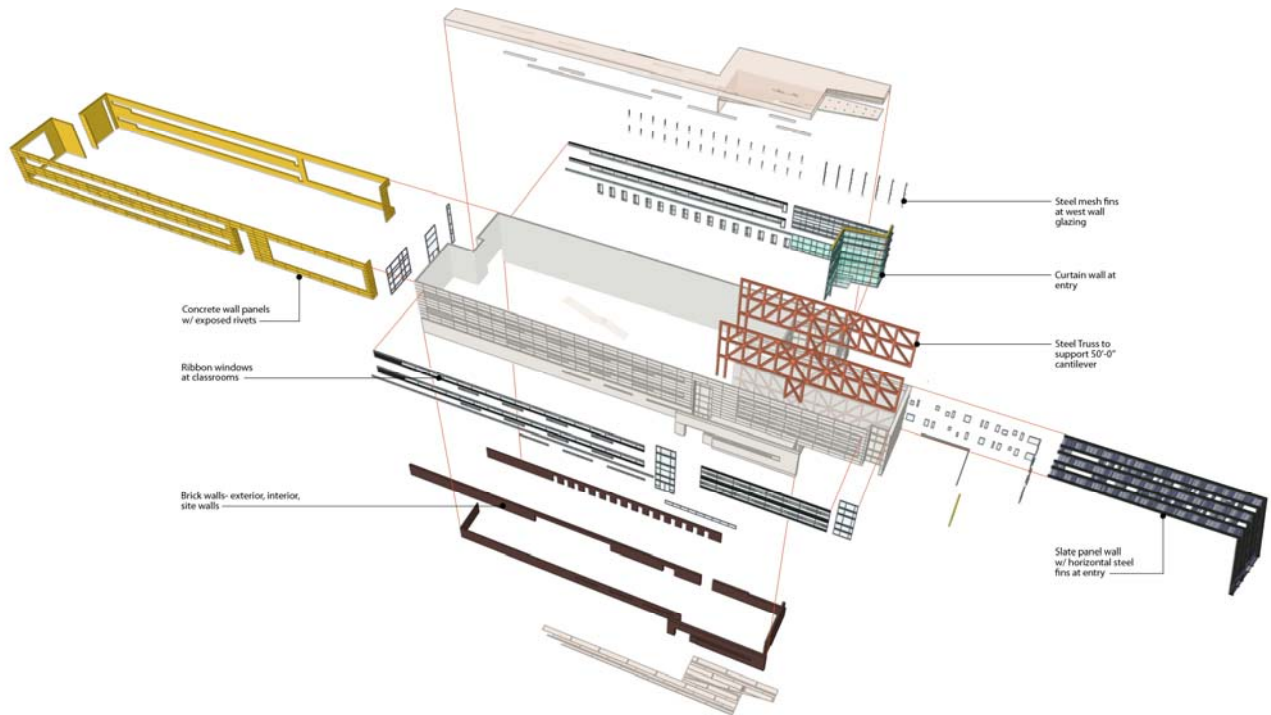
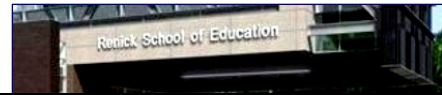


## COST ANALYSIS AND SCHEDULING RESPONSES





A cost analysis for the concrete truss system attained from R.S. Means output data located in CostWorks, specified values for a location roughly about Greensboro, NC. The estimated results located in the following charts include the cost of the raw concrete, placing, reinforcement, and formwork required to build this structure. The total lengths of each member, out of ETABS, were utilized to calculate to the cubic yardage of concrete.

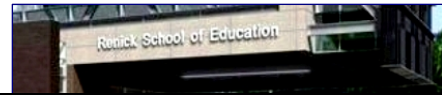
2005 Costs for Greensboro, NC RS Means (Concrete Truss)										
Members	Type	#	CY	L (ft)	Unit	Materials	Labor	Equipment	Total	\$
10"x12" Beam	Beam	146	1238.80	40137.03	C.Y.	205	176	40	448	\$554,981.16
12"x16" Beam	Beam	137	2509.63	50820.00	C.Y.	205	176	40	448	\$1,124,314.07
24"x24" Beam	Beam	24	1130.67	7632.00	C.Y.	205	176	40	448	\$506,538.67
12"x12" Column	Brace	4	29.92	807.82	C.Y.	205	176	40	448	\$13,403.88
24"x40" Truss	Brace	18	2851.71	11549.44	C.Y.	205	176	40	448	\$1,277,567.46
12"x12" Column	Column	109	734.48	19831.08	C.Y.	435	320	72	854	\$627,249.72
16" Circ. Col.	Column	12	2040.33	2192.16	C.Y.	127	27.5	23	201	\$410,106.86
30"x36" Column	Column	6	304.47	1096.08	C.Y.	490	183	41	726	\$221,042.80
										\$4,735,204.61

