VIDA Fitness Center

Washington D.C.

Penn State Architectural Engineering Capstone Project

Clara Watson | Construction Option | Advisor: Dr. Robert Leicht

Building Overview

Building: Existing Results Gym + New Addition

Building Location: 1612 U Street NW, Washington DC

Building Size: 60,370 SF

Number of Stories: 4 Stories + Penthouse/Accessible Roof

Occupancy / Function Type: Fitness Gym, Salon, Spa, Restaurant

Project Cost: $14 Million

Dates of Construction: September 2010 – August 2011

Project Delivery Method: Design – Bid – Build with Design Assist

Contract Type: Negotiated

Project Participants

Owner: David von Storch

Architect: Core Architects; Stoneking von Storch

MEP Engineer: Allen and Shariff Engineers

Structural Engineer: Rathgeber-Goss Associates

Interior Designer: Wade Allyn Hallock Interiors

General Contractor: Forrester Construction Company

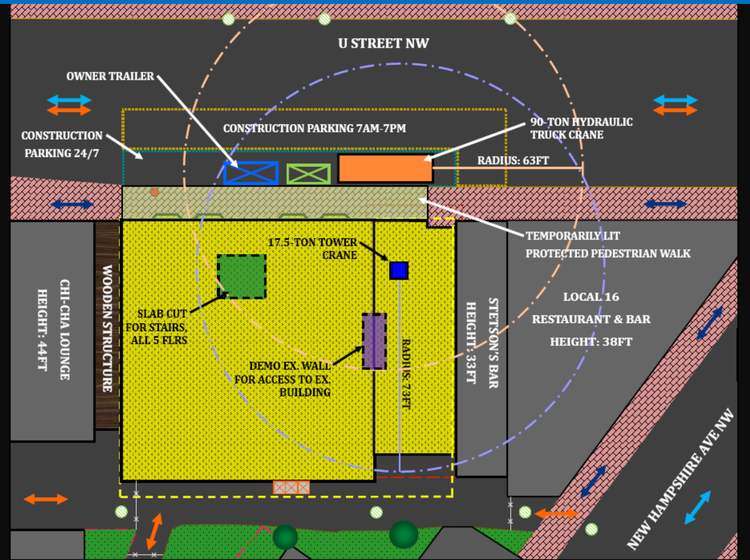
Outline

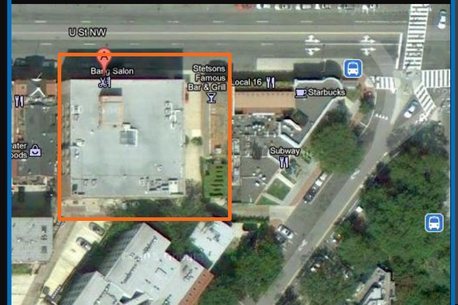
Building Location

1921 Parking Garage → Results Gym → Bought by David von Storch → Renovated into VIDA

Located on the U Street Corridor: D.C. Historic District

Construction Site Plan





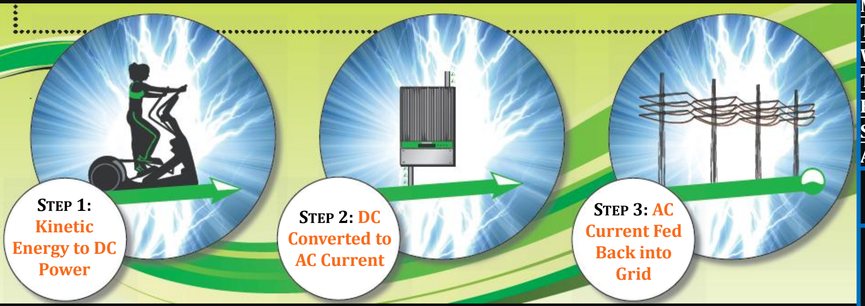
Outline

Analysis 1: ReRev Energy Harvesting System

ReRev System Overview

Captures kinetic energy produced in the form of DC power generated from cardio equipment use and converts it to AC power to be fed back into the grid

ReRev™ *A Renewable Energy Revolution*



Cardio Equipment Usage

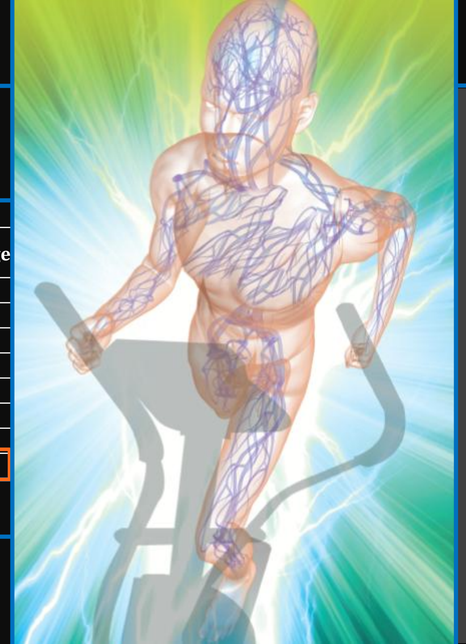
Crowd Farming: **The collective impact of small contributions from a mass of people**

Cardio Equipment Usage Summary Per Equipment Type

Day	Treadmills	Ellipticals	Stair Masters	Upright Bikes	Recumbent Bikes	Daily Average
Sundays	14.00	13.00	12.00	10.00	10.00	11.80
Mondays	18.00	18.00	18.00	18.00	18.00	18.00
Tuesdays	18.00	18.00	18.00	17.00	17.00	17.60
Wednesdays	18.00	18.00	17.00	17.00	16.00	17.20
Thursdays	18.00	18.00	18.00	16.00	16.00	17.20
Fridays	18.00	18.00	17.00	16.00	16.00	17.00
Saturdays	14.00	14.00	14.00	14.00	14.00	14.00
Average	16.86	16.71	16.29	15.43	15.29	16.11

$$(Avg\ Hourly\ Use) \times (\#\ of\ Cardio\ Machines) = Total\ Hours\ of\ Daily\ Use$$

The Total ReRev System Cost Provided is $148,000



Outline

Potential Funding and Incentives

PEPCO C&I Energy Savings Program: Total $14,311.10

Brainstorming Renewable Energy Opportunities: **$1,000.00**

Renewable Energy Simulation Analysis for first 50,000 SF: **$5,000.00**

$0.03 is available for each additional SF: **$311.10**

Incorporating Designed Measures During Construction: **$8,000.00**

D.C. Renewable Energy Incentive Program: Total $16,500/Yr

$1.50 Provided for first 3,000 Watts Produced: **$4,500.00**

$1.00 Provided for next 7,000 Watts Produced: **$7,000.00**

$0.50 Provided for next 10,000 Watts Produced: **$5,000.00**

(Annual kW Savings) + (Annual AC Savings) = Total Annual Cost Savings

Cost and Payback Analysis

ReRev System Annual Savings Calculations With Incentives

Year	Annual KW Savings	Annual A/C Savings	Potential Pepco Incentive	Potential REIP Incentive	Total Savings	Potential Profit
1	$ 9,080.67	$ 2,594.80	$ 14,311.10	$ 16,500.00	$ 42,486.57	$ (105,513.43)
2	$ 9,534.70	$ 2,724.54	$ -	$ 16,500.00	$ 71,245.81	$ (76,754.19)
3	$ 10,011.43	$ 2,860.77	$ -	$ 16,500.00	$ 100,618.01	$ (47,381.99)
4	$ 10,512.01	$ 3,003.81	$ -	$ 16,500.00	$ 130,633.82	$ (17,366.18)
5	$ 11,037.61	$ 3,154.00	$ -	$ 16,500.00	$ 161,325.42	$ 13,325.42

Rise in Energy Costs Per Year: 5%

ReRev Estimated Monthly Air Conditioning Savings: 30%

Months of Air Conditioning Savings: 11.43

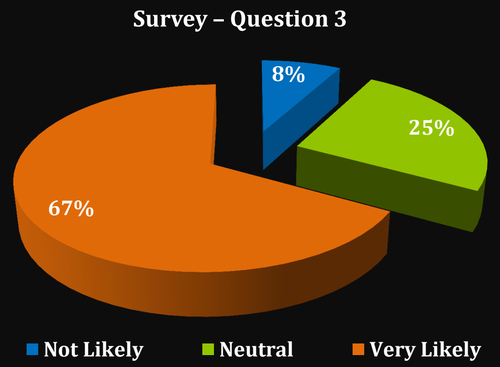
Watts Generated Per Year: 70,175,160

Twenty Year Potential Profit of $582,371.52

Outline

ReRev System Survey

Would you consider using a fitness center that offered energy generating cardio equipment over a fitness center with typical cardio equipment?



Social Impact

Kilograms of CO_2 Saved: 41,648 kg Annually

US EPA Study on Energy Generating Equipment:

- **Improved user understanding of renewable energy sources**
- **Increased amount of participants engaging in positive environmental behavior**

LEED Gold Rating: 3 Additional Points for Renewable Energy

Instead of an immeasurable quantity people find difficult to relate to, ReRev allows for energy to become a quantifiable value tied to activities and decisions in everyday life.

