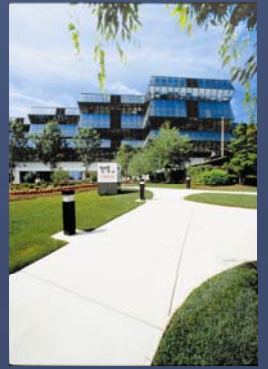
CHILDREN'S NATIONAL MEDICAL CENTER

SURGERY EXPANSION PHASE 1

Washington, DC

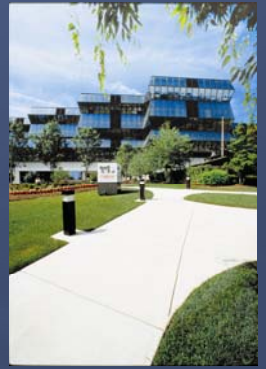
By: Andrea Klein

Construction Management Option
Spring 2008
Advisor: Dr. Messner



Presentation Outline

- Project Overview
- Technical Analyses
  - Resize Mechanical Fans
  - Prefabricated Walls
- Critical Research
  - Prefabrication and ICRA
- Acknowledgements
- Questions?



Presentation Outline

• Project Overview •

Owner: Children's Hospital

Architect: Wilmot/Sanz Inc

Project Managers: KLMK Group, LLC

Contractor: Gilbane Building Company
CM @ Risk

Cost: $10.2 million

Schedule:
Planned: April 2007 – December 2007
Actual: October 2007 – September 2008

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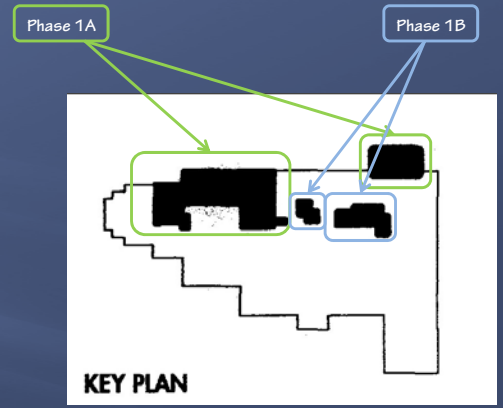
• Project Overview •

Building	Project
902, 972 gsf	45,312 sf
15 floors - 6 occupied - 5 interstitial - 4 below grade	3 floors - 1 occupied - 2 intersitial (levels 1.5, 2, 2.5)

- 2 new Operating Rooms + Support
- Male/Female Locker rooms
- Offices
- Decontamination Area

- Waiting Room
- On- Call Station
- Reception
- Registration



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Technical Analysis 1: Resize Mechanical Fans

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• Resize Mechanical Fans•

Problem:

-Fans sized for "future duty"
-Operating at lower demand until future construction is built

Goal:

-Reduce initial cost
-Reduce operating costs
-Examine benefits of using smaller fans until the larger fans are needed, and replace them at a later date

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• Resize Mechanical Fans•

Procedure:

1. Compare Design Load to Demand Load
2. Select New Fans
3. Calculate Costs for Original Conditions
4. Calculate Costs for New Conditions
5. Compare Costs and Make Recommendation

Step 1:

Fan Unit	Location	Design Load		Current Demand Load		% of Design Load	Hand Calculated Load	% of Design Load
		cfm	*wg*	*cfm*	*wg*		*cfm*	
SF-26B-1 (x2)	DECON	8500	8.5	3685/2960	3.5	21.7	3685	21.7
RF-26B	DECON	15300	3.5	2720/1995	3.5	17.8	2515	16.4
RF-12B	LOCKER	15365	2.5	8450/6220	2.5	55.0	8085	52.6

Presentation Outline

• Resize Mechanical Fans•

Step 2:

New Fans Selected

SF – 26B – 1		
	-Original	EPFN 182, Class III
	-New	EPFN 165, Class II
RF – 26B**		
	-Original	TCVX 32B6, Class II
	-New	TCVX 21B7, Class I
RF – 12B		
	-Original	TCVX 32B4, Class II
	-New	TCVX 21B7, Class I

