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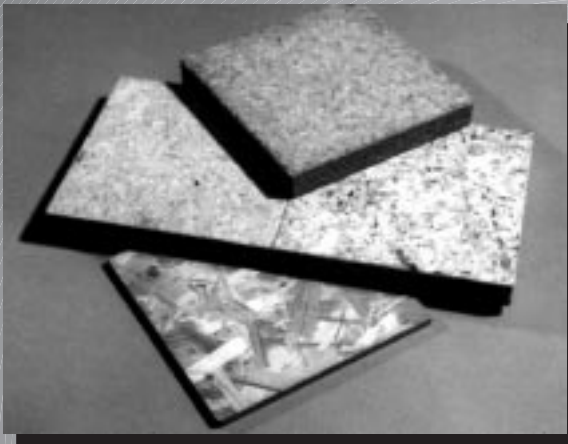
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Capacity, Production, and Manufacture of Wood-Based Panels in the United States and Canada

Henry Spelter



Abstract

Structural and nonstructural panel products have constituted the fastest growing segment of the wood products industries over the past two decades. Based on announced plans, growth will accelerate in the next 2 years. The cost of wood fiber used in these processes has been rising. To keep wood costs as low as possible, a growing share of the new production is being channeled into regions where panel manufacturing has been low or nonexistent and where underutilized timber supplies are still available. There is also increasing interest in using agricultural fibers for panels, either to complement or to replace wood. The projected increases in production over the next 2 years are likely to exceed projected growth in demand, leading to an oversupply, at least temporarily. This paper summarizes capacity growth in various wood-based panels: Southern Pine plywood, oriented strandboard, medium density fiberboard, and particleboard. It also examines changes in the manufacturing costs and the emerging supply-demand balance through 1997.

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Capacity, Production, and Manufacture of Wood-Based Panels in the United States and Canada

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Introduction

The purposes of this report are to review the growth of wood-based panel capacity in the United States and Canada and to examine trends in costs, pricing, and profitability for various kinds of panels. Over the past few decades, there has been a general decline in the quality and size of timber available for processing. Manufacturing plants have increasingly turned to composites technology as a means to make products from lower grade material, resulting in a gradual transition in the type of raw material used. The first phase of this transition occurred in plywood with the old-growth Douglas-fir. Then, manufacturers began to use pulpwood from softwoods and low density hardwood species such as aspen for composite panels as a substitute for plywood. Now, even nonwood fibers are being used for the manufacture of panels for non-structural purposes. These changes have stimulated a large amount of investment in new technologies that will markedly affect timber and wood product markets.

Information in this paper is presented for four panel manufacture sectors: oriented strandboard, Southern Pine plywood, particleboard, and medium density fiberboard. The data are based on information obtained from a collection of sources, including the Census of Manufactures, private and public timber market price reporting agencies, publications on panel market prices, trade association surveys, company financial reports, and trade journals.

Oriented Strandboard

Capacity

Oriented strandboard (OSB) is a structural panel that consists of wood strands glued with an exterior-type, waterproof resin. The physical properties of the board are enhanced by alignment of the wood particles. In 1964, the total OSB industry was represented by one plant with just 71 thousand m³ of capacity. Based on current announcements, OSB capacity will

reach 18.4 million m³ in 1997, with production projected at 15.5 million m³ (Fig. 1). Between 1995 and 1997, almost 8.3 million m³ of capacity will be built, representing an 82-percent increase relative to capacity at the end of 1994. Plants manufacturing OSB are listed in the Appendix.

The largest OSB share is located in the U.S. South; capacity is projected to be 6.8 million m³ in 1997 (Table 1).

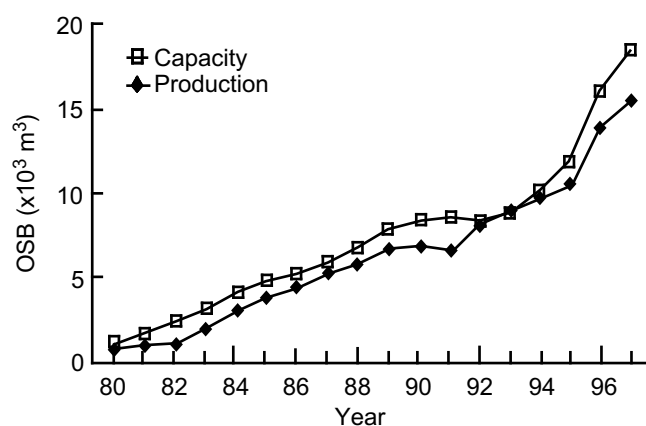


Figure 1—North American OSB capacity and production, 1980–1997.

Table 1—Projected 1997 OSB industry capacity, by region

Region	Projected OSB capacity (× 10 ³ m ³)
U.S. South	6,852
Eastern Canada	5,014
U.S. North	3,238
Western Canada	3,049
U.S. West	239

Manufacture of OSB is comparatively small in the U.S. West, with only two mills in operation; a third plant, which produces a hybrid OSB/veneer panel called COMPLY, is not included in these data.

The ability to use diverse species and sizes of trees has led the OSB industry to expand to many areas new to panel manufacture. During the next 2 years, OSB plants will be built in Tennessee, West Virginia, and Manitoba. Tennessee and West Virginia offer plentiful supplies of yellow-poplar, a low-density hardwood suitable for OSB. In Manitoba, as in most of Canada as well as the U.S. North and West, the most available species is aspen, followed by balsam poplar, birch, and softwoods. In the U.S. South, a mix of pine and low- to medium-density hardwoods is most often used.

Costs and Prices

The manufacture of OSB is favored by the ability to use relatively low cost, small-diameter trees that are not suitable for plywood. However, the value of the smaller pulpwood species used for OSB has been rising. From 1978 to 1994, the prices of delivered aspen pulpwood in the North and mixed hardwood pulpwood in the South rose from

\$12–\$14 per cubic meter to about \$27 (Fig. 2). The price of that timber on the stump rose even more rapidly—from about \$1.5–\$3.0 to \$7.5–\$8.0 per cubic meter (Fig. 3). In the U.S. South, softwood pulpwood has historically been more costly than hardwood, a condition that prevails, although with reduced premiums.

The manufacture of 1 m³ of OSB requires about 2 m³ of wood (Fig. 4). Changes in manufacturing processes, such as improvements in adhesives, more efficient flakers capable of processing tree-length bolts, and larger presses that reduce trim waste, have led to more economical use of wood. Recent mill reports imply a recovery rate of about 1.8 m³/m³ of product. Recovery rates could also be improved if log conditioning were universally adopted, a measure that would tend to reduce fines generation during flaking.

Higher productivity has also helped moderate labor costs in OSB manufacturing. The tendency in recent years has been to build larger plants in which productivity is considerably higher. Census figures indicate that average hourly wages rose by more than 130 percent between 1977 and 1992, but output per hour of work increased by about half (Fig. 5),

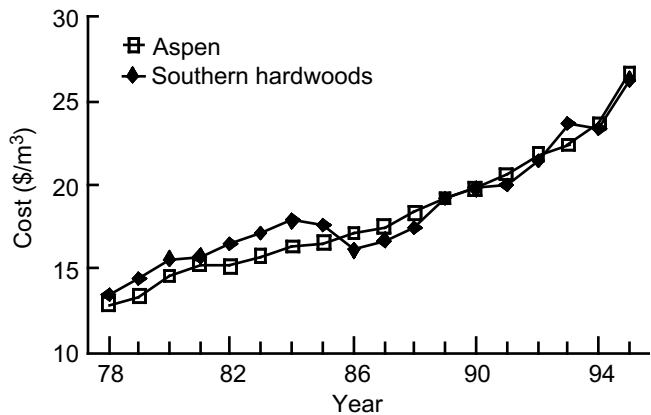


Figure 2—Cost of delivered aspen and southern hardwood pulpwood.

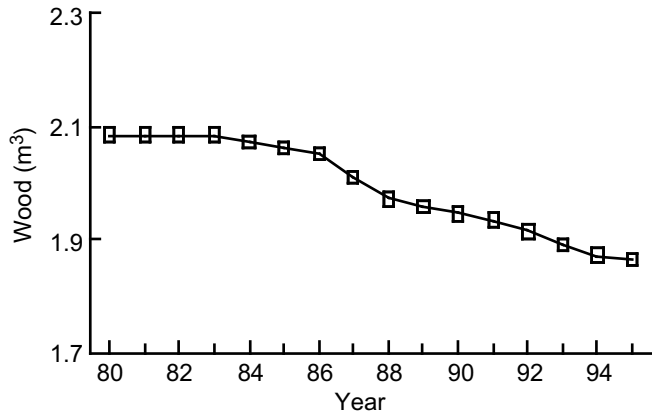


Figure 4—Wood input per cubic meter of OSB output in North America.

