

APPENDIX C | PROJECT COST EVALUATION

*D4COST, RS MEANS SQUARE FOOT, GENERAL CONDITIONS, AND
DETAILED STRUCTURAL SYSTEMS COST ESTIMATE DATA CAN BE
FOUND ON THE FOLLOWING PAGES.*

D4COST ESTIMATE

Prepared By: **Lindsay Hagemann**
 PSU 5th Year Thesis

Prepared For: **Technical Report 1**
 PSU 5th Year Thesis

Fax:
 Building Sq. Size: **360000**
 Bid Date: **9/13/2001**
 No. of floors: **2**
 No. of buildings: **1**
 Project Height: **47**
 1st Floor Height: **23.5**
 1st Floor Size:

Fax:
 Site Sq. Size: **851163**
 Building use: **Industrial**
 Foundation: **CAI**
 Exterior Walls: **PRE**
 Interior Walls: **MSD**
 Roof Type: **MEM**
 Floor Type: **ACC**
 Project Type: **NEW**

Division		Percent	Sq. Cost	Amount
00	Procurement and Contracting Require	2.42	1.22	439,745
	General Conditions	2.42	1.22	439,745
01	General Requirements	9.75	4.92	1,772,082
	Builders Fee	5.47	2.76	994,407
	Construction Staking	0.11	0.05	19,580
	Overhead	3.65	1.84	662,936
	Permits	0.45	0.23	81,412
	Winter Protection	0.08	0.04	13,747
03	Concrete	17.26	8.71	3,137,392
	Concrete	-0.45	-0.23	-81,141
	Precast	9.01	4.55	1,637,585
	Sealer	0.23	0.12	41,778
	Shell	8.41	4.25	1,529,750
	Testing	0.05	0.03	9,420
04	Masonry	0.59	0.30	107,708
	Masonry	0.59	0.30	107,708
05	Metals	16.41	8.29	2,983,806
	Metal Coping	0.01	0.01	2,072
	Metal Wall Panels	0.36	0.18	65,938
	Misc Metals	1.14	0.57	206,424
	Misc Steel	0.11	0.06	20,757
	Structural Steel	14.79	7.47	2,688,615
06	Wood, Plastics, and Composites	1.26	0.64	228,992
	Finish Carpentry	0.52	0.26	95,317
	Rough Carpentry	0.70	0.36	128,022
	Wood & Plastics	0.03	0.02	5,652
07	Thermal and Moisture Protection	3.37	1.70	612,382
	Caulking	0.05	0.03	9,766
	Insulation	0.23	0.12	41,512
	Roofing	3.09	1.56	561,104
08	Openings	4.63	2.34	841,747
	Coiling Door	0.06	0.03	11,511
	Doors & Windows	0.12	0.06	21,477
	Doors Frames Hardware	0.25	0.13	46,062
	Entrances & Storefronts	3.42	1.73	621,697
	Glass & Glazing	-0.12	-0.06	-21,264
	Metal Doors	0.25	0.13	45,214
	Overhead Doors	0.64	0.33	117,050
09	Finishes	7.17	3.62	1,304,306
	Acoustical Ceilings	0.19	0.09	34,065
	Finishes	1.59	0.80	288,844
	Flooring	1.73	0.87	314,188
	Metal Studs & Drywall	2.90	1.46	526,466
	Painting	0.77	0.39	140,743

10	Specialties	0.43	0.22	77,597
	Specialties	0.21	0.11	38,035
	Toilet Partitions & Accessories	0.22	0.11	39,563
11	Equipment	0.02	0.01	4,374
	Equipment	0.02	0.01	4,374
14	Conveying Systems	0.33	0.16	59,108
	Elevators	0.33	0.16	59,108
21	Fire Suppression	1.63	0.82	296,229
	Sprinkler	1.63	0.82	296,229
22	Plumbing	4.44	2.24	806,680
	Plumbing	4.44	2.24	806,680
23	HVAC	19.01	9.60	3,455,731
	HVAC	19.01	9.60	3,455,731
26	Electrical	11.29	5.70	2,051,989
	Electrical	11.29	5.70	2,051,989
Total Building Costs		100.00	50.50	18,179,868
02	Existing Conditions	100.00	1.64	1,400,000
	Site Work	100.00	1.64	1,400,000
Total Non-Building Costs		100.00	1.64	1,400,000
Total Project Costs		--	--	19,579,868

