HOW THE UNIVERSITY IS PREPARING STUDENTS TO INFLUENCE THE DEVELOPMENT AND MANAGEMENT OF THE HEALTHCARE BUILT ENVIRONMENT

2015 MIDWEST HEALTHCARE ENGINEERING CONFERENCE

NOVEMBER 11-13,2015

Phillip S. Dunston, Ph.D.

Professor, Lyles School of Civil Engineering & Division of Construction Engineering and Management

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Associate Professor, Division of Construction Engineering & Management

Bradley Benhart, MBA, LEED

Clinical Assistant Professor & Assistant Head, School of Construction Management Technology

Principal, Integrated Construction Resources

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OVERVIEW

Brief History at Purdue

Research Examples

Healthcare Construction Management Education

Facilities Engineering and Management Education

Industry-Academe Cooperation and Collaboration

BRIEF HISTORY

BACKGROUND OF DEVELOPMENTS AT PURDUE

- Regenstrief Center for Healthcare Engineering (RCHE) established 2005
- Healthcare Construction Management (HCM) concentration within the Polytechnic Institute (formerly College of Technology)
- ASHE engaged regarding succession planning leading to first student chapter of ASHE (2007)

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HEALTHCARE CONSTRUCTION MANAGEMENT (HCM) - SCHOOL OF CONSTRUCTION MANAGEMENT TECHNOLOGY

Bradley Benhart, MBA, LEED

Clinical Assistant Professor & Assistant Head, School of Construction Management Technology

HEALTHCARE CONSTRUCTION MANAGEMENT
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PROGRAM DETAILS

- Classroom
- Partnerships
- Case Studies
- Guest Lectures
- Project Tours
- Mock Ups
- Internships
- Applied Research

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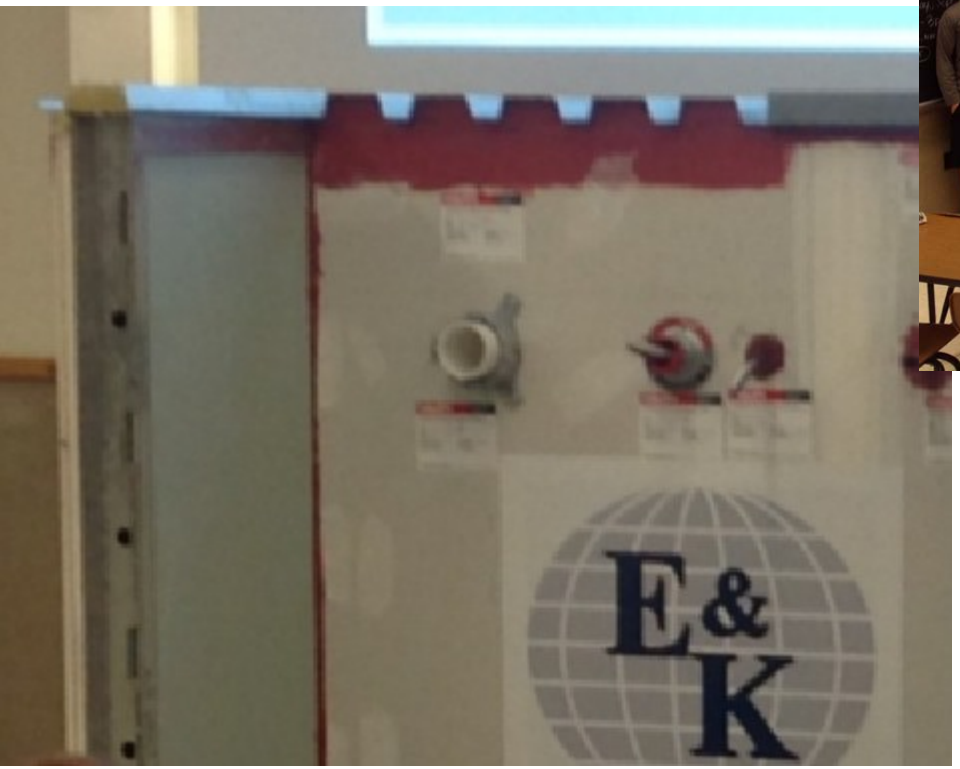

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ISHE

Indiana Society for Healthcare Engineering

HEALTH

HCC HealthCare CONSTRUCTION™ CERTIFICATE

ASHE

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ASHE

American Society for Healthcare Engineering
of the American Hospital Association

PURDUE ASHE CHAPTER
2014-2015

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ASC CONSTRUCTION COMPETITION

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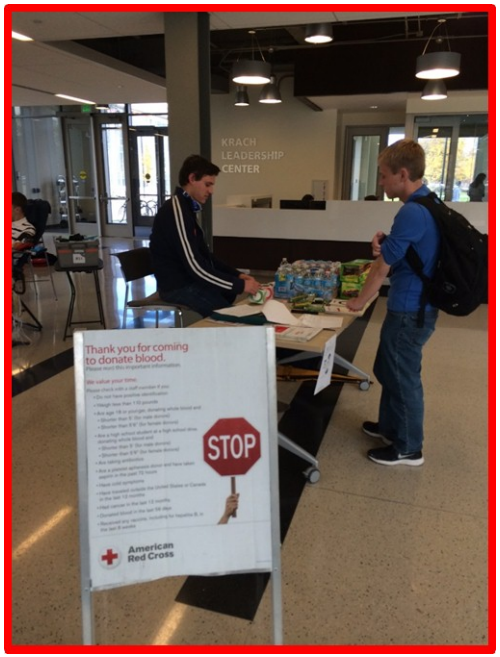
ANNUAL ASHE BLOOD DRIVE

American Red Cross



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2015 PDC SUMMIT

PDC SUMMIT 2015

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P+D STUDENT DESIGN CHALLENGE

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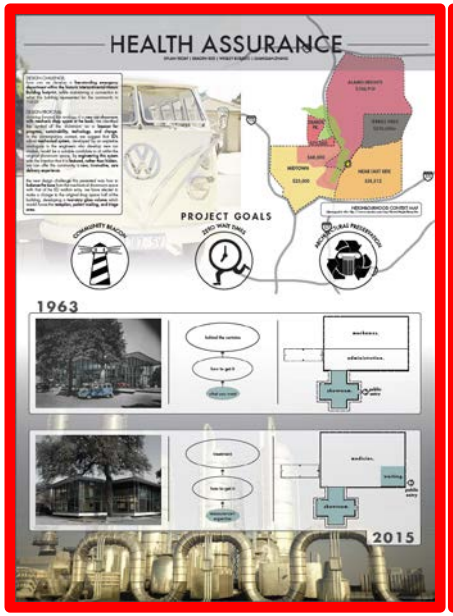