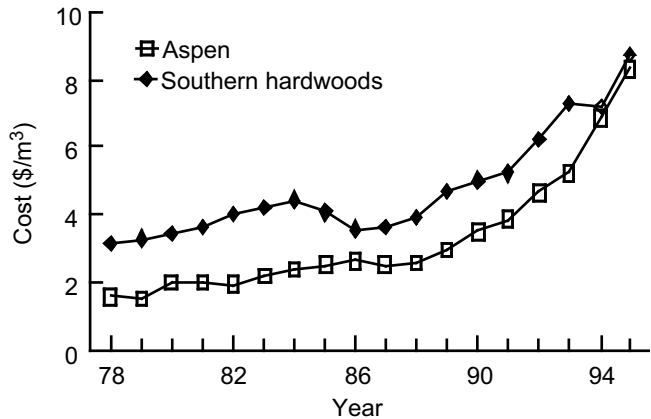


Figure 3—Cost of aspen and southern hardwood pulpwood on the stump.

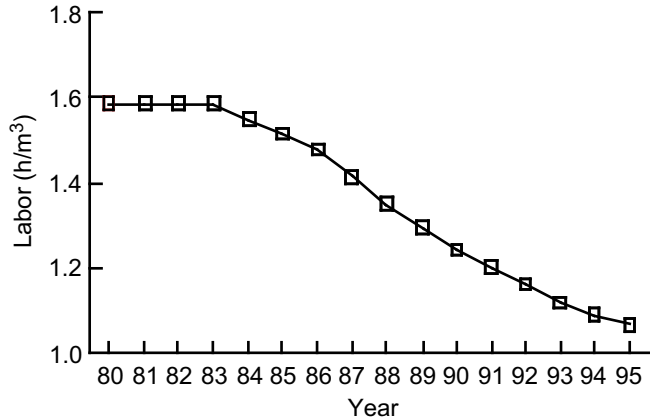


Figure 5—Average hours of labor per cubic meter of OSB in North America.

resulting in unit cost increases of about 50 percent over that period and virtually no increase since the early 1980s.

The use of adhesives is one area where OSB technology is at a disadvantage relative to plywood because of the greater surface area presented by the flakes. This disadvantage has been mitigated by advances in resins and blending that have reduced requirements for adhesives. Resin costs ranged between \$20/m³ and \$25/m³ in the 1990s.

Average manufacturing costs for the U.S. OSB industry show about a 30-percent increase since 1980, primarily as a result of rising wood costs (Table 2). Prices, on the other hand, have risen even more sharply, especially since 1991, resulting in exceptional profitability that has stimulated the projected rapid expansion of capacity in 1995–1997.

Southern Pine Plywood

Capacity

The southern softwood plywood industry began in 1964 to satisfy the need for a complementary source of supply for old-growth-based western plywood. By 1970, almost 40 plants were in production (Fig. 6). New plants continued to

Table 2—U.S. OSB manufacturing costs and prices (\$/m³)

Year	Power and fuel	Labor and management	Glue and wax	Other costs	Wood	Variable costs	Price
1976	5	14	23	16	24	83	122
1977	6	15	20	16	26	83	131
1978	7	17	15	16	27	81	139
1979	8	18	22	18	28	94	145
1980	9	20	27	21	30	107	123
1981	11	22	28	22	32	115	136
1982	13	26	28	23	31	121	144
1983	12	25	28	24	34	123	158
1984	12	25	28	24	35	124	140
1985	12	24	29	25	36	125	153
1986	11	24	24	23	35	117	146
1987	11	23	27	24	36	121	141
1988	11	23	28	25	37	124	123
1989	11	23	30	27	39	130	166
1990	11	23	23	26	40	123	124
1991	11	23	18	25	41	119	144
1992	11	23	18	26	43	121	208
1993	11	23	20	28	46	128	227
1994	11	23	22	28	47	130	252
1995	11	23	24	31	52	141	242

be built until the early 1980s, when a recession led to consolidation of plants. Since then, the bulk of investment has flowed into the OSB sector; only a handful of new plywood plants has opened while more than a dozen facilities have closed. However, overall capacity has increased because many plants have been improved and expanded. In 1995, production capacity was approximately 11.5 million m³. Current Southern Pine plywood plants are listed in the Appendix.

Costs and Prices

Wood represents the largest share of plywood manufacturing costs. In 1995, delivered costs for sawtimber-grade logs reached approximately \$70/m³; after accounting for process losses and gains from residue sales, this figure translates to about \$127/m³ of product. The installation of more rapid, accurate lathes that maintain high throughput and recovery has prevented further rises in costs. This innovation has enabled the use of smaller logs than those traditionally used in plywood manufacturing. The amount of wood required to manufacture 1 m³ of plywood depends on mill process parameters such as average log size and target core diameter. Average recovery is estimated at more than 50 percent regionwide (Fig. 7). Other input costs are summarized in

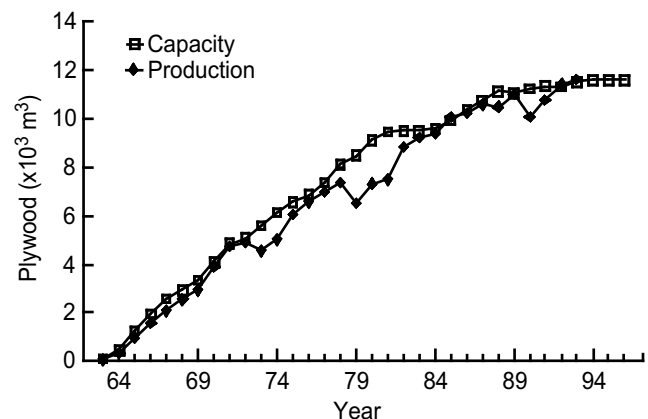


Figure 6—Southern plywood capacity and production.

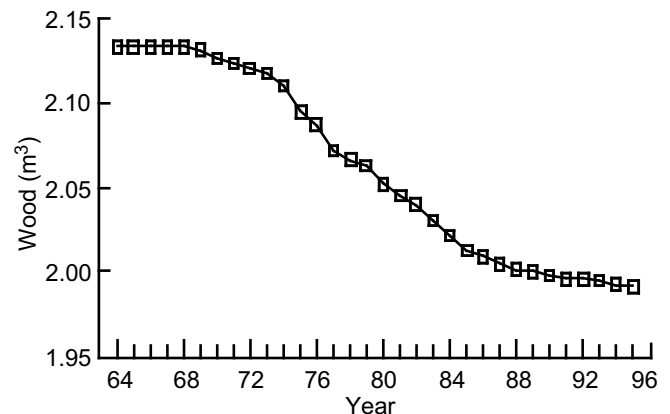


Figure 7—Wood input per cubic meter of plywood output in U.S. South.

Table 3—U.S. southern plywood manufacturing costs and prices (\$/m³)

Year	Power and fuel	Labor and management	Main-tenance	Glue	Supplies	Net wood	Variable costs	Price
1964	4	14	3	3	4	18	46	61
1965	4	15	3	3	4	18	47	59
1966	4	15	3	3	5	20	49	62
1967	4	15	3	3	5	21	51	55
1968	4	16	3	3	5	23	54	74
1969	4	18	3	3	5	27	60	76
1970	4	18	3	3	6	26	60	62
1971	4	19	3	3	6	31	67	74
1972	4	20	4	4	6	36	74	103
1973	4	22	4	4	7	45	86	106
1974	5	23	4	7	7	48	95	95
1975	6	23	4	9	8	42	93	98
1976	7	25	5	8	8	52	105	131
1977	8	25	5	8	9	61	115	168
1978	8	26	5	6	9	76	131	184
1979	9	29	6	8	10	96	158	174
1980	11	30	6	10	11	85	153	179
1981	14	32	6	10	12	79	152	161
1982	16	34	7	10	13	63	142	160
1983	16	35	7	10	13	69	149	180
1984	16	35	7	10	14	66	148	169
1985	15	37	8	10	15	51	135	164
1986	14	38	8	9	16	49	133	168
1987	13	39	8	10	16	62	149	168
1988	13	39	8	11	17	63	151	159
1989	13	40	8	12	17	65	155	184
1990	13	40	9	10	18	69	159	168
1991	13	40	9	8	18	74	162	175
1992	13	41	9	8	18	85	174	226
1993	13	42	9	9	19	98	190	257
1994	13	42	9	10	20	119	212	274
1995	13	42	9	11	20	127	221	267

Table 3. In 1995, total manufacturing costs for plywood were estimated at about \$221/m³ compared with an estimated selling price of \$267. Profitability during 1992–1995 improved from previous levels, but did not match that in the OSB sector.

Particleboard

Capacity

The manufacturing of particleboard in the United States began on a large scale after World War II as a low-cost replacement for lumber and plywood in furniture and cabinetry. The early postwar years were characterized by fast growth in the industry as ample supplies of inexpensive sawmill

residues favored particleboard economics. Growth temporarily halted during the recession of 1974 to 1975—the industry found itself with excess capacity on the one hand and rising furnish costs on the other as residues acquired additional value for their energy potential. After a period of retrenchment, growth resumed on a more modest scale that was as much the result of improvements to existing mills as the construction of new ones. During this period, a few plants were converted to OSB or medium density fiberboard. In 1995, production capacity was approximately 8.5 million m³; this figure is scheduled to rise to more than 9.1 million m³ by 1997 (Fig. 8). The Canadian particleboard industry has also been growing, even though some plants have been closed. Currently, there are eight plants with approximately 2.5 million m³ of capacity.

