

Katie Sennett  
Adviser: Dr. Messner  
Apr 9, 2008



The Kennedy Krieger Institute  
Outpatient Medical Center  
Baltimore, Maryland

# Appendix A

## General Condition Estimate



Description	Unit	Price	Amount
Personnel	MO	\$69,339	\$1,802,824
Site Trailer	MO	\$330.00	\$8,580
Field Trailer	MO	\$110.00	\$2,860
Building Demolition	MO	\$480.77	\$12,500
Overhead Protection	MO	\$1,421.38	\$36,956
Shoring & Underpinning	MO	\$23,967.31	\$623,150
Site Development	MO	\$56,097.31	\$1,458,530
Temporary Electric	MO	\$1,539.00	\$40,000
Electric Usage	MO	\$6,923.00	\$180,000
Temporary Water	MO	\$385.00	\$10,000
Utilities	MO	\$14,769.23	\$384,000
Foundation Drain - Site	MO	\$454.04	\$11,805
Parking Equipment	MO	\$384.62	\$10,000
Landscaping - Base	MO	\$3,716.35	\$96,625
Landscaping - Garden	MO	\$0.00	\$0
Construction Fence	MO	\$214.62	\$5,580
Construction Fence	MO	\$1,153.85	\$30,000
Pest Control	MO	\$196.96	\$5,121
Dumpster	MO	\$3,699.23	\$96,180
Demobilize Trailers	MO	\$1,153.85	\$30,000
Layouts and Grades	MO	\$1,230.77	\$32,000
Site Maintenance	MO	\$1,538.46	\$40,000
Site Maintenance	MO	\$293.46	\$7,630
Trash Chutes	MO	\$484.62	\$12,600
Hoisting/Access	MO	\$2,076.92	\$54,000
Misc. Supplies	YR	\$10,000	\$21,600
		<b>Total</b>	<b>\$5,012,541</b>

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# Appendix B

## Detailed Project Schedule









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# Appendix C

## Site Layout





Kennedy Krieger Institute

STANLEY BEAMAN & SEARS

ARCHITECTURE AND INTERIOR

III

120 Madison Street, NW  
Atlanta, GA 30309  
404-524-2222  
fax 404-524-9110

RK+K  
Civil Engineering

Mahan Rykiel Associates Inc.  
Landscape Consultant

RMF Engineering, Inc.  
Structural Engineer  
Mechanical, Electrical, Plumbing &  
Fire Protection Engineers