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• Resize Mechanical Fans •

Step 3 & 4:

Initial Cost Savings

Fan Name	Fan Type	Cost	Savings
SF-26B-1	EPFN 182, Class III	$2,721.00	
	EPFN 165, Class II	$2,125.00	$596.00
SF-26B-2	EPFN 182, Class III	$2,721.00	
	(eliminated)	$0.00	$2,721.00
RF-26B	TCVX 32B6, Class II	$5,034.00	
	TCVX 21B7, Class I	$4,473.00	$561.00
RF-12B	TCVX 32B4, Class II	$6,037.00	
	TCVX 21B7, Class I	$4,473.00	$1,564.00
		Total Savings	$5,442.00

Operating Cost Savings

Fan Name	Fan Type	Settings	KWH/yr	Operating Cost		
				1 yrs	5 yrs	10 yrs
SF-26B-1 (x2)	EPFN 182	Design	109787.3	$12,746.31	$66,280.81	$132,561.61
	Class III	Demand	19147.43	**$2,223.02**	**$11,559.69**	**$23,119.38**
	EPFN 165	Demand	21826.77	**$2,534.09**	**$13,177.26**	**$26,354.51**
	Class II		Savings	**-$311.07**	**-$1,617.57**	**-$3,235.13**
RF-26B	TCVX 32B6	Design	88091.26	$10,227.40	$53,182.46	$106,364.91
	Class II	Demand	34700.64	**$4,028.74**	**$20,949.47**	**$41,898.94**
	TCVX 21B7	Demand	21761.42	**$2,526.50**	**$13,137.80**	**$26,275.61**
	Class I		Savings	**$1,502.24**	**$7,811.67**	**$15,623.33**
RF-12B	TCVX 32B4	Design	66983.34	$7,776.77	$40,439.18	$80,878.36
	Class II	Demand	66591.24	**$7,731.24**	**$40,202.46**	**$80,404.93**
	TCVX 21B7	Demand	50123.14	**$5,819.30**	**$30,260.34**	**$60,520.69**
	Class I		Savings	**$1,911.95**	**$9,942.12**	**$19,884.24**

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• Resize Mechanical Fans•

Outcome

-Initial Cost Savings for All Fans = $ 5,442.00

-Operating Costs Savings for Return Fans only

Recommendation

Combine old and new design for best savings

Effective only if future duty takes more than 5 yrs

Optimal Design Cost Savings

Fan Name	Fan Type		Initial Cost		1 Year Op. Cost		5 Year Op. Cost	
	Original	New	Original	New	Original	New	Original	New
SF-26B-1	EPFN 182, III	N/A	$2,721.00	$2,721.00	$2,223.02	$2,223.02	$20,949.47	$20,949.47
SF-26B-2	EPFN 182, III	N/A	$2,721.00		$0.00		$0.00	
RF-26B	TCVX 32B6, II	TCVX 21B7, I	$5,034.00	$4,473.00	$4,028.74	$2,526.50	$20,949.47	$13,137.80
RF-12B	TCVX 32B4, II	TCVX 21B7, I	$6,037.00	$4,473.00	$7,731.24	$5,819.30	$40,202.46	$30,260.34
		Total	$16,513.00	$11,667.00	$13,983.00	$10,568.82	$82,101.40	$64,347.61
		Savings	$4,846.00		$3,414.18		$17,753.79	

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Technical Analysis 2: Prefabricated Wall Panels

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• Prefabricated Wall Panels•

Problem:

-Multiple walls being built on interior
-Generate lots of dust in hospital

Goal:

-Reduce material and labor cost
-Reduce schedule
-Examine benefits of installing prefabricated wall system and if it meets acoustical requirements

Wall System Selected: Prestowall™ by DURRA

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• Prefabricated Wall Panels•

Wall Features:

