



Wesley A. Brown Field House
Annapolis, Maryland

Peter Schneck
Construction Management
Technical Assignment #2

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A. Executive Summary

Technical Assignment #2 will provide an examination of construction management techniques utilized on the Wesley A. Brown Field House. Construction management techniques are illustrated using a Detailed Project Schedule, a Site Layout Plan of the Steel / Concrete Phase of Construction, an Assemblies Estimate, a Detailed Structural Estimate, and finally a General Conditions Estimate.

The Wesley A. Brown Field House is a Fast-tracked project with construction commencing the date of May 29, 2006 and finishing March 22, 2008. Milestone dates highlighted at the top of the schedule provide a quick reference to track the project. Further exploration of the schedule provides more insight on how the Wesley A. Brown Field House is being constructed. The Detailed Project Schedule is followed by a Site Layout for the Steel and Concrete Sequence of construction. A tight space and limited access to the site, make an organized Site Plan imperative for the critical path phases of steel and concrete. An Assemblies Estimate explores the exterior skin of the Wesley A. Brown project. Having a central location on campus and bordering the Santee Basin, the Wesley A. Brown project, the largest construction project on the Naval Academy's Campus in over 10 years, will have many onlookers getting their first impression of the project's success by viewing the exterior skin. The skin must be visibly appealing and at the same time not take away funding for functionality for a world-class athletic facility. A Detailed Structural Estimate is also included Technical Assignment #2. This estimate allows further understanding on how the Wesley A. Brown Field House will be constructed. The final portion of Technical Assignment #2 is a General Conditions Estimate. This estimate looks at the support requirements that a construction manager must budget for to complete the Wesley A. Brown project in 2 years.

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B. Detailed Project Schedule

(Please see Appendix A on page 8 for the Detailed Schedule)

The project schedule is a 2-year fast tracked project. Any preconstruction delays, whether the delays are permitting or Naval approvals, can affected the overall project schedule. The need for proper management of time prior to construction is key a step in not only starting the project on time, but finishing the project on time as well. Starting construction before the final design is created is always risky, but with the added policies and regulations of the NAVY, the approval of a change in design takes longer than normal. A well organized team of designers and builders need to work well together, so that the highest possible quality Wesley A. Brown Field House is delivered to the NAVY on time and on budget.

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C. Site Layout

(Please see Appendix B on page for the Steel / Concrete Phasing Site Layout)

The Site Layout Plan takes a closer look at the Steel / Concrete Placement phase of the Wesley A. Brown Field House. There is limited site access to the jobsite due to the security on the Naval Academy and the one-way streets that lead to the project's entrance. Therefore, careful planning is required for material delivery and placement of both steel and concrete. Steel staging areas will be located on the east side and northwest corner, so that picks can be made of the steel delivery trucks and placed in staging areas that minimize pick lengths. The staging locations also allows for free traffic in and out of the site for concrete trucks. Concrete pumps and hoses are located near gates will ample space for more than one concrete truck to have room to place concrete in the pump, which will prevent a stoppages in a pour. Not only does the Wesley A. Brown Field project need a well organized and functional site plan for the steel and concrete phase of construction, there will always need to be an effort to organize material delivery.

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D. Assemblies Estimate

Assemblies Estimate: Summary	
Project Name: Wesley A. Brown Field House	
Annapolis, Maryland	
B20 - EXTERIOR CLOSURE	
B2010 - Exterior Walls	
Elevation	Cost
North Elevation (Holloway Road)	\$1,481,998
East Elevation (Brownson Road)	\$ 831,321
West Elevation (MacDonough Hall)	\$ 823,811
South Elevation (Bancroft Hall)	\$1,014,447
Miscellaneous	\$ 367,135
Total	\$4,518,711

(Please see Appendix C on page for a more Detailed Assemblies Estimate)

The Wesley A. Brown exterior skin is comprised of mostly Pre-cast Concrete Panels. There are many different types of panels used in the field house. Some panels are thicker than others to help provide force protection; while other panels simply have different textures to add a different effect to the skin of the building. The estimate also demonstrates the North (Holloway Road) elevation of the Wesley A. Brown Field House was designed to not only provide onlookers a spectacular building to look at, but the athletes inside an incredible view of the Santee Basin. Large curtain wall windows and numerous types of Pre-cast panels adorn the North elevation, which accounts for it being the most expensive elevation by more than \$400,000.