BRIEF SUMMARY OF SIEMENS WESTINGHOUSE FUEL CELL FACILITY

From the early stages of the project, Siemens embraced the goals of achieving LEED(R) 2.0/2.1 Certification for the entire building, which includes a two-story office and one-story high-bay manufacturing area for a total of 190,000 square feet. Conference rooms, laboratories, cafeteria, restrooms and other support spaces are included in the office wing.

The perimeter walls are 8-inch precast concrete walls with insulation integral to each panel, and are considered as mass walls. The insulated precast wall panels achieve an effective u-value which is 5% more efficient than what is required. The largest energy saving feature of the building's skin is the vertical glazing system. The total glazing area is 19% of the gross wall area, and conducts 16% less heat than the required glazing.

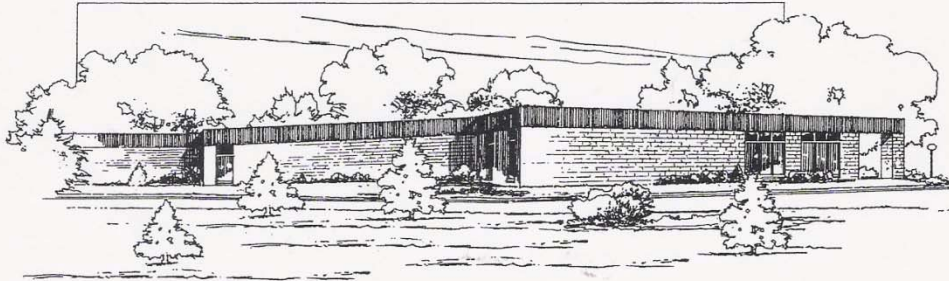
The heating, ventilating, and air conditioning (HVAC) systems serving the building consist of a chilled water plant, hydronic hot water boiler plant, ten constant volume air handling units for air distribution and ventilation in the manufacturing area, and a variable air volume, roof top air handling unit serving the office and laboratory areas.

RS MEANS SQUARE FOOT ESTIMATE

**COMMERCIAL/INDUSTRIAL/
 INSTITUTIONAL**

M.175

Computer Data Center



Costs per square foot of floor area

Exterior Wall	S.F. Area	10000	12500	15000	17500	20000	22500	25000	30000	40000
	L.F. Perimeter	400	450	500	550	600	625	650	700	800
Brick Veneer	Steel Frame	264.25	261.15	259.10	257.50	256.45	254.65	253.35	251.25	248.65
	Bearing Wall	275.80	271.45	268.65	266.55	265.05	262.70	260.80	257.90	254.35
Tilt Up Concrete	Steel Frame	258.55	255.45	253.40	251.85	250.70	248.95	247.65	245.55	242.95
Concrete Panels	Bearing Wall	278.60	274.05	271.05	268.75	267.20	264.60	262.70	259.60	255.90
EIFS	Steel Frame	259.25	256.65	254.90	253.60	252.70	251.20	250.10	248.35	246.20
	Bearing Wall	260.95	258.15	256.35	254.90	253.95	252.35	251.20	249.30	247.05
Perimeter Adj., Add or Deduct	Per 100 L.F.	7.75	6.15	5.10	4.45	3.85	3.50	3.05	2.55	1.95
Story Hgt. Adj., Add or Deduct	Per 1 Ft.	1.45	1.25	1.15	1.15	1.00	1.00	0.90	0.80	0.75

For Basement, add \$30.95 per square foot of basement area

The above costs were calculated using the basic specifications shown on the facing page. These costs should be adjusted where necessary for design alternatives and owner's requirements. Reported completed project costs, for this type of structure, range from \$143.35 to \$290.85 per S.F.

