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A STUDY OF CODE PROVISIONS FOR THE DESIGN OF FRAMED STRUCTURES

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Introduction

Many countries are today faced with the problem of designing structures to resist earthquakes. Some countries have already formulated building codes[1], giving due consideration to the earthquake occurences in the past and providing adequately to strengthen the buildings against the forces resulting from an earthquake shock. Some other countries are also following through and are formulating such codes.

In these codes, the earthquake forces are taken into consideration as static lateral forces, which do not take into account the properties of the structure, viz. the period and damping. Almost all these codes provide lateral forces, much lesser than those indicated by a dynamic analysis using response spectrum. However, it has been observed that the structures so designed have withstood strong motion shocks without much damage. This behaviour could be explained by the inelastic properties of the structure and its enormous energy absorbing capacity[2] However. one must know before hand as to how much the reserve energy a structure has got so that it could be estimated as to what size of earthquake could be resisted by it at a particular distance from the epicentre.

This paper examines the order of reserve energy capacity of simple framed structures designed according to the I.S. Code 1893–1966[3].

I.S. 1893–1966 Provisions

For framed structures, the I.S. Code[3] specifies that the total base shear V_B is given by

$$V_B = C\,\alpha\,W \qquad (1)$$

in which C is a coefficient defined by the flexibility of the structure, and is given by $\frac{9}{N+5}$ but is not greater than 1.

N is the number of storeys

α is the seismic coefficient

W is the total dead load and appropriate live load.

The lateral force along the height of the structure (Fig. 1) at a point i is given by Q_i

$$Q_i = V_B \frac{W_i h_i^2}{\sum_{i=1}^{N} W_i h_i^2} \qquad (2)$$

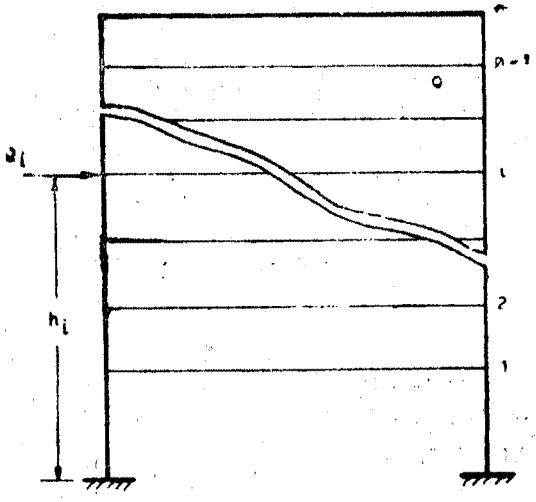

Fig. 1. Lateral Loading on a Multi-Storey Frame.

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