Breadth – Construction Management

Cost Analysis

The cost analysis of each system was done by making detailed take offs of members and materials in each design and comparing the total structural systems costs based on labor, material, and equipment. MC^2 Ice software was used to estimate the costs for each structural system.

Existing Steel System	
Labor	$6,408,362
Material	$975,741
Equipment	$109,651
Total	**$7,493,754**
New PT Concrete System	
Labor	$1,844,563
Material	$1,650,612
Equipment	$42,550
Total	**$3,537,725**

Concrete - Total Savings / Loss	
Labor	$4,563,799
Material	($674,871)
Equipment	$67,101
Total	**$3,956,029**

Table F.20 – Cost Comparison

This cost comparison does not include the additions that will take place to the foundations system due to the proposed concrete systems. With additional foundation info the system costs would be within approximately $1.5 million.

The difference in labor costs can be directly related to the number of structural elements that need to be placed. Another impact to labor cost id the steel system requires a significantly larger build team made up of highly trained workers for the erection process. Concrete system does not require as large a labor force.

The high material costs in the concrete can be directly associated to the cost of the formwork. The formwork makes up 65% of the costs of the concrete system. Material costs for the concrete was also slightly adjusted to make up for the fact that the estimating software does not contain data for the required strength of concrete needed for the post-tensioned beams. The adjustment made was adding and additional 20% of concrete material.

Schedule

The scheduling was done using Microsoft project and was only done for the superstructure of each system. The existing composite steel construction was scheduled to be completed in 73 days with a 30 day lead time for fabrication and delivery of steel. The proposed concrete was scheduled to be completed in approximately 262 days allowing for concrete curing time and staged jacking of the post tension cables. If the projects started structural construction 4/11/07 the concrete would be finished almost 1 year from now if no work is done on Saturday and Sunday. The composite steel system would finish on 7/20/07.

Additional concerns created by the concrete schedule would be the need to employ the use of heaters during the placing of concrete during winter months as well as provide protection from the cold for curing concrete. These issues will also have impact on the total system costs that were not included in the previous estimate.

Constructability

Both systems provide unique challenges during construction however the Steel system itself will be the easier system to construct.

The sloping columns will pose significant issues for the concrete system as each portion of the column will have to be shored until the interior concrete beams and slabs have cured to a sufficient strength to hold and transfer the load from the sloped column to the interior columns. In the steel system a second crane which most likely will already be on site to assist with construction would be used to hold the column in place while another crane lifts the intermediate beam in place. The second crane will immediately be able to release the column as the steel beam and connecting interior column will have been design to adequate strength for construction.

Also the jacking of the post-tensioning in the concrete system will need to be monitored by on site inspectors and engineers to ensure that to much or not enough force is applied to the tendons.

The complexity of the placement of the post-tensioned strands will provide some issues. The position of the strands will need to be checked by on site engineers to be sure they are with in allowable tolerances.