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Construction Management Option

Baldwin High School
Pittsburgh, PA

Dr. Riley
October 6, 2006

TECHNICAL ASSIGNMENT #1
Construction Project Management

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Executive Summary

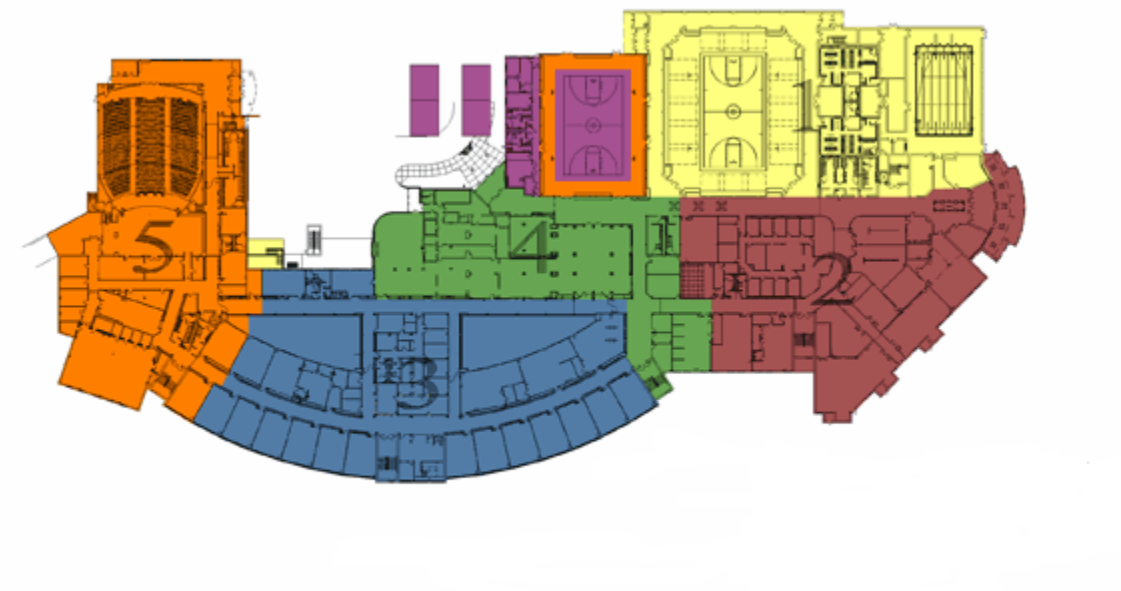
This technical document emphasizes the conditions under which Baldwin (junior/senior) High School is being constructed. It also elaborates on the scope of work that will be involved during the renovation and addition phases of construction. Included within this report are a project schedule summary, building systems summary, and also several forms of cost evaluation.

The tentative project schedule has work beginning in January of 2006 and finishing in February of 2009. Phase I of the project required demolition of the existing pool and locker room structure and construction of the new gymnasium, natatorium, and locker rooms. Phase II focuses primarily on the demolition of a portion of the two-story south wing containing guidance offices and language classrooms. Beginning fall of 2006, the new athletic entrance and graphics and communication classrooms will begin construction in this same area.

Accompanying the schedule is a detailed list of the major building systems that will makeup the new facility. A few of the main processes being looked at are the demolition, site work, structural, mechanical, and electrical areas of construction. The assignment also gives insight on how this high school project compares to other projects of its same size and complexity. By producing relative cost estimates, a reference base will be established; in order to easily justify any comparisons needed.

