Architectural Engineering 2013 Senior Thesis

Technical Assignment 1

FOR

BLOCK 12

DEVELOPED BY

Josue Fernandez

BLOCK 12

ROCKVILLE, MD

Advisor: Dr. Dubler

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FOR

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DEVELOPED BY

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SECTION A: EXECUTIVE SUMMARY

This report will analyze the major architectural engineering systems to gain a thorough understanding of the technical and construction issues affecting Block 12. Data will be compiled on current key issues facing the building and on the technical system analysis. A defined area of investigation will be developed for a thesis proposal.

Block 12 is part of a new community development in the heart of Rockville, MD. The developed, Federal Realty Investment Trust, will own, operate, and manage the newly constructed building, which is intended to achieve LEED certified status. Within the structure's four total floors and two sublevels, various usage types will be incorporated. A parking garage will provide 163 spaces over 72,266 square feet spanning over 2 levels. In various locations across two levels, retail space will occupy 44,254 square feet and consist of 13 individual retail spaces. The residential space makes up 175,284 square feet of the building and includes 174 units, a fitness center for the tenants, and an outdoor courtyard with a swimming pool.

The existing conditions of Block 12 are ideal. Block 12 sits at on a large open commercial lot. Existing stored include Starbucks, Bank of America, AC Moor, Chipotle, and Bally Total Fitness among others. As part of phase 1 of the overall project, Bally Total Fitness will be under demolition. The existing building does not affect Block 12's construction progress, but it does affect Block 10 and 11, which are the other 2 buildings being built adjacent. Utilities are readily accessible, but due to the high occupancy demands of the overall project, most of the utilities will have to be upsized. Construction traffic flow is of a concern due to the high car flow and accessibility issues on the two primary roads. Based on the geotechnical reports, Block 12 sits above 3 feet of the water level, facilitated with the drainage concerns during excavation.

The project schedule has a critical finish date of May 2014. Federal Realty Investment Trust plans on leasing the apartments to recent college graduates, whom seek a place to live after having accepted a job near the densely populated DC/Northern Virginia Area. The project is fast paced, with a construction schedule lasting only 8 months. This was achieved through prefabricating wood framing into sections. The production rate was increased by systematically managing workflow and through effectively splitting the building into four sections as seen on Figure 1.2. The project had a 5 day delay due to Hurricane Sandy hitting the job site. The effect was mitigated by proactively planning accumulated water deposits within the excavation. The only activity in the schedule that lies on the critical path is close-out, which also marks the period of most workforce demand.

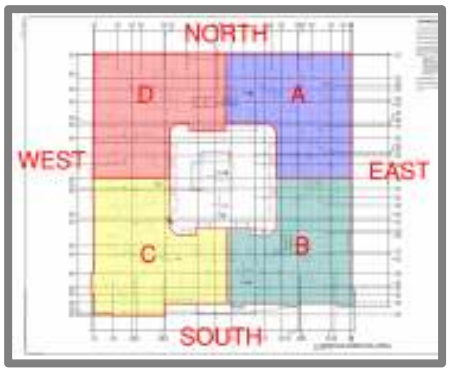

Figure 1.2: Wood framing sequence

The wood frame building sits on spread footing set 3 feet below the slab on grade level with two post tensioned concrete slabs. The cast-in-place concrete was pumped and poured using concrete barrels, to reach the building's extremes. The residential units will be heated by split system heat pumps and cooled with a cooling system. The mechanical equipment will primarily be located on the roof, including 2 RTU's. The parking garage will circulate air with 3 exhaust fans, which will be activated with CO_2 sensors. Active fire protection measures are taken by 2hr fire rated shafts and fire rated I-beams. Passive fire protection measures are

additionally taken by a wet pipe system in the stairs & residential areas and a dry pipe system in the garage & retail slabs. The electrical system is a 3 phase 480/277V low voltage fed from one location to electrical closets on each level. The building will contain 1 diesel 250 KW generator for emergency power outages with an auto start specification of 10 seconds max and minimum fuel storage of 24 hours at rated load. Load bearing concrete masonry walls will house the stair shafts. The exterior retail space façade will primarily be composed of curtain walls, to be designed, furnished, and installed by the subcontractor. The systems to support excavation walls were steel soldier piles and wood lagging boards with tiebacks on the north, south, and east. The west side was laid back to facilitate truck flow traffic inside the excavation. Temporary pumps were used only used during excavation, due to the building sitting on 3 feet above the water line.

The patented system by SCA Consulting Engineers, Inc. was incorporated for faster production time installing drywall. Full sheets of drywall can be placed and drilled in place, compared to traditionally trimming the drywall to fit properly. Zip system sheathing and tape was used as a moisture resistant barrier to enclose the building and reduce air leakage. This system discards the need for house wrap and felt typically required. The owner is seeking LEED Accreditation through implementing a green roof, a waste management plan, and an indoor air quality management plan.

The actual construction cost for Block 12 is $30M, which does not include land cost, site work, permitting, general conditions, designer's fees, construction management fees, liability insurance, nor any contingencies. Four of the major building systems breakdowns are mechanical at $2.5M, electrical $2.9M, structural $8.1M, and interiors $7.7M. The total project cost $36M, includes an additional $6M for the deficiencies in the construction cost. The RS Means square foot cost $24M was calculated through the assumption that the building was composed of three individual sections, an apartment space, a retail space, and a parking space. The square foot costs were added and further refined by subtracting the retail roof cost due to redundancy with the apartment floor already being accounted for. The discrepancies from the RS Means square foot estimate and the actual construction cost data yield a $6M deficit pointing primarily to the substructure and Interior costs bearing 3M, respectively. The substructure is $3M low due to 12" actual concrete walls rather than 5" calculated in RS Means. The additional $3M deficit is due to the interior finished being of higher quality with innovative appliances, as compared to a typical commercial apartment complex, whose main concern is not high quality materials.

Figure 1.1: Major building systems costs of actual construction cost

The project delivery system is a traditional Design-Bid-Build project delivery system with the CM at risk providing a GMP. This was the chosen method due to the owner feeling comfortable with the delivery method and by previous project's success. The owner settled on a price with the general contractor, The Whiting-Turner Construction Company, through a negotiation. The owner's representative is compensated through a cost by fee basis, while the architects, engineers, and subcontractor's contract types are lump sums. It is worth noting, even though the architect and construction manager do not have a contract, they have a strong communication for the success of this project. The construction contract terms are typical AIA

language stating explicitly each party's responsibilities. The schedule to abide is attached and the consequences for delay or non-compliance are stated. The contractor was selected based on a good relationship with the owner.

