

The Residences of Sherman Plaza Evanston, IL

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10/31/2005



Structural Technical Report 2 Pro-Con Structural Study of Alternate Floor Systems

Executive Summary

Several alternate floor framing systems can be used in place of Sherman Plaza's existing cast-in-place reinforced concrete system. This report evaluates and compares these floor systems in order to determine which could be considered for the final building redesign proposal. The systems analyzed in this report are:

1. Composite Steel System
2. Non-Composite Steel System
3. One-Way Pan Joist Concrete System
4. Hollow Core Plank System
5. Double Tee Beam System
6. Two-Way Concrete Slab System with Drop Panels
7. Concrete Waffle Slab System

Preliminary sizes for slabs and framing members were determined using different design aids, such as RAM Structural System, the CRSI Handbook and the PCI Handbook. These seven systems were then compared and contrasted by several different criteria. The comparison took into account the system's fire rating, susceptibility to vibration, weight, finish floor to ceiling section depth, constructability and cost. This criteria is not intended to be an exhaustive comparison but will be used to determine which systems should receive further investigation.

When each of the systems was used in the typical bay in Sherman Plaza, each was found to have a number of positive and negative aspects.

The steel systems were found to be the lightest and easiest systems to erect. The non-composite system is easier to erect than the composite system, because shear studs are

not needed. The disadvantages of the steel systems are that they have a large floor section depth and require additional fireproofing.

The double tee and hollow core plank systems are both precast systems, which make them very easy to construct. They are also the least expensive systems. A major downfall, however, is that they have the largest floor section depths. The hollow core plank system has a very high weight, and the double tee system needs additional fireproofing and vibration could be an issue.

The concrete waffle slab and one-way pan joist systems are both cast-in-place systems with relatively small ceiling to floor depths. These systems are harder to construct than the existing system however, since it is necessary to layout the pans to form the joists or waffle voids. Both these designs are more expensive. The waffle slab is even harder to design and therefore, the most expensive of the systems considered.

The two-way flat slab with drop panels has the same section depth as the existing system. It requires no additional fireproofing, and vibrations will be low. It is somewhat harder to construct than the existing system, however, and its weight is higher.

The purpose of the comparison of the floor framing systems is to determine which of the systems should be considered for further investigation. It was found that the steel systems, waffle slab, one-way pan joists, and two-way flat slab with drop panels should be continued as candidates for the building redesign. The double tee and hollow core plank systems, however, will not be considered due to their very large section depths, which can have a large impact on the costs and construction of the building.