River Tower at Christina Landing

Wilmington, DE

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Structural Option
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Structural Technical Report #2:
Feasibility Study of Alternate Floor Systems

Executive Summary

This technical assignment involves the investigation of alternate floor framing systems for the River Tower at Christina Landing. Currently, the typical floor system for the residential portion of the River Tower is a post-tensioned floor plate concrete slab. This report will determine whether another type of system can be utilized, with the consideration of fire protection, overall floor depth, system dead weight, and assembly cost as determining factors. The overall purpose of this report is to determine whether these alternate floor systems could be utilized in an overall redesign of the structure.

The River Tower, standing at 25 stories in this design configuration, has since been redesigned for value engineering. In the actual redesign, the structural engineer considered a composite steel/braced frame system, a girder-slab proprietary system, and a filigree proprietary system. With this in mind, I have considered two forms of steel framed systems, both non-composite and composite, in this preliminary report. Girder-slab systems were researched, but only a suitable hollow core slab was found, not a composite system. As a proprietary system, a filigree system proved more difficult to research, and has not been considered in this preliminary report. Instead, I have investigated the use of one-way concrete joists as another alternate floor system. Finally, I have examined the use of a two-way flat plate reinforced concrete slab, without post-tensioning. Without the pre-stressing of the original configuration, drop panels were needed in this alternate reinforced concrete slab system at each column location.

The steel framing systems each significantly provide a lighter overall building weight, but sacrifice floor-to-floor height by several inches per floor. This would ordinarily be a deciding factor, had the River Tower design team not already acquired a code provision for building height from the city of Wilmington, DE. Other factors not considered in the scope of this preliminary report are column sizing and connections. The current architectural layout does not offer many viable options for column layouts, so the original grid lines were kept in order to fully compare each alternative system. Ultimately, the non-composite steel framing and non-prestressed two-way flat plate did not offer significantly different results than their counterparts, the composite steel framing and post-tensioned flat plate slab. The one-way concrete joist system proved too expensive and too deep to warrant further research. The composite steel framing system and hollow-core slab system will be scrutinized in more detail for upcoming technical assignments.