Turner
Building the Future

City Hospital
Phase 1

Monjia Belizaire
Construction Management
April 14, 2008

Agenda

Project Background

LEED® Points

Stormwater Management

Medium Voltage

Generators

BIM

3D Modeling

Conclusion

- Project Background
- Analysis
  - LEED ® Points
  - Medium Voltage
  - BIM- 3D
- Conclusion

Project Background

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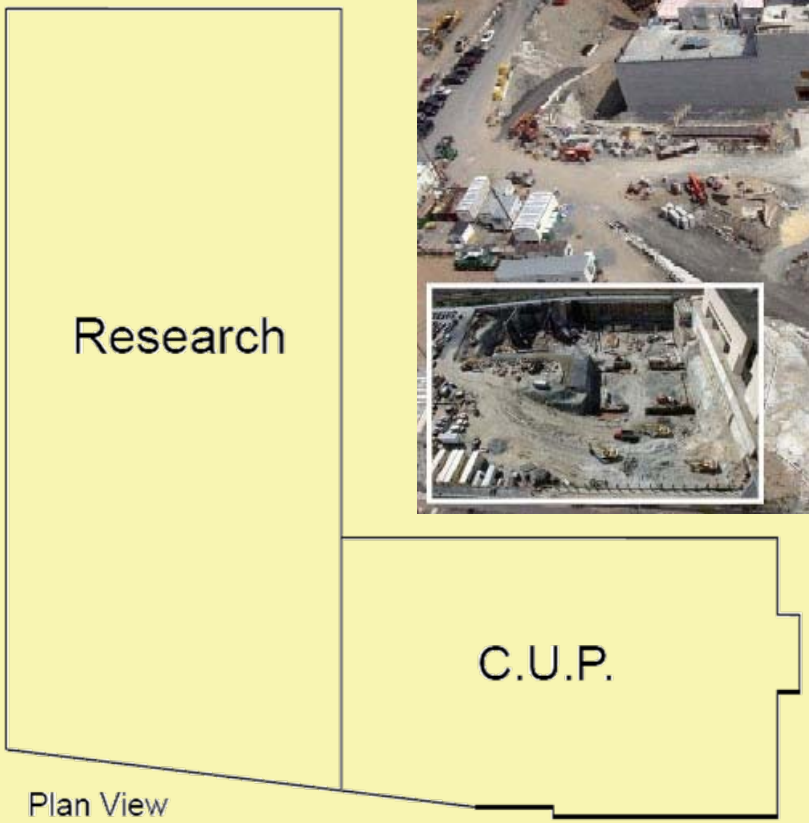

Project Background

- **Owner:** City Hospital
- **Location:** Southeast Pennsylvania
- **Building Occupants:** Research
- **Building Use:** Research and office
- **Size:** 200,000 sq. ft.; 3.5 stories
- **Construction Manager:** Turner Construction
- **Total Cost:** $156 million (GMP)
- **Construction:** March 2005- December 2007
- **Exterior:** Masonry, and Thermoplastic Roofing

LEED® Points

Current

LEED NC silver certified

4 points

Proposed

***EA Credit 5*: Measurement & Verification (1 Point)**
***EQ Credit 1*: Outdoor Air Delivery Monitoring (1 Point)**
***WE Credit 2*: Innovative Wastewater Technologies (1 Point)**
***SS Credit 6.2*: Stormwater Design: Quality Control (1 Point)**

LEED® Points

Methodology

- Review the LEED® points that are intended to be achieved on the project
- Review potential LEED® points with LEED® consultant, Gabriella Edwards
- Identify four LEED® additional points for Gold Certification (includes *SS Credit 6.2*)
- Investigate the implementation of *SS Credit 6.2: Stormwater Design*

LEED® Points

Project Background

LEED® Points

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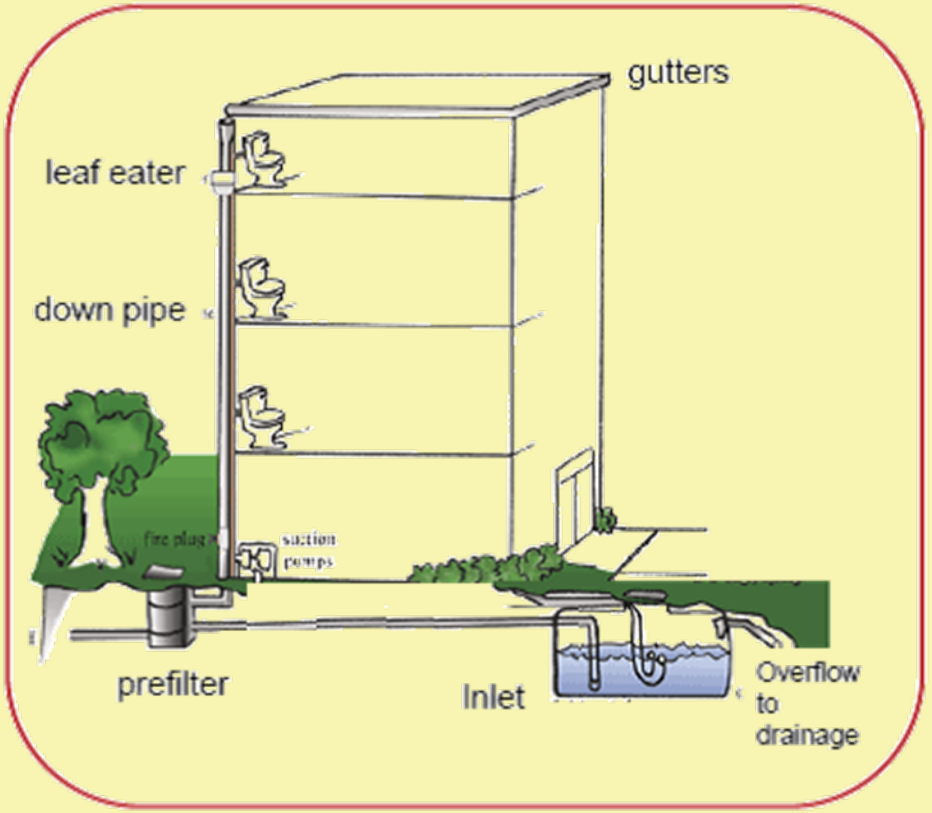
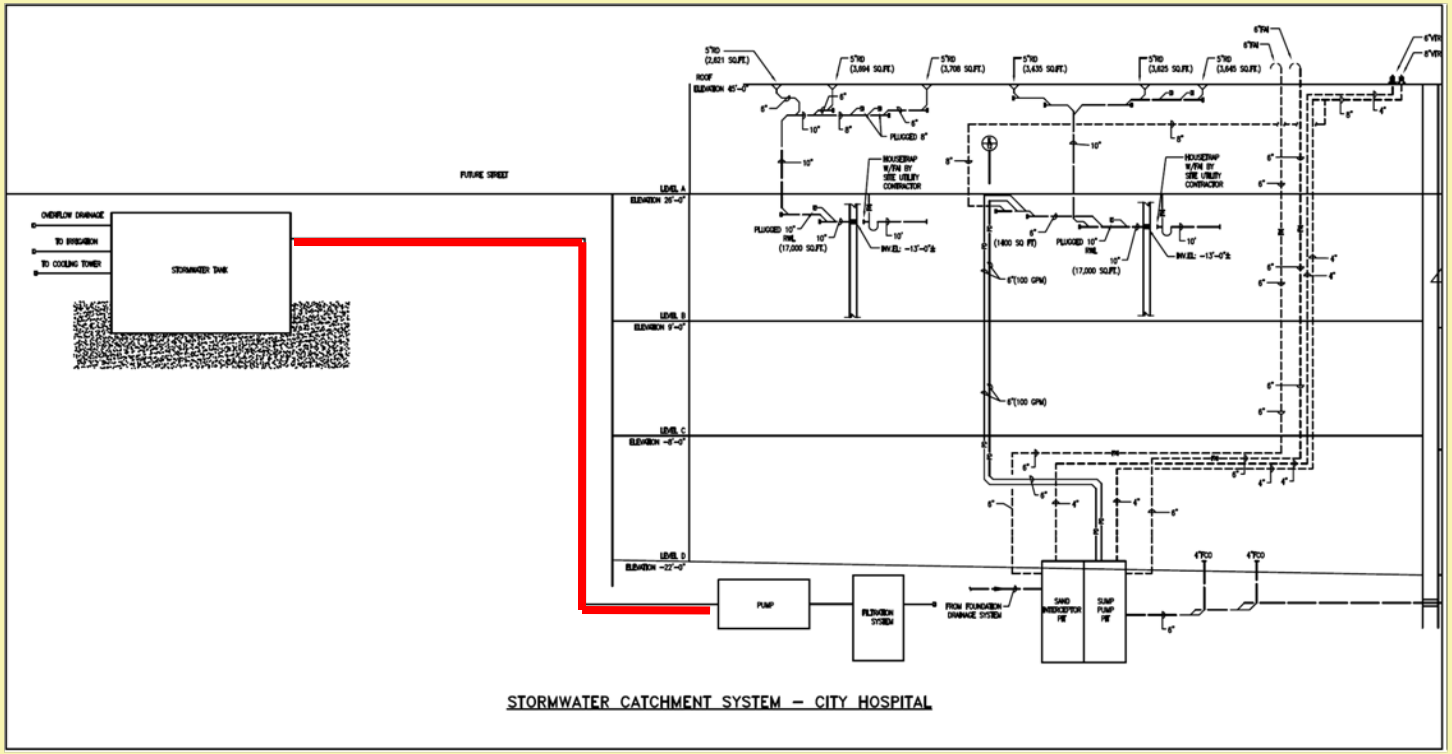
Typical Stormwater Catchment System