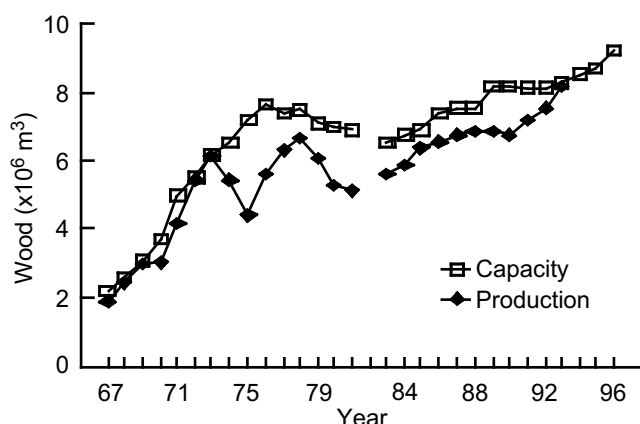


Figure 8—Particleboard capacity and production in the United States.

Particleboard plants in the United States and Canada are listed in Tables A3 and A4 in the Appendix. These tables do not include data on several small plants that utilize straw as the fiber furnish. At least two such plants are operational—one in North Dakota and the other in Texas. Plans to build a \$120 million (Canadian dollars), 180-thousand-m³ straw-based particleboard plant in Manitoba in 1996 hinge on the availability of financing.

Costs and Prices

Costs of particleboard manufacturing are shown in Table 4. Unlike plywood and OSB, particleboard is primarily made from lumber and plywood residues. Approximately 0.9 t of fiber are required to make an average cubic meter of product, or 1.2 t of fiber per ton of board. The cost of that fiber has increased to approximately \$33/t (\$31/m³ of product) from less than \$10/t (\$9/m³ of product) in the 1960s (Fig. 9). In 1995, total manufacturing costs, excluding depreciation and overhead, were approximately \$120/m³ compared to an average selling price of \$169/m³.

Medium Density Fiberboard

Capacity

The first North American medium density fiberboard (MDF) plant was started in 1966 in New York. By 1994, the number of plants had increased to 18, representing more than 2.5 million m³ of capacity. Plans for many new plants were announced in 1995. If all are realized, the industry will more than double in size by the end of 1997 (Fig. 10). One proposed plant would constitute the first attempt in North America to make MDF from urban waste wood furnish. Since financing for this plant, which is to be located outside Toronto, has not been finalized and completion is not assured, the project should be viewed as tentative. Medium density fiberboard plants are listed in Table E in the Appendix.

Table 4—U.S. particleboard manufacturing costs and prices (\$/m³)

Year	Power and fuel	Labor and management	Glue and wax	Other costs	Wood	Variable costs	Price
1972	2	17	9	8	8	44	54
1973	3	19	13	9	9	52	64
1974	3	19	18	11	10	61	66
1975	4	19	22	11	10	66	61
1976	5	19	18	10	11	64	65
1977	6	20	15	10	12	63	77
1978	6	23	16	11	14	71	124
1979	7	23	19	13	18	80	96
1980	9	24	22	14	20	89	102
1981	11	26	22	15	23	98	106
1982	13	28	22	16	25	104	111
1983	13	28	23	16	23	103	114
1984	13	28	23	16	25	106	123
1985	13	28	23	16	21	101	115
1986	11	28	22	15	22	98	120
1987	11	28	21	15	23	98	127
1988	11	29	24	15	22	101	127
1989	12	29	23	16	23	104	129
1990	12	30	23	16	24	105	122
1991	11	30	23	16	26	107	120
1992	11	32	21	16	28	108	129
1993	11	32	24	17	29	114	153
1994	11	33	25	18	31	118	171
1995	11	34	25	18	31	120	169

Costs and Prices

Few cost figures exclusive to MDF are available in the public domain. Thus, it is difficult to separate and quantify costs in this segment from particleboard costs. The production processes for MDF and particleboard are similar in most respects, but census figures show that average labor productivity for MDF is lower than that for particleboard (Table 5). Power, wax, wood, and resin requirements are also generally higher for MDF (Vesihäisi 1980). Medium density fiberboard has been priced at substantial premiums compared to particleboard, but it is unclear what part of that is due to higher costs and what is due to premium properties.

Outlook for Panels

The capacity of structural panel plants is poised for rapid growth over the next 2 years (Table 6). For OSB alone, capacity is slated to increase by about 7 million m³ between the end of 1995 and the beginning of 1998. The capacity of Southern Pine plywood and OSB plants would increase by about 30 percent if all announced plans were implemented. Total U.S. and Canadian structural panel capacity would

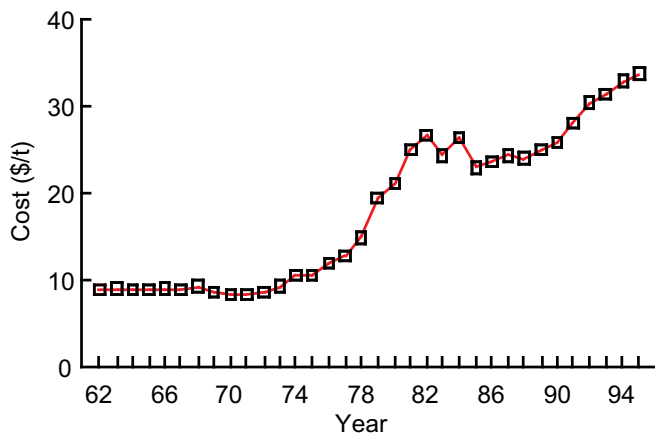


Figure 9—Average cost of wood fiber for particleboard in the United States.

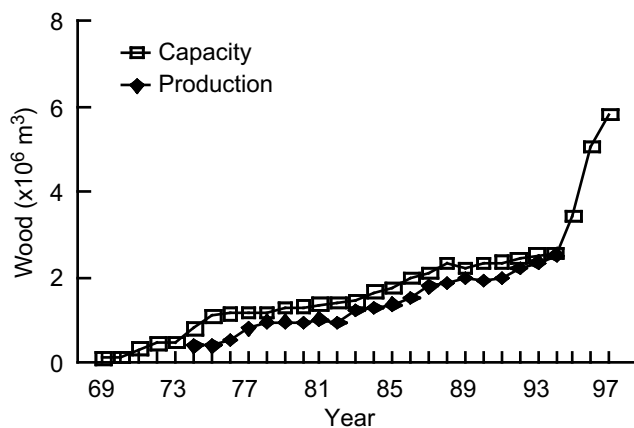


Figure 10—Capacity and production of medium density fiberboard (MDF) in North America.

increase by 25 percent, assuming the status quo remains in the plywood industry in the western United States and Canada. To absorb this amount of growth without major disruptions in pricing and markets will be a challenge for industry marketers.

The major market for structural panels (softwood plywood and OSB) is residential construction (Table 6). In an average year, this segment consumes on the order of 12–13 million m^3 in the United States and Canada. Two important factors affect housing demand. A long-term determinant is the growth in that segment of the population that is a net buyer of homes. Typically, these are people between 25 and 45 years of age who are acquiring their first independent residences. A short-term determinant is the availability and cost of financing. At present, these determinants are working in opposite directions in the United States. Interest rates are low, and it is probable that this situation will continue as inflation ebbs. However, the growth of the population in the middle-age group is also slowing as a result of the decline in the birthrate that followed the postwar population boom. The net effect is likely to be little change in the level of housing

Table 5—Average labor productivity in particleboard and MDF industries (h/m^3)

Year	Particleboard	MDF
1982	3.2	4.8
1987	2.7	4.0
1992	2.6	3.5

Table 6—Structural panel consumption and capacity, 1994–1997 (million m^3)

	1994	1997
Consumption		
Residential	13.0	13.0
Remodeling	7.2	7.4
Industrial	4.0	4.3
Nonresidential	2.8	3.0
Exports	1.6	2.7
Total	28.6	30.4
Capacity		
Southern Pine plywood	11.5	11.9
Douglas Fir plywood	7.8	4.6
Canadian plywood	2.1	1.9
Oriented strandboard	10.1	18.5
Total	31.5	36.9
“Excess” capacity	2.9	6.5

activity when the growth in additional capacity comes to fruition.

Other markets, such as repair and remodeling, nonresidential construction, and shipping, which have consumed approximately 14 million m^3 a year, are relatively stable and unlikely to rise sharply. Export markets have been a growing source of demand, accounting for 1.6 million m^3 . In traditional lumber markets, OSB is being used to an increasing extent for the web component in the popular composite I-joist. However, both the export and I-joist markets are small relative to the total market for structural panels. In the absence of increases in demand proportional to the projected increases in capacity, an excess supply is likely, especially by 1997. This looming imbalance suggests that the high profit levels of the past 3 years will be under pressure as the market seeks equilibrium between supply and demand. Plywood and OSB are used in many of the same markets, and there are few end-uses for which the products are not interchangeable. Plywood manufacture, particularly the West Coast segment, currently operates under a higher cost structure than that of OSB and would be most vulnerable in a

downward market. However, even assuming significant reductions in West Coast plywood capacity, a gap between consumption and capacity will likely remain, which may lead to a delay in the construction of some plants or the closure of some high-cost plants.

