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METHOD FOR PRODUCING STUDS FROM CORDWOOD AND VENEER CORES

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ABSTRACT OF THE DISCLOSURE

The method of this invention contemplates the production of straight, kiln-dried, stud grade SPIB (Southern Pine Inspection Bureau specification) 8 foot, 2 x 4 inch studs from selected pin cordwood of 4-foot and of 8-foot length and from selected pine veneer cores. The method which has as its primary aim the upgrading of raw material normally destined for wood chips in the pulp industry is characterized by firm control of the warping normally associated with lumber produced from young trees and consists of center ripping the green cordwood or the veneer core, blanking the half cores oversize on a surfacer-edger or like mill machine to remove excess wood in the form of pulp chips, kiln-drying the oversize stud blanks, face-jointing and thicknessing the dried blanks to remove distortion caused by the drying process, straight-line ripping to approximate width and finally planing and end trimming to size.

The method of this invention contemplates the use of conventional, commercially available woodworking machines such as can be found in any woodworking plant but the method per se involves a plurality of operational steps not heretofore combined in the sequence disclosed.

The studs produced by this method are lighter, straighter, and more easily nailed than the denser southern pine studs made by conventional means from the usual raw material. Their low specific gravity renders them somewhat weaker than the conventional southern pine stud but they still have more than enough strength for the loads normally imposed on studs. At 9 percent moisture, a typical stud made by the method supported 13 tons before failure when loaded in full-length compression (with lateral support).

Three separate embodiments, each employing a different starting material but each similar in most respects to the other embodiments, comprise the invention. One embodiment is a method for converting 8-foot lengths of southern pine cordwood into straight, 2-foot, kiln dry, 2 x 4 inch studs. This embodiment employs selected pine cordwood in the range of from 5¼ inches to 6¼ inches in diameter (diameter measured inside the bark). Southern pine in this diameter range averages about 4 growth rings per inch or less and the specific gravity of this wood is lower than normal. The lumber produced therefrom normally warps severely during drying, since "juvenile wood" is always present and there is likely to be considerable compression wood. Two of the embodiments of the method herein disclosed control warping by center ripping the cordwood bolt or the veneer core, then debarking the half bolts (in the case of cordwood) and subsequently blanking the half cores or the half bolts oversize on a surfacer-edger which machine removes excess wood in the form of pulp chips. It will be obvious,

of course, that the bark could be removed as the first step. The oversize stud blanks thus formed are then kiln-dried, after which all distortion is removed by face-jointing, thicknessing, and straight-line ripping to approximate size. The stud is finished by planing and end-trimming to size. A particular embodiment of the method herein disclosed comprises a procedure for converting 4-foot lengths of southern pine cordwood into finger-jointed, straight-kiln-dried, 8-foot 2 x 4 inch studs. This embodiment of the method employs as starting material 4-foot lengths of cordwood selected with diameters (diameter measured inside the bark) in the range of from 5¼ inches to 6¾ inches.

The procedure is essentially the one described above except that following the center ripping operation, the bark-free half-bolts are fed to a 3-head chipping head rig which produces a piece thicknessed to 2⅝ inches and width sized to 6 inches. The thicknessed and width sized pieces thus formed are then kiln-dried, face-jointed and thicknessed to 2⅛ inches, straight-line ripped to a width of 4⅛ inches, double-end trimmed to 50-inch lengths, and a finger-joint cut on one end of each individual piece with a tenoner machine. These pieces constitute component halves of oversize stud blanks. A water-resistant, cold-setting glue is applied to each mating half of the finger joint and the joint is secured by blows from an air cylinder ram applied to the ends of the center-jointed, 8-foot, stud blank thus formed. Alternatively, adhesives requiring heat or high-frequency energy can be used to make a water-resistant joint. The center-jointed blanks are then ready to be double-end trimmed to length, face and edge jointed and planed to size.

A variant of this embodiment contemplates the use of 4-foot cordwood bolts of 4-foot cordwood bolts of even smaller diameters, namely 4¼ to 5 inches (measured inside the bark). These smaller bolts, being of insufficient cross-section to permit center-ripping, are faced on two sides on a 2-head chipping headrig to 5⅝ inch thickness. Except for omission of the center-ripping operation, the sequence of method steps is the same as that employed in the case of the 4-foot bolts of larger diameter.

This particular variant of the method, i.e., end-jointing of 4-foot blanks, effectively breaks up the warp causing pattern of longitudinal shrinkage inherent in a continuous 8-foot length of lumber carrying juvenile or compression wood.