Six Full Charges

Ten Minutes of TV

One Hour of Laptop Use

2.5 Hours of CFL Use

EQUIVALENT TO A 30 MINUTE WORKOUT

Outline

Analysis 2: Overtime Effects on Productivity

Overtime Effects on Productivity

Productivity levels decrease with: Increases in the number of work hours and work days per week

Scheduled Overtime → **Accelerate Project Schedule** → **Make Up Lost Time**

Accelerate Project Schedule → **Ensure Project Doesn't Fall Behind**

Productivity loss : Due mainly to the increase of disruptions

Disruptions: The inability to acquire materials, tools, or other resources at an enhanced rate

Wage Loss Calculations

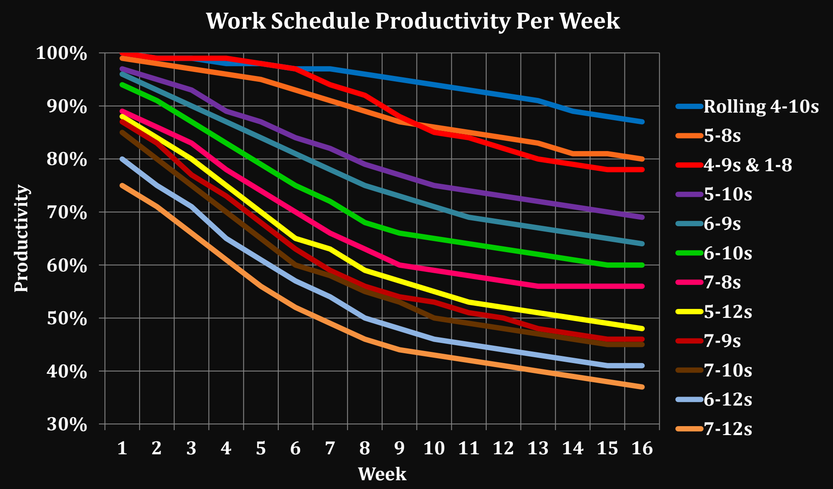
Electrical Subcontractor Lost Wages (6-12s)

Week	Regular Hrs/ Wk	OT Hrs/ Wk	Produc-tivity	Effective Regular Hrs	Effective OT Hrs	Regular Hrs Lost	OT Hrs Lost	Avg Laborer $/Hr	OT Laborer $/Hr	Lost $ Per Laborer	Avg Labor /Wk	Total Lost Wages
1	40	32	0.80	32.0	25.6	8.0	6.4	$ 48.25	$ 72.38	$ 849.20	6	$ 5,095.20
2	40	32	0.75	30.0	24.0	10.0	8.0	$ 48.25	$ 72.38	$ 1,061.50	9	$ 9,553.50
3	40	32	0.71	28.4	22.7	11.6	9.3	$ 48.25	$ 72.38	$ 1,231.34	9	$ 11,082.06
4	40	32	0.65	26.0	20.8	14.0	11.2	$ 48.25	$ 72.38	$ 1,486.10	11	$ 16,347.10
5	40	32	0.61	24.4	19.5	15.6	12.5	$ 48.25	$ 72.38	$ 1,655.94	11	$ 18,215.34
6	40	32	0.57	22.8	18.2	17.2	13.8	$ 48.25	$ 72.38	$ 1,825.78	9	$ 16,432.02
7	40	32	0.54	21.6	17.3	18.4	14.7	$ 48.25	$ 72.38	$ 1,953.16	8	$ 15,625.28
8	40	32	0.50	20.0	16.0	20.0	16.0	$ 48.25	$ 72.38	$ 2,123.00	9	$ 19,107.00
9	40	32	0.48	19.2	15.4	20.8	16.6	$ 48.25	$ 72.38	$ 2,207.92	10	$ 22,079.20
10	40	32	0.46	18.4	14.7	21.6	17.3	$ 48.25	$ 72.38	$ 2,292.84	10	$ 22,928.40
11	40	32	0.45	18.0	14.4	22.0	17.6	$ 48.25	$ 72.38	$ 2,335.30	9	$ 21,017.70
12	40	32	0.44	17.6	14.1	22.4	17.9	$ 48.25	$ 72.38	$ 2,377.76	12	$ 28,533.12
13	40	32	0.43	17.2	13.8	22.8	18.2	$ 48.25	$ 72.38	$ 2,420.22	12	$ 29,042.64
14	40	32	0.42	16.8	13.4	23.2	18.6	$ 48.25	$ 72.38	$ 2,462.68	15	$ 36,940.20
15	40	32	0.41	16.4	13.1	23.6	18.9	$ 48.25	$ 72.38	$ 2,505.14	12	$ 30,061.68
16	40	32	0.41	16.4	13.1	23.6	18.9	$ 48.25	$ 72.38	$ 2,505.14	11	$ 27,556.54
Total				345.2	276.2	294.8	235.8			$ 31,293.02		$ 329,616.98

The Total Lost Wages for the Six Main Subs is $1,539,481

Outline

Productivity Loss Calculations



Overtime Schedule Alternatives

Work Schedule Alternatives

	6-12s			Rolling 4-10s			4-9s & 1-8			5-10s		
Week	Weekly Hrs	Productivity	Effective Hrs	Weekly Hrs	Productivity	Effective Hrs	Weekly Hrs	Productivity	Effective Hrs	Weekly Hrs	Productivity	Effective Hrs
1	72	0.80	57.6	40	1.00	40.0	44	1.00	44.0	50	0.97	48.5
2	72	0.75	54.0	40	0.99	39.6	44	0.99	43.6	50	0.95	47.5
3	72	0.71	51.1	40	0.99	39.6	44	0.99	43.6	50	0.93	46.5
4	72	0.65	46.8	40	0.98	39.2	44	0.99	43.6	50	0.89	44.5
5	72	0.61	43.9	40	0.98	39.2	44	0.98	43.1	50	0.87	43.5
6	72	0.57	41.0	40	0.97	38.8	44	0.97	42.7	50	0.84	42.0
7	72	0.54	38.9	40	0.97	38.8	44	0.94	41.4	50	0.82	41.0
8	72	0.50	36.0	40	0.96	38.4	44	0.92	40.5	50	0.79	39.5
9	72	0.48	34.6	40	0.95	38.0	44	0.88	38.7	50	0.77	38.5
10	72	0.46	33.1	40	0.94	37.6	44	0.85	37.4	50	0.75	37.5
11	72	0.45	32.4	40	0.93	37.2	44	0.82	36.1	50	0.74	37.0
12	72	0.44	31.7	40	0.92	36.8	44	0.78	34.3	50	0.73	36.5
13	72	0.43	31.0	40	0.91	36.4	44	0.79	34.8	50	0.72	36.0
14	72	0.42	30.2	40	0.89	35.6	44	0.79	34.8	50	0.71	35.5
15	72	0.41	29.5	40	0.88	35.2	44	0.79	34.8	50	0.70	35.0
16	72	0.41	29.5	40	0.87	34.8	44	0.79	34.8	50	0.69	34.5
Totals			621.4			605.2			627.9			643.5

- The existing schedule used 621.4 effective hours
- Meaning 621.4 hours of work took place in 16 weeks
- Any alternative schedule must have at least 621.4 effective hours

Outline

Overtime Schedule Alternatives

OT Schedule Comparisons	
Alt. Schedule	Effective Hrs
4-10s	605.2
4-9s & 1-8	627.9
5-8s	570
5-10s	643.5
6-9s	662.6
6-10s	690
7-8s	597.5
5-12s	599.4
7-9s	605.4
7-10s	651.7
6-12s	621.4
7-12s	672

The 4-9s and 1-8 Schedule was Selected

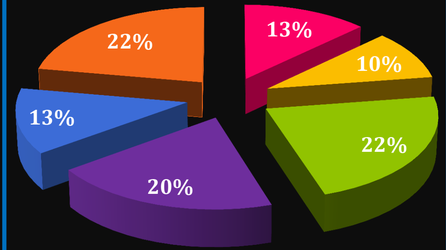
Cost Comparison

6-9s Schedule Vs 4-9s & 1-8 Schedule

72 Work Week Hours	44 Work Week Hours
6 Work Days Per Week	5 Work Days Per Week
41% Productivity After 16 Weeks	79% Productivity After 16 Weeks
$1,539,481 Lost Wages	$192,790 Lost Wages

The 4-9s & 1-8 Schedule Saved $1,346,619 in Labor Costs

Lost Wages per Subcontractor



Outline

Analysis 3: Implementation of Job Order Contracting

Job Order Contracting

Allows Owner to achieve many smaller contracts under the umbrella of a larger, competitively bid contract

