



Project Stakeholder Integration in Off-Site Construction

Challenges, Opportunities and Needs.

PRESENTERS



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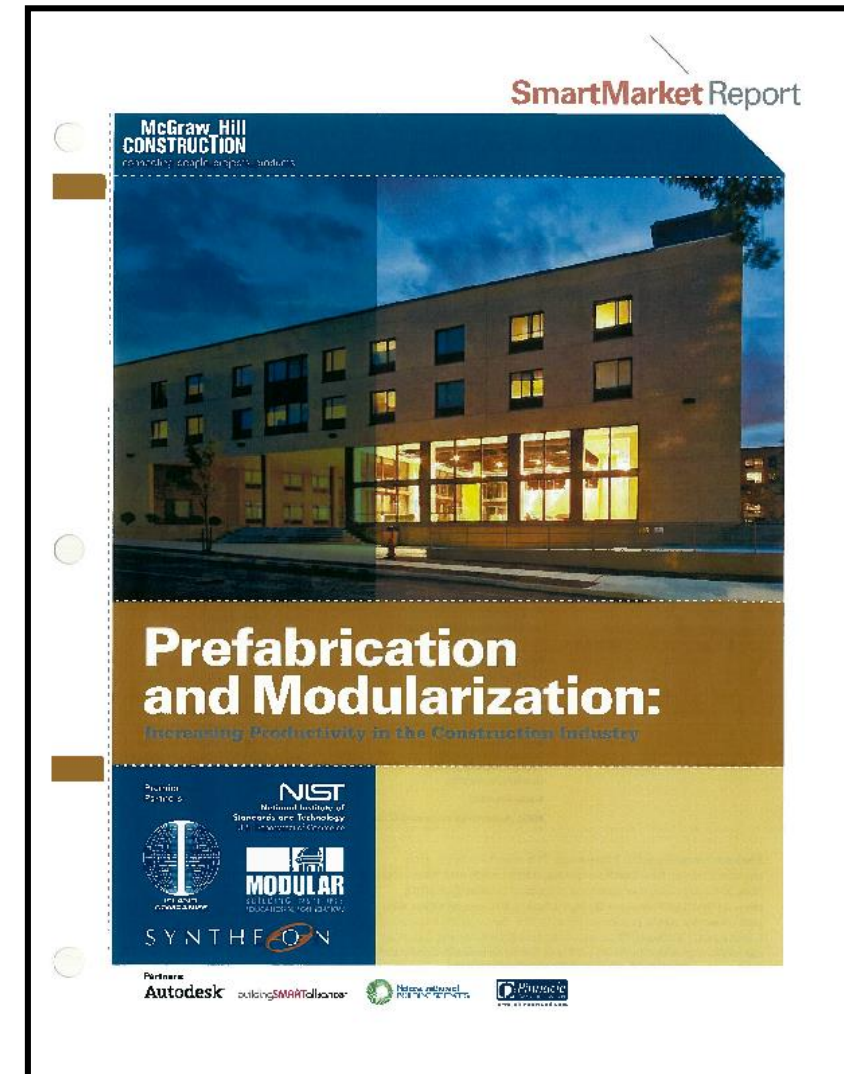
Session Overview

1. Defining off-site construction and permanent modular construction
2. Millmont Elementary School – A Case Study
3. Challenges, Opportunities & Integration Needs from the Viewpoints
 - of the Modular Builder
 - of the Construction Manager/GC
 - of the Architect
4. Q & A

What defines the “off-site construction” industry?

- Prefabrication
- Modularization
- Off-site construction
- Modern methods of construction
- Sub-assemblies
- Permanent modular construction
- Volumetric modular construction

And why is it such a hot topic?



The Off-Site Construction Council (OSCC) of the National Institute of Building Sciences has this definition:

- Off-site construction is the planning, design, fabrication and assembly of building elements at a location other than their final point of assembly onsite. An integrated planning and supply chain optimization strategy characterizes off-site delivery.



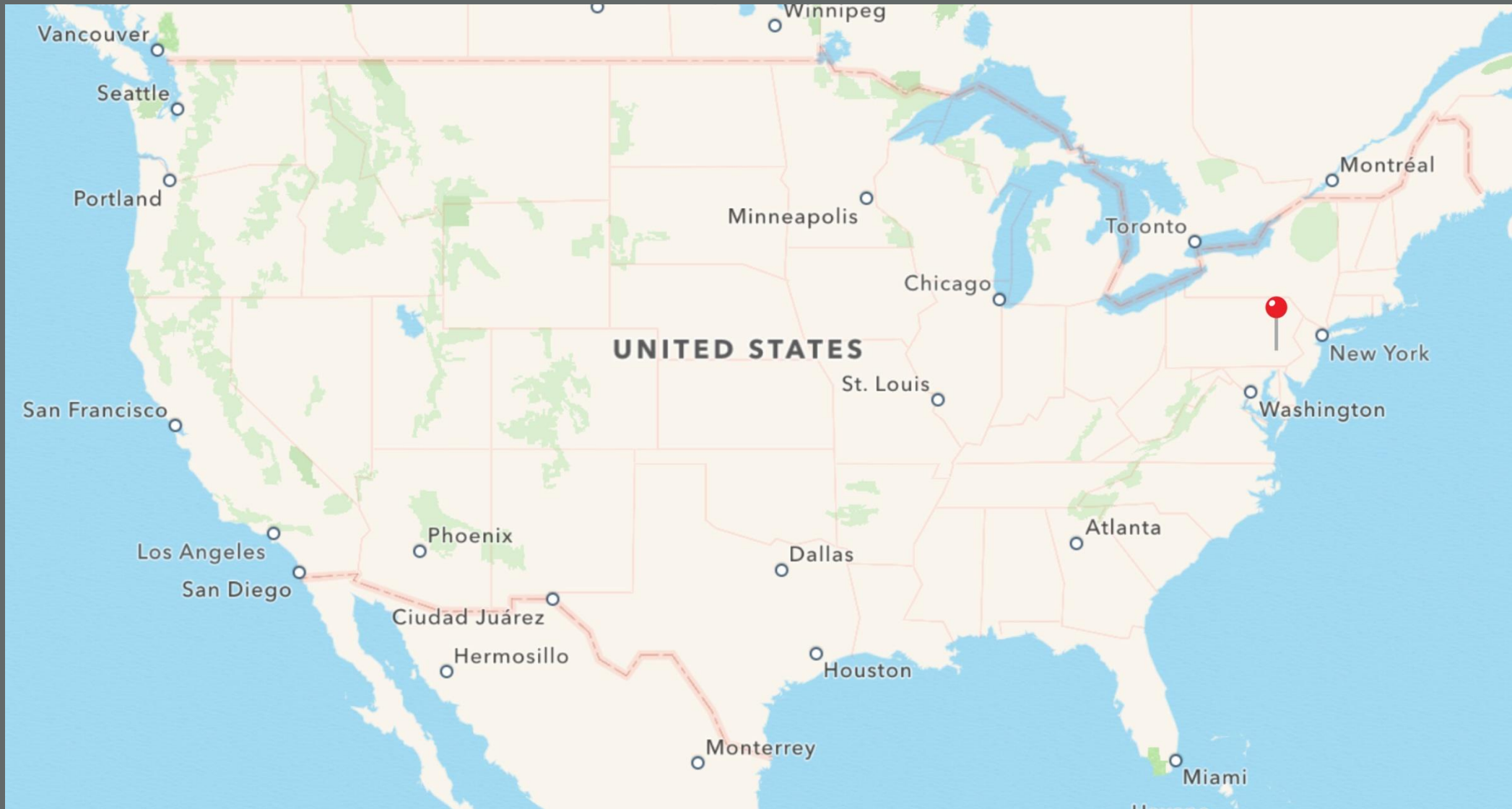
What is Permanent Modular Construction? (PMC)