For particleboard and MDF, the supply situation is similar. By the end of 1997, capacity is slated to grow by more than 3 million m³, a 22-percent increase relative to the end of 1995, although some new plants may not be built as a result of the uncertainty of financing. Furniture and cabinetry are the major markets for nonstructural panels. Growth in these industries is tied to general economic activity. Overall growth from 1996 to 1997 should be at a moderate level—between 5 and 6 percent. The rise in demand for nonstructural panels (Table 7) may exceed this level as a result of the capture of market share from other products, but growth in internal demand by itself is unlikely to absorb the added supply. On the other hand, demand for these panels is growing rapidly overseas, particularly in the Far East where increasing economic growth is rapidly driving the demand for consumer goods. Many new Canadian MDF mills will be equipped with presses and lines capable of producing panels either to offshore or U. S. size specifications. Therefore, export of MDF is likely to increase in the next few years and to absorb some slack, although not all.

A second issue pertaining to particleboard and MDF is the availability and cost of the fiber. Most plants rely on shavings and sander dust generated in lumber and plywood plants for their furnish supply. Neither the lumber nor the plywood sector is likely to match the growth of the particleboard and MDF sectors. If residues from traditional sources are not available in adequate amounts, then particleboard and MDF plants will need to resort to potentially more expensive

alternative fibers, such as agricultural waste, waste wood (urban wood), or roundwood. To some extent, this change has already occurred in the West, where contraction of the lumber and plywood industries has reduced the amount of residues available and has caused some mills to augment their furnish with straw and waste wood collected in cities. Such problems have been reported in the South and may increase as projected growth in particleboard and MDF capacity is likely to be greater than growth in lumber production (Fig. 11).

A new development in particleboard technology that has the potential to change the economics of the industry has been the construction of several plants that use straw furnish. Tests in Germany, Sweden, and other countries have shown that the physical properties of boards made with straw are equal or better than those made with wood for boards of similar densities and resin contents (Hesch 1978). In terms of the process, straw furnish offers advantages such as the ability to be processed with less costly chipping and drying equipment. On the other hand, greater press capacity may be needed to accommodate the longer press times required for adequate steam dissipation. A plant with an annual capacity of 52,000 m³ was built in South Dakota for a reported cost of \$15 million (Donnel 1995). This cost is considerably below the \$60–\$80 million price tag associated with current wood-based particleboard plants, although on the basis of per cubic meter capacity, the cost of \$290/m³ is comparable or higher than the cost of a large wood-based particleboard facility.

The market viability of straw-based particleboard (strawboard) will depend in large measure on how operating costs compare with those of wood-based plants. In terms of the furnish cost, straw can be advantageous in regions where it has little alternative agricultural value. If a region is rich in dairy operations, then straw is valued for livestock bedding and its cost can range from \$50 to \$90 per dry ton (Youngquist and

Table 7—Nonstructural panel consumption and capacity, 1994–1997 (million m³)

	1994	1997
Consumption		
Construction	1.8	1.9
Industrial	10.1	10.9
Exports	0.4	1.0
Imports	(0.3)	(0.2)
Total	12.0	13.6
Capacity		
U.S. particleboard	8.3	9.2
Canadian particleboard	1.8	2.2
Medium density fiberboard	2.6	5.8
Total	12.7	17.2
"Excess" capacity	0.7	3.6

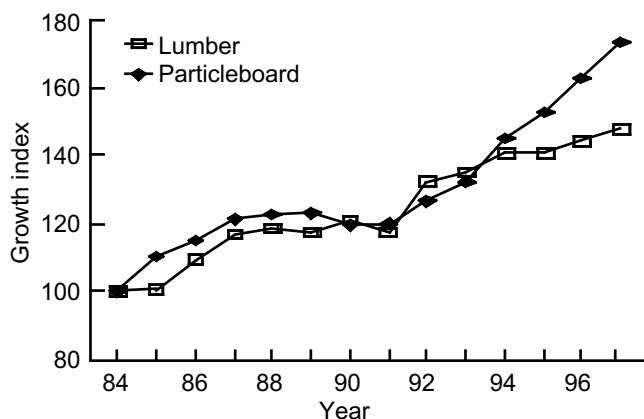


Figure 11—Historical and projected lumber and particleboard production in the U.S. South.

others 1993). Where there are few dairy operations, such as in North Dakota, the cost of straw is generally much lower, about \$25–\$30/ton. This figure is lower than the typical cost of wood residue (\$30–\$40/ton). Likewise, in Manitoba, a ton of baled straw can be bought for a competitive price of \$40 (Canadian dollars).

In terms of the cost of adhesive, strawboard has a disadvantage. Conventional urea formaldehyde (UF) resin, used in most of the particleboard industry, does not perform well with straw fiber. Consequently, more expensive isocyanate resins are used. Although the application of resin solids at about 3 to 4 percent is less than half that used for UF, isocyanate is about four to five times as expensive as UF, resulting in higher net resin expense. Offsetting that disadvantage, however, are the superior physical properties of strawboard. Because strawboard is more homogeneous than wood-based panels, its machining characteristics are more like those of MDF. Thus, strawboard would be appropriate for high-value applications where it would command a premium relative to industrial-grade particleboard. There is potential for additional board capacity in agricultural areas such as Kansas, eastern Washington, Minnesota, and Manitoba.

Roundwood costs for OSB have been rising in recent years, reflecting the demand for not only OSB but also paper. Despite substantial increases in paper recycling, pulpwood harvest for paper in North America is increasing; it is projected to increase by 27 million m³ over the next decade (Ince and Spelter 1995). The need for fiber to supply the additional OSB capacity in the next 2 years will be on the order of 13 million m³. Increases of this magnitude are likely to encourage the trend toward higher pulpwood prices. The high concentration of OSB mills in some traditional production regions and the resulting pressure on pulpwood costs has led the industry to locate to new regions, such as West Virginia,

Tennessee, and Manitoba, where supplies of underutilized fiber suitable for OSB are still plentiful. Mills are also likely to increase the use of different species such as birch, balsam poplar, cottonwood, and other low-to-medium density hardwoods.

In summary, the favorable cost and pricing scenarios in panel-manufacturing industries are likely to be tested in the coming 2 years by rising wood fiber costs and declining product prices.

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Appendix—Panel Manufacturing Industries

The tables in this Appendix show the capacity of various wood-based panel plants by year of construction.

Table A—OSB capacity by year of plant construction

Reg- ion	Location	Company (former name)	Initial Capacity (×10 ³ m ³)	Year built	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
4	Hudson Bay	McM-Bloed	71	1964	71	71	71	71	71	71	71	80	80	80	80	80	80	80	80	80	80	80	80	80	
4	Hudson Bay	McM-Bloed	97	1968	97	97	97	97	97	97	97	97	106	106	106	106	106	106	106	106	106	106	106	106	
1	Gr.Rapids	Potlat (Bland)	89	1972	115	124	124	124	212	248	248	248	248	301	301	301	301	301	301	301	301	301	301	301	
4	Timmins	Wfbd/Mal	62	1973	62	62	62	62	62	62	71	71	80	80	80	80	80	80	80	80	177	177	177	266	
4	Longlac	Weldwood	97	1973	97	97	97	97	97	97	97	97	97	120	120	120	120	120	120	120	124	142	142	142	
4	Thunder B	McM-Bloed	89	1974	97	106	106	106	106	106	106	115	142	142	150	150	150								
4	Thunder b	Gt.Lakes	111	1975	111	111	111	111	115	115	124	124	133	71											
5	Slave Lk	Weyerhaeus	97	1977	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	124	177	177	177	177	
1	Hayward	L-P	115	1978	115	115	115	115	115	115	115	133	142	150	155	159	177	204	204	204	212	212	212	212	
4	Chatham	Atl Wfbd/Eagle	142	1979	142	142	142	142	142	142	142	142	159	159	177	177	195	195	133					288	
4	LeSarre I	Norbd (Norm-P)	71	1980				71	71	71	71	71	80	89	89	89	89	89	89	89	89	89	89	89	
4	St.Georges	Malette	133	1980				133	133	133	133	133	133	142	142	142	142	142	142	142	142	142	142	266	
1	Clairmont	Elmendorf	89	1981					62	89	89	89	89	89	89	44									
1	Woodland	G-P	124	1981				89	124	124	124	124	137	137	137	137	137	137	137	137	177	177	177	177	
1	Bemidji	Potlat	137	1981				80	137	137	142	150	159	168	173	177	195	195	199	204	208	212	212	212	
1	Solway	Norboard	230	1981				212	230	230	230	230	230	230	230	230	230	230	230	274	310	310	310	310	
1	Hayward	L-P	115	1982				89	115	133	142	150	159	159	159	177	204	204	204	204	212	212	212	212	
1	Houlton	L-P	115	1982				62	124	133	133	150	155	155	155	159	164	177	177	177	217	217	217	217	
4	Val d'or	Norbd (N-P)	150	1982				75	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	
4	Englehart	Grant	155	1982				155	155	155	155	155	168	177	177	177	177	177	177	177	195	195	195	195	
1	Grayling	Weyerhaeus	266	1982				111	266	266	266	266	266	266	266	266	266	266	266	336	336	336	336	336	
2	Dudley	G-P	111	1983					111	111	111	111	111	111	111	111	111	111	111	111	124	124	124	124	
2	Corrigan	L-P	115	1983				89	124	124	124	124	128	128	128	128	124	119	119	119	119	119	124	124	
1	Easton	Huber	119	1983				49	119	119	119	119	119	119	164	164	164	164	164	164	164	164	164	164	
2	LeMoyen	Martin	124	1983				53	124	142	150	159	159	159	159	168	195	212	230	230	230	230	230	230	
1	Cook	Potlat	142	1983				142	155	159	164	168	168	168	168	168	168	186	212	212	212	212	212	212	
3	Chilco	L-P	80	1984					80	89	97	106	111	115	119	111	111	111	111	111	111	111	111	111	
3	Kremmling	L-P	97	1984					97	102	106	111	115	115	111	106									
3	Montrose	L-P	97	1984					97	102	106	111	115	115	106	106	106	106	106	106	128	128	128	128	
2	Urania	L-P	106	1984					106	115	119	128	133	115	97	89	89	89	89	89	102	102	102	102	
5	Edson	Weyerhaeus	221	1984					221	221	221	221	221	221	221	221	221	221	221	221	292	292	292	292	
1	Two-Harbor	L-P	89	1985									89	97	102	106	111	115	115	115	115	115	115	115	
2	Grenada	G-P	221	1985					221	235	248	248	248	248	266	266	266	266	266	266	298	298	298	298	
2	Skippers	G-P	221	1985					221	235	248	248	248	266	266	292	292	292	292	292	309	309	309	309	
2	Dungannon	L-P	97	1986									97	106	106	106	106	106	106	106	106	106	106	106	
2	Elkin	Weyerhaeus	199	1986									199	199	199	199	199	199	199	217	230	230	230	230	
2	New Waverly	L-P	89	1987											62	80	80	80	80	80	80	80	80	80	
2	Nacogdoch	I-P	168	1987											106	168	168	168	168	177	212	212	212	212	
5	Dawson Cr.	L-P	221	1987											221	248	266	305	319	319	332	332	332	332	
5	Drayton	Weyerhaeus	221	1987											115	221	221	230	235	310	310	310	310	310	
2	Quitman	Langlade	119	1988												133	164	164	164	164	190	190	190	190	
4	Chambord	Norbd (Norm-P)	230	1988												177	230	230	230		243	266	266	266	