LEED® Points

LEED® point *SS 6.2* Stormwater Design: Quality Control



LEED® Points

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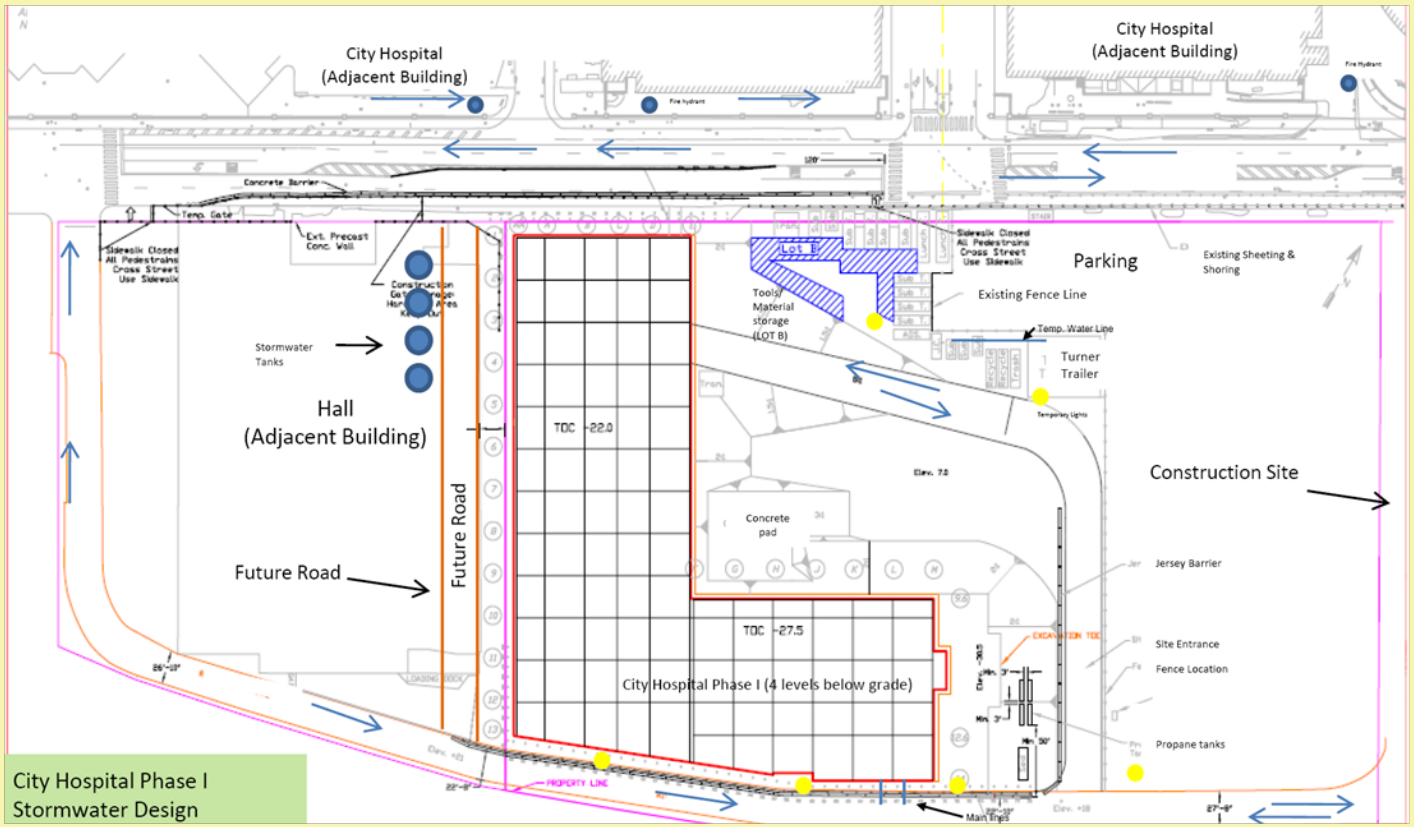
LEED® point *SS 6.2* Stormwater Design: Quality Control



