


UPMC Passavant Pavilion & Addition
Pittsburgh, Pa


Project Overview

- Architectural Precast Concrete
- Matrix Schedule
- Mobile Information Technology Documents
- Conclusion
- Questions

Client Information

- UPMC Passavant is a member of the University of Pittsburgh Medical Center system
- Recently ranked 14th among 'America's Best Hospitals' by U.S. News & World Reports
- Integral part of the long term healthcare goals of UPMC





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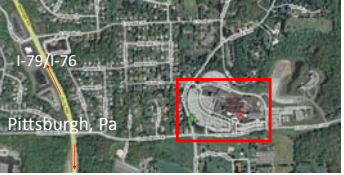
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Area Map



9100 Babcock Blvd., Pittsburgh, Pa 15237

Project Information

- **Size**
 - 191,400 SF Addition
 - 18,000 SF Penthouse
 - 30,000 SF Central Plant
- **Cost**
 - \$85.9 Million
- **Schedule**
 - NTP: November 2007
 - Addition: Spring 2008 – Fall 2009
 - Renovation: Fall 2009 – Spring 2010




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Architectural Precast Concrete vs. Masonry Brick Veneer

- **Problem Statement**
 - Masonry veneer is not panelized and requires substantial time and space.
 - Located on the critical path and controls the installation of the curtain wall and metal panel system.
- **Goal**
 - Accelerate the schedule
 - Reduce Costs
 - Reduce Site Congestion



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Site Logistics

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Structural Implications

Typical Bay: 28'-0"
3 Equal Spaces of 9'-4"
Edge Beams: W24x55
Cant Beams: W10x22

Material Weights			
Material	Density (lb/ft ³)	Thickness (in.)	Weight (lb/ft ²)
Brick Veneer	130	4	43.33
Precast Concrete	150	6	75

Panel Characteristics	
Density of Concrete:	150 pcf
Thickness of Panel:	0.5 ft
Weight of Panel:	75 psf
Max. Panel Height:	14 ft
Tributary Area:	9.33 ft


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Shear & Moment

W10x22:
 $\phi_v M_{pr} = 97.5 \text{ ft-k} > 13.72 \text{ ft-k}$ **OK**
 $\phi_v V_r = 73.2 \text{ k} > 13.72 \text{ k}$ **OK**

W24x55
 $\phi M_{pr} = 503 \text{ ft-k} > 323 \text{ ft-k}$ **OK**
 $\phi V_r = 251 \text{ k} > 34.61 \text{ k}$ **OK**

Deflection

$\Delta_{max} = (Pa / 24EI)(3l^2 - 4a^2)$
 $= 1.19 \text{ in}$

$\Delta = l/240 = 28 \text{ ft (12 in)} / (240) = 1.4 \text{ in} > 1.19 \text{ in}$ **OK**

Column


W12x72
 $\phi P_n = 761 \text{ k}$

$P_u = 725 \text{ k}$ **OK**

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Durations

Average Masonry Duration: 15 Days

Average Precast Duration: 2-3 Days
Based Upon 15-20 Panels/Day

Elevation	Masonry vs. Precast		Masonry & Metal Panel vs. Precast		
	Masonry	Precast	Masonry	Mtl. Panel	Precast
South	15 Days	2 Days	15 Days	15 Days	3 Days
East	20 Days	2 Days	20 Days	15 Days	3 Days
North	10 Days	2 Days	10 Days	--	2 Days
West	15 Days	2 Days	15 Days	15 Days	2 Days


Activity	Start		Completion	
	Original	Proposed	Original	Proposed
Masonry Veneer @ East Studs/Sheathing	8/4/2008	8/4/2008	8/29/2008	8/5/2008
Masonry Veneer/Cast Stone Sill @ South	9/1/2008	8/11/2008	9/19/2008	8/12/2008
Masonry Veneer/Cast Stone Bands @ West	9/22/2008	8/13/2008	10/10/2008	8/14/2008
Substantial Completion G-3			8/25/2009	7/30/2009
Substantial Completion 4-6			9/29/2009	9/3/2009

Time Savings of Up To 18 Days

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Summary of Material Costs & Savings (With Metal Panels)				
Elevation	Item	SF	Cost/SF	Cost
South	Precast	2849	\$35.00	\$99,715.78
	Masonry	2882	\$74.00	\$209,382.41
	Loover	47	\$480.00	\$22,560.00
				\$131,228.19
East	Precast	4907	\$35.00	\$171,750.25
	Masonry	3192	\$43.00	\$137,271.64
	Masonry	2955	\$17.00	\$50,238.91
				-\$39,346.10
North	Precast	2434	\$35.00	\$85,189.86
	Masonry	2434	\$23.00	\$55,981.91
				\$29,207.95
West	Precast	2922	\$35.00	\$102,270.10
	Masonry	3148	\$48.00	\$151,056.20
	Curtain wall	103	\$120.00	\$12,360.00
				-\$39,119.70
Proposed Savings				\$239,700


