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FINAL REPORT

Air

Industry Profile for the Proposed Wood Building Products NESHAP

Final Report



SECTION 1

INTRODUCTION

The U.S. Environmental Protection Agency's (EPA's) Office of Air Quality Planning and Standards (OAQPS) is compiling information on plants that apply surface coatings to wood building products as part of its responsibility to develop national emission standards for hazardous air pollutants (NESHAP) under Section 112 of the 1990 Clean Air Act.¹ The NESHAP, which is also a maximum achievable control technology (MACT) standard, will limit air emissions from the coating process for wood building products and is scheduled to be proposed in the spring of 2001. The Innovative Strategies and Economics Group within OAQPS is responsible for developing an economic impact analysis (EIA) that evaluates the economic impacts associated with the regulatory options considered for this NESHAP. This industry profile of the wood building products industry provides information that will be used to develop and implement the EIA methodology.

Although the NESHAP will most directly affect facilities that apply surface coatings to wood building products, the rule will also indirectly affect the coatings manufacturers. For the wood building products industry, the relevant Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS) codes are listed in Table 1-1. The products associated with each industry accompany the SIC and NAICS code descriptions.

For the indirectly affected coatings manufacturing industry, the relevant SIC and NAICS codes are

- C SIC 2851: Paints, Varnishes, Lacquers, Enamels, and Allied Products;
- C SIC 2891: Adhesives and Sealants; and
- C NAICS 3255: Paint, Coating, and Adhesive Manufacturing.

¹ The products covered under this coatings rule include exterior siding, doorskins, interior stock panels, interior wall paneling, tileboard, flooring, windows, and doors. The proposed rule only regulates the surface coating and laminating of these products, and does not cover the manufacture of the substrate.

Table 1-1. Industries Affected by the Wood Building Products NESHAP

Product	SIC	Description	NAICS	Description
Hardwood and parquet flooring	2426	Hardwood dimension and flooring mills	321918	Other millwork (including flooring)
Wood shingles	2429	Special product sawmills, NEC	321113	Sawmills
Awnings, doors, garage doors, mantels, shutters, moldings	2431	Millwork	321911	Wood window and door manufacturing
			321918	Other millwork (including flooring)
Hardwood plywood panels, prefinished hardwood plywood	2435	Hardwood veneer and plywood	321211	Hardwood veneer and plywood manufacturing
Softwood plywood panels	2436	Softwood veneer and plywood	321212	Softwood veneer and plywood manufacturing
Arches, Trusses	2439	Structural wood members, NEC	321213	Engineered wood members (except trusses) manufacturing
			321214	Truss manufacturing
Hardboard, particleboard, reconstituted wood panels, wall tile, wallboard	2493	Reconstituted wood products	321219	Reconstituted wood product manufacturing

Within the four-digit NAICS classification, the following six-digit NAICS codes are applicable:

- C NAICS 325510: Paint and Coating Manufacturing and
- C NAICS 325520: Adhesive Manufacturing.

These codes include facilities that manufacture coatings for a variety of industries in addition to the wood building products industry.

The domestic wood building products industry is a large, mature industry, that competes on a global level. Although there are over 5,000 establishments employing over 240,000 workers producing wood building products, most of these facilities do not apply coatings. It is estimated that there are 205 wood building products facilities in the United States that coat wood building products and are major sources of hazardous air pollutants

(HAPs) (Reeves, 2000).² HAPs are primarily emitted during coating operations as the liquid portion of the coating evaporates and the HAPs in the coating are released into the air.

This industry profile is organized into four additional sections. In Section 2, the affected production process, inputs, outputs, and costs of production are described. Section 3 discusses industry organization, including market structure, manufacturing plants, and parent company characteristics. Section 4 describes the uses and consumers of wood building products. Finally, Section 5 provides market data on the wood building products industry, including market volumes, prices, and future outlook. While the industry profile focuses on the wood building products industry, information is also provided on the indirectly affected coatings industry.

²A major source of HAP emissions is defined as a facility that emits, or has the potential to emit, 10 or more tons of any HAP or 25 or more tons of any combination of HAPs.

SECTION 2

SUPPLY-SIDE OVERVIEW

This section provides an overview of the supply side of the coatings process for wood building products. The term “wood building products” is a general term used to describe any wood product that contains more than 50 percent by weight wood or wood fibers and is used in the construction, either interior or exterior, of a residential, commercial, or institutional building. In this profile, the term is more narrowly defined as those wood building products that are sold to distributors having received at least one laminate, varnish, paint, or protective coating at production facilities. Products falling into this category include hardwood and laminate flooring; windows; interior paneling and veneer, doors, moldings, and other millwork; exterior wood panels and siding; structural wood members, like arches and trusses; and wood shingles, among other products. All of these products are available in any dimension or shape and in either softwood (e.g., fir, cedar, pine, and hemlock) or hardwood (e.g., maple, oak, birch, sherry, mahogany, and walnut). Table 2-1 lists sample coated wood building products produced by industries included in this profile. This section describes characteristics of the coatings used in this industry; the production process for coating wood building products, including inputs used in the production process and the final outputs produced; and data on the costs of production.

2.1 Characterization of Coatings

Wood is widely used in buildings for roof trusses, timber frames, and joists, and nonstructurally in doors, windows, frames, cladding, and fencing. It is an attractive material and a naturally renewable resource, but it is vulnerable to light, moisture, and biological attack (Stoye, 1993). Coatings are used for three principal purposes: protection, appearance, and surface modification. First, coating wood products reduces the potential for damage from environmental elements, such as moisture and temperature extremes and other climate-related hazards, and from insect infestation, such as termites. Surface coatings are also applied to enhance surfaces to make other coatings applications, such as those for aesthetic purposes, more effective. In this way, coatings are used to meet special physical and

Table 2-1. Wood Building Products

Arches	Hardwood and softwood veneer	Sashes, window and door
Awnings	Hardwood flooring	Shakes (hand split shingles)
Door jambs	Interior hardwood and softwood panels	Shutters
Door trim	Laminated flooring	Timbers
Doors	Laminated wood products	Trellises
Exterior hardwood and softwood panels	Medium-density fiberboard (MDF)	Trim
Fencing	Moldings	Trusses
Framing, window and door	Oriented strand board (OSB)	Waferboard
Furniture stock	Panel work	Wall tile
Garage doors	Parque flooring	Wallboard
Hardboard	Particleboard	Windows
Hardboard	Railings	Wood shingles
Hardwood and softwood plywood		

functional requirements. Finally, coatings are applied to improve the appearance of the wood product. However, releases of HAPs occur during the coating process as the coatings dry and HAPs contained within the coating evaporate into the air.

The HAPs associated with wood building products manufacturing include methanol (49 percent), formaldehyde (13 percent), and toluene (9 percent). These three chemicals account for over 70 percent of the 14,311 tons of HAPs emitted by the industry each year (Hellwig, 1999). The predominant HAPs associated with the industry's surface coating operations are xylenes (44 percent), toluene (11 percent), ethylene glycol monobutyl ether (EGBE) (10 percent), ethyl benzene (7 percent), methyl ethyl ketone (MEK) (5 percent), methyl isobutyl ketone (MIBK) (4 percent), and methanol (4 percent).

The types of coatings used in the industry fall into the following categories:

- C *Fillers* are used to fill pores, voids, and cracks in the wood to provide a smooth surface.
- C *Adhesives* are used as bonding agents.
- C *Sealers* have a dual purpose: they both seal off substances in the wood that may affect subsequent finishes and protect the wood from moisture.

- C *Groove coats* cover grooves cut into panels and assure the grooves are compatible with the final surface color.
- C *Primers* further reduce the potential for moisture damage and provide a good surface for further coatings applications.
- C *Stains* are nonprotective coatings that color the wood surface without obscuring the grain.
- C *Basecoats* provide color and hide substrate characteristics.
- C *Inks* are used to print decorative designs on printed panels or produce a simulated wood grain.
- C Pigmented (enamels) and clear *topcoats* provide protection, durability, and gloss.

Chemicals used as coatings are as diverse as the products produced by the industry. The chemicals used in these coatings include polyvinyl chlorides and other vinyls, resins, acrylics, polyesters, phenol-formaldehydes, urea-formaldehydes, and polyurethanes (EPA, 1995; LMA, 2000; Stoye, 1993). These chemicals may be solvent-borne or waterborne. Solvent-borne coatings are preferred for applying coatings that must dry quickly, provide water resistance, or are applied to workpieces on quick-moving coatings lines (MRI, 1998).

Many companies supply the chemical inputs used by in this industry. A cross-section of both large and small suppliers includes Akzo Nobel, Ashland Chemical, Mohawk Finishing, Witco, Hunsman, and Willamette Valley Co. Some manufacturers are related to wood building products companies themselves, but this is generally only true of larger companies. These subsidiaries or spin-offs may serve both their parent companies and other firms. Georgia-Pacific Resins sells one-third of its product to its parent company, another third to other wood building products and paper companies, and the final third to companies outside of the forest products industry (McCoy, 1997).

2.2 Wood Building Products Coatings Processes

The choice of coating technology and the quality of the coat applied to a given article primarily depend on the workpiece, its geometry, design, and surface state (Stoye, 1993). For these reasons, the finishing processes and types of coatings used in the wood building

products industry vary by product type¹. Workpieces that are finished again after field installation (e.g., exterior siding) are typically only primed and sold to distributors after which building contractors or homeowners apply architectural coatings formulated for consumer use. High-end products (e.g., wall paneling and millwork) receive numerous coatings prior to sale to distributors.

Typical coating application methods and technologies used in the wood building products industry are spraying, roll coating, rotogravure cylinder, curtain coating, flow coating, pneumatic (air knife) coating, brush coating, vacuum coating, and dip coating. This section begins by describing each of these technologies and processes, places them in the context of wood building products finishing processes, and concludes by associating each with a product type.

2.2.1 Spray Coating

The most popular coating method among all industries, spray coating involves mixing material and compressed air to apply coatings. At wood building products facilities, operators usually spray coat workpieces using a handheld or automatic spray gun in a spray booth. A spray booth is a sealed environment through which air is constantly pulled and vented to keep levels of volatile compounds low. The spray booth may be a stand-alone building or a dedicated workspace in a larger facility enclosed in glass, plastic shields, or some other material. Spray coating is most often used to coat products that are not flat because the geometry of multidimensional objects is not conducive to roller-based or pass-through coating operations.

There are five main spray coating technologies:

- C Conventional air spray uses compressed air to atomize the finishing materials. Compressed air flows through the gap in the head of the spray gun to meet a coatings stream. The air atomizes the coatings into a mist.
- C Airless spraying involves atomizing the finish by forcing it through a small opening at high pressure.
- C Air-assisted airless spraying uses an airless spray unit with a compressed air jet to finalize breakup and help shape the spray pattern of the finish material.

¹The majority of the information used in the preparation of this section came from “Preliminary Industry Characterization: Wood Building Products Surface Coating” (EPA-453/R-00-004) prepared by Midwest Research Institute, Cary, NC, for Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency in September 1998.

- C Electrostatic finishing is performed by spraying negatively charged finish particles onto grounded wood products.
- C High-volume low-pressure spraying involves the use of a high-volume of air delivered at an effectively low pressure to atomize a finish into a pattern of low-speed particles, which typically results in less overspray.

2.2.2 Roll Coating

Roll coating is a process in which cylindrical rollers apply a limited amount of coating to the wood workpiece. In a roll coater, a rubber-covered coating roll and a smooth chrome-plated doctor roll create a reservoir that holds the coating material. The material is held in this reservoir by the adjustable ends of the rolls. As they rotate, the doctor roll transfers the coating material from its surface to that of the coating roll. A feed roll or conveyor belt holds the workpiece in contact with the coating roll and helps drive it through the machine (see Figure 2-1).

There are four types of roll coaters:

- C Direct roll coaters have cylinders that move in the same direction as the product being coated. A rotogravure cylinder is similar to the direct roll coater, only the coating cylinder is etched and coated with ink to apply a pattern such as a simulated wood grain on the workpiece.
- C Reverse roll coaters have cylinders that move in the opposite direction of the workpiece.
- C Differential roll coaters have two coating cylinders, each moving at a different pace.
- C Sock roll coaters have a fabric sock over their coating cylinders to produce a textured finish on the workpiece.

Roll coating is suitable for applying coatings when a low-build finish is sufficient. This process has become important because it is easily automated and has a high material yield (Stoye, 1993).

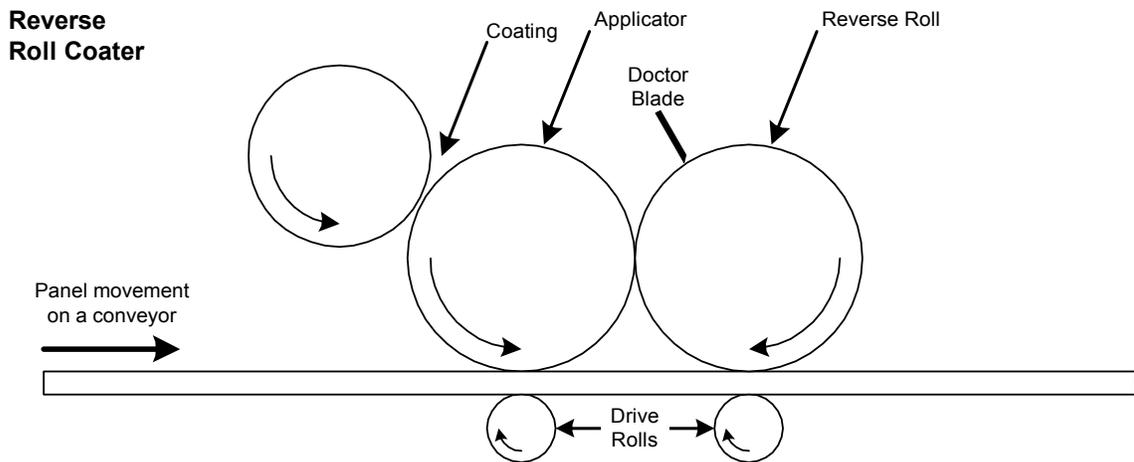
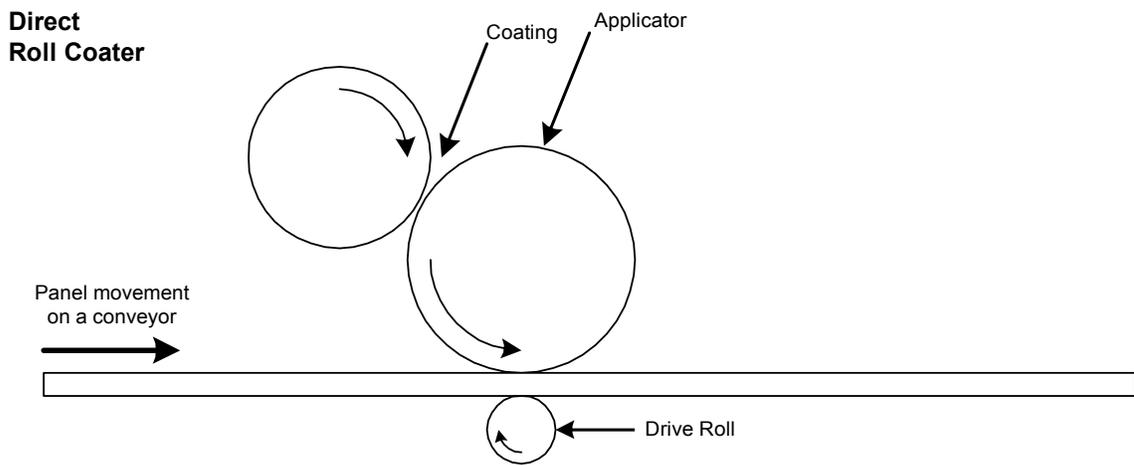
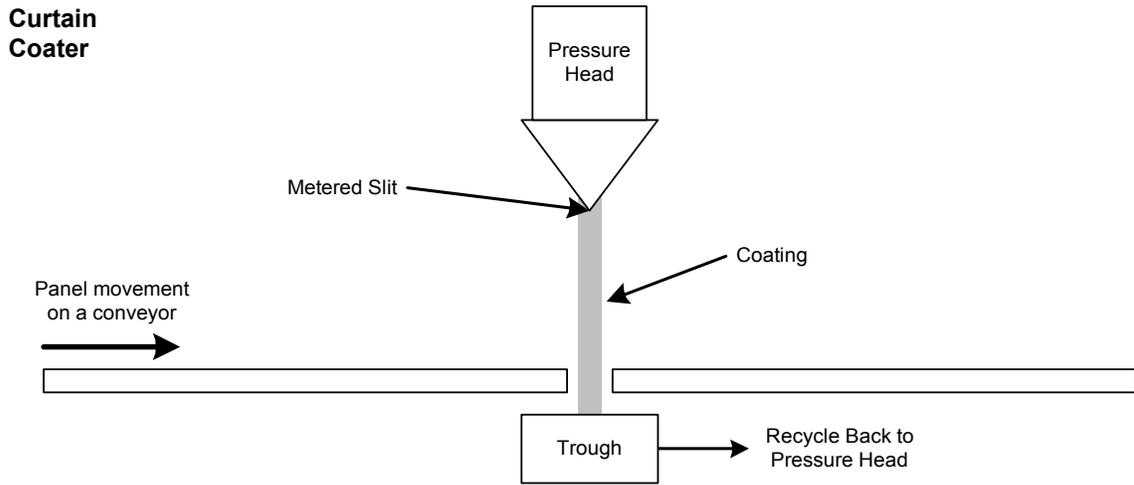


Figure 2-1. Simplified Curtain and Roll Coater Diagrams

2.2.3 *Curtain Coating*

A curtain coating applicator uses a metered slit in a pressure head to create a free-falling film of coating through which workpieces pass on a conveyor belt (see Figure 2-1). The pressure head is connected via distribution lines to coatings materials stored elsewhere in the workspace. If some of the coating does not connect with a workpiece, it is collected in a reservoir underneath the conveyor belt and returned to the coating head.

