Breadth: Construction Management

Construction management is an important part of the engineering of a building. While construction management has many items to take into consideration, I have decided to concentrate on three aspects; site layout, cost, and scheduling.

Site Layout:

Due to its location in downtown Washington D.C., site layout is very important for Lexington II. The site must accommodate site offices, trailers, cranes, and lay down areas as well as circulation paths around the site and maintain a safe work area. As in the original design of Lexington II, concrete buildings allow for a clearer site by eliminating the need for a crane and lay down area.

For my steel design of Lexington II, a crane will be needed for erection. The most logical type of crane for placement of steel would be a moving crawler crane. This crane can be located to the east of the building and move north to south depending on the stage of steel construction. To reach all areas of the building, the crane must reach a radius of 75'.

A unique feature of the Market Square North complex is that at the time of construction there was an open area in the center along Eighth Street. This open area allows space for offices, storage, lay down areas, parking, sanitary facilities and other necessary accompaniments.

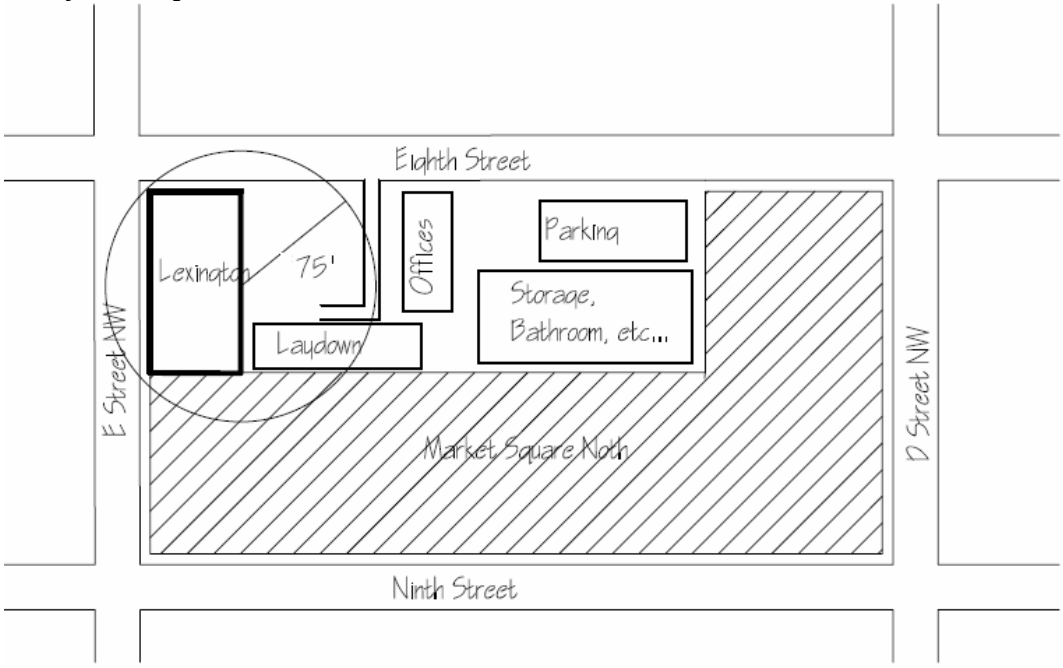

Figure 33
Site Layout

Cost:

Cost is always an important part of any building project. Cost is usually the determining factor to decide if a building will be a profitable venture to invest in. Steel and concrete buildings often differ greatly in cost. Besides accounting for material costs, concrete buildings require formwork, rebar, finishes, and accessories such as ties and chairs. Steel buildings also have many additional costs, usually caused by expensive labor intensive connections.

For a cost analysis on Lexington II, the R.S. Means Construction Estimating Guide was used. Each stage of the building was analyzed separately and added to find the total cost of the building materials, labor, and equipment. To simplify the analysis, many small items such as concrete accessories were not included. The façade and finishes of the building were also not included because these items will remain unchanged between a concrete and steel design.

