BOLT, LOG, AND TREE GRADES FOR BIRCH

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A BIRCH TREE is made up of a variety of round pieces of wood that can be used to manufacture many different products. To convert the tree into its best end use, it is first necessary to classify the usable round pieces into major product classes. These product classes will vary from low-quality wood suitable only for pulpwood or charcoal to high-quality wood for making fancy veneer (fig. 1). After the major product classification is made, a grading system is used to determine the relative value of the log, bolt, or tree for that product.

CLASSIFYING AND GRADING BIRCH LOGS

Birch logs can be segregated into four major product classes: veneer, factory lumber, construction lumber, and local-use lumber.

Veneer logs

Veneer logs are those best suited to conversion into veneer by rotary cutting, slicing, or sawing. Grade specifications are used to segregate the veneer-class logs into high, medium, or low value strata in proportion to their yields of the better quality products. Veneer products represent a great spread in both the value and the timber quality required to yield the various items. Birch veneers include: (1) face veneers for furniture, cabinets, and plywood panels; (2) backs and core stock for plywood panels; and (3) container veneer for containers and picnic utensils.

There are no standard hardwood veneer-log grades now. Work to develop such grades is scheduled for early attack in current project programs. However, we have developed some interim northern hardwood veneer-log specifications; they were evolved by extending some general specifications published earlier by the Northern Hardwood and Pine Manufacturing Association (fig. 2).

Factory-Lumber Logs

Factory-lumber logs are those best suited to sawing into standard factory lumber for remanufacture into other products. Grades for standard hardwood factory lumber logs include three grades, which are related to the yield of various grades of lumber that can be sawed from these logs.

The Forest Service hardwood sawlog grades for standard lumber were developed through research by the Forest Products Laboratory with assistance from the eastern forest experiment stations; they were published by the Forest Products Laboratory in March 1949. My project in Columbus, Ohio, took this work over in late 1959 and is continuing to check the specifications and to develop lumber grade yields for species on which data was either inadequate or lacking. Two publications are planned to make these lumber yield data available within the next year or two. The factory-lumber log grade specifications are shown in figure 3.

Hardwood Construction Logs

Hardwood construction logs are those best suited for sawing into railway cross and switch ties, structural timbers, and other articles of structural lumber such as: studs, railway car material, construction boards, wagon stock, mine lumber and timbers, bridge and crossing plank, and sound square edge lumber. The Forest Service has published standard specifications for this class of logs, but yield data to accompany them in terms of the several alternative products remain to be developed. Present specifications represent the minimum requirements for this class of products, so there is but one grade. The hardwood construction log class specifications are shown in figure 4.

Local-Use Logs

The local-use class of logs includes the droppings from the previous classes. The

