MASTER PLANNING THE ENTIRE BUILDING | AN INTEGRATED ARCHITECTURAL AND ENGINEERING APPROACH

Why is Engineering important to Master Planning Design?

Your Presenters

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Agenda

- Learning Objectives
- Team Roles
- Master Planning
  - Definition
  - Process
  - Tools
  - Financial Impact
- Case Studies
- Summary

Learning Objectives

LEARNING OBJECTIVES

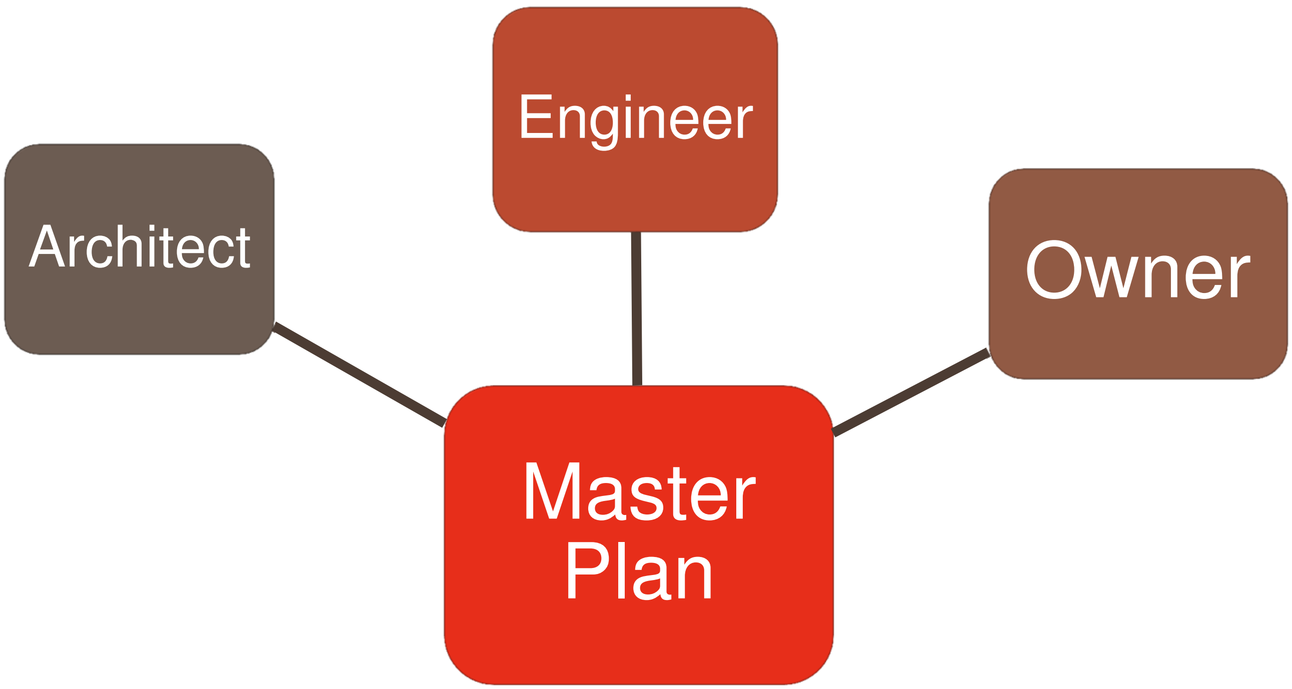
- Understand objectives of master planning
- Determine options for Engineering systems to complement architectural programming needs
- Evaluate facility needs for new, modified or upgraded engineering systems and planning
- Identify opportunities to incorporate engineering master planning efforts

Team Roles

Roles | Misconception

- Owner
  - Has money to spend
- Architect
  - Sets the program and builds a showpiece building
- Engineer
  - Tries to fit everything in too small of spaces

Roles | Redefined



Engineering Contribution

> “Engineering refers to the practice of organizing the design and construction [and, I would add operation] or any artifice which transforms the physical world around us to meet some recognized need.” – GFC Rogers

Master Planning Definition

Facility Master Plan

CRITERIA

- Improve Patient Safety
- Reduce or Optimize Operational Costs
- Create Ideal Patient Experience
- Long Term Flexibility
- Careful Stewardship of Resources
- Support Population Health Management
- Support Physician Recruitment
- Maximize Return on Investment
- Create a sustainable solution
- Incorporate resiliency

Facility Master Plan

SPECIFIC PROJECT PRIORITIES

- Address core patient safety, accreditation, high risk maintenance, and structural issues in current facilities
- Deliver exceptional services deployed in easy to access, impressively branded facilities.
- Continue hospital inpatient services as a key strategic distinction in the community, but “right size” capacity to match the community need.
- Assure safe, effective and efficient performance by developing an efficient, universal inpatient care platform.

- So, when do Engineers enter the picture?
- And… how can their efforts complement the architectural programming needs?

AN ARCHITECT'S VIEWPOINT

> "I do not like ducts. I do not like pipes. I hate them really thoroughly. But because I hate them thoroughly I feel that they have to be given their place. If I hated them and took no care, I think they would invade the building and completely destroy it. I want to correct any notion you may have that I am in love with that kind of thing."
>
> – Louis Kahn, *World Architecture* 1964

Centre Georges Pompidou
Not a Louis Kahn Building

AN ENGINEER’S REALITY

- Contrary to popular belief, not all engineers want to design gold plated infrastructures.
- What we really want to design is a solid base for the building infrastructure that will provide an appropriate code compliant system and still allow flexibility.

