

# New Regional Medical Center

## East Norriton, PA



**Brian J. Nahas [Construction Management Option]**  
**Advisor: Dr. Robert Leicht**



# New Regional Medical Center

East Norriton, PA



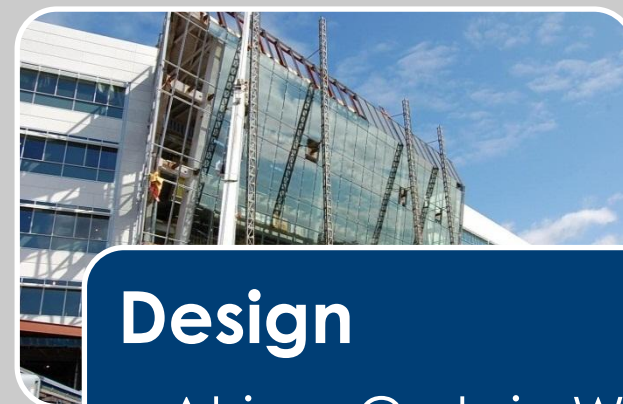
Brian J. Nahas [Construction Management Option]  
Advisor: Dr. Robert Leicht

*implement virtual design and construction processes to identify options & trends in design, construction, and facility management*



# New Regional Medical Center East Norriton, PA

Project Background



## Design

- Atrium Curtain Wall
- Pour Strip System

23.40 Lightweight Framing		
23.17 Columns, Structural		
HSS4x4x3/8: 10	117'-2 3/4"	9
4500 Structural Tubing, 4"x4"x1/4" x 12'		# of 12' increme
HSS4x4x5/16: 10	98'-0 3/8"	8
4500 Structural Tubing, 4"x4"x1/4" x 12'		# of 12' increme
HSS5x5x3/8: 1	15'-8"	1
4550 Structural Tubing, 6"x6"x1/4" x 12'		# of 12' increme
HSS6x6x1/4: 3	37'-4 13/16"	3
4550 Structural Tubing, 6"x6"x1/4" x 12'		# of 12' increme

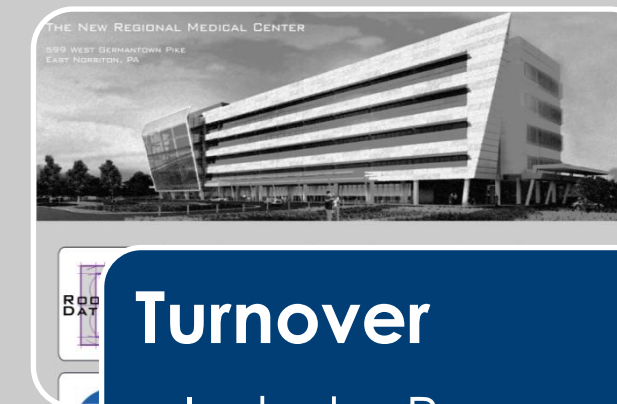
## Preconstruction

- 3D Quantity Takeoff & Estimating



## Construction

- Steel Trending
- Crane Logistics



## Turnover

- Industry Research
- FM Dashboard
- FM Interact

Recommendations





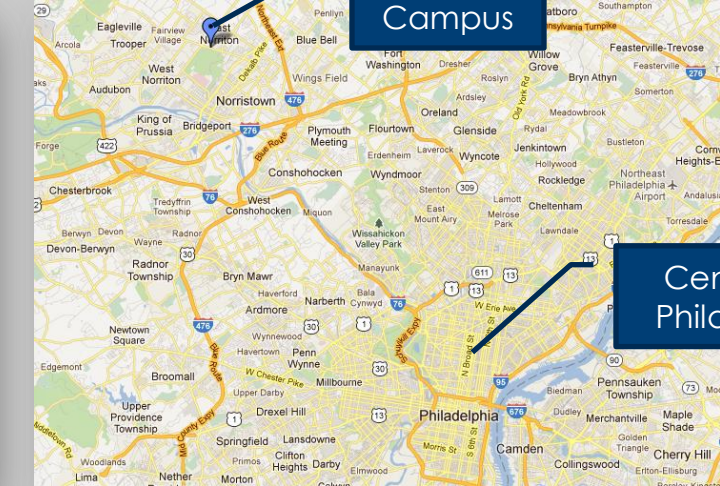
### Owner's Goals

- service to the community
- hosting excellence in clinical care
- fulfill the void in healthcare in Montgomery County

**“From its soaring atrium to its advanced imaging services, the center's architectural elegance is matched by top tier patient care capabilities.”**  
*Barry Freedman, President & CEO*

### Location

- East Norriton, PA
- 84-acre former golf course
- access to major highways and state roads
- Norristown Farm Park
- Goal to preserve 1/3 of the campus as green space



### Project Team Members



### Presentation Outline

- I. Project Background
- II. VDC Implementation
  - I. Design
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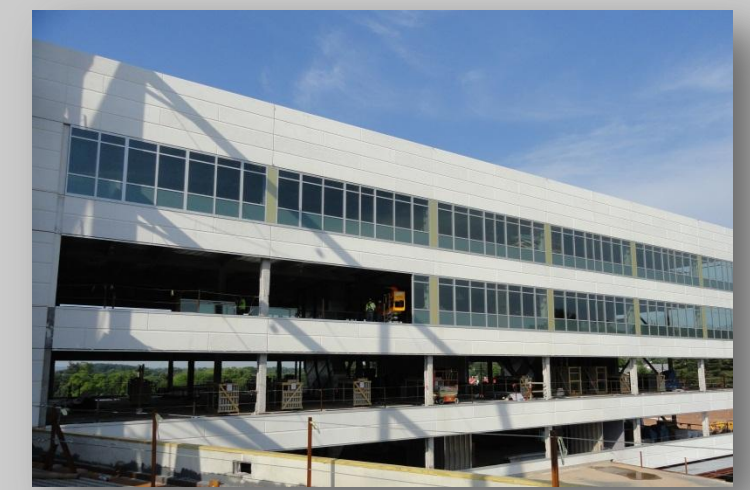
## Building Program

- 146 beds
  - medical/surgical
  - intensive care
  - neo-natal
- emergency care
- trauma center (pending)
- LEED certification (pending)



## Systems & Engineering

- cast-in-place spread footings & foundation walls
- structural steel system [30' x 30' grid]
  - W12 & W14 columns | 1<sup>st</sup> & 3<sup>rd</sup> floor splices
  - composite decking
- composite curtain wall façade



## Architecture

- precast panels
- glazing units
- curtain wall glazing
- metal panel
- Split-faced masonry block



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## Construction Program & Logistics

