INELASTIC ANALYSIS OF CONNECTING BEAMS IN COUPLED SHEAR-WALLS UNDER CYCLIC LOADING

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SYNOPSIS

The paper presents the results of the finite element analysis of reinforced concrete connecting (or coupling) beams of coupled shear-walls subject to inplane monotonic and cyclic loadings. The analysis is general in nature and takes into account cracking of concrete, and inelastic behavior of steel and concrete in compression.

INTRODUCTION

Initially the beam is uncracked and elastic, and this elastic state continues until the first cracking or plasticity occurs. Loading the beam in increments and using an iterative procedure, the elastic solution is extended to cover the study of tensile crack propagation, and plasticity of concrete and reinforcement. Within each load increment, a check for cracking of concrete, and plasticity of concrete and reinforcement is made. Whenever an element cracks or plasticity of concrete and/or reinforcement occurs, the material property matrix of component material is modified; excess stresses are released and additional nodal displacements are calculated due to these stresses. The process of distributing the excess stresses to surrounding elements is repeated until no more cracking and/or plasticity occurs, at which time a new load increment is given.

A rectangular finite element with three degrees of freedom at each node is used. Reinforcement within each rectangular element is assumed to be uniformly distributed over it. The composite material property matrix for reinforced concrete is obtained as the sum of the material property matrices of concrete and reinforcement. A maximum normal stress theory is assumed for tension cracking and a Von-Mises yield criterion is adopted for biaxial compression of concrete.

Using the procedure outlined above, the coupling beams (subject to equal and opposite end moments and a constant shear force) were analyzed for monotonic and cyclic loads. The analytical results were then compared with experimental data, and good correspondence between the two was noted.

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