Medium Voltage

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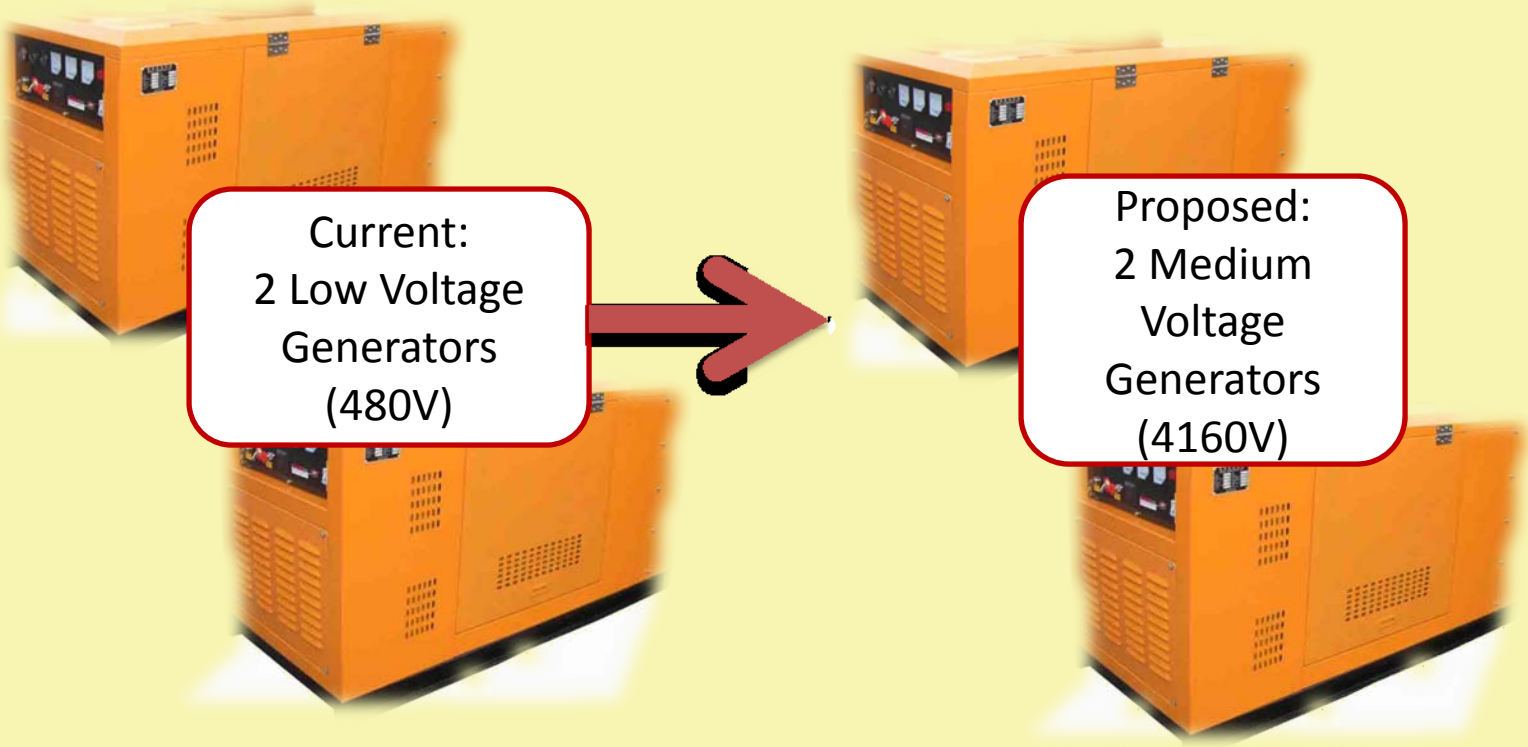
Goal:



Medium Voltage

Project Background

LEED® Points

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Medium Voltage

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Methodology

- **Review literature** on using medium voltages on construction projects
- Review **electrical CDs and specifications** for info. about the generators
- **Analysis** using 4160V generator
- Compare **costs, installation, materials** used between systems

Medium Voltage

Advantages

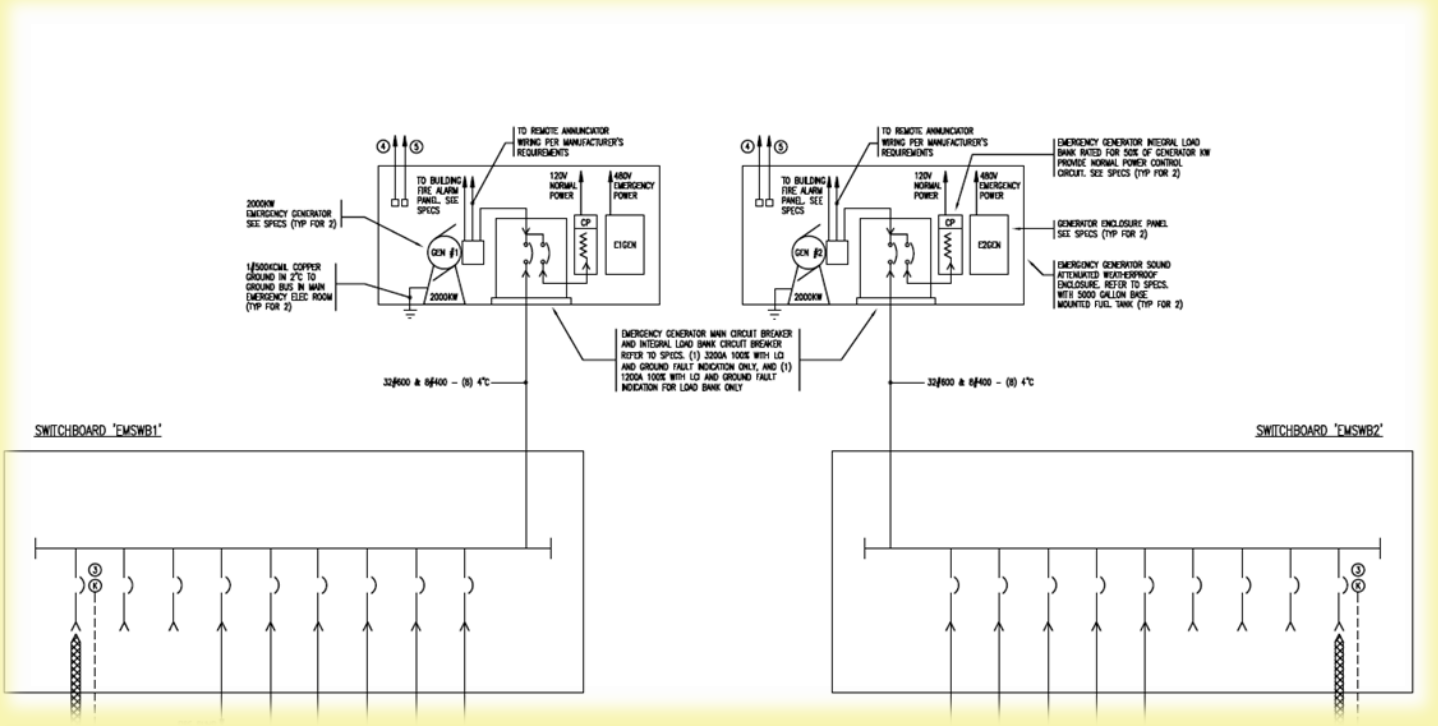
- Cost saving due to difference in wire size

Disadvantages

- Maintenance staff would prefer not to maintain medium voltage system due to the amount of caution and knowledge required to maintain them
- Medium voltage cable has a tendency to fail when it's energized after sitting in a de-energized state for a long time