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E. Detailed Structural Systems Estimate

Detailed Structural Estimate: Summary			
Project Name: Wesley A. Brown Field House			
Annapolis, Maryland			
	Estimate Category		Cost
	Excavation and Fill		\$ 3,340,584.29
	Concrete		\$ 502,515.55
	Steel		\$ 2,831,469.16
	Formwork		\$ 316,782.99
	Concrete Accessories		\$ 52,228.20
	Reinforcing Steel		\$ 626,865.00
	Welded Wire Fabric		\$ 41,991.92
	Finishing		\$ 156,014.53
	Total		\$ 7,868,451.63

(Please see Appendix D on page for a more detailed Structural Systems Estimate)

Assumptions

- All concrete is 4000psi except the 2nd floor SOD
- Existing Grade elevation is 2 meters
- The basketball area is recessed 8”and is a 10” SOG
- Thickened Slab beneath the West and South bar – 13mm thicker
- No foundation insulation included
- No curbs are included

The Wesley A. Brown Field House SOG has many recesses and pits to allow proper pits for activities such as pole vaulting. Carefully coordinated pours and forming are key for the elimination of rework on the SOG. Also, the hydraulic track requires strict tolerances for the concrete slab, so that it can be raised and lowered to sit flush with the surrounding floor.

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F. General Conditions Estimate

General Conditions Estimate: Summary	
Project Name: Wesley A. Brown Field House	
Annapolis, Maryland	
	Project Cost
Personnel	\$ 1,481,000.00
Field Office Support	\$ 22,968.00
Temporary Utilities	\$ 3,097.20
Bonds & Fees	\$ 3,582,000.00
General Requirements	\$ 333,207.00
Total	\$ 5,422,272.20

(Please see Appendix E on page for a more detailed General Conditions Estimate)

The Wesley A. Brown Field House is located on one of the most prestigious college campuses in America. The NAVY will only accept the highest quality construction. The field house is filled with expensive long-lead unique items including: a hydraulic track and a roll-out football field. Only with an experienced construction team will the project be successful. Cutting the budget for personnel on the Wesley A. Brown Field House would not be a wise decision; while spending more than usual on personnel may drive the project to success.

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APPENDIX A

- Detailed Project Schedule -

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APPENDIX B

- Steel / Concrete Sequence Site Plan -

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APPENDIX C

- Assemblies Estimate -

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Assemblies Estimate				
Project Name: Wesley A. Brown Field House				
Annapolis, Maryland				
B20 - EXTERIOR CLOSURE				
B2010 - Exterior Walls				
North Elevation (Holloway Road)	Quantity	Unit	Price/Unit	Cost
Precast Panel PC-1A	345	SQFT	41.00	13,455
Precast Panel PC-2A	556	SQFT	45.00	23,352
Precast Panel PC-2B	44	SQFT	45.00	1,848
Precast Panel PC-2C	285	SQFT	45.00	11,970
Precast Panel PC-3A	87	SQFT	58.00	4,785
Precast Panel PC-3B	332	SQFT	58.00	18,260
Precast Panel PC-3C	64	SQFT	58.00	3,520
Metal Panel MP-1	66	SQFT	52.00	3,300
Metal Panel MP-2	739	SQFT	52.00	36,950
Metal Panel MP-3	690	SQFT	52.00	34,500
Metal Panel MP-5	560	SQFT	52.00	28,000
Metal Panel MP-5A	906	SQFT	52.00	45,300
Glazing GL-2	6,377	SQFT	85.00	512,073
Glazing GL-2A	4,115	SQFT	85.00	330,435
Glazing GL-2B	2,540	SQFT	85.00	203,962
Glazing GL-3	390	SQFT	85.00	31,317
Glazing GL-3B	70	SQFT	82.00	5,621
Plastic Glazing PG-1A	3,395	SQFT	52.00	169,750
Metal deck & sheathing backup for metal panels	600	SQFT	10.00	3,600
Total				1,481,998
East Elevation (Brownson Road)				
Precast Panel PC-3A	2,307	SQFT	62.00	126,885
Precast Panel PC-3B	5,815	SQFT	62.00	319,825
Precast Panel PC-3C	290	SQFT	62.00	15,950
12" CMU Backup @ Metal Panel	1,088	SQFT	25.00	21,760
Masonry CMU-2	92	SQFT	25.00	1,840
Metal Panel MP-3	270	SQFT	52.00	13,500
Metal Panel MP-5A	2,680	SQFT	52.00	134,000
Metal Panel MP-5B	540	SQFT	52.00	27,000
Glazing GL-3B	492	SQFT	100.00	48,511
Plastic Glazing PG-2A	2,225	SQFT	52.00	111,250
Metal deck & sheathing backup for metal	1,800	SQFT	10.00	10,800