Succeeding construction projects won on previous performance

Project Implementation

1 - Construction Need Identified

2 - Criteria & Objectives Determined

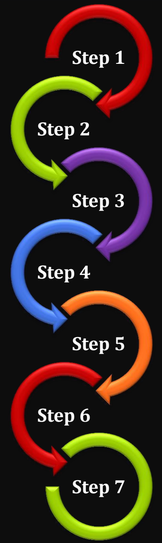
3 - RFQ Issued

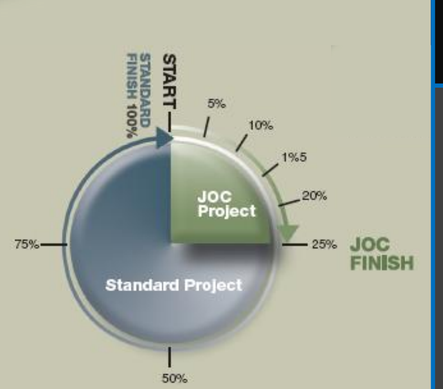
4 - Selection Criteria Weighted

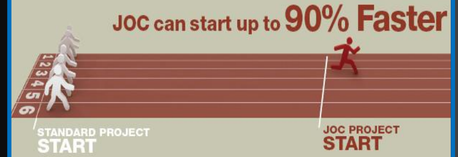
5 - Contractors Submit Coefficients

6 - Contractor Selected

7 - Contract Negotiated







Outline

Comprehensive Cost Analysis – GC Savings

Forrester Construction Cost Savings from Employing JOC						
VIDA Name	Square Footage	Cost/SF	Total Cost	Min Savings (9%)	Max Savings (21%)	Avg Savings (15%)
U Street	80,000	$ 199.91	$ 15,992,800.00	$ 1,439,352.00	$ 3,358,488.00	$ 2,398,920.00
Metropole	65,000	$ 199.91	$ 12,994,150.00	$ 1,169,473.50	$ 2,728,771.50	$ 1,949,122.50
Verizon Center	60,000	$ 199.91	$ 11,994,600.00	$ 1,079,514.00	$ 2,518,866.00	$ 1,799,190.00
Renaissance Hotel	32,000	$ 199.91	$ 6,397,120.00	$ 575,740.80	$ 1,343,395.20	$ 959,568.00
TOTAL			$ 47,378,670.00	$ 4,264,080.30	$ 9,949,520.70	$ 7,106,800.50

Avg Savings (15%)
$ 2,398,920.00
$ 1,949,122.50
$ 1,799,190.00
$ 959,568.00
$ 7,106,800.50

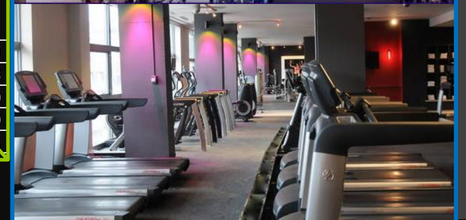
The GC total savings for all four VIDA's is $7,106,800

Comprehensive Cost Analysis – Sub Savings

The total subcontractor savings for all four VIDA's is $356,222

Avg Savings (11.5%)
$ 120,244.00
$ 97,698.25
$ 90,183.00
$ 48,097.60
$ 356,222.85

Steel Subcontractor Cost Savings from Employing JOC						
VIDA Name	Square Footage	Steel Cost/SF	Total Cost	Min Savings (8%)	Max Savings (15%)	Avg Savings (11.5%)
U Street	80,000	$ 13.07	$ 1,045,600.00	$ 83,648.00	$ 156,840.00	$ 120,244.00
Metropole	65,000	$ 13.07	$ 849,550.00	$ 67,964.00	$ 127,432.50	$ 97,698.25
Verizon Center	60,000	$ 13.07	$ 784,200.00	$ 62,736.00	$ 117,630.00	$ 90,183.00
Renaissance Hotel	32,000	$ 13.07	$ 418,240.00	$ 33,459.20	$ 62,736.00	$ 48,097.60
TOTAL			$ 3,097,590.00	$ 247,807.20	$ 464,638.50	$ 356,222.85



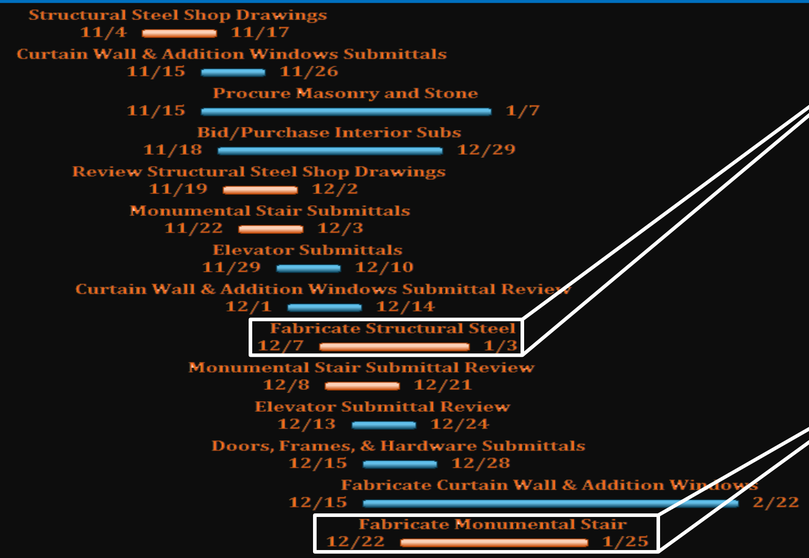
Outline

Decreased Preconstruction Durations

Task Durations Savings Per VIDA Gym					
Task Name	U Street Durations (Days)				
	Actual	Savings			New
		Min (75%)	Max (85%)	Avg (80%)	
Structural Steel Shop Drawings	10.00	7.50	8.50	8.00	2.00
Review Structural Steel Shop Drawings	10.00	7.50	8.50	8.00	2.00
Monumental Stair Submittals	10.00	7.50	8.50	8.00	2.00
Fabricate Structural Steel	20.00	15.00	17.00	16.00	4.00
Monumental Stair Submittal Review	10.00	7.50	8.50	8.00	2.00
Fabricate Monumental Stair	25.00	18.75	21.25	20.00	5.00
TOTAL	85.00	63.75	72.25	68.00	17.00

The Steel Precon Schedule Could be Reduced by 68 days

Decreased Preconstruction Durations



Revised schedule allows **fabricated steel** to be completed **6 weeks** sooner

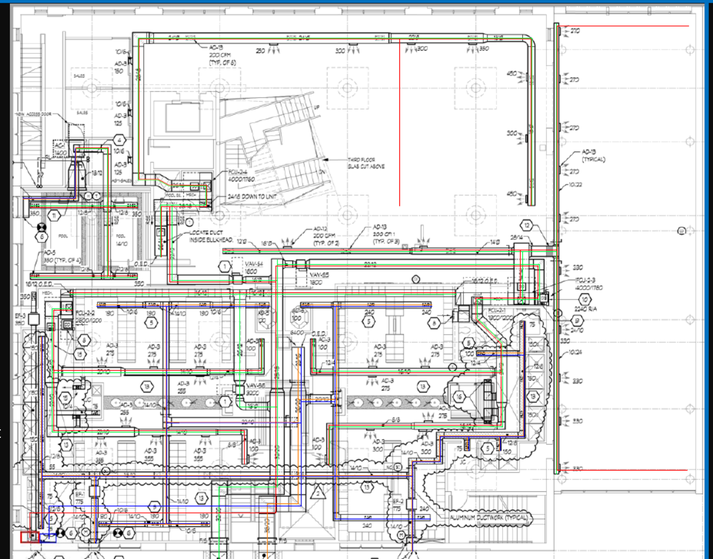
Revised schedule allows **fabricated monumental stair** to be completed **8 weeks** sooner

Outline

Analysis 4: Mechanical System Layout

Quantity Take-Off

- Ext Supply
- Ext Exhaust
- New Supply
- New Exhaust



Optional Ductwork Layouts

Existing Layout: Supply & Exhaust lines located outside

Layout 1: Move Supply & Exhaust lines to SW corner

- Remove Y Duct in GM Office on 3rd Floor
- Add 3 additional branch lines on 2nd Floor
- Add 2 additional branch lines on 3rd Floor

Layout 2: Move Supply & Exhaust lines to elevator

- Reroute Supply through GM Office on 3rd Floor
- Remove Y Duct in GM Office on 3rd Floor
- Add 2 additional branch lines on 2nd Floor
- Add 2 additional branch lines on 3rd Floor

Outline

Cost Analysis

Average Cost Per LF of Ductwork

Duct	Layout	Linear Feet	Avg $/LF	Duct Cost	Difference	% Difference	Layout Cost	Difference	% Difference
Supply	Exst	1106.35	$ 768.03	$ 849,709.99	$ -	0.00%	$ 1,186,475.78	$ -	0.00%
Exhaust	Exst	438.48	$ 768.03	$ 336,765.79	$	0.00%			
Supply	1	1926.49	$ 768.03	$ 1,479,602.11	$ 629,892.12	74.13%	$ 2,066,522.96	$ 880,047.18	74.17%
Exhaust	1	764.19	$ 768.03	$ 586,920.85	$ 250,155.05	74.28%			
Supply	2	1217.53	$ 768.03	$ 935,099.57	$ 85,389.58	10.05%	$ 1,277,182.43	$ 90,706.65	7.65%
Exhaust	2	445.40	$ 768.03	$ 342,082.87	$ 5,317.07	1.58%			

Layout	Duct Cost
Exst - Supply	$ 849,709.99
Exst - Return	$ 336,765.79
1 - Supply	$ 1,479,602.11
1 - Return	$ 586,920.85
2 - Supply	$ 935,099.57
2 - Return	$ 342,082.87

Schedule Analysis

Layout	Duration (Days)
Exst - Supply	109.65
Exst - Return	43.46
1 - Supply	190.93
1 - Return	75.74
2 - Supply	120.67
2 - Return	44.14

