APPENDIX A-1 **RSM**EANS **SQUARE FOOT COST ESTIMATE**

Square Foot Cost Estimate Report

	•	
Estimate Name:	U.S. GSA Headquarters Modernization	
	Office, 5-10 Story with Precast Concrete Panel /	
Building Type:	R/Conc. Frame	
Location:	WASHINGTON, DC	
Story Count:	9	
Story Height (L.F.):	12	
Floor Area (S.F.):	430000	
Labor Type:	Union	
Basement Included:	Yes	
Data Release:	Year 2012	Costs are derived from a building model with basic components.
Cost Per Square Foot:	\$149.47	Scope differences and market conditions can cause costs to vary significantly.
Building Cost:	\$64,270,000	Parameters are not within the ranges recommended by RSMeans.

		% of Total	Cost Per S.F.	Cost
A Substructure	6. 1.15 1.1.	4.80%	\$6.25	\$2,685,500
A1010	Standard Foundations		\$4.39	\$1,889,500
	12" deep x 32" wide			
A1020	6" square x 30" deep		ć0.57	\$246 F00
A1030	Slab on Grade		\$0.57	\$246,500
A2010	Slab on grade, 4" thick, non industrial, reinforced Basement Excavation		ć0.24	¢146 000
A2010			\$0.34	\$146,000
A2020	storage		ć0.04	\$402 F00
A2020	Basement Walls		\$0.94	\$403,500
D Chall	thick	32.20%	\$42.06	¢18 086 000
B Shell B1010	Floor Construction	32.20%	\$42.06	\$18,086,000 \$9,287,000
P1010	394 lbs/LF, 4000PSI		321.60	\$9,267,000
	394 lbs/LF, 6000PSI			
	394 lbs/LF, 6000PSI			
	load, 10'-14' story height, 375 lbs/LF, 4000PSI			
	bay, 75 PSF superimposed load, 153 PSF total load			
	load, 188 PSF total load			
B1020	Roof Construction		\$1.58	\$679,000
22020	deep beam, 8.5" slab, 146 PSF total load		¥=.00	4070,000
B2010	Exterior Walls		\$15.11	\$6,497,000
22020	2" rigid insulation, high rise		¥-0:	40,107,000
B2020	Exterior Windows		\$2.96	\$1,274,500
	Windows, aluminum, sliding, insulated glass, 5' x 3'		•	. , , ,
B2030	Exterior Doors		\$0.25	\$107,000
	6'-0" x 10'-0" opening		•	. ,
	opening			
B3010	Roof Coverings		\$0.56	\$241,500
	mopped			
	Insulation, rigid, roof deck, composite with 2" EPS, 1" perlite			
	Roof edges, aluminum, duranodic, .050" thick, 6" face			
	Flashing, aluminum, no backing sides, .019"			
C Interiors		19.10%	\$24.93	\$10,718,000
C1010	Partitions		\$2.48	\$1,068,500
	F /0 O 24 O 0 f			

C1020	1/2" fire ratedgypsum board, taped & finished, painted on metal furring Interior Doors	\$3.03	\$1,303,500
C1020	0" x 7'-0" x 1-3/8"	73.03	71,303,300
C1030	Fittings	\$0.68	\$294,000
	Toilet partitions, cubicles, ceiling hung, plastic laminate		
C2010	Stair Construction	\$2.97	\$1,276,000
	Stairs, steel, cement filled metal pan & picket rail, 16 risers, with landing		4
C3010	Wall Finishes	\$0.93	\$399,500
	& 2 coats		
C3020	Vinyl wall covering, fabric back, medium weight Floor Finishes	\$8.46	\$3,639,000
33023	Carpet, tufted, nylon, roll goods, 12' wide, 36 oz	φοιτο	40,003,000
	Carpet, padding, add to above, minimum		
	Vinyl, composition tile, maximum		
	Tile, ceramic natural clay		
C3030	Ceiling Finishes	\$6.37	\$2,737,500
	channel grid, suspended support		
D Services	43.90%	\$57.32	\$24,646,500
D1010	Elevators and Lifts	\$15.61	\$6,711,000
	200 FPM		
D2010	Plumbing Fixtures	\$2.56	\$1,100,500
	Water closet, vitreous china, bowl only with flush valve, wall hung		
	Urinal, vitreous china, wall hung		
	Lavatory w/trim, vanity top, PE on Cl, 20" x 18"		
	Service sink w/trim, PE on CI, wall hung w/rim guard, 24" x 20" Water cooler, electric, wall hung, 8.2 GPH		
	Water cooler, electric, wall hung, wheelchair type, 7.5 GPH		
D2020	Domestic Water Distribution	\$0.53	\$229,500
	Gas fired water heater, commercial, 100< F rise, 200 MBH input, 192 GPH	·	. ,
D2040	Rain Water Drainage	\$0.27	\$115,000
	Roof drain, CI, soil, single hub, 5" diam, 10' high		
	Roof drain, CI, soil, single hub, 5" diam, for each additional foot add		
D3050	Terminal & Package Units	\$16.30	\$7,010,500
	Rooftop, multizone, air conditioner, offices, 25,000 SF, 79.16 ton		
D4010	Sprinklers	\$2.92	\$1,256,500
	Wet pipe sprinkler systems, steel, light hazard, 1 floor, 10,000 SF		
	SF		
D4020	Standard High Rise Accessory Package 8 story	ć0.70	¢202.000
D4020	Standpipes Wet standpipe risers, class III, steel, black, sch 40, 4" diam pipe, 1 floor	\$0.70	\$302,000
	floors		
	Fire pump, electric, with controller, 5" pump, 100 HP, 1000 GPM		
	Fire pump, electric, for jockey pump system, add		
D5010	Electrical Service/Distribution	\$0.38	\$163,000
	4 wire, 120/208 V, 1600 A		
	Feeder installation 600 V, including RGS conduit and XHHW wire, 60 A		
	Feeder installation 600 V, including RGS conduit and XHHW wire, 200 A		
	Feeder installation 600 V, including RGS conduit and XHHW wire, 1600 A		
	Switchgear installation, incl switchboard, panels & circuit breaker, 1600 A		
D5020	Lighting and Branch Wiring	\$12.26	\$5,271,000
	with transformer		

	Miscellaneous power, 1.2 watts			
	Central air conditioning power, 4 watts			
	Motor installation, three phase, 460 V, 15 HP motor size			
	15 HP, 575 V 20 HP			
	Motor connections, three phase, 200/230/460/575 V, up to 5 HP			
	Motor connections, three phase, 200/230/460/575 V, up to 100 HP			
	fixtures @32watt per 1000 SF			
D5030	Communications and Security		\$4.64	\$1,997,000
	Telephone wiring for offices & laboratories, 8 jacks/MSF			
	detectors, includes outlets, boxes, conduit and wire			
	Fire alarm command center, addressable with voice, excl. wire & cor	nduit		
	Internet wiring, 8 data/voice outlets per 1000 S.F.			
D5090	Other Electrical Systems		\$1.14	\$490,500
	engine with fuel tank, 100 kW			
	Uninterruptible power supply with standard battery pack, 15 kVA/12	2.75 kW		
E Equipment & I	Furnishings	0.00%	\$0.00	\$0
E1090	Other Equipment		\$0.00	\$0
F Special Constr	uction	0.00%	\$0.00	\$0
G Building Sitew	vork	0.00%	\$0.00	\$0
			_	
SubTotal		100%	\$130.55	\$56,136,000
	(General Conditions,Overhead,Profit)	7.00%	\$9.14	\$3,929,500
Architectural Fe	es	7.00%	\$9.78	\$4,204,500

0.00%

\$0.00

\$149.47

\$0

\$64,270,000

User Fees

Total Building Cost

APPENDIX A-2 RSMEANS MEP ASSEMBLIES COST ESTIMATE

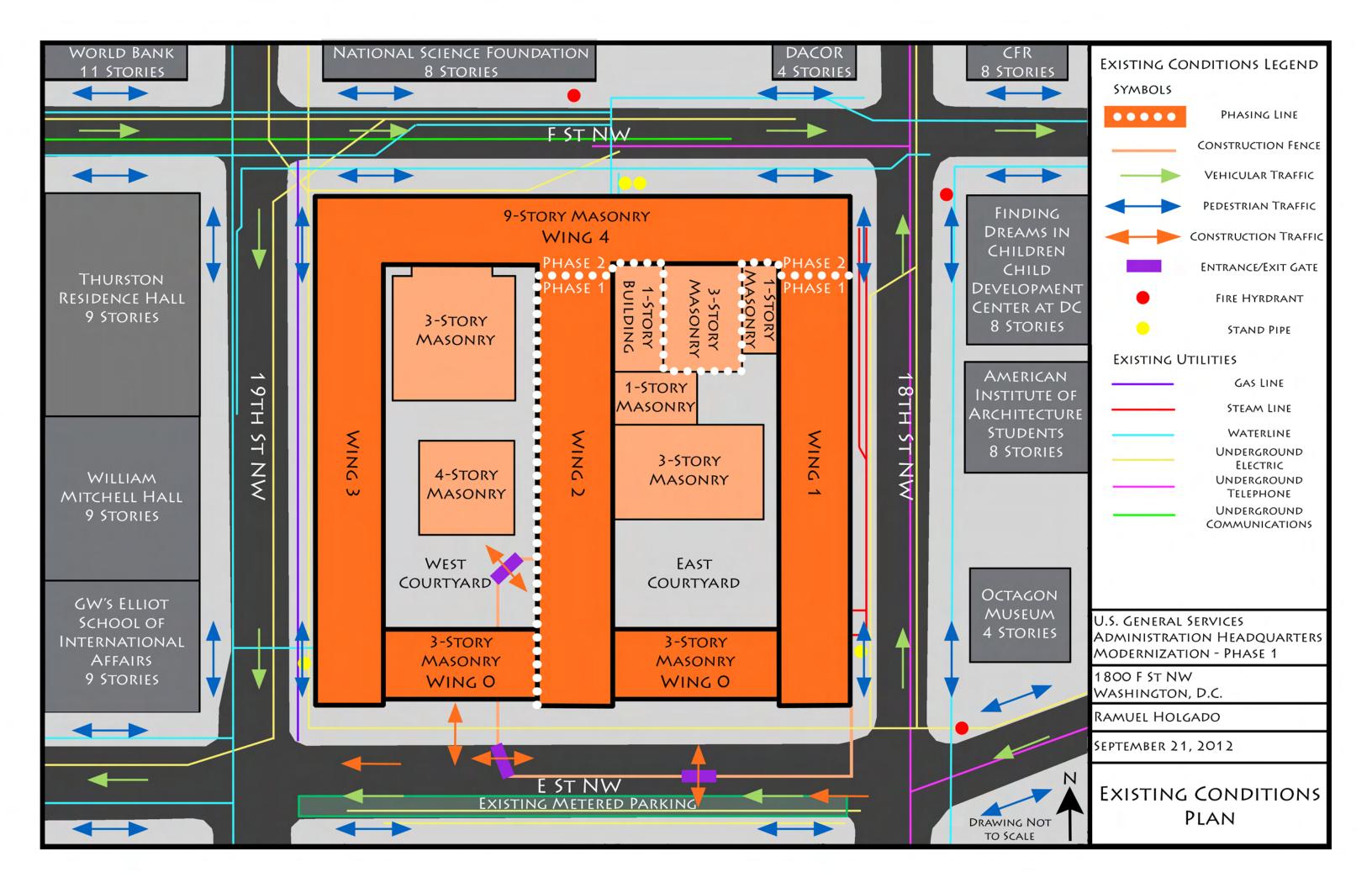
			MEP A	٩ss	emblies Co	ost	Estimate								
Assembly Number	Description	Quantity	Unit	М	aterial O&P	li	nstallation O&P	1	Total O&P	E	ext. Material O&P	Ext	t. Installation O&P	E	Ext. Total O&P
D20101101920	Water closet, vitreous china, tank type, floor mount, 1 piece	162	Ea.	\$	1,352.70	\$	701.79	\$	2,054.49	\$	219,137.40	\$	113,689.98	\$	332,827.38
D20102102000	Urinal, vitreous china, wall hung	54	Ea.	\$	641.28	\$	739.47	\$	1,380.75	\$	34,629.12	\$	39,931.38	\$	74,560.50
D20103102160	Lavatory w/trim, wall hung, vitreous china, 18" x 15"	162	Ea.	\$	781.56	\$	748.89	\$	1,530.45	\$	126,612.72	\$	121,320.18	\$	247,932.90
D20108102040	Drinking fountain, 1 bubbler, wall mounted, semi-recessed, stainless steel	54	Ea.	\$	1,477.95	\$	433.32	\$	1,911.27	\$	79,809.30	\$	23,399.28	\$	103,208.58
D20202402140	Electric water heater, commercial, 100< F rise, 350 gal, 30 KW 123 GPH	4	Ea.	\$	27,655.20	\$	2,260.80	\$	29,916.00	\$	110,620.80	\$	9,043.20	\$	119,664.00
D20402102200	Roof drain, DWV PVC, 6" diam, 10' high	16	Ea.	\$	1,177.35	\$	1,036.20	\$	2,213.55	\$	18,837.60	\$	16,579.20	\$	35,416.80
D20908101320	Copper tubing, hard temper, solder, type K, 1-1/2" diameter	27900	L.F.	\$	23.05	\$	12.43	\$	35.48	\$	643,095.00	\$	346,797.00	\$	989,892.00
D30105302000	Commercial building heating systems, terminal unit heaters, forced hot water, 1mil SF bldg, 10mil CF, total, 5 floors	430000	S.F.	\$	1.48	\$	1.34	\$	2.82	\$	636,400.00	\$	576,200.00	\$	1,212,600.00
D30203301020	Pump, base mounted with motor, end- suction, 3" size, 5 HP, to 225 GPM	14	Ea.	\$	13,426.80	\$	4,074.55	\$	17,501.35	\$	187,975.20	\$	57,043.70	\$	245,018.90
D30203301030	Pump, base mounted with motor, end- suction, 4" size, 7-1/2 HP, to 350 GPM	2	Ea.	\$	15,030.00	\$	4,912.30	\$	19,942.30	\$	30,060.00	\$	9,824.60	\$	39,884.60
D30203301040	Pump, base mounted with motor, end- suction, 5" size, 15 HP, to 1000 GPM	36	Ea.	\$	21,543.00	\$	7,450.65	\$	28,993.65	\$	775,548.00	\$	268,223.40	\$	1,043,771.40
D30301103520	Packaged chiller, air cooled, with fan coil unit, offices, 40,000 SF, 126.66 ton	430000	S.F.	\$	7.11	\$	3.65	\$	10.76	\$	3,057,300.00	\$	1,569,500.00	\$	4,626,800.00
D30303301050	Cooling tower, stainless steel, packaged unit, draw thru, 1000 ton AHU, central station, cool/heat coils,	3	Ea.	\$	198,897.00	\$	34,951.40	\$	233,848.40	\$	596,691.00	\$	104,854.20	\$	701,545.20
D30401101020	constant volume, filters, 5,000 CFM	10	Ea.	\$	22,745.40	\$	8,030.55	\$	30,775.95	\$	227,454.00	\$	80,305.50	\$	307,759.50
D30401101030	AHU, central station, cool/heat coils, constant volume, filters, 10,000 CFM	7	Ea.	\$	45,390.60	\$	11,125.40	\$	56,516.00	\$	317,734.20	\$	77,877.80	\$	395,612.00
D30401101040	AHU, central station, cool/heat coils, constant volume, filters, 15,000 CFM	3	Ea.	\$	64,128.00	\$	15,098.60	\$	79,226.60	\$	192,384.00	\$	45,295.80	\$	237,679.80
D30401341070	VAV terminal, cooling, hot water reheat, with actuator / controls, 1500 CFM	8	Ea.	\$	4,383.75	\$	7,324.05	\$	11,707.80	\$	35,070.00	\$	58,592.40	\$	93,662.40
D30401381050	VAV terminal, cool, hot water reheat, fan powered, with actuator/controls, 1000 CFM	3	Ea.	\$	4,108.20	\$	4,969.05	\$	9,077.25	\$	12,324.60	\$	14,907.15	\$	27,231.75
D30402201010	Fan system, in-line centrifugal, 500 CFM	4	Ea.	\$	2,655.30	\$	3,249.90	\$	5,905.20	\$	10,621.20	\$	12,999.60	\$	23,620.80
D30402201030	Fan system, in-line centrifugal, 1500 CFM	7	Ea.	\$	3,607.20	\$	6,523.35	\$	10,130.55	\$	25,250.40	\$	45,663.45	\$	70,913.85
D30402201060	Fan system, in-line centrifugal, 5000 CFM	9	Ea.	\$	9,569.10	\$	39,752.40	\$	49,321.50	\$	86,121.90	\$	357,771.60	\$	443,893.50
D30402201080	Fan system, in-line centrifugal, 10,000 CFM	17	Ea.	\$	13,527.00	\$	47,571.00	\$	61,098.00	\$	229,959.00	\$	808,707.00	\$	1,038,666.00
D30402401060	Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 5000 CFM	4	Ea.	\$	5,961.90	\$	29,296.20	\$	35,258.10	\$	23,847.60	\$	117,184.80	\$	141,032.40
D30402401070	Roof vent. system, power, centrifugal, aluminum, galvanized curb, back draft damper, 8500 CFM	5	Ea.	\$	7,915.80	\$	37,680.00	\$	45,595.80	\$	39,579.00	\$	188,400.00	\$	227,979.00
D30406101030	Plate heat exchanger, 1200 GPM	2	Ea.	\$	124,248.00	\$	24,671.80	\$	148,919.80	\$	248,496.00	\$	49,343.60	\$	297,839.60
D30501509030	Components of duct pkgs for abv sys, diffusers; al, 24" x 12", one	18		\$	-	\$	-	\$	-	\$	-	\$	-	\$	-
D40104101100	Wet pipe sprinkler systems, steel, ordinary hazard, 1 floor, 50,000 SF	50000	S.F.	\$	1.84	\$	2.19	\$	4.03	\$	92,000.00	\$	109,500.00	\$	201,500.00
D40104101240	Wet pipe sprinkler systems, steel, ordinary hazard, each additional floor, 50,000 SF	380000	S.F.	\$	1.40	\$	1.91	\$	3.31	\$	532,000.00	\$	725,800.00	\$	1,257,800.00
D40203100600	Wet standpipe risers, class I, steel, black, sch 40, 6" diam pipe, 1 floor	1	Floor	\$	7,615.20	\$	5,401.90	\$	13,017.10	\$	7,615.20	\$	5,401.90	\$	13,017.10
D40203100620	Wet standpipe risers, class I, steel, black, sch 40, 6" diam pipe, additional floors	8	Floor	\$	1,978.95	\$	1,499.85	\$	3,478.80	\$	15,831.60	\$	11,998.80	\$	27,830.40
D50101200560	Service installation, includes breakers, metering, 20' conduit & wire, 3 phase, 4 wire, 120/208 V, 2000 A	1	Ea.	\$	31,220.80	\$	10,706.00	\$	41,926.80	\$	31,220.80	\$	10,706.00	\$	41,926.80
D50102400280	Switchgear installation, incl switchboard, panels & circuit breaker, 800 A	10	Ea.	\$	16,993.60	\$	7,950.00	\$	24,943.60	\$	169,936.00	\$	79,500.00	\$	249,436.00
D50201200920	Receptacles and wall switches, 1000 SF, 14 receptacles	430000	S.F.	\$	0.68	\$	2.75	\$	3.43	\$	292,400.00	\$	1,182,500.00	\$	1,474,900.00
D50202080600	Fluorescent fixtures, type A, 17 fixtures per 1000 SF	430000	S.F.	\$	2.69	\$	5.78	\$	8.47	\$	1,156,700.00	\$	2,485,400.00	\$	3,642,100.00
D50303100280	Telephone systems, underfloor duct, 7' on center, low density	430000	S.F.	\$	7.90	\$	2.78	\$	10.68	\$	3,397,000.00	\$	1,195,400.00	\$	4,592,400.00
D50303100520	Telephone systems, telepoles, low density	430000	S.F.	\$	1.21	\$	0.71	\$	1.92	\$	520,300.00	\$	305,300.00	\$	825,600.00
D50303101020	Telephone wiring for offices & laboratories, 8 jacks/MSF	430	S.F.	\$	0.43	\$	1.80	\$	2.23	\$	184.90	\$	774.00	\$	958.90
D50309100440	Communication and alarm systems, fire detection, non-addressable, 100 detectors, includes outlets, boxes, conduit and wire	1	Ea.	\$	23,613.20	\$	41,764.00	\$	65,377.20	\$	23,613.20	\$	41,764.00	\$	65,377.20
D50309200110	Internet wiring, 8 data/voice outlets per 1000 S.F.	430	M.S.F.	\$	637.26	\$	1,855.00	\$	2,492.26	\$	274,021.80	\$	797,650.00	\$	1,071,671.80
	1000 J.F.													\$	26,543,531.06

