ASSESSMENT OF A MULTISTOREYED BUILDING BY VIBRATION TESTS

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SYNOPSIS

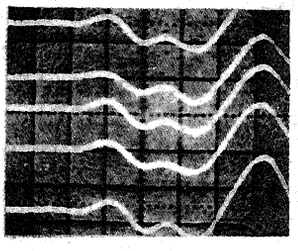
The paper reports about the vibration tests conducted on a fire damaged multistoreyed building. The tests were aimed at assessing its reserve strength and structural stiffness. The extent of structural damage caused was inferred from the test results and appropriate remedial measures were suggested.

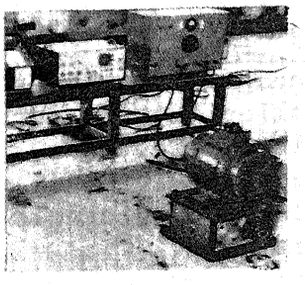
INVESTIGATIONS CARRIED OUT

Three types of tests namely (1) wave propagation tests (2) steady state resonance tests and (3) free vibration tests were conducted on typical damaged structural elements on the upper floors of the building as well as on similar but undamaged elements in the lower floors of the same building. The wave propagation tests involved measurement of the velocity of the P wave originating from a source of disturbance (say a pulse) as the wave traverses between two points at known distance apart. The measuring equipment consisted of a pair of vibration transducers, a pair of preamplifiers and a storage oscilloscope (Fig. 1). Figure 2 shows successive wave forms stored on the oscilloscope. Steady state resonance tests were conducted (Fig. 3) to evaluate the resonant frequency of the structural element and hence its stiffness. The equipment used for excitation consisted of a mechanical oscillator, a D. C. motor and a speed controller while for the measurement of response, a vibration transducer, a preamplifier and a recorder were used. Free vibration records obtained by giving a pulse to the elements yielded natural frequencies which were in close agreement with those obtained in resonance tests. Theoretical resonant frequencies were in very good agreement with the test results obtained on the undamaged elements.

DISCUSSION OF RESULTS

The P wave velocity gave a measure of the dynamic modulus of concrete and hence its reserve strength after damage. The frequencies obtained from the vibration tests indicated the reduction in stiffness of the elements tested in the damaged area as compared to the corresponding elements in the undamaged area. The extent of damage could be inferred from the test results and appropriate measures for repairing the structure were suggested.





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