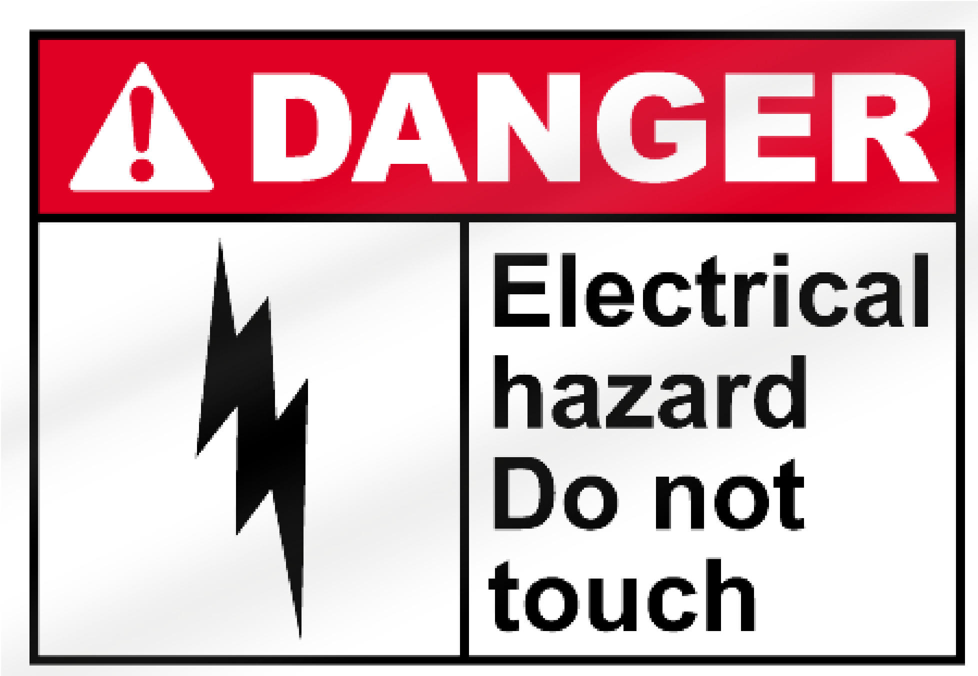
Master Planning Process

Process | Overview

- **Step ONE** — Send questionnaires to departments
- **Step TWO** — Current state meetings
- **Step THREE** — Future state meetings
- **Step FOUR** — Extreme schemes of master planning
- **Step FIVE** — Owner master plan final review
- **Step SIX** — Board report out

Process | Engineering

- When to include Engineering
- When not to Include engineering



Master Planning | Preliminary Questions

- Project Vision
  - Is program already planned
  - Is expansion realistic
  - Is it necessary
- Type of Construction
  - Existing Campus
  - Greenfield Site
  - Remodel / Expansion
- Who owns the building
- Location of building
  - Urban – Rural – Strip mall

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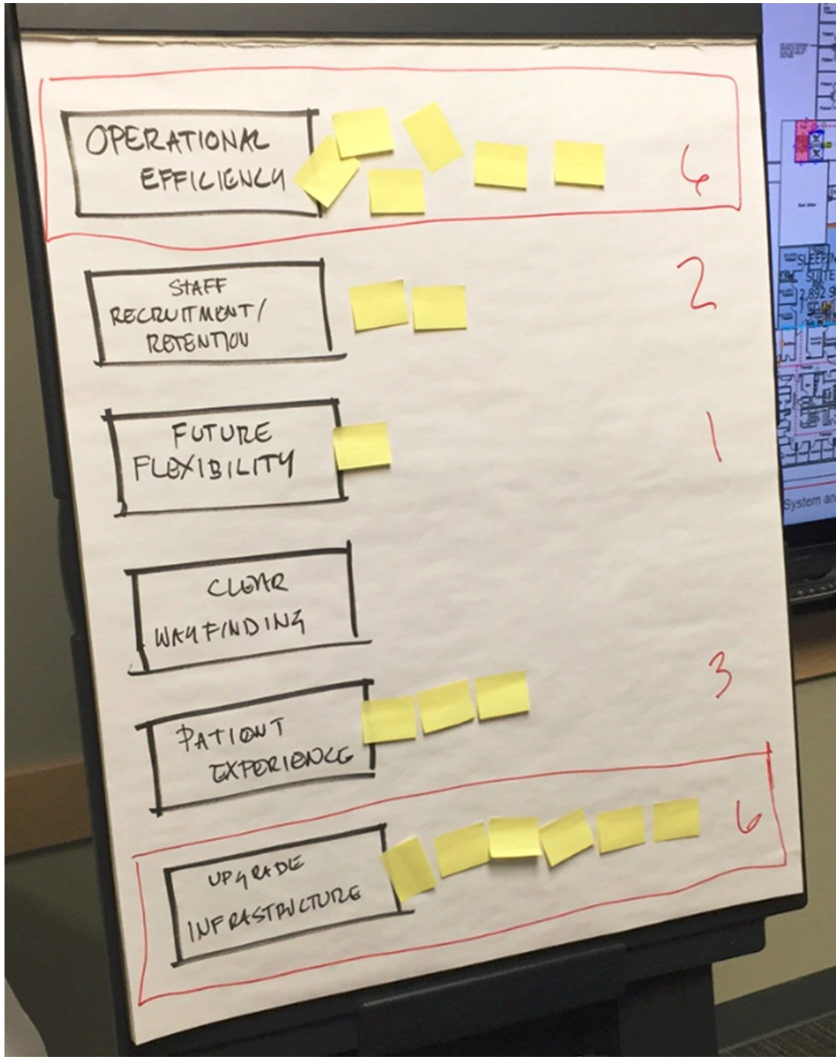
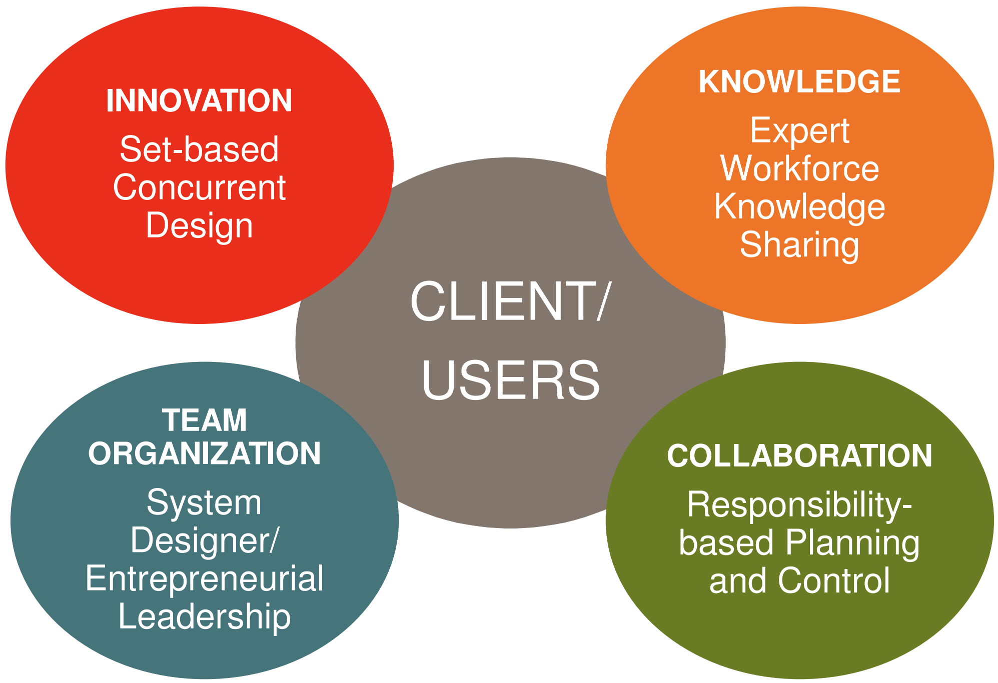
Project Understanding

- What is the required program-including infrastructure
- Right sizing the program to the projected volumes and modalities.
- Initial space program and associated support spaces
- Focus on improving operational efficiencies
- Evaluate the infrastructure needs
- Will LEAN principles will be a part of the design effort.