2005 Costs for Greensboro, NC RS Means (Concrete Truss)							
Area Sections	Volume	Unit	Materials	Labor	Equipment	Total	\$
Concrete Slabs	1612.00	C.Y.	183	134	37	354	\$570,648.00
Shear Walls	96.21	8' ht.	123	50.5	11.25	184.75	\$17,774.80
* Includes Placing, formwork, reinforcement, and concrete							\$588,422.80

**Total Structural Cost: \$5,323,627**

The results show a structural cost in excess of \$5,000,000; a large quantity for a building originally estimated at \$14,000,000. A rough, square-footage approximation showed the concrete system to have a total cost of \$15,854,430, 33.6% of which is structural.

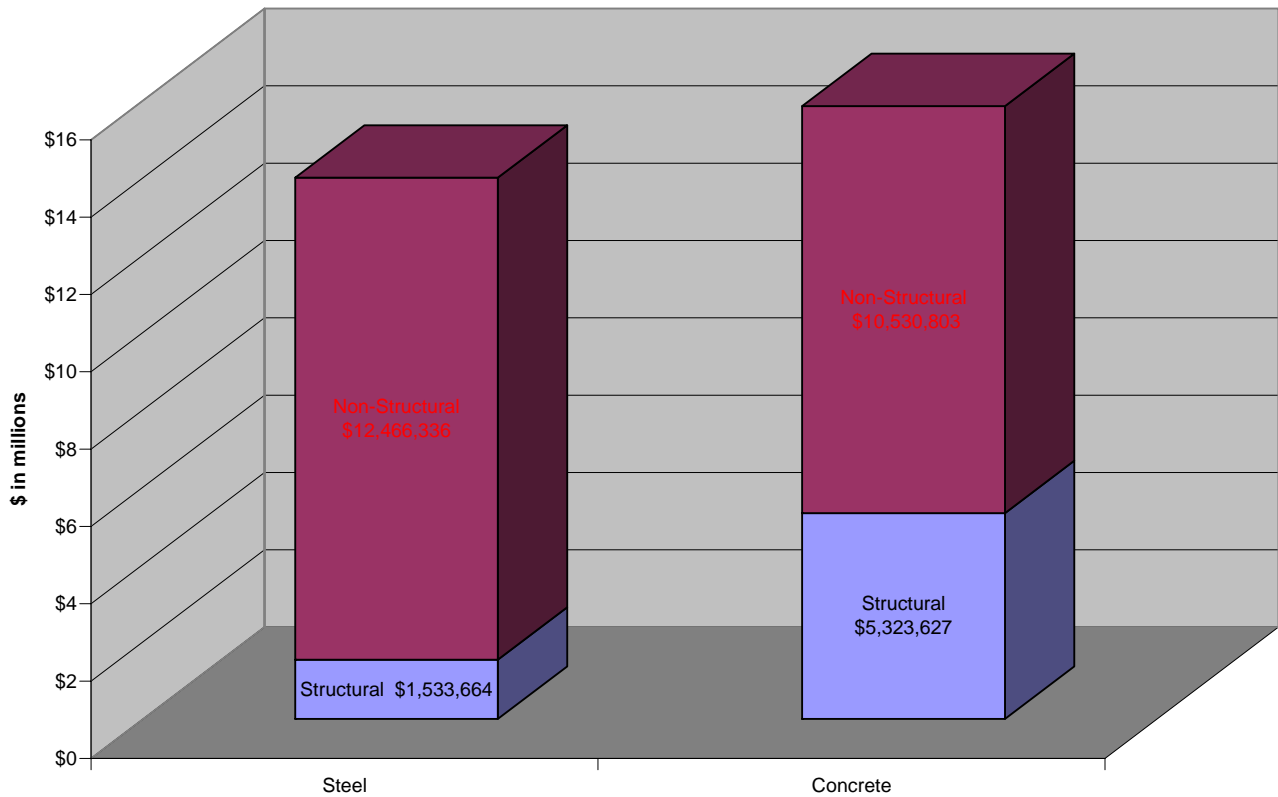
For comparison, the original steel frame's estimated cost was obtained using R.S. Means values also. It indicates a total structural price of over \$1.5 million, roughly 11% of the total building cost. Ten percent is a reasonable overall value for a structural system in a mixed use, institutional building located on a college campus. The concrete truss structure would increase the price of the superstructure 350%, and ultimately make construction time longer. With concrete, all the prep-work must be completed before the raw mixture can be delivered to the site. This entails setting up formwork and laying out reinforcement for all the members that will be poured throughout the day; which is extremely significant over the length of the cantilever, where excessive formwork, temporary bracing, a mass of reinforcement bars, and numerous safety precautions lead to slowed construction time. The R.S. Means data was assumed for maximum reinforcing in the north building, since two 24"x24" girders, two 24"x40" braces, one 10"x12" beam, and 30"x36" columns from above and below, all meeting at one



