

# Spring Run Assisted Living

Willow Street, PA



*Andrew Solomon*

*Senior Thesis 2006*

*Structural Discipline*



# Spring Run Assisted Living

Willow Street, PA

↪ *Introduction*

*Background*

*Current Design*

*Proposed Design*

*Exterior Wall Design*

*Cost Analysis*

*Schedule Analysis*

*Conclusions*

## Outline of Presentation

Background

Current Structural Design

Proposed Structural Design

Exterior Wall Design

Cost Analysis

Schedule Analysis

Conclusion



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## Project Team (Design-Build project)

Owner – Willow Valley Retirement Community, Inc.

Designer/Builder – Paul Risk Associates, Inc.

Architect – Bernardon Haber Holloway Architects

Structural Eng. – Baker Ingram and Associates

Mechanical Consultant – Protech



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## General Information:

Located 5 miles south of Lancaster Borough

4 Stories w/ partial basement

116,200 square feet

126 assisted living units

Estimated cost - \$11.8 Million



# Spring Run Assisted Living

## Willow Street, PA

Introduction

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Current Design

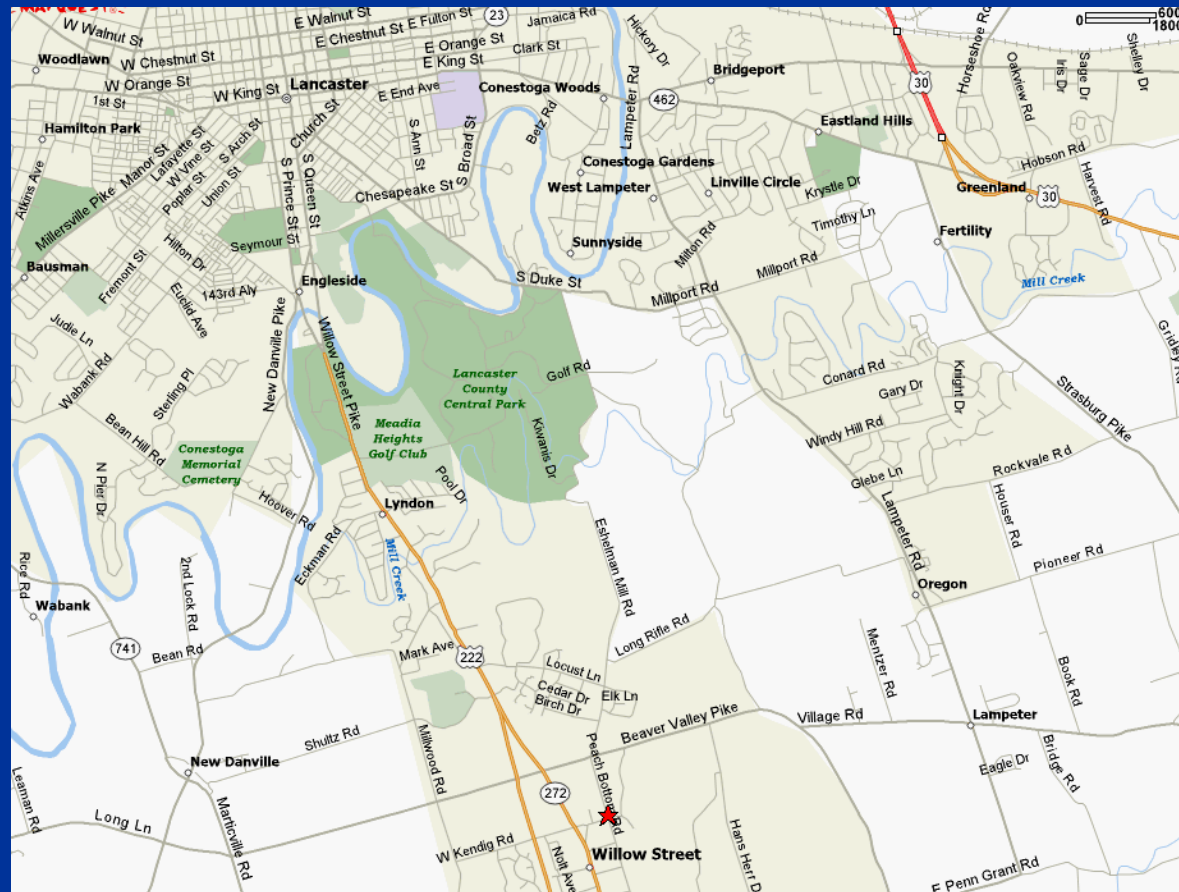
Proposed Design

Exterior Wall Design

Cost Analysis

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Conclusions





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## Current Structural Design:

Load bearing masonry walls

Grouted & reinforced – shear walls

8" hollow core pre-cast plank flooring

Meets 2 hr fire-rating

Several steel columns and lintels

Column spread footings and wall footings used respectively



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### Current Structural Design – Shortcomings:

No freedom for future changes

Use of planks restrict span lengths

Reinforcement for masonry walls are labor intensive



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## Proposed Structural Design:

Structural steel skeleton w/ mtl. form deck and concrete slab

20 gage TF125 form deck – 5” total slab depth

Spread footings for columns

Stairwells and elevator shafts are masonry

-All other masonry walls eliminated

-Require wall footings

Cementitious fire proofing to achieve 2 hr. rating

Increase basement to full basement





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## Codes:

LRFD Third Edition, AISC

IBC 2003, ICC

IFC 2003, ICC

ASCE 7-02, ASCE

## Catalogues:

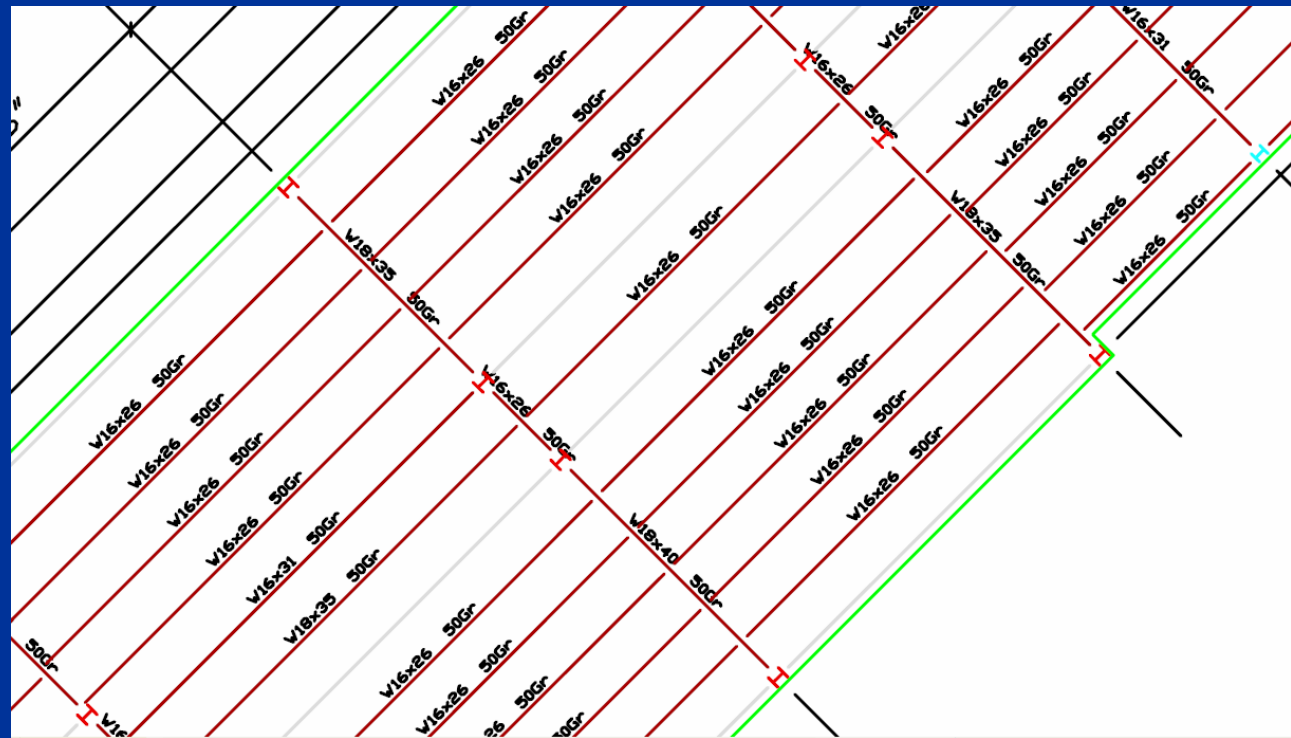