Fundamental Cornerstones



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Specific Goals for a Project?

Goals

- Each project is unique…
  - Understand the programming needs
  - Focus on improving operational efficiencies
  - Right sizing the facility to the projected volumes.
  - Initial design and future needs and objectives
  - Will LEAN principles be a part of the design effort.
  - What are the sustainability and resiliency goals

Operational and Planning Considerations

Business Success
- Increase Market Share
- Increase Patient Volume
- Flexibility
- Ongoing Operations
- Meet Schedule and Budget

Patient Experience
- Wayfinding
- Convenience
- Healing Environment
- HCAPS

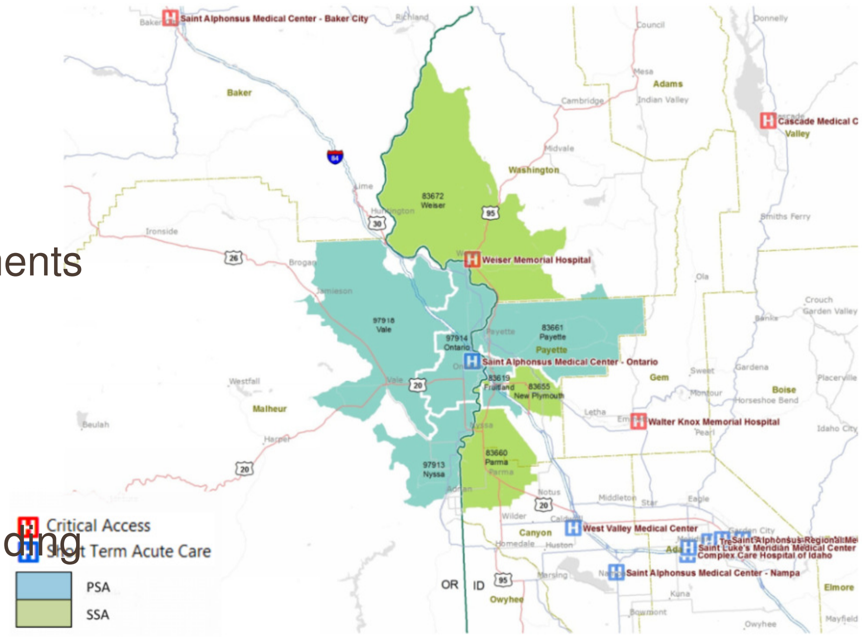
Staff
- Retention
- Recruitment
- Productive and Efficient

Functionality
- Maintenance & Operations
- Infrastructure
- Adaptability
- Resiliency
- Need for new, modified, or upgraded engineered systems

Facility Master Plan

PROCESS

- Demographic analysis & service line volume projections
- Translate volumes to space requirements
- Facility & infrastructure assessment
- Develop system based strategy for inpatient & outpatient services
- Develop master plan scenarios- including infrastructure options
- Final recommendation



Overall market consists of 8 ZIP codes through Eastern Oregon and Western Idaho.

Source: Administration

Master Planning Tools

Many Tools Available

- Program
- Pull scheduling
- Owner’s Project Requirements (OPR)
- A3s
- Basis of Design (BOD)
- Set Logs
- Component Design

- Match tools to Project and Team

Program

ARCHITECTURAL SPACES

- Here is where we start…
- Space program
- Modalities
- Expansion plans
- Architectural design flexibility
- Infrastructure

Clinic Program Summary **January 21, 2015**

Space Needs		Total DGSF	Actual DGSF	COMMENTS
Public/ Lobby				
A.	Public and Patient Support - Entry	2,171	1,743	
B.	Central Registration/ Appointment Center	910	636	
Provider/ Clinic Space				
C.	Clinic Module	30,083	30,818	
C1.	Urgent Care Module	3,423	4,109	
D.	Clincal Support	8,628	7,558	
E.	Staff Support	1,946	2,226	
Ancillary Space				
F.	Pharmacy	2,445	2,116	
G.	Diagnostic Imaging	4,437	4,278	
H.	Therapy - PT/ OT/ Speech	7,765	6,976	
J.	Clinical Laboratory	2,113	2,125	
Health and Wellness				
K.	Conference/ Education Center	2,500	1,313	
L.	Retail	1,670	1,351	
Administration				
M.	Administrative Offices	1,885	2,242	
Support				
N.	Building Support Area	1,463	1,161	
	Total DGSF	**71,438**	**68,652**	
	DGSF to BGSF Multiplier	1.20	1.27	
	Total BGSF	**85,725**	**87,015**	
			500	Line item add for enclosed mechanical penthouse
			87,515	

High Level Pull Schedule

CONSIDERATIONS

- Program Needs
- Staffing and Department Considerations
- Infrastructure to support program
- Utility location
- Phasing
- Department of Health Approvals
- AHJ Approvals

Tools | Owner's Project Requirements

Tools | A3

Option 3 – New Infrastructure for Addition, Peak Shaving Program, Modification of Existing Infrastructure:

This discusses the advantages and disadvantages of Electrical Distribution system design Option 3.

DESCRIPTION:

New normal distribution drawout switchgear with a new single utility feeder.

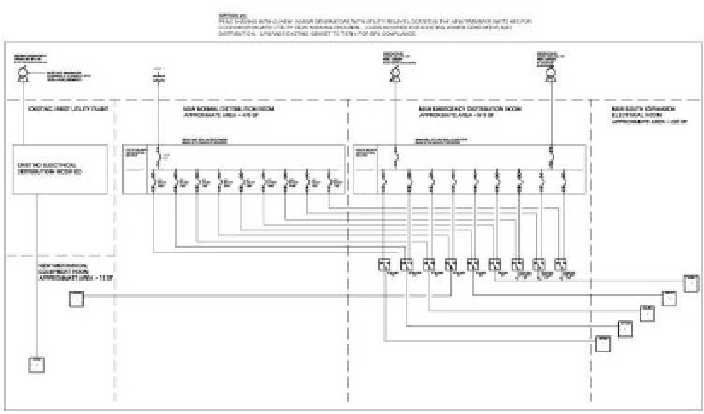
New individually mounted paralleling gear and two new 1500 KW 480V Tier 4 generators. Existing generator upgraded to meet Tier 4 emissions requirements.

