

FORMULATION OF RESPONSE SPECTRA FOR TRAFFIC INDUCED VIBRATIONS

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Mode of Study : F. Time

ABSTRACT

Control of traffic induced vibrations is an important concept for enhancing living standards in residential apartments along the railway lines. Vibrations generated by metro trains, running underground or on elevated rail tracks, move through ground to affect the nearby structures. These traffic induced vibrations, apart from being a threat to safety of structures, may also significantly lower the quality of life and the working conditions of people using these structures. Traffic induced vibrations usually exceed the safety limits determined by occupational standards for building occupants and service standards for equipment that is housed, long before any failures and cracks appear in the structure. In the present study, vibration data generated due to movement of metro trains has been collected and its effect on nearby structures studied. Effect of vibrations on the occupants has also been dwelved upon by comparing the vibration levels with Federal Transport Authority Guidelines. The first part of the study involves collection of vibration data at two residential buildings located just above the metro tunnel on the “Central Secretariat - Mandi House” corridor of Delhi Metro. The second part involves the analysis of one of these structures modeled in SAP 2000 and subjected to linear dynamic analysis (Response Spectrum Analysis), to observe displacements at each joint of the structure. A comparison was made between the displacements generated in the building with and without inducing the effect of vibrations. It was concluded that the displacement at each joint increased significantly after introducing the effect of vibrations on the building. The percentage increase in the displacements came out to be almost 45-55 %. Traffic induced vibrations have a considerable effect on the behavior of structures lying nearby. The joint displacements increased by 45-55% after considering the effect of traffic induced vibration through Dynamic Analysis. The worst effect of traffic induced vibration is seen in the top storey joints, where the rotation increased by about 100%.