- PMC is a specific subset of the “off-site” construction” industry.
- It is a permanent, rather than a temporary building but retains the inherent ability to relocate, reuse or repurpose more readily.
- PMC companies create 3D volumetric modules for some or all of the building off-site in a controlled environment.
- PMC describes a process rather than a product.
- May be an entire building, an addition to an existing building or a part of a building (pod).
- It may be 30 to 100 percent of a project



Millmont School – A Case Study

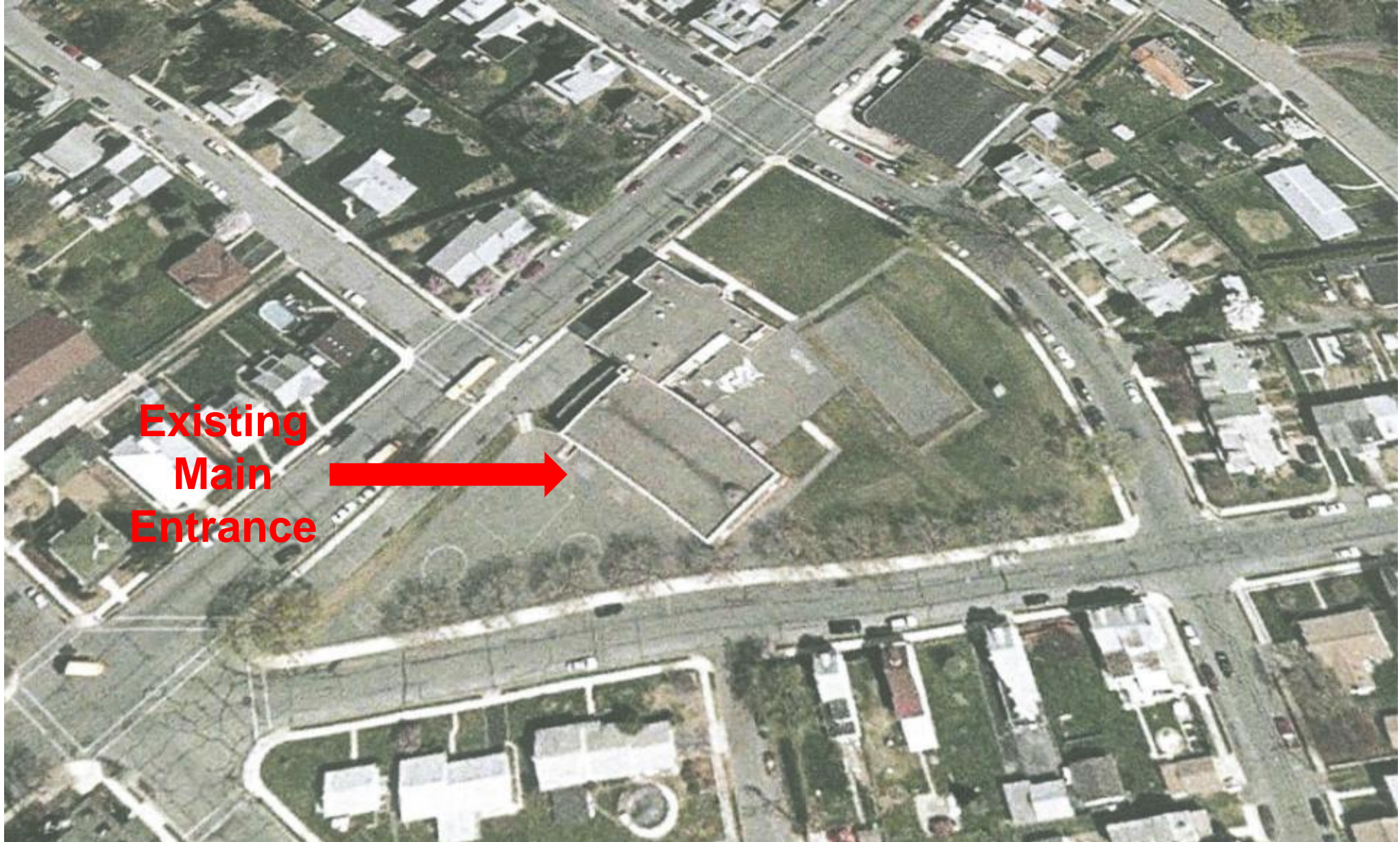




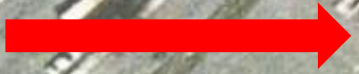