Wheeling Deck Products



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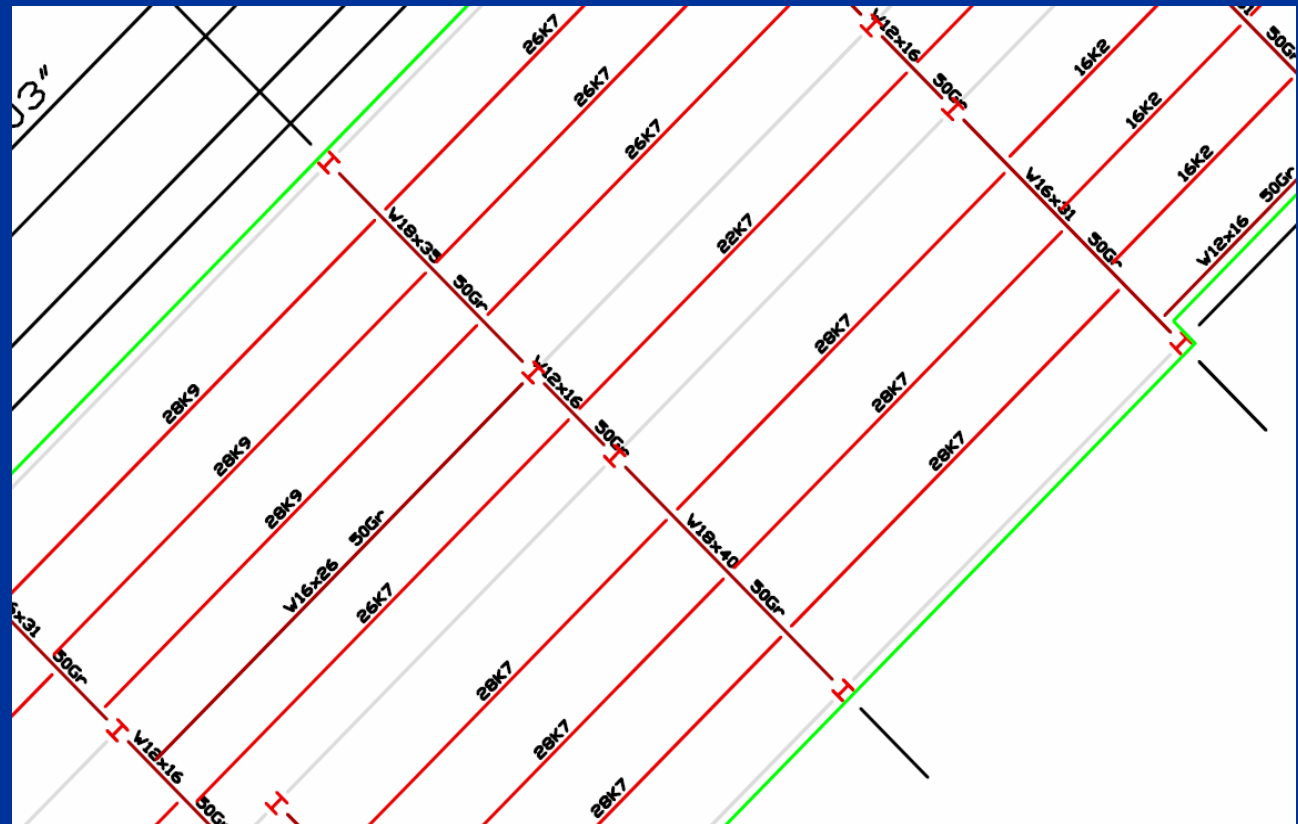