[illegible]

Table B—Southern plywood plant capacity by year of plant construction

State	Location	Company (former name)	Initial Capacity ($\times 10^3$ m ³)	Year built	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
AR	Fordyce	G-P	80	1964	53	80	106	106	106	119	119	133	133	133	133	133	150	159
TX	Silsbee	Kirby	32	1964	32	32	35	44	53	53	53	106	106	106	106	106	106	115
TX	Diboll	TE (SPPCo)	62	1964	44	62	62	62	62	62	62	62	106	106	106	106	106	106
Tex	Keltys	L-P (Angel)	53	1965		44	64	64	64	64	64	64	64	64	64	64	89	89
AR	Crossett #1	G-P	106	1965		53	115	115	115	128	137	137	137	137	155	177	177	177
LA	Ruston	Willam (Santm)	53	1965		31	62	62	71	71	71	75	75	75	75	75	75	75
AL	Fulton	Scotch	40	1965		40	53	53	71	71	89	89	89	89	89	89	115	135
LA	Oakdale	BC (Vanply)	89	1965		53	89	89	111	111	111	111	111	111	111	146	146	146
LA	Florien	BC (Vanply)	89	1965		44	89	89	111	111	111	111	111	111	111	146	146	146
NC	Plymouth	Weyerhaeus	64	1965		53	64	64	64	64	64	64	64	64	64	71	71	71
LA	Minden	Willam (Col)	53	1966			18	53	71	71	71	71	71	71	71	75	75	75
MS	Beaumont	Hood (Del pn)	80	1966			53	80	80	80	80	80	80	80	80	80	80	84
AR	Crossett #2	G-P	115	1966			80	115	115	128	128	133	137	137	155	177	177	177
MS	Louisville	G-P	80	1966			44	80	80	80	80	80	133	133	133	133	148	166
VA	Emporia	G-P	80	1966			80	89	97	115	133	0	142	142	142	142	142	142
GA	Savannah	G-P	49	1966			35	49	66	66	89	89	89	89	89	89	89	89
LA	Dodson	Willam (Hunt)	71	1966			18	71	71	115	115	115	115	115	115	115	115	115
LA	Winnfield	LP (Manville)	53	1966			27	53	53	53	89	89	89	89	89	89	89	89
LA	Haynesv	Santiam	27	1966			27	27	27	27	27	27	27	27	27	27	27	27
NC	Eliz. City	Triangle	27	1966			9	27	27	27	27	27	27	27	27	27	27	27
MD	Pocomoke	Chespk (USPLY)	53	1966			53	53	53	53	53	53	53	53	53	53	80	80
LA	Hammond	CI (USPLY)	89	1966			44	89	89	89	89	89	89	89	89	89	89	89
MS	Philadel	Weyerhaeus	27	1966			27	27	49	49	49	49	49	49	49	49	49	49
NC	Jacksonv	Weyerhaeus	53	1966			22	53	53	89	89	89	89	89	89	89	89	89
AR	Gurdon	Arkla	89	1967				35	106	106	106	106	106	106	106	106	106	106
NC	Moncure	Willam (BC)	53	1967				44	71	71	71	71	71	71	71	74	74	74
LA	Joyce	Riverwd (CZ)	62	1967				31	62	62	75	75	75	75	75	75	155	155
MS	Gloster	G-P	80	1967				80	80									
FL	Chieftand	G-P	80	1967				53	80	80	80	80	80	80	80	80	80	80
LA	Natchitoch	Willam (SPly)	53	1967				40	53	53	66	66	66	66	66	66	75	75
AL	Chapman	Union-Camp	106	1967				80	106	106	106	106	106	106	106	106	133	159
LA	Plain Deal	IP (Anthon)	53	1968					35	53	53	53	53	53	53	53	64	64
SC	Russelville	G-P	80	1968					80	97	119	133	133	133	133	133	133	133
GA	Cedar Spr.	Gt Northn	53	1968					53	74	89	89	89	89	89	89	89	89
AL	Pine Hill	McM-Bloed	106	1968					71	106	106	106	106	106	106	106	119	133
GA	Waycross	CI (USPLY)	49	1968					49	49	49	49	49	49	49	49	49	66
MS	Gloster	G-P	44	1969						89	124	155	155	155	155	155	168	177
MS	Taylorvil	G-P	80	1969						44	80	168	168	168	168	168	168	168
TX	Nacogdoch	I-P	89	1969						62	89	89	89	89	89	89	111	133
AL	Cordova	Champion Int	44	1970							22	44	49	49	53	62	62	66
GA	Monticello	G-P	106	1970							53	106	106	106	159	177	195	212
LA	Urania	LP (G-P)	106	1970							62	124	124	177	177	177	181	186
AL	Andalusia	Independ	53	1970							27	53	53	80	80	80	80	80
FL	Pensacola	B-C	53	1971								53	80	80	80			
NC	Whiteville	G-P	66	1971								66	75	80	133	133	133	133
TX	New Waver	L-P (G-P)	142	1971								89	150	155	159	177	177	177
MS	Wiggins	Hood (I-P)	89	1971								44	89	111	111	111	119	128
TX	Jasper	L-P (O-I)	89	1971								44	89	89	89	89	111	124
AR	Huttig	Manv (OlnM)	62	1971								31	62	62	62	62	66	66
AL	Livingston	MBI (Sumter)	80	1971								40	80	89	89	89	89	89
AR	Mt. Pine	Weyerhaeus	75	1971								40	75	75	75	75	75	75
AR	Dierks	Weyerhaeus	75	1971								44	75	75	75	75	75	75
OK	Wright Cty	Weyerhaeus	75	1971								40	75	75	75	75	80	84
TX	Corrigan	CI (G-P)	142	1972									71	142	168	168	168	177
SC	Holly Hill	Holly H.	89	1972									44	89	89	89	89	89
LA	DeQuincy	B-C	89	1973										35	89	89	89	89
GA	Warm Spr.	G-P	146	1974											87	146	164	173
TX	Pineland	Temple	106	1974											106	106	124	124
SC	Newberry	CI (USPLY)	62	1974											62	133	133	133
SC	Prosperity	G-P	84	1975											0	84	84	84
AL	Talladega	G-P	106	1975											0	115	142	159
TX	Bon Wier	LP (Kirby)	142	1975											0	142	150	164
AL	Millport	Weyerhaeus	71	1977														71
AL	Peterman	G-P	204	1978														
LA	Zwolle	Willamette	89	1978														
LA	Taylor	Willamette	111	1978														
TX	Camden	Champ. Int.	195	1979														
GA	Madison	GP (GA-Kraft)	199	1979														
LA	Logansport	LP (GA-P)	142	1979														
AK	Gurdon	I-P	133	1979														
AK	Emerson	Willamette	133	1979														
NC	Dudley	G-P	89	1980														
TX	Cleveland	LP (Kirby)	159	1980														
SC	Chester	Willam (B-C)	133	1981														
FL	Havana	Coastal	111	1981														
LA	Pollock	Hunt Plywd	66	1981														
LA	Springhill	I-P	195	1981														
FL	Hawthorne	G-P	195	1982														
LA	Natalbany	Hunt Plywd	106	1988														
LA	Chopin	Martoo	248	1995														
GA	Fitzgerald	Springfield	66	1995														
Total ($\times 10^3$ m ³)					129	492	1274	1973	2601	2945	3371	4101	4822	5092	5577	6136	6560	6883
Change ($\times 10^3$ m ³)					129	363	781	699	628	344	426	730	721	270	485	558	424	323
Number of mills					3	10	24	31	36	38	42	52	54	55	61	60	60	61
Average mill capacity ($\times 10^3$ m ³)					43	49	53	64	72	78	80	79	89	93	91	102	109	113
Production ($\times 10^3$ m ³)					71	356	1009	1574	2100	2544	2934	3903	4707	4921	4540	5023	6030	6591
Capacity utilization (percent)					55	72	79	80	81	86	87	95	98	97	81	82	92	96

