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Damage to Structures from Ground Vibration Caused by Piling Operation

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Ground-Borne vibration from piling operations often cause noticeable vibration in nearly buildings. Building vibration could cause discomfort or annoyance to occupants and damage to sensitive equipment or buildings. Damage to structures could be ranging from hairline cracks in plaster to major impairment to the building superstructure. In extreme causes vibration can be the cause of building collapse.

During last two years several piling operation with different types of piling method were carried out in the city of Colombo. It has been now realized that, the control of ground vibration due piling operation is an urgent need due mainly to an increasing number of complaints from the public. National standards with respect of building vibration is not available in Sri Lanka. However, as a result of several measurements carried out by CISIR during different types of piling operations revealed that a combination of British and German standards could be used in Sri Lanka in assessment of building vibration. A set of guidelines proposed by the CISIR in this paper was submitted to the Central Environmental Authority to be gazetted under National Environment act (NEA). Damage to building can occur as a result of dynamic stresses or strains on the structure. Dynamic strains are directly related to the "peak particle Velocity", which is normally measured in case if assessment of building vibration. The natural frequency and the degree of damping of the building can also have an effect. However, it is not possible to define universal criteria that could be used to predict structural damage to buildings because of many variables that are involved.

The paper provides some guidance abut what parameters should be measured, location of measurement and interpretation of data, with respect to damage criteria of buildings. A comparison of vibration data, with different types of piling operations and practical methods to reduce the vibration is also discussed.