- 4′ x 10′ Panels
- Electrical conduit in place
- Patented disk connection system = easy installation
- 2 -1/4″ Thick
- Can be finished the same as traditional wall
- Can be used for LEED credit

- - Still requires taping and sanding at joint--

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• Prefabricated Wall Panels•

Cost & Time Savings

-Overall cost savings = 30%
-Overall duration savings = 34%

Wall Type	Original		New System		Savings	
	Cost	Duration	Cost	Duration	Cost	Duration
2	$5,861.16	69.95	$5,150.36	51.59	$710.80	18.36
3	$23,700.18	286.78	$18,622.38	201.36	$5,077.80	85.42
3A	$84,947.66	971.73	$56,594.19	623.56	$28,353.47	348.17
Total	$114,509.00	1328.46	$80,366.93	876.51	$34,142.07	451.95

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• Prefabricated Wall Panels•

Acoustic Calculations

Partitions Examined:

-Office to Office
-Locker Room to Staff Lounge
-Locker Room to Locker Room
-Locker Room to Bathroom
-Hallway to Office
-Bathroom to Physician's Lounge

Partitions Schematic

Presentation Outline

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• Prefabricated Wall Panels•

Acoustic Calculations

Speech Privacy Rating – This method was selected because patient confidentiality is the primary acoustic concern in this section of the building.

Ratings Used

SP < 9 - Worse than Normal Privacy
9 < SP < 15 - Normal Privacy
15 < SP - Confidential Privacy

Rating required for offices is Normal Privacy

Speech Privacy Calculations

Source Room	Office	Office	Locker	Locker	Locker	Hall	Bathroom
Receiving Room	Office	Office	Staff Lounge	Locker	Bathroom	Office	Phys Lounge
Wall Type	3A	3A	3A	3A	3A	3	3A
Original STC	49	49	49	49	49	37	49
Panel STC	34	34	34	34	34	34	34
Source Room Area	90	90	468	468	306	40	312
Receiving Room Area	90	90	550	306	312	90	368
Ceiling Height	9	9	9	9	9	9	9
Partition Length	10	9	18	17	17	10	16
Ratio	1	1.1	3.4	2	2	1	2.6
RR	0	0.1	5	2.5	2.5	0	4
N + 8	33	33	38	43	43	33	33
VL	60	60	60	60	60	60	60
SR	8	8	1.5	1.5	3	9	3
Original Privacy	14	14.1	30.5	33	31.5	1	23
New Privacy	-1	-0.9	15.5	18	16.5	-2	8

Worse than Normal Normal Confidential

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Recommendations

-Attempted to add second panel layer for better acoustics
-Increased cost and duration
-Defeats purpose of using new system

Do not use Prestowall™ system

If project were larger and had more public spaces, it may be applicable

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Critical Research: Prefabrication & ICRA

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• Prefabrication and ICRA•

Problem:

- Hospital renovation and expansions take place in/near occupied spaces
- ICRA guidelines provide safety regulations, but no means and methods

Goal:

- Provide prefabrication methods to apply to ICRA regulations as a supplemental guide
- Aid implementation of prefabrication in health care projects

Presentation Outline

• Prefabrication and ICRA•

Procedure:

1. Obtain understanding of ICRA
2. Verify need for prefabrication guide
3. Interview industry contacts
4. Compile data and determine focus
5. Research methods and technologies
6. Determine guide format
7. Create guide

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• Prefabrication and ICRA•

Research Gathering

- Interview questions sent to industry contacts
  - 4 helpful email responses
  - 3 helpful phone interviews
- Peer reviewed journals
- Magazine articles
- Product catalogs and websites

Sample Interview Questions:

Are you familiar with the 2006 ICRA guidelines established by the AIA?

Have you used the ICRA guidelines for past or present healthcare projects?

Did you have difficulties maintaining any of the procedures outlined in your programs? If so, what were they, and how did you attempt to solve them?

Was prefabrication used to any extent during your project?

What trades, methods, or specific technologies did you use for prefabrication, and how well did they work?

