption Figures

In comparison with the United States, a Canadian particleboard consumption of about 404 MMsf 5/8" in 1974, corresponding to about 337 MMsf 3/4", appears to be a reasonable figure, representing about *10.7%* of U. S. consumption for that year which is estimated to be in the order of 3.1 to 3.2 billion square feet (Bsf) 3/4" (see Section I). Although Canadian per capita consumption of particleboard appeared to lag behind that of the United States up to 1973 -- for a number of reasons (U.S. consumption in 1973 was over 3.8 Bsf 3/4" - Canadian consumption about 303 MMsf 3/4"), it is highly probable that such per capita consumption was higher in Canada than in the United States in 1974. The reasons for this contention are summarized as follows:

(a) Consumption in Canada in 1972-73 was probably retarded because particleboard prices in Canada were substantially higher than in the U. S. -- both in terms of absolute prices and in comparison with other available wood products. Furthermore, Canadian production was limited and as U. S. demand exceeded the U. S. supply during this period, U. S. board was high priced and difficult to obtain.

(b) The economic downturn occurred in the United States early in the second quarter of 1974 whereas, in Canada, the downturn was not really felt until the third quarter. As a result, a great deal of U.S. board became available after May 1974 in Canada at sharply lower price levels which further encouraged Canadian buyers, in spite of the pending and foreseeable Canadian economic downturn.

> A significant drop in Canadian purchases did not, in all probability, occur until the fourth quarter. Even then, the low price levels probably permitted particleboard to penetrate end users who had not previously considered the use of the product.

At any rate and based on the exhaustive study conducted during the past four months, Columbia is confident that the total volume figures contained in Table II-7 represent a true picture of the Canadian particleboard consumption in 1974.

DISTRIBUTION OF RAW BOARD CONSUMPTION BY END USER INDUSTRIES

The 1974 distribution of the consumption by end user industries is shown in Table II-7 and Figures II-1 and II-2. Somewhat similar industry distribution figures were estimated by D.I.T.C. for 1971 and it is of interest to evaluate the changes which have taken place over the three years between 1971 and 1974.

A comparison of D.I.T.C. 1971 figures with the present study's 1974 figures is given in Table II-10.

Comparison of Industry Distribution Figures 1971 - 1974

In 1974, the furniture industry used over *50%* more particleboard than in 1971, although the furniture industry percentage of the total dropped from *37%* to *33.7%*.

In 1971, all furniture manufacturing was handled under a single heading whereas the present study gives a breakdown as to household, office and miscellaneous furniture.

The kitchen cabinet industry doubled its use of particleboard between 1971 and 1974, although its share of the total industry rose only by *1.4%*.

TABLE II-10 - COMPARISON OF RAW U. F. PARTICLEBOARD END USE BREAKDOWN - 1971/1974

	PRESENT STUDY 1974				D.I.T.C. 1971			
	MMsf 5/8"	Total	%	Total	MMsf 5/8"	Total	%	Total
1. Furniture								
Household	91.3		22.7					
Office	15.4		3.8					
Miscellaneous	29.0	135.7	7.2	33.7		89.54		37.0
2. Kitchen Cabinets		43.1		10.4		21.7		9.0
3. Sash & Door		12.7		3.1		-		-
4. Prefinishing								
Hardwood Plywood	50.0		12.3		48.4		20.0	
Other Prefinished	43.0	93.0	10.7	23.0	19.3	67.7	8.0	28.0
5. Manufactured Homes					(Included in Item 6)			
Mobile Homes	37.6							
Prefabricated Homes	9.7	47.3		11.7		-		-
6. Construction & Distribution								
Construction					31.45		13.0	
Distribution		73.0		18.1	31.45	62.90	13.0	26.0
TOTALS		404.0		100.0		242.0		100.0

Source: D.I.T.C. & CEI Research

The use of particleboard by the sash and door industries was not listed in the 1971 breakdown. In 1974, about 12.7 MMsf 5/8" was used by this sector, mainly in general millwork and some, about 2.7 MMsf 5/8", as solid door core.

The use of particleboard by the hardwood plywood industries remains relatively stable. In terms of percentages, however, in 1971 twenty per cent of the total particleboard consumed was used by the hardwood plywood industries whereas in 1974 this percentage dropped to *12.3*.

The other laminating and prefinishing operations used twice as much particleboard in 1974 as in 1971 and their share of the total consumption increased from *8%* to *10.7%*.

It is of interest to note here that in addition to the prefinished particleboard manufactured and sold by the hardwood plywood and laminating industries, there was approximately 17 MMsf, 5/8" basis prefinished particleboard imported into Canada in 1974. The total prefinished board sold and used in Canada, therefore, was in the order of 110 MMsf 5/8" (rather than 93 MMsf domestically produced prefinished board). This would constitute *27%* of the total (421 MMsf) which is close to the percentage figure in 1971. In 1974, however, plywood was only *11.8%* of the total used whereas other prefinishing methods used up *14.2%* of the total volume. The corresponding percentages in 1971 are *20%* for plywood and *8%* for other prefinishing applications.

While prefinished board declined in Canada over the past three years -- even counting imported prefinished board -- in the United States, prefinished board increased its share of the market by at least 3 to 4 points, from *29%* to about *32%* to *33%*.

The differences are even greater in terms of percentage of industrial consumption: 33% in Canada (28% excluding imports) and about 42% to 43% in the United States. (CEI-LGA* estimates)

In 1971, about 26% of the total volume was used in the construction industry and/or sold through retail distribution outlets. The volume was 62.9 MMsf 5/8". The present survey indicates that the construction use and distribution channels used up 73 MMsf 5/8" of particleboard, constituting 18.1% of the total.

Some studies include mobile homes and prefabricated homes in the construction sector although the present study classifies these applications as industrial. If the use in mobile homes and in prefabricated homes is added to the construction and distribution sector, the total particleboard used in all housing and construction is in the order of 120 MMsf 5/8", constituting 30% of the total volume.

It is not known just how the mobile home sector was treated in the 1971 study. Probably it was included in the construction sector. To Columbia's knowledge, however, there was very little particleboard used by the Canadian mobile and prefabricated home industries in 1971 as the industry used essentially plywood for most of its decking and sheathing applications. At the present, almost all of the floor decking used in mobile homes is the mobile home decking type particleboard (MHD). This has been a sizeable growth area over the past three years, although it is all served by imported products.

The total consumption of particleboard increased by over 65% in Canada between 1971 and 1974 which is a growth similar to the one experienced in the United States. The largest growth areas were in the furniture industry, in kitchen cabinets, door cores, prefinishing applications (other than hardwood plywood) and in the mobile and prefabricated home industries.

*LGA=Leonard Guss & Associates

The growth in the construction and distribution end uses is somewhat marginal and significantly less than the growth in the same end use in the United States. This is probably due to the availability of the waferboard type product in Canada. Very little of this board type was marketed in the U. S. Waferboard is a much more all around utility type panel than urea bonded particleboard and therefore moves in much greater volumes through the distribution channels and is applied more readily in construction .

The use of urea bonded particleboard as floor underlayment is certainly not as widespread in Canada as it is in the United States and this is reflected in the relatively low Canadian growth of particleboard in the construction end use.

It is to be noted that the growth in total volume between 1971 and 1974 may not be as large as indicated by Table II-10, if the total volume figures given by the Department of Industry, Trade and Commerce for 1971 are as understated as they seem to be for 1974. It has been established, however, that the major error in the apparent consumption figures as given by D.I.T.C. is in the import section. In 1971, imports constituted only *20%* of the total apparent domestic consumption whereas in 1974, according to figures published by Statistics Canada, imports were running at a rate of about *45%*. It may be assumed therefore that the error in the total volume given by D.I.T.C. for 1971, if any, is proportionately less and therefore affects the assumed total to a much lesser degree.

Comments on the Quality of the 1974 Distribution By End User Industry Figures

Regarding the quality of the industry breakdown figures contained in Table II-7 and Figures II-1 and II-2, the following comments are offered:

- the volume used by the veneer, plywood and laminating sector (SIC 252) is thought to be quite accurate. Any possible error is on the low side or, in other words, the figure may be understated. An actual usage of 100 MMsf 5/8" would not be surprising.

  The firms in this sector are rather easy to identify, certainly the firms which overlay particleboard with veneers.

- The laminators, that is the firms who apply vinyl or low pressure laminates to the board and/or print or prime particleboard, are somewhat more difficult to identify. Columbia feels confident however that it has located all the end users in this category -- at any rate all the significant end users.

- The figure used for the sash, door and millwork sector is less accurate. Most of the large sash, door and millwork companies use little particleboard and it is difficult to locate the ones who use any significant amount of it. Dollar sales volumes in terms of total sales of any given firm do not give any indication as to particleboard use. The total volume figure given here may be out by as much as ±20% which would effect the percentage figure used by the sector but does not significantly influence the total volume of particleboard used in Canada.

- The board consumption figures used for the manufactured and mobile home industries are certainly within the ±5% range. The firms here are easy to identify and so is their end use application of particleboard.

  On the whole, prefabricated homes use relatively less particleboard per unit than do mobile homes.

  Mobile homes use particleboard almost exclusively as floor decking. Some particleboard is used in a number of cabinetry applications. The biggest of these applications is in the kitchen cabinets which are generally bought in prefabricated form and the use of particleboard in this application is included (most of it) in the kitchen cabinet sector.

- The furniture industries, including the kitchen cabinet sector, were somewhat more difficult to analyze. A great number of the large firms are involved in all or at least two types of manufacturing designated in categories 2544, 2619, 264 and 266. These firms purchase their particleboard in bulk and the distribution of the total volume used per SIC category or by product line is sometimes difficult to ascertain. In addition, a great number of these firms purchase a significant volume of their particleboard in prefinished form which is not clearly separated from the raw board.

- The kitchen cabinet sector presents probably the greatest difficulties. Although about 70% of the board volume used by this sector is consumed by relatively few large firms, the remaining 30% is used by a host of small operations throughout the country. The use of prefinished board, especially by small operations, is widespread.

- Institutional furniture (schools, hospitals, etc.) and store fixtures are included in miscellaneous furniture. It would appear to be useful to separate these two categories from the miscellaneous furniture as both of the applications singled out above use significant amounts of particleboard and would appear to constitute a fairly substantial growth area for particleboard in the future. The institutional furniture field is also a large user of specialty products such as high density particleboards and medium density fiberboards.

- The construction and distribution sector proved to be the most difficult to analyze.

  The original plan was to carry out a number of interviews with contractors and retail outlets and attempt to arrive at some kind of an average use figure by contractor and by retail outlet. Alternatively, efforts were made to determine the average square footage of particleboard used per house or apartment building. All of these attempts however proved to be futile. Most of the particleboard volume in this sector is used in the single home family dwelling and garden apartments or low rise (2 to 3 storey) apartment house construction. These types of jobs are essentially undertaken by relatively small firms. Their use of particleboard varies greatly by region and location and certainly by contractor.

- The same is true of retail distribution outlets. Some outlets sell a great deal of particleboard in raw form or in prefinished form (shelving). Others sell none. At any rate, the interviews conducted with various contractors and retail outlets did not yield any clues as to methods of valid generalization for a given area or region and certainly not for the total country.

- The figures used for the construction and distribution sector given in Table II-7 are based on the information received from wholesale distributors and manufacturing plants. These firms had reasonably accurate data as to the amount of board sold to industrial accounts and the amount that went through distributors and to contractors. They were indeed helpful in supplying the study group with these figures.

- Almost all the board used in the construction industry went through retail distribution channels. On the other hand, little or no board went to the industrial accounts through retail outlets.

- The distribution of the total construction volume between underlayment and wall panelling on the one hand and general or miscellaneous on the other is based on the board thickness breakdown given to us by the various wholesale distributors and Canadian board manufacturers, since most underlayment board actually used on the floor is in 3/8" thickness.

- Certainly *90%* of the total volume classified as underlayment and wall panelling (52.8 MMsf 5/8") is actually used as floor underlayment.

- The board volume given under miscellaneous distribution is essentially sold to the shoulder trade or, in other words, it constitutes the board used for various "do-it-yourself" activities in existing homes or small remodelling construction jobs around the home.

- It should be noted again that the board here is all raw board and does not include the sale of any prefinished boards, such as shelving.

- The panelling included in the underlayment and wall panelling sector is not meant to include prefinished panelling such as printed or paper overlayed board or vinyl boards. It is the raw board used as interior sheathing or partitioning, mostly in 3/8" thickness, in place of gyproc or similar wall panelling products. This end use is not widespread but some of it was observed.

- It is to be noted that some of the particleboard manufacturers are also acting as laminators. In other words, they overlay or finish in some other way, their own product and sell it in prefinished form. The amount of raw board (their own) used by these operations was counted as raw board consumption in SIC #252. Examples of this are the Bisonal operation of Flakeboard in Milltown, N.B., New Ontario Dynamics in New Liskeard, Ontario and MacMillan Bloedel in Burnaby, B. C.

  The interviews with particleboard manufacturing plants revealed that an additional number of manufacturers are planning to enter such prefinishing operations utilizing their own product.

REGIONAL DISTRIBUTION

Table II-7 and Figures II-2 and II-3 also present the regional distribution of particleboard consumption, broken down by end user industry. The comments in this regard may be summarized as follows:

- The largest part of the laminators and prefinishers (veneer and other, SIC 252) are located in Ontario and in Quebec. Some prefinishing is done in B. C. and in the Atlantic Provinces, none in the Prairies.

- The prefinishing in B. C. is carried out essentially by three firms -- MacMillan Bloedel (using their own board), Canfor and Sauder Industries. In the Atlantic Provinces, all of the volume noted in Table II-7 is manufactured by Flakeboard in Milltown, N. B. (low pressure laminate) and Fibrply board, veneered in Newfoundland.

- There are a number of firms operating in Ontario and Quebec. A large percentage of these apply hardwood veneer to particleboard.

  The following chapter will present a detailed analysis of the prefinishing and laminating industries, as well as the end use of such prefinished products.

- About half of the particleboard used in the sash and door and millwork sector is in Ontario; 25% in Quebec and 25% in B. C. and the Prairies combined. None is shown for the Atlantic Provinces as none was located.

- The particleboard usage by the prefabricated building sector (SIC# 2543) is concentrated mainly in B.C. and the Prairies (Alberta). Quebec and Ontario both have relatively large prefabricated building industries which, however, use less particleboard than their counterparts in the West. In all probability, the high usage of particleboard by the Western prefabricated building industry is based on, or caused by, the relatively easy availability of particleboard in this area from the two Western particleboard manufacturing plants.

- The use of particleboard by the mobile home industry (SIC #3242) is divided fairly evenly between all regions. The largest concentration is in the Prairies (in Alberta) followed by Ontario, Quebec and British Columbia. There is a significant mobile home manufacturing end use in the Atlantic Provinces.

  Some wholesale distributors interviewed felt that the use of particleboard by the mobile home industry in Quebec is larger than in Ontario and that, indeed, the Quebec mobile home industry is larger than its counterpart in Ontario. The interviewers reports were rechecked with these comments in mind. An evaluation of the reports and some checks by telephone did not turn up evidence which would justify changing the figures in Table II-7.

- Similarly, some observers felt that the difference between the kitchen cabinet industry (SIC #2544) in Quebec and Ontario is not as large as indicated in Table II-7. Again, a recheck of the interviewers reports and some phone calls confirmed the original totals.

- It is possible that some of the volume shown for household furniture (SIC#2619) in Quebec belongs, in reality, in the kitchen cabinet sector. The interviewers were not successful in finding such misallocation. They did establish, however, a greater use of prefinished particleboard by this sector in Quebec than in Ontario, which may account for the apparent discrepancy. At any rate, the figures are the best obtainable and are still judged to be accurate within ±15%.

- B. C. has a sizeable kitchen cabinet industry as it supplies most of the kitchen cabinets to the Prairies as well. No large users were located in this field in the Prairies.

- As expected, the household furniture industry is concentrated in Ontario and Ouebec. More than half of the total particleboard usage in this sector is concentrated essentially in the southern townships in the Province of Quebec.

  It was expected that the consumption in this sector would be almost evenly divided between Ontario and Quebec. The figures in Table II-7 indicate a large edge by Ouebec over Ontario.

  The Dun & Bradstreet computer printout gives the number of firms in this sector in the two provinces. It does show a greater number of large firms in Quebec as against Ontario (50 vs. 39 of $1,000,000 and over sales volume). This may account for the difference.

- The total volume for kitchen cabinets (SIC# 2544) and household furniture (SIC# 2619) in Ontario and Quebec is about the same (about 59 MMsf 5/8") giving further rise to the suspicion that some figures may have been misallocated. Attempts to recheck this item were made. No real justification for changing the figures was found.

- In the West, most of the household furniture is manufactured in Manitoba, mainly around Winnipeg. The B. C. household furniture industry consumed little particleboard in 1974.

- In office furniture (SIC # 264), Quebec again leads the way. The use in the miscellaneous sector (SIC# 266) is the greatest however in Ontario. Even the Prairies -- mainly Manitoba -- appear to have a greater consumption in this sector than has Quebec. In both cases, the allocations are somewhat surprising and an error in these allocations, in excess of ±15%, is possible.

  The large discrepancy between Ontario and Quebec in this miscellaneous sector was rechecked. It was found, however, that the discrepancy is caused by the large concentration of institutional furniture and store fixture industries in the Province of Ontario and the Ontario figures were reconfirmed. The Ouebec figure may possibly be higher than stated, but not by a significant amount.

- In total, about half of the raw board consumed by the industrial sector is purchased by firms located in Ontario, about one-third in Quebec, about 17% to 18% in the Prairies and B. C. and the remainder in the Atlantic Provinces.

- A greater per capita consumption in the construction and distribution sectors was found in B. C. and the Prairies and the Atlantic Provinces than in Ontario and Quebec.

- The use of underlayment in home construction is certainly much wider spread in B. C. and the Prairies than it is in the East. In addition, there is a greater amount of board sold through distribution outlets (in relative terms). The cause of this is, in all likelihood, the presence of two particleboard plants in the West, one of which -- MacMillan Bloedel -- is spending a great deal of effort in the retail distribution and construction fields. In addition, the proximity of the large Western U. S. particleboard plants would also encourage the use of particleboard in the Western Provinces.

- The particleboard plants in eastern Canada are essentially geared to the manufacture of industrial grade board and have not expended any effort in the promotion of particleboard within the construction industry sector.

- In Quebec and Ontario, particleboard is seldom used as underlayment in home construction, partly because of the ready availability of 4' x 4' poplar plywood.

- The use of particleboard in home construction in the Provinces of Quebec and Ontario would appear to present a significant growth opportunity for particleboard in the future.

- In the Atlantic Provinces, the relatively large consumption of particleboard per capita is probably caused by the inordinately large production in this region. After all, between Flakeboard, Weyroc (now Northwood) and Fibrply, the Atlantic Provinces produced over half of the total Canadian production in 1974. Granted, most of Weyroc's production was exported. One would suspect however that the "seconds" or shop grade from these plants would be sold in the local areas and that the consumption therefore, mainly in New Brunswick, would be greater than is indicated in Table II-7. Most of this board, however, is sold (if at all) directly from the plant to local users and it was found to be impossible to trace its movement.

- In total, the survey indicates that close to 75% of all the end users of raw particleboard are located in Ontario and Quebec, about 21% in the West and less than 5% in the Atlantic Provinces.

THE PREFINISHING OF PARTICLEBOARD

Particleboard is, essentially, a core material and serves as a base for various types of finishes or finishing materials. The final end user seldom sees particleboard in its original form.

A number of finishes are applied to particleboard. It is either overlayed with veneers (mainly hardwood veneers), low or high pressure laminates, vinyl sheets or impregnated papers. In addition, particleboard is also filled, primed and painted or printed with various simulated patterns.

In the construction applications, particleboard serves as a base for tiles or other floor covering materials (floor underlayment) or it is painted, printed or overlayed with vinyl in the wall panelling applications.

A significant amount of particleboard is used in the home construction industry, mainly in cabinet work. Even here, it is either painted or overlaid with high pressure laminates (as in bathroom vanities, sink tops, etc.).

The finishing of particleboard may be accomplished by the particleboard manufacturer, the industrial end user or by an intermediate fabricator or laminator who supplies finished particleboard to various industrial end users and contractors.

In Table II-7, the industrial classification S.I.C. 252 - Veneer, Plywood-Prefinishers - summarizes this fabricator or laminator who does the prefinishing of particleboard and sells it in prefinished form to other industrial end users. The remaining industrial end users shown in Table II-7 may buy prefinished board from firms in S.I.C. 252 or actually do some of the finishing themselves.

Some of the output of the laminators or fabricators is sold to contractors or through retail distribution outlets.

The principal methods of finishing particleboard, mainly for industrial end uses, are summarized here as follows.

(a) Hardwood Veneers

This is the original method of finishing particleboard since the first application of particleboard in the industry was the replacement of real wood core veneers in hardwood plywood.

In the first phases of particleboard use, during the Fifties and early Sixties, the face veneers were applied over a crossband, particleboard serving as the middle core. With the improvement of particleboards, especially with regard to surface quality and board dimensional stability, hardwood veneers were applied directly to the particleboard core.

The application of hardwood veneers is executed by middle-man type hardwood/plywood manufacturers (laminators) as well as the end user, such as the furniture manufacturer himself. The veneering of particleboard is not a capital intensive type of operation. Furthermore, true high grade and high cost veneers are applied to the final cut to size pieces of particleboard which do not lend themselves to large production-oriented operations. As a result, a large part of the hardwood veneering operation was, and still is, carried out by furniture manufacturers and other industrial end users of particleboard.

(b) High Pressure Laminates

As hardwood veneers became scarcer and a more serviceable material was desired for horizontal furniture surfaces such as table tops, desk tops, etc., industrial end users turned to high pressure laminates.

Most high pressure laminates are sold in either a simulated wood grain pattern or in patterns simulating some other material. Solid colours are also used.

High pressure laminates are manufactured with the use of melamine resins in specialized plants. The finished melamine high pressure laminate sheet is readily shippable and is applicable to a variety of core materials.

The application of high pressure melamine laminates to particleboard or other core material does not require an expensive plant and is, therefore, carried out mainly by the industrial end user himself, or on the construction site.

(c) Low Pressure Laminates

Low pressure laminates are either melamine or polyester impregnated paper sheets pressed directly onto the particleboard (or possibly other) core in a specialized hot pressing operation. The wearing properties of low pressure laminates are not as good as those of the high pressure laminates. As a result, low pressure laminates are applied mainly on vertical surfaces, although some low pressure laminates are used in horizontal surface applications.

Low pressure laminates, like high pressure laminates, come in solid colours or simulated wood grain or other type patterns.

The prefinishing of particleboard with low pressure laminates, that is the hot pressing of melamine or polyester impregnated papers on particleboard (usually connected with the impregnation of paper with the appropriate chemicals), is a technologically complex and relatively capital intensive operation and must therefore be justified by an adequate volume production. Furniture manufacturers or other industrial end users are unlikely to have sufficient volume demand for low pressure laminates to justify a captive, in-house low pressure laminating operation.

As a result, this type of prefinishing is, and will likely continue to be, performed by either particleboard manufacturers or, mainly, intermediate fabricators.

(d) Vinyl

In North America until recently, printed or patterned vinyl sheets continuously roll laminated to particleboard provided one of the most important methods of finishing particleboard, third only to hardwood veneers and high pressure laminates. In most cases, these were applied to vertical surfaces, either in furniture or as wall panelling. The "miter fold" process served to increase the importance of vinyl in the particleboard finishing field.

The position of vinyl in the United States is much stronger than it is in Canada; in the U. S., vinyl occupied first place among all the particleboard finishing methods up to 1974. At the present and in the near future, vinyl is likely to face strong competition from low pressure laminates and paper laminates in the vertical surface applications.

The application of vinyl is, again, a relatively complex process requiring volume production. The installation of a vinyl overlaying plant, however, is not as expensive as that of a high or low pressure laminating plant. As a result, this application is often carried out by the industrial end user himself. Still, a great number of intermediate vinyl applicators are in operation in the U. S. and there are some in Canada.

(e) Prime/Fill and Paint

A great deal of particleboard laminators or end users simply use particleboard in a painted form. The paint is seldom applied directly to the particleboard. In almost all cases, painting is preceded by a priming or filling operation where a base paint coat is applied to the panel under industrially controlled conditions and the paint or primer is set in a high temperature oven prior to shipping.

The painting may either be applied on a production line or by spray painting or by hand, either in an industrial plant or on a construction site.

The priming and filling operation is often carried out by particleboard manufacturers. Intermediate laminators also have priming lines as do furniture and other industrial end users.

(f) Direct Print

Direct grain print, long used on veneer and paper surfaces, is coming into increasing play on particleboard. This growth has been enhanced by the development of better ground or base coats which may be polymerized with ultraviolet radiation, rather than heat, forming a very smooth, durable, printable surface. The grain can be printed in one, two or three colours and finished conventionally by lacquers or varnish. In addition and lately, these polyester coats are also applied and polymerized by means of ultraviolet (UV) heat and light. All these variations, along with embossing for more realistic grain reproduction, are in common use.

Several of the particleboard producers supply UV cured base coated particleboard to end users. Some end users do their own base coating but, in most cases, only execute their own direct printing. Printing lines are not too expensive to install and since all end users prefer their own colours and patterns, they are likely to continue to perform this type of operation in the future.

The installation of a print line or filling lines for small volume end users (smaller industrials) is unlikely to be economical. As a result, priming and printing at the middle-man applicator's level is likely to develop in the future in order to service the demand from small volume users for this type of particleboard finish.

(g) Roll-on Paper Laminates

Last but not least, one has to mention the newly emerging, chemically treated paper overlays which are becoming available ready for simple roll-on type finishing operations. The quality and appearance of these paper overlays is steadily improving and they are likely to make an increasing impact on the prefinishing markets.

(h) Other Finishes

As mentioned earlier, there are two other major finishing operations applied to particleboard. The first one is plastic tiles which are essentially applied at the construction site to underlayment particleboard panels, mainly in the floor application. The other is conventional painting of particleboard which does occur in some limited cases at construction sites.

The finishes applied to particleboard on construction sites, such as floor coverings and paint, are somewhat difficult to trace. It is known that all particleboard used as floor underlayment is overlayed by some type of floor covering such as plastic tiles, linoleum or carpet. Some particleboard is painted and used as dividers, wall panelling, etc. In an industrial application, however, the methods of prefinishing may be determined more accurately. Consequently, a great deal of time was spent in the course of this study establishing current board finishing practices, possible future trends and determining the requirements of the various finishing operations as to particleboard quality and characteristics.

Table II-11 shows the supply of prefinished urea bonded particleboard both from domestic sources and from imports. The figures are given on a 5/8" particleboard thickness basis. The Table shows that a total of about 110 MMsf 5/8" basis prefinished board was available in the Canadian markets in 1974. Of this amount, 93 MMsf was prefinished in Canada and 17 MMsf came from imports.

Of the total volume available, about *46%* was overlayed with hardwood veneers, *21%* with low pressure laminates, *23.6%* with vinyl overlays. About *6%* was filled, primed, painted or direct printed and less than *2%* was supplied with roll laminated paper overlays. No significant amount of particleboard was finished or overlayed with high pressure laminates by intermediate laminators. A substantial amount of board, however, was overlayed with high pressure laminates by counter top manufacturers in the miscellaneous furniture category (S.I.C. 266) and resold to other end users.

Imports constituted over *15%* of the total prefinished board available on the Canadian markets.

Against this supply of 110.2 MMsf 5/8", the study located 84.6 MMsf 5/8" prefinished particleboard purchased by industrial end users from laminators or intermediate operators. The use of prefinished particleboard per region and type is shown in Table II-12, against the total Canadian supply per type, noting the excess or shortage of the supply vs. located purchases.

It is of interest to note that, in the veneering, low pressure laminate, vinyl overlay and primed sections, the supply exceeded the located demand by often significant amounts. On the other hand, in high pressure laminates, direct print and roll laminates, the located purchases by industrials exceeded the discovered supply.

TABLE II-11 - SUPPLY OF PREFINISHED UREA PARTICLEBOARD - DOMESTIC & IMPORTS - 1974
BREAKDOWN BY TYPE OF PREFINISHING (MMsf 5/8" Basis)

TYPE	DOMESTIC	% OF TOTAL DOMESTIC	IMPORTS	% OF TOTAL IMPORTS	TOTAL DOMESTIC + IMPORT	% OF TOTAL DOMESTIC + IMPORT
Veneer	51.0	*54.8*	-	-	51.0	*46.3*
Low Pressure Laminate	21.0	*22.5*	3.0	*17.5*	24.0	*21.8*
High Pressure Laminate*	-	-	-	-	-	-
Vinyl Overlay	20.0	*21.6*	6.0	*34.9*	26.0	*23.6*
Filled/Primed, Painted	1.0	*1.1*	3.2	*18.6*	4.2	*3.8*
Print	-	-	3.0	*17.4*	3.0	*2.7*
Roll Laminate (Paper)	-	-	2.0	*11.6*	2.0	*1.8*
TOTAL SUPPLY	93.0	*100.0*	17.2	*100.0*	110.2	*100.0*
% OF TOTAL SUPPLY	*84.4*		*15.6*		*100.0*	

* Note: These figures apply to board prefinished by S.I.C. 252 only (does not include board prefinished by (S.I.C. 266 and resold.).

Source: C.E.I. Estimates

TABLE II-12 - THE INDUSTRIAL PURCHASES COMPARED TO THE SUPPLY OF PREFINISHED U.F. PARTICLEBOARD IN 1974
DISTRIBUTION BY REGION AND TYPE OF PREFINISH (Volumes in MMsf 5/8")

TYPE DESCRIPTION	B.C.	PRAIRIES	ONT.	QUE. & ATL.	TOTAL PURCHASES VOLUME	%	TOTAL SUPPLY DOMESTIC & IMPORTS	INDICATED EXCESS OR SHORTAGE
Veneer	0.8	0.6	16.4	7.7	25.5	*30.1*	51.0	25.5
Low Pressure Laminate	0.1	-	7.8	9.4	17.3	*20.5*	24.0	6.7
High Pressure Laminate	0.1	3.9	-	2.6	6.6	*7.8*	-	(6.6)
Vinyl Overlay	0.6	0.3	20.0	1.8	22.7	*26.8*	26.0	3.3
Primed/Filled	0.7	1.7	-	1.5	3.9	*4.6*	4.2	0.3
Print	3.1	1.1	-	0.8	5.0	*5.9*	3.0	(2.0)
Roll Laminate (Paper)	0.6	2.6	-	0.4	3.6	*4.3*	2.0	(1.6)
Total Prefinished Purchased	6.0	10.2	44.2	24.2	84.6	*100.0*	110.2	27.6
% of Total Prefinished Purchased	*7.1*	*12.1*	*52.2*	*28.6*	*100.0*		*130.0*	*33.0*

Source: C.E.I. Findings & Estimates

The excess supply in the various forms was probably sold to small industrials who were not contacted or recorded by the study team. Part of this excess supply, in all likelihood, was sold by the retail distribution trade. Columbia estimates that about two-thirds of the 27 MMsf 5/8" basis (about 16 to 18 MMsf 5/8") excess of supply over recorded prefinished usage by industrials, was sold to small industrials, and one-third of this (about 8 to 9 MMsf 5/8") was sold by the retail distribution trade.

In the cases where the recorded purchases exceeded the apparent supply, the purchases, in all probability, were made from industrials who are overlaying or finishing for their own use but also selling some of this production to other industrials. It is quite possible that such small sales to other industrials were not reported by these firms to our interviewers and were therefore not recorded. The sale of board overlayed with high pressure laminate by manufacturers in S.I.C. category 266 is in this category and may be considered as semi-finished furniture parts rather than as prefinished particleboard.

Table II-13 shows purchases of prefinished board by S.I.C. industrial categories. Table II-14 shows the distribution of the various finishes applied to particleboard used industrially, either by "prefinishers" or by end users. Figures II-5, II-6 and II-7 graphically illustrate the numbers shown in Tables II-12, II-13 and II-14.

Column 1 in Table II-14 records all the prefinished board manufactured by intermediate operators, both domestic and imports, and resold to industrials. Column 2 shows the percentage of each prefinish as a percentage of total prefinished board. Columns 3 and 4 show Columbia's estimate of the type of finishes applied by end user industrial operations in their own plants. Column 5 shows the total volume (MMsf 5/8") of board in each finishing application and Column 6 shows each finishing type as a percentage of the total board finished either by the industrials themselves or by prefinishers.