Project Schedule Summary

Phasing Plan

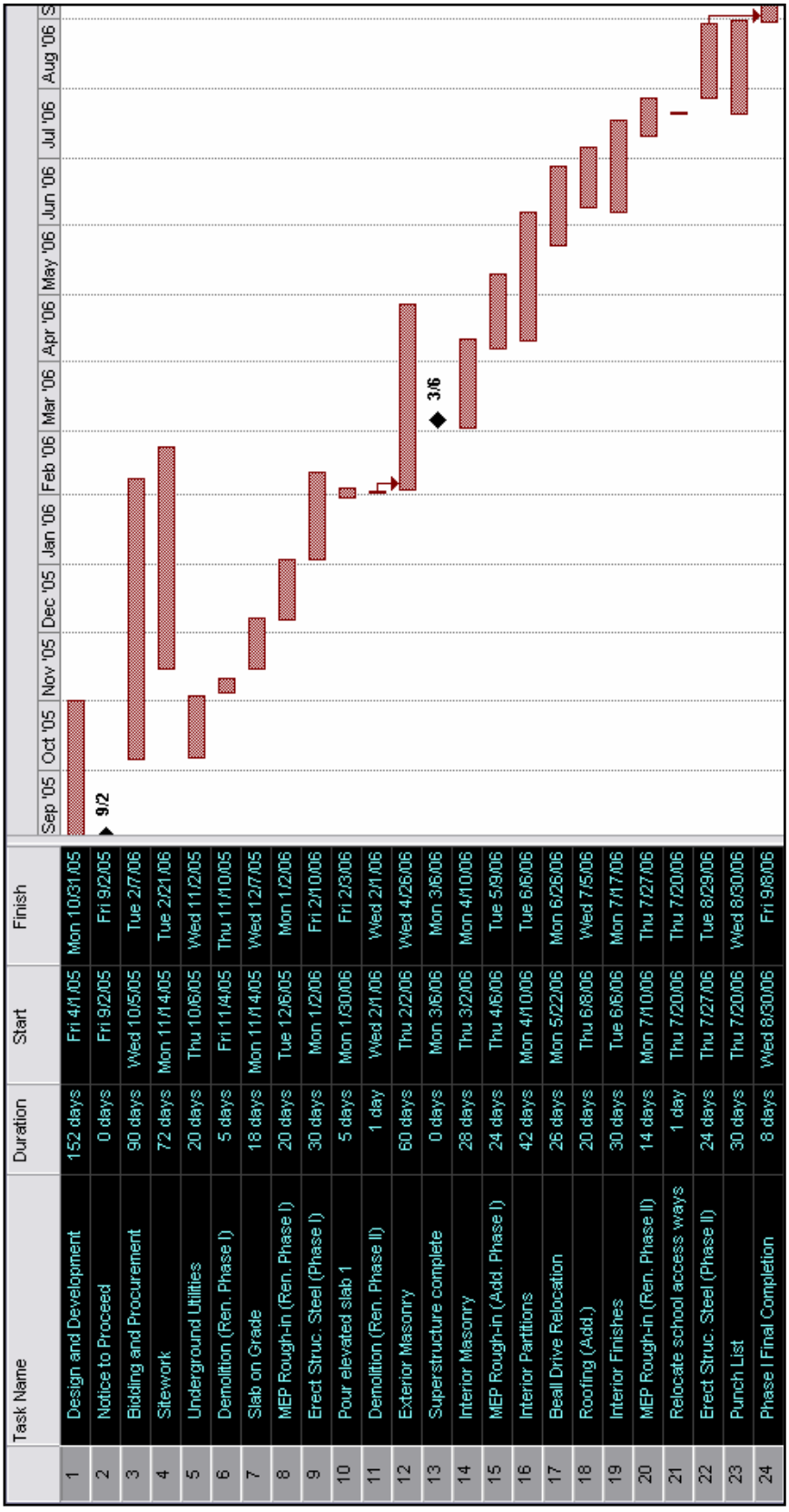


SEPT 2005 – SEPT 2006	MAY 2007 – JAN 2008
JUNE 2006 – MAY 2007	JUNE 2007 – AUG 2007
JUNE 2006 – AUG 2006	JAN 2008 – AUG 2008

The total timeframe for the construction and renovation of the high school building is about 159 weeks (roughly 3 years.) The design phase consists of over 400 drawings, and simply defines the magnitude of this project as a whole. Phase I took nearly 52 weeks to complete, which resulted in construction of the new gymnasium, natatorium, and locker rooms. Relocating Beall Drive was also performed during this time period and took about 1 month. Phase II is expected to wrap up by May 2007; its construction was started sequentially during the last 12 weeks of Phase I's completion. Managing a healthy cash flow, while the entire project is phased, will be a difficult task for the construction management team. However, identifying problems early and healthy sub-contractor interaction should progress the schedule for a timely delivery date by February 2009.