Do you think fabricating materials and systems off site is a viable option to help maintain the ICRA guidelines?

Did you have problems with construction interfering with the surrounding occupied spaces? If so, what were they, and how large was the impact?

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Research Results

Major Concerns:

-Price compared to traditional methods
-Availability
-Meeting code

Initial Reactions

-Mixed from industry
-Good addition, but needs development

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Research Results

Standard Methods Used

Technology	Application
Ductwork	All Building Types
Plumbing	All Building Types
Medical Gas Piping	Surgery Suites, Patient Rooms
Modular Buildings	Outpatient Centers

New/Unused Methods

Technology	Application
Panelized Wall Systems	All Building Types
Roofing Systems	All Building Types
Floors and Ceilings	All Building Types

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Research Results

ICRA Guidelines and Prefabrication

-Type A & B are not conducive to prefabrication
-Class I & II are not conducive to prefabrication
- Prefabrication needs to be implemented early in project
-ICRA Panel needs to understand prefabrication

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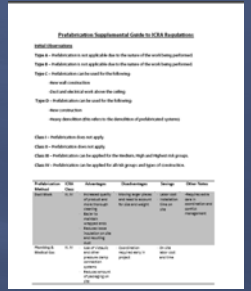
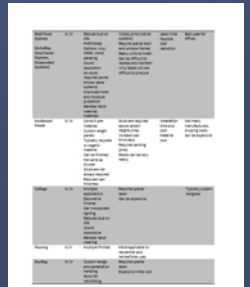
Supplemental Guide

Evaluation Criteria

-Cost Savings
-Labor/Schedule Savings
-Advantages
-Disadvantages
-Accessibility
-What ICRA Class
-Other Items to Note





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Reflections

- ❑ Attitude change
- ❑ More Information: Lack of knowledge and expertise
- ❑ Owner Driven
  - ❑ Decision
  - ❑ Early Implementation
  - ❑ ICRA Panel Awareness

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Advancement From Here

- ❑ More in depth research into dust control
- ❑ Extensive cost comparisons
- ❑ Limitations of materials
- ❑ Lead times and availability
- ❑ Trade interaction

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• Acknowledgments•

Penn State Faculty

Dr. Messner

Dr. Riley

Dr. Freihaut

Professor Parfitt

Profesor Holland

Gilbane Building Company

Manfred Leckszas

Kyte Picheco

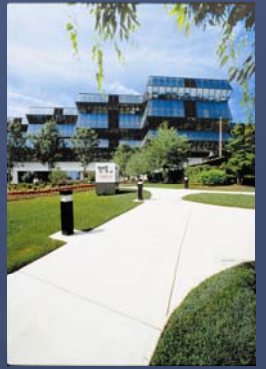
Todd Brodsky

Deckman Co

Scott Adams

Children's National Medical Center

Questions?



Fan Calculations

SF-26B-1

Model	cfm	Type	Size		Neck
			Width	Depth	
300RL	235	5	10	6	8
300RL	240	5	12	10	8
300RL	175	5	10	6	8
300RL	170	5	10	6	8
300RL	170	5	10	6	8
300RL	160	4	8	6	6
300RL	175	5	10	6	8
300RL	160	4	8	6	6
300RL	95	4	8	6	6
300RL	85	4	8	6	6
TDC	200	3	10	8	
300RL	130	4	12	8	6
	180		10	6	
300RL	100	4	8	6	6
300RL	310	6	12	14	10
300RL	100	4	8	6	6
300RL	185	5	10	6	8
300RL	100	4	8	6	6
300RL	125	4	8	6	6
300RL	95	4	8	6	6
	495		12	10	
Total	3685				

RF-26B

Model	cfm	Type	Size	
			Width	Depth
350RL	245	11	10	10
350RL	245	11	10	10
350RL	320	11	10	10
350RL	475	11	10	10
350RL	95	9	8	6
350RL	200	10	10	6
350RL	165	9	8	6
	180			
350RL	95	9	8	6
	495			
Total	2515			

Wall Sections