1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
168	168	177	199	204	204	226	226	226	230	252	257	252	252	252	252	252	252	252	252
128	133	133	133	133	133	133	142												
106	106	106	106	111	111	111	44												
89	89	89	97	124	124	124	137	150	150	150	168	168	168	177	177	177	177	177	177
177	177	177	177	195	212	212	221	243	266	270	274	279	279	279	279	279	279	279	279
75	75	75	75	75	75	89	102	115	115	115	115	133	155	155	155	155	155	155	155
135	135	159	177	204	204	204	204	212	212	212	235	235	235	235	235	251	251	251	251
146	146	146	155	155	155	155	155	164	177	221	230	230	230	252	252	252	252	252	252
146	146	146	155	155	155	155	155	164	199	235	257	261	263	263	263	274	274	274	274
71	71	71	71	71	71	89	89	89	97	97	97	97	97	97	97	97	97	97	97
75	75	75	75																
89	89	89	89	89	89	89	106	106	124	124	124	124	124	124	155	161	177	177	177
177	177	177	177	195	212	212	221	243	266	274	279	283	283	283	283	283	283	283	283
177	177	177	248	248	248	248	257	257	257	257	258	258	258	258	258	258	258	258	258
142	142	142	142	142	177	204	221	221	235	235	257	261	266	281	281	281	281	281	281
89	89	89																	
115	115	115	115	133	133	133	133	142	159	168	174	173	173	173	173	173	173	173	173
89	89	89	89	89	89														
27	27																		
27																			
80	80	80	80	80	80	80	80	89	89										
89	89	89	89	89	89														
49	49	49	58	58	58	66	66	75	75	75	75	75	75	75	75	75	75	75	75
89	115	115	115	115	115	140	140	146	142	142	136	137	137	137	137	137	137	137	137
106																			
74	74	74	74	80	80	80	84	84	84	84	96	97	97	97	97	119	119	119	119
155	155	166	166	166	166	166	173	173	173	173	173	173	173	175	175	175	175	175	175
80	80	80																	
75	75	75	75	75															
168	168	168	168	168	168	168	177	186	186	186	181	186	186	186	186	212	212	212	212
64	64																		
133	133	133	133	133	190	199	199	199	212	221	243	243	243	243	243	243	243	243	243
89	89	89	89	89	97	115	137	146	146	142	142	142	142	142					
133	133	133	133	133	133	133	133	142	142	119	119	119	122	124	124	124	124	124	124
66	66	66	66	66	66	73	76	80	89	89	89	89	89	87	133	133	133	133	133
186	186	204	204	204	204	212	239	248	248	248	230	248	248	248	248	248	248	248	248
168	168	221	221	221	221	217	226	266	310	310	305	305	305	305	305	305	305	305	305
142	142	0	0	142	142														
66	71	75	75	80	80	80													
221	230	230	230	239	257	266	266	283	283	283	274	274	274	274	274	274	274	274	274
195	195	195	195	195	195	195	195	204	204	221	239	239	239	239	239	239	239	239	239
80	80	80	80	80	80														
133	133	177	177	177	177	212	212	221	239	248	248	248	248	248	248	248	248	248	248
177	177	186	186	186	186	186	199	212	212	212	239	266	266	266	266	266	266	266	266
133	133	133	133	133	133	133	155	159	168	177	195	195	195	181	181	181	181	181	181
124	124	124	124	124	124	128	133	133	142	142	133	133	142	142	142	142	142	142	142
71	71	71	71	71	80	89	89	89											
89	89	89	89	89	89	89	89	89											
75	75	75	75	75	80	89	97	106	106	106	106	106	106	106	106	106	106	106	106
75	75	75	75	75	84	97	97	106	106	106	106	106	106	111	111	158	164	164	164
89	93	97	97	97	97	102	106	106	106	106	106	106	106	142	142	142	142	142	142
177	177	177	195	204	204	204	204	208	239	257	264	264	266	266	266	266	266	266	266
89	89	89	89																
106	111	111	111	89															
177	177	177	177	177	177	190	190	199	221	257	261	261	261	261	261	261	261	261	261
133	137	137	137	137	173	173	173	181	177	177	177	177	177	177	177	177	177	177	177
133	155	159	159	159	159	164	164	177	203	203	150								
84	106	115	124	124	124	124	124	128	155	164	190	199	218	218	218	218	218	218	218
177	177	195	195	195	195	200	200	212	221	248	274	274	283	289	289	289	289	289	289
177	177	190	195	204	204	204	208	243	243	243	243	243	243	243	243	243	243	243	243
71	71	71	71	71	71	80	80	84	89	105	110	111	115	115	115	115	115	115	115
177	204	204	204	204	204	204	204	208	235	266	274	274	274	274	274	274	274	274	274
80	93	93	93	93	93	95	95	102	133	155	159	164	164	169	169	169	169	169	169
111	115	115	115	115	115	115	133	142	164	186	177	177	186	186	186	186	186	186	186
	195	204	221	230	230	230	252	266	279	279	281	279	279	279	279	279	279	279	279
	159	199	199	199	208	230	239	243	243	243	274	274	274	310	319	319	319	319	319
	106	142	150	150	150	150	168	177	177	177	221	212	221	221	221	221	221	221	221
	133	159	186	204	208	208	217	230	230	230	230	230	230	243	243	252	252	252	252
	111	124	133	133	133	133	142	150	155	159	164	164	168	170	170	170	170	170	170
		93	97	124	124	124	124	124	177	190	221	226	227	227	227	227	227	227	227
		159	195	221	221	230	248	266	274	283	266	266	266	266	266	266	266	266	266
			133	133	133	133	137	150	168	190	195	208	232	232	232	232	232	232	232
			111	111	111	124	124	124	124	124	124	128	133	142	159	177	177	177	177
			66	71	71	71	111	115	115	115	106	102	97	97	97	97	97	97	97
			195	195	195	204	221	226	235	248	239	239	239	243	243	266	270	270	270
				177	177	212	212	221	239	248	243	243	243	243	243	257	257	257	257
										53	124	133	137	137	137	137	137	137	137
																0	133	292	66
																66	66	66	66
7407	8123	8489	9104	9472	9534	9493	9639	9921	10371	10796	11123	11090	11220	11366	11328	11520	11613	11745	11904
524	717	366	615	368	62	42	147	281	450	425	327	33	130	146	38	192	93	132	159
64	67	67	69	68	66	62	60	58	57	57	57	56	56	56	55	55	57	57	57
116	121	127	132	139	144	153	161	171	182	189	195	198	200	203	206	209	204	206	209
6990	7371	6543	7352	7484	8821	9204	9379	10111	10283	10618	10491	11010	10071	10766	11403	11628	11600	11860	
94	91	77	81	79	93	97	97	102	99	98	94	99	90	95					

Table C—Particleboard capacity, by year of plant construction ($\times 10^3 \text{ m}^3$)