splice location. To counteract that, formwork was assumed to be reused four times.

Since the preassembled steel frame members can be delivered by flatbed and fastened using bolted shear connections, the principal steel structure can be erected very quickly. The major issue in the steel frame would be welding; with shear studs to be attached with metal decking to beams, the moment connections in the south building, and any remaining brace members that require weld connections.

**Structural Cost per Total Cost**

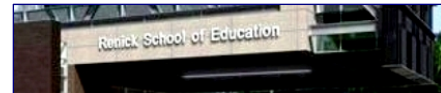


2005 RS Means Costs for Greensboro, NC (Steel Braced Frame – Original Design)								
Area Section	Units	Area/Volume	Unit	Materials	Labor	Equipment	Total	\$
Concrete Slabs	yd <sup>3</sup>	797.36	C.Y.	163	123	34	320	\$255,155.52
Metal Deck (flrs)	ft <sup>2</sup>	41885.00	S.F.	6.65	0.75	0.06	7.46	\$312,462.10
Metal Deck (roof)	ft <sup>2</sup>	22115.00	S.F.	6.05	0.71	0.06	6.82	\$150,824.30
Shear Walls	yd <sup>3</sup>	82.80	8' ht.	123	50.5	11.25	184.75	\$15,297.30
								\$733,739.22

\* Includes Placing, formwork, reinforcement, and concrete

**Total Structural Cost: \$1,533,664.10**

2005 RS Means Costs for Greensboro, NC (Steel Braced Frame – Original Design)								
Accessories	#	Unit	Bare Mat.	Bare Labor	Bare Equip.	Total	\$	
Bolts	6580	Ea.	0.23	1.77		2	\$13,160.00	
Shear Studs	11500	Ea.	0.34	0.5	0.24	1.08	\$12,420.00	
								\$25,580.00