One of the advantages of this application system is that operators can control the amount of coating applied by varying coating pump speed, weir or metered slit coating reservoir head, and conveyor belt speed. Therefore, curtain coating is typically used when a relatively thick coat is required. The rate of panel movement and the controlled uniform flow of the film of coating determines the coating thickness (Lambourne, 1999).

2.2.4 *Flow Coating*

Flow coaters use nozzles and low pressure to create a wet film of coating that the wood workpiece passes through. The coating is pumped into a tank that has at its bottom a pouring head fitted with an adjustable nozzle so that operators can vary the amount of coating being applied. As in curtain coaters, coating that does not come into contact with a workpiece is collected in a reservoir under the conveyor belt and returned via connecting channel to the tank (see Figure 2-2).

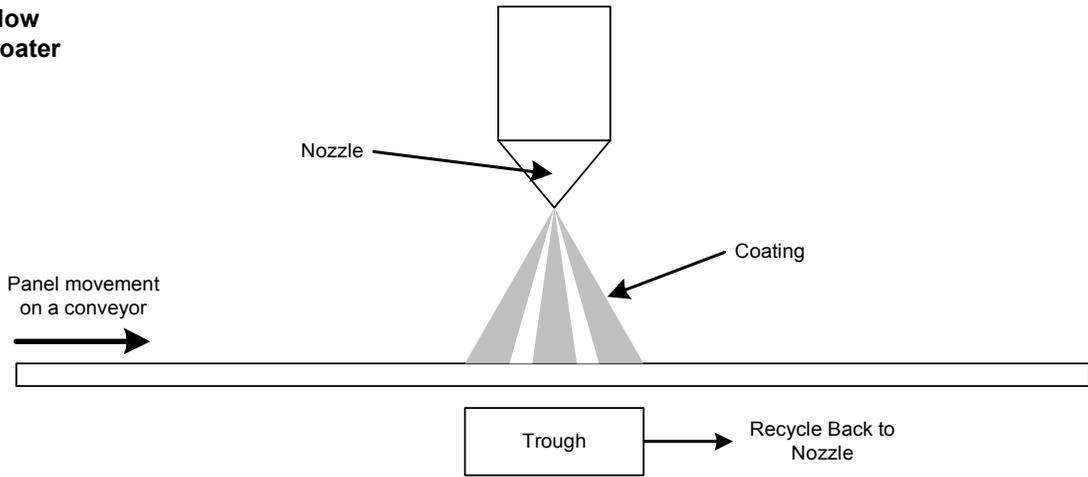
Brush and pneumatic coaters are flow coaters that are fitted with special apparatus to remove excess coating. Brush coaters flood a panel with coating similarly to flow coaters and then use brushes to remove the excess. Pneumatic (air knife) coaters also operate similarly, with the exception that excess coating is removed from the panel by exposure to pressurized air.

2.2.5 *Vacuum Coating*

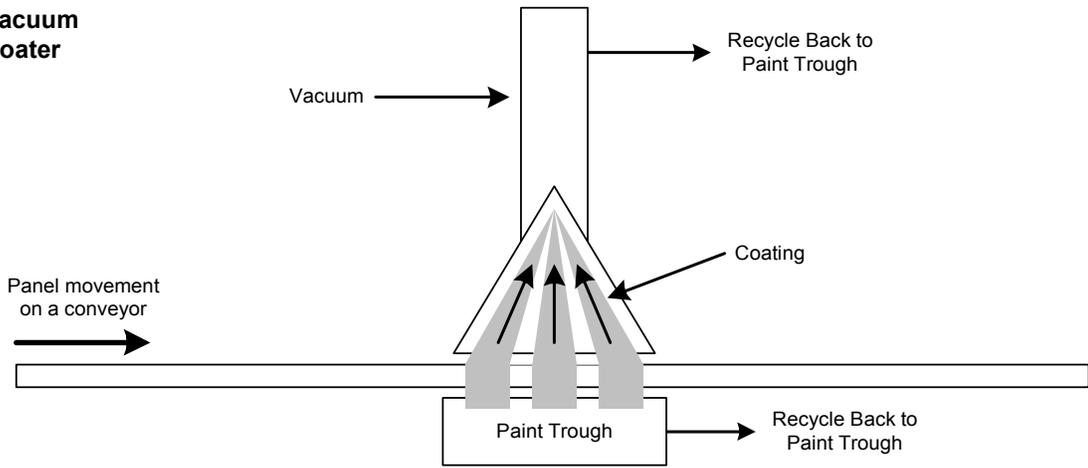
A vacuum coater uses a suction system to pull paint up from a reservoir below the conveyor belt. This creates what is essentially a wall of coating through which the workpiece passes to receive its coating (see Figure 2-2). Any excess coating material can be vacuumed off the piece as it exits the coating apparatus.

There are two principal advantages to vacuum coaters. First, coating thickness can be controlled by vacuum and the speed of the conveyor belt. Second, vacuum coaters can be

Flow Coater



Vacuum Coater



Pneumatic or Brush Coater

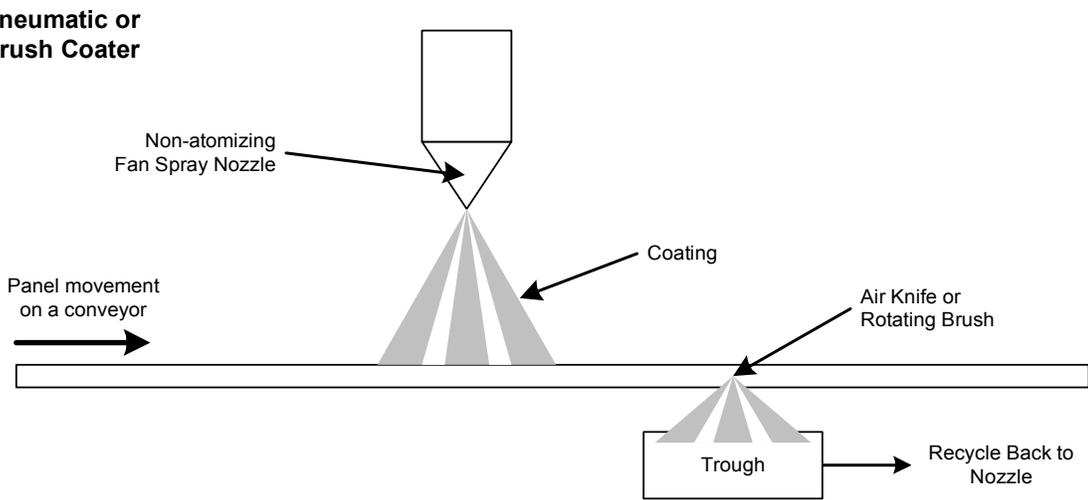


Figure 2-2. Simplified Flow, Vacuum, and Pneumatic Coater Diagrams

used in coating applications that require all sides of a workpiece to be coated at one time. It is not necessary to change the orientation of workpieces and pass them through the coatings process a second time.

2.2.6 Dip Coating

Dip coating is a process in which the product is dipped into a vat of coating, and the excess is allowed to run off. This is the oldest and simplest coatings process (Stoye, 1993). Dip coaters can be used on multidimensional pieces and/or nontypical part configurations.

2.2.7 Wood Building Product Finishing Processes

Figures 2-3 and 2-4 provide typical schematics for wood building products finishing operations for doors, doorskins, and paneling. Each example depicts the placement of a coatings technology in the production process. Although the examples provided here mostly indicate direct roll coaters, any of the aforementioned technologies can readily be substituted for direct roll coaters in most applications. The decision of which technology to employ is made on a facility-by-facility basis, depending on its anticipated production capacity, layout and space limitations, and input requirements. Table 2-2 lists some of the technologies that are known to be used to coat many of the wood building products produced.

Figure 2-4 depicts a spray coating process and roll coating process. In the case of molded door finishing (top of Figure 2-4), workpieces are typically cleaned with solvents or other chemicals before entering the spray booth areas. Most coating lines are automated processes that use conveyor belts to move workpieces through a finishing apparatus at speeds of between 100 and 400 feet per minute. In this example, as the doors move through the spray booth, they are coated twice, once with a stain and the second time with a top coat. In between the two coatings applications, the doors are allowed to dry. This interim drying step allows the first coating to bond with the wood substrate and dry before another coating is applied on top of it. As the doors come off the production line, they are moved to a storage area to dry prior to packaging and shipment. The bottom portion of Figure 2-4 depicts a finishing process for doorskins that is essentially the same as that for doors except that it uses a different set of technologies. Rather than spray coaters, direct roll coaters are used. The drying stages are accelerated using ovens and UV-curing stations. It is not atypical for a workpiece to undergo multiple coatings applications during a finishing process, but usually those that do are millwork or other such specialized products (MRI, 1998).

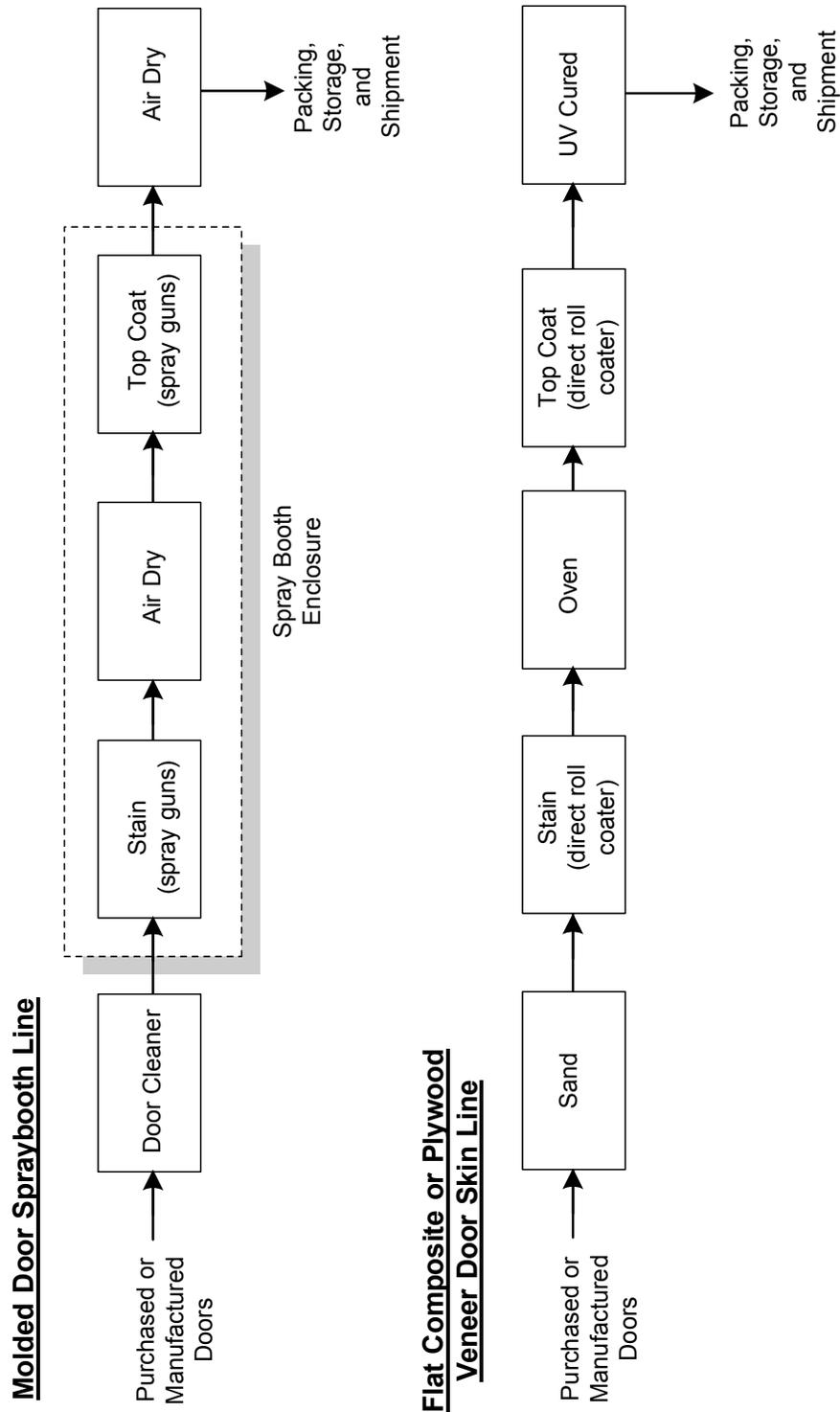


Figure 2-3. Generic Coating Line Schematic for Prefinished Molded Doors and Doorskins

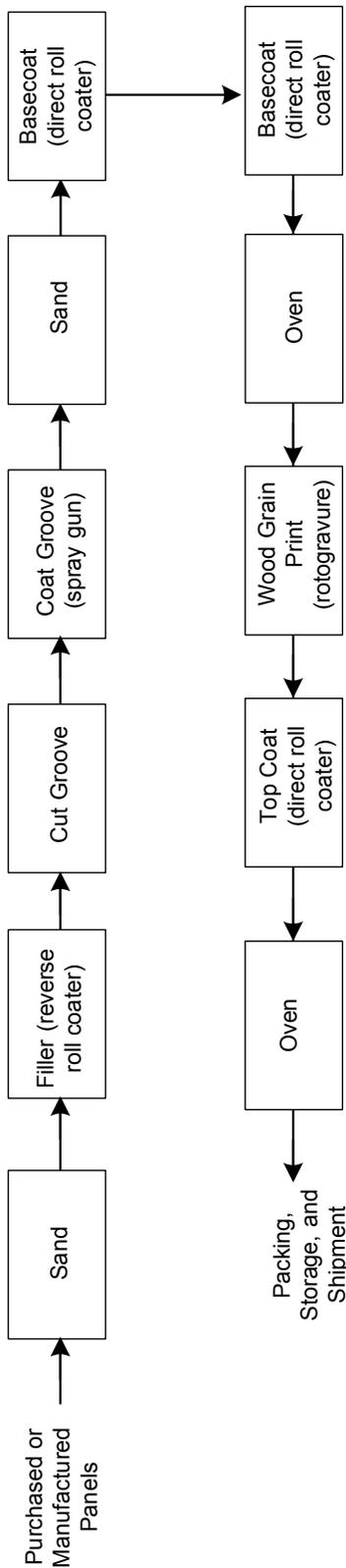


Figure 2-4. Generic Coating Line Schematic for Prefinished Woodgrain Moldings

Table 2-2. Example Coating Technologies by Product

Hardboard siding	DRC, RRC, curtain coater
Laminate flooring	DRC (adhesive)
Miscellaneous wood products	DRC, HVLP, airless spray guns
Prefinished doors, millwork, and moldings	AAA, airless spray guns, spray booths
Prefinished doors and moldings	HVLP, airless spray guns, dip tank, spraybooths
Prefinished doors and window trim	Flow coaters, rotogravure cylinder
Prefinished doors, windows, and miscellaneous wood products	HVLP, spray booths
Prefinished interior wall paneling	AAA, DRC, airless spray guns, rotogravure cylinder
Prefinished medium density fiberboard moldings	Flow coater
Primed cementitious and cedar siding	Flow coater

DRC = Direct roll coater

RRC = Reverse roll coater

HVLP = High volume low pressure spray gun

AAA = Air assisted airless spray gun

Source: Midwest Research Institute (MRI). September 1998. "Preliminary Industry Characterization: Wood Building Products Surface Coating." (EPA-453/R-00-004) Prepared for the Coatings and Consumer Products Group of the Office of Air Quality Planning and Standards of the U.S. Environmental Protection Agency.