TABLE II-13 - 1974 INDUSTRIAL PURCHASES OF PREFINISHED PARTICLEBOARD
DISTRIBUTION BY S.I.C. CATEGORY & TYPE (Volumes in MMsf 5/8")

SIC#	DESCRIPTION	VENEER	PRIMED/ FILLED	LPL	HPL	VINYL	PRINT	ROLL LAM.	TOTALS	
									VOLUME	%
2541	Sash, Door & M'wk.	1.6	0.1	0.4	-	-	-	-	2.1	2.5
2543	Prefab. Bldgs.	-	0.2	-	-	-	-	-	-	0.2
3242	Mobile Homes	0.3	0.4	-	-	0.4	1.5	0.5	3.1	3.7
2544	Kitchen Cabinets	12.8	1.1	4.2	0.1	1.8	1.2	0.5	21.7	25.6
258	Caskets & Coffins	0.3	-	-	-	-	-	-	0.3	0.4
2619	Household Furn.	4.5	1.7	9.9	3.6	19.5	2.3	2.6	44.1	52.2
264	Office Furn.	3.1	0.1	2.4	1.2	0.7	-	-	7.5	8.8
266	Misc. Furn.	2.9	0.3	0.4	1.7	0.3	-	-	5.6	6.5
	Total Prefinished	25.5	3.9	17.3	6.6	22.7	5.0	3.6	84.6	100.0
	% of Total Prefin.	30.1	4.6	20.5	7.8	26.8	5.9	4.3	100.0	%

Source: CEI Research

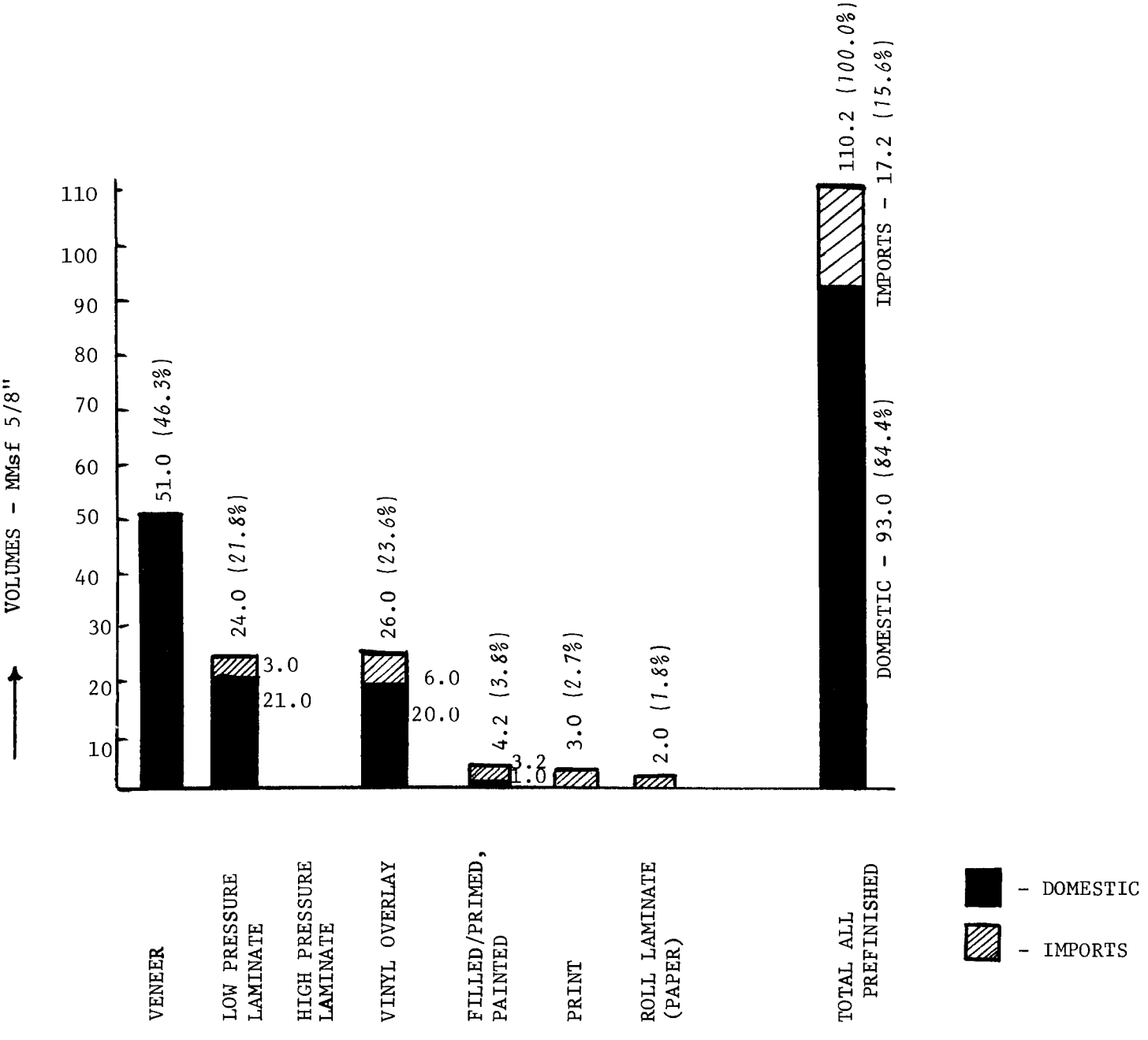
TABLE II-14 - ALL INDUSTRIAL PARTICLEBOARD FINISHING IN 1974 (MMsf 5/8" Basis)
(Prefinished and Self-finished by End User)

TYPE	PREFINISHED *	% OF TOTAL PREFINISHED	SELF-FINISHED **	% OF TOTAL SELF-FINISHED	TOTAL ALL BOARD FINISHING	% OF TOTAL ALL BOARD FINISHING
Veneer	51.0	*46.3*	66.7	*35.0*	117.7	*39.1*
Low Pressure Laminate	24.0	*21.8*	4.8	*2.5*	28.8	*9.6*
High Pressure Laminate	-	-	51.5	*27.0*	51.5	*17.1*
Vinyl Overlay	26.0	*23.6*	8.6	*8.6*	34.6	*11.5*
Filled/Primed, Painted	4.2	*3.8*	38.1	*20.0*	42.3	*14.1*
Printed	3.0	*2.7*	19.1	*10.0*	22.1	*7.3*
Roll Laminate (Paper)	2.0	*1.8*	1.9	*1.0*	3.9	*1.3*
TOTAL FINISHED	110.2	*100.0*	190.7	*100.0*	300.9	*100.0*
% OF TOTAL FINISHED	*36.6*		*63.4*		*100.0*	

* Finished by Laminators or "Prefinishers" (SIC 252)
** Finished by other Industrial End Users

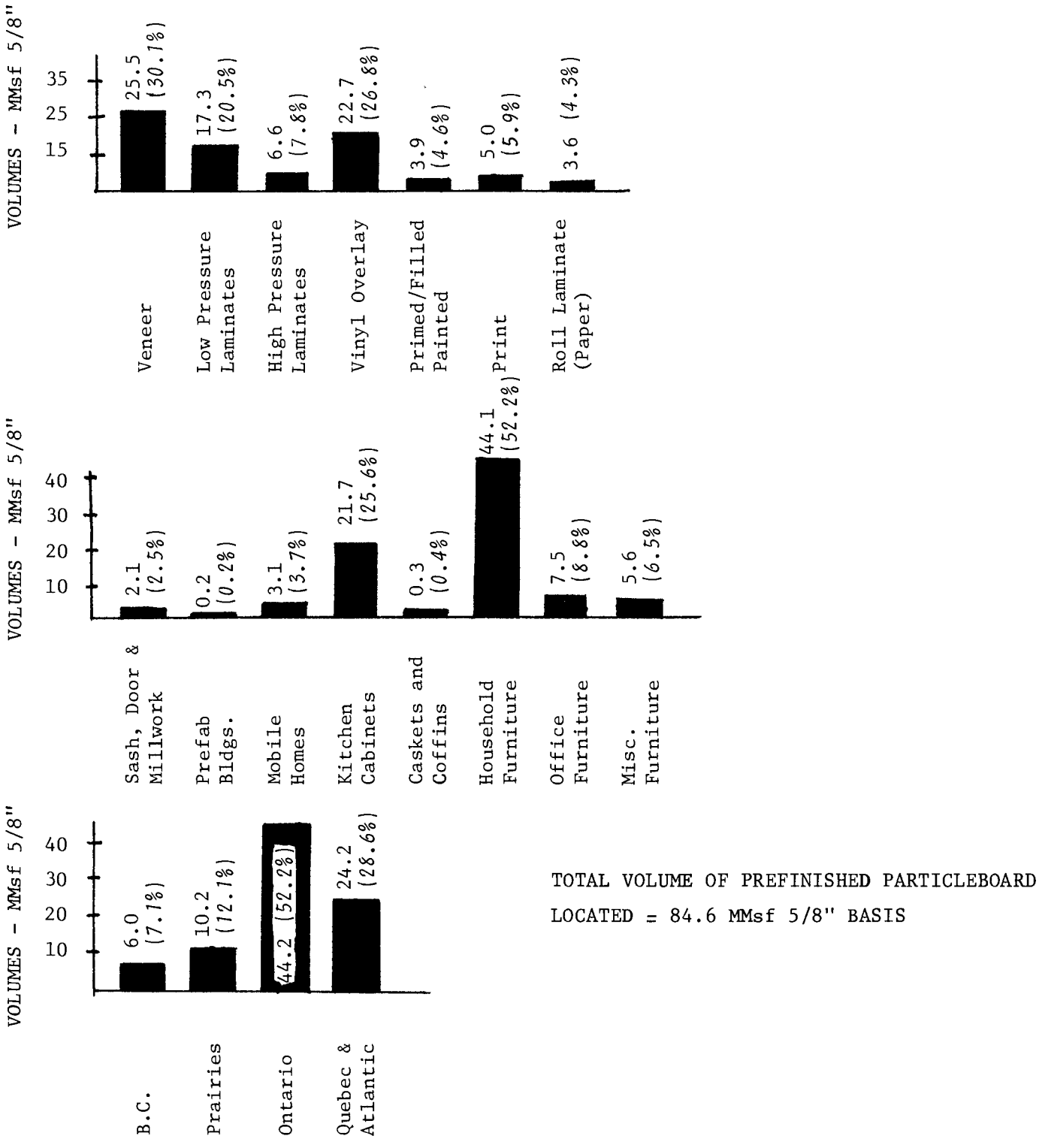
Source: CEI Research

FIGURE II-5 - SUPPLY OF PREFINISHED U.F. PARTICLEBOARD
DOMESTIC & IMPORTS
BREAKDOWN BY TYPE OF PREFINISHING



Source: C.E.I. Research

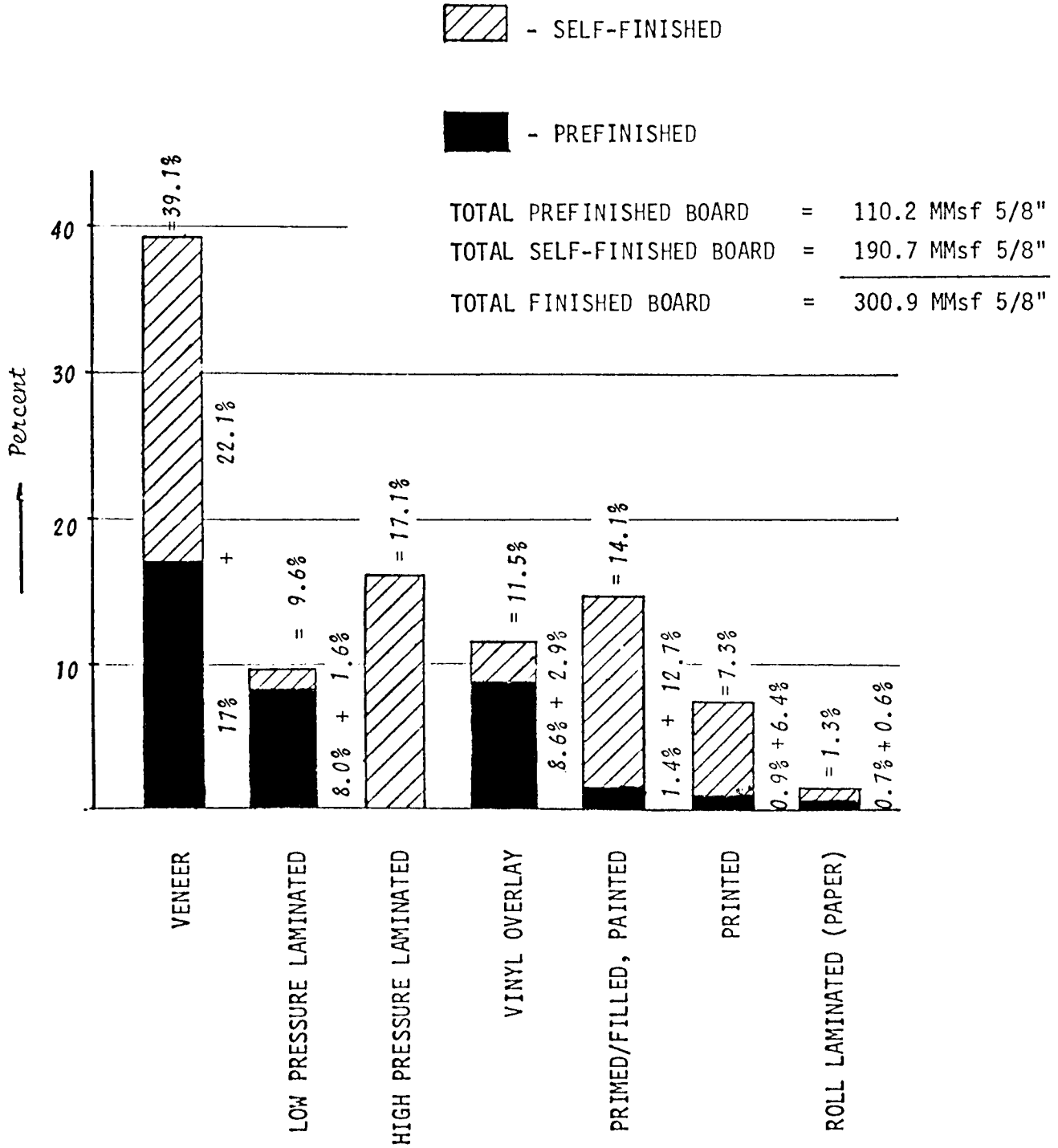
FIGURE II-6 - INDUSTRIAL USAGE OF PREFINISHED U.F. PARTICLEBOARD BY TYPE OF PREFINISH, S.I.C. CATEGORY & REGION



TOTAL VOLUME OF PREFINISHED PARTICLEBOARD LOCATED = 84.6 MMsf 5/8" BASIS

Source: CEI Research

FIGURE II-7 - ALL BOARD FINISHING - PREFINISHED & SELF-FINISHED
PERCENT DISTRIBUTION BY TYPE OF FINISHING & BY APPLICATOR



Source: CEI Research

Among the finishing methods, hardwood veneer still occupies the first place with nearly *40%* of the total. In 1970-71, veneer was probably used in over *50%* of the cases.

High pressure laminates occupy second place with *17.1%*, down from a probable level in 1970-71 of *25%* to *28%*.

The third most frequently applied finish is simply filling or priming and/or painting, constituting about *14%* of the total. These are followed by vinyl (*11.5%*), low pressure laminates (*9.6%*), direct print (*7.3%*) and roll laminates (*1.3%*).

The total amount of board finished by industrial users, either by prefinishers or end user industrials, is in the order of 300 MMsf 5/8", constituting about *75%* of the total U.F. bonded particleboard use in 1974. The total amount of industrial board eventually finished was arrived at by subtracting from the 421.1 MMsf 5/8" total (includes the imported prefinished board), the 73 MMsf construction and retail distribution volume and the volume used by industrial home builders (mobile and prefabricated homes) who use the board essentially for floor underlayment or decking.

Of the total finished volume, 110 MMsf 5/8" was supplied by prefinishing operations, either domestic or foreign, constituting about *27%* of the total volume consumption and about *30%* of the total industrial consumption, excluding use in mobile and prefabricated homes.

It is of interest to note here that, as a matter of comparison, in the United States about one billion square feet (Bsf) 3/4" was prefinished out of a total estimated consumption of 3.2 Bsf 3/4". The U. S. consumption figure of 3.2 Bsf 3/4" is derived by taking the U.S. production for 1974 as reported by Leonard Guss Associates, Inc. at 3.49 Bsf 3/4" and subtracting the exports to Canada, a total of 160 to 170 MMsf 3/4" and excess inventories accumulated during the second half of 1974 in U. S. plants, which are known to be in the order of 150 to 200 MMsf 3/4".

The prefinished board in the United States therefore constituted about 30% of the total consumption and close to 45% of the total estimated industrial consumption (excluding mobile and prefabricated home use and construction use) of about 2.3 Bsf 3/4" per annum.

It is a known fact that the prefinishing of particleboard has lagged in Canada vis a vis the United States. The application of veneer to particleboard in Canada was probably at the same level as in the U.S., in relative terms, and so was the use and application of high pressure laminates. Vinyl overlays and direct print however did not enter the Canadian picture until recently. In the United States, on the other hand, both of these prefinishing methods underwent an unprecedented growth between 1967 and 1973.

There are a number of reasons for these differences.

Hardwood veneers were probably more readily available in Canada during the past decade than they were in the U. S. and, therefore, most prefinishers and industrial end users stayed with hardwood veneers rather than changing to plastic simulated finishes.

The use of high pressure laminates (sink tops, table tops, vanities, etc.) developed during the Fifties and the early Sixties. Canada again lagged behind the U. S. in the use of these materials. However, since the development took place mostly in the Fifties, by the mid-Sixties the Canadian per capita use of these finishes did catch up with that of the States.

Direct print and vinyl was developed during the mid-Sixties in the U. S. and its use enlarged during the second part of that decade. The greater availability of hardwood veneers in Canada (vs. the U. S.) and the economics of installing such operations in low volume output plants resulted in the lag in Canadian use of these finishes. Only during the past two to three years did Canadian furniture manufacturers and other industrial end users turn to these finishes.

Low pressure laminates, predominant in Europe for the past ten years, are just beginning to enter the North American markets. The use of low pressure laminates in the U. S. is not significantly higher than in Canada, in relative terms, and it would appear that the development and the growth of this type of prefinishing will go on simultaneously and in parallel in the two countries.

It is known that a large additional prefinishing capacity is being installed in Canada in 1975. It is therefore reasonable to expect that the use of prefinished board in Canada will rapidly catch up and possibly exceed that of the U. S., again in relative terms.

BOARD THICKNESS DISTRIBUTION

During the course of the study, the interviewers made a concerted effort to obtain information as to the thicknesses of board used by the various end users. It was found that the industrial end users had reasonably good information on this matter, although a great deal of conversion and recalculation work had to be done in order to consolidate the figures on a 5/8" board thickness basis. The relatively narrow range of thicknesses used by the construction sector was confirmed by contractors, retailers and wholesalers alike. The figures relating to the miscellaneous retail sector are, on the other hand, questionable estimates at best.

Tables II-15 and II-16 give the numerical data as to regional and industry category board thickness distribution respectively. These numbers are also shown in the form of bar charts in Figures II-8 and II-9.

Table II-15 and Figure II-8 show that 5/8" is indeed the dominant thickness in the board industry in Canada, certainly in the industrial sector. In the construction and retail distribution trades, 3/8" thickness appears to be dominant, mainly due to the wide use of this thickness in floor underlayment application.

TABLE II-15 - PANEL THICKNESS BREAKDOWN OF THE 1974 CONSUMPTION OF U.F. PARTICLEBOARD IN CANADA

DISTRIBUTION BY REGION - MMsf 5/B" Basis

	1/4"		3/8"		1/2"		5/8"		11/16"		3/4"		1" & Over		Totals	
Area	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%
B.C.	0.1	*0.4*	0.9	*3.4*	8.6	*32.3*	15.1	*56.8*	0.4	*1.5*	1.4	*5.3*	0.1	*0.4*	26.6	*100.0*
PRAIRIES	0.8	*2.8*	5.3	*18.5*	2.6	*9.1*	11.8	*41.2*	3.2	*11.2*	1.9	*6.6*	3.0	*10.5*	28.6	*100.0*
ONTARIO	0.6	*0.4*	7.3	*4.8*	38.1	*24.8*	80.2	*52.2*	18.1	*11.8*	1.8	*1.2*	7.5	*4.9*	153.6	*100.0*
QUE8EC	0.7	*0.6*	3.2	*2.9*	15.9	*14.3*	57.3	*51.1*	24.4	*21.9*	4.1	*3.7*	5.7	*5.1*	111.3	*100.0*
ATLANTIC	-	-	-	-	3.1	*28.4*	6.0	*55.0*	1.8	*16.5*	-	-	-	-	10.9	*100.0*
TOTAL INDUSTRIAL END USE	2.2	*0.7*	16.7	*5.0*	68.3	*20.6*	170.4	*51.5*	47.9	*14.5*	9.2	*2.8*	16.3	*4.9*	331.0	*100.0*
CONSTRUC-TION & MISC. DISTR.	1.0	*1.4*	49.5	*67.8*	5.0	*6.8*	12.0	*16.4*	1.0	*1.4*	4.0	*5.4*	0.5	*0.8*	73.0	*100.0*
INDUSTRIAL & CONSTR. TOTALS	3.2	*0.83*	66.2	*16.4*	73.3	*18.1*	182.4	*45.1*	48.9	*12.1*	13.2	*4.2*	16.8	*4.2*	404.0	*100.0*

Source: CEI Research

Source: CEI Research

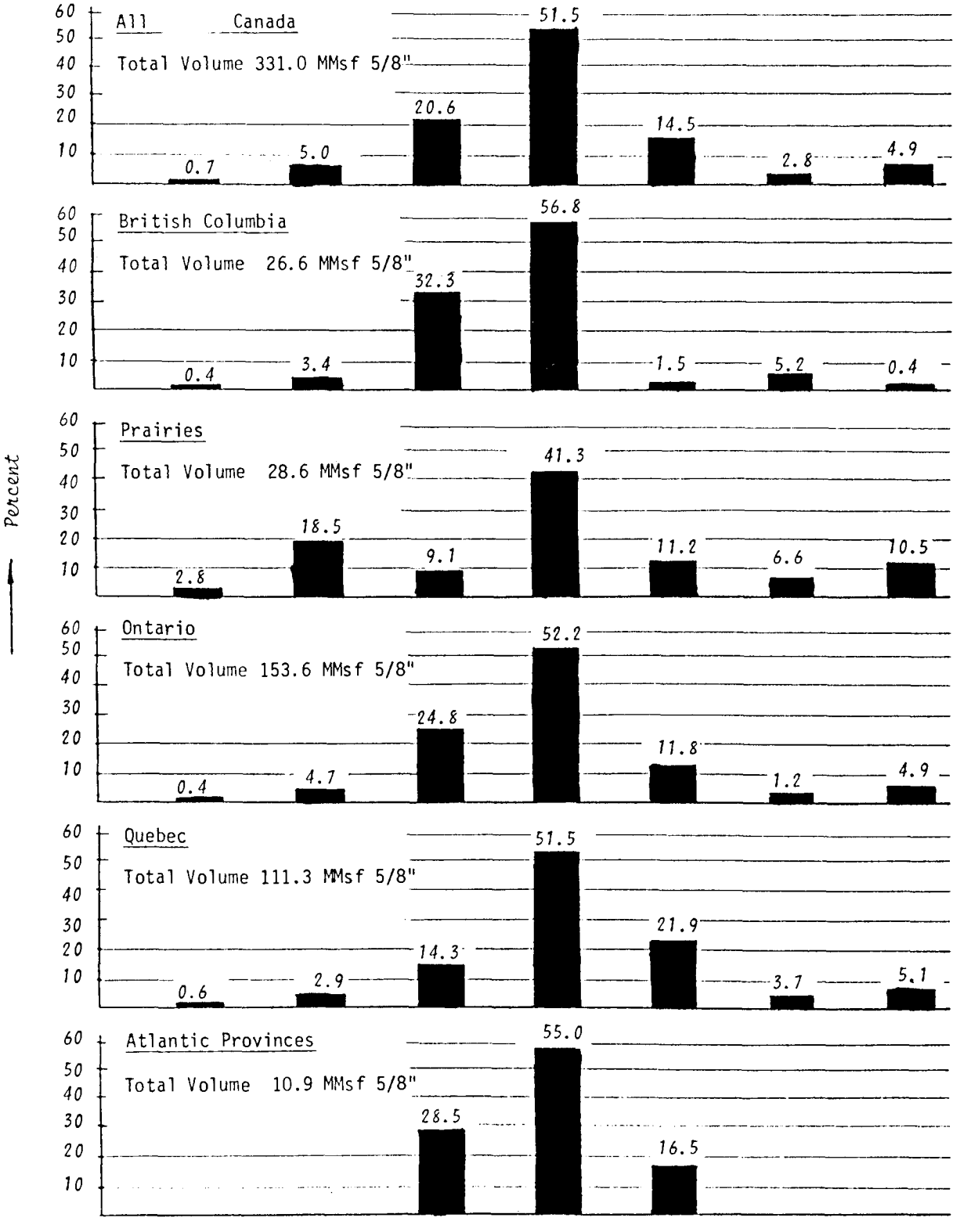
TABLE II-16 - PANEL THICKNESS BREAKDOWN OF THE 1974 CONSUMPTION OF U.F. PARTICLEBOARD IN CANADA

DISTRIBUTION BY S.I.C. CATEGORY - MMsf 5/8" Basis

	1/4"		3/8"		1/2"		5/8"		11/16"		3/4"		1" & Over		Totals	
SIC#	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%	Vol.	%
252	0.5	0.5	5.6	6.0	19.8	21.3	47.1	50.6	17.0	18.3	2.2	2.4	0.8	0.9	93.0	100.0
2541	0.2	1.6	-	-	0.2	1.6	7.5	59.0	0.4	3.1	1.8	14.2	2.6	20.5	12.7	100.0
2543	-	-	6.5	67.0	1.3	13.4	1.9	19.6	-	-	-	-	-	-	9.7	100.0
3242	-	-	1.6	4.2	0.7	1.8	35.3	93.9	-	-	-	-	-	-	37.6	100.0
2544	0.5	1.2	0.3	0.7	23.1	54.9	16.6	39.4	0.2	0.5	1.4	3.3	-	-	42.1	100.0
258	-	-	-	-	-	-	-	-	0.2	100.0	-	-	-	-	0.2	100.0
2619	0.8	0.9	1.9	2.1	12.7	13.9	47.3	51.8	22.5	24.6	2.2	2.4	3.9	4.3	91.3	100.0
264	-	-	0.8	5.2	-	-	5.5	35.8	6.5	42.2	0.9	5.8	1.7	11.0	15.4	100.0
266	0.2	0.7	-	-	10.5	36.2	9.2	31.7	1.1	3.8	0.7	2.4	7.3	25.2	29.0	100.0
TOTALS INDUSTRIAL	2.2	0.7	16.7	5.0	68.3	20.6	170.4	51.5	47.9	14.5	9.2	2.8	16.3	4.9	331.0	100.0
CONSTRUCTION & MISC. DISTR.	1.0	1.4	49.5	67.8	5.0	6.8	12.0	16.4	1.0	1.4	4.0	5.4	0.5	0.8	73.0	100.0
INDUSTRIAL & CONSTR. TOTALS	3.2	0.8	66.2	16.4	73.3	18.1	182.4	45.1	48.9	12.1	13.2	8.2	16.8	4.2	404.0	100.0

Source: CEI Research

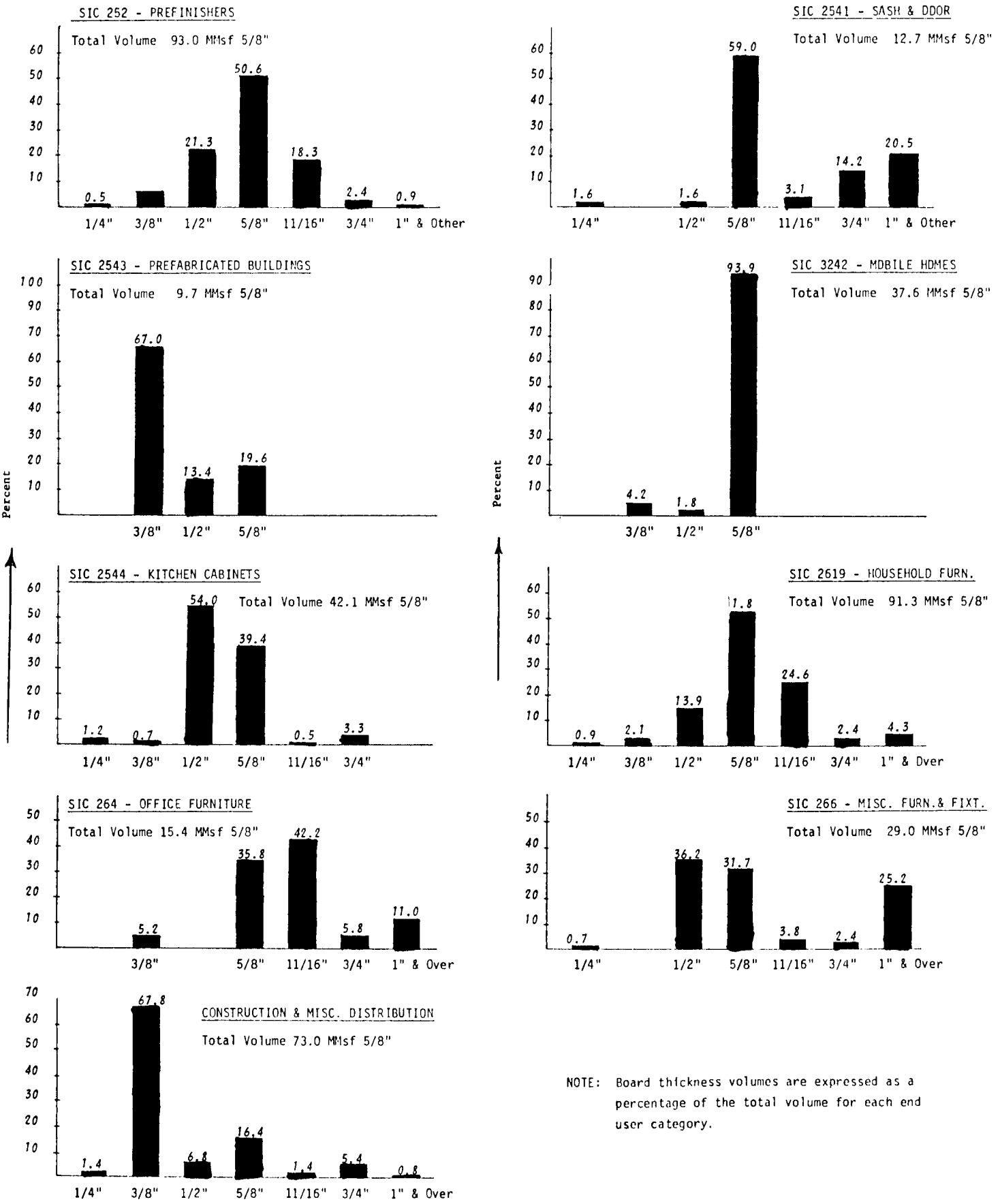
FIGURE II-8 - PANEL THICKNESS PROFILES BY REGION OF THE 1974 CANADIAN CONSUMPTION OF U. F. PARTICLEBOARD



NOTE: Board thickness volumes are expressed as a percentage of the total volume for each region.

Source: CEI Research

FIGURE II-9 - PANEL THICKNESS PROFILES PER END USER CATEGORY OF THE 1974 CANADIAN CONSUMPTION OF U. F. PARTICLEBOARD



NOTE: Board thickness volumes are expressed as a percentage of the total volume for each end user category.

Source: CEI Research

In the industrial sector, 5/8" is used most frequently (51.5%) followed by 1/2" (20.6%) and 11/16" (14.5%). Adding the construction and retail distribution section to the industrial totals, 5/8" leads with 45.4%, 1/2" is a poor second with 18.1%, followed closely by 3/8" (16.4%) and 11/16" (12.1%).

Table II-16 and Figure II-9 show the breakdown of thicknesses purchased by the various end user industries and reveal some interesting facts.

In the laminating and fabricating section (SIC 252), 5/8" is still the dominant thickness followed by 1/2" and 11/16".

Surprisingly, 5/8" is also the dominant thickness in the sash and door (SIC 2541) end use with 1" and over occupying second place at 20.5%. One would have expected a higher percentage of thick door core use in the sash and door category, indicating that there is room for growth for particleboard as solid door core.