APPENDIX B

GENERAL CONDITIONS ESTIMATE

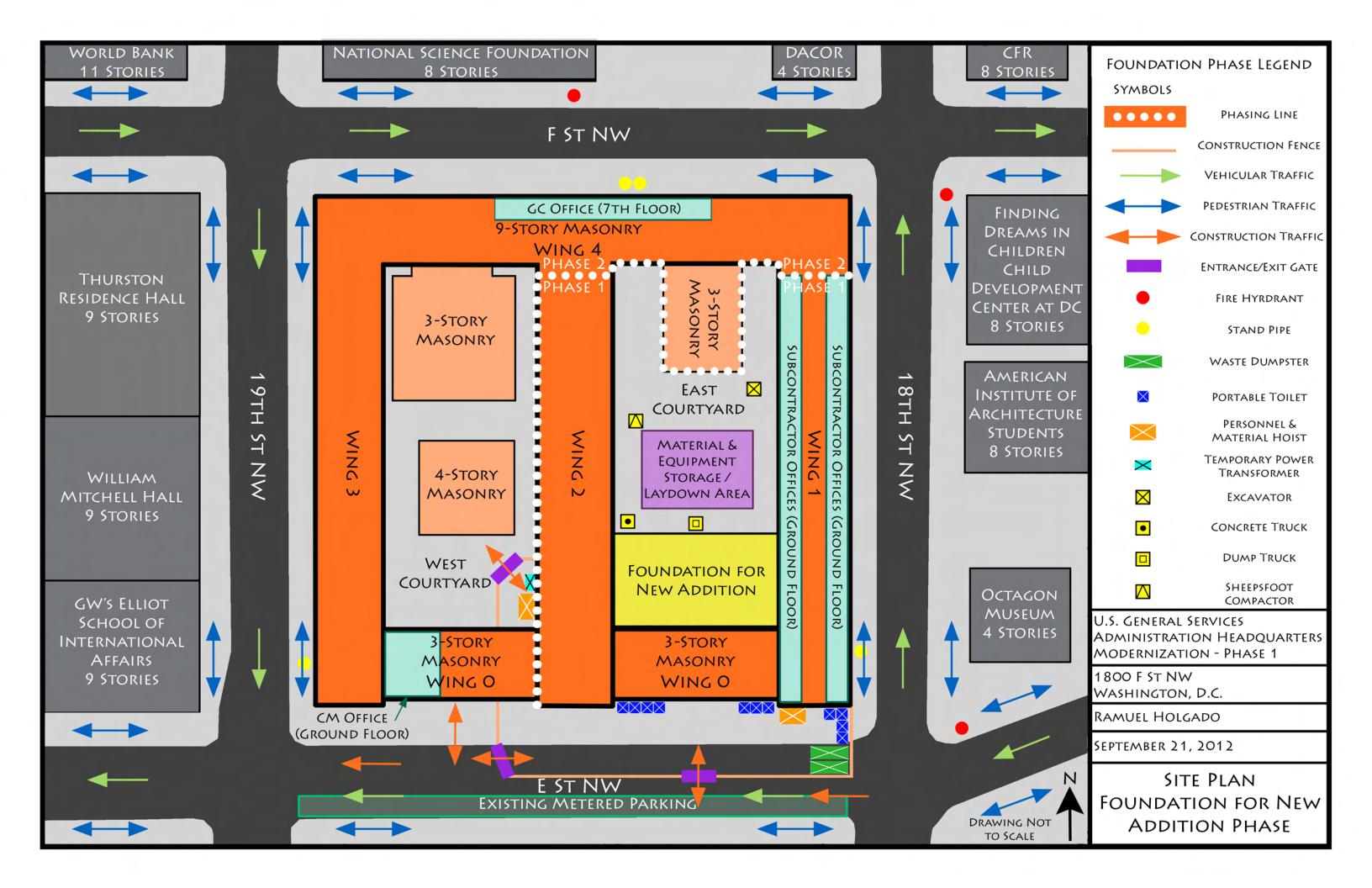
Line Item	Quantity	Unit		Rate		Total Cost
Personnel						
Senior Project Manager	100	Week	\$	3,476.00	\$	347,600.00
Project Manager	100	Week	\$	2,821.30	\$	282,130.00
Quality Control Manager	104	Week	\$	3,158.78	\$	328,513.12
Safety Manager	104	Week	\$	1,689.98	\$	175,757.92
Senior Superintendent	104	Week	\$	3,265.23	\$	339,583.92
Superintendent	104	Week	\$	3,111.27	\$	323,572.08
MEP Manager	100	Week	\$	2,869.74	\$	286,974.00
Assistant Project Manager	100	Week	\$	1,640.66	\$	164,066.00
Project Engineer/Scheduler	104	Week	\$	1,482.00	\$	154,128.00
Assistant Project Engineer	104	Week	\$	1,127.68	\$	117,278.72
Officer Manager	104	Week	\$	864.28	\$	89,885.12
Site Expenses						
Mobilization	1	LS	\$	23,752.00	\$	23,752.00
Temporary Buildings	0	Week	\$		\$	*
Temporary Utilities	104	Week	\$	3,684.13	\$	383,149.52
Temporary Job Construction	104	Week	\$	2,936.29	\$	305,374.16
Job Office Expenses	104	Week	\$	3,784.65	\$	393,603.60
Job Maintenance	104	Week	\$	3,517.85	\$	365,856.40
Demobilization	1	LS	\$	23,752.00	\$	23,752.00
Miscellaneous Costs						
Labor Escalation	1	LS	\$	90,000.00	\$	90,000.00
General Liability and Builders Risk Insuran	0.59%	Job	\$86	5,412,506.00	\$	509,833.79
Payment and Performance Bonds	0.89%	Job	\$86	5,412,506.00	\$	769,071.30
TOTAL					\$!	5,473,881.65