\$147 million | CM at Risk contract

Construction Schedule: July 6, 2010 – August 31, 2012

Staff Training: August 8 – October 15, 2012

Opening Day: September 29, 2012



## Presentation Outline

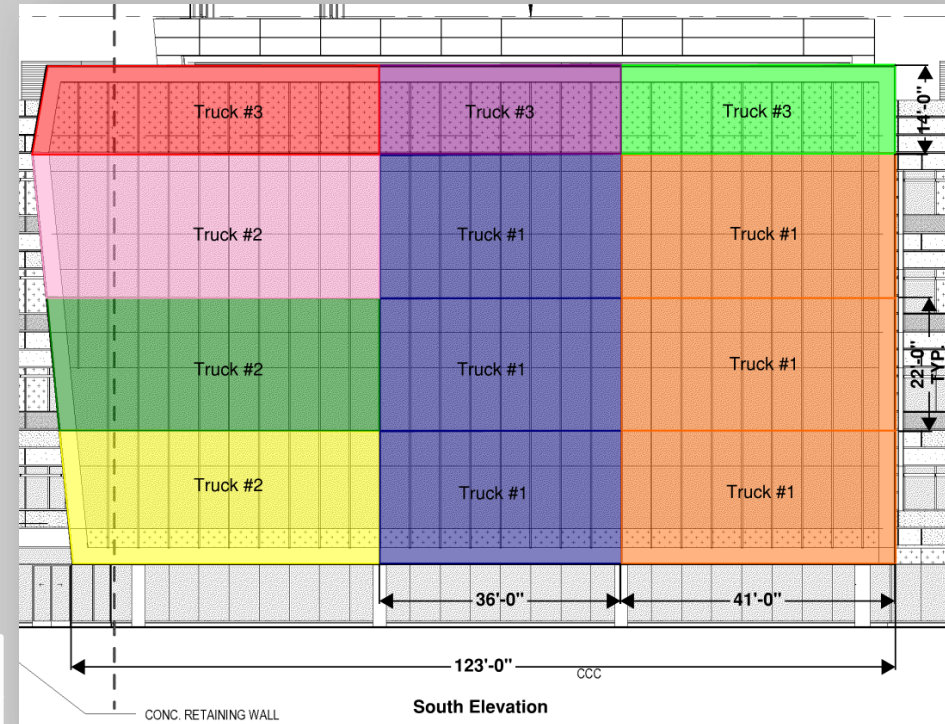
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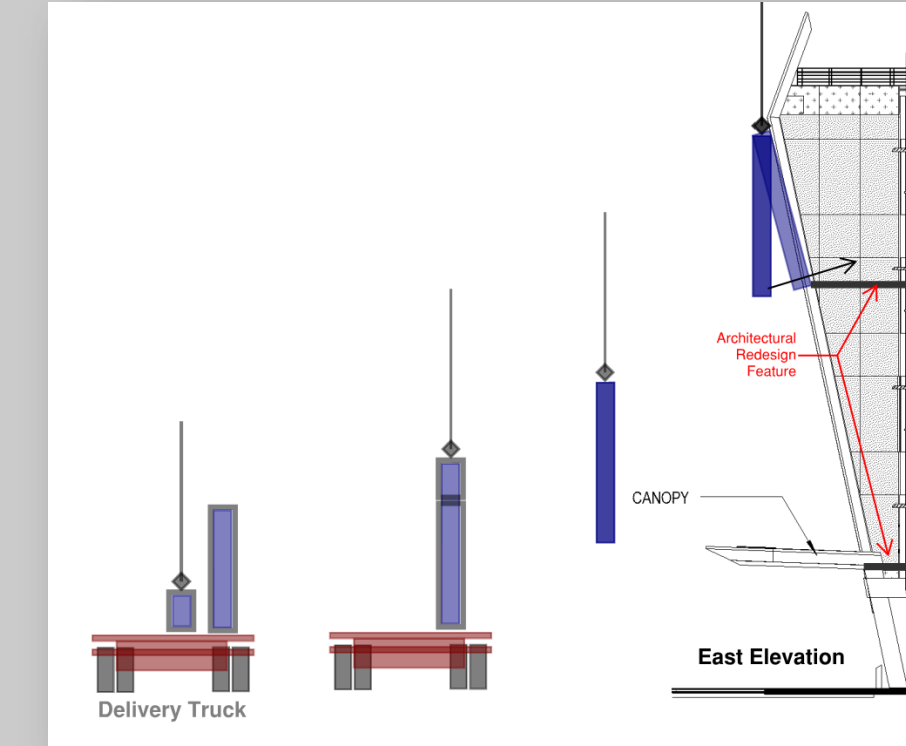
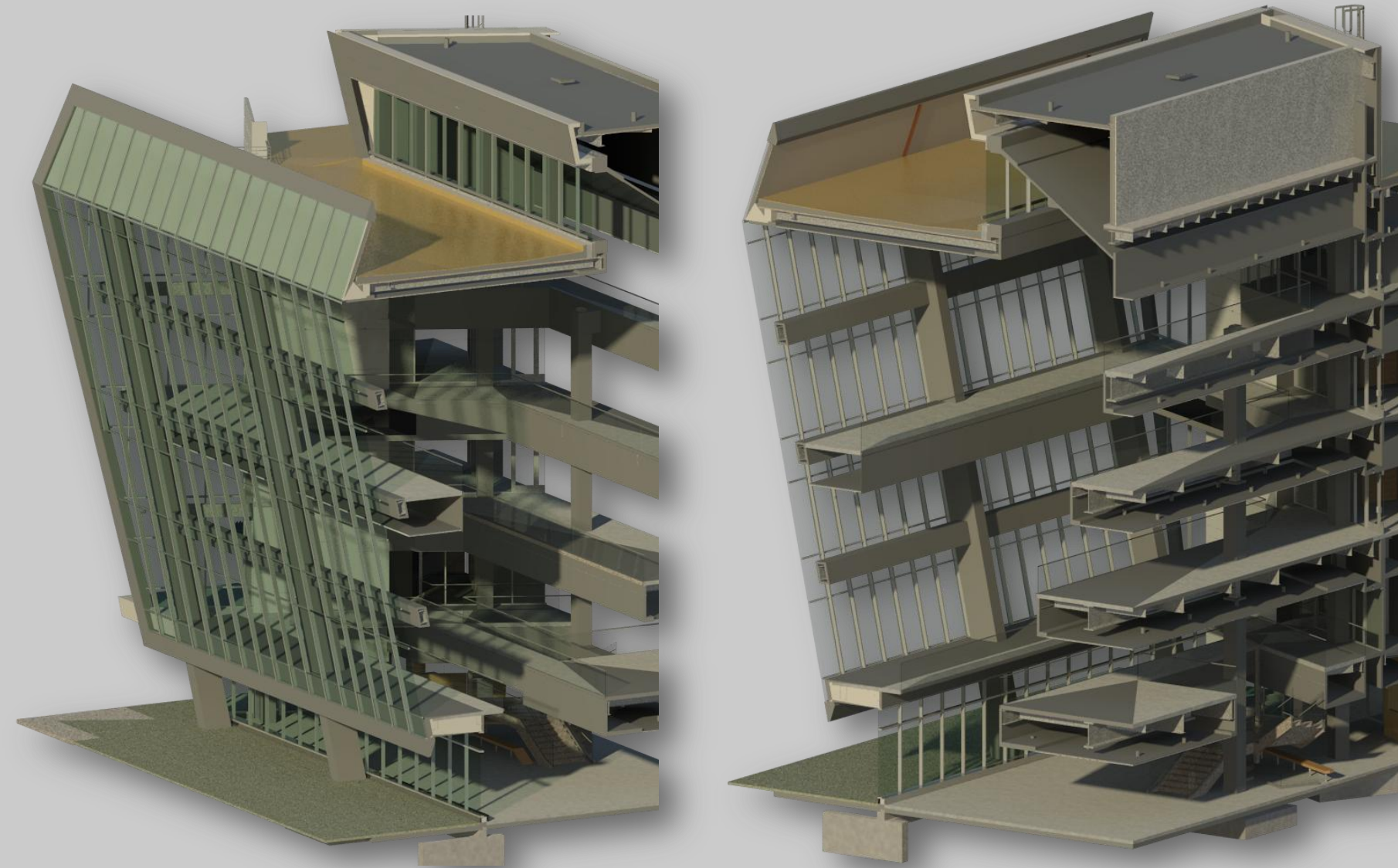


**Architectural Breadth Analysis**

- improve curtain wall constructability
- addition of public space
- modularization of glazing panels



System	Cost
Floor System	\$8,450
Structural Steel	\$24,338
GWB	\$3,280
Finishes	\$87,387
<b>Redesign Total</b>	<b>\$123,455</b>



