

Chapter IV

TEST METHODS

4.1 Minor tests

Minor tests for mechanical properties of timber concerning the research are static bending, compression parallel to grain, shear parallel to grain and test of split ring connector joint.

4.2 Static bending test

The prepared clear specimen was approximately 4 x 4 x 76 cm. size. The actual cross sectional dimensions were measured to the nearest 0.02 cm. and weigh to the nearest 0.1 gm. Six specimens were tested.

The supports of the beam were placed at 70 cm. apart. The specimen was placed in position such that the tangential surface nearest to the pith was facing up. The deflectometer with least reading of 0.002 cm. was attached at mid span. The center load was applied continuously through out the test at a constant speed of movable crosshead of 0.25 cm. per minute. The set up is shown in Fig. 8.

Before the proportional limit was reached center deflections were recorded with the corresponding load increment of 100 kg. After the proportional limit was well passed deflections were recorded at the load increment of 200 kg. The maximum load, type of failure were recorded. Load deflection curves were plotted to determine the proportional limit load.

Failure of some specimens are shown in Fig. 9 to Fig. 11.

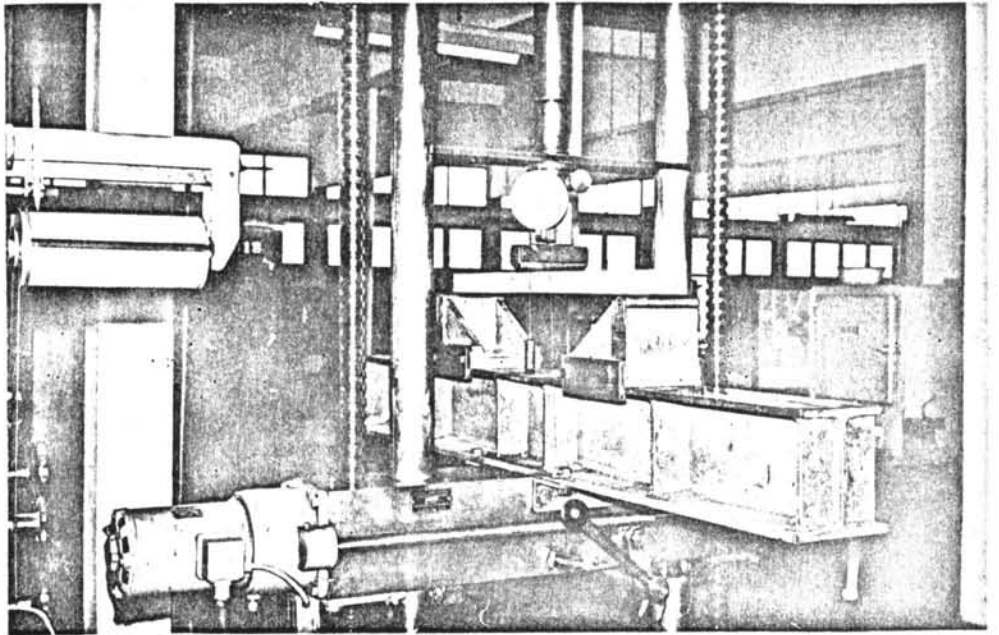


Fig. 8 Static bending test set up

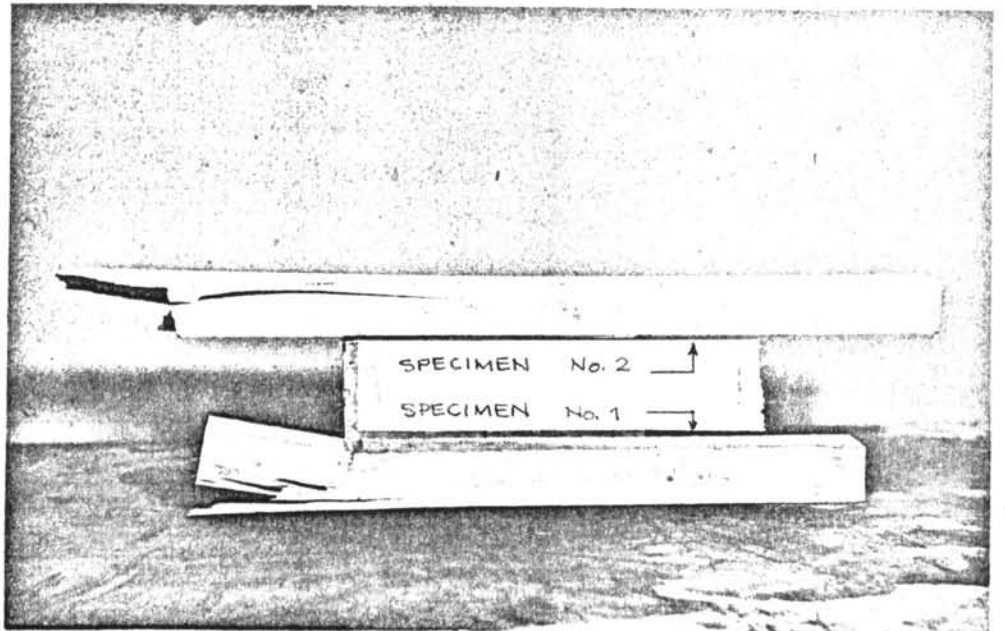


Fig. 9. Static bending test failure
Specimen No. 1 and No. 2

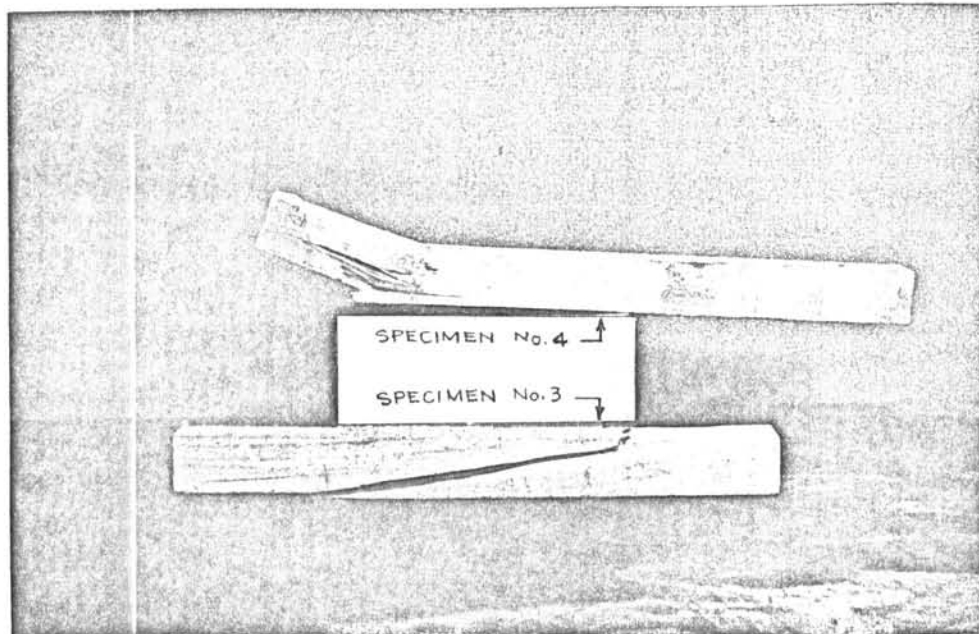


Fig. 10 Static bending test failure

Specimen No. 3 and No. 4 005363

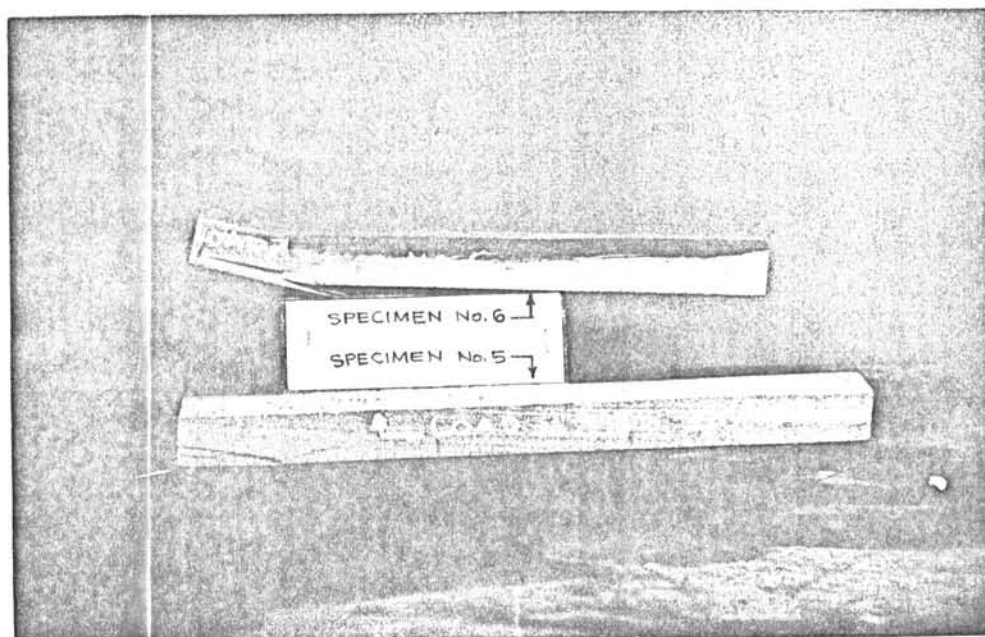


Fig. 11 Static bending test failure

Specimen No. 5 and No. 6

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4.3 Compression parallel to grain test

Clear specimens were prepared approximately to the size 4 x 4 x 20 cm. Five selected clear specimens were tested. The actual cross sectional dimensions of each specimen were measured to the nearest 0.02 cm. and weigh to the nearest 0.1 gm. The compressometer with least reading of 0.0002 cm; was used. The end grain surfaces were parallel to each other and at right angles to the longitudinal axis.