Reading, Pennsylvania



Reading, Pennsylvania



**Existing
Main
Entrance**



**Reading School District
Existing Millmont Elementary School**





Reading School District – Millmont Elementary School 



Reading School District – Millmont Elementary School 












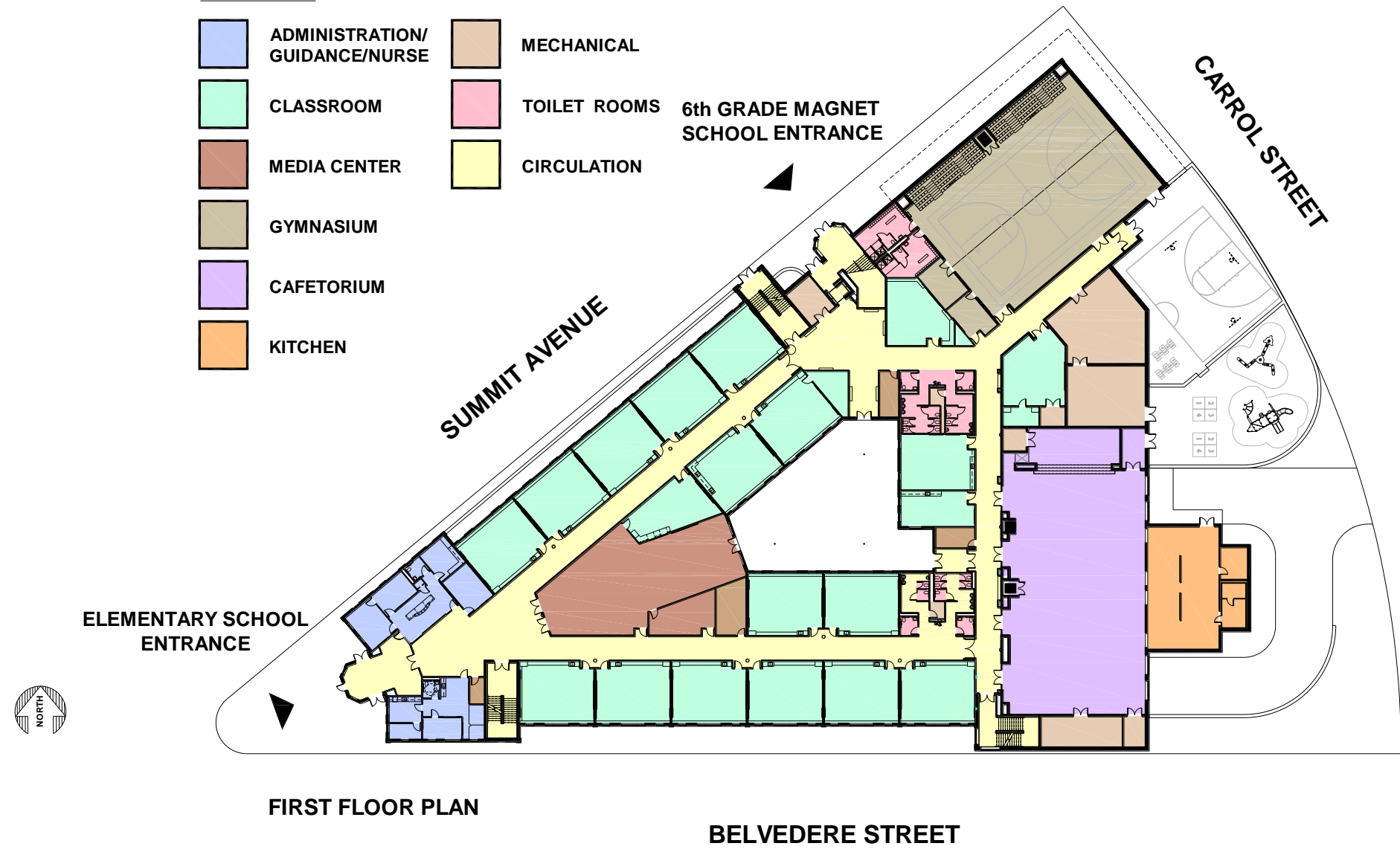
Reading School District – Millmont Elementary School RB



Reading School District – Millmont Elementary School RB

LEGEND

- | | |
|---|--|
|  ADMINISTRATION/
GUIDANCE/NURSE |  MECHANICAL |
|  CLASSROOM |  TOILET ROOMS |
|  MEDIA CENTER |  CIRCULATION |
|  GYMNASIUM | |
|  CAFETORIUM | |
|  KITCHEN | |