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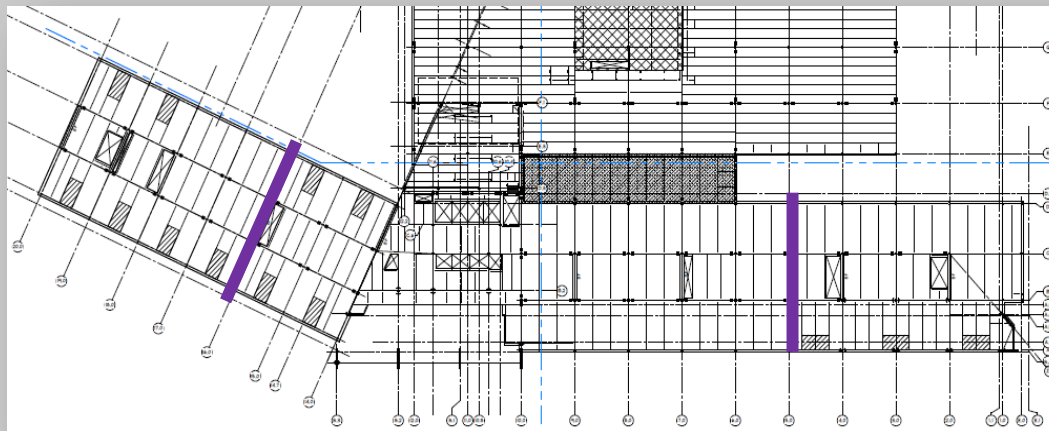
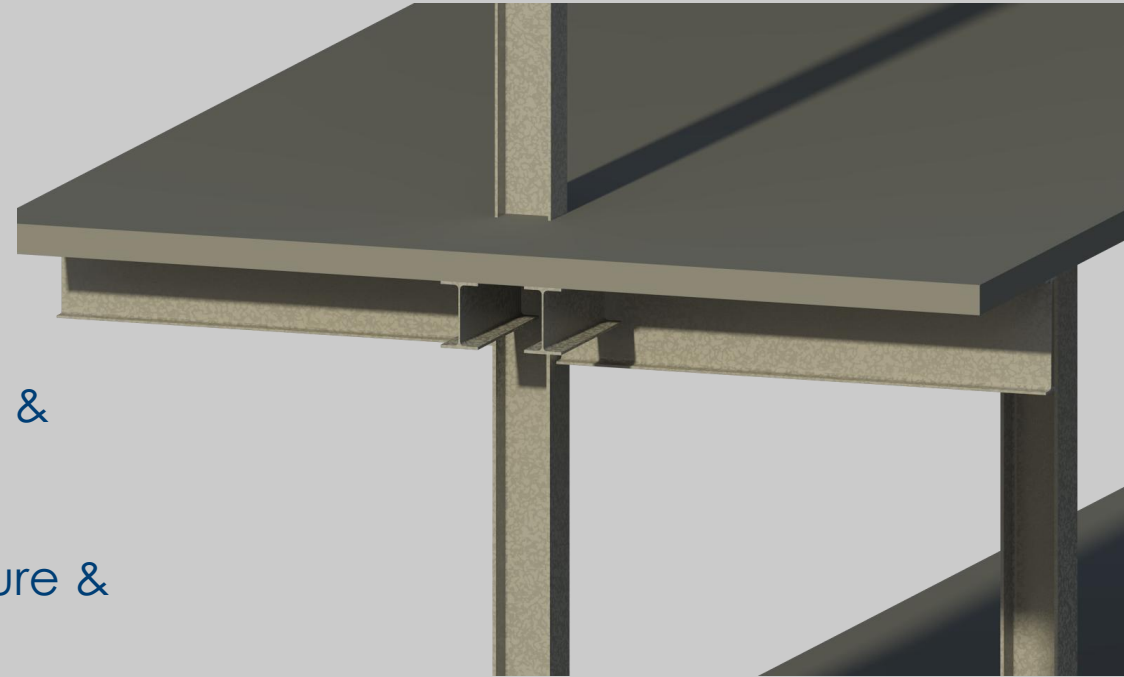
**Structural Breadth Analysis**

Pour Strip Assembly*	
Foundation System	\$59,512
Structural Columns	\$61,217
Structural Beams	\$101,826
Slab on Grade	\$684
Slab on Metal Deck	\$9,230
Reinforcing	\$7,303
<b>Total:</b>	<b>\$239,772</b>

\*quantities derived through Revit design alternates

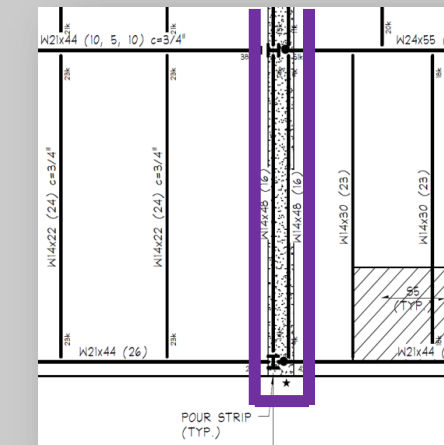
**Existing System:**

- 2 pour stops per floor
- 125 foot offset from east & west end wall
- requires building enclosure & temperature regulation



IT IS UNDERSTOOD THAT THIS DESIGN DECISION MAY CREATE CONSTRUCTION ISSUES, AND AREAS FOR DELAY. ALTHOUGH THIS DECISION DOES NOT SIMPLIFY THE AEC'S PROJECT APPROACH, IT EASES THE MAINTENANCE AND LIFECYCLE CONTROL OF THE SPACE... **FOCUS ON COST SAVINGS.**

*RICHARD MONTALBANO, PROJECT MANAGER, EINSTEIN HEALTHCARE NETWORK*



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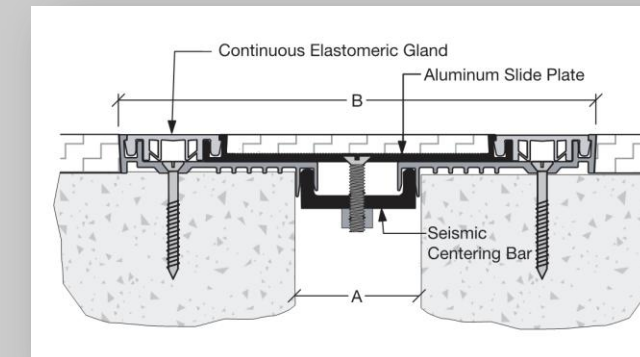
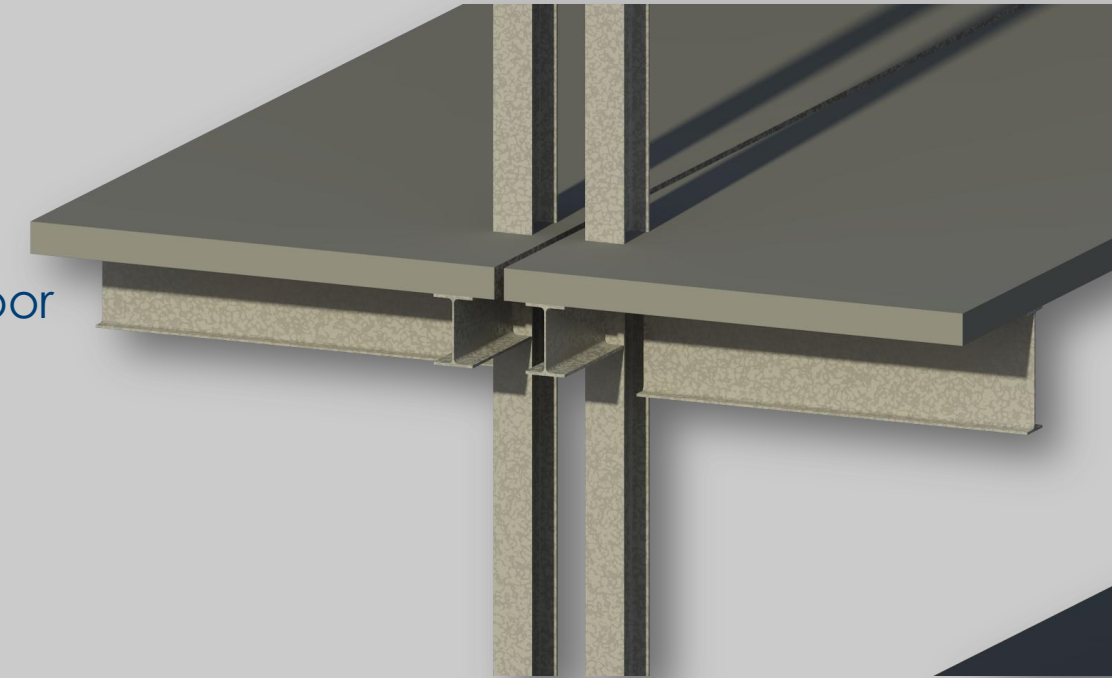
**Structural Breadth Analysis**

**Method:**

- calculate design tolerance & joint gap
- size structural steel members
  - tributary area
  - load calculation
  - locate splices
  - design member per AISC Table 4-1
- size spread footings per column case
- model redesign
- export quantities for estimate