In the kitchen cabinet end use (SIC 2544), 1/2" is the dominant thickness with 5/8" a reasonably close second. The use of other thicknesses is insignificant.

In household furniture (SIC 2619), 5/8" again dominates. The use of 11/16" is almost half of the 5/8" usage and the use of 1/2" is almost half of the 11/16" usage. A reasonably high percentage of 1" and over is utilized here (4.3%).

In the office furniture section (SIC 264), 11/16" takes over the leading position from 5/8" with a quite high 1" and over content (11%). Upon reflection, it would appear to be logical and to be expected that the office furniture is heavy to the thicker panels.

In the prefabricated homes sector (SIC 2543), 3/8" is the dominant thickness obviously due to the use of this thickness in floor underlayment. In the mobile home sector (SIC 3242), 5/8" is again the most commonly used panel as the majority of the particleboard in this end use is 5/8" mobile home decking.

In the miscellaneous furniture section (SIC 266), 1/2" and 5/8" appear to be the dominant thicknesses, followed fairly closely by 1" and thicker. This section includes items such as school furniture, hospital and other institutional furniture as well as store fixtures and laboratory furniture. The school and hospital furniture industry is known to use a great deal of 7/16" and 9/16" relatively high density boards (probably reported here as 1/2" or 5/8"). In the store fixtures and laboratory furniture application, 1" and thicker boards are used rather frequently (25.7%). On the whole, therefore, the distribution shown for this sector of the industry appears to be well justified by previous experience.

In the construction and retail distribution sector, the 3/8" thickness dominates, mainly due to the heavy use of this thickness in the floor underlayment application. Well over 60% of the board sold through retail distribution channels and to contractors (mainly) and to the shoulder trade is in the 3/8" thickness, followed by 5/8" and 1/2". The distribution here is rather similar to the one found in the prefabricated housing section.

A greater percentage of 1/4" board could have been expected in this retail distribution section for the wall panelling end use. All the wall panelling, however, was sold in a prefinished form, either printed or overlayed with vinyl. Even at that, there was very little particleboard wall panelling sold in Canada in 1974. Some wholesalers and retailers did bring in thin (Mende) type wall panelling from the States but had little success in distributing and selling this product. The only Canadian manufacturer of thin continuous board (Flakeboard in New Brunswick) probably sold most of this type of board for industrial end uses. This was certainly true in 1974.

In the future, a greater proportion of the thin board production is likely to find its way into the wall panelling application.

It is of interest to compare the thickness distribution of the particleboard consumption in Canada against that in the United States. In Table II-17 and Figure II-10, Columbia has assembled and arranged the relevant data to shown this comparison.

The figures relating to Canada are derived from the present study although they are assembled to correspond to the U. S. figures. The figures relating to the United States are based on the data available from the U. S. Department of Commerce, coupled with LGA estimates as given in the Leonard Guss report on the U. S. markets in Appendix C.

The U. S. industrial sector does not include the mobile home industry. For the sake of comparison, therefore, the mobile home decking figures were excluded from the Canadian section as well. It should be noted here that the U. S. figures are shown on a 3/4" basis while the figures for Canada are shown on a 5/8" basis, as well as converted to a 3/4" thickness basis. Furthermore, the U. S. total volume figure is shown as the production of platen pressed particleboard only, excluding MDF, Mende board and extruded board.

The industrial sector shows a marked difference between the Canadian and U. S. industry manufacturing and buying habits. In Canada, over *45%* of the board used was in 5/8" thickness. In the U. S., the corresponding figure is *19.3%*. On the other hand, Canada used *19.3%* 3/4" and 11/16" board, whereas the corresponding figure in the States is *34.8%*. Other thicknesses account for *10.6%* of the total in Canada, whereas in the States they constitute about three times this figure or *32.4%*. These thicknesses, by the way, are in both cases mostly higher than 3/4" or 11/16".

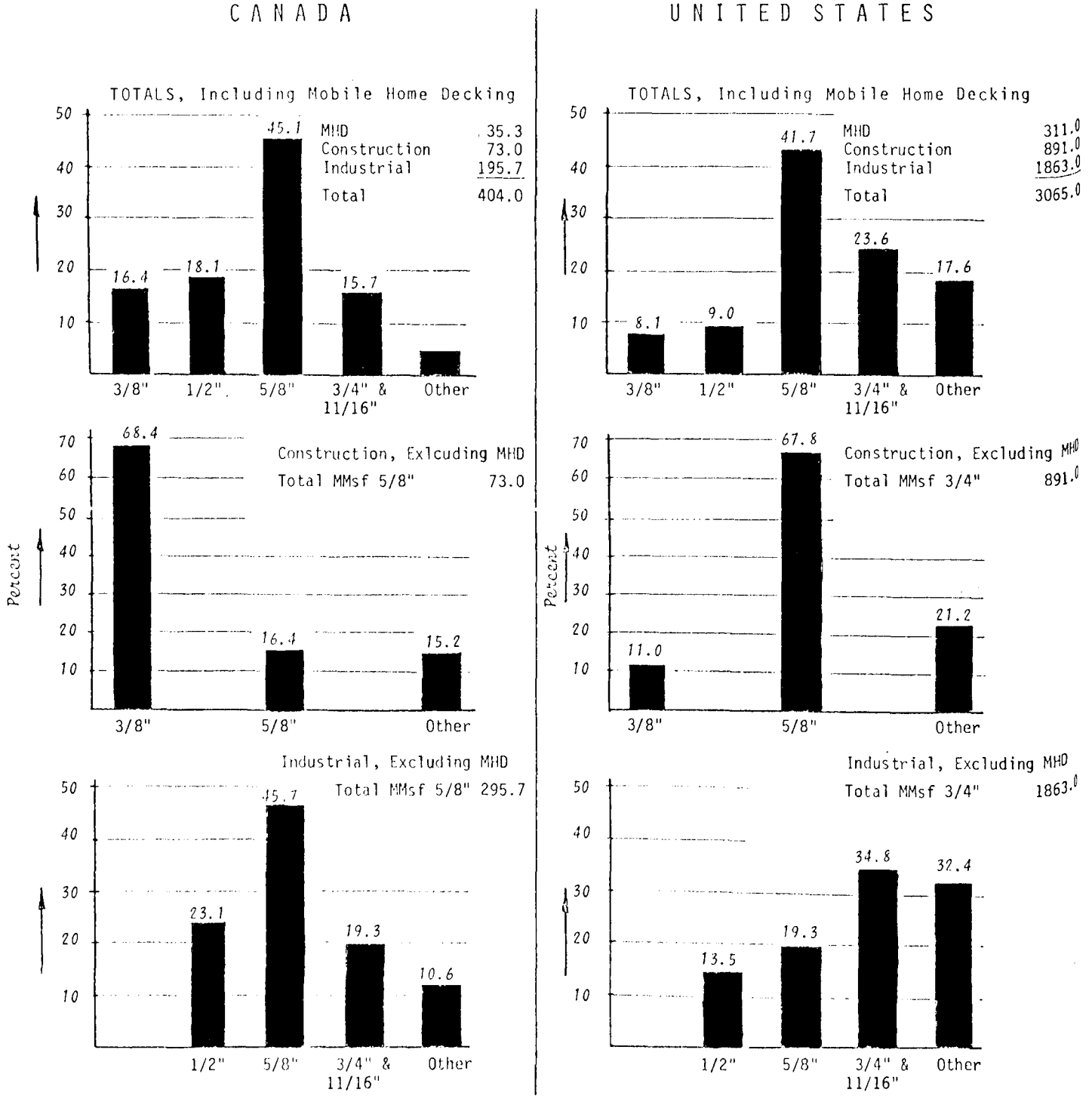
TABLE II-17 - COMPARISON OF CANADIAN & U. S. PANEL THICKNESS DISTRIBUTION (1974)

Thickness	CANADA			U. S. A.	
	Volume			Volume	
	MMsf 5/8"	MMsf 3/4"	%	MMsf 3/4"	%
Industrial (Excl. Mobile Home Decking)					
1/2"	68.3	56.9	*23.1*	251.0	*13.5*
5/8"	135.1	112,6	*45.7*	359.0	*19.3*
11/16" & 3/4"	57.1	47.6	*19.3*	650.0	*34.8*
Other	35.2	29.3	*11.9*	603.0	*32.4*
Total Industrial	295.7	246.4	*100.0*	1863.0	*100.0*
Construction (Excl. Mobile Home Decking)					
3/8"	49.5	41.2	*67.8*	98.0	*11.0*
5/8"	12.0	10.0	*16.4*	604.0	*67.8*
Other	11.5	9.6	*15.8*	189.0	*21.2*
Total Construction	73.0	60.8	*100.0*	891.0	*100.0*
Mobile Home Decking					
5/8"	35.3	29.4	*100.0*	319.0	*100.0*
TOTALS - ALL END USES					
3/8"	66.2	55.2	*16.4*	250.0	*8.1*
1/2"	73.3	61.1	*18.1*	280.0	*9.0*
5/8"	182.4	152.0	*45.1*	1282.0	*41.7*
11/16" & 3/4"	62.1	51.7	*15.7*	710.0	*23.6*
Other	20.0	16.7	*4.7*	543.0	*17.6*
TOTALS	404.0	336.7	*100.0*	3065.0	*100.0*

Sources: C.E.I. Research
LGA Estimates
U. S. Department of Commerce

FIGURE II-10

COMPARATIVE PANEL THICKNESS PROFILES
CANADA AND THE UNITED STATES



Source: CEI Estimates (CANADA) & LGA Estimates (U.S.A.)

The construction sector, again excluding mobile home decking, shows the predominance of 3/8" in floor underlayment application in Canada vs. 5/8" in the United States. The percentage figures are nearly the same: 68.4% for 3/8" in Canada and 67.8% for 5/8" in the U. S.

The total industry figures, including industrials and construction, as well as mobile home decking are shown in the last part of Table II-17. Here, the percentage of 5/8" used in the U. S. is closer to that in Canada, mainly because of the large floor underlayment use in the U. S. in the 5/8" thickness. Still, the total of 3/4", 11/16" and "other thicknesses" used in the United States is nearly twice as much as the percentages for the same thicknesses in Canada.

The high percentage of 5/8" used in the industrial sector in Canada illustrates the vulnerability of the Canadian particleboard industry to competition from its U. S. counterpart. In the U. S. industrial sector, probably over 50% of the total consumption is in 3/4" thick boards or thicker. In Canada, on the other hand, close to 70% of the consumption is in boards 5/8" thick and thinner.

The U. S. particleboard industry is in the position to differentiate fairly clearly between industrial grade and underlayment grade board. Underlayment is 5/8" and thinner. Some 5/8" board and certainly anything thicker than 5/8" is industrial grade. The underlayment grade is a commodity item whereas the industrial grade may be handled as a specialty customer service oriented product.

It is not easy to differentiate between industrial grade and underlayment grade products in the more or less standard mill waste raw material based particleboard plants. Underlayment is of lower density (40 to 42 lbs) and has a lower resin content (5% to 6%) and, therefore, lower strength and other physical properties. The higher physical properties of the industrial grade board are simply achieved by increasing density (45 to 50 lbs) and resin content (7% to 9%). The appearance of the two grades of products, however, is similar and most customers would find it difficult to differentiate between the two, just by sight. In fact, a good portion of the customers are perfectly satisfied with the properties of underlayment grade panels for industrial applications and would purchase this grade were it available in the proper full size or cut-to-size panels.

It is the practice of the U.S. particleboard manufacturers to provide oversize full panels (49" x 97" instead of 48" x 96") and/or cut-to-size services in the industrial grades only. In underlayment grades, neat 4' x 8' panels only and no cut-to-size services are offered. This general rule is not strictly adhered to in poor markets in which case some U. S. industrial customers do use underlayment grade board. Their thickness requirements, however, do prevent an excessive spreading of such practices.

When U. S. markets are soft and the U. S. particleboard industry is looking for export markets, the Canadian industrial sector with its heavy emphasis on 5/8" board is a "sitting duck" for low cost U. S. underlayment grade panels. Most U. S. manufacturers provide what they call a "Canadian special" which is an underlayment grade panel cut oversize, 49" x 97". U. S. manufacturers do charge a premium of $3 to possibly $10/Msf 5/8" for this type of service but this underlayment grade board, even with the slight premium, can still be sold in Canada at a lower delivered cost than the industrial boards available from Canadian manufacturers.

The buying habits of Canadian industrial customers, as to panel size, provide further impetus to the import of U. S. underlayment grade board to Canada as will be illustrated in the following chapter.

PANEL SIZE AND TYPE DISTRIBUTION

The results of the study as to panel size usage and distribution are summarized in Table II-18. The same Table also shows the distribution of this panel size variation for the various board types and densities purchased. The numbers in Table II-18 are illustrated in Figure II-11.

Eighty-one per cent of the total consumption, or 327.3 MMsf 5/8" basis, was purchased in 4' x 8' or 49" x 97" panels. Although it was difficult to separate accurately the actual breakdown between neat 4' x 8' and oversize 49" x 97" panel purchases on the basis of the information received from consumers, it is estimated that about *70%* of the total volume or about 230 MMsf 5/8" was purchased in oversize panels (49" x 97"); the remaining *30%* or about 100 MMsf 5/8" in neat 4' x 8' panels.

About 67.8 MMsf 5/8" was purchased in full panel sizes other than 4' x 8', constituting about *16.7%* of the total. Of this amount over half, or 34 MMsf 5/8", was purchased in mainly 4' x 12' panels but also in 4' x 14' sizes for the mobile home decking application. The cut-to-size purchases amounted to less than 10 MMsf 5/8" or *2.3%* of the total.

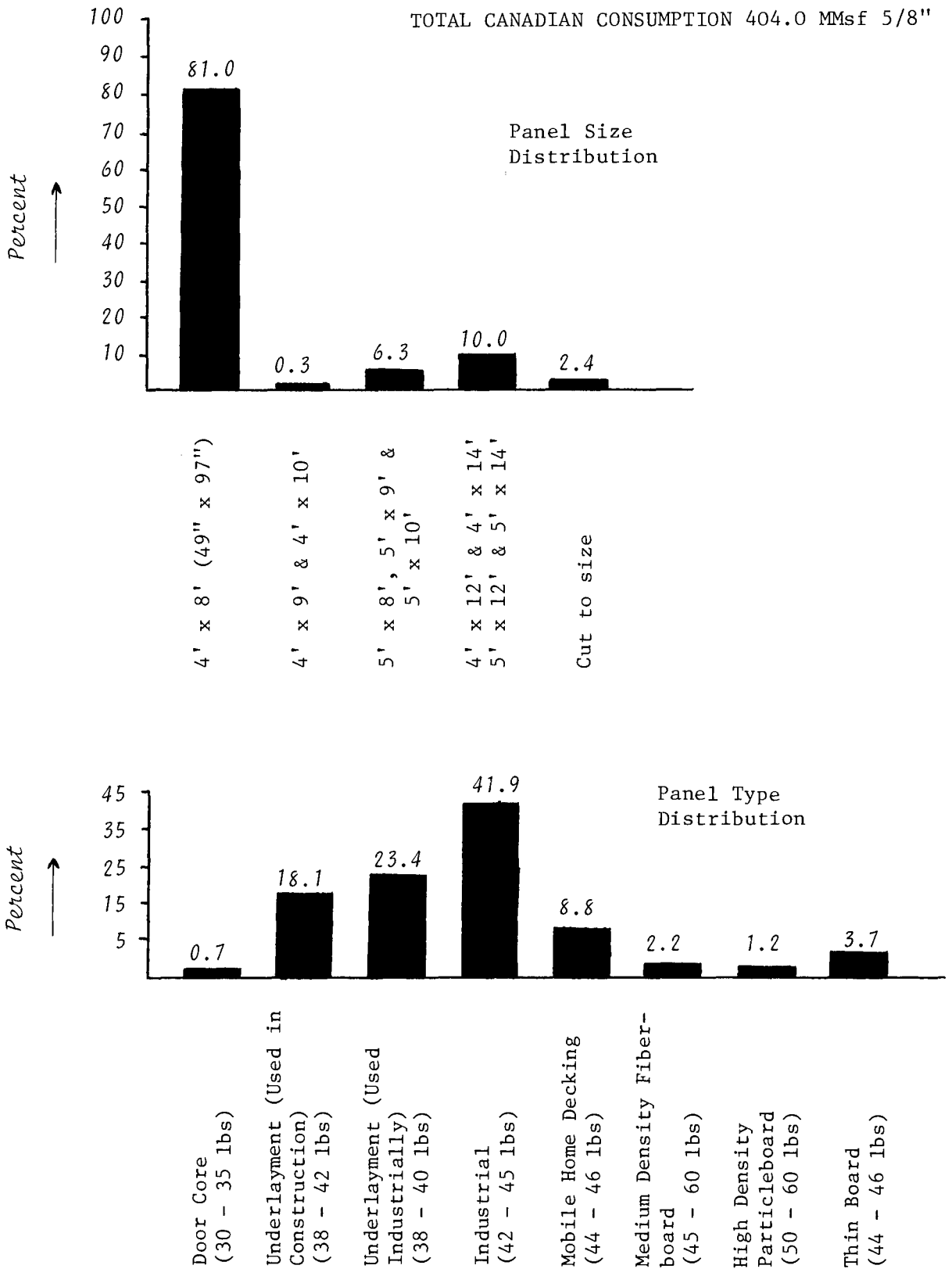
In terms of board density and board grade, about 167.5 MMsf 5/8" or *41.5%* was purchased in 38 lb to 42 lb density underlayment grade panels. Only 50 to 60 MMsf 5/8" of this, including the 9 MMsf use by prefabricated homes, ended up on the floor. An additional 20 to 30 MMsf was used in miscellaneous construction applications. The rest or about 80 MMsf 5/8" found industrial end uses.

TABLE II-18 - PANEL SIZE, TYPE & DENSITY BREAKDOWN OF THE 1974 CANADIAN CONSUMPTION OF U. F. PARTICLEBOARD
(Volumes in MMsf 5/8" Basis)

PANEL SIZE:	4' x 8' (49" x 97")	4' x 9' 4' x 10'	5' x 8' 5' x 9' & 5' x 10'	4' x 12', 5' x 12' 4' x 14', 5' x 14'	Cut to Size	TOTALS
PANEL TYPE:						
Door Core 32 - 35 lbs	1.6				1.3	2.9 (0.7%)
Underlayment (Used in Construction) 38 - 42 lbs	73.0					73.0 (18.1%)
Underlayment (Used Industrially 38 - 42 lbs	81.0	0.3	12.4	0.5	0.3	94.5 (23.4%)
Industrial 42 - 45 lbs	152.8	0.8	6.8	2.5	6.3	169.2 (41.9%)
Mobile Home Decking 44 - 46 lbs				35.6		35.6 (8.8%)
Medium Density Fiberboard 45 - 60 lbs	1.9		5.8		1.2	8.9 (2.2%)
High Density Particleboard 50 - 60 lbs	2.0		0.5	1.6	0.8	4.9 (2.2%)
Thin Board 44 - 46 lbs	15.0					15.0 (3.7%)
TOTALS MMsf 5/8"	327.3	1.1	25.5	40.2	9.9	404.0 (100.0%)
Percent	*81.0*	*0.3*	*6.3*	*10.0*	*2.4*	

Source: CEI Research

FIGURE II-11 - PANEL SIZES, TYPES & DENSITIES DISTRIBUTION PROFILES OF THE 1974 CANADIAN CONSUMPTION OF U. F. PARTICLEBOARD



Source: CEI Research

About an equal amount, 169.2 MMsf or 41.9% of the total, was purchased in 42 lb to 45 lb industrial grade board, mainly in 49" x 97" panel sizes.

Mobile home decking comprised almost 9% of the total consumption, medium density fiberboard in 45 lb to 60 lb densities about 2.2%, and high density particleboard, mainly for institutional furniture, was 1.2%. Thin board, that is thinner than 3/8" made either on multi-opening presses or by the continuous Mende process, amounted to 3.7% of the total purchases, whereas door cores accounted for only .7%.

Again, it is of interest to compare this panel size distribution with that of the United States. Although there is no accurate information available from the U. S. in this regard for either 1974 or previous years, the U.S. data shown in Figure II-12 were assembled on the basis of estimates prepared by LGA and Columbia.

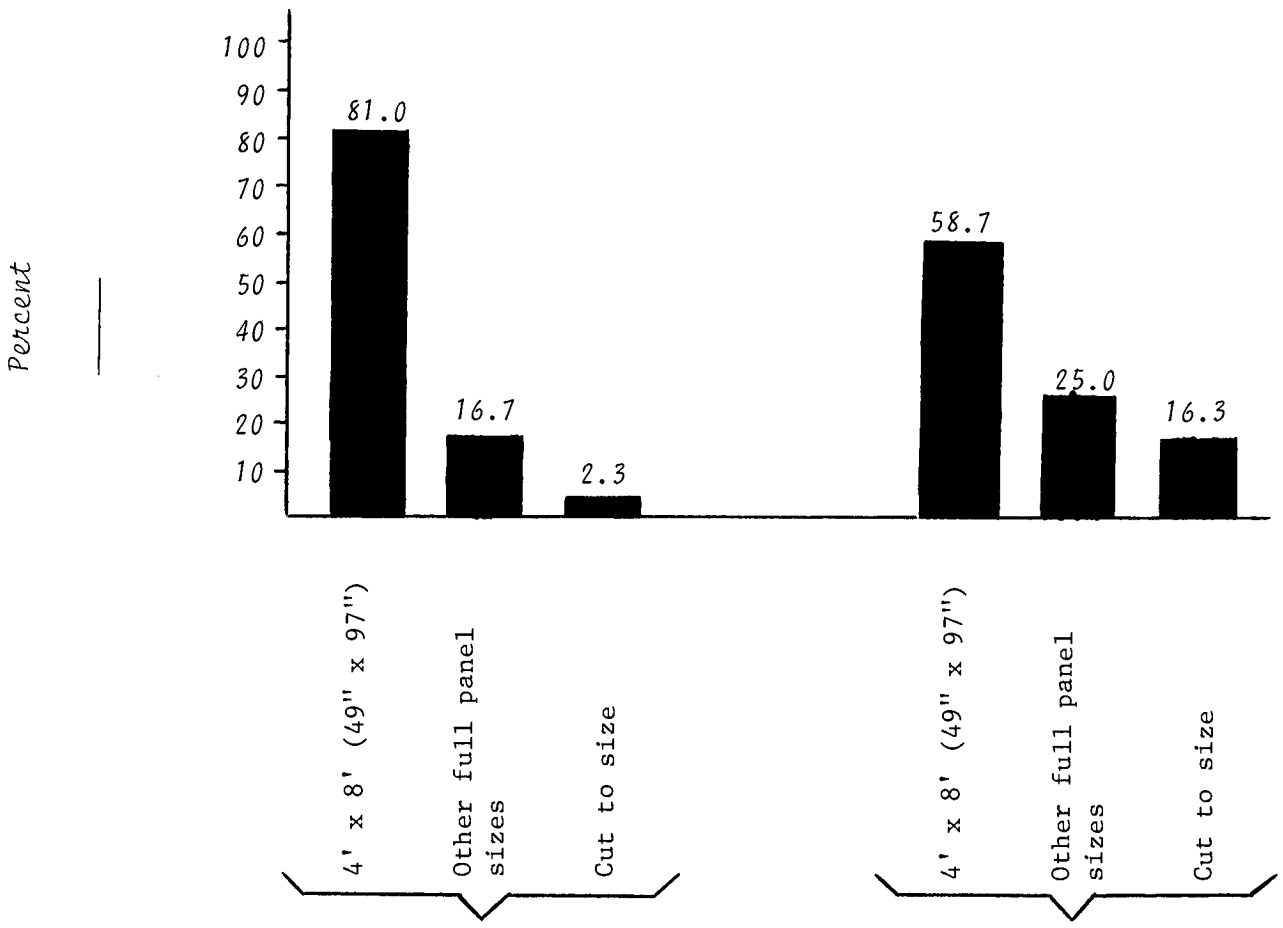
In Canada, 81% of the total consumption was purchased in 4' x 8' or 49" x 97" panel sizes. In the United States, the corresponding figure is 58.7%. Other full size panels in Canada accounted for 16.6% of the total. In the United States, these panels accounted for 25% of the total.

The U. S. industry consumed 16.3% of the total, or 500 MMsf 3/4" in the form of cut-to-size panels. The Canadian industry, on the other hand, used only 2.4% of the total in cut-to-size form (about 8.3 MMsf 3/4").

It is to be noted here that the nominal 4' x 8' panel size content of the total consumption mix in Canada is higher than in the U. S., in spite of a lower construction end use or actual floor underlayment end use content of the Canadian total.

FIGURE II-12

COMPARATIVE PANEL SIZE DISTRIBUTION PROFILES
CANADA AND THE UNITED STATES



	CANADA			U.S.A.	
	MMsf 5/8"	MMsf 3/4"	%	MMsf 3/4"	%
4' x 8'	327.3	272.75	81.0	1800.0	58.7
Other full panel sizes	67.8	56.5	16.7	765.0	25.0
Cut to size	9.9	8.75	2.3	500.0	16.3
TOTAL	404.0	337.5	100.0	3065.0	100.0

Source: C.E.I. Research (CANADA); LGA Estimates (U.S.A.)

Figure II-13 shows a comparison between the U.S. and Canada on the basis of estimates as to the actual end use applications of particleboard.

In Canada, about *12.4%* of total consumption was actually used as floor underlayment on the floor of a building (on site construction). In the U. S., the corresponding figure is 600 MMsf 3/4" or *19.6%* of the total. The consumption of mobile home decking as a percentage of the total is fairly similar in the two countries: *8.6%* in Canada and *10.2%* in the United States.

The actual industrial application (including miscellaneous distribution) in Canada appears to be higher than in the U. S.: *79%* in Canada and *70.2%* in the U. S., which is a somewhat surprising figure.

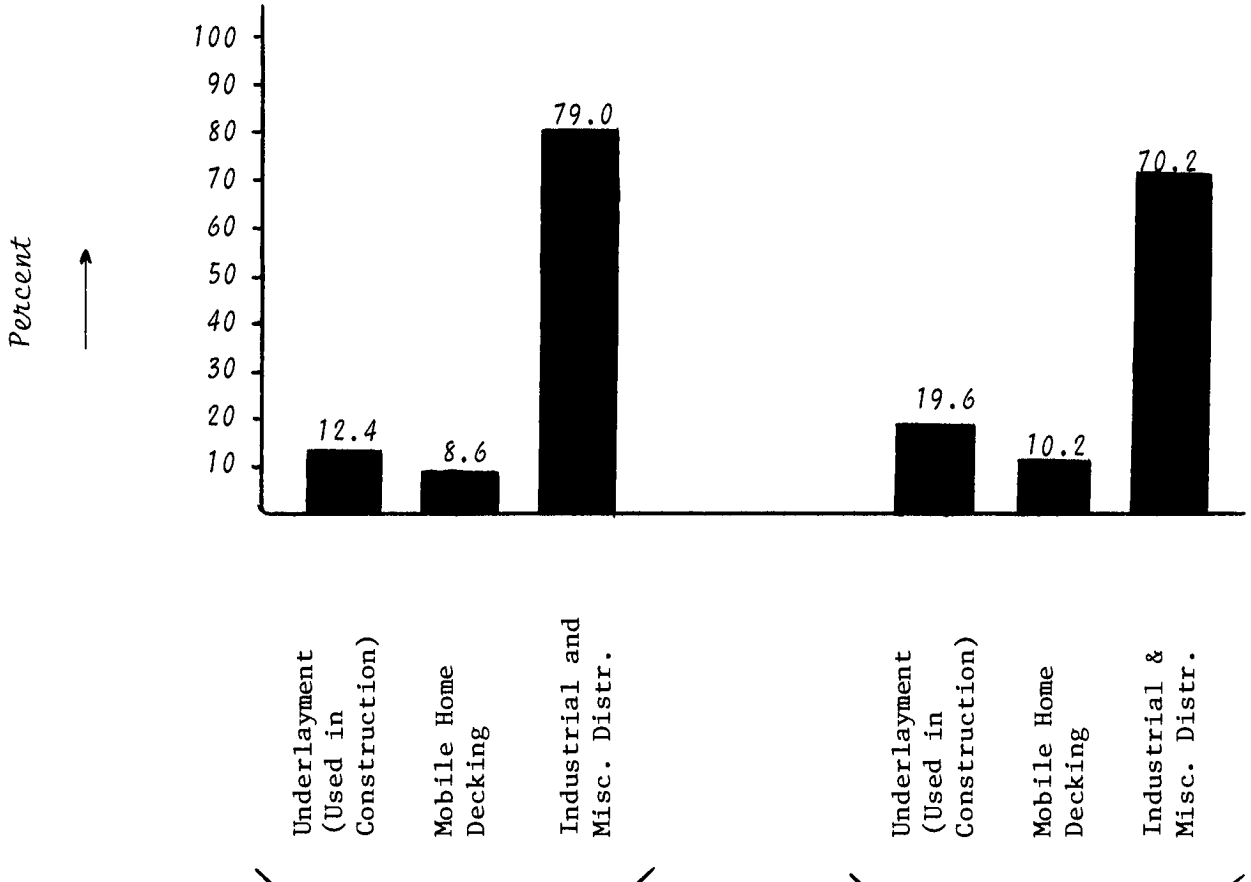
Previous experience and the historical data available from industry sources would contradict these figures. Firstly, the per capita consumption of all types of furniture and cabinetry in the U. S. was consistently higher than in Canada. Secondly, the penetration of particleboard into the furniture industry appears to be at least on the same level if not higher in the United States than in Canada.

It is possible that these figures and ratios apply to 1974 only and possibly indicate an earlier and sharper downturn in the production of furniture in the U. S. in 1974 than was the case for the similar industries in Canada.

In 1971, industrial use in Canada was 177 MMsf 5/8" or about 145 MMsf 3/4". In the U. S. in the same year, the industrial content of the total was 1.6 to 1.7 Bsf 3/4" out of a total of 2.4 Bsf 3/4".

FIGURE II-13

COMPARATIVE PARTICLEBOARD END USAGE PROFILES - 1974
CANADA AND THE UNITED STATES



	CANADA			U.S.A.	
	MMsf 5/8"	MMsf 3/4"	%	MMsf 3/4"	%
Underlayment (Constr.)	50.0	41.7	12.4	600.0	19.6
Mobile Home Decking	35.0	29.2	8.6	312.0	10.2
Industrial & Misc. Dist.	319.0	265.8	79.0	2153.0	70.2
TOTALS	404.0	336.7	100.0	3065.0	100.0

Source: C.E.I. Research (CANADA) & LGA Estimates (U.S.A.)

In 1973, U. S. industrials consumed about 2.8 Bsf 3/4" whereas in Canada only 260 MMsf 3/4" was sold to this sector. In both years, Canadian industrial consumption was less than *10%* of U. S. figures. In 1974, however, Canadian industrials consumed about *12%* of the U. S. industrial volume, probably for the reasons given in the foregoing paragraph.

In any event, in 1974 in spite of the higher industrial content in Canada, the consumption of nominal size 4' x 8' panels was also higher. The industrial sector in Canada purchased about 254 MMsf 5/8" (327 less 73 in construction) in nominal 4' x 8' size constituting about *77%* of the 331 MMsf 5/8" total industrial purchases. Relating the strictly floor underlayment use against miscellaneous distribution and industrials in Canada (not including mobile homes), 277 MMsf 5/8" (327 - 50) 4' x 8' panels were used in a total consumption of 319 MMsf 5/8", or a 4' x 8' content of about *87%*.

In the United States, the total construction and retail end use in 1974 was about .9 Bsf 3/4", representing about *30%* of the estimated particleboard consumption of 3.0 Bsf 3/4" and *28%* of the total estimated consumption of 3.2 Bsf 3/4", including MDF. The industrial sector, therefore, used 1800 - 900 = 900 MMsf 3/4" out of a total of 2.1 Bsf 3/4" or about *43%* nominal 4' x 8' panels. This compares with the Canadian figure of *77%* as given above.

Comparing strictly floor underlayment end use against miscellaneous distribution and industrials (excluding mobile homes), the U. S. consumed 1.2 Bsf 3/4" (1800 - 600) 4' x 8' panels out of a total of 2.15 to 2.3 Bsf 3/4", or *55%* to *52%*, against the Canadian figure of *87%*.

It is evident from the foregoing comparisons that the 4' x 8' content of the Canadian industrial consumption is about 50% higher than in the U. S.