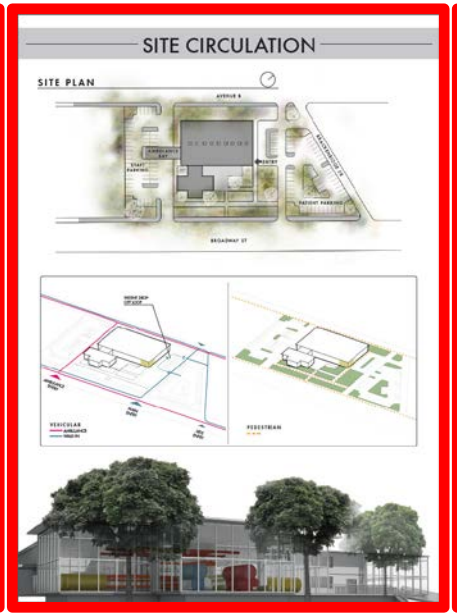

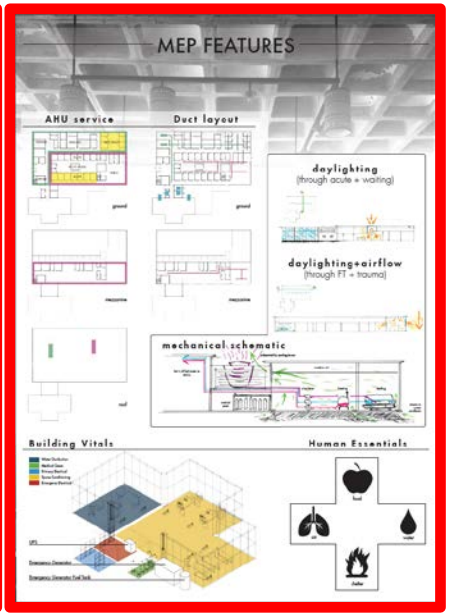

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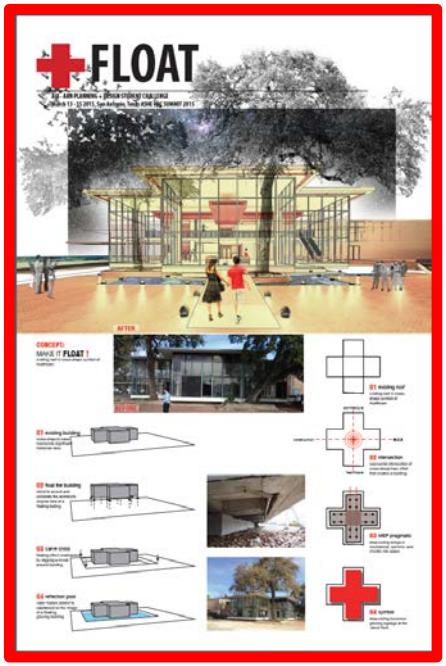

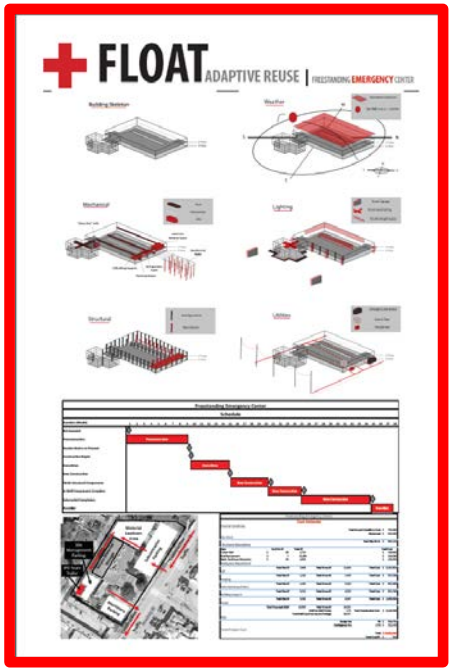

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THANK YOU!

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HEALTHCARE CONSTRUCTION MANAGEMENT

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FACILITIES ENGINEERING & MANAGEMENT

Theodore J. Weidner, Ph.D., PE, AIA, GGP, CEFP

Associate Professor, Division of Construction Engineering & Management

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INCREASING STUDENT AWARENESS

FACILITY ENGINEERING & MANAGEMENT

- Technical/numerical approach to operating and maintaining hospital facilities
- Analysis of total staff requirements
- Determination of maintenance expenditures
- Workload balancing
- Capital renewal projections
- Energy consumption and management

- Data Inputs
  - Building size
  - Building area breakdown
    - Clinical facilities
    - Laboratories
    - Offices
    - Other
  - Building Components
    - Recognized standards for maintenance
    - Empirically developed standards

EXAMPLE SQUARE FOOT ANALYSIS

Description	Classification	Level	Area	Sf/person/ day	People
Telecom	Utility	2	1,305	6,000	0.2
Electrical	Utility	2	1,305	6,000	0.2
Janitrorial supply	Utility	2	1,305	6,000	0.2
Floor mechanical rooms	Utility	2	1,305	6,000	0.2
Laundry / Housekeeping	Public (Circulation) with Hard Floor	2	17,500	24,400	0.7
Stairwell	Stairwell	2	6,750	18,600	0.4
Elevators	Vending	1	920	5,900	0.2
Mail/Receiving	Storeroom	2	2,500	240,200	0.0
Structural Components	No Cleanable Area	1	33,750	0	

CUSTODIAL EMPLOYEES REQUIRED

Sum of Required Employees	52.70
Adjusted FTE required	74.80
Round up	75

Direct Wage	$9.50
Overhead (Assumed)	$15.00
Per Hour Cost	$24.50
Custodial Required Budget	$3,836,700

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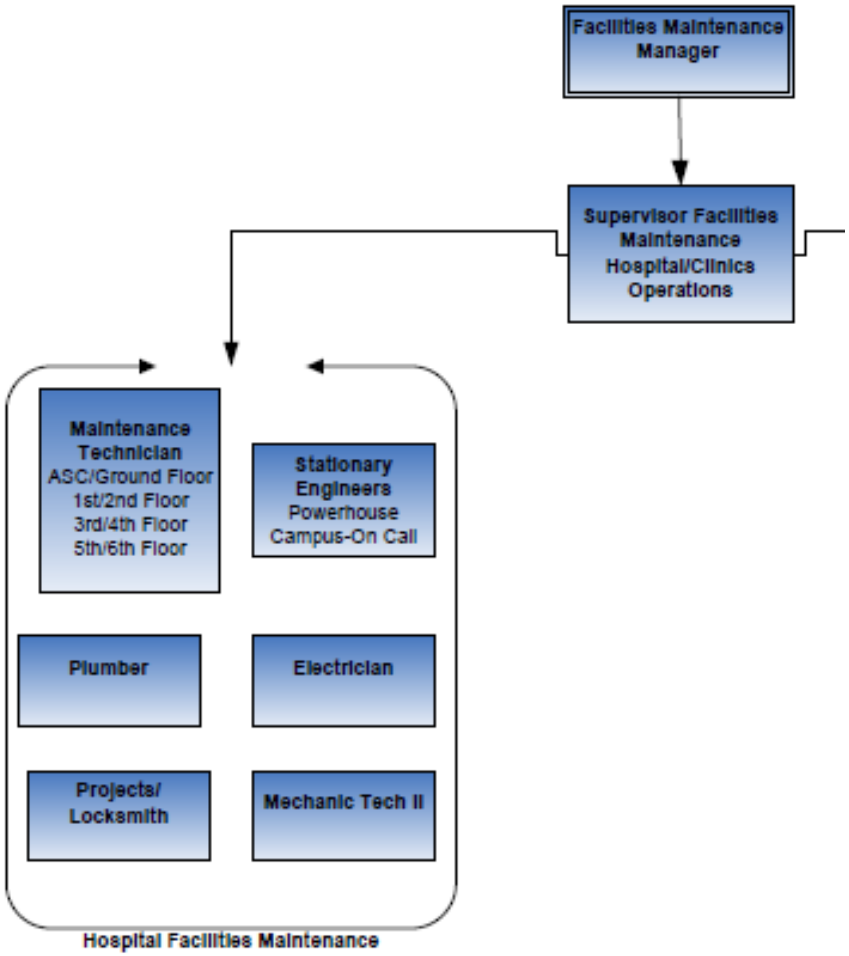
EXAMPLE MAINTENANCE ANALYSIS

Current staffing

- Lead (1)
- Electrician (1)
- HVAC (1)
- Carpenter (2)
- Plumber (1)
- Mechanic Tech (4)
- Stationary Eng. (1)

Trade hours?