Pool Consultant  
Counselman Hunsaker & Associates

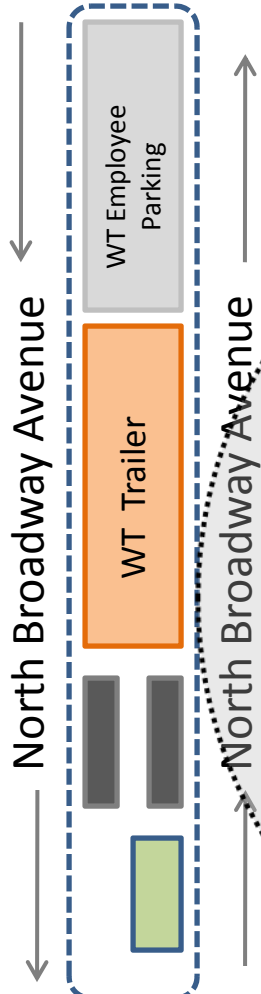
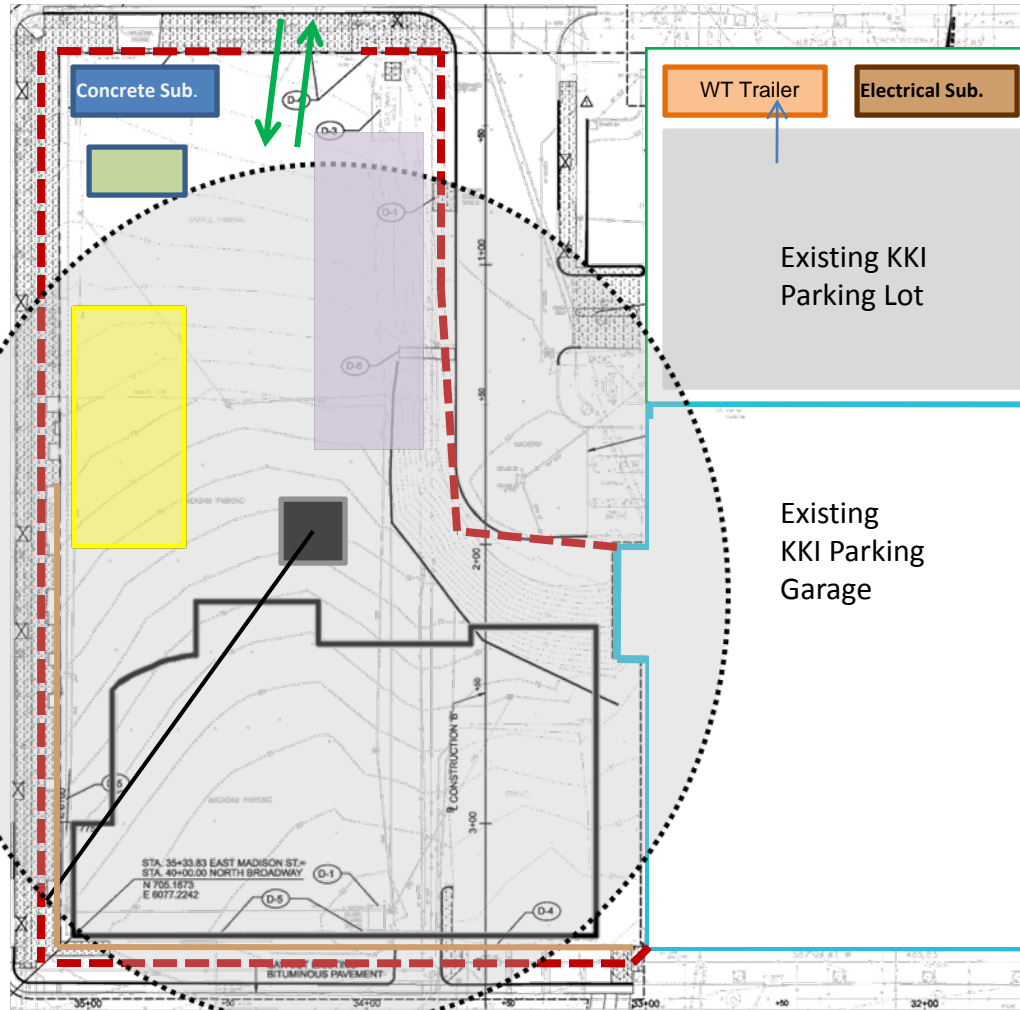
Phase:  
Superstructure







4C1

Ashland Avenue



East Madison Avenue



-  Formwork Lay down/Storage
-  Site Fence
-  Dumpsters
-  Reinforcing Lay down/Storage
-  Support for Excavation
-  Storage Units

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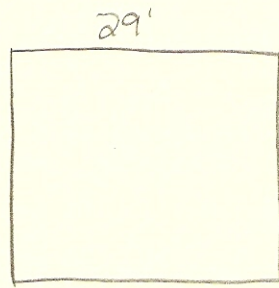


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# Appendix D

## Structural “Breadth” Analysis

# STRUCTURAL STEEL CALCULATIONS



TYPICAL BAY SIZE = 29' x 29'

METAL DECK = 1/2"

CONCRETE = 5" @ 150 PCF

$$\text{CONCRETE: } 150 \text{ PCF} \times \frac{5''}{12''} = 62.5 \text{ psf}$$

SUPERIMPOSED DEAD LOAD = 10 psf

DECK LOAD = 2 psf

TOTAL DEAD LOAD

62.5 psf

+ 10.0 psf

+ 2.0 psf

74.5 psf

LIVE LOADS:

SNOW LOAD = 30 psf

ROOF LIVE LOAD = 20 psf

FLOORS 2 & UP = 80 psf ← (FOR CORRIDORS: MOST CONSERVATIVE)

1<sup>st</sup> FLOOR = 100 psf ← (FOR LOBBY AREAS)

$$\text{MAX DEAD LOAD: } 74.5 + 100 = 174.5 \text{ psf}$$

FOR METAL DECKING: 18 GAGE INTERMEDIATE RIB DECK  
SPACING = 3 BEAM (SPANS) FOR DECK

## BEAMS

TRIBUTARY WIDTH = 4'10"

LOAD ON BEAM:

$$4'10'' \times (1.2 \times 74.5 + 1.6 \times 80) = 1.05 \text{ K/ft}$$

MOMENT ON BEAM (PINNED CONNECTION)

$$M = \frac{WL^2}{8} = \frac{1.05 \text{ K/ft} (29\text{ft})^2}{8} = 110 \text{ K-ft}$$

MOMENT ON BEAM (FIXED CONNECTION)

$$M = \frac{WL^2}{12} = \frac{1.05 \text{ K/ft} (29\text{ft})^2}{8} = 74 \text{ K-ft}$$

