

FINAL REPORT

GRAVITY LOAD TESTING

OF

SPPL DEMO PROJECT

New Delhi

BY

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BACKGROUND AND OBJECTIVES

The load testing covered in this report has been undertaken to check the adequacy of the existing roof and the supporting structure to withstand the additional gravity loads without exceeding the permissible limits on deflections specified by the Indian Standard Codes of practice or causing any visible distress on the structure members.

METHODOLOGY AND INSTRUMENTATION

As per IS 875 (II), the uniformly distribute load specified the intended use of the roof (lecture theatre, canteen and office) is 300 kg/m^2 . An area of $12.92 \text{ m} \times 12.92 \text{ m}$ on the roof enclosed by grid 18, 20, A and C was selected as a representative test area. It was decided to apply gravity loads within this area with the help of bags filled with sand and brick bags and monitor deflections at key locations. Fig. 1 shows a lay out of the beams and the columns in the test area. Seven key locations chosen for monitoring deflections are also indicated in the figure. Point 7 is situated at the centre of the roof slab for deflection measurement. All other points are located on the soffit of beams. At all these locations, dial gauges with a resolution of 0.01 mm were installed.

The filling of the bags was carried out by the contractor and duly verified by SPPL India staff. Fig. 2 shows the use of electronic weighing machine for accurate and uniform filling of the bags. The bags were uniformly placed on the roof in the chosen area, the number chosen so as to result into the necessary uniformly distributed load. Fig. 3 shows the test area on the roof after application of the loads and also while the loading was in progress. It shows the view of the roof when the loading was in progress. Loads were increased gradually at an interval of 100 Kg/m^2 . After each increment, the load was sustained for nearly one week before final values of the deflections were measured. Fig. 4 shows the deflection of beam and slab under uniform loading using dial gauges.

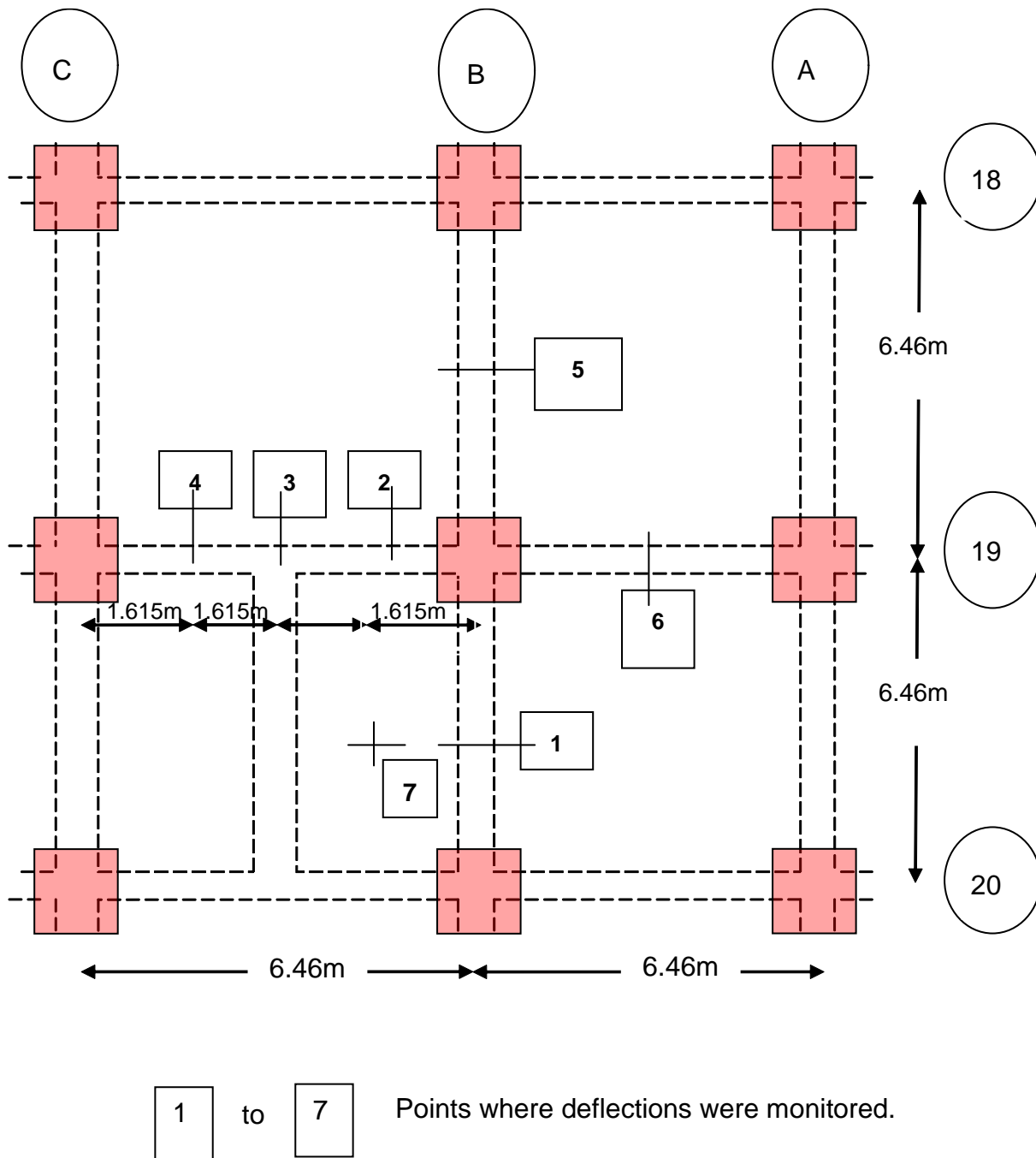


Fig.1 Layout of area where loads were applied and deflections were monitored.