**Outcome:**

- 2 expansion joints per floor
- 2" structural gap
- use W12 x 50 & W12 x 40
- 13' x 13' x 30"  
#7 bars each way 6" oc
- 13.5' x 13.5' x 30"  
#7 bars each way 6" oc



Expansion Joint Assembly		Diff.
Foundation System	\$32,758	-45%
Structural Columns	<b>\$60,671</b>	-1%
Structural Beams	\$101,826	-
Slab on Grade	\$684	-
Slab on Metal Deck	\$8,552	+7%
Reinforcing	\$8,613	+18%
Expansion Joint Covers	<b>\$40,289</b>	+100%
Misc. Steel Angle	<b>\$44,177</b>	+100%
<b>Total:</b>	<b>\$297,570</b>	<b>+24%</b>

**Presentation Outline**

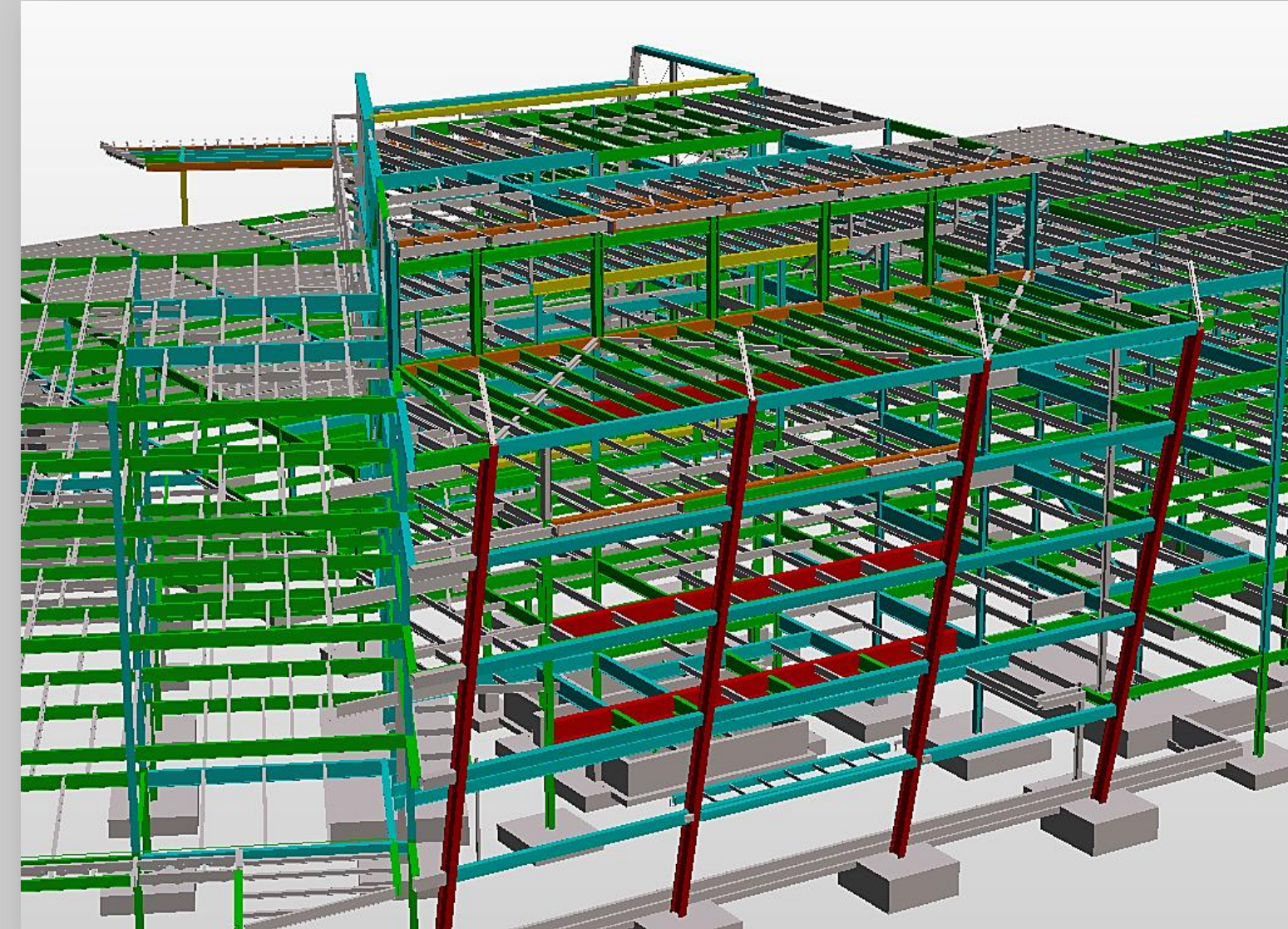
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### Steel Trending

AT EACH EXCHANGE POINT A THOROUGH UNDERSTANDING IS NEEDED OF WHO IS INVOLVED, WHAT SOFTWARE IS INVOLVED, AND WHAT DATA NEEDS TO BE EXCHANGED (OR CAN BE EXCHANGED) AND WHAT THE DATA WILL BE USED FOR.”  
*LUKE FAULKNER, AISC DIRECTOR OF INFORMATION TECHNOLOGY INITIATIVES*



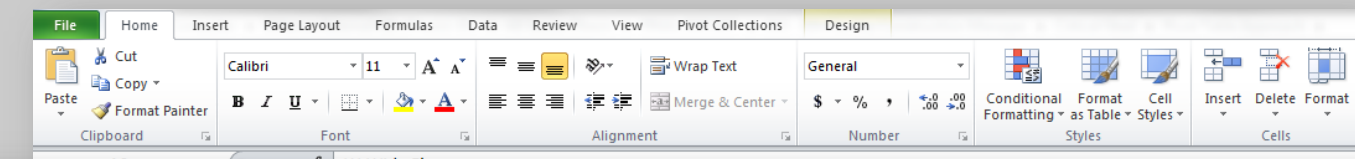
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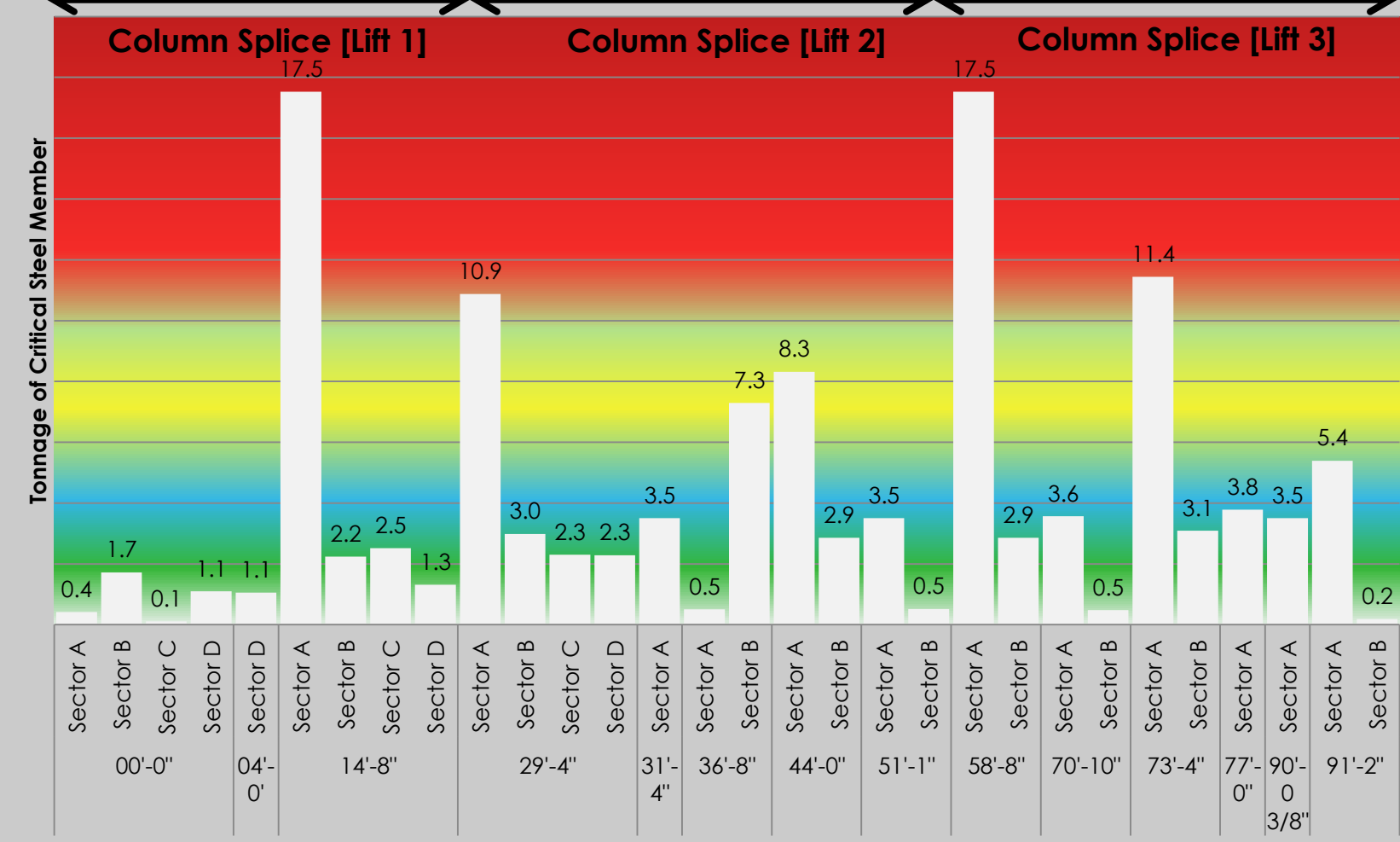
## Steel Trending