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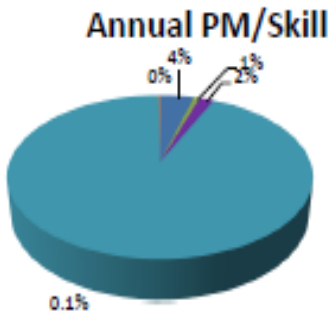
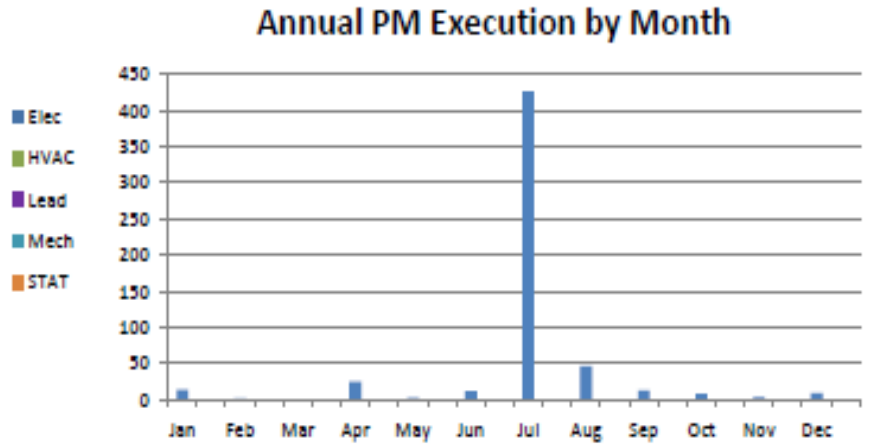
MONTHLY REVIEW OF STAFFING

Annual PMs	554	554															
Due Date:	Jan		Feb		Mar		Apr		May		Jun						
	1	31	1	28	1	31	1	30	1	31	1	30					
	13		1		0		24		2		11						
Quantity:	13			1			21	3	1	1	9	2					
%:	2.35	0.00	0.00	0.18	0.00	0.00	3.79	0.54	0.18	0.18	1.62	0.36					
Due Date:	Jul		Aug		Sep		Oct		Nov		Dec						
	1	31	1	31	1	30	1	31	1	30	1	31					
	427		46		12		7		3		8						
Quantity:	238	189	46		12		1	6	3		7	1					
%:	42.96	34.12	8.30	0.00	2.17	0.00	0.18	1.08	0.54	0.00	1.26	0.18					
Skill	Trade	# PMs	% PMs	Trade	# PMs	% PMs	Trade	# PMs	% PMs	Trade	# PMs	% PMs	Trade	# PMs	% PMs		
	Elec	24	4.33	HVAC	4	0.72	Lead	10	1.81	Mech	515	92.96	STAT	1	0.18		





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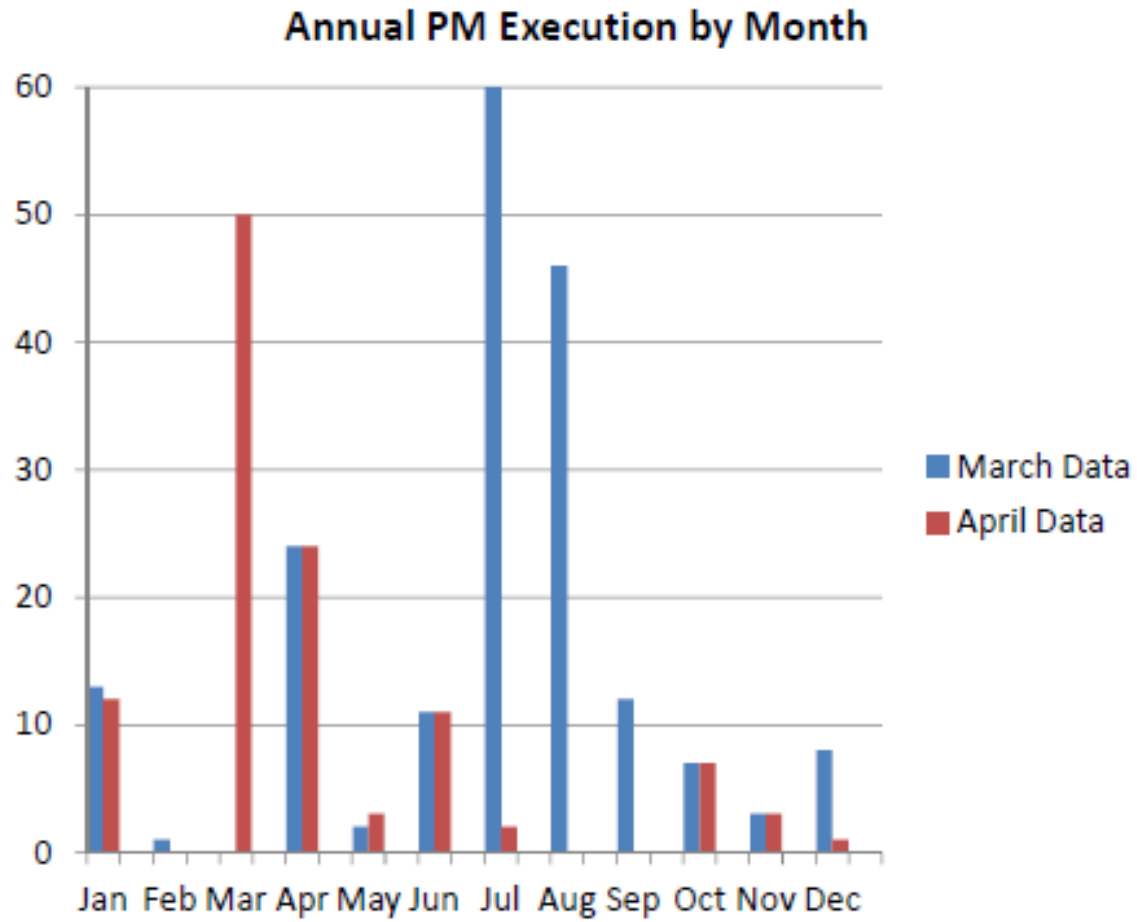
MONTHLY COMPARISONS

