Aric Heffelfinger
Fordham Place
Bronx, NY
Structural Option
Advisor - Dr. Hanagan

Breadth Work

Construction Management / Cost Analysis

Both time and durations were compared for each of the composite steel and entire concrete structure. While the cost of the concrete and composite steel superstructures were comparable, the duration of the all concrete building needed nearly double the time as the composite steel. The total cost of each building is as follows:

All concrete = $2.42 Million

Composite Steel = $1.74 Million

Yielding a difference of 2.42 - 1.74 = $0.68 = $680,000. However these numbers are only taken from the differences that would between composite steel and all concrete building; and do not include the entire building. They are basically the superstructures of each building; columns, floor slabs, and lateral resisting systems. However material, labor, and equipment cost were taken into account for the entire superstructure. The material costs of the two structures were almost exactly the same, which means the labor costs of the concrete structure was a significant amount more. This can be seen in the following two tables.

ARIC HEFFELFINGER
FORDHAM PLACE
BRONX, NY
STRUCTURAL OPTION
ADVISOR - DR. HANAGAN

Estimate Detail - Manhours - Standard Construction Project

Detail - Without Taxes and Insurance

Estimator :
Project Size : sqft

ItemCode	Description	Quantity	UM	Crew	MH/Unit	Lab.Unit	Mat.Unit	Eqp.Unit	Sub.Unit	Lab.Total	Mat.Total	Eqp.Total	Sub.Total	Tot.UnitCost	TotalCost
03220.010	6x6 W1.4/W1.4 MESH	1,873.87	SQS	C320	0.80	18.8640	8.200			35,348.72	15,365.75			27.064	50,714.47
03311.700	**CONC IN SLAB OVER MTL DECK**		****												
03311.726	4000 PSI W/CRANE	2,366.00	CUYD	C230	0.576	13.9420	56.000			32,986.77	132,496.00			69.942	165,482.77
03315.991	* SLAB OVER METAL DECK AREA *	170,352.00	SQFT												
05129.101	STEEL BEAMS		****												
05129.102	I BEAMS	705.60	CWT	C510	0.90	28.7300	35.000	5.000		20,271.89	24,696.00	3,528.00		68.730	48,495.89
05129.121	STEEL COLUMNS		****												
05129.122	I SHAPES	4,003.22	CWT	C510	0.90	28.7300	35.000	5.000		115,012.51	140,112.70	20,016.10		68.730	275,141.31
05129.181	BRACING		****												
05129.182	I BEAMS	4,564.63	CWT	C510	1.20	38.3067	35.000	5.000		174,855.76	159,761.91	22,823.13		78.307	357,440.80
05129.304	ASTM A572 50 KSI STEEL ADDER	4,003.22	CWT												
05129.310	TYPE B STEEL ADDER	4,564.63	CWT												
05129.404	SHEAR STUD, 3/4"	72.00	EACH	C509	0.01714	0.5434	0.717	0.300		39.12	51.61	21.60		1.560	112.33
05129.990	* STRUCTURAL STEEL WEIGHT *	463.67	TONS												
05129.101	STEEL BEAMS		****												
05129.102	I BEAMS	8,593.36	CWT	C510	0.90	28.7300	35.000	5.000		246,887.23	300,767.60	42,966.80		68.730	590,621.63
05129.404	SHEAR STUD, 3/4"	1,173.00	EACH	C509	0.01714	0.5434	0.717	0.300		637.41	840.81	351.90		1.560	1,830.11
05129.990	* STRUCTURAL STEEL WEIGHT *	429.67	TONS												
05310.019	3" METAL DECK	170,352.00	SQFT	C510	0.01393	0.4445	1.011			75,721.46	172,259.94			1.456	247,981.41
	Total Estimate									$701,761	$946,352	$89,708			$1,737,821

