

PENNSYLVANIA JUDICIAL CENTER EXECUTIVE SUMMARY

The Pennsylvania Judicial Center is a nine-story, 425,000 square foot building project currently under construction in Harrisburg, PA. This \$95 million building will house the Pennsylvania Unified Judicial System, and features courtrooms, conference rooms, and offices.

The building's primary structural system is comprised of a steel frame with composite floor slabs. The building resists lateral loads using concentrically braced frames between the floor slabs, which act as rigid diaphragms. The frames use stiffness in the plane of the lateral load and act similar to a truss to transfer the loads to the columns, which then transfer the loads to the foundation below.

The function of this building creates an increased security concern over other buildings of a similar size and location. In order for the judicial officials to be able to perform their jobs adequately, the building should provide them with a sense of security. Therefore, the main focus of this thesis will be a study of blast resistance and progressive collapse. National interest in blast prevention was reinvigorated after the attacks on September 11, 2001, and the United States Department of Defense responded by publishing guidelines on how to accomplish this for a building.

Two primary areas in which an attack is most likely to occur have been identified: the parking area below the building and the exterior at front face of the building. For an interior explosive blast, building damage is basically inevitable no matter how well designed the structural system may be. Therefore, for interior blasts, the design goal will be to simply prevent catastrophic failure. For the exterior of the building, the façade elements, especially the glazing, should be designed for blast resistance according to ASTM standards. Glass shards falling in from the primary atrium to the main lobby of the building could represent a serious life safety risk.

The building will be redesigned using the same type of structural system as the existing one: steel frame with composite slabs. The system will be designed to withstand a large, quick pressure force in several different locations in the lower parking deck, though not necessarily simultaneously. The building will be analyzed as a whole using a model developed in RAM Structural System, and the effect of a blast on an individual frame or bay will be modeled using RAM Advanse. The frame will be designed based on provisions of the 13th Edition of the AISC Steel Construction Manual.

The breadth study of the mechanical system will also focus on terrorism prevention. Airborne contaminants can cause sickness or death within minutes of exposure. The mechanical system will be designed to depressurize automatically upon sensing a dangerous level of contaminants, exhausting the space while bringing in 100% outdoor air. This system will be designed for a courtroom, which may often be the most occupied room besides the main lobby.

The other breadth study involves the architectural aspect of the building. Designing the exterior façade for blast resistance and adding large exhaust towers to the roof of the structure will obviously impact its appearance. The architectural goal is to make the changes to the exterior and the floor plan while maintaining the original architect's vision for the edifice and maintaining the conservative appearance appropriate for a judicial building.