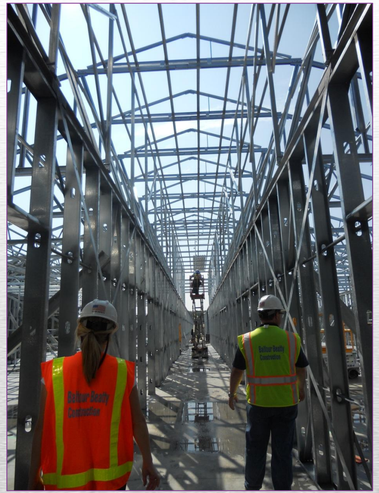
Advanced Individual
Training
A.I.T. Barracks
Fort Eustis, VA

AE Senior Thesis

Natalie Bockhorst | Construction Management
Chimay Anumba, PhD. PE



Presentation Outline

1. Project Overview
2. Analysis #1: SIPS
    1. Architectural Breadth
    2. Structural Breadth
3. Analysis #2: Comparing Contracts
4. Analysis #3: Schedule Acceleration
5. Analysis #4: Modularization
6. Final Recommendations
7. Acknowledgements

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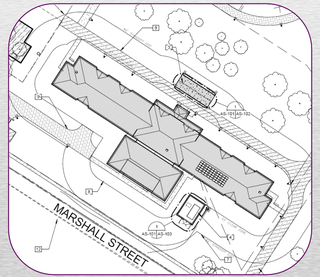
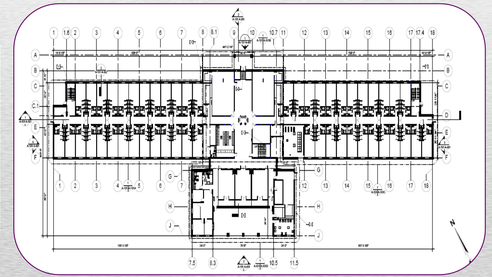
Project Overview

Project Name:	**Advanced Individual Training Barracks**
Location:	Building #2301, Marshall St. Fort Eustis, VA
Building Occupancy Type:	Barracks
Number of Stories:	3
Gross Building Area:	91,800 S.F.





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    1. **Problem Identification**
    2. Durations
    3. Typical Sequencing
    4. SIPS
    5. Recommendation
    6. Architectural Breadth
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Analysis #1 Short Interval Production Schedule: Masonry Façade Work

Problem Identification:

- Unforeseen conditions
- Mortar time consternate concerning precast elements
- Limited scaffolding

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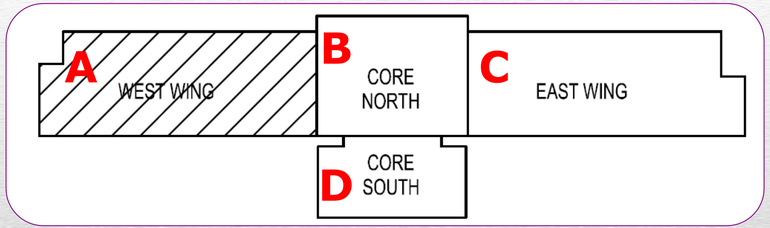
Analysis #1 Short Interval Production Schedule: Masonry Façade Work



Activity	Area A (Days)	Area B (Days)	Area C (Days)	Area D (Days)
Spray Foam Insulation	11	11	11	5
Install Brick Veneer	13	7	13	6
Brick Wash	2	2	2	2
Install Precast	6	6	6	1
Total	32	22	32	14

Activity	Total Duration	Unit	Unit/Day
Spray Foam Insulation	38 Days	36,391sqft	960 SF/Day
Install Brick Veneer	39 Days	173,223 Bricks	4500 Bricks/Day or 990 SF/Day
Install Precast	19 Days	297 precast	16 Precast/Day