Common additives

Description	Unit	\$ Cost	Description	Unit	\$ Cost
Clock System			Smoke Detectors		
20 room	Ea.	15,400	Ceiling type	Ea.	174
50 room	Ea.	37,400	Duct type	Ea.	445
Closed Circuit Surveillance, one station			Sound System		
Camera and monitor	Total	1750	Amplifier, 250 watts	Ea.	2225
For additional camera stations, add	Ea.	940	Speakers, ceiling or wall	Ea.	181
For zoom lens - remote control, add	Ea.	2750 - 9275	Trumpets	Ea.	345
For automatic iris for low light, add	Ea.	2425			
Directory Boards, plastic, glass covered					
30" x 20"	Ea.	580			
36" x 48"	Ea.	1450			
Aluminum, 24" x 18"	Ea.	570			
36" x 24"	Ea.	635			
48" x 32"	Ea.	925			
48" x 60"	Ea.	1950			
Emergency Lighting, 25 watt, battery operated					
Lead battery	Ea.	278			
Nickel cadmium	Ea.	800			

GENERAL CONDITIONS COST ESTIMATE

Table 26 - General Conditions Estimate p.1

Description	Qty.	Unit	Cost/Unit	Total Cost
Construction Requirements				
Continuous Cleanup	58	WK	\$ 7,397	\$ 429,000
Dumpster	58	WK	\$ 4,103	\$ 238,000
Final Cleanup	1	LS	\$ 95,000	\$ 95,000
Engineering Services	58	WK	\$ 3,638	\$ 211,000
Miscellaneous Hoisting	1	LS	\$ 167,000	\$ 167,000
General Safety	58	WK	\$ 948	\$ 55,000
Safety Coordinator	58	WK	\$ 328	\$ 19,000
Safety Program	58	WK	\$ 259	\$ 15,000
Safety Equipment	1	LS	\$ 29,000	\$ 29,000
First Aid	1	LS	\$ 3,000	\$ 3,000
Safety/OSHA Signs	1	LS	\$ 10,000	\$ 10,000
Substance Abuse Testing	1	LS	\$ 2,000	\$ 2,000
Perimeter Safety Rails	1	LS	\$ 78,000	\$ 78,000
General Small tools	1	LS	\$ 19,000	\$ 19,000
Temporary Protection/Dry-In	1	LS	\$ 67,000	\$ 67,000
Temporary Cooling	58	WK	\$ 1,638	\$ 95,000
Temporary Power	58	WK	\$ 2,466	\$ 143,000
Temporary Water	58	WK	\$ 1,638	\$ 95,000
Temporary Toilets	58	WK	\$ 655	\$ 38,000
HCC Commissioning	1	LS	\$ 71,000	\$ 71,000
3rd Party Commissioning	1	LS	\$ 714,000	\$ 714,000
Warranty	1	LS	\$ 165,000	\$ 165,000
Mechanical Commissioning	1	LS	\$ 57,000	\$ 57,000
Temporary Power -Startup	58	WK	\$ 828	\$ 48,000
Subtotal: Construction Requirements				\$ 2,863,000
Insurance/Permits/Fees				
Performance Bond	1	LS	\$ 1	\$ 1
GL Insurance	1	LS	\$ 182,000	\$ 182,000
Equipment Floater Insurance	1	LS	\$ 14,000	\$ 14,000
Builders Risk Insurance	1	LS	\$ 150,000	\$ 150,000
CCIP Premium	1	LS	\$ 1,034,000	\$ 1,034,000
Miscellaneous Permits	1	LS	\$ 143,000	\$ 143,000
Gross Receipts Taxes	1	LS	\$ 214,000	\$ 214,000
Subtotal: Insurance/Permits/Fees				\$ 1,737,001
Project Team: Field/Staff				
Senior Project Manager	58	WK	\$ 2,100	\$ 121,800
Project Manager	58	WK	\$ 1,850	\$ 107,300
Field Office Processor	58	WK	\$ 750	\$ 43,500
Administrative Assistant	58	WK	\$ 750	\$ 43,500
Senior Engineer	58	WK	\$ 1,573	\$ 91,234
MEP Coordinator	34	WK	\$ 1,573	\$ 53,482
Project Engineer	58	WK	\$ 1,430	\$ 82,940
Project Engineer	58	WK	\$ 1,430	\$ 82,940
Office Engineer	41	WK	\$ 1,300	\$ 53,300
Office Engineer	40	WK	\$ 1,300	\$ 52,000
Regional Superintendent	58	WK	\$ 1,950	\$ 113,100
Superintendent	58	WK	\$ 1,700	\$ 98,600
Assistant Superintendent	29	WK	\$ 1,445	\$ 41,905

