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 = \$6\$0,000. 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.

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Estimate Detail - Manhours - Standard Construction Project

Estimator : Project Size : sqft

Quantity UM	Crew	MH/Unit	Lab.Unit	Mat.Unit	Eap.Unit	Sub.Unit	Lab.Total	Mat Total	Fon Total	Sub Total Tot InitCost	TotalCost	
									10000	POOLUTION INTERNATION	1000000	
1,873.87 SQS	C320	0.80	18.8640	8 200			35,348.72	15,365.75		27.064	50,714.47	
	-											
170 353 00 505	L C230	0.070	13.9420	56.000			32,986.77	132,496.00		69.942	165,482.77	
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	
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	
4,564.63 CWT	C510	1.20	38.3067	35 000	5 000		174 855 76	150 761 01	22 822 13	702 977	367 440 00	
4,003.22 CWT							1. 10001.0	100,101,01	FF, 020, 10	10.001	001,1440.00	
4,564.63 CWT												
72.00 EACH	4 C509	0.01714	0.5434	0.717	0.300		39.12	51 61	21 60	1 580	112 33	
463.67 TON:	S										112.00	
:												
8,593.36 CWT	C510	0.90	28.7300	35.000	5.000		246.887.23	300 767 60	42 966 80	68 730	500 621 63	
1,173.00 EACH	4 C509	0.01714	0.5434	0.717	0.300		637 41	840 81	351 90	1 500	1 820 11	
429.67 TON:	0											
170,352.00 SQF	F C510	0.01393	0.4445	1.011			75 721 46	172 259 94		1 475	247 081 41	
							\$701.761	\$946 352	\$89 708	1.100	21 737 831	
	Quantity UM 1.873 87 SOS 2.360 CUY1 170.352.00 SOC 705.60 CUY1 4.564.55 CW/T 4.564.55 CW/T 4.564.55 CW/T 4.564.55 CW/T 4.564.55 CW/T 4.564.55 CW/T 4.564.55 CW/T 4.564.55 CW/T 1.173.50 EACI 1.173.50 EACI 1.175.50 EACI 1.175.50 EACI 1.175.50 EACI	Quantity UM Crew 1.873.87 SQS C320 2.366.00 CUYD C320 170.362.00 SQFT C510 4.003.22 CWT C510 4.564.63 CWT C510 4.563.67 TCNH C509 4.593.07 EACH C509 1.173.00 EACH C519 1.292.67 TONH C519 1.173.00 EACH C519 1.173.00 SAFT C510 1.173.00 SAFT C510 1.173.00 SAFT C510	Quantity UM Crew MHQLnit 1.873 87 SQS C320 0.80 2.36600 CUYD C330 0.576 170.35200 SQFT C510 0.90 4.003.22 CWT C510 0.90 4.644.53 CWT C510 1.20 4.644.53 CWT C510 1.20 4.644.53 CWT C509 0.01714 4.534.51 TCXD C509 0.01714 5.533.53 CWT C510 0.90 1.73.052.00 SQFT C510 0.01374 1.73.352.00 SQFT C510 0.01333	Quantity UM Crew MH/Unit Lab.Unit 1.873 87 SQS C320 0.80 18.8640 2.3600 CUVF C320 0.576 13.9420 170.352.00 SQFT C510 0.90 28.7300 4003.22 CWT C510 0.90 28.7300 4564.63 CWT C510 1.20 38.3067 4.664.63 CWT C510 1.20 38.3067 4.564.63 CWT C510 0.01714 0.5434 4.534.57 TOXE C509 0.01714 0.5434 8.593.38 CWT C510 0.992 28.7300 1.173.00 EACH C509 0.01714 0.5434 43547 TOXE C510 0.992 28.7300 1.93267 DACH C509 0.01714 0.5434 43547 TOXE C510 0.01393 0.4445	Quantify UM Crew MHUnit Lab.Unit Mat.Unit 187387 SQS C320 0.80 