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Required insulation value from ASHRAE std. 90.1

Climate Zone 5A

Required  $U \leq 0.064$

Outdoor Design Conditions from ASHRAE Handbook of Fundamentals 2001

Summer – 93.2°F & 1% condition

Winter – 9°F & 99% condition

Psychometric Chart

Summer – 75°F & 50% relative humidity – DP = 55°F

Winter – 70°F & 50% relative humidity – DP = 51°F



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## New Exterior Wall Design (Mech. Breadth):

Outside Air – R = 0.33

4" Brick Veneer – R = 0.43

1" Air Space – R = 0.91

2" Rigid Insulation – R = 13.89

Vapor Barrier – R = 0.00

2x4 Mtl. Studs – R = 0.91

5/8" GWB – R = 0.56

Inside Air – R = 0.69

Required  $U \leq 0.064$  – Actual  $U = 0.056$  ✓

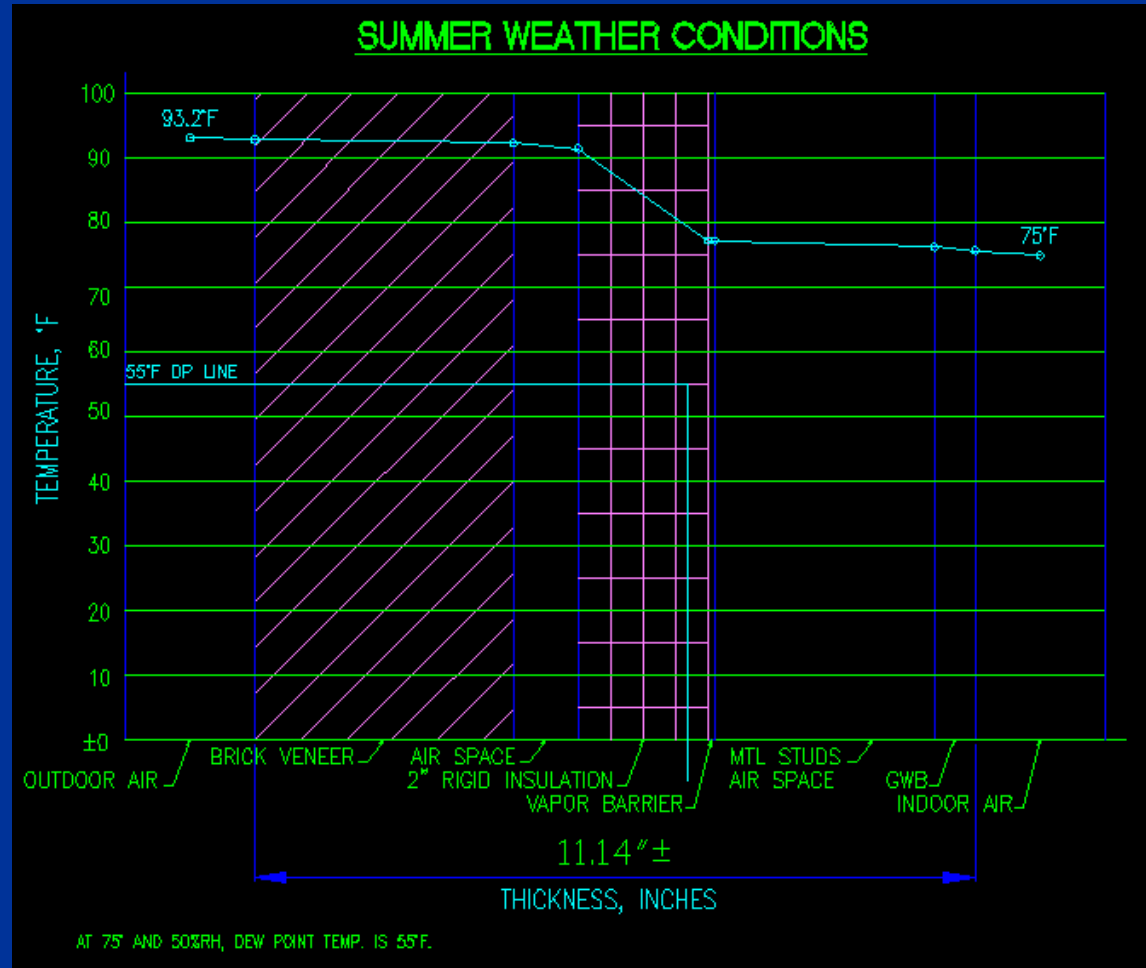
\*R values taken from HAAP



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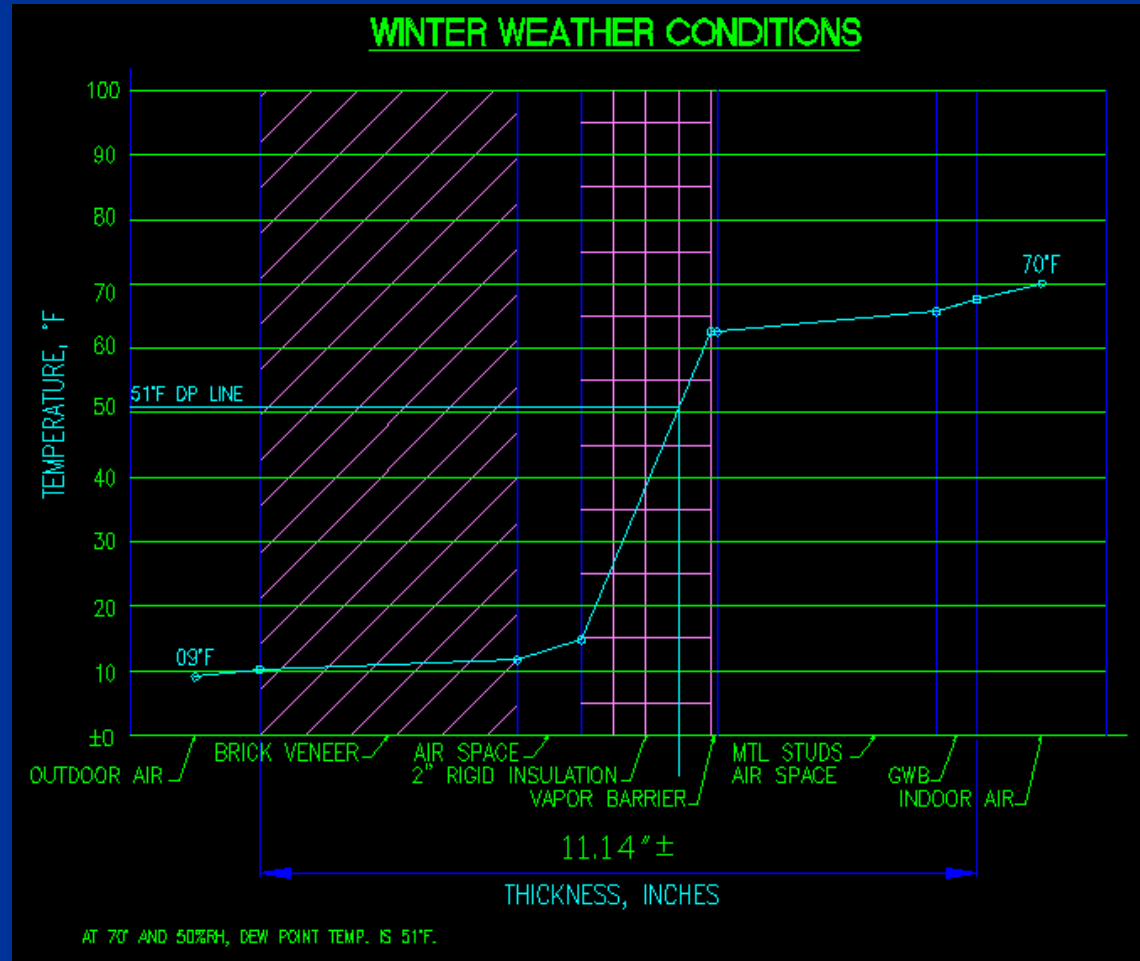