Table 27 - General Conditions Estimate p.2

Senior Field Coordinator	41	WK	\$ 1,314	\$ 53,874
Field Coordinator	38	WK	\$ 1,194	\$ 45,372
Subtotal: Project Team: Field/Staff				\$ 1,084,847
General Conditions				
Temp. Administrative	16	WK	\$ 563	\$ 9,000
Field Office #1 -Management	58	WK	\$ 655	\$ 38,000
Field Office #2 -Field Trail	58	WK	\$ 345	\$ 20,000
Field Office #3 -Conference	58	WK	\$ 259	\$ 15,000
Field Office Setup	1	LS	\$ 19,000	\$ 19,000
Field Office In/Out	58	WK	\$ 241	\$ 14,000
Site/ Trailer Security	58	WK	\$ 34	\$ 2,000
PC's/ Modems	13	MO	\$ 2,077	\$ 27,000
Network Connection Fees	1	LS	\$ 30,000	\$ 30,000
Telephone	13	MO	\$ 2,615	\$ 34,000
Telephone Set-Up	1	LS	\$ 5,000	\$ 5,000
Ice, Cups and Water -Trailer	58	WK	\$ 155	\$ 9,000
Office Supplies	13	MO	\$ 1,385	\$ 18,000
Office Furniture	1	LS	\$ 10,000	\$ 10,000
Copier	1	LS	\$ 17,000	\$ 17,000
Postage/Expressage	58	WK	\$ 362	\$ 21,000
Monthly Photos	13	MO	\$ 1,462	\$ 19,000
Daily Photos	13	MO	\$ 37	\$ 480
Extra Plans	1	LS	\$ 10,000	\$ 10,000
Moving Expenses	1	LS	\$ 53,000	\$ 53,000
Living Expenses	1	LS	\$ 53,000	\$ 53,000
Travel Expenses	13	MO	\$ 3,846	\$ 50,000
Meals/ Entertainment	13	MO	\$ 2,385	\$ 31,000
Communications Equip	13	MO	\$ 2,462	\$ 32,000
Superintendent Truck	13	MO	\$ 2,923	\$ 38,000
Project Manager Car	13	MO	\$ 1,769	\$ 23,000
Courier	13	MO	\$ 231	\$ 3,000
Software	1	LS	\$ 46,000	\$ 46,000
Subtotal: General Conditions				\$ 646,480
Miscellaneous Labor				
Continuous Cleanup	58	WK	\$ 4,105	\$ 238,095
General Safety	58	WK	\$ 3,285	\$ 190,533
Safety Director	58	WK	\$ 2,759	\$ 160,000
Safety/OSHA Signs	1	LS	\$ 3,333	\$ 3,333
Perimeter Safety Rails	1	LS	\$ 6,667	\$ 6,667
Temporary Protection/Dry-In	1	LS	\$ 76,333	\$ 76,333
Field Office Setup	1	LS	\$ 19,048	\$ 19,048
Subtotal: Miscellaneous Labor				\$ 694,010
TOTAL				\$ 7,025,338