18.8640 8.200 2.366.00 CUYD C330 0.576 13.9420 56.000 170.352.01 SQFT C510 0.90 28.7300 35.000 4003.22 CWT C510 0.90 28.7300 35.000 4003.22 CWT C510 1.20 38.3967 35.000 4003.22 CWT C510 1.20 38.3967 35.000 4564.53 CWT C510 0.01714 0.5434 0.717 4564.53 CWT C510 0.99 28.7300 35.000 4.564.53 CWT C510 0.01714 0.5434 0.717 8.593.35 CWT C510 0.01393 0.4445 1.011 1770.352.00 S0FT C510 0.01393 0.4445 1.011	Quantify UM Crew MH/Unit Lab.Unit Mat.Unit Exp.Unit 1873.07 SLS C320 0.80 18.864.0 8.200 72.366.00 CHYD C330 0.576 13.942.0 56.000 70.52.02 SLS C450 0.90 28.7300 35.000 5.000 4003.22 CWT C510 0.90 28.7300 35.000 5.000 4564.52 CWT C510 1.20 38.3067 35.000 5.000 4564.52 CWT C510 1.20 38.3067 35.000 5.000 4564.53 CWT C510 0.01714 0.5434 0.717 0.300 4564.53 CWT C510 0.01393 0.4445 1.011 1.011	Quantify UM Crew MHUnit Lab.Unit Mat.Unit Exp.Unit Sub.Unit Sub.Uni	Quantify UM Crew MH/Unit Lab.Unit Mat.Unit Exp.Unit Sub.Unit Lab. Total 1873.87 SS5 C320 0.80 18.8640 8.200 35.348.72 35.348.72 2.386.00 CUVD C30 0.576 13.9420 56.000 20.271.89 32.986.77 70.852.00 SUVT C510 0.90 28.7300 35.000 5.000 20.271.89 4.003.22 CWT C510 0.90 28.7300 35.000 5.000 115.012.51 4.564.32 CWT C510 1.20 38.3957 35.000 5.000 174.665.76 4.564.32 CWT C510 0.01714 0.5434 0.717 0.300 39.12 4.564.32 CWT C510 0.90 28.720 35.000 39.12 4.595.07 C459 0.01714 0.5434 0.717 0.300 246.867 23 1.173.92 C459 0.01714 0.5434 0.717 5.000 246	Quantify VM Crew MH/Unit Lab.Unit Mat.Unit Exp.Unit Sub. Unit Mat. Total Mat. Total 1873.07 SSS C320 0.80 18.8640 8.200 35.348.72 15.365.75 72.366.00 CUVP C330 0.576 13.9420 56.000 20.217.89 24.866.00 705.60 CUVP C510 0.90 28.7300 35.000 5.000 20.217.189 24.866.00 4003.22 CUVP C510 0.90 28.7300 35.000 5.000 115.012.51 140.112.70 4564.53 CUVP C510 1.20 38.3967 35.000 5.000 174.865.76 159.761.91 4.564.53 CUVP C510 0.017.14 0.5434 0.717 0.300 39.12 5.161 4.563.5 CUVP C510 0.019.92 28.720 35.000 5.000 24.686.72 390.767.60 5.161 4.563.5 CUVP C510 0.019.93 0.4445 <t< td=""><td>Quantify IM Crew HHUnit Lab.Unit Kat.Unit Eab.Unit Stab.Unit Lab. Total Mat.Total Eab. Total 1873.67 SS. C320 0.80 18.8640 8.200 35.348.72 15.365.75 15.365.75 32.966.00 32.967.00 39.000 50.000 17.485.76 459.761.40 22.823.13 459.761.40 22.823.13 459.761.40 22.863.00 21.60 23.966.00 21.60 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00</td><td></td><td></td></t<>	Quantify IM Crew HHUnit Lab.Unit Kat.Unit Eab.Unit Stab.Unit Lab. Total Mat.Total Eab. Total 1873.67 SS. C320 0.80 18.8640 8.200 35.348.72 15.365.75 15.365.75 32.966.00 32.967.00 39.000 50.000 17.485.76 459.761.40 22.823.13 459.761.40 22.823.13 459.761.40 22.863.00 21.60 23.966.00 21.60 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00 23.966.00		