2.3 Costs of Production

The overall costs of production for wood building products include capital expenditures, labor, energy, and materials. This section provides data on the costs of production and the value of shipments for wood building products industries (see Tables 2-3 through 2-9).

With the exception of the special products sawmills industry, the shipment values for wood building products industries grew during the U.S. economy's economic expansion of the 1990s. During the expansion, housing starts and invigorated remodeling expenditures on existing structures boosted industry output and revenues. In real terms, shipments increased

Table 2-3. Industry Statistics for the Hardwood Dimension and Flooring Mills Industry (SIC 2426; NAICS 312918), 1987 to 1997

	Production Workers												
	All					Employees							
Value of Shipments (\$10 ⁶)	Number	Payroll (\$10 ⁶)	% of Value of Shipments	Number	Hours (\$10 ⁶)	Payroll (\$10 ⁶)	Hourly Wage (unadjusted)	Hourly Wage (1997\$)	Cost of Materials (\$10 ⁶)	% of Value of Shipments	New Capital Expenditures (\$10 ⁶)	% of Value of Shipments	
1987	2,286,894	29,700	588,135	26	26,200	53,200	460,848	6.49	8.66	1,156,389	51	88,460	4
1988	2,195,607	28,900	574,012	26	25,200	51,200	445,683	6.90	8.71	1,156,101	53	62,966	3
1989	2,158,369	29,200	569,695	26	26,000	52,900	447,833	7.01	8.47	1,097,844	51	53,745	2
1990	2,146,243	29,300	544,756	25	26,000	53,300	440,096	6.93	8.26	1,065,552	50	104,898	5
1991	2,046,058	26,100	543,639	27	22,900	48,300	412,671	7.26	8.54	1,019,969	50	78,369	4
1992	2,347,706	28,500	581,252	25	24,800	49,900	448,302	7.76	8.99	1,201,300	51	55,357	2
1993	2,807,251	31,400	646,376	23	27,400	55,100	502,317	8.21	9.12	1,525,820	54	53,495	2
1994	3,002,392	33,400	663,433	22	29,900	60,800	532,269	8.16	8.75	1,547,795	52	67,673	2
1995	3,019,488	34,500	659,198	22	30,600	59,900	524,348	8.49	8.75	1,601,397	53	80,415	3
1996	2,859,403	31,700	644,151	23	28,100	54,500	510,914	9.19	9.37	1,524,783	53	67,435	2
1997	3,206,954	33,940	708,100	22	^a	^a	^a	^a	^a	^a	^a	^a	^a

Note: All dollar (\$) data were adjusted to 1997 real dollars using the Bureau of Labor Statistics' producer price index for "materials and components for construction."

^a The transition from the Standard Industrial Classification (SIC) system to the North American Industry Classification System (NAICS) is ongoing. At this time data comparability is only available for general statistics. These more detailed statistics are currently unavailable by SIC code, the system used to generate statistics for 1987 to 1996.

Sources: U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Various Reports. MC92-I-24A through -24D. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1996. *1994 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M94(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1998. *1996 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M96(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 2000. "Bridge Between NAICS and SIC: Lumber and Wood Products." <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>.
 <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>. As obtained on August 24, 2000.

Table 2-4. Industry Statistics for the Special Product Sawmills Industry (SIC 2429; NAICS 321113), 1987 to 1997

	All				Employees				Production Workers				
	Value of Shipments (\$10 ³)	Number	Payroll (\$10 ³)	% of Value of Shipments	Number	Hours (\$10 ³)	Payroll (\$10 ³)	Hourly Wage (unadjusted)	Hourly Wage (1997\$)	Cost of Materials (\$10 ³)	% of Value of Shipments	New Capital Expenditures (\$10 ³)	% of Value of Shipments
1987	199,069	2,200	43,496	22	1,900	3,200	34,290	8.03	10.71	114,745	58	4,270	2
1988	180,696	2,200	42,903	24	2,000	3,200	35,710	8.84	11.15	114,323	63	5,552	3
1989	211,598	2,300	43,600	21	1,900	3,100	32,730	9.06	10.94	126,934	60	2,174	1
1990	251,875	2,500	48,396	19	2,100	3,600	37,906	8.83	10.53	152,818	61	2,026	1
1991	218,279	2,000	42,008	19	1,700	2,900	32,006	9.38	11.04	133,556	61	2,118	1
1992	166,767	1,800	36,249	22	1,500	2,800	27,331	8.43	9.76	96,702	58	5,559	3
1993	201,659	2,000	38,845	19	1,600	3,100	27,191	7.90	8.77	120,419	60	6,770	3
1994	165,268	1,800	33,890	21	1,500	2,800	23,594	7.86	8.43	91,375	55	3,217	2
1995	160,109	1,800	31,960	20	1,400	2,800	22,269	7.71	7.95	90,416	56	3,815	2
1996	157,008	1,800	33,054	21	1,400	2,800	23,056	8.07	8.23	88,349	56	4,591	3
1997	129,111	1,343	27,935	22	^a	^a	^a	^a	^a	^a	^a	^a	^a

Note: All dollar (\$) data were adjusted to 1997 real dollars using the Bureau of Labor Statistics' producer price index for "materials and components for construction."

^a The transition from the Standard Industrial Classification (SIC) system to the North American Industry Classification System (NAICS) is ongoing. At this time data comparability is only available for general statistics. These more detailed statistics are currently unavailable by SIC code, the system used to generate statistics for 1987 to 1996.

Sources: U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Various Reports. MC92-1-24A through -24D. Washington, DC: U.S. Government Printing Office.
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 <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>. As obtained on August 24, 2000.

Table 2-5. Industry Statistics for the Millwork Industry (SIC 2431; NAICS 312911/312918), 1987 to 1997

	All				Employees				Production Workers				
	Value of Shipments (\$10 ³)	Number	Payroll (\$10 ³)	% of Value of Shipments	Number	Hours (\$10 ³)	Payroll (\$10 ³)	Hourly Wage (unadjusted)	Hourly Wage (1997\$)	Cost of Materials (\$10 ³)	% of Value of Shipments	New Capital Expenditures (\$10 ³)	% of Value of Shipments
1987	12,444,361	89,000	2,413,914	19	71,600	140,600	1,739,321	9.27	12.37	7,294,713	59	246,035	2
1988	11,842,651	90,700	2,540,974	21	73,000	141,300	1,847,465	10.60	13.38	7,007,142	59	196,721	2
1989	11,659,975	90,900	2,387,358	20	73,500	140,200	1,730,946	10.22	12.34	6,950,718	60	248,072	2
1990	11,353,690	90,500	2,337,444	21	72,100	140,100	1,642,016	9.83	11.72	6,741,265	59	235,425	2
1991	10,554,354	84,900	2,160,316	20	66,700	130,900	1,534,543	9.96	11.72	6,160,531	58	165,445	2
1992	11,163,879	86,300	2,297,560	21	68,800	136,900	1,616,596	10.20	11.81	6,517,339	58	220,850	2
1993	12,054,952	89,100	2,326,908	19	71,900	141,900	1,638,358	10.40	11.55	7,140,210	59	204,989	2
1994	12,432,659	92,300	2,365,128	19	73,800	148,500	1,654,935	10.39	11.14	7,353,742	59	190,150	2
1995	11,502,260	94,800	2,300,081	20	76,300	149,700	1,602,118	10.38	10.70	6,698,277	58	198,357	2
1996	12,078,394	95,300	2,411,435	20	76,400	151,700	1,671,998	10.80	11.02	6,889,683	57	203,835	2
1997	12,013,383	92,259	2,344,586	20	^a	^a	^a	^a	^a	^a	^a	^a	^a

Note: All dollar (\$) data were adjusted to 1997 real dollars using the Bureau of Labor Statistics' producer price index for "materials and components for construction."

^a The transition from the Standard Industrial Classification (SIC) system to the North American Industry Classification System (NAICS) is ongoing. At this time data comparability is only available for general statistics. These more detailed statistics are currently unavailable by SIC code, the system used to generate statistics for 1987 to 1996.

Sources: U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Various Reports. MC92-1-24A through -24D. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1996. *1994 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M94(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1998. *1996 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M96(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 2000. "Bridge Between NAICS and SIC: Lumber and Wood Products." <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>.
 <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>. As obtained on August 24, 2000.

Table 2-6. Industry Statistics for the Hardwood Plywood and Veneer Industry (SIC 2435; NAICS 321211), 1987 to 1997

	Production Workers											
	All					Employees						
	Number	Payroll (\$10 ³)	% of Value of Shipments	Number	Hours (\$10 ³)	Payroll (\$10 ³)	Hourly Wage (unadjusted)	Hourly Wage (1997\$)	Cost of Materials (\$10 ³)	% of Value of Shipments	New Capital Expenditures (\$10 ³)	% of Value of Shipments
1987	2,749,210	453,776	17	17,400	35,300	329,425	6.99	9.33	1,764,404	64	41,762	2
1988	2,650,249	438,491	17	17,300	35,100	318,994	7.20	9.09	1,786,013	67	46,941	2
1989	2,638,449	430,200	16	17,000	34,300	313,894	7.58	9.15	1,745,319	66	57,006	2
1990	2,445,680	398,733	16	15,700	31,600	295,026	7.83	9.33	1,609,712	66	48,635	2
1991	2,231,624	376,664	17	14,800	29,400	277,820	8.03	9.45	1,415,931	63	53,540	2
1992	2,602,836	457,103	18	17,000	35,100	330,059	8.12	9.40	1,623,544	62	54,431	2
1993	2,815,908	463,140	16	16,800	35,000	332,289	8.55	9.49	1,827,366	65	51,719	2
1994	2,787,468	467,599	17	18,700	39,300	346,087	8.21	8.81	1,853,450	66	56,090	2
1995	2,723,498	469,707	17	18,800	38,700	348,981	8.75	9.02	1,846,354	68	33,197	1
1996	2,675,461	464,903	17	18,300	37,800	345,030	8.95	9.13	1,841,554	69	38,461	1
1997	2,856,487	525,887	18	^a	^a	^a	^a	^a	^a	^a	^a	^a

Note: All dollar (\$) data were adjusted to 1997 real dollars using the Bureau of Labor Statistics' producer price index for "materials and components for construction."

^a The transition from the Standard Industrial Classification (SIC) system to the North American Industry Classification System (NAICS) is ongoing. At this time data comparability is only available for general statistics. These more detailed statistics are currently unavailable by SIC code, the system used to generate statistics for 1987 to 1996.

Sources: U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Various Reports. MC92-1-24A through -24D. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1996. *1994 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M94(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1998. *1996 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M96(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 2000. "Bridge Between NAICS and SIC: Lumber and Wood Products." <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>. As obtained on August 24, 2000.

Table 2-7. Industry Statistics for the Softwood Plywood and Veneer Industry (SIC 2436; NAICS 321212), 1987 to 1997

	Production Workers												
	All					Employees							
	Value of Shipments (\$10 ³)	Number	Payroll (\$10 ³)	% of Value of Shipments	Number	Hours (\$10 ³)	Payroll (\$10 ³)	Hourly Wage (unadjusted)	Hourly Wage (1997\$)	Cost of Materials (\$10 ³)	% of Value of Shipments	New Capital Expenditures (\$10 ³)	% of Value of Shipments
1987	6,563,947	38,900	1,186,276	18	35,200	77,000	1,024,166	9.97	13.30	3,958,435	60	147,034	2
1988	6,117,921	38,400	1,136,164	19	34,700	76,600	974,900	10.09	12.73	3,890,894	64	159,118	3
1989	6,413,149	36,500	1,071,878	17	32,900	73,300	915,353	10.34	12.49	3,964,437	62	168,843	3
1990	5,996,368	35,600	1,049,698	18	32,200	71,500	890,205	10.44	12.44	4,027,856	67	122,779	2
1991	5,403,908	31,700	953,603	18	28,600	63,600	807,103	10.78	12.68	3,665,089	68	102,020	2
1992	6,308,186	31,300	958,214	15	28,000	63,500	816,115	11.10	12.85	3,781,553	60	114,305	2
1993	6,698,380	30,700	939,598	14	27,700	63,500	804,973	11.42	12.68	4,029,305	60	131,184	2
1994	7,027,603	30,300	918,145	13	27,200	62,500	792,773	11.83	12.68	4,451,198	63	161,300	2
1995	7,038,907	32,400	959,415	14	29,100	66,200	828,689	12.14	12.52	4,489,230	64	190,110	3
1996	6,154,326	31,900	949,495	15	28,600	64,900	818,502	12.36	12.61	4,250,438	69	212,609	3
1997	5,762,664	28,843	912,613	16	^a	^a	^a	^a	^a	^a	^a	^a	^a

Note: All dollar (\$) data were adjusted to 1997 real dollars using the Bureau of Labor Statistics' producer price index for "materials and components for construction."

^a The transition from the Standard Industrial Classification (SIC) system to the North American Industry Classification System (NAICS) is ongoing. At this time data comparability is only available for general statistics. These more detailed statistics are currently unavailable by SIC code, the system used to generate statistics for 1987 to 1996.

Sources: U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Various Reports. MC92-I-24A through -24D. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1996. *1994 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M94(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1998. *1996 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M96(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 2000. "Bridge Between NAICS and SIC: Lumber and Wood Products." <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>.
 <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>. As obtained on August 24, 2000.