# BEAMS

LIVE LOAD DEFLECTIONS:

$$L/360 = \Delta_{LL} = \frac{5WL^4}{384EI} (1728)$$

$$\frac{(12'')(29')}{(1')(360)} = \frac{5[(80 \times 4'10'') \div 1000](29')^4 (1728)}{(384)29000 \cdot I}$$

$$I = 220 \text{ in}^4$$

$$L/240 = \Delta_{LT} = \frac{5WL^4}{384EI} (1728)$$

$$\frac{(12'')(29')}{(1')(240)} = \frac{5[(154.5 \times 4'6'') \div 1000](29')^4 (1728)}{(384)29000 \cdot I}$$

$$I = 282 \text{ in}^4$$

BEAM SIZE: 10 x 20 I = 301  $\phi M_n = 166$   
• ASSUMING BEAM IS FULLY BRACED.

# GIRDERS

$$\text{TRIBUTARY WIDTH} = 14.5' + 10.5' = 25'$$

LOAD ON GIRDER:

$$25' \times (1.2 \times 74.5 + 1.6 \times 80) = 5.44 \text{ k/ft}$$

MOMENT ON GIRDER (PINNED CONNECTION)

$$M = \frac{WL^2}{8} = \frac{5.44 \text{ k/ft} (29')^2}{8} = 572 \text{ kft}$$

MOMENT ON GIRDER (FIXED CONNECTION)

$$M = \frac{WL^2}{12} = \frac{5.44 \text{ k/ft} (29')^2}{12} = 283 \text{ kft}$$



# GIRDERS

LIVE LOAD DEFLECTIONS:

$$L/360 = \Delta_{LL} = \frac{5WL^4(1728)}{384EI}$$

$$\frac{(12'')(29')}{(1')(360)} = \frac{5(2)(29')^4(1728)}{(384)(29000)I} \Rightarrow I = 1135 \text{ in}^4$$

$$L/240 = \Delta_{LT} = \frac{5WL^4(1728)}{384EI}$$

$$\frac{(12'')(29')}{(1')(240)} = \frac{5(3.86)(29')^4(1728)}{384(29000)I} \Rightarrow I = 1461 \text{ in}^4$$

GIRDER SIZE: 21 x 68  $I = 1480$   $\phi M_n = 600$

# COLUMNS

$$\text{TRIBUTARY AREA } (A_T) = 29' \times 25' = 725 \text{ SF}$$

$$\text{INFLUENCE AREA } (A_i) = 29'(2) \times (50) = 2900 \text{ SF}$$

$$L = 80 \left( 0.25 + \frac{15}{12A_i} \right) \Rightarrow L_{6th} = 0.45(80)$$

$$L_{5th} = 0.41(80)$$

$$L_{4th} = 0.40(80)$$

$$L_{3rd} = 0.40(80)$$

$$L_{2nd} = 0.40(80)$$

$$L_{1st} = 0.40(80)$$

LIVE LOAD (1st):

$$L = 0.4(80)(5 \text{ floors})(725) + 150 \text{ psf}(725) + 30 \text{ psf}(725)$$

$$L = 246,500 \# = 246.5^k$$

DEAD LOAD:

$$74.5(725 \text{ SF})(7 \text{ floors}) = 378,088 \# = 378.1^k$$

TOTAL LOAD:

$$1.2(D) + 1.6(L) = 1.2(378.1) + 1.6(246.5) = 848.12^k$$

1st FLOOR 18' HIGH: COLUMN SIZE: 14 x 90  $\phi P_n = 928$

\*ASSUME FLOOR SLABS ARE CONSISTANT FOR ALL FLOORS.

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# Appendix E

## Cost Calculations

	# of bays	# columns	#of Griders	# of beams	Total Pieces/fl
1st Floor	14	24	18	89	131
2nd Floor	22	35	27	157	241
3rd Floor	20		24	126	170
4th Floor	24	35	28	150	237
5th Floor	22		21	138	181
6th Floor	22	30	21	138	189
<b>Total</b>	124	124	139	798	1149
					42.6

20 to 30 pieces per day

original 86 days for concrete

new 43 days for steel

schedule ahead = 43days ~ 2months

Sizes		Unit Cost	# of	Length	Total Cost
Beam	16x26	35.41	798	29	819458.22
Grider	21x68	118.09	139	25	410362.75
Column	14x90	114.29	124	30	425158.8
					1654979.77
Metal Decking	116,100 sf	\$2.11/sf			244,971
				<b>Total Steel \$</b>	<b>1,899,951</b>

