Technical Assignment #1

Cover Page

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The Science & Technology Building
Construction Management

Executive Summary

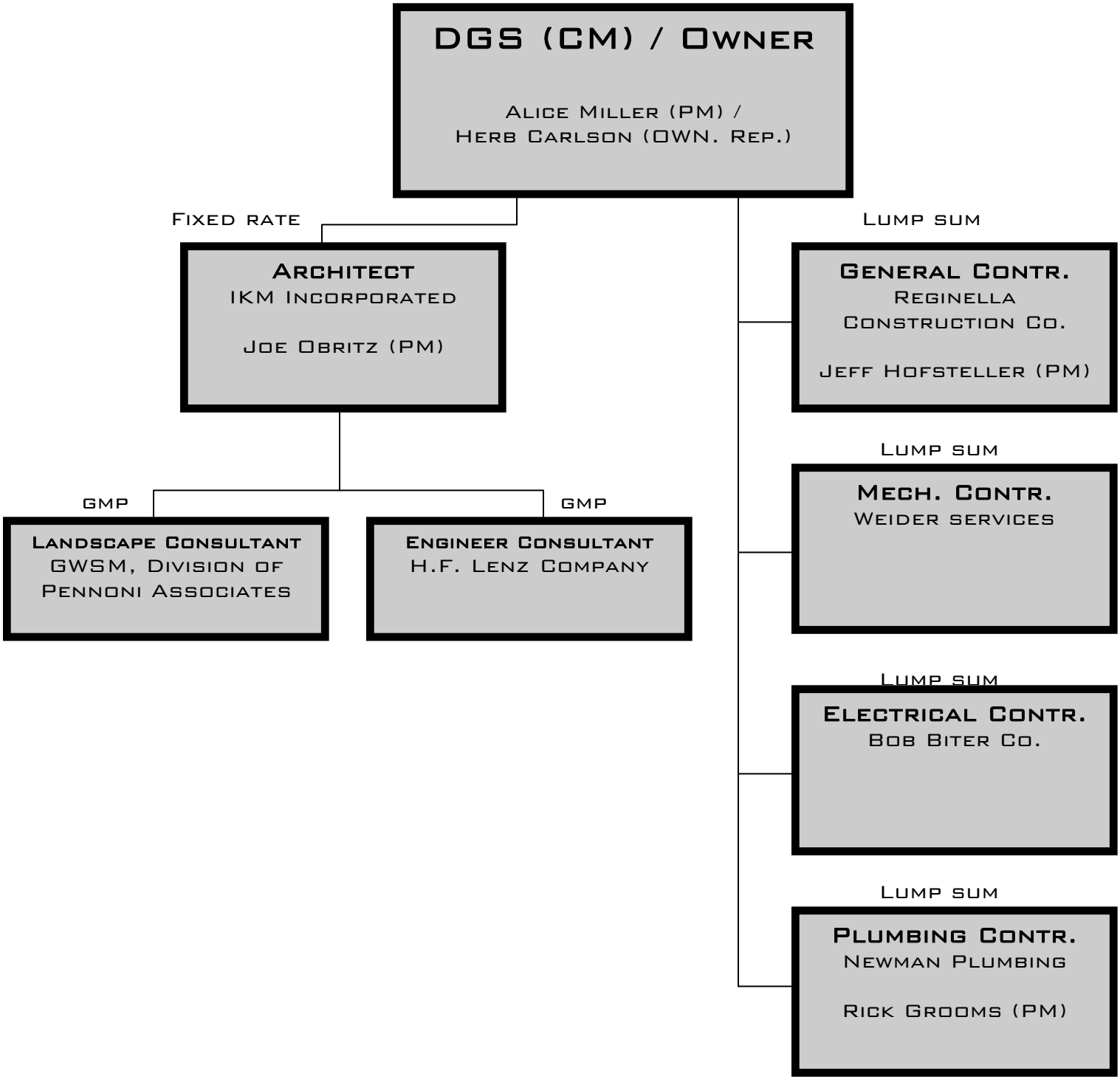
The following document contains information pertaining to the existing conditions of the site of the new Science and Technology Building at Slippery Rock University. There has been interesting bits of information learned from preparing this report. One of the most intriguing bits is simply adjusting to the DGS way of running a project. With previous experience to design – bid – build projects this projects seems to be completely different. DGS has a certain way to do everything that needs to be performed. Its different from the fixed rate of pay for the architect to the exact number of contractors winning bids to the owner/cm relationship. This project is sure to keep curiosity high.

