

## APPENDIX IX

### Forest Products Shipping Weights and Volumes

#### Important Shipping Parameters

The cost of transportation is based on; weight, volume, and stowage factor.

#### Weight

Wood products originate from living fibers and as such are more difficult to measure than other raw materials.

The weight of wood depends on species and moisture content. It also depends to a lesser degree on rate of growth, growing site, proportion of sapwood to heartwood, thickness of the bark, and stowing methods.

Bottom log usually are heavier than second- or third- cut logs.

To reduce damage through handling and season checking during transportation veneer logs are often delivered with the bark on.

Fresh-cut roundwood can be grouped into four density categories:

1. Very heavy; 65 lbs/ft<sup>3</sup> & up = 1040 kg/m<sup>3</sup> & up
2. Heavy; 55-64 lbs/ft<sup>3</sup> = 880-1024 kg/m<sup>3</sup>
3. Moderate; 45-54 lbs/ft<sup>3</sup> = 720-864 kg/m<sup>3</sup>
4. Light; 35-44 lbs/ft<sup>3</sup> = 560-704 kg/m<sup>3</sup>

The weight of any given species depends very strongly on moisture content.

	Weight		Moisture Content
Fresh-cut roundwood	65 lbs/ft <sup>3</sup>	=	(100%) Approx. 40-60%
After 6 months approx	56 lbs/ft <sup>3</sup>	=	(86%) Approx. 30%
“Shipping dry” lumber	52 lbs/ft <sup>3</sup>	=	(80%) Approx. 20%
“Kiln-dry” lumber for the production of flooring	48 lbs/ft <sup>3</sup>	=	(74%) Approx. 10%
The production of furniture parts	47 lbs/ft <sup>3</sup>	=	(72%) Approx. 8%

\* With no allowances for shrinkage of the wood.

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This means, for example, that a very heavy species of wood in a “fresh-cut” state would weigh 65 lbs/ft<sup>3</sup> = 1040 kg/m<sup>3</sup>. The same log would weigh approx. 56 lbs/ft<sup>3</sup> = 897 kg/m<sup>3</sup> after 6 months if left in round state. For this species:

Shipping dry lumber would weigh approx.	52 lbs/ft <sup>3</sup> = 833 kg/m <sup>3</sup>
Kiln-dry lumber for flooring would weigh approx.	48 lbs/ft <sup>3</sup> = 769 kg/m <sup>3</sup>
Kiln-dry lumber for furniture parts would weigh approx.	47 lbs/ft <sup>3</sup> = 753 kg/m <sup>3</sup>

The specific gravity is 1.0 at 4N C, at normal pressure. One cubic foot of water weighs 62.4 lbs.

## Approximate shipping weight of logs and lumber of coniferous North American species

North American Species	lb/ft <sup>3</sup>	kg/m <sup>3</sup>	kg/m <sup>3</sup>	t/chord	t/Mbf	t/Mbf
Fir Douglas (Oregon Pine)	47	750	600	1.810	2.980	1.430
Fir Balsam	39	625	500	1.350	2.500	1.200
Fir White	38	610	490	1.465	2.410	1.160
Fir Silver	40	640	510	1.540	2.540	1.210
Fir Grand	42	670	540	1.620	2.670	1.280
Hemlock Eastern	45	720	580	1.735	2.860	1.370
Hemlock Western	48	770	620	1.850	3.050	1.460
Larch Eastern	47	750	600	1.810	2.980	1.430
Larch Western	50	800	640	1.930	3.180	1.520
Pine Jack	44	700	560	1.700	2.800	1.340
Pine Pitch	50	800	640	1.930	3.180	1.520
Pine Ponderosa	42	670	510	1.620	2.670	1.210
Pine Red	44	700	560	1.700	2.800	1.340
Pine White Eastern	40	640	510	1.620	2.670	1.210
Pine White Western	42	670	540	1.620	2.670	1.280
Pine Sugar	42	670	540	1.620	2.670	1.280
Pine Southern Yellow Longleaf	55	880	700	2.120	3.490	1.650
Shortleaf	50	800	640	1.930	3.180	1.520
Slash	58	930	750	2.240	3.680	1.770
Spruce Black	45	720	580	1.735	2.860	1.370
Spruce Engelmann	38	610	490	1.465	2.410	1.160
Spruce Red	42	670	540	1.620	2.670	1.280
Spruce Sitka	40	640	510	1.540	2.540	1.210
Spruce White	40	640	510	1.540	2.540	1.210
Cedar Red	37	590	413	2.350	0.990	
Cedar White	32	510	351		2.030	0.850
Redwood California	45	720	510		2.860	1.210