Shear Walls :Concrete		
East wall	99,792	Between column 1a.1 and 2a.1
Mat Foundation	32,000	24" deep
Elevator Shaft	256,500	3 sides of the shaft with 30' section of wall @ column A between 1 & 2
<b>Total</b>	<b>388,292</b>	

Concrete flooring	406,350	Assume 5" Thick with WWM
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Tower Crane = 34,700 /month	
For two months=	69400

Fire Proofing (spray)			
Beams and Columns	110,000sf	\$1.25/sf	137,500
Floor Decks	110,000sf	\$2.00/sf	0 B/c concrete to provide enough protection
Roof	16,990sf	\$2.10/sf	35,679
	Total Fire proofing		173,179

**Project Re-design Cost:**

\$1,899,951
\$388,292
\$406,350
\$69,400
\$173,179

**Total**                    **\$2,937,172**  
**Total + Mech**           **\$2,937,172**



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# Appendix F

## Mechanical “Breadth” Analysis

# System Checksums

By PSUAE

**EXISTING (1-3)**

System - 001

Variable Volume Reheat (30% Min Flow Default)

COOLING COIL PEAK					CLG SPACE PEAK					HEATING COIL PEAK					TEMPERATURES		
Peaked at Time:		Mo/Hr: 7 / 15			Mo/Hr: 7 / 16		Mo/Hr: 13 / 1										
Outside Air:		OADB/WB/HR: 91 / 77 / 118			OADB: 91		OADB: 5										
Envelope Loads	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)	Envelope Loads	Space Sensible Btu/h	Percent Of Total (%)	Envelope Loads	Space Sens Btu/h	Coil Peak Tot Btu/h	Percent Of Total (%)	SADB	Cooling	Heating			
Skylite Solar	0	0	0	0.00	0	0.00	0.00	Skylite Solar	0	0	0.00	Plenum	52.9	106.7			
Skylite Cond	0	0	0	0.00	0	0.00	0.00	Skylite Cond	0	0	0.00	Return	70.8	66.5			
Roof Cond	0	0	0	0.00	0	0.00	0.00	Roof Cond	0	0	0.00	Ret/OA	70.8	66.5			
Glass Solar	897,453	0	897,453	30.30	950,942	46.18	46.18	Glass Solar	0	0	0.00	Fn MtrTD	71.9	55.9			
Glass Cond	281,413	0	281,413	9.50	274,713	13.34	13.34	Glass Cond	-870,661	-870,661	38.35	Fn BldTD	0.1	0.0			
Wall Cond	65,897	21,696	87,592	2.96	63,740	3.10	3.10	Wall Cond	-86,648	-115,446	5.08	Fn Frict	0.2	0.0			
Partition	0	0	0	0.00	0	0.00	0.00	Partition	0	0	0.00						
Exposed Floor	0	0	0	0.00	0	0.00	0.00	Exposed Floor	0	0	0.00						
Infiltration	450,465	0	450,465	15.21	151,910	7.38	7.38	Infiltration	-459,434	-459,434	20.24						
<b>Sub Total ==&gt;</b>	<b>1,695,228</b>	<b>21,696</b>	<b>1,716,924</b>	<b>57.96</b>	<b>1,441,305</b>	<b>69.99</b>	<b>69.99</b>	<b>Sub Total ==&gt;</b>	<b>-1,416,743</b>	<b>-1,445,542</b>	<b>63.67</b>						
<b>Internal Loads</b>								<b>Internal Loads</b>									
Lights	369,430	92,357	461,787	15.59	369,430	17.94	17.94	Lights	0	0	0.00	Vent	5,600	5,600			
People	126,000	0	126,000	4.25	70,000	3.40	3.40	People	0	0	0.00	Infil	6,682	6,682			
Misc	153,929	0	153,929	5.20	153,929	7.47	7.47	Misc	0	0	0.00	Supply	108,405	32,521			
<b>Sub Total ==&gt;</b>	<b>649,359</b>	<b>92,357</b>	<b>741,716</b>	<b>25.04</b>	<b>593,359</b>	<b>28.81</b>	<b>28.81</b>	<b>Sub Total ==&gt;</b>	<b>0</b>	<b>0</b>	<b>0.00</b>	MinStop/Rh	32,521	32,521			
<b>Ceiling Load</b>	<b>25,255</b>	<b>-25,255</b>	<b>0</b>	<b>0.00</b>	<b>24,691</b>	<b>1.20</b>	<b>1.20</b>	<b>Ceiling Load</b>	<b>-14,843</b>	<b>0</b>	<b>0.00</b>	Return	102,805	26,921			
Ventilation Load	0	0	377,545	12.75	0	0.00	0.00	Ventilation Load	0	-385,062	16.96	Exhaust	0	0			
Ov/Undr Sizing	0	0	0	0.00	0	0.00	0.00	Ov/Undr Sizing	0	0	0.00	Rm Exh	12,282	12,282			
Exhaust Heat	0	0	0	0.00	0	0.00	0.00	Exhaust Heat	0	0	0.00	Auxiliary	0	0			
Sup. Fan Heat	0	0	125,962	4.25	0	0.00	0.00	OA Preheat Diff.	0	0	0.00						
Ret. Fan Heat	0	0	0	0.00	0	0.00	0.00	RA Preheat Diff.	0	-439,804	19.37						
Duct Heat Pkup	0	0	0	0.00	0	0.00	0.00	Additional Reheat	0	0	0.00						
Reheat at Design	0	0	0	0.00	0	0.00	0.00										
<b>Grand Total ==&gt;</b>	<b>2,369,842</b>	<b>88,798</b>	<b>2,962,146</b>	<b>100.00</b>	<b>2,059,354</b>	<b>100.00</b>	<b>100.00</b>	<b>Grand Total ==&gt;</b>	<b>-1,431,586</b>	<b>-2,270,408</b>	<b>100.00</b>						

