Richard B. Fisher Middle School Building
The William Penn Charter School
Philadelphia, PA

Analysis 1 – Redesign of the Structural System

The structural system that was used in the middle school was load bearing concrete masonry units with steel joists bearing on them. These load-bearing walls were located in the basement, on the first floor and on the second floor. There was a minimal amount of structural steel framing used on the project. On the top of the building there was wood trusses used to frame the roof. The basement foundation consisted of concrete spread footings under columns and continuous spread footings under the CMU walls. The basement floor was slab on grade and the rest of the floors were slab on metal deck.

I propose to look into a structural system that doesn't cause construction sequencing problems such as the actual system does. The actual system's sequencing follows this pattern repeated from the basement to the top of the second floor:

1. Install concrete masonry units
2. Install bond beam
3. Install bearing plate
4. Set steel trusses
5. Lay concrete decking
6. Pour concrete slab on deck

When looking at the schedule by trades you can easily notice the problem caused by the original system. There are time gaps between trade's activities that they are performing on the job. The masons, steel erectors, and concrete contractor were the most effected by the system. Some of the issues were:

- Masons needed to complete their work before the steel trusses could be erected
- During erection of the steel trusses there was no masonry work able to be performed
- Once steel decking was completed and concrete poured, the masons could begin on the next floor
- Steel erectors and concrete contractors were then waiting for the masons to complete the block work up to the next floor level

I will look into developing the design into a primarily steel building or a Cast in Place Concrete building. This will allow me to show the schedule and cost impact by permitting the construction to develop a flow throughout the erection of the structure. Then the options can be compared to see if the original system was the best alternative for this particular project.

Changing the structure will change many aspects of the project. One aspect I will look into is the type of interior wall systems used. Since the majority of the walls **were designed to be CMU with framing and drywall**, acoustical noises would not carry through the walls easily. The drywall used was an abuse resistant gypsum wall board. Some walls were framed with metal studs and drywall with acoustical insulation. Since the structure would no longer require load bearing CMU in the redesign, most of the interior walls could be framed and filled with acoustical insulation to address the noise criteria. Using the concrete block as a partition without GWB is not an option because of the high quality level of finishes required by the owner.

One headache during construction was the working space in the attic trusses. The trusses in the building were designed to be wood trusses. Steel trusses in this area would be as

effective and could create much more space to maneuver around during construction and after construction for any necessary maintenance. I propose to replace the wooden roof trusses with steel roof trusses. All of the trusses would be substituted for steel except the **exposed** heavy wooden timbers and trusses. They should remain untouched as they serve as in integral part of the exposed architecture in the building. They create much more open spaces in the entrance and the commons area with the natural look of the timber and it helps to meet the owner's needs for an aesthetically pleasing building.

Analysis 2 – ***Site Renovation Planning***

During the first 3 months of the project the main focus of the owner and contractor was not on the building, but on the site renovations that needed to be completed before the start of the 2001 school year. During the summer of 2001 the construction on the 45-acre site was hectic and fast paced. Some conflicts arose between the owner and the contractor because a well-defined plan was not communicated to the owner and agreed upon prior to the start of the contract. Therefore, I want to look into a means to communicate to the owner as well as other major players in this summer construction a plan that is clear and that will dictate the events of the summer. Some areas that I want to look into concerning the site construction are:

- Creating a schedule that creates flow throughout the campus while meeting the owner's requirements for access (day camps, teacher and administrative access)

- Well defined site plan that dictates lay down areas for sewer pipes, catch basins, manhole structures
- Create a site access plan to communicate to the subcontractors that shows activities on going throughout the site and how it affects their access for equipment and materials. A plan should be generated to show how the project site would look throughout the duration of the summer.
- Come up with a mutually agreed upon plan between the owner and contractor on access to certain areas of the site and at what dates
- Look into putting delay clauses in the subcontracts to discourage them from not staffing the job with the manpower that they promised
- Use 2.5 CAD as a tool to communicate all of the concerns listed above

Analysis 3 – *2.5D CAD Applications*

I would like to look into the opportunity to use 2.5D CAD as a tool to help analyze the site construction that took place in the summer of 2001. This will allow me to communicate the construction plan to the owner and subcontractors visibly through easy to understand sequential CAD drawings. Looking at this case study, I will be able to identify the benefits of this technology to the owner and the benefits to the contractor. 2.5D CAD will help to communicate the following:

- No access areas to the owner and when they will not be available
- Numerous lay down areas for underground piping and structures
- Site access plan that will show how subcontractors, school staff, visitors, and camp attendees will access the site
- Owner's needs for the site throughout the summer, and to be certain that they will be met before any major conflicts arise during construction

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Proposed Weight Matrix

	Value Engineering Analysis	*Constructability Review*	*Schedule Reduction / Acceleration Proposal*	*Research or Developing Methods Study*	*Systems Engineering / Integration*
Analysis 1	10	10	10		15
Analysis 2		35			
Analysis 3		5		15	
Totals	10	50	10	15	15
				Total	100%