It is not clear whether end user industry practices caused this condition or the limitations and/or practices of the Canadian particleboard manufacturers forced the consumer firms to adopt these purchasing habits. Whatever the cause, the consequences of the existing practice in Canada are quite clear: it is much more difficult to differentiate between "underlayment" grade and "industrial" grade in Canadian markets than in U. S. markets. The predominance of the 5/8" thickness in Canadian industrial end use (as against 3/4" in the U. S.) heightens this condition. This, in turn, may result in problems for the Canadian particleboard industry with regard to maintaining price stability and consumer loyalty in the industrial markets. It may also present certain opportunities to be exploited in the future. It certainly does explain the extreme vulnerability of the Canadian industrial markets to low priced underlayment grade imports from the United States for industrial end uses.

DISTRIBUTION & MARKETING

General

The interviewers made a concerted effort to establish the distribution channels, marketing patterns and buying habits as related to the movement of particleboard. Serious difficulties were encountered in attempting to obtain information in this regard. Some industrial end users did not wish to disclose the sources of their supply. Some information received was given under the condition that it would be held confidential.

Distribution

In all probability, 1974 was, or can be considered, a somewhat irregular year. The limited supply from domestic sources and the large surge of imports probably caused a number of end users to change suppliers, both in terms of particleboard manufacturers and distributors.

The information received in the course of the interviews and their evaluation may be summarized as follows:

1. All industrial end users contacted, purchased either directly from a manufacturing plant or through a wholesale distributing outlet.

   All large industrial end users made their purchases in full rail car or truck load lots, shipped direct from the plant, even if handled through a wholesale outlet. Smaller industrials purchased in truck loads from the wholesalers warehouse.

   Columbia estimates that less than two per cent of the total industrial consumption is purchased through retail outlets.

2. Most larger industrials are interested in relatively long term (6 months to possibly 1 year) supply contracts.

   Security and continuity of supply appear to be more important than price, within certain limits.

   The uniformity of product quality and appearance is also important as it affects the end users product quality, the efficiency of the remanufacturing process, as well as reject and downgrade factors in the customer's end product.

   The actual source of supply, i.e., direct purchase from the board manufacturers vs. purchase through a wholesale distributor, often depends upon credit considerations.

3. The construction sector purchases almost entirely through retail lumber yard outlets, with the possible exception of some large contractors.

   The volume of board handled through retail distributing outlets therefore equals about the volume consumed by the construction sector, plus the relatively minor volume sold to the "shoulder trade".

4. The large established wholesale distributors throughout Canada (about 15 to 20 in number) all claim that about *40%* to *60%* of the particleboard handled by them is eventually sold through retail outlets.

   If, therefore, the total handled or sold through retail outlets is in the order of 70 to 80 MMsf/annum, the total board volume handled through the large wholesale distributors should be in the order of 130 to 190 MMsf/annum 5/8". This in turn would mean that over 200 MMsf is purchased directly from board manufacturers (by industrials) which is at variance with the information received from the board manufacturers or the industrial end users.

5. It is highly probable that a great deal of the imports were handled by smaller distributors, agents or manufacturers representatives. After all, Dun & Bradstreet lists over 900 wholesalers who are, in one way or another, involved in the distribution of building products. These distributing channels, however, were somewhat difficult to track down.

6. Columbia estimates that the *industrial* users in Canada purchased their board supply (331 MMsf 5/8") in 1974 in the following manner:

   - through large wholesale distributors: 140-180 MMsf 5/8"
   - direct from domestic plants: 40-80 MMsf 5/8"
   - direct from U.S. plants: 30-60 MMsf 5/8"
   - through small distributors, agents or factory representatives: 30-80 MMsf 5/8"

   The board sold to the construction sector through retail outlets was, in its entirety, purchased from large wholesale distributors.

7. Almost all of the board from the Canadian or U.S. West Coast to the East or to the Prairies moved by rail.

   Eastern Canadian plants, on the other hand, moved the board to Eastern Canadian customers mostly by truck. The ability to ship board overnight by truck to a customer's plant gives Eastern manufacturers a significant edge in the industrial and construction markets.

General Customer Attitudes

The attitudes of the customers in the construction industry are difficult to generalize. It may be stated, however, that price, availability and established product performance are essential to successful market penetration.

It is common knowledge that the construction industry, especially the housing sector, is extremely conservative. The establishment of a new product in this industry, therefore, takes time and encounters a number of difficulties.

As mentioned earlier, the use of particleboard as floor underlayment in housing construction is less accepted in Canada than it is in the United States. Furthermore, whereas in the U.S. 5/8" board is accepted as a standard, in Canada mostly 3/8" is utilized in this application. The use of particleboard as underlayment has gained increasing acceptance in B.C. and the Prairies. Little particleboard is used in the Central and Eastern Provinces in this application, probably because of the wide acceptance of poplar plywood for this end use.

It would appear that the failures of the early particleboards in the late Fifties and the early Sixties in the housing construction applications are still remembered in Quebec and Ontario and there is a certain resistance to trying the new and improved products. Given an adequate sales and promotional effort and product performance, urea particleboard would appear to have a great deal of growing room left in the Central and Eastern Canadian construction industries.

The attitudes of industrial end users may be summarized as follows.

as to board quality:

- opinions and requirements as to board quality vary greatly depending upon specific end uses. The properties most often thought to be important are surface smoothness and edge tightness or edge quality.

- Dimensional stability (no warp), screw holding and machineability are also given a high priority.

- Strength properties (m.o.r., m.o.e. and i.b.)* are mentioned less often. These are given higher priority mainly by the larger end users who have the facilities for testing these properties and/or have special requirements (such as larger tables, shelving, etc.).

- For somewhat questionable reasons, the light coloured board is most often preferred, probably simply because of eye appeal.

as to price:

- Price is obviously quite important in all cases, but with most customers is second to continuity of supply and consistent uniformity of board quality.

- Improved board quality may fetch a premium price but, in most cases, only if it results in savings in the customer's manufacturing process and/or lesser downgrade and reject factor in, or claims against, the customer's end product (e.g., the use of MDF).

*See Glossary

as to panel size:

- Most industrial customers appear to be reasonably satisfied with the panel sizes they are able to purchase.

- As mentioned earlier, a very high percentage of the customers purchase 4' x 8' or 49" x 97" panels and have set up their operations to utilize such panels. Often they are unwilling to change to a different panel size, even if the use of larger panels would be more economical or otherwise advantageous.

- Change to a different panel size would only occur if continuity of supply in such a panel size was available from alternative sources rather than from a single source.

- Cut-to-size panels are desired and, possibly, would be preferred by a great number of customers. Here again there is a strong distrust regarding the continuity of supply in this type of service. Most customers or end users will admit that it would be more practical and economical to purchase cut-to-size panels than to continue their own cut-to-size operations. They will not discontinue these cut-to-size operations, however, unless they can be assured of an adequate and safe supply source in this regard.

- All mobile home manufacturers rely on a continuous supply of 4' x 12' or 4' x 14' mobile home decking panels. There was no Canadian supplier in this panel size in 1974 and therefore all of this business went to U. S. suppliers.

as to service:

- Knowledgeable and attentive technical service is highly desired by most industrial end users, either from the board manufacturer or from the distributor.

- A successful salesman or technical serviceman should "think furniture", speak the customer's technical and trade language and have a great deal of empathy for the customer's production problems.

- Prompt response to requests for service calls or claim calls is highly desirable.

as to suppliers:

- A certain residue of resentment was detected toward Canadian particleboard manufacturers and suppliers because of an alleged nonchalance towards and disinterest in Canadian industrial customers in 1973. A number of end users expressed the opinion that board prices in Canada in 1973 were unnecessarily high and that the Canadian suppliers "creamed the market". The limited Canadian supply and the interruptions in the supply from Canadian sources appear to be an often expressed concern. The stability and the reliability of the domestic Canadian particleboard supply is often questioned, as is the reliability of supply from the U. S. There is a distinct feeling that U. S. suppliers tend to neglect the Canadian customer whenever U. S. markets are strong.

- In general, Canadian suppliers of particleboard are preferred, especially Eastern Canadian suppliers by Eastern Canadian customers, if board quality and price and service are equal to or competitive with foreign sources. The impression was gained in the course of the study that the Eastern Canadian end user would prefer to purchase from Eastern Canadian manufacturers a product of equal quality and uniformity (equal to that available from foreign sources) even at a slight premium, not so much because of any nationalistic feeling but simply because of proximity.

PRICING

The price of particleboard in Canada, as in the United States, underwent wild fluctuations and gyrations during the 1973-75 period. During the second half of 1973, prices were at an all time high. Underlayment grade board in the U. S. was selling for $125 to $130 per Msf 5/8" FOB West Coast, exceeded only by the short-lived price peak of $145/Msf 5/8" in 1969.

Forty-five pound industrial grade board was selling on the U. S. West Coast for $110 to $120/Msf 3/4" in full size panels. This price level seems low in comparison with the 5/8" high price mentioned above. It is the custom of West Coast particleboard plants, however, to raise underlayment board prices above those of industrial products in time of good industrial markets as they prefer to manufacture and sell industrial grade board and hold on to their industrial customers. Quite often, underlayment grade board, even at this high price, was simply not available on the West Coast.

In the U. S. East and Midwest, good quality industrial grade board was selling at $175 to $190/Msf 3/4" and $155 to $170/Msf 5/8" delivered, mainly from West Coast sources. The large Southern U. S. particleboard plants were manufacturing mainly underlayment grade products for the construction markets and were charging $130 to $145/Msf 5/8" FOB Southern mill.

In Eastern Canada, board prices were even higher. Industrial grade or, in fact, any kind of grade board was selling delivered in Montreal or Toronto at close to $200/Msf 5/8". Eleven-sixteenth inch board was selling around $225 to $240/Msf 5/8". Some Canadian suppliers were selling at slightly lower prices, mainly due to problems with product quality. This, however, was the exception rather than the rule.

The high prices prevailed throughout the first quarter of 1974. By April/May 1974, there was a sharp downturn in the U. S. markets causing a rapid decline in prices. By July/August 1974, underlayment was selling below $50/Msf 5/8" FOB U. S. West Coast and industrial grade board prices dropped to $90 to $95/Msf 3/4" FOB West Coast mill.

As the U. S. underlayment market collapsed, Southern U. S. mills turned to the manufacture of industrial grade board, causing a further weakening in the prices of industrial grade products. Industrial grade 3/4" board was selling FOB U.S. Southern mill below $120/Msf 3/4".

Only medium density fiberboard held its high price level of above $200/Msf 3/4" because the demand for this product still exceeded the then operative supply.

Not only did the U. S. markets collapse in 1974, but U. S. plant capacity was also increased by a substantial amount (about 500 MMsf 3/4") during this period. As a result of this overcapacity, U. S. producers turned to the Canadian markets where the demand was still relatively high.

By August 1974, board imported from the U. S. (mainly West Coast) could be purchased, delivered in Montreal, for $120/Msf 5/8" or less -- a precipitous drop indeed from the $180 to $200/Msf levels. Canadian manufacturers inevitably had to follow suit or were forced to curtail production.

The curtailment of Canadian domestic production had little chance in retarding the price collapse in Canada, in view of the fact that excess inventories in U. S. plants in August and September of 1974 were estimated to be in the order of 200 MMsf 3/4", an amount equal to more than half of the total Canadian consumption of 1974.

The year 1974 also saw a marked increase in the cost of particleboard manufacture. This was caused mainly by the more than doubling of resin prices and chemical additive costs in general, but also partly because of higher wood costs (due to the higher opportunity costs of wood waste as fuel) and partly due to the substantial increases in labour costs and outbound transportation costs. The sharp increases in the capital costs of plants constructed in the 1973-74 period also contributed to rising operating costs.

The extremely low prices which prevailed during August and September of 1974 were essentially due to inventory liquidations at below operating cost levels. By the end of 1974, inventories were at least partly liquidated (a great number of U.S. plants were shut down and almost all the remaining plants were operating on a curtailed production basis) and prices were adjusted upward to reflect, or at least approach, current minimum operating cost levels. Underlayment prices recovered to about $55 to $58/Msf 5/8", FOB West Coast, and industrial grade board prices were held at the $90/Msf 3/4" level.

As illustrated above, the year 1974 cannot be regarded as typical. The typical aspect of 1974 is in its soberingly educational value to the Canadian industry.

The U.S. particleboard industry is highly efficient and is more than ten times larger than its Canadian counterpart. The presence of this large U.S. industry and its proximity to the Canadian markets does, and is likely to continue to, effect Canadian markets and Canadian pricing patterns. The future of the Canadian particleboard industry therefore must be evaluated and judged in this context.

IMPORTED BOARD

It is obvious from the foregoing that imported board, constituting about 50% of the total consumption in 1974, plays a significant role in the Canadian particleboard markets. Imported board made up about 10% of the Canadian consumption in 1967, rising to about 20% in 1971 and 50% in 1974. This, in spite of the fact that Canadian plants were not running at full capacity during this period for a variety of reasons.

The rated productive capacity of Canadian plants exceeded or equalled Canadian consumption up to 1972. One large plant, Weyroc at Chatham, New Brunswick (from 1971 on), was built to serve the United Kingdom export markets exclusively and its output was not available for Canadian domestic consumption. Other Canadian producers had a series of production interruptions due to strikes and other reasons. Still others curtailed production or shut down their plants for various financial reasons.

In 1974, the Weyroc plant in Chatham exported about 65MMsf 5/8" to the U.K., an amount equal to about 1/3 of Canadian imports. It is highly probable that, in 1973, the Canadian consumption of 370 MMsf 5/8" would have been closer to 400 MMsf 5/8" had there been a greater availability of board at a slightly lower price. These high prices did attract 120 MMsf 5/8" of U.S. imports in spite of the shortage of board in the U.S. domestic markets in 1973.

It is obvious then that the main reason for the inordinately large import content of Canadian particleboard consumption is due to the shortages in the supply of Canadian board. Furthermore, indications are that Canadian suppliers failed to develop a supply of adequate quality board at a competitive price or to offer a reliable continuity of supply.

The major U.S. brands of imported panels, located in the plants of various industrial end users are as follows:

- Boise Cascade Corporation - LaGrande, Oregon
- "Korpine" Brooks Willamette Corp. - Bend, Oregon
- "Duraflake" Willamette Industries - Albany, Oregon
- "Firlock/Fircraft" Cascade Fiber Corp. - Eugene, Oregon
- "Resintite" Roseburg Lumber Company - Roseburg, Oregon
- "Versaboard" Weyerhaeuser Corp. - Springfield & North Bend, Oregon

- Evans Products Company - Missoula, Montana
- Georgia Pacific Corp. - Ukiah and Arcata, California
- Pope & Talbot Corporation - Oakridge, Oregon
- "Resincore" Rodman Industries - Marinette, Wisconsin
- "Baraboard" (MDF) Celotex Corporation - Deposit, New York
- "Masonite" Masonite Corporation - Waverley, Virginia
- Union Camp Corporation - Franklin, Virginia

It is of interest to note that the first nine board brands all come from plants located on the U. S. West Coast, some 3,000 miles distant from the Eastern Canadian markets. A check with these plants revealed that the board shipped from them to Canada, partly to Western Canada but mainly to the East, was in the order of 150 to 160 MMsf 5/8". The remaining plants plus some others whose boards have not been located (American Forest Products, Collins Pine on the West Coast and some in the South and North-central U. S.) would easily account for the rest of the 195 MMsf 5/8" imports in 1974, as estimated by Columbia.

In the U. S. industrial markets, boards from the West Coast made with western softwood mill waste type material, especially those made from Ponderosa Pine, are considered to be the most desirable for demanding industrial applications. In most cases, even the underlayment grade boards coming from these West Coast plants are considered to be more suitable for overlaying with vinyl sheets or low pressure laminates or for direct print than boards made in the Southern U.S. with southern pine raw material or hardwoods, mainly because of better surface characteristics and better machineability.

Since most Canadian particleboards in the East are made from hardwood raw material it is easy to see that the Ontario and Quebec end user found the West Coast boards, even in the underlayment grade, highly attractive. The low price of the board and the lack of Canadian supply further enhanced the inflow of imported board.

In some cases, some Canadian end users purchased U. S. boards simply because they could not obtain the desired panel size from a Canadian supplier. This was certainly the case with the mobile home industry which purchased the 4' x 12' and the 4' x 14' panels from the large U. S. plants having 4' x 24' or 5' x 24' hot presses. In Western Canada in 1974, the mobile home industry imported over 20 MMsf 5/8" of mobile home decking. In 1973, the entire Canadian mobile home industry experienced a serious shortage in mobile home decking, as U. S. plants allocated their production essentially to U. S. customers.

In addition to raw board, about 14 to 17 MMsf 5/8" were imported from the United States in prefinished form. This reflects the inadequate domestic supply in prefinished particleboard.

Table II-19 restates the data on all imported board in 1974 -- raw board as well as prefinished.

As mentioned earlier, the impression gained by the interviewers was that Canadian industrial end users would prefer to buy particleboard from Canadian suppliers. In spite of this, U. S. imports are likely to continue to play a major role in the Canadian particleboard markets and to achieve massive infiltration of the Canadian markets during soft U. S. marketing periods unless the Canadian particleboard industry develops a price-competitive supply of particleboard of adequate volume and quality.

TABLE II-19 - THE ESTIMATED BREAKDOWN OF PARTICLEBOARD IMPORTS IN 1974
(Volumes in MMsf 5/8" Basis)

PANEL TYPE	B.C.	Pr.	Ont.	Que.	Atl. Prov.	TOTALS Volume	TOTALS %
Underlayment (Used in Construction	3.7	3.1	15.6	15.6	-	38.0	*18.0*
Underlayment (Used Industrially	7.7	7.7	27.1	27.1	3.9	73.5	*34.7*
Industrial	4.8	4.8	9.7	9.7	1.7	30.7	*14.5*
Mobile Home Decking	5.4	12.1	8.9	8.1	1.1	35.6	*16.8*
Medium Density Fiberboard	0.3	0.3	4.0	4.1	0.2	8.9	*4.2*
High Density Particleboard	0.2	0.2	2.0	2.5	-	4.9	*2.3*
Thin Board	0.5	0.5	0.8	0.9	0.3	3.0	*1.4*
TOTAL RAW BOARD IMPORTED	22.6	28.7	68.1	68.0	7.2	194.6	*91.9*
TOTAL RAW BOARD IMPORTED-%	*11.6*	*14.8*	*35.0*	*34.9*	*3.7*	*100.0*	
Low Pressure Laminate	0.4	0.4	1.0	1.0	0.2	3.0	*1.4*
Vinyl Overlay	0.8	0.8	2.0	2.0	0.4	6.0	*2.8*
Filled/Primed Painted	0.5	0.5	1.0	1.0	0.2	3.2	*1.5*
Print	0.5	0.6	0.8	0.9	0.2	3.0	*1.4*
Roll Laminate (Paper)	0.2	0.2	0.8	0.7	0.1	2.0	*1.0*
TOTAL PREFINISHED IMPORTED	2.4	2.5	5.6	5.6	1.1	17.2	*8.1*
TOTAL PREFINISHED IMPORTED-%	*14.0*	*14.5*	*32.5*	*32.5*	*6.5*	*100.0*	
TOTAL ALL BOARD IMPORTED	25.0	31.2	73.7	73.6	8.3	211.8	*100.0*
TOTAL ALL BOARD IMPORTED-%	*11.8*	*14.7*	*34.8*	*34.7*	*4.0*	*100.0*	

Source: C.E.I. Research

EXPORTS IN 1974

Virtually all the board exported from Canada in 1974, about 65 MMsf 5/8", came from Airscrew Weyroc in Chatham, N.B.

The Weyroc plant was built in 1970 by a British corporation and output was directed to the United Kingdom markets. Presumably, a major increase in ocean freight rates coupled with the increase in import duties and the softening of the U.K. markets rendered the export of particleboard from Canada to the United Kingdom unattractive in 1974. As a result, Weyroc curtailed production during the second half of 1974, terminated export shipments and decided to divest itself of the plant during the fourth quarter of 1974.

The plant was purchased by Northwood in 1975 and is at present undergoing modifications to permit the production of a board suitable for the Canadian markets.

This is a large plant with a potential capacity of 140 to 150 MMsf 5/8" per annum. Given the appropriate operating conditions, it could go a long way toward making up the deficiency in Canadian supply vs. Canadian demand and it would appear to be capable of competing with U.S. imports in Eastern Canada.

S E C T I O N I I I

THE FUTURE DEMAND FOR PARTICLEBOARD

(DOMESTIC AND EXPORT)

GENERAL

Particleboard has experienced a spectacular growth over the past twenty years in all the industrialized countries. The growth rates in North America (U.S. and Canada) up to 1973 were in the order of 20% on an annually compounded basis.

The main reasons for this growth were growing population and the consequent demand for housing and furniture, steadily increasing living standards and purchasing power and the growing scarcity and cost of conventional wood products such as lumber, veneer and plywood.

Although the somewhat unprecedented overall growth of the past thirty years, since the termination of World War II, was interrupted by a few mild recessions of relatively short duration, each of these recessions was followed by strong and rapid recovery and the entire period may be characterized by a general confidence in continued improvement and growth.

The current economic recession appears to be deeper, more complex, and the corrective measures to be taken less obvious than was previously the case. The pressures of increasing population and rising social expectations are in contradiction with the current and projected raw material and capital shortages and environmental constraints, some real and some possibly imagined. At any rate, even the most casual observer cannot fail to take note of a substantial reduction in confidence on the part of governments, business, economists and the public in general, in either the feasibility or indeed the desirability of an uninterrupted continuation in economic expansion and growth.

The current economic climate is not, therefore, conducive to confident forecasting. Economic projections are revised almost monthly. The validity of established indicators is seriously questioned and authoritative opinions vary widely as to future trends or possible solutions to current and foreseeable problems.

As to particleboard, the sharp drop in the U. S. demand in 1974 (vs. 1973), the first reduction in U. S. particleboard sales or demand ever, adds a further degree of uncertainty as to the continuation of past trends. Although the Canadian demand for particleboard continued to grow in 1974 and is not expected to decrease in 1975, the delayed repetition of the U. S. trend in Canada cannot be ruled out.

Columbia has examined the current revisions of the overall economic forecasts prepared by both Canadian and U. S. authorities. The conclusions relevant to the sectors affecting particleboard, namely housing and furniture, appear to be valid even in the case of a reduced rate of future overall economic growth. After all, housing and furniture are essential needs and it is difficult to visualize, at the present, conditions which will negate people's ability to satisfy these essential needs, at least at a somewhat reduced standard. In fact, the necessity for producing relatively lower cost housing and furniture may help, rather than hinder, the growth of the particleboard industry itself.

The projections as to population growth and household formations in Canada and North America are not in serious doubt. Consequently, the demand projections for housing and furniture are also valid. The major part of the uncertainty appears to be the viability or feasibility of financing the implementation of this demand.

The assessment of such financial problems is not within the scope of this study. The projections regarding the future growth of particleboard, presented in the following, are therefore and of necessity based on the assumption that whatever financial problems exist or are currently foreseeable, are soluble and indeed will be, on the whole, overcome.

COMPARISONS WITH THE UNITED STATES

The Canadian particleboard industry, along with the entire Canadian forest industry, is inevitably connected to and affected by the same industry sector in the United States.

For one, Canada sells about 50% of its lumber and pulp and about 75% of its newsprint output to the United States. As a result, U. S. economic conditions and markets have a decisive influence on these Canadian industries. Secondly, some forest products manufactured in the United States on a large scale, such as plywood, fine papers and particleboard, flow across the border into Canada and compete favourably with similar products made in Canada, in spite of duty and extra freight costs, mainly because of the larger scale of the U. S. operations. It is therefore considered to be impractical or even impossible to consider any sector of the Canadian forest industry in isolation from the United States.

As was demonstrated in Section II of this report, almost half of the 1974 Canadian particleboard demand was supplied from U. S. sources, while Canadian particleboard plants were operating at much less than rated capacity. In addition, U. S. imports have effectively set the price levels of particleboard in the Canadian markets.

In projecting the Canadian particleboard markets for the short and medium term, it is important to take into account product supply, availability and price factors. In this regard, the demand-supply conditions in the United States are likely to have a continuing and substantial impact on Canada. Comparisons with the United States particleboard industry are therefore considered to be significant and will be used throughout the following analyses in terms of output, markets and prices, as well as cost factors.

Before embarking on the projections of the Canadian particleboard markets, it is useful to review the comparisons between the past performance of the U.S. and Canadian particleboard industries.

Figure III-1 shows the comparative growth of particleboard in Canada and the United States from 1964 to 1975 (1975 consumption figures are estimates by Columbia Engineering). The U.S. and Canadian plant capacities for the years 1973, 1974, 1975 and 1976 are also noted on Figure III-1.

It is evident that, in 1973, North American plant capacity was running full out to supply the large jump in U.S. demand. The Canadian market was probably short of supply, prices were high and the growth retarded. As U.S. demand dropped in 1974, the Canadian market, now having a plentiful supply and greatly reduced prices, continued its growth in spite of a downturn in the general economy. The 1975 consumption estimates are based on current trends which indicate that they will remain at the same level as 1974 in both countries.

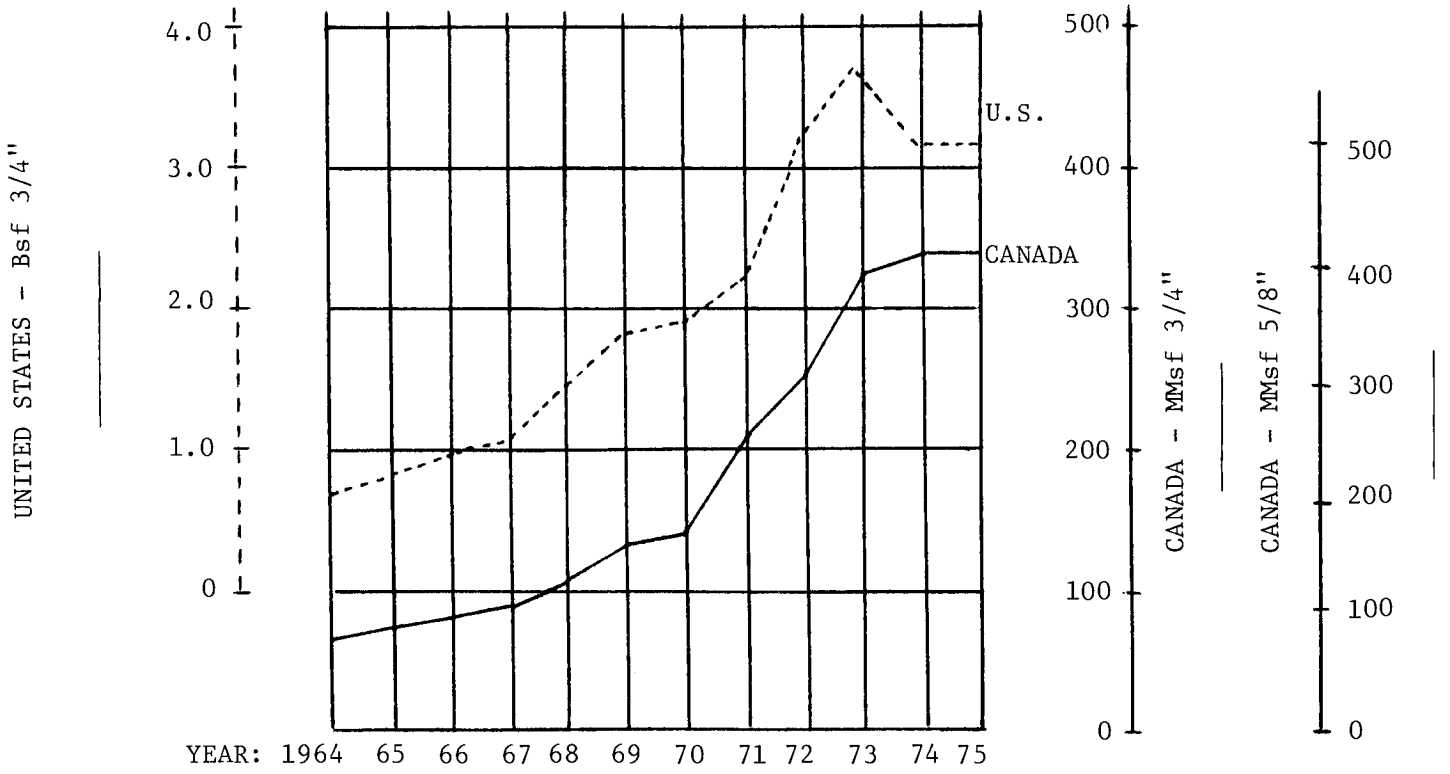
It is of interest to note that in Canada the consumption per capita of particleboard is still somewhat below U.S. levels, in spite of the sharp drop in U.S. consumption in 1974. The consumption figures are as follows.

	1973	1974	1975
UNITED STATES			
Population in Millions (Estimate)	210	212	214
Particleboard Consumption (Bsf 3/4")	3.8	3.2	3.2
Msf 3/4" per 1000 population	18.1	15.1	15.05
CANADA			
Population in Millions	22.1	22.4	22.6
Particleboard Consumption (Bsf 3/4")	0.315	0.334	0.334
Msf 3/4" per 1000 population	14.25	14.9	14.75

The data presented above and in Figure III-1 should be kept in mind as they form the basis of further comparative analyses to follow.

FIGURE III-1

COMPARISON BETWEEN CANADIAN AND U.S. UREA PARTICLEBOARD CONSUMPTION FOR YEARS 1964 THROUGH 1975



Estimated Effective Plant Capacity - Bsf 3/4"

	U.S.A.	CANADA		TOTAL
1973	3.95	.260	=	4.21
1974	4.35	.300	=	4.75
1975	4.90	.330	=	5.23
1976	5.40	.450	=	5.85

SOURCE: CANADA - Statistics Canada, D.I.T.C. & CEI Research;
U.S.A. - U.S. Dept. of Commerce & LGA

SHORT TERM DOMESTIC DEMAND PROJECTIONS

TRENDS IN 1975

In the course of the interviews, conducted largely throughout the second and third quarter of 1975, Columbia has collected information regarding the Canadian particleboard consumption and trends in 1975 which may be summarized as follows:

- Indications are that 1973 Canadian particleboard consumption was substantially retarded by the curtailed availability and high price of particleboard in Canada. As U.S. demand and price dropped in May 1974, both the availability and price improved from the point of view of the purchaser. As a result, Canadian particleboard consumption increased in 1974, in spite of reduced housing starts and in the face of a sharply decreased consumption in the United States. The growth was due to increased penetration into the various end user industries, caused mainly by lower price and improved availability.

  Since the price/availability situation is not expected to change in 1975, the penetration of particleboard should continue and the consumption of particleboard in 1975 should not decrease in spite of some decrease in end user industry activity.

- In 1975, housing construction and furniture manufacturing activity in Canada proceeded at a relatively higher rate than in the United States. Housing starts in Canada should reach between 190,000 and 200,000 for the year (222,000 in 1974) while, in the United States, they are not expected to reach 1,500,000 (1,350,000 in 1974). In addition, manufactured home construction (mobile and prefabricated) also continued at a relatively higher level in Canada than in the U.S.

(1973 housing starts totalled about 2,300,000 in the United States and 270,000 in Canada, not including mobile homes.)

- Canadian purchases during the first half of 1975 were at a reduced level, about 185 to 190 MMsf 5/8" for the period. Third quarter purchases appeared to be at an increased rate, so that the total Canadian consumption for 1975 should be similar to 1974, about 400 MMsf 5/8".

- Domestic production will increase in 1975, partly because of some improvement in the prices of particleboard and partly because certain plants more or less resolved some financial and some labour (strike) problems. Domestic production for the first half of the year was in the order of 118 MMsf 5/8" and should reach 230 to 240 MMsf 5/8" for the whole year of 1975.

- Imports are recorded at about 60 MMsf 5/8" by Statistics Canada for the first six months of 1975. If they are subject to the same error as indicated in 1974, they could have reached 70 to 75 MMsf 5/8" for this period. At any rate, U.S. imports are expected to be still very strong in 1975, reaching a total for the year of 160 to 170 MMsf 5/8". No significant export volume is expected for 1975.

- One of the most important occurrences in the Canadian particleboard industry in 1975 is the growing interest in the purchase and manufacture of prefinished particleboard products. The major firms installing new prefinishing operations in the East are Canadian Cyanamid and Domtar (low pressure laminates) and Flakeboard (roll on paper). A number of additional firms such as Rexwood and others are also contemplating prefinishing operations of various types.

In the West, MacMillan Bloedel and Sauder, both in B. C., are installing U.V. direct printing lines. As a result, the consumption of particleboard by "prefinishers" (S.I.C. 252) is expected to increase substantially throughout 1975/76.