Fig.2 Measurements for filling bags with equal weights of sand/ brickbats.



Fig. 3 Test area of the roof



(a)

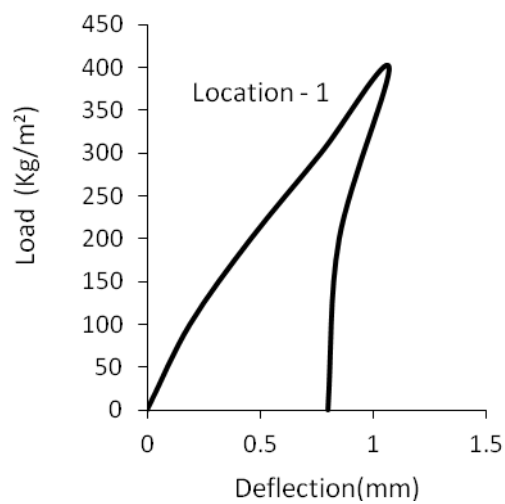


(b)

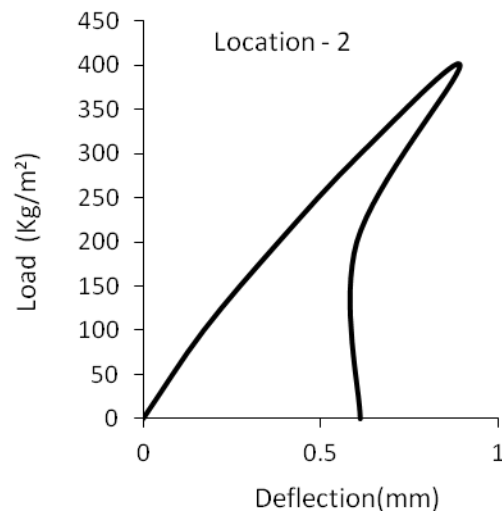
Fig. 4 (a) Measurement under slab
(b) Measurement under beam

OBSERVATIONS AND RESULTS

Fig. 5 shows the plot of the load vs deflection at points 1 to 4 and Fig. 6 shows the same for points 5 to 7.



(a)



(b)

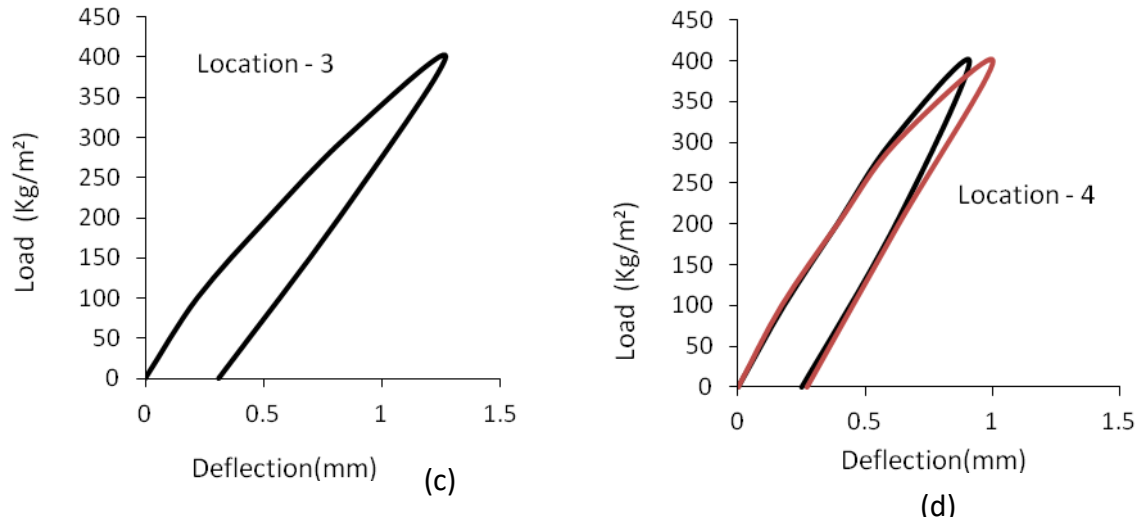
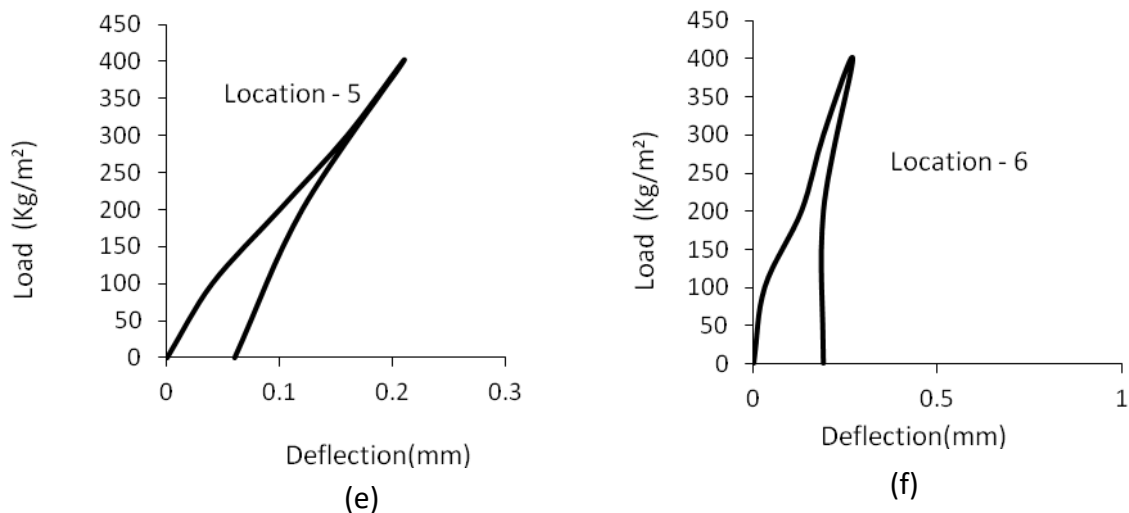