FIRST FLOOR PLAN

BELVEDERE STREET

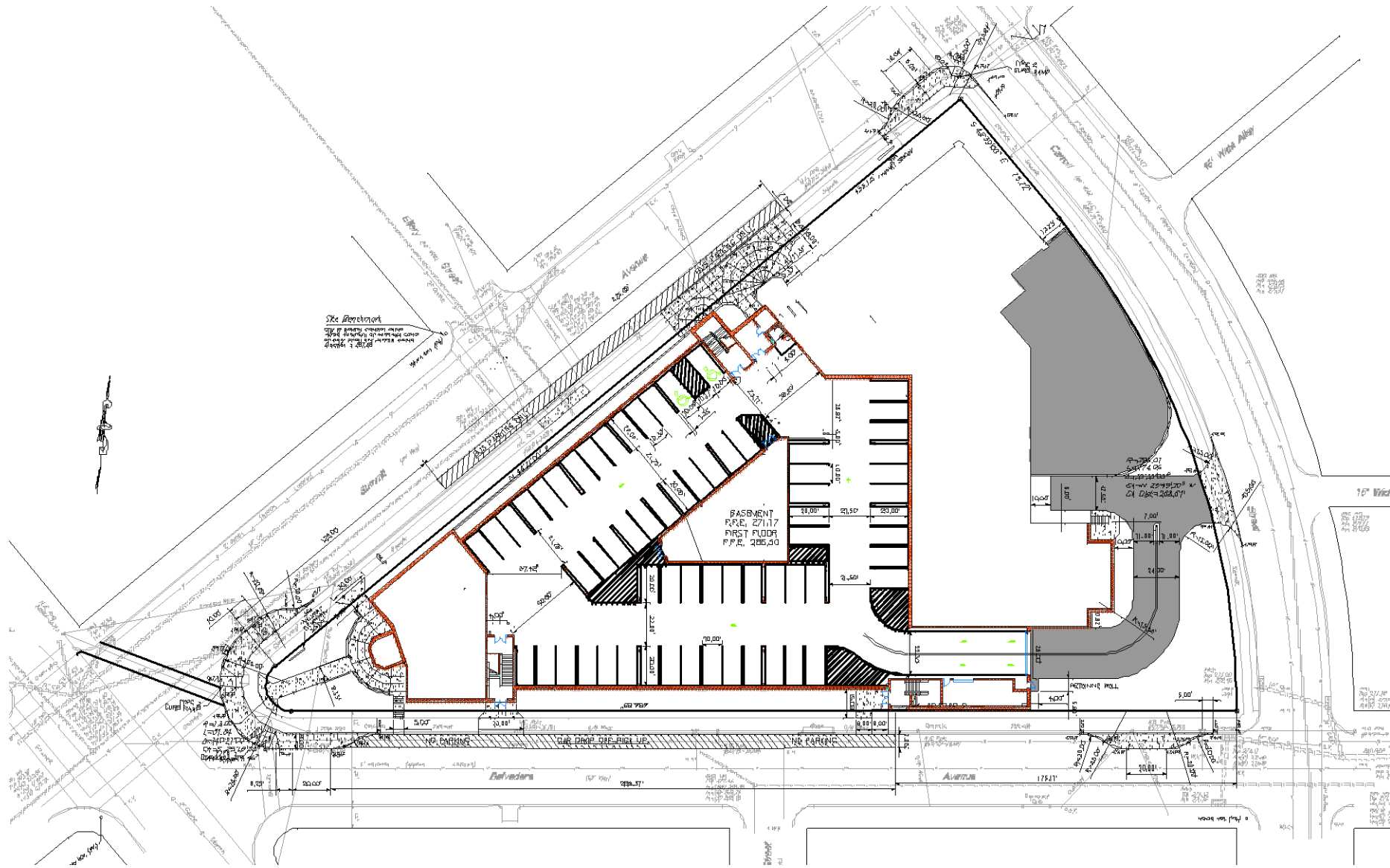


LEGEND

	ADMINISTRATION/ GUIDANCE/NURSE		MECHANICAL
	CLASSROOM		TOILET ROOMS
	MEDIA CENTER		CIRCULATION
	GYMNASIUM		
	CAFETORIUM		
	KITCHEN		



SECOND FLOOR PLAN



Reading School District – Millmont Elementary School





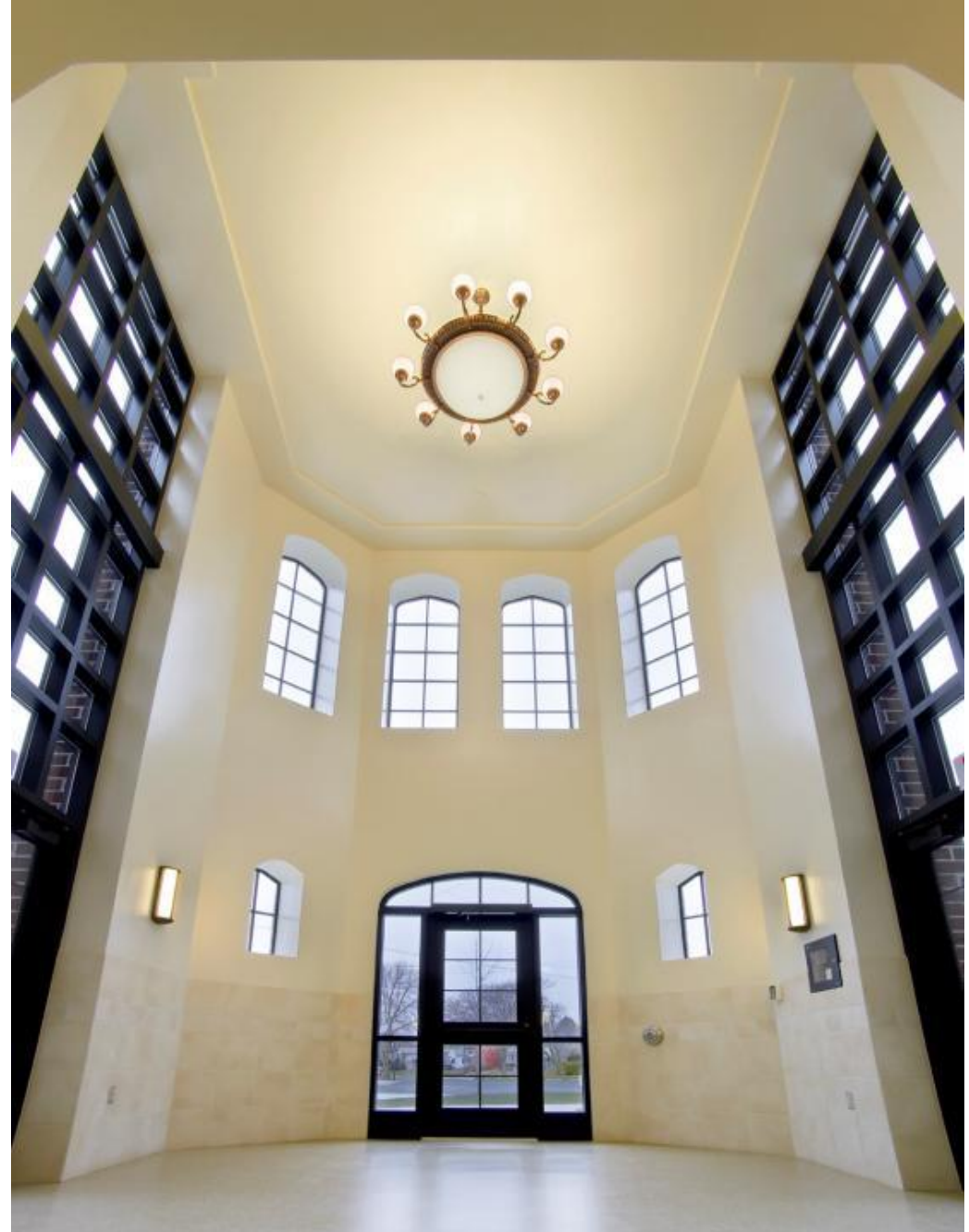
Reading School District – Millmont Elementary School RB