AIRFLOWS		
	Cooling	Heating
Vent	5,600	5,600
Infil	6,682	6,682
Supply	108,405	32,521
MinStop/Rh	32,521	32,521
Return	102,805	26,921
Exhaust	0	0
Rm Exh	12,282	12,282
Auxiliary	0	0

ENGINEERING CKS		
	Cooling	Heating
% OA	5.2	17.2
cfm/ft²	1.08	0.32
cfm/ton	439.16	
ft²/ton	406.02	
Btu/hr-ft²	29.56	-22.65
No. People	280	

COOLING COIL SELECTION										
	Total Capacity ton	Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR			Leave DB/WB/HR		
					°F	°F	gr/lb	°F	°F	gr/lb
Main Clg	246.9	2,962.2	2,364.2	106,280	71.9	59.9	58.4	51.8	49.8	50.3
Aux Clg	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>246.9</b>	<b>2,962.2</b>								

AREAS		
	Gross Total	Glass ft² (%)
Floor	100,224	
Part	0	
ExFlr	0	
Roof	0	0 0
Wall	51,840	24,365 47

HEATING COIL SELECTION				
	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Aux Htg	0.0	0	0.0	0.0
Preheat	-290.7	5,600	5.0	51.8
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
<b>Total</b>	<b>-2,270.4</b>			

EXISTING (2-3)

**MONTHLY ENERGY CONSUMPTION**  
By PSUAE

Alternative: 1      No Economizer

----- Monthly Energy Consumption -----

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
<b>Electric</b>													
On-Pk Cons. (kWh)	45,891	41,332	54,081	51,162	68,299	80,376	78,286	83,816	63,555	55,582	51,040	44,748	718,168
Off-Pk Cons. (kWh)	16,863	15,216	18,708	19,546	31,591	40,354	50,933	42,246	34,127	21,062	18,699	16,677	326,022
On-Pk Demand (kW)	239	254	308	327	428	499	522	497	460	345	314	249	522
Off-Pk Demand (kW)	190	192	194	206	233	250	272	259	241	210	202	194	272
<b>Gas</b>													
On-Pk Cons. (therms)	946	850	635	233	0	0	0	0	0	301	417	634	4,015
Off-Pk Cons. (therms)	2,290	2,038	1,321	969	734	452	239	534	657	1,071	1,150	1,620	13,075
On-Pk Demand (therms/hr)	23	23	23	23	0	0	0	0	0	23	23	23	23
Off-Pk Demand (therms/hr)	24	24	23	23	23	23	17	23	23	23	23	23	24

Building Energy Consumption = 52,610 Btu/(ft2-year)  
 Source Energy Consumption = 124,635 Btu/(ft2-year)  
 Floor Area = 100,224 ft2

EXISTING (3-3)