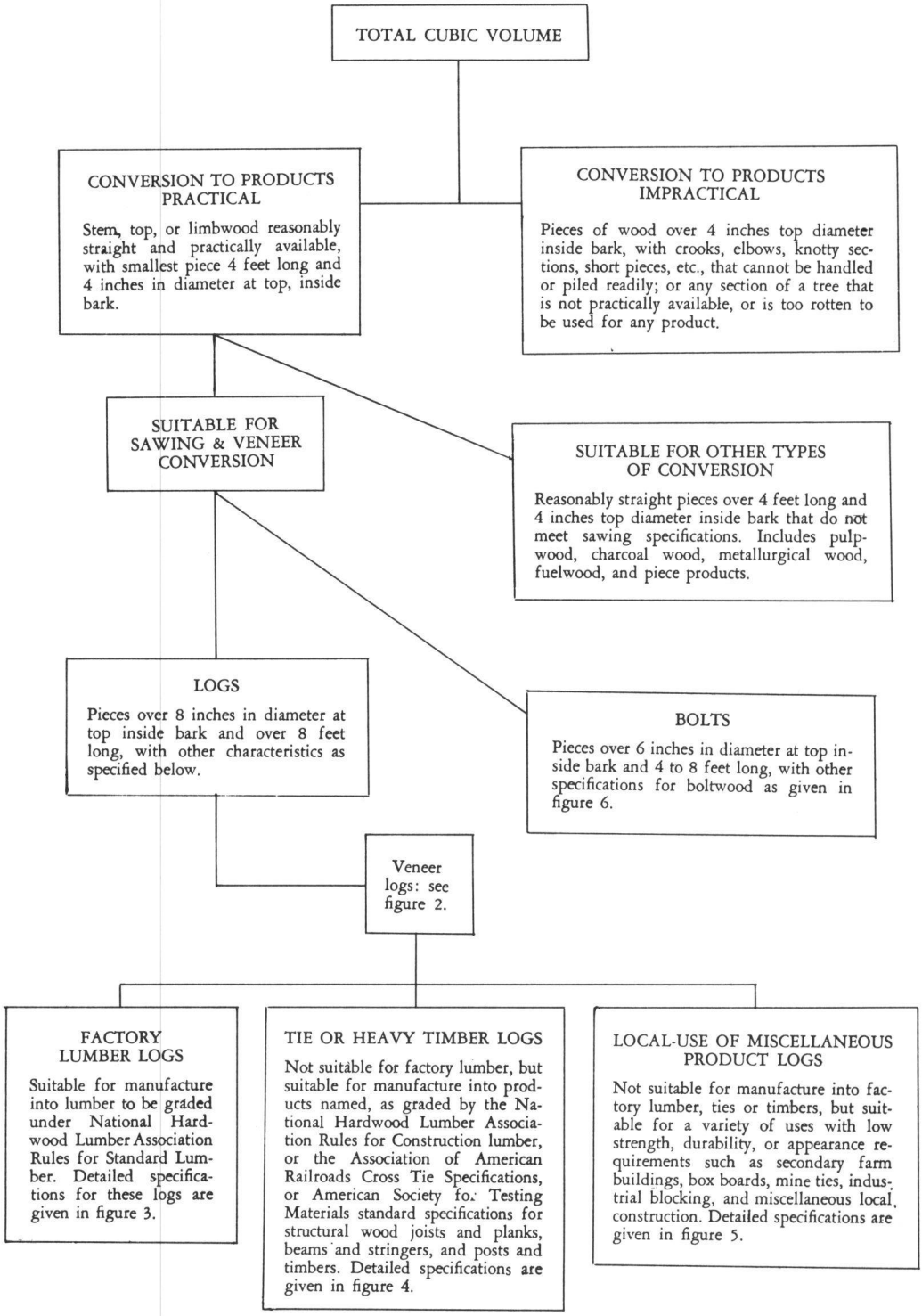


Figure 1.—The products obtainable from the total cubic volume in a birch tree.

NORTHERN HARDWOOD VENEER-LOG AND BOLT SPECIFICATIONS

GRADING FACTORS	*SPECIFICATIONS*
1. Length	8 feet over (plus 6 inches trim)[1]
2. Diameter, minimum	12 inches d.i.b. (small end)[2]
3. Sweep	1/4 inch per foot of log length
4. Crook and/or catface	1 admitted if it can be contained in a 2-foot long scaling reduction from either end, or from within the log provided that a cutting at least 52 inches long remains on each side of the scaled-out portion.
5. Spiral grain	Maximum 1/2 inch per foot of log length.
6. Crotch	Crotch admitted in logs of all diameters provided it can be cut off by deducting 1 foot of length in scaling.
7. Seam	No seams that enter the right cylinder admitted in logs 12-14 inches d.i.b. Logs 15 inches d.i.b. and larger admit 1 seam that enters the right cylinder provided it diverges no more than 1/2 inch per foot of log length from a straight line between the log ends. Such a seam constitutes 1 standard defect.
8. Standard defect other than seam[3]	One standard defect admitted in logs 8-10 feet long, 2 in logs 12 feet, and 3 in logs 14-16 feet.
9. End defects	
A. Black heart and/or mineral stain	Admitted in hard maple logs when not in excess of 1/2 the scaling diameter.
B. Hole, rot, ring shake, loose or spider heart, and heart checks	Admitted when confined to a central core around the geometric center of the log end and the last 2 feet of log length (subject to scaling reduction.)[4] After scaling reduction: logs 12-14 inches d.i.b. can contain central core if long axis is no longer than 3 inches; logs 15 inches d.i.b. can contain central core if long axis is no longer than 4 inches; and logs 16 inches d.i.b. and larger can contain central core if long axis is no longer than 6 inches.
C. Knots, partial ring shake, worm holes, bird pecks, stain spots, incipient rot areas, and bark pockets.	Admitted to all logs outside the central core (9B) when limited to a 1/4 segment of one end. When they occur on both log ends they must be limited to same 1/4 segment in logs 12-15 inches d.i.b.; they can be in different 1/4 segments in logs 16 inches d.i.b. and larger.