Schedule

	Task Name	Duration	Start	Finish
1	Design and Development	152 days	Fri 4/1/05	Mon 10/31/05
2	Notice to Proceed	0 days	Fri 9/2/05	Fri 9/2/05
3	Bidding and Procurement	90 days	Wed 10/5/05	Tue 2/7/06
4	Sitework	72 days	Mon 11/14/05	Tue 2/21/06
5	Underground Utilities	20 days	Thu 10/6/05	Wed 11/2/05
6	Demolition (Ren. Phase I)	5 days	Fri 11/4/05	Thu 11/10/05
7	Slab on Grade	18 days	Mon 11/14/05	Wed 12/7/05
8	MEP Rough-in (Ren. Phase I)	20 days	Tue 12/6/05	Mon 1/2/06
9	Erect Struc. Steel (Phase I)	30 days	Mon 1/2/06	Fri 2/10/06
10	Pour elevated slab 1	5 days	Mon 1/30/06	Fri 2/3/06
11	Demolition (Ren. Phase II)	1 day	Wed 2/1/06	Wed 2/1/06
12	Exterior Masonry	60 days	Thu 2/2/06	Wed 4/26/06
13	Superstructure complete	0 days	Mon 3/6/06	Mon 3/6/06
14	Interior Masonry	28 days	Thu 3/2/06	Mon 4/10/06
15	MEP Rough-in (Add. Phase I)	24 days	Thu 4/6/06	Tue 5/9/06
16	Interior Partitions	42 days	Mon 4/10/06	Tue 6/6/06
17	Beall Drive Relocation	26 days	Mon 5/22/06	Mon 6/26/06
18	Roofing (Add.)	20 days	Thu 6/8/06	Wed 7/5/06
19	Interior Finishes	30 days	Tue 6/6/06	Mon 7/17/06
20	MEP Rough-in (Ren. Phase II)	14 days	Mon 7/10/06	Thu 7/27/06
21	Relocate school access ways	1 day	Thu 7/20/06	Thu 7/20/06
22	Erect Struc. Steel (Phase II)	24 days	Thu 7/27/06	Tue 8/29/06
23	Punch List	30 days	Thu 7/20/06	Wed 8/30/06
24	Phase I Final Completion	8 days	Wed 8/30/06	Fri 9/8/06



Building Systems Summary

Baldwin High School is a renovation and nearly 80% of the building is to be of new construction. Because of this, heavy demolition work is required for the site. Tearing down parts of the existing building includes the removal of masonry, concrete, and structural steel. Precautions for asbestos were also of particular interest due to the building being an educational facility. All materials that are demolished will be removed to neighboring landfills and recycling centers.

Demolition

Phase I of the project required demolition of the existing pool and locker structure. Erection of a steel frame became the foundation for the new gym and new locker room area. The steel columns are held in place by concrete footers and vertically span the height of four floors. Lateral support comes from both wide flange beams and open web steel joists. All beams are moment connected to columns. All supported floor slabs are composite slabs.

Structural

Any cast in place concrete will be placed by truck and chute for both above and below grade construction. For this project spread footings, grade beams, slab-on-grade, piers, and stair erection will be constructed via a cast in place method. Cast in place concrete walls will also range from a thickness of 10”-20”. For construction of curbs and sidewalks a hand trowel will be used to make sure all surfaces are of equal grade.