APPENDIX C-1 EXISTING CONDITIONS SITE PLAN

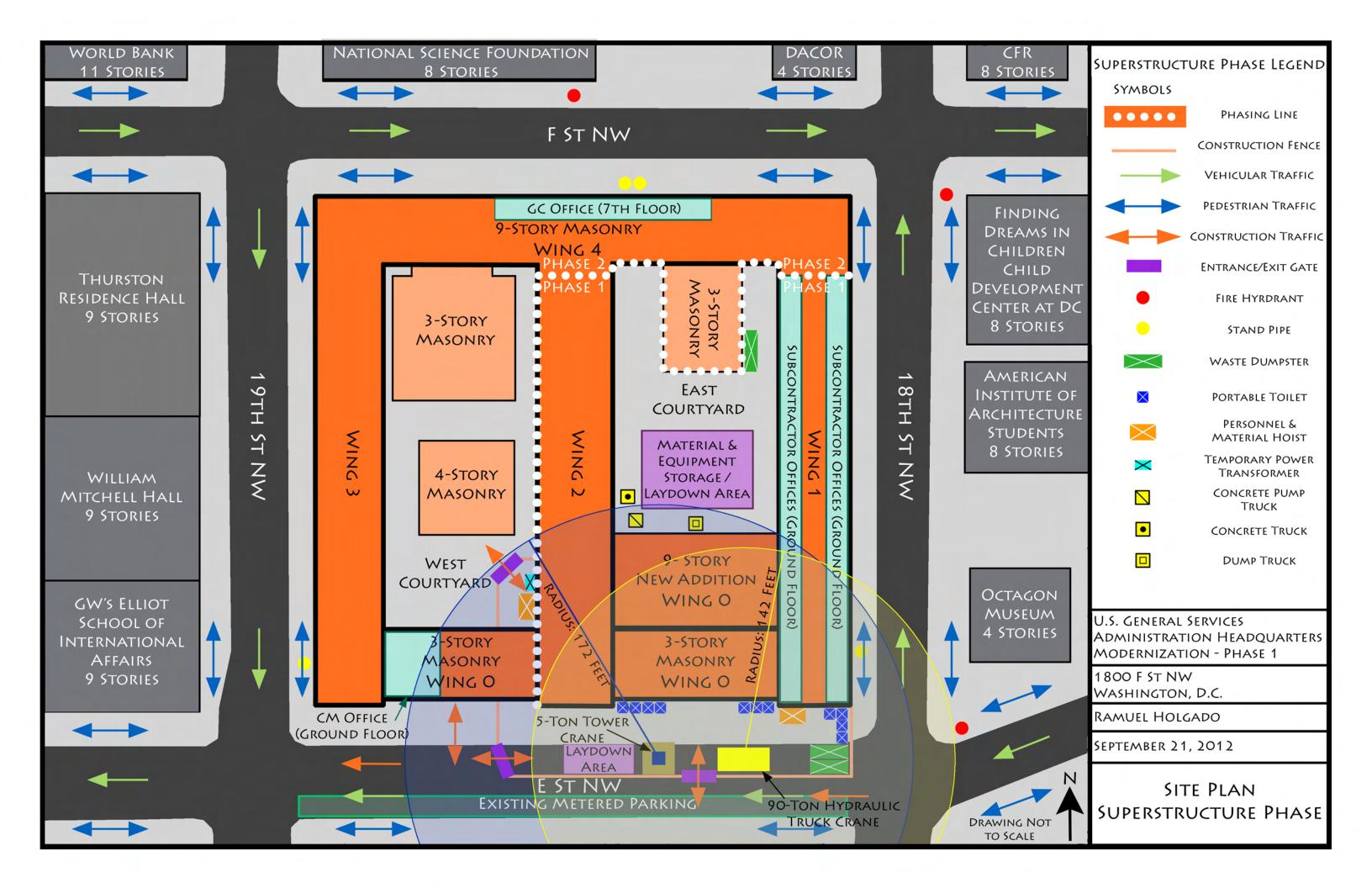


APPENDIX C-2

FOUNDATION FOR THE NEW ADDITION SITE PLAN

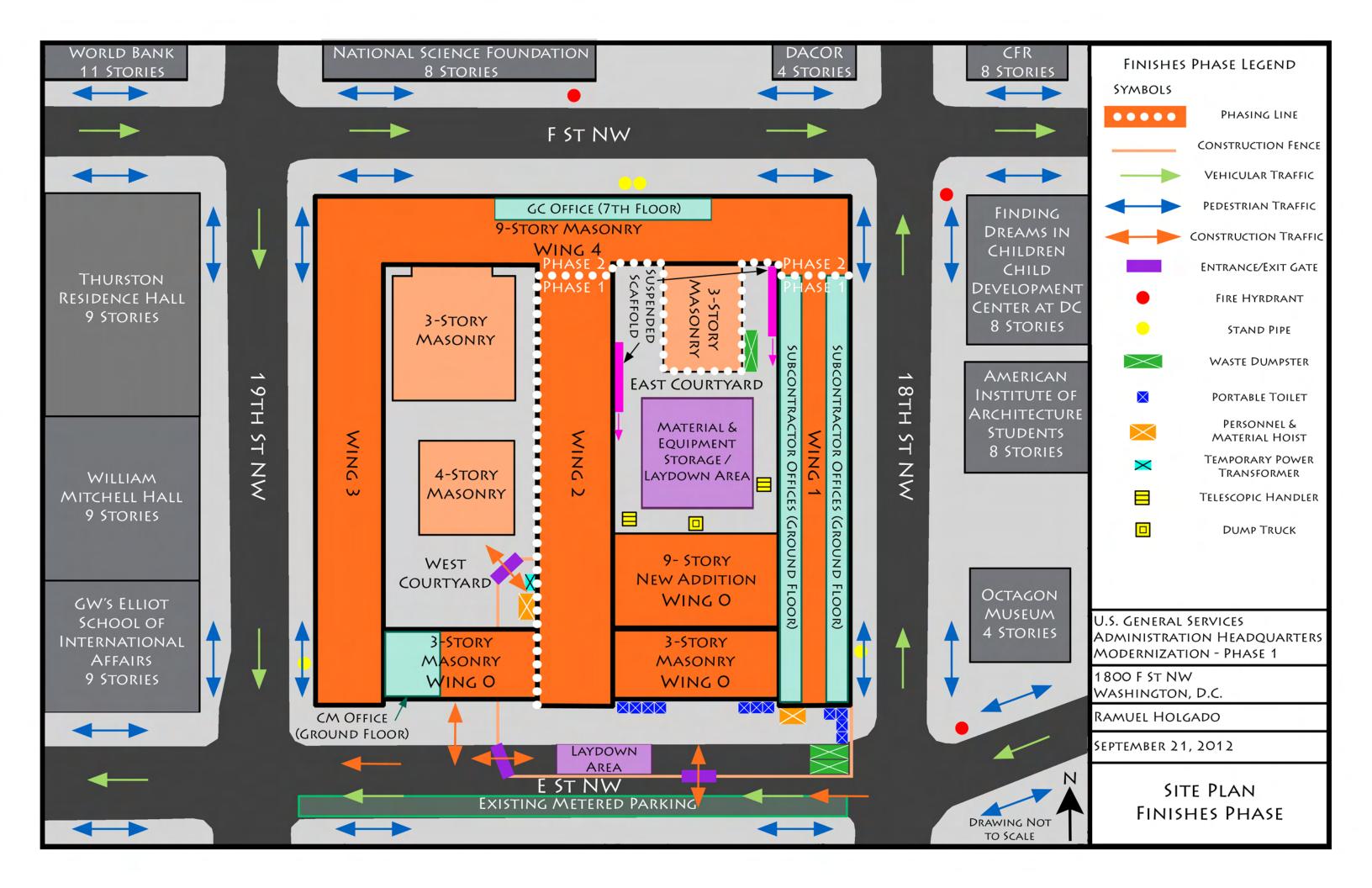


APPENDIX C-3 SUPERSTRUCTURE SITE PLAN



APPENDIX C-4

FINISHES SITE PLAN



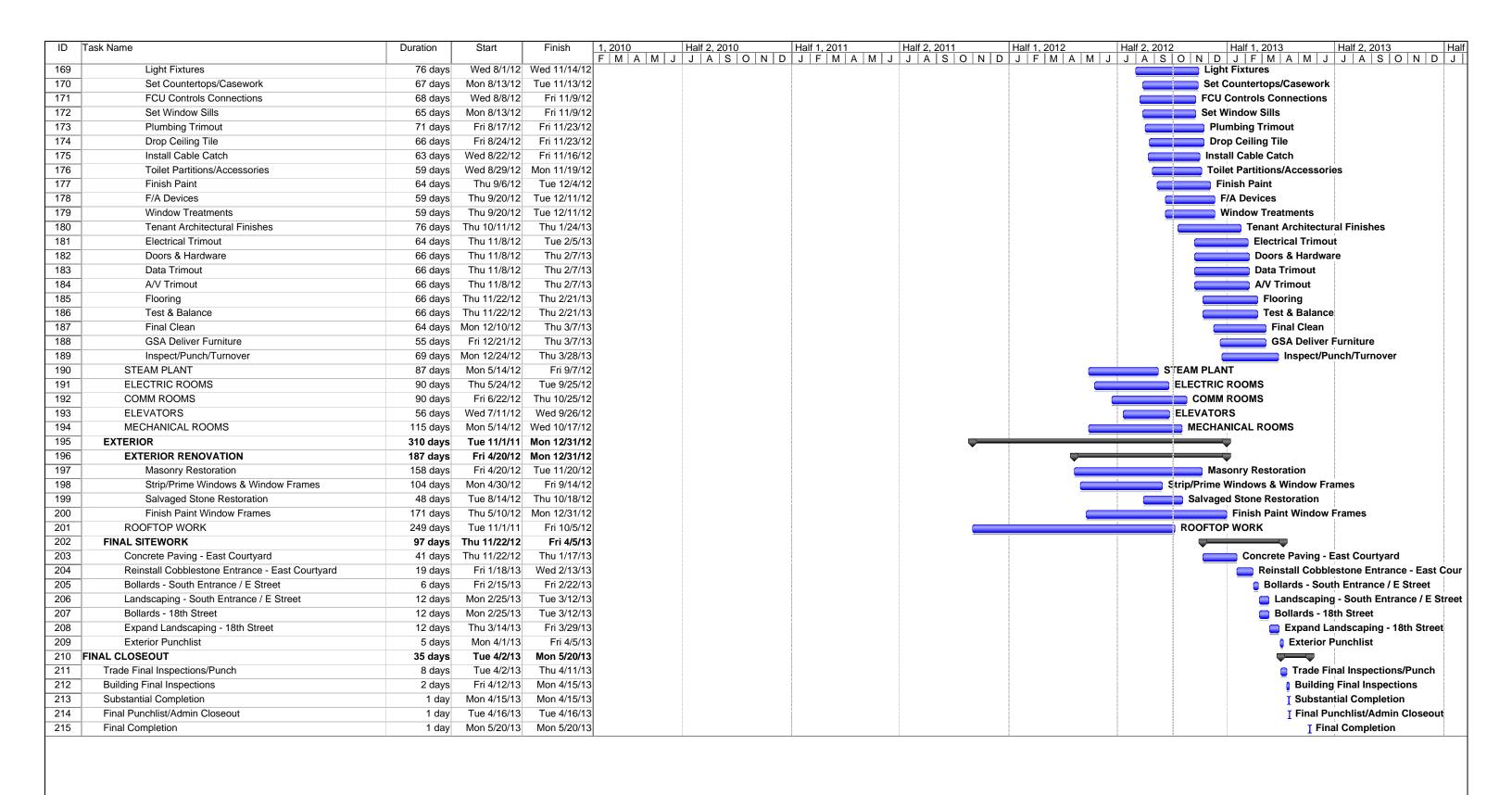
APPENDIX D

DETAILED PROJECT SCHEDULE

2 Design Phase 140 days 3 Project Award 1 day W 4 Administrative Notice to Proceed 1 day W 5 Procurement of Construction Services 533 days M 6 Mobilization 4 days 7 Demolition/Abatement Plan 46 days 8 CONSTRUCTION PHASE 547 days 9 NEW ADDITION 134 days 10 INITIAL SITEWORK/DEMOLITION 184 days 11 Electric Ductbank at Courtyard 90 days 12 Excavate For SWM Facility 30 days 13 FRP SWM Structure 30 days 14 SWM Connections to Structure 15 days 15 Backfill SWM Structure 7 days 16 Storm Piping From Structure to Street 22 days 17 STRUCTURE 239 days 18 Grade Beams & Foundation Walls - East 12 days 19 U/G Plumbing R/I 5 days 20 U/G Electric R/I 5 days	on 10/24/11 Tue 11/22/11 ed 11/23/11 Mon 10/15/12	Design Phase Project Award Administrative Notice to Proceed Project Award Administrative Notice to Proceed Mobilization
3	Ned 9/15/10 Ned 9/15/10 Ned 9/15/10 Ned 10/14/10 Thu 10/14/10 Wed 11/14/12 Tue 1/4/11 Wed 3/9/11 Thu 3/10/11 Thu 7/7/11 Wed 7/13/11 Thu 7/7/11 Wed 8/17/11 Wed 8/17/11 Ton 10/17/11 Tue 10/25/11 Tue 11/22/11 Tue 11/22/11 Tue 12/6/11 Tue 12/6/11 Tue 12/6/11 Tue 12/6/11 Tue 12/12/11 Tue 12/12/11 Tue 12/12/11 Tue 12/11 Tue 12/13/11 Tue 12/12/11 Tue 12/13/11 Tue 12/12/11 Tue 12/13/11 Tue 12/12/11 Tue 12/13/11 Tue 12/13/11 Tue 12/12/11 Tue 12/13/11 Tue 12/13/11 Tue 12/13/11 Tue 12/13/11 Tue 12/12/11 Thu 6/14/12 Fri 6/15/12 Thu 6/28/12 Fri 6/29/12 Thu 7/12/12 Fri 6/29/12 Thu 7/19/12 Tri 7/6/12 Thu 7/19/12	Project Award Administrative Notice to Proceed Procurement of Construction Services
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25 Cooling Tower Steel 5 days 26 Roof Deck 10 days 27 Erect Atruim Steel 15 days 28 Set & Assemble Cooling Towers 10 days 29 Roof Blocking 5 days 30 Photovoltaic Framing 10 days 31 Curtain Wall Courtyard Elevation 18 days 32 Skylight Framing 13 days 33 Mech Pipe Connections 20 days 34 Electric Connections 20 days 35 Set Skylights 9 days 36 Exterior Louvers 12 days 37 Curtain Wall South Elevation 19 days 38 Controls Connection 21 days 39 Roofing 18 days 40 Penthouse Screenwall 17 days	Fri 6/29/12 Thu 7/5/12 Fri 6/29/12 Thu 7/12/12 Fri 6/29/12 Thu 7/19/12 Fri 7/6/12 Thu 7/19/12	12 Cooling Tower Steel 12 Roof Deck 12 Erect At uim Steel 12 Set & Assemble Cooling Towers
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38Controls Connection21 days39Roofing18 days40Penthouse Screenwall17 days	Thu 8/9/12 Fri 8/24/12	
39 Roofing 18 days 1 40 Penthouse Screenwall 17 days	Thu 8/9/12 Tue 9/4/12	
40 Penthouse Screenwall 17 days	Fri 8/17/12 Fri 9/14/12	12 Controls Connection
·	Thu 8/23/12 Mon 9/17/12	
41 Install Photovoltaic Panels 18 days	Wed 9/5/12 Thu 9/27/12	12 Penthouse Screenwall
	Tue 9/18/12 Thu 10/11/12	12 Install Photovoltaic Panels
42 Install Operable Louvers 12 days	Fri 9/28/12 Mon 10/15/12	12 Install Operable Louvers
· · · · · · · · · · · · · · · · · · ·	Mon 5/14/12 Wed 12/12/12	
-	Mon 5/14/12 Mon 9/17/12	
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	Thu 6/7/12 Wed 10/24/12	
	Thu 6/7/12 Wed 10/24/12	
-	Fri 6/29/12 Fri 10/12/12	
•	Fri 6/15/12 Fri 11/2/12	
Mech Pipe Insulation 99 days	Tue 6/19/12 Fri 11/2/12	12 Mech Pipe Insulation
Project: Detailed Project Schedule Task Summary Vate: Tue 10/2/12		

ID	Task Name	Duration	Start	Finish	1, 2010 Half 2, 2010	Half 1, 2011	Half 2, 2011	Half 1, 2012	Half 2, 2012 Half 1, 2013 Half 2, 2013 Half J A S O N D J F M A M J J A S O N D J
57	VAV Electric Connections	99 days	Tue 6/19/12	Fri 11/2/12	F	JFINIAINIJ	JAJSOND	JFINIAINI	VAV Electric Connections
58	VAV Mech Pipe Connections	102 days	Tue 6/19/12	Wed 11/7/12					VAV Mech Pipe Connections
59	Sprinkler R/I	82 days	Thu 7/5/12	Fri 10/26/12					Sprinkler R/I
60	Set Electrical Panels	88 days	Thu 7/5/12						Set Electrical Panels
61	Pull F/A Wire, Security, & Power Wire	89 days		Wed 11/14/12					Pull F/A Wire, Security, & Power Wire
62	VAV Controls Connections	99 days	Tue 7/3/12						VAV Controls Connections
63	Pull Data Cabling	52 days		Wed 12/12/12					Pull Data Cabling
64	FINISHES		Wed 6/20/12	Mon 4/1/13					T un bata dabing
65	Interior Glass Wall	157 days	Wed 6/20/12	Thu 1/24/13				`	Interior Glass Wall
66	Insulate/Hang Drywall	47 days		Wed 11/21/12					Insulate/Hang Drywall
67	Finish Drywall	48 days		Mon 12/3/12					Finish Drywall
68	Frame Hard Ceiling	43 days		Mon 11/26/12					Frame Hard Ceiling
69	Prime & 1st Coat Walls & Ceilings	48 days	Mon 10/8/12		l i				Prime & 1st Coat Walls & Ceilings
70	Set Window Sills	,	Tue 10/23/12						Set Window Sills
		,							
71	Ceiling Grid	49 days	Fri 10/12/12						Ceiling Grid
72	Window Treamtents	,	Tue 10/30/12						Window Treamtents
73	Sprinkler Heads		Tue 10/23/12						Sprinkler Heads
74	HVAC Trimout	,	Tue 10/23/12	Fri 12/28/12					HVAC Trimout
75	Light Fixtures	,	Tue 10/23/12	Thu 1/3/13					Light Fixtures
76	Drop Ceiling Tile	,	Mon 11/5/12	Mon 1/14/13					Drop Ceiling Tile
77	Finish Paint	,	Mon 11/12/12	Wed 1/23/13					Finish Paint
78	F/A Devices	,	Mon 11/26/12	Tue 1/29/13					F/A Devices
79	Tenant Architectural Finishes	53 days	Mon 11/26/12	Wed 2/6/13					Tenant Architectural Finishes
80	Door & Hardware	37 days	Thu 12/27/12	Fri 2/15/13					Door & Hardware
81	Electrical Trimout	36 days	Thu 12/27/12	Thu 2/14/13					Electrical Trimout
82	Data Trimout	37 days	Thu 12/27/12	Fri 2/15/13					Data Trimout
83	A/V Trimout	37 days	Thu 12/27/12	Fri 2/15/13					A/V Trimout
84	Test & Balance	38 days	Wed 1/9/13	Fri 3/1/13					Test & Balance
85	Install Glass Floor	10 days	Mon 2/18/13	Fri 3/1/13					□ Install Glass Floor
86	Flooring	34 days	Wed 1/9/13	Mon 2/25/13					Flooring
87	Glass Guard Rail	20 days	Mon 1/28/13	Fri 2/22/13					Glass Guard Rail
88	Final Clean	36 days	Mon 1/21/13	Mon 3/11/13					Final Clean
89	GSA Deliver Furniture	12 days	Fri 2/22/13	Mon 3/11/13					GSA Deliver Furniture
90	Inspect/Punch/Turnover	26 days	Mon 2/25/13	Mon 4/1/13					Inspect/Punch/Turnover
91	CHILLER PLANT	118 days	Wed 5/9/12	Tue 10/16/12					CHILLER PLANT
92	LOADING DOCK	108 days	Mon 5/14/12						LOADING DOCK
93	WING 2	, ,	Tue 2/28/12						
94	ROUGH-INS & FINISHES	288 days	Tue 2/28/12	Thu 3/28/13					<u> </u>
95	Interior Framing/Blocking Core & Shell	124 days	Tue 2/28/12	Fri 8/10/12				•	Interior Framing/Blocking Core & Shell
96	Set Door Frames Core & Shell	102 days	Fri 3/2/12	Mon 7/16/12					Set Door Frames Core & Shell
97	Prep/Pour Infill Slab	74 days	Fri 3/16/12	Wed 6/20/12					Prep/Pour Infill Slab
98	Structural Steel Infill/Reinforcing	63 days	Mon 3/19/12	Thu 6/7/12					Structural Steel Infill/Reinforcing
99	Pull Power Wire	72 days	Tue 3/27/12	Wed 6/27/12	I :				Pull Power Wire
	Plumbing Insulation		Mon 5/14/12	Mon 7/9/12					Plumbing Insulation
100	Inwall Electric R/I - Core	43 days							
101	Set Electrical Panels	65 days	Mon 5/14/12	Wed 8/8/12					Inwall Electric R/I - Core Set Electrical Panels
102		67 days	Tue 5/15/12	Mon 8/13/12					
103	Frame Hard Ceilings	60 days	Tue 5/22/12	Fri 8/10/12					Frame Hard Ceilings
104	Pull F/A Wire, Security, & Cabling	70 days	Thu 5/31/12	Tue 9/4/12					Pull F/A Wire, Security, & Cabling
105	Insulate/Hang Drywall Walls - Core	59 days	Mon 6/4/12	Wed 8/22/12				_	Insulate/Hang Drywall Walls - Core
106	Finish Drywall Walls	50 days	Wed 6/20/12	Tue 8/28/12					Finish Drywall Walls
107	Set Window Sills	44 days	Wed 6/20/12	Mon 8/20/12					Set Window Sills
108	Patch Existing Plaster Ceilings	53 days	Tue 6/26/12	Thu 9/6/12					Patch Existing Plaster Ceilings
109	Prime & Coat Walls & Ceilings	44 days	Wed 7/11/12	Mon 9/10/12					Prime & Coat Walls & Ceilings
110	Set FCU's	45 days	Mon 7/16/12	Fri 9/14/12					Set FCU's
111	Ceramic Tile @ Bathrooms	73 days	Mon 7/23/12						Ceramic Tile @ Bathrooms
112	Ceiling Grid	68 days	Mon 7/23/12	Wed 10/24/12					Ceiling Grid
	Detailed Project Schedule Task	Summary 🖵		7					
Date: T	ue 10/2/12								
					Page 2				
					1 490 2				