**MONTHLY UTILITY COSTS**  
By PSUAE

Alternative: 1

Utility	----- Monthly Utility Costs -----												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
<b>Electric</b>													
On-Pk Cons. (\$)	4,022	3,623	4,740	4,484	5,986	7,776	7,574	8,109	6,149	4,872	4,474	3,922	65,731
Off-Pk Cons. (\$)	1,196	1,079	1,327	1,386	2,240	2,815	3,553	2,947	2,381	1,494	1,326	1,183	22,926
On-Pk Demand (\$)	932	987	1,199	1,275	1,667	3,607	3,773	3,592	3,326	1,342	1,222	969	23,889
Off-Pk Demand (\$)	557	561	567	601	682	1,355	1,474	1,401	1,306	615	590	567	10,277
<b>Total (\$):</b>	<b>6,707</b>	<b>6,250</b>	<b>7,833</b>	<b>7,746</b>	<b>10,575</b>	<b>15,554</b>	<b>16,374</b>	<b>16,049</b>	<b>13,162</b>	<b>8,323</b>	<b>7,612</b>	<b>6,640</b>	<b>122,824</b>
<b>Gas</b>													
On-Pk Cons. (\$)	890	799	597	219	0	0	0	0	0	282	392	596	3,774
<b>Monthly Total (\$):</b>	<b>7,596</b>	<b>7,049</b>	<b>8,430</b>	<b>7,965</b>	<b>10,575</b>	<b>15,554</b>	<b>16,374</b>	<b>16,049</b>	<b>13,162</b>	<b>8,605</b>	<b>8,003</b>	<b>7,236</b>	<b>126,598</b>

REDESIGN (1-3)

# System Checksums

By PSUAE

System - 001

Variable Volume Reheat (30% Min Flow Default)

COOLING COIL PEAK					CLG SPACE PEAK					HEATING COIL PEAK					TEMPERATURES							
Peaked at Time:		Mo/Hr: 7 / 16			Mo/Hr: 7 / 16		Mo/Hr: 13 / 1						Cooling			Heating						
Outside Air:		OADB/WB/HR: 91 / 75 / 110			OADB: 91		OADB: 5						SADB	53.9	104.4							
Space Sens. + Lat. Btu/h	Plenum Sens. + Lat. Btu/h	Net Total Btu/h	Percent Of Total (%)	Space Sensible Btu/h	Percent Of Total (%)	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)	Envelope Loads	Envelope Loads	Envelope Loads	Envelope Loads	Envelope Loads	Envelope Loads	Envelope Loads	Envelope Loads	Envelope Loads	Envelope Loads				
Envelope Loads									Skylite Solar	0	0	0.00	Skylite Solar	0	0	0.00	Skylite Solar	0	0	0.00		
Skylite Solar	0	0	0.00	0	0.00	0	0	0.00	Skylite Cond	0	0	0.00	Skylite Cond	0	0	0.00	Skylite Cond	0	0	0.00		
Skylite Cond	0	0	0.00	0	0.00	0	0	0.00	Roof Cond	0	0	0.00	Roof Cond	0	0	0.00	Roof Cond	0	0	0.00		
Roof Cond	0	0	0.00	0	0.00	0	0	0.00	Glass Solar	950,942	0	36.58	Glass Solar	0	0	0.00	Glass Solar	0	0	0.00		
Glass Solar	950,942	0	36.58	950,942	46.20	950,942	-870,661	44.09	Glass Cond	274,713	0	10.57	Glass Cond	-870,661	-870,661	44.09	Glass Cond	0	0	0.00		
Glass Cond	274,713	0	10.57	274,713	13.35	274,713	-86,648	5.85	Wall Cond	63,740	20,999	3.26	Wall Cond	-86,648	-115,454	5.85	Wall Cond	0	0	0.00		
Wall Cond	63,740	20,999	3.26	63,740	3.10	63,740	0	0.00	Partition	0	0	0.00	Partition	0	0	0.00	Partition	0	0	0.00		
Partition	0	0	0.00	0	0.00	0	0	0.00	Exposed Floor	0	0	0.00	Exposed Floor	0	0	0.00	Exposed Floor	0	0	0.00		
Exposed Floor	0	0	0.00	0	0.00	0	0	0.00	Infiltration	407,719	407,719	15.68	Infiltration	-459,434	-459,434	23.27	Infiltration	0	0	0.00		
Infiltration	407,719	407,719	15.68	151,910	7.38	151,910	-459,434	23.27	Sub Total ==>	1,697,114	20,999	66.09	Sub Total ==>	-1,416,743	-1,445,549	73.20	Sub Total ==>	0	0	0.00		
Sub Total ==>	1,697,114	20,999	66.09	1,441,305	70.03	1,441,305	-1,416,743	73.20	Internal Loads				Internal Loads				Internal Loads					
Internal Loads									Lights	369,430	92,357	17.76	Lights	0	0	0.00	Lights	0	0	0.00		
Lights	369,430	92,357	17.76	369,430	17.95	369,430	0	0.00	People	126,000	126,000	4.85	People	0	0	0.00	People	0	0	0.00		
People	126,000	126,000	4.85	70,000	3.40	70,000	0	0.00	Misc	153,929	0	5.92	Misc	0	0	0.00	Misc	0	0	0.00		
Misc	153,929	0	5.92	153,929	7.48	153,929	0	0.00	Sub Total ==>	649,359	92,357	28.53	Sub Total ==>	0	0	0.00	Sub Total ==>	0	0	0.00		
Sub Total ==>	649,359	92,357	28.53	593,359	28.83	593,359	0	0.00	Ceiling Load	23,527	-23,527	0.00	Ceiling Load	-14,341	0	0.00	Ceiling Load	0	0	0.00		
Ceiling Load	23,527	-23,527	0.00	23,526	1.14	23,526	0	0.00	Ventilation Load	0	0	0.13	Ventilation Load	0	-3,851	0.20	Ventilation Load	0	0	0.00		
Ventilation Load	0	0	0.13	0	0.00	0	0	0.00	Ov/Undr Sizing	0	0	0.00	Ov/Undr Sizing	0	0	0.00	Ov/Undr Sizing	0	0	0.00		
Ov/Undr Sizing	0	0	0.00	0	0.00	0	0	0.00	Exhaust Heat	0	0	0.00	Exhaust Heat	0	0	0.00	Exhaust Heat	0	0	0.00		
Exhaust Heat	0	0	0.00	0	0.00	0	0	0.00	Sup. Fan Heat	0	136,217	5.24	Sup. Fan Heat	0	0	0.00	Sup. Fan Heat	0	0	0.00		
Sup. Fan Heat	0	136,217	5.24	0	0.00	0	0	0.00	Ret. Fan Heat	0	0	0.00	Ret. Fan Heat	0	0	0.00	Ret. Fan Heat	0	0	0.00		
Ret. Fan Heat	0	0	0.00	0	0.00	0	0	0.00	Duct Heat Pkup	0	0	0.00	Duct Heat Pkup	0	0	0.00	Duct Heat Pkup	0	0	0.00		
Duct Heat Pkup	0	0	0.00	0	0.00	0	0	0.00	Reheat at Design	0	0	0.00	Reheat at Design	0	0	0.00	Reheat at Design	0	0	0.00		
Reheat at Design	0	0	0.00	0	0.00	0	0	0.00	Grand Total ==>	2,369,999	89,830	2,599,463	100.00	Grand Total ==>	-1,431,085	-1,974,687	100.00	Grand Total ==>	2,369,999	89,830	2,599,463	100.00
Grand Total ==>	2,369,999	89,830	2,599,463	100.00	2,058,190	100.00	-1,431,085	100.00														

