TEST REPORT
STRUCTURAL ENGINEERING DIVISION

PROJECT : **REPORT ON TESTING OF TIMBER BEAMS**

CLIENT : **M/s. EXIMCORP INDIA PRIVATE LIMITED**

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DATE: 14-02-2019

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LABORATORY TEST REPORT

STRUCTURAL ENGINEERING LABORATORY

DEPARTMENT OF CIVIL ENGINEERING

INDIAN INSTITUTE OF TECHNOLOGY MADRAS, CHENNAI- 600 036

Title: REPORT ON TESTING OF TIMBER BEAMS

Client: M/s. EXIMCORP INDIA PRIVATE LIMITED Letter Date: 06-02-2019

INTRODUCTION

This report deals with the details of the bending and shear tests conducted on timber formwork beams designated as H-20, observations made and the results obtained from the tests.

TEST SPECIMENS

PRODUCT: TIMBER BEAM – 2.50 M LENGTH – 3 SPECIMENS

The test specimens (H-shaped, 200 mm size) were made of chemically treated seasoned timber wood and plywood. Dimensional properties of the specimens are detailed in figure 1. Top and bottom flanges were made of spruce wood without any joints in the flanges. The web was made of birch plywood and a tongue-and-groove joint was given at 1.49 m from one end and was glued properly. The web and flanges were connected by a groove joint as shown in figure below and was glued properly.

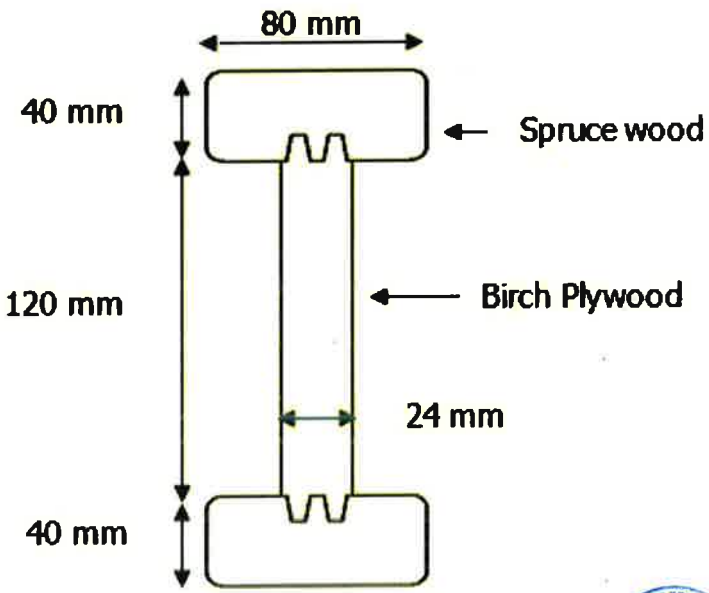

Figure 1. Sectional details of timber beam H-20

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TEST PROCEDURE

a) Bending Test

Three specimens with same cross-sectional dimensions were tested. two point loads were gradually applied using flexural testing machine. Deflections of the specimen under loading were observed at the mid-span point at 1 kN increments. A plot of the load versus deflection is drawn, and the slope k_1 of the straight line (in kN/mm) determined. The flexural rigidity, EI (kN - m^2) is given by

$$EI = Q \times k_1 \times L^3$$

where Q is a constant $= \frac{1}{12}\left[\frac{3a}{4L} - \left(\frac{a}{L}\right)^3\right]$

'a' is the distance to the point load from the support
'L' is the effective span
'k_1' is the slope of the load deflection graph.

b) Shear Test

Three specimens with same cross-sectional dimensions were tested for shear. Two point loads were gradually applied using flexural testing machine. The ultimate load was found out for each specimen. Details of the observations are shown in table 2.

TEST SET-UP

a) Bending Test

The schematic diagram of the test set-up is shown in figure 2. Three specimens were tested for 2200 mm span using the flexural testing machine of capacity 400 kN. Two-point load was applied on the specimen. The point loads were applied in the plane of the web at 900 mm from each support.