Fig. Fig. Care Special content Fig. Fig.	ID	Task Name	Duration	Start	Finish	1, 2010 Half 2, 2010 Half 1, 2011 Half 2, 2011 Half 1, 2012 Half 2, 2012 Half 1, 2013 Half 2, 2013
FOU Exists Connections	113	FCU Mech Pipe Connections	43 days	Wed 8/1/12	Fri 9/28/12	
Sci Continent Continent St.		•	•			
			-			
Princip Princip Second Fig. 1971 Princip Pri		•	-			
So So So So So So So So			-			
MAC Finance			-			
1-30 Capit Finance		·	-			
Commonwealth			-			
Common C		Ŭ				
Somewhat St. de	122	Electrical R/I	-		Fri 12/14/12	2 Electrical R/I
PACK 68		Sprinkler R/I	-	Thu 10/4/12	Fri 12/14/12	2 Sprinkler R/I
Description Security Description Security Description Descri	124	HVAC R/I	-	Thu 10/4/12	Fri 12/14/12	2 HVAC R/I
Paint Dyvall	125	Frame Ceilings	51 days	Wed 10/17/12	Wed 12/26/12	2 Frame Ceilings
Paint Dyvall		<u>-</u>	-			
Terrus Architectural Finishes	127		72 days	Fri 10/26/12	Mon 2/4/13	
Terrar Advisoral Finishes	128	Finish Paint	102 days	Fri 9/14/12	Mon 2/4/13	3 Finish Paint
FA Devices		Tenant Architectural Finishes	78 days	Tue 10/9/12	Thu 1/24/13	Tenant Architectural Finishes
Window Treatments						
Sarvider Trimost			,			
HYAC Timout 193			-			
Ternat Architectural Finance 12 days Fin 1074 No. 27 11/3		·	-			
Does à Fardware 103 days Tue \$1912 Tue \$2713	134	Tenant Architectural Finishes	-		Mon 2/11/13	Tenant Architectural Finishes
193		Electrical Trimout	63 days	Mon 10/15/12		
AV Trimout	136	Doors & Hardware	103 days	Tue 9/18/12	Thu 2/7/13	Doors & Hardware
Footing	137	Data Trimout	103 days	Tue 9/18/12		
Test & Balance 103 days Test & Balance 76 days Test & Balance Test & Bala	138	A/V Trimout		Tue 9/18/12	Thu 2/7/13	3 A/V Trimout
Final Clean	139	Flooring	79 days	Mon 11/5/12	Thu 2/21/13	3 Flooring
GSA Deliver Furniture	140	Test & Balance	103 days	Tue 10/2/12	Thu 2/21/13	Test & Balance
Inspectify number 79 days Mon 12/01/2 Thu 3/28/13 Inspectify number 1/14 COMM ROOMS 88 days Wed 69/12 Thu 3/28/13 COMM ROOMS 18/24/2 ELEVATORS 12/24/2 ELEVATORS 12/24/2 ELEVATORS 18/24/2 ELEVATORS 18/24/2 ELEVATORS ELE	141	Final Clean	76 days	Thu 11/22/12	Thu 3/7/13	3 Final Clean
COMM ROOMS	142	GSA Deliver Furniture	65 days	Fri 12/7/12	Thu 3/7/13	3 GSA Deliver Furniture
145	143	Inspect/Punch/Turnover	79 days	Mon 12/10/12	Thu 3/28/13	3 Inspect/Punch/Turnover
MECHANICAL ROOMS 118 days 128 days 28 days 34 55/12 128 days 34 65/12 12	144	COMM ROOMS	83 days	Wed 6/6/12	Thu 9/27/12	2 COMM ROOMS
WiNCs Sal days Sal 55712 Thu 328/13	145	ELEVATORS	124 days	Wed 7/11/12	Mon 12/31/12	2 ELEVATORS
ROUGH-INS & FINISHES 28 days Set 56/12 The 3/28/13 Plumbing Rough-In 40 days Fire 6/11/2 Wed 7/28/12 Plumbing Rough-In Inwall Electric R/I 65 days Fire 5/18/12 Tue 8/14/12 Tue 8/14/12	146	MECHANICAL ROOMS	118 days	Tue 5/22/12	Wed 10/31/12	2 MECHANICAL ROOMS
Plumbing Rough-In 40 days Fri R P I	147	WING 1	238 days	Sat 5/5/12	Thu 3/28/13	3
Inval Electric R7	148	ROUGH-INS & FINISHES	238 days	Sat 5/5/12	Thu 3/28/13	
151	149	Plumbing Rough-In	40 days	Fri 6/1/12	Wed 7/25/12	2 Plumbing Rough-In
Prep/Pour Infil Slab	150	Inwall Electric R/I	65 days	Fri 5/18/12	Tue 8/14/12	2 Inwa Electric R/I
153	151	Insulate/Hang Drywall	95 days	Sat 5/5/12	Mon 9/10/12	2 Ir sulate/Hang Drywall
Frame Hard Ceilings 60 days Thu 6/14/12 Wed 9/5/12	152	Prep/Pour Infill Slab	18 days			
Flumbing Insulation Flumbing Insulation	153	Mech Pipe Insulation	58 days	Mon 7/16/12	Wed 10/3/12	2 Mech Pipe Insulation
Set Door Frames Core & Shell		Frame Hard Ceilings	60 days	Thu 6/14/12	Wed 9/5/12	2 Frame Hard Ceilings
Set Electrical Panels	155	Plumbing Insulation	75 days	Mon 5/14/12	Wed 8/22/12	Plumbing Insulation
Finish Drywall - Core			-			
Patch Existing Plaster Ceilings 97 days Fri 6/1/12 Fri 10/12/12 160 Pull F/A Wire, Security, Data Cabling, & Power Wire 96 days Fri 6/1/12 Thu 10/11/12 Pull A Wire, Security, Data Cabling, & Power Wire 96 days Fri 6/1/12 Thu 10/11/12 Pull A Wire, Security, Data Cabling, & Power Wire 96 days Fri 6/1/12 Thu 10/11/12 Pull A Wire, Security, Data Cabling, & Power Wire Pull A Will A Walls Pull A Will A Walls Pull A Wal			-			
Full F/A Wire, Security, Data Cabling, & Power Wire 96 days Fri 6/1/12 Thu 10/11/12 Prime and 1st Coat Ceilings & Walls 89 days Fri 6/15/12 Wed 10/17/12 Prime and 1st Coat Ceilings & Walls			-			
161		9	-			
162 Ceramic Tile @ Bathrooms 97 days Tue 6/26/12 Wed 11/7/12 163 Set FCU's 68 days Wed 7/11/12 Fri 10/12/12 164 Ceiling Grid 86 days Wed 7/11/12 Wed 11/7/12 165 FCU Mechanical Pipe Connections 68 days Wed 7/25/12 Fri 10/26/12 166 FCU Electric Connections 68 days Wed 7/25/12 Fri 10/26/12 167 Sprinkler Heads 76 days Wed 8/1/12 Wed 11/14/12 168 HVAC Trimout Task Summary		1	-			
163		•	-			
164 Ceiling Grid						
FCU Mechanical Pipe Connections 68 days Wed 7/25/12 Fri 10/26/12 166 FCU Electric Connections 68 days Wed 7/25/12 Fri 10/26/12 167 Sprinkler Heads 76 days Wed 8/1/12 Wed 11/14/12 168 HVAC Trimout 75 days Wed 8/1/12 Tue 11/13/12 Project: Detailed Project Schedule Date: Tue 10/2/12			-			
166 FCU Electric Connections 68 days Wed 7/25/12 Fri 10/26/12 167 Sprinkler Heads 76 days Wed 8/1/12 Wed 11/14/12 168 HVAC Trimout 75 days Wed 8/1/12 Tue 11/13/12 Project: Detailed Project Schedule Date: Tue 10/2/12 Task Summary		-	-			
167 Sprinkler Heads 168 HVAC Trimout 75 days Wed 8/1/12 Tue 11/13/12 Project: Detailed Project Schedule Date: Tue 10/2/12 Task Sprinkler Heads HVAC Trimout Sprinkler Heads HVAC Trimout Task Summary		·				
168 HVAC Trimout 75 days Wed 8/1/12 Tue 11/13/12 Project: Detailed Project Schedule Date: Tue 10/2/12 Task Summary HVAC Trimout HVAC Trimout			-			
Project: Detailed Project Schedule Date: Tue 10/2/12 Task Summary		•	-			
Date: Tue 10/2/12	168	HVAC Trimout	75 days	Wed 8/1/12	Гue 11/13/12	2 HVAC Trimout
Date: Tue 10/2/12	Project:	Detailed Project Schedule Task	Summary 🛡		,	
Page 3				•	•	
		<u> </u>				Page 3



Project: Detailed Project Schedule Date: Tue 10/2/12

Task

APPENDIX E

ATRIUM TAKEOFFS AND CALCULATIONS

Original System (60-Foot Tall Curtain Wall)

Atrium Steel

1) Baltimore Steel Original Contract: \$2.5M

2) Assume **\$1M** was used for the truss columns and roof trusses

Curtain Wall

1) GPR Original Contract: \$5.35M

2) Assume that **\$2M+** was used for the blast curtain wall

Skylights

1) Supersky Original Contract: \$225,000 2) McCoy Original Contract: \$575,000 3) Total Skylight Contract: \$800,000

<u>Total</u>

1) Total Atrium Cost: \$8.65M

Alternate System (36-Foot Tall Curtain Wall)

	Alternate System Cost Estimate													
System	Design	Unit	Quantity		Actual Cost		Actual Cost/Unit		OTAL Estimated Cost	Estimated Cost/Actual Cost				
Curtain Wall	Original	SF	9575.0	\$	5,350,000.00	\$	558.75	\$	-	N/A				
Curtain waii	Alternate	SF	5400.0	\$	-	\$	-	\$	3,017,232.38	56.4%				
Skylights	Original	SF	3595.7	\$	800,000.00	\$	222.49	\$	-	N/A				
Skylights	Alternate	SF	3595.7	\$	-	\$	-	\$	800,000.00	100.0%				
Atrium Steel	Original	LF	730.3	\$	2,500,000.00	\$	3,423.20	\$	-	N/A				
Athum Steel	Alternate	LF	535.5	\$	-	\$	-	\$	1,833,125.66	73.3%				
Limestone Wall	Original	SF	0.0	\$	-	\$	-	\$	-	N/A				
Limestone wan	Alternate	SF	1890.0	\$	-	\$	56.18	\$	106,180.20	N/A				
Windows	Original	SF	0.0	\$	-	\$	-	\$	-	N/A				
windows	Alternate	SF	1332.0	\$	-	\$	28.06	\$	37,375.92	N/A				

	Atrium System Cost Comparison														
System		Curtain Wall		Skylights		Atrium Steel	L	imestone Wall		Windows		TOTAL			
Original	\$	5,350,000.00	\$	800,000.00	\$	2,500,000.00	\$	-	\$	-	\$	8,650,000.00			
Alternate	\$	3,017,232.38	\$	800,000.00	\$	1,833,125.66	\$	106,180.20	\$	37,375.92	\$	5,793,914.15			
SAVINGS											\$	2,856,085.85			

Notes

Limestone Wall Actual Cost/Unit was taken from Means Costworks

Limestone Wall includes brick masonry backup and 2-1/2" rigin insulation

Window Actual Cost/Unit was calculated from the estimated total taken from Means Costworks

Original System (60-Foot Tall Curtain Wall)

Atrium Steel

- 1) Lead time for truss columns and roof trusses: approximately 4-6 months due to site measurements, coordination, and painting
- 2) One truss column and one roof truss was delivered and erected each day (7 days total)

Curtain Wall

- 1) The curtain wall was allotted for 20 days in the schedule
- 2) In reality, it took **30-35 days** because the crane broke and some of the belt courses needed to be notched <u>Skylights</u>
- 1) Skylight framing took **15 days**
- 2) Setting skylights took **10 days**
- 3) Overall, it took 25 days to install the skylights

Alternate System (36-Foot Tall Curtain Wall)

	Atrium System Schedule Comparison												
System	Curtain Wall	Skylights	Atrium Steel	Limestone Wall	Windows	TOTAL							
Original	35	25	7	0	0	67							
Alternate	20	25	4	9	6	64							
DIFFERENCE						3							

Notes

Assumed that two truss columns and two roof trusses will be delivered and erected each day (4 days total)

Limestone daily output of 275 square feet was taken from Means Costworks (1890 total square feet)

Limestone Wall includes brick masonry backup and 2-1/2" rigin insulation

Window daily output of 3 each was estimated from comparing to the closest line item in Means Costworks (16 total windows)

APPENDIX F ACOUSTICAL ANALYSIS CALCULATIONS

	Construction of Atruim Components
South Wall (1st Floor)	Salvaged limestone with brick masonry backup and 2-1/2" rigid insulation
East Wall (1st Floor)	Salvaged limestone with brick masonry backup and 2-1/2" rigid insulation
West Wall (1st Floor)	Salvaged limestone with brick masonry backup and 2-1/2" rigid insulation
Windows (1st Floor)	Guardian SN-68 (1" Clear Insulated, Low E)
Interior Atrium Curtain Wall	Viracon V1085 screen #2 (3/8" total thickness: 2 layers 3/16" laminated glass with a clear interlayer)
Atrium Curtain Wall	Viracon VNE 1-63#2 (1 3/16" Clear, Insulated, Argon, Laminated, Low-E)
Floor	Stone Paving
Doors	Viracon (3/8" total thickness: 2 layers 3/16" laminated glass with a clear interlayer)
Atrium Skylights (Ceiling)	Viracon VE1-2M #2 w/ V175 White Silkscreen #2 (1 5/16" Clear, Insulated Argon, Laminated, Low-E, Fritted)
Atrium Trusses	Steel
Concrete Encased Columns	Concrete
Balcony Floor (2nd Floor)	Greenlite Glasse Systems LITEFLOOR/ R 28/3 (1-1/8" Glass Floor System)
Balcony Floor (Floors 3-6)	Terroxy Resin Systems Terrazzo
Balcony Ceiling	Match Munsell #7.5YR 8/4 (Tan) Paint on Gypsum Wallboard
Balcony Railing	Viracon V1085 screen #2 (3/8" total thickness: 2 layers 3/16" laminated glass with a clear interlayer)

	Absorption Coefficient									Total Absorption						
			Coeffi	icients				Room Absorption								
	125 HZ	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	Area (m²)	125 HZ	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz			
South Wall (1st Floor)	0.36	0.44	0.31	0.29	0.39	0.25	105.8	38.08	46.54	32.79	30.67	41.25	26.44			
East Wall (1st Floor)	0.36	0.44	0.31	0.29	0.39	0.25	27.3	9.83	12.02	8.47	7.92	10.65	6.83			
West Wall (1st Floor)	0.36	0.44	0.31	0.29	0.39	0.25	27.3	9.83	12.02	8.47	7.92	10.65	6.83			
Windows (1st Floor)	0.35	0.25	0.18	0.12	0.04	0.04	71.6	25.08	17.91	12.90	8.60	2.87	2.87			
Interior Atrium Curtain Wall	0.35	0.25	0.18	0.12	0.04	0.04	826.8	289.38	206.70	148.83	99.22	33.07	33.07			
Atrium Curtain Wall	0.35	0.25	0.18	0.12	0.04	0.04	889.5	311.34	222.39	160.12	106.74	35.58	35.58			
Floor	0.01	0.01	0.02	0.02	0.02	0.02	334.1	3.34	3.34	6.68	6.68	6.68	6.68			
Doors	0.35	0.25	0.18	0.12	0.04	0.04	77.3	27.07	19.34	13.92	9.28	3.09	3.09			
Atrium Skylights (Ceiling)	0.35	0.25	0.18	0.12	0.04	0.04	334.1	116.92	83.51	60.13	40.09	13.36	13.36			
Atrium Trusses	0.05	0.10	0.10	0.10	0.07	0.02	386.6	19.33	38.66	38.66	38.66	27.06	7.73			
Concrete Encased Columns	0.10	0.05	0.06	0.07	0.09	0.08	229.7	22.97	11.49	13.78	16.08	20.68	18.38			
Balcony Floor (2nd Floor)	0.35	0.25	0.18	0.12	0.04	0.04	36.3	12.71	9.08	6.54	4.36	1.45	1.45			
Balcony Floor (Floors 3-6)	0.01	0.01	0.02	0.02	0.02	0.02	391.3	3.91	3.91	7.83	7.83	7.83	7.83			
Balcony Ceiling	0.29	0.10	0.05	0.04	0.07	0.09	427.6	124.01	42.76	21.38	17.11	29.93	38.49			
Balcony Railing	0.35	0.25	0.18	0.12	0.04	0.04	143.1	50.07	35.77	25.75	17.17	5.72	5.72			
People (40 Adults)	0.25	0.35	0.42	0.46	0.50	0.50	76.0	19.00	26.60	31.92	34.96	38.00	38.00			
										598.16	453.28	287.89	252.36			

Surface Area of Atrium	Component	
	ft ²	m ²
South Wall (1st Floor)	1138.5	105.8
East Wall (1st Floor)	294.0	27.3
West Wall (1st Floor)	294.0	27.3
Windows (1st Floor)	771.2	71.6
Interior Atrium Curtain Wall	8899.7	826.8
Atrium Curtain Wall	9575.0	889.5
Floor	3595.7	334.1
Doors	832.5	77.3
Atrium Skylights (Ceiling)	3595.7	334.1
Atrium Trusses	4161.5	386.6
Concrete Encased Columns	2473.0	229.7
Balcony Floor (2nd Floor)	390.9	36.3
Balcony Floor (Floors 3-6)	4212.2	391.3
Balcony Ceiling	4603.1	427.6
Balcony Railing	1540.0	143.1
People (40 Adults)	818.1	76.0
Total Area	47194.8	4384.5

Volume									
ft ³ m ³									
Total Volume	283459.8	8026.7							

Reverberant Field Level (L _{irt} in Source Room)																
Octave Band (Hz)	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000
Sound Pressure Level (dB)	86	-	-	85	-	-	84	-	-	83	-	-	82	-	-	80
Sound Pressure Level (dB)	81	81	80	80	80	79	79	79	78	78	78	77	77	77	75	75