Average Duration Per LF of Ductwork

Duct	Layout	Linear Feet	Avg LF/Day	Duration (Days)	Difference	% Difference	Total Duration (Days)	Difference	% Difference
Supply	Exst	1106.35	10.09	109.65	0.00	0.00%	153.11	0.00	0.00%
Exhaust	Exst	438.48	10.09	43.46	0.00	0.00%			
Supply	1	1926.49	10.09	190.93	81.28	74.13%	266.67	113.56	74.17%
Exhaust	1	764.19	10.09	75.74	32.28	74.28%			
Supply	2	1217.53	10.09	120.67	11.02	10.05%	164.81	11.70	7.65%
Exhaust	2	445.40	10.09	44.14	0.69	1.58%			

Outline

Metrics Chart and Examination

Each layout was evaluated on 4 design variables with a 0-5 scale

91-100%	81-90%	71-80%	61-70%	51-60%	41-50%	31-40%	21-30%	11-20%	1-10%	0%
0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5

Ductwork Layout Metrics Measuring Chart

Layout	Aesthetics	Cost	Schedule	Constructability	Total
Existing	0.5	5	5	2	12.5
Layout 1	3.5	1.5	1.5	4	10.5
Layout 2	4.5	4.5	4.5	4	17.5

Very Poor		Poor		Weak		Neutral		Good		Excellent
0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5

Layout 2 was Chosen as the Best Option

Mechanical Breadth

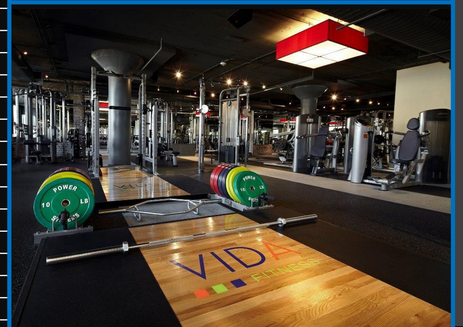
Calculate CFM of Outside Air for each space

CFM Requirements Per Space

Space Name	Floor	Area (SF)	Occupant Density (#/1000SF)	Occupants (#)	OA Per Occupant (CFM)	OA Per SF (CFM)	OA Provided (CFM)
Bang Salon	1	1500	25.00	37.50	7.50	0.06	371.25
Lobby	1	1800	10.00	18.00	5.00	0.06	198.00
Break Room	1	505	5.00	2.53	15.00	0.06	68.18
Office	1	50	5.00	0.25	5.00	0.06	4.25
Women's Lockers	2	2400	10.00	24.00	30.00	0.12	1008.00
Men's Lockers	2	2400	10.00	24.00	30.00	0.12	1008.00
Sales Rm 1	2	120	15.00	1.80	7.50	0.12	27.90
Sales Rm 2	2	120	15.00	1.80	7.50	0.12	27.90
Cardio Area	2	4525	10.00	45.25	20.00	0.06	1176.50
Group Fitness	3	2040	40.00	81.60	20.00	0.06	1754.40
Equipment Area	3	7350	10.00	73.50	20.00	0.06	1911.00
Office	3	190	5.00	0.95	5.00	0.06	16.15
Spin Class	3	605	40.00	24.20	20.00	0.06	520.30
GTS	4	375	40.00	15.00	20.00	0.06	322.50
Pilates	4	400	40.00	16.00	20.00	0.06	344.00
Inner Fitness	4	1100	40.00	44.00	20.00	0.06	946.00
Open Fitness	4	1850	40.00	74.00	20.00	0.06	1591.00
Laundry	4	250	10.00	2.50	35.00	0.12	117.50

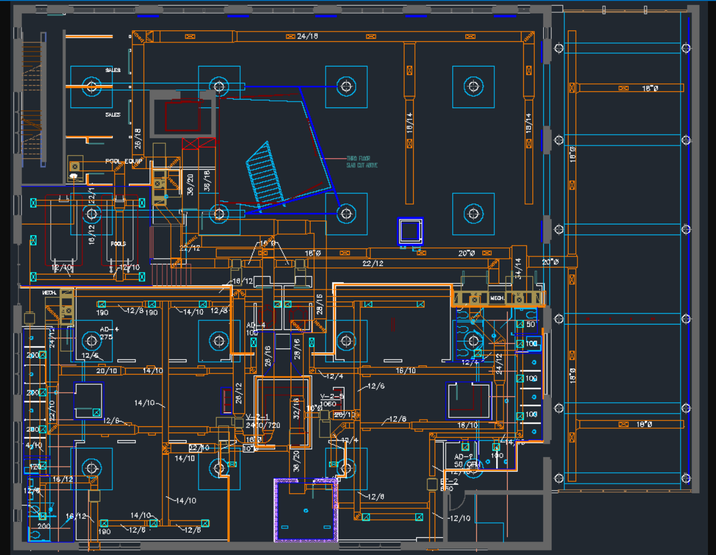
$$Area \times \frac{Occupant\ Density}{1000\ SF} = \#\ of\ Occupants$$

$$(Area \times OA\ CFM\ Per\ SF) + (\#\ of\ Occupants \times OA\ CFM\ Per\ Occupant) = CFM\ Provided$$



Outline

Mechanical Breadth



Mechanical Breadth

All outside air and occupancy requirements were calculated using ASHRAE

Step 1
- **Calculate CFM for Each Area**

Step 2
- **Redesign Layout**

Step 3
- **Size Ductwork**

Outline

Conclusions and Recommendations

Conclusions and Recommendations – Analysis 1

Analysis 1: ReRev Energy Harvesting System

Twenty Year Potential Profit: $582,371.52

Forty Year Potential Profit: $1,936,704.75

Kilograms of CO2 Saved: 41,648 kg Annually

Simple Payback with Incentives: 5 Years

Various Other Social and Environmental Benefits

An Accrued Potential Profit of $1,936,704.75 Over 40 Years

Conclusions and Recommendations – Analysis 2

Analysis 2: Overtime Effects on Productivity

Total Labor Wages Saved: $1,346,619

Total Work Hours Saved Per Week: 32 Hours

Overtime Hours Saved: 28 Hours

Work Days Saved Per Week: 1 Day

The 4-9s & 1-8 Schedule Saved $1,346,619 in Labor Costs

Outline

Conclusions and Recommendations – Analysis 3

Analysis 3: Job Order Contracting

Steel Precon Schedule Reduction: 68 Days

Steel Construction Could Start: 6 to 8 Weeks Earlier

GC total savings for all four VIDA's : $7,106,800

GC total savings for U St VIDA: $2,398,920

Subcontractor total savings for all four VIDA's : $356,222

Subcontractor total savings for U St VIDA: $120,244

GC and Subcontractor U St VIDA Savings of $2,519,164

Conclusions and Recommendations – Analysis 4

Analysis 4: Mechanical System Layout

Layout 2 Additional Costs: $85,422.06

Approximate Aesthetic Increase: 89%

Approximate Schedule Decrease: 10%

Approximate Constructability Increase: 50%

Layout 2 Accrues Additional Material & Labor Costs of $85,422

Outline

Conclusions and Recommendations

Analysis 1: An Accrued Potential Profit of $582,371.52 Over 20 Years

Analysis 2: The 4-9s & 1-8 Schedule Saved $1,346,619 in Labor Costs

Analysis 3: GC and Subcontractor U St VIDA Savings of $2,519,164

Analysis 4: Layout 2 Accrues Additional Material & Labor Costs of $85,422

Conclusions and Recommendations

Total Cost Savings with Implementation of all Analyses					
Party	Analysis 1	Analysis 2	Analysis 3	Analysis 4	Total
Owner	$ 582,371.52			$ (85,422.06)	$ 496,949.46
GC			$ 2,398,920.00		$ 2,398,920.00
Subcontractors		$ 1,346,619.00	$ 120,244.00		$ 1,466,863.00
Total	$ 582,371.52	$ 1,346,619.00	$ 2,519,164.00	$ (85,422.06)	$ 4,362,732.46

Total Savings of $ 4,362,732.46

Outline

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Acknowledgements

Penn State Architectural Engineering Faculty

Dr. Robert Leicht – CM Thesis Advisor

Seth Glinski – Forrester Construction PM

Luis Ortiz – Forrester Construction Super

Ryan Major – Forrester Construction APM

Casey Mowery – Forrester Construction APM

Emory Land – VIDA Fitness General Manager

Britnei Godusky – MAE Student Graduate

Tom Horensky – MAE Student Graduate

PACE Industry Members

Family and Friends

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Questions

Supplemental Slides

Cardio Equipment Usage – Page 39

Usage Summary Prepared for Every Day of the Week

Cardio Equipment Usage Summary - Sundays

Time	Treadmills	Ellipticals	StairMasters	Upright Bikes	Recumbent Bikes
7:00 AM	In Use				
8:00 AM	In Use	In Use	In Use		
9:00 AM	In Use	In Use	In Use		
10:00 AM	In Use	In Use	In Use	In Use	In Use
11:00 AM	In Use	In Use	In Use	In Use	In Use
12:00 PM	In Use	In Use	In Use	In Use	In Use
1:00 PM	In Use	In Use	In Use	In Use	In Use
2:00 PM	In Use	In Use	In Use	In Use	In Use
3:00 PM	In Use	In Use	In Use	In Use	In Use
4:00 PM	In Use	In Use	In Use	In Use	In Use
5:00 PM	In Use	In Use	In Use	In Use	In Use
6:00 PM	In Use	In Use	In Use	In Use	In Use
7:00 PM	In Use	In Use	In Use	In Use	In Use
8:00 PM	In Use	In Use			
Total Hours	14	13	12	10	10