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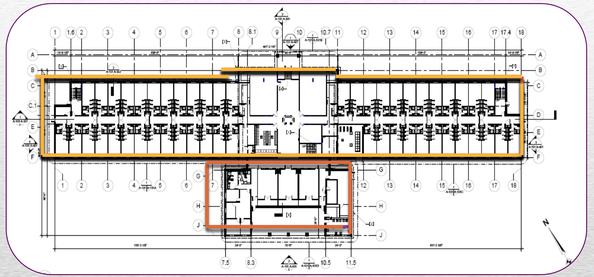

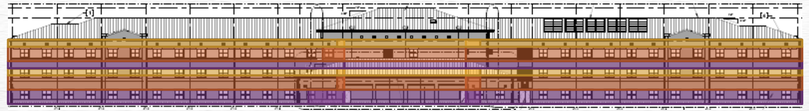

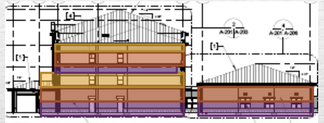

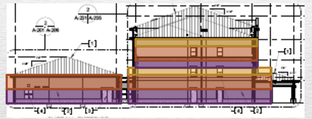

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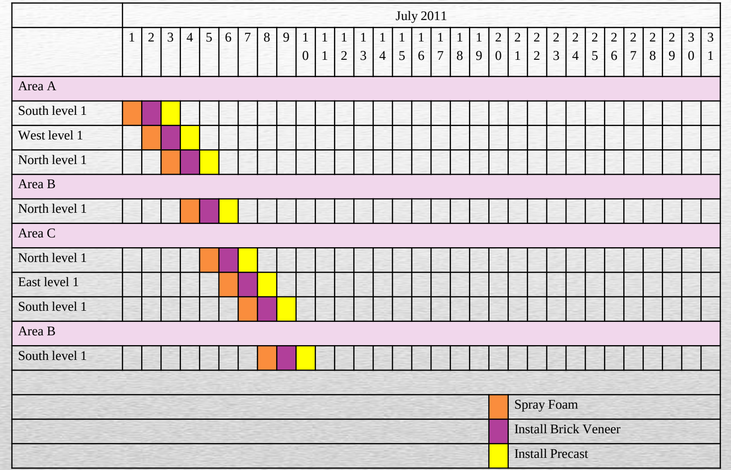

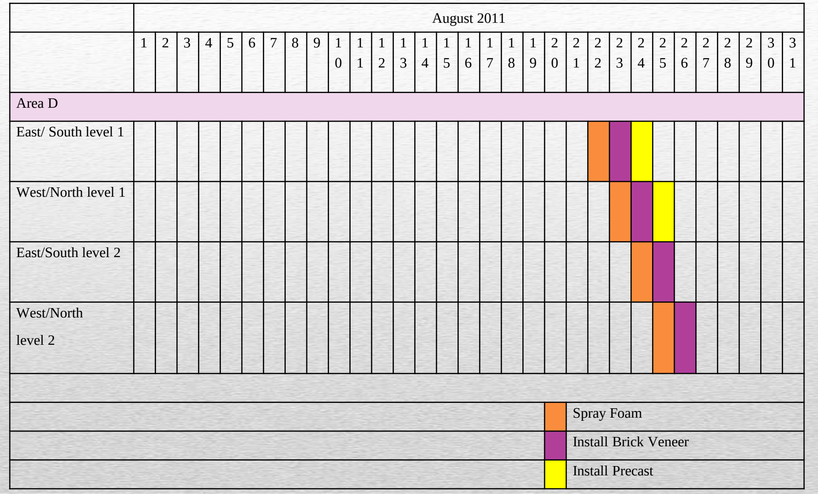

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Analysis #1 Short Interval Production Schedule: Masonry Façade Work

Façade Work Schedule Durations		
Original Target	Actual	SIPS
120 Days	194 Days	59 Days