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panels				
Total				831,321
West Elevation (MacDonough Hall)				
Precast Panel PC-1A	2,694	SQFT	45.00	105,066
Precast Panel PC-1B	524	SQFT	45.00	20,436
Precast Panel PC-1C	773	SQFT	45.00	30,147
Precast Panel PC-2C	375	SQFT	45.00	15,750
Precast Panel PC-4A	650	SQFT	45.00	27,300
Precast Panel PC-4B	80	SQFT	42.00	3,360
Metal Panel MP-1	413	SQFT	55.00	20,650
Metal Panel MP-2	152	SQFT	55.00	7,600
Metal Panel MP-3	2,344	SQFT	55.00	117,200
Metal Panel MP-4	744	SQFT	55.00	37,200
Metal Panel MP-5	236	SQFT	55.00	11,800
Metal Panel MP-5A	1,298	SQFT	55.00	64,900
Glazing GL-1	2,475	SQFT	100.00	244,035
Glazing GL-1A	95	SQFT	100.00	9,367
Plastic Glazing PG-2	1,685	SQFT	55.00	84,250
Plastic Glazing PG-2A	495	SQFT	55.00	24,750
Total				823,811
South Elevation (Bancroft Hall)				
Precast Panel PC-1A	985	SQFT	42.00	38,415
Precast Panel PC-1B	30	SQFT	42.00	1,170
Precast Panel PC-1C	308	SQFT	42.00	12,012
Precast Panel PC-3A	840	SQFT	60.00	46,200
Precast Panel PC-3C	30	SQFT	60.00	1,650
CMU-1 Split Face 4" w/ 2" rigid insulation	7,373	SQFT	20.00	110,595
CMU-2 Ground Face 4" w/ 2" rigid insulation	3,688	SQFT	25.00	73,760
CMU-3A Ground Face 8" w/2" rigid insulation	691	SQFT	25.00	13,820
CMU-4 Ground Face 8" w/2" rigid insulation	1,506	SQFT	25.00	30,120
CS-1 Cast Stone parpet cap ~ 20" wide x 6" thick	390	LNFT	42.00	15,600
CS-2 Cast Stone vertical veneer ~ 18" high x 8" thick	390	SQFT	42.00	15,600
Standard CMU Back-up for CMU veneers	13,479	SQFT	15.00	161,748
Metal Panel MP-1	128	SQFT	55.00	6,400

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Metal Panel MP-2	45	SQFT	55.00	2,250
Metal Panel MP-3	3,355	SQFT	55.00	167,750
Metal Panel MP-5	5,300	SQFT	55.00	265,000
Glazing GL-1	451	SQFT	100.00	44,469
Glazing GL-1B	80	SQFT	100.00	7,888
Total				1,014,447
Miscellaneous				
Misc. Metals Budget Skin Work	20	TONS	4,000.00	80,000
Steel Framing & Misc Support for blast shown on Santee Elev	50	TONS	4,000.00	200,000
Glass Catcher System				
3/4" Stainless Steel rods 5,850 LF @ 1.5lb/lf	8,775	LBS	3.00	26,325
1" Stainless Steel rods 756 LF @ 2.67lb/lf	2,020	LBS	3.00	6,060
Install rods @ east & west clearstories 1,000 Inft	86	EACH	100.00	8,600
Install rods @ Santee Basin Elevation (North) 5,750 Inft	378	EACH	100.00	37,800
Install 1" rods @ 1/3 points on Santee Basin Elev. 756 Inft	14	EACH	100.00	1,400
Embeds @ Santee Basin Elevation	98	EACH	25.00	2,450
Caulking @ Masonry & Precast	3,000	LNFT	1.50	4,500
Total				367,135
Assembly Total				\$4,518,711