						Α	djoining Wa	all								
Wall Type	Salvaged L	imestone w	ith Brick Ma	sonry Back	up and 2-1/			all								
Wall Area (m²)	105.8			,	,	0										
Window Type	Guardian S	Guardian SN-68 (1" Clear Insulated, Low E)														
Window Area (m²)	65.0	5.0														
Door Type	Viracon (3,	firacon (3/8" total thickness: 2 layers 3/16" laminated glass with a clear interlayer)														
Door Area (m²)	6.0															
Atrium Curtain Wall Type	Viracon VN	racon VNE 1-63#2 Viracon VNE 1-63#2 (1 3/16" Clear, Insulated, Argon, Laminated, Low-E)														
Atrium Curtain Wall Area (m²)	889.5	589.5														
Octave Band (Hz)	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000
Wall TL (dB)	38	39	46	47	52	54	57	58	60	61	69	68	71	71	72	74
Window TL (dB)	20	26	26	30	34	34	37	39	40	41	41	40	39	39	46	49
Door TL (dB)	29	30	31	34	32	33	35	35	35	35	34	35	34	38	42	45
Atrium Curtain Wall TL (dB)	23	23	32	31	37	38	41	43	47	50	52	52	48	43	50	46
Wall τ	0.000158	0.000126	2.51E-05	2E-05	6.31E-06	3.98E-06	2E-06	1.58E-06	0.000001	7.94E-07	1.26E-07	1.58E-07	7.94E-08	7.94E-08	6.31E-08	3.98E-08
Window τ	0.01	0.002512	0.002512	0.001	0.000398	0.000398	0.0002	0.000126	0.0001	7.94E-05	7.94E-05	0.0001	0.000126	0.000126	2.51E-05	1.26E-05
Doorτ	0.001259	0.001	0.000794	0.000398	0.000631	0.000501	0.000316	0.000316	0.000316	0.000316	0.000398	0.000316	0.000398	0.000158	6.31E-05	3.16E-05
Atrium Curtain Wall τ	0.005012	0.005012	0.000631	0.000794	0.0002	0.000158	7.94E-05	5.01E-05	2E-05	0.00001	6.31E-06	6.31E-06	1.58E-05	5.01E-05	0.00001	2.51E-05
$ au_{ ext{eff}}$	0.004818	0.004367	0.000685	0.000729	0.000195	0.00016	8.04E-05	5.14E-05	2.45E-05	1.49E-05	1.22E-05	1.3E-05	2.3E-05	5.04E-05	1.02E-05	2.2E-05
Composite TL (dB)	23	24	32	31	37	38	41	43	46	48	49	49	46	43	50	47
(Source Room L _{Irf})-TL	58	57	48	49	43	41	38	36	32	30	29	28	31	34	25	28
(Source Room Lift)-TE	61	-	-	53	-	-	44	-	-	35	-	-	37	-	-	30
Absorption (Receiving Room)	1082.89	-	-	792.03	-	-	598.16	-	-	453.28	-	-	287.89	-		252.36

Noise Reduction										
Octave Band (Hz)	125	250	500	1000	2000	4000				
Noise Reduction (dB)	0	-1	-3	-4	-6	-6				

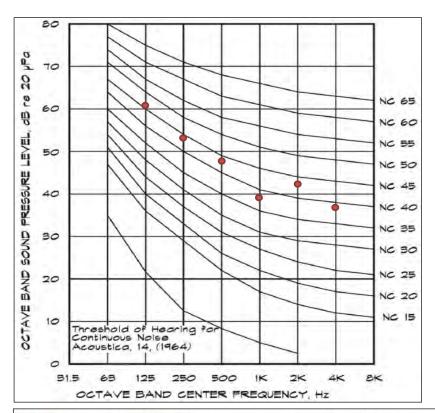
Reverberant Field Level (L _{irf} in Receiving Room)											
Octave Band (Hz) 125 250 500 1000 2000 400											
Reverberant Field Level (dB)	61	54	47	39	43	36					

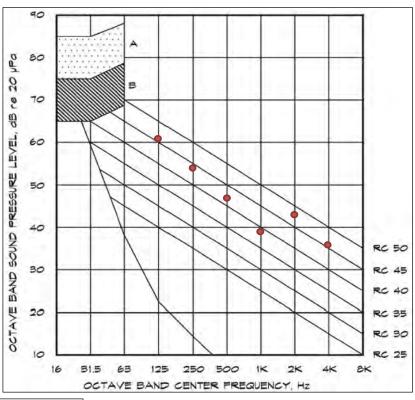
NC Rating (Receiving Room)

46

RC Rating (Receiving Room)

48





NC and RC Recommendations

	Type of Area	Recommended NC or RC Criteria Range
1	Private Residences	25 to 30
2	Apartments	25 to 30
3	Hotels/motels	
	a Individual rooms or suites	30 to 35
	b Meeting/banquet rooms	25 to 30
	c Halls, corridors, lobbies	35 to 40
	d Service/support areas	40 to 45
4	Offices	
	a Executive	25 to 30
	b Conference room	25 to 30
	c Private	30 to 35
	d Open plan areas	35 to 40
	e Computer equipment rooms	40 to 45
	f Public circulation	40 to 45

	Construction of Atruim Components
South Wall (1st Floor)	Salvaged limestone with brick masonry backup and 2-1/2" rigid insulation
East Wall (1st Floor)	Salvaged limestone with brick masonry backup and 2-1/2" rigid insulation
West Wall (1st Floor)	Salvaged limestone with brick masonry backup and 2-1/2" rigid insulation
Windows (1st Floor)	Guardian SN-68 (1" Clear Insulated, Low E)
Interior Atrium Curtain Wall	Viracon V1085 screen #2 (3/8" total thickness: 2 layers 3/16" laminated glass with a clear interlayer)
Atrium Curtain Wall	Viracon VNE 1-63#2 (1 3/16" Clear, Insulated, Argon, Laminated, Low-E)
Floor	Stone Paving
Doors	Viracon (3/8" total thickness: 2 layers 3/16" laminated glass with a clear interlayer)
Atrium Skylights (Ceiling)	Viracon VE1-2M #2 w/ V175 White Silkscreen #2 (1 5/16" Clear, Insulated Argon, Laminated, Low-E, Fritted)
Atrium Trusses	Steel
Concrete Encased Columns	Concrete
Balcony Floor (2nd Floor)	Greenlite Glasse Systems LITEFLOOR/ R 28/3 (1-1/8" Glass Floor System)
Balcony Floor (Floors 3-4)	Terroxy Resin Systems Terrazzo
Balcony Ceiling	Match Munsell #7.5YR 8/4 (Tan) Paint on Gypsum Wallboard
Balcony Railing	Viracon V1085 screen #2 (3/8" total thickness: 2 layers 3/16" laminated glass with a clear interlayer)

	Total Absorption												
			Coeff	icients				Room Absorption					
	125 HZ	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	Area (m²)	125 HZ	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
South Wall (1st Floor)	0.36	0.44	0.31	0.29	0.39	0.25	105.8	38.08	46.54	32.79	30.67	41.25	26.44
East Wall (1st Floor)	0.36	0.44	0.31	0.29	0.39	0.25	27.3	9.83	12.02	8.47	7.92	10.65	6.83
West Wall (1st Floor)	0.36	0.44	0.31	0.29	0.39	0.25	27.3	9.83	12.02	8.47	7.92	10.65	6.83
Windows (1st Floor)	0.35	0.25	0.18	0.12	0.04	0.04	71.6	25.08	17.91	12.90	8.60	2.87	2.87
Interior Atrium Curtain Wall	0.35	0.25	0.18	0.12	0.04	0.04	427.4	149.60	106.86	76.94	51.29	17.10	17.10
Atrium Curtain Wall	0.35	0.25	0.18	0.12	0.04	0.04	501.7	175.59	125.42	90.30	60.20	20.07	20.07
Floor	0.01	0.01	0.02	0.02	0.02	0.02	334.1	3.34	3.34	6.68	6.68	6.68	6.68
Doors	0.35	0.25	0.18	0.12	0.04	0.04	66.5	23.27	16.62	11.96	7.98	2.66	2.66
Atrium Skylights (Ceiling)	0.35	0.25	0.18	0.12	0.04	0.04	334.1	116.92	83.51	60.13	40.09	13.36	13.36
Atrium Trusses	0.05	0.10	0.10	0.10	0.07	0.02	268.1	13.41	26.81	26.81	26.81	18.77	5.36
Concrete Encased Columns	0.10	0.05	0.06	0.07	0.09	0.08	229.7	22.97	11.49	13.78	16.08	20.68	18.38
Balcony Floor (2nd Floor)	0.35	0.25	0.18	0.12	0.04	0.04	36.3	12.71	9.08	6.54	4.36	1.45	1.45
Balcony Floor (Floors 3-4)	0.01	0.01	0.02	0.02	0.02	0.02	195.7	1.96	1.96	3.91	3.91	3.91	3.91
Balcony Ceiling	0.29	0.10	0.05	0.04	0.07	0.09	231.9	67.25	23.19	11.60	9.28	16.23	20.87
Balcony Railing	0.35	0.25	0.18	0.12	0.04	0.04	81.3	28.45	20.32	14.63	9.75	3.25	3.25
People (34 Adults)	0.25	0.35	0.42	0.46	0.50	0.50	64.6	16.15	22.61	27.13	29.72	32.30	32.30
							Total	714.43	539.69	413.04	321.26	221.88	188.36

Surface Area of Atrium	Component	ts
	ft ²	m ²
South Wall (1st Floor)	1138.5	105.8
East Wall (1st Floor)	294.0	27.3
West Wall (1st Floor)	294.0	27.3
Windows (1st Floor)	771.2	71.6
Interior Atrium Curtain Wall	4600.8	427.4
Atrium Curtain Wall	5400.0	501.7
Floor	3595.7	334.1
Doors	715.5	66.5
Atrium Skylights (Ceiling)	3595.7	334.1
Atrium Trusses	2886.3	268.1
Concrete Encased Columns	2473.0	229.7
Balcony Floor (2nd Floor)	390.9	36.3
Balcony Floor (Floors 3-4)	2106.1	195.7
Balcony Ceiling	2496.2	231.9
Balcony Railing	875.0	81.3
People (34 Adults)	695.3	64.6
Total Area	32328.2	3003.4

Volume											
	ft ³	m ³									
Total Volume 183380.7 51											

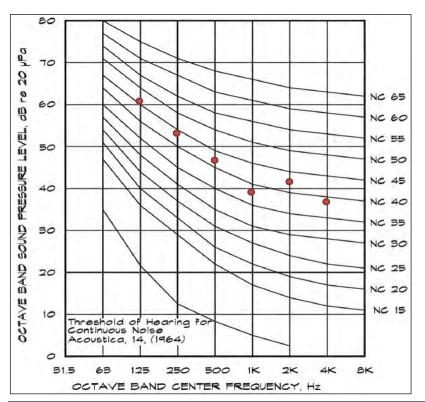
Reverberant Field Level (L _{irt} in Source Room)																
Octave Band (Hz)	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000
Sound Pressure Level (dB)	86	-	-	85	-	-	84	-	-	83	-	-	82	-	-	80
Sound Pressure Level (dB)	81	81	80	80	80	79	79	79	78	78	78	77	77	77	75	75

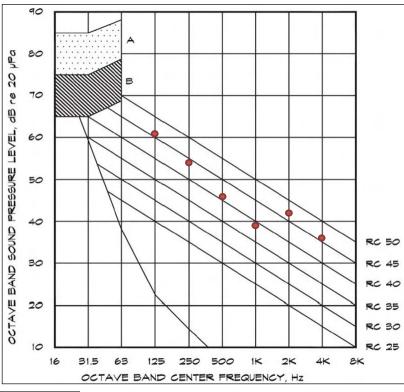
						Δ	djoining Wa	all								
Wall Type	Salvaged L	imestone w	ith Brick Ma	sonry Back	un and 2-1/		<u>, </u>	AII								
Wall Area (m ²)	105.8	cstoric W	Terr Briok ivic	Jonny Buch	ap ana 2 1/	g.us	uiu tioii									
Window Type	Guardian S	N-68 (1" Cle	ear Insulate	d, Low E)												
Window Area (m²)	65.0	5.0														
Door Type	Viracon (3,	iracon (3/8" total thickness: 2 layers 3/16" laminated glass with a clear interlayer)														
Door Area (m²)	6.0	0														
Atrium Curtain Wall Type	Viracon VN	racon VNE 1-63#2 Viracon VNE 1-63#2 (1 3/16" Clear, Insulated, Argon, Laminated, Low-E)														
Atrium Curtain Wall Area (m²)	501.7															
Octave Band (Hz)	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000
Wall TL (dB)	38	39	46	47	52	54	57	58	60	61	69	68	71	71	72	74
Window TL (dB)	20	26	26	30	34	34	37	39	40	41	41	40	39	39	46	49
Door TL (dB)	29	30	31	34	32	33	35	35	35	35	34	35	34	38	42	45
Atrium Curtain Wall TL (dB)	23	23	32	31	37	38	41	43	47	50	52	52	48	43	50	46
Wall τ	0.000158	0.000126	2.51E-05	2E-05	6.31E-06	3.98E-06	2E-06	1.58E-06	0.000001	7.94E-07	1.26E-07	1.58E-07	7.94E-08	7.94E-08	6.31E-08	3.98E-08
Window τ	0.01	0.002512	0.002512	0.001	0.000398	0.000398	0.0002	0.000126	0.0001	7.94E-05	7.94E-05	0.0001	0.000126	0.000126	2.51E-05	1.26E-05
Doorτ	0.001259	0.001	0.000794	0.000398	0.000631	0.000501	0.000316	0.000316	0.000316	0.000316	0.000398	0.000316	0.000398	0.000158	6.31E-05	3.16E-05
Atrium Curtain Wall τ	0.005012	0.005012	0.000631	0.000794	0.0002	0.000158	7.94E-05	5.01E-05	2E-05	0.00001	6.31E-06	6.31E-06	1.58E-05	5.01E-05	0.00001	2.51E-05
$ au_{ ext{eff}}$	0.004699	0.003974	0.000718	0.00069	0.000192	0.00016	8.1E-05	5.22E-05	2.73E-05	1.79E-05	1.58E-05	1.71E-05	2.73E-05	5.05E-05	1.04E-05	2.01E-05
Composite TL (dB)	23	24	31	32	37	38	41	43	46	47	48	48	46	43	50	47
(Source Room L _{irf})-TL	58	57	49	48	43	41	38	36	32	31	30	29	31	34	25	28
(Source Room E _{lef})-1E	61	-	-	53	-	,	44	-	-	36	-	-	37	-	-	30
Absorption (Receiving Room)	714.43	-	-	539.69	-	-	413.04	-	-	321.26	-	-	221.88	-	-	188.36

Noise Reduction											
Octave Band (Hz) 125 250 500 1000 2000 4000											
Noise Reduction (dB)	0	-1	-2	-3	-5	-6					

Reverberant Field Level (L _{irf} in Receiving Room)											
Octave Band (Hz) 125 250 500 1000 2000 4000											
Reverberant Field Level (dB)	61	54	46	39	42	36					

NC Rating (Receiving Room)
46
RC Rating (Receiving Room)
47





NC and RC Recommendations

	Type of Area	Recommended NC or RC Criteria Range
1	Private Residences	25 to 30
2	Apartments	25 to 30
3	Hotels/motels	
	a Individual rooms or suites	30 to 35
	b Meeting/banquet rooms	25 to 30
	c Halls, corridors, lobbies	35 to 40
	d Service/support areas	40 to 45
4	Offices	
	a Executive	25 to 30
	b Conference room	25 to 30
	c Private	30 to 35
	d Open plan areas	35 to 40
	e Computer equipment rooms	40 to 45
	f Public circulation	40 to 45

	Construction of Office Components
South Wall	Salvaged limestone with brick masonry backup and 2-1/2" rigid insulation
South Wall Windows	Guardian SN-68 (1" Clear Insulated, Low E)
East Wall	Salvaged limestone with brick masonry backup and 2-1/2" rigid insulation
East Wall Windows	Guardian SN-68 (1" Clear Insulated, Low E)
West Wall	Salvaged limestone with brick masonry backup and 2-1/2" rigid insulation
West Wall Windows	Guardian SN-68 (1" Clear Insulated, Low E)
North Glazing Type 1	Viracon VE 1-2M #2 (1" Clear, Insulated, Low-E)
North Glazing Type 2	Viracon V-908#2 (1/4" Spandrel glass, Clear w/ color V-908)
Floor	Carpet, heavy, on concrete
Ceiling	Match Munsell #7.5YR 8/4 (Tan) Paint on Gypsum Wallboard
Columns	Gypsum Board

	Abso	rption Coef	ficient						To	tal Absorpt	ion		
			Coeff	icients						Room Al	sorption		
	125 HZ	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	Area (m ²)	125 HZ	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
South Wall	0.36	0.44	0.31	0.29	0.39	0.25	67.4	24.25	29.64	20.88	19.53	26.27	16.84
South Wall Windows	0.35	0.25	0.18	0.12	0.04	0.04	66.9	23.41	16.72	12.04	8.03	2.68	2.68
East Wall	0.36	0.44	0.31	0.29	0.39	0.25	31.2	11.24	13.73	9.68	9.05	12.17	7.80
East Wall Windows	0.35	0.25	0.18	0.12	0.04	0.04	25.1	8.78	6.27	4.52	3.01	1.00	1.00
West Wall	0.36	0.44	0.31	0.29	0.39	0.25	31.2	11.24	13.73	9.68	9.05	12.17	7.80
West Wall Windows	0.35	0.25	0.18	0.12	0.04	0.04	25.1	8.78	6.27	4.52	3.01	1.00	1.00
North Glazing Type 1	0.35	0.25	0.18	0.12	0.04	0.04	58.8	20.59	14.71	10.59	7.06	2.35	2.35
North Glazing Type 2	0.35	0.25	0.18	0.12	0.04	0.04	73.8	25.84	18.46	13.29	8.86	2.95	2.95
Floor	0.02	0.06	0.14	0.37	0.60	0.65	656.4	13.13	39.39	91.90	242.87	393.85	426.67
Ceiling	0.29	0.10	0.05	0.04	0.07	0.09	656.4	190.36	65.64	32.82	26.26	45.95	59.08
Columns	0.29	0.10	0.05	0.04	0.07	0.09	180.6	52.37	18.06	9.03	7.22	12.64	16.25
People (40 Adults Seated)	0.39	0.57	0.80	0.94	0.92	0.87	76.0	29.64	43.32	60.80	71.44	69.92	66.12
								419.63	285.94	279.73	415.40	582.97	610.56