Block 12 is one of three buildings under construction at the same time, with a team dedicated to site work, due to the heavy site work involvement. Ted Border is the Vice President overseeing all the work performed throughout the overall project. Adam Haubert is the Sr. Project Manager primarily in charge of scheduling. Luther Hildreth is the Senior Superintendent making sure everything runs smoothly in the field. Site work and Block 12 are structured similarly with a project engineer being under a superintendent under a project manager.

Federal Realty Investment Trust is a large realty investment trust, which focuses on development and redevelopment. They typically own, operate, and manage their buildings. Federal Realty is a privately funded company who focuses on obtaining a quality building at a feasible cost.

SECTION O: ATTACHMENTS

1. **RS Means SF Estimate of Building Types** [FROM SECTION A]
2. **SF Assembly Breakdown Summary (RS MEANS)** [FROM SECTION A]
3. **Construction Cost SF Assembly Breakdown Summary** [FROM SECTION A]
4. **SF Assembly Breakdown Summary Replaced Values** [FROM SECTION A]
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6. **Presentation Slides in Note Format**[FROM SECTION A]

Square Foot Building Type 1 Estimate

RS Means Source	2012	Model #	M.010
Page(s)	78,79	Ext Wall Type	Brick Veneer
Area	172,000	Frame	Wood Frame
L.F. Perimeter	1,500		
Story Additional Hgt.	1		

Area Falls Between	32,000	36,000
Values	149.00	147.90
L.F. Perimeter Between	480	520
Additional Perimeter Adj. (per 100 L.F.)	5.40	4.80
Additional Hgt Adj. (per 1 Ft.)	2.35	2.20

Base cost per SF $110.50

Cost Adj Type: Perimeter — Per SF Adj $ 59.28

Cost Adj Type: Floor Height — Per SF Adj $ (2.90)

Adj Base cost per SF $166.88

Base Bldg Cost	$ 166.88 (Adj Base Cost / SF)	x	172,000 (FloorArea)	=	$28,703,360.00
Basement Cost	(Basement Cost / SF)	x	(Basement Area)	=	$0.00

Total Base Bldg Cost $28,703,360.00

RS Means Additions — Amount

RS Means Additions — Amount

New Subtotal Cost $28,703,360.00

Multiplier Type	RS Means Conv. To 2013	Value	1.02
Multiplier Type	Time	Value	1.00
Multiplier Type	Location	Value	0.91

New Subtotal Cost $26,660,179.15

Allowance — Amount

Allowance — Amount

New Subtotal Cost $26,660,179.15

Total Cost $ 26,660,179.15

Cost based on RS Means

Square Foot Building Type 1 Estimate Assembly Breakdown

	Assembly	% of Total	Cost per SF	Total Cost
A	Substructure	4.20%	$4.36	$750,217.44
B	Shell	25.30%	$26.27	$4,519,166.97
	B10 Superstructure	13.10%	$13.60	$2,339,963.92
	B20 Exterior Enclosure	10.60%	$11.01	$1,893,405.92
	B30 Roofing	1.60%	$1.66	$285,797.12
C	Interiors	23.20%	$24.09	$4,144,058.25
D	Services	47.30%	$49.12	$8,448,877.37
	D10 Conveying	4.00%	$4.15	$714,492.80
	D20 Plumbing	15.80%	$16.41	$2,822,246.56
	D30 HVAC	15.40%	$15.99	$2,750,797.28
	D40 Fire Protection	2.80%	$2.91	$500,144.96
	D50 Electrical	9.30%	$9.66	$1,661,195.76
E	Equipment & Furnishings	0.00%	$0.00	$0.00
F	Special Construction	0.00%	$0.00	$0.00
G	Building Sitework	0.00%	$0.00	$0.00
	Additions	0.00%	$0.00	$0.00
			Subtotal	$17,862,320.03
	Jobsite OH & GC's	15.00%		$3,999,026.87
	Profit	10.00%		$2,666,017.91
	Designer's Fee	8.00%		$2,132,814.33
			Total	$26,660,179.15

Cost based on RS Means

Square Foot Building Type 2 Estimate

RS Means Source	2012	Model #	M.630
Page(s)	212,213	Ext Wall Type	Face Brick on Concrete Block
Area	45,000	Frame	Steel Joist
L.F. Perimeter	1,000		
Story Additional Hgt.	-3		

Area Falls Between	20,000	22,000
Values	111.35	109.85
L.F. Perimeter Between	565	594
Additional Perimeter Adj. (per 100 L.F.)	3.25	2.95
Additional Hgt Adj. (per 1 Ft.)	0.90	0.85

Base cost per SF $92.60

Cost Adj Type:	Perimeter			Per SF Adj	$ (0.36)
Cost Adj Type:	Floor Height			Per SF Adj	$ (0.82)

Adj Base cost per SF $91.41

Base Bldg Cost	$ 91.41 (Adj Base Cost / SF)	x	45,000 (FloorArea)	=	$4,113,562.50
Basement Cost	(Basement Cost / SF)	x	(Basement Area)	=	$0.00

Total Base Bldg Cost $4,113,562.50

RS Means Additions		Amount	
RS Means Additions		Amount	

New Subtotal Cost $4,113,562.50

Multiplier Type	RS Means Conv. To 2013	Value	1.02
Multiplier Type	Time	Value	1.00
Multiplier Type	Location	Value	0.91

New Subtotal Cost $3,820,748.27

Allowance		Amount	
Allowance		Amount	$ -

New Subtotal Cost $3,820,748.27

Total Cost $ $3,820,748.27

Cost based on RS Means

Square Foot Building Type 2 Estimate Assembly Breakdown

	Assembly	% of Total	Cost per SF	Total Cost
A	Substructure	12.10%	$6.88	$309,748.06
B	Shell	29.30%	$16.67	$750,051.09
	B10 Superstructure	7.80%	$4.44	$199,672.30
	B20 Exterior Enclosure	14.60%	$8.31	$373,745.60
	B30 Roofing	6.90%	$3.93	$176,633.19
C	Interiors	16.10%	$9.16	$412,144.12
D	Services	42.50%	$24.18	$1,087,958.07
	D10 Conveying	0.00%	$0.00	$0.00
	D20 Plumbing	11.00%	$6.26	$281,589.15
	D30 HVAC	8.40%	$4.78	$215,031.71
	D40 Fire Protection	6.30%	$3.58	$161,273.78
	D50 Electrical	16.80%	$9.56	$430,063.43
E	Equipment & Furnishings	0.00%	$0.00	$0.00
F	Special Construction	0.00%	$0.00	$0.00
G	Building Sitework	0.00%	$0.00	$0.00
	Additions	0.00%	$0.00	$0.00
			Subtotal	$2,559,901.34
	Jobsite OH & GC's	15.00%		$573,112.24
	Profit	10.00%		$382,074.83
	Designer's Fee	8.00%		$305,659.86
			Total	$3,820,748.27

