NUMERICAL STUDY OF INTERIOR SECTIONS OF CURVED STEEL PLATE COMPOSITE WALLS UNDER AXIAL COMPRESSION

The concept of steel plate composite (SC) construction began well before the 2000s, but only in the past couple of decades has the technology seen significant strides in development in commercial and protective design applications. The ability of modular construction, structural integration, and prefabrication helps distinguish this structural system apart from an alternative such as a reinforced concrete design. An application where SC construction is rapidly rising in prevalence is in the design of nuclear facilities. As the world of nuclear facilities continues to develop, the SC design must be tailored by engineers to fit the requirements of this evolution. One of these developments that has garnered recent interest is in the design of cylindrical SC containment vessels for nuclear facilities. Codes and standards have been established to guide the general design of SC construction, also including a particular emphasis in SC design for nuclear construction. However, many of the provisions and recommendations found in these standards stem from research and development of straight SC construction. Therein, little research is available exploring the concept of curved SC construction and what effect this curvature has on the behavior of an SC component.

The goal of this thesis was to further the understanding of how curvature effects the behavior of interior sections of curved SC walls subjected to axial compression. This was achieved numerically by creating finite element models in ABAQUS to benchmark behavior observed from an experimental study. Utilizing techniques from the benchmarked simulations, a parametric study was generated. This study featured 22 unique finite element models of curved SC walls. From results of this study, it was determined that curvature can have a substantial effect on the performance of curved SC walls.