State	Location	Company (former name)	Year built	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
CA	Arcata	Sierra-P/L-P		80	124	124	124	124	124	124	124	150	301	266
OR	Brownsville	Browns/Forr		53	53	53	53	53	53	53	53	18		
CA	Chester	Collins Pine		42	42	42	42	42	42	42	42	44	50	57
CA	Crescent city	Hambro		21	21	41	41	41	41	41	41	44	46	50
Ark	Crossett	G-P		74	74	112	112	112	112	127	127	186	186	186
OR	Dillard	Permaneer		44	44	44	44	44	44	53	53	53		
OR	Eugene	Boh/William		64	89	89	89	89	89	89	89	117	117	115
NC	Farmville	IP(Formica)		71	71	71	106	124	124	124				
MI	Gaylord	Champion		71	71	177	177	177	177	191	191	191	191	191
AR	Hope	S. Plaswood		21	21	25	25	25	25	25	25	25		
AL	Huntsville	Giles-Kend		12	12	12	12	12	12	12	12	12	12	12
TX	Jacksonville	Wynnewood		21	21	21	21	21	21	21	32	32	32	
WA	Longview	I-P		12	21	21	21	18	18	18	18	18	19	19
WI	Marinette	Rodman		27	35	35	42	42	42	42	42	42	42	42
OR	Medford	Timber prod		71	106	106	106	106	106	142	142	142	143	143
OR	N Bend	Weyerhaeus		62	62	62	62	62	62	124	124			
CA	Redding	Champion		124	124	124	124	124	124	124	124	150		
CA	Redlands	Golden State		46	46	46	53	53	53	64	64	64		
OR	Sweet Home	Smurfit (Publ.)		21	21	21	21	35	35	35	35	35	27	27
AR	Trumann	Singer		9	9	9	9	18	18	27	39	39	39	27
PA	Tyrone	Westvaco		44	44	44								
OR	White City	Down River		80	80	80	80	80	80	80	80	80	133	124
VA	South Boston	G-P (Cham)		53	53	53	53	53	53	53	53	113	113	124
VA	Waverly	I-P (Masonite)		106	106	106	106	106	106	106	106	142	142	159
IN	Seymour	Swain	1947	21	21	21	21	21	21	27	27	27	27	27
MS	Meridien	Kroehler	1959	21	21	21								
OR	Albany	Willamette	1960	177	177	177	177	294	294	294	294	294	299	314
OR	Oakridge	Pope-Talb	1963	42	42	53	53	53	53					
NC	Lenoir	Nu-Wood	1964	13	13	27	27	27	27	27	27	30	30	30
OR	Springfield	Weyerhae	1965	53	53	53								
OR	Bend	Brks-William	1966	80	80	80	195	195	195	195	195	248	248	257
OR	LaGrande	Boise	1966	115	115	115	115	212	212	266	266	266	266	271
KY	Middlesboro	Tenn-Flake	1967	53	89	89	89	89	89	89	89	89		
WI	Marshfield	Weyerhaeus	1967	67	67	67	67	67	106	106	106	110	110	113
MS	Louisville	G-P	1967	106	127	127	127	127	159	159	159	159	161	161
TX	Silsbee	Evans Pr	1967	80	124	124	127	127						
GA	Adel	Weyerhae	1968		62	62	62	62	89	89	89	89	133	133
AK	Malvern	I-P	1968		124	124	124	124	124	124	124	124		
GA	Vienna	G-P	1969			133	133	159	159	159	159	159	177	181
MS	Oxford	G-P (CI)	1969			177	177	177	195	195	204	212	212	212
NM	Albuquerque	Ponderosa	1970				53	53	53	53	53	53	80	80
		(Mexw)												
OR	Springfield	Weyerhae	1970				159	159	159	159	159	159	177	186
SC	Greenwood	I-P	1970				124	124	124	124	124			
AZ	Flagstaff	SWFI	1970				133	133	133	133	133	133		
MT	Missoula	Evans Pr/L-P	1970				142	142	142	142	150	159	170	170
OR	Roseburg/Dil	Roseburg	1971					177	177	177	177	266	489	489
OR	Klamath Falls	Weyerhae	1971					99	99	127	127	168	168	168
LA	Urania	L-P (G-P)	1971					127	127	168	168	168	168	159
MS	Taylorville	G-P	1971					129	129	212	212	212	212	212
TX	Diboll	Temple	1971					142	142	142	142	177	177	159
SC	Russelville	G-P	1971					168	168	168	168	168	212	192
LA	Lillie	Willam (Olinkr)	1971					177	177	177	177	177	177	177
CA	Chowchilla	Wickes	1972						28	57	57	57	64	60
LA	Ruston	Willamette	1972						106	106	106	106	120	113
VA	Franklin	Union Camp	1972						106	106	124	124	149	149
CA	Ukiah	G-P/L-P	1972						142	142	142	142	143	142
CA	Martell	G-P (AFPC)	1972						159	159	159	159	168	170
IN	Evanston	Swain	1973							21	21	21	21	22
FL	Greenville	Fla-ply	1973							18	18	18	18	18
VA	Stuart	I-P (Stuart)	1973							106	106	106	106	106
TX	Corrigan	G-P / L-P	1973							80	159	159	177	177
AL	Monroeville	T-I (Olinkr)	1974								35	142	186	177
AL	Pine Hill	McM-Bloed	1974								177	177	177	177
MN	Virginia	Publishers	1974								21	21	21	21
TX	Silsbee	L-P (Kirby)	1974								124	124	124	127
GA	Thomson	Temple	1974								53	177	177	159
AL	Eufala	L-P	1975									191	191	177
ID	Post Falls	Potlatch	1975									89	101	106
NC	Lenoir	Broyhill	1976										48	74
OR	Philomath	Smurfit (Publ.)	1976										30	30
NM	Navajo	Navajo FP	1976										53	53
MI	Gaylord #2	G-P (Cham)	1978											
SD	Rapid City	Merrillat	1984											
VA	Galax	Webb	1985											
VA	Ridgeway	Triwood, Inc	1985											
NC	Moncure	Weyerhaeus	1987											
PA	Mt Jewett	Allegheny	1990											
AK	Hope	Temple Intl.	1996											
TX	Eastern Tx	I-P	1997											
				177	142	124	89	89	89	89	89	89	89	89
Total ($\times 10^3 \text{ m}^3$)				2023	2236	2610	3092	3717	5014	5544	6163	6535	7218	7380
Change ($\times 10^3 \text{ m}^3$)				2023	212	374	482	625	1297	529	619	372	683	-271
Number of mills				46	46	46	51	55	59	62	62	62	58	54
Average mill capacity ($\times 10^3 \text{ m}^3$)				44	49	57	61	68	85	89	99	105	124	137
Production($\times 10^3 \text{ m}^3$)				1678	1901	2462	2977	3066	4175	5450	6124	5443	4430	6317
Capacity utilization (percent)				83	85	94	96	82	83	98	99	83	61	86

1978	1979	1980	1981	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
221	221	221	221	138	138	177	177	204	212	230	230	230	230	230	230	230	230
53 50 227	64 60 212	64 62 239	64 53 168	67 44	53	53	62	62	64	64	62	62	62	62	62	62	62
115	115	115	115	106	127	127	131	133	142	142	142	142	142	142	89		
12	18	18	18	21	18	32	32	11	11	11	11	11	11	11	11	11	11
19 44 135	32 142	44 149	42 170	62 170	62 170	62 170	62 170	76 170	76 170	76 170	76 170	76 170	76 170	76 170	76 170	76 170	76 170
23 39	28 35	28 28	39												39	39	39
124 133 159 27	89 136 172 27	142 149 172 27	133 149 177 27	177 170 170 27	177 170 170 27	191 172 172 30	191 173 173 30	191 173 173 30	191 173 173 30	191 182 177 30	191 177 177 30	191 177 177 30	191 177 177 30	191 177 177 30	191 184 184 28	191 184 184 28	191 184 184 28
312	303	297	303	315	301	319	335	336	336	375	381	381	381	381	372	372	372
44	41	42	42	42	42	42	42	42	41	41	28	28	28	28	41	41	41
253 294	266 269	239 271	248 273	251 294	266 315	301 320	301 319	301 319	301 326	301 331	301 331	301 327	301 327	301 327	283 345	283 345	283 345
124 188	112 159	117 177	115 131	113 119	113 166	113 172	124 219	124 219	124 182	124 182	124 209	124 209	124 209	124 230	124 230	124 230	124 230
133	124	124	133	133	133	133	133	152	158	163	163	165	165	165	177	248	248
181 212 74	186 232 80	186 269 80	186 274 80	191 310 80	198 342 85	202 354 85	205 354 85	212 354 85	209 354 80	202 354 89	198 354 89	204 310 89	204 310 89	204 354 89	211 354 89	211 354 89	211 354 89
186	177	186	177	170	170	170	170	177	186	230	230	230	230	230	257	257	257
177 489 170 159 212 159 196 177 65 110 135 142 165 21 14 89 177 177 14 127 177 177 120 48 34 53 290	170 510 165 159 198 177 191 177 64 115 138 142 172 19 42 80 177 177 14 127 177 177 120 35 30 51 304	177 510 168 159 186 177 186 177 64 117 142 204 23 28 97 177 177 14 127 177 177 120 44 30 51 319	177 510 177 177 152 177 191 177 65 142 133 195 27 19 106 177 177 14 127 177 177 133 44 35 44 310	170 531 177 177 127 159 195 177 65 145 154 186 21 30 97 184 177 127 159 133 55 39 64 354 156	170 531 177 177 186 181 212 158 159 149 150 204 27 30 97 177 127 191 133 55 39 67 366 115 32 35	177 558 177 177 189 186 223 168 154 159 204 32 25 97 212 212 181 181 133 55 50 67 366 150 27 35	266 602 177 177 195 186 223 177 159 163 230 32 25 135 204 204 186 186 135 55 50 67 443 166 25 35 159	266 602 184 184 212 195 202 221 177 172 172 181 181 163 248 248 186 186 135 51 50 71 427 168 25 35 159	266 620 184 184 205 202 221 177 172 172 181 181 159 248 248 193 124 124 186 129 50 64 427 168 27 35 329	266 620 186 186 221 221 221 186 195 195 221 221 193 248 248 193 124 124 193 129 53 60 425 186 28 35 329	266 620 186 186 221 221 221 195 195 221 221 193 248 248 193 124 124 193 129 53 60 425 186 28 35 329	266 646 195 195 248 195 267 212 195 195 267 212 195 195 221 221 193 248 248 193 124 124 193 129 53 60 425 186 28 35 329	266 673 195 195 267 212 195 195 267 212 195 195 221 221 193 248 248 193 124 124 193 129 53 60 425 186 28 35 329	266 673 195 195 267 212 195 195 267 212 195 195 221 221 193 248 248 193 124 124 193 129 53 60 425 186 28 35 329			
89	89	89	89	71	71	71	71	71	71	71	35	35	35	35	35	35	35
7521 141 54 139 6682 89	7119 -402 52 137 6089 86	7007 -112 50 140 5310 76	6892 -115 47 147 5151 75	6501 -115 43 151 5657 87	6740 239 44 153 5896 87	6921 181 43 161 6377 92	7406 485 44 168 6560 89	7544 138 44 171 6777 90	7569 25 44 172 6852 91	8192 623 46 178 6876 84	8170 -21 45 182 6779 83	8138 -32 45 181 7207 89	8138 0 45 181 7531 93	8305 166 46 181 8204 99	8523 218 46 185 190	8735 212 46 190	9186 451 47 195