[1] 7-foot lengths are accepted by most mills; 6-foot lengths are accepted by most mills for black walnut.

[2] Select veneer-grade logs (those 14 inches d.i.b. and over) must be free of all defects except for the allowable unsound central core (9B) and sweep (3).

[3] Standard defects are knots, worm holes, dead or rotten areas, high bumps (with height over length ratio greater than 1 to 6), heavy bark distortions, and old bird pecks (4 or more per square foot). Treat any number of defects as 1 standard defect when they are located not more than 10 inches from an end or when they are so located within the log that they can be included in a 1-foot reduction in log length when scaling.

[4] Logs subject to 2-foot scaling reduction in length due to unsound central core (9B) permit unlimited surface defects over the 2 feet that are so treated (8).

Figure 2.—Northern hardwood veneer-log and bolt specifications.

HARDWOOD TIMBER-GRADING SPECIFICATIONS FOR HARDWOOD FACTORY-LUMBER LOGS

GRADING FACTORS		LOG GRADES							
		F1			F2				F3
Position in tree		Butts only	Butts & uppers		Butts & uppers				Butts & uppers
Diameter, scaling, inches		[1] 13-15	16-19	20+	[2] 11+	12+			8+
Length, without trim, feet		10+			10+	8-9	10-11	12+	8+
Clear cuttings[3] on each 3 best faces [4]	Length, minimum, feet	7	5	3	3	3	3	3	2
	Number, maximum	2	2	2	2	2	2	3	No limit
	Percent of log length required in clear cutting	5/6	5/6	5/6	2/3	3/4	2/3	2/3	1/2
Sweep allowance (maximum) in percent of gross volume	For logs with less than 1/4 of end in sound defects	15%			30%				50%
	For logs with more than 1/4 of end in sound defects	10%			20%				35%
Total scaling deduction [5]		40%			[6] 50%				50%
End defect:		Covered by special instructions							

[1] Ash and basswood butts can be 12 inches if otherwise meeting requirements for small No. 1's.
[2] 10-inch logs of all species can be No. 2 if otherwise meeting requirements for small No. 1's.
[3] A clear cutting is a portion of a face free of defects, extending the width of the face.
[4] A face is 1/4 of the surface of the log as divided lengthwise.
[5] Otherwise No. 1 logs with 41-60 percent deductions can be No. 2.
[6] Otherwise No. 2 logs with 51-60 percent deductions can be No. 3.

Figure 3.—Hardwood timber-grading specifications for hardwood factory-lumber logs (USFS Research Paper FPL-63).

products of this class of log are simply local-use lumber plus a limited yield of pallet boards. The specifications have not been approved by the Forest Service as standard but have been published by the Northeastern Forest Experiment Station on an interim basis (figure 5).

CLASSIFYING AND GRADING BIRCH BOLTS

Birch bolts can be segregated into three major product classes: veneer, saw, and chip and chemical classes.

Veneer bolts

Veneer-bolt grades are subject to the same considerations as veneer-log grades, and the same research program will be followed in developing grades for them.

Saw bolts

Saw bolts are those best suited to sawing into blanks for: (1) furniture dimension — flat and squares, (2) box and crate material, (3) turnery material, (4) handle stock, and (5) specialty products. A single set of bolt grade specifications may apply to several of these product groups, thus making it unnecessary to formulate specifications for each individual product group. For instance, the same bolt-grade specifications may prove satisfactory for turnery material, handle stock, and specialty products.