### AIRFLOWS

	Cooling	Heating
Vent	5,600	5,600
Infil	6,682	6,682
Supply	114,933	34,480
MinStop/Rh	34,480	34,480
Return	109,333	28,880
Exhaust	0	0
Rm Exh	12,282	12,282
Auxiliary	0	0

### ENGINEERING CKS

	Cooling	Heating
% OA	4.9	16.2
cfm/ft²	1.15	0.34
cfm/ton	530.57	
ft²/ton	462.67	
Btu/hr-ft²	25.94	-19.70
No. People	280	

### COOLING COIL SELECTION

	Total Capacity ton	Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR °F °F gr/lb	Leave DB/WB/HR °F °F gr/lb
Main Clg	216.6	2,599.5	2,285.5	14,893	70.7 58.7 55.0	52.8 50.4 51.0
Aux Clg	0.0	0.0	0.0	0	0.0 0.0 0.0	0.0 0.0 0.0
Opt Vent	0.0	0.0	0.0	0	0.0 0.0 0.0	0.0 0.0 0.0
<b>Total</b>	<b>216.6</b>	<b>2,599.5</b>				

### AREAS

	Gross Total	Glass ft² (%)
Floor Part	100,224	
ExFlr	0	
Roof	0	0 0
Wall	51,840	24,365 47

### HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent °F	Lvg °F
Main Htg	-1,974.7	34,480	52.8	104.4
Aux Htg	0.0	0	0.0	0.0
Preheat	0.0	0	0.0	0.0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
<b>Total</b>	<b>-1,974.7</b>			

REDESIGN (2-3)