Cost based on RS Means

Square Foot Building Type 3 Estimate

RS Means Source	2012	Model #	M.280
Page(s)	139, 140	Ext Wall Type	Reinforced Concrete
Area	69,000	Frame	R/Conc. Frame
L.F. Perimeter	1,000		
Story Additional Hgt.	1		

Area Falls Between	50,000	75,000
Values	84.30	80.05
L.F. Perimeter Between	650	775
Additional Perimeter Adj. (per 100 L.F.)	2.30	1.55
Additional Hgt Adj. (per 1 Ft.)	1.45	1.15

Base cost per SF $81.07

Cost Adj Type:	Perimeter			Per SF Adj	$ 4.41
Cost Adj Type:	Floor Height			Per SF Adj	$ 1.22

Adj Base cost per SF $86.70

Base Bldg Cost	$ 86.70 (Adj Base Cost / SF)	x	69,000 (FloorArea)	=	$5,982,541.50
Basement Cost	(Basement Cost / SF)	x	(Basement Area)	=	$0.00

Total Base Bldg Cost $5,982,541.50

RS Means Additions		Amount	
RS Means Additions		Amount	

New Subtotal Cost $5,982,541.50

Multiplier Type	RS Means Conv. To 2013	Value	1.02
Multiplier Type	Time	Value	1
Multiplier Type	Location	Value	0.91

New Subtotal Cost $5,556,688.42

Allowance		Amount	
Allowance		Amount	

New Subtotal Cost $5,556,688.42

Total Cost $ 5,556,688.42

Cost based on RS Means

Square Foot Building Type 3 Estimate Assembly Breakdown

	Assembly	% of Total	Cost per SF	Total Cost
A	Substructure	21.90%	$11.82	$815,332.89
B	Shell	55.20%	$29.78	$2,055,085.65
	B10 Superstructure	44.60%	$24.06	$1,660,449.63
	B20 Exterior Enclosure	6.80%	$3.67	$253,162.72
	B30 Roofing	3.80%	$2.05	$141,473.29
C	Interiors	2.30%	$1.24	$85,628.57
D	Services	19.90%	$10.74	$740,873.27
	D10 Conveying	3.10%	$1.67	$115,412.42
	D20 Plumbing	2.80%	$1.51	$104,243.47
	D30 HVAC	0.30%	$0.16	$11,168.94
	D40 Fire Protection	7.40%	$3.99	$275,500.61
	D50 Electrical	6.30%	$3.40	$234,547.82
E	Equipment & Furnishings	0.70%	$0.38	$26,060.87
F	Special Construction	0.00%	$0.00	$0.00
G	Building Sitework	0.00%	$0.00	$0.00
	Additions	0.00%	$0.00	$0.00
			Subtotal	$3,722,981.24
	Jobsite OH & GC's	15.00%		$833,503.26
	Profit	10.00%		$555,668.84
	Designer's Fee	8.00%		$444,535.07
			Total	$5,556,688.42

Cost based on RS Means

SF Assembly Breakdown Summary (RS MEANS)

	Assembly	% of Total	Cost per SF	Total Cost
A	Substructure	7.77%	$ 6.56	$1,875,298.40
B	Shell	30.33%	$ 25.61	$7,324,303.71
	B10 Superstructure	17.40%	$ 14.69	$4,200,085.86
	B20 Exterior Enclosure	10.44%	$ 8.81	$2,520,314.24
	B30 Roofing	2.50%	$ 2.11	$603,903.60
C	Interiors	19.22%	$ 16.23	$4,641,830.93
D	Services	42.57%	$ 35.94	$10,277,708.71
	D10 Conveying	3.44%	$ 2.90	$829,905.22
	D20 Plumbing	13.29%	$ 11.22	$3,208,079.19
	D30 HVAC	12.33%	$ 10.41	$2,976,997.94
	D40 Fire Protection	3.88%	$ 3.28	$936,919.36
	D50 Electrical	9.63%	$ 8.13	$2,325,807.01
E	Equipment & Furnishings	0.11%	$ 0.09	$26,060.87
F	Special Construction	0.00%	$ -	$0.00
G	Building Sitework	0.00%	$ -	$0.00
	Additions	0.00%	$ -	$0.00
			Subtotal	$24,145,202.61
	Jobsite OH & GC's	12.00%		$2,897,424.31
	Profit	5.00%		$1,207,260.13
	Designer's Fee	10.00%		$2,414,520.26
			Total	$30,664,407.32

Building Type		GSF
Apartments	Type 1	172,000
Retail	Type 2	45,000
Parking	Type 3	69,000
Building Total		286,000

Construction Cost SF Assembly Breakdown Summary

	Assembly	% of Total	Cost per SF	Total Cost
A	Substructure	15.58%	$ 16.38	$4,685,700.00
B	Shell	21.66%	$ 22.77	$6,512,436.00
	B10 Superstructure	8.72%	$ 9.17	$2,623,352.00
	B20 Exterior Enclosure	10.35%	$ 10.88	$3,110,719.00
	B30 Roofing	2.59%	$ 2.72	$778,365.00
C	Interiors	25.75%	$ 27.07	$7,741,802.00
D	Services	30.58%	$ 32.15	$9,195,005.00
	D10 Conveying	2.31%	$ 2.43	$695,060.00
	D20 Plumbing	7.47%	$ 7.85	$2,245,634.00
	D30 HVAC	8.80%	$ 9.25	$2,644,945.00
	D40 Fire Protection	2.20%	$ 2.31	$661,364.00
	D50 Electrical	9.80%	$ 10.31	$2,948,002.00
E	Equipment & Furnishings	6.43%	$ 6.76	$1,932,981.00
F	Special Construction	0.00%	$ -	$0.00
G	Building Sitework	0.00%	$ -	$0.00
	Additions	0.00%	$ -	$0.00
			Subtotal	$30,067,924.00
	Jobsite OH & GC's	12.00%		$3,608,150.88
	Profit	5.00%		$1,503,396.20
	Designer's Fee	8.00%		$2,405,433.92
			Total	$37,584,905.00