- The other major development in 1975 was the acquisition of the Weyroc plant at Chatham, New Brunswick, by Northwood. This plant was originally designed by Weyroc mainly for the supply of the United Kingdom markets and sold only a small fraction of its output in Canada. It is understood that Northwood intends to modify the plant to enable it to produce board suitable for North American markets. This is a large, modern plant (operational capacity 120 to 140 MMsf 5/8" per annum) and should give Canada its first world market scale particleboard operation.

- Particleboard prices in Canada continued at a relatively low level during the first three quarters of 1975, although somewhat higher than late 1974 and early 1975 figures. Prices appeared to stabilize around $140 to $145 per Msf 5/8" in the East corresponding to the somewhat increased but still low price of U. S. imports. In the third quarter, Northwood appeared to sell at a slightly reduced price in an attempt to achieve Eastern, domestic market penetration.

- Raw board purchased by the furniture industries and kitchen cabinet manufacturers in 1975 appeared to be at a somewhat reduced rate from 1974, by about 10% to 15%. On the other hand, prefinished board sales appeared to be somewhat higher, both by industrials and through retail outlets.

- Purchases in 1975 by the manufactured home industries (mobile and prefabricated) continued at rates fairly similar to the rate in 1974.

- The construction and retail sector does not seem to have experienced significantly reduced particleboard consumption during 1975, in spite of reduced housing starts -- probably due to the increased use of particleboard in housing modifications and remodelling. The lower price and greater availability of underlayment grade board (from U. S. imports) appeared to contribute to such increased use.

- Regional distribution in 1975 should be similar to that of 1974. End use distribution should, however, change somewhat along the lines shown in Table III-1.

PROJECTED CONSUMPTION FOR 1976

Government sources and economists forecast a gradual, but relatively slow, economic recovery through 1976 in Canada as well as in the United States, coupled with an inflation rate of less than 10%. Indications are that the recovery may be somewhat slower in Canada than in the United States. Furthermore, the inflation rate in Canada is currently expected to be only slightly below 10% while U. S. Government sources are hoping for an inflation rate of less than 7%.

Despite these comparative forecasts, Canadian housing activity is expected to continue at a relatively higher level than in the U. S. Most Canadian authorities are looking for 220,000 to 225,000 housing starts in Canada in 1976, while nobody in the U. S. is expecting 1976 housing starts (excluding mobile homes) to exceed the 1.6 to 1.7 million level.

TABLE III-1

PROJECTED PARTICLEBOARD CONSUMPTION IN CANADA 1975, 1976 COMPARED TO 1974

Volumes in MMsf 5/8" Basis

Description	1974	1975	1976
Prefinished	93.0	110.0	125.0
Sash, Door & Millwork	12.7	11.0	14.0
Prefabricated Homes	9.7	11.0	13.0
Mobile Homes	37.6	37.0	42.0
Kitchen Cabinets	42.1	38.0	40.0
Household Furniture	91.3	82.0	85.0
Office Furniture	15.4	15.0	16.0
Miscellaneous Furniture	29.2	30.0	30.0
TOTAL INDUSTRIAL	331.0	334.0	365.0
TOTAL CONSTRUCTION	73.0	70.0	80.0
T O T A L	404.0	404.0	445.0

Source: C. E. I. Research & Study

These discrepancies in forecasts are partly due to the relatively large increase in household formations in Canada as well as a higher rate of vacancies or housing inventory (single and multi family) in the United States.

As noted earlier, the ability to finance the housing demand in Canada is open to question considering the shortage of capital, high mortgage interest rates, real estate prices in major Canadian cities as related to incomes and the apparent lack of incentive to construct rental units.

Still, accepting the general projections noted above, the trends expected in the Canadian particleboard industry are outlined as follows:

- U.S. particleboard demand for 1976 will continue well below U.S. plant capacity, at about 3.4 to 3.6 Bsf 3/4" demand vs. 5.2 to 5.4 capacity. It is estimated that about 10% to 12% of this capacity (about 500 to 600 MMsf 3/4") is shut down, unable to meet price competition; another 18% to 20% (about 1.0 Bsf3/4") is operating on a sharply curtailed basis, probably at a loss. About 70% of the total (or 4.0 Bsf 3/4" capacity) is operating at 70% to 75% utilization, some marginally, others very modestly profitable as related to current price levels. Increased utilization of this capacity due to improved market volume would lower costs in these plants. As a result, no major price increases are expected until market demand is well above 4.0 Bsf 3/4" per annum level which is not likely to happen in 1976. Whatever price increases may occur will be implemented to compensate for cost increases, mainly labour costs, as all other costs should remain stable at the projected use levels (wood, chemicals). Relatively low priced U.S. imports will therefore continue to play a major role in the Canadian markets in 1976 and keep Canadian prices close to U.S. price levels.

- The relatively low and stable particleboard prices in Canada, coupled with good availability, should cause the continuing penetration of particleboard in all end user industries. In addition, both housing construction and furniture manufacturing activity should gradually recover.

  The recovery of Canadian housing starts should take hold in about the second or third quarter of 1976. Canadian furniture sales of all types and classifications should also improve somewhat in the second half of 1976.

- The use of particleboard by prefinishers is expected to continue to increase in 1976, mainly because of the new manufacturing capacity and consequent need for a strong sales and promotional effort by this sector. In addition, an increasing number of Canadian particleboard manufacturers are expected to turn to prefinishing their raw board in order to avoid the need to compete with low priced U.S. raw board imports.

- Canadian factory built home manufacturing (mobile & prefabricated) should continue at a strong level and should increase raw particleboard purchases, mainly in the decking and underlayment grades. Some increase in the use of thin, prefinished particleboard wall panelling by this sector is a strong possibility.

- The increased use of particleboard in on-site home construction (underlayment) especially in eastern Canada is expected, due to low price, as are increased sales to the shoulder trade through retail outlets.

These trends should result in an increase of 10% to 12% in raw particleboard consumption in Canada in 1976, amounting to 445 MMsf 5/8" for the year.

DOMESTIC DEMAND PROJECTION TO 1985

Demographic Background

Manex, Inc. of Quebec, Quebec prepared a demographic background study which is presented in the Appendices. The relevant findings of this study are summarized here as follows:

- The Canadian population will increase by about three to four million people in the forecast period (1975-1985). The rate of increase is expected to be 1.4% to 1.6% per annum as compared to a rate of 2.0% per annum over the past 25 years. Ontario and British Columbia will experience the greatest growth in population. The rate of population growth in Canada is expected to be higher than that in the United States.

- The number of people between the ages of 20 and 44 will increase by a factor of 32% over the ten year period.

- Household formations will increase at a yearly average rate of 3%, or an average of about 230,000 to 245,000 new households per year, as compared to an average of about 180,000 new households over the previous ten years and an average of about 200,000 new households over the 1971/76 five year period. In comparison, U. S. household formations are expected to be at an average level of 1,300,000 to 1,450,000 over the same period, so that Canadian household formations will average about 17% to 18% of U. S. household formations while Canadian population as related to U. S. population will grow from 10.65% to 11.05%. These comparative figures are somewhat surprising and it is possible that either the Canadian or the U. S. authorities are using differing assumptions or that the date of the latest revision of the respective projections differ.

- Non-family households will increase from about 19% of all households in 1975 to about 21% in 1985. The non-family household group is thought to consume at a higher rate than the family group.

- The net disposable income of Canadians will increase at a rate of 3% per year in real terms, in spite of continued inflationary trends in the order of 10%.

- Canadians are expected to save less and buy more during this period and will increase their purchases of durable vs. non-durable goods. Housing and furniture are likely to be high on the list of future purchases.

- Governments are expected to encourage the purchase of housing and furniture through various monetary and budgetary measures.

GENERAL FORECAST FOR THE END USER INDUSTRIES

The effect of the demographic forecast, as given above, on the housing, furniture and related industries which are the major purchasers of particleboard, should be as follows:

- Residential housing construction should average well over 250,000 units per year as indicated by the Economic Council of Canada forecast shown in Table III-2. The same table indicates some increase in multi-family units and a large increase in mobile homes.

  Here again, the question of financing housing purchases arises. The actual figures for 1974 and 1975 are well below the projections given in Table III-2, creating a delayed demand, but also indicating the need for improved financing arrangements. In contrast, mobile home construction levels are well ahead of the projections.

TABLE III-2 - CANADIAN HOUSING CONSTRUCTION, HISTORY & PROJECTIONS

(000s)

YEAR	SINGLE FAMILY	MULTI-FAMILY	TOTAL ON-SITE	MOBILE HOMES	TOTAL, INCLUDING MOBILE HOMES
1969	78	132	210	9	219
1970	71	120	191	9	200
1971	98	136	234	15	249
1972	116	134	250	20	270
1973	132	137	269	24	293
1974	115	135	250	27	277
1975	115	135	250	31	281
1976	120	140	260	34	294
1977	120	140	260	38	298
1978	120	140	260	42	302
1979	125	145	270	46	316
1980	125	145	270	51	321
1981	125	150	275	56	331
1982	125	150	275	61	336
1983	130	150	280	67	347
1984	130	150	280	71	351
1985	135	155	285	78	363

Source: Housing Statistics, Economic Council of Canada

At any rate, a housing construction activity averaging, over the forecast period, as low as 230,000 to 240,000 units per year, coupled with 50,000 to 60,000 mobile home units per year (which is probably the minimum to satisfy the demand) would still create a highly favourable market climate for particleboard in Canada.

The latest revision of the projected U. S. housing demand for the 1975/85 period shows about 2.0 million conventional units per year (at medium level) plus around 500,000 to 750,000 mobile homes (U. S. Forest Service Projection 1974/75). This projection is drastically reduced from earlier figures but would still generate an acceptable growth climate for particleboard in the United States.

Here again, a discrepancy between U. S. and Canadian assumptions and/or revision dates is possible or indicated.

- The mobile home construction industry in Canada should be enhanced by the large northern construction projects planned for the forecast period, as well as by a good opportunity for exports in this sector.

  Prefabricated housing should also grow at a rate greater than housing as a whole, due to the increasing cost of on-site housing construction and the expectation of a rising demand for second, recreational type homes, especially by apartment dwellers.

- Household furniture and kitchen cabinets should experience strong growth over the period in view of the growing percentage of the 20 to 45 year age group and increasing family formations. Although there are no late projections available for this manufacturing sector, an average yearly growth rate of 5% to 6% appears to be conservative, a growth rate of 7% to 8% possible.

The growing shortages in hardwood lumber and veneer and plywood and the need to reduce labour costs by automation should permit a further 25% to 35% rate of penetration of particleboard into these end uses.

- Office and institutional furniture and store fixtures should also be on the increase as additional offices, hospitals and retail outlets will be required to serve the growing population. The service industries occupying such facilities are expected to grow at a faster rate than the primary and secondary manufacturing sector.

  School construction is likely to be stagnant throughout the forecast period but is expected to increase again by 1990.

DEMAND PROJECTION FOR U.F. PARTICLEBOARD TO 1985

On the basis of these considerations, Columbia estimates that the total use of particleboard, *raw board and prefinished board combined,* should grow over the next ten years at an annual compounded rate of about 8.0% to 8.5% in the household furniture and kitchen cabinet sectors, at about 10% in the office and miscellaneous furniture, mobile home and sash and door applications and over 15% in the prefabricated housing sector.

The use in the construction and retail sector should grow at an annually compounded rate of 7% to 8%.

Growth rates should be greater during the first half of the period, subject to reasonable overall economic conditions, and should decline somewhat over the second five years.

The estimated growth and distribution of *raw* board per end user industries for the years 1985 and 1980 is shown in Table III-3.

TABLE III-3

PROJECTIONS FOR UREA BONDED PARTICLEBOARD CONSUMPTION IN CANADA TO 1985

Volumes in MMsf 5/8"

	1976	Projected Annual Growth Rate	1980	Projected Annual Growth Rate	1985
Prefinished	125	*15.2%*	220	*8.1%*	325
Sash, Door & Millwork	14	*10.6%*	21	*10.7%*	35
Prefabricated Homes	13	*11.4%*	20	*16.0%*	42
Mobile Homes	42	*11.5%*	65	*9.0%*	100
Kitchen Cabinets	40	*8.3%*	55	*7.0%*	77
Household Furniture	85	*8.5%*	118	*6.9%*	165
Office Furniture	16	*9.5%*	23	*6.8%*	32
Miscellaneous Furniture	30	*7.5%*	40	*7.0%*	56
TOTAL INDUSTRIAL	365	*11.4%*	562	*8.2%*	832
TOTAL CONSTRUCTION	80	*11.8%*	125	*6.3%*	170
T O T A L	445	*11.5%*	687	*7.0%*	1002

Source: CEI Research

In Columbia's judgment, the growth rate indicated by Table III-3 for the prefinishing sector is well supported by U. S. and European experience. Canada is lagging in this area and is expected to catch up during the forecast period.

The growth in purchases by the manufactured home sectors (mobile and prefabricated) is justified by the growth expected in these industries. It is possible that, in the future, phenolic bonded board will be specified for mobile home decking and that prefabricated housing will utilize a single panel floor deck -- without a separate underlayment board. If this is the case, both of these applications may utilize "waferboard" or some variation of waferboard rather than U.F. particleboard or even particleboard bonded with a phenolic resin. As a result, U.F. particleboard may lose this sector or about 10% to 15% of its total projected 1985 market.

With this reservation, the overall growth rate of U.F. particleboard in Canada over the forecast period is expected to be between 8% and 9% on an annually compounded basis, or about half of the growth rate of the previous ten year period.

Historically, the growth of particleboard has depended to a large extent on availability and price factors. It is assumed here that particleboard will be readily available in Canada throughout the forecast period from either domestic or foreign sources, at a price close to corresponding price levels in the United States. Restricted supply and higher prices (as compared to U. S. prices) would result in slower growth rates. On the other hand, if the Canadian particleboard industry develops an export orientation, resulting in a Canadian price level somewhat below U. S. price levels, the market penetration could accelerate and market growth rates may increase.

The U. S. market projection prepared by Leonard Guss & Associates shows a U. S. particleboard consumption of 8.4 Bsf 3/4" (about 10.0 Bsf 5/8"), including medium density fiberboard and thin board, by 1985. Both the Canadian and the U. S. projections presented here are scaled down from estimates made two or three years ago, at which time most researchers projected similar volumes by 1980 rather than 1985.

PARTICLEBOARD FINISHING

At the present, board finishing techniques are developing and changing rapidly, due to the limited supply and increasing price of hardwood veneers and the consequent need to develop alternate surfacing materials at reasonable cost. Various manufacturers are experimenting with a number of finishing materials and techniques. The performance and appearance of these various synthetic finishes are not dissimilar and cost may be the important determining factor in the degree of acceptance eventually achieved by each.

The use of hardwood veneer finishes both in furniture and as wall panelling will be stagnant in terms of volume and decline sharply as a percentage of all finishes. The growth of high pressure laminates as related to particleboard will also be limited by the competition from other synthetic surfaces which may be of lower performance quality but may be manufactured and sold at a lower cost. The growth of these newer finishes (low pressure laminates, vinyl, roll on paper and direct print) will benefit the growth of particleboard. As noted earlier, the prefinishing of particleboard is thought to result in significant cost savings to many of the industrial end users.

Figure III-2 shows the expected changes in the finishing techniques and materials used on particleboard by *all sources*, prefinishers as well as other industrial end users (self-finished), not including on-site finishing such as tiling and painting or the application of high pressure laminates on construction sites.

The share of the market for veneer faced particleboard will drop from 39.1% (at the present) to 17.0% in 1985, while high pressure laminates are expected to decrease from 17.1% to 11%. Filling/priming and painting finishes will marginally increase their share of the market.

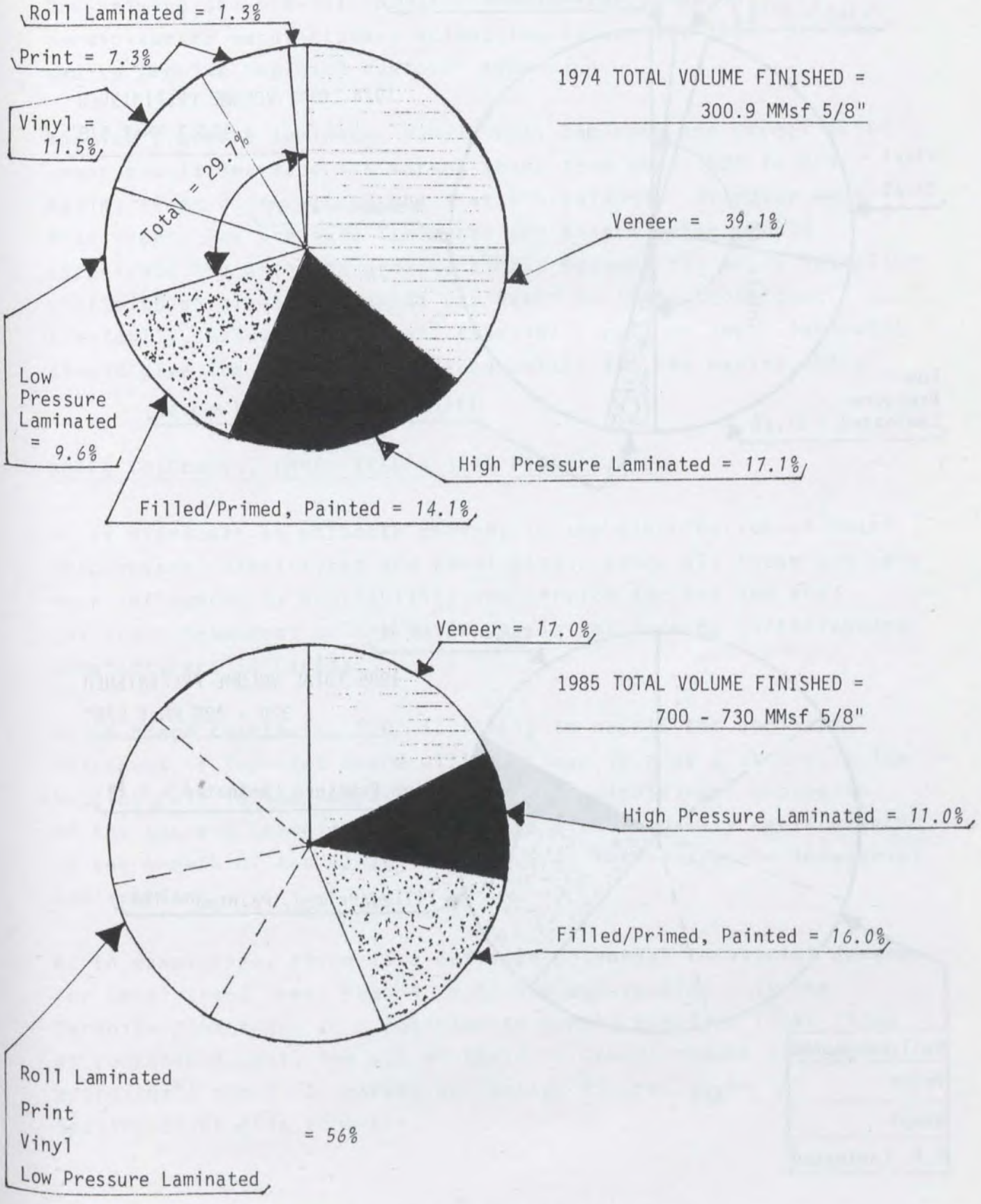
The total share of the newer type finishes, suitable mainly for the finishing of vertical surfaces but also some horizontal members, namely low pressure laminates, roll on paper, vinyl and direct (U.V.) print, will about double. Each of these should attain a market share of at least 8% while any one may capture over 15% of the total market. It is impossible to predict at this time a more definitive breakdown of these finishing types, as the decision of individual manufacturers to install various types of finishing lines will have a great impact on future developments.

Figure III-3 shows the expected changes in the use of various finishes by *prefinishing* operations, including *self-prefinishing* by particleboard manufacturers.

Hardwood veneer is again expected to drop from 46.3% to 16.9% of all the prefinished volume.

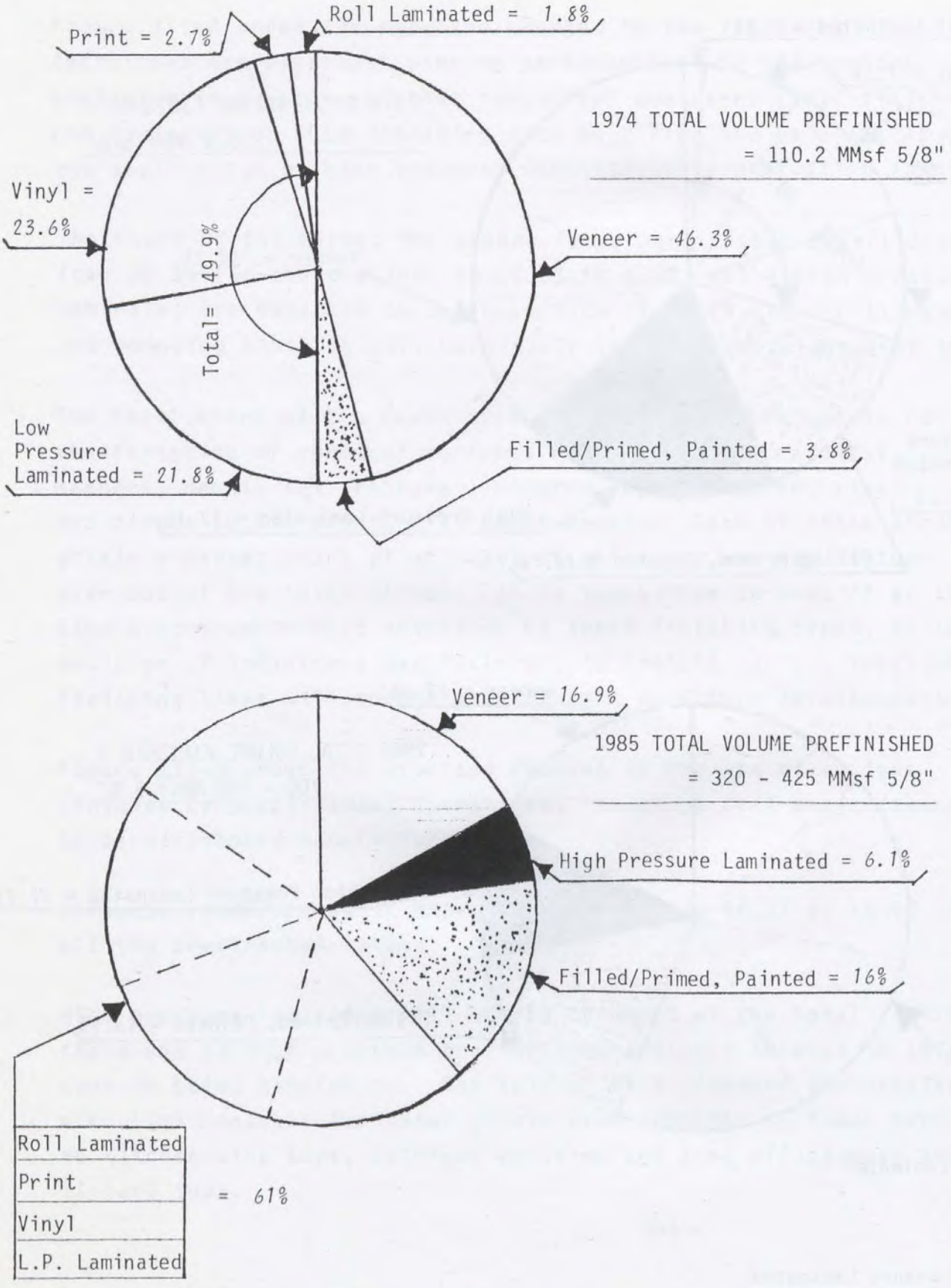
High pressure laminates will occupy about 6% of the total. Although there was no high pressure prefinishing activity located in 1974, some is being carried on. The sale of particleboard pre-overlayed with high pressure laminates should grow somewhat in items such as kitchen sink tops, bathroom vanities and some office desk and fixture tops.

FIGURE III-2 - PROJECTED BOARD FINISHING TYPE DISTRIBUTION BY 1985 COMPARED TO 1974 - ALL BOARD FINISHING



Source: C.E.I. Research

FIGURE III-3 - PROJECTED FINISHING TYPE DISTRIBUTION BY 1985 COMPARED TO 1974 - PREFINISHERS ONLY



Source: C.E.I. Research

Pre-priming and pre-filling should also grow, especially by particleboard manufacturers attempting to upgrade their product and to provide improved customer servicing.

The low pressure laminate, vinyl, roll laminate and direct print group should increase its market share from about 50% to 61%. Again, it is difficult to guess at a breakdown. Over the next five years, low pressure laminates and direct print should experience the greatest growth, simply because the newly installed prefinishing plants in Canada are based on these techniques. Eventually, however, vinyl and especially roll on paper laminates should give the other two a strong battle for the market share.

BOARD THICKNESS, PANEL TYPE & SIZE DISTRIBUTION

It is difficult to estimate changes in the distribution of board thicknesses, panel types and panel sizes, since all these are very much influenced by availability and service factors and are therefore dependent on the future decisions made by particleboard manufacturers in Canada.

As to board thickness, 5/8" is likely to remain the dominant thickness if imported board will continue to play a strong, price setting role in the Canadian markets. A significant expansion of the eastern Canadian particleboard plant capacity could result in the growth of the 11/16" and the 3/4" thicknesses in industrial applications.

As to panel size, there is a definite potential industrial demand for panel sizes other than 4' x 8' and cut-to-size. If the Canadian plants are in a position to supply board in those sizes at reasonable cost, the use of these in Canada should eventually approximate the U. S. market percentage figures given in Section II of this report.

The use of prefinished, cut-to-size panels should grow, if promoted and supplied.

As to board type, Figure III-4 shows the range of market share each board type is expected to capture by 1985 against the board type distribution in 1974.

The use of industrial board is expected to be greater than the construction use, hence the projected drop in the market share range of underlayment type board used as floor underlayment.

The use of underlayment board in industrial application will again depend on supply and price factors. The total standard industrial board (42 to 45 lbs/cu ft) usage however should remain at the 60% to 65% level. The final, actual market share of standard industrial board will depend on the acceptance of medium density fiberboard by the Canadian industrial end users.

At the present, MDF in the United States occupies about 10% of the current total market, or about 330 MMsf 3/4". It is estimated that in about 15% to 20% of the industrial applications, MDF would give significant cost and quality advantages. In such markets, therefore, MDF demands a premium justifying its higher manufacturing cost. This means a premium market for MDF in the U.S. by 1985 of about 750 to 1,000 MMsf 3/4". It is possible that a similar situation could develop in Canada, creating a market for MDF of about 150 to 200 MMsf 5/8" by 1985.

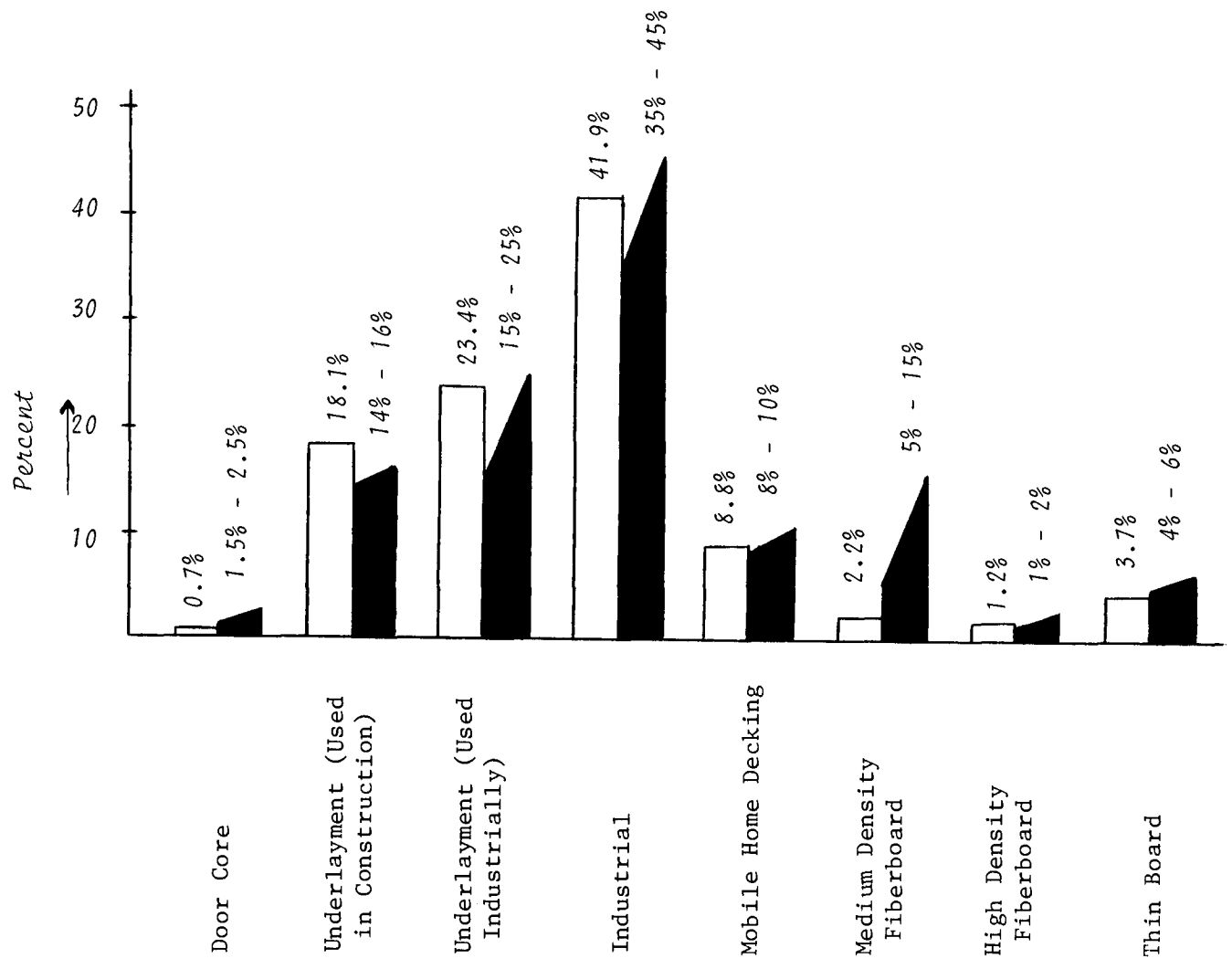
The Canadian MDF market is at present retarded by the absence of a Canadian MDF plant. Furthermore, the possibility of seeing a Canadian MDF plant installation within the next five years appears to be somewhat remote.

FIGURE III-4

PANEL TYPE DISTRIBUTION PROFILE PROJECTION FOR 1985 AS COMPARED TO 1974

- 1974 Consumption 404.0 MMsf 5/8"

- 1985 Projected Consumption 1002.0 MMsf 5/8"



Source: CEI Research

The reasons for this contention are discussed in Section IV of this report.

If no Canadian plant is built, Canadian MDF consumption is unlikely to exceed 50 MMsf 5/8" by 1985. The installation and operation of a large size Canadian MDF plant by, say, 1980 could result in an MDF consumption of about 150 MMsf 5/8" by 1985.

Mobile home decking and high density board should retain their market share; in the case of MHD, subject to the continued acceptance of either U.F. or P.F. bonded particleboard (as against flakeboard or waferboard) by the Code supervisory authorities.

The use of particleboard should increase in the door core as well as the thin board (wall panelling, case goods, etc.) applications.