Typical studs produced from 4-foot lengths of cordwood by our method exhibit the following characteristics. Specific gravity of the finished studs (based on volume at 9.11% moisture content, and oven-dry weight) averaged 0.46. At 9.11% moisture, the average 8-foot stud manufactured by our method weighed 10.23 pounds (1920 pounds per 1000 board feet). The manufactured studs averaged 3.8 growth rings per inch with approximately 59% of the stud production having less than 4 growth rings per inch. The rather low specific gravity enables these studs to be more easily handled, and more easily nailed than is the case with the denser southern pine stud to which the trade is accustomed. All of the studs produced by the method were Southern Pine Inspection Bureau stud grade or better with the approximate following breakdown: Southern Pine Inspection Bureau No. 1—6.2% of the production . . . No. 2—18.8% of the production . . . stud grade—72.9% of the production . . . stud grade and better but 7–8 foot lengths by reason of cutback—2.1%. Immediately after final machining and at 11% moisture content, warp averaged as follows: Crook, 0.05 inch, twist, 0.08 inch, bow, 0.07 inch. When the studs were equilibrated in a dry atmosphere to 9% moisture content, warp increased to the following average values: Crook, 0.10 inch, bow, 0.16 inch, and twist, 0.14 inch.

When the moisture content was raised to 20.7%, the warp values were as follows: Crook, 0.19 inch, bow, 0.27 inch, and twist, 0.14 inch. No commercial dip or spray treatment was found that effectively controlled warp if the studs were previously suspended by one end for 60 days in a very damp atmosphere or if they were placed under a continuous water shower. Because of a relatively high juvenile wood content, low specific gravity, and the finger joint resulting from our method of manufacture, these studs were not as strong as southern pine studs in general. Strength tests on a limited sample revealed average strengths of stud grade and better in edgewise bending, full-length compression, and full-length tension of 4780, 4240, and 2290 p.s.i.; modulus of elasticity averaged 1,100,000 p.s.i.

Another embodiment of the invention involves the manufacture of 8-foot, 2 x 4 inch studs from southern pine veneer cores and the method for this starting material comprises the following sequential steps: (a) selection at the veneer mill of 8-foot cores of 5¼ inch minimum diameter, (b) longitudinally center ripping each core once with a bandsaw, (c) reducing each half-core to a stud blank of uniform but oversize width and thickness, with a chipping surfacer-edger, (d) kiln-drying the oversize stud blank, (e) face-jointing, thicknessing, and straight-line ripping the blanks to approximate size, and (f) double-edge trimming and planing to finish size.

Another embodiment of this invention contemplates the production of straight studs from 8-foot southern pine cordwood, in a limited range (a minimum of 5¼ inches diameter inside the bark at the mill for straight bolts and up to 6¾ inches diameter or larger inside the bark for crooked bolts). Southern pine in this diameter range generally averages less than 4 growth rings per inch. The specific gravity of this wood is lower than normal and the lumber produced therefrom typically warps severely during drying. Because of the low growth ring count, two-by-fours cut from such raw material by conventional methods can, at best, qualify for no more than stud grade. This grade, as defined by the Southern Pine Inspection Bureau has stringent warp limitations: the maximum allowable deviations over an 8-foot length are 3/16 inch for crook, 9/16 inch for bow, and ¼ inch for twist.

An experimental sampling of studs produced by the embodiment concerned with the production of studs from 8-foot lengths of pine veneer cores, yielded the following data. Approximately 12% of the studs produced were No. 1 grade according to the Southern Pine Inspection Bureau specifications; 15% were No. 2 grade; 73% were stud grade. Immediately after machining and at a 10% moisture content, crook averaged 0.05 inch and twist and bow averaged 0.06 and 0.17 inch, respectively. When moisture content of these studs was reduced to 8% after machining, crook, twist, and bow increased to 0.16, 0.12, and 0.32 inch, respectively. When moisture content was increased to 20%, crook, twist, and bow were measured at 0.17, 0.11, and 0.22 inch, respectively. Trimmed to an overall length of 96 inches, the experimental studs weighed 10.23 pounds at 9% moisture (1920 per 1000 board feet). The studs averaged 3.8 growth rings per inch, with about 41% having four or more growth rings per inch. The low specific gravity and low growth ring count as noted above make these studs somewhat weaker than southern pine studs in general. At 9% moisture content, average ultimate strengths were 5,790 lbs./sq. in. in edgewise bending, 4,290 lbs./sq. in. in full-length compression, and 3,500 lbs./sq. in. in full-length tension. Modulus of elasticity averaged 1,280,000 lbs./sq. in. In any event, these strengths are more than adequate for the loads normally imposed on studs.