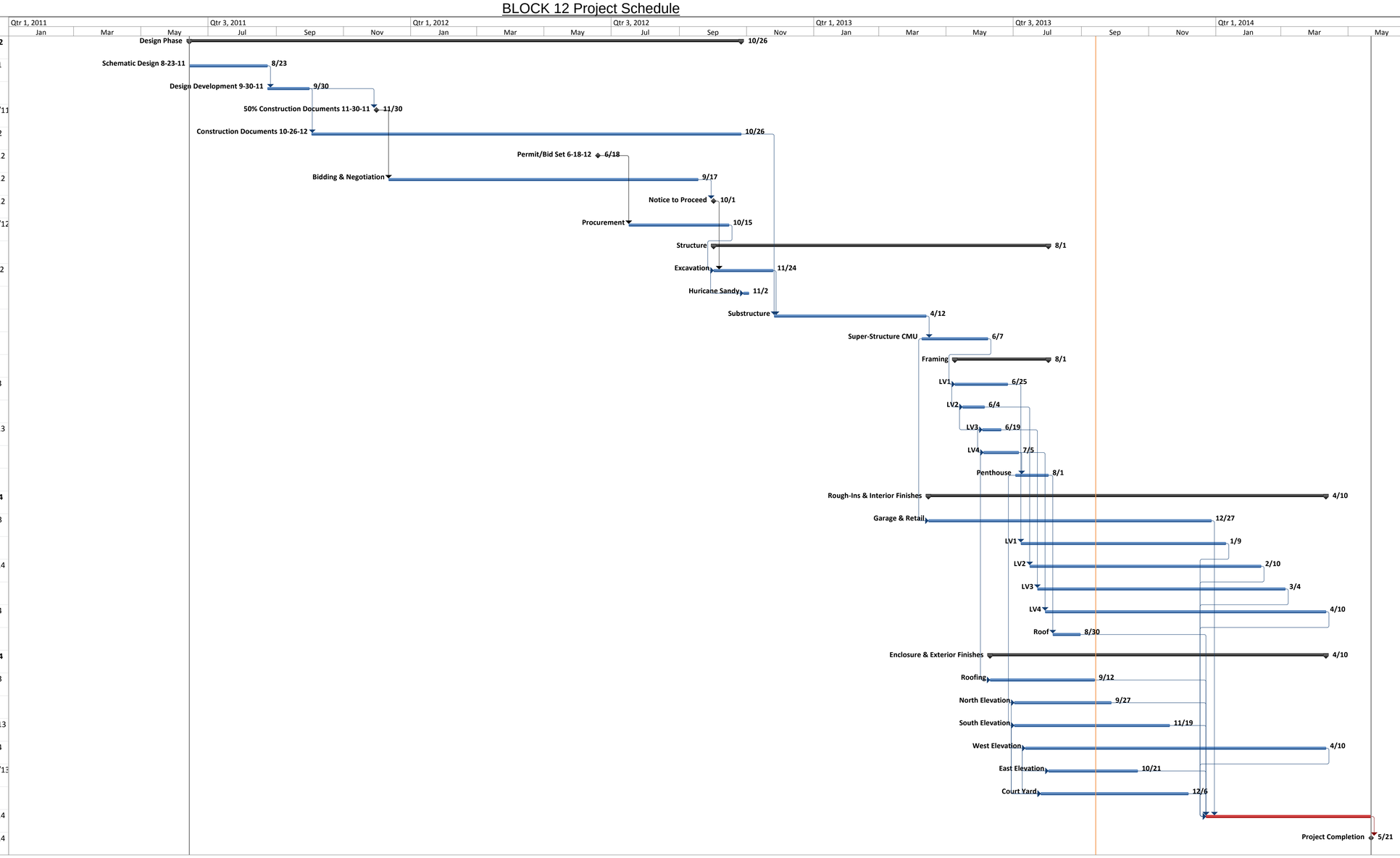
Building Type		GSF
Apartments	Type 1	172,000
Retail	Type 2	45,000
Parking	Type 3	69,000
Building Total		286,000

SF Assembly Breakdown Summary (Replaced with More Adequate SF Building Cost for Type)

	Assembly	SF Assembly Estimate Value		SF Assembly Estimate Replacement Value	SF Assembly Value
A	**Substructure**	$ 1,875,298.40			$1,875,298.40
B	**Shell**				
	B10 Superstructure	$ 4,200,085.86		$ 3,199,674.75	$3,199,674.75
	B20 Exterior Enclosure	$ 2,520,314.24			$2,520,314.24
	B30 Roofing	$ 603,903.60			$603,903.60
C	**Interiors**	$ 4,641,830.93			$4,641,830.93
D	**Services**				
	D10 Conveying	$ 829,905.22			$829,905.22
	D20 Plumbing	$ 3,208,079.19			$3,208,079.19
	D30 HVAC	$ 2,976,997.94			$2,976,997.94
	D40 Fire Protection	$ 936,919.36			$936,919.36
	D50 Electrical	$ 2,325,807.01			$2,325,807.01
E	**Equipment & Furnishings**	$ 26,060.87			$26,060.87
F	**Special Construction**	$ -			$0.00
G	**Building Sitework**	$ -			$0.00
	Additions	$ -			$0.00
				Subtotal	$23,144,791.50
	Jobsite OH & GC's	8 (time (months))	x	$ 362,178.00 (monthly cost)	$2,897,424.00
	Profit	5.00%			$1,157,239.58
	Designer's Fee	10.00%			$2,314,479.15
				Total	$29,513,934.23
					Cost based on RS Means

