

Cost and Schedule Analysis (Breadth Topic I)

The cost and schedule of the new design was compared to the original design in order to evaluate the efficiency and cost-effectiveness of the new structural system. In order to do so, the existing design had to be estimated and scheduled as a building that would be built in the United States in order to have a fair and successful comparison.

Instead of performing a rough estimate for the entire building, a typical residential floor was estimated in detail. Since most of the building is residential, a comparison of a typical floor from each design would give a good indication of how the two systems compare.

Table 10: Cost of Original Design

Cost of Original Design:

Original Structure								
Code		Material Details	Quantity	Units	Material Cost	Labor Cost	Equipment Costs	Total Cost
03 11 10.60		Forms In Place, Beams and Girders			\$0.00		\$0.00	
	1500	Form Sprandel, job built plywood 24" wide,	15,932	SFCA	\$32,182.64	4.13	\$0.00	\$7,547.26
03 11 10.60		Forms In Place, Columns			\$0.00		\$0.00	
	7000	36" x 36" columns, 1 use	13,394	SFCA	\$24,109.20	4.27	\$0.00	\$2,016.00
03 11 13.35		Forms In Place, Elevated Slabs			\$0.00		\$0.00	
	7000	Depressed area forms to 12" high, 4 use	751	LF	\$503.17	2.84	\$0.00	\$89,376.00
03 11 00.60		Forms In Place Walls			\$2,379.78		\$0.00	
	2450	2 use	2,034	SFCA	\$0.00	3.83	\$0.00	\$48,658.50
03 21 10.60		Uncoated Reinforcing Steel			\$840.00		\$0.00	
	0100	Beams and Girders, #3 to #7	1.50	Ton	\$380.80	630	\$0.00	\$9,874.80
	0200	Columns, #3 to #7	0.68	Ton	\$100.30	670	\$0.00	
	0400	Elevated Slabs, # 4 to #7	0.17	Ton	\$26.50	350	\$0.00	\$158,126.56
	0700	Walls, #3 to #7	0.050	Ton	\$0.00	335	\$0.00	\$40,068.00
03 31 00.70		Concrete			\$83,655.00		\$0.00	
	0400	5000 PSI Concrete	1,170	CY	\$0.00		\$0.00	\$21,674.31
03 31 00.90		Placing Concrete			\$0.00		\$1,326.49	\$8,620.91
	0200	Beams (Large Beams, Pumped)	163	CY	\$0.00	17	\$1,213.33	\$11,738.34
	1000	36" Square Columns (Pumped)	231	CY	\$0.00	10.95	\$3,421.26	
	1500	Elevated Slabs 6"-10" (Pumped)	747	CY	\$0.00	9.55	\$190.39	\$26,209.68
	5050	12" Walls (Pumped)	29	CY	\$0.00	13.9	\$0.00	
03 35 01.40		Finishing Concrete			\$0.00		\$0.00	\$6,719.92
	0250	Creed, bull float, machine trowel and finish	594	SF	\$0.00	0.39	\$0.00	
03 35 01.40		Finishing Walls			\$0.00		\$0.00	\$10,880.10
	0010	Break Ties and patch voids	74	SF	\$3.70	0.4	\$0.00	
Subtotal:					\$144,181.09	\$147,482.09	\$6,151.47	\$297,814.65
5% Contingency								\$14,890.73
Total:								\$312,705.38

Cost of New Design:

Table 11: Cost of New Design

New Structure								
Code		Material Details	Quantity	Units	Material Cost	Labor Cost	Equipment Costs	Total Cost
03 11 10.60		Forms In Place, Beams and Girders						
	1500	form Sprandel, job built plywood 24" wide,	1,996	SFCA	\$4,031.92	8243.48	\$0.00	\$12,275.40
03 11 10.60		Forms In Place, Columns						\$0.00
	7000	36" x 36" columns, 1 use	5,749	SFCA	\$10,348.20	24548.2	\$0.00	\$34,896.43
03 11 13.35		Forms In Place, Elevated Slabs						
	7000	Depressed area forms to 12" high, 4 use	751	LF	\$503.17	2132.84	\$0.00	\$2,636.01
03 11 00.60		Forms In Place Walls						
	2450	2 use	4,884	SFCA	\$5,714.28	18705.7	\$0.00	\$24,420.00
03 21 10.60		Uncoated Reinforcing Steel					\$0.00	
	0100	Beams and Girders, #3 to #7	0.39	Ton	\$218.40	245.7	\$0.00	\$464.10
	0200	Columns, #3 to #7	0.38	Ton	\$212.80	254.6	\$0.00	\$467.40
	0400	Elevated Slabs, # 4 to #7	0.17	Ton	\$100.30	59.5	\$0.00	\$159.80
	0700	Walls, #3 to #7	0.090	Ton	\$47.70	30.15	\$0.00	\$77.85
03 41 00.90		Stressing Tendon						
	1200	UngROUTed Strand, 50' Span, 100 kips	21K	Lb	\$40,389.12	16828.8	\$1,262.16	\$58,480.08
03 31 00.70		Concrete						
	0400	5000 PSI Concrete	903	CY	\$64,564.50		\$0.00	\$64,564.50
03 31 00.90		Placing Concrete						
	0200	Beams (Large Beams, Pumped)	16	CY	\$0.00	265.54	\$127.30	\$392.84
	1000	36" Square Columns (Pumped)	93	CY	\$0.00	1018.24	\$488.20	\$1,506.44
	1500	Elevated Slabs 6"-10" (Pumped)	747	CY	\$0.00	7133.85	\$3,421.26	\$10,555.11
	5050	12" Walls (Pumped)	47	CY	\$0.00	653.3	\$312.55	\$965.85
03 35 01.40		Finishing Concrete						
	0250	screed, bull float, machine trowel and finish	594	SF	\$0.00	231.66	\$0.00	\$231.66
03 35 01.40		Finishing Walls						
	0010	Break Ties and patch voids	121	SF	\$6.05	48.4	\$0.00	\$54.45
Subtotal:					\$126,136.44	\$80,400.01	\$5,611.47	\$212,147.92
5% Contingency								\$10,607.40
Total:								\$222,755.32

By comparing the two floors, it is evident that building the new structure would save around \$90,000 per floor. Such a huge saving is achieved by eliminating the interior beams in the residential floors and also reducing the number of columns. Hence using the new structural system would be more cost-effective.

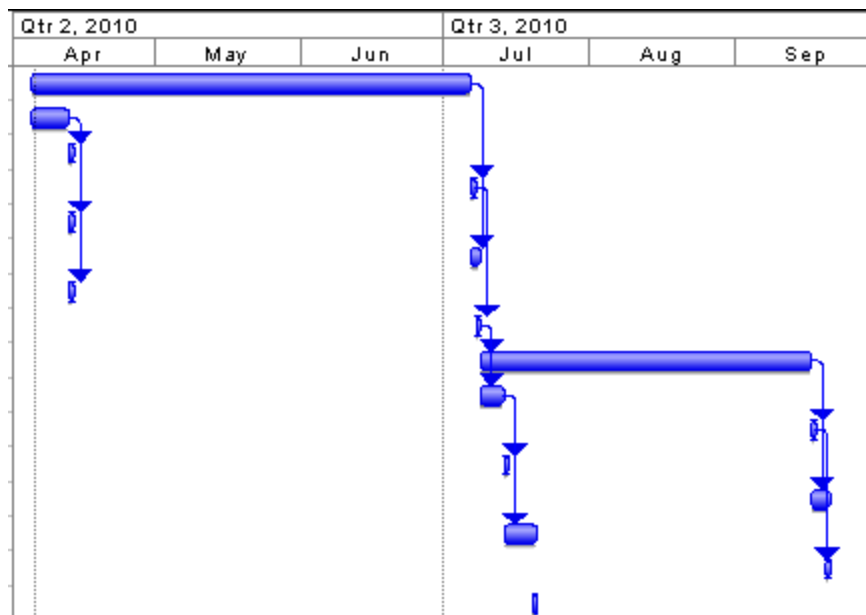
A similar comparison was made to examine the two schedules. Only a schedule for building a single residential floor was examined. Similar construction processes were used to avoid changing any variables. Only the structural systems will be compared.

Schedule of Existing Design:

Table 12: Schedule of Existing Design

ID	Task Name	Duration	Start	Finish	Predecessors
1	Form Columns	67 days	Mon 4/5/10	Tue 7/6/10	
2	Form Wall	6 days	Mon 4/5/10	Mon 4/12/10	
3	Place Wall Rebars	1 day	Tue 4/13/10	Tue 4/13/10	2
4	Place Column Rebars	1 day	Wed 7/7/10	Wed 7/7/10	1
5	Place Concrete for walls	1 day	Tue 4/13/10	Tue 4/13/10	2
6	Place Concrete for Columns	2 days	Wed 7/7/10	Thu 7/8/10	1
7	Finish Wall	1 day	Tue 4/13/10	Tue 4/13/10	2
8	Finish Columns	1 day	Thu 7/8/10	Thu 7/8/10	4
9	Form Beams	50 days	Fri 7/9/10	Thu 9/16/10	8
10	Form Slab	3 days	Fri 7/9/10	Tue 7/13/10	8
11	Place Beam Rebar	1 day	Fri 9/17/10	Fri 9/17/10	9
12	Place Slab Rebar	1 day	Wed 7/14/10	Wed 7/14/10	10
13	Place Beam Concrete	2 days	Fri 9/17/10	Mon 9/20/10	9
14	Place Slab Concrete	5 days	Wed 7/14/10	Tue 7/20/10	10
15	Finish Beam	1 day	Mon 9/20/10	Mon 9/20/10	11
16	Finish Slab	1 day	Tue 7/20/10	Tue 7/20/10	

