Nonlinear Vibration Analysis Of Shear Wall-Frame Structure Under Seismic Load

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ABSTRACT

In order to design and model compatible with a structure against lateral forces such as earthquakes, it is necessary to know enough about its behavior under these types of forces. It is worth noting that in order to complete a design, it is not enough simply to guide the instructions and the behavior of a structure against an earthquake is influenced by several factors that are important to know. Therefore, other than the case codes, it was necessary to pay attention to natural frequency modes, hysteresis cycle and displacements. In this paper, by modeling the structure of a two-dimensional Shear Wall-Frame under a nonlinear vibrating load, we have tried to extract and display the highest quality diagrams. Initially, the natural frequency of the Shear Wall-Frame was obtained from the software 1, 3 and 5 stories. Subsequently, the loading history was exerted to the top of the structure, which was finally drawn using force-time, time-displacement, and hysteresis diagrams. The results obtained from the analysis show that the structure of the Shear Wall-Frame is more in vertical direction than the horizontal direction, and there is no lysis of hardness and strength.

Key words:
Shear wall, Frame, Hysteresis, Seismic Load, ABAQUS Software

1. INTRODUCTION

Today, the use of shear walls in steel and concrete structures has become widespread and to obtain the lateral stiffness of the structures are used, which has been considered by engineers for its proper operation in past earthquakes. The shear wall strongly increases the strength, stiffness and structural shape of the structure, improves the seismic behavior of the structure, reduces deformations and damages to other structural elements and like a vertical cantilever cause lateral stability of the structure against the shear and bending anchor due to the earthquake. In order to prove the superiority of the dual system structure of the steel bending frame and the concrete shear wall compare with steel bending frame, these two systems are evaluated by a seismic analysis [1]. On the other hand, the evaluation of the seismic performance of the structure with the dual system steel bending frame and concrete shear wall under the influence of an earthquake close to the fault [2]. Some researchers have done research on the various parameters of this research system. Such as hysteresis behavior, excess coefficient of resistance and ductility coefficient [3]. On a research it presents a numerical study of steel-plate concrete (SC) composite walls using the general-purpose finite element (FE) program ABAQUS [4]. Analysis demonstrated that the proposed model could better evaluate the hysteretic behavior of steel plate shear wall structures with a wide range of width-to-thickness ratios and different steel materials [5]. A comparison between the experimental and numerical results showed excellent agreement. It occurred on the steel plate shear walls with beam-only-connected web plates [6]. Five types of three-dimensional finite element model is developed using ABAQUS emphasizing constitutive material modeling and element type to represent the real physical behavior of complex shear wall structures [7].

In this paper three type of structure is modeled that includes shear wall and frame. Shear walls are made from concrete and frames are made from steel, all of the processes were followed by ABAQUS software. The outputs of the analysis include force-time, time-displacement, and hysteresis diagrams. Meanwhile, it was two dimensional modeling.

2. Modeling the shear wall and frame by ABAQUS