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Properties of Brace Encased in Concrete-Filled Steel Tube

Propriétés d'une entretoise de contreventement encastrée
dans un profil tubulaire rempli de béton

Eigenschaften betonumhüllter Fachwerkdiagonalen

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1. PREFACE

Steel has high strength and deformation resistance (see Fig. 1). Braces are extremely effective in increasing the horizontal stiffness and strength of steel frame structures. But braces buckle and rapidly lose strength when subjected to compression force (see Fig. 2). This makes it difficult in plastic design depending on stable plasticity and braces cannot be expected to absorb energy.

Therefore, particularly in earthquake-prone countries, designs of structure are considerably limited when braces are adopted for high-rise buildings.

The authors considered that, if brace buckling could be prevented and the energy absorption capacity increased, damage by earthquakes to columns and beams which support permanent loads would be reduced. The authors developed a bracing system having stable restoration property (see Fig. 3) and in which buckling was prevented by using core plate encased in concrete-filled steel tubes. This paper reports on an experiment conducted on a scale model to study the application of such braces to an actual 24-storied building.

2. EXPERIMENT

2.1 Experiment models

As shown in Fig. 4, the experiment models are 1/2.5 scale and consist of braces, columns and beams. Model A has braces whose core steel yield point is 260.7 N/mm^2 , and model B 477.3 N/mm^2 , while model C has no braces. Figure 5 shows the cross section of the brace used in Models A and B. Core steel is bound by mortar and steel tube to prevent buckling. The coating material isolates the core plate from mortar to prevent an axial force from traveling from core steel to mortar and steel tube.

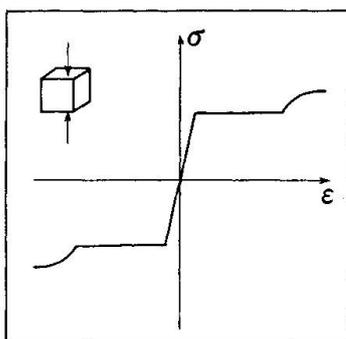


Fig. 1

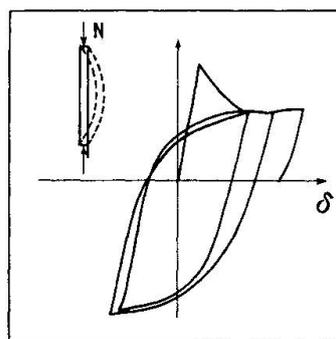


Fig. 2

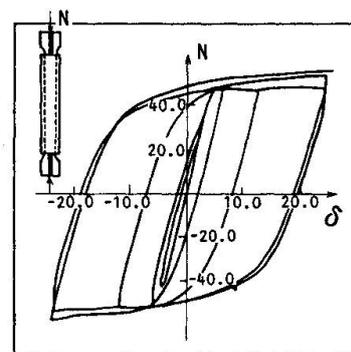


Fig. 3