Table 2-8. Industry Statistics for the Structural Wood Members Industry (SIC 2439; NAICS 321213/321214), 1987 to 1997

	All				Production Workers				New Capital Expenditures (\$10 ³)	% of Value of Shipments	% of Value of Shipments	
	Number	Payroll (\$10 ³)	% of Value of Shipments	Number	Hours (\$10 ³)	Payroll (\$10 ³)	Hourly Wage (unadjusted)	Hourly Wage (1997\$)				Cost of Materials (\$10 ³)
1987	2,573,490	579,996	23	18,500	35,100	363,315	7.76	10.35	1,547,590	60	62,042	2
1988	2,575,043	562,908	22	18,000	35,500	357,480	7.98	10.07	1,589,418	62	57,666	2
1989	2,578,424	542,642	21	18,900	36,500	357,494	8.11	9.79	1,563,311	61	99,035	4
1990	2,417,906	511,856	21	17,000	33,200	328,880	8.31	9.91	1,454,153	60	45,059	2
1991	2,147,490	449,149	21	14,500	28,400	284,881	8.52	10.03	1,299,908	61	29,535	1
1992	2,901,395	596,539	21	18,100	35,700	365,845	8.85	10.25	1,718,045	59	49,219	2
1993	3,434,204	632,281	18	18,900	38,100	381,233	9.02	10.01	2,093,063	61	72,140	2
1994	4,440,044	767,570	17	24,900	51,200	485,616	8.84	9.48	2,711,966	61	114,004	3
1995	4,336,132	797,451	18	26,100	52,600	493,729	9.10	9.39	2,668,754	62	141,861	3
1996	4,806,751	893,487	19	28,400	58,100	555,088	9.36	9.55	3,014,982	63	109,059	2
1997	5,085,234	949,344	19	^a	^a	^a	^a	^a	^a	^a	^a	^a

Note: All dollar (\$) data were adjusted to 1997 real dollars using the Bureau of Labor Statistics' producer price index for "materials and components for construction."

^a The transition from the Standard Industrial Classification (SIC) system to the North American Industry Classification System (NAICS) is ongoing. At this time data comparability is only available for general statistics. These more detailed statistics are currently unavailable by SIC code, the system used to generate statistics for 1987 to 1996.

Sources: U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Various Reports. MC92-1-24A through -24D. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1996. *1994 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M94(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1998. *1996 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M96(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 2000. "Bridge Between NAICS and SIC: Lumber and Wood Products." As obtained on 8/24/00 at <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>.

Table 2-9. Industry Statistics for the Reconstituted Wood Products Industry (SIC 2493; NAICS 321219), 1987 to 1997

	Production Workers												
	All					Employees							
	Value of Shipments (\$10 ³)	Number	Payroll (\$10 ³)	% of Value of Shipments	Number	Hours (\$10 ³)	Payroll (\$10 ³)	Hourly Wage (unadjusted)	Hourly Wage (1997\$)	Cost of Materials (\$10 ³)	% of Value of Shipments	New Capital Expenditures (\$10 ³)	% of Value of Shipments
1987	3,822,476	22,000	673,126	18	17,700	37,100	494,204	9.98	13.32	1,986,556	52	200,003	5
1988	3,749,315	22,800	671,301	18	18,300	38,700	495,904	10.16	12.82	1,998,760	53	272,053	7
1989	3,863,349	22,200	660,156	17	18,200	39,500	484,308	10.15	12.26	2,061,387	53	160,510	4
1990	3,626,858	22,300	660,740	18	18,200	39,100	485,274	10.41	12.41	2,120,376	58	155,202	4
1991	3,577,895	21,000	631,892	18	17,100	36,900	465,741	10.73	12.63	2,066,415	58	220,397	6
1992	4,609,944	22,800	711,423	15	18,500	39,900	531,338	11.50	13.32	2,350,717	51	165,377	4
1993	5,182,216	23,500	732,167	14	19,200	41,900	545,158	11.72	13.01	2,506,260	48	189,340	4
1994	5,746,747	24,100	733,680	13	19,500	42,800	543,423	11.84	12.70	2,712,180	47	357,241	6
1995	5,362,766	25,000	750,645	14	20,400	44,800	550,638	11.92	12.29	2,684,734	50	451,975	8
1996	5,244,618	26,100	806,566	15	21,100	46,100	598,854	12.73	12.99	2,847,058	54	584,572	11
1997	5,273,794	25,269	797,838	15	^a	^a	^a	^a	^a	^a	^a	^a	^a

Note: All dollar (\$) data were adjusted to 1997 real dollars using the Bureau of Labor Statistics' producer price index for "materials and components for construction."

^a The transition from the Standard Industrial Classification (SIC) system to the North American Industry Classification System (NAICS) is ongoing. At this time data comparability is only available for general statistics. These more detailed statistics are currently unavailable by SIC code, the system used to generate statistics for 1987 to 1996.

Sources: U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Various Reports. MC92-1-24A through -24D. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1996. *1994 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M94(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 1998. *1996 Annual Survey of Manufactures: Statistics for Industry Groups and Industries*. M96(AS)-1. Washington, DC: U.S. Government Printing Office.
 U.S. Census Bureau. 2000. "Bridge Between NAICS and SIC: Lumber and Wood Products." <http://www.census.gov/epcd/ec97brdg/E97B2_24.htm>. As obtained on August 24, 2000.

substantially, either returning to or exceeding pre-recessionary levels. Growth was most marked between 1992 and 1994, the years following the 1990 to early 1992 recession. Overall, the dollar value of shipments of structural wood products, such as particleboard, more than doubled between 1991 and 1997 in real terms. Value of shipments for plywood and veneer companies declined as the decade progressed due in large part to the substitution of reconstituted products for softwood products (Twarok, 2000).

The employment figures also reflect the industry's economic recovery and growth. In fact, some industries, notably reconstituted products, ended the 10-year period depicted in the tables having experienced significant employment growth. The wood building products collective labor force totaled 241,699 in 1997, a 6 percent increase over 1987's figures. The only industry to experience substantial declines in employment is the softwood industry in which 10,000 jobs were lost from 1987 to 1997. Although its total labor force declined, the industry's value of shipments did not decline at as great a rate, suggesting that dollar output per employee increased. These gains suggest that increased automation allowed producers to reap more output from each unit of labor. Thus, although total employment decreased, the productivity of remaining labor resources increased. Payroll expenses for the wood building products industries profiled were between 15 and 20 percent of value of shipments.

The cost of materials averaged about 60 percent of value of shipments for these industries. Materials costs as percentage of value of shipments increased for most facilities between 1987 and 1997. The only industry for which these costs were relatively stable was the millwork industry. Two issues underlie this trend. First, price volatility in wood building products markets in the mid-1990s due to build-ups in inventories caused the prices for many wood building products to drop. For example, the plywood and veneer industry, anticipating increases in demand due to new housing starts in the mid-1990s, did not cut back production levels even while inventories rose (Twarok, 2000). Second, as wood building products producers faced lower prices for their products, timber prices increased because of changing forest policies and resultant market speculation, which triggered materials costs' growth as a percentage of value of shipments (Carliner, 1998). Other factors contributing to this phenomenon include lower prices due to increases in imports and competition with substitutes made of other materials (including reconstituted wood).

The costs of coating are a subset of the overall costs of production and include the specific capital expenditures required for the coating operation, the labor associated with the coating process, and the cost of the coatings themselves. Financial, ingredients, and operations data for coatings processes are unavailable because this information is treated as proprietary and confidential business information by companies. A recent survey of wood

building products coating facilities revealed, however, that on average these factories have three coating lines that use nine coatings, one thinning solvent, and one cleaning solvent. There is an average of 37 coating employees per facility (MRI, 1998). Coatings are estimated to cost in the range of \$20 per gallon: prices are higher for those with low or no HAPs. Table 3-5 in Section 3 provides information on the coatings usage of select wood building products facilities; accurate industry-wide consumption volumes are not available.

SECTION 3

INDUSTRY ORGANIZATION

This section describes the market structure of the industry, the characteristics of wood building products facilities, and the characteristics of firms that own these facilities. In addition, it provides information on the market structure of the wood coatings industry and the characteristics of firms that manufacture these coatings for use at wood building products factories.

3.1 Market Structure

Market structure is important because it determines the behavior of producers and consumers in the industry. If an industry is perfectly competitive, then individual producers are not able to influence the price of the output they sell or the inputs they purchase. This condition is most likely to hold if the industry has a large number of firms, the products sold and the inputs purchased are undifferentiated, and entry and exit of firms are unrestricted. Product differentiation can occur both from differences in product attributes and quality and from brand name recognition of products. Entry and exit are unrestricted for most industries except, for example, in cases where one firm holds a patent on a product, where one firm owns the entire stock of a critical input, or where a single firm is able to supply the entire market.

The wood building products industry is a mature industry whose constituent sectors (e.g., hardwood veneer, millwork, etc.) compete in a global marketplace. Few foreign companies own U.S. wood building products manufacturers, and all of the largest companies are U.S.-based operations largely located in the Deep South, north-central United States, or the Pacific Northwest. As one moves down the wood building products supply chain, from lumber inputs to moldings and custom doors, companies whose principal business activities are concentrated at lower levels tend to be less vertically integrated than those located above them in the supply chain. Medium- and large-sized companies, however, may be vertically integrated at all levels of the wood building products supply chain. Smaller firms operate in each wood building products industry, but they are more concentrated in those portions of the industry that are less capital-intensive.

The relative ease of entry and exit of firms in this industry is largely dependent on the markets in which those companies compete and the capital outlays required to commence production. Small specialty manufacturers may have an easier time commencing or shutting down operations than a reconstituted products manufacturer because the latter's capital outlays are typically larger. In fact, the tables in Section 2 that provide descriptive industry statistics show that new capital expenditures in most wood building products industries is about 2 percent of value of shipments a year. But this percentage is higher for those industries with higher concentrations of automated production processes. This is particularly true of the reconstituted products manufacturers who in the aggregate have invested between 4 and 11 percent of their annual value of shipments in new capital expenditures in the latter half of the 1990s. An individual firm will typically continue to operate so long as it is able to cover its variable costs of production. If the firm's sales, however, do not cover these expenses, it may close, offer itself for sale, or seek alternative sources of revenues or financing, either in the financial markets or by producing another type of output.

The market structure of wood building products industries is not influenced by a high degree of product differentiation for those wood building products that are raw materials. Among those products that are basic building supplies, one company's output may be easily substituted for another. The decision to purchase one company's product over another's in these markets is influenced more by factors such as transportation and delivery costs, pricing options for bulk deliveries, and producer-customer relations than by brand identification.

Brand identification does become important, however, the closer the industry's end product is to the final user. In order to differentiate their product from competitors, companies producing doors, windows, trim, and other products that may be directly purchased by an individual consumer rather than a contracting company or distributor will dedicate a larger portion of their expenses to advertising and marketing initiatives, such as television commercials and sponsorship of remodeling and home repair programs. The development of brand names is important because they embody consumers' perceptions of the characteristics and reliability of the company's wood building products.

In addition to evaluating the factors that affect competition in an industry, one can also evaluate four-firm concentration ratios (CR4s), eight-firm concentration ratios (CR8s), and Herfindahl-Hirschmann indexes (HHIs). These values are reported at the four-digit SIC level for 1992, the most recent year available, in Table 3-1. The data in Table 3-1

Table 3-1. Measures of Market Concentration for Wood Building Products Manufacturers, 1992 and 1998

SIC	SIC Description	NAICS	CR4	CR8	HHI	Number of Companies
			1992	1992	1992	1992
2426	Hardwood dimension and flooring mills	321918	17	25	152	782
2429	Special product sawmills, NEC	321113	23	35	220	181
2431	Millwork	321911	20	26	170	3,044
		321918				
2435	Hardwood veneer and plywood	321211	27	40	281	281
2436	Softwood veneer and plywood	321212	47	66	797	123
2439	Structural wood members, NEC	321213	19	25	166	830
		321214				
2493	Reconstituted wood products	321219	50	66	765	193

Source: U.S. Census Bureau. 2000. *1992 Census of Manufactures: Concentration Ratios in Manufacturing*. MC92-S-2. <<http://www.census.gov/epcd/www/concentration.html>>. As obtained on August 24, 2000.

suggest that the four largest companies that own factories in each wood building products industry generally control about one-fifth to one-quarter of the market, while the eight largest companies tend to have a market share of about 25 to 40 percent. Exceptions are the reconstituted wood products industry, whose relatively high capital intensity is prohibitive to the entry of smaller firms, and the softwood products industry. In these two industries, the largest four firms control half of the market and the largest eight firms control two-thirds of the market. Smaller firms may not have access to the capital resources necessary to commence profitable operations in such highly mechanized industries. Smaller firms are more likely in industries with lower capital requirements. For example, a small millwork manufacturer can orient its business plans towards niche markets, such as custom doors or moldings, with relatively low capital requirements. In 1992, SIC codes with low CR4s and CR8s also had the largest number of companies.

The criteria for evaluating the HHIs are based on the 1992 Department of Justice's Horizontal Merger Guidelines. According to these criteria, industries with HHIs below 1,000 are considered unconcentrated (i.e., more competitive), those with HHIs between 1,000 and 1,800 are considered moderately concentrated (i.e., moderately competitive), and those with HHIs above 1,800 are considered highly concentrated (i.e., less competitive). In general, firms in less-concentrated industries are more likely to be price takers, while firms in more-concentrated industries are more likely to be able to influence market prices. The HHI

as calculated by the Department of Commerce indicates that all wood building products SIC codes are unconcentrated. With the exception of the reconstituted wood products and softwood industries, no wood building products industry has an HHI greater than 300. Other than some niche market producers, most companies are price-takers. Even in the relatively concentrated softwood and reconstituted wood markets, producers can be characterized as price takers because output for this sector is not highly differentiated.

3.2 Wood Building Products Facilities

Facilities comprise a site of land with a plant and equipment that combine inputs (raw materials, fuel, energy, labor) to produce outputs (in this case, paneling, windows, doors, flooring, and siding, for example). The terms facility, establishment, and plant are synonymous in this report and refer to the physical locations where products are manufactured.

According to the 1997 Economic Census, 4,720 wood building products facilities were in operation during that year. Sales for these facilities ranged from the tens of thousands to hundreds of millions of dollars; a facility may produce products for niche markets, such as cedar wood shingles, or be engaged in large-scale, automated production of particleboard and plywood. Because of the great diversity in the scope and scale of facilities in this industry, it is a cumbersome task to go into great detail about each facility in operation. Therefore, much of this section provides general summary information on facility attributes: location, employment, and capacity utilization. The final portion of this section, however, presents information on wood building products facilities that have onsite coatings operations, identifying their location, parent information, and sales and employment statistics.

3.2.1 Facility Location

Many wood building products facilities that have a high primary-good content are located in regions with significant concentrations of other forest product industries, such as logging and saw mills. Areas of the United States with substantial lumber industries include the Pacific Northwest (particularly northern California, Idaho, Oregon, Washington) and the South (particularly Alabama, Mississippi, Georgia, North Carolina, and Texas). These two regions account for significant percentages of plywood, veneer, and other wood product that are used as inputs in the production of wood product outputs further down the supply chain, such as doors, trusses, windows, and other types of millwork. States with millwork industries include not only those mentioned above, but also some in the north-central United States, such as Iowa, Wisconsin, and Minnesota.

This subsection presents information on the geographic distribution of wood building products facilities on an industry-by-industry basis and their contribution to respective industry-wide value of shipments. Table 3-2 facilitates the discussion by listing principal states for each industry, including number of establishments, number of employees, and value of shipments. It should be noted that this table, much like subsequent tables in this section, is based on the 1997 Economic Census, for which information was collected by NAICS code. Because industry-level facility information is aggregated differently using NAICS codes than using SIC codes, the descriptive statistics presented in Table 3-2 may not match those of tables in Section 2. No bridge document between the 1997 and 1992 Economic Censuses is currently published that provides the level of detail required for this section. The 1997 data are presented here to provide the most accurate representation of the current economic geography of wood building products industries.

A quarter of the value of shipments of the hardwood dimension and flooring industry (SICs 2426 and 2431 (part)/NAICS 312918), known as “Other Millwork” under the NAICS system, is produced by California and Tennessee. California employs 12 percent of the industry’s total employees, but on both a dollar output by employee basis and a dollar output by facility basis, Tennessee exceeds California and most other states. Most Tennessean facilities are large establishments with a high degree of automation. Other states with significant participation in this industry include, in order of value of shipments, Texas, Georgia, Oregon, Virginia, and Alabama.