BLOCK 12 Project Schedule

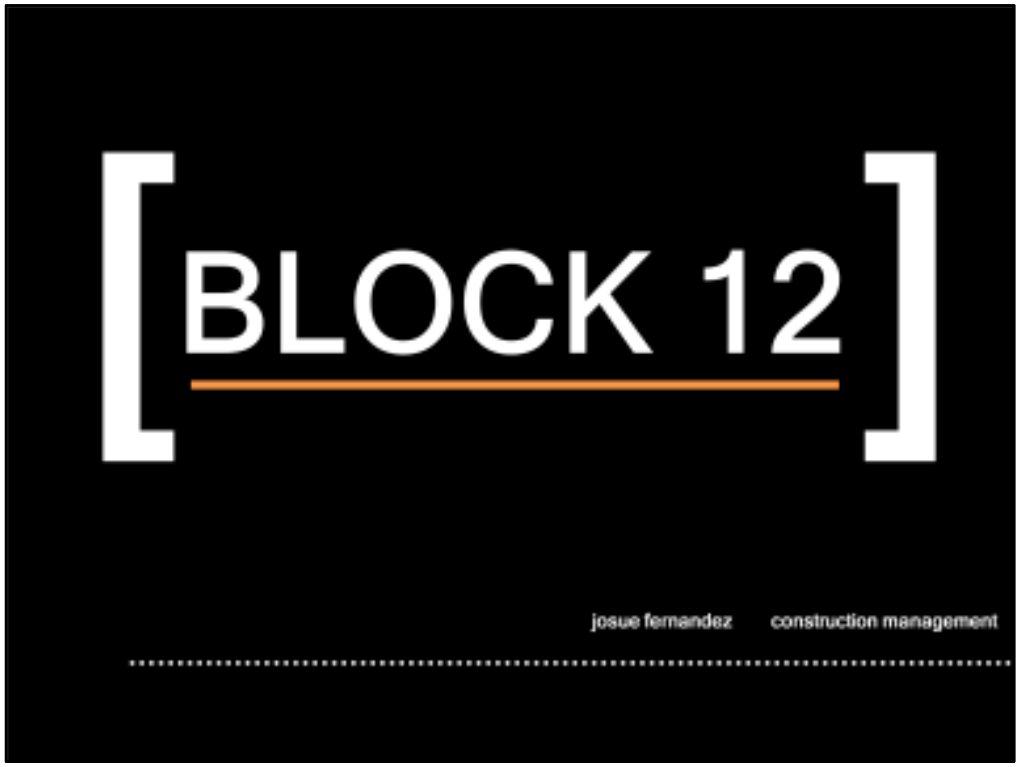
ID	Task Name	Duration	Start	Finish
1	**Design Phase**	**359 days**	**Tue 6/14/11**	**Fri 10/26/12**
2	Schematic Design 8-23-11	51 days	Tue 6/14/11	Tue 8/23/11
3	Design Development 9-30-11	28 days	Wed 8/24/11	Fri 9/30/11
4	50% Construction Documents 11-30-11	0 days	Wed 11/30/11	Wed 11/30/11
5	Construction Documents 10-26-12	280 days	Mon 10/3/11	Fri 10/26/12
6	Permit/Bid Set 6-18-12	0 days	Mon 6/18/12	Mon 6/18/12
7	Bidding & Negotiation	201 days	Mon 12/12/11	Mon 9/17/12
8	Notice to Proceed	0 days	Mon 10/1/12	Mon 10/1/12
9	Procurement	65 days	Tue 7/17/12	Mon 10/15/12
10	**Structure**	**219 days**	**Tue 10/2/12**	**Thu 8/1/13**
11	Excavation	40 days	Tue 10/2/12	Sat 11/24/12
12	Huricane Sandy	5 days	Mon 10/29/12	Fri 11/2/12
13	Substructure	100 days	Mon 11/26/12	Fri 4/12/13
14	Super-Structure CMU	44 days	Tue 4/9/13	Fri 6/7/13
15	**Framing**	**61 days**	**Thu 5/9/13**	**Thu 8/1/13**
16	LV1	34 days	Thu 5/9/13	Tue 6/25/13
17	LV2	14 days	Thu 5/16/13	Tue 6/4/13
18	LV3	13 days	Mon 6/3/13	Wed 6/19/13
19	LV4	24 days	Tue 6/4/13	Fri 7/5/13
20	Penthouse	22 days	Wed 7/3/13	Thu 8/1/13
21	**Rough-Ins & Interior Finishes**	**259 days**	**Mon 4/15/13**	**Thu 4/10/14**
22	Garage & Retail	185 days	Mon 4/15/13	Fri 12/27/13
23	LV1	134 days	Mon 7/8/13	Thu 1/9/14
24	LV2	150 days	Tue 7/16/13	Mon 2/10/14
25	LV3	161 days	Tue 7/23/13	Tue 3/4/14
26	LV4	183 days	Tue 7/30/13	Thu 4/10/14
27	Roof	19 days	Tue 8/6/13	Fri 8/30/13
28	**Enclosure & Exterior Finishes**	**219 days**	**Mon 6/10/13**	**Thu 4/10/14**
29	Roofing	69 days	Mon 6/10/13	Thu 9/12/13
30	North Elevation	64 days	Tue 7/2/13	Fri 9/27/13
31	South Elevation	101 days	Tue 7/2/13	Tue 11/19/13
32	West Elevation	195 days	Fri 7/12/13	Thu 4/10/14
33	East Elevation	57 days	Fri 8/2/13	Mon 10/21/13
34	Court Yard	96 days	Fri 7/26/13	Fri 12/6/13
35	Close-Out	108 days	Mon 12/23/13	Wed 5/21/14
36	Project Completion	0 days	Wed 5/21/14	Wed 5/21/14



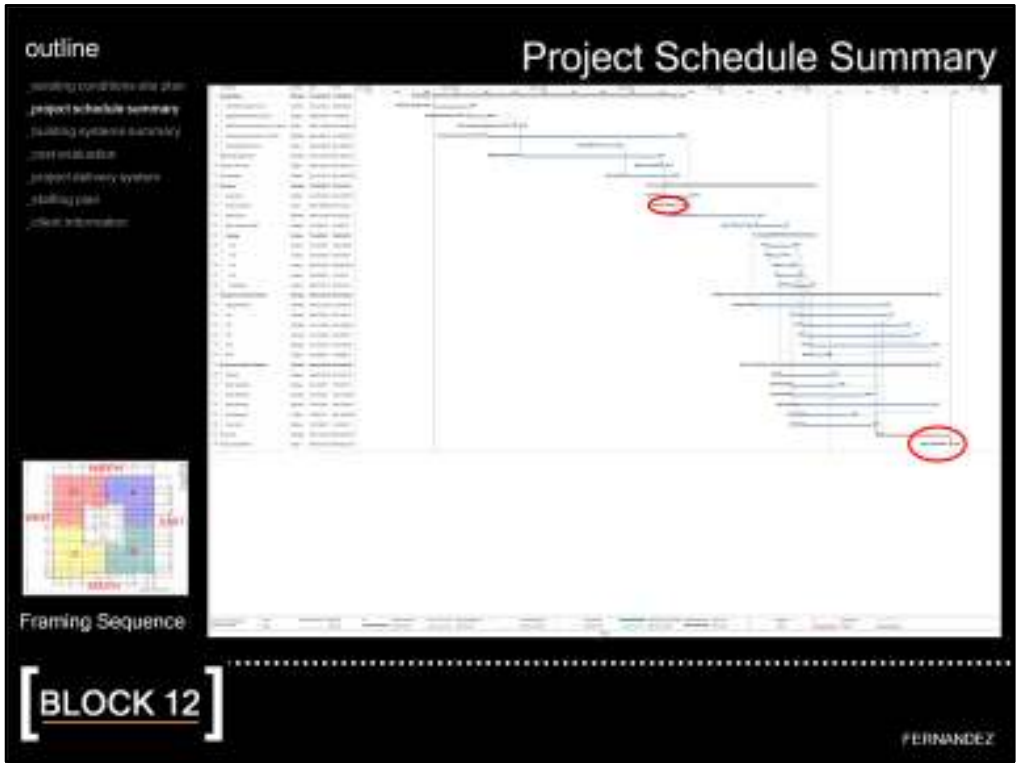
Project: AE 372 Draft 07
Date: Sat 9/14/13