DETAILED STRUCTURAL SYSTEMS COST ESTIMATE

Table 28 - Caisson & Concrete Estimate - pg 1

Div.	Description	Qty	Unit	Mat'l	Labor	Equip.	Total	Ext. Mat.	Ext. Labor	Ext. Equip.	Ext. Total
03310	3000 psi concrete	9790	CY	\$105.20	\$ -	\$ -	\$ 105.20	\$ 1,029,855.40	\$ -	\$ -	\$ 1,029,855.40
03311	3500 psi concrete	2167	CY	\$108.36	\$ -	\$ -	\$ 108.36	\$ 234,761.94	\$ -	\$ -	\$ 234,761.94
03312	4000 psi concrete	674	CY	\$111.51	\$ -	\$ -	\$ 111.51	\$ 75,129.86	\$ -	\$ -	\$ 75,129.86
03313	5000 psi concrete	6204	CY	\$114.67	\$ -	\$ -	\$ 114.67	\$ 711,384.01	\$ -	\$ -	\$ 711,384.01
03314	Placing, topping slab, pumped, <6" thick	5343	CY	\$ -	\$ 9.45	\$ 5.57	\$ 15.02	\$ -	\$ 50,488.99	\$ 29,759.12	\$ 80,248.11
03315	Placing, topping slab, pumped, 6"-10" thick	1594	CY	\$ -	\$ 8.26	\$ 4.87	\$ 13.13	\$ -	\$ 13,168.51	\$ 7,764.00	\$ 20,932.50
03316	Placing, continuous footing, pumped	648	CY	\$ -	\$ 8.84	\$ 5.22	\$ 14.06	\$ -	\$ 5,723.90	\$ 3,379.95	\$ 9,103.85
03317	Placing, grade beam, pumped	674	CY	\$ -	\$ 7.36	\$ 4.33	\$ 11.69	\$ -	\$ 4,958.80	\$ 2,917.34	\$ 7,876.14
03318	Placing, SOG, pumped, up to 6" thick	12143	CY	\$ -	\$ 10.19	\$ 6.02	\$ 16.21	\$ -	\$ 123,739.72	\$ 73,102.37	\$ 196,842.08
03319	Placing, SOG, pumped, over 6" thick	3442	CY	\$ -	\$ 7.15	\$ 4.21	\$ 11.36	\$ -	\$ 24,612.09	\$ 14,491.87	\$ 39,103.96
03320	Placing, spread footing, pumped	1526	CY	\$ -	\$ 20.55	\$ 11.99	\$ 32.54	\$ -	\$ 31,359.30	\$ 18,296.74	\$ 49,656.04
03321	CIP, topping slab, 4" slab	471508	SF	\$ 1.43	\$ 0.46	\$ 0.28	\$ 2.17	\$ 674,257.08	\$ 216,893.89	\$ 132,022.37	\$ 1,023,173.34
03322	CIP, topping slab, 6" slab	76167	SF	\$ 2.13	\$ 0.47	\$ 0.28	\$ 2.88	\$ 162,235.71	\$ 35,798.49	\$ 21,326.76	\$ 219,360.96
03323	CIP, spread footing	1308	CY	\$201.98	\$ 60.83	\$ 0.57	\$ 263.38	\$ 264,189.84	\$ 79,565.64	\$ 745.56	\$ 344,501.04
03324	CIP, continuous strip footing, 24" x 12"	648	CY	\$139.92	\$ 54.25	\$ 0.51	\$ 194.68	\$ 90,598.20	\$ 35,126.88	\$ 330.23	\$ 126,055.30
03325	CIP, slab on grade, 6" thick	589057	SF	\$ 2.05	\$ 0.48	\$ 0.01	\$ 2.54	\$ 1,207,567.57	\$ 282,747.53	\$ 5,890.57	\$ 1,496,205.67
03326	CIP, slab on grade, 8" thick	97650	SF	\$ 2.81	\$ 0.51	\$ 0.01	\$ 3.33	\$ 274,396.50	\$ 49,801.50	\$ 976.50	\$ 325,174.50