Reading School District – Millmont Elementary School RB



- Built on site





Built off site





















Reading School District – Millmont Elementary School RB

Industry Challenges, Opportunities & Project Integration Needs

From the viewpoint of the Architect

Industry Challenges, Opportunities & Project Integration Needs

From the viewpoint of the modular construction company

Industry Opportunities

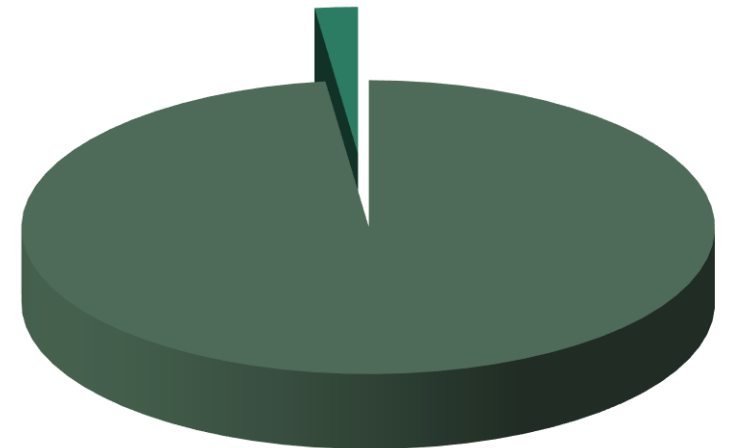
INCREASED MARKET SHARE

Clearly the largest opportunity for the PMC industry is a gain in commercial construction market share in North America.

The challenge is the same

What will it take to get there?

Currently 2.34% of the market*



Industry Challenges

In a recent industry stakeholder survey issued by the OSCC of NIBS, the question was asked:

Rate the barriers to implementing off-site construction.

Top three highest ranking:

- 1. Design + Construction Culture
- 2. Distance from factory to site/transportation
- 3. Industry knowledge



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Industry Challenges



Transforming Perception

55780 Low Carbon Architecture: modular construction workshop for the 2015 AIA Convention.

Ryan E. Smith

University of Utah, Director

Integrated Technology in Architecture Center - ITAC

Transforming Challenges to Opportunities

KNOWLEDGE & EDUCATION

- At the grass roots level of academia
- Of Owners and Design professionals
- Of Construction Managers and GC's

Project Integration Success Requires

1. Collaborative thinking
2. Understanding the importance of the modules
3. Believing that timing is everything
4. A defined scope of work between parties.



1. Collaborative approach

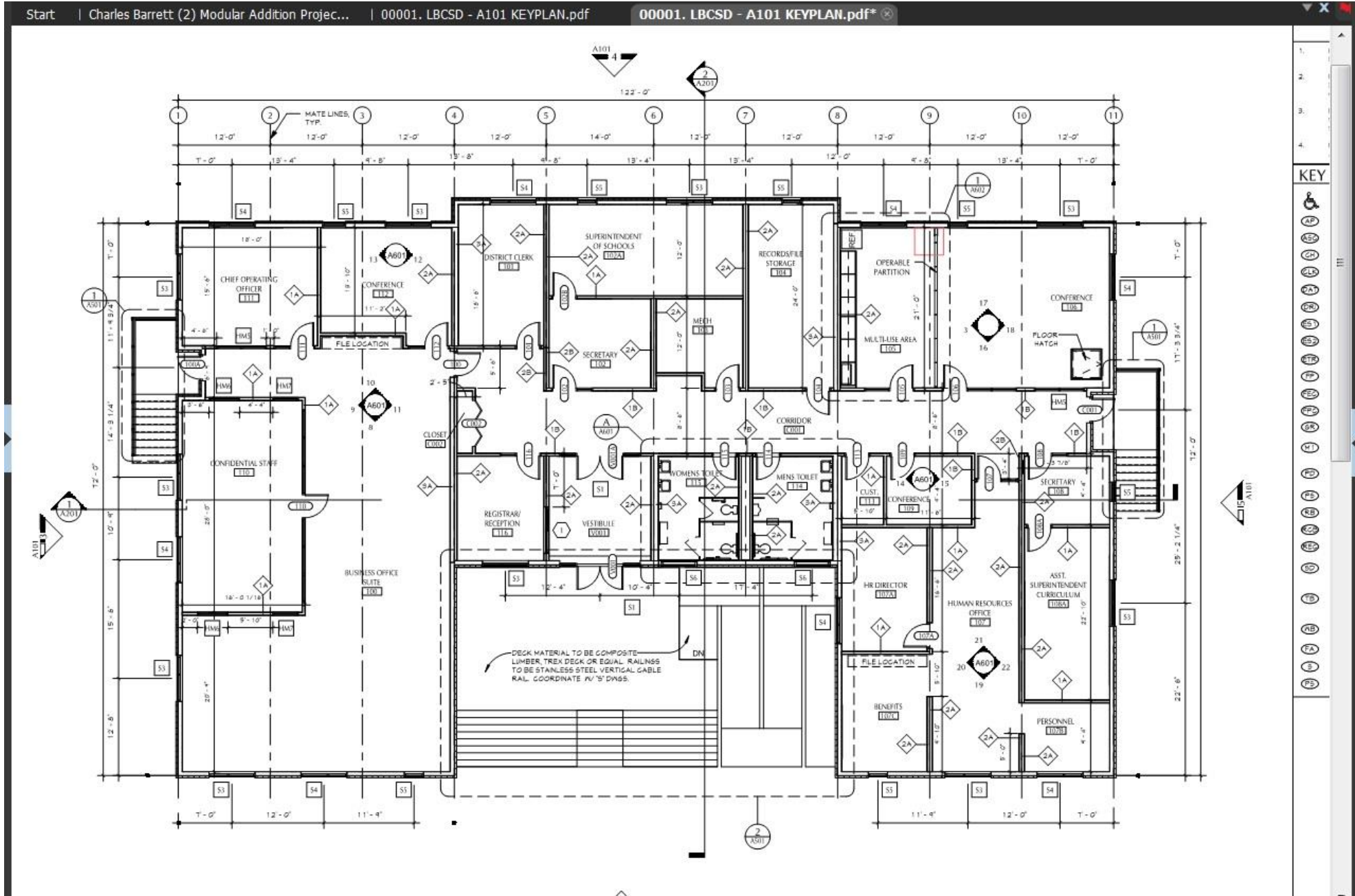
1. Understanding the dynamics of building off site – what's the same
 - Owner/architect vision and final outcome.
2. Understanding the dynamics of building off site – what's different
 - Structural design, scheduling, sequencing, scope of work - roles and responsibilities.
3. Design / Pre-construction – how and when to engage a modular company
4. Communication, co-ordination and co-operation throughout the project