Surface Area of Office (Component	
	ft ²	m²
South Wall	725.0	67.4
South Wall Windows	720.0	66.9
East Wall	336.0	31.2
East Wall Windows	270.0	25.1
West Wall	336.0	31.2
West Wall Windows	270.0	25.1
North Glazing Type 1	633.3	58.8
North Glazing Type 2	794.7	73.8
Floor	7065.6	656.4
Ceiling	7065.6	656.4
Columns	1944.0	180.6
People (40 Adults Seated)	818.1	76.0
Total Area	20978.3	1948.9

Vol	ume	
	ft ³	m ³
Total Volume	84787.4	2400.9

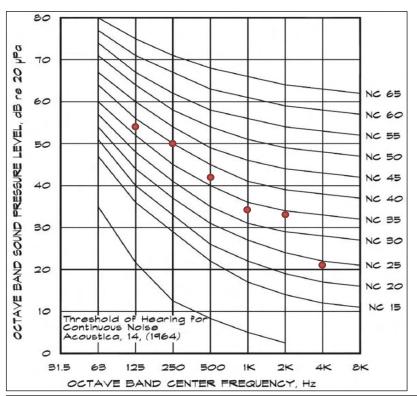
Reverberant Field Level (L _{irt} in Source Room)																
Octave Band (Hz)	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000
Sound Pressure Level (dB)	86	-	-	85	-	-	84	-	-	83	-	-	82	-	-	80
Sound Pressure Level (dB)	81	81	80	80	80	79	79	79	78	78	78	77	77	77	75	75

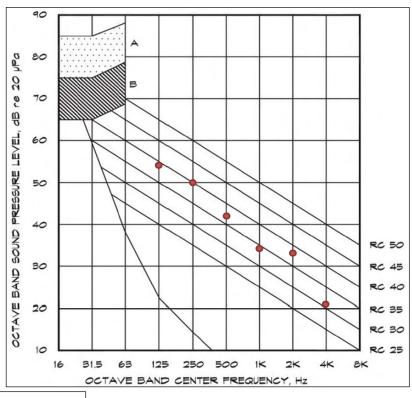
						A	djoining W	all								
Wall Type	Salvaged L	imestone w	ith Brick Ma	sonry Back	up and 2-1/	2" Rigid Ins	ulation									
Wall Area (m²)	67.4															
Window Type	Guardian S	Guardian SN-68 (1" Clear Insulated, Low E)														
Window Area (m²)	66.9															
Octave Band (Hz)	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000
Wall TL (dB)	38	39	46	47	52	54	57	58	60	61	69	68	71	71	72	74
Window TL (dB)	20	26	26	30	34	34	37	39	40	41	41	40	39	39	46	49
Wall τ	0.000158	0.000126	2.51E-05	2E-05	6.31E-06	3.98E-06	2E-06	1.58E-06	0.000001	7.94E-07	1.26E-07	1.58E-07	7.94E-08	7.94E-08	6.31E-08	3.98E-08
Window τ	0.01	0.002512	0.002512	0.001	0.000398	0.000398	0.0002	0.000126	0.0001	7.94E-05	7.94E-05	0.0001	0.000126	0.000126	2.51E-05	1.26E-05
$ au_{ m eff}$	0.005061	0.001314	0.001264	0.000508	0.000201	0.0002	0.0001	6.35E-05	5.03E-05	4E-05	3.96E-05	4.99E-05	6.28E-05	6.28E-05	1.25E-05	6.29E-06
Composite TL (dB)	23	29	29	33	37	37	40	42	43	44	44	43	42	42	49	52
(Source Room L _{lrf})-TL	58	52	51	47	43	42	39	37	35	34	34	34	35	35	26	23
(Source Noon L _{irf})-TL	59	-	-	53	-	-	45	-	-	39	-	-	39	-	-	28
Absorption (Receiving Room)	419.63	-	-	285.94	-	-	279.73	-	-	415.40	-	-	582.97	-	-	610.56

Noise Reduction						
Octave Band (Hz)	125	250	500	1000	2000	4000
Noise Reduction (dB)	5	3	3	5	6	7

Reverberant Field Level (L _{irf} in Receiving Room)						
Octave Band (Hz)	125	250	500	1000	2000	4000
Reverberant Field Level (dB)	54	50	42	34	33	21

NC Rating (Receiving Room)
40
RC Rating (Receiving Room)
40





NC and RC Recommendations

	Type of Area	Recommended NC or RC Criteria Range
1	Private Residences	25 to 30
2	Apartments	25 to 30
3	Hotels/motels	
	a Individual rooms or suites	30 to 35
	b Meeting/banquet rooms	25 to 30
	c Halls, corridors, lobbies	35 to 40
	d Service/support areas	40 to 45
4	Offices	
	a Executive	25 to 30
	b Conference room	25 to 30
	c Private	30 to 35
	d Open plan areas	35 to 40
	e Computer equipment rooms	40 to 45
	f Public circulation	40 to 45

APPENDIX G

GEOTECHNICAL REPORT

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings were performed with a truck-mounted auger drill rig, which utilized continuous flight, hollow stem augers to advance the boreholes. Drilling fluid was not used in the boring exploration. The borings were subsequently backfilled with the auger spoils generated during drilling procedures after their completion.

In the soil borings, representative soil samples were obtained by means of the split-barrel sampling procedure in general accordance with ASTM Specification D-1586. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 or 24 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval is termed the Standard Penetration Test (SPT) N-value and is indicated for each sample on the boring logs. This value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the standard penetration resistance value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies.

A field log of the soils encountered in the borings was maintained by the drill crew. After recovery, each sample was removed from the sampler and visually classified. Representative portions of each sample was in sealed in glass jars and brought to our laboratory for further visual examination and laboratory testing.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to verify field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications of all soil samples recovered during drilling and excavating operations, natural moisture content, Atterberg Limits and grain size analysis of selected soil samples. The data from the laboratory testing program has been included on the applicable boring logs and on separate sheets in the Appendix of this report.

An ECS engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. A brief explanation of the Unified System is included with this report. The engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual, rather than distinct.

The soil samples from our most recent exploration will be retained in our laboratory for a period of 60 days, after which they will be discarded unless other instructions are received as to their disposition.

EXPLORATION RESULTS

Site Conditions

The site is currently occupied by an existing nine story building with two centrally located paved courtyards. Several smaller 1-story to 4-story masonry buildings are located within each of these courtyards. The site is accessed from a ramp from E Street down to each of the courtyards, and therefore, the existing building has a partially buried basement. Finished floor elevations range from approximately EL 11.1 to 11.3. Ground surface elevation in the courtyards ranged from approximately EL. 11 to approximately EL. 12 across each of the courtyards.

Regional Geology

The natural soils at the site consist of river terrace deposits consisting of clay, silt, sand and gravel, underlain by residual materials formed from the in-place physical and chemical weathering of the underlying parent bedrock. This rock is believed to be part of the Wissahickon Formation and normally consists of schist, composed of mica, chlorite, quartz, and peltic, and having metagraywacke, gneiss, and quartz veins. The intactness of this type of rock varies dramatically depending upon the frequency, size and orientation of natural joints and fractures, and the presence of quartz viens.

Subsurface Conditions

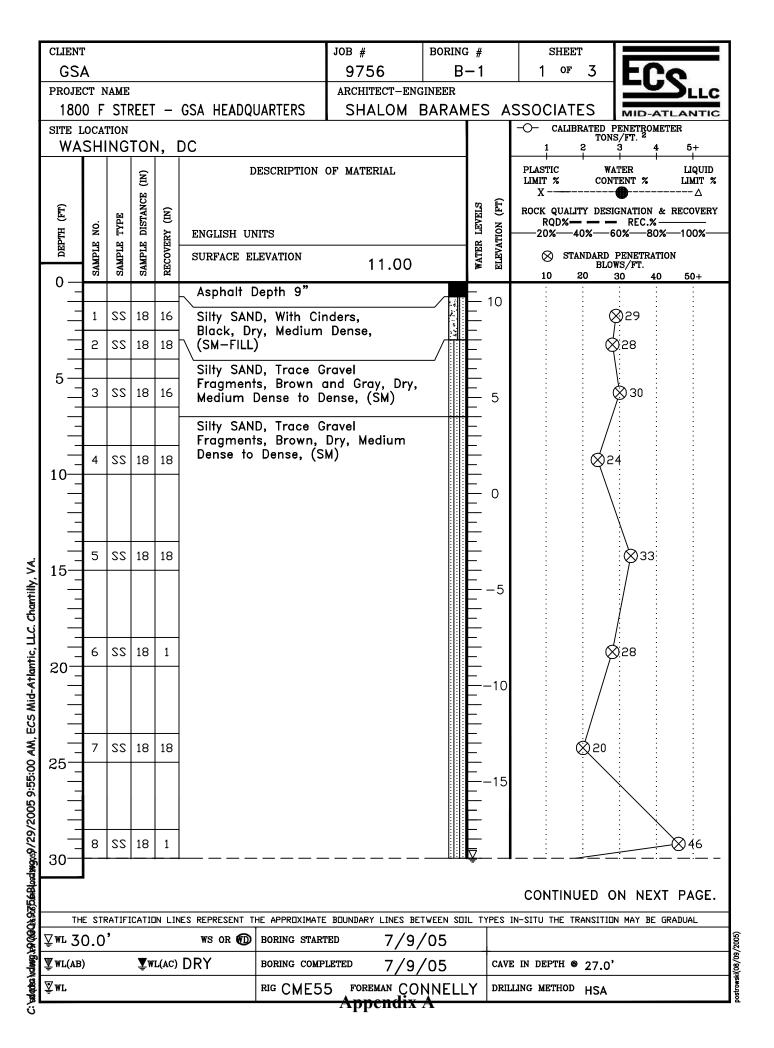
The natural residual materials encountered at the site are generally consistent with the regional geology and soils information available to us. Asphalt encountered at the site ranged from 4 inches to 9 inches in thickness. The asphalt was underlain by approximately 2 inches to 7 inches of gravel. Existing man-placed fill material was encountered within all of the borings conducted on-site to depths on the order of $2.5\pm$ feet to $6.0\pm$ feet below the existing ground surface. These existing fill materials generally consisted Silty SAND (SM) and poorly-graded SAND (SP) materials with gravel and cinders.

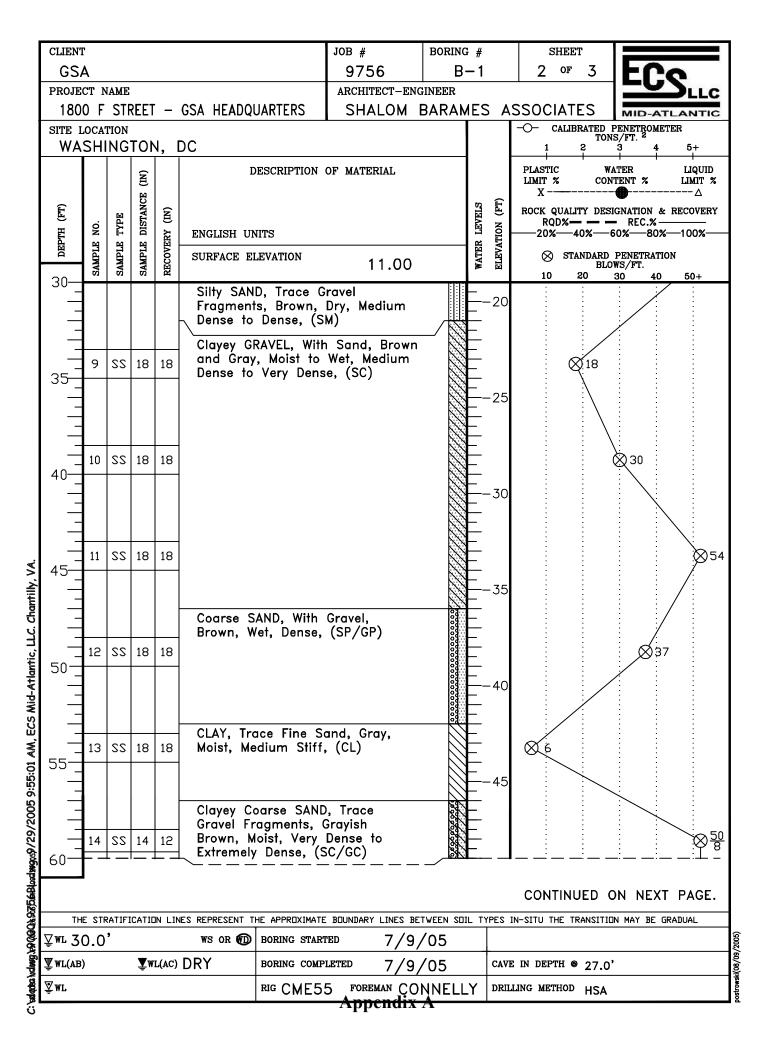
Beneath the asphalt, gravel, and man-placed fill material, terrace deposit soils underlain by residual soils and hard schist rock were encountered to boring termination depths. The borings were extended to depths on the order of 73.05 feet to 78.8 feet below the existing ground surface, as interpolated using the above-mentioned site plan. Auger refusal was encountered in Boring B-4 at a depth of 73.05 feet below the existing ground surface. The natural soils encountered generally consisted of CLAY (CL), Silty SAND (SM), Clayey SAND (SC), poorly-graded SAND (SP), poorly-graded SAND and GRAVEL (SP/GP) and Clayey SAND and GRAVEL (SC/GC). The residual soils were encountered at EL -55 feet to EL -60 feet and typically became more dense with depth. Standard Penetration Test (SPT) N-values in the natural soils ranged from 10 blows per foot (bpf) to more than 50 blows per one inch of sampler penetration, indicating medium dense to extremely dense relative densities for he natural granular materials encountered at the site. The N-values for the cohesive clay were recorded at 6 bpf indicating a consistency of medium stiff.