The special product sawmills industry (SIC 2429) was aggregated into the sawmills industry (NAICS 321113) during the transition to the NAICS classification system. Because this industry is relatively small (it mainly manufactures wood shingles and other specialty products) and it was incorporated into the larger sawmills industry, it is difficult to discern which facilities once operated under SIC 2429 but are now under NAICS 321113 to give a current geographic breakdown by facility. It would also be beyond the scope of this profile to

Table 3-2. Number of Establishments by State

SIC	NAICS		Description			
2426 and 2431 (part)	312918		Hardwood Dimension and Flooring (Other Millwork)			
State	Number of Establishments	% of Total	Number of Employees	% of Total	Value of Shipments (\$10³)	% of Total
California	151	10%	4,343	12%	609,721	14%
Tennessee	34	2%	3,201	8%	487,517	11%
Texas	95	6%	2,161	6%	218,584	5%
Georgia	59	4%	1,825	5%	215,613	5%
Oregon	25	2%	1,405	4%	196,254	4%
Virginia	43	3%	1,494	4%	191,569	4%
Alabama	37	3%	1,813	5%	191,100	4%
North Carolina	60	4%	1,559	4%	176,185	4%
Missouri	25	2%	1,321	4%	167,095	4%
Wisconsin	49	3%	1,417	4%	157,599	4%
U.S. Total	1463		37,742		4,462,759	
2431 (part)	321911		Millwork (Window and Door Manufacturing)			
State	Number of Establishments	% of Total	Number of Employees	% of Total	Value of Shipments (\$10³)	% of Total
Wisconsin	50	4%	10,017	16%	1,478,853	17%
Minnesota	36	3%	6,923	11%	1,372,671	16%
Iowa	17	1%	5,437	8%	719,229	8%
California	178	13%	4,024	6%	498,696	6%
Oregon	44	3%	3,165	5%	429,476	5%
Texas	92	7%	3,045	5%	413,894	5%
Washington	65	5%	2,164	3%	296,270	3%
Virginia	38	3%	2,814	4%	288,245	3%
Illinois	55	4%	2,200	3%	266,804	3%
Pennsylvania	53	4%	2,100	3%	246,250	3%
US Total	1408		64,083		8,730,522	

(continued)

Table 3-2. Number of Establishments by State (Continued)

SIC	NAICS		Description			
2435	321211		Hardwood veneer and plywood			
State	Number of Establishments	% of Total	Number of Employees	% of Total	Value of Shipments (\$10³)	% of Total
Oregon	12	4%	1,834	8%	404,362	14%
North Carolina	63	19%	3,686	17%	386,280	14%
Indiana	28	8%	2,485	11%	277,385	10%
Virginia	19	6%	1,500	7%	262,182	9%
Wisconsin	23	7%	1,949	9%	184,615	6%
South Carolina	17	5%	1,057	5%	98,114	3%
Arkansas	10	3%	518	2%	98,049	3%
Washington	5	2%	578	3%	70,488	2%
U.S. Total	332		22,025		2,856,487	
2436	321212		Softwood Veneer and Plywood			
State	Number of Establishments	% of Total	Number of Employees	% of Total	Value of Shipments (\$10³)	% of Total
Oregon	44	28%	7,135	25%	1,542,573	27%
Louisiana	12	8%	3,461	12%	618,325	11%
Texas	8	5%	3,075	11%	502,168	9%
Arkansas	7	5%	2,395	8%	483,781	8%
Washington	17	11%	1,899	7%	382,361	7%
Mississippi	9	6%	1,936	7%	377,562	7%
Alabama	8	5%	1,717	6%	376,453	7%
Idaho	5	3%	676	2%	120,671	2%
US Total	155		28,843		5,748,047	

(continued)

Table 3-2. Number of Establishments by State (Continued)

SIC	NAICS		Description			
2439	321213 and 321214		Structural Wood Members (Truss and Engineered Wood Members)			
State	Number of Establishments	% of Total	Number of Employees	% of Total	Value of Shipments (\$10³)	% of Total
Oregon	45	4%	2,245	6%	699,581	14%
Florida	102	10%	4,010	11%	402,447	8%
California	85	8%	2,737	7%	293,383	6%
Michigan	32	3%	1,598	4%	211,046	4%
Texas	36	3%	1,710	4%	199,040	4%
Ohio	37	4%	1,595	4%	188,092	4%
Louisiana	3	0%	345	1%	172,411	3%
Arizona	29	3%	1,423	4%	171,750	3%
US Total	1045		38,093		5,112,873	
2493	321219		Reconstituted Wood Products			
State	Number of Establishments	% of Total	Number of Employees	% of Total	Value of Shipments (\$10³)	% of Total
Oregon	28	9%	2,662	11%	663,302	13%
North Carolina	22	7%	2,260	9%	434,184	8%
Mississippi	10	3%	1,812	7%	409,975	8%
California	23	7%	1,534	6%	336,567	6%
Michigan	17	5%	1,323	5%	322,030	6%
Georgia	12	4%	1,243	5%	284,889	5%
Texas	19	6%	1,357	5%	278,666	5%
Virginia	12	4%	1,341	5%	268,839	5%
Minnesota	12	4%	1,266	5%	245,151	5%
Pennsylvania	16	5%	1,335	5%	244,292	5%
US Total	317		25,304		5,278,809	
Total	4,720		216,090		32,189,497	

Source: U.S. Census Bureau. 1999. *1997 Economic Census, Manufacturing Industry Series*. Various Reports. EC97M-3212A through -3212E, -3219A, and -3219C. Washington, DC: U.S. Government Printing Office.

present information on the sawmills industry itself. Although this industry is not included in Table 3-2, it is known that most companies that produce wood shingles are located in regions where there is demand for this product. States where significant numbers of homes and light commercial buildings use wood shingles as siding and roofing materials include Washington, Oregon, California, and the New England states. Consequently, many of the largest wood shingle manufacturers are located in these regions: Pacific Coat Building Products (Sacramento, CA), GeoMcQuesten Company (North Billerica, MA), Miller Shingle Company (Granite Falls, WA), and Robbins Lumber (Searsmont, ME) (Heil, 1998).

The window and door manufacturing industry (SIC 2431 (part)/NAICS 321911) is concentrated in Wisconsin, Minnesota, and Iowa. These states are the base of manufacturing operations for some of the nation's largest suppliers of windows and doors: Andersen Corporation, Eggers Industries, and Pella Corporation. Wisconsin alone employs 16 percent of the industry's labor force, followed by Minnesota (11 percent) and Iowa (8 percent). Although California has more factories than these three states combined (178 versus 103), its facilities are smaller operations that do not rival the scale on a dollar output by facility basis of those in the north-central United States. Wisconsin, Minnesota, and Iowa account for over 40 percent of the industry's value of shipments, \$3.6 billion. Other states with a relatively high degree of participation in this industry include, in order of value of shipments, Oregon, Texas, Washington, and Virginia.

Oregon and North Carolina each account for 14 percent of the industry-wide value of shipments for the hardwood veneer and plywood industry (SIC 2435/NAICS 321211), although North Carolina has twice as many factories as Oregon. In fact, North Carolina is home to 63 veneer and plywood factories partly because of a relatively large hardwood timber industry and other industries that consume veneer as inputs, such as furnishings, paneling, and manufactured housing. Other states with a relatively high degree of participation in the hardwood industry include, in order of value of shipments, Indiana, Virginia, Wisconsin, and South Carolina.

Oregon, the home state of many of the top timber companies, is the top-producing softwood veneer and plywood state (SIC 2436/NAICS 321212), accounting for \$1.5 billion of the industry's total \$5.7 billion in shipment value in 1997. Facilities in this state employ 7,135 people at 44 locations. Louisiana and Texas also have factories that each ship more than \$500 million worth of wood building products per year. Other states with a relatively high degree of participation in the softwood industry include, in order of value of shipments, Arkansas, Washington, Mississippi, and Alabama.

The structural wood members industry (SIC 2439/NAICS 321213/-14), which

manufactures trusses, arches, and other wood structural products, is less geographically concentrated than other industries in this profile. However, Oregon and California again are among the top four producing states on a value of shipments basis. Joined by Florida and Michigan, the factories in the top four states account for one-third of the industry's dollar output. Other states with a relatively high degree of participation in the structural wood products industry include, in order of value of shipments, Texas, Ohio, Louisiana, and Arizona.

Oregon and North Carolina each account for 10 percent of the value of shipments for the reconstituted wood products industry, but many other states also have factories that ship more than \$200 million in output a year. The ten states listed in Table 3-2 operate slightly more than half of the industry's 317 factories, employ two-thirds of the industry's labor, and account for two-thirds of industry value of shipments.

3.2.2 Facility Employment

Table 3-3 lists the number of establishments by employment range in 1997 for each of the wood building products industries profiled in this document. This information is useful because it provides an industry-level picture of both the number and size of factories in each industry. As in the facility location discussion, the special products sawmills industry is not included in the table because of changes in the industrial classification system.

In most industries there are a significant number of small-scale, niche market producers manufacturing specialized products. These producers may market items of regional or special interest or that involve traditional or labor-intensive production practices or are custom-manufactured to fulfill some functional or aesthetic requirement. The wood building products industries are no exception. A relatively large number of facilities in these industries have fewer than 20 employees. These smaller facilities are most likely local or special-interest producers manufacturing items such as custom doors and window frames, moldings, and wooden arches and trusses. Because of the small-scale of their operations, it is unlikely that these facilities operate coatings operations.

In 1997, the hardwood dimension and flooring (other millwork), millwork (windows and doors), and structural products industries each operated more than 1,000 factories. Apart

Table 3-3. Number of Establishments by Employment Range

	2426 and 2431 (part)		2435	2436	2439	2493	
SIC	2431 (part)	2431 (part)	2435	2436	2439	2493	
NAICS	312918	321911	321211	321212	321213 and 321214	321219	
Industry Description	Hardwood Dimension and Flooring (Other Millwork)	Millwork (Window and Door Manufacturing)	Hardwood Veneer and Plywood	Softwood Veneer and Plywood	Structural Wood Members (Truss and Engineered Wood Members)	Reconstituted Wood Products	Total
Number of Employees							
1 to 4	515	410	56	10	147	49	1,187
5 to 9	288	272	20	9	141	35	765
10 to 19	264	251	48	8	224	33	828
20 to 49	221	235	74	19	287	42	878
40 to 99	86	109	66	18	169	53	501
100 to 249	69	87	53	37	70	93	409
250 to 499	15	28	14	48	7	10	122
500 to 999	5	10	1	6		2	24
1,000 to 2,499		3					3
2,500 or more		3					3

Source: U.S. Census Bureau. 1999. *1997 Economic Census, Manufacturing Industry Series*. Various Reports. EC97M-3212A through -3212E, -3219A, and -3219C. Washington, DC: U.S. Government Printing Office.

from niche-market players, these factories are mostly medium-sized establishments employing between 20 and 250 employees. Although there are relatively few factories employing more than 250 employees, many of these are large-scale operations owned by major market players, such as Georgia-Pacific Corporation, Andersen Corporation, and Armstrong Holdings. Only the windows and doors industry has facilities with more than 1,000 employees.

The veneer and plywood industry and the reconstituted wood products industry have fewer plants than the other wood building products industries, but they tend to be large-scale plants with a relatively high degree of automation. Most factories employ between 50 and 500 employees. Only nine employ greater than 500 employees, and none more than 1,000 employees.

3.2.3 Capacity Utilization

Capacity utilization indicates how well the current facilities meet demand. One measure of capacity utilization is, quite simply, capacity utilization rates. A capacity utilization rate is the ratio of actual production volumes to full-capacity production volumes. For example, if an industry is producing as much output as possible without adding new floor space or equipment, the capacity utilization rate would be 100 percent. On the other hand, if under the same constraints the industry were only producing 75 percent of its maximum possible output, the capacity utilization rate would be 75 percent. On an industry-basis, capacity utilization is highly variable from year to year depending on economic conditions. It is also variable on a company-by-company basis depending not only on economic conditions, but also on a company's strategic position in its particular industry. While some plants may have idle production lines or empty floor space, others may be in need of additional space or capacity.

Table 3-4 lists the capacity utilization rates for each wood building products industry for 1993 through 1998. The rise in new housing starts and remodeling of existing residential and light commercial buildings that accompanied the United State's economic expansion through the 1990s boosted the capacity utilization rates of many key wood building products industries, particularly those industries producing structural panels, hardboard, particleboard, and medium-density fiberboard (SIC codes 2435, 2436, and 2493). In general, companies in these industries invested heavily in capacity additions at existing plants and construction projects for new facilities in the mid-1990s, leading to lower capacity utilization rates in 1996 and 1997 as the new capacity came on-line. However, increased growth in demand for

Table 3-4. Full Production Capacity Utilization Rates by Industry: Fourth Quarters 1993 through 1998

SIC	SIC Description	NAICS	1993	1994	1995	1996	1997	1998
2426	Hardwood dimension and flooring mills	321918	87	85	73	76	79	75
2429	Special product sawmills, NEC	321113	59	77	68	59	38	35
2431	Millwork	321911	64	61	74	69	71	71
		321918						
2435	Hardwood veneer and plywood	321211	85	86	81	83	84	86
2436	Softwood veneer and plywood	321212	92	95	95	86	84	91
2439	Structural wood members, NEC	321213	66	66	74	77	72	73
		321214						
2493	Reconstituted wood products	321219	92	92	88	86	82	84

Source: U.S. Census Bureau. 2000. *Survey of Plant Capacity, 1998*. MQ-C1(98). Washington, DC: U.S. Government Printing Office.

structural wood products fueled capacity utilization increases in 1998 (*Wood Technology*, 1996). The softwood products industry was operating at 95 percent capacity in 1994 and 1995. Additional capacity lowered rates to the mid-80s over 1996 and 1997, but spare production capacity was used to meet demand in 1998, pushing the rate once again over the 90 percent mark. As such, this industry is seeing the most construction projects for new facilities that are expected to come online in the next 1 or 2 years of any wood building products industry (CPA, 2000).

Wood flooring, windows, doors, and other types of millwork companies also saw fluctuations in capacity utilization, but these fluctuations were not as pronounced as in the structural products industry. An increasingly large share of these products are made of other materials, such as vinyl, fiberglass, and aluminum. This does not imply that the companies manufacturing these products are doing poorly overall; rather, many of the major producers of wood windows and doors are also producing the same products using those other materials. The wood shingles and other special sawmills products industry, however, declined over the 1990s. Capacity utilization for this industry peaked in 1994 at 77, before dropping to 35 in 1998.

3.2.4 Wood Building Products Database Facilities

Table 3-5 presents detailed information on a selected number of wood building products facilities that have coatings operations, including the location of each facility, its estimated sales volume in dollars, its employment, and its coatings usage in gallons. As Table 3-5 indicates, a relatively small number of large companies, such as Masonite Corporation (a subsidiary of International Paper, one of the largest American paper companies) and Georgia-Pacific Corporation, operate many facilities. Georgia-Pacific and one of its many subsidiaries operate 9 of the 47 facilities listed. Other major market players with facilities in this table include Jeld-Wen Inc., Andersen Corporation, Armstrong Holdings, Willamette Industries, and Weyerhaeuser Company. As Section 3.4 discusses, it is common for many of the largest wood building products manufacturers to operate in more than one industry either directly or through one of their subsidiaries.

3.3 Wood Building Products Companies

Companies that own individual facilities are legal business entities that have the capacity to conduct business transactions and make business decisions that affect their respective facilities. The terms “company” and “firm” are synonymous and refer to the legal business entity that owns one or more facilities. This section presents information on the parent companies that own wood building products manufacturing facilities.

3.3.1 Company Characteristics

Table 3-6 lists some of the largest companies operating in each wood building products industry profiled in this document. As the following sections discuss, many companies cross industry lines, producing a diverse array of forest products. Because of the large number of firms in these markets, only a selection of the largest firms is presented.