The load was applied continuously through out the test at a constant speed of movable crosshead of 0.06 cm. per minute. Deformations were recorded at the load increment of 500 kg. until the proportional limit was passed. Figure 12 shows the set-up of the test.

The compressometer was removed and the specimen was loaded to failure. The ultimate load and the sketch of failure of each specimen were recorded.

The load-deformation curve was plotted as shown in Figure 13. Load and deformation at proportional limit were determined.

Failure of specimens subjected to compression parallel to grain after tested are shown in Fig. 14 and 15.

4.4 Shear parallel to grain test.

The clear specimens of 5 x 5 x 6.30 cm. were notched as shown in figure 16. Five selected clear specimens were tested. The actual dimensions on shear plane were measured to the nearest 0.02 cm. and weighed to 0.1 gm.

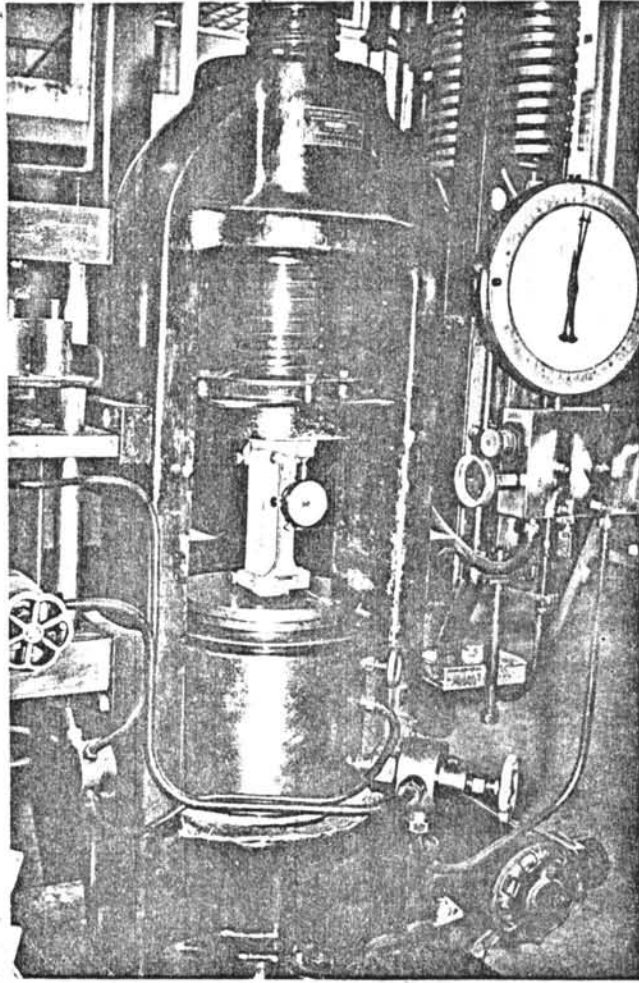


Fig. 12 Compression test set up

TYPICAL LOAD DEFORMATION CURVE
(COMPRESSION PARALLEL TO GRAIN)