Façade Work Schedule Savings		
Original Target	Actual	SIPS
38%	0%	70%

Cost Reduction: 1. Labor 2. Equipment

It is recommended to use a SIPS for the Masonry Façade Work

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        1. **Original Brick Veneer Elevations**
        2. New Precast Façade Elevations
        3. Comparison
        4. Recommendation
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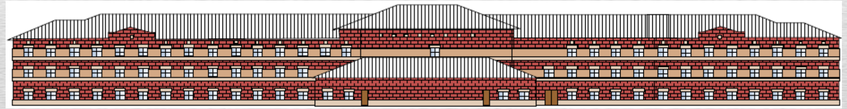
Architectural Breadth

Original Brick Veneer Elevations

North Elevation



South Elevation

Original Brick Veneer Elevations

East Elevation

West Elevation

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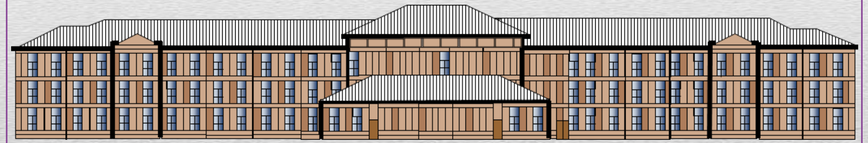
Architectural Breadth

New Precast Façade Elevations

North Elevation



South Elevation

New Precast Façade Elevations

East Elevation

West Elevation

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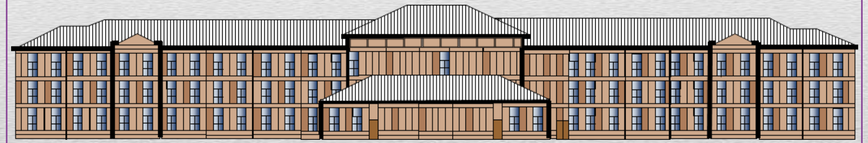
Architectural Breadth

New Precast Façade Elevations

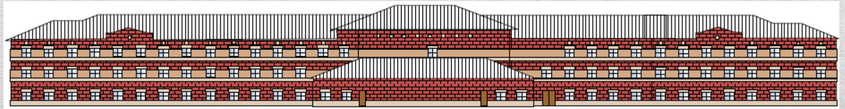
North Elevation



South Elevation

Original Brick Veneer Elevations

North Elevation



South Elevation

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Architectural Breadth

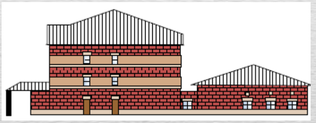
New Precast Façade Elevations

East Elevation

West Elevation

Original Brick Veneer Elevations

East Elevation



West Elevation

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Architectural Breadth

Façade Cost Comparison			
Original Façade		New Façade	
Unit Masonry	$65.00 Cost/SF	Precast Panels	$ 50.00 Cost/SF
Precast Concrete	$10.00 Cost/SF		
Total	$75.00 Cost/SF	Total	$ 50.00 Cost/SF

Façade Schedule Comparison			
Original Target	Actual	SIPS	New Façade
120 Days	194 Days	59 Days	48 Days

It is recommended to use a Precast Concrete Façade

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    2. Design Build vs. Integrated Project Delivery
    3. Risk Analysis Matrix
    4. Recommendations
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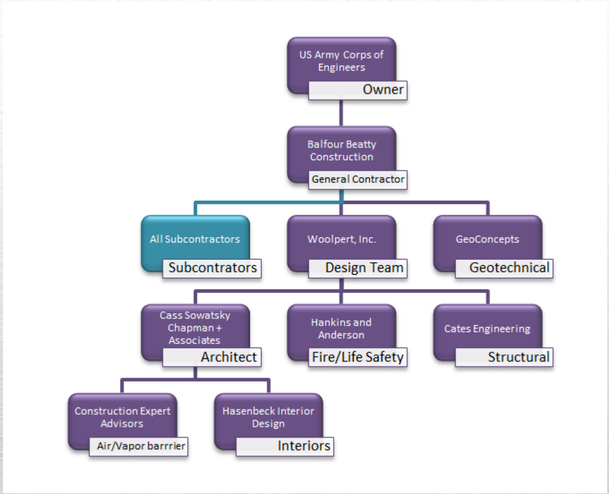
Analysis # 2: Comparing Contracts and Evaluating the Risk