2005 RS Means Costs for Greensboro, NC (Steel Braced Frame – Original Design)									
Members	Type	#	L (ft)	Unit	Materials	Labor	Equipment	Total	\$
10K1	Beam	1	10.00	LF.	3.21	2.09	1.24	6.54	\$65.40
12K1	Beam	6	87.89	LF.	3.15	1.67	0.99	5.81	\$510.66
14K1	Beam	1	20.00	LF.	3.77	1.67	0.99	6.43	\$128.60
28K8	Beam	21	840.00	LF.	7.85	1.05	0.62	9.52	\$7,996.80
30K7	Beam	3	127.50	LF.	8.15	1.05	0.62	9.82	\$1,252.05
30K9	Beam	21	892.50	LF.	8.15	1.05	0.62	9.82	\$8,764.35
HSS4X4X1/4	Beam	8	23.32	12' LF.	127	27.5	23	177.5	\$345.00
HSS8X8X1/4	Beam	65	916.09	14' LF.	450	32	26.5	508.5	\$33,273.54
W8X10	Beam	21	244.29	LF.	8.5	2.68	2.2	13.38	\$3,268.54
W8X15	Beam	1	10.00	LF.	12.75	2.68	2.2	17.63	\$176.30
W10X12	Beam	27	235.40	LF.	10.2	2.68	2.2	15.08	\$3,549.81
W10X22	Beam	14	118.84	LF.	18.5	2.68	2.2	23.38	\$2,778.46
W12X14	Beam	48	490.72	LF.	11.9	1.82	1.51	15.23	\$7,473.70
W12X19	Beam	7	93.00	LF.	11.9	1.82	1.51	15.23	\$1,416.39
W12X22	Beam	1	15.00	LF.	18.5	1.82	1.51	21.83	\$327.45
W12X65	Beam	1	24.57	LF.	49.5	2.14	1.76	53.4	\$1,311.82
W14X22	Beam	50	829.17	LF.	22	1.62	1.34	24.96	\$20,696.00
W14X34	Beam	62	632.50	LF.	28.5	1.99	1.64	32.13	\$20,322.23
W14X43	Beam	3	57.00	LF.	36.5	1.99	1.64	40.13	\$2,287.41
W14X90	Beam	6	212.00	LF.	76	2.17	1.78	79.95	\$16,949.40
W14X211	Beam	28	424.00	LF.	102	2.23	1.83	106.06	\$44,969.44
W16X26	Beam	13	211.15	LF.	22	1.61	1.33	24.94	\$5,266.18
W16X31	Beam	16	375.60	LF.	26.5	1.78	1.47	29.75	\$11,174.10
W18X35	Beam	1	30.00	LF.	29.5	2.43	1.46	33.39	\$1,001.70
W18X40	Beam	11	325.00	LF.	34	2.43	1.46	37.89	\$12,314.25
W21X44	Beam	172	5632.47	LF.	37.5	2.19	1.32	41.01	\$230,987.44
W21X50	Beam	20	455.00	LF.	42.5	2.19	1.32	46.01	\$20,934.55
W21X55	Beam	1	40.00	LF.	42.5	2.19	1.32	46.01	\$1,840.40
W21X57	Beam	1	40.75	LF.	42.5	2.19	1.32	46.01	\$1,874.91
W21X62	Beam	4	165.00	LF.	52.5	2.25	1.36	56.11	\$9,258.15
W21X73	Beam	1	42.50	LF.	57.5	2.25	1.36	61.11	\$2,597.18
W24X55	Beam	17	190.00	LF.	46.5	2.1	1.27	49.87	\$9,475.30
W24X62	Beam	3	100.00	LF.	52.5	2.1	1.27	55.87	\$5,587.00
W24X68	Beam	5	165.00	LF.	57.5	2.1	1.27	60.87	\$10,043.55
W24X76	Beam	16	480.00	LF.	64.5	2.1	1.27	67.87	\$32,577.60
W27X84	Beam	5	140.00	LF.	71.5	1.96	1.18	74.64	\$10,449.60
W30X99	Beam	1	30.00	LF.	84	1.94	1.17	87.11	\$2,613.30
W30X108	Beam	2	50.00	LF.	91.5	1.94	1.17	94.61	\$4,730.50
W33X118	Beam	3	105.00	LF.	100	1.98	1.2	103.18	\$10,833.90
HSS6X6X1/2	Brace	38	807.05	12' LF.	208	30	24.5	262.5	\$17,654.32
W14X43	Brace	43	764.87	LF.	36.5	1.99	1.64	40.13	\$30,694.11
W14X90	Brace	11	198.07	LF.	76	2.17	1.78	79.95	\$15,835.49
10" dia. PIPE	Column	39	593.71	16' LF.	675	33.5	27.5	736	\$27,310.66
HSS8X8X1/4	Column	3	41.62	14' LF.	450	32	26.5	508.5	\$1,511.70
HSS8X8X1/2	Column	2	27.07	14' LF.	450	32	26.5	508.5	\$983.22
W8X24	Column	2	27.07	LF.	26.5	1.49	1.23	29.22	\$790.99
W8X40	Column	5	72.74	LF.	26.5	1.49	1.23	29.22	\$2,125.46
W8X48	Column	4	54.14	LF.	40.5	1.56	1.28	43.34	\$2,346.43
W10X33	Column	23	367.02	LF.	38.5	1.56	1.28	41.34	\$15,172.61
W10X49	Column	5	72.74	LF.	38.5	1.56	1.28	41.34	\$3,007.07
W12X53	Column	3	45.67	LF.	42.5	1.56	1.28	45.34	\$2,070.68
W12X65	Column	32	483.77	LF.	42.5	1.56	1.28	45.34	\$21,934.13
W12X96	Column	14	209.75	LF.	73.5	1.63	1.35	76.48	\$16,041.68
W14X43	Column	45	634.40	LF.	62.5	1.63	1.35	65.48	\$41,540.51
W14X132	Column	6	91.34	LF.	149	1.76	1.45	152.21	\$13,902.86
									\$774,344.88