Project Delivery System

Delivery System

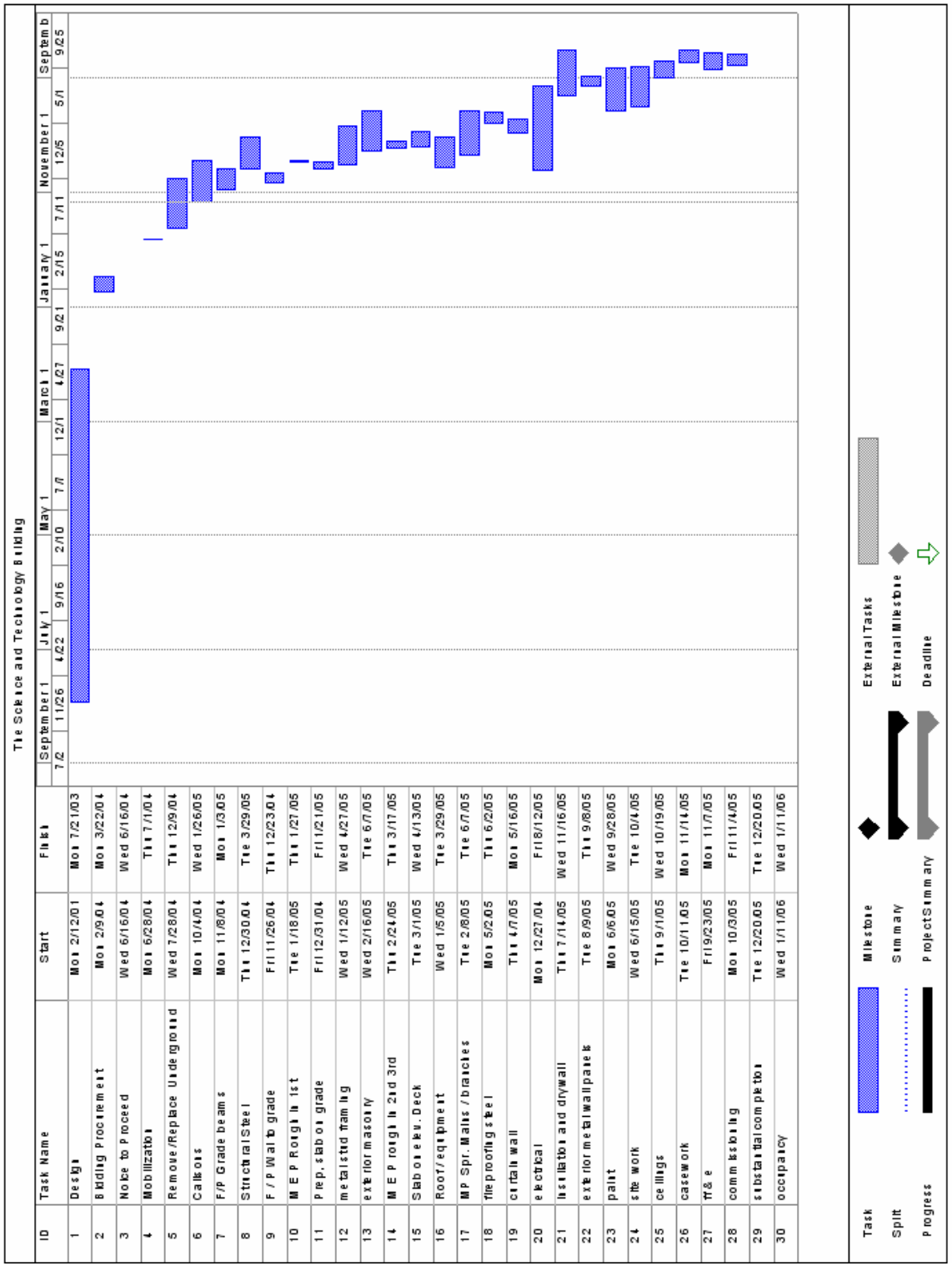
The Science & Technology Building is a standard DGS run design – bid – build project. The Department of General Services handles most all of state funded university projects. This project is funded by DGS. The delivery system is quite interesting if one has never been exposed to a DGS project. DGS starts by accepting bid applications from architects. These bid applications do not have a monetary figure, rather they are company applications for review. In these applications relative projects are mentioned as well as type of project "resume." The applicants are discussed by DGS and the owner until an architect is chosen. There is no monetary figure enclosed because DGS pays a fixed rate of 4%. After the design is complete, the project delivery returns to normal with a bid session. For all DGS projects there are 4 and only 4 prime contracts: General, Mechanical, Electrical, Plumbing. Bids are submitted as lump sum and the low bid wins, unless restricted by DGS.