Summary of Material Costs & Savings (Without Metal Panels)				
Elevation	Item	SF	Cost/SF	Cost
South	Precast	1818	\$35.00	\$63,630.48
	Masonry	2882	\$74.00	\$209,382.41
	Metal Panel	1274	\$14.40	\$18,345.60
	Loover	47	\$480.00	\$22,560.00
				\$107,918.49
East	Precast	1389	\$35.00	\$48,615.00
	Masonry	3822	\$30.00	\$114,660.00
	Masonry	2955	\$17.00	\$50,238.91
	Metal Panel	476	\$14.40	\$6,864.00
North	Precast	144	\$480.00	\$69,120.00
	Masonry	2434	\$23.00	\$55,981.91
	Masonry	2434	\$23.00	\$55,981.91
	Metal Panel	209	\$93.40	\$19,519.54
				-\$24,148.81
West	Precast	4742	\$35.00	\$165,970.00
	Masonry	3148	\$48.00	\$151,056.20
	Curtain wall	103	\$120.00	\$12,360.00
	Metal Panel	1881	\$14.40	\$27,076.80
				-\$124,175.00
Proposed Savings				\$422,175

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Conclusion



- Time Savings of Up to 18 Days
- Cost Savings of Between \$240,000 and \$422,000
- Reduces the Site Space Required by Masons





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<ul style="list-style-type: none">•Project Overview•Architectural Precast Concrete•Matrix Schedule•Current Sequence•Sequence by Zone•Sequence by Floor•Issues•Mobile Information Technology Documents•Conclusion•Questions 	<p>Matrix Scheduling</p> <ul style="list-style-type: none">• Problem Statement• Project delays are often unavoidable and a means by which to recover must be determined.• Goal• Accelerate the schedule• Recover Schedule Delays	
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<ul style="list-style-type: none">•Project Overview•Architectural Precast Concrete•Current Sequence•Sequence by Zone•Sequence by Floor•Issues•Mobile Information Technology Documents•Conclusion•Questions 	<p>Current Sequencing</p>	
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Current Sequencing

Zone 3	Zone 2	Zone 1	
			R
			7
			6
			5
			4
			3
			2
			1



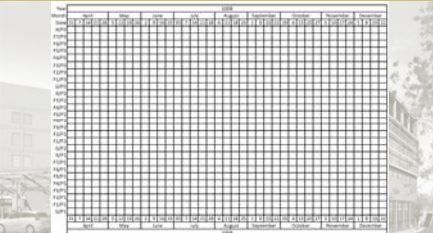
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Proposed Sequencing By Zone


Zone 3	Zone 2	Zone 1	
			R
			7
			6
			5
			4
			3
			2
			1



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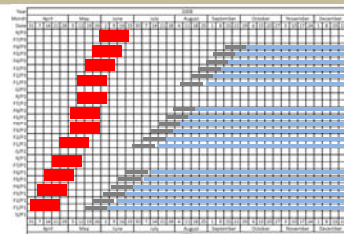


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Proposed Sequencing By Zone

	Zone 3	Zone 2	Zone 1	R
7	█	█	█	
6	█	█	█	
5	█	█	█	
4	█	█	█	
3	█	█	█	
2	█	█	█	
1	█	█	█	


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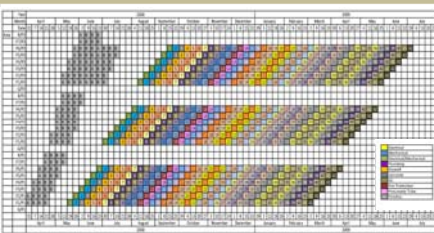
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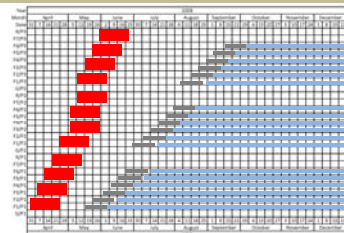
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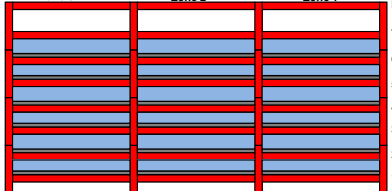
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Proposed Sequencing By Floor

Zone 3
Zone 2
Zone 1




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Year	2008	2009										
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	October	November	December
F1001												
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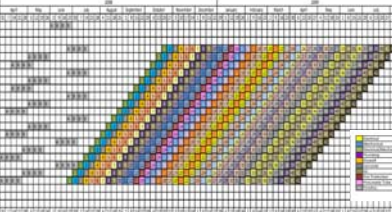
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Year	2008	2009										
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	October	November	December
F1001												
F1002												
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F1080												
F1081												