Task	Milestone	Project Summary	External Milestone	Inactive Milestone	Manual Task	Manual Summary Rollup	Start-only	Deadline	Critical Split
Split	Summary	External Tasks	Inactive Task	Inactive Summary	Duration-only	Manual Summary	Finish-only	Critical	Progress

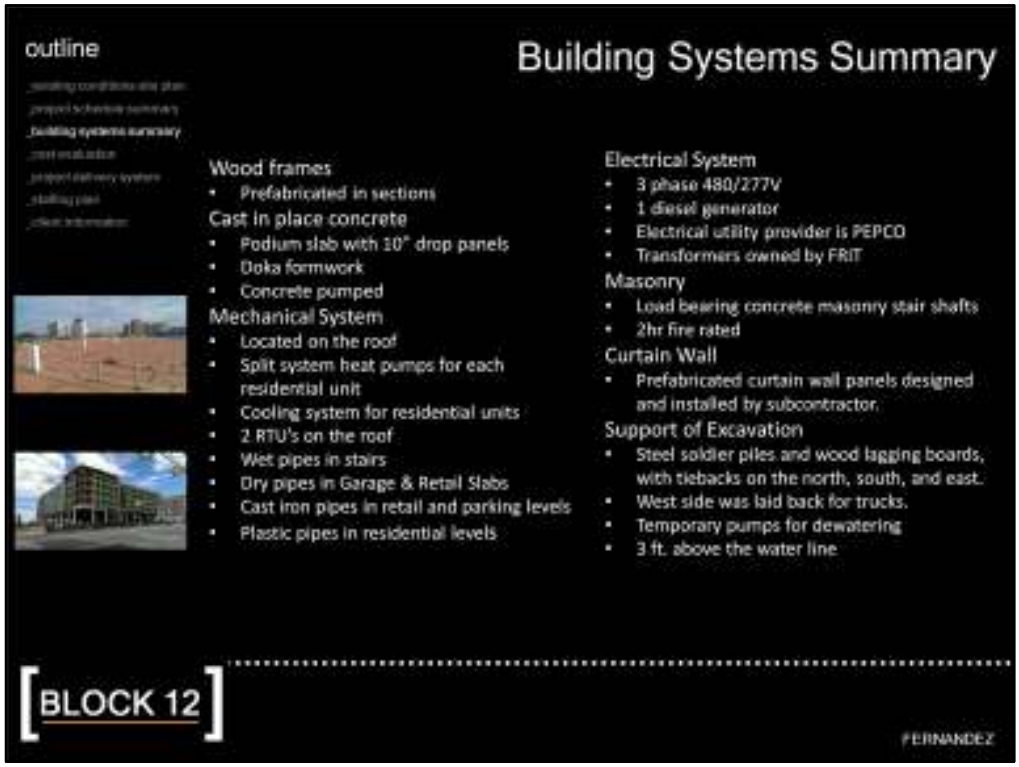
Presentation Slides in Note Format



- Part of a large mixed-use community in Rockville, MD
- Two primary roads have heavily car flow patterns
- Utility tie-in points are readily accessible, but due to overall project size, utilities will have to be upsized
- Based on geotechnical report, building is 3’ above water level
- Pedestrian sidewalk bordering project will remain functional
- Large parking area will aid in material storage and delivery