Table D—Canadian particleboard capacity by year of plant construction

Provi- dence	Location	Company	Year Built	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
ON	Sturgeon F	Abitibi	1958	35	35	35														
NB	St Stephen	Flake Bd	1960	35	35	35	44	60	53	48	48	48	48	48	48	48	53	53	71	71
QU	Lac des Iles	Sogefors	1960	27	27	27	71	71	71	80	80	89	97	97	97	97	92	92	110	110
BC	Vancouver	McM-BI	1962	37	37	37	57	71	71	71	78	78	85	85	89	92	92	96	96	96
MA	Sprague	Weldwood	1962	21	21	21	35	35	37	35	35	35	35	35	35	35				
ON	New Liskeard	Rexwood	1964	18	18	44	44	44	44	44	53	53	62	62	62	62	62	62	62	62
QU	Val d'Or	Forpan	1964														150	150	150	150
ON	Timmins	Mallette	1972								64	64	64	64	64	64	64	64	64	64
ON	Huntsville	Domtar	1974											74	74	74	74	74	74	74
BC	Grand Forks	CanPar	1976														35	44	53	53
ON	Hearst	Levesque	1976												80	80	80	80	80	97
ON	Atikokan	Proboard	1976												80	80	80	81	89	89
BC	Smithers	Northwest P	1983																	
QU	Sayabec	Panval	1983																	
ON	Bancroft	Comb/GP	1991																	
QU	Lac-Megantic	Tafisa	1992																	
MA	Winnipeg	Palliser	1994																	
Total ($\times 10^3$ m ³)				173	173	200	251	281	276	278	358	366	391	466	628	632	782	797	848	866
Change ($\times 10^3$ m ³)					0	27	51	30	-5	2	80	9	25	74	163	4	150	14	51	18
Production ($\times 10^3$ m ³)															496	519	637	710	720	715
Capacity utilization (percent)														0	79	82	81	89	85	83

Table E—MDF Capacity by year of plant construction ($\times 10^3$ m³)

State/ Prov.	Location	Company	Year built	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
NY	Deposit	Norboard	1966	50	50	50	50	50	50	50	50	50	44	44	50	50	50	
VA	Bassett	Bassett	1969	35	35	35	35	35	35	39	42	42	39	39	39	39	39	39
MS	Meridian	Kroehler	1970		33	33	33	33	33	33	33	33	33					
OR	Oakridge	Pope-Talbott	1971			53	53	53	78	78								
NC	Moncure	Weyerhaeus	1971			110	110	110	110	110	110	106	106	106	106	106	106	106
OK	Broken Bow	Weyer>Pan Pac	1972				127	127	127	127	127	150	124	124	124	124	124	126
NC	Spring Hope	Masonite>I-P	1973					71	97	106	124	124	127	131	131	131	131	131
SC	Marion	Masonite>I-P	1974						101	101	101	101	97	97	101	101	101	101
MT	Columbia Falls	Plum Creek	1974						124	124	124	124	133	135	142	142	142	142
SC	Holly Hill	HH>G-P	1975							89	89	89	106	106	110	110	110	143
CA	Oroville	L-P	1975							89	89	89	89	89	89	89	89	89
OR	Medford	Meditate	1975						114	114	124	142	142	142	142	142	142	150
CA	Rocklin	Fbd>Sierra	1976								106	106	106	120	133	133	133	142
AL	Eufala	L-P	1979											106	106	106	106	106
ALT	White Court	Blue Ridge	1981													80	90	90
AK	Malvern	Willamette	1983															71
NM	Las Vegas	Meditate	1984															
MI	Newberry	L-P	1985															
QU	Mont-Laurier	Uniboard	1986															
SC	Bennetsville	Willamette	1990															
NB	St. Stephen	Flakeboard	1991															
LA	Urania	L-P	1993															
PA	Mt Jewett	Allegheny	1995															
GA	Monticello	G-P	1995															
OR	Eugene	Willamette	1995															
ON	SaultSteMarie	GP/Flakebd	1996															
PA	Shippenville	MB/Clarion F	1996															
ON	Pembroke	MB/FIDEV	1996															
QU	Sainte-Foy	Uniboard	1996															
BC	Quesnel	West Fraser	1996															
BC	Prince George	Canfor/Sincl	1996															
ON	Scarborough	CanFibre	1997															
Q/O	?	Grant Forest	1997															
BC	Port Alberni	MB	1997															
AK	Murphy	Temple-Inland	1997															
Total ($\times 10^3$ m ³)				1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Number of Mills				85	118	281	408	479	755	1059	1109	1138	1146	1239	1271	1351	1361	1435
Production, U.S. ($\times 10^3$ m ³)				2	3	5	6	7	9	12	12	12	12	12	12	13	13	13
Production, Canada. ($\times 10^3$ m ³)									393	381	496	781	940	938	908	938	832	1115
Production, Total ($\times 10^3$ m ³)									393	381	496	781	940	938	908	991	903	1195
Capacity Utilization (percent)									52	36	45	69	82	76	71	73	66	83

1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
71	71	71	80	124	142	142	142	145	149	149	149	149	159	168	168
115	119	119	159	159	159	159	106								
96	96	96	96	96	96	101	101	97	96	99	99	99	96	96	96
62	62	62	71	71	80	115	115	115	115	115	115	115	113	113	113
150	150	212	230	248	248	248	266	274	289	301	301	301	386	386	386
64	64	64	64	64	64	67	57	53	50						
80	80	80	80	80	80	89	89	133	177	177	177	177	177	177	177
71	71	71	74	74	80	80	115	115	126	147	147	147	177	177	177
97	97	97	97	103	103	103	103	101	101	110	110	110	101	101	101
97	124	124	124	124	124	124	124	110	110	110	110	110	140	140	140
	89	80	76	74	71	62	62	53	44	44	44	44	64	64	64
	177	177	177	177	177	177	177	195	212	212	212	212	248	248	248
									188	188	188	248	251	251	251
										147	147	147	150	227	227
												53	53	53	53
903	1198	1251	1328	1393	1421	1466	1455	1391	1655	1798	1798	1912	2115	2200	2200
37	296	53	76	65	28	44	-11	-64	264	143	0	113	204	85	0
563	717	843	1044	1138	1354	1212	1278	1145	1058	1205	1421	1476	1682	1770	1770
62	60	67	79	82	95	83	88	82	64	67	79	77	79	80	80

1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
		97	97	97	97	96	97	97	106	106	110	110	110
39	39	39	39	37	37	37	37	37	37	37	37	37	37
124	124	124	124	124	124	133	142	142	142	142	133	133	133
133	133	133	133	225	225	53					65	65	65
127	131	110	110	110	110	119	122	122	122	122	122	122	122
101	101	101	101	101	101	112	112	112	112	122	133	133	133
142	142	142	150	156	154	177	195	195	195	195	218	218	218
143	143	143	143	177	170	177	177	177	177	177	177	177	177
89	89	89	89	78	78	78	78	78	78	78	78	78	78
150	150	156	156	165	168	177	170	170	170	170	177	177	177
142	133	142	145	145	156	156	150	156	156	165	165	165	165
124	124	124	124	212	212	221	221	230	230	230	239	239	239
90	90	90	106	106	106	106	106	106	106	115	195	195	195
80	87	103	212	212	212	212	212	212	212	216	283	283	283
142	142	142	142	150	159	159	159	159	159	159	159	159	159
	89	89	89	106									
		106	106	106	106	112	112	112	112	119	124	124	124
						177	177	212	212	212	257	257	257
							71	85	97	97	154	154	154
									89	106	89	89	89
											177	177	177
											283	283	283
											106	106	106
												266	266
												212	212
												230	230
												212	212
												212	212
													106
													301
													212
													177
1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1625	1715	1928	2066	2308	2216	2301	2338	2402	2512	2565	3413	4613	5409
14	15	17	17	17	16	17	17	17	18	18	22	27	31
1165	1241	1416	1628	1690	1751	1715	1729	1933	2078	2241			
78	78	106	159	177	186	168	193	257	257	283			
1243	1319	1522	1788	1867	1936	1883	1922	2189	2335	2524			
76	77	79	87	81	87	82	82	91	93	98			