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APPENDIX D

- Detailed Structural Estimate -

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Detailed Structural Estimate				
Project Name: Wesley A. Brown Field House				
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	Quantity	Unit	Price/unit	Amount
Excavation and Fill				
Fine Grade Floor by Hand	119921.1	SQFT	\$ 27.50	\$ 3,297,830.25
Hand Excavate for Slab Edge	43.1	CUYD	\$ 27.50	\$ 1,185.25
Machine Excav Continuous Ftg	98	CUYD	\$ 14.30	\$ 1,401.40
Hand Excavate for Continuous Ftg	66.4	CUYD	\$ 27.50	\$ 1,826.00
Machine Excav Stepped Ftg	16.6	CUYD	\$ 14.30	\$ 237.38
Hand Excav Stepped Ftg	452.8	CUYD	\$ 27.50	\$ 12,452.00
Mach Excav Pile Cap	113.2	CUYD	\$ 27.50	\$ 3,113.00
Machine Excav Grade Beam	451.3	CUYD	\$ 14.30	\$ 6,453.59
Hand Excav Pit	5.4	CUYD	\$ 14.30	\$ 77.22
Hand Backfill Grade Beam	350.1	CUYD	\$ 23.50	\$ 8,227.35
Hand Backfill Footing	300.9	CUYD	\$ 23.50	\$ 7,071.15
Hand Backfill Stepped Ftg	30.2	CUYD	\$ 23.50	\$ 709.70
Total				\$ 3,340,584.29
Concrete				
CIP Pile Caps Concrete 4000psi	668.3	CUYD	\$ 92.50	\$ 61,817.75
CIP Sonotube Concrete 4000psi	22.6	CUYD	\$ 92.50	\$ 2,090.50
CIP Cont. Ftg. Concrete 4000psi	20.2	CUYD	\$ 92.50	\$ 1,868.50
CIP Grade Beams Concrete 4000psi	242.5	CUYD	\$ 92.50	\$ 22,431.25
CIP SOG Concrete 4000psi	2438.2	CUYD	\$ 92.50	\$ 225,533.50
CIP Pits Concrete 4000psi	3.1	CUYD	\$ 92.50	\$ 286.75
CIP Walls Concrete 4000psi	451.1	CUYD	\$ 92.50	\$ 41,726.75
CIP Stepped Ftg. Concrete 4000psi	1014.4	CUYD	\$ 92.50	\$ 93,832.00
CIP Arch. Col. Concrete 4000psi	61.1	CUYD	\$ 92.50	\$ 5,651.75
CIP Concrete SOD 3000psi	531.2	CUYD	\$ 89.00	\$ 47,276.80
Total				\$ 502,515.55
Steel				
Columns & Beams	194.481	TONS	\$ 4,325.00	\$ 841,130.33
Box Trusses	485.4485	TONS	\$ 4,100.00	\$ 1,990,338.83
Total				\$ 2,831,469.16
Formwork				
Cont Stepped Ftg Form	723.4	SQFT	\$ 5.00	\$ 3,617.00
Stepped Ftg end Forms	32	SQFT	\$ 2.90	\$ 92.80

