A NEW METHOD FOR ANTISEISMIC BUILDINGS DESIGN EMPLOYING AN "ELECTRICAL NETWORK ANALOGIE OF FRAMES" TOGETHER WITH DIFFERENTIAL ANALOG COMPUTER

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ABSTRACT

This paper describes an analog computation procedure for evaluating forces in the frames of multistory buildings submitted to simulated earthquake motions. This analogy is designed in order to include floor displacements due to bending, shear and traction or compression at the columns or beams. Records can be obtained of the forces at any point of the frame during the selected motion or earthquakes, and any shape of beams or columns could be simulated. The mass of the buildings is assumed to be concentrated at floor levels. Lineal damping is also included and the characteristics of ground and foundations could be represented.

Introduction

This analog method, as distinguished from others, has the following advantages:

1. Any kind of building frames may be simulated including beams and columns of any shape.

2. Horizontal displacements of floors due to bending moments, shear and traction-compression forces may be included.

3. The addition of one hypothetical floor (before the first one) in a multistoreyed building, permits the simulation of foundations and ground.

4. Lineal damping effect between neighboring floors is represented.

5. Any assumption of infinite rigidity of floors is unnecessary.

6. Bending moments at extremities of the beams and columns may be measured or recorded during the simulated earthquakes facilitating recognition of the weak elements of the structures in order to change them. Successive testings may lead to a definite earthquake-resistant design. If we prefer to employ another computation method, such as those based on the knowledge of natural period and shape functions of the buildings it is possible to find these values or shapes, the procedure consists in employing a sinusoidal generator in the analog computer and changing continuously the frequency until resonance is observed.

Although other building characteristics may be simulated by employing this method, those mentioned above are the main ones.

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