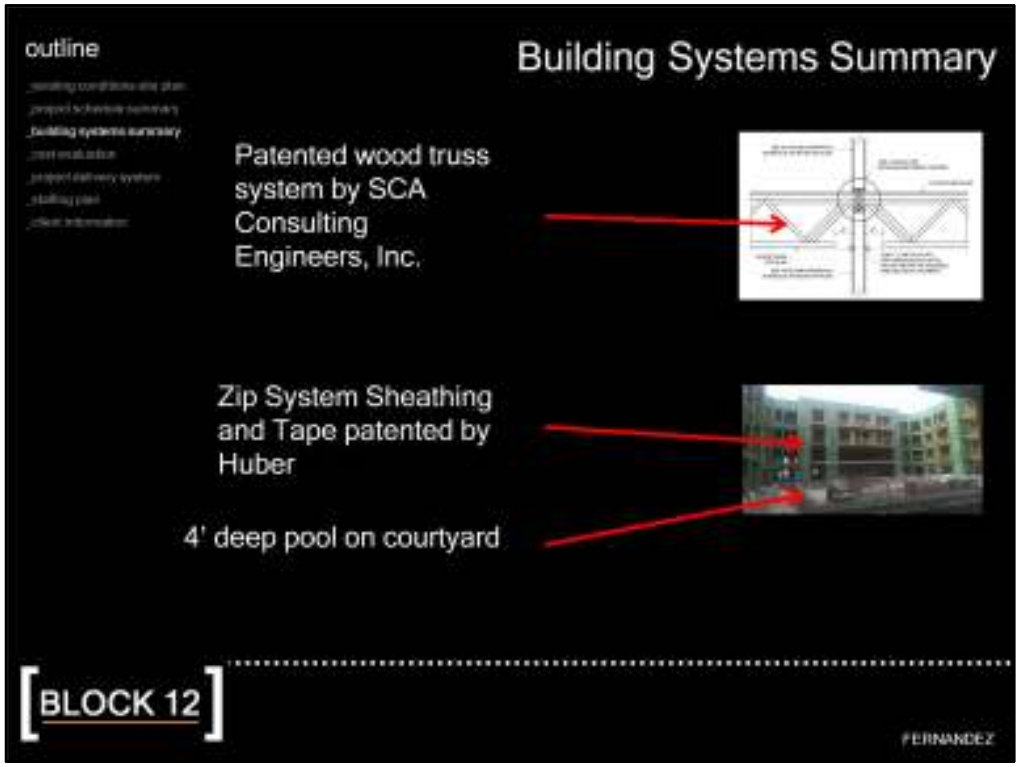


- Critical May 2014 completion date
- 8 month project construction duration
- Hurricane Sandy delayed excavation by 5 days
- Project accelerated through prefabricating wood framing into sections
    - Building split into 4 sections
    - Framer had enough workers to work on 2 sections consecutively.
    - Exterior walls→ interior walls →floor trusses →Floor Plywood/ Sheathing
    - 5 days/ activity
- Close-out is the only activity which lies on the critical path
    - Scheduled for rough-ins and enclosure to be near completion date
        - High work demand near end of project
- Foundation
    - 12” spread footings
- Structural
    - Prefabricated wood framing
    - Patented truss system (faster and more efficient)

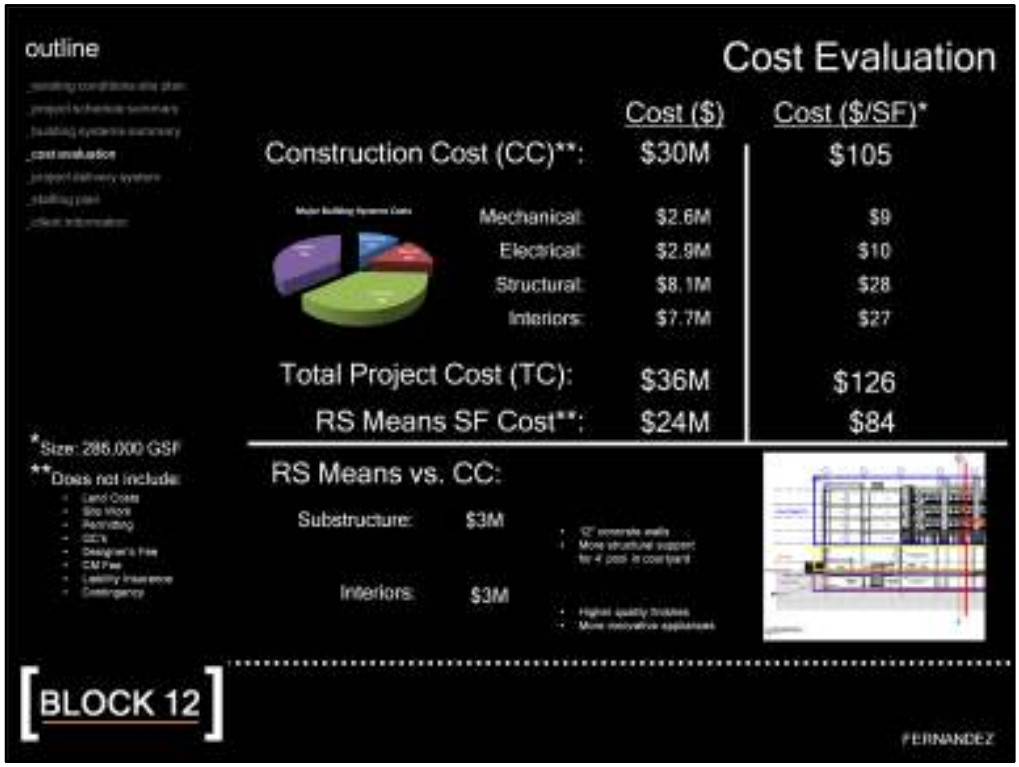


- Prefabricated wood frames:
    - Brought to site in sections and assembled on site
- Cast in place concrete:
    - Cast-in place concrete podium slab with 10” drop panels
    - Doka formwork
    - Concrete pumped from concrete truck
    - Used concrete barrel for areas out of reach
    - Doka Formwork system
        - Load-bearing tower staxo 40
        - Floor props Eurex top
- Mechanical System:
    - Mechanical equipment will be located on the roof
    - Split system heat pumps for each residential unit
    - Cooling system for residential units
    - 2 RTU’s on the roof
    - 3 Exhaust fans in parking garage (activated with CO2 sensors)
    - Heat pumps at concierge
    - Fire Protection
        - Wet pipe
            - Stairs
        - Dry pipe

        - Garage & Retail Slabs
    - Cast iron pipes in retail and parking levels
    - Plastic pipes in residential levels
- Electrical System:
    - 3 phase 480/277V low voltage fed from one location to electrical closets on each level
    - 1 diesel generator
    - Electrical utility provider is PEPCO
    - Transformers owned by FRIT
- Masonry:
    - Load bearing concrete masonry stair shafts
    - 2hr fire rated
- Curtain Wall:
    - Prefabricated curtain wall panels designed and installed by subcontractor.
- Support of Excavation:
    - Steel soldier piles and wood lagging boards, with tiebacks on the north, south, east. West laid back
    - Temporary pumps used to dewater
        - Building sits 3 ft. above the water line