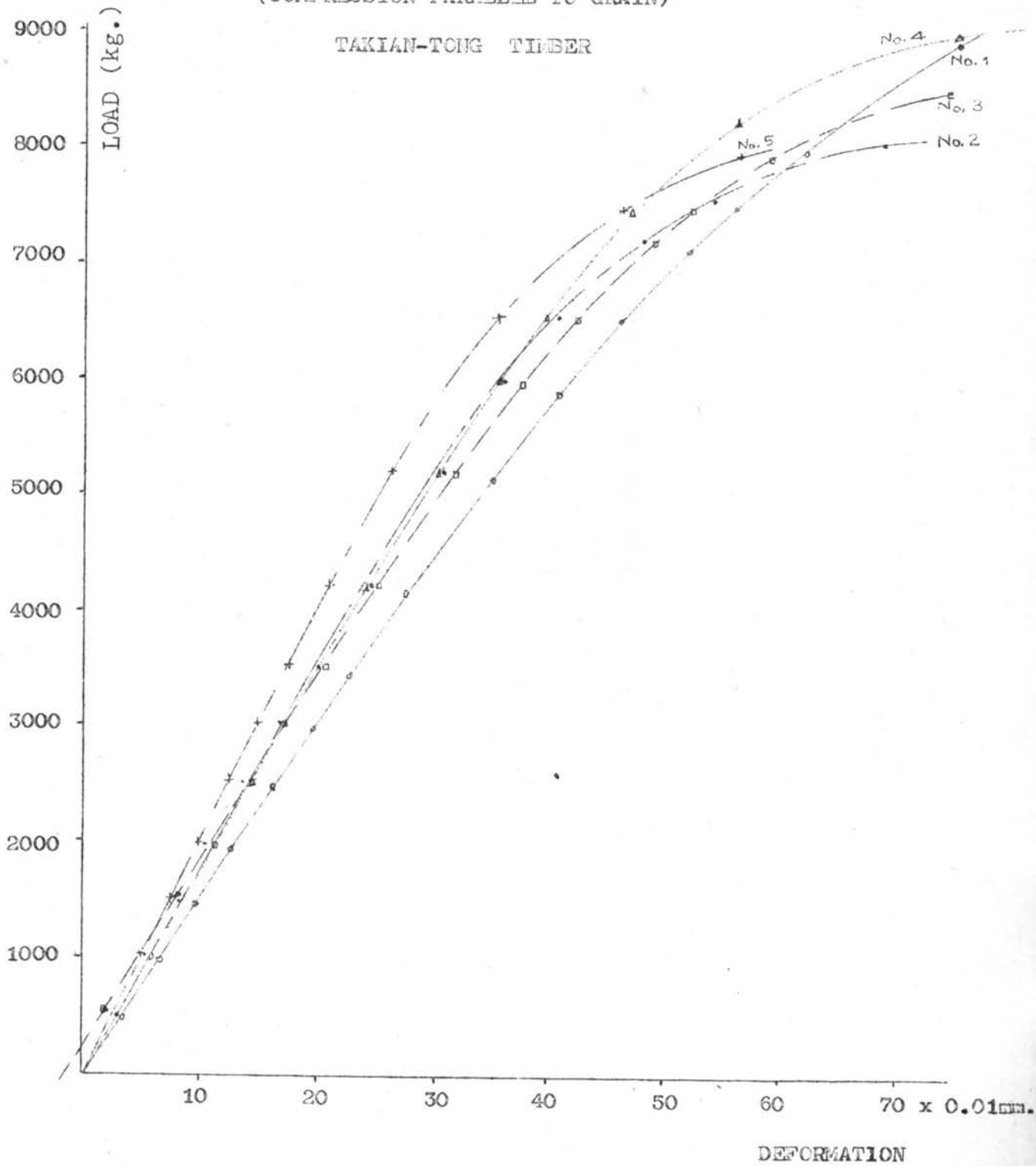


FIG. 13

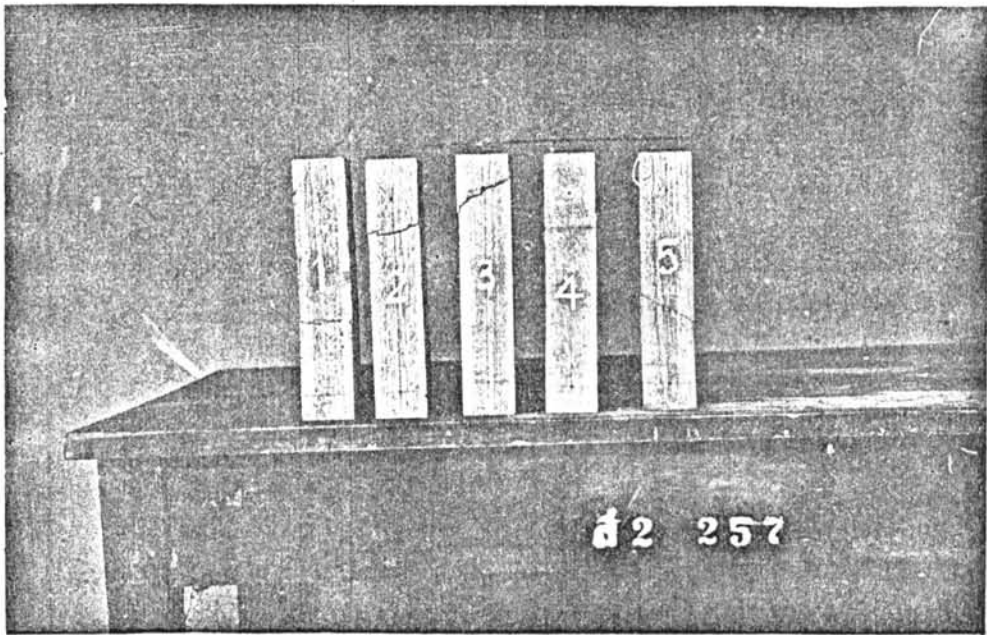


Fig. 14 Compression test failure (Front Side)

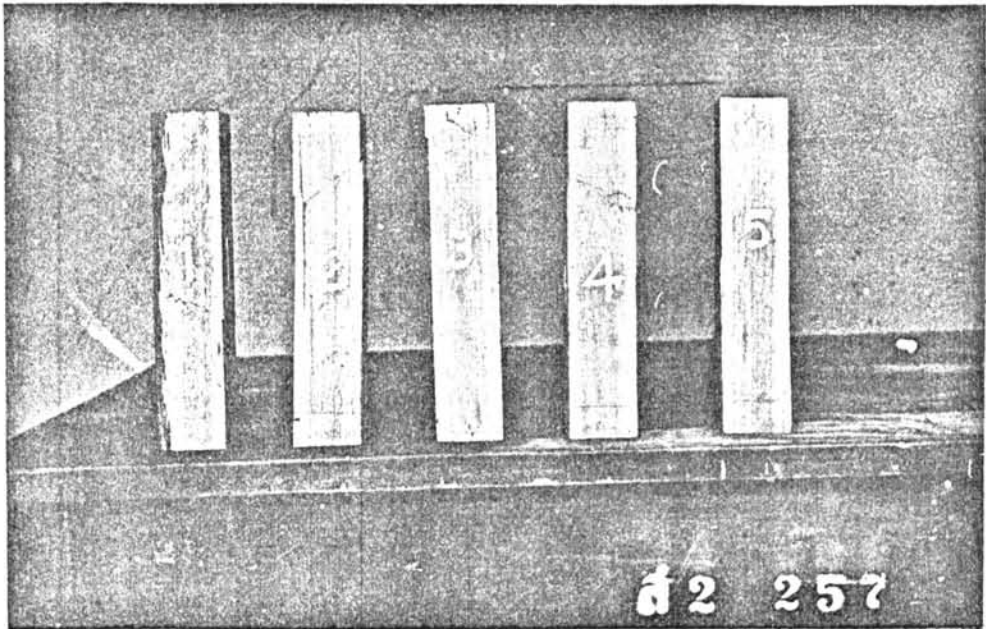


Fig. 15 Compression test failure (Back Side)

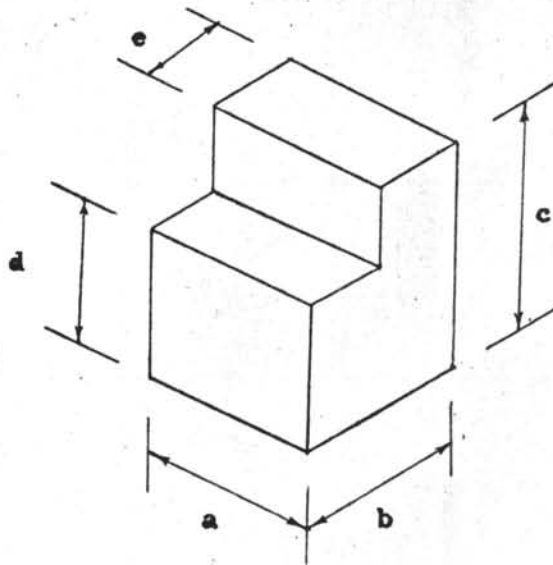


Fig. 16 Specimen for shear parallel to grain test



Fig. 17 Shear tool

The specimen was placed into the shear tool such that the specimen would not twist when load was applied, its axis was vertical and the base end was resting levelly on support. Load was applied such that the movable crosshead attained a speed of 0.06 cm. per minute. The load was applied continuously through out the test.