GOAL TO LEVEL MONTHLY WORKLOAD WHILE REMAINING COMPLIANT



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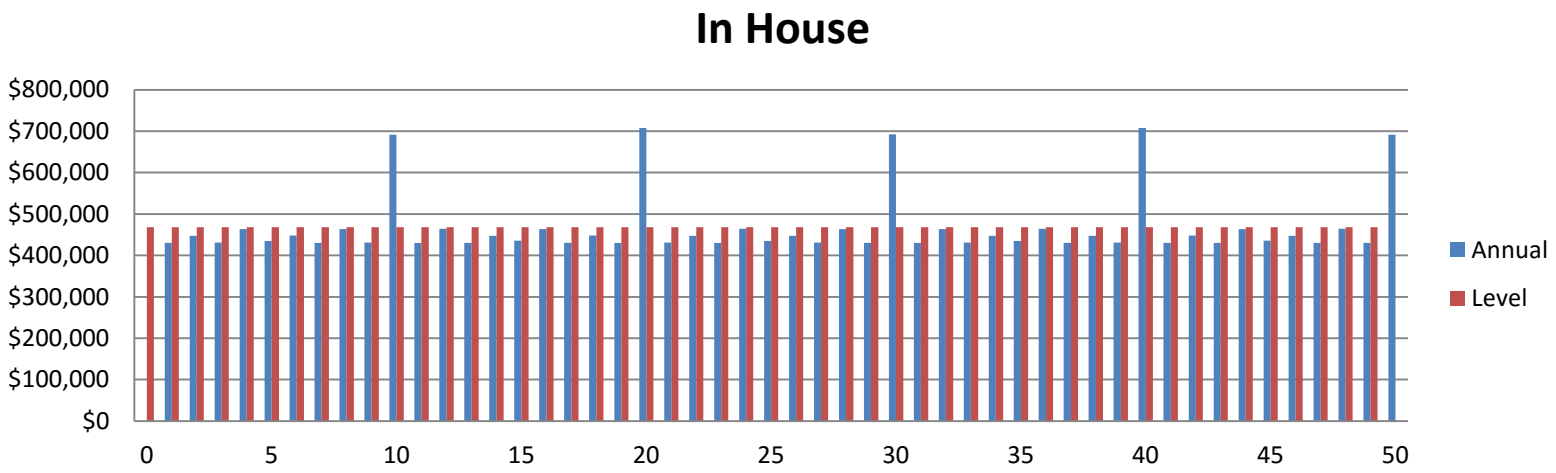
MAINTENANCE – IN HOUSE $



Maximum	$707,736	
Minimum	$430,011	
Average		$467,831

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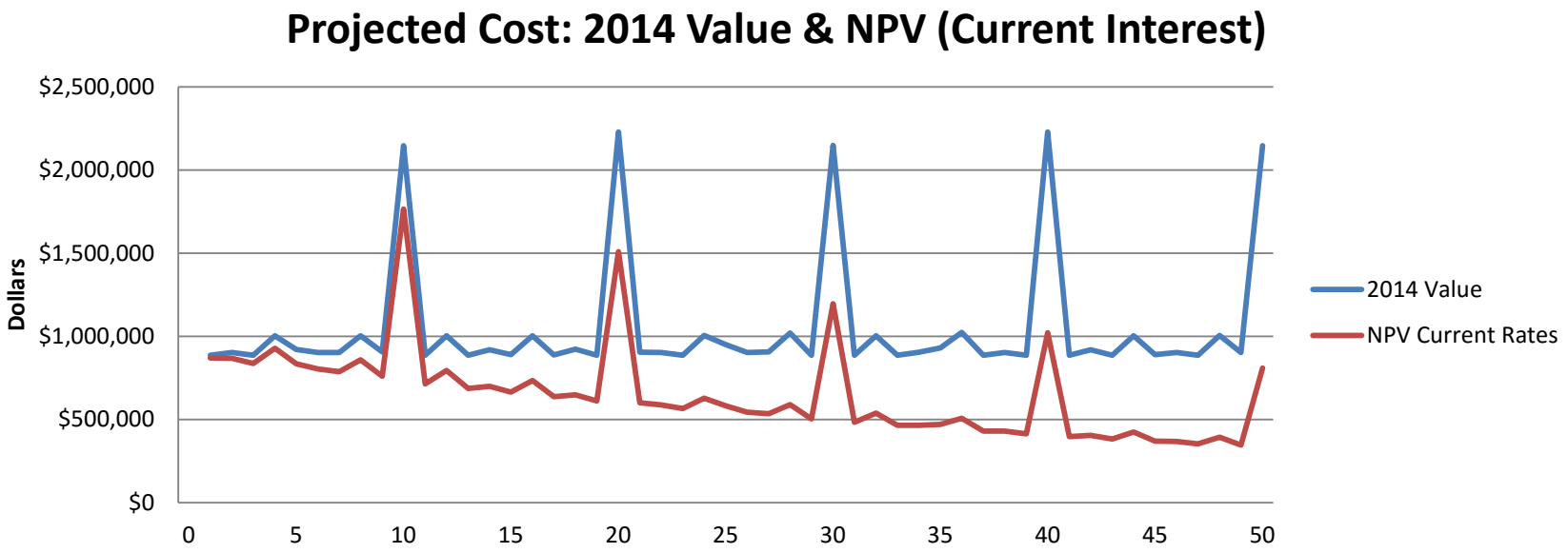
LONG-TERM MAINTENANCE

Planned Budget and Capital Expenditures



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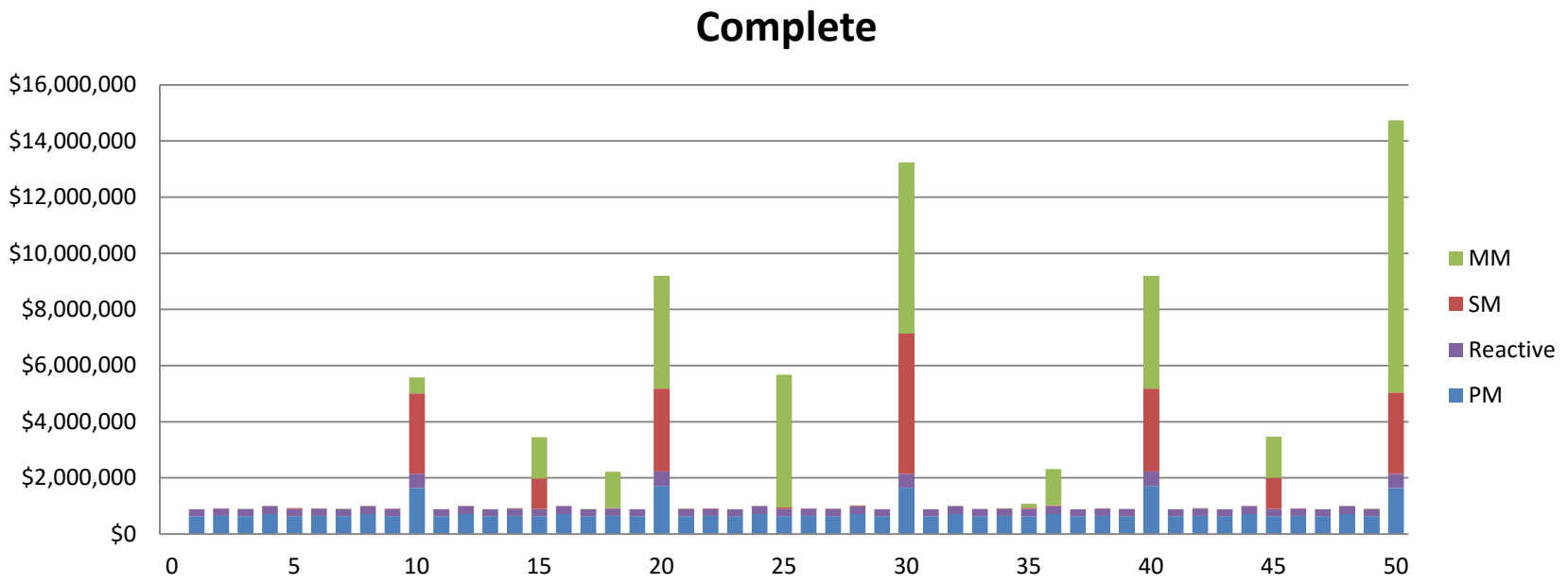
LONG TERM MAINTENANCE PLANNING