A typical mill operation using selected cordwood bolts or veneer cores will operate according to the method of this invention as follows:

Selected cordwood bolts or veneer cores are arranged to move from the storage piles in endwise procession through a center ripping bandsaw. Visual inspection just prior to the center ripping operation permits an occasional oversize or undersize cordwood bolt or veneer core to be rejected from the production line and relegated to separate storage. These rejects can be resold to lumber, veneer, or to pulp mills. The next operation involves debarking and sizing of the green blanks. The half-bolts or half-cores emerging from the ripsaw are automatically turned face down and moved transversely to a planer-type automatic feeding table, the purpose of which table is to again get the half-bolts traveling in endwise procession. The half-bolts or half-cores proceed via a centering channel to a slab barker in the case of cordwood bolts and thence through a dip-chain straight-line ripsaw equipped with top in feed rolls capable of accommodating half-bolts or half-cores ranging in thickness from 2 to 5 inches. A single top chipping head mounted on the saw arbor is set to profile each bolt or core to a thickness of 2½ inches and a width of 5¼ inches. The profiled cutter head carries two knives and is set to produce ¾ inch chips for pulp. Alternatively, a surfacer-edges can be set up with three chipping heads, one at the top and two at the sides. All chips are valuable byproducts for wood pulp production. The green oversize stud blanks (about 2½ inches thick, 5¼ inches wide, and 100 inches long) are discharged to a sideways conveying table from which they proceed to a stacker for transport to the drying kilns. After the oversize stud blanks are kiln-dried, they are unstacked onto the feed table of a facing planer. About half the blanks go directly through one side of the planer for facing and thicknessing to 1¾ inches. Blanks which are badly bowed are fed through the other side of the planer for repeated face jointing via merry-go-round conveyor until they are judged, visually, to be within one pass of complete face joint, at which times they are then fed through the finishing side of the machine. The finish facing side of the machine discharges directly onto a self-centering table feeding a 2-saw, dip-chain, straight-line ripsaw set for 3¾ inch width. The saws are integral with cutter heads designed to hog the edgings as produced. The partly machined straight blanks emerging from the ripsaw operation are automatically double-end trimmed to 96 inch lengths. Cutter heads mounted directly on two trim saws hog the trim ends. Trimmed blanks drop automatically into a hopper, feeding a 4-head planer and matcher. A few finished studs produced from whichever embodiment employed will have defective ends. Some of these can be upgraded by trimming a few inches from one or from both ends. Inevitably, a few total rejects will be produced. These are discarded, cut up, sold for factory grade, or for rip grade from which two-by-three's can be recovered.

Having thus described the methods of the invention what I claim is:

1. A method for converting veneer cores into straight, kiln-dried, 8-foot, 2 x 4 inch studs, which method consists of the following sequential mill operations:
   (a) selecting veneer cores at least 8 feet long and at least 5¼ inches in diameter,
   (b) center-ripping each selected core once longitudinally to produce two half-cores,
   (c) reducing each half-core to the uniform but oversize thickness and width of about 2½ by 5¼ inches, to form oversize stud blanks,
   (d) kiln-drying the oversize stud blanks,
   (e) removing all warp from the dried stud blanks by face-jointing and thickness-planing the dried stud blanks to produce warp-free stud blanks about 1¾ inches thick,
   (f) straight-line ripping the edges of the warp-free stud blanks to produce stud blanks about 3¾ inches wide,
   (g) double end-trimming and planing the stud blanks to finish length and thickness.
2. A method for converting cordwood into straight,

kiln-dried, 8-foot, 2 x 4 inch studs, which method consists of the following sequential mill operations:

(a) selecting cordwood bolts at least 8 feet long and from 5¼ inches to 6¾ inches in diameter, exclusive of the bark,

(b) center-ripping each selected cordwood bolt once longitudinally to produce two half-bolts,

(c) debarking the half-bolts,

(d) reducing the debarked half-bolts to the uniform but oversize thickness and width of about 2½ inches by 5¼ inches to form oversize stud blanks,

(e) kiln-drying the oversize stud-blanks,

(f) removing all warp from the dried stud blanks by face-jointing and thickness-planing said dried stud blanks to produce warp-free stud blanks about 1¾ inches thick,

(g) straight-line ripping the face-jointed, kiln-dried, thicknessed stud blanks to 3¾ inch width,

(h) double end-trimming and planing the stud blanks to finish length and finish width and thickness.

3. A process for converting 4-foot cordwood into finger-jointed, straight, 8-foot, 2 x 4 inch studs, which method consists of the following sequential mill operations:

(a) selecting cordwood bolts of at least about 52 inches long and from 5¼ to 6¾ inches in diameter exclusive of the bark,

(b) debarking the selected cordwood bolts,

(c) center-ripping each selected and debarked cordwood bolt once longitudinally to produce two half-bolts,

(d) reducing the half-bolts to the uniform but oversize thickness and width of 2⅝ inches by 6 inches to form oversize half-length stud blanks,

(e) kiln-drying the oversize half-length stud blanks,

(f) removing all warp from the dried stud blanks by face-jointing and thickness-planing said dried stud blanks to produce warp-free stud blanks about 1¾ inches thick,

(g) straight-line ripping the thicknessed half-length stud blanks to width 4⅛ inches,

(h) double end-trimming the half length stud blanks to 50 inch length,

(i) cutting a finger joint at one end of each half-length stud blank,

(j) applying a water-resistant, quick-setting glue to the cut finger joints,

(k) mating in pairs the glue-coated finger-jointed stud blanks to form full-length stud blanks,

(l) double end-trimming, edge and face jointing, and planing the full-length stud blanks to finish length and finish width and thickness.

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