New infrastructure to participate in the Peak Shaving Program.

New transfer switches with peak shaving relays. Peak shaving accomplished on a per ATS basis.

Distribution provided to the new east expansion. Life Safety, Critical, and Select equipment branch code required loads assigned to new switchgear. Existing life safety and critical loads migrated to new distribution. Evaluation of other new and existing loads added to new system pending capacity. Some new loads may be connected to existing 3000A normal branch switchboard.

Existing distribution modified to eliminate essential systems loads (life safety and critical) and select building critical loads. Existing generator distribution panelboard eliminated.



PROS for Option 3 Design:
1. Less initial cost than Option 4.
2. Addresses and rectifies any potential code issues of existing infrastructure.
3. Provides additional reliability for life safety and critical hospital loads.
4. Utilizes peak shaving program to the maximum extent.
5. Utility cost will be significantly less than the standard utility rate without peak shaving.
6. All of the facility will have generator back up. (Island Power) "White outlets" and mechanical systems will continue to work for most outage scenarios.
7. Easier to trace origin of power.
8. Eliminate overload situation of existing peak shaving switchboard during peak demand times.

CONS for Option 3 Design:
1. More upfront cost than previous options for new infrastructure.
2. New Generators will be required to be Tier 4 emissions.
3. Existing Generator required to be upgraded to Tier 4 emissions.

Economic Analysis:

Initial Cost Savings Realized in the following items:
- Will realize the 20% savings for each utility bill for a payback time.

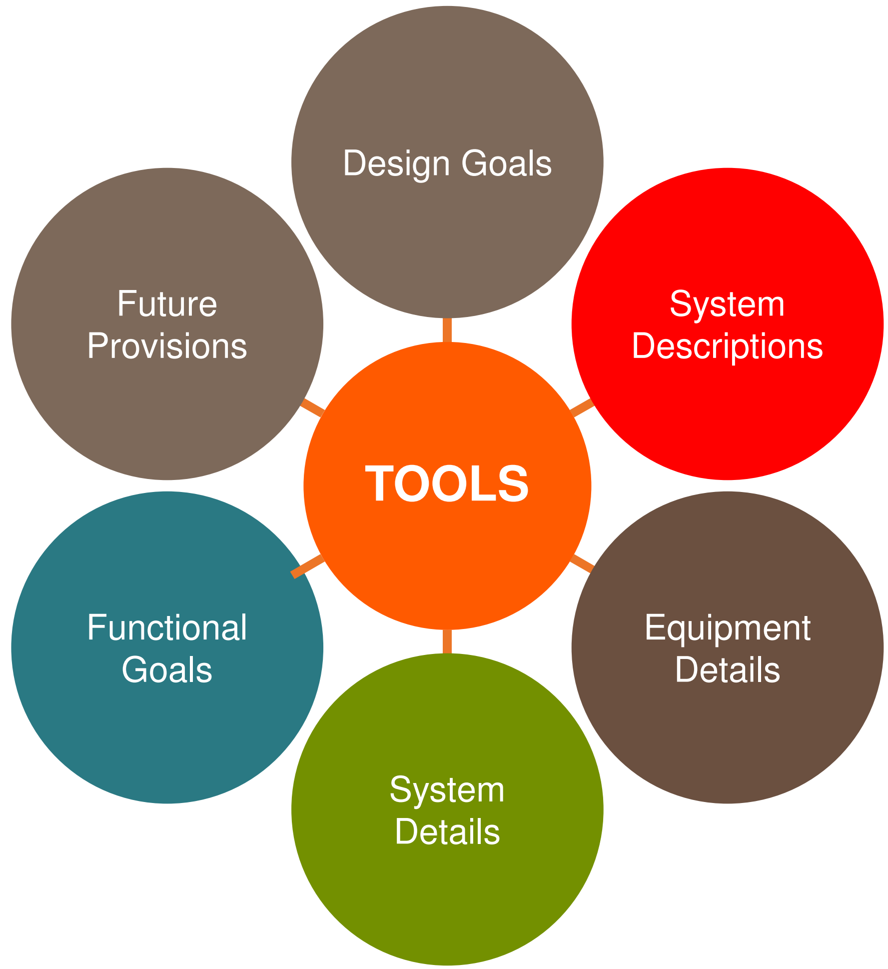
Cost Negatives:
- Switchgear more expensive than switchboards
- ATS equipment slightly more expensive due to additional Peak Shaving relays required. More ATSs required.
- Larger generators and Tier 4 emissions required
- Existing generator to be upgraded to Tier 4.
- Existing infrastructure modified.

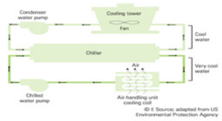
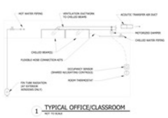
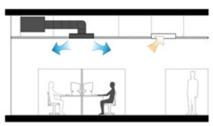
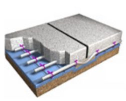
Economic Comments:
- Peak shaving via individual ATS equipment is more cost efficient than a single switch and allows additional reliability for the system.
- Programs are available to assist in the upfront cost of the equipment, but limit choices.

Recommendations:

This Option is recommended.

Tools | Owner's Project Requirements



ID	Description	MAIN GOALS: Energy	MAIN GOALS: Capital Cost	Evaluation Criteria: Energy Cost	Evaluation Criteria: Healthcare Environmental Quality	Evaluation Criteria: Sustainability	Evaluation Criteria: Complexity	Evaluation Criteria: Flexibility	Evaluation Criteria: Redundancy	Evaluation Criteria: Space Needed	Evaluation Criteria: Maintenance	
Alt 2	**Water Cooled Magnetic Bearing Chiller w/Cooling Tower**  	++	-	++	0	+	0	0	0	-	0	This option could also use a non-modular heat recovery chiller.
Alt 2	**Chilled Beams (Patient areas, admin & wellness/rehab areas). 100% OA AHU.**  	+	-	+	0	+	0	0	-	+	0	The air handling unit serving the chilled beam system(s) is a standalone 100% OA air handling unit. In the energy model this is dealt with separately.
Alt 2	**Overhead Variable Air Volume (remainder of buidling). 25% Min OA AHU** 	0	0	0	+	0	+	+	0	0	0	The air handling unit serving the variable air volume system(s) is a standalone 25% min. OA air handling unit.
Alt 2	**Radiant Floor Heating (Perimeter of new building, match existing building)** 	+	0	+	0	+	+	0	0	+	0	Radiant floor heating is used through out the existing building and will be continued through out the new building.
Alt 2	**Gas Fired Condensing Boilers**  	+	0	+	0	+	+	0	+	0	0	
Alt 2	**Supplement w/Exising Facility** 	-	+	-	0	0	-	-	+	+	-	