- Revit data to Excel Pivot Table & Chart



Family	Type	Level	Elevation	WtperFt	Length	Weight (Tons)	Sector
W-Wide Flange	W36x487	1st Floor	14'-8"	487	72'-0"	17.532	Sector A
W-Wide Flange	W36x487	4th Floor	58'-8"	487	72'-0"	17.532	Sector A
Sloped Column	W24x306	Penthouse	73'-4"	306	74'-9"	11.43675	Sector A
Sloped Column	W24x306	Penthouse	73'-4"	306	74'-9"	11.43675	Sector A
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Sloped Column	W24x306	Penthouse	73'-4"	306	74'-9"	11.43675	Sector A
W-Wide Flange	W36x302	2nd Floor	29'-4"	302	72'-0"	10.872	Sector A
W-Wide Flange	W36x231	3rd Floor	44'-0"	231	72'-0"	8.316	Sector A
W-Wide Flange	W36x302	Penthouse	73'-4"	302	39'-11"	6.027417	Sector A
W-Wide Flange	W36x302	Penthouse	73'-4"	302	39'-5"	5.951917	Sector A
W-Wide Flange	W18x106	Penthouse	73'-4"	106	102'-4 7/8"	5.427543	Sector A
W-Wide Flange	W18x106	ROOF	91'-2"	106	101'-9 1/2"	5.395022	Sector A
W-Wide Flange	W18x143	Exhaust Fan Support	77'-0"	143	52'-11 1/4"	3.785155	Sector A
W-Wide Flange	W21x101	ROOF	91'-2"	101	52'-11 1/4"	2.673431	Sector A
W-Wide Flange	W36x182	Penthouse	73'-4"	182	28'-0"	2.548	Sector A
W-Wide Flange	W36x150	Penthouse	73'-4"	150	32'-6 3/4"	2.442318	Sector A
W-Wide Flange	W24x131	ROOF	91'-2"	131	34'-9 3/8"	2.278093	Sector A
W-Wide Flange	W24x131	ROOF	91'-2"	131	34'-9 3/8"	2.278093	Sector A
W-Wide Flange-Column	W12x152	3rd Floor	44'-0"	152	29'-4"	2.229333	Sector A
W-Wide Flange-Column	W12x87	3rd Floor	44'-0"	87	46'-0"	2.001	Sector A
W-Wide Flange	W36x135	ROOF	91'-2"	135	28'-0"	1.89	Sector A
HSS-Hollow Structural Section	HSS20x12x1/2	Penthouse	73'-4"	103	36'-0"	1.854002	Sector A
HSS-Hollow Structural Section	HSS20x12x1/2	2nd Floor	29'-4"	103	36'-0"	1.854	Sector A
HSS-Hollow Structural Section	HSS20x12x1/2	2nd Floor	29'-4"	103	36'-0"	1.854	Sector A

## Critical Pick Workflow Trending By Elevation



Row Labels	Max of Weight (Tons)
00'-0"	
Sector A	0.421232
Sector B	1.723333
Sector C	0.110208
Sector D	1.096194
04'-0'	
Sector D	1.05598
14'-8"	
Sector A	17.532
Sector B	2.243667
Sector C	2.520781
Sector D	1.316
29'-4"	
Sector A	10.872

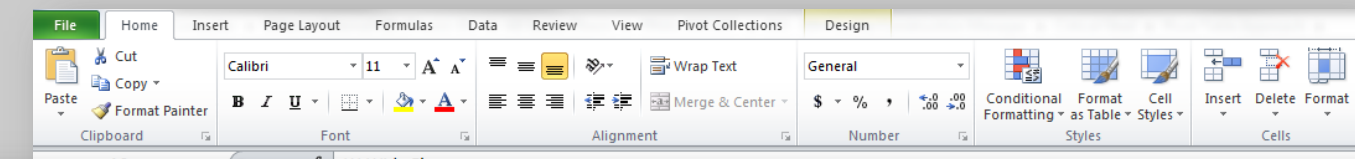
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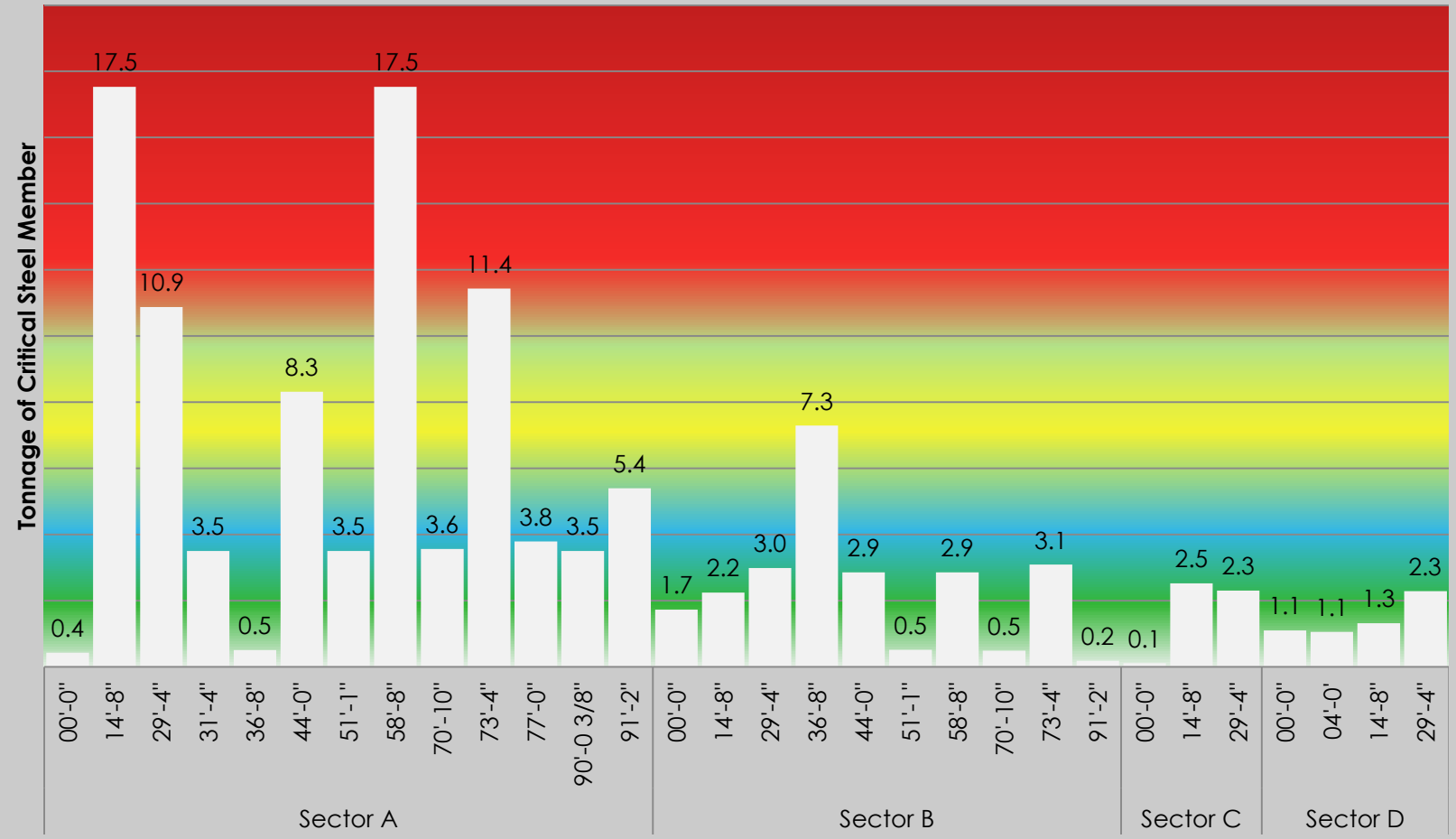
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Sloped Column	W24x306	Penthouse	73'-4"	306	74'-9"	11.43675	Sector A
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**Critical Pick Workflow Trending By Sector**