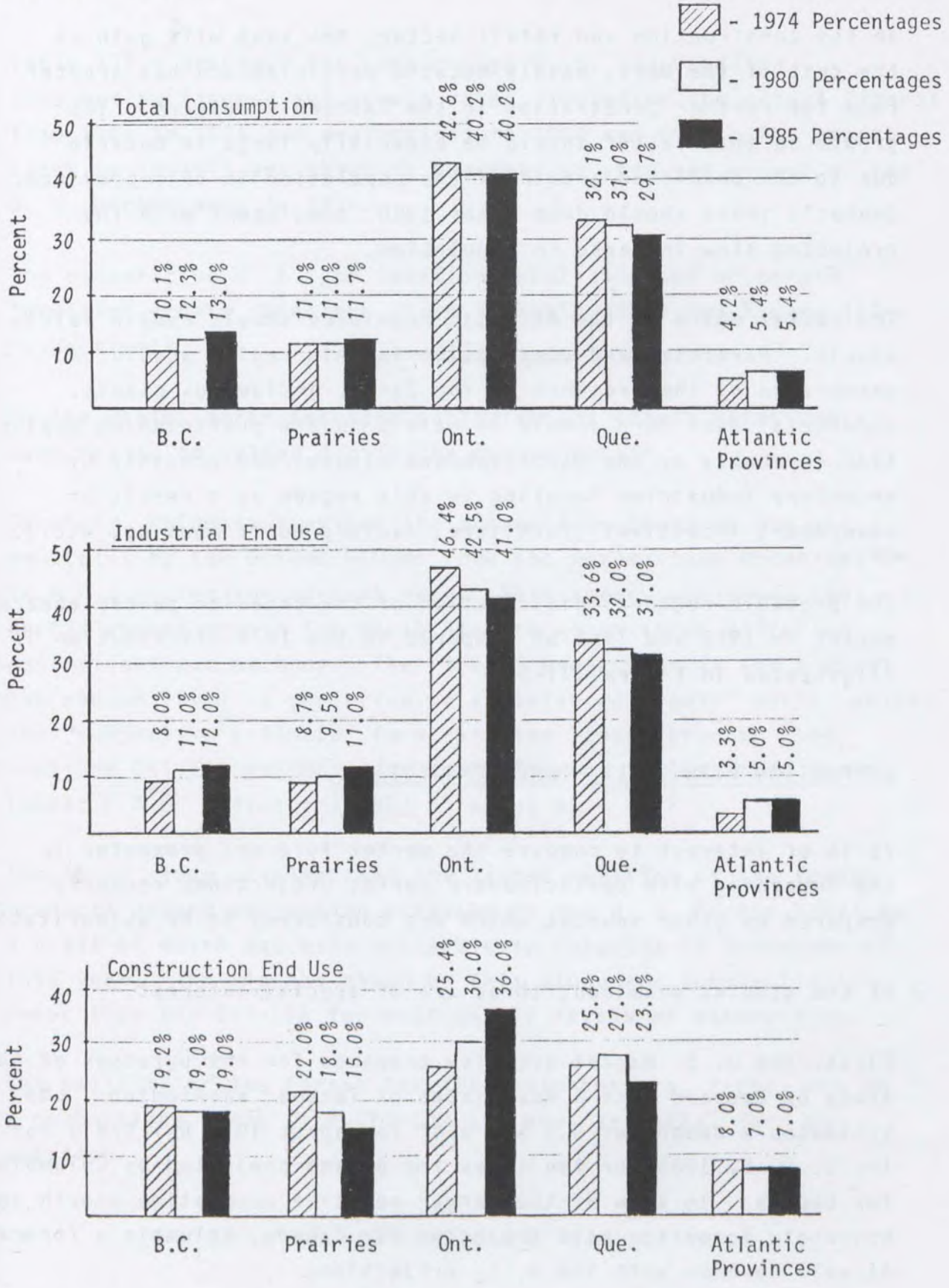
REGIONAL DISTRIBUTION

The regional distribution of consumption in 1985 is difficult to estimate. Population distribution changes will have some influence, certainly in the construction and retail end uses. Regional distribution of the industrial consumption, however, will be affected by the location of future particleboard plants and end user industries which will, to a certain extent, be influenced by Government incentives and individual decisions.

On the whole, the projected growth of population in B. C. and in Ontario should result in the continued growth of particleboard in all sectors in these provinces. By 1980, however, the population in the West should be sufficiently large to justify the locating and/or expansion of industrial plants (furniture, prefinishing) in these regions. As a result, the West's share of industrial consumption should increase at the cost of both Ontario and Quebec, in terms of per cent of total industrial consumption. The prefinishing and manufactured homes sectors should have significant growth in the West.

FIGURE III-5

PROJECTED REGIONAL DISTRIBUTION 1980 - 1985
COMPARED TO 1974



Source: CEI Research

In the construction and retail sector, the East will gain at the cost of the West, mainly because particleboard has greater room for further penetration in the Eastern Provinces. The growth in this sector should be especially large in Ontario due to the predicted growth of the population in this province. Quebec's share should drop after 1980, consistent with the projected slow increase in population.

The market share of the Atlantic Provinces should remain fairly stable. Particleboard consumption in this region should be encouraged by the presence of the large, indigenous plants. Industrial uses here should be mainly in the prefinishing application (probably by the particleboard plants) and possibly by secondary industries locating in this region as a result of Government incentives (furniture, factory built housing, etc.).

The probable regional distribution of the Canadian particleboard market in 1980 and 1985 as compared to the 1974 distribution is illustrated in Figure III-5.

COMPARISON WITH OTHER MARKET PROJECTIONS

It is of interest to compare the market forecast presented in the foregoing with particleboard market projections recently prepared by other sources which are considered to be authoritative.

Of the studies examined, three are of special interest.

First, the U. S. market overview prepared for the purposes of this study by Leonard Guss & Associates of Tacoma, Washington. LGA estimates a demand of 8.4 Bsf 3/4" (or about 10.0 Bsf 5/8") for the U. S. by 1985, or ten times the demand projected by Columbia for Canada. In view of the larger relative population growth and household formation rate projected for Canada, Columbia's forecast is well in line with the U. S. projection.

Table III-4 presents the comparative U. S. and Canadian consumption figures and growth rates, including the actual figures from 1964 to 1974 and projections to 1980 and 1985. The growth rates up to 1973 are shown in brackets to show the effect of the U. S. market drop in 1974.

The comparative U. S. and Canadian population and household formation growth rates are given in Table III-5 and Figure III-6 respectively.

On the whole, North American particleboard growth rates are expected to be halved during the coming decade.

Secondly, Columbia examined the projections prepared for all countries by the United Nations Food and Agriculture Organization (F.A.O.) during the current year. This agency projected the particleboard growth for North America using three differing assumptions and methods. The "trend" projection is the highest. The medium level is projected on a "balanced growth" basis, while the "subjective estimate" forecasts the lowest growth. The combined CEI-LGA estimate for North America is less than the lowest F.A.O. estimate (1985) by about 6%.

The third study examined was the latest revision of the forest products demand projection prepared by the U. S. Forest Service, a draft of which was made available to Columbia in September of this year. The figures given by this study are substantially lower than the CEI-LGA forecast at all levels of assumptions.

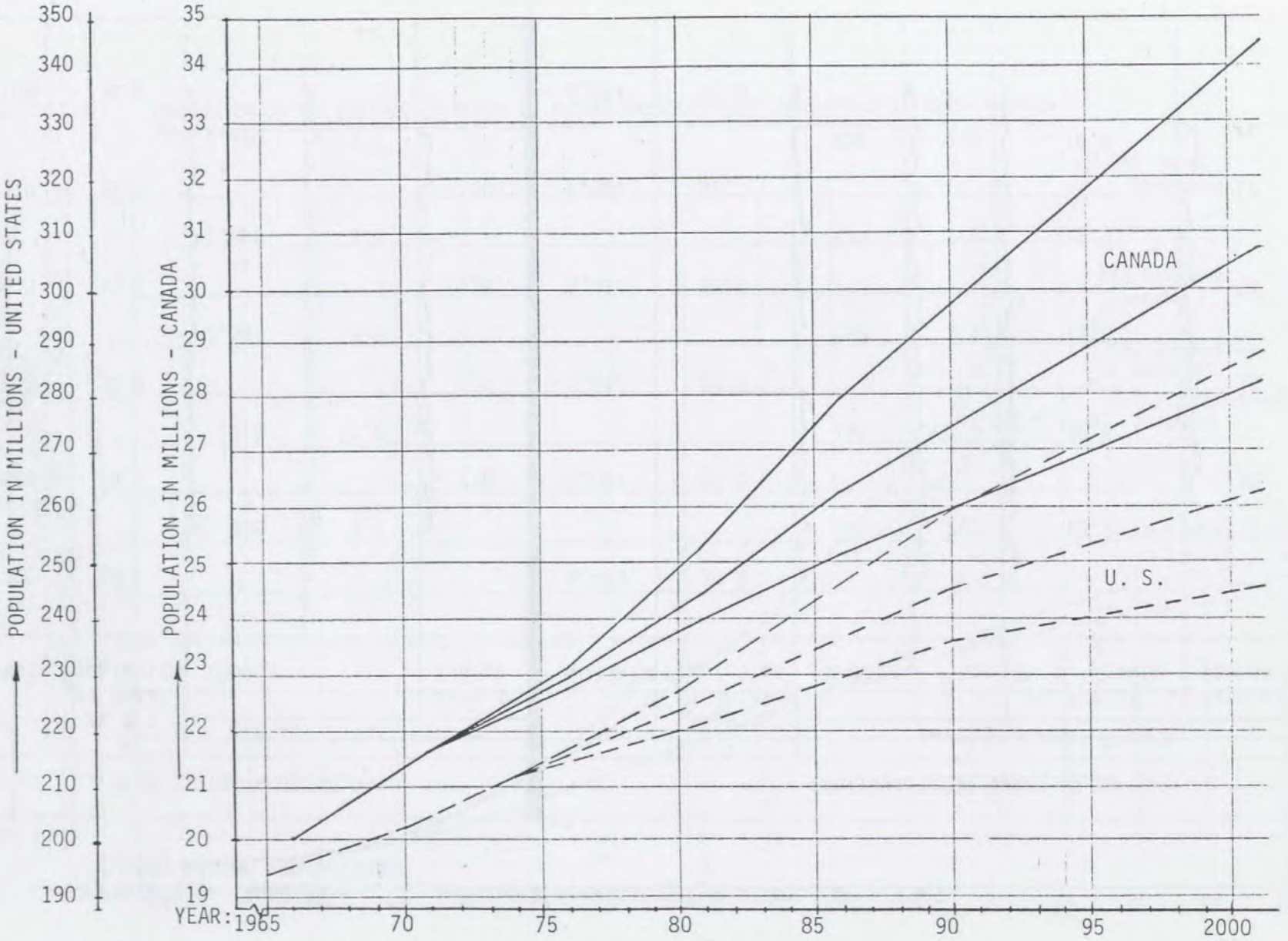
The validity of the Forest Service estimates are, first, not on a comparative basis with CEI-LGA and are, secondly, open to question.

TABLE III-4 - COMPARISON BETWEEN CANADIAN AND U.S. UREA PARTICLEBOARD CONSUMPTION GROWTH RATES-Past and Projected

	CANADA					U. S. A.				CANADA & U. S. COMBINED			
	MMsf		Average Compounded Annual Growth Rate			MMsf	Average Compounded Annual Growth Rate			MMsf	Average Compounded Annual Growth Rate		
YEAR	5/8"	3/4"	%	%	%	3/4"	%	%	%	3/4"	%	%	%
1964	70	58				639				697			
			18.4				21.6				21.3		
				(20.7)				(22.2)				(22.1)	
1969	163	135		19.2		1700		17.5		1835		17.6	
			(23.6)				(23.1)				(23.1)		
			20.0				13.5				14.0		
(1973)	(380)	(315)				(3900)				(4215)			
1974	404	337			13.5	3200			13.0	3537			13.1
			9.4				9.8				9.8		
1980	687	573		8.7		5600		9.2		6173		9.1	
			7.8				8.4				8.4		
1985	1002	835				8400				9235			

Source: C.E.I. & LGA Estimates

FIGURE III-6 - POPULATION COMPARISON BETWEEN CANADA AND THE UNITED STATES



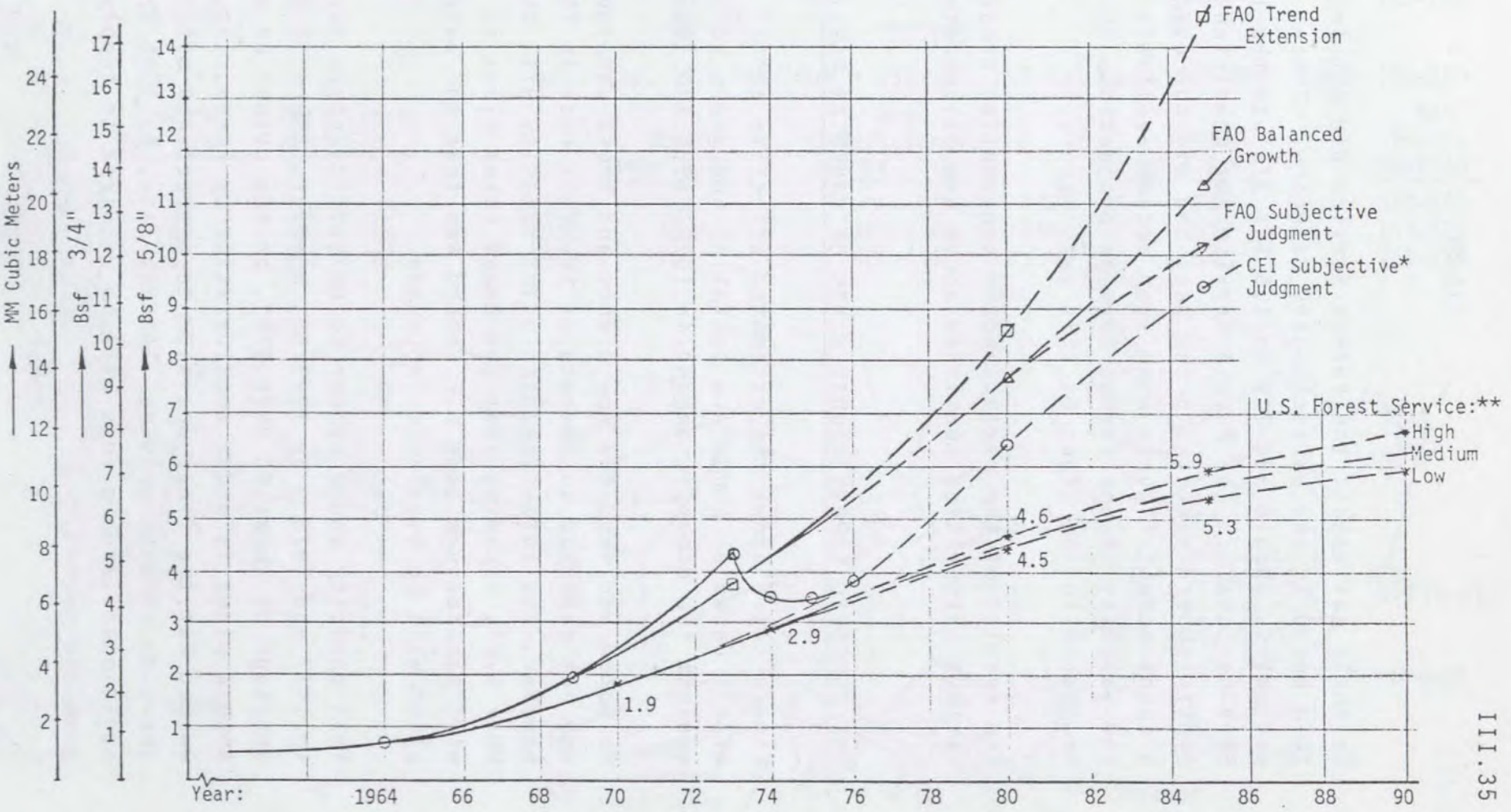
Source: U.S. Department of Agriculture, Forest Service and Statistics Canada

TABLE III-5 - COMPARISON OF CANADIAN & U. S. HOUSEHOLD FORMATIONS FOR YEARS 1960 - 1985
(USING MEDIUM PROJECTIONS)

YEAR	U. S. TOTAL HOUSEHOLDS					CANADIAN TOTAL HOUSEHOLDS					
			Average Annual Growth					Average Annual Growth			
	(000s)	As A % of Total Population	(000s)	%	Rate of Change	(000s)	As A % of Total Population	(000s)	%	As A % of U. S. Growth	Rate of Change
1960	52,600	29.1				4,443	24.8				
			936	1.7				125	2.7	13.3	
1965	57,280	29.5			278	5,067	26.0				30
			1,214	2.0				155	2.9	12.8	
1970	63,350	30.9			430	5,842	27.5				39
			1,644	2.5				194	3.1	11.8	
1975	71,570	33.5			(136)	6,810	30.1				24
			1,508	2.0				218	3.0	14.4	
1980	79,110	35.5			(110)	7,900	32.7				17
			1,398	1.7				235	2.8	16.8	
1985	86,100	36.8				9,074	35.0				

Source: CANADA - Central Mortgage & Housing Corporation
U.S.A. - U.S. Dept. of Commerce - Bureau of the Census
U.S. Dept. of Agriculture - Forest Service

FIGURE III-7 - COMPARISON OF THE VARIOUS ESTIMATES OF FUTURE PARTICLEBOARD CONSUMPTION IN NORTH AMERICA



* CEI & LGA Projections
** U.S. Forest Service projections corrected to include Canada

In their estimates, the Forest Service did not include MDF and thin board in the particleboard category. These, using CEI-LGA estimates, should add 1.2 to 1.5 Bsf 3/4" to the 1985 U.S. Forest Service totals. The Forest Service has consistently underestimated particleboard markets in the past and did not even take into account actual figures when such became available. The significance and validity of the Forest Service projections should therefore be judged in the light of this past record.

The results of the particleboard consumption projections by the various authorities mentioned above are illustrated in Figure III-7.

THE DOMESTIC SUPPLY REQUIREMENTS OF CANADIAN PARTICLEBOARD

Figure III-8 shows the estimated effective annual output capacities of all Canadian plants now operating and under construction, against the domestic demand in 1976, 1980 and 1985.

As noted earlier, the new plants and those undergoing modifications are not expected to operate at the full rate in 1976. In 1977, however, the total Canadian plant capacity will be close to 600 MMsf 5/8", assuming that the Great Lakes plant at Thunder Bay will manufacture some U.F. board and that the output of the Pluswood plant will be available in Canada.

This capacity would appear to be sufficient to supply domestic needs in 1977 and 1978. By 1979/80, however, there is likely to be a shortage of about 90 MMsf 5/8", or the output of one large plant. Such a plant is under consideration by Forex, Inc. at Val d'Or, Quebec but the final decision to proceed has not been confirmed at the time of this writing. At any rate, by 1985 three to four additional large plants will be required to supply the indicated domestic demand.

FIGURE III-8 - 1976 PLANT CAPACITY AND LOCATIONS vs. PROJECTED REGIONAL DEMAND

WEST (B.C. & PRAIRIES)

Capacity Plants	Capacity MMsf 5/8"
1	50- 60
2	15- 20
Total Capacity 1976	65- 80

	Demand MMsf 5/8"	Net Deficiency MMsf 5/8"
1976	90	10 - 25
1980	160	80 - 95
1985	247	167 - 182

ONTARIO & QUEBEC

Capacity Existing Plants	Capacity MMsf5/8"	New Plants	Capacity MMsf5/8"
5	45- 50	8	40- 50
7	45- 50	3	50- 60
6	15- 20	4	15- 20
9	45- 50		
	150-170		105-130

Total Cap. 1976 MMsf 5/8"= 255-300

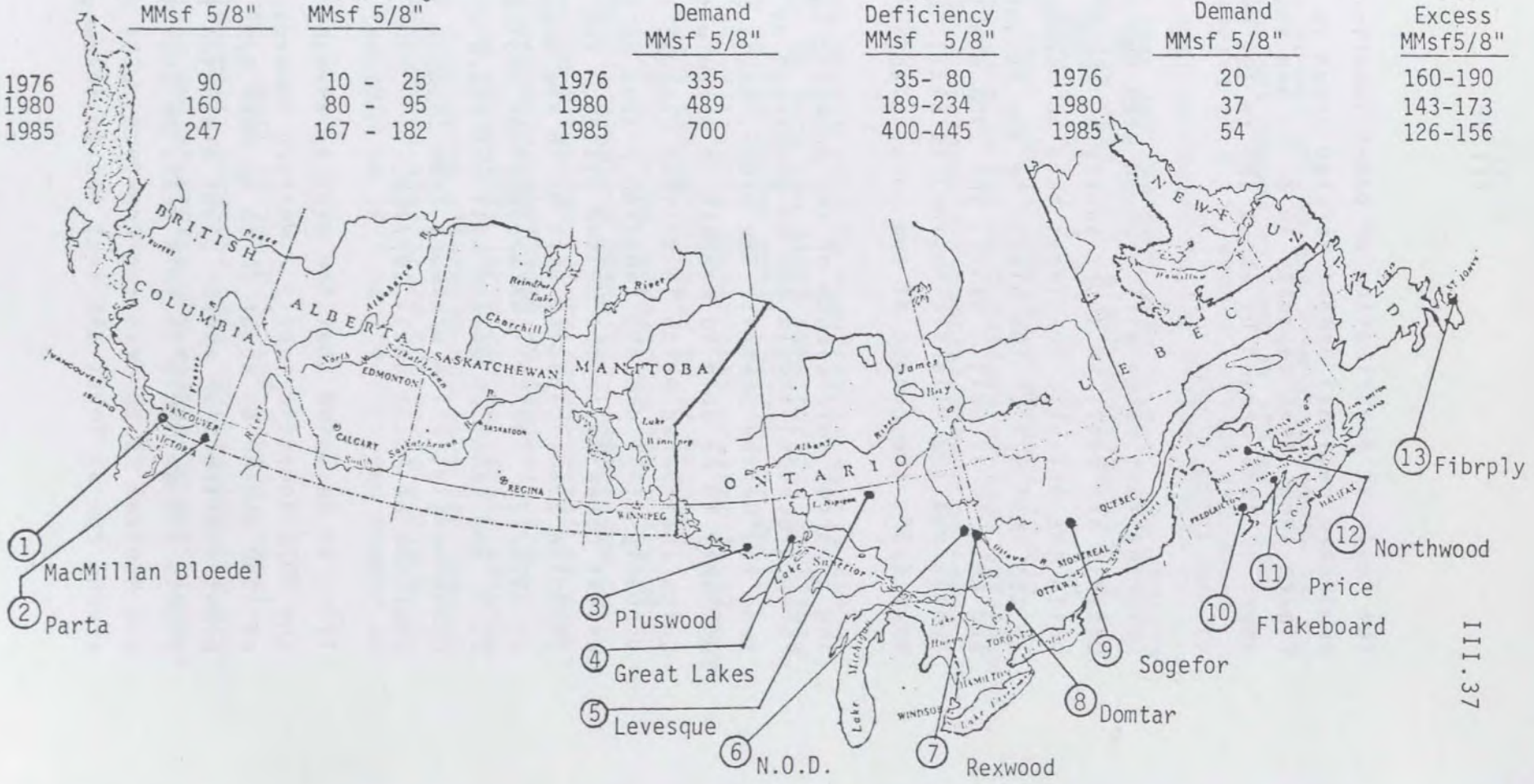
	Demand MMsf 5/8"	Net Deficiency MMsf 5/8"
1976	335	35- 80
1980	489	189-234
1985	700	400-445

ATLANTIC PROVINCES

Capacity Existing Plants	Capacity MMsf5/8"	New Plants	Capacity MMsf 5/8"
10	45- 50		
11 & 13	15- 20	12	120-140
	60- 70		120-140

Total Cap. 1976 MMsf 5/8"= 180-210

	Demand MMsf 5/8"	Net Excess MMsf5/8"
1976	20	160-190
1980	37	143-173
1985	54	126-156



The regional distribution of plant locations against the 1985 projected regional demand is also shown in Figure III-8. This Figure shows that capacity in B. C. and the Prairies will be short of 1985 demand by about 167 to 182 MMsf 5/8", or the output of two large plants.

Assuming that Forex will proceed with their plant, Quebec and Ontario are still in short supply by about 310 to 355 MMsf 5/8", while the Atlantic Provinces have an oversupply of about 126 to 156 MMsf 5/8". The plants in the Atlantic Provinces supply Quebec and Ontario as well. Still, the 1985 shortage in the East (Ontario, Quebec and the Atlantic region) is still in the order of 180 to 200 MMsf 5/8", the output of two large plants.

The apparent sufficiency of the domestic supply up to 1980 (if Forex proceeds) should not be construed as the end of imports from the United States. The older, small Canadian plants are unlikely to be able to compete in price with the large U. S. units (delivered price in eastern Canada) so that imports will probably still dictate Canadian prices as long as there is an excess capacity in the United States. The combined U. S. and Canadian plant capacity will be in the order of 6.0 Bsf 3/4" by 1976/77. The CEI-LGA projections indicate that the combined U. S. and Canadian demand will not reach this level until 1979. Consequently, price pressure from imports is expected to continue at least until 1977/78.

It is to be noted that the West is already slightly short of the 1976 domestic supply. Western domestic supply will be short of 1980 demand by about 70 to 80 MMsf 5/8", unless some new plant construction and/or plant expansion takes place. Eastern plants are unlikely to ship West, so that imports from Oregon and Montana to the Western Provinces will surely continue to be strong for at least the next two to three years.

PRICE PROJECTIONS

As noted above, particleboard prices are likely to remain at fairly low levels throughout Canada as long as the efficient U. S. capacity is in excess of U. S. demand. Price increases will be due mainly to cost increases in the United States -- around 10% to 12% per year for the next year or two. By 1977/78 however, the efficient, low cost U. S. plant capacity should be exceeded by the U. S. demand (about 4.0 to 4.5 Bsf 3/4") and prices will rise by at least 25% to 30% above present levels (in 1975 dollars), adjusting to the cost factors of less efficient plants and/or to permit a reasonable financial return on newly constructed units.

By 1980/81, several new plants will be required to supply the North American demand. No such new plant construction is likely to be initiated in the United States until 1977/78, or until prices stabilize at a significantly higher than present level. By that time, capital costs should increase by at least a further 15% to 20%, so that a strong increase in the price of particleboard after 1980 is almost a certainty, either due to shortages in supply or the financial return requirements of newer units. In view of the projected shortages in capital, the difficulty of assuring an adequately large concentration of wood supply and the rapidly developing alternate end uses for "waste" wood (fuel!), an over-expansion similar to the large scale U. S. plant construction in the 1969 to 1974 period does not appear to be a strong possibility.

The older, smaller plants, both in the U.S. and Canada, should benefit by these developments, provided they can weather the present soft markets and maintain and/or modify the plants to meet future market demands.

EXPORT OPPORTUNITIES

UNITED STATES

The report by Leonard Guss and Associates on the U. S. markets, which is enclosed in Appendix B of this report, shows some very interesting export opportunities for the Canadian particleboard industry. The pertinent conclusions may be summarized as follows:

1. The total demand for particleboard in the United States by 1985, including medium density fiberboard and thin board but excluding phenolic structural board (waferboard or similar) is estimated by LGA at 8.4 Bsf 3/4" or about 10.1 Bsf 5/8". Thirty-nine per cent of this demand or about 3.9 Bsf 5/8" will be located in the North-Central and North-East regions, adjacent to the Canadian border.

2. Eastern Canadian particleboard plants have a distinct freight advantage against Western U. S. particleboard plants in these North-East and North-Central markets. The average freight advantage, at the present, is in the order of $29.75 3/4" basis or $24.80 5/8" basis.

   Assuming an FOB mill value of $130 to $150 per Msf 5/8" and a duty cost of 10% or $12 to $15 per Msf 5/8", the freight advantage including duty would be in the order of $10 to $12 per Msf 5/8".

3. The main competition in these areas does, and is likely to continue to, come from West Coast U. S. plants. The distribution of U. S. plant capacity against U. S. demand is given as follows.

TABLE III-6

U.S. Plant Capacity 1976	Total	West	East (Total)	N.E. & N.C.
MMsf 3/4"	5,350	2,450	2,900	300
Percent	100	45.8	54.2	5.6
U.S. Demand				
Percent	100	15	85	39
1976 MMsf 3/4"	3,600	540	3,060	1,400
1980 MMsf 3/4"	6,117	917	5,200	2,380
1985 MMsf 3/4"	8,400	1,260	7,140	3,280

The figures as to total productive capacity and regional distribution of capacity differ somewhat from the figures given by LGA, as they are based on the latest information of plant shutdowns and relocations.

It is obvious from the foregoing that Eastern U. S. plant capacity (East of the Rockies) nearly equals the 1976 projected demand in the East but falls short of the projected eastern demand by 1980. Furthermore, about 90% of the eastern plants are located in the South, while about half of the demand is in the North-East and in the North-West. As a result, the Southern plants always have and will continue to concentrate sales to the South in order to minimize outbound freight costs. The North-East and North-Central States get most of their supply from the West.

4. LGA projects that about 55% of the 1985 U. S. plant capacity will be located in the West. This could be good news indeed for eastern Canadian particleboard plants.

In Columbia's judgment, however, LGA's estimate is somewhat questionable, as increasing freight costs will continue to erode the competitive position of western plants in relation to eastern markets, regardless of raw material availability and cost advantages. The industry will therefore tend to prefer eastern plant locations, in spite of less suitable and more costly raw material and also power cost conditions. In spite of this, total eastern U. S. plant capacity is not likely to exceed the 4.0 Bsf 3/4" to possibly the 4.5 Bsf 3/4" mark and will fall short of 1985 eastern demand by at least 3.4 to 3.0 Bsf 3/4". Chances are that southern capacity will be no more than equal to southern demand, about 3.8 Bsf 3/4", while plants in the northern region will be producing at a rate of .600 to .800 Bsf 3/4". As a result, out of the total northern market of 3.28 Bsf 3/4", 2.3 to 2.5 Bsf 3/4" or 2.65 to 3.0 Bsf 5/8" will be or could be available to eastern Canadian plants.

True, U. S. western plants will compete for this market. It is not unreasonable to assume, however, that, say, 30% of the excess or .85 to 1.0 Bsf 5/8", could be captured by eastern Canadian plants in view of the distinct freight advantage (including duty cost) against the U. S. West.

The eastern Canadian market (Ontario, Quebec and Atlantic region) for 1985 is estimated at about 750 MMsf 5/8". The northern U. S. markets, therefore, more than double the market potential of eastern Canadian plants.

5. The *average* freight advantage given earlier is related to a point somewhere in Indiana or central Ohio. To selected locations in New York State, New England, Pennsylvania and New Jersey from selected locations in the Atlantic Provinces, Quebec and Ontario, this freight advantage is, at the present, $5 to $10 per Msf 5/8" higher.

As freight rates surely will continue to increase, the freight advantage should continue to improve from the eastern Canadian point of view and is likely to be in the order of $15 to $18 per Msf 5/8", after duty charges, by 1980. Any possible reduction of duty rates would result in further improvements, as should a possible widening discount position of the Canadian dollar against the U. S. dollar.

6. Eastern U. S. plants always had a strong marketing advantage against western plants, due to their ability to ship to customers by truck, overnight, against two to three week rail shipments from the West.

   Eastern Canadian plants would have similar advantages to most northern U. S. locations while still retaining a large part of the freight cost advantage.

Leonard Guss and Associates are somewhat skeptical about the ability of eastern Canadian plants to export to the United States, possibly based on past performance. This subject will be discussed in Section IV of this report. Suffice it to say that the North-Central and North-East U. S. markets do present a large export potential for plants located in the Atlantic Provinces, Ontario and Quebec. The north-central U.S. (North-Midwest) may be a potential for plants in the Prairie Provinces or possibly B. C., given certain favourable conditions.

EUROPE AND JAPAN

The examination of the markets in Japan and Europe was not within the scope of this study. Columbia did, however, study the recent projections prepared by the United Nations Food and Agriculture Organization (F. A. O.). The particleboard consumption figures for Europe and Japan from 1960 to 1963 with projections to 1980 and 1990 as estimated by the F.A.O. study group in 1975, are given here in Table III-7.

TABLE III-7 - UNITED NATIONS F. A. O. PROJECTIONS OF PARTICLEBOARD CONSUMPTION IN EUROPE AND JAPAN

	1960	1965	1970	1973	1980		1990			
					TREND EXTENSION	SUBJECTIVE JUDGMENT	TREND EXTENSION	BALANCED GROWTH	SUBJECTIVE JUDGMENT	
EUROPE	2.2	6.2	12.4	19.5	33.3	33.0	74.0	60.0	45.0	MM m^3
	1.2	3.5	7.0	11.0	18.8	18.6	42.0	33.9	25.4	Bsf 3/4"
JAPAN	0.08	0.2	0.8	0.7	2.3	1.5	7.5	5.5	3.0	MM m^3
	0.04	D.1.	0.4	D.4	1.3	0.8	4.2	3.1	1.7	Bsf 3/4"

It is evident that the particleboard consumption in Europe is expected to more than double within the next fifteen years and, in Japan, to more than quadruple, using the low "subjective judgment" projection figures.

The domestic raw material resources in these countries are insufficient to supply this projected demand. F. A. O. suggests that raw material for board manufacture in Europe will have to be imported from the U.S.S.R. and/or Africa and to Japan from eastern Russia and/or Southeast Asia. Alternately, Europe and Japan will have to import manufactured board from the areas noted above.