Tools | Set Logs

TOOLS | TEAM CONCENSUS

Site	Core Shell	Interior	Thermal Comfort	Power	Technology
Leader:	**Leader:**	**Leader:**	**Leader:**	**Leader:**	**Leader:**
Civil Engineer	Proj. Designer	Proj. Designer	Sr. Engineer	Sr. Engineer	Sr. Engineer
Team:	**Team:**	**Team:**	**Team:**	**Team:**	**Team:**
Owner's Representative	Owner's Representative	Owner's Representative	Owner's Representative	Owner's Representative	Owner's Representative
Project Designer	Project Architect	Project Architect	Mech. Engineer	Electrical Engineer	Electrical Engineer
Project Architects	Architects	Architects	Electrical Engineer	Mech. Engineer	Mech. Engineer
Mech. Engineer	Mech. Engineer	Medical Planners	Project Architect	Project Architect	Project Architect
Elec. Engineer	Structural Engineer	Interior Designers	Structural Engineer	Project Designer	Project Designer
Construction Mgr.	Construction Mgr.	Mech. Engineer	Srvcs. Technical Grp.	Interior Designer	Interior Designer
		Electrical Engineer	Construction Mgr.	Srvcs. Technical Grp.	Srvcs. Technical Grp.
		Construction Mgr.		Construction Mgr.	Construction Mgr.

Program | Infrastructure Base Line

Mechanical Rooms and Penthouses

- 7 to 9% of Building Gross Square Feet (BGSF)
- 16 feet clear vertical height
- Access to exterior walls

Shafts

- 0.27% of BGSF- 1 sf per 375 sf
- One shaft per smoke compartment- Aligned vertically
- Coordinated with structural system

Main Electrical Rooms

- 1 to 2% of BGSF

Distribution "Closets"