Organizational Chart



Project Schedule Summary

Schedule Summary



Key Elements

One key element to look out for when working with the schedule is the removal/replacement of the underground utilities. There is an extensive amount of underground utilities to be removed and if delayed by any reason such as unforeseen conditions, the project could be delayed significantly

Building Systems Summary

Yes	No	Work Scope	If yes, address these questions / issues
X		Demolition Required?	There is little demolition needed for this project. Any demolition that is necessary is underground. So far there has been some problems with asbestos insulation wrap covering water utilities.
X		Structural Steel Frame	The steel framework for this building consists of relatively small members. The largest is a W30x99, however it spans the lecture hall area. The crane needed for this light lifting, but long spans, is the manitowach 550 (100 ton).
X		Cast in Place Concrete	The only cast in place concrete for this project is in the Foundation system. This is a massive part of the framework for this building. Over 80 caissons drilled to depths over 50 feet are placed, as well as 3' x 2' grade beams spanning the entire perimeter. Also CIP are the slab on grade/deck and the CMU infills.
	X	Precast Concrete	There is no precast concrete used on this project

X	.	Mechanical System	The mechanical room in this building is located in the south western wing tip. Its unfortunate that there is no basement for this building; the room occupies 1500 sq. ft. Its enormous size mainly because of the large laboratory sq. footage. The fire suppression system is a wet system throughout the building.
X		Electrical System	480/277V, 3p, 4w 120/208V, 3p, 4w 12,470V; 480Y/277V 3p step down transformer Main distribution switchboard 3p – 4w – 277/480V Emergency Generator 208Y/120V-3p-4w 35kw nat. gas 100A life safety automatice transfer switch
X		Masonry	The veneer is non-loadbearing. It consists of brick with 1 ¾" air space and 1 ½" rigid insulation. All brick masonry is held by brick ties. All exterior walls above have aluminum studs.
X		Curtain wall	The project consists of masonry and enormous windows. It is constructed by floor for the entire perimeter.
	X	Support of Excavation	Excavation is limited for this project because the foundation system is compiled of caissons. The grade beams however, cannot be formed and poured without excavation. There is no forms needed for the excavation because depths of excavation will be at the most 6' and in that case the walls will be stepped. Because of a very high ground water content, pumping will be extremely important during excavation

Project Cost Evaluation

Actual Building Cost

The total construction cost for this project is $11,823,842.
The total construction cost per square foot for this project is $156/sq.ft.

By omitting the cost for land, sitework, bidding and permitting the total cost for construction is $10,778,558.

The total construction cost per square foot omitting these items is $141.82/sq.ft.

Total Project Cost

The total project cost including design is $12,296,796.
The total project cost per square foot for this project is $162/sq.ft.