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### Cost Analysis:

Spring Run Assisted Living - Existing								
Qty	Assembly Number	Description	Unit	Mat.	Inst.	Total	Release	
17,000.000	A20101103500	Excav & f, 4000 SF, 16' d, sand, gravel, or com earth, on site storage	S.F.	0.00	110,500.00	110,500.00	2005	
24,800.000	A10301202240	Slab on grade, 4" thick, non industrial, reinforced	S.F.	35,216.00	44,392.00	79,608.00	2005	
39,400.000	B20101245330	Deep grv hol reinf blk wall, 8x8x16", 125 PCF wt, #5@16" vert reinf&gt sp	S.F.	208,820.00	244,280.00	453,100.00	2005	
20,000.000	B20101245330	Deep grv hol reinf blk wall, 8x8x16", 125 PCF wt, #5@24" vert reinf&gt sp	S.F.	102,000.00	118,000.00	222,000.00	2005	
20,000.000	B20101245320	Deep grv hol reinf blk wall, 8x8x16", 125 PCF wt, #5@32" vert reinf&gt sp	S.F.	98,000.00	110,000.00	208,000.00	2005	
20,000.000	B20101245300	Deep grv hol reinf blk wall, 8x8x16", 125 PCF wt, #4@48" vert reinf&gt sp	S.F.	94,000.00	106,000.00	200,000.00	2005	
0.000	C10101265500	Ptns/met, 5/8" fr drwl f, none b, 3-5/8"@24" OC fmg, nothing opp f, 0 insul	S.F.	0.00	0.00	0.00	2005	
0.000	C10101265400	Ptns/met, 5/8" fr drwl f, none base, 3-5/8"@24" OC fmg, same opp f, 0 insul	S.F.	0.00	0.00	0.00	2005	
24,800.000	B10102291300	Prctst plk w/no top, 30'span, 75PSF supimp, 8" tot d, 55PSF dl, 130PSF tot	S.F.	138,880.00	32,984.00	171,864.00	2005	
74,400.000	B10102303500	Prctst plk w/2" conc tp, 30'sp, 75PSF supimp, 10" tot d, 80PSF dl, 155PSF tot	S.F.	476,160.00	197,904.00	674,064.00	2005	
17,000.000	B10102303500	Prctst plk w/2" conc tp, 30'sp, 75PSF supimp, 10" tot d, 80PSF dl, 155PSF tot	S.F.	108,800.00	45,220.00	154,020.00	2005	
0.000	B10102580950	Met dk/conc f, 125 PSF supimp, 8' span, 20ga 1.5"d, 5" slb, 165 PSF tot	S.F.	0.00	0.00	0.00	2005	
0.000		Structural Steel (price given by CM on jobsite)	TON	0.00	0.00	0.00	2005	
0.000	78126000400	Cementitious Fireproofing, sprayed mineral fiber or cementitious for fireproofing, beams, 1 hour rated, 1-3/8" thick, excl. tamping or canvas protection	S.F.	0.00	0.00	0.00	2005	
<b>Totals</b>				<b>\$1,261,876.00</b>	<b>\$1,009,280.00</b>	<b>\$2,273,156.00</b>		