Problem Identification:

- Design Build Contract Approach
- Industry Issue



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Analysis # 2: Comparing Contracts and Evaluating the Risk

Fundamental Principles	
Integrated Project Delivery	Design Build Project Delivery
• Mutual respect and trust	• Mutual respect and trust
• **Mutual risk and reward**	• Collaborative innovation and decision making
• Collaborative innovation and decision making	• Early goal definition
• Early involvement of all key participants	• Intensified Planning
• Open and enhanced communication	

IPD		**DB**	
Pros	Cons	Pros	Cons
√Collaborative team	X Target cost/value design	√ Speed	X Design choices are typically limited
√ Early decision-making	X Shared risk, reward, contingency	√Consolidated cost risk held with the Design Builder	X Decision making process is accelerated
√ Dynamic cost modeling	X Larger team	√ Owner staffing requirement is reduced	
√ Advanced technical coordination			
√ Reduce RFI's CO's and total cost			

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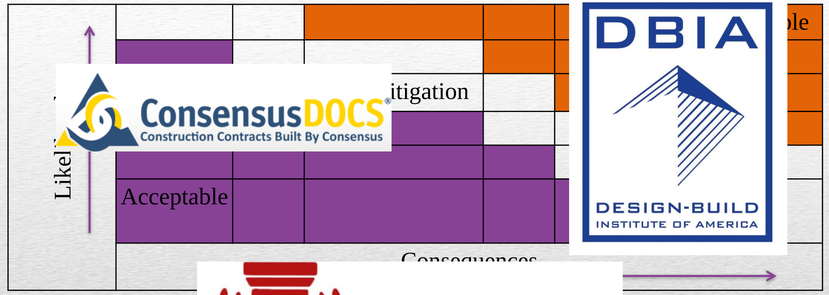

When evaluatin ood (probability) versus consequ f risk in various areas, likeli bility of their C195 conseq n matrix A141

Risk Analysis								
	Design Build				Integrated Project Delivery			
Description	Owner	Arch	CM	SUB	Owner	Arch	CM	SUB
Delays and Extras								
Insurance								
Dispute Resolution								
Incentive Compensation								

High Risk | Medium Risk | Low Risk

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Analysis # 2: Comparing Contracts and Evaluating the Risk

It is not recommended to use an IPD Approach

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    2. Flow Charts
    3. Last Planner
    4. Recommendations
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Analysis #3 Schedule Acceleration Techniques

Problem Identification:

- Unforeseen conditions
- Site work moved to critical path

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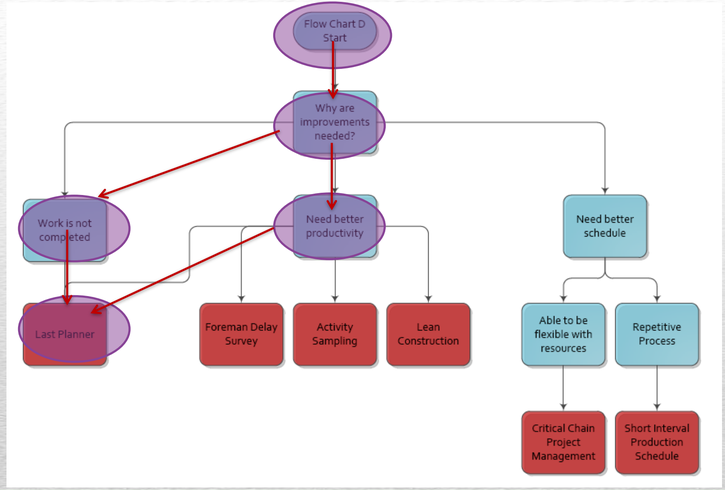