Row Labels	Max of Weight (Tons)
<b>Sector A</b>	
00'-0"	0.421232
14'-8"	17.532
29'-4"	10.872
31'-4"	3.502
36'-8"	0.502917
44'-0"	8.316
51'-1"	3.502
58'-8"	17.532
70'-10"	3.564423
73'-4"	11.43675
77'-0"	3.785155
90'-0 3/8"	3.502
91'-2"	5.395022

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**Crane Logistics**

**300 Ton Lattice Crane**

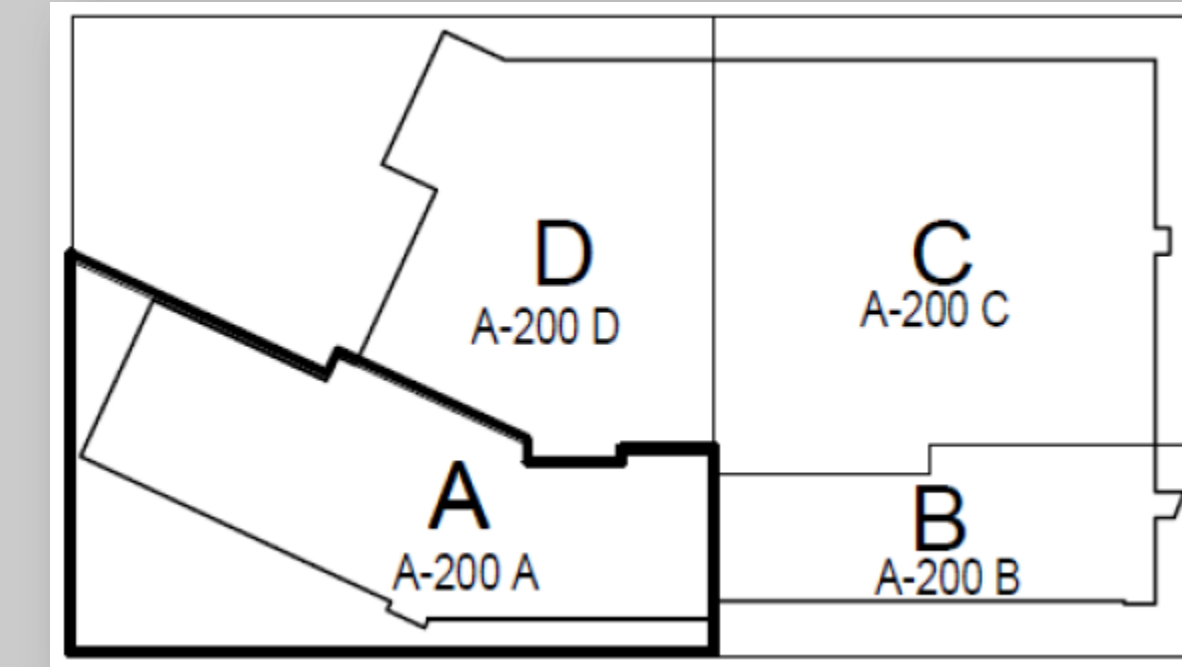
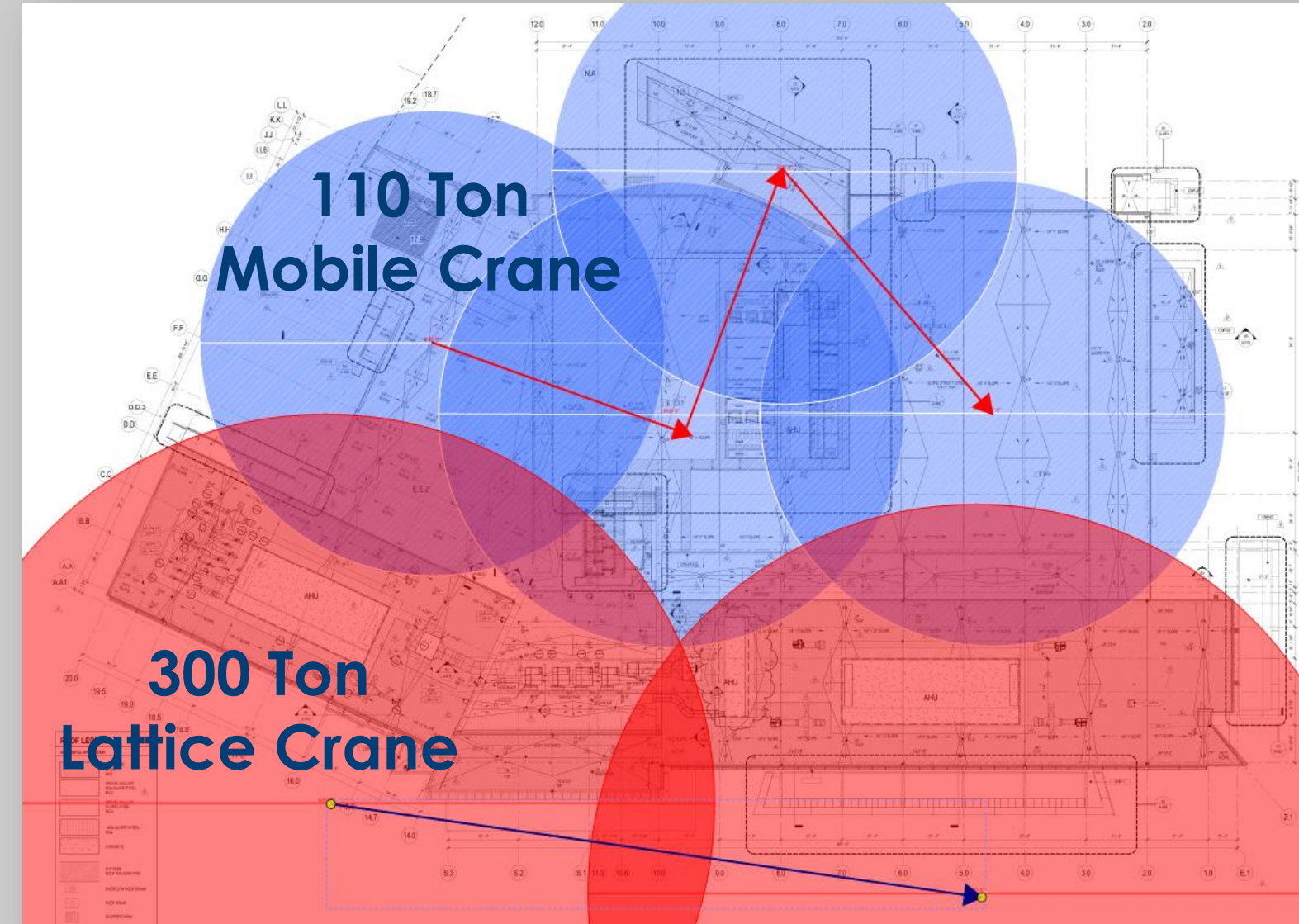
Mobilization & Demobilization Costs:  $\$9,000 \times 2 = \$18,000$   
 Rental Costs:  $\$20,000 \times 18 \text{ weeks} = \$360,000$   
**TOTAL: \$378,000**