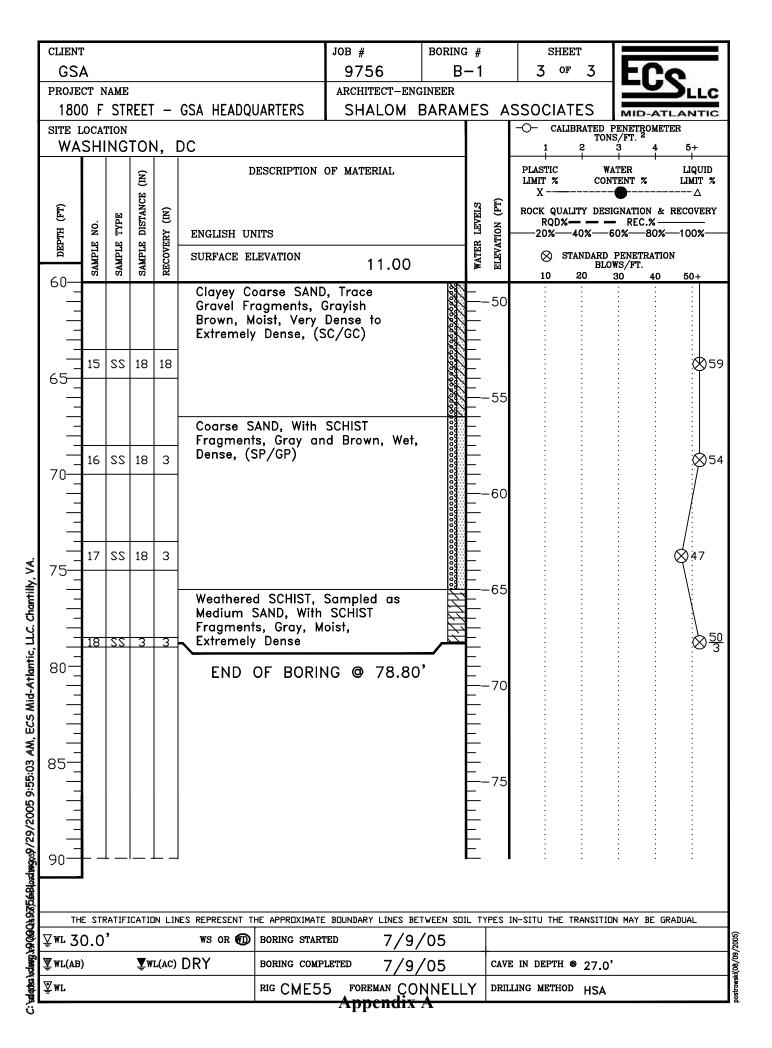
Groundwater Observations

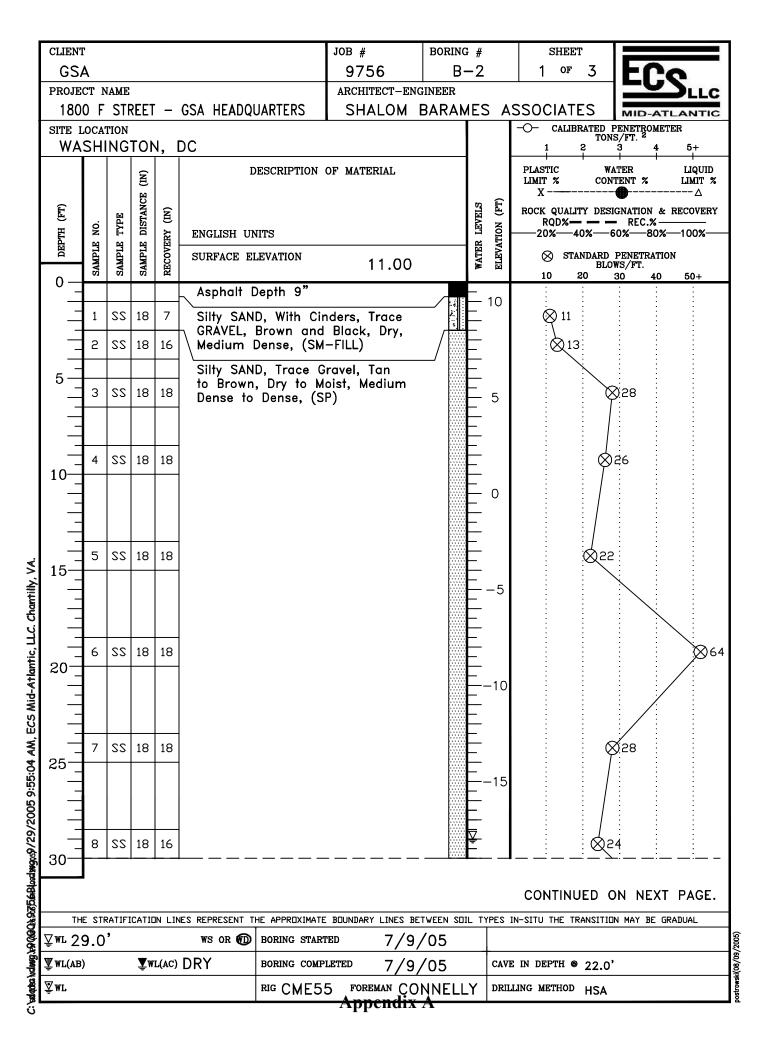
In auger drilling operations, water is not introduced into the boreholes, and the groundwater position can often be determined by observing water flowing into or out of the borings. Furthermore, visual observation of the soil samples retrieved during the auger drilling exploration can often be used in evaluating the groundwater conditions. Groundwater observations were made while drilling, after boring but before the augers were removed, and after the augers were removed prior to backfilling. Groundwater was encountered in all of the borings conducted on site. The groundwater levels recorded in the borings ranged from 28.5 feet to 33.5 feet below the existing ground surface, corresponding to elevations ranging from .

Considering the granular nature of the soils, the recorded groundwater levels are believed to be an accurate representation of the static groundwater table for the times shown. It should be noted that due to the borings being located in a parking area, the boreholes were backfilled after removal of the augers and groundwater readings after 24 hours from completion of the boring were not recorded. The cave-in depths can also be useful in estimating the elevation of the groundwater table and these readings correlate well with corresponding groundwater level measurements. The highest groundwater observations are normally encountered in late winter and early spring and our current groundwater observations are not expected to be at the seasonal maximum water table. Variations in the location of the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, and other factors not immediately apparent at the time of this exploration. Free water may also be encountered at the interface of existing man-placed fill materials, or at the interface between soil and weathered rock materials.



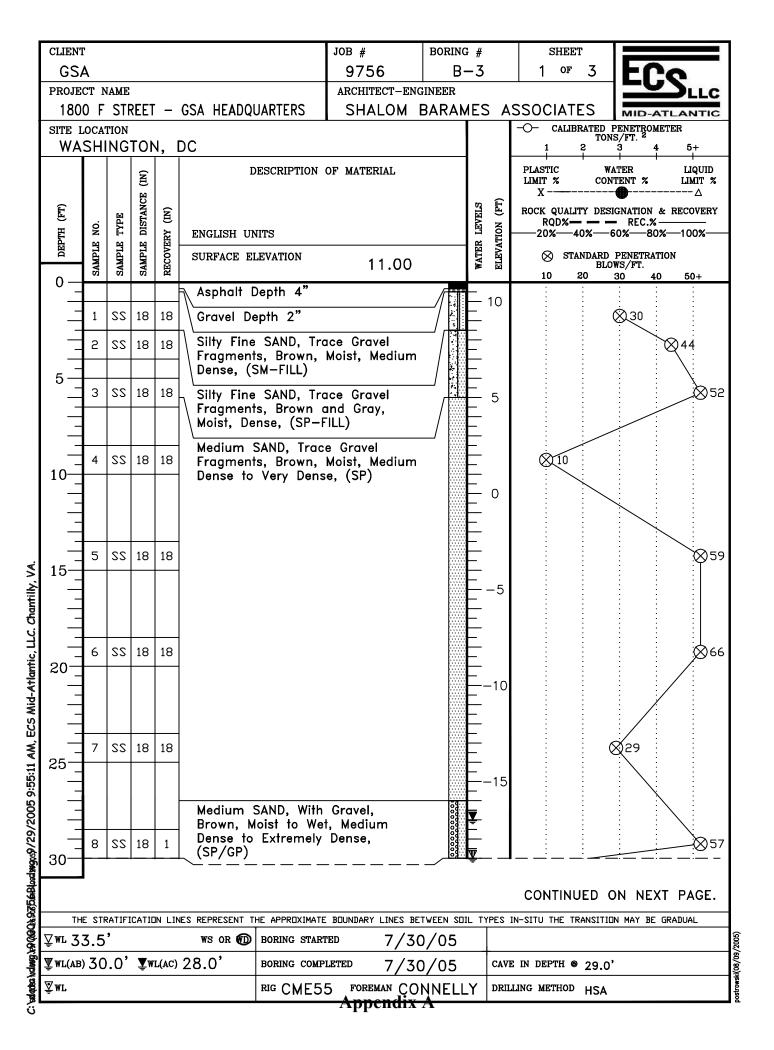






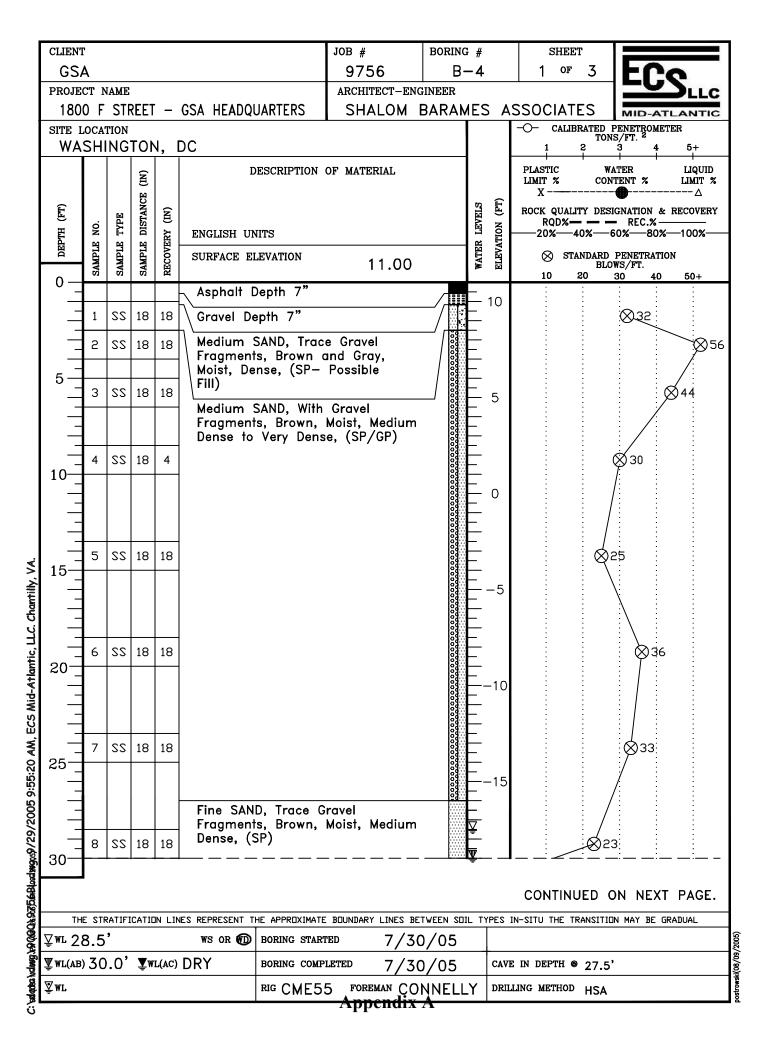
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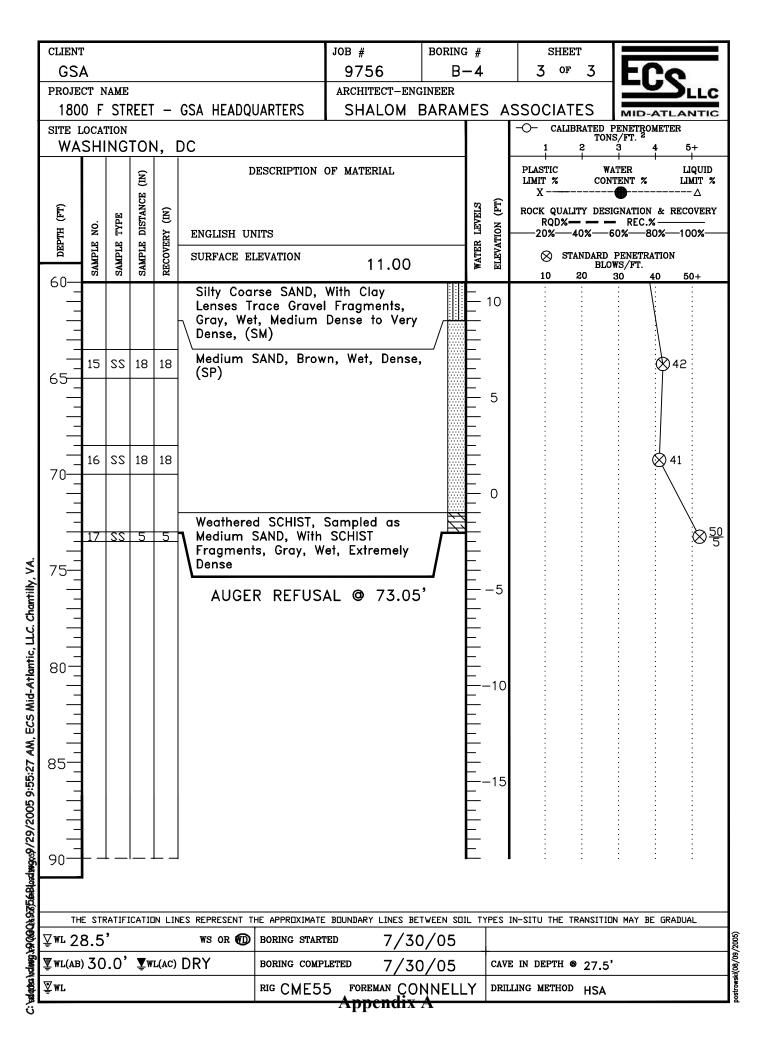


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deeg	<u>™</u> WL(AB	30	.0'	Ţw	L(AC)	28.0' BORING COM	PLETED	7/30	0/05	CA	VE IN DEPTH ® 29.0'	
dectes)	Ā́Mr					RIG CME5	55 FORE	MAN CO	NNELL	Y DR	ILLING METHOD HSA	
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dadta)	Ā́MT					RIG CMES	55 FORE	MAN CO	NNELL'	Y DRII	LLING METHOD HSA		
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	CLIENT JOB # BORING # SHEET											
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ОЕРТН (FT)		ET		ÆRY	ENGLISH UNITS				WATER LEVELS ELEVATION (FT	20%—40%—	60%80%	
Ö	SAMPLE	SAMPLE	SAMPLE	RECOVERY	SURFACE ELEVAT	ION	11.0	0	WATI		PENETRATIONS/FT.	NC
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APPENDIX H

FOUNDATION TAKEOFFS AND CALCULATIONS

```
Given: P = 285k (from Thornton-Tomassetti Calculations)
       Allowable Soil Bearing Capacity: q<sub>a</sub> = 5000 psf (from Thornton-Tomassetti Calculations)
      Local Frost Depth: 30 inches (from Washington, D.C. Construction Codes)
                  140 k
Assume: P<sub>D</sub> =
       P<sub>L</sub> =
                  145 k
       f'c =
                 3000 psi
       36" x 36" square concrete pier
      Design and detail the footing for this condition
Find:
Solution: P
          = P_D + P_L
           =
               140 k +
                                145 k
           =
                  285 k
          ≥ P / A
          5 ksf ≥ 285 k
      B ≥
               7.55
      Use B
                        8 ft
                1.2 P<sub>D</sub> +
          =
                              1.6 P<sub>L</sub>
                  1.2 140 k + 1.6 145 k
           =
                  400 k
                P<sub>u</sub> / A
                  400 k
                  6.25 ksf
                  43.4 psi
          = ф *
       V_c
                                    sqrt f'c
                             4 *
                  0.75 *
                                   sqrt 3000 psi
                 164.3 psi
       This equation for the 2-way shear stress controls by inspection
       d^2 ( V_c + q /
                                    164.3 + 43.4 /
                                                                                                                                                          26)
       175.2 d^2 + 6697 d =
                                    85938
                                     10.1 in
                         d =
      h =
                d +
                        3 in + d_b
                 10.1 in + 3 in +
                                              0.625 in
                13.725 in
      Use h
                        16 in
                   16 in -
                                 3 in -
                                              0.625 in = 12.375 in
                        8 ft -
                                       2 ft ) /
                                                        2 = 3 ft
       M_u
                                       2
                 6.25 *
                             3 *
                                       3 /
                                                2
                 28.13 ft-k
                               fy ) / 0.85 * f'c * b
                               60 ksi ) / 0.85 * 3 ksi *
                                                                        12 in
```

1.961 A_s

60 ksi (d - a / 2)

 $M_u = \Phi M_n$

8' x 8' x 1.33' Spread Footing with (16) #5 each way

OK!

```
Given: P = 225k (from Thornton-Tomassetti Calculations)
Allowable Soil Bearing Capacity: q<sub>a</sub> = 5000 psf (from Thornton-Tomassetti Calculations)
Local Frost Depth: 30 inches (from Washington, D.C. Construction Codes)
```

Assume: P_D = 110 k P_L = 115 k f'c = 3000 psi $36" \times 36" \text{ square concrete pier}$

Find: Design and detail the footing for this condition

This equation for the 2-way shear stress controls by inspection

26)

7' x 7' x 1' Spread Footing with (14) #5 each way

			Con	crete				Reinfo	orcement	
Location		Size		Cubic	Cubic	Formwork	Bottom	Ton Done	Weight	Total Weight
Location	W (ft)	L (ft)	H (ft)	Feet	Yards	(SFCA)	Bars	Top Bars	(lbs)	(tons)
D-4.3	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
D-5	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
D-7	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
D-9	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
D-11	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
D-11.7	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
F-4.3	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
F-5	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	233.63	0.12
F-7	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
F-9	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
F-11	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
F-11.7	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
H-4.3	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
H-5	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
H-7	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
H-9	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
H-11	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
H-11.7	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
J-4.3	8.0	8.0	1.3	85.33	3.16	42.67	16 - #5	16 - #5	311.51	0.16
J-5	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
J-7	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
J-9	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
J-10	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
J-11	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
J-11.7	7.0	7.0	1.0	49.00	1.81	28.00	14 - #5	14 - #5	233.63	0.12
TOTAL					61.52	876.00				3.35
TOTAL + WASTI	FACTOR				64.59	919.80				3.52

Original System (Caissons + Grade Beams)

Caissons

1) Brayman Original Contract: \$1.56M

Grade Beams

1) Perrin Enterprises Original Contract: \$195,000

Tota

1) Total Foundation System Cost: \$1,755,000

Alternate System (Spread Footings)

	Detaile	d Foundatio	on System E	stimate									1	
Line Number	ltem	Unit	Crew	Daily Output	Labor Hours	Bare Material	Bare Labor	Bare Equipment	Bare Total	Total Incl O&P	Quantity	Project Total	Pro	oject Total Incl O&P
		Division 03	- Concrete											
03 11 13.05 1000	C.I.P. concrete forms, aluminum, average cost, buy, includes accessories, exludes ties	SFCA	C2	315.00	0.152	23.90	5.33		29.23	34.50	919.80	\$ 26,885.75	\$	31,731.44
03 30 53.40 0740	Cast-In-Place Concrete, Columns, square (4000 psi), 12" x 12", Over 3% reinforcing	CY	C14A	9.03	22.148	1055.22	894.00	86.98	2036.20	2641.11	64.59	\$ 131,527.21	\$	170,601.03
TOTAL												\$ 158,412.96	\$	202,332.48
		Division 31	- Earthworl											
31 23 16.13 0050	Excavation common earth with no sheeting or dewatering included, 1' to 4' deep, 1/2 CY Excavator	BCY	B11M	200.00	0.080		3.10	2.07	5.17	7.00	217.90	\$ 1,126.54	\$	1,525.30
TOTAL												\$ 1,126.54	\$	1,525.30
DETAILED STRUCTUR	AL SYSTEM ESTIMATE TOTAL											¢ 150 520 50	ć	202 957 79

