factors mentioned above. In all cases the strength values of Douglas fir have been expressed as percentages of the corresponding values given for longleaf pine. In cases where the strength of Douglas fir exceeds that of longleaf pine the figures are shown in bold-face type; in cases where the reverse is true the figures are shown in ordinary type. By noting the grouping of the bold-face and ordinary type the comparative strength of the two species can be readily seen.

Taking up in order the factors mentioned above as affecting the design of timber structures reference to Table I. leads to the following conclusions:—

1. Strength in Bending.—In modulus of rupture the majority of tests show Douglas fir to be weaker than longleaf pine by about 10 per cent. On the other hand, all tests with the exception of two show Douglas fir to be stronger than longleaf pine by varying amounts, say, 10 per cent. on the average, in fibre stress at elastic limit.

Table I.—Comparative Properties of Douglas Fir and Longleaf Pine. Values for Douglas Fir as Percentages of Corresponding Values for Longleaf Pine.

Class of Specimen.	Static Bending.			Compression Parallel to grain.		Compression Perpendicular to grain C.S. at E.L.	Longitudinal Shearing Strength.	Weight.
	F.S. at E.L.	M. of R.	M. of E.	C.S. at E.L.	C.S. at M.L.			
Small specimens	**105·7**	91·3	**103·7**	...	91·6	...	78·6	...
"	99·1	90·1	97·4	...	...	...	83·5	...
"	**110·0**	92·3	**103·9**	...	...	...	79·4	...
"	**105·5**	91·3	**103·7**	...	91·6	...	...	...
"	**102·4**	94·9	**104·5**	**100·2**	93·7	**109·0**	89·9	83·9
"	**102·7**	95·9	96·1	...	94·2	...	76·0	87·1
Structural timber	**106·3**	97·5	**103·7**	79·6	72·8	**100·3**	...	80·0
"	**123·8**	**110·7**	90·8	94·1	88·7	**111·6**	...	71·8
"	**105·2**	83·4	96·8	80·0	72·9	**100·0**	...	80·6
"	**126·0**	**109·8**	**111·0**	...	...	...	...	...
"	**117·9**	**112·6**	**112·3**	...	...	...	...	...
All sizes—Average	98·0	87·4	**111·4**	...	...	...	...	...

Tests of long duration on timber have shown that if a beam is loaded in excess of its elastic limit it will eventually fail. In accordance with this it appears that the elastic limit stress is the greatest stress which can be safely used in timber structures, and it would therefore be logical to base working stresses for design on the elastic limit stress and *not* on the ultimate breaking strength as determined in the testing machine. This practice is at present followed in determining suitable standard working stresses for other structural materials such as steel, and it is now being recognized that the elastic limit is the logical basis for design in the case of timber as well.

Douglas fir should, therefore, be capable of taking a greater working stress in bending than longleaf pine by the amount mentioned, for the same degree of safety. This, however, would not apply in the case of extremely short beams.

2. Strength in Longitudinal Shear.—All tests show Douglas fir to be weaker than longleaf pine by from 20 to 25 per cent. In the case of beams so short that strength in shear rather than bending strength becomes the deciding factor, longleaf pine should accordingly be allowed a working stress greater by the amount mentioned.

3. Stiffness.—Not infrequently, as in the case of ceiling joists under certain conditions, the maximum deflection of a beam becomes the deciding factor in its design rather than its strength. A stiff timber of high modulus of elasticity would in this case be desirable. Referring to the table it will be seen that in the majority of cases Douglas fir is credited with a higher modulus of elasticity than longleaf pine by from 4 to 10 per cent., although there are a few exceptions to this rule. It would look as though the safe working modulus of elasticity for Douglas fir might be taken to be about 5 per cent. greater than that for longleaf pine. In any case the same modulus could certainly be used.

4. Strength in Compression parallel to grain.—All tests, almost without exception in the case of stress at elastic limit and without any exception in the case of maximum crushing strength, show Douglas fir to be from 10 to 20 per cent. weaker than longleaf pine. A greater working stress for longleaf pine than for Douglas fir in the case of columns would, in accordance with this, be good practice.

5. Strength in Compression Perpendicular to Grain.—All tests without exception show Douglas fir to have somewhat greater strength in compression perpendicular to grain than longleaf pine, by amounts ranging up to 10 per cent., indicating that greater working stresses for Douglas fir in compression perpendicular to grain would be permissible.

6. Weight of Material.—All the tests show Douglas fir to be lighter than longleaf pine by about 20 per cent. on the average. The obvious advantages of a structural material of light weight over one of heavier weight, both having the same strength, are two-fold: (1) Less dead weight to be supported in the structure, leaving greater net strength effective for supporting live loading; (2) less weight to be handled.

In the present instance the former consideration is of little importance because of the magniture of the loads supported in proportion to the weight of the material used. The latter consideration, however, involves a very considerable difference in charges for transportation and labor of handling.

In the above comparison an effort has been made not to favor either one timber or the other, existing reliable comparative figures having been taken and analyzed without regard to their bearing on the result. It is probable that the comparison is fairly equitable, or even conservative as to the strength of Douglas fir.

A nitrogen plant is being erected at La Grande, Wash., near the Tacoma municipal power plant, from which source power was contracted for at a rate of 1.15 mills per kilowatt-hour. The power sold is surplus which the plant does not require at present, and the municipality retains the privilege of discontinuing service at any time. The American Nitrogen Products Co. is erecting the plant, which is reported to involve a $500,000 investment.

The Bureau of Navigation at Washington, D.C., reports that there were in progress or on order in United States shipyards at the beginning of the year 682 vessels of 2,098,761 tons. Of these 403, of 1,495,601 tons gross, were steel merchant vessels; 161, of 207,623 tons gross, wooden merchant vessels; and 118, of 395,537 tons displacement, war craft. The tonnage of 61 submarines which are in progress is not included.