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b) Shear test

The schematic diagram of test set-up is shown in figure 3. Three specimens were tested for 2500 mm span using the flexure testing machine of capacity 400 kN. Two-point load was applied on the specimen. The point load was applied in the plane of the web at 400 mm away from the supports.

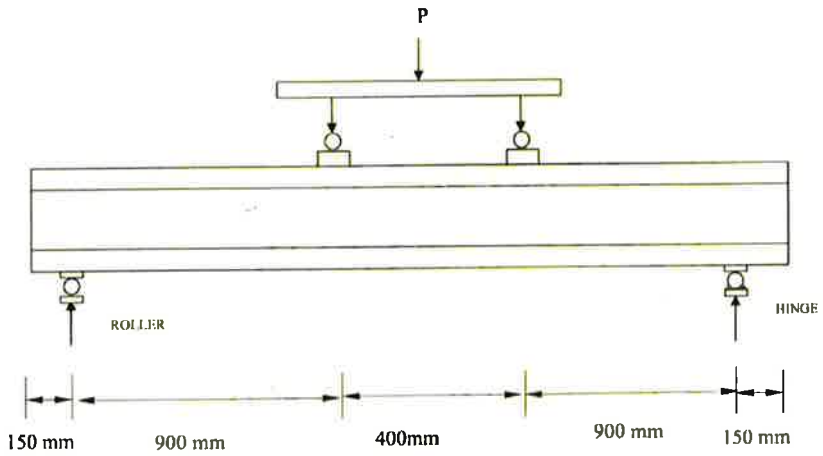

Figure 2. Test set up for bending test

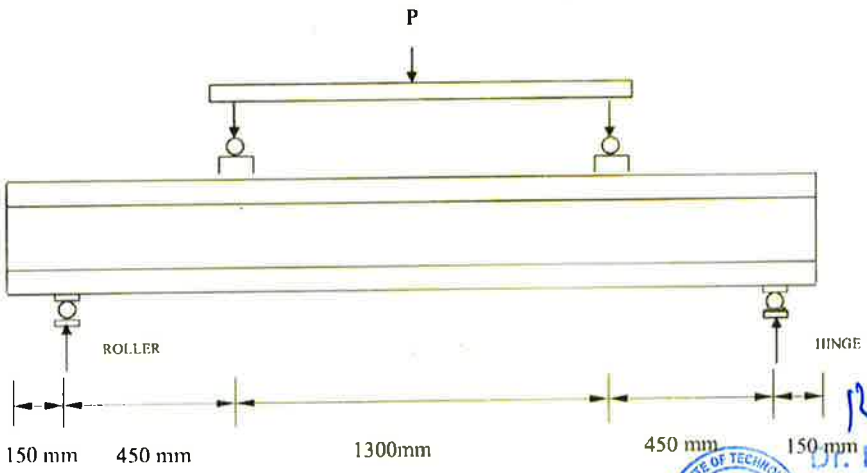

Figure 3. Test set up for shear test

TESTING EQUIPMENT AND MEASURING DEVICES

The bending and shear test was done using bending testing machine of capacity of 400 kN. The deflection was noted using LVDT. The testing equipment were well calibrated at the time of testing also as per standards.

TEST RESULTS

The bending and shear tests were conducted for the H-20 timber beams and the results are tabulated below.

Bending test

The observations and results of bending test are tabulated in table 1. The load-deflection curves for each of the above tests are plotted in figure 4 to figure 5, and the flexural rigidity is determined for each specimen. The failure pattern of the beams bending in the plane of web is shown in figure 7.

Shear test

The results of the shear test are summarized in table – 2. The failure pattern of the beams is shown in figure 9.

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S.No.	Ultimate Moment Capacity (kN-m)	EI (kN-m^2)	Observations
1	18.31	370.75	Failure of beam occurred at the Centre of flange.
2	17.21	359.79	Failure of beam occurred at the top flange at the left support.

Table -1 Test results (Bending Test)

S.No.	Ultimate Shear strength (kN)	Observations
1	22.56	Failure of beam occurred at the top flange in right support.