Medium Voltage

Existing Design system



Medium Voltage

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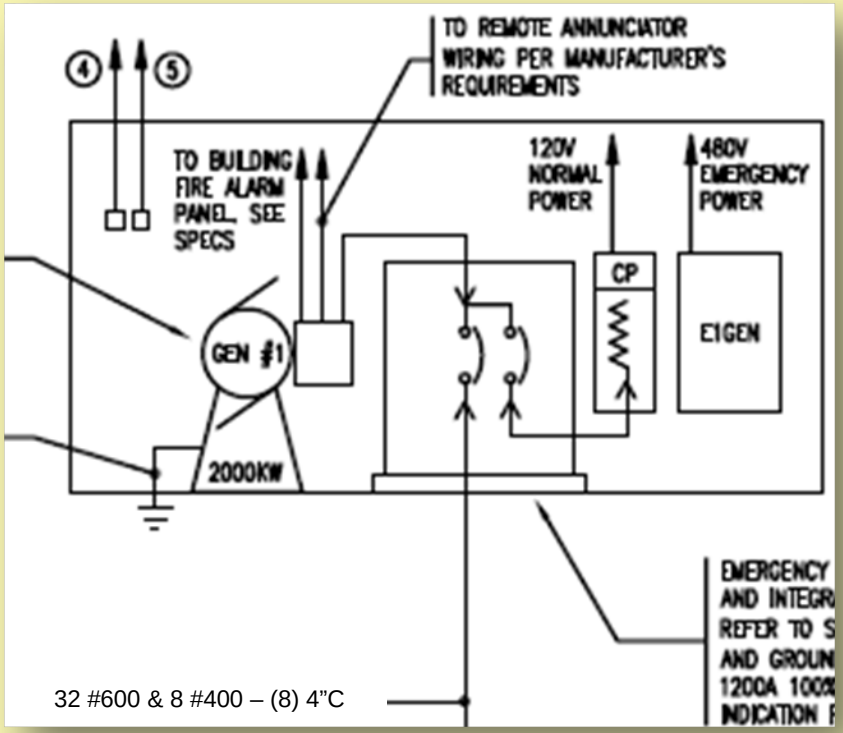

Medium Voltage

Existing Design system

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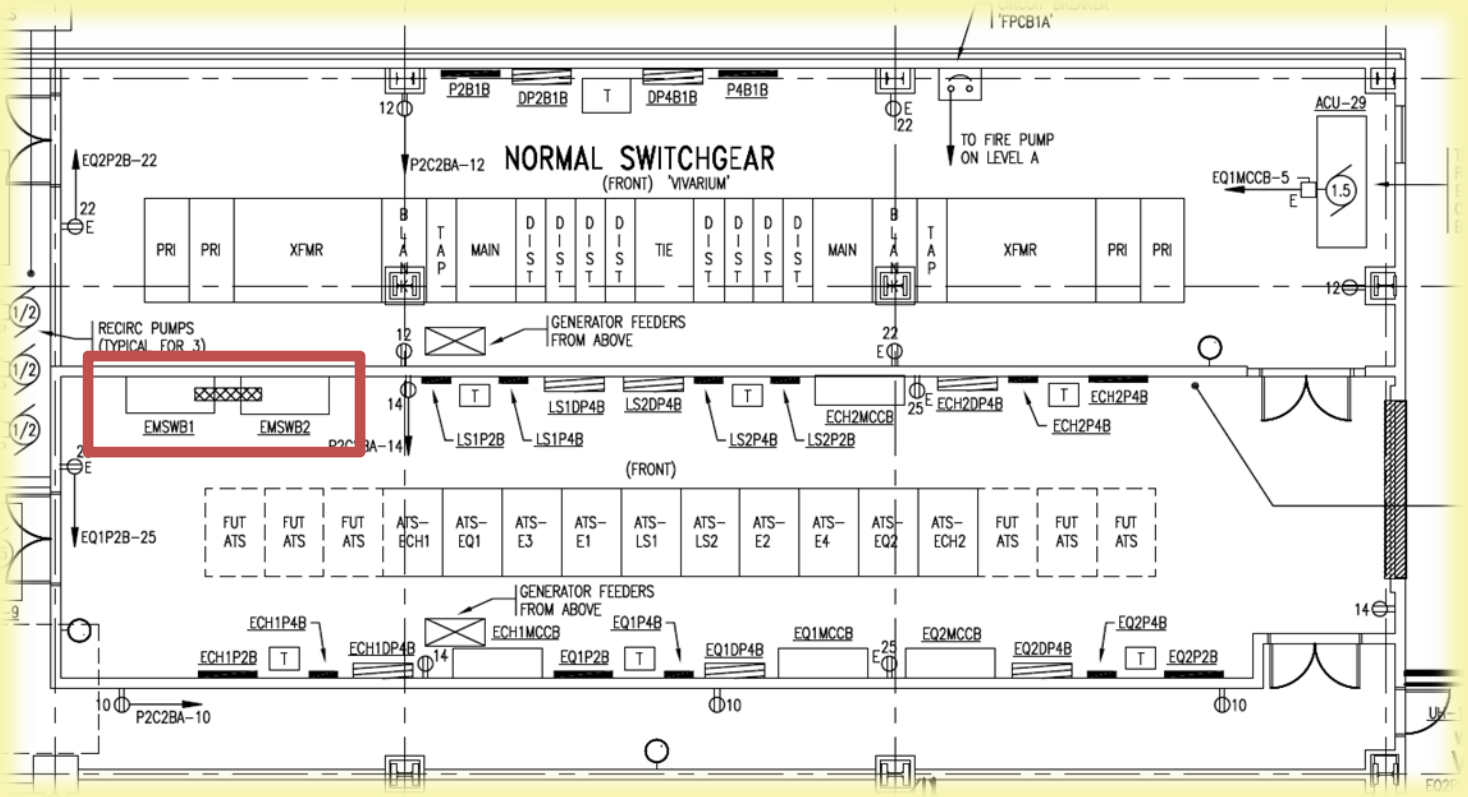
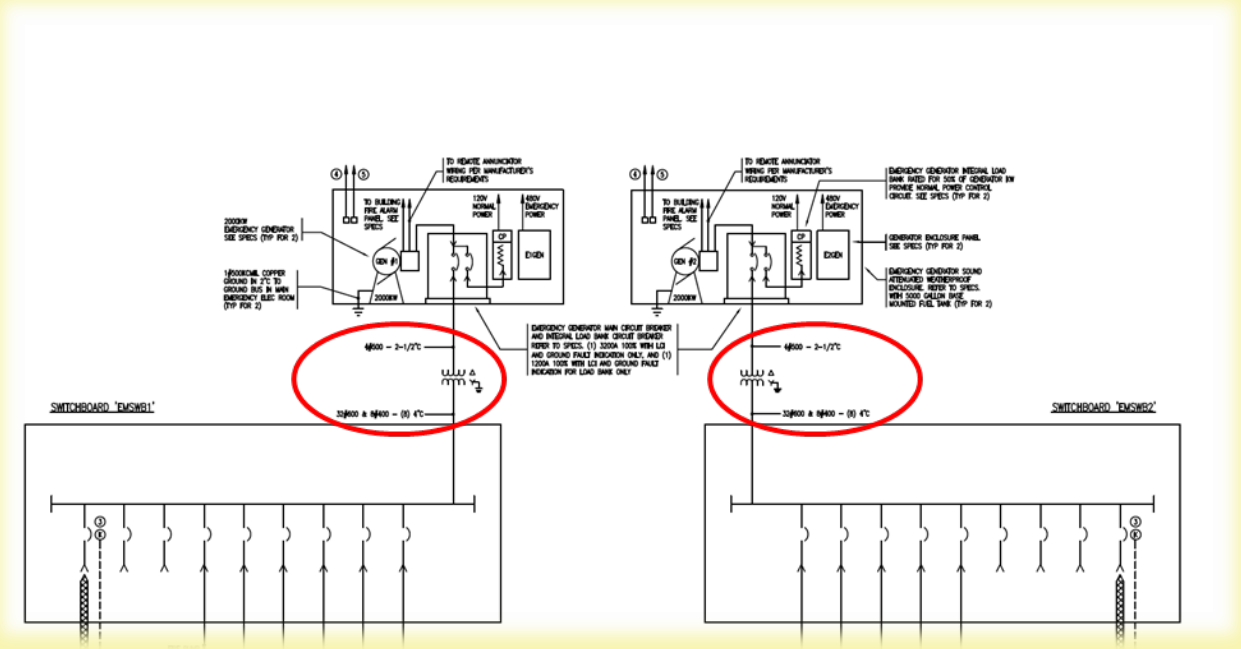