Note: m<sup>3</sup>a = 35.31 ft<sup>3</sup> of logs, Mbf a = 140 ft<sup>3</sup>/3.96 m<sup>3</sup> of logs  
m<sup>3</sup>b = 35.31 ft<sup>3</sup> of lumber, Mbf b = 83.33 ft<sup>3</sup>/2.36 m<sup>3</sup> of lumber

cord: 90 ft<sup>3</sup> = 2.55 m<sup>3</sup> solid wood

- (a) Roundwood
- (b) Lumber

## Weight Conversion Factors

Unit of weigh		Equivalents			
Pounds	X	0.45359	=	kg	
lbs	X	0.0004536	=	t (metric ton)	
	X	0.0004464	=	tn (long ton)	
	X	0.0005000	=	shtn (short ton)	
Kilograms	X	2.2046	=	lbs	
	X	0.001	=	t (metric ton)	
	X	0.000984	=	tn (long ton)	
	X	0.001102	=	shtn (short ton)	
Ton metric t	X	2204.622	=	lbs	
	X	1000	=	kg	
	X	0.9842	=	tn	
	X	1.1023	=	shtn	
Ton long tn	X	2242	=	lbs	
	X	1016.04	=	kg	
	X	1.01604	=	t	
	X	1.12	=	tn	
Ton short shtn	X	2000	=	lbs	
	X	907.184	=	kg	
	X	0.907184	=	t	
	X	0.892857	=	tn	

## Equivalents for Weights and Volumes for Conventional Shipping Units

Weight Metric Tons	Estimate Ft <sup>3</sup>	Volume Assumed		Specific Weight kg/m <sup>3</sup>
		M <sup>3</sup>	lb/ft <sup>3</sup>	
1 loading ton of round wood	40	1.132	55	883
1 loading ton of lumber	50	1.416	44	706
1 ton of plywood conif.	63	1.784	35	560
1 ton of plywood non-conif.	55	1.560	40	640
1 ton of plywood particleboard	55	1.560	40	640
1 ton of plywood hardboard	37	1.050	59	950
1 ton of plywood softboard	118	3.330	19	300

## International Container Standards

Freight containers are a popular method of shipping lumber and wood products. These containers can be packed and sealed at the manufacturer and not reopened until the product reaches the final customer. During shipment, the products such as veneer logs, lumber, dimension stock, flooring, mouldings, panel products, furniture, and veneer are protected from pilferage and the environment. These containers come in standardized sizes and can be transported by ship, truck, and rail.

The majority of containers used today come in one of five lengths: 20 ft, 40 ft, 45 ft, 48 ft, or recently 53 ft. Most containers are 8' wide and 8'-6" tall. Although some containers, called high cube, are 9'-6" tall. In the table below, the average internal dimensions and capacity for each type of container is shown. These dimensions may vary from one model to another, and carriers should be consulted well in advance of shipping for specifications, availability, and rates. Many carriers provide valuable assistance and information on loading and operating their equipment.

At present, the 48-ft and 53-ft containers, which have an outside width of 8'-6", are only used in domestic rail and truck transportation. This may change as new ocean vessels which are capable of handling the wider containers are developed.

Maximum cargo weights are limited by carriers to comply with restrictions on particular transport and handling equipment or limits enforced by Government agencies to protect roads and bridges. Due to low product density or load limits, many loads do not utilize the maximum rated weight capacity of the container. If the container is shipped to the port by rail, or loaded at the port, more cargo may be loaded. Some states provide overweight permits for highway travel.

Container type	Interior Dimensions			Capacity	
	Length	Height	Width	Volume	Weight
20 foot	19'4"	7'9"	7'8"	1186 ft <sup>3</sup>	41000 lb
40 foot	39'6"	7'10"	7'8"	2387 ft <sup>3</sup>	58867 lb
40 foot, high cube	39'6"	8'4"	7'8"	2548 ft <sup>3</sup>	60400 lb
45 foot, high cube	44'6"	8'10"	7'8"	3050 ft <sup>3</sup>	64250 lb
48 foot, high cube	47'6"	8'10"	8'2"	3450 ft <sup>3</sup>	56920 lb
53 foot, high cube	52'6"	8'10"	8'2"	3830 ft <sup>3</sup>	56920 lb
20 foot	589 cm	236 cm	234 cm	33.5 m <sup>3</sup>	18598 kg
40 foot	1204 cm	239 cm	234 cm	67.6 m <sup>3</sup>	26702 kg
40 foot, high cube	1204 cm	239 cm	234 cm	72.2 m <sup>3</sup>	27397 kg
45 foot, high cube	1356 cm	269 cm	234 cm	86.4 m <sup>3</sup>	29144 kg
48 foot, high cube	1448 cm	269 cm	249 cm	97.7 m <sup>3</sup>	26808 kg
53 foot, high cube	1600 cm	269 cm	249 cm	109 m <sup>3</sup>	25819 kg

Source: Example specifications from the Official Intermodal Equipment Register.