- 8x10 is good for planning- stacked

Server Room

- 1 sf per 100 of total GSF

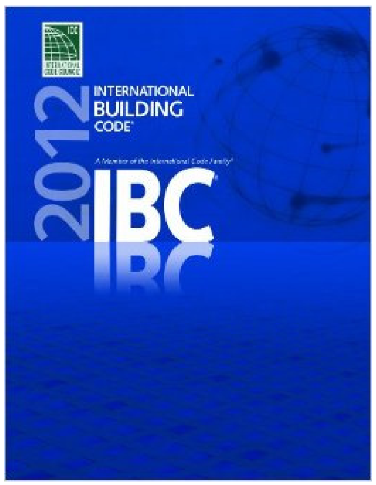
Tele/Data Rooms

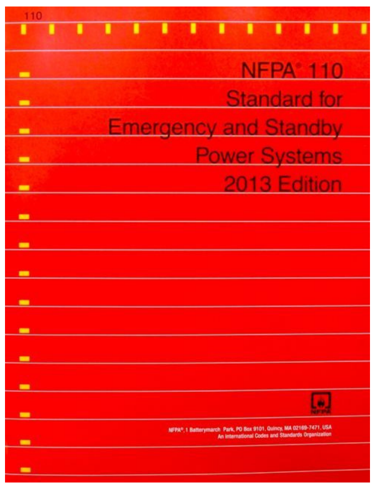
- Minimum 10'x15' or Owner's standards

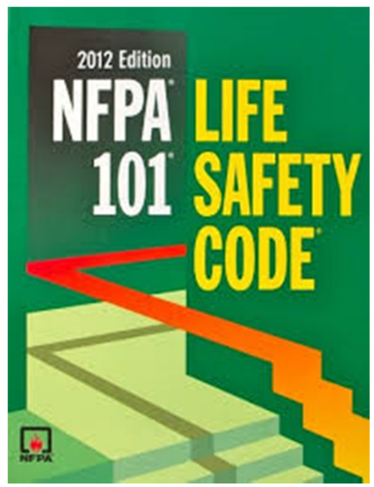
Central Plant

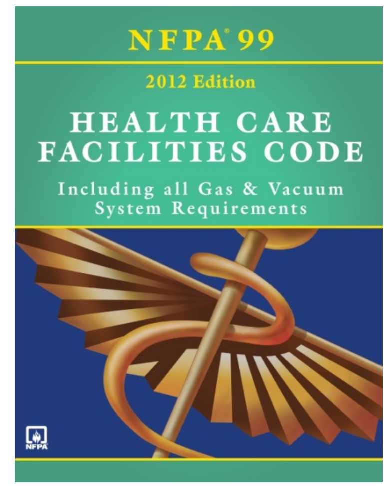
- 2 to 3% of BGSF

Program | Code Considerations







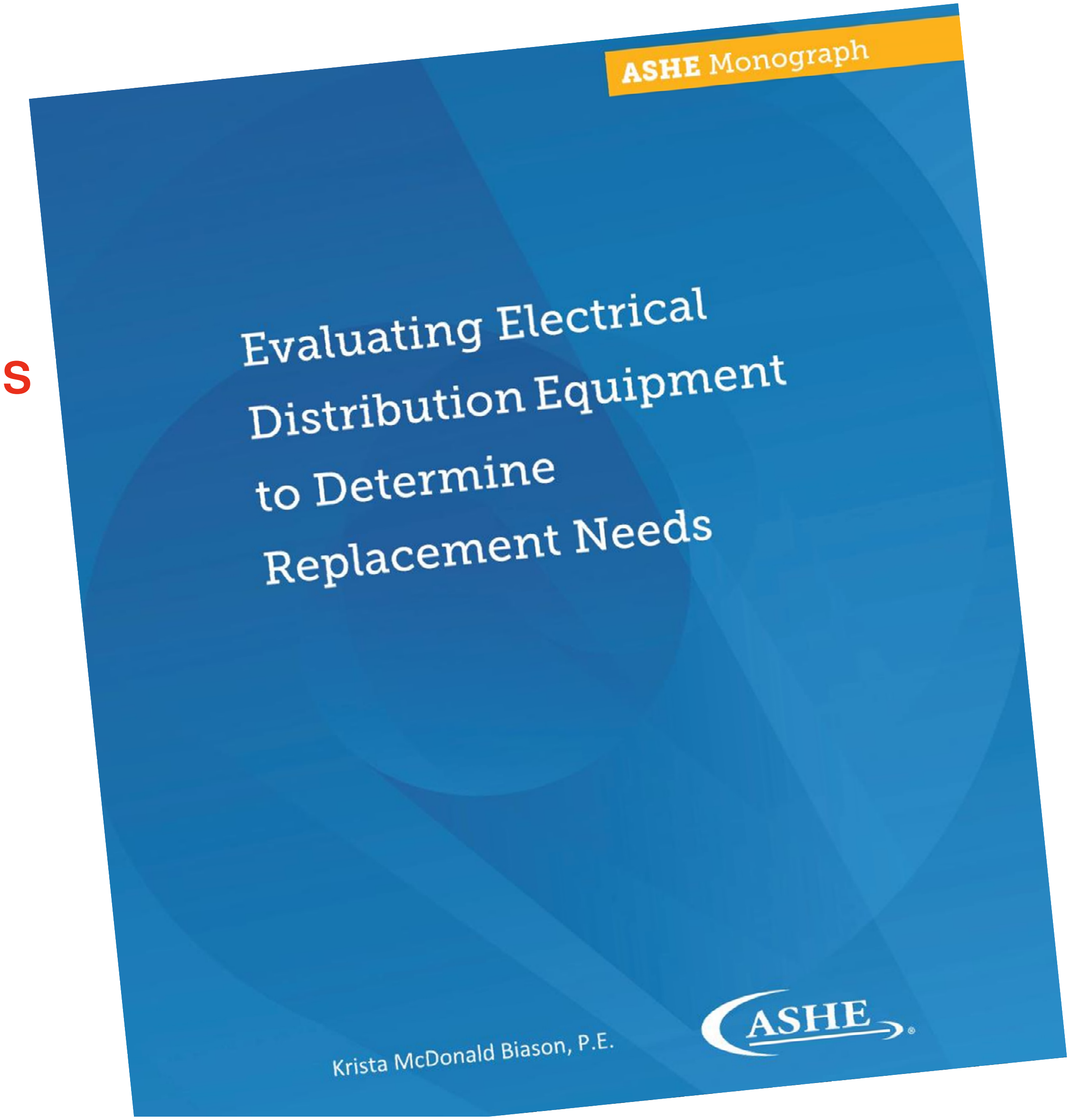


These are only some of the documents required for health care design

Existing System Evaluation

ELECTRICAL CONSIDERATIONS

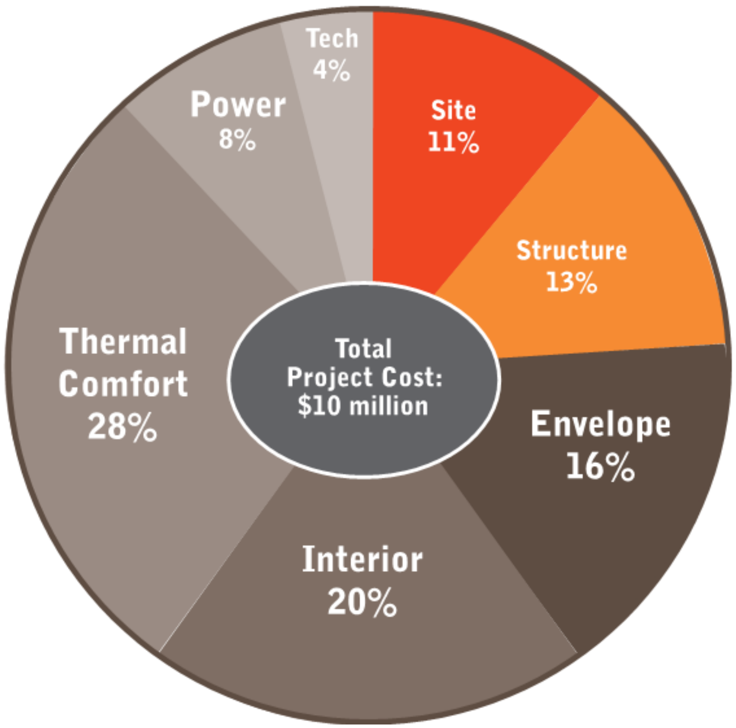
- Age of system
- Condition of equipment
- Code compliance
- Applicability
- Desire for future flexibility