Medium Voltage

Proposed Alternative Design



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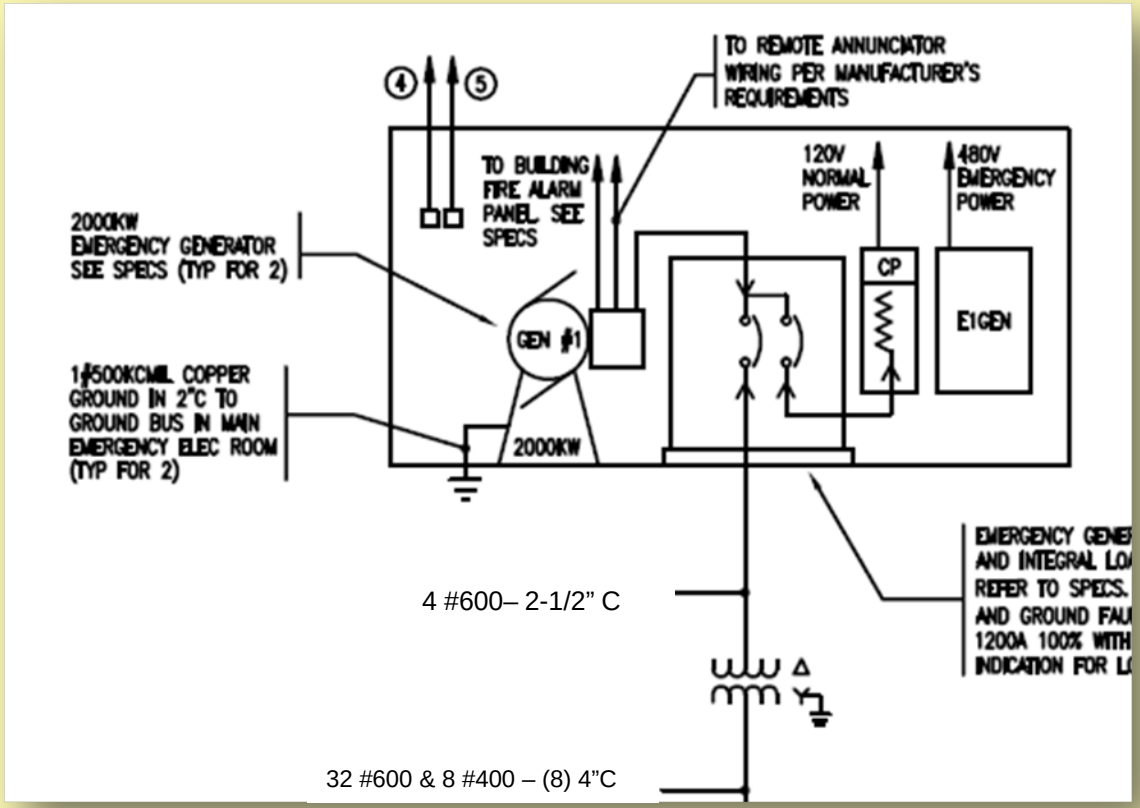