A steel frame will be used for the bulk of the facility’s structural stability. Utilization of wide flange beams and columns will suffice for both the exterior support steel and gym framing. Accompanying the steel structure will be concrete and masonry bearing walls. The majority of the masonry work will be seen as the veneer exterior of the building. CMU walls can be found throughout the interior of the structure and will support the elevated floor slabs and composite metal decking. Connections are attained by way of bolted steel angles. Segmental concrete facing units are used for the curved and unique underground retaining wall which lies beneath the perimeter of the building.

Mechanical

The mechanical system will utilize variable air volume boxes with hot water reheat coils, water boilers, and air-cooled condensers. Most of the mechanical elements can be located on the roof or in the basement of the new building. New air handling units can be found on the auditorium and gym roofs, as well as the interior of the pool area. Demolition of the existing boiler room and construction of the new one will take place during Phase I of the project. Fire protection will be of great importance and a new alarm system will be installed throughout the high school. Preferred Fire Protection was the specialized contractor elected to install the new system.

Electrical

The electrical system will branch off of the existing power supply and a series of new transformers will be installed. The transformers will convert the incoming electricity from 5KV down to a 480/277V three-phase system. Some areas will also call for a 5KV to a 208/120V system. Power distribution will then be run both above and below grade. A wireless electrical signal will also be installed and ran to the high school stadium. The auxiliary sound system will be installed in all areas of Phase I construction. The sound system will be accompanied by new voice and data cabling systems, which are all major additions to the facility. Subsequently, a new back-up generator will be needed for temporary power outages. Being that this is a school building; the risk of having unavailable power is not one that can be taken.

Site Work

Phases I and 2A of the project are currently unexcavated and will need to be conducted for installation of the new gym, natatorium, and pool areas. Inclusion of new fire hydrants, underground domestic water tanks, and a new sanitary manhole were some of the big-ticket items on the project. Extensive underground sanitary piping and relocation of existing natural gas piping will also need to take place.

During other phases of the project, minimal excavation will need to occur because a large portion of the site has been previously excavated. For the areas that will need to be, most of the drainage will be tied into existing 15” storm pipes and drains. A new bleeder drain line will also be installed to retain much of the sediment runoff that may accumulate from construction.

Project Cost Evaluation

Construction Costs

Sitework	$4,853,000
Concrete	$2,651,000
Masonry	$4,459,000
Metals	$6,178,000
Wood & Plastics	$315,000
Thermal and Moisture Protection	$3,828,000
Doors and Windows	$2,301,000
Finishes	$5,231,000
Specialties	$1,094,000
Equipment	$821,000
Furnishings	$2,121,000
Elevators	$164,000
General Conditions/Profit	$1,701,000
Liability Insurance	$432,000
Contractor Bonds	$361,000
HVAC	$7,351,000
Plumbing	$2,985,000
Electrical	$6,355,000
Fire Protection	$650,000
Stage Equipment	$35,000
Data Cabling	$666,000

Actual Cost: $54,400,000
$137.49 per SF

Total Project Cost: $64,400,000
$162.76 per SF

D4 Cost Estimate (comparative)

This cost estimate was prepared using D4 cost estimating software. The building chosen (Carnegie Mellon University Center) resembled the project in question in regard to size, floor height, location, and relative cost. This building was also constructed in Pittsburgh, Pennsylvania and was a mixed use facility-part student union. With so many similarities to Baldwin High School, a quantitative comparison of the individual CSI division costs was able to be achieved between both projects.

The University Center's overall building cost ($34.4 million) was quite smaller than mine ($54.4 million) even though it reasonably had the same square footage, number of floors, and recreational facilities as Baldwin. This discrepancy was assumed to be because Baldwin's mechanical and electrical construction was almost twice as much as Carnegie Mellon's was. Baldwin's HVAC contract seems to be the difference maker. Baldwin's general construction also seems to be a bit higher and this statistic brings recognition to the complexity of what will be going into the renovation. Although both projects had similar characteristics, the premonition felt is that the innovation going into Baldwin is on a more up-scale level than that of the University Center.