Estimate Detail - Manhours - Standard Construction Project

Detail - Without Taxes and Insurance

Estimator :
Project Size : sqft

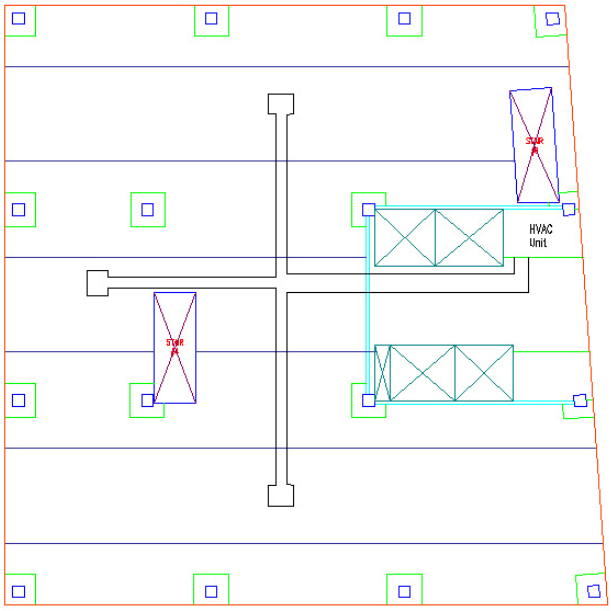
ItemCode	Description	Quantity	UM	Crew	MH/Unit	Lab.Unit	Mat.Unit	Eqp.Unit	Sub.Unit	Lab.Total	Mat.Total	Eqp.Total	Sub.Total	Tot.UnitCost	TotalCost
03111.118	WALL FORM 20'+ HIGH	72,912.00	SQFT	C311	0.14795	3.8747	1.600			282,512.13	116,673.78			5.475	399,185.91
03111.189	WALL FORM HARDWARE	36,456.00	SQFT				0.102				3,733.09			0.102	3,733.09
03111.203	WOOD COLUMN FORMS, 12'-16'	44,165.33	SQFT	C311	0.044	1.1524	1.227			50,896.13	54,182.03			2.379	105,078.16
03111.612	SLAB FORM W/2.6 BM/SF	176,587.00	SQFT	C311	0.0969	2.5380	1.263			448,177.81	223,047.04			3.801	671,224.85
03150.900	FORM RELEASING AGENT	117,077.33	SQFT	C311	0.008	0.2095	0.023			24,527.70	2,692.78			0.233	27,220.48
03150.650	SCREEDS FOR SLAB	21,190.44	LNFT	C311	0.0352	0.9219	0.320			19,535.47	6,780.94			1.242	26,316.41
03150.900	FORM RELEASING AGENT	176,587.00	SQFT	C311	0.008	0.2095	0.023			36,994.98	4,061.50			0.233	41,056.48
03210.150	COLUMN REBAR	3,322.62	CWT	C321	0.77778	24.7222	26.750			82,142.56	88,880.18			51.472	171,022.74
03210.130	SUPPORTED SLAB REBAR	5,886.23	CWT	C321	1.01818	32.3636	26.750			190,499.70	157,456.74			59.114	347,956.44
03310.550	**CONCRETE IN WALLS**		****												
03310.576	4000 PSI W/CRANE	1,350.22	CUYD	C230	0.68571	16.5977	56.000			22,410.58	75,612.44			72.598	98,023.03
03310.650	**CONCRETE IN COLUMNS**		****												
03310.676	4000 PSI W/CRANE	886.03	CUYD	C230	0.90	21.7845	56.000			19,301.78	49,617.84			77.785	68,919.63
03315.982	* CONCRETE WALL AREA *	36,456.00	SQFT												
03315.984	* NO. OF COLUMNS *	392.00	EACH												
03311.500	**CONC IN SUPPORTED SLAB**		****												
03311.526	4000 PSI W/CRANE	4,905.19	CUYD	C230	0.576	13.9420	56.000			68,388.22	274,690.89			69.942	343,079.11
03315.986	* SUPPORTED SLAB AREA *	176,587.00	SQFT												
03350.131	POINT & PATCH	117,077.33	SQFT	C276	0.00427	0.1102	0.013			12,901.92	1,498.59			0.123	14,400.51
03350.130	MACHINE TROWEL FINISH	176,587.00	SQFT	C276	0.0128	0.3304				58,344.34				0.330	58,344.34
03350.131	POINT & PATCH	176,587.00	SQFT	C276	0.00427	0.1102	0.013			19,459.89	2,260.31			0.123	21,720.20
03390.010	PROTECT & CURE	176,587.00	SQFT	C276	0.00427	0.1102	0.019			19,459.89	3,390.47			0.129	22,850.36
	Total Estimate									$1,355,553	$1,064,579				$2,420,132

With this said, it was no surprise to see that the concrete structure took almost twice as long as the composite steel structure. The composite steel structure needs structural steel crews, concrete crew, wire mesh, and miscellaneous steel crew. Because the steel erectors can work as fast as they can, there will be 2 crews to speed up the project. The total duration of the composite steel building is 40.2 calendar weeks. For the all concrete structure, formwork crews, reinforcing steel crews, concrete crew, and a finishing crew are needed. Since there is a tremendous amount of formwork to be place, there will be five formwork crews. There will also be two concrete and reinforcing steel crews. Even with all these crews, the total duration of the concrete superstructure is 78.3 weeks. A complete set of descriptions and calculations for both superstructures are in the appendix.

Mechanical / Duct Work Reroute

After reviewing the duct work and HVAC plans, the HVAC units and duct work routes were still sufficient. However, there is a better solution. Because a concrete floor system does not work well with large openings in the slab, one HVAC unit serving multiple floors is not a great idea. Therefore the new design will employ a single HVAC unit for each floor, eliminating the need for large duct work both through the floors and throughout each floor level. Having only one HVAC unit per floor gives you, the owner, the ability to rent each floor out to different tenants while keeping their utilities separated. The disadvantage to having an HVAC unit on each floor is that you need to have a place to store each unit on each floor, taking away from valuable square feet of floor space. Whereas with a single unit serving every couple floors, one can be put on the rooftop, one in the basement, and as they are needed throughout the building. With a composite steel building, the single unit serving multiple floors is a better option, but with a concrete system, it eliminates the need for very detailed engineering of floor slabs by using a single unit for each floor. The duct work for the new systems will be 20” wide x 6” deep and then decreases to 12 x 6 when it branches off. This may seem a little large however; it is only six inches deep. The large area that the air will travel through will also reduce the need to “force”

air through the duct work and in turn reduce noise produced by the airflow. An example of the duct work routes can be seen in the following diagram.



Diffusers also can be located at the end of the duct work. The large diffuser size of 36” x 42” also permits air to flow at a slower rate; reducing both noise and the sensation of sitting just below an air conditioner.