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Schedule Comparison

- Project Overview
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- Matrix Schedule**
 - Original Schedule
 - Matrix
- Comparison**
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Floor	Comparison of Schedule Dates					
	Original		Sequencing By Zone		Sequencing By Floor	
	Start	Complete	Start	Complete	Start	Complete
1	4/29/2008	7/7/2009	5/19/2008	5/29/2009	6/23/2008	4/24/2009
2	5/2/2008	7/14/2009	5/26/2008	6/5/2009	7/14/2008	5/11/2009
3	5/6/2008	7/21/2009	6/2/2008	6/12/2009	8/4/2008	6/5/2009
4	5/12/2008	8/7/2009	6/9/2008	6/19/2009	8/25/2008	6/26/2009
5	5/13/2008	8/7/2009	6/16/2008	6/26/2009	9/15/2008	7/17/2009
6	5/16/2008	8/25/2009	6/23/2008	7/3/2009	10/6/2008	8/7/2009

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Conclusion

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- The alternative matrix schedules allow for savings of between 8 and 13 weeks.
- Sequencing by zone would be ideal for a recovery schedule
- Sequencing by floor would be ideal for a schedule from the beginning.

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Mobile Information Technology Documents




- Project Overview
- Architectural Precast Concrete
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- **Mobile Information Technology Documents**
 - Background
 - Use at UPMC
 - Implementation Plan
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Problem Statement

- Increasing the use of mobile information technology within an industry segment averse to its use.

Goal

- Develop Implementation Plan
- Reduce Costs



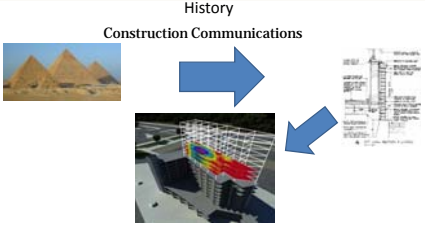


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History


Construction Communications



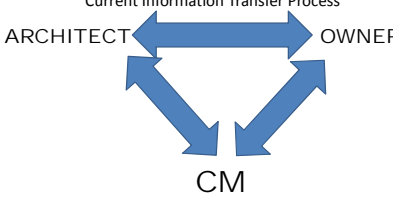
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Current Information Transfer Process



Costs of Accurate & Timely Information

- 2000 Economist Magazine Study
- 30 % of construction projects cost attributed to the lack of timely information.
- 60 % of which is labor costs
- 10 % of which is material costs


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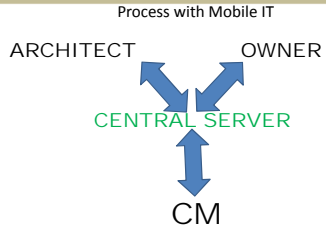
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Process with Mobile IT



Uses of Mobile IT

- Digital Construction Documents
- Digital Updates/As-Built
- Checklists/Inspections
- Reduce use of paper drawings
- Communication in the field
- Limited only by the system and the project team


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Uses at UPMC

- **Electronic As-Built Drawings**
- **Progress/Foremen Meetings**






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Contractor Perspectives

- **Advantages**
 - Information always in the hand of field workers
 - Compact size compared to set of drawings
 - Notes can be permanently attached to drawings
 - Lessening of administrative functions
- **Disadvantages**
 - Changes may bypass the office
 - Ability to view large drawings on a small screen
 - Only as good as the effort that goes into maintaining the system
- **Will Paper Drawings Be Replaced?**
 - Many believe that the increase of digital drawings will reduce need for paper versions.
 - Will further decrease as younger generations move into the industry
 - Just in time printing would be a viable option
 - Expansion of use will increase with decrease in cost

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Costs of Paper Construction Documents

Costs of Document Reproduction				
Contractor	Sets	Purpose	Cost/Set	Cost
General	2	Staff	\$1150.00	\$2,300.00
	20	Subcontractors	\$1150.00	\$23,000.00
Subcontractor	20	Field Staff	\$1150.00	\$23,000.00
Total Cost:				\$48,300.00

3 Copies/Project = ~\$145,000

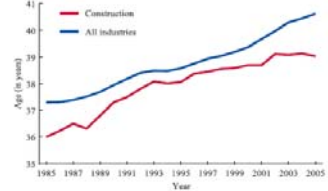


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Roadblocks to Implementation



The Center for Construction Research and Training, *The Construction Chart Book*, Silver Spring, Md. - CPWR, 2008

- Average age of construction workers: 39 years old
- 54% of CMs and 52% of Foremen were Baby Boomers
- Aging demographic not comfortable with computers
- Many have no experience with computers even at home
- Lack of experience = Lack of confidence


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Implementation Plan

- **Training**
 - Give users confidence
- **Mobile Computers**
 - Basis of the whole system
- **Large Screen Displays**
- **Digital Kiosks**



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Conclusion

- **The use of any or all of these proposed systems or schedules have the ability to result in a positive schedule and budget adjustment.**
- **The alternative precast will save up to 18 days and between \$240,000 and \$422,000.**
- **Matrix scheduling allows for a savings of between 8 and 13 weeks depending upon the sequencing used. This time savings could be utilized for delays or initially.**
- **Mobile IT Documents will allow for a more efficient updating process and communication flow.**



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