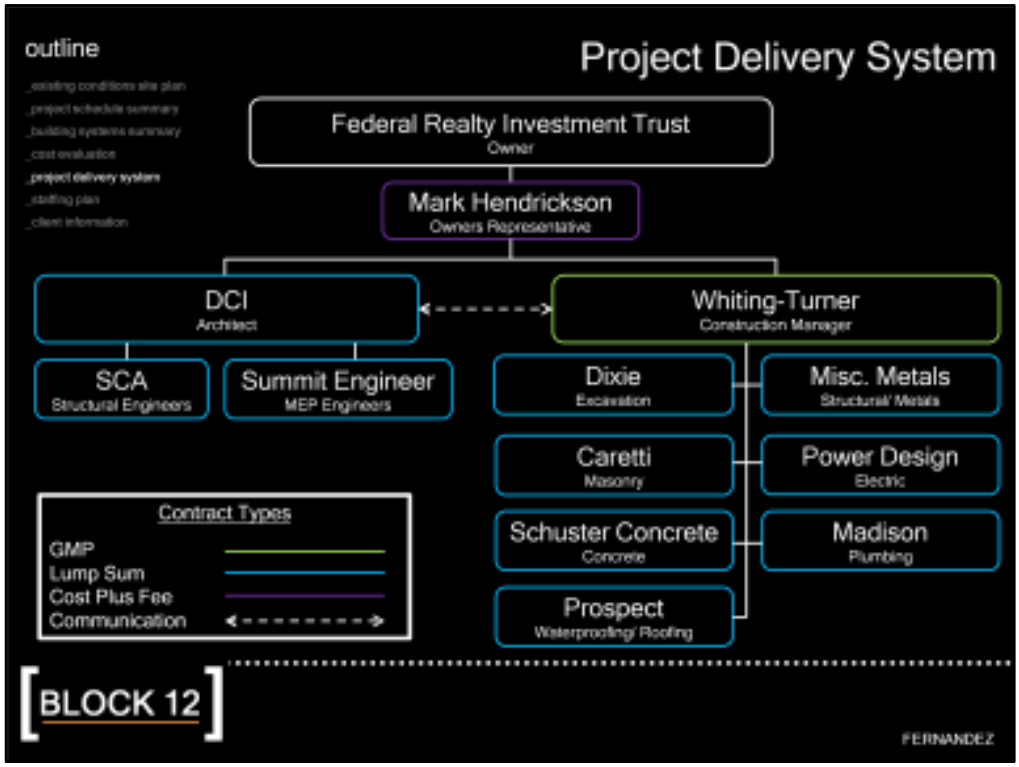


- Unique about Project:
  - Patented wood truss system by SCA Consulting Engineers, Inc.
    - System for efficiency
    - Faster drywall installation- full sheets placed and drilled in place
  - Zip System Sheathing and Tape
    - Acts as a barrier to keep moisture out
    - Reduces air leakage
    - Install panels, then tape
    - No house wrap and felt required
  - Owner seeking LEED Certification
    - Green roof system
    - Waste management plan
    - Indoor air quality management plan



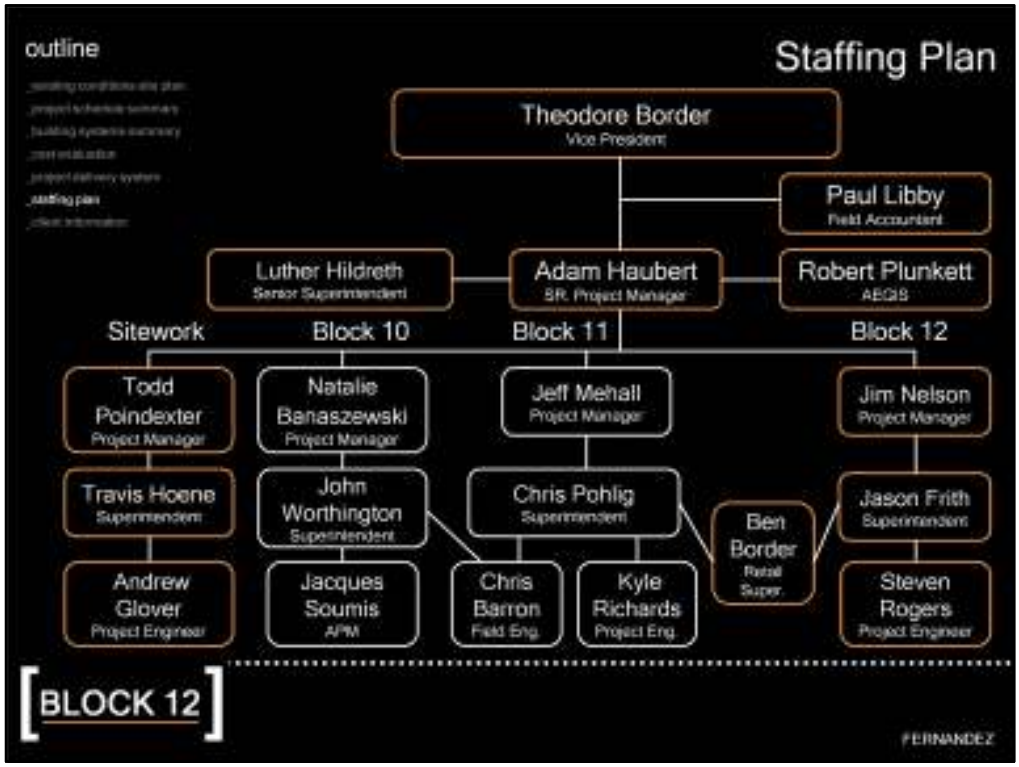
- Construction Cost
  - $30M or $105 /SF
    - Does not include
      - Land cost
      - Site work
      - Permitting
      - GC’s
      - Designer’s Fee
      - CM Fee
      - Liability Insurance
      - Contingency
    - Mechanical: $2.6M or $9/SF (12%)
    - Electrical: $2.9M $10/SF (14%)
    - Structural: $8.1M $28/SF (38%)
    - Interiors: $7.7M $27/SF (36%)
- Total Project Cost
  - $36M or $126/SF
- RS Means Cost
  - $24M or $84/SF
  - Assumed building was 3 different building types
    - Apartments, Retail, and Parking

        - Added three different building section estimates
        - Subtracted retail roof SF estimate for more accurate estimate
- Discrepancies
    - Substructure- $3M Low
        - 12” actual concrete walls rather than 5” calculated in RS Means
        - More dead load on podium level due to heavy equipment and 4’ swimming pool.
    - Interiors- $3M Low
        - Higher quality finishes
        - More innovative appliances



- Traditional Design-Bid-Build project delivery system with the CM at Risk providing a GMP
    - Owner is comfortable with project delivery
        - Past good experience
    - Project is negotiated
- Owner's rep is by cost plus fee
- Architect, engineers, and subcontractor's contract types are lump sums

The architect and CM do not have a contract, but they communicate
The construction contract term are in typical AIA language stating explicitly each party's responsibilities. The schedule to abide are attached and the consequences for delay or non-compliance are stated. The contractor was selected based on a good relationship with the owner. The project's cost was negotiated with the owner. The contract document is not available for further review.



- This is the overall project staffing plan
- There are 3 buildings under construction at the same time, with a team dedicated to site work, due to the heavy site work involvement
- Ted Border is the Vice President overseeing all the work performed throughout the overall project.
- Adam Haubert is the Sr. Project Manager primarily in charge of scheduling
- Luther Hildreth is the Senior Superintendent making sure everything runs smoothly in the field
- Site work and Block 12 are structured similarly with a project engineer being under a superintendent under a project manager.

- Federal Realty Investment Trust is a large realty investment trust, which focuses on development and redevelopment
    - Typically own, operate, and manage their buildings
- Federal Realty
    - Privately funded
    - focused on obtaining a quality building at a low cost
        - above average finishes (granite), but not over the top