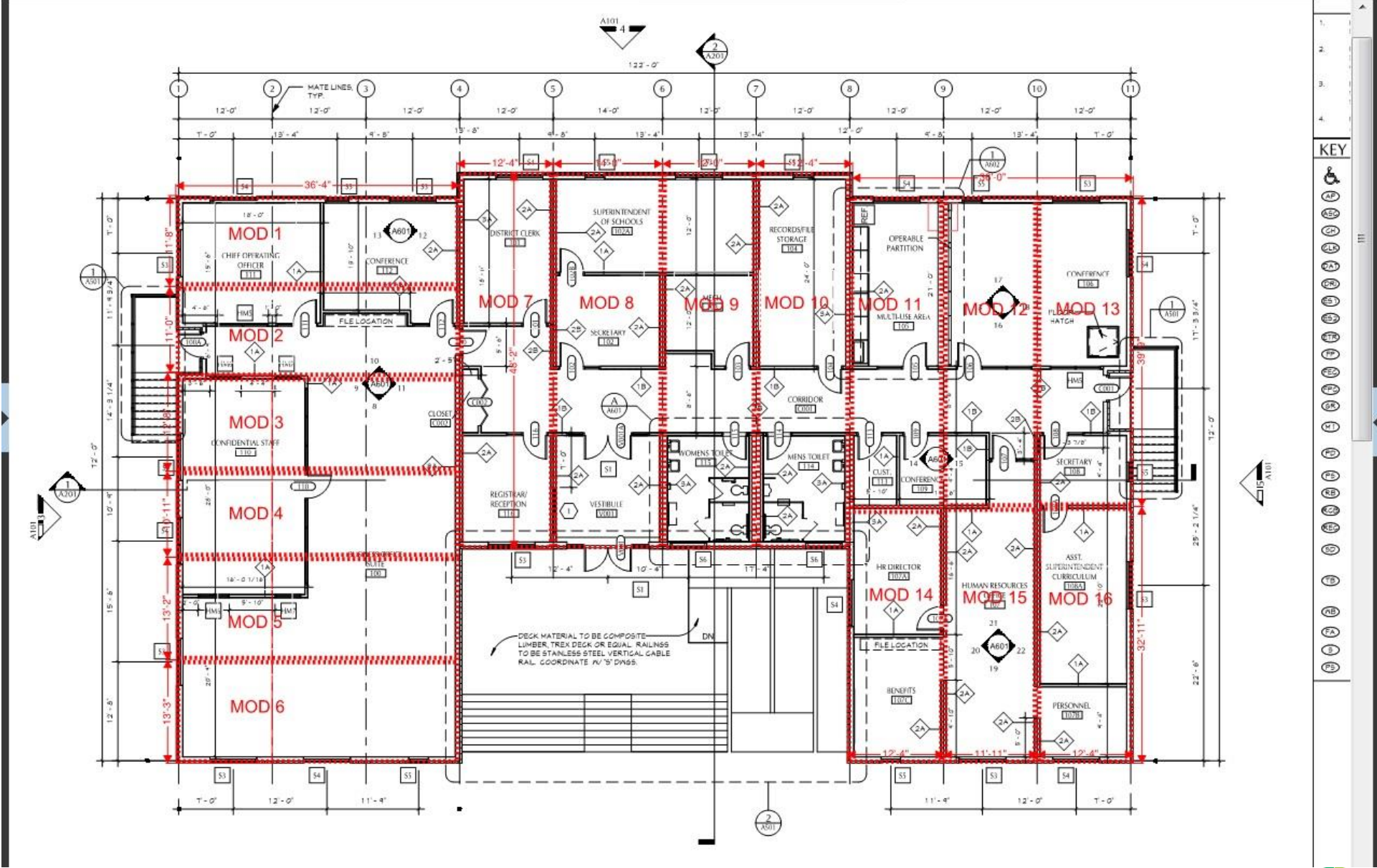


2. Why does the module matter?

SUBHEADER

DESIGN - The impact of building layout





Road transport and site access will influence module sizes





Module sizes may be governed by adjacency of existing buildings

Modules may be designed around weight, cubic dimension, crane reach, connection to existing buildings.



Module sizes and layout impact foundation design



3. Timing is everything

- Final Design and Approvals are more time sensitive.
 - Project schedules should establish a reasonable but finite time for final design development and decision making
 - Decisions must be made early and modular footprint frozen
 - Turnaround time for approvals is shorter
 - Changes during fabrication are costly and can be avoided with more collaboration between stakeholders.



Color choices may be needed before foundations are in

4. Scope of work.

Define and Delineate the Project Scope of Work

- During pre-bid/pre-construction phases, establish a scope of work document that best suits the requirements of the stakeholders
- Clearly communicate to avoid scope creep/overlap or scope gaps