DETAILED STRUCTURAL SYSTEM ESTIMATE TOTAL

Notes

All items were chosen to closest possible match

Used labor totals from Line Number 03 11 13.20 1150 for Line Number 03 11 13.05 1000

Frost Depth = 30"

Excavation per interior spread footing = approximately 10.25 CY

Excavation per exterior spread footing = approximately 7.3 CY

	Foundation System Cost Comparison								
System		Caissons		Grade Beams	s	pread Footings		TOTAL	
Original	\$	1,560,000.00	\$	195,000.00	\$	-	\$	1,755,000.00	
Alternate	\$	-	\$	-	\$	203,857.78	\$	203,857.78	
SAVINGS							\$	1,551,142.22	

Original System (Caissons + Grade Beams)

Caissons

- 1) Work was delayed since Whiting-Turner/Walsh couldn't obtain the Erosion and Sediment Control (E & S) Permit a) The Owner (GSA) never applied for a building permit
- 2) No schedule impacts due to good weather
- 3) Duration for mobilizing caisson rig is 2 days
- 4) Duration for caissons is **25 days**

Grade Beams

1) Duration for grade beams and foundation walls is 20 days

Alternate System (Spread Footings)

Activity	Units	Daily Output	Quantity	TOTAL DAYS
Excavation	BCY	200.00	217.90	2
Concrete Forms	SFCA	315.00	919.80	3
Cast-In-Place Spread Footing with Reinforcing	CY	10.25	64.59	7
TOTAL				12

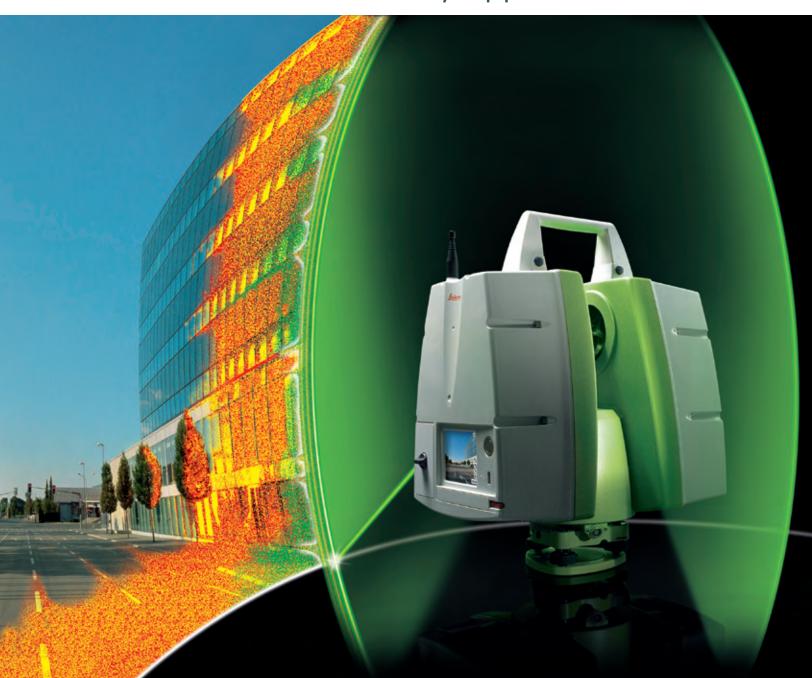
	Foundation System Schedule Comparison								
System	Caissons	Grade Beams	Spread Footings	TOTAL					
Original	27	20	0	47					
Alternate	0	0	12	12					
DIFFERENCE	DIFFERENCE 35								

APPENDIX I

LEICA SCANSTATION C10 BROCHURE AND DATASHEET

Leica ScanStation C10

The All-in-One Laser Scanner for Any Application





Leica ScanStation C10 Versatility, Productivity, Value

Many organizations interested in laser scanning – to diversify and/or improve current business – have been waiting for a scanner with greater versatility, a lower cost of ownership, and even higher productivity for as-built and topographic surveys. Your wait is over.

The "All-in-One" ScanStation C10 delivers a faster payback for your investment in High-Definition Surveying™ (HDS™) at many levels:

- All critical components in one, portable survey instrument: full field-of-view, high-speed, high-accuracy, long range scanner; rich, graphic controller; powerful camera/video; data storage; hot-swap battery; tilt compensator, and more.
- All-in-One versatility in applications and sites where scanning is profitable.
- One-stop-shopping via the industry's leading vendor: the most comprehensive scanning software, scanner selection, and customer support.

Next Generation of the Most Popular Laser Scanner

No one has packed more laser scanning capability and value into a single unit.



Unprecedented Versatility

- Compact, full dome, accurate, excellent range take advantage of scanning on more sites for more applications
- Use targets, traverse, resection or free-station registration and "geo-referencing" methods as site logistics dictate
- Even faster scanning makes HDS cost effective for more projects: exteriors and interiors, short and long range
- Onboard or PC control
- GPS and prism options



Major Productivity Advances

- Up to 10x faster full dome scans: now, just minutes
- Several times faster area scans
- Move, setup and tear-down faster
- Locate targets easier and faster
- Register and geo-reference faster
- Check scan results in the field easier
- Up to 90% field labor savings vs traditional methods



Valuable Cost Savings

- Reduced ownership cost
- Platform designed for incremental upgradeability
- Easy-to-learn, total station-like interface
- Cable-less, with reduced accessory and maintenance costs
- Reduced site re-visits





Leica ScanStation C10

All-in-One





Leica ScanStation C10 One Scanner for Any Application

Reap all of the benefits of High-Definition Surveying™ (HDS™) for more as-built, topographic and mapping surveys.

Benefits

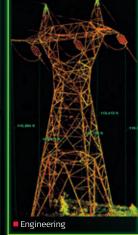
- Lower cost
- Faster
- More accurate & complete
- Safer
- Less intrusive
- More informative

Applications

- Design & engineering
- Construction & fabrication QA
- Asset management & archive
- Forensics & security planning
- Marketing proposals
- Research & education





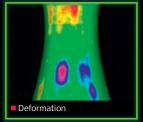




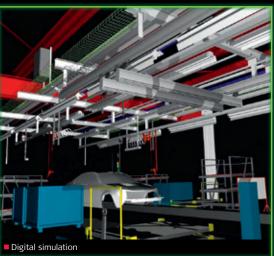








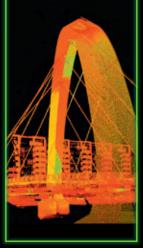








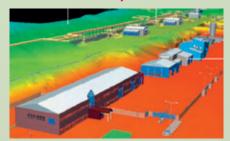




Leica Geosystems The All-in-One Vendor

Organizations that enter into laser scanning need more than just hardware. You also need software, training and support, and at some point you may even want more than one type of laser scanner. For meeting your complete needs in High-Definition Surveying, no organization measures up to Leica Geosystems – the acknowledged industry leader.

Software: Comprehensive, Powerful, Versatile



Leica Cyclone & Cyclone II

This comprehensive, industry-standard suite includes powerful, stand alone modules for scanning, registration & geo-referencing, viewing, modeling & data management, and creating a wide range of deliverables & QA reports.



Leica CloudWorx

This popular suite of affordable CAD plug-ins makes it easy to learn and work efficiently with rich scan data directly in leading CAD applications for civil/survey, architectural, and plant projects.



More Software

Leica Geosystems also offers specialized scanning software solutions to meet the full range of user needs. These include free, web-based view/measure/markup software (Leica TruView); forensic mapping; mining; and efficient 3D meshing.

Worldclass Training and Support

From on-site and factory-based classroom and field training to a global network of experienced HDS support specialists, no organization can help you succeed in High-Definition Surveying better than Leica Geosystems.

Moreover, Leica Geosystems actively cultivates a HDS user community network that supports itself – through idea exchange, training, backup hardware and backup staff.

The user network includes a worldwide HDS user group conference and many local HDS user group meetings, where Leica Geosystems staff and experienced users share their latest insights.

Active Customer Care

Working with the best maintained equipment and most up-to-date firmware and software ensures the best results for your business. That's what Leica Geosystems Customer Care

Packages (CCP) offer. They protect your initial investment and keep your tools up-to-date for additional gains.



Whether you're designing a modification to a complex refinery piping system, surveying a site or documenting a historic building, you need reliable measurements. High-Definition Surveying scanning systems and software by Leica Geosystems provide you with exact data of what's there. When your as-built information has to be right, rely on Leica Geosystems.

Leica Geosystems is best known for its pioneering scanning technology and trustworthy, total solutions: versatile, accurate laser scanners, industry standard point cloud software, and a full complement of accessories, training and support.

Precision, quality and service from Leica Geosystems.

When it has to be right.

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Total Quality Management – our commitment to total customer satisfaction.

Ask your local Leica Geosystems dealer for more information about our TQM program.

Laser plummet:

Laser class 2 in accordance with IEC 60825-1 resp. EN 60825-1

Scanner:

Laser class 3R in accordance with IEC 60825-1 resp. EN 60825-1







Leica ScanStation C5 Product information and specifications



HDS7000Product information and specifications



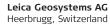
HDS8800Product information and specifications



Leica Cyclone REGISTER Product information



Leica Cyclone MODEL Product information



www.leica-geosystems.com/hds

Leica ScanStation C10

The All-in-One Laser Scanner for Any Application



New platform represents the most capabilities and best value packed into a single instrument

Leica ScanStation C10: new standard for pulsed scanners

The industry's most popular class of laser scanner – ScanStation – is now in a compact, all-in-one ScanStation C10 platform: scanner, battery, controller, data storage, and video camera. In addition, ScanStation C10 also features major advances in productivity, versatility, and ease-of-use for as-built and topographic High-Definition SurveyingTM (HDSTM).

All-in-one scanner capabilities for higher value

ScanStation C10 gives users the advantage of high-accuracy, long range scanning plus the advantage of fast, full-dome interior scanning – all in one instrument. The key is the new Smart X-Mirror™ design that automatically spins or oscillates

the mirror for optimum productivity. Smart X-Mirror also automatically aligns the embedded, high-resolution video camera with the laser for fast targeting and fast, accurate texture mapping of scans.

Full field-of-view + traverse + high accuracy + excellent range = Versatility

ScanStation C10 includes the hallmark versatility features that have made the ScanStation class so popular. These capabilities let users take advantage of scanning for more applications and more sites, while minimizing field labor.

Easy to learn

ScanStation C10 includes surveyor-friendly, total station-like onboard graphic control, including the ability to view target scans in 3D. Users can also take advantage of laptop control for more comprehensive scan viewing.



Leica ScanStation C10

Product Specifications

General	
Instrument type	Compact, pulsed, dual-axis compensated, very high speed laser scanner, with survey-grade accuracy, range, and field-of-view; integrated camera and laser plummet
User interface	Onboard control, notebook, tablet PC or remote controller
Data storage	Integrated solid-state drive (SSD), external PC or external USB device
Camera	Auto-adjusting, integrated high-resolution digital camera with zoom video

System Performance	
Accuracy of single measurement	
Position*	6 mm
Distance*	4 mm
Angle (horizontal/vertical)	60 µrad / 60 µrad (12" / 12")
Modeled surface	2 mm
precision**/noise	
Target acquisition***	2 mm std. deviation
Dual-axis compensator	Selectable on/off, resolution 1", dynamic range +/- 5',
	accuracy 1.5"

Laser Scanning System	
Type	Pulsed; proprietary microchip
Color	Green, wavelength = 532 nm visible
Laser Class	3R (IEC 60825-1)
Range	300 m @ 90%; 134 m @ 18% albedo (minimum range 0.1 m)
Scan rate	Up to 50,000 points/sec, maximum instantaneous rate
Scan resolution	
Spot size	From 0 – 50 m: 4.5 mm (FWHH-based);
	7 mm (Gaussian-based)
Point spacing	Fully selectable horizontal and vertical; < 1 mm minimum
	spacing, through full range; single point dwell capacity
Field-of-View	
Horizontal	360° (maximum)
Vertical	270° (maximum)
Aiming/Sighting	Parallax-free, integrated zoom video
Scanning Optics	Vertically rotating mirror on horizontally rotating base;
	Smart X-Mirror™ automatically spins or oscillates for
	minimum scan time
Data storage capacity	80 GB onboard solid-state drive (SSD) or external USB
Communications	device
Communications	Dynamic Internet Protocol (IP) Address, Ethernet or wireless LAN (WLAN) with external adapter
Integrated color digital	Single 17° x 17° image: 1920 x 1920 pixels (4 megapixels)
camera with zoom video	Full 360° x 270° dome: 260 images; streaming video with
Camera With 200m video	zoom; auto-adjusts to ambient lighting
Onboard display	Touchscreen control with stylus, full color graphic
Olibbard display	display, QVGA (320 x 240 pixels)
Level indicator	External bubble, electronic bubble in onboard control and
zever mareato.	Cyclone software
Data transfer	Ethernet, WLAN or USB 2.0 device
Laser plummet	Laser class: 2 (IEC 60825-1)
	Centering accuracy: 1.5 mm @ 1.5 m
	Laser dot diameter: 2.5 mm @ 1.5 m
	Selectable ON/OFF

Electrical	
Power supply	15 V DC, 90 - 260 V AC
Power Consumption	< 50 W avg.
Battery Type	Internal: Li-lon; External: Li-lon
Power Ports	Internal: 2, External: 1 (simultaneous use, hot swappable)
Duration	Internal: >3.5 h (2 batteries), External: >6 h (room temp)

Environmental	
Operating temp.	0° C to 40° C / 32° F to 104° F
Storage temp.	-25° C to +65° C / -13° F to 149° F
Lighting	Fully operational between bright sunlight and complete darkness
Humidity	Non-condensing
Dust/humidity	IP54 (IEC 60529)

Physical	
Scanner Dimensions (D x W x H) Weight	238 mm x 358 mm x 395 mm / 9.4" x 14.1" x 15.6" 13 kg / 28.7 lbs, nominal (w/o batteries)
Battery (internal) Dimensions (D x W x H) Weight	40 mm x 72 mm x 77 mm / 1.6" x 2.8" x 3.0" 0.4 kg / 0.9 lbs
Battery (external) Dimensions (D x W x H) Weight	95 mm x 248 mm x 60 mm / 3.7" x 9.8" x 2.4" 1.9 kg / 4.2 lbs
AC Power Supply Dimensions (D x W x H) Weight	85 mm x 170 mm x 41 mm / 3.4" x 6.7" x 1.6"

Standard Accessories Included

Scanner transport case

Tribrach (Leica Professional Series)

4x Internal batteries

Battery charger/AC power cable, Car adapter, Daisy chain cable

Height meter and distance holder for height meter

Cleaning kit Cyclone™ SCAN software

1year CCP Basic support agreement

Additional Accessories

HDS scan targets and target accessories Service agreement for Leica ScanStation C10 Extended warranty for Leica ScanStation C10

External battery with charging station, AC power supply and power cable

Professional charger for internal batteries

AC power supply for scanner

Tripod, tripod star, rolling base, external wireless LAN adapter (third-party)

Notebook PC for scanning with Cyclone software Δ	
Component	required (minimum)
Processor	1.7 GHz Pentium M or higher
RAM	1 GB (2 GB for Windows Vista)
Network card	Ethernet
Display	SVGA or OpenGL accelerated graphics card (with latest drivers)
Operating system	Windows XP Professional (SP2 or higher) (32 or 64)
	Windows Vista (32 or 64), Windows 7 (32 or 64)

Control Options

Full color touch screen for onboard scan control

Leica Cyclone SCAN software for laptop PC (see Leica Cyclone SCAN data sheet for full list of features)

Remote controller (Leica CS10/15 or any other remote desktop capable device)

Ordering Information
Contact Leica Geosystems or authorized representatives

All specifications are subject to change without notice.

All ± accuracy specifications are one sigma unless otherwise noted.

* At 1 m - 50 m range, one sigma
** Subject to modeling methodology for modeled surface

*** Algorithmic fit to planar HDS targets

 Δ Minimum requirements for modeling operations are different. Refer to Cyclone data sheet specifications

Scanner: Laser class 3R in accordance with IEC 60825-1 resp. EN 60825-1 Laser plummet: Laser class 2 in accordance with IEC 60825-1 resp. EN 60825-1

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APPENDIX J

DATA COLLECTION TOOL

INTERVIEW QUESTIONS

1)	What are the benefits of using energy management software during the operational phase of a building?
2)	What are the initial costs of implementing energy management software and what is the typical payback period?
3)	What are the difficulties of monitoring a web-based energy reporting tool?
4)	What is the importance of balancing energy efficiency and occupant comfort?
5)	How can you integrate methods that allow occupants to physically see the impact of their behavior (e.g. leaving a window open when the heating system is operating)?