Maximum load and sketch of failure were recorded.

4.5 Joint testing procedure

Six selected prepared joints were tested for load parallel to grain with rings on two faces. The test was conducted in air dry condition as soon after assembly as possible.

Joint slip was measured from the beginning of load application. The successive slips were recorded with load increment of 500 kg. Load was continuously applied at a constant speed of the movable crosshead of 0.06 cm. per minute. The general behaviour of the joint under load and kind of failure were observed.

Load was continued until a total slip of 15 mm. or failure occurred. The ultimate load with its corresponding slip and type of failure were recorded.

4.6 Moisture content determination

The determination of the moisture content of the tested columns was also made. Tested column was cut immediately after test at the portion near to the point of failure. The small clear specimen for moisture content determination was weighed

to the nearest 0.01 gm. The determination of oven dried weight was made at the temperature of 105° and after the specimen obtained a constant weight.

$$\text{Moisture content (M.C.)} = \frac{\text{Weight after tested-Oven dried weight}}{\text{Oven dried weight}} \times 100$$

4.7 Testing machine and devices

The major tests were performed by the use of Amsler Universal Testing Machine capacity of 500 tons using 50 tons load range. Dial gauges with least reading of 0.01 mm. were used for lateral deflection of the column.

4.8 Major test

Solid and spaced columns were tested under the same condition and testing procedure. There were five samples of solid squared columns and five samples for each type of spaced columns. One sample were tested for column lengths of 1.50, 2.00, 2.50, 3.00 and 3.50 meters

For the purpose of axial column load without end restraint, the roller bearing plates were used at both ends of column. The end surfaces of the column were cut at right angle with the longitudinal axis to ensure full bearing and minimizing eccentricity. To reduce eccentricity due to loading the column was placed at the center of the crosshead.

Two dial gauges with least reading of 0.01 mm. were attached on both narrow sides of spaced column shafts and on opposite buckling sides of solid column to determine the