Cardio Equipment Usage – Page 39

VIDA Cardio Equipment	
Type	Number
Treadmill	36
Elliptical	25
Stairmaster	4
Upright Bike	6
Recumbent	6
X-Trainer	8
Arc Trainer	5
Spin	30
Total	120

(Average Hourly Use) × (# of Cardio Machines) = Total Hours of Daily Use

(Hrs of Daily Use) × (Watts Per Hr Generated) = Watts Per Day Generated

(Watts Per Day Generated) × (Days Per Year) = Watts Per Year Generated

Cardio Equipment Usage Summary Per Equipment Type

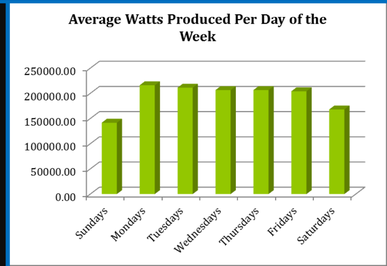
Day	Treadmills	Ellipticals	Stair Masters	Upright Bikes	Recumbent Bikes	Daily Average
Sundays	14.00	13.00	12.00	10.00	10.00	11.80
Mondays	18.00	18.00	18.00	18.00	18.00	18.00
Tuesdays	18.00	18.00	18.00	17.00	17.00	17.60
Wednesdays	18.00	18.00	17.00	17.00	16.00	17.20
Thursdays	18.00	18.00	18.00	16.00	16.00	17.20
Fridays	18.00	18.00	17.00	16.00	16.00	17.00
Saturdays	14.00	14.00	14.00	14.00	14.00	14.00
Average	16.86	16.71	16.29	15.43	15.29	16.11

Wattage Generation Calculations – Page 40

Average Watts Produced Per Day of the Week

Day	Daily Hours of Use	Watts Produced Per Hour	Number of Machines	Watts Produced Per Day
Sundays	11.80	100.00	120.00	141600.00
Mondays	18.00	100.00	120.00	216000.00
Tuesdays	17.60	100.00	120.00	211200.00
Wednesdays	17.20	100.00	120.00	206400.00
Thursdays	17.20	100.00	120.00	206400.00
Fridays	17.00	100.00	120.00	204000.00
Saturdays	14.00	100.00	120.00	168000.00
Average	16.11			193371.43

ReRev provided approximate energy production to be 100 watts/hour



ReRev Cost Analysis– Page 41

Annual Kilowatt Savings:

$$(Avg\ Cost\ Per\ kW) \times \frac{Watts\ Per\ Yr\ Generated}{1000\ Watts} = kW\ Savings\ for\ Year\ One$$

$$(kW\ Savings\ From\ Previous\ Yr) \times (5\%\ Energy\ Rise) = Yearly\ kW\ Savings$$

Annual Air Conditioning Savings:

$$(kW\ Savings/Yr) \times (\%\ AC\ Savings) \times \frac{Months\ of\ AC\ Use}{12\ Months\ Per\ Yr} = Annual\ AC\ Savings$$

Total Annual Savings:

$$(Annual\ kW\ Savings) + (Annual\ AC\ Savings) = Total\ Annual\ Cost\ Savings$$

System Payback– Page 42

System Information	
Price	$148,000.00
Number of Machines	120
Hours per day usage	16.11
Average Watts per hour	100
Watts per Day	193,320
Days in Year	363
Watts per Year	70,175,160
Cost per kW	$0.129
Energy Rise per Year	5.00%
A/C Savings %	30.00%
Months of A/C Savings	11.43

ReRev System Proposal provided total cost to be $148,000

ReRev System Annual Savings Calculations

Year	Annual KW Savings	Annual A/C Savings	Total Savings	Potential Profit	Simple Payback
1	$ 9,080.67	$ 2,594.80	$ 11,675.47	$ (136,324.53)	
2	$ 9,534.70	$ 2,724.54	$ 23,934.71	$ (124,065.29)	
3	$ 10,011.43	$ 2,860.77	$ 36,806.91	$ (111,193.09)	
4	$ 10,512.01	$ 3,003.81	$ 50,322.72	$ (97,677.28)	
5	$ 11,037.61	$ 3,154.00	$ 64,514.32	$ (83,485.68)	
6	$ 11,589.49	$ 3,311.70	$ 79,415.50	$ (68,584.50)	
7	$ 12,168.96	$ 3,477.28	$ 95,061.74	$ (52,938.26)	
8	$ 12,777.41	$ 3,651.14	$ 111,490.30	$ (36,509.70)	
9	$ 13,416.28	$ 3,833.70	$ 128,740.28	$ (19,259.72)	
10	$ 14,087.09	$ 4,025.39	$ 146,852.76	$ (1,147.24)	
11	$ 14,791.45	$ 4,226.66	$ 165,870.86	$ 17,870.86	11

System Payback With Incentives– Page 45

ReRev System Annual Savings Calculations With Incentives

Year	Annual KW Savings	Annual A/C Savings	Potential Pepco Incentive	Potential REIP Incentive	Total Savings	Potential Profit
1	$ 9,080.67	$ 2,594.80	$ 14,311.10	$ 16,500.00	$ 42,486.57	$ (105,513.43)
2	$ 9,534.70	$ 2,724.54	$ -	$ 16,500.00	$ 71,245.81	$ (76,754.19)
3	$ 10,011.43	$ 2,860.77	$ -	$ 16,500.00	$ 100,618.01	$ (47,381.99)
4	$ 10,512.01	$ 3,003.81	$ -	$ 16,500.00	$ 130,633.82	$ (17,366.18)
5	$ 11,037.61	$ 3,154.00	$ -	$ 16,500.00	$ 161,325.42	$ 13,325.42
6	$ 11,589.49	$ 3,311.70	$ -	$ 16,500.00	$ 192,726.60	$ 44,726.60
7	$ 12,168.96	$ 3,477.28	$ -	$ 16,500.00	$ 224,872.84	$ 76,872.84
8	$ 12,777.41	$ 3,651.14	$ -	$ 16,500.00	$ 257,801.40	$ 109,801.40
9	$ 13,416.28	$ 3,833.70	$ -	$ 16,500.00	$ 291,551.38	$ 143,551.38
10	$ 14,087.09	$ 4,025.39	$ -	$ 16,500.00	$ 326,163.86	$ 178,163.86
11	$ 14,791.45	$ 4,226.66	$ -	$ 16,500.00	$ 361,681.96	$ 213,681.96
12	$ 15,531.02	$ 4,437.99	$ -	$ 16,500.00	$ 398,150.97	$ 250,150.97
13	$ 16,307.57	$ 4,659.89	$ -	$ 16,500.00	$ 435,618.43	$ 287,618.43
14	$ 17,122.95	$ 4,892.88	$ -	$ 16,500.00	$ 474,134.26	$ 326,134.26
15	$ 17,979.10	$ 5,137.53	$ -	$ 16,500.00	$ 513,750.88	$ 365,750.88
16	$ 18,878.05	$ 5,394.40	$ -	$ 16,500.00	$ 554,523.34	$ 406,523.34
17	$ 19,821.95	$ 5,664.12	$ -	$ 16,500.00	$ 596,509.42	$ 448,509.42
18	$ 20,813.05	$ 5,947.33	$ -	$ 16,500.00	$ 639,769.80	$ 491,769.80
19	$ 21,853.70	$ 6,244.70	$ -	$ 16,500.00	$ 684,368.20	$ 536,368.20
20	$ 22,946.39	$ 6,556.93	$ -	$ 16,500.00	$ 730,371.52	$ 582,371.52
21	$ 24,093.71	$ 6,884.78	$ -	$ 16,500.00	$ 777,850.01	$ 629,850.01
22	$ 25,298.39	$ 7,229.02	$ -	$ 16,500.00	$ 826,877.42	$ 678,877.42

Energy Impact– Page 42

Case Study on The California State University of San Bernardino

The 38,000 square foot fitness facility on campus had 20 machines retrofitted with ReRev back in 2009.