Steel Design Cost:[1]

Excavation:[2]	$23,600
Foundation:	$159,000
Sub Grade Levels:[3]	$741,200
Steel Levels:[4]	$467,200
Braced Frames:	$156,400
Connections:	$51,300
Total:	**$1,455,600**

Concrete Design Cost:[1]

Excavation:[2]	$23,600
Foundation:	$159,000
Sub Grade Floors:	$671,000
Super Structure Floors:	$154,000
Columns:	$395,000
Shear Walls:	$123,900
Total:	**$1,526,000**

These totals seem reasonable. Steel is generally considered a cheaper material; however this concept is based on the economy of larger construction projects. For steel building projects, the cost of steel connections may be expensive. For a building the size of Lexington II the conclusion that there is no large price difference between a steel and concrete building is appropriate.

[1] All cast in place concrete costs from RS Means includes formwork, reinforcing steel, and finishes. Concrete costs have also been adjusted for 10% waste. Steel costs are as written in RS Mean and do not include any adjustment factors since over 99 tons of steel are in the building.
[2] Includes equipment, sheathing, and hauling costs
[3] Includes joist floor, grade walls, columns, and shear walls
[4] Includes composite decking, slab, shear studs, beams, and columns

Scheduling:

Scheduling is another important issue dealt with by the construction manager. The time it takes to erect a building can greatly affect the cost. An inefficient schedule can cause major setbacks in the construction of a building, and employing workers and equipment before they are needed is a great waste of capital.

To schedule Lexington II's construction, each stage of construction was looked at individually to ensure its completion before the next phase of construction began. Multiple crews were employed when needed and to limit certain tasks, such as pouring concrete, to a single day. The schedule is as follows:

Excavation:

Level 1- Backhoe (B-12A) ½ day
-Wood Sheathing (3 B-31) ½ day
-Hauling (4 trucks) 1 day
-Wood Sheathing (3 B-31) 3 days

Level 2- Backhoe (B-12A) ½ day
-Wood Sheathing (3 B-31) ½ day
-Hauling (4 trucks) 1 day
-Wood Sheathing (3 B-31) 3 days

Level 3- Backhoe (B-12A) ½ day
-Wood Sheathing (3 B-31) ½ day
-Hauling (4 trucks) 1 day
-Wood Sheathing (3 B-31) 3 days

Item Time: 12 days **Total Work Weeks: 2.4**

Foundation:

-Cast in Place, MAT (12 C-14C) 1 day
-Concrete Curing 4 days

Item Time: 5 days[5] **Total Work Weeks: 3**

[5] If building construction begins on a Monday, the final two curing days can be Saturday and Sunday, therefore these 2 curing days are no included in the work week schedule.

Sub-Grade Levels:

Level 3-Cast in Place, Columns (1 C-14A) 1.1 day
-Cast in Place, Grade Wall (1 C-14D) 2 days
-Cast in Place, Shear Wall (1 C-14D) 1/2 day
-Cast in Place, One Way Joist (2 C-14B) 5 days
-Concrete Curing 4 days

Level 2-Cast in Place, Columns (1 C-14A) 1.1 day
-Cast in Place, Grade Wall (1 C-14D) 2 days
-Cast in Place, Shear Wall (1 C-14D) 1/2 day
-Cast in Place, One Way Joist (2 C-14B) 5 days
-Concrete Curing 4 days

Level 1-Cast in Place, Columns (1 C-14A) 1.1 day
-Cast in Place, Grade Wall (1 C-14D) 2 days
-Cast in Place, Shear Wall (1 C-14D) 1/2 day
-Cast in Place, One Way Joist (2 C-14B) 5 days
-Concrete Curing 4 days

Item Time: 11 days/ floor
33 days **Total Work Weeks: 9.2**

Super Structure:[6]