**MONTHLY ENERGY CONSUMPTION**  
By PSUAE

Alternative: 2      Wheel

----- Monthly Energy Consumption -----

Utility	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
<b>Electric</b>													
On-Pk Cons. (kWh)	46,290	41,670	54,883	51,506	67,516	77,664	74,558	80,813	62,419	55,799	51,542	45,321	709,981
Off-Pk Cons. (kWh)	16,756	15,084	18,749	19,673	30,835	37,123	44,401	38,422	32,355	21,048	18,775	16,492	309,714
On-Pk Demand (kW)	239	253	307	329	420	483	495	480	451	347	314	250	495
Off-Pk Demand (kW)	193	190	194	207	231	241	253	245	235	212	203	192	253
<b>Gas</b>													
On-Pk Cons. (therms)	924	831	599	208	0	0	0	0	0	274	386	610	3,832
Off-Pk Cons. (therms)	2,009	1,792	1,265	935	707	438	226	515	634	1,030	1,101	1,482	12,134
On-Pk Demand (therms/hr)	23	23	23	23	0	0	0	0	0	23	23	23	23
Off-Pk Demand (therms/hr)	23	23	23	23	23	23	16	23	23	23	23	23	23

Building Energy Consumption = 50,655 Btu/(ft2-year)  
 Source Energy Consumption = 120,953 Btu/(ft2-year)  
 Floor Area = 100,224 ft2

REDESIGN(3-3)

## MONTHLY UTILITY COSTS

By PSUAE

Alternative: 2

Utility	Jan	Feb	Mar	Apr	----- Monthly Utility Costs -----				Sept	Oct	Nov	Dec	Total
					May	June	July	Aug					
<b>Electric</b>													
On-Pk Cons. (\$)	4,057	3,652	4,810	4,514	5,918	7,514	7,213	7,819	6,039	4,891	4,518	3,972	64,917
Off-Pk Cons. (\$)	1,188	1,070	1,330	1,395	2,187	2,590	3,097	2,680	2,257	1,493	1,331	1,170	21,788
On-Pk Demand (\$)	932	985	1,195	1,281	1,636	3,494	3,576	3,469	3,260	1,352	1,221	974	23,375
Off-Pk Demand (\$)	563	555	566	605	674	1,306	1,371	1,327	1,276	619	593	562	10,018
<b>Total (\$):</b>	<b>6,740</b>	<b>6,262</b>	<b>7,901</b>	<b>7,796</b>	<b>10,414</b>	<b>14,903</b>	<b>15,258</b>	<b>15,296</b>	<b>12,833</b>	<b>8,355</b>	<b>7,663</b>	<b>6,677</b>	<b>120,098</b>
<b>Gas</b>													
On-Pk Cons. (\$)	869	782	563	196	0	0	0	0	0	257	363	573	3,602
<b>Monthly Total (\$):</b>	<b>7,608</b>	<b>7,044</b>	<b>8,464</b>	<b>7,991</b>	<b>10,414</b>	<b>14,903</b>	<b>15,258</b>	<b>15,296</b>	<b>12,833</b>	<b>8,612</b>	<b>8,026</b>	<b>7,250</b>	<b>123,700</b>

Katie Sennett  
Adviser: Dr. Messner  
Apr 9, 2008



The Kennedy Krieger Institute  
Outpatient Medical Center  
Baltimore, Maryland

# Appendix G

## Sample Survey



# Implementing 3D Design Coordination with MEP systems for clash detection: Survey

Name: \_\_\_\_\_ Company: \_\_\_\_\_  
Position: \_\_\_\_\_

1. Does the following information need to be confidential?

Yes       No       Only Information given below, no Name or Company.

2. Does your company use 3D design coordination programs? (Such as AutoCAD, Revit, or NAVISworks)

Yes       No

If No please briefly explain why not?

_____ _____ _____ _____
----------------------------------

3. If your company does not use 3D design coordination, what do you see in the future for your company?

_____ _____ _____ _____
----------------------------------

3. If your company does use 3D design coordination, what does it take to implement it on projects?

_____ _____ _____ _____
----------------------------------

4. What are the difficulties of using 3D design coordination?

_____ _____ _____
-------------------------

5. Do employees need to be trained in 3D design?

Yes       No

6. Is there an extra cost for your company to use 3D design?

Yes       No

If yes, what is the added cost?

---

7. Is 3D design coordination used all on projects in your company or just a select few?

All Projects       Select Few

If only a select few projects, what type of projects? (Such as office buildings, hospital, . . .)

<hr/> <hr/> <hr/> <hr/>
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8. Is it difficult to get other subcontractors on board with using 3D design Coordination?

Yes       No

If Yes, Briefly explain why?

<hr/> <hr/> <hr/> <hr/>
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9. What are the steps needed to implement 3D Design Coordination with MEP systems for clash detection?

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10. What would you say to a small company who was looking into implementing 3D design coordination on their project?


11. What would you say are advantages to using 3d Design Coordination?


12. What would you say are disadvantages to using 3d Design Coordination?


I would like to take this moment to say Thank You for your participation with this survey.

I greatly appreciate your time. Thanks again.

Katie Sennett  
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