

Executive Summary

The 400 is a condominium currently under construction in Bremerton, WA. The Structural Blast Resistance of the building along with several general recommendations for blast resistance was designed for this thesis report. A progressive collapse study was conducted, mostly in accordance with the blast resistant design. Lastly, the details of the building envelope of The 400 were evaluated to resist failure, mostly due to water penetration.

Structural Blast Resistance

It was determined that it was feasible for The 400 to be designed to resist blast loads. The 400 was then upgraded to be considered blast resistant. The same floor system, non-composite steel, was used for the new design. As expected, the member sizes of both girders and columns increased slightly as a result of the additional design loading. The two rules of thumb of increasing the design loading and removing an interior column proved to yield similar designs, although the connections were the limiting factor of the new design.

Progressive Collapse

The possibility of a progressive collapse of The 400 was then analyzed because when a building is considered for blast resistance, the most common cause of failure is progressive collapse. To study the possibility of progressive collapse, it was originally intended to research and evaluate the most common causes of progressive collapses. Then, possibilities to prevent these progressive collapses from occurring would be determined and evaluated. Progressive collapses were researched, and the results for blast resistant design were very similar for design against progressive collapse. While the loading is critical, the connections are not often considered to be controlling, but during a blast, the loading creates additional rotation that would otherwise not be present.

Building Envelope Study

In any location, it is possible for water to seep through the envelope of the building to affect the inside the structure, deteriorating the structural support of the building. In an area of increased precipitation, such as Bremerton, special consideration must be taken to make sure water does not penetrate the envelope and deteriorate the structural integrity of the building. The building envelope of The 400 was evaluated to determine possible areas of consideration for seepage into the structure. The current building envelope proved to be fairly representative of an ideal building envelope design, and few improvements were made. The reality of construction proves that no matter how well-designed the structure, the design means nothing unless it is constructed properly. Site investigations should be performed to determine if construction procedures are actually followed.