Medium Voltage

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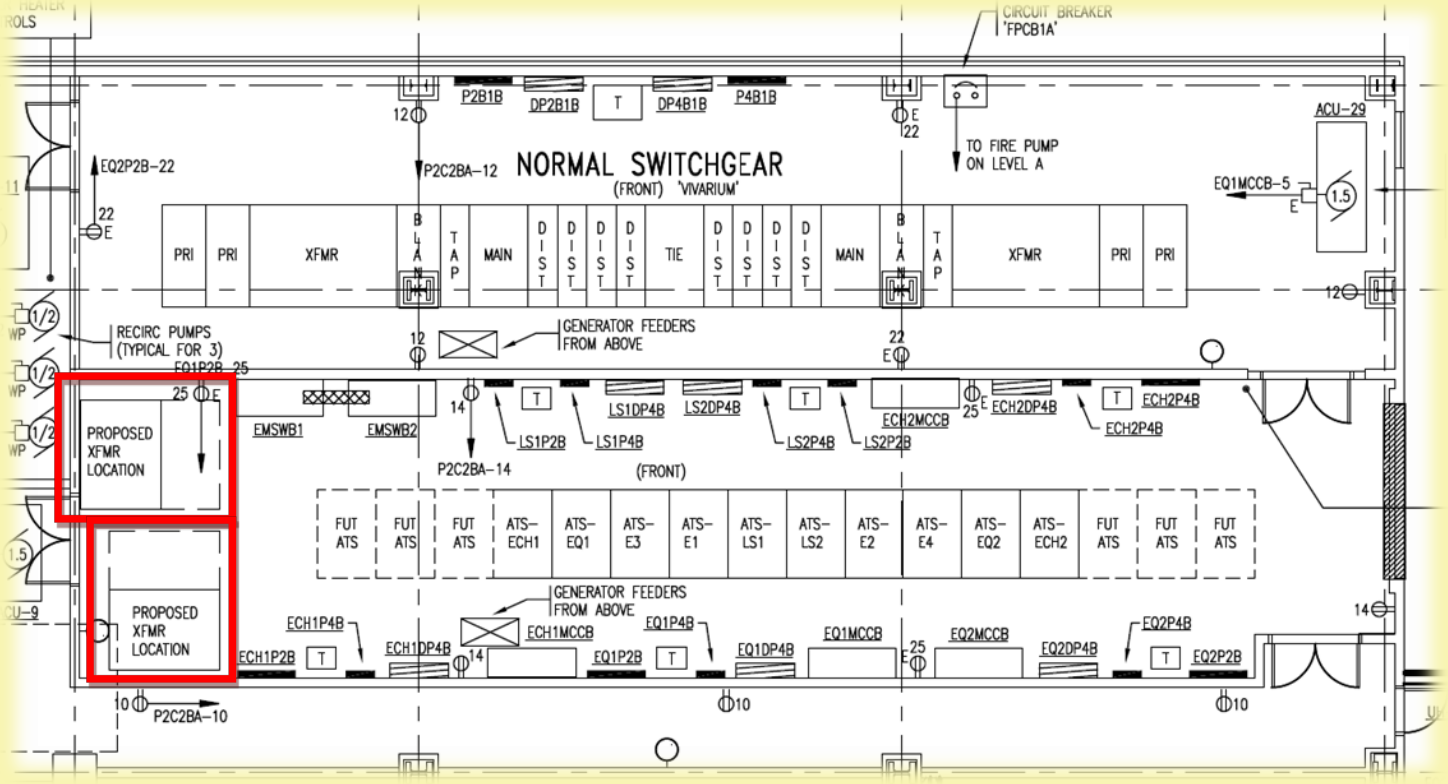
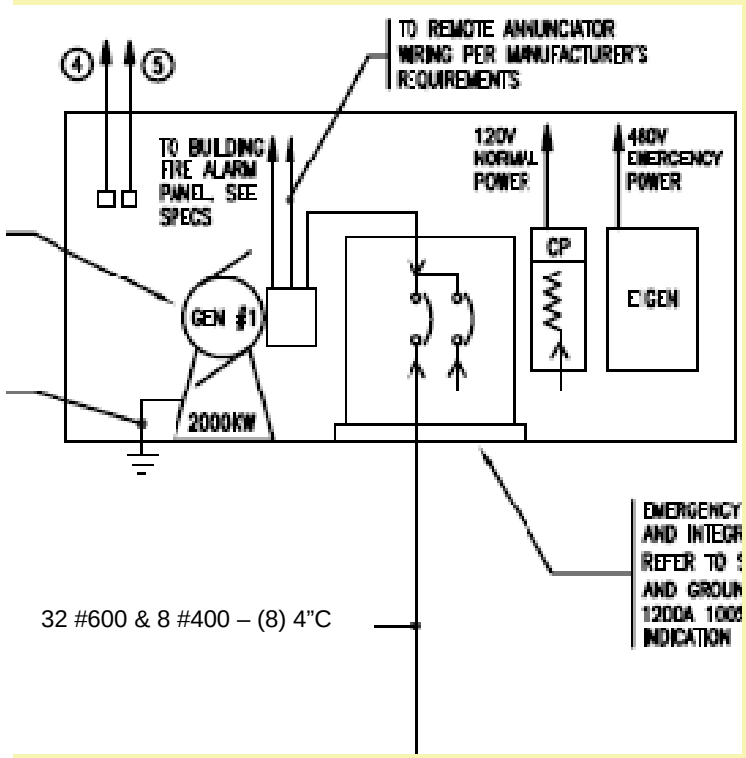
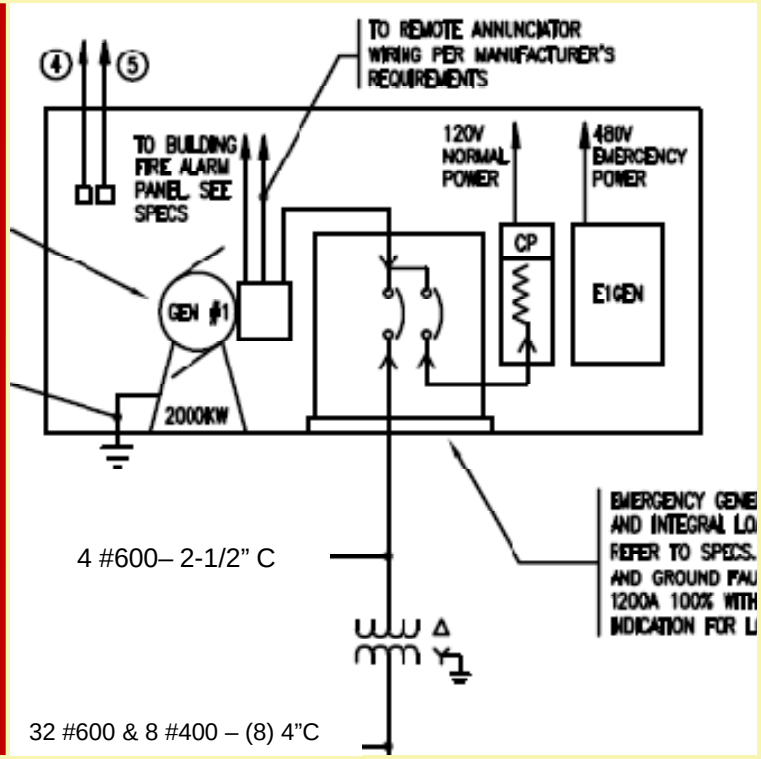


Medium Voltage

Existing vs. Proposed





Medium Voltage

Cost Analysis

Cost Analysis: Existing System vs. Proposed System			
	Quantity	Unit	Cost
Existing System			
2,000 KW Generator @ 480V	1		$450,000.00
Feeder [32 # 600 & 8 # 400 - (8) 4" C]	600	ft.	$483,000.00
Individual Total			$933,000.00
Number of generators			x2
Final Total			$1,866,000.00
Proposed System			
2,000 KW Generator @ 4160V	1		$490,000.00
2,500 KVA Transformer	1		$55,000.00
Feeder {10" of [32 # 600 & 8 # 400 - (8) 4" C] & 590' of [4 # 500 - 2.5" C]}	600	ft.	$67,800.00
Individual Total			$612,800.00
Number of generators			x2
Final Total			$1,225,600.00
	Cost Savings=		**$640,400.00**

**Assumptions: Installation included in wiring cost*
Freight and start up included in generator cost
**Pricing Info. provided by manufacturer and electrical contractor*

BIM-3D Modeling

Project Background

LEED® Points

Stormwater Management

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Conclusion

Goal:

Evaluate how innovative technology such as 3D CAD modeling is an effective tool for evaluating the City Hospital construction process.

Comparing the advantages and disadvantages between using and not using 3D.

BIM-3D Modeling

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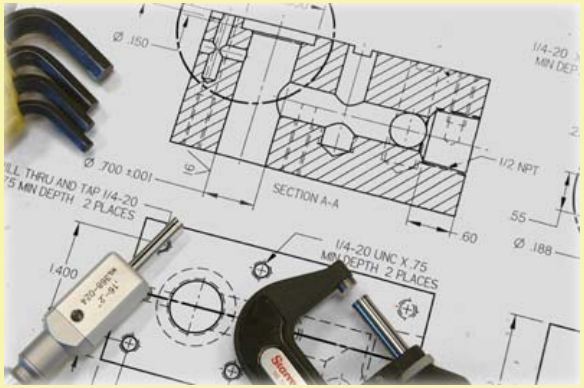
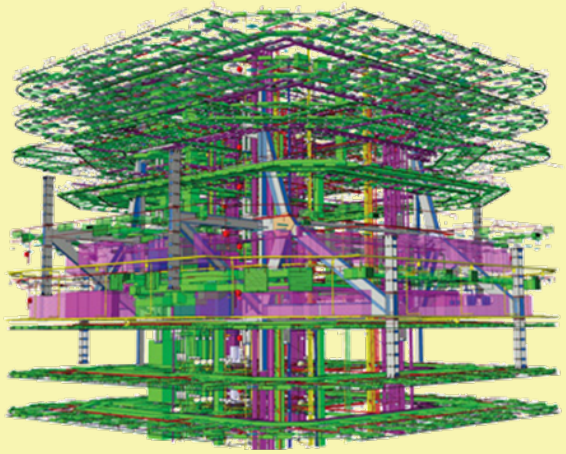
City Hospital

Phase 1 vs. Phase 2

2D Drafting

3D Modeling





BIM-3D Modeling

Methodology

Review literature on BIM-3D modeling.