Building System Costs

The total cost for the electrical systems for this project is $1,385,000.
The total cost for the mechanical systems for this project is $2,517,842

Design Cost

For all DGS run projects there is a standard 4% fee for the design. For this particular project the design cost incurred was $472,954. This does not include any costs from DGS for their part in the design.

Estimate of Probable Cost

Science & Technology Building - Feb 2001 - PA - Pittsburgh

Prepared By:	**Jason Phillips**	Prepared For:	**Senior Thesis**
	Construction Management		**Architectural Eng. Dept.**
Building Sq. Size:	**76,000**	Building use:	**Educational**
Bid Date:	**2/5/2003**	Foundation:	**Caissons**
No. of Floors:	**3**	Exterior Walls:	**Masonry/Brick/Block**
No. of buildings:	**1**	Interior Walls:	**Metal Stud/Drywall**
Project Height:	**48' 10"**	Floor Type:	**VCT**
Ist Floor Height:	**15' 4"**	Project Type:	**NEW**

Division		Percent	Sq. Cost	Amount
0	Bidding Requirements	1.81	3.02	229,413.00
1	General Requirements	5.83	9.72	739,033.00
2	Site Work	6.44	10.74	815,871.00
3	Concrete	13.04	21.74	1,652,491.00
4	Masonry	5.99	9.98	758,724.00
5	Metals	7.12	11.87	902,339.00
6	Wood & Plastics	2.32	3.87	294,055.00
7	Thermal & Moisture Protection	3.67	6.13	465,552.00
8	Doors & Windows	4.72	7.87	597,859.00
9	Finishes	7.39	12.33	936,744.00
10	Specialties	0.98	1.63	123,555.00
11	Equipment	6.67	11.13	845,673.00
12	Furnishings	1.70	2.84	215,899.00
13	Special Construction	0.44	0.74	55,906.00
14	Conveying Systems	0.99	1.65	125,069.00
15	Mechanical	21.26	35.45	2,694,245.00
16	Electrical	9.61	16.03	1,218,229.00
	.			
	Total Building Costs	**100.00**	**166.72**	**12,670,659.00**

When using D4 Cost Estimating to generate a probable cost for the Science & Technology Building, I took a smart average of 11 different projects. Each of these individual projects was similar in construction size, construction materials, or general purpose of the building. After taking the smart average, the cost was modified by sq. ft. and location. All of the projects used for the smart average are listed on the next page:

Building Name	Use	Size	Floors	Cost
College of Eng. offices & Lab.	Educational	26,451	2	2,557,036.00
Classroom & Laboratory Building	Educational	30,515	2	2,577,197.00
Engineering Building, VA State Univ.	Educational	108,288	4	11,769,200.00
Science Lecture / Lab. Building	Educational	25,563	2	2,746,552.00
Biopyschological Sciences Building Add.	Educational	30,000	2	7,660,300.00
Science & Eng. Res. Fac. UCSD	Educational	110,677	4	17,274,430.00
Ezra Taft Benson Science Building	Educational	191,310	4	24,388,293.00
Comm. & Info Sciences Building	Educational	77,782	3	7,248,361.00
Rice Univ., Ctr. For Nanoscale	Educational	77,710	4	12,425,839.00
College Library, Tech Center	Educational	125,500	3	13,348,952.00
New School of Management	Educational	95,903	3	13,846,000.00

From the D4 Cost analysis, the base cost estimate for The Science & Technology Building is **$12,670,659** with a cost per square foot of **$166.72**.