3.3.2 Horizontal and Vertical Integration

Companies within wood building products industries can be horizontally and/or vertically integrated. Vertical integration refers to the degree to which firms own different levels of production and marketing. Vertically integrated firms may produce the inputs used in their production processes and own the distribution network to sell their products to consumers. These firms may own several plants, each of which handles these different stages of production. For example, a company that owns a plywood and veneer plant may also operate sawmills and door factories or other wood-based products, such as paper and

Table 3-5. Selected Wood Building Products Facilities, by Product Category

Product Market	Company	Facility	City	State	SIC	NAICS	Sales Estimates (\$10⁶)^a	Number of Employees at Facility^a	Coatings Usage (Gallons)
Exterior Siding and Door Skins	Abt Co. Inc. (A subsidiary of Louisiana Pacific's ABT Building Products Corp.)	ABTCO Inc	Roaring River	NC	2493	321219	250.0	600	468,792
		Catawba Hardboard subsidiary of Georgia-Pacific Corp.)	Catawba	SC	2493	321219	NA	NA	207,094
	Collegewood, Inc.	Collegewood, Inc	Lincoln	CA	2435	321211	15.0	40	146,145
		Jeld-Wen Fiber Inc. (A subsidiary of Jeld-Wen Inc.)	Klamath Falls	OR	2493	321219	NA	150	219,551
	Jeld-Wen Fiber of North Carolina	Jeld-Wen Fiber of Marion	Marion	NC	2493	321219	7.5	85	238,249
		Jeld-Wen Fiber of White Swan	White Swan	WA	2493	321219	35.0	80	237,238
	Jeld-Wen Fiber of Iowa	Jeld-Wen Fiber of Dubuque	Dubuque	IA	2493	321219	15.0	80	188,132
		Masonite Corp. (A subsidiary of International Paper Co.)	Laurel	MS	2493	321219	NA	NA	1,992,450
	Masonite Corp./Towanda PA Mill	Masonite Corp./Towanda PA Mill	Wysox	PA	2493	321219	NA	NA	938,766
		Masonite Corp./Ukiah Facility	Ukiah	CA	2493	321219	250.0	300	454,600
	Stimson Lumber Co.	Stimson Lumber - Forest Grove	Forest Grove	OR	2493	321219	75.0	250	58,541

(continued)

Table 3-5. Selected Wood Building Products Facilities, by Product Category (Continued)

Product Market	Company	Facility	City	State	SIC	NAICS	Sales Estimates (\$10 ⁶) ^a	Number of Employees at Facility ^a	Coatings Usage (Gallons)
Interior "Stock" Panels	DuraFlake Inc. (A subsidiary of Willamette Industries, Inc.)	Duraflake	Albany	OR	2493	321219	35.0	120	1,103
		Georgia-Pacific Corp (North Little Rock Hardboard)	North Little Rock	AR	2493	321219	NA	NA	13,570
	Georgia-Pacific Corp.	Georgia-Pacific Panelboard/MDF	Monticello	GA	2493	321219	15.0	35	70,832
		Georgia-Pacific Corp (Duluth, MN)	Duluth	MN	2493	321219	NA	NA	12,028
	Louisiana-Pacific Corp.	Eugene Operations	Eugene	OR	2435	321211	75.0	285	21,243
		Louisiana-Pacific Corp Missoula PB	Missoula	MT	2493	321219	75.0	240	93,101
		Masonite Corp. (A subsidiary of International Paper Co.)	Danville	VA	2493	321219	NA	NA	7,776
	States Industries Inc. Willamette Industries Inc.	Masonite Corp/Lisbon Falls Facility	Lisbon Falls	ME	2493	321219	NA	NA	302,758
		Masonite Corp/Pilot Rock Mill	Pilot Rock	OR	2493	321219	NA	NA	1,278,574
		States Industries, Inc	Eugene	OR	2435	321211	75.0	500	74,606
	Willamette Industries Inc.	Willamette Industries, Inc/KorPine Div	Bend	OR	2493	321219	75.0	175	33,413
		Willamette Industries, Inc/Lillie Div	Lillie	LA	2493	321219	35.0	125	27,285
		Willamette Industries, Inc/Surepine Div	Simsboro	LA	2493	321219	35.0	170	18,155

(continued)

Table 3-5. Selected Wood Building Products Facilities, by Product Category (Continued)

Product Market	Company	Facility	City	State	SIC	NAICS	Sales Estimates (\$10 ⁶) ^a	Number of Employees at Facility ^a	Coatings Usage (Gallons)
Interior Wall Paneling and Tileboard	ABT Building Products Corp. (A subsidiary of Louisiana Pacific)	ABT Building Products Corp/Toledo	Toledo	OH	2499	321999	15.0	81	320,440
	AFCO Industries Inc.	AFCO Industries, Inc.	Holland	MI	2493	321219	15.0	85	154,127
	Chesapeake Hardwood Products Inc.	Chesapeake Hardwood Products, Inc	Chesapeake	VA	2435	321211	75.0	100	298,173
	Georgia-Pacific Corp.	Georgia-Pacific Corp/Hardwood Plywood	Savannah	GA	2435	321211	75.0	268	249,463
		Georgia-Pacific Corp (Phillips, WI)	Phillips	WI	2499	321999	35.0	90	125,246
Flooring	Georgia Pacific Corp (Superior, WI)	Georgia Pacific Corp (Superior, WI)	Superior	WI	2493	321219	35.0	125	30,513
	Bruce Hardwood Floors, Inc. (A subsidiary of Armstrong Holding's Triangle-Pacific Corp. unit.)	Bruce Hardwood Flooring, LP	Statesville	NC	2426	321918	NA	NA	7,946
		Bruce Hardwood Flooring, LP	Center	TX	2426	321918	75.0	385	37,416
		Bruce Hardwood Flooring, LP	Nashville	TN	2426	321918	75.0	400	19,273
	Hartco Quality Wood Flooring, Inc. (A subsidiary of Armstrong Holding's Triangle-Pacific Corp. unit.)	Hartco Flooring Co/East & West PlantsOneida	Oneida	TN	2426	321918	NA	600	6,628
	Hartco Flooring Co/Industrial Lane Plant	Oneida	TN	2426	321918	NA	600	1,348	

(continued)

Table 3-5. Selected Wood Building Products Facilities, by Product Category (Continued)

Product Market	Company	Facility	City	State	SIC	NAICS	Sales Estimates (\$10⁶)^a	Number of Employees at Facility^a	Coatings Usage (Gallons)
Windows, Doors, and Other Products	Andersen Corp.	Andersen Corp.	Bayport	MN	2431	321911	NA	300	459,207
	Eagle Window and Door, Inc. (A subsidiary of American Architectural Products Inc.)	Eagle Window and Door, Inc	Dubuque	IA	2431	321911	NA	500	33,236
	Eggers Industries Inc.	Eggers Industries	Neenah	WI	2431	321911	35	200	36,961
		Eggers Industries Custom Plywood Div, East Plant	Two Rivers	WI	2431	321911	NA	NA	12,820
	Georgia-Pacific Corp.	Georgia Pacific Corp./Roxboro Eng Lumber Plant	Roxboro	NC	2493	321219	75	240	93,311
	Oshkosh Architectural Door Company	Oshkosh Architectural Door Company	Oshkosh	WI	2431	321911	15	105	4,738
	Pella Corp.	Pella Corp.	Pella	IA	2431	321911		3,500	339,671
		Pella Corp.	Carroll	IA	2431	321911		700	87,021
	Quaker Window Products Inc.	Quaker Window Products Co	Freeburg	MO	2431	321911	35	400	100
	Suburban Door Co	Suburban Door Co	Tualatin	OR	2431	321911	15	80	29,706
	Weyerhaeuser Co.	Weyerhaeuser Co.	Marshfield	WI	2499	321999	250	700	29,151
	Woodgrain Millworks, Inc.	Woodgrain Millwork, Inc, Millwork & Prefinish Divs	Fruitland	ID	2431	321918	NA	750	NA

^a Current sales and employment estimates are from American Business Information.

Table 3-6. Sample Companies in Wood Building Products Industries, 1998

Industry	Company	Location	Organization Type	Industry Sales (\$10⁶)^a	Employment
<i>Hardwood dimension and flooring (SIC 2426/NAICS 321918)</i>					
	Willamette Industries	Portland, OR	Public	3,425	
	Georgia-Pacific Corp.	Atlanta, GA	Public	1,470	
	Triangle-Pacific Corp.	Dallas, TX	Division	534	
	WTD Industries Inc.	Portland, OR	Public	284	
	Coastal Lumber Co.	Weldon, NC	Private	250	
	Northwest Hardwoods Div.	Portland, OR	Division	250	
	Crown Pacific LP	Portland, OR	Subsidiary	210	
	Collins Pine Co.	Portland, OR	Private	90	
	Anderson-Tully Co.	Memphis, TN	Private	70	
	Anthony Timberlands Inc.	Bearden, AR	Private	66	
	Woodcraft Industries Inc.	St. Cloud, MN	Private	58	
	Geo McQuesten Company Inc.	North Billerica, MA	Subsidiary	50	
	Pierson-Hollowell Company Inc.	Lawrenceburg, IN	Private	50	
	Robbins Inc.	Cincinnati, OH	Private	50	
	Walter H. Weaver Sons Inc.	Lebanon, PA	Private	50	
	Webster Lumber Co.	Bangor, WI	Private	45	
	Burruss Co.	Lynchburg, VA	Private	40	
	LD McFarland Company Ltd.	Tacoma, WA	Private	40	
	Memphis Hardwood	Memphis, TN	Private	38	
	Linden Lumber Company Inc.	Linden, AL	Private	37	
	Catawissa Lumber and Specialty	Catawissa, PA	Private	35	
	SDS Lumber Co.	Bingen, WA	Subsidiary	29	
	Lafayette Manufacturing Co.	Lafayette, TN	Subsidiary	28	
	Ross-Simmons Hardwood	Longview, WA	Private	28	
	Charles D. Roberts Co.	Greensboro, NC	Private	27	
<i>Special product mills (SIC 2429/NAICS 321113)</i>					
	Pacific Coast Building Products	Sacramento, CA	Private	360	2,500
	Geo McQuesten Company Inc.	North Billerica, MA	Subsidiary	50	1,500
	Miller Shingle Company Inc.	Granite Falls, WA	Private	36	200
	Shakertown1992 Inc.	Louisville, KY	Subsidiary	26	200
	Blue Grass Cooperage Co.	Winlock, WA	Private	24	200
	Independent Stave Company Inc.	Lebanon, MO	Private	23	400
	Robbins Lumber Inc.	Searsmont, ME	Private	16	75
	Colonial Cedar Company Inc.	Kent, WA	Private	14	75

(continued)

Table 3-6. Sample Companies in Wood Building Products Industries, 1998 (Continued)

Industry	Company	Location	Organization Type	Industry Sales (\$M)^a	Employment
<i>Millwork (SIC 2431/NAICS 321911 & -18)</i>					
	Champion International Corp.	Stamford, CT	Public	5,880	24,400
	Potlatch Corp.	San Francisco, CA	Public	1,554	6,700
	MascoTech Inc.	Taylor, MI	Public	1,281	5,100
	SPX Corp.	Muskegon, MI	Public	1,109	7,100
	Andersen Corp.	Bayport, MN	Private	1,000	3,600
	Jeld-Wen Inc.	Klamath Falls, OR	Private	850	9,000
	Sierra Pacific Industries	Redding, CA	Private	750	2,500
	Griffon Corp.	Jericho, NY	Public	655	3,600
	Greif Bros. Corp.	Delaware, OH	Public	637	4,800
	Mannington Mills Inc.	Salem, NJ	Private	600	3,000
	TJ International Inc.	Boise, ID	Public	577	3,000
	Clopay Corp., A Griffon Co.	Cincinnati, OH	Subsidiary	577	1,600
	Morgan Products Ltd.	Williamsburg, VA	Public	500	1,600
	Associated Materials Inc.	Dallas, TX	Private	373	2,700
	Marvin Windows and Doors	Warroad, MN	Private	350	2,700
	SNE Enterprises Inc.	Wausau, WI	Subsidiary	350	1,800
	Alside Div.	Akron, OH	Division	311	1,400
	West Lumber Company Inc.	Atlanta, GA	Private	290	1,800
	Overhead Door Corp.	Dallas, TX	Private	285	2,800
	Marvin Lumber and Cedar Co.	Warroad, MN	Private	280	2,800
	Woodgrain Millworks Inc.	Fruitland, ID	Private	260	2,500
	Springs Window Fashions Div.	Middleton, WI	Division	250	1,900
	Huttig Sash and Door Co.	Chesterfield, MO	Subsidiary	240	2,300
	Marley (USA) Holding Corp.	Johnson City, TN	Subsidiary	220	1,600
<i>Hardwood plywood and veneer (SIC 2435/NAICS 321211)</i>					
	Georgia-Pacific Corp.	Atlanta, GA	Public	5,923	6,000
	Champion International Corp.	Stamford, CT	Public	5,880	24,400
	Boise Cascade Corp.	Boise, ID	Public	5,108	20,000
	Louisiana-Pacific Corp.	Portland, OR	Public	2,486	12,000
	Ply Gem Industries, Inc.	New York, NY	Subsidiary	775	4,000
	Temple-Inland	Diboll, TX	Subsidiary	502	2,900

(continued)

Table 3-6. Sample Companies in Wood Building Products Industries, 1998 (Continued)

Industry	Company	Location	Organization Type	Industry Sales (\$M)^a	Employment
<i>Hardwood plywood and veneer (SIC 2435/NAICS 321211) (continued)</i>					
	Columbia Forest Products, Inc.	Portland, OR	Private	500	3,500
	Timber Products Co.	Springfield, OR	Private	360	1,000
	Crown Pacific LP	Portland, OR	Subsidiary	210	1,600
	Medite Corp	Medford, OR	Subsidiary	200	700
	Sierra Pacific Industries	Standard, CA	Division	180	600
	Darlington Veneer Company Ltd.	Darlington, SC	Private	140	600
	Springfield Forest Products Inc.	Eugene, OR	Private	100	700
	Plywood Panels Inc.	New Orleans, LA	Private	97	200
	Indian Head Div.	Newport, VT	Division	90	800
	Hunt Plywood Company Inc.	Ruston, LA	Private	63	500
	States Industries Inc.	Eugene, OR	Private	63	400
	Besse Forest Products Group	Gladstone, MI	Private	60	600
	Chesapeake hardwood Products	Chesapeake, VA	Private	60	200
	David R. Webb Inc.	Edinburgh, IN	Private	60	600
	Atlantic Veneer Corp.	Beaufort, NC	Private	50	600
	Day Companies Inc.	Memphis, TN	Private	50	200
	Pierson-Hollowell Company Inc.	Lawrenceburg, TN	Private	50	100
	Eggers Industries Inc.	Two Rivers, WI	Private	45	400
<i>Softwood plywood and veneer (SIC 2436/NAICS 321212)</i>					
	Georgia-Pacific Corp.	Atlanta, GA	Public	5,923	6,000
	Champion International Corp.	Stamford, CT	Public	1,310	6,300
	Boise Cascade Corp.	Boise, ID	Public	994	5,000
	TJ International Inc.	Boise, ID	Public	992	4,000
	Kimball International Inc.	Jasper, IN	Public	992	8,900
	Ply Gem Industries, Inc.	New York, NY	Subsidiary	775	4,000
	Plum Creek Manufacturing LP	Seattle, WA	Subsidiary	376	1,800
	Timber Products Co.	Springfield, OR	Private	360	1,000
	MacMillan Bloedel Inc.	Montgomery, AL	Subsidiary	320	2,500
	WTD Industries Inc.	Portland, OR	Public	284	1,100
	Medite Corp	Medford, OR	Subsidiary	200	700
	Sierra Pacific Industries	Standard, CA	Division	180	600
	Union Camp Corp.	Savannah, GA	Division	162	1,400