Figure 23: Timeline of Existing Design

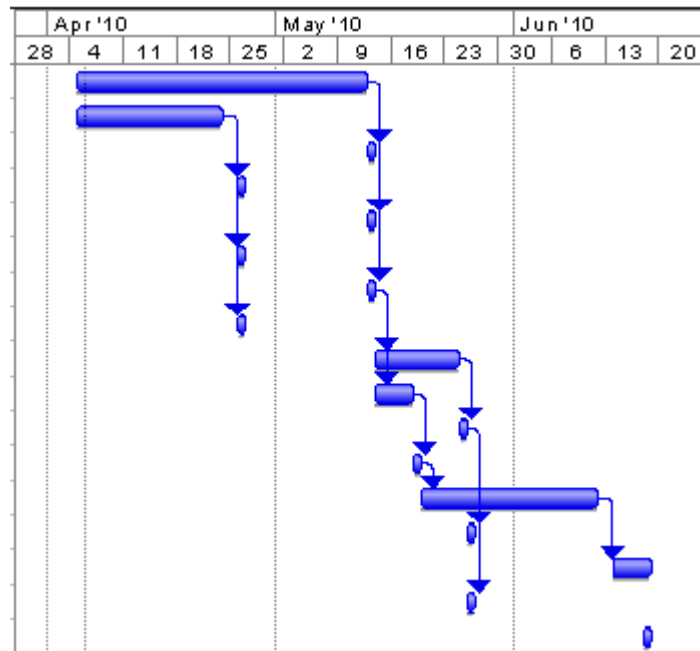


Schedule of New Design:

Table 13: Schedule of New Design

ID	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1	Form Column	28 days	Mon 4/5/10	Wed 5/12/10		
2	Form Wall	15 days	Mon 4/5/10	Fri 4/23/10		
3	Rebar Column	1 day	Thu 5/13/10	Thu 5/13/10	1	
4	Rebar Wall	1 day	Mon 4/26/10	Mon 4/26/10	2	
5	Place Column Concrete	1 day	Thu 5/13/10	Thu 5/13/10	1	
6	Place Wall Concrete	1 day	Mon 4/26/10	Mon 4/26/10	2	
7	Finish Column	1 day	Thu 5/13/10	Thu 5/13/10	1	
8	Finish Wall	1 day	Mon 4/26/10	Mon 4/26/10	2	
9	Form Beam	7 days	Fri 5/14/10	Mon 5/24/10	7	
10	Form Slab	3 days	Fri 5/14/10	Tue 5/18/10	7	
11	Rebar Beam	1 day	Tue 5/25/10	Tue 5/25/10	9	
12	Rebar Slab	1 day	Wed 5/19/10	Wed 5/19/10	10	
13	Place Tendons	17 days	Thu 5/20/10	Fri 6/11/10	12	
14	Place Concrete Beam	1 day	Wed 5/26/10	Wed 5/26/10	11	
15	Place Concrete Slab	5 days	Mon 6/14/10	Fri 6/18/10	13	
16	Finish Beam	1 day	Wed 5/26/10	Wed 5/26/10	11	
17	Finish Slab	1 day?	Fri 6/18/10	Fri 6/18/10		

Figure 23: Timeline of New Design



The schedule of the existing design states that the construction process would take about 17 weeks. On the other hand, the schedule for the new design indicates that it will only take about 8 weeks to construct the new structural system.

Analyzing the two schedules, we realize that the huge number of different columns and sizes in the existing design combined with the beams would cause a great increase in the schedule. This is due to the fact that the form work would take a longer time to construct. Remember that the original design had 112 columns with 14 different sizes on each floor compared to 88 columns and only 2 sizes for the new design.

In summary, using the new structural design would save about \$90,000 per floor while also saving about 9 weeks per floor in construction time. Therefore, the new structural system would be a more efficient alternative in terms of savings in construction cost and construction time.

Table 14: Summary of cost and schedule analysis

	Existing Design	New Design
Construction Cost	\$312,705	\$222,755
Construction Time	17 weeks	8 weeks