Table -2 Test results (Shear test)

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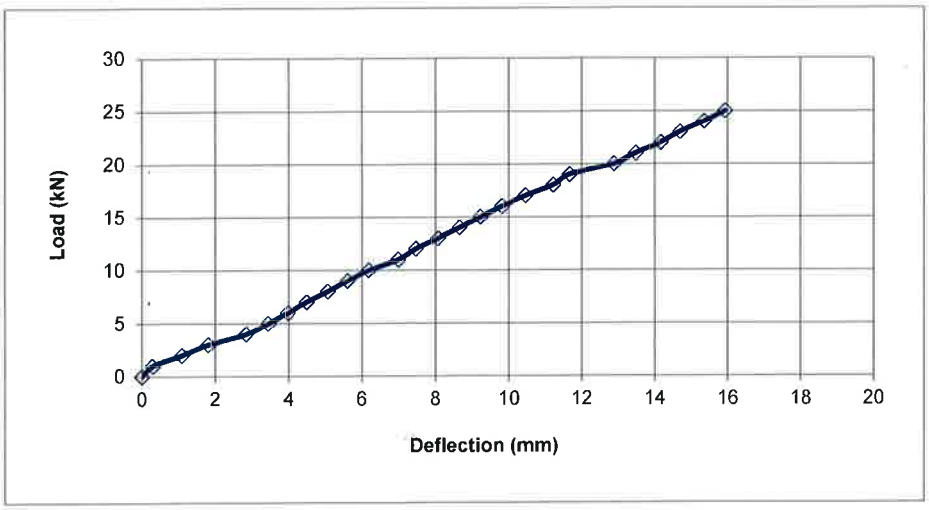

Figure 4. Load vs. Deflection of beam 1

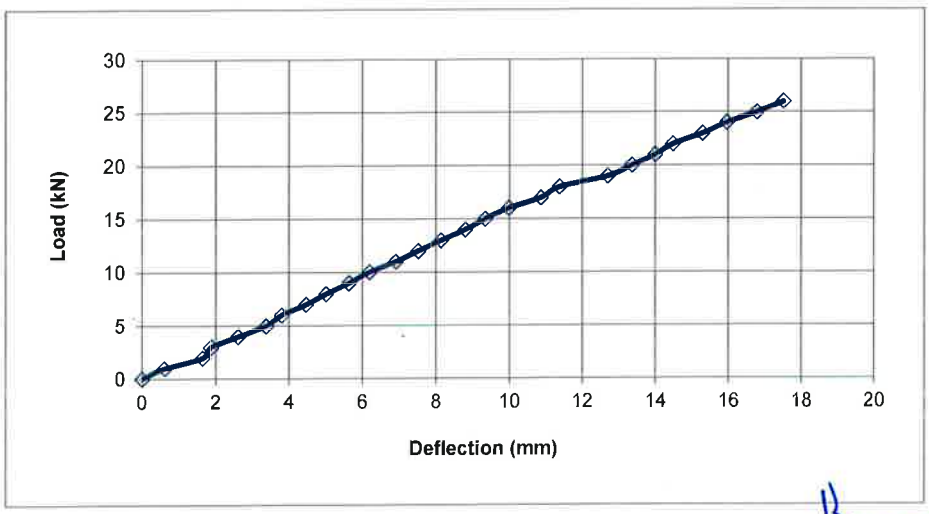

Figure 5. Load vs. Deflection of beam 2

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CONCLUSION

Two beams were tested for bending and one beams for shear. The value of ultimate moment capacity and flexural rigidity varies between 17.21 kN-m to 18.31 kN-m and 359.79 kN-m^2 to 370.75 kN-m^2 respectively for the beams tested. Shear strength of the specimens is found to 22.56 kN. **Appropriate factor of safety is to be applied to obtain the safe load.**

Note:

This certificate is based on the sample submitted for testing.

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Figure 6. Test setup for bending test

Figure 7. Typical failure pattern of beams in bending test

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Figure8. Test set up for shear test

Figure 9. Typical failure pattern of beams in shear test

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