(continued)

Table 3-6. Sample Companies in Wood Building Products Industries, 1998 (Continued)

Industry	Company	Location	Organization Type	Industry Sales (\$M)^a	Employment
<i>Softwood plywood and veneer (SIC 2436/NAICS 321212) (continued)</i>					
	Stimson Lumber Co.	Portland, OR	Private	130	1,400
	US Forest Industries Inc.	Medford, OR	Private	120	800
	Springfield Forest Products Inc.	Eugene, OR	Private	100	700
	Borden Inc.	St. Louis, MO	Subsidiary	90	500
	Omak Wood Products Inc.	Omak, WA	Private	90	500
	South Coast Lumber Co.	Brookings, OR	Private	90	500
	Freres Lumber Co.	Lyons, OR	Private	75	300
	Sun Studs Inc.	Roseburg, OR	Private	75	400
	Atlantic Veneer Corp.	Beaufort, NC	Private	50	600
	Decor Gravure Corp.	Fairfield, AL	Private	50	200
	Philomath Forest Products Co.	Philomath, OR	Subsidiary	41	300
	K-Ply Inc.	Port Angeles, WA	Subsidiary	40	200
<i>Structural Wood Members (SIC 2439/NAICS 321213 & -14)</i>					
	Georgia-Pacific Corp	Atlanta, GA	Public	5,923	6,000
	Frank Calandra Inc.	Cresson, PA	Private	577	3,000
	Robbins Manufacturing Co.	Tampa, FL	Private	100	400
	Richardson Industries Inc.	Sheboygan Falls, WI	Private	100	500
	Trussway Inc.	Houston, TX	Private	56	500
	Automated Building	Excelsior, MN	Private	35	400
	Denlinger Inc.	Paradise, PA	Private	28	300
	Florida Engineered Construction	Tampa, FL	Private	28	300
	Fierson Building Supply Inc.	Jackson, MS	Private	25	200
	Lumber Inc.	Albuquerque, NM	Private	25	100
	East Coast Lumber and Supply Co.	Fort Pierce, FL	Private	21	100
	Schuck Component Systems	Glendale, AZ	Division	21	200
	Shelter Systems of New Jersey	Hainesport, NJ	Private	20	200
	Standard Structures Inc.	Santa Rosa, CA	Private	20	200
<i>Reconstituted Wood Products (SIC 2493/NAICS 321219)</i>					
	Louisiana-Pacific Corp.	Portland, OR	Public	2,486	12,000
	Contran Corp.	Dallas, TX	Private	1,961	11,300
	Boise Cascade Corp.	Boise, ID	Division	994	5,000
	Temple-Inland Corp.	Diboll, TX	Subsidiary	502	2,900

(continued)

Table 3-6. Sample Companies in Wood Building Products Industries, 1998 (Continued)

Industry	Company	Location	Organization Type	Industry Sales (\$M)^a	Employment
<i>Reconstituted Wood Products (SIC 2493/NAICS 321219) (continued)</i>					
	Jason Inc.	Milwaukee, WI	Public	443	2,800
	Valcor, Inc.	Dallas, TX	Subsidiary	396	5,300
	Masonite Corp.	Chicago, IL	Division	250	1,300
	Medite Corp.	Medford, OR	Subsidiary	200	700
	Celotex Corp.	Tampa, FL	Subsidiary	190	2,700
	Timber Products Co.	Medford, OR	Division	187	900
	Union Camp Corp.	Savannah, GA	Division	162	1,400
	Collins Pine Co.	Portland, OR	Private	90	300
	TEC Inc.	Palatine, IL	Subsidiary	30	200
	Panel Processing, Inc.	Alpena, MI	Subsidiary	28	200
	Woods Group Inc.	Albuquerque, NM	Private	27	200
	Homasote Co.	West Trenton, NJ	Private	24	200
	Domtar Industries Inc.	Albany, OR	Subsidiary	20	100
	Dominance Industries Inc.	Broken Bow, OK	Subsidiary	20	100
	Ponderosa Products Inc.	Albuquerque, NM	Subsidiary	20	100
	Tectum Inc.	Newark, OH	Private	16	100
	GVK America Inc.	Biscoe, NC	Subsidiary	15	100
	Bally Block Co.	Bally, PA	Private	14	100
	Rodman Industries Div.	Marinette, WI	Division	13	100
	Lydall Inc.	Covington, TN	Division	12	100
	Davis Wood Products Inc.	Hudson, NC	Private	12	200

^a This column includes company sales for each industry where possible. Otherwise, total company sales are listed.

Source: Heil, Scott F., ed. *Ward's Business Directory of U.S. Public and Private Companies 1998*. Volume 5: Ranked by sales within four-digit SIC. Information Access Company.

paperboard. A company may be integrated as far back as the logging camp, as in the cases of Georgia-Pacific and Champion International. Indeed, the largest players in the structural wood products industry (e.g., siding, panels) earn substantial portions of their revenues in pulp and paper, paperboard, and other forest industries. Georgia-Pacific's chemical unit is one of the largest producers of chemical inputs for forest products.

Horizontal integration refers to a company owning more than one facility that produces the same or similar products or owning facilities that produce a diversity of products. The companies may be directly integrated by owning additional facilities outright or indirectly by owning additional facilities through affiliations with other companies and

subsidiaries. Several wood building products companies have high degrees of horizontal integration. First, most of the largest market players are horizontally integrated within their own industry in that they own multiple flooring factories, such as Armstrong Holdings, which operates Bruce Hardwood Flooring and Hartco Quality Wood Floors, among other companies, through its Triangle Pacific unit. Second, many also operate numerous subsidiaries in other Wood building products industries or related industries, such as pulp and paper, like International Paper.

3.3.3 *Company Trends*

Among the largest forest products companies, business decisions focus on core areas of operations, such as paper, pulp, and paperboard. Although the burgeoning housing and remodeling market in the U.S. helped boost corporate profits in the 1990s, pulp and paper divisions, rather than wood products, are driving business decisions because they are the largest part of the industry and the most capital intensive (Morrison and George, 2000). The predominant strategic philosophy of the industry is that larger companies with larger market shares will be able to maintain a greater degree of price stability in key markets relative to recent years. As a result, key players in the hardwood, softwood, and reconstituted wood products industries have been bought, sold, or merged into the operations of former rivals. International Paper's acquisition of Champion International is currently pending, as is Plum Creek Timber Company's purchase of Georgia-Pacific's Timber Company unit.

Despite consolidation in the millwork and structural members industries, regional and small manufacturers are expected to thrive. Many larger industry players are purchasing smaller companies in a drive to increase market share, boost income, and increase brand identification (Halladay, 1998). For example, Jeld-Wen, Inc., an Oregon-based window and door manufacturer, now owns more than 150 companies in the U.S., Canada, and Europe. Profit ratios for the wood building products industries vary; the median for millwork is 2.8 percent, for hardwood dimension and flooring 3.5 percent, and for structural wood members 4.7 percent (Dun & Bradstreet, 1997). Profit margins are expected to remain stable or improve so long as the remodeling and new construction markets continue to grow. When the expected slow down in these markets occurs, it is expected that margins will be squeezed as prices drop and more capacity is idled (Halladay, 1998).

SECTION 4

DEMAND-SIDE OVERVIEW

Wood building products are demanded primarily as an input into the construction of new residential and commercial buildings as well as for remodeling and renovation of existing buildings. The demand for wood building products is based on their value to consumers as part of a final good and is essentially a derived demand dependent on the rate of new construction, remodeling, and renovation. Surface-coating of these products is a value-adding process demanded for its ability to increase a wood building product's aesthetic value and durability.

This section provides information on the uses and the consumers of the wood building products industry. Consumers, desired and evaluated product characteristics, and the purpose of consumption are described. In addition, substitution possibilities are discussed and demand elasticity estimates are provided.

4.1 Demand Characteristics

Contractors and individual homeowners purchase wood building products for new construction, additions to existing structures, remodeling, and renovations of residential and commercial buildings. From 1990 to 1999, total construction sales increased 26 percent. As construction sales increase, the sales of wood building products also increase because these products are used as inputs into the construction process. Table 4-1 presents construction sales for the period 1990 to 1999. In 1999, remodeling and improvements consisted of 23 percent of total construction sales.

When choosing wood building products to purchase, consumers consider characteristics such as

- C distinctive grains and colors,
- C heat resistance,
- C energy efficiency,

Table 4-1. Annual Value of Construction: 1990-1999 (\$10⁶ 1997)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total Construction	585,483	508,296	667,672	548,012	583,988	585,037	627,646	656,630	701,083	735,956
Residential Buildings	234,674	195,345	287,126	250,049	247,945	260,461	287,581	289,014	309,888	335,919
Nonresidential Buildings	176,225	136,970	152,130	122,915	130,273	143,778	157,452	172,990	187,850	188,532

Source: Annual value of construction put in place in the United States: 1995 - 1999 and annual value of construction put in place in the United States: 1990-1994. Available from the U.S. Census Bureau.

All numbers have been adjusted to 1997 dollars by the consumer price index available from the Bureau of Labor Statistics.

- C maintenance,
- C flexibility of structures, and
- C conformance to shapes.

While many of the above characteristics of wood building products are determined primarily by the uncoated wood substrate, coatings influence some of the characteristics of the wood building products. In particular, the coating directly affects durability and aesthetics.

Consumers can readily observe the aesthetic characteristics of the coatings when they purchase wood building products. The most important aspects of coating appearance are color and shine. While the benefits of coatings for the appearance of wood building products are easily observable at purchase, the durability aspects of the coatings are only observable over time. Coatings add increased resistance to water damage, mildew, insects, decay, chipping, and scratching. As wood building products age, coatings that chip, crack, or scratch greatly diminish the appearance of the product and may reduce the product's resistance to decay. Because the quality of the coating cannot be perfectly known at the time of purchase, the reputation of the company manufacturing the wood building products is important. A company with a history of problems with their wood coatings may experience a reduced demand for their wood building products in the future.

4.2 Substitution Possibilities in Consumption

The possibilities for substitution in the wood building products industries include four major types of materials: fiberglass, gypsum-fiberboard, plastic, vinyl, and metal products. The specific substitutes for each type of wood building products may differ (e.g., wood windows may be replaced by vinyl windows, while wood entrance doors are more likely to be competing with metal doors), but there are generally viable substitutes for the wood building products potentially affected by this regulation. The appearance and durability of each material affects the consumer's choice of product. An increased price of coated wood building products due to regulation of the industry may lead to some substitution towards products that have become relatively cheaper to consumers in comparison to wood building products. If there is a reduction in the durability and/or aesthetic quality of the wood coatings as a result of environmental regulations leading to changes in the coatings used, this might also lead to the substitution of alternative products for wood building products.

4.2.1 Demand Elasticity Estimates

The elasticity of demand for coated wood building products is a measure of the responsiveness of the quantity of coated products demanded to a change in the price of those products. The responsiveness of the quantity demanded to price increases with the availability of substitutes, the time frame of adjustment (consumers are typically more responsive to price changes in the long run than in the short run), and the share of the consumer's budget devoted to the good. The more inelastic the demand, the more easily firms will be able to pass the costs of regulation on to consumers. Based on empirical estimates provided by EPA, the demand for wood building products produced by sawmills and planing mills and for miscellaneous wood products is inelastic (see Table 4-2). Demand for wood furniture and millwork, on the other hand, is highly elastic, with an elasticity of -3.4, implying that a 1 percent increase in price will lead to a 3.4 percent reduction in quantity demanded. However, because millwork is grouped with furniture in this estimate, the demand elasticity of furniture is likely dominating the elasticity estimate. The demand for furniture is likely to be much more elastic than the demand for wood building products in general, but millwork is likely to be more elastic than the demand for windows and doors, for example, because it is a more expensive specialty product. Overall, the demand for wood building products is probably fairly price inelastic because it depends so strongly on the rate of building construction, remodeling, and renovation and the cost of wood building products is a relatively small share of the total cost of construction.

Table 4-2. Estimates of Elasticities of Demand for the Wood Building Products Industry

SIC	NAICS	Industry	Demand Elasticity
242	321918, 337215, 321113, 321912,32113, 32192, and 321999	Sawmills and Planing Mills	-0.2
243, 251, 252, 253, 254	321911, 321918, 321211, 321212. 321214 and 321213	Wood Furniture and millwork	-3.4
249	321114, 321219, 339999, 32192, 321999, and 333414	Miscellaneous Wood Products	-0.2

Source: E.H. Pechan & Associates, Inc. *Qualitative Market Impact Analysis for Implementation of the Selected Ozone and PM NAAQS*. Prepared for the U.S. Environmental Protection Agency.

SECTION 5

MARKET DATA

This section provides data on domestic production, domestic consumption, imports, and exports of wood building products. It also includes data on gross margin growth in prices. Finally, this section discusses trends and projections for the wood building products industry.

5.1 Market Value

Data on the volumes of wood building products produced and consumed annually in the United States, including imports and exports, are discussed below.

5.1.1 Domestic Production and Consumption

The growing U.S. housing market has spurred increased production in the wood building product industry. Table 5-1 lists the historical value of production and Table 5-2 lists output figures for each product in the wood building product industry. From 1992 to 1997, total U.S. production of softwood veneer increased almost 70 percent and the production of double-hung windows increased 24 percent. In 1999, new construction projects were valued at 764.2 billion dollars, a 7.4 percent increase over 1998. Furthermore, the average size of residential housing is increasing (McGraw-Hill, 2000). On average, the construction of a 2085 square foot single family home requires 2,325 square feet of siding, 3,100 square feet of roofing material, 6,144 square feet of interior wall material, 15 windows, 12 interior doors, 7 closet doors, 2 exterior doors, 2 garage doors, and 2,085 square feet of flooring material (Materials Used in Building a 2085, 2000).

5.1.2 International Trade

As indicated in Tables 5-3 and 5-4, international trade is a major component of the U.S. market for wood building products. From 1991 to 1997, total imports of sawmill and planing millwood products increased 71 percent, while exports of millwork increased 30 percent. Table 5-5 provides data on imports of wood products by country for 1993 to 1997.

Table 5-1. Total Production of Wood Products (\$10⁶ 1997)

	1977	1982	1987	1992	1997
Prefabricated Wood Buildings	4,073.10	2,502.20	3,841.10	2,774.60	
Hardwood Dimension and Flooring Mills	1,764.70	1,697.00	2,716.40	2,640.20	NA
Special Product Sawmills, NEC	303.60	319.00	298.30	347.70	
Wood Window Units	1,331.60	1,346.10	3,283.00	3,217.70	2,579.40
Wood Sash, Excluding Sash shipped in Window Units	208.50	117.90	274.30	180.40	136.90
Wood Window and Door Frames (including door frames shipped in door units, excluding window frames shipped in window units wood panel, flush, and molded face doors, interior and exterior, including doors with glazed sections)	578.30	369.90	589.80	653.90	462.90
Other wood doors, including garage, bifold, patio Cabinet, screen, storm, and louver	1,546.20	1,508.30	2,484.10	2,138.20	2,042.20
Millwork	1,047.00	934.40	1,637.80	1,305.00	1,335.50
Hardwood Veneer and Plywood	3,360.00	3,480.80	6,213.10	5,040.10	NA
Softwood Veneer and Plywood	2,535.00	2,406.00	3,018.70	2,725.40	2,741.40
Structural Wood Members, NEC	7,828.70	5,407.10	7,212.30	6,388.50	5,748.00
Reconstituted Wood Products	1,708.30	1,556.40	3,106.10	3,138.10	
	NA	NA	4,766.10	5,359.30	5,167.80

NA = Not available

Sources: U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Millwork, Plywood, and Structural Members Not Elsewhere Classified. MC92-1-24B. Washington, DC: U.S. Government Printing Office.
U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Wood Buildings and Mobile Homes. MC92-1-24. Washington, DC: U.S. Government Printing Office.
U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Logging Camps, Sawmills, and Planing Mills. MC92-1-24A. Washington, DC: U.S. Government Printing Office..
U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Other Millwork (Including Flooring). EC97M-3219C. Washington, DC: U.S. Government Printing Office.
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U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Sawmills. EC97M-3211A.
U.S. Census Bureau. 1995. *1992 Census of Manufactures, Industry Series*. Softwood Veneer and Plywood Manufacturing. EC97M-3212B. Washington, DC: U.S. Government Printing Office.