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Slab Keyway	1011.8	LNFT	w/ Slab		
Pile Cap Edge Form	6411.2	SQFT	\$ 8.10	\$	51,930.72
Round Sonotube Form	312	LNFT	\$ 34.50	\$	10,764.00
Continuous Ftg Edge Forms	510.9	SQFT	\$ 5.00	\$	2,554.50
Ftg Keyways	593.8	LNFT	\$ 4.00	\$	2,375.20
Grade Beam Form	5129.8	SQFT	\$ 5.20	\$	26,674.96
Floor Edge Form	6587	SQFT	\$ 4.80	\$	31,617.60
Slab Blockout Edge Forms	1752.8	LNFT	\$ 2.90	\$	5,083.12
Forms @ Pit	76.3	SQFT	\$ 9.00	\$	686.70
Forms @ Pad	390.4	SQFT	\$ 9.00	\$	3,513.60
Wall Form	14063.9	SQFT	\$ 10.90	\$	153,296.51
Pilaster Edge @ Wall	390.6	SQFT	\$ 12.20	\$	4,765.32
Wall Key Form	4398	LNFT	w/ Bulkhead		
Wall Bulkheads	80	SQFT	\$ 12.40	\$	992.00
Slab Edge Form at Metal Deck	2808.8	LNFT	\$ 6.70	\$	18,818.96
Total				\$	316,782.99
Concrete Accessories					
Saw Cut Joint	7300	LNFT	\$ 3.00	\$	21,900.00
Construction Joints	1450	LNFT	\$ 2.70	\$	3,915.00
Waterstop	6003	LNFT	\$ 4.40	\$	26,413.20
Total				\$	52,228.20
Reinforcing Steel					
SOG Rebar	240.4	TONS	\$ 1,725.00	\$	414,690.00
Column Rebar	41.4	TONS	\$ 1,725.00	\$	71,415.00
Wall Rebar	17.1	TONS	\$ 1,725.00	\$	29,497.50
Cont. Ftg. Rebar	3.6	TONS	\$ 1,725.00	\$	6,210.00
Stepped Ftg. Rebar	7.7	TONS	\$ 1,725.00	\$	13,282.50
Pile Cap Rebar	26.4	TONS	\$ 1,725.00	\$	45,540.00
Grade Beam Rebar	15.4	TONS	\$ 1,725.00	\$	26,565.00
Pit Rebar	1	TONS	\$ 1,725.00	\$	1,725.00
Vertical Rebar Dowels	10.4	TONS	\$ 1,725.00	\$	17,940.00
Total				\$	626,865.00
Welded Wire Fabric					

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6x6 W2.9/W2.9 mesh	59563	SQFT	70.5/C.S.F.	\$	41,991.92
Total				\$	41,991.92
Finishing					
Finish Ftg. Top Surface	5985	SQFT	\$	0.50	\$ 2,992.50
Machine Trowel	162373.7	SQFT	\$	0.70	\$ 113,661.59
Point & Patch	26926.1	SQFT	\$	0.70	\$ 18,848.27
Hand Trowel	7750.1	SQFT	\$	1.30	\$ 10,075.13
Rub Concrete Column	13046.3	SQFT	\$	0.80	\$ 10,437.04
Total				\$	156,014.53
Structural Total				\$	7,868,451.63

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APPENDIX E

- General Conditions Estimate -

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General Conditions Estimate						
Project Name: Wesley A. Brown Field House						
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Personnel	Quantity	Time (Months/year)	Price/Month	Amount/year	% of Project	Project Cost
Operations Manager	1	2	12450	24900		49800
Project Manager	1	12	9600	115200		230400
General Superintendent	1	2	11600	23200		46400
Project Superintendent	1	12	9300	111600		223200
Project Engineer	1	12	7800	93600		187200
Office Engineer	1	12	6700	80400		160800
Field Engineer	1	12	5200	62400		124800
Field Engineer	1	12	5200	62400		124800
Secretary	1	12	5200	62400		124800
QC Manager	1	6	9600	57600		115200
Estimator	1	6	7800	46800		93600
Total						1481000
Field Office Support						
Office Trailer	32x8	2	12	180	4320	8640
Air Conditioning - Trailer			4	43.5	174	348
Field Office Expense			12	157	1884	3768
Office Supply			12	93.5	1122	2244
Telephone			12	224	2688	5376
Field Office Lights & HVAC			12	108	1296	2592
Total						22968
Temporary Utilities						
Heat			4	11.25	45	90
Lighting Including Service Lamps			12	16.8	201.6	403.2
Power For Job Duration Including Elevator			12	51.5	618	1236
Portable Chemical Toilet	5	12	11.4	684	684	1368
Total						3097.2
Bonds & Fees						
Permit	\$45 mil				2	900000
Performance Bond	\$45 mil				2.5	1125000
Builder's Risk	\$45 mil				0.64	288000
All-risk	\$45 mil				0.62	279000
Public Liability	\$45 mil				2.2	990000
Total						3582000
General Requirements						
Dumpsters	3	12	450	16200		
Scaffold	94000sqft		73/C.S.F.			68620
20T Crane		2	5800			11600
Fence	2455ft		11.4			27987
Clean Up	\$45 mimi				0.5	225000
Total						333207
General Conditions Total						\$ 5,422,272.20