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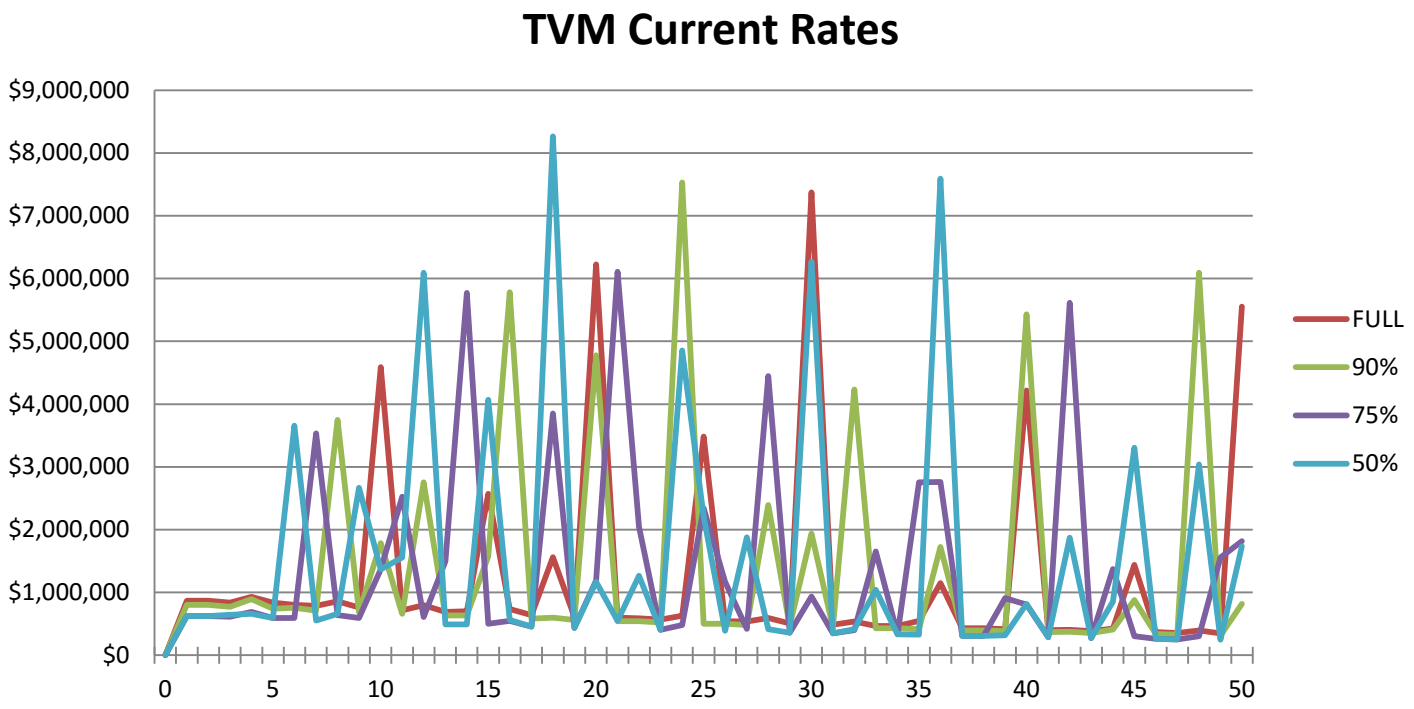
DEFERRED MAINTENANCE:



NPV			
FULL	90%	75%	50%
$61,992,559	$70,209,823	$69,113,727	$78,153,448

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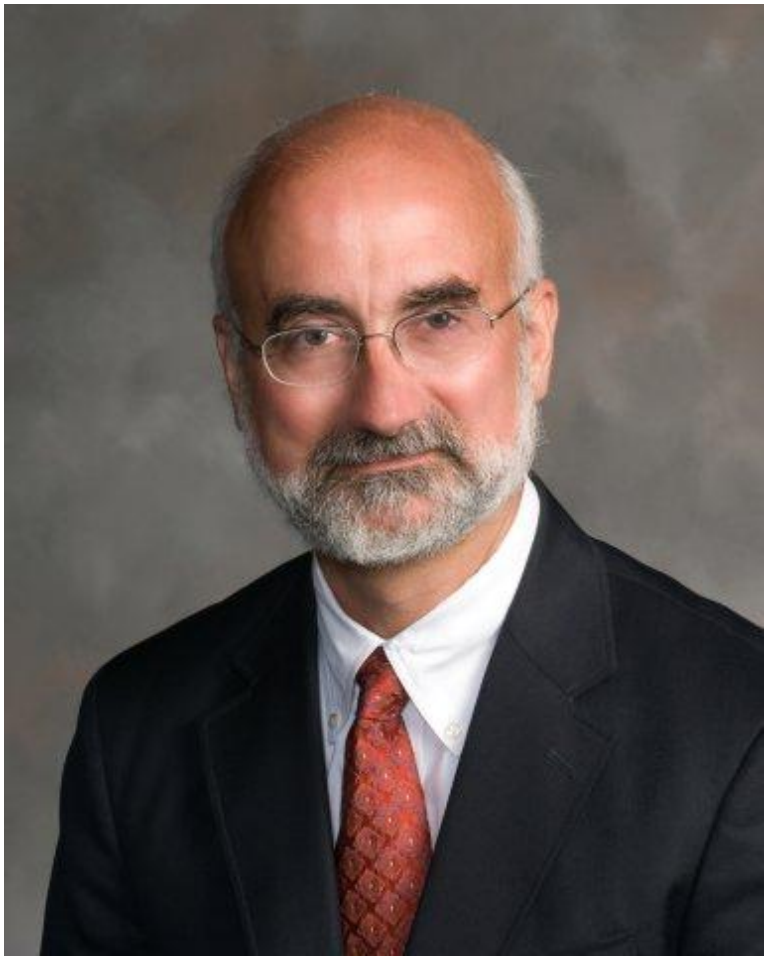

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RESEARCH IN THE HEALTHCARE FACILITY DOMAIN

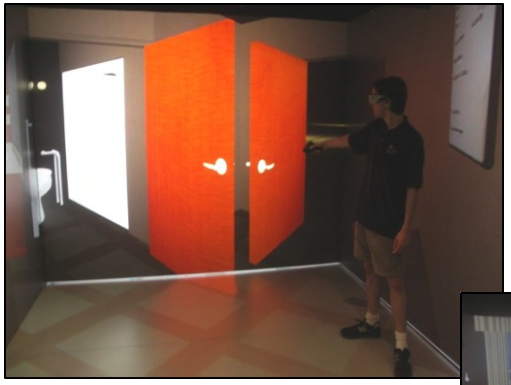
EXPLORATION OF VIRTUAL MOCK-UPS FOR HEALTHCARE FACILITY PROJECTS

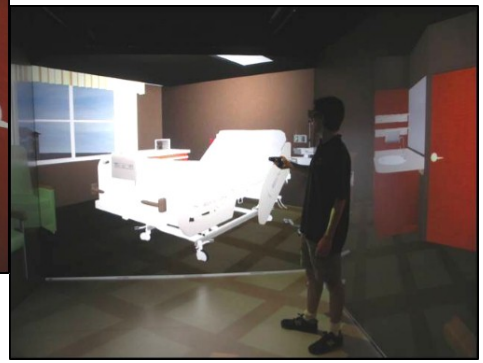
Team:

Phillip Dunston (Civil Engrg/CEM)

James McGlothlin (Health Sciences)

Laura Arns (Envision Ctr)





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RESEARCH IN THE HEALTHCARE FACILITY DOMAIN

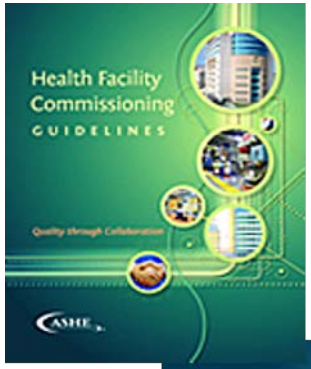
HFCX PROJECT CASE STUDY FOR UNIVERSITY OF ARKANSAS FOR MEDICAL SCIENCES

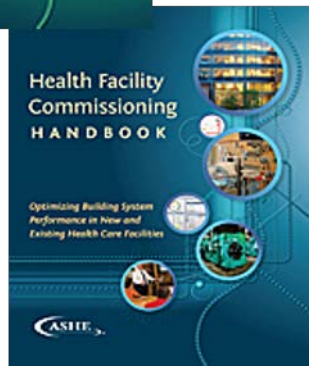
Team Leaders:

Gregory Lasker (BCM)

Phillip Dunston (Civil Engrg/CEM)

Focus: ASHE-funded engagement on health facility commissioning (~2010-2012). Involved unique deployment of student interns from Purdue and University of Arkansas at Little Rock





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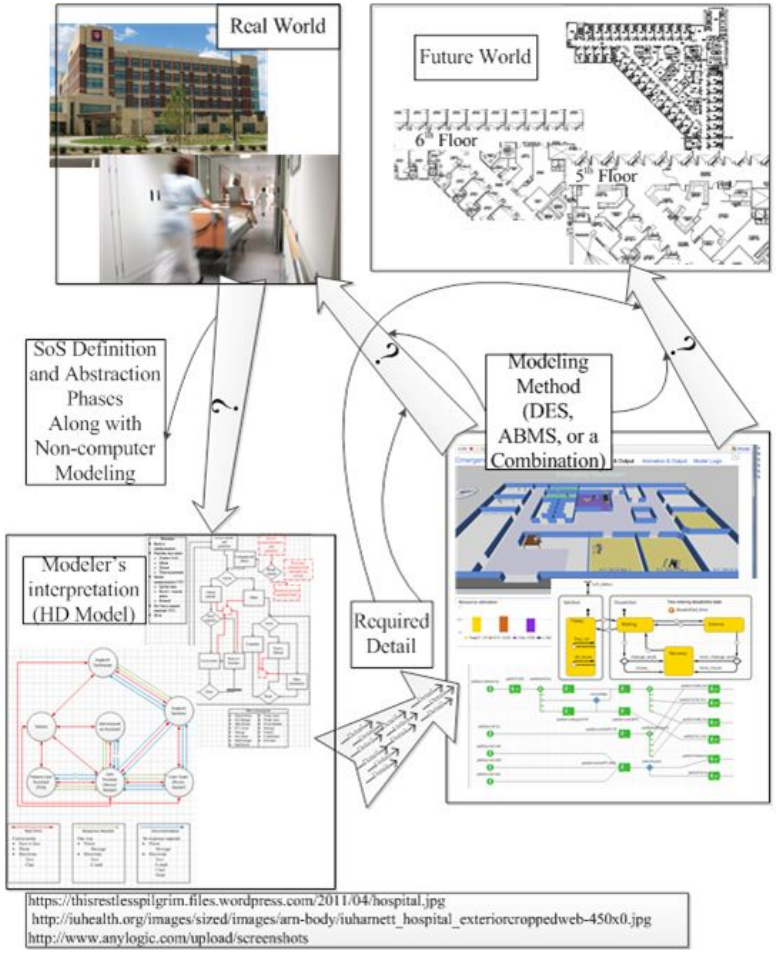
RESEARCH IN THE HEALTHCARE FACILITY DOMAIN

PROTOCOL AND COMPUTER MODELING TECHNIQUE FOR IDENTIFYING INEFFICIENCIES FROM MEDICAL BUILDING CONFIGURATION

Student: Timothy B. McClure

Advisor: Phillip S. Dunston

Focus: Validation of a procedure for modeling healthcare delivery operations and validating a corresponding simulation model that then can be used to evaluate proposed design layouts for future facilities.



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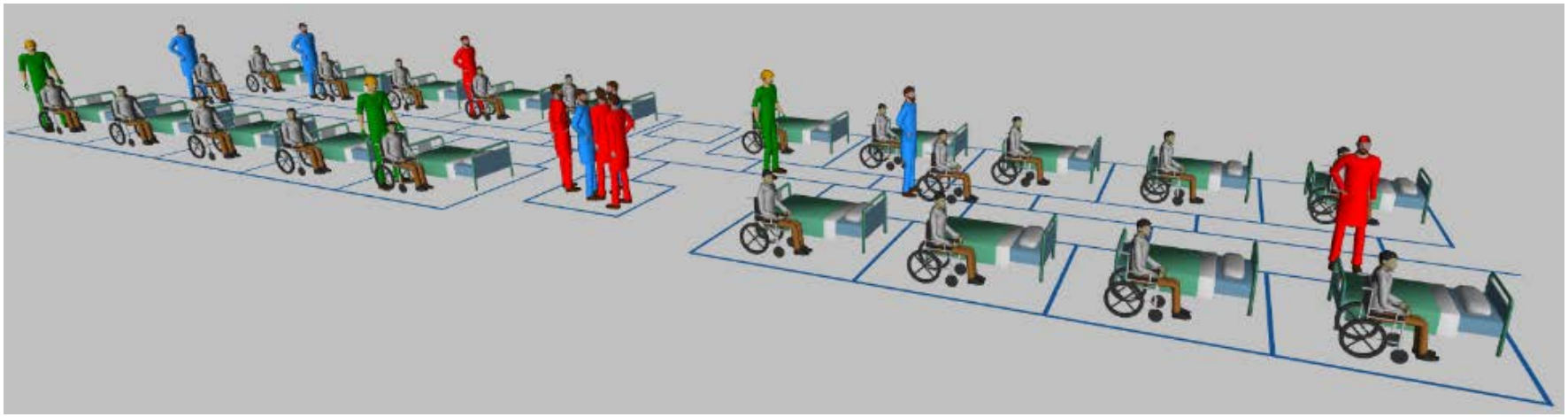
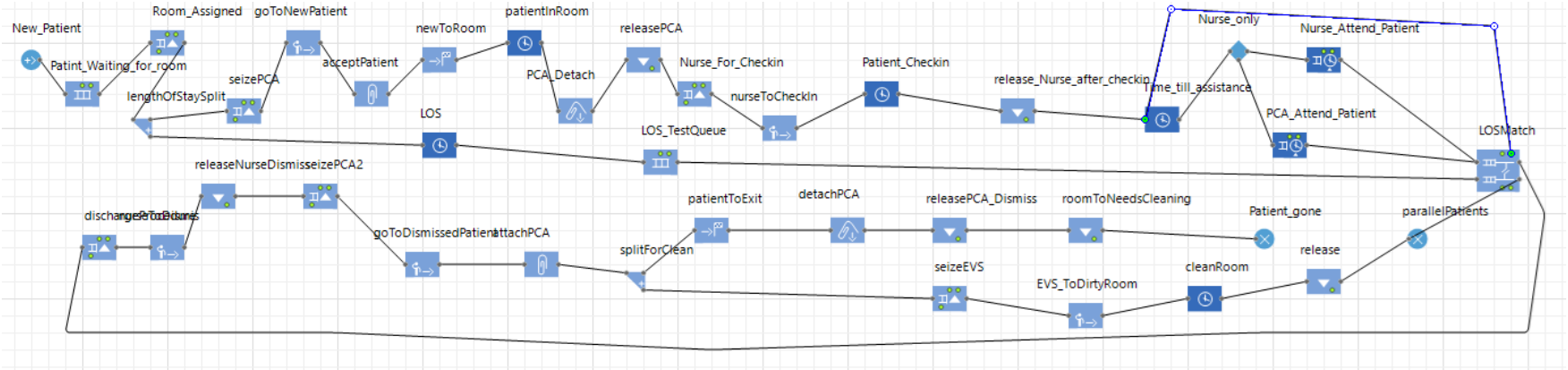
RESEARCH IN THE HEALTHCARE FACILITY DOMAIN