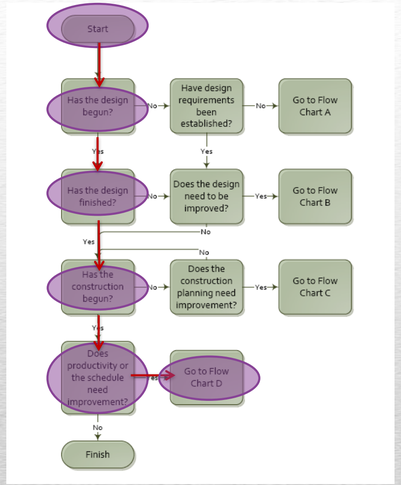

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Analysis #3 Schedule Acceleration Techniques

Project: A.I.T. Barracks

4 Week Lookahead Schedule Site Work

Activity	M T W T F S	M T W T F S	M T W T F S	M T W T F S	Schedule
Mark Existing Utilities	X X				Actual Last Planner
Earthwork Inspections	X X X X X X X X X X X X	X X X X X X X X X X X X	X X X X X X X X X X X X	X X X X X X	Actual Last Planner
Remove Existing Trees	X X X X X				Actual Last Planner
Rough Grade Building Pad	X X X				Actual Last Planner
Install Storm Drain	X X X X	X X X X			Actual Last Planner
Underground Electric		X X X X X X X X X	X		Actual Last Planner

The process for creating the weekly work plans will be as followed:

Monday – Update the project schedule
Tuesday – Develop the future schedule
Wednesday – Update the schedule if necessary
Thursday – Distribute the weekly work plan for the following week to foremen, so they can prepare for the next weeks work

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Analysis #3 Schedule Acceleration Techniques

It is recommended to use the Last Planner

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    2. Schedule Impact
    3. Areas of Modularization
    4. Financial Feasibility
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Analysis #4: Analyzing the Effects of Modularization

Problem Identification:

- Repetitive and standardized building
- Reduce schedule

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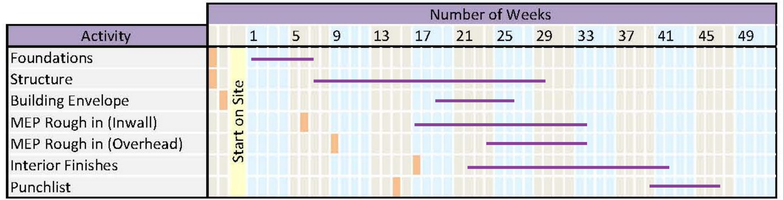
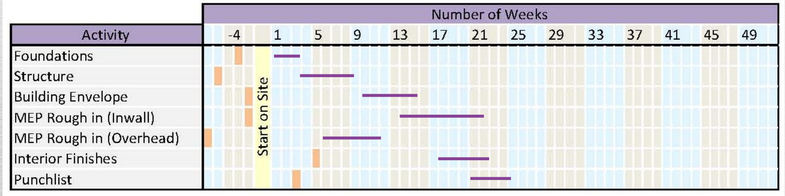
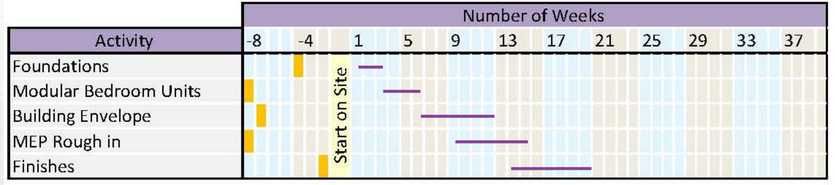
Analysis #4: Analyzing the Effects of Modularization