**300 Ton Lattice Crane & 110 Ton Mobile Crane**

Mobilization & Demobilization Costs:  $\$9,000 \times 2 + \$3,400 \times 2 = \$24,800$   
 Rental Costs:  $\$20,000 \times 15 \text{ weeks} + \$5,840 \times 3 \text{ weeks} = \$317,520$   
**TOTAL: \$342,320**

Results:  
 2 week schedule reduction:  $\$280,047$  [general conditions]  
 Crane rental:  $\$35,680$

**Total Project Savings: \$315,727**



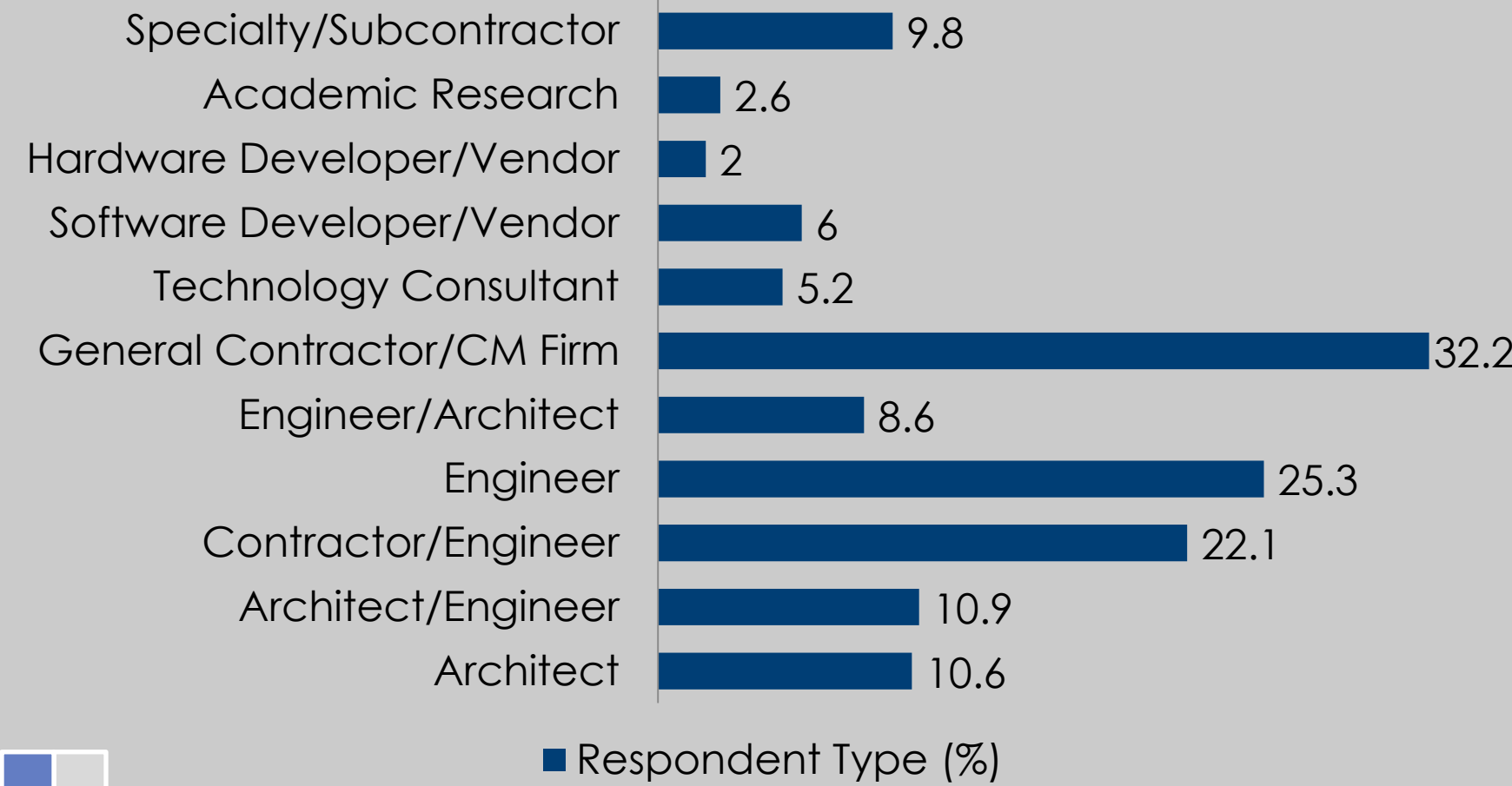
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Industry Research



Current Information Technology Use

01   BIM	02   iPads	03   Collaboration Environment
04   Online Project Documents	05   3D CAD	06   Mobile Tools & Devices

Desired Information Technology

<b>01   Cheaper, Better Software</b>	02   Data Integrations (BIM)	<b>03   Online Collaboration</b>
<b>04   Mobile Hardware</b>	05   Cloud Storage & Tools	<b>06   Linked &amp; Live Project Controls</b>

Owner Interview

Current Use

- Paper Plan Room
- Outdated As-Built information

Desired Use

- Room Data Log
- As-Built Drawings
- Submittal Log

**“THE WORDS THAT CAME UP MOST OFTEN WERE ‘CHEAPER,’ ‘SIMPLER,’ STREAMLINED,’ ‘USER-FRIENDLY,’ ‘INTEROPERABLE,’ AND ‘INTEGRATED’.”**

*TOM SAWYER, ENGINEERING NEWS-RECORD*

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**FM Dashboard**



**Room Log**

- Direct access to equipment files
- Construction & As-built Photographs



**As-Built Drawings**

- PDF Digital Set
- Hyperlinked details



**Submittal / O&M**

- Material Submittal Information
- Equipment & Room Locations

**“A FM DOCUMENT INTERFACE SHOULD NOT CONSIST OF A SERIES OF INTERNET PAGES BUILT AROUND A SPECIFIC ATTRIBUTE; IT SHOULD CONSIST OF AN INTERFACE WHICH READS A DATABASE OF RELATIVE INFORMATION, DATA, AND ASSET.”**

*DR. CRAIG DUBLER, OFFICE OF THE PHYSICAL PLANT [PSU]*

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## FM Interact

- Microsoft Silverlight – Pivot Viewer

Pivot View of Netflix Instant Watch Movies

Netflix Instant Watch Results

Search...

Rating

Genre

Sort: Quantity

MPAA Rating

Year

Cast

Director

AvailableFrom

AvailableTo

Created by Steve Mann, Windows Azure team

Learn how it was built

Powered by Windows Azure

Clear All

Search...

Rating

Genre

Sort: Quantity

Documentaries 138

Dramas 115

Comedies 84

Foreign Movies 84

Independent Movies 74

Biographical Documentaries 55

Social & Cultural Documentaries 55

Action & Adventure 52

TV Shows 50

Independent Dramas 47

Romantic Movies 46

Thrillers 42

Foreign Dramas 41

Children & Family Movies 38

Crime Thrillers 30

Independent Comedies 30

Movies for ages 8 to 10 29

Historical Documentaries 28

Political Documentaries 27

Action Thrillers 26

British Movies 25

Family Features 25

MPAA Rating

Year

Cast

Director

AvailableFrom

AvailableTo

HEY BOO Harper Lee TO KILL A MOCKINGBIRD

THE STREET STOPSHERE

180° SOUTH CONQUERORS OF THE USELESS

Lincoln The Untold Stories

Fr New Thinking

180° South

Inspired by pioneering outdoorsman Yvon Chouinard's freewheeling 1968 van trip to Patagonia, South America, a band of bliss-seeking surfer-mountaineers sets out -- in 2007, by boat -- to remake the journey in this adventure documentary. Jeff Johnson and his buddies hug the coast, stopping at the Galapagos Islands and Easter Island before arriving in Patagonia -- a region that's still breathtaking but is now besieged by environmental threats.