Master Planning Financial Impact

Financial Impact | Typical New Project

COMPONENT TEAM PRICING



PROJECT COST $10.3 M

- Approximately $6.8 M Construction Cost
- Approximately $3.5 M Soft Costs

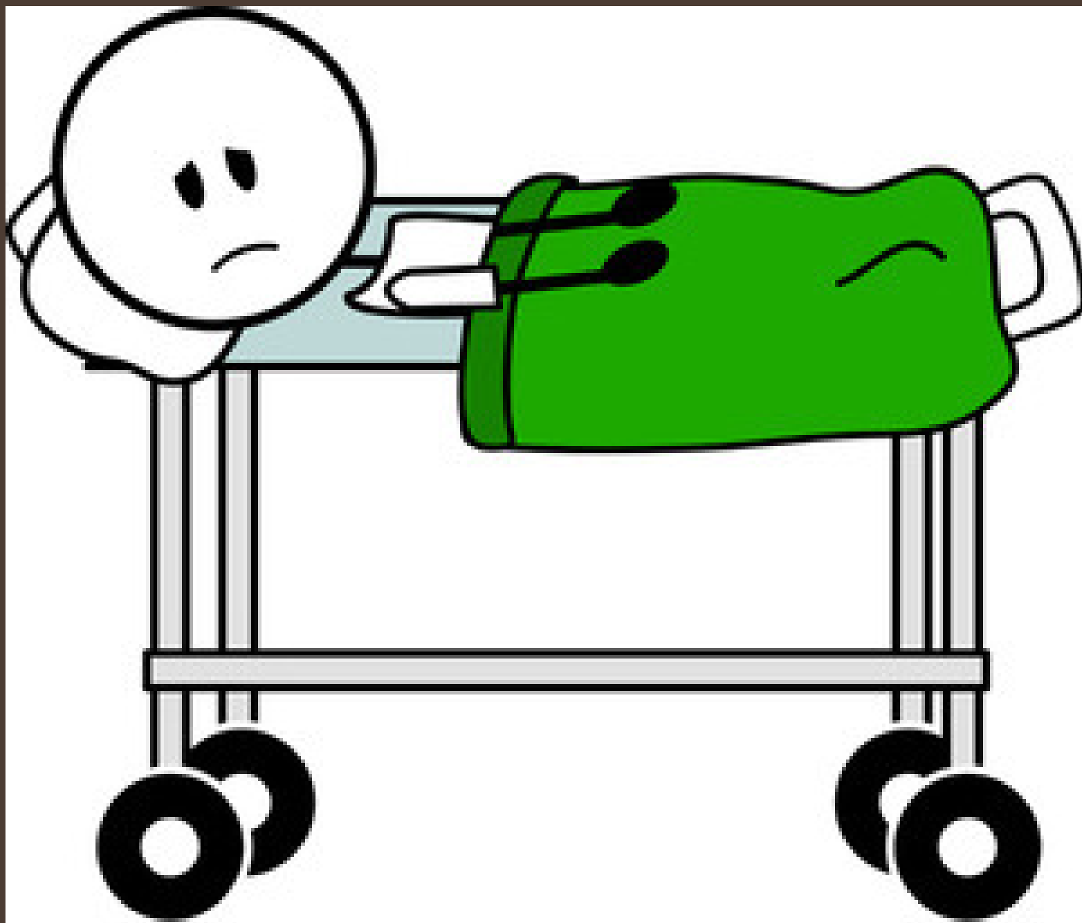
Cost Impact

Rarely shifts towards infrastructure budget

- What can the project afford?
- What is the “code required” minimum?
- Where is the money best spent?

- Stakeholder input: Who will yell the loudest if their program doesn’t make the final cut?