Table 29 - Caisson & Concrete Estimate - pg 2

03327	CIP Piers square, 36" x 36"	152	CY	\$378.72	\$209.61	\$32.60	\$620.93	\$57,660.12	\$31,913.12	\$4,963.35	\$94,536.59	
03328	CIP Piers square, 24" x 24"	231	CY	\$431.32	\$275.37	\$42.63	\$749.32	\$99,634.92	\$63,610.47	\$9,847.53	\$173,092.92	
03329	CIP Stairs, cast on ground	98	LF Nose	\$4.65	\$9.25	\$0.20	\$14.10	\$455.24	\$905.58	\$19.58	\$1,380.39	
03330	CIP Stair Landing, cast on ground	277	SF	\$3.59	\$2.43	\$0.05	\$6.07	\$995.15	\$673.60	\$13.86	\$1,682.60	
02465	Cassion piles, 30" diameter, concrete	315	VLF	\$20.88	\$7.16	\$16.90	\$44.94	\$6,568.85	\$2,252.54	\$5,316.74	\$14,138.12	
02466	Cassion piles, 48" diameter, concrete	1145	VLF	\$53.36	\$10.79	\$25.58	\$89.73	\$61,102.54	\$12,355.63	\$29,291.66	\$102,749.82	
02467	Cassion piles, 60" diameter, concrete	364	VLF	\$83.06	\$11.98	\$28.08	\$123.12	\$30,242.15	\$4,361.92	\$10,223.93	\$44,827.99	
03220	WWF, sheets, 6 x 6 - W4 x W4 (4 x 4), A185	2730	CSF	\$28.65	\$16.25	\$-	\$44.90	\$78,214.50	\$44,362.50	\$-	\$122,577.00	
03221	WWF, sheets, 4 x 4 - W2.9 x W2.9 (6 x 6), A185	2919	CSF	\$31.12	\$16.25	\$-	\$47.37	\$90,839.28	\$47,433.75	\$-	\$138,273.03	
03210	Rebar, avg. price, A615, grade 40	473	Ton	\$923.78	\$-	\$-	\$923.78	\$436,486.05	\$-	\$-	\$436,486.05	
TOTAL									\$5,586,574.91	\$1,161,854.35	\$370,680.03	\$7,119,109.22

Table 30 - Precast Estimate

Activity	Quantity	Unit	Cost/Unit	Total Cost
Material				
12'x32" WT 2" Flange	584	EA	\$ 3,200	\$ 1,868,800
12'x32" XT 2" Flange	76	EA	\$ 4,600	\$ 349,600
PC Flat Slab 4", 8", 12"	22	EA	\$ 3,500	\$ 77,000
PC Stair/Elevator Wall 8"	19	EA	\$ 2,800	\$ 53,200
PC Screen Walls 12", 16"	12	EA	\$ 6,900	\$ 82,800
PC Stair - 8"	6	EA	\$ 4,900	\$ 29,400
24"x24" PC Column	168	EA	\$ 3,800	\$ 638,400
PS L Beams	88	EA	\$ 7,000	\$ 616,000
PS Walls 8", 10"	51	EA	\$ 8,000	\$ 408,000
PS Insulated Walls 8"	354	EA	\$ 4,200	\$ 1,486,800
PS Inverted T Beams	106	EA	\$ 21,000	\$ 2,226,000
SUBTOTAL				\$ 7,836,000
Labor				
Erection	1488	EA	\$ 930	\$ 1,383,840
SUBTOTAL				\$ 1,383,840
TOTAL				\$ 9,219,840