-Level 1: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 1: Structural Steel Beams, (1 E-2) 1 day
-Level 1: Composite Deck, (1 E-4) 2 days
-Level 2: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 2: Structural Steel Beams, (1 E-2) 1 day
-Level 2: Composite Deck, (1 E-4) 2 days
-Level 3: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 3: Structural Steel Beams, (1 E-2) 1 day
-Level 3: Composite Deck, (1 E-4) 2 days
-Level 4: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 4: Structural Steel Beams, (1 E-2) 1 day
-Level 1: Slab,(1 C-8) 1 day
-Level 4: Composite Deck, (1 E-4) 2 days
-Level 1: Slab, (1 C-8) 1 day
-Level 1: Concrete Curing, 1 day
-Level 5: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 5: Structural Steel Beams, (1 E-2) 1 day
-Level 2: Slab, (1 C-8) 1 day
-Level 1: Concrete Curing, 1 day
-Level 5: Composite Deck, (1 E-4) 2 days
-Level 2: Slab, (1 C-8) 1 day

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[6] Each level is built in the sequence of 1 day for columns and beams and 2 days for deck, and then the next level is started. The slabs were poured once the beam, column, and deck construction was a full 3 stories ahead.

-Level 1: Concrete Curing, 3 day
-Level 6: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 6: Structural Steel Beams, (1 E-2) 1 day
-Level 3: Slab,(1 C-8) 1 day
-Level 2: Concrete Curing, 1 day
-Level 6: Composite Deck, (1 E-4) 2 days
-Level 3: Slab, (1 C-8) 1 day
-Level 7: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 7: Structural Steel Beams, (1 E-2) 1 day
-Level 4: Slab, (1 C-8) 1 day
-Level 3: Concrete Curing, 1 day
-Level 7: Composite Deck, (1 E-4) 2 days
-Level 4: Slab, (1 C-8) 1 day
-Level 4: Concrete Curing, 1 day
-Level 8: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 8: Structural Steel Beams, (1 E-2) 1 day
-Level 5: Slab,(1 C-8) 1 day
-Level 4: Concrete Curing, 1 day
-Level 8: Composite Deck, (1 E-4) 2 days
-Level 5: Slab, (1 C-8) 1 day
-Level 4: Concrete Curing, 2 days
-Level 5: Concrete Curing, 3 days
-Level 9: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 9: Structural Steel Beams, (1 E-2) 1 day
-Level 6: Slab, (1 C-8) 1 day
-Level 5: Concrete Curing, 1 day
-Level 9: Composite Deck, (1 E-4) 2 days
-Level 6: Slab, (1 C-8) 1 day
-Level 6: Concrete Curing, 1 day
-Level 10: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 10: Structural Steel Beams, (1 E-2) 1 day
-Level 7: Slab,(1 C-8) 1 day
-Level 6: Concrete Curing, 1 day
-Level 10: Composite Deck, (1 E-4) 2 days
-Level 7: Slab, (1 C-8) 1 day
-Level 6: Concrete Curing, 2 days
-Level 7: Concrete Curing, 3 days
-Level 11: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 11: Structural Steel Beams, (1 E-2) 1 day
-Level 8: Slab, (1 C-8) 1 day
-Level 7: Concrete Curing, 1 day
-Level 11: Composite Deck, (1 E-4) 2 days
-Level 8: Slab, (1 C-8) 1 day
-Level 8: Concrete Curing, 1 day
-Level 12: Structural Steel Columns, (E-2 or E-5)1/2 day
-Level 12: Structural Steel Beams, (1 E-2) 1 day

-Level 9: Slab,(1 C-8) 1 day
-Level 8: Concrete Curing, 3 day
-Level 12: Composite Deck, (1 E-4) 2 days
-Level 9: Slab, (1 C-8) 1 day
-Level 9: Concrete Curing, (1 C-8) 1 day
-Level 10: Slab, (1 C-8) 2 days
-Level 9: Concrete Curing, 2 days
-Level 11: Slab, (1 C-8) 2 days
-Level 10: Concrete Curing, 2 days
-Level 9: Concrete Curing, 1 day
-Level 12: Slab, (1 C-8) 2 days
-Level 11: Concrete Curing, 2 days
-Level 10: Concrete Curing, 2 days
-Level 12: Concrete Curing, 4 days
-Level 11: Concrete Curing, 2 days

Item Time: 45 days **Total Work Weeks: 18**

The complete structural system of Lexington II will take 18 five day work weeks to complete. This time does not include interior construction, finishes, or façade.