All values inflated to 1997 dollars using the producer price index available from the Bureau of Labor Statistics.

Table 5-2. Total Quantity and Value of Wood Products Produced in the United States

	1997		1992	
	Quantity (10 ⁶ sq. ft.)	Value (\$10 ⁶)	Quantity (10 ⁶ sq. ft.)	Value (\$10 ⁶)
Laminated veneer lumber	20.30	314,631	NA	NA
Wood I-joists, I-beams	520.90	515,751	NA	NA
Glued laminated timber beams	326.40	333,364	NA	NA
Softwood veneer, including veneer backed with paper, cloth, or other flexible material	1,609.10	764,064	2,731.50	609,467
Interior softwood plywood rough including touch sanded, C-D exterior glue	6,802.40	1,411,433	8,977.50	1,673,290
Interior softwood plywood rough including touch sanded underlayment exterior glue	2,944.20	669,793	2,620.60	539,930
Other interior softwood plywood, rough including touch sanded	1,019.40	223,408	1,205.20	225,079
Exterior plywood rough, including touch sanded, C-C	907.20	217,402	310.30	68,600
Exterior softwood plywood, rough, including touch sanded, C-C plugged	186.20	55,018	436.30	96,266
Exterior softwood plywood, sanded, A-C	909.30	288,355	NA	NA
Exterior softwood sanded B-B plyform	274.00	77,299	NA	NA
Exteriro softwood plywood, sandedB-C	1,157.00	293,568	NA	NA
Softwood plywood overlays	215.50	101,754	NA	NA
Softwood plywood siding	887.70	286,470	NA	NA
Other softwood specialties	129.10	47,336	NA	NA
Softwood veneers including 2ply veneers			452.20	106,281
Birch veneer, including veneer backed with paper, cloth, or toher flexible material			416.10	29,980
Maple veneer, including veneer backed with paper, cloth, or toher flexible material			439.40	39,493
Other domestic hardwood veneers including veneers backed with paper, cloth, or other flexible material, nsk			1,224.90	153,321

(continued)

Table 5-2. Total Quantity and Value of Wood Products Produced in the United States (continued)

	1997		1992	
	Quantity (10 ⁶ sq. ft.)	Value (\$10 ⁶)	Quantity (10 ⁶ sq. ft.)	Value (\$10 ⁶)
Hardwood plywood veneer cor, except prefinished hardwood plywood			822.70	454,300
Hardwood plywood, particleboard coreexcept prefinished hardwood plywood			101.70	87,198
Hardwood plywood, medium density fiberboard (MDF) core, except prefinished hardwood plywood made from purchased hardwood plywood			87.50	71,023
Hardwood plywood, other coreincluding lumber, hardboard, oriented strandboard, and waferboard except prefinished hardwood plywood made from purchased hardwood plywood, nsk			13.90	30,009
Prefinished hardwood plywood made from purchased hardwood plywood			738.10	178,358
Hardwood veneered panels, including two-plyveneer			510.90	296,980
Particleboard, industrial, including commercial and shelving, made from particleboard produced at this location (3/4 ")	3,723.00	1,040,834	NA	NA
Particleboard, flooring, included underlayment and manufactured (mobile) home decking, made from particleboard produced at this location	399.80	108,043	NA	NA
Other particle board, including stepping, siding, sheathing, and door core, made from particleboard prouded at this location	140.80	53,893	NA	NA
Waferboard and oriented strandboard sheathing (3/8")	6,882.10	796,045	NA	NA
Waferboard and oriented strandboard underlayment (3/8")	1,155.40	146,499	NA	NA
Other waferboard and oriented strandboard	2,011.40	266,250	NA	NA
Industrial medium density fiberboard (MDF) made from MDF produced at this location	884.90	301,860	NA	NA

(continued)

Table 5-2. Total Quantity and Value of Wood Products Produced in the United States (continued)

	1997		1992	
	Quantity (10 ⁶ sq. ft.)	Value (\$10 ⁶)	Quantity (10 ⁶ sq. ft.)	Value (\$10 ⁶)
Other medium density fiberboard(MDF) made from MDF produced at this location	349.00	129,935	NA	NA
Coated or laminated hardboard siding made from hardboard produced at this location	2,561.10	352,483	NA	NA
Cellulosic fiberboard (insulating board) (1/2")	1,020.20	130,043	1,097.40	104,301
Coated or laminated hardboard interior paneling made from purchased hardboard			100.40	46,422
Prefinished particleboard made form purchased particle board (3/4")			737.90	321,652
Double hung wood window units, cladde	4,089.70	688,857	5,075.40	679,716
Other double hung wood window units	1,336.40	168,471	2,485.60	217,350
Other casement wood windows	824.60	142,351	NA	NA
Horizontal siding wood windows, cladde	146.90	34,534	NA	NA
All other wood window units, including awning and single hung	1,833.20	302,269	NA	NA
Glazed wood sash, excluding sash shipped in window units	924.10	68,592	1,008.30	57,206
Panel Douglas fir doors, interior and exterior, including doors with glazed sections	1,211.30	143,988	NA	NA
Wood siding (weatherboards or clapboards) including drilled or treated with permanent wood preservatives (mill board ft)			60.20	46,380
Oak flooring (3/4 ", 1/2", and 3/8" nominally thick tounge and groove (T&G) and end matched (EM) strip; and 5/16" nominally thick square edge strip (million board ft)	409.70	657,958	273.10	380,887
Oak parquetry (mill board ft)	22.30	31,384	27.60	42,373
Other oak flooring (mill board ft)	49.10	121,315	41.60	80,387
Maple flooring (mill board ft)	26.70	58,095	15.40	26,192

NA = Not available

Source: U.S. Census Bureau. 1999. *1997 Economic Census, Manufacturing Industry Series*. Various Reports. EC97M-3211A, -3212A through -3212E, -3219A, and -3219C. Washington, DC: U.S. Government Printing Office.

Table 5-3. Total Imports, 1991-1997 (\$10⁶ 1997)

SIC	NAICS	Description	1991	1992	1993	1994	1995	1996	1997
242	11331,321912,321918,32199 9,321918,337215, and 32192	Lumber, hard wood dimension stock and flooring, etc.	4,446	5,004	5,599	6,480	6,440	7,644	7,595
243	321911, 321918, 33711,321211, 321212,321214, and 321213	Millwork, plywood, and vener	1,241	1,492	1,671	1,829	1,867	2,163	2,528
245	32192, 321991, and 321992	Prefabricated wood products	13	13	11	23	25	44	44
249	321114, 321219, 339999, 32192, 321999, and 333414	Miscellaneous wood products	1,323	1,561	1,694	2,035	2,213	2,623	2,916

Source: U.S. Department of Commerce. U.S. Total Imports, 1991-1997 by two-digit and three-digit SIC product groups. U.S. Foreign Trade Highlights, <www.ita.doc.gov/tc/industry/otea/usfth/aggregate/H198t27.txt>.

U.S. Department of Commerce. U.S. Total Imports, 1991-1997 by two-digit and three-digit SIC product groups. U.S. Foreign Trade Highlights, <www.ita.doc.gov/tc/industry/otea/usfth/aggregate/H198t27.txt>.

All prices were inflated by the timber products producer price indexes: 1990 to 1998 available from the U.S. Bureau of Statistics.

Table 5-4. Total Exports, 1991-1997 (\$10⁶ 1997)

SIC	NAICS	Description	1991	1992	1993	1994	1995	1996	1997
242	11331,321912,321918,321999,321918,337215, and 32192	Lumber, hard wood dimension stock and flooring, etc.	3,565	3,262	2,719	2,605	2,800	2,709	2,598
243	321911, 321918, 33711,321211, 321212,321214, and 321213	Millwork, plywood, and veneer	1,100	1,220	1,182	1,160	1,215	1,274	1,431
245	32192, 321991, and 321992	Prefabricated wood products	281	97	63	90	94	117	119
249	321114, 321219, 339999, 32192, 321999, and 333414	Miscellaneous wood products	523	541	531	576	586	707	779

Source: U.S. Department of Commerce. U.S. Total Exports, 1991-97 by two-digit and three-digit SIC product groups. U.S. Foreign Trade Highlights, <www.ita.doc.gov/tel/industry/otea/usfth/aggregate/H198t28.txt>.

All prices inflated by the selected timber products producer price indexes: 1990 to 1998 available from the U.S. Bureau of Statistics.

Table 5-5. Value of U.S. Imports of Wood Products (\$1997)

	1993	1994	1995	1996	1997
Canada	6,220,872	7,471,052	7,095,740	8,632,951	9,468,470
Indonesia	464,396	476,093	473,759	452,142	481,954
China; Peoples Republic of	150,881	194,400	226,366	258,238	340,066
Mexico	317,687	300,141	303,747	392,964	439,767
Brazil	255,786	334,187	367,633	344,468	407,145
Chile	95,287	134,769	163,474	173,361	252,533
Malaysia	198,898	214,403	188,179	217,413	180,727
Taiwan	212,228	197,941	173,171	151,098	155,989
France	46,686	51,999	72,772	79,781	97,888
Thailand	76,985	98,165	115,280	122,043	126,139
New Zeland	54,111	76,951	75,833	66,623	83,426
Italy	48,080	59,094	66,926	69,413	90,708
Sweden	11,240	21,872	44,806	72,458	101,497
Germany	29,798	38,576	43,333	53,424	64,838
Russian Federation	12,926	22,337	36,962	42,096	47,659
Austria	1,042	950	1,359	23,805	25,802
Philippines	37,746	37,451	44,271	43,025	44,096
Peru	6,733	8,714	8,304	12,940	24,256
Finland	18,757	21,835	20,746	25,540	27,809
Ecuador	20,710	18,316	21,840	30,194	33,078
All Others	206,674	292,885	322,927	332,360	372,876
Total	8,487,523	10,072,135	9,867,443	11,596,341	12,866,756

Source: U.S. Department of Agriculture. Wood Products: International Trade and Foreign Markets. <www.fas.usda.gov/ffpd/wood-circulars/dec98/dec98.html>.

In 1997, Canada made up nearly 74 percent of U.S. imports followed by Indonesia at 4 percent and Mexico at 3 percent. However, this data also includes lumber and wood chips as well as wood building products.

Table 5-6 lists export value on U.S. wood products exports between 1993 and 1997. In 1997, exports to Japan made up the majority of U.S. exports at 35 percent, followed closely by Canada at 22 percent, and Germany at 5 percent. Over time exports of wood products may decline as the price of wood increases and foreign manufactures substitute other products for wood (“Vinyl Slows Wood Millwork”, 2000).

Table 5-6. Value of U.S. Exports by Country (\$10³)

	1993	1994	1995	1996	1997
Japan	3,193,977	3,132,187	3,273,102	3,336,328	2,510,776
Canada	1,113,409	1,197,738	1,297,404	1,275,534	1,579,428
Mexico	474,287	412,812	248,688	249,774	292,288
Germany	319,970	332,370	344,759	299,433	367,241
United Kingdom	232,990	231,588	239,115	244,264	291,027
Italy	170,623	203,699	207,616	182,779	223,971
Spain	104,646	132,853	139,232	146,458	175,909
Belgium-Luxembourg	119,228	116,215	121,852	104,285	101,724
Hong Kong	36,419	54,195	62,021	79,836	101,825
Taiwan	178,690	159,386	149,510	125,924	129,294
Republic of Korea	378,078	311,530	323,686	274,335	286,355
Dominican Republic	55,762	56,535	63,241	50,231	73,257
Netherlands	86,012	86,456	94,500	70,232	86,003
France	55,134	53,520	49,293	48,223	52,511
The Bahamas	24,026	26,662	31,016	29,543	45,172
Jamaica	32,171	32,725	39,204	38,679	48,447
Australia	96,950	61,401	67,790	53,660	55,429
Peoples Republic of China	106,277	64,065	28,001	31,967	49,640
Saudi Arabia	26,649	13,150	25,375	24,191	24,204
Indonesia	17,013	22,346	28,752	35,737	37,607
Portugal	7,781	8,805	12,079	15,530	19,565
Leeward-Windward Islands	22,797	21,295	25,437	26,406	26,674
Denmark	22,042	20,862	19,133	20,063	33,325
Ireland	15,160	18,212	24,123	20,557	30,455
Philippines	23,048	12,889	12,501	39,523	33,119
All Others	374,121	386,971	402,567	455,119	517,222
Total Exports	7,286,660	71,170,467	7,329,997	7,278,610	7,192,468

Source: U.S. Department of Agriculture. Wood Products: International Trade and Foreign Markets.
<www.fas.usda.gov/ffpd/wood-circulars/dec98/dec98.html>.

5.2 Market Prices

Increased domestic construction rates have caused wood building product prices to rise over the past couple of years. Between June and July 1998, for example, the gross margins of wood building products manufacturers increased sharply because of rising prices. The largest gross margin increase was for softwood veneer and plywood at 5.41 percent, followed by a 2.29 percent increase in general sawmills and planing mills, 1.57 percent increase in reconstituted wood products, and 1.19 percent increase for other special product sawmills (“What’s Up,” 2000). The drop in the Asian housing market has decreased demand for lumber and wood building products in that region. However, the growing domestic housing market has been increasing demand enough to more than compensate for the decline in Asia markets.

5.3 Industry Trends

Products in the wood building products industry are geared to construction and renovation markets. Consumers are interested in cost efficiency and aesthetics. The strong domestic housing and residential repairs market significantly attributes to growth in this industry. Sawmill and planing mill products are projected to increase output around 2 to 4 percent with prices remaining stable (McGraw-Hill, 2000).

The drop in the Asian housing markets decreased millwork exports, and increased imports from Latin America place downward pressure on U.S. prices of wood building products (“Wood Molding & Millwork Producers Association,” 1998). New trends in the industry focus on coatings that better preserve and prevent moisture (“Millwork Industry Faces Opportunities, Challenges,” 1999). Since 1992, residential window sales have grown by approximately 5 percent. Commercial window sales have also increased by 11 percent annually. Window production is estimated at 50 million units annually (Halladay, 1998). In 1997, 48.9 million units were shipped to residential construction sites. Non-residential construction consumed around 400 million total square feet of windows. Current trends in the window industry include the use of vinyl framing in residential and commercial markets, reducing the amount of wood consumed. Window markets are projected to continue expanding at 3 percent annually as a result of new construction growth (“Window Industry,” 2000).

Softwood plywood and veneer maintained a small increase in output in 1998. Within the next five years, softwood plywood will fall into niche high-end construction markets. Growth in the construction and mobile home markets is expected to increase demand for hardwood veneer and plywood. Hardwood veneer and plywood are projected to increase

shipments 2 percent annually. However, they are expected to face stronger competition from lower-end products (McGraw-Hill, 2000).

In 1998, reconstituted wood products product shipments increased by 4.6 percent to 4.9 billion dollars. In 1998, the U.S. and Canada particle board and MDF manufacturers shipped 7.74 billion square feet (3/4-inch basis), a 5.1 percent increase over 1997. American and Canadian structural panels have also experienced production growth. In 1999, structural panel producers produced 40.2 billion square feet (3/8-inch basis), an increase of nearly 4 percent over 1998. Panel production is projected to drop slightly in 2001 and rebound in 2002 (“North American Industry, “ 2000). Reconstituted wood products are forecasted to increase shipments 4.8 percent this year.

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