This fitness center uses approximately 2,100 kilowatt hours of electricity per day.

$$\frac{kW\ Hours\ Used\ Per\ Day}{Total\ Square\ Feet} = Kilowatt\ Hours\ Used\ Per\ SF\ of\ a\ Fitness\ Center$$

$$(kWHrs\ Used\ Per\ SF) \times (VIDA\ SF) = Kilowatt\ Hours\ Used\ Per\ Day\ at\ VIDA$$

$$\frac{Kilowatt\ Hours\ Generated\ Per\ Day}{Kilowatt\ Hours\ Used\ Per\ Day} = Percent\ of\ Total\ Energy\ Generated$$

Energy Impact– Page 43

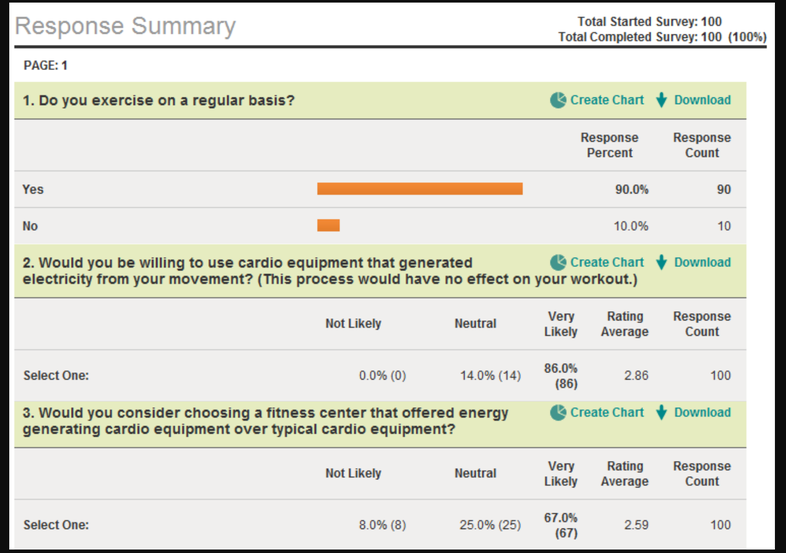
The estimated kilowatt hours per square foot used for one day was found to be approximately 0.055 kWh/SF.

The kilowatt hours used daily at VIDA comes to approximately 3336.24 kWh/day or 1,217,726.45 kWh/year.

The percentage of energy generated was estimated to be 5.76%.

Greater than 5% in Renewable Energy Generation adds an additional 3 points to the LEED Scorecard making VIDA applicable for LEED Gold

Social Impact – Page 43



Response Summary

Total Started Survey: 100
Total Completed Survey: 100 (100%)

PAGE: 1

1. Do you exercise on a regular basis? Create Chart Download

	Response Percent	Response Count
Yes	90.0%	90
No	10.0%	10

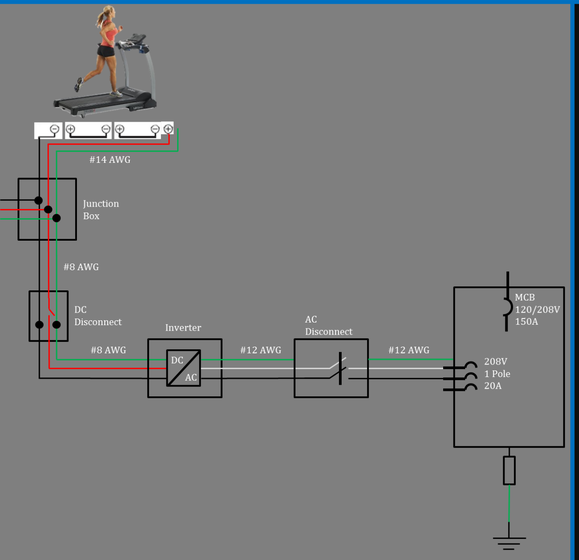
2. Would you be willing to use cardio equipment that generated electricity from your movement? (This process would have no effect on your workout.) Create Chart Download

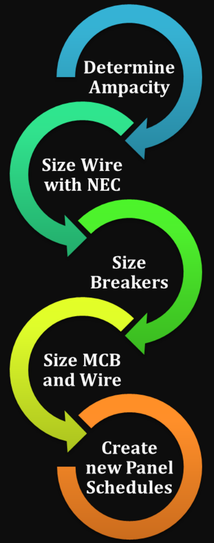
	Not Likely	Neutral	Very Likely	Rating Average	Response Count
Select One:	0.0% (0)	14.0% (14)	86.0% (86)	2.86	100

3. Would you consider choosing a fitness center that offered energy generating cardio equipment over typical cardio equipment? Create Chart Download

	Not Likely	Neutral	Very Likely	Rating Average	Response Count
Select One:	8.0% (8)	25.0% (25)	67.0% (67)	2.59	100

Electrical Breadth – Wire/Breaker Sizing – Page 46





Electrical Breadth – Panel Sizing – Page 46

PANEL SCHEDULE	Amps = 150	AIC = 10,000
Volts = 208/120	Mounting = Surface	Type = MCB
Phase / Wire = 3Φ 4W	Fed From = DPB	Spaces = 12

REV 1

CKT NO	NO	LOAD	TRIP	POLE	VOLT	kVA	WIRE	COND
1	1 - ReRev Inverter		20	1	208	3.6	3 #12 + 1#12g	3/4" EMT
2	2 - ReRev Inverter		20	1	208	3.6	3 #12 + 1#12g	3/4" EMT
3	3 - ReRev Inverter		20	1	208	3.6	3 #12 + 1#12g	3/4" EMT
4	4 - ReRev Inverter		20	1	208	3.6	3 #12 + 1#12g	3/4" EMT
5	5 - ReRev Inverter		20	1	208	3.6	3 #12 + 1#12g	3/4" EMT
6	6 - ReRev Inverter		20	1	208	3.6	3 #12 + 1#12g	3/4" EMT

PANEL SCHEDULE	Amps = 800	AIC = Existing
Volts = 208/120	Mounting = Surface	Type = 800A Main
Phase / Wire = 3Φ 4W	Fed From = MDB	Spaces = SWBD

DPB

CKT NO	NO	LOAD	TRIP	POLE	VOLT	kVA	WIRE	COND
1	1 - Panel 1A		200	3	208	30	3 #12 + 1#12g	3/4" EMT
2	2 - Panel 2A		200	3	208	23	3 #12 + 1#12g	3/4" EMT
3	3 - Panel 3A		200	3	208	13	3 #12 + 1#12g	3/4" EMT
4	4 - Panel REV1		150	3	208	22	3 #12 + 1#12g	3/4" EMT
5	5 - Panel 5A		200	3	208	20	3 #12 + 1#12g	3/4" EMT
						108 = Total kVA Connected		

Electrical Breadth - Equations

$$\frac{Watts}{Volts} = Amps \times Power\ Factor$$

$$\frac{3600\ Watts}{208\ Volts} = 17.3\ Amps$$

$$(\#\ of\ Breakers) \times (Ampacity\ of\ Wires) = Ampacity\ of\ Main\ Circuit\ Breaker$$

$$(6) \times (17.3\ Amps) = 103.8\ Amps$$

$$(Ampacity\ of\ MCB) \times (\%\ Spare) = Adjusted\ Ampacity\ of\ MCB$$

$$(103.8) \times (25\%) = 129.8\ Amps$$

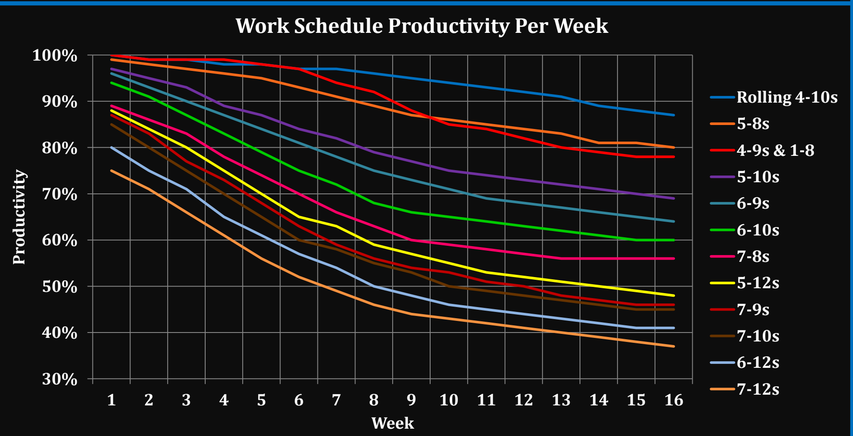
Subcontractors Present on Site – Page 53

Subcontractors Present on Site

	Date	Steel Sub	Masonry Sub	Electrical Sub	Plumbing Sub	Drywall Sub	Mechanical Sub
WEEK 1	3/28/2011		X	X	X		X
	3/29/2011		X	X	X		X
	3/30/2011		X	X	X	X	X
	3/31/2011		X	X	X	X	X
	4/1/2011		X	X	X	X	X
	4/2/2011		X	X	X	X	X
WEEK 2	4/4/2011		X	X	X		
	4/5/2011	X	X	X	X	X	
	4/6/2011	X	X	X	X	X	
	4/7/2011	X	X	X	X	X	
	4/8/2011	X	X	X	X	X	X
	4/9/2011			X	X		X
WEEK 3	4/11/2011	X	X	X	X		X
	4/12/2011	X	X	X	X	X	X
	4/13/2011	X	X	X	X	X	X
	4/14/2011	X	X	X	X	X	X
	4/15/2011	X	X	X	X	X	X
	4/16/2011	X	X	X	X	X	X
WEEK 4	4/18/2011	X	X	X	X	X	X
	4/19/2011	X	X	X	X	X	X
	4/20/2011	X	X	X	X	X	X
	4/21/2011	X	X	X	X	X	X
	4/22/2011	X	X	X	X	X	X
	4/23/2011	X	X	X	X		X
WEEK 5	4/25/2011		X	X	X	X	X
	4/26/2011	X	X	X	X	X	X
	4/27/2011	X	X	X	X	X	X
	4/28/2011	X	X	X	X	X	X
	4/29/2011	X	X	X	X	X	
	4/30/2011	X	X		X	X	X