Estimate Detail - Manhours - Standard Construction Project

Detail - Without Taxes and Insura Estimator : Project Size : sqft

I OTAL ESTIMATE	The PROTECT & CURE	U3350.131 POINT & PATCH	03350.130 MACHINE TROWEL FINISH	03350.131 POINT & PATCH	03315.986 * SUPPORTED SLAB AREA *	03311.526 4000 PSI WICRANE	03311.500 **CONC IN SUPPORTED SLAB**	03315.984 * NO. OF COLUMNS *	03315.982 CONCRETE WALL AREA *	03310.676 4000 PSI W/CRANE	03310.650 **CONCRETE IN COLUMNS**	03310.576 4000 PSI W/CRANE	03310.550 **CONCRETE IN WALLS**	03210.130 SUPPORTED SLAB REBAR	03210.150 COLUMN REBAR	03150.900 FORM RELEASING AGENT	03150.650 SCREEDS FOR SLAB	03150.900 FORM RELEASING AGENT	03111.612 SLAB FORM W/2.6 BM/SF	03111.203 WOOD COLUMN FORMS, 12'-16'	US111.189 WALL FORM HARDWARE	03111.118 WALL FORM 20'+ HIGH	ItemCode Description
	1/6,58/.00 SUFT	176,587.00 SQFT	176,587.00 SQFT	117,077.33 SQFT	176,587.00 SQFT	4.905.19 CUYD	1	392.00 EACH	36,456.00 SQFT	886.03 CUYD		1,350.22 CUYD		5,886.23 CWT	3,322.62 CWT	176,587.00 SQFT	21,190.44 LNFT	117.077.33 SQFT	176,587.00 SQFT	44,165.33 SQFT	36,456.00 SQFT	72,912.00 SQFT	Quantity UM
	C2/6	C276	C276	C276		C230				C230		C230		C321	C321	C311	C311	C311	C311	C311		C311	Crew
	0.00427	0.00427	0.0128	0.00427		0.576				0.90		0.68571		1.01818	0.77778	0.008	0.0352	0.008	0.0969	0.044		0.14795	MH/Unit
	0.1102	0.1102	0.3304	0.1102		13 9420				21.7845		16.5977		32 3636	24.7222	0.2095	0.9219	0.2095	2.5380	1.1524		3.8747	Lab.Unit
	0.019	0.013		0.013		56 000				56.000		56,000	Contraction of the second s	26.750	26.750	0.023	0.320	0.023	1.263	1.227	0.102	1.600	Mat.Unit
																							Eqp.Unit
																							Sub.Unit
\$1,355,553	19,459.89	19,459.89	58,344.34	12,901.92	00,000,00	CC ARF AR				19 301 78		22 410 58		190 499 70	82,142.56	36,994.98	19,535.47	24,527.70	448,177.81	50,896,13		282,512.13	Lab, Total
\$1,064,579	3,390.47	2,260.31		1,498.59	ETT.000.00	274 RON 80				49 617 84		75 612 44		157 456 74	88,880,18	4,061.50	6,780.94	2.692.78	223,047.04	54,182.03	3,733.09	116,673.78	Mat.Total
																							Eqp.Total
	0.129	0.123	0.330	0.123	246.60	6003				77 785		70 50R		50 114	51 472	0.233	1 242	0 233	3.801	2 379	0.102	5.475	Sub.Total Tot.UnitCost
\$2,420,132	22,850,36	21,720.20	58.344.34	14.400.51	343,073,11	343 070 44			00,010,000	RR 010 R3	00,020,00	98 022 02	11,000,110	347 056 44	171 022 74	41.056.48	26.316.41	27 220 48	671 224 85	105.078.16	3.733.09	399, 185.91	TotalCost

E.



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 There will also be two concrete and formwork crews. reinforcing steel crews. Even with all these crews, the total duration of the concrete superstructure is 78.3 weeks. Α complete set of descriptions and calculations for both superstructures are in the appendix.

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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.