Timber Report Workshop 2
Building Materials Science SRT153

Aim

Our aim was to test the compressive strength of different species of timber and also to observe the defects in our individual sample.

Method

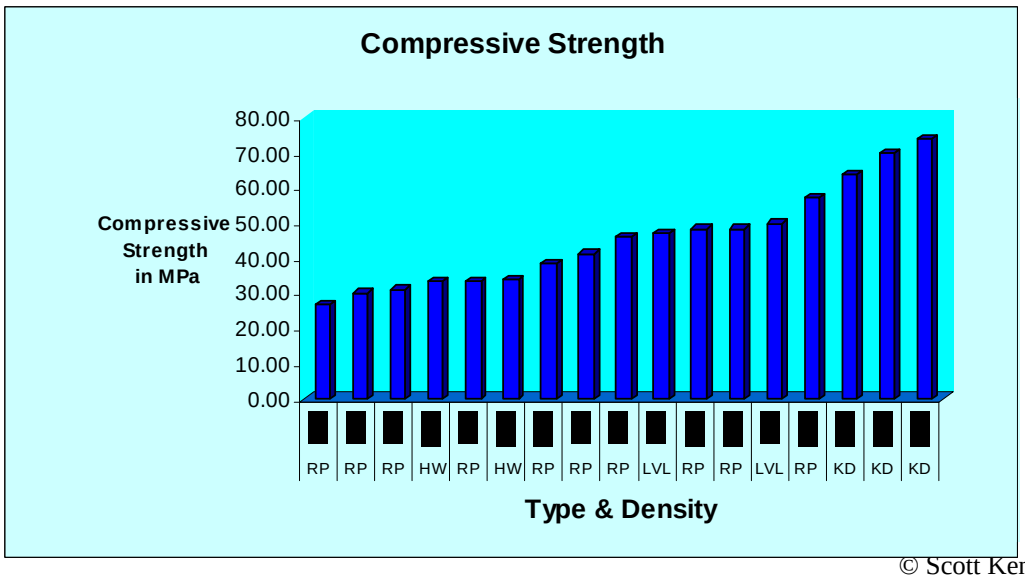
Each sample was put into a compression tester to increase the compressive force on until the sample failed to hold the weight and cracked. We predicted that the sample would split along one of the visible defects like the largest knot on the top surface.

Result

Using the equation for calculating compressive strength: Strength (Mpa) = Force (N) / Area (m^2), and assuming that all the samples were the same area, 4050 mm^2, to use the equation properly first we converted Ns to kNs, e.g. 108 to 108 x 10^3, then we calculated, 108 x 10^3 / 0.00405 = Pa, the divide that number by 10^6 to get MPa. Using this equation I found these results are shown in table 1 below:

Table 1: Compression test results for wood sample.

Sample	Type	Hard/Soft	Seasoned	Grade	Load at Failure	(kN)	Compressive Strength	(MPa)
G	Radiator Pine	Soft	Yes	MGP10	108	kN	26.67	MPa
F	Radiator Pine	Soft	Yes	MGP10	122	kN	30.12	MPa
J	Radiator Pine	Soft	Yes	MGP10	126	kN	31.11	MPa
A	Hardwood	Hard	No	F8	136	kN	33.58	MPa
I	Radiator Pine	Soft	Yes	MGP10	136	kN	33.58	MPa
B	Hardwood	Hard	No	F8	138	kN	34.07	MPa
L	Radiator Pine	Hard	No	MGP12	155	kN	38.27	MPa
H	Radiator Pine	Soft	Yes	MGP10	167	kN	41.23	MPa
E	Radiator Pine	Soft	Yes	MGP10	187	kN	46.17	MPa
V	LVL	Soft	No	S20	191	kN	47.16	MPa
K	Radiator Pine	Hard	No	MGP12	196	kN	48.40	MPa
M	Radiator Pine	Hard	No	MGP12	196	kN	48.40	MPa
W	LVL	Soft	No	S20	202	kN	49.88	MPa
N	Radiator Pine	Hard	No	MGP12	232	kN	57.28	MPa
R	Kiln dried	Hard	Yes	F17	258	kN	63.70	MPa
P	Kiln dried	Hard	Yes	F17	283	kN	69.88	MPa
Q	Kiln dried	Hard	Yes	F17	300	kN	74.07	MPa



Discussion

From the results we can see that the hardest woods are the strongest and that the kiln dried samples have the highest load at failure and there fore the highest compressive strength. The seasoned soft wood Radiator pine was mostly at the bottom end of the load at failure scale with the exception of a few anomalies. In the table there seems to be a few anomalies, such as the LVL samples being so far apart and one of the hardwood radiator pine samples having a very low compressive strength. This could be due to a number of reasons, like a change in density, change in moisture content, other unseen defects or Pre-existing defects.

The limitations of the workshop were that we could not report on the samples as accurately as we would have liked, because we were too focused on our own sample rather than the defects or testings of other samples.

Our individual sample was radiator pine soft wood and measured 90mm by 45mm, giving it an area 4050mm^2. The sample had a moisture content of 10%, was back sawn and was graded as MGP10. The sample had knot defects in the top, right side and the front portions, shown in the figures below:

Figure 1, Top

Figure 2, Right side

Figure 3, Left side

Figure 4, Bottom

The sample split at a loading of 126N and the split occurred at the knot on the top surface, creating longitudinal and radial failures along the top and left portions (Fig 5), this indicates a weakness in the area of the knot as shown. Our sample seemed to be in the lower area of the table compared to the other samples. Though our sample was part of the majority or seasoned wood, the failure seems to start at the knot on the top surface and the got to the knot on the back surface, shown in the diagram below.

(Diagram is on hard copy, as it is hand drawn)

Figure 5, Failure

Conclusion

The features of the wood to watch out for when selecting timber are the amount and kind of defects. If you are selecting wood for studs in plaster walls for example you will need to select Kiln dried hard wood. It is the best in compressive strength, for it did not fail at any thing less than 258N. Wood is an inexpensive material to produce and buy. Although it does not have the massive compressive strength of concrete, it is a lot lighter then other materials and therefore is a popular material for modern, and even early houses.