The U.S.S.R. has a large potential domestic demand of its own and is not likely to export sufficiently large quantities. The timber resources of Africa and Southeast Asia are mainly of the high density mixed hardwood species and are not especially suitable for particleboard manufacture. The unsettled political climate in these countries, remote locations, transport, chemical supply and cost and other problems are also likely to retard plant construction in these areas. As a result, in Columbia's judgment, Canada has an excellent opportunity to capture some of these markets after 1980.

In Europe, the United Kingdom appears to be an obvious target. It is the largest importer of particleboard (about 400 MMsf 5/8" in 1972) and relies on other western European countries (mainly Finland) for its supply. Other western European countries, mainly France, Belgium, the Netherlands and even West Germany, should present further export targets in the Eighties.

For plants in B. C., the Japanese market is an interesting potential in view of the large supply of unused softwood mill residues in this province.

The actual economic feasibility of penetrating the European and Japanese particleboard markets will depend on many factors which will be discussed in Section IV of this report.

S E C T I O N I V

OPPORTUNITIES

FOR

CANADIAN PARTICLEBOARD MANUFACTURERS

GENERAL

The foregoing sections of this report show that the effective Canadian particleboard plant capacity was insufficient to meet the 1973/74 Canadian demand and that Canadian plants experienced difficulties in competing with the lower priced U. S. imports in 1974/75. As a result, the Canadian plants were running below rated capacity throughout 1974/75, while United States plants supplied some 40% to 48% of the Canadian market demand. Over the past three years, the insufficiency of the Canadian plant capacity and the curtailed operating rate of the plants in the face of high import levels were recognized by both industry and Government and illustrated by the figures published by Statistics Canada. The reasons for this occurrence, however, were not fully understood.

Sections I, II and III of this report pointed out some of the weaknesses of the Canadian industry in comparison with its U. S. counterpart. The opinion was expressed that the Canadian industry cannot operate in isolation from the United States and must develop the capacity to compete in the total North American markets, in order to become fully competitive on the domestic scene. The alternate solution of increasing the duty protection of domestic particleboard may give short term relief but it is unlikely to result in long term benefits to either the Canadian particleboard manufacturers or the end user industries.

Columbia is familiar with both the Canadian and the United States particleboard plants and industry. The study team visited and/or talked to all major Canadian plant operators over the past four months. No attempt was made to obtain specific cost information. Overall quantity and material purchasing costs and data known to and shared by the industry, however, were discussed and evaluated and possible solutions to short term and long term problems were considered.

In the following chapters, Columbia submits a review and analysis of the Canadian particleboard industry, its present state and its long term potential. The evaluations are made in comparison with the industry in the United States in an attempt to provide Canadian particleboard operators with basic industry information which, hopefully, will contribute to decisions as to short term problems and future developments. Some of the remarks presented may, of necessity, sound overly critical. They are meant, however, to be constructive and are based on a concern for the future health of the Canadian industry.

Columbia is hopeful that they will be accepted in this spirit.

REVIEW OF THE CANADIAN PARTICLEBOARD MANUFACTURING INDUSTRY IN COMPARISON WITH THE UNITED STATES INDUSTRY

The list of Canadian particleboard plants now operating and under construction is presented in Table IV-1.

This table reveals that the *average* output capacity of the Canadian particleboard industry is about 45 to 48 MMsf 5/8" per annum, including Northwood's plant at Chatham, New Brunswick, whose production was, in the past, not sold in Canada and which is still not operating anywhere near its rated capacity. Excluding the Northwood plant, the average Canadian capacity is about 41 MMsf 5/8", and excluding the two new plants as well (Domtar and Pluswood), the average capacity is about 38 MMsf 5/8" per annum.

In comparison, the average plant capacity for 76 plants in the United States is in the order of 58.5 MMsf 3/4" or about 70 MMsf 5/8".

TABLE IV-1 - CANADIAN U.F. BONDED PARTICLEBOARD PLANTS AT PRESENT OPERATING AND UNDER CONSTRUCTION

PLANT IDENTIFICATION		PRESS SIZE	RATED CAPACITIES (MMsf 5/8"/Annum)
MacMillan Bloedel Ltd. Vancouver, B.C.		4' x 8'-25	50 - 60
Parta Industries Grand Forks, B. C.		4' x 10'-5	15 - 20
Great Lakes Paper Co.[1] Thunder Bay, Ontario		8' x 20'-10	15 - 20
Levesque Plywood Hearst, Ontario		5' x 24'-8	45 - 50
New Ontario Dynamics[2] New Liskeard, Ontario		5' x 12'-4	15 - 20
Rexwood, Ltd. New Liskeard, Ontario	#1 Line #2 Line	5' x 10'-10 4' x 16'-7	45 - 50
Sogefor Ltee. Lac des Iles, Quebec		4' x 16'-16	45 - 50
Flakeboard, Ltd. Milltown, New Brunswick	#1 Line #2 Line	8' x 32'-1 5' Mende	45 - 50
Price Mills Berry Mills, New Brunswick		4' Extrusion	15 - 20
Fibrply St. John's, Newfoundland		4' x 8'-10	
Northwood Chatham, New Brunswick		8' x 24'-11	120 - 140
1975 CAPACITY:			410 480
Domtar Huntsville, Ontario		5' x 56'-1	40 - 50
Pluswood[3] Atikokan, Ontario	#1 Line #2 Line	5' x 56'-1 8' Mende	60 - 70
1976 CAPACITY:			510 - 600

[1] Will primarily produce P.F. bonded board

[2] Number of openings uncertain

[3] Press length uncertain

The "average" size advantage of the U.S. industry, however, does not convey sufficiently the significant picture. The important fact is that about 70% of the U.S. output is manufactured in plants having a capacity in excess of 80 MMsf 5/8" and about 50% of the output in plants with a capacity in excess of 100 or 120 MMsf 5/8".

Plant size, however, is not the only important difference between the Canadian and the U.S. industries. About 80% of the U.S. industry is integrated with sawmill and/or plywood mill operations and utilizes, at least partially, self-generated and owned mill waste for raw material. About 60% of the U.S. output is from plants with not only a capacity in excess of 80 to 100 MMsf 5/8" and integrated with sawmill and/or plywood operations, but which are also owned and operated by companies which have well organized, nation wide wholesale and retail distribution outlets (Georgia-Pacific, Louisiana-Pacific, Weyerhauser, Willamette Industries, etc.).

In contrast, the Canadian industry is characterized by plant units integrated neither with raw material generating wood products plants nor national or even regional wood products sales distribution outlets. Only the MacMillan Bloedel plant in Burnaby, B.C. is operating with self-generated raw material as well as selling its product through a self-owned distribution outlet. The acquisition of the Chatham, New Brunswick plant by Northwood may result in a somewhat similar situation. All other plants, however, rely on mainly purchased raw material and/or have limited or contracted sales distribution capability.

In addition to the above, there is a further important difference in the financial status or capability of the corporations involved in the manufacture of particleboard in Canada and the U. S. It is estimated that all but 15% of the U. S. particleboard output capacity (not number of plants) is owned by corporations with annual sales volumes in excess of $150,000,000. About half of the output is owned by corporations with sales in excess of $250,000,000 per year and about one-third of the output by corporations with overall gross sales in excess of $500,000,000 per year.

Of the older Canadian particleboard plant owners, only MacMillan Bloedel Limited has a comparative size. The other existing plants are all owned by small companies with sales well below the $50,000,000 per year level. The acquisition of the Chatham plant by Northwood and Domtar's entry into particleboard will improve the future "average" financial strength of the Canadian particleboard industry.

The arguments presented above are not meant to degrade, per se, the economic viability of smaller plants operated by independent small companies. Such units did and will continue to operate and flourish both in Canada and the United States, given certain favourable conditions. The economics of scale, industry integration and financial stature do, however, significantly affect competitive strength and, especially, the capability to survive weak market conditions.

In addition to these overall factors, the Canadian particleboard industry has further significant and basic handicaps in attempting to compete with U. S. plants. Some of these are, so to speak, self-inflicted, mostly due to a misreading of the overall North American economic and marketing climate, while others are inherent in the basic Canadian circumstance. These are summarized in the following pages.

Wood Raw Material Costs

The early Canadian plants (with the exception of Plaswood) were based on the utilization of roundwood, as were the early plants in the eastern United States (1950 to 1962). By 1962, however, the U.S. industry realized the economic advantages of mill waste type raw material utilization, as well as the difficulty of converting the somewhat marginal board quality advantages resulting from the use of roundwood into adequate sales premiums. As a result, old plants were rapidly converted to the utilization of mill waste, expanded in capacity and all new plants -- certainly up to 1972 -- were based on the use of mainly dry softwood shavings and some softwood sawdust type raw material. In contrast, the bulk of the eastern Canadian industry stayed with roundwood, partly because of necessity (the lack of mill waste in the proximity of a given plant) and partly because of a strong European influence which overemphasized, at least in North American terms, the technical and quality advantages of roundwood.

The two western plants, MacMillan Bloedel and Parta, utilize either self-generated or readily available, low cost softwood mill waste and compare favourably with United States plants in this regard. The use of spruce mill waste gives Partaboard a distinct quality and sales appeal advantage and helped Parta to survive in spite of its plant and press size limitations.

In the East, all operating plants, with one exception are partly or totally utilizing roundwood. Furthermore, most of the roundwood used is of the hardwood species. Some plants do use some softwood mill waste which, however, has to be transported from distant locations as these plants were not originally located with the utilization of softwood mill waste in mind.

Of the new plants, Pluswood is reported to be based on roundwood (Aspen) raw material, while the Domtar plant's raw material conditions are not known at this time.

The cost advantages of using mill waste, especially dry shavings, as against roundwood, cannot be overemphasized. Mill waste is not only cheaper to buy but also less costly to handle and process. While it is recognized that the purchased cost of mill waste type wood may significantly escalate in the future, due to its alternate end use as fuel, in present day terms the wood cost difference between a typical mill waste and a roundwood plant, in terms of the cost of the dry furnish as delivered in the dry bin prior to blending, is substantial. The appropriate general and comparative figures are given here as follows:

TABLE IV-2

	ROUNDWOOD	MILL WASTE
	Eastern Canada (Mainly mixed hardwood species)	U.S. West Coast or South (About 70% dry shavings, 30% green sawdust, soft-wood species)
	$/O.D. Ton	$/O.D. Ton
Purchased Cost (Delivered in Yard)	$20.00 - $30.00	$10.00 - $15.00
Processing Cost (Unloading, Storage, Milling and Drying)	8.00 - 12.00	3.00 - 5.00
Cost Delivered in Dry Bin	$28.00 - $42.00	$13.00 - $20.00
Cost per Msf 5/8" (@ 2500 O.D. lbs/Msf 5/8")	$35.00 - $52.50	$16.30 - $25.00

The processing costs given above are meant to include all operating, maintenance and capital overhead costs applicable to the "front end" of the plant.

The higher roundwood processing costs are due mainly to the greater number of people and equipment required in the handling of roundwood and the fact that roundwood handling equipment, either mobile or permanently installed, requires a great deal of maintenance and the higher drying cost of all green versus partially dry (dry shavings) furnish.

The average difference between the two types of operation is likely to be in the order of $20 per O.D. ton or $25/Msf 5/8", comparing similar plant capacities. In Columbia's judgment, the bulk of the eastern Canadian plants have, at the present, a cost disadvantage in this plant section, against U. S. mill waste based operations, amounting to at least $25 but most likely approaching $30/Msf 5/8".

Resin Costs

The purchasing cost of resin is, on the average, 10% to 15% higher in Canada than in the United States. This is partly due to the higher resin price, FOB resin plant, and partly due to the greater average freight distances between resin plant and particleboard plant in Canada.

Urea formaldehyde resin prices in the States vary somewhat by region. At the present, prices on the West Coast and in the North are in the order of 14 to 15 cents per lb. of solids and in the South are somewhat lower, due to the large concentration of chemical plant capacity in this region, in the order of 13 to 13½ cents per lb. of solids. Canadian U.F. resin prices are in the order of 16 to 17 cents per lb. of solids. Higher than present industry usage rates will probably result in some increase in resin prices.

Canadian plants also appear to use more resin per unit of board produced than do U. S. plants. U. S. plants, both in the West and in the South, use 5.5% to 6% resin solids (per cent of wood used) in the manufacture of underlayment grades and 7.5% to 8.5% in industrial grades. Plants utilizing the "caul-less" systems do have to use more resin in underlayment grades (7% to 8%) in order to hold the mat together. In industrial grades, however, the resin amounts required to achieve adequate board properties are usually sufficient for satisfactory mat compaction.

Plants in the U. S. South, operating on southern pine, use slightly more resin than western plants operating with western softwood species. The use of the Douglas Fir species probably results in a minimum of resin addition requirements.

The resin consumption of the western Canadian plants (Parta and MacMillan Bloedel) is comparable to U. S. West Coast practice. Most eastern Canadian plants, however, do appear to use higher resin addition levels, probably averaging in the order of 9% and in some plants close to 10%, mainly as dictated by the hardwood species raw material but also by other factors. The low resin content underlayment grade is seldom, if ever, manufactured in eastern Canada.

The difference of 1% of resin addition amounts to about $3.50 to $4.25 per Msf 5/8" at a resin purchasing price of 14 to 17 cents per lb. of solids. The eastern Canadian plants would appear to have a resin cost disadvantage of about $13 to $15/Msf 5/8", Canadian industrial grade board vs. U. S. underlayment grade board and $5 to $8 per Msf 5/8" industrial vs. industrial grade.

Wax costs are also higher in Canada than in the United States. This cost difference, however, is in the order of only $0.50 to $1.00 per Msf 5/8" and is therefore not considered to be significant.

Plant Size

The significance of plant size in reference to the manufacturing costs has been mentioned in earlier chapters. For the sake of clarity and in order to illustrate the cost disadvantage of the basically smaller Canadian plants (as compared to U. S. plants) in numerical terms, the following plant size dependent cost factors are presented:

- Capital Costs

  It is less costly to install a large plant than a small plant in terms of capital cost per unit of output, assuming comparable equipment quality and degree of automation. In the 1969 to 1973 period, particleboard plants with an output capacity of 100 to 120 MMsf 5/8" were installed in North America for a capital cost of $7.0 to $9.0 million, while plants having a capacity of 40 to 50 MMsf 5/8" were installed for $4.5 to $7.5 million. The capital cost of the larger plants per unit of output ranged from $60 to $90/Msf 5/8" output per year, while the cost of the smaller units ranged from $110 to $190 per Msf 5/8" output per year level. All the larger plants in question had multi-opening 16' to 24' long and 4' to 5' wide presses while the smaller units were either of the multi or single opening press (8' width) type. The low capital cost of $4.5 million refers to a 4' x 8' size multi-opening press unit.

Present capital costs are considerably higher in all cases, probably twice the figures given above. The relative cost relationships, however, still prevail as do the basic reasons for these cost differences. The unit capital cost relationship is essentially due to the fact that the front end (receiving and storage, wet bins, etc.) and the finishing end equipment and installation costs, as well as the cost of installing utilities, services and even basic buildings, does not differ greatly by plant capacity, assuming a similar degree of mechanization and automation in both cases. If, on the other hand, a small plant is automated or mechanized to a lesser degree, it incurs a further penalty in future unit labour costs.

- Unit Labour Costs

The main part of any plant -- from raw material receiving to the end of the press line -- requires about the same number of operators, regardless of plant capacity. The number of operators required in a plant using mill waste raw material is in the order of 4 to 7 per shift, depending more on the degree of automation than on the plant size. The large plant may require more maintenance people than a small plant. The extra cost of sturdy equipment and automation is, however, more difficult to justify in a small plant than in a large one. As a result, the total number of people employed by the large and the small plant are likely to be equal or certainly not vary in proportion to the output capacity.

The large plant does employ more people in the finishing and warehousing section, but not more than in proportion to throughput.

On the average, unit labour costs (operating and maintenance) in a 50 MMsf 5/8" output plant are likely to be nearly twice the unit labour costs in a 120 MMsf 5/8" output plant, or in the order of $17 to $27 per Msf 5/8" in the small plant against $10 to $15 in the large plant (at the current wage rates, resulting in a yearly wage cost of $13,000 to $15,000 per man, including fringes).

A roundwood front end increases unit labour costs in both cases. Therefore, the unit labour cost difference between a large, mill waste plant and a small, roundwood plant could be in the order of $15 to $20 per Msf 5/8".

- Overhead

Yearly administrative and other overhead costs are also relatively independent from plant output, so that the smaller units are likely to have a $3 to $7 per Msf unit cost disadvantage in this regard.

It is recognized that the decision to build smaller plants in Canada was justified by the small size of the Canadian market. In 1964, a 100 MMsf 5/8" capacity plant in the United States (Roseburg #1 plant) was meant to capture about 15% to 20% of the U. S. market at that time. In the same year, a similar size Canadian plant would have been forced to count on capturing the entire Canadian market. Even in 1970/71, the output of such a large Canadian plant would have meant about a third of the Canadian market demand. The Northwood (then Weyroc) plant was such a unit and it is considered to be unfortunate that this plant was not designed to serve and compete in the North American as well as the United Kingdom markets.

The large plants built on the U.S. West Coast in the sixties did not have a local market of adequate size. They were essentially aiming at the eastern U.S. markets some 3,000 miles away and, at that time, about $35/Msf 5/8" freight cost distant. The same opportunity existed in eastern Canada in relationship to the same eastern U.S. markets. Canadian operators, however, chose to restrict themselves to the eastern Canadian markets which were and still are comparable in size to the U.S. West Coast markets. The strong penetration of U.S. West Coast boards into eastern Canada (and eastern U.S.) coupled with the highly satisfactory financial track record of the U.S. West Coast plants as compared to the weak financial performance of eastern Canadian plants, is taken as a strong argument in favour of the larger plant units in general and, especially, their capability to absorb higher outbound freight costs and survive weak markets.

Press Size

The older Canadian plants have distinct press size limitations. The 4' x 8' or 4' x 16' press sizes are well suited for industrial cut-up, or full panels which are eventually used for cut-up. The 5' x 10' or 5' x 12' press size presents difficulties and/or low utilization when making 4' x 8' panels.

The 5' x 24' press is a size suitable for many alternate end uses, as is the 8' x 32' and the 8' x 24' press and the new single opening presses being installed. By 1976, the press size limitations of the Canadian industry should be largely overcome.

At the present, the western plants cannot supply 4' x 12' mobile home decking panels and the eastern plants do not choose to do so. However, two eastern plants are in a good position to supply this market.

About 80% of the U. S. output is made on 5' wide and 16', 18' and 24' long multi-opening presses, manufacturing board in either 4' or 5' widths.

The press size limitation of presently operating Canadian plants may and usually does result in cost increases in terms of lower productivity, higher waste factors or missed market potential.

Climate

Canadian plants, with the exception of the coastal region of B.C., do have to operate under extremely cold winter weather conditions over almost half of the operating year. This cold weather operation results in not only higher capital costs (deeper footings, insulated buildings, covered equipment, etc.) but also higher on-going costs due to higher heating costs and more difficult maintenance procedures.

It is estimated that this cold climate operation results in 4% to 8% higher capital costs as well as about 3.5% to 5% higher unit operating costs, against comparable plants located in the U. S. South or West Coast.

Equipment Duty Costs and Taxes

Plants are more costly to construct in Canada, not only because of the cold climate but also because of the higher cost of particleboard plant equipment in Canada as compared to similar costs in the United States and Europe.

Very few particleboard equipment items are manufactured in Canada. Certainly, the major items such as presses, saws, sanders, milling and drying equipment have to be imported from the United States or Europe at a duty cost of 7% to 15% of the original purchase price. Federal and/or Provincial taxes on equipment and buildings are also higher in Canada than in the United States. These two items add a further 5% to 7% to the capital cost of a Canadian plant as compared to the cost of a similar plant in the U. S.

Equipment Quality and Degree of Automation

Most existing Canadian plants are operating with lower quality, less sturdy equipment and are automated to a significantly lower degree than the bulk of the U. S. plants. The decision to install these plant configurations is probably justified by the need to keep capital costs in line with U. S. costs, despite duty cost and climatic disadvantages and to keep "front end" and finishing end capital costs in proportion to the smaller plant size. Unfortunately, these decisions do result in higher operating and maintenance costs and plant earnings are seldom adequate to pay for the installation of improved equipment or for the suitable modification of the existing plant.

Overall Cost Comparison

All the cost disadvantages enumerated above could, if all additive, amount to a unit cost difference between a large West Coast U. S. plant utilizing largely dry mill waste and a smaller eastern Canadian plant utilizing roundwood, of about $60 to $70 per Msf 5/8". This is about equal to the actual direct unit operating cost of a large West Coast plant as well as the freight plus duty cost of shipping the board from the U. S. West to the Canadian East. On the whole, this must be the case, as the delivered cost of U. S. West Coast board is not only competitive with but is, at times, below the cost of Canadian made board on a delivered in eastern Canada (duty paid) basis.

No attempt was made to estimate the cost figures of individual Canadian plants. For the consideration of the management and operators of Canadian plants, however, the probable operating cost range applicable to a large U. S. West Coast operation was estimated and assembled in Table IV-3. The details are estimates prepared by Columbia. The accuracy of the cost total is backed up by the knowledge that present FOB West Coast mill prices are close to or are slightly above the breakeven costs of the large established U. S. West Coast units.

The depreciation costs shown are tentative, as most West Coast units were built in the Sixties and most are largely depreciated in financial terms. At present day construction costs, a 120 MMsf 5/8" plant would cost in the order of sixteen to eighteen million dollars and would carry a depreciation cost of $10 to $15 per Msf 5/8" (10 to 15 year straight line depreciation schedule).

It is recognized that small specialty plants do have their place in the industry. Specialties, however, are hard to define (as related to particleboard) and, in practice, it is difficult to get away from competition in the general commodity markets. Suggestions in this regard will be submitted later on in this section of the report.

TABLE IV-3 - ESTIMATED OPERATIONAL COST RANGE OF A TYPICAL U.S. WEST COAST PARTICLEBOARD PLANT

Output: 120 MMsf 5/8" per year

Raw Material: About 80% Dry Shavings;
20% Green Sawdust

COST ITEMS	Density:	UNDERLAYMENT GRADE (40-42 lbs/cu ft)	INDUSTRIAL GRADE Incl. 15% to 20% Cut-up (44-45 lbs/cu ft)
Wood		$ 12.00 - 18.00	$ 12.50 - 20.00
Resin		18.00 - 22.00	24.50 - 31.00
Wax		2.50 - 3.00	2.50 - 3.00
Power		1.50 - 2.50	1.50 - 2.75
Fuel		1.00 - 2.00	1.50 - 2.25
Labour (Operating & Maintenance)		8.00 - 11.00	12.00 - 15.00
Supplies (Operating & Maintenance)		4.50 - 5.00	5.50 - 6.00
Administration & Overhead		4.00 - 4.50	4.00 - 5.00
Depreciation		1.00 - 3.00	1.00 - 3.00
TOTAL		$ 52.50 - 71.00	$ 65.00 - 88.00

* * *

Range of Conditions:

Wood: 2400 to 2500 O.D. lbs/Msf 5/8" - $10 to $15/O.D. Ton

Resin: 5.5% to 6.0% in U.L. - 7.5% to 8.5% in Industrial

Wax: 0.75% to 1.0%

Power: 200 to 275 kWh/Msf 5/8" - 0.8 to 1.0 cents/kWh

Fuel: Mostly self-generated waste

Labour: 64 - 88 men for U.L. Grade (4 shift operation)
96 - 120 men for Industrial Grade (4 shift operation)
@ $15,000/year per man, including fringes - average

CRITERIA FOR COST COMPETITIVE PLANTS IN CANADA

It was demonstrated in earlier chapters that, in theory, only one large additional plant will be required in Canada to supply the domestic demand by 1980. One such new plant is under consideration at the present (Forex, Inc. in Val d'Or, Quebec). Three to four additional plants are needed to meet the projected demand by 1985.

It may be argued that the Canadian market is still too restricted to justify the installation of large plants. It was also shown, however, that any new Canadian plant must be cost competitive with existing U. S. plants in order to establish itself in the Canadian markets. Furthermore, the analysis presented in Section III in regard to the eastern U. S. markets concluded that this section of the U. S. markets doubles the market potential available to well located, cost competitive Canadian plants.

The previous chapter of Section IV argued that, on the whole and with some exceptions, large, fully cost competitive plants are likely to be more profitable catering to large markets at lower mill nets (due to higher outbound freight and possibly duty costs) than smaller units catering to restricted markets at higher mill nets. The financial performance of large West Coast (U.S.) over the past 15 years, as compared to the earnings record of smaller eastern plants (both in the United States and Canada) was taken as an example to demonstrate the validity of this contention.

Columbia submits that the Canadian condition is suitable for the establishment of such fully cost competitive particleboard plants, that such plants could produce at the same basic cost as the large established U.S. plants, excepting capital cost factors, and thereby be competitive in the eastern U.S. markets. It is further contended that the establishment of such plants would be beneficial to Canada both in economic and social terms, subject to certain raw material limitations which will be discussed later in this Section.

In attempting to establish such plants, however, one must face the realities of the market place. Competition is likely to be strong and tough. Nothing can be given away and all cost factors must be carefully evaluated. Experience shows that particleboard quality, beyond basic requirements, is a somewhat elusive concept and price is more often than not the determining factor in the largest segments of the market.

It is therefore considered to be useful to review here some basic criteria which are, on the whole, characteristic of the most successful established North American plants and which are likely to retain their validity in spite of any foreseeable technological or overall economic developments. They are as follows.

1. Raw Material

All financially successful North American particleboard plants operate on low cost, softwood mill waste. While it is recognized that the cost of such softwood mill waste may increase and the availability be restricted due to the alternate end uses in pulp and as fuel, this type of raw material is still the most suitable for particleboard and results in the simplest, most trouble free and lowest cost operation. The use of dry shavings results in the lowest drying and milling costs.

"White wood", such as spruce, is preferred as the resulting light board colour is a distinct sales advantage. The rapidly growing eastern Canadian spruce sawmill industry appears to offer an excellent opportunity for the establishment of particleboard plants. Wood waste availability and quality in B. C. is excellent. The development of large softwood saw mills in the Prairies will create opportunities in this region. These western locations, however, are less favourable in regard to markets.

At the present, plants in the U. S., both on the West Coast and in the South, purchase softwood mill waste for a delivered to mill cost of between $10 and $15 per O.D. ton. Eastern Canadian plants should match this cost, while western Canadian plants should stay well below this cost level.

At least for the mid-term, low wood cost is considered to be the major, possibly the only, justification for the establishment of a Canadian particleboard industry.

2. Integration

It is highly important, if not essential, that a particleboard plant be integrated with a large lumber mill or be located in the vicinity of an adequate concentration of such waste generating mills. Mill waste is bulky, especially shavings, and cannot be economically transported over long distances.

A self-owned wood waste supply, at least in part (50% to 60% of total), is considered to be a must, if strong staying power in weak markets is to be assured.

The ability to ship mixed cars -- mixed with the products of adjacent saw mills and/or plywood plants -- is considered to be an advantage.

Integration with a large wood products sales organization is most certainly a great advantage but not absolutely essential.

3. Plant Size

As noted earlier, an output capacity of 80 MMsf 5/8" per year is considered to be minimum for domestic competitive capability, 120 MMsf 5/8" per year for export capability. The wood requirements of these plants are in the order of 100,000 to 150,000 O.D. tons per year respectively. This amount of wood waste (sawdust and shavings) is generated by the sawing and planing of 200 to 300 MMBf of lumber per year (generally about .5 O.D. tons per Mbf). Shavings are, as a rule of thumb, half of the wood waste generated ("wood waste" other than pulp chips or chippable material).

4. Fuel

At the present and at presently foreseeable fossil fuel costs, the plant should be designed to utilize self-generated wood waste as fuel (such as trim and sanderdust). If dry shavings constitute 80% of the raw material input, the self-generated trim and sanderdust is sufficient to satisfy boiler and dryer fuel requirements. A large percentage of green raw material input will require fuel purchases from the outside (wood, bark or other). Integration with saw mills is an advantage in this regard.

5. Power Costs

The plant should be located in areas where electrical power costs are low and are likely to remain relatively low. Power costs on the U. S. West Coast and in the T.V.A. served southern regions are well below one cent per kWh. Power costs in this range are obtainable in Canada.

6. Press Size

The most successful U. S. plants are operating with 5' x 16', 5' x 18', 4' x 24' and 5' x 24' multi-opening press units. The 5' x 24' press size offers the greatest flexibility and is the most suited for the above stated output capacity.

The 8' press width is acceptable but does not offer the degree of added flexibility in North American markets as it is claimed to have in European markets. The extra capital cost of an 8' press is difficult to justify in terms of savings in trim and, in the case of single opening presses, better thickness tolerance (less sanding losses). Extra capacity does justify 8' width, in plant output ranges above 150 MMsf 5/8" per annum.

These judgments are based on the experience and financial performance of operating North American plant units.

7. Resin Costs

A large plant uses a great deal of resin, about 8,000 to 14,000 tons of resin solids per year or a value of $2.5 to $4.5 million per year. The plant location should be chosen with regard to resin location. Alternately, the possibility of constructing a resin plant in the vicinity of the particleboard plant, by a resin supplier, should be explored. This was found to be a practical solution in some U. S. plant locations, remote from then existing resin manufacturing facilities (LaGrande, Oregon and Missoula, Montana).

Government incentives aimed at reducing the resin price differential between the United States and Canada are considered to be highly desirable.

8. Plant Locations

The operation of a large particleboard plant requires good personnel, especially in maintenance and quality control. Such skilled people do not usually prefer locations remote from relatively large population centers. For this reason, plant locations adjacent to relatively large towns (populations of 10,000 to 15,000) and not too far from larger cultural centers are preferred.

This is a difficult problem in Canada and some compromises will have to be made in most cases. Nevertheless, it is a point to be considered and kept in mind.

9. Medium Density Fiberboard Plants

The raw material criteria given above refers to particleboard. Some medium density fiberboard plants prefer the use of mixed hardwood chips. In this type of operation, hardwood is certainly not a disadvantage. Chips are preferred to sawdust and shavings as they give better fiber length.

The MDF process is favoured in the eastern U.S. as neither southern pine nor hardwoods lend themselves to the manufacture of a high quality particleboard, similar to the board made from western species. By the MDF process, they may be converted into top quality industrial products.

The eastern Canadian area does offer suitable "white wood" (spruce) softwood mill waste raw material; the particleboard process is less costly and simpler to operate than an MDF process. As a result, and all things considered, an MDF plant in eastern Canada is, at this time, considered to be financially less attractive and less export capable than a particleboard plant based on spruce mill waste.

10. Thin Board "Mende" Plants

Thin particleboard as manufactured by the continuous Mende process has proved to be of much higher quality and strength if roundwood or chips are used as raw material. The extra cost of roundwood is therefore justified, if not demanded by this process.

The integration of "Mende" lines with standard particleboard or waferboard operations is considered to be a distinct advantage, assuming a market is available for such a thin board product.

POTENTIAL CANADIAN PLANT LOCATIONS

The previous chapter summarized the criteria which should be observed in the establishment of a new, fully competitive particleboard plant in Canada. A plant of sufficient size to be fully competitive in the domestic market may be too large to survive on the future Canadian market demand alone. The economic justification for such a plant should preferably be supported by an export potential. Such an export potential was identified in Section III of this report -- the northern part of the United States for the short term and long term potential to Europe and Japan. The potential locations for the establishment of suitable plants must therefore be examined in terms of raw material availability as well as in relation to domestic and export markets.

The spruce and also the pine saw mill industry of eastern Canada, mainly Quebec and Ontario, offer interesting opportunities. The old small saw mills are being replaced by large capacity, new installations, creating adequate concentrations of softwood mill waste in a number of given locations.

In Quebec, the northern area, extending from Chicoutimi to Val d'Or into northern Ontario, would appear to offer the best potential. The non-chippable mill waste is not utilized in this area at the present and may not be required for use in pulp or as fuel in the future. The area is well located in relation to the eastern Canadian and the North-East U.S. markets and is sufficiently close to deep sea port facilities to make exports to Europe a good economical possibility.

Northern Ontario, adjacent to Quebec, and northwestern Ontario (West of Sault Ste. Marie) would be the next choice. It is understood that large softwood saw mill installations are projected for this area and the waste generated by such mills offers good potential. The area is well located relative to the North-Midwest of the United States and has European export potential, within certain limitations, through Great Lakes ports.