R.S. Means Square Foot Estimate

** All Information taken from RSMeans Facilities Construction Cost Data 2002

COLLEGES Science, Engineering, Laboratories

		Unit Costs			% of Total		
	unit	1/4	median	3/4	1/4	median	3/4
Total	S.F.	135	**164**	199			
	C.F.	8.05	11.75	13.3			
Equipment	S.F.	7.8	17.7	19.3	5.30%	9.70%	15.00%
Electrical	S.F.	11.6	16.75	25.5	7.10%	9.60%	15.40%
Mech. & Elect.	S.F.	46	51	79	28.00%	31.60%	39.80%

City Cost Multiplier:
Butler County = 97.7

Calculation:
76,000 sq. ft. * 135 = $10,260,000 for low range project
76,000 sq. ft. * 164 = **$12,464,000 for medium range project**
76,000 sq. ft. * 199 = $15,124,000 for high range project

Because of building materials and budget this project can be assumed to be of Medium scale

Incorporating the City Index:
$12,464,000 * .977 = **$12,177,328**

Total RSMeans Square Foot Cost for The Science and Technology Building

$12,177,328

Compare and Contrast of Estimates

After computing the cost for this project by way of RSMeans and comparing it to the actual cost, there is a 3 % deviance. This a very little amount of error considering that the RSMeans Square foot estimate is the most basic estimate. The D4 cost estimate however, is a much better estimate for a project. It incorporates many different projects and specific divisions when calculating the total cost. The devience for this estimate was nearly 7%. Although the more precise estimating tool had a larger error, it still gives a better estimate. This is because the RSMeans estimate requires a much broader assumption, which if assumed wrong can lead to enormous error.

Site Plan of Existing Conditions

JASON PHILLIPS	10/4/04	THE SCIENCE & TECHNOLOGY BLDG	L - 1

LEGEND

"P" TREES TO BE PROTECTED
"X" TREES TO BE REMOVED
LIMIT OF WORK
SITE FENCE
GAS LINE
ELECTRIC
WATER
TIE IN
TEMPORARY UT.
FIRE HYDRANT

NOTES;

ALL HATCHED CONCRETE / ASPHALT / UTILITIES TO BE REMOVED

EISENBURG BUILDING 48'

TRAILOR/ LAYDOWN AREA

PROTECT EXIXTING SIDEWALKS

LOADING DOCK

SOIL STOCKPILE

THE SCIENCE AND TECHNOLOGY BLDG (54')

CRANE

CONTR. PARKING

PROTECT EXIXTING SIDEWALKS

SPORTS WORLD CULTURES BUILDING 48'

N

Local Conditions

Slippery Rock University exists in an area surrounded by lakes and streams. The soil in this area is just what one would expect from an area plagued with water. As for this building and any other building constructed in this area, special design techniques are necessary to ensure for a proper foundation system.

Slippery Rock as a town is a very small community. This will be the only construction project going on in the area. However, even though there is a lack of construction in the area, there are nearby towns with construction taking place. Thus there will be ample manpower in the area to supply the site.

Client Information

In the Fall of 1994, Slippery Rock University began researching the idea of building a new Science and Technology Building to replace the existing Vincent Science Building. After a steady rise in student enrollment over the past few years there became an increasing demand for updated science and technology facilities. In order to stay competitive amongst the areas universities, Slippery Rock were in need of an updated facility. "This new building will enable Slippery Rock University to create an environment that revolutionizes our curriculum and the way we teach to remain consistent with the demands of new technology in the new economy," said G. Warren Smith, university president.

Slippery Rock requested the funds from DGS to build a new facility that would hold classrooms and labs for a variety of curriculums. In particular the university needed new chemistry, biology, cytotechnology, medical technology, marine science, and pre-professional health areas with the latest in high-tech classrooms. Also, the university

needed an auditorium that could fit 350 students and provide for specialized instruction. Finally in addition the specialized classrooms and lecture hall, the university needed to provide for the growing number of faculty and staff by including office space in this building.

Originally the university intended for the project to be constructed and ready for the 2003 fall semester. Because of approval durations from DGS, the university did not receive authorization of funds until 2001. As of now the university expects construction to complete on time and be ready for the fall semester of 2006.

Because this project is being constructed on campus in a major pedestrian traffic area, there are many safety concerns that the university has. All of these issues were addressed early in the design phase. The entire construction area will be fenced off and temporary route ways will be made for students. Another concern by the university is security. In a town of college students, security is always a concern, however extensive temporary lighting will be installed for the purposes of monitoring these construction areas.