TITLE: PROTOCOL AND COMPUTER MODELING TECHNIQUE FOR IDENTIFYING INEFFICIENCIES FROM MEDICAL BUILDING CONFIGURATION





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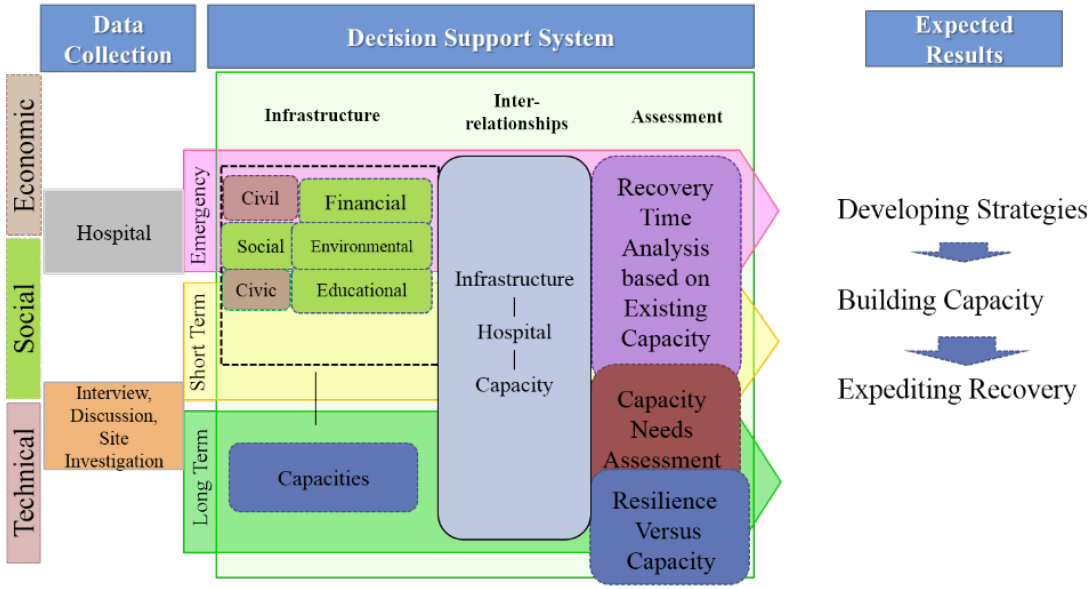
RESEARCH IN THE HEALTHCARE FACILITY DOMAIN

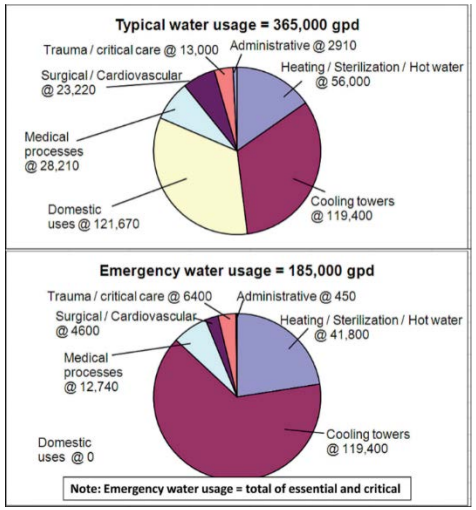
CAPACITY BUILDING OF HOSPITALS – EMERGENCY PLANNING

Student: Abhijeet Deshmukh

Advisor: Makarand Hastak

Focus: Decision support system for emergency planning procedure for water outages impacting essential facilities, focusing on domestic water supply outage exceeding 8 hours





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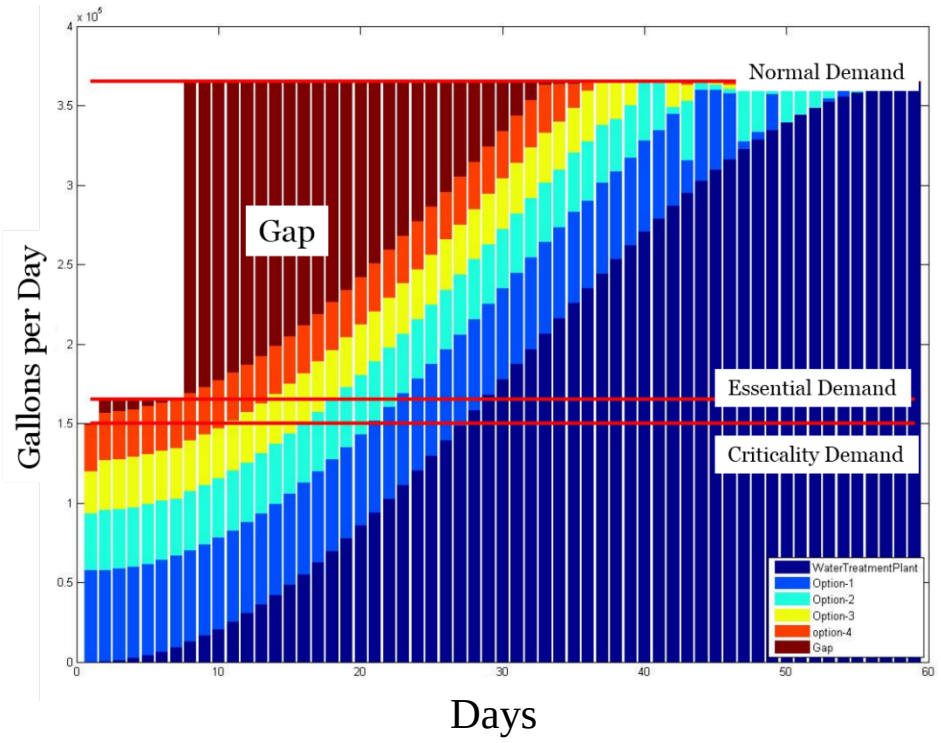
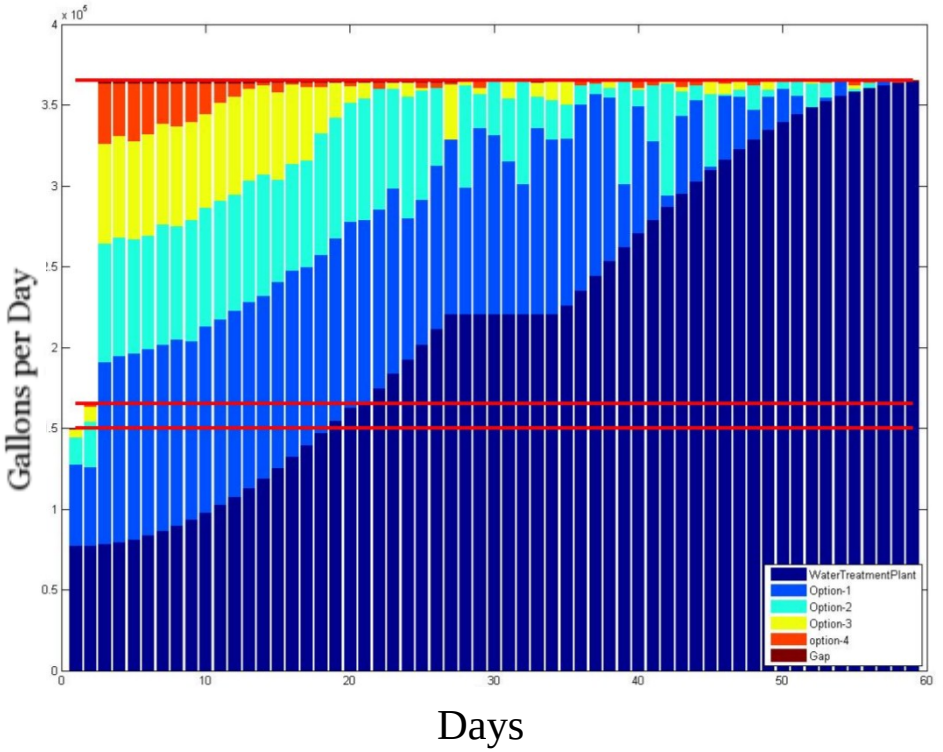
RESEARCH IN THE HEALTHCARE FACILITY DOMAIN

