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Studying the Buckling Behavior of Composite Columns (CFST) by Cyclic Loading

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ABSTRACT

One of the most sensitive decisions a structural designer should consider is choosing the type of consumables in the structure. This decision is in many cases dependent on the type of structure, financial issues also the experience and skill of the designer. The main aim pursued in the design is to obtain highly secure, economical structures. Concrete and steel are materials that are widely used in construction. The benefits of both materials are well known today. The clever combination of these two materials, an effective explosion-proof system, will have the effect of exploding explosions in the Plasco building in Tehran compared to using any of the materials. Lack of efficient performance factors, lack of clear and valid guidelines for the seismic design of such columns, how to model their geometry and material can still be obstacles to using such systems. In this research, according to the objectives of the problem, different parameters should be evaluated, this parameter is the type of column cross-section geometry. The aim is to determine the effect of defined parameters, especially column geometry, on the behavior and seismic capacity of composite columns (CFST), achieving high resistivity, especially for columns that, incidentally, increase their loading exponentially with increasing classes. It is found that circular sections of composite columns (CFST) show better behavior and performance than columns with square geometry and further show that composite columns (CFST) can be used as a basic solution. Use it to solve challenges between designers and architects.

Key words: **CFST Column, Seismic Load, Nonlinear Analysis (NSP), Finite Element Analysis**

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1. INTRODUCTION

The use of concrete-filled steel tubular columns (CFT) has become widespread in construction work, because of high earthquake resistance, high ductility, and high energy absorption capacity. The confinement created by the steel tube improves the concrete properties by creating triaxial tension And prevents the internal buckling of the steel tube [1]. In 1967, studies by Jacob Sen and Gardner showed that at low strains, the Poisson's ratio of concrete was in the range of 0.15 to 0.25, But for larger strains, Poisson's ratio of concrete reaches even about 0.6. As a result, Poisson's ratio for concrete is lower than steel in the initial stages of loading. Therefore, the steel tube has no confining effect on the concrete core, when the longitudinal strain increases, the lateral strain of concrete will be greater than steel. So, a radial pressure Will be created. At the contact, surface of steel and concrete. In this situation, the concrete core is under triaxial stress and the steel tube is under tensile stress. Due to the cyclic tensile stress, the steel tube cannot withstand the normal yield stress, in this condition, the load transfer from the steel tube to the concrete core will occur, In composite columns, when the collapse occurs, due to the confinement effect of the concrete, the load proportionally to the failure is substantially larger than the sum of the concrete and steel collapse loads. in addition to the confinement effect of the core concrete, this load also depends on the factors: steel tube thickness, slenderness ratio, eccentricity load, and cross-section