Fig. 5 Load vs. deflection at location 1, 2, 3 & 4

For beams/ maximum observable deflection was 1.27 mm at point 3 on beam along grid 19 (see Fig. 5c). The maximum deflection observed for the slab was 1.49 mm under 400 Kg/m² at point 7 (see Fig. 6c). These are much less than the allowable value of 9.93mm for slab and 19.88mm for beams in accordance with (span/325) criteria as per IS 456 (2000). In addition, after the removal of loads, the residual deflections are also negligible. No cracks were observed anywhere in slabs, beams or base of the main column.



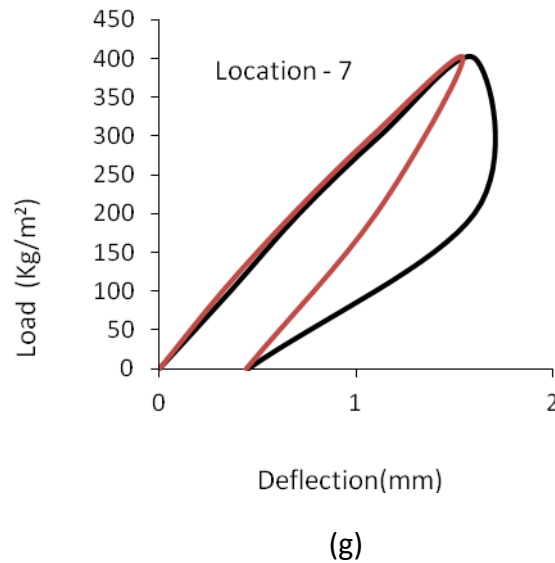


Fig. 6 Load vs. deflection at locations 5, 6 & 7

CONCLUSION AND RECOMMENDATIONS

1. In view of test results, it can be concluded that the roof of the existing building can withstand the additional loads from new construction. It is recommended that the total loads (Dead loads +imposed loads) should not exceed 400Kg/m² in any case.
2. After construction of the facility, the limiting-imposed loads should be posted on the walls at appropriate location in accordance with IS 875 (II).
3. The gravity load testing conducted on the SPPL Demo Project provides the data and basis to evaluate the structural adequacy of the roof of the buildings under the specified design gravity (vertical) loads **only**. It should be noted that the results of the gravity load testing reported herein cannot be used to assess the adequacy of the structural design of the buildings against lateral design loads (such as design wind or earthquake loads) without reviewing the structural design drawings of the building. The report therefore does not certify the earthquake resistance of the building.
4. The results of gravity load testing conducted on the SPPL Demo Project reported herein cannot be used to evaluate the general condition (in terms of corrosion and deterioration) and durability of the building materials against

aggressive environment without performing detailed non-destructive testing on the materials at representative locations.

5. It should be noted that SPPL India will not be responsible or liable for the structural safety and serviceability of the buildings or their roofs in any way if the buildings or their roofs are subjected to any incidental loads not accounted for in the original design of the building for e.g additional loads due to installation and operation of heavy machinery which is not the intended use of the building or additional loads due to structural alterations in the building for renovation or other purposes.

Team SPPL India

REFERENCES

1. IS 456 (2000), *Plain and Reinforced Concrete- Code of Practice*, Bureau of Indian Standards.
2. IS 875 III (1987), *Design Loads (Other than Earthquake) for Buildings and Structures Part 2 Imposed Loads*, Bureau of Indian Standards.