The Atlantic Provinces, mainly New Brunswick, Nova Scotia, possibly Newfoundland, provide favourable locations in relation to both the North-East U.S. and Europe. The softwood mill waste in this region, however, appears to be fully utilized, either by particle-board plants or by pulp mills and additional concentrations of softwood mill waste do not appear to be available.

The Atlantic region does have a large reserve of low grade mixed hardwoods which are suitable for use by MDF plants, if wood costs can be kept at reasonable levels. Whole tree chipping and/or the establishment of hardwood saw mills (furniture components, railroad ties, pallets) appear to be a prerequisite to assuring sufficiently low wood costs. The pulp mills in the area, however, may be forced to utilize hardwoods sooner than expected.

For the sake of comparison, eastern U.S. MDF plants pay, at the present, $20 to $30 per O.D. ton for hardwood chips. A Canadian plant would have to keep wood costs below the $20/O.D. ton level to be cost competitive in the United States.

Central and southwestern Ontario would appear to offer the best opportunities for establishing a Canadian MDF plant. This region offers availability of hardwood roundwood and mill waste (chips and sawdust), proximity to domestic furniture markets; North-East U.S. markets and potential for exports to Europe. Again, for good export capability (to the United States), wood costs should be kept below $20/O.D. ton average.

The West is in a less favourable position. The Prairies do not have large concentrations of softwood mill waste at the present and are also distant from either domestic or export markets. Some large softwood sawmills may be forthcoming in this area and create opportunities for particleboard manufacture.

British Columbia, of course, has large concentrations of softwood mill waste. In the Coastal locations, which are best suited for overseas export as well as for the supply of the relatively large market concentrations around Vancouver and Victoria, the available mill waste is likely to find uses in pulp and as fuel. The interior regions of B.C. have plenty of suitable locations. Here, the mill waste generation is in excess of pulp and fuel requirements, certainly in present day terms. These locations are well suited for the supply of the western Canadian particleboard markets, as well as having some export potential at a relatively low profit level to the U.S. and possibly Japan. The availability of white spruce in this region is an advantage. This is probably the most suitable general area for the location of a large plant which will be required to supply the western domestic demand by 1980.

Section III of this report showed that there is already a shortage of domestic board in the West and that two large new plants are required to supply the demand by 1985. Such plants may be established in the interior of B.C. or, possibly, the Prairies but export capability to the United States and eastern Canada should be maintained as particleboard products from the older, established plants in Oregon and Montana are likely to continue to dictate prices in western Canada. In order to establish a strong competitive position, a western plant must keep all costs to a minimum and should keep base wood costs below the $5/O.D. ton level (delivered). Additional returns on the wood should be subject to the future price levels of particleboard. An integrated operation is in the best position to achieve such a strong cost competitive position.

In the long run, the availability of suitable softwood mill waste may be better in western Canada than in the western United States. In this case, there is a good long term potential for western plants. Much will depend on the relative fossil fuel availability and price in the two countries.

Any chance for a successful exploitation of the overseas market potential (Europe and Japan) is subject to suitable deep sea shipping arrangements. The large Canadian forest industry corporations which are already shipping pulp and lumber to Europe and Japan, on either chartered or self-owned special vessels, are in the best position to exploit these opportunities.

Cooperation with strong established marketing organizations in the export market areas appears to be a must. The export potential will also depend on the future relationship between the Canadian dollar and the currency of the importing countries.

THE FUTURE OF THE EXISTING CANADIAN PLANTS

The foregoing remarks do not sound encouraging with regard to the future of the existing smaller Canadian plants. Competition from U. S. imports is likely to be severe, at least for the next year or two. The Northwood plant, when it attains its full potential, should be more than cost competitive with imports in eastern Canadian markets and may contribute to the extension of lower price levels in eastern Canada. In addition, if in the future several large plants are built in Canada, designed for and aimed at U. S. and European export markets, Canadian board price levels will have to settle below those in the United States, creating a further pressure on the profit potential of smaller, older plants, especially on plants which are forced to operate with expensive roundwood.

The situation, however, is not all that bleak. A number of options appear to be availble to existing Canadian plant operators for lowering costs and upgrading their products and thereby maintaining and/or improving profitability.

The most important occurrence which should help the position of the existing plants is the massive escalation of capital costs which has taken place over the past three years. This escalation of costs is likely to continue, if only at a lesser rate than in the immediate past.

The capital cost disadvantages of small vs. large plants noted earlier refers to the capital cost of plants built during the same period. Most existing Canadian plants, however, were built between 1962 and 1971 at a substantially lower capital cost and should also be partially depreciated. They do have a size disadvantage against the existing larger U. S. plants built during the same period. Against new large plants, however, the capital cost disadvantage should be minimal or nonexistent.

The other cost disadvantages resulting from size, such as higher labour and overhead costs, may be minimized by modifying and automating existing facilities. Such modifications require capital investments which probably are justifiable in terms of overall savings in operating costs.

Wood costs are a different matter. While it is true that the cost of mill waste will increase in the United States, probably at a faster rate than in Canada, roundwood costs will also rise, if only due to the large labour content in the harvesting of roundwood, both in Canada and in the U. S. Furthermore, the processing costs of roundwood are still higher than those of mill waste. At any rate, it would appear to be prudent on the part of existing plants, to explore all the options which may be available for lowering wood purchasing and processing costs.

If suitable mill waste is available in a given area, it should be utilized. In Columbia's judgment, dry shavings shipped from substantial distances and purchased at about the same delivered to mill cost per O.D. ton as roundwood, still permit substantial savings in milling and drying costs and thereby lower total operating costs.

If there is no mill waste in the area, whole tree chipping may be investigated. Based on present figures in the U. S. South, this harvesting method is less costly. Furthermore, the transport, storage and handling costs may also be reduced by the bulk handling of chips against the more or less "piece handling" of roundwood.

Plant expansion is a further option to be explored, if sufficient and suitable raw material is available in the area at reasonable cost. It may be possible in some cases to expand existing plants at present capital costs and still keep the unit capital cost of the expanded unit well below the unit capital cost of an entirely new plant.

If little or no improvement is possible in wood costs and output capacity, the possibility of changing to product lines, whose price would justify the higher wood costs, should be investigated. The phenolic bonded mobile home decking or floor and roof decking type product appears to have possibilities. Flakes, made from roundwood, do impart strength properties to the board which are not possible to achieve with shavings or other non-chippable mill waste. The price of such products is more likely to support roundwood costs. The product in question would be somewhat similar to "waferboard" utilizing smaller flakes or wafers.

The price of thin wall panelling board made with U.F. or P.F. resins could also support roundwood costs. Indications are that such thin board will have to be made with flakes, at least in part, in order to obtain adequate strength properties. The manufacture of such thin wall panelling board does not necessarily require the continuous pressing equipment. Several plants in the U. S. successfully and profitably manufacture these products on multi-opening press units. Existing press size (other than 4' x 8' or multiples of 4' x 8') may be a limiting factor in this regard.

The most obvious solution to small plant problems is specializing in certain products and services, and/or upgrading the product by either prefinishing or further secondary manufacturing operations.

Plants relatively close to large industrial market concentrations could easily develop cut-to-size operations and services. They may go even further and consider the manufacture and supply of semi-finished or finished and machined furniture components.

Several Canadian particleboard plants have already turned to various prefinishing operations. As noted earlier, prefinishing in Canada appears to have good potential and may be developed into further secondary operations, such as cut-to-size and the manufacture of finished components.

The manufacture and sale of fire-proof or flame retardant particleboard products is gaining increasing attention in the United States. The door core and wall panel applications deserve special interest in this regard. The eastern Canadian metropolitan markets would appear to offer a good potential for such products.

The foregoing summarizes the options which may be available in general and overall terms, to the operators of smaller existing plants for the improvement of plant profitability. The specifics will have to be based on the problems and merits of each individual operation. On the whole, the existing plants do have an opportunity to survive and prosper, subject to management's imagination and willingness, a strong sales effort and, possibly, some support in obtaining the capital necessary to implement plant modifications.

OPTIONS FOR A NATIONAL STRATEGY

The decisions as to further particleboard plant construction in Canada will most likely be made by individual corporations and entrepreneurs, based on economic feasibility and within the limits of the available financing. Governments, however, do influence these decisions in terms of tax regulations and other incentives. In fact, the growing pressures on Federal and Provincial Governments with regard to job creation and improved forest utilization are likely to result in a significant impact on the decision making of individual corporations.

In the foregoing, Columbia has expressed and supported the opinion that the encouragement of the construction of additional, small domestic market oriented plants, lacking export capability is unlikely to result in either satisfactory long term plant earnings or employment stability. The proximity of the U.S. particleboard industry would cause such smaller plants to be at a cost disadvantage even in the domestic markets, certainly for the next four to five year period and most likely, at least from time to time, in the long term as well.

Nevertheless, the market forecasts suggest that well managed and well located existing mills can probably survive while new, larger capacity mills are developed to take advantage of available surplus wood supply.

From the point of view of national strategy, two basic options appear to be available:

1. discourage, or at least not encourage, new particleboard plant construction in Canada;

2. actively encourage the construction of large, new particleboard plants with strong export capability.

The consequences of the first option would be the acceptance of a continuing reliance of the Canadian secondary industries on imported board (at least from time to time), a restricted supply situation in the Canadian particleboard markets and a higher board price level in Canada versus the United States. It could also mean a loss of opportunities for employment and improved forest resource utilization.

The loss in employment opportunities may not be too serious. The Canadian industry could concentrate on the prefinishing and otherwise upgrading of particleboard products and purchase some or most of the raw board from the U.S. at reasonable and/or relatively low prices.

Prefinishing and other secondary manufacturing operations, such as the manufacture of furniture components, is less capital and more labour intensive than the manufacture of particleboard. Considering the projected shortages of capital, these finishing or remanufacturing operations would generate a higher rate of employment per invested dollar and probably a better return on investment. Discouraging the importation of prefinished and remanufactured particleboard rather than that of raw board, would help to foster this type of development.

As to the resource aspect, the underdevelopment of the basic Canadian particleboard manufacturing industry may not necessarily mean the underutilization of the forest resource. Softwood shavings and sawdust may be used in the manufacture of both chemical and thermo-mechanical (groundwood) pulp, as can mixed hardwoods and whole tree chips with a relatively high bark and dirt content. In fact, the Canadian pulp and paper industry may soon be forced to use these, in present day terms, lower grade raw materials. Furthermore, the value added to these raw materials may be, and probably is, significantly higher in pulp and certainly in paper than in particleboard. On the other hand, the greater capital intensity of pulp and paper manufacture may render the utilization of these raw materials in particleboard more desirable. This aspect of the problem will have to be resolved in terms of the future world demand for pulp and paper vs. particleboard, against the available world raw material supply.

The utilization of the available mill waste in Canada as fuel must also be considered. The future fuel supply situation in Canada is by no means clear at this time. It is possible that the forest industry could economically utilize its own waste as fuel in the future or indeed may be forced to do so.

It would appear therefore that the demand on the available Canadian "wood waste" supply from the various potential end use sources requires careful investigation before this aspect of the national strategy in regard to particleboard can be clarified. If it is decided that part of this resource is available to and is best utilized in particleboard, the second basic option noted above offers interesting opportunities.

Job creation, both in the primary and secondary aspects of particleboard manufacture, would be a major beneficial consequence, coupled with a plentiful supply of both raw and finished particleboard to the Canadian furniture, cabinetry and housing construction industries, probably at or below U.S. price levels.

The present deficit in the Canadian trade balance due to particleboard imports, amounting to over $20,000,000 in 1974, could be easily turned into a trade surplus of an equal amount or more.

The ready availability of domestically manufactured particleboard at a relatively low price level would encourage the growth of the Canadian furniture and manufactured housing industries and improve their export capabilities.

A strong, developing particleboard industry in Canada could encourage the domestic manufacture of particleboard plant equipment, at the present largely imported from the United States or Europe, and thereby create additional secondary industry export opportunities.

The potential benefits enumerated above could certainly be substantial and are deserving of careful consideration.

There are, however, disadvantages, mainly in connection with the future of the small, existing plants. These plants -- in their present form -- may find it difficult to achieve any degree of profitability if Canada becomes a net, large scale exporter of particleboard. Some may have to be aided in the financing of plant modifications and the installation of prefinishing and other manufacturing facilities, which will be required in order to assure survival.

As noted earlier, the Canadian particleboard industry is likely to develop along the lines and on the basis of the decisions of individual corporations, to some extent independent of government incentives. The degree of such incentives, however, will be decided by governments. Considering the arguments presented above, the final stance adopted by governments in this regard will have to be, or should be, subject to a careful evaluation of the available supply of suitable raw material in Canada against the demand on this raw material from all potential sources.

The basic potential advantage of an export oriented Canadian particleboard industry in Canada is the large supply of low cost raw material. If the cost of this raw material escalates to near or above the raw material price levels prevailing in the importing countries, due to demand pressures from other sources, the future economic feasibility of such an industry is highly questionable.

S E C T I O N V

WAFERBOARD REVIEW

WAFERBOARD REVIEW

The study was to determine the present and future demand for urea formaldehyde bonded particleboard products. As a secondary objective, the study also attempts to access the domestic and export markets for phenolic resin bonded waferboard.

The questionnaires which were mailed to wholesalers, retailers and contractors included inquiries regarding waferboard sales and consumption. The interviewing team also questioned industrial end users, but mainly wholesalers, retailers and contractors, regarding waferboard purchases and sales.

The information received from these sources, however, cannot be judged as sufficient for the presentation of a clear overview of the present consumption of and future demand for waferboard in the domestic markets. At best, Columbia gained some general impressions about the market which gives some indications as to the present use of waferboard in Canada, as well as future trends.

The main reason for the difficulties encountered in the collection of data in regard to waferboard sales and sales volumes is that only a very small portion of the Canadian waferboard output is sold to industrial end users. Probably over 95% of the volume is sold through retail outlets to either contractors or to the "shoulder" trade. There are over 15,000 contracting firms and over 5,000 building products retail outlets in Canada. Each of these may or may not sell or use significant volumes of waferboard.

As the small contractors and retail outlets in rural areas may, and sometimes do, use or sell more waferboard than large firms in metropolitan centers, it was difficult to determine the significant sales or end user firms. Most of the information obtained was either from wholesalers or larger contractors and/or retail outlets and from the waferboard manufacturing plants themselves. Due to the large volume of waferboard sold to the shoulder trade, even these sources were somewhat in doubt as to the actual end use of the waferboard product.

The waferboard market volumes given below are assembled on the basis of the estimated plant output of the Canadian waferboard plants operating in 1975. The rest of the evaluation is based on the general impressions gained by the interviewers in the course of the survey.

The Domestic Markets For Waferboard in 1975

The years 1974/75 represent a somewhat difficult period on which to base any judgment as to waferboard sales trends.

Up to 1974, waferboard was produced in Canada by two plants: MacMillan Bloedel at Hudson Bay, Saskatchewan and Waferboard Corporation Limited at Timmins, Ontario. The combined capacity of these two units is estimated to be in the order of 170 to 180 MMsf 3/8" per annum. During 1974 and 1975, three new plants reached the start-up stage: Weldwood of Canada at Longlac, Ontario, MacMillan Bloedel's second plant, located at Thunder Bay, Ontario and the Great Lakes Paper Company's plant also at Thunder Bay, each rated at an output capacity of about 100 MMsf 3/8" per annum. As a result, the productive capacity of waferboard was more than doubled in Canada in the 1974/75 period.

The start-up of these new plants also coincided with a substantial drop in the housing construction activity in Canada and, therefore, a drop in the general construction grade panel board markets. Not only waferboard but also plywood seemed to be over-produced in Canada during the current year. In addition, a significant volume of plywood entered Canada from the United States, mainly sheathing grade. As a result, the market place for construction grade panel products appeared to be quite confused and it was difficult to discern any kind of trend which might be called pertinent or lasting.

While it is true that the new waferboard plants did not start at their full productive capacity and operated throughout the first three quarters of 1975 at a curtailed production rate, the market was still asked to absorb about half as much board again as the consumption in 1973, in the face of a general weakness in the overall market place.

Columbia estimates that the five waferboard plants noted above will produce about 240 to 280 MMsf (3/8" basis) of board in 1975. It would also appear that about 30 to 50 MMsf 3/8" will be exported to the United States. The domestic consumption of waferboard is therefore likely to be in the order of 200 to 230 MMsf 3/8" for the whole year of 1975. This volume amounts to about 10% of the total estimated softwood plywood consumption in Canada for the same year (about 2 Bsf 3/8").

While waferboard production and consumption figures are measured on a 3/8" thickness basis, similar to plywood (some sources keep records on a 5/16" basis), the dominant thicknesses in waferboard appear to be 1/4" and 5/16". It is estimated that around 70% of the total waferboard production in Canada in 1975, as well as in previous years, was sold in the 1/4" and 5/16" thicknesses. The remaining 30% was sold in thicknesses of 3/8", 7/16" and 1/2". Only a very small amount was sold in thicknesses above 1/2".

The general impressions gained in the course of the survey regarding the sales and end uses of waferboard in Canada are summarized as follows:

1. Very little waferboard is used in industrial applications. Some prefabricated home and mobile home manufacturers tried waferboard in periods of plywood shortages. Most of them experienced difficulties, however, mainly due to the "rolling" or warping of the waferboard over the studs or supports. As a result, most returned to the use of plywood and/or lumber. Certainly, in 1975, very little waferboard was used by this industry sector.

   Some furniture manufacturers also tried waferboard in various applications such as case goods, bottoms and backs, dust bins, and others. No extensive use, however, was uncovered in this industry sector.

   Based on the information received from wholesalers and plants, a significant volume of waferboard was sold to various industrial firms for use in packaging and crating. No attempt was made to uncover or interview such firms as they are likely to be engaged in activities completely unrelated to particleboard.

   On the whole, the best potential for the future sales of waferboard in the industrial sector would appear to be the prefabricated housing and/or the prefabricated housing component industry, as well as the various crating and packaging applications. Some present strength and dimensional property problems will have to be overcome in order to substantially penetrate these markets. In addition, a reasonable price discount (against fir, spruce or poplar plywood) appears to be a requisite for at least initial market penetration.

2. As a general observation, more waferboard was seen in the wall sheathing and roof decking applications of on-site constructed single family and multi-family (low rise and garden apartments) than was the case in former years. The contractors interviewed generally liked waferboard although they did have certain complaints. These complaints were mainly in connection with the slipperiness of the panel on the roof and the "roll" or warp of the panel on the roof or wall. Contractors stated that the use of waferboard, either on the wall or on the roof, required closer support spacing. The warp or roll was also observed on the roof and the contractors interviewed stated that such roll sometimes does not appear until two to three years after the completion of the building.

   At least one plant (Waferboard Corporation Ltd. of Timmins, Ontario) supplied a "skid proof" panel. The skid proof feature consisted of one rough panel surface which was obtained by placing a wire or cloth mesh screen next to the mat in the pressing operation. This skid proof product appeared to be well received.

Waferboard is required to be 1/16" (in some cases 1/8") thicker than plywood if used in certain load bearing applications (roof deck, floor deck, etc.). This results in a somewhat higher price of the applicable panel as well as greater weight. Both of these features appear to be a significant constraint on the further penetration of waferboard into these large volume panel markets. Some improvement in dimensional stability would also appear to help future sales in the housing construction industry.

3. All, or certainly most, of the retail yards interviewed were quite encouraged about waferboard sales. Most felt that waferboard was a "good mover", better than U. F. particleboard. All the retail yards visited had waferboard in stock, mostly 1/4" and 5/16" panels, while quite a number of them did not carry U. F. particleboard. The impression was gained that well over half of the waferboard sold through retail yards was moved through the shoulder trade and retailers had only a vague idea as to its actual end use application.

4. Fencing would appear to be the most popular or certainly the most visible end use application of waferboard. In this end use, waferboard may be found from one end of the country to the other, from B.C. to the Atlantic Provinces.

   Waferboard is also used extensively in the construction and repair of farm buildings, mainly in the Prairies but also in the other Provinces.

   Waferboard is frequently found in the construction of recreational homes throughout the country, such as hunting, fishing and ski cabins, beach houses, etc. In these structures it is used as roof deck, wall panelling, dividers and many other general panel applications. Interestingly, a large amount of waferboard is used in B. C. where it must compete with indigenous plywood at a freight disadvantage.

   In general, it may be stated that the main penetration of waferboard into the panel markets is as a utility panel in 1/4" and 5/16" thicknesses in a great number of mainly non-structural applications. The penetration of waferboard into the truly structural applications is very limited at this time.

The existence of a number of new alternate suppliers will probably result in increased promotional and sales activity and competition in the market place. This in turn is likely to accelerate the penetration of waferboard into the large volume structural end uses. In Columbia's judgment, the sales efforts and future market penetration could be aided and accelerated by some improvements in the strength and the dimensional stability properties of present waferboards, so that waferboard may compete with plywood at the same thickness in load bearing applications.

The Demand/Supply Situation

In addition to the waferboard plants noted earlier, a further plant will start operations in 1976: Alberta Aspen Board at Lesser Slave Lake, Alberta. The addition of this plant means that by 1976 the waferboard plant capacity in Canada will be about 600 MMsf 3/8" per annum. In 1976, the Canadian waferboard industry will consist of the following plants:

TABLE V-1

MacMillan Bloedel Ltd. Hudson Bay, Saskatchewan	Capacity:	120 - 130 MMsf 3/8"
MacMillan Bloedel Ltd. Thunder Bay, Ontario		100 - 110 MMsf 3/8"
Waferboard Corporation Ltd. Timmins, Ontario		45 - 50 MMsf 3/8"
Great Lakes Paper Company Thunder Bay, Ontario		100 - 110 MMsf 3/8"
Weldwood of Canada Ltd. Longlac, Ontario		100 - 110 MMsf 3/8"
Alberta Aspen Board Ltd. Lesser Slave Lake, Alberta		100 - 110 MMsf 3/8"
TOTAL CAPACITY		565 - 620 MMsf 3/8"

The location of these plants is illustrated in Figure V-1.

FIGURE V-1 - ESTIMATED EFFECTIVE ANNUAL OUTPUT CAPACITY OF ALL CANADIAN WAFERBOARD PLANTS PRESENTLY OPERATING AND UNDER CONSTRUCTION

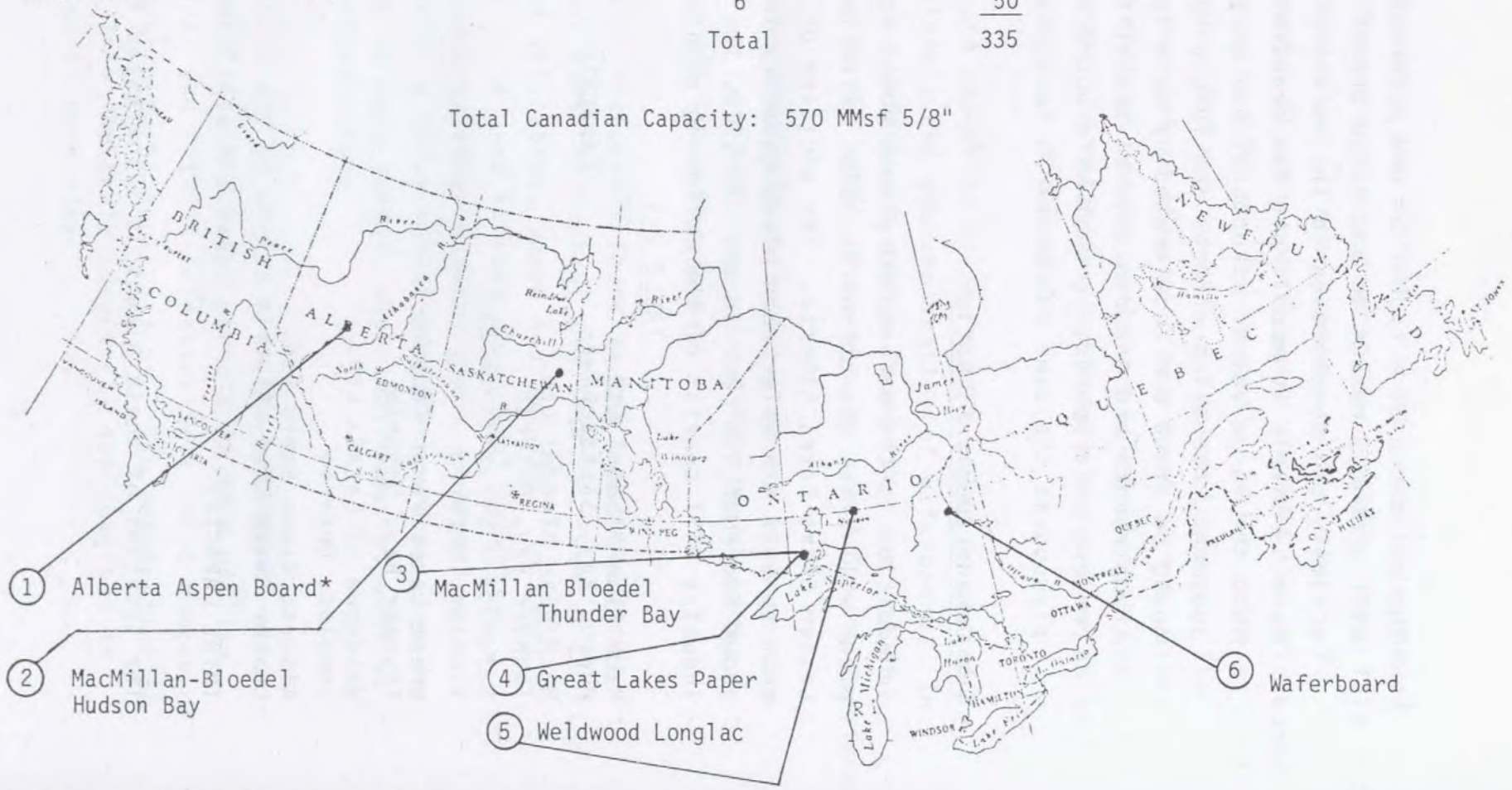
WEST (B. C. & PRAIRIES)

Plant	Capacity MMsf 5/8" Basis
1	100*
2	135
Total	235

ONTARIO AND QUEBEC

Plant	Capacity MMsf 5/8" Basis
3	85
4	100
5	100
6	50
Total	335

Total Canadian Capacity: 570 MMsf 5/8"



*Start-up late '75 or early '76

In order to absorb this plant capacity, the waferboard markets would have to grow from the present 10% to nearly 30% of the Canadian plywood markets. This apprears to be a highly difficult sales task, even in good markets, not to mention the present prevailing depressed market conditions.

In Columbia's judgment, it will be extremely difficult to move this large volume of waferboard if the product remains restricted to the present utility board type markets. A strong and lasting penetration will have to be made into the large volume floor deck and wall sheathing applications in order to absorb this increased plant capacity. In all likelihood, substantial price discounts will have to be given in order to promote or accelerate the use of waferboard in these structural load bearing applications.

Exports to the United States appear to be a good possibility. Utility board markets in the northern U.S. are at least three times the size of the entire Canadian market for such products. This U.S. market is largely untapped as there is only one effectively operating waferboard plant in the U.S., namely Blandin Paper Company at Grand Rapids, Minnesota. The output of this plant is estimated to be in the order of 100 MMsf 3/8" per year which is a minute amount in relation to the large United States markets.

United States Market Potential

The northeastern and north-central U.S. marketing area which is within economically feasible freight distances from the existing Canadian waferboard plants is estimated now to consume approximately 6 to 7 Bsf 3/8" per annum of plywood.

Waferboard did manage to capture a utility panel market in Canada amounting to about 10% of the plywood volume consumed. A utility type board market of similar size in terms of percentage of plywood consumed should, and probably does, exist in the northern United States as well. Is is therefore reasonable to assume that waferboard could penetrate these northern U. S. markets to an extent of 600 to 700 MMsf 3/8" volume, mainly in 1/4" and 5/16" thicknesses and the general utility board applications.

As noted earlier, Canadian plants are already exporting waferboard to these northern U.S. markets, at an annual rate of about 30 to 50 MMsf 3/8". The product appears to be well received and several retail yards interviewed by Leonard Guss and Associates gave favourable and encouraging opinions and reactions regarding the future potential sale of a waferboard type product.

LGA projects the market for a waferboard type product in the entire United States by 1985 in the order of 2,000 MMsf 3/8" (1 Bsf 3/4"). Again, about 30% to 40% of this projected volume should be located in the northern part of the U. S., amounting to 600 to 800 MMsf 3/8". If the Canadian example is applicable, which it probably is, this market already exists today but is not served because there is no appropriate supply available.

The U. S. Forest Service (U. S. Department of Agriculture) projects a plywood consumption or demand in the U. S. by 1990 in the order of 25,000 MMsf 3/8", at the medium projection level. The present plywood production capacity in the United States is in the order of 19,000 MMsf 3/8". Most observers do not believe that the U. S. peeler log supply will be sufficient to meet this projected growth in the demand for plywood.

In all likelihood, the deficiency will have to be made up by some type of reconstituted wood product, probably similar to waferboard. All interested observers, plywood plant operators, researchers, including the American Plywood Association, expect some sort of reconstituted structural wood product or a combination of waferboard and veneer (called "ComPly") to supplement the supply of plywood type products.

Potlatch Forests Inc. at Lewiston, Idaho, is at present constructing a plant which will manufacture oriented "Strandwood" board made with elongated flakes, called strands, and oriented for greater strength and dimensional stability properties for use as plywood core. Potlatch plans to use this panel in their existing Idaho plywood plants to supplement the supply of core veneer.

Various research laboratories in the United States, including the American Plywood Association, are working on similar products. Others are working on purely reconstituted wood products, made with flakes, wafers or strands, in an attempt to achieve a structural grade particleboard which would have strength and dimensional stability properties similar to those of plywood. All of these efforts, however, are still in the research stage and it will be at least two to three years before a plant based on these ideas is constructed in the United States.

Considering the above, the existing Canadian waferboard plants would have an excellent opportunity to penetrate and establish themselves in the northern U.S. markets before similar or other types of structural particleboard plants are constructed in these regions of the U.S.

For the present, the 1/4" and 5/16" thick utility type boards alone have a substantial potential in these U. S. markets. In Columbia's opinion, waferboard as it is made and sold in Canada at the present has sufficient physical properties and other merits to achieve this somewhat initial U.S. market penetration.

For a deeper and more lasting market penetration, the strength properties of waferboard will, in all likelihood, have to be improved so that it can be applied in the load bearing applications at equal thickness to plywood. Indications are that such improved properties may also be required for quick U. S. Code approval.

* * *

In summary, it may be stated that the Canadian waferboard industry does appear to be at an over-capacity stage, as related to the 1975/76 domestic markets, especially in its present utility board end use. Considering waferboard's present cost/panel strength property relationship to softwood plywood, the potential rate of penetrating the structurally more sensitive markets does not appear to be sufficient to absorb the existing plant capacity within the next two years.

Exports to the United States offer interesting alternative marketing potentials to Canadian plants. Waferboard, as it is manufactured at the present, should find a ready market in the general utility panel end use in the northern U. S. With a strong sales promotional program, this market should be able to absorb the existing Canadian over-capacity. Indications are, however, that waferboard will have to be improved in terms of strength properties in order to reach its full penetration in both the domestic and the U. S. markets.

Foreseeable new technology is likely to utilize the following features in the manufacture of a higher strength, structural grade reconstituted wood product:

(a) the use of "maxichips" or "fingerlings" (large, more length-grain cut chips) for the manufacture of wafers, strands or flakes, opening the way for the use of whole tree chipping or forestry waste chipping or mill waste chipping and thereby reducing wood costs.

Such "semiflakes" or "semiwafers" may be used in the core of the board only or, possibly, in the entire board.

(b) the use of orientation in the forming operation -- along the panel length in the faces and cross-panel in the core -- thereby obtaining significant improvements in bending strength, stiffness and dimensional stability, as well as thickness parity with plywood in structural applications

(c) the use of different resin systems (liquid phenol, isocyanates, etc.) which may promise to impart improved structural properties to the board at possibly lower board densities. The use of isocyanates is currently being explored in Europe and appears to be promising.

This new technology is applicable to the existing waferboard plants and the plant modifications which would be required for their adoption do not appear to be excessive.

The waferboard sector represents the most unique Canadian technology and the best export potential in the entire existing Canadian particleboard industry. The existence of these large plants and the availability of a wood supply in Canada (Aspen) suitable for the manufacture of structural grade products gives Canada a distinct advantage in this field. The waferboard industry will have to respond, however, to the challenges of the new technology, the demands and requirements of the market and the changing economic conditions. The ultimate realization of the industry's full potential may well depend on the acceptance of and a positive response to this challenge.

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