

This shows that the majority of our superintendents, roadmasters and others, classify the oaks, beech, hickory, ash and hard maple as hard woods, and the balance as soft woods. It has been argued that some of those to whom the circular letter was sent were not familiar enough with the different kinds of wood to make a classification along the lines suggested. This may be true, and some replied that they did not know about certain kinds of wood, and in all such cases the replies were either omitted entirely or placed in the column, "don't know." Many of the answers received were from men of long experience in railroading, and who have had practical experience in the use of timber and ought to be in a position to know. From a more theoretical point of view, Table 2 will show the spike holding power of different kinds of wood. Some of these tests were made at the University of Illinois, and others in our own laboratory at Aurora:—

Table 2.—Holding Power of Spikes.

Kind of Wood.	Resistance				Where Test Was Made
	Maximum		in per cent.		
	Resistance		of that of White Oak		
	in Lbs. Pull				
	Untr'td	Tr'td	Untr'td	Tr'td	
White Oak	7,870		100	...	Univ. of Illinois
Water Oak		6,780	...	86	" "
Black Oak		7,230	...	92	" "
Red Oak	6,460	7,730	82	98	" "
Burr Oak		9,210	...	117	" "
Ash		7,730	...	98	" "
Chestnut	5,190	5,200	66	66	" "
Elm	7,290	7,500	93	96	" "
Beech	8,180	8,900	104	113	" "
Poplar	4,920	5,670	62	72	" "
Loblolly Pine	3,630	4,210	46	55	" "
Sweet Gum	5,040	5,300	64	67	" "
Hemlock	5,633	4,200	72	53	Aurora Labor'try
Soft Maple	6,513	5,887	83	75	" "
Hard Maple	10,177	8,960	129	114	" "
Hickory	10,153	10,433	129	133	" "
Cypress	3,163	2,840	40	36	" "
Birch	6,337	5,907	80	75	" "
Cottonwood	2,810	2,743	36	35	" "
Nor'n Hard Maple	10,393		132	..	" "
White Cedar	1,467		19	..	" "

These tests, very largely, bear out our classification. Two exceptions, however, have been made by our purchasing department, viz.: elm and chestnut are classified as hard woods. The classification in use now is as follows:—

Hardwood Ties.

For use without treatment: White oak, burr oak, chestnut, locust, black walnut, mulberry, sassafras.

To be treated: Red oak, black oak, pin oak, water oak, turkey oak, Spanish oak, blackjack, beech, hickory, ash, elm, hard maple, cherry.

Soft Wood Ties.

For use without treatment: Cedar and cypress.

To be treated: Shortleaf pine, loblolly pine, bull pine, lodgepole pine, douglas fir, tamarack, hemlock, gum, tupelo birch, sycamore, soft maple, hackberry, butternut.

MONTREAL DOMINION EXPRESS BUILDING.

The new office building of the Dominion Express Company at the corner of St. James and St. Francois Xavier Streets, is well on its way toward completion. The stone work, of light colored granite, of the first and second storeys is now in place and most of the floors, all of concrete, have also been laid.

NOTES ON PILE DRIVING COSTS.*

Victor Windett.

A sand trench 4,017 ft. long and 10 ft. deep was sheeted with 2 x 10 in. x 14 ft. hemlock and yellow pine sheeting, to carry a steam shovel over the trench. Triple lap sheeting was made by nailing 1 x 6 in. x 12 ft. hemlock sides to give a 2 in. groove. The cost of making the sheeting ready for driving was 8.8 hours of labor at \$2.63 per 1,000 ft. B.M. with labor at \$0.31 per hour. The work was nailing on the side pieces, pointing the driving end, and cutting the hammer end to 8 in. in width to permit the use of a steel driving cap. The total labor cost, including the making of the sheeting in place, with labor at \$0.30 per hour, was:—

	Per M.	Per lin.	Per sq. ft. of
	ft. B.M.	ft. of trench.	penetration
Hours of labor	21.9	1.4	0.12
Cost of labor	\$6.56	\$0.422	\$0.035

A pile driver having two sets of leads complete was built for the work at a cost of about \$600 for labor and material, excluding the double-drum hoisting engine. The leads and sheaves for the hammer line were fastened on the deck timbers so that when the width of the trench was reduced at a change in the size of the sewer, the leads were moved in towards the center line of the machine. This change took 1½ hours to make.

The sheet piling was pulled by a machine consisting merely of a platform to carry a hoisting engine and an A-frame carrying two sheaves. Over these sheaves two lines ran from the engine, on the free end of which was a few feet of ½-in. chain and a hook with which to pull the sheeting.

This machine would be manned by a pick-up crew of enginemen, firemen, and four laborers, who would pull, in 1½ hours to 2 hours' work, all of the sheeting corresponding to a day's progress of the work, which would be from 130 to 160 ft. The average rate of wages per hour was \$0.30. The average of work was:—

	Per M.	Per lin. ft.
	ft. B.M.	of trench.
Hours of labor	3.72	0.24
Cost of labor	\$1.11	\$0.07

One disadvantage of such sheeting was that the 1-in. side pieces had a short life, requiring renewing after about four times of use. The loss of the center pieces from hard driving and even though used nine times was very little. The pulling chain was rather severe upon the sheeting, as it was liable to cut into the wood. At the close of the work the sides were stripped off and half of the 2 x 10-in. pieces were sawed up for catch-basin bottom, which otherwise would have required the purchase of new lumber. The total waste of sheeting was about one-fourth and the remainder was shipped to another job.

Hand driven sheeting of 2-ins. x 10-12 ft. long is best driven in sand by a combination of hand mauling and the use of the water jet. Employing labor at \$0.314 per man per hour, the expense of this work for 1,102 ft. of trench was:—

* Abstracted from a paper presented before the Western Society of Engineers.