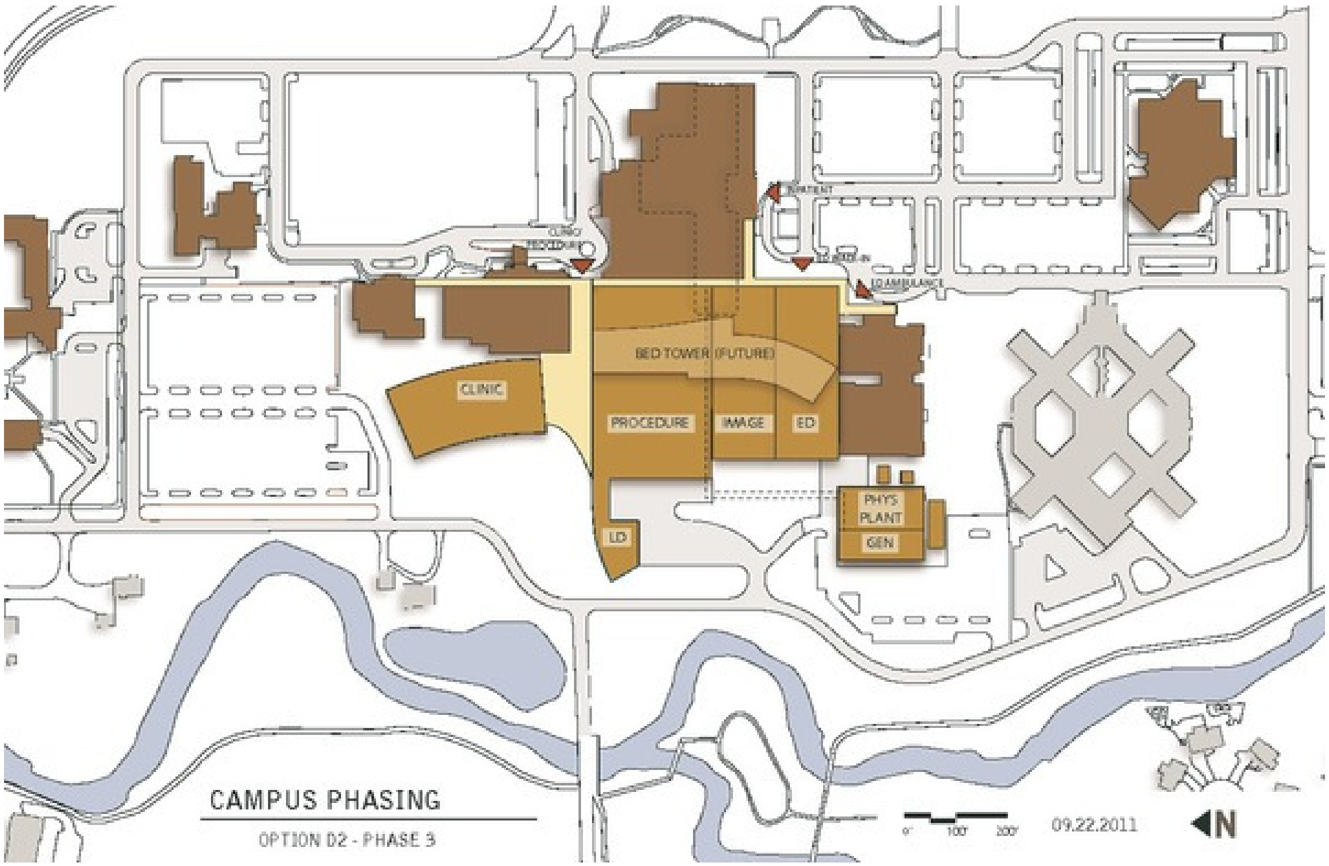
Budget | Decision Considerations



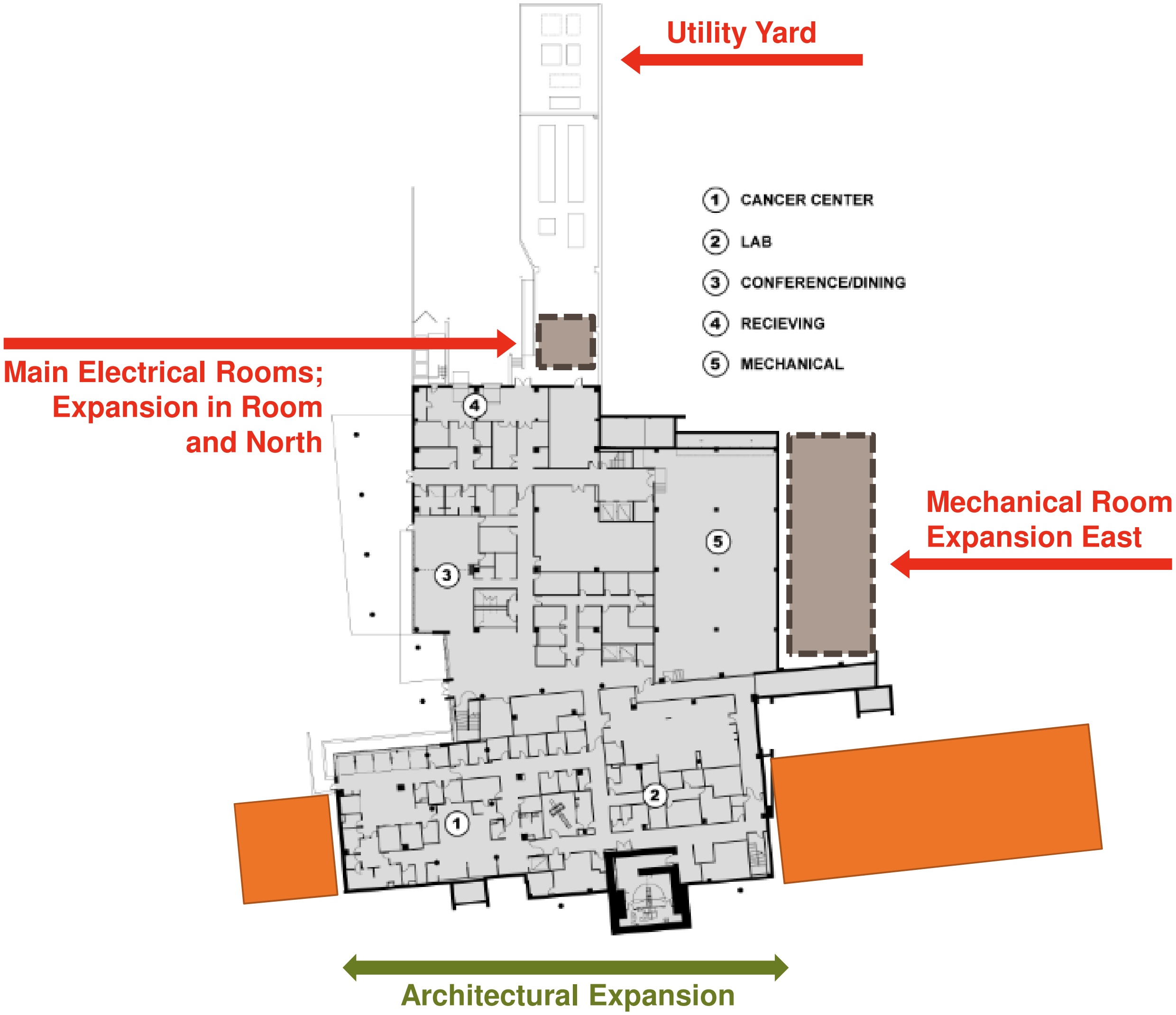
Case Studies

Case Study #1
Existing Campus

EXISTING CAMPUS



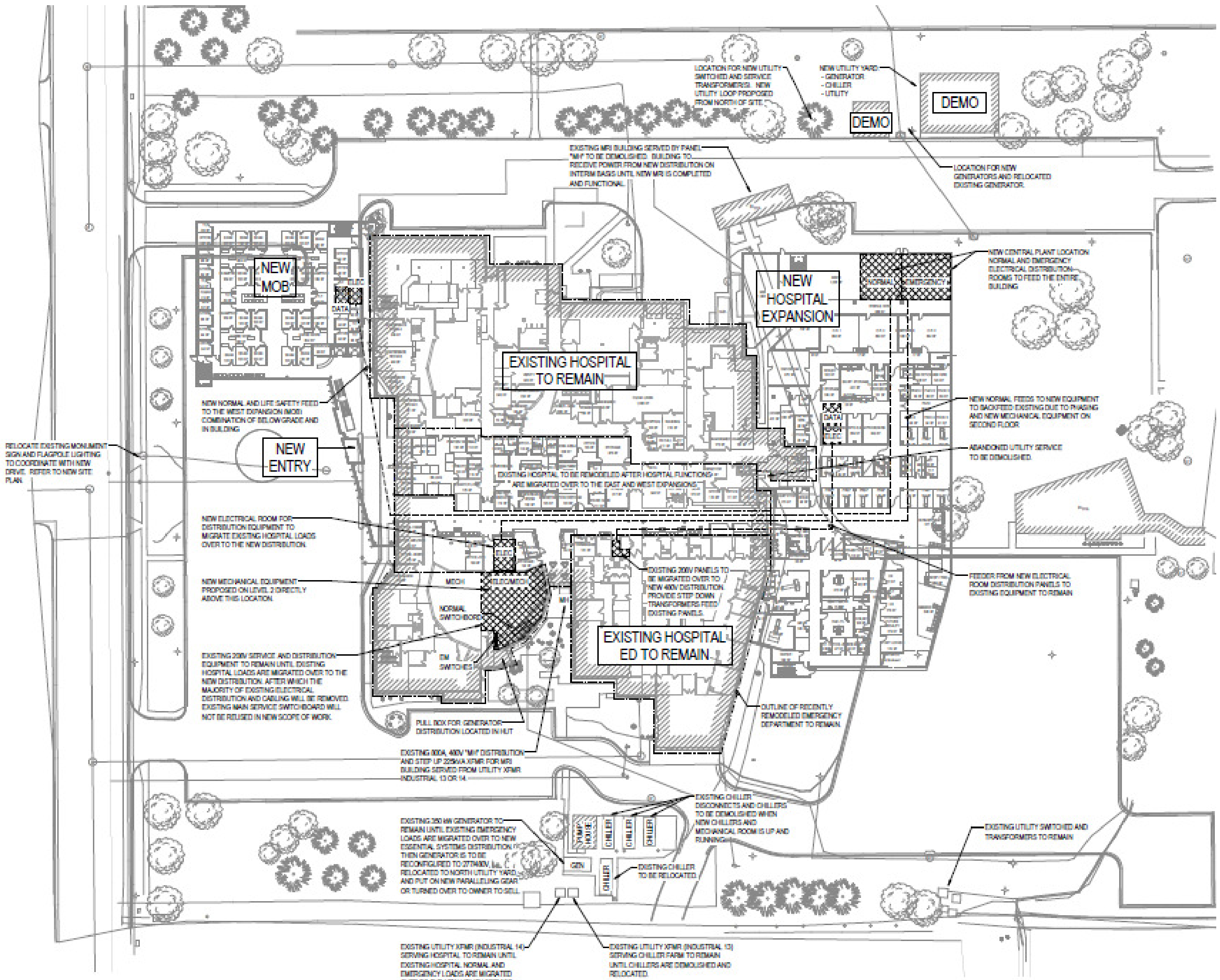
Case Study #2
Greenfield Site



GREENFIELD SITE

Case Study #3
Remodel / Expansion

REMODEL / EXPANSION



Summary

THANK YOU!

Master Planning the Entire Building – An Integrated Architectural and Engineering Approach