Point Pleasant Apartments

Point Pleasant, NJ

Ryan P. Flynn

Structural Option

Faculty Consultant: Dr. Hanagan

Final Report

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POINT PLEASANT APARTMENTS

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Building Information

Occupancy: Residential

Square Footage: 64,000

Number of Stories: 4 over parking

Building Height: 65 Feet

Construction: Aug. 2006-Fall 2007

Structural:

- Shallow foundation with spread footings, a 12" thick concrete foundation wall, and 5" thick slab on grade
- Floor system is 16" deep Vescom Composite Joist w/ 3.5" thick concrete on 22 GA. metal deck
- First floor is 12" thick reinforced concrete slab
- Parking garage has 5" slab on grade over 6" of stone
- Frame is steel beam and column, mostly HSS
- Walls are steel stud
- Metal trusses frame the roof

Architecture:

- Building 1 of 5 waterfront, luxury apartment complexes
- Each apartment has front and rear balcony, rear balconies overlook the water
- 3 different veneer types (stone, hardshingle, stucco) create unique façade
- Hip roof with multiple dormers, a dome feature on one side and a steeple at the center

Mechanical:

- Each unit has 5 ton air-conditioner located on concrete pads outdoors along with two 2 ton ac's for corridors
- Two 1.5 ton, 710 cfm heat pumps located in machine room at garage level
- Common areas have two 5 kW, 250-500 cfm unit heaters
- The attic houses two 800 cfm, 39,000 btu air handling units/ warm air furnaces
- Heating system is gas powered
- Air distributed through ceiling diffusers

Lighting/Electrical:

- 120/208V, 3-phase, 4-wire system
- 1600A main switchboard
- Unit lighting consists of surface mounted, wall mounted, recessed at wet areas, and pendant mounted chandeliers
- Recessed fluorescents in common areas
- Parking garage lighting is 2 x 4 troffers

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http://www.engr.psu.edu/ae/thesis/portfolios/2008/RPF129/

Executive Summary

The purpose of this report is to explore the feasibility of a wood structural system to replace the existing composite steel joist system for floors 2-4. Based on previous research, it has been determined that the current structural system of open-web steel joists with metal deck and concrete slab may not be the most economical or efficient choice for Point Pleasant Apartments. Throughout this semester, an alternate system using wood floor trusses was designed and compared to the existing structure. The wood trusses are supported by PSL's, wood bearing walls and built-up or PSL posts, replacing the current W and HSS shapes and metal stud bearing walls. In addition to the redesign of floors 2-4, alternative options for the 12" thick concrete slab on the first floor were explored. A RAM Structural System Model was created and the first floor was redesigned as a composite steel system.

A wood system drastically changes the weight of the building, therefore, the seismic loads were recalculated and the lateral forces redistributed to ensure that wind was still the controlling design load. With the switch to a wood truss floor system, wood shear walls were utilized to resist lateral load as opposed to the braced frames of the existing system. The shear walls were designed based on the code provisions outlined in IBC 2006 and the 2005 NDS.

After the loads had been recalculated and shear walls designed, the members were rechecked to ensure adequacy and the results compared to those of the existing structural system. The members were checked for strength, deflection, and vibration.

In addition to the structural changes made to Point Pleasant Apartments, two breadth topics were explored. The first of these breadths was construction management. Changing from steel to wood creates drastic changes in both scheduling and cost of construction. A detailed schedule of the construction of the structure was created for the new structural system and then compared to the schedule of the existing building. An in depth cost analysis was also performed and compared to the existing cost to ensure that switching from steel to wood would be economically beneficial.

The second breadth option explored was acoustical performance. With the new structural system, the noise barrier created by the 3.5" concrete slab is lost and replaced with a subfloor. Over the course of the semester, a vibration analysis was performed and research was done to provide an adequate sound barrier from apartment to apartment. This included comparisons of the new and old floor systems and new and old common walls.

After performing all of the previously mentioned analyses, the proposed changes to the structural system of Point Pleasant Apartments resulted in significant cost savings and a decrease in construction time. All systems designed are adequate to support the loads of the building and only very slight changes had to be made to the floor plan. An effective sound barrier for both the common walls and floor system was designed to negate the consequences of switching to a wood system. Therefore, it is the recommendation of this educational study that the changes proposed in this report be implemented in place of the existing structural conditions.