Phone **interview with Jan Reinhardt,** the Program Manager of ViCon - Virtual Design and Construction

Attend a Modeling coordination meeting with Paul White, MEP coordinator on Phase 2 and subcontractors

BIM-3D Modeling

The steps for 3D modeling coordination are:

1. Developing a plan
2. Decide how to divide building in terms of level and elements (ex: levels and zones)
3. Develop a discipline specific 3D model (ex: electrical, plumbing, etc.)
4. Integrate discipline specific 3D model into NavisWorks
5. Identify conflicts between systems/connections
6. Decide how to resolve conflicts
7. Documentation of conflicts and solutions

BIM-3D Modeling

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Conclusion

1. Developing a plan

ViCon - Virtual Design and Construction at Turner Construction kicked off a 3D modeling meeting with all the trades that were to be involved in the summer of 2007.

BIM-3D Modeling

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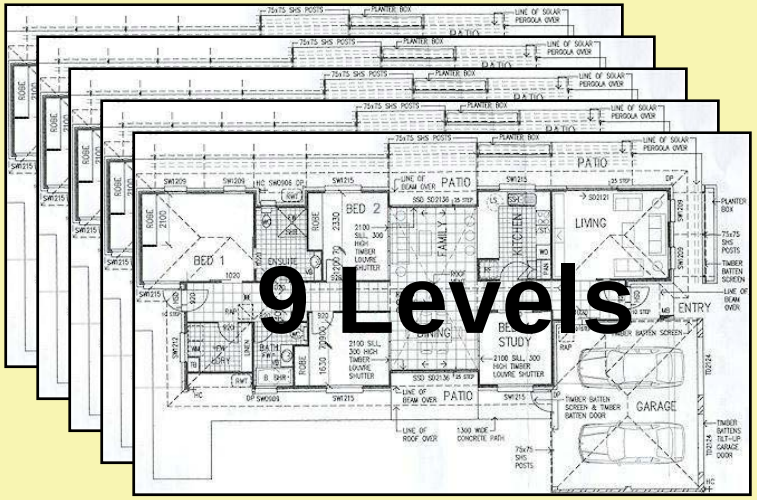
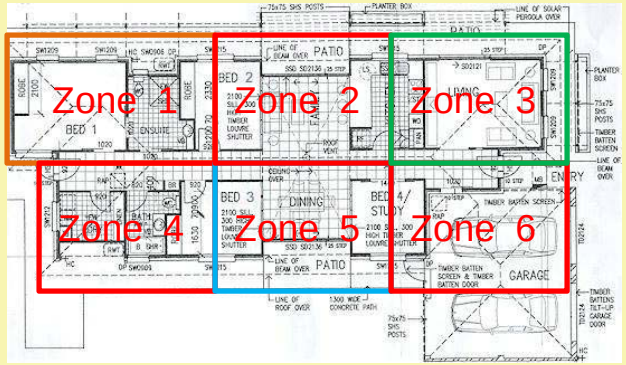
Conclusion

2. Decide how to divide building in terms of level and elements (ex: levels and zones)

City Hospital Phase 2:



5 to 6 zones per level



BIM-3D Modeling

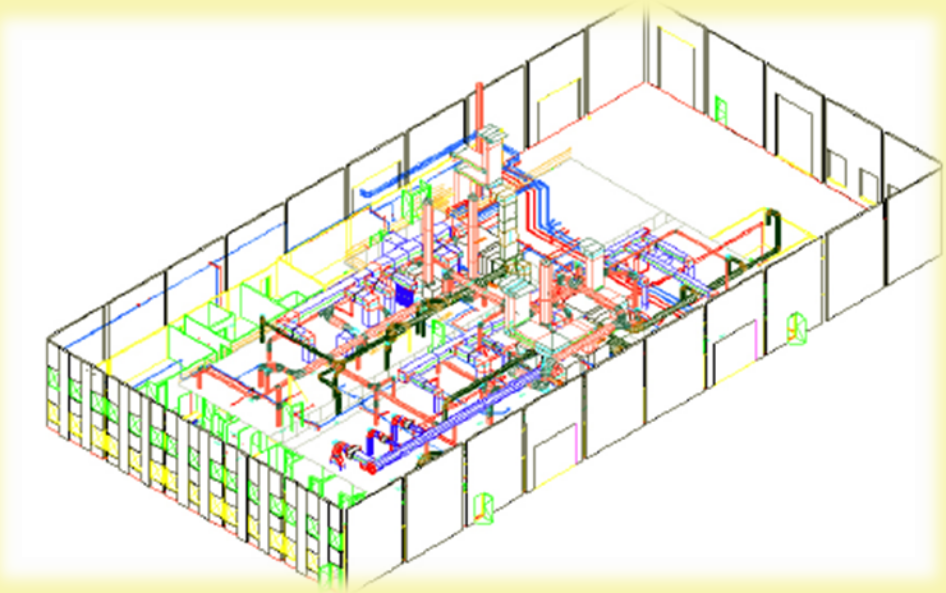
3. Develop a discipline specific 3D model (ex: electrical, plumbing, etc.)

Modeling Responsibilities for the City Hospital Project

Company	Role	Modeling Scope	3D software	Phase Model Created/Coordinated
3rd Party Company	Architect	Architectural Modeling in 3D	AutoCAD 2007	Design Development
Turner Construction Company	Construction Manager	Overall Coordination of MEP in 3D	NavisWorks	Construction Documents and During Construction
Burns	Mechanical Subcontractor	Piping in 3D	AutoCAD MEP 2008	Construction Documents
SMM Industries, Inc.	Structural Subcontractor	Ductwork in 3D	AutoCAD MEP 2008	Construction Documents
Carr and Duff	Electrical Subcontractor	Conduit and Cable trays in 3D	AutoCAD MEP 2008	Construction Documents
Chadwick	Plumbing Subcontractor	Plumbing System in 3D	AutoCAD 2007, QuickPen	Construction Documents
Majek Fire Protection	Fire Protection Subcontractor	Fire Protection System in 3D	AutoCAD MEP 2008, HydroCAD	Construction Documents
Johnson Controls, Inc.	Integrated Technology Contractor	Controls in 3D	AutoCAD 2008	Construction Documents