Productivity Loss Calculations – Page 53

Productivity levels decrease with: Increases in the number of work hours and work days per week



Wage Loss Calculations – Page 54

Electrical Subcontractor Lost Wages (6-12s)

Week	Regular Hrs/ Wk	OT Hrs/ Wk	Produc-tivity	Effective Regular Hrs	Effective OT Hrs	Regular Hrs Lost	OT Hrs Lost	Avg Laborer $/Hr	OT Laborer $/Hr	Lost $ Per Laborer	Avg Labor/ Wk	Total Lost Wages
1	40	32	0.80	32.0	25.6	8.0	6.4	$48.25	$72.38	$ 849.20	6	$ 5,095.20
2	40	32	0.75	30.0	24.0	10.0	8.0	$48.25	$72.38	$ 1,061.50	9	$ 9,553.50
3	40	32	0.71	28.4	22.7	11.6	9.3	$48.25	$72.38	$ 1,231.34	9	$ 11,082.06
4	40	32	0.65	26.0	20.8	14.0	11.2	$48.25	$72.38	$ 1,486.10	11	$ 16,347.10
5	40	32	0.61	24.4	19.5	15.6	12.5	$48.25	$72.38	$ 1,655.94	11	$ 18,215.34
6	40	32	0.57	22.8	18.2	17.2	13.8	$48.25	$72.38	$ 1,825.78	9	$ 16,432.02
7	40	32	0.54	21.6	17.3	18.4	14.7	$48.25	$72.38	$ 1,953.16	8	$ 15,625.28
8	40	32	0.50	20.0	16.0	20.0	16.0	$48.25	$72.38	$ 2,123.00	9	$ 19,107.00
9	40	32	0.48	19.2	15.4	20.8	16.6	$48.25	$72.38	$ 2,207.92	10	$ 22,079.20
10	40	32	0.46	18.4	14.7	21.6	17.3	$48.25	$72.38	$ 2,292.84	10	$ 22,928.40
11	40	32	0.45	18.0	14.4	22.0	17.6	$48.25	$72.38	$ 2,335.30	9	$ 21,017.70
12	40	32	0.44	17.6	14.1	22.4	17.9	$48.25	$72.38	$ 2,377.76	12	$ 28,533.12
13	40	32	0.43	17.2	13.8	22.8	18.2	$48.25	$72.38	$ 2,420.22	12	$ 29,042.64
14	40	32	0.42	16.8	13.4	23.2	18.6	$48.25	$72.38	$ 2,462.68	15	$ 36,940.20
15	40	32	0.41	16.4	13.1	23.6	18.9	$48.25	$72.38	$ 2,505.14	12	$ 30,061.68
16	40	32	0.41	16.4	13.1	23.6	18.9	$48.25	$72.38	$ 2,505.14	11	$ 27,556.54
Totals				345.2	276.2	294.8	235.8			$31,293.02		$329,616.98

Total Lost Wages per Subcontractor (6-12s)

Steel Sub	Masonry Sub	Electrical Sub	Plumbing Sub	Drywall Sub	Mechanical Sub	Total
$ 205,874.14	$ 151,021.89	$ 329,616.98	$ 299,003.37	$ 224,169.08	$ 329,796.02	$ 1,539,481.48

Alternative Schedules – Page 59

Alternative Schedules – Page 59

Work Schedule Alternatives - Part 1

	Rolling 4-10s			4-9s & 1-8			5-8s			5-10s		
Week	Weekly Hrs	Produc-tivity	Effective Hrs	Weekly Hrs	Produc-tivity	Effective Hrs	Weekly Hrs	Produc-tivity	Effective Hrs	Weekly Hrs	Produc-tivity	Effective Hrs
1	40	1.00	40.0	44	1.00	44.0	40	0.99	39.6	50	0.97	48.5
2	40	0.99	39.6	44	0.99	43.6	40	0.98	39.2	50	0.95	47.5
3	40	0.99	39.6	44	0.99	43.6	40	0.97	38.8	50	0.93	46.5
4	40	0.98	39.2	44	0.99	43.6	40	0.96	38.4	50	0.89	44.5
5	40	0.98	39.2	44	0.98	43.1	40	0.95	38.0	50	0.87	43.5
6	40	0.97	38.8	44	0.97	42.7	40	0.93	37.2	50	0.84	42.0
7	40	0.97	38.8	44	0.94	41.4	40	0.91	36.4	50	0.82	41.0
8	40	0.96	38.4	44	0.92	40.5	40	0.89	35.6	50	0.79	39.5
9	40	0.95	38.0	44	0.88	38.7	40	0.87	34.8	50	0.77	38.5
10	40	0.94	37.6	44	0.85	37.4	40	0.86	34.4	50	0.75	37.5
11	40	0.93	37.2	44	0.82	36.1	40	0.85	34.0	50	0.74	37.0
12	40	0.92	36.8	44	0.78	34.3	40	0.84	33.6	50	0.73	36.5
13	40	0.91	36.4	44	0.79	34.8	40	0.83	33.2	50	0.72	36.0
14	40	0.89	35.6	44	0.79	34.8	40	0.81	32.4	50	0.71	35.5
15	40	0.88	35.2	44	0.79	34.8	40	0.81	32.4	50	0.70	35.0
16	40	0.87	34.8	44	0.79	34.8	40	0.80	32.0	50	0.69	34.5
Totals			605.2			627.9			570.0			643.5

Work Schedule Alternatives - Part 2

	6-9s			6-10s			7-8s			5-12s		
Week	Weekly Hrs	Produc-tivity	Effective Hrs	Weekly Hrs	Produc-tivity	Effective Hrs	Weekly Hrs	Produc-tivity	Effective Hrs	Weekly Hrs	Produc-tivity	Effective Hrs
1	54	0.96	51.8	60	0.94	56.4	56	0.89	49.8	60	0.88	52.8
2	54	0.93	50.2	60	0.91	54.6	56	0.86	48.2	60	0.84	50.4
3	54	0.90	48.6	60	0.87	52.2	56	0.83	46.5	60	0.80	48.0
4	54	0.87	47.0	60	0.83	49.8	56	0.78	43.7	60	0.75	45.0
5	54	0.84	45.4	60	0.79	47.4	56	0.74	41.4	60	0.70	42.0
6	54	0.81	43.7	60	0.75	45.0	56	0.7	39.2	60	0.65	39.0
7	54	0.78	42.1	60	0.72	43.2	56	0.66	37.0	60	0.63	37.8
8	54	0.75	40.5	60	0.68	40.8	56	0.63	35.3	60	0.59	35.4
9	54	0.73	39.4	60	0.66	39.6	56	0.6	33.6	60	0.57	34.2
10	54	0.71	38.3	60	0.65	39.0	56	0.59	33.0	60	0.55	33.0
11	54	0.69	37.3	60	0.64	38.4	56	0.58	32.5	60	0.53	31.8
12	54	0.68	36.7	60	0.63	37.8	56	0.57	31.9	60	0.52	31.2
13	54	0.67	36.2	60	0.62	37.2	56	0.56	31.4	60	0.51	30.6
14	54	0.66	35.6	60	0.61	36.6	56	0.56	31.4	60	0.50	30.0
15	54	0.65	35.1	60	0.60	36.0	56	0.56	31.4	60	0.49	29.4
16	54	0.64	34.6	60	0.60	36.0	56	0.56	31.4	60	0.48	28.8
Totals			662.6			690.0			597.5			599.4

Work Schedule Alternatives - Part 3

	7-9s			7-10s			6-12s			7-12s		
Week	Weekly Hrs	Produc-tivity	Effective Hrs	Weekly Hrs	Produc-tivity	Effective Hrs	Weekly Hrs	Produc-tivity	Effective Hrs	Weekly Hrs	Produc-tivity	Effective Hrs
1	63	0.87	54.8	70	0.85	59.5	72	0.80	57.6	84	0.75	63.0
2	63	0.83	52.3	70	0.80	56.0	72	0.75	54.0	84	0.71	59.6
3	63	0.77	48.5	70	0.75	52.5	72	0.71	51.1	84	0.66	55.4
4	63	0.73	46.0	70	0.70	49.0	72	0.65	46.8	84	0.61	51.2
5	63	0.68	42.8	70	0.65	45.5	72	0.61	43.9	84	0.56	47.0
6	63	0.63	39.7	70	0.60	42.0	72	0.57	41.0	84	0.52	43.7
7	63	0.59	37.2	70	0.58	40.6	72	0.54	38.9	84	0.49	41.2
8	63	0.56	35.3	70	0.55	38.5	72	0.50	36.0	84	0.46	38.6
9	63	0.54	34.0	70	0.53	37.1	72	0.48	34.6	84	0.44	37.0
10	63	0.53	33.4	70	0.50	35.0	72	0.46	33.1	84	0.43	36.1
11	63	0.51	32.1	70	0.49	34.3	72	0.45	32.4	84	0.42	35.3
12	63	0.50	31.5	70	0.48	33.6	72	0.44	31.7	84	0.41	34.4
13	63	0.48	30.2	70	0.47	32.9	72	0.43	31.0	84	0.4	33.6
14	63	0.47	29.6	70	0.46	32.2	72	0.42	30.2	84	0.39	32.8
15	63	0.46	29.0	70	0.45	31.5	72	0.41	29.5	84	0.38	31.9
16	63	0.46	29.0	70	0.45	31.5	72	0.41	29.5	84	0.37	31.1
Totals			605.4			651.7			621.4			672.0