CAPACITY BUILDING OF HOSPITALS – EMERGENCY PLANNING

Capacity for Present Situation



Emergency Decisions Integrated with Long Term Planning



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RESEARCH IN THE HEALTHCARE FACILITY DOMAIN

STRESS ASSESSMENT FOR THE POST-DISASTER MEDICAL FACILITY

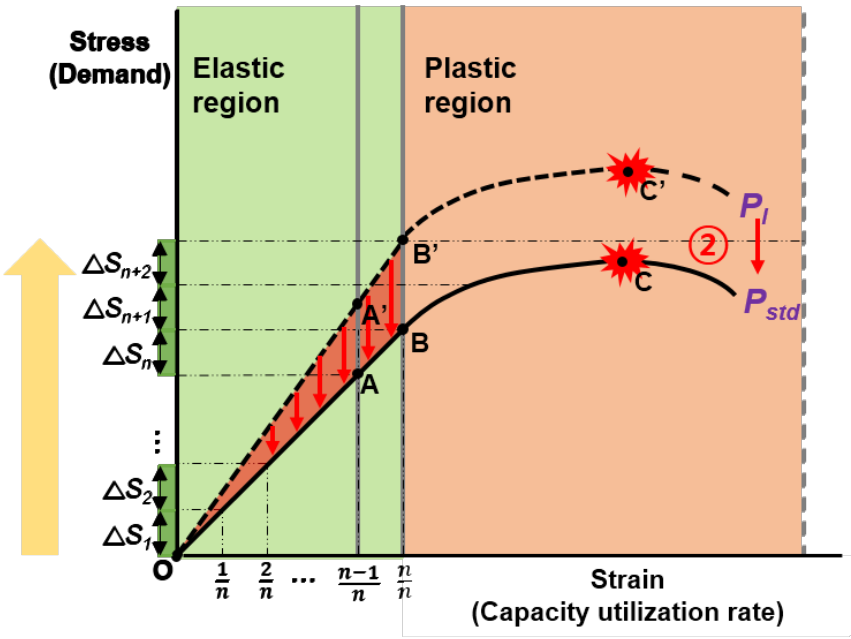
Cause for excessive stress :

- Reduced utility service
- Limited road access to facilities
- …
- Increase in demands
- Insufficient capacities of other facilities

Student: Juyeong Choi

Advisor: Makarand Hastak

Focus: Understand and evaluate the stress level in infrastructure facilities under disaster conditions in terms of their quality of service in response to affected communities' demands, especially hospitals, and then develop effective strategies for relieving increased stress on infrastructure supporting essential facilities.



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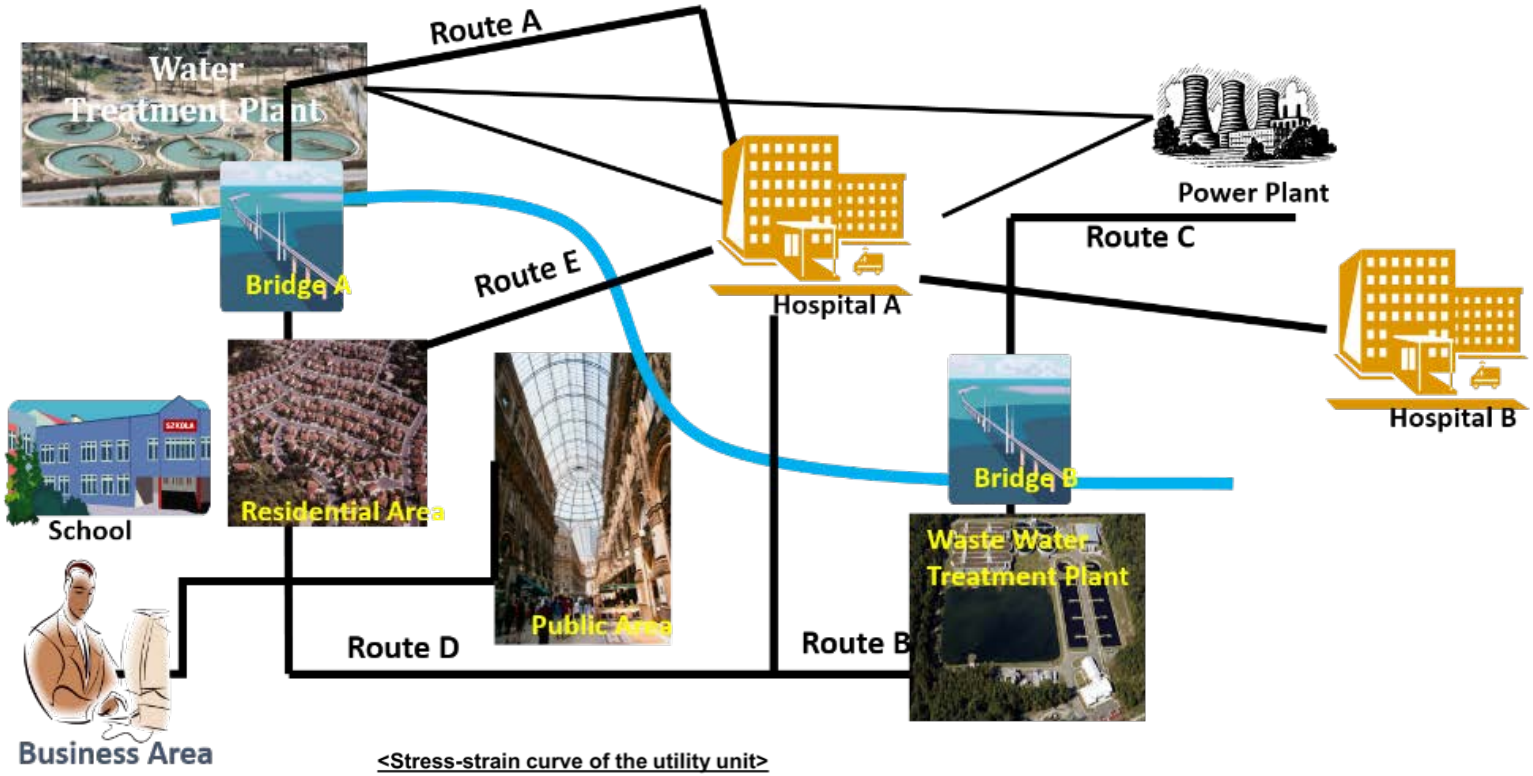
RESEARCH IN THE HEALTHCARE FACILITY DOMAIN

STRESS ASSESSMENT FOR THE POST-DISASTER MEDICAL FACILITY



<Stress-strain curve of the utility unit>

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INDUSTRY-ACADEME COOPERATION AND COLLABORATION

Undergraduate curriculum materials

Graduate curriculum materials

Student interns

Faculty interns

Guest lectures by industry

Facility access for case studies/projects

Research collaborations

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