Spring Run Assisted Living - New								
Qty	Assembly Number	Description	Unit	Mat.	Inst.	Total	Release	
24,800.000	A20101103500	Excav & f, 4000 SF, 16' d, sand, gravel, or com earth, on site storage	S.F.	0.00	161,200.00	161,200.00	2005	
24,800.000	A10301202240	Slab on grade, 4" thick, non industrial, reinforced	S.F.	35,216.00	44,392.00	79,608.00	2005	
21,000.000	B20101245330	Deep grv hol reinf blk wall, 8x8x16", 125 PCF wt, #5@16" vert reinf&gt sp	S.F.	111,300.00	130,200.00	241,500.00	2005	
0.000	B20101245330	Deep grv hol reinf blk wall, 8x8x16", 125 PCF wt, #5@24" vert reinf&gt sp	S.F.	0.00	0.00	0.00	2005	
0.000	B20101245320	Deep grv hol reinf blk wall, 8x8x16", 125 PCF wt, #5@32" vert reinf&gt sp	S.F.	0.00	0.00	0.00	2005	
0.000	B20101245300	Deep grv hol reinf blk wall, 8x8x16", 125 PCF wt, #4@48" vert reinf&gt sp	S.F.	0.00	0.00	0.00	2005	
49,300.000	C10101265500	Ptns/met, 5/8" fr drwl f, none b, 3-5/8"@24" OC fmg, nothing opp f, 0 insul	S.F.	29,087.00	49,793.00	78,880.00	2005	
38,100.000	C10101265400	Ptns/met, 5/8" fr drwl f, none base, 3-5/8"@24" OC fmg, same opp f, 0 insul	S.F.	33,528.00	61,341.00	94,869.00	2005	
0.000	B10102291300	Prctst plk w/no top, 30'span, 75PSF supimp, 8" tot d, 55PSF dl, 130PSF tot	S.F.	0.00	0.00	0.00	2005	
0.000	B10102303500	Prctst plk w/2" conc tp, 30'sp, 75PSF supimp, 10" tot d, 80PSF dl, 155PSF tot	S.F.	0.00	0.00	0.00	2005	
0.000	B10102303500	Prctst plk w/2" conc tp, 30'sp, 75PSF supimp, 10" tot d, 80PSF dl, 155PSF tot	S.F.	0.00	0.00	0.00	2005	
99,200.000	B10102580950	Met dk/conc f, 125 PSF supimp, 8' span, 20ga 1.5"d, 5" slb, 165 PSF tot	S.F.	237,088.00	173,600.00	410,688.00	2005	
231.000		Structural Steel (price given by CM on jobsite)	TON	462,000.00	231,000.00	693,000.00	2005	
100,000.000	78126000400	Cementitious Fireproofing, sprayed mineral fiber or cementitious for fireproofing, beams, 1 hour rated, 1-3/8" thick, excl. tamping or canvas protection	S.F.	41,000.00	82,000.00	123,000.00	2005	
<b>Totals</b>				<b>\$949,219.00</b>	<b>\$933,526.00</b>	<b>\$1,882,745.00</b>		





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## Cost Analysis:

Cost of existing = \$2.27 Million

Cost of alternate design = \$1.88 Million

Savings = \$390,000 – 3.3%

## Considerations:

Existing – Earth removal, SOG, retaining walls, masonry bearing/shear walls, and planks w/ topping where relevant.

Alternate – Earth removal, SOG, basement retaining walls, structural steel, cementitious fireproofing, partitions, and exterior wall assembly.



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## Schedule Analysis:

Data compiled from Costworks 2005 and Bill Koch of Paul Risk and Associates.

Original construction duration

June 13<sup>th</sup> 2005 – April 14<sup>th</sup> 2006

Alternate construction duration

June 13<sup>th</sup> 2005 – July 5<sup>th</sup> 2006

~3 months difference



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## Conclusion:

Structural steel skeleton is a viable alternative

Savings of 3.3%

Increased duration ~3 months

Does not fall into current architecture

-Need to conceal columns



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## Final Recommendation:

The current design seems to outweigh the alternate design.



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