Wage Loss Calculations – Page 60

Mechanical Subcontractor Lost Wages (4-9s & 1-8)

Chosen Week	Regular Hrs/ Wk	OT Hrs/ Wk	Produc-tivity	Effective Regular Hrs	Effective OT Hrs	Regular Hrs Lost	OT Hrs Lost	Avg Laborer $/Hr	OT Laborer $/Hr	Lost $ Per Laborer	Avg Labor Per Wk	Total Lost Wages
3	40	4	1.00	40.0	4.0	0.0	0.0	$45.95	$68.93	$ -	3	$ -
4	40	4	0.99	39.6	4.0	0.4	0.0	$45.95	$68.93	$ 21.14	8	$ 169.10
5	40	4	0.99	39.6	4.0	0.4	0.0	$45.95	$68.93	$ 21.14	4	$ 84.55
6	40	4	0.99	39.6	4.0	0.4	0.0	$45.95	$68.93	$ 21.14	10	$ 211.37
7	40	4	0.98	39.2	3.9	0.8	0.1	$45.95	$68.93	$ 42.27	11	$ 465.01
8	40	4	0.97	38.8	3.9	1.2	0.1	$45.95	$68.93	$ 63.41	13	$ 824.34
9	40	4	0.94	37.6	3.8	2.4	0.2	$45.95	$68.93	$ 126.82	12	$ 1,521.86
10	40	4	0.92	36.8	3.7	3.2	0.3	$45.95	$68.93	$ 169.10	12	$ 2,029.15
11	40	4	0.88	35.2	3.5	4.8	0.5	$45.95	$68.93	$ 253.64	11	$ 2,790.08
12	40	4	0.85	34.0	3.4	6.0	0.6	$45.95	$68.93	$ 317.06	12	$ 3,804.66
13	40	4	0.82	32.8	3.3	7.2	0.7	$45.95	$68.93	$ 380.47	12	$ 4,565.59
14	40	4	0.78	31.2	3.1	8.8	0.9	$45.95	$68.93	$ 465.01	12	$ 5,580.17
15	40	4	0.79	31.6	3.2	8.4	0.8	$45.95	$68.93	$ 443.88	12	$ 5,326.52
16	40	4	0.79	31.6	3.2	8.4	0.8	$45.95	$68.93	$ 443.88	11	$ 4,882.65
17	40	4	0.79	31.6	3.2	8.4	0.8	$45.95	$68.93	$ 443.88	12	$ 5,326.52
18	40	4	0.79	31.6	3.2	8.4	0.8	$45.95	$68.93	$ 443.88	12	$ 5,326.52
Totals				570.8	57.1	69.2	6.9			$3,656.70		$42,908.11

Cost Comparison – Page 60

Comparison of Lost Wages Between Actual and Proposed Work Schedules

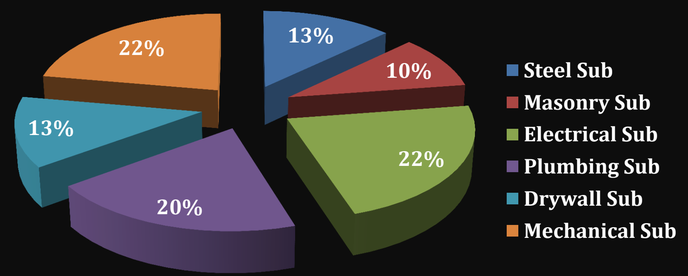
Schedule	Steel Sub	Masonry Sub	Electrical Sub	Plumbing Sub	Drywall Sub	Mechanical Sub	Total
6-12s	$205,874.14	$151,021.89	$329,616.98	$299,003.37	$224,169.08	$329,796.02	$ 1,539,481.48
4-9s & 1-8	$ 24,883.66	$ 18,826.21	$ 43,147.08	$ 38,423.87	$ 24,601.18	$ 42,908.11	$ 192,790.11
Savings	$180,990.48	$132,195.68	$286,469.90	$260,579.50	$199,567.90	$286,887.91	$1,346,691.37
% Savings	88%	88%	87%	87%	89%	87%	87%

6-9s Schedule Vs 4-9s & 1-8 Schedule

6-9s Schedule	4-9s & 1-8 Schedule
72 Work Week Hours	44 Work Week Hours
6 Work Days Per Week	5 Work Days Per Week
41% Productivity After 16 Weeks	79% Productivity After 16 Weeks
$1,539,481 Lost Wages	$192,790 Lost Wages

The 4-9s & 1-8 Schedule Saved $1,346,619 in Labor Costs

Cost Comparison – Page 61



Decreased Preconstruction Durations – Page 70

Task Durations Savings Per VIDA Gym - Part 1

Task Name	U Street Durations (Days)					Metropole Durations (Days)				
	Actual	Savings			New	Actual	Savings			New
		Min (75%)	Max (85%)	Avg (80%)			Min (75%)	Max (85%)	Avg (80%)	
Structural Steel Shop Drawings	10.00	7.50	8.50	8.00	2.00	8.13	6.09	6.91	6.50	1.63
Review Structural Steel Shop Drawings	10.00	7.50	8.50	8.00	2.00	8.13	6.09	6.91	6.50	1.63
Monumental Stair Submittals	10.00	7.50	8.50	8.00	2.00	8.13	6.09	6.91	6.50	1.63
Fabricate Structural Steel	20.00	15.00	17.00	16.00	4.00	16.25	12.19	13.81	13.00	3.25
Monumental Stair Submittal Review	10.00	7.50	8.50	8.00	2.00	8.13	6.09	6.91	6.50	1.63
Fabricate Monumental Stair	25.00	18.75	21.25	20.00	5.00	20.31	15.23	17.27	16.25	4.06
TOTAL	85.00	63.75	72.25	68.00	17.00	69.06	51.80	58.70	55.25	13.81

Decreased Preconstruction Durations – Page 71

Task Durations Savings Per VIDA Gym - Part 2

Task Name	Verizon Center Durations (Days)					Renaissance Hotel Durations (Days)				
	Actual	Savings			New	Actual	Savings			New
		Min (75%)	Max (85%)	Avg (80%)			Min (75%)	Max (85%)	Avg (80%)	
Structural Steel Shop Drawings	7.50	5.63	6.38	6.00	1.50	4.00	3.00	3.40	3.20	0.80
Review Structural Steel Shop Drawings	7.50	5.63	6.38	6.00	1.50	4.00	3.00	3.40	3.20	0.80
Monumental Stair Submittals	7.50	5.63	6.38	6.00	1.50	4.00	3.00	3.40	3.20	0.80
Fabricate Structural Steel	15.00	11.25	12.75	12.00	3.00	8.00	6.00	6.80	6.40	1.60
Monumental Stair Submittal Review	7.50	5.63	6.38	6.00	1.50	4.00	3.00	3.40	3.20	0.80
Fabricate Monumental Stair	18.75	14.06	15.94	15.00	3.75	10.00	7.50	8.50	8.00	2.00
TOTAL	63.75	47.81	54.19	51.00	12.75	34.00	25.50	28.90	27.20	6.80

Decreased Preconstruction Durations – Page 71

Task Durations Savings Summary Per VIDA Gym

Task Name	U Street Durations		Metropole Durations		Verizon Center Durations		Renaissance Durations	
	Actual	New	Actual	New	Actual	New	Actual	New
Structural Steel Shop Drawings	10.00	2.00	8.13	1.63	7.50	1.50	4.00	0.80
Review Structural Steel Shop Drawings	10.00	2.00	8.13	1.63	7.50	1.50	4.00	0.80
Monumental Stair Submittals	10.00	2.00	8.13	1.63	7.50	1.50	4.00	0.80
Fabricate Structural Steel	20.00	4.00	8.13	3.25	15.00	3.00	8.00	1.60
Monumental Stair Submittal Review	10.00	2.00	16.25	1.63	7.50	1.50	4.00	0.80
Fabricate Monumental Stair	25.00	5.00	8.13	4.06	18.75	3.75	10.00	2.00
TOTAL	85.00	17.00	56.88	13.83	63.75	12.75	34.00	6.80


Start Process
Identify Ductwork Areas and Boundaries
All Disciplines
Develop Initial Ductwork Layout
Mechanical Designer
Perform Load Calculation and CPM per Area
Mechanical Designer
Size Ductwork Accordingly
Mechanical Designer
Analyze Air Friction Loss
Mechanical Designer
Analyze Duct Heatflow and Airflow Leakage
Mechanical Designer
Analyze Duct Material and Shape Options
Mechanical Designer
Analyze Noise Levels
Mechanical Designer
Analyze Space Availability
Mechanical Designer
Analyze Overall Aesthetics
Architect
Analyze Installation Logistics and Constructability
Contractor
Analyze Installation Cost
Contractor
Produce Ductwork Documents
Mechanical Designer
End Process