

## Executive Summary

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Pearl Condominiums is located on 9<sup>th</sup> and Arch Street in Philadelphia, Pennsylvania. This structure is a mixed use development building. The building includes a retail floor at the ground level containing 10 units and five floors of housing above containing a total of 90 condominium units. One of the main design considerations for the site was the location of an existing SEPTA commuter rail tunnel which runs under the site.

The gravity system of this building is comprised of load bearing walls and precast concrete planks. The main component in the lateral system is the use of concrete masonry units as shear walls in the stair towers and the elevator core. The ground floor contains moment frame to transfer lateral loads from the stair tower shear walls which end on the second floor. Finally, the use of metal stud walls with metal strapping is used to help resist lateral load in the east to west direction of the building. From research and analysis comprised during this semester the existing structural system used in Pearl Condominiums, was a very efficient and economical construction type to use for this type of building.

The purpose of this paper is to propose an alternative structural system for Pearl condominiums. The major factor influencing the redesign is the use of interior load bearing walls. For the redesign, they will be eliminated, which will result in a more flexible floor plan. This objective will be completed through the structural breadth study of the flex frame system to be used as an alternative to the wall and plank type of construction. The flex frame is composed of a special type of steel beam called a d-beam. The d-beam is created by cutting a wide flange beam in two and adding a smaller plate to act as a top flange. This system also employs the use of steel columns and precast concrete planks used for the floor. The lateral system will be changed to the implementation of concrete shears walls compared to the concrete masonry shear walls present in the existing design.

The second major topic that will be discussed in the paper is the foundation system. The analysis will focus on a possible alternative to the use of drilled pier, but will also include the effect on the train tunnel that runs underneath the site. This will help to determine if the drilled piers was the most economical system for the foundation of Pearl Condominiums.

The paper will also briefly discuss two breadth topics concerning construction management and sustainability. It is proposed to analyze the effect of the flex frame system on construction cost and scheduling. Proposed for the issue of sustainability is the certification of the building for a bronze LEEDS rating and how this will affect the building redesign.

## Breadth Options

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### **Topic 1:**

The first topic that will be covered is in the field of construction management. with this new design I will compare the effect of cost and scheduling of the new system to the existing system in Pearl Condominiums. This information will then be used to see if the flex frame system is an economical and efficient alternative to the existing structural system.

### **Topic 2:**

The second topic that will be covered is in the field of Sustainability and its impact on the overall building systems and its architecture. I will try to see how using these ideas will change the systems used in this building. With the use of this idea, the architecture aspect will have to be considered with respect to the floor layouts and the façade. During this analysis, the pros and cons of using the sustainable design will be discussed and a conclusion will be made on whether this could have been done with the current design or if it would have been too costly to use.