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Estimate of Probable Cost

Carnegie Mellon University Center - May 1994 - PA - Pittsburgh

Prepared By:

Prepared For:
Michael Dennis & Assoc/UDA Architects

, Fax:

, Fax:

Building Sq. Size:	237342	Site Sq. Size:	0
Bid Date:	5/1/1994	Building use:	Educational
No. of floors:	3	Foundation:	CON
No. of buildings:	1	Exterior Walls:	MAS
Project Height:	45	Interior Walls:	MAS
1st Floor Height:	17	Roof Type:	MET
1st Floor Size:	83940	Floor Type:	TER
		Project Type:	NEW

Division		Percent	Sq. Cost	Amount
01	General Requirements	8.54	12.36	2,934,000
	General Conditions	8.54	12.36	2,934,000
03	**Concrete**	**9.52**	**13.77**	**3,269,000**
	Concrete	9.52	13.77	3,269,000
04	**Masonry**	**15.20**	**22.00**	**5,221,000**
	Masonry	15.20	22.00	5,221,000
05	**Metals**	**11.54**	**16.70**	**3,963,000**
	Metals	11.54	16.70	3,963,000
06	**Wood & Plastics**	**2.46**	**3.56**	**844,000**
	Wood & Plastics	2.46	3.56	844,000
07	**Thermal & Moisture Protection**	**3.26**	**4.72**	**1,121,000**
	Thermal & Moisture Protection	3.26	4.72	1,121,000
08	**Doors & Windows**	**5.69**	**8.23**	**1,954,000**
	Doors & Windows	5.69	8.23	1,954,000
09	**Finishes**	**14.63**	**21.17**	**5,024,000**
	Finishes	14.63	21.17	5,024,000
10	**Specialties**	**2.47**	**3.58**	**850,000**
	Specialties	2.47	3.58	850,000
11	**Equipment**	**0.05**	**0.07**	**17,000**
	Equipment	0.05	0.07	17,000
12	**Furnishings**	**1.46**	**2.11**	**500,000**
	Furnishings	1.46	2.11	500,000
13	**Special Construction**	**0.00**	**0.00**	**0**
	Special Construction	0.00	0.00	0
14	**Conveying Systems**	**0.69**	**0.99**	**236,000**
	Conveying Systems	0.69	0.99	236,000
15	**Mechanical**	**14.85**	**21.49**	**5,101,000**
	Mechancial	14.85	21.49	5,101,000
16	**Electrical**	**9.66**	**13.98**	**3,318,000**
	Electrical	9.66	13.98	3,318,000
Total Building Costs		**100.00**	**144.74**	**34,352,000**

Square Foot Estimate (comparative)

R.S. Means SF Estimate (RS Means 2006 Building Construction Cost Data)

Schools – Senior High School

Square Foot Cost: $ 110/SF

Total Cost: $ 43,523,370.00

Location multiplier: Pittsburgh, PA – 1.002

Adjusted total cost: $ 43,610,417.00

Baldwin High School Cost: $ 54.4 million

Average High School Cost: $ 43.5 million

Summary

When preparing this cost estimate the median value for the average SF cost of a typical Senior High School was used. This was done to evaluate the costs on an "average" cost basis. When multiplying that number ($110 /SF) by Baldwin's building's square footage (395,667) and location factor (1.002) it was easy to arrive at a typical industry cost, in which was able to be compared.

Mirroring the result of the D4 estimate, the Means estimate is also substantially less when comparing both Baldwin and that of an industry standard building. This discrepancy exists because many schools do not provide as many "high-tech" additions to the extent of what Baldwin is planning to utilize. Acquiring a new state of the art security system, natatorium, and sporting facility are all accommodations that many other high schools are unable to provide. With this increase in specialized systems, it is clear why both the D4 and Means cost estimates seemed a bit low.