Industry Challenges, Opportunities & Project Integration Needs

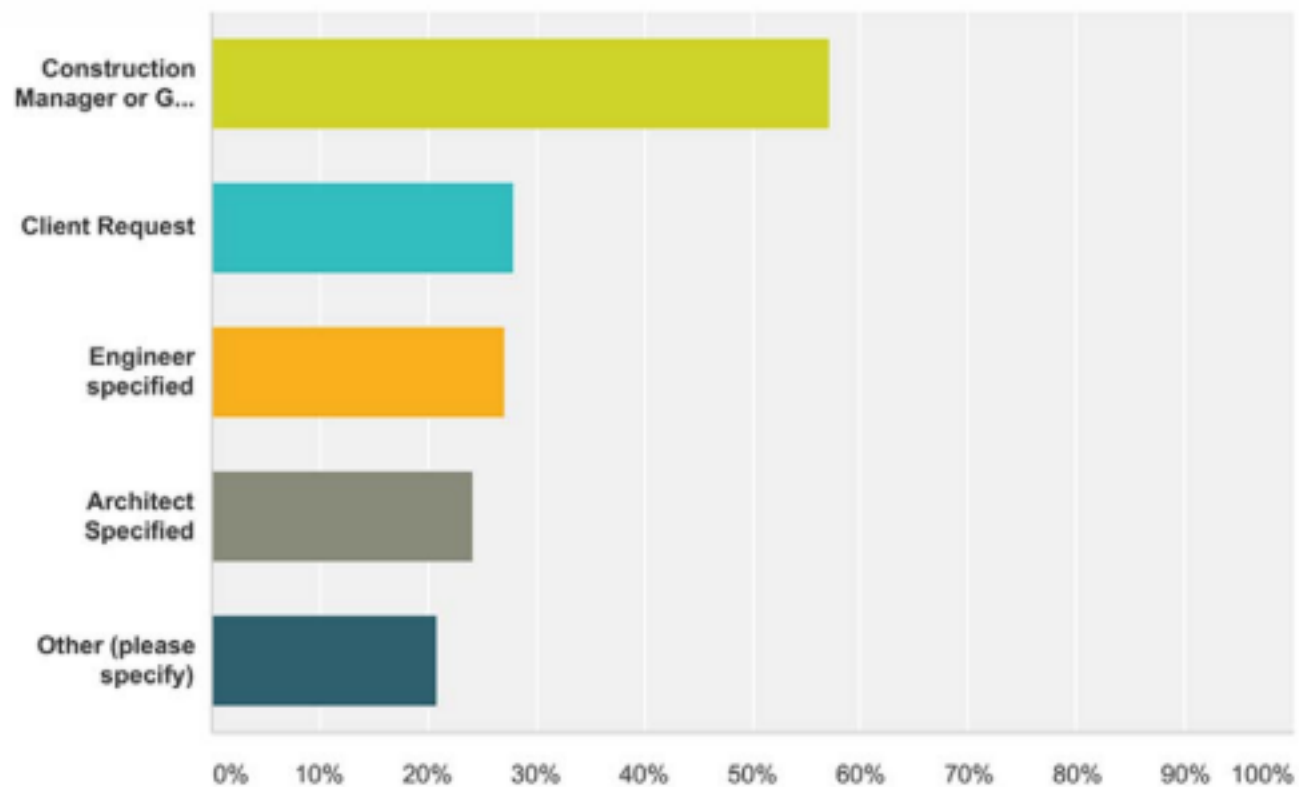
From the viewpoint of the Construction Manager/GC

Up to 35%



Q4 During project planning phase for this project, who was responsible for the decision to use off-site? (select all that apply)

Answered: 301 Skipped: 10



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Opportunities

Will There Be Value-Add?

- **Schedule benefit**
 - Concurrent Work
 - Complex Site/Foundation
 - Site constraints
- **Logistics benefit**
 - Workforce availability
 - Site constraints
 - Crane time (“hook time”)
 - Manpower stacking

Opportunities

Will There Be Value-Add?

- **Productivity benefit**
- Profitability
- Best People

Opportunities

Will There Be Value-Add?

- **Reducing Uncertainty**
- Schedule
- Budget
- **Management**
- Doing more with less?
- **Safety**
- Will the work be safer for those doing it?
- **Quality**
- Will quality be improved and reliable

Industry Challenges

- Lack of Awareness
- Client Procurement Requirements
- Maximizing Modular Requires Early Team Buy-In and Collaboration
- The Right People on the Bus
- Doing More with Less?
- Client Decision-Making Moves Upstream

Industry Challenges

- Mapping and Covering the Risk Management and Legal Issues
- Pay Terms, Ownership
- Redirects Leadership Effort
- Project Management Skill Sets Expand
- Perceptions: Labor; Regulatory; Risk of Unknown
- Is There Appropriate Competition?
- Sufficient Capacity
- Data, Proof, Lack of Consistent Voice, Lack of Rapid Learning Cycle

Project Integration Success

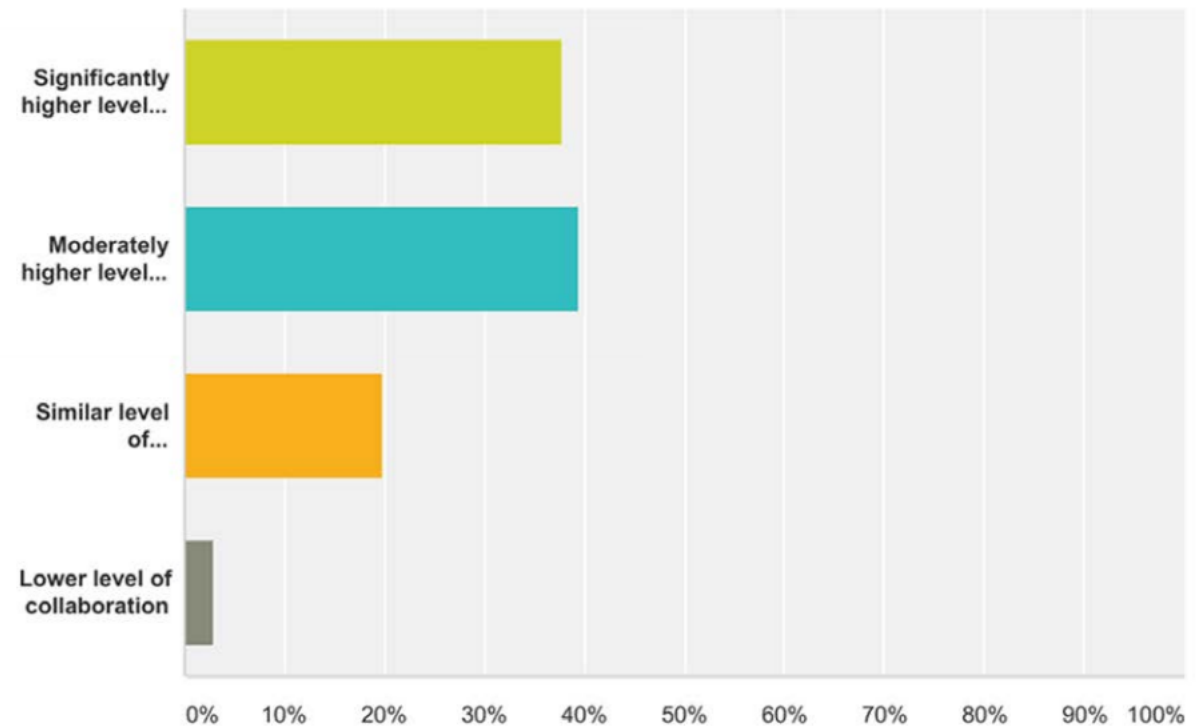
What are some of the primary considerations?