Two bolt-grading systems for saw bolts have been used. Both are of arbitrary origin. The first was developed by R. D. Carpenter and C. R. Lockard in 1948 at the Southern Forest Experiment Station; they were used at log-grade training schools in the South. They follow the same basic principle of determining size and number of clear face cuttings that is used in the Forest Service hardwood saw-log grades for standard lumber. There are no product yield tables for them. The grade specifications for this system are included in figure 6.

The second bolt-grading system was published in a report by the Southern Furniture Manufacturers' Association, High Point, N.C., in February 1957.[1] Yield data are included in the report for sweetgum, oak, and yellow-poplar. The grades are as follows:

[1] SHORT LOG BOLTER FOR FURNITURE STOCK, by George P. Redman, Department of Engineering Research, North Carolina State College, Raleigh, North Carolina.

HARDWOOD TIMBER-GRADING SPECIFICATIONS FOR CONSTRUCTION LOGS

Note: These specifications are minimum for the class. If, from a group of logs, factory logs are selected first, thus leaving only non-factory logs from which to select construction logs, then the quality range of the construction logs so selected is limited, and the class may be considered a grade. If selection for construction logs is given first priority, then it may be necessary to subdivide the class into grades.

Position in tree		Butt and Upper
Diameter, small end		8 inches +
Length, without trim		8 feet
Clear cuttings		No requirements
Sweep allowance, absolute		1/4 diameter small end for each 8 feet of length.
Sound surface defects	Single knots	Any number, if no one knot has an average collar diameter in excess of 1/3 of log diameter at point of occurrence.
	Whorled knots	Any number if sum of collar diameters does not exceed 1/3 of log diameter at point of occurrence.
	Holes	Any number provided none has a diameter over 1/3 of log diameter at point of occurrence, and none extends over 3 inches into included timber.[1]
Unsound surface defects		Same requirements as for sound defects if they extend into included timber.[1] No limit if they do not.
End defects	Sound	No requirements.
	Unsound	None allowed; must be sound internally, will admit 1 shake not more than 1/3 width of timber and 1 split not more than 5 inches long in contained timber.

[1] Included timber is always square, and dimension is judged from small end.

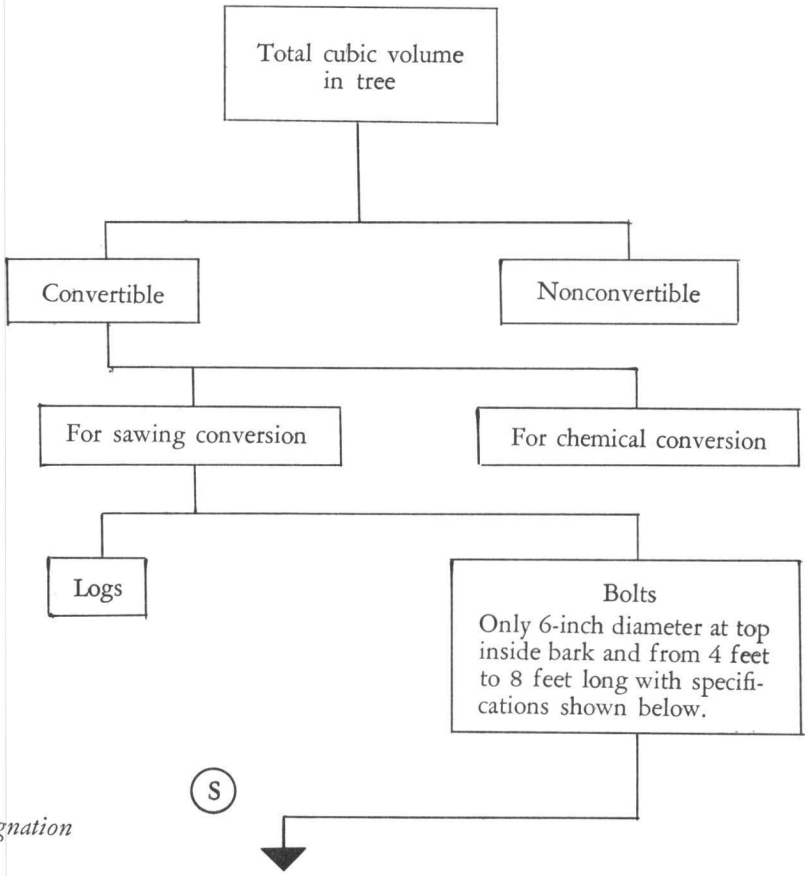
Figure 4.—Hardwood timber-grading specifications for construction logs.