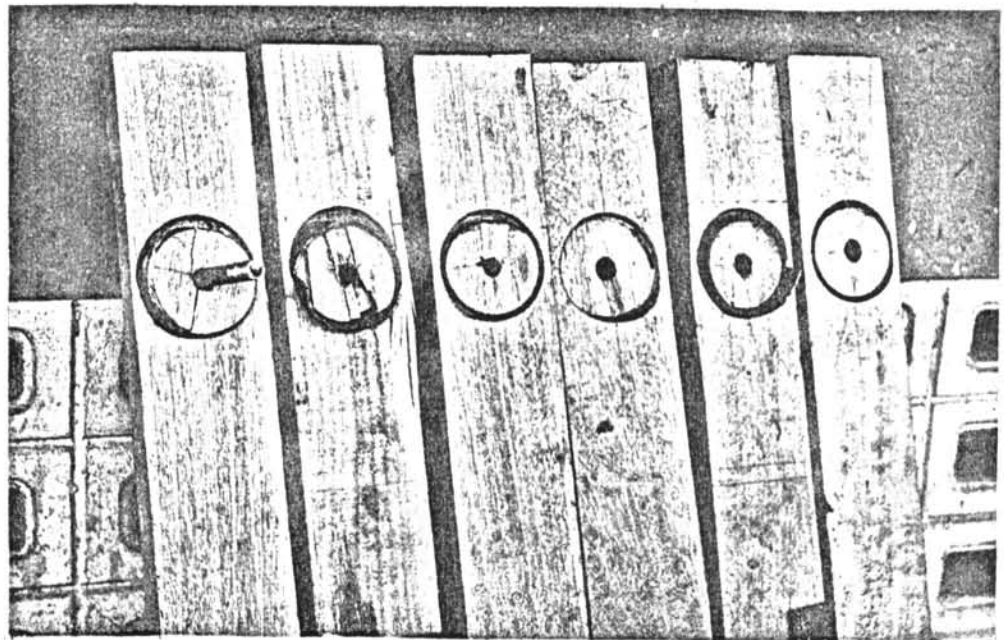


Fig. 18 Failure of split ring joint

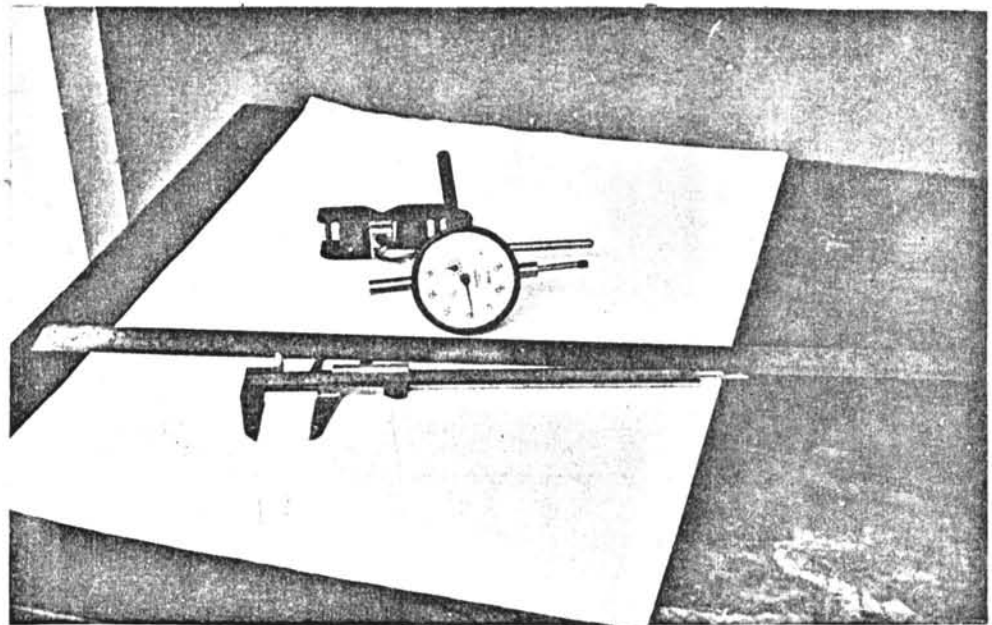


Fig. 19 Dial gauge, vernier and steel ruler

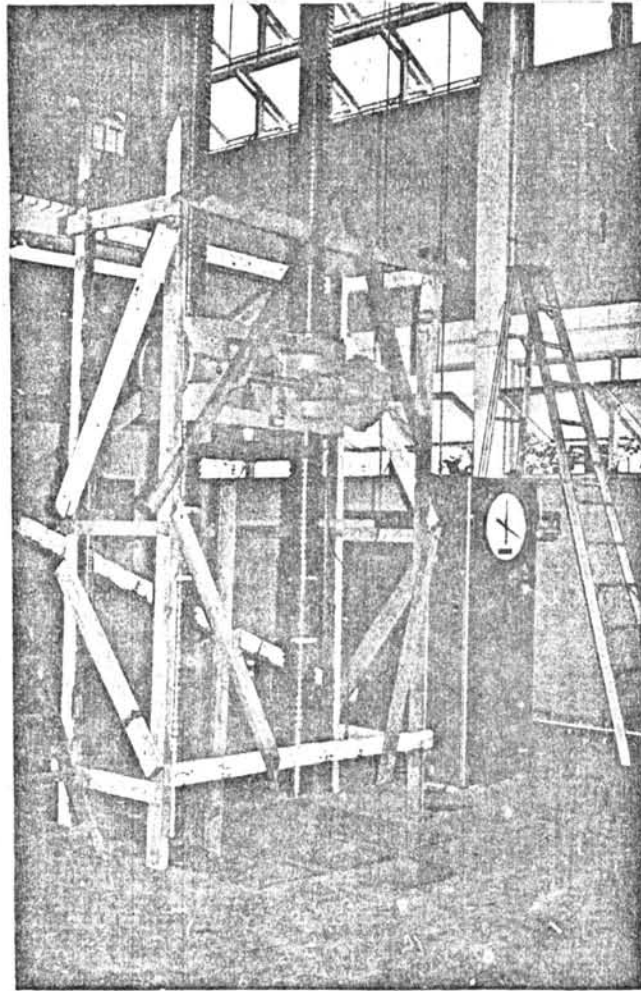


Fig. 20 Amsler testing
machine

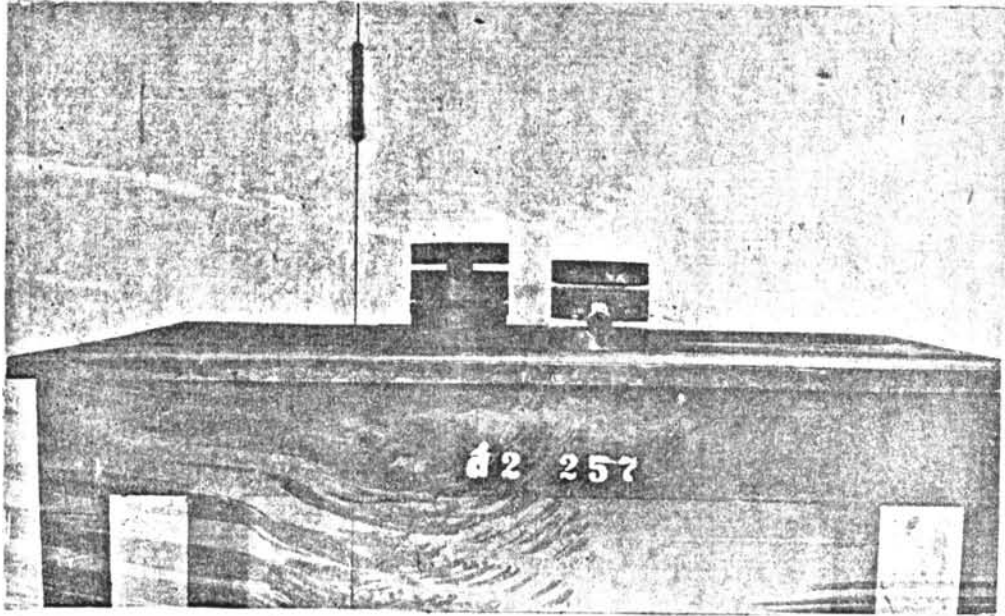


Fig. 21 Roller bearing plates

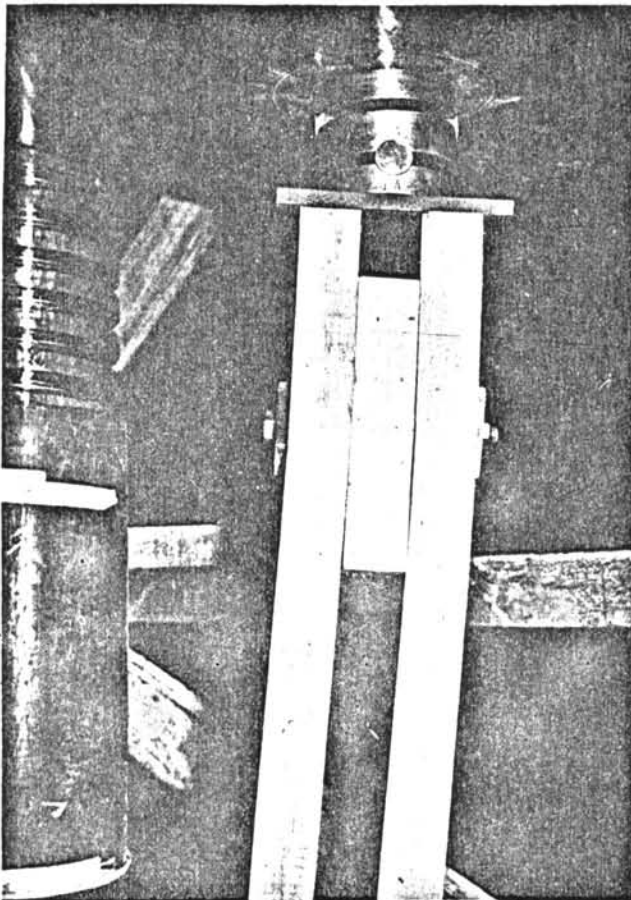


Fig. 22 Arrangement of
roller bearing
plates on column

lateral deflection at mid height of column for small lateral deflection. Larger lateral deflection was determined from the ruler. The load was applied continuously and at constant rate of movable crosshead of 0.06 cm. per minute.

The maximum load was recorded and the load was continued until possible sign of failure or excessive lateral deflection was occurred.