Project Integration - Considerations

- Strong Project Management System – Lean!
- “Conductor” with Orchestra
- Collaborative Team
- Commitment
- Project Management System
 - Process, Process, Process
 - Upstream, Upstream, Upstream
 - Decision Making
 - Flow
- Measurement

Q8 What level of stakeholder collaboration is required to implement off-site construction in comparison to traditional construction methods?

Answered: 299 Skipped: 12



Project Integration Results – Case Study

- **Time Savings**
 - **Cost Savings**
 - **Profitability**
 - **Best People**
 - **Safer**
 - **Repeat Work**
 - **References**
 - **Growth**
- ▶ **Cost: create reliability**
 - Lowered mechanical/plumbing bids by more than 1%
 - One change order for \$3,000 on \$40M in MEP work
 - Project delivered 7% under client's budget
 - Vs. other 9 “like” projects: 10% lower cost
 - ▶ **Safety: think differently**
 - Dramatically reduced first aid incidents
 - Dramatically reduced “hot work” onsite – welding, cutting, soldering
 - 447,000 manhours with no lost time incidents



Thank you!

West Reading Elementary School Reading, Pennsylvania A Case Study

Main
Entrance



Wyomissing Area School District
West Reading Elementary School





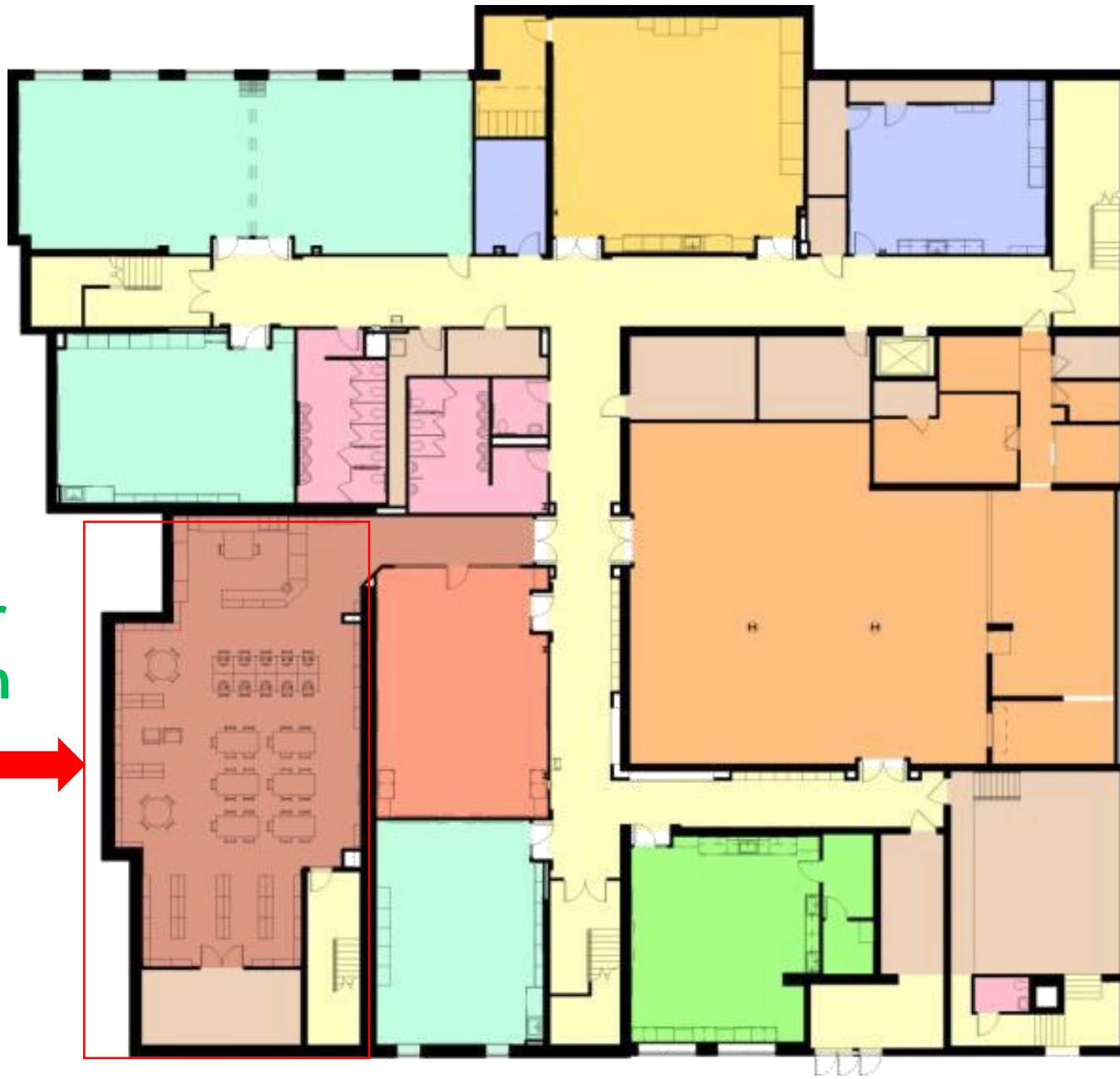
**Wyomissing School District
West Reading Elementary School**







Minimizing the impact to the Neighborhood



COLOR LEGEND

- ADMIN
- ART
- CIRCULATION
- CLASSROOM
- FOOD SERVICE
- MAINTENANCE
- MEDIA CENTER
- MUSIC
- TECHNOLOGY EDUCATION
- TOILETS

**Modular
Addition**



Ground Level



COLOR LEGEND

- ADMIN
- CIRCULATION
- CLASSROOM
- MAINTENANCE
- PHYSICAL EDUCATION
- TOILETS

New Main Entrance



Modular Addition



Main Level



COLOR LEGEND

-  CIRCULATION
-  CLASSROOM
-  MAINTENANCE
-  PHYSICAL EDUCATION
-  TOILETS

**Modular
Addition**



Second Level





got milk?

Swift Pick.

Some studies suggest
teens who choose
milk instead of sugary
drinks tend to be leaner,
plus the protein
helps build muscle.

bodyinmilk.com

STAY ACTIVE. EAT RIGHT. DRINK 3 GLASSES OF LOWFAT MILK A DAY.

































Project Costs

Budget: Total project cost \$13,000,000

Actual construction cost including asbestos
abatement \$ 9,031,419

50,150 s.f. renovations; 8,698 s.f. new

Schedule

Hired: January 2010

Bid opening: October 2010

School opened: August 2011 — 10 months