HARDWOOD TIMBER-GRADING SPECIFICATIONS FOR LOCAL-USE LOGS

Position in tree		Butt and upper
Diameter, small end		8 inches +
Length, without trim		8 feet +
Sweep allowance, absolute		1/2 diameter of small end
Total scale deduction allowed		50% to 67%
Clear cuttings		No requirements
Surface defects	Sound	Only requirement is that diameter of knots, holes, rot, etc., shall not exceed 1/2 diameter of log at point of occurrence.
	Unsound	
Sound end defects		No requirements.

Figure 5.—Hardwood timber-grading specifications for local-use logs.

SPECIFICATIONS FOR SAW BOLTS



Specifications \ Grade		S1		S2
Position		Butts	Upper	Butt and upper
Diameter, minimum top		6″	10″	8″
Length		4 feet to 8 feet w/o trim		4 feet to 8 feet w/o trim
Sweep		Max. 1″ per 4′ length		Max. 15% (in inches) of diam.
Total cull allowed		15% including sweep, if interior confined to heart core or bad face		25%, including sweep
Best 3 faces	% in clear cutting	100% clear		⅔
	Max. no. cuttings			2
	Min. lgth. cuttings			2
Sound end defects		None except that confined to heart core		¼ area of end outside heart core

Figure 6.—Specifications for saw bolts.

Grade *Description*

0 — No defects visible on bolt.

1 — Visible defects confined to 1 quarter of the bolt.

2 — Visible defects confined to 2 quarters of the bolt.

3 — Visible defects confined to 3 quarters of the bolt.

4 — Visible defects in all 4 quarters of the bolt.

Anything was considered a defect which would not be permissible in a clear face cutting.

No mention was made of the admission of any sweep, crook, or interior cull; so it must be assumed that all bolts were straight and sound. Bolt lengths were 26, 35, 43, 51, and 72 inches.

Chip and Chemical Bolts

Chip and chemical bolts are those best suited for: (1) pulpwood, (2) charcoal, (3) chemical-distillation wood, (4) roofing felt, and (5) excelsior. Here too it may be possible to develop grade specifications that will apply for more than one product. A set of minimum specifications may be developed rather than a full grading system.

GRADING BIRCH TREES FOR FACTORY LUMBER

There are now no tree grades for birch. However, our plans call for the publication of yellow birch tree grades for factory lumber by 1970. Yellow birch was one of the first species for which we were able to get adequate tree data for this purpose. These data have been used to test different lengths of sections of the butt log as an indicator of tree grade for lumber. So far none of these tests has provided segregation between grade 2 and grade 3 trees. A final set of tests is being run for indicator sections. If these fail, we plan to test defect count on the butt log as an indicator of tree grade. The only way we now have to determine tree quality or grade is to grade each log in the tree, and the grade is expressed only in terms of lumber.

A complete tree-grade system is needed to express the highest potential tree value, when each piece of the stem (log or bolt) is channelled to conversion for the best end product. To accomplish this, we need to complete the development of quality specifications for the whole package of primary round pieces from veneer logs to pulpwood bolts and fence posts.

We also hope to investigate the possibility of developing a hardwood tree-grading system based on yields of random-sized clear cuttings. System analysis will be employed for this investigation. We hope that such a system will permit classification of trees into classes that will reflect their overall value for a wide variety of products.

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