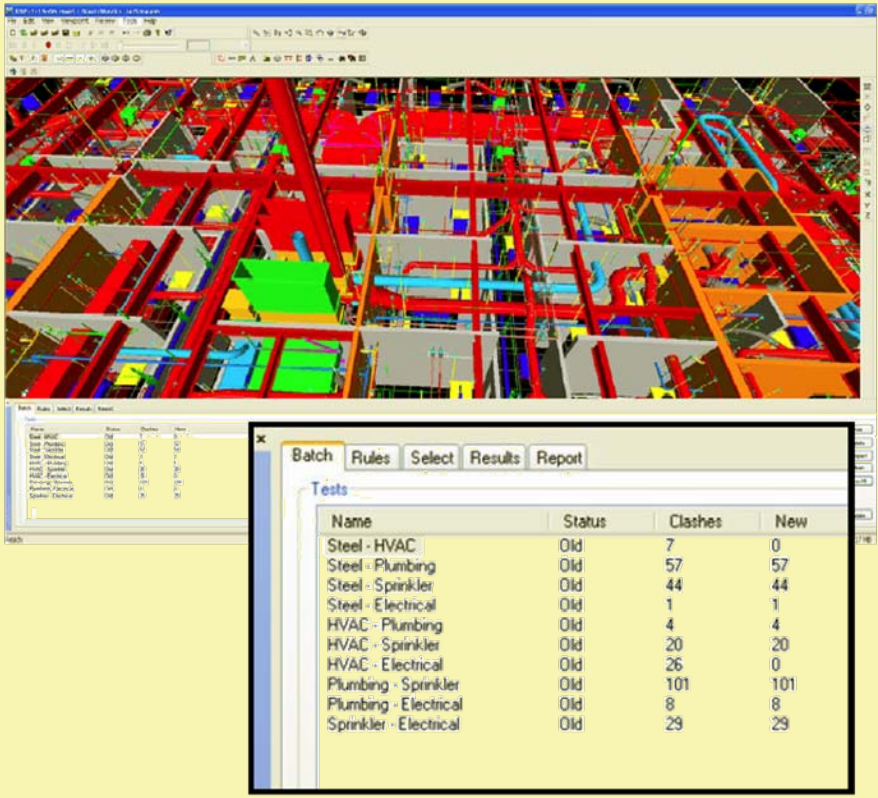
BIM-3D Modeling

4. Integrate discipline specific 3D model into NavisWorks



BIM-3D Modeling

5. Identify conflicts between systems and connections
6. Decide how to resolve conflicts
7. Documentation of conflicts and solutions



BIM-3D Modeling

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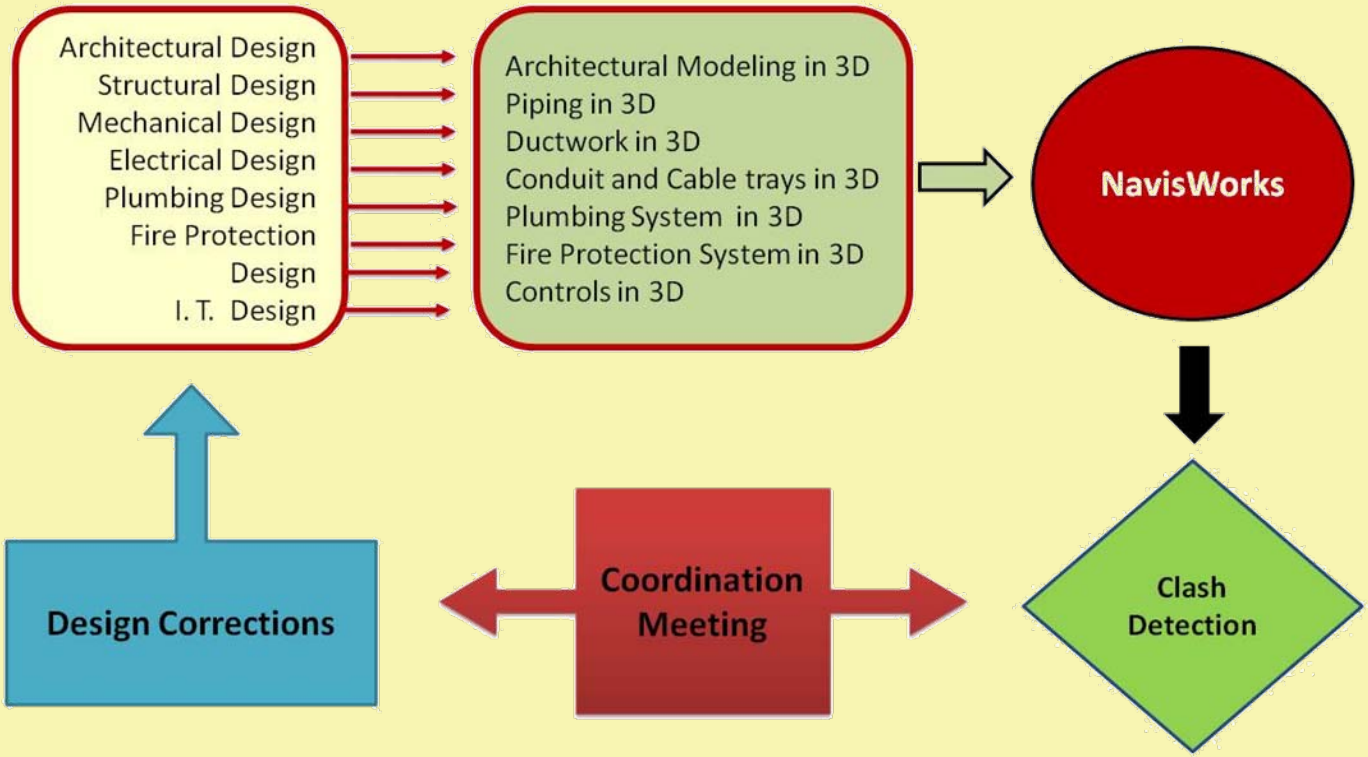
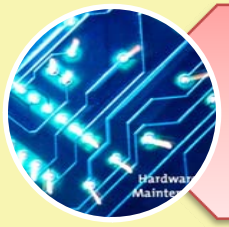


BIM-3D Modeling

Disadvantages to using 3D modeling:

Overcoming the learning curve in using the modeling programs

Upgrades that would not have any significant difference to prior versions of the modeling software such as AutoCAD



3D modeling software outpaces the hardware on computer systems

BIM-3D Modeling

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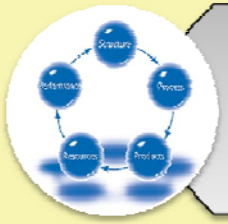
Advantages to using 3D Modeling



Coordinates the design and construction process

Prefabrication of piping which reduces installation time on the project site.

Extensive documentation to achieve LEED points

Conclusion

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Value Engineering:

Value can be increased by either improving the function or reducing the cost.

Acknowledgement

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Conclusion

Turner Construction Company

Pat Bolger -Senior Project Executive

Kathleen McCartney - Human Resources

Sarah Gallo – Assistant Superintendent

Keith Mondock - Project Controls

Tom Bedesem – MEP Superintendent

Gabriella Edwards – Project Engineer

Paul White – MEP Engineer

Graham D. Dewar - Assistant Engineer

Jan Reinhardt - Program Manager of ViCon – Virtual Design and Construction

CCRD Partners

Taiwo O. Alo - Electrical Designer

James E. Coppage, P.E. - Electrical Senior Associate

Timothy M. Bogardus- Mechanical Senior **Associate**

Marie Slagle - Plumbing Associate

Bay Diesel Corporation

Lee Newton - Vice President

Truland Systems Corporation

Keith R. Bush, PE - Director Integrated Construction Services

The Pennsylvania University

John I. Messner –Associate Professor - Construction

David R. Riley – Associate Professor - Construction

Robert Holland – Associate Professor – Architecture

Theodore H. Dannerth- Associate Professor- Architecture

James D. Freihaut – Associate Professor- Mechanical