On-Site Construction Schedule



Light Steel Framing with Modular Bathroom Units Schedule



Modular Construction Schedule

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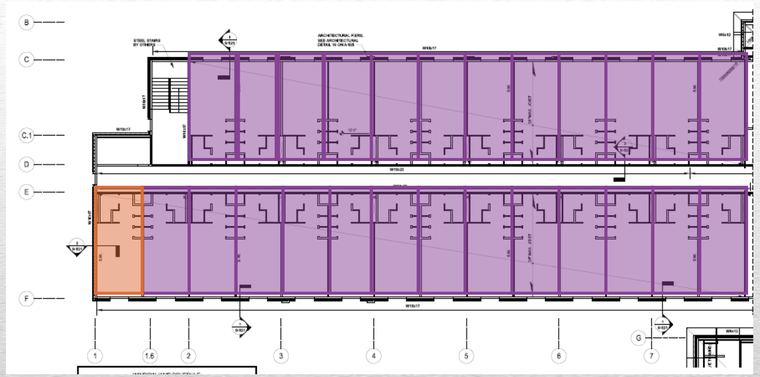
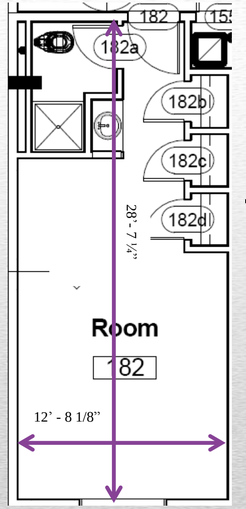
Analysis #4: Analyzing the Effects of Modularization



Partial First Floor Plan – West Wing



Typical Room Enlarged

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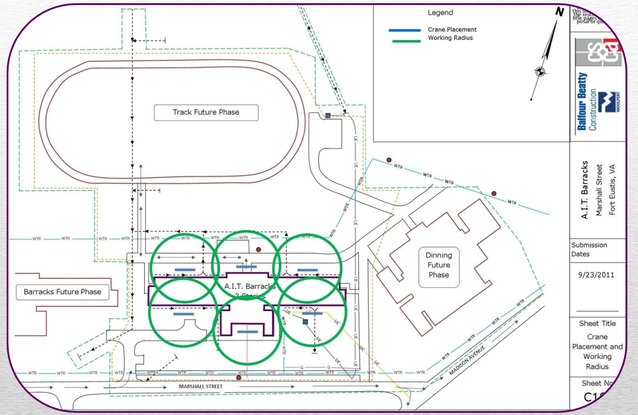

Crane Placement and Working Radius Plan

Cost Comparison	
Original Cost:	$18,618,720
Modular Construction Cost:	$16,756,848

Benefits

1. Controlled factory environment
2. Cost Savings
3. Modular units are built on a flat surface
4. Average 50% schedule savings
5. There is less of a disturbance on site
6. Standardized design
7. Low waste
8. Environmentally friendly construction process

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Analysis #4: Analyzing the Effects of Modularization

Cost Comparison	
Original Cost:	$18,618,720
Modular Construction Cost:	$16,756,848

Problems

1. Double Walls
2. Continual Vapor Barrier
3. Installation
4. Insulation
5. Water Infiltration
6. Roof
7. Logistics

It is not recommended to use Modularization

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6. **Final Recommendations**
7. Acknowledgements

Final Recommendations

Analysis #1: SIPS

- SIPS is Recommended

Analysis #2: Contract Comparison

- IPD is not Recommended

Analysis #3 Schedule Acceleration

- The Last Planner is Recommended

Analysis #4 Modularization

- Modularization is not Recommended

Presentation Outline

1. Project Overview
2. Analysis #1: SIPS
    1. Architectural Breadth
3. Analysis #2: Comparing Contracts
4. Analysis #3: Schedule Acceleration
5. Analysis #4: Modularization
6. Final Recommendations
7. **Acknowledgements**

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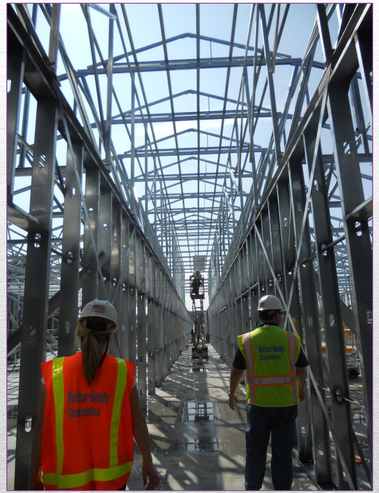

Questions?