Research project synopsis

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- **Overview of Thesis**

Structural engineering is the subfield of civil engineering concerned with the strength and stability of buildings, bridges, airplanes, vehicles and other structures. The structural engineer works with architects and designers to calculate the system of support and other requirements to ensure the structural integrity of the finished product. Structural engineers apply knowledge of physics, math and many other disciplines in their work and structural design requirements can vary based on geological constraints and challenges such as earthquake zones and soil types.

The objectives of my Ph.D. in Structural engineering program are to provide the knowledge about the structural behavior of steel structures in different stages.

- **Literature Review**

  Performance based assessment of steel frame structures by different material models: Acceptable limit conditions for materials used in structures are one of the influential factors for design and evaluation of buildings. These limits are described using different material models. Material models can be generally defined by the stress-strain relationship. Stress-strain relationship varies based on the material. Mathematical models are used for describing the stress-strain relationship for any material. The material model takes a very important role in the seismic analysis of structures. The aim of this study is investigate of effects of steel models on structural performance of steel frame buildings. For this aim, pushover curves were obtained for three different steel models. It was determined that the pushover curves obtained according to three various steel models used in the study were consonant with each other.

  Performance Analysis of Steel Structures with A3 Irregularities: Determination of the behaviour of structures during earthquakes is a very important engineering concern. Irregularities in the structure may lead to more damage imposed on it by weakening its defence mechanism during an earthquake. Some of these irregularities may be indentations or protrusions in the plan. Such irregular buildings may be encountered in practice because of various reasons. This study examined the state of irregularity by the A3 plan in the Turkish Building Earthquake Regulation of 2016. Four different A3-type irregularity cases were considered. The building with no irregularities in its plan was taken as the reference building.

Finite Element Modeling and Structural Behavior of Stainless Steel Plates in Compression: Featuring for non-linear stress-strain relation, the behavior of thin-wall plates differ widely from stainless steel to carbon steel, which plays a basic role in relevant research. This paper describes the development of FE models for analyzing stainless steel plates in compression which is based on the existing results of Rasmussen's test, as well as the strength curve achieved by such advanced FE models. The explicit strength equations and design method are proposed for determining the local buckling strength of stainless plate and cold-formed square and rectangular hollow section in compression. It is shown excellent agreement with test results achieved by using Quach's model as stress-strain relations in FE models. The proposed design method also exhibits reliable results, which could be used in structural design of stainless steel plates in compression.

- **Research Methodology**

Qualitative and quantitative Research

- Research Deadlines - expecting to complete the research by 2024