Rating 4.2

Genre Documentaries Science & Nature Documentaries Sports Documentaries Sports Movies Travel & Adventure Documentaries MPAA Rating PG

Year 2010

Cast Keith Malloy Yvon Chouinard Timmy O'Neill Jeff Johnson Doug Tompkins Makeo

Director Chris Malloy

AvailableFrom June 8, 12:00 AM, 2010

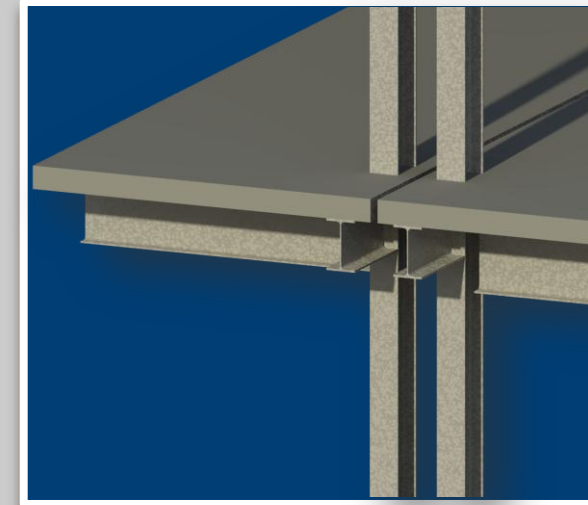
AvailableTo January 1, 12:00 AM, 2100

Filter Parameter	Document Data & Relationships
System	Construction Photos, Submittals, RFI's, Contract Drawings, Design Model, As-Built Model, Equip. Data Sheet
Zoom Format	JPG, TIFF
Link to Original File	JPG, PDF, RVT, DWG, NWD, DOC, XLS, SKP, Hyperlink, Other
Document Name	Individual Description
Campus	East Norriton
Facility Name	New Regional Medical Center
Building Sector	A, B, C, D, Central Utility, Site
Floor Level	Ground Level, 1, 2, 3, 4, Roof
Room Number	###
Date Added to Database	YYYY-MM-DD
Model/Drawing	Yes, No
CSI Discipline	## - Title
Bid Package #	BP ##
Trade Contractor	Company Name
Trade Contact	Contact – linked to email address
Design Team	Company Name
Design Contact	Contact – linked to email address
Construction Manager	Company Name
Construction Contact	Contact – linked to email address
Asset Management	Hyperlink to external software/file

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    - II. Preconstruction
      - I. 3D QTO & Estimating
  - III. Construction
    - I. Steel Trending
    - II. Crane Logistics
  - IV. Turnover
    - I. FM Documentation
    - II. FM Interact
- III. Recommendations
- IV. Acknowledgements





**Design**

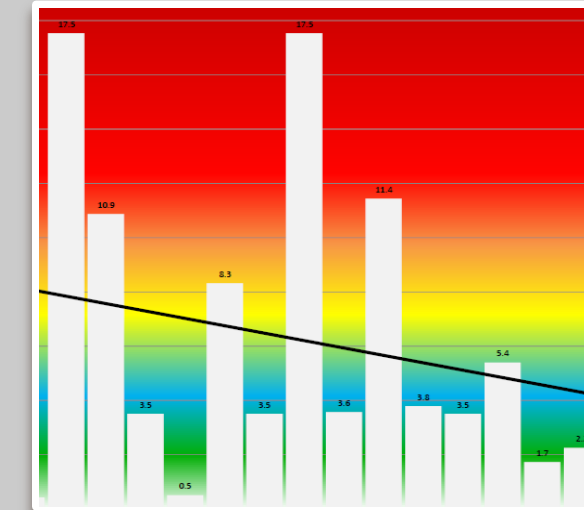
Atrium & Pour Strip Redesign

Benefit to NRMC: NO  
Benefit to the Industry: YES  
Development: Externally

**Construction**

Steel Trending

Benefit to NRMC: YES  
Benefit to the Industry: YES  
Development: Internally



**Preconstruction**

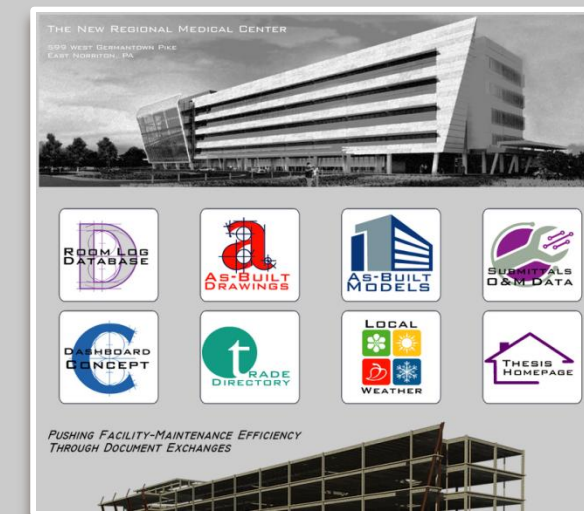
3D Quantity Takeoff & Estimate

Benefit to NRMC: YES  
Benefit to the Industry: YES  
Development: Internally

**Turnover**

Document Management

Benefit to NRMC: YES  
Benefit to the Industry: YES  
Development: Internally & Externally



**Presentation Outline**

- I. Project Background
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Family	Quantity	Measured Unit	Total	Material Cost	Labor Cost	Equipment Cost
W12x16		LF	\$	435.60	\$	66.22
W12x19-408	4843	4843'-1 1/2"				40.48
W12x22		LF	\$	130,761.00	\$	14,577.43
W12x26-132	4369	1369'-2 15/16"				8,911.12
W12x26		LF	\$	139,808.00	\$	13,150.69
W12x35-1	9	8'-8"				8,038.96
W12x35		LF	\$	378.00	\$	29.43
W14x34		LF	\$	16,128.00	\$	1,335.60
W14x40-135	1122	1122'-6 11/16"				816.48
W16x40		LF	\$	55,563.75	\$	3,726.70
W14x22-524	13187	13187'-3 9/16"				2,278.68
W14x26		LF	\$	421,984.00	\$	34,945.55
W14x26-18	504	504'-0"				21,362.94
W14x26		LF	\$	16,128.00	\$	1,335.60
W14x30-15	412	412'-9 1/4"				741.60
W14x30		LF	\$	15,244.00	\$	1,215.40
W14x34-46	715	715'-5 11/16"				1,431.00
W14x34		LF	\$	30,051.00	\$	2,339.69
W14x38-27	756	755'-9 3/4"				1,534.68
W16x40		LF	\$	37,422.00	\$	2,509.92
W14x43-99	1158	1158'-4 7/8"				2,350.74
W16x40		LF	\$	57,321.00	\$	3,844.56
W14x48-33	902	902'-0 15/16"				1,713.80
W18x50		LF	\$	55,924.00	\$	3,788.40
W14x53-22	502	501'-9 1/2"				953.80
W18x55		LF	\$	94,136.00	\$	2,108.40
W14x109-6	78	78'-1 11/16"				175.50
W14x120		LF	\$	11,622.00	\$	287.04



## Special Thanks

Richard Montalbano & the Facility Management Staff at Albert Einstein Healthcare Network

Andrew Packer & Jerry Shaheen at Gilbane Building Company

Gene Hodge, Jason Brown, Nicholas Kantor, & Michal Wojtak at Mortenson Construction

Dr. Craig Dubler & the Facility Management Staff at Penn State's Office of Physical Plant

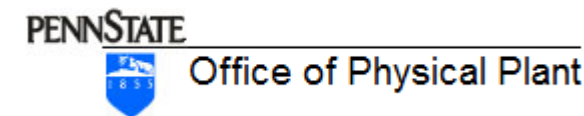
PACE Industry Members

My Family & Friends

## Industry Acknowledgements



Gilbane Building Company



## Lessons Learned

VDC implementation goes beyond the utilization of models and design software.

Additional insight into design data produces a stronger understanding of construction and FM usage.



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# New Regional Medical Center

East Norriton, PA



Brian J. Nahas [Construction Management Option]  
Advisor: Dr. Robert Leicht

*implement virtual design and construction processes to identify options & trends in design, construction, and facility management*

