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# OFF-SITE CONSTRUCTION

## CHECKLIST FOR PROJECT SUCCESS

6 PRE-CONSTRUCTION STRATEGIES FOR BUILDING WITH PERMANENT MODULAR CONSTRUCTION (PMC) AND HOW TO IMPLEMENT THEM.

FOLLOW THE LOGIQ



# CHECKLIST FOR PROJECT SUCCESS



## 6 PRE-CONSTRUCTION STRATEGIES AND HOW TO IMPLEMENT THEM

Projects built off site look, feel and perform exactly the same as those conventionally constructed on site once completed, but the methodology used for Permanent Modular Construction (PMC) results in some critical differences in the process – particularly at the pre-construction stage. Getting the most from

your PMC project requires different thinking and co-ordination. Some of these key distinctions can be better understood and implemented by following this pre-construction checklist. It's a must for those who are new to building off site, and a great refresher for experienced practitioners of the methodology.

STRATEGY 1

✓ **RESEARCH AND PRE-QUALIFY**

STRATEGY 2

✓ **GET THE COMMITMENT TO BUILDING OFF SITE**

STRATEGY 3

✓ **COLLABORATE AT EVERY STAGE**

STRATEGY 4

✓ **DESIGN WITH A MODULAR APPROACH IN MIND**

STRATEGY 5

✓ **UNDERSTAND THAT TIMING IS EVERYTHING**

STRATEGY 6

✓ **CLEARLY DEFINE EVERYONE'S SCOPE OF WORK**

# RESEARCH AND PREQUALIFY



Pre-construction strategies should begin with a good understanding of the modular building industry itself, including manufacturers and their expertise or capabilities. This is part of the due diligence required of any construction project, but can take on greater significance with a modular building project if you are exploring it for the first time. Don't delay

finding a qualified modular building expert and integrating them with the design team – early engagement of all stakeholders is a key to the success of building your project off site. A modular building expert will bring valuable experience and insight to the planning table that can guide the design process and optimize the use of modularization and prefabrication.

## RESEARCH THE INDUSTRY.

The commercial modular construction industry is very diverse. Different companies specialize in different building applications - from temporary offices or storage containers to permanent schools, hotels, retirement homes or health care facilities. Look for companies that can meet your particular construction requirements. Check their geographical coverage. Review case studies. Ask for referrals to establish their capabilities in permanent modular construction (PMC). Share that knowledge with the entire team so everyone understands the possibilities.

## ISSUE A FORMAL REQUEST FOR PRE-QUALIFICATION.

If you choose to formally pre-qualify modular building companies, this would allow you to gather information on various aspects of their corporate structure, resources and capabilities, including QA/QC, past project experience, project management and sample execution plans, as well as geographical coverage, and financial strength.

# GET THE COMMITMENT TO BUILDING OFF SITE



Deciding to use off-site construction as your project delivery method should not be an afterthought. If you are already well down the design development path conventionally, choosing this solution at that late point will require backtracking, so ideally you want early engagement and commitment to the process. Off-site construction is a methodology that can achieve the overall vision, permanence

and performance demanded by any architect or owner. If you keep this in mind, no one involved in the project will be influenced or constrained by their impression of what PMC can accomplish. Instead, the project team will be open to the innovative potential of modularization and will gain its benefits to the fullest as you begin designing.

## Off-site Construction Process



**Stakeholders collaborate at every stage (see Strategy 3)**

*Credit: Ryan E. Smith, Prefab Architecture: A Guide to Modular Design and Construction, John Wiley & Sons, 2010.*

# GET THE COMMITMENT TO BUILDING OFF SITE

## SHARE THE KNOWLEDGE.

You can share what you've learned about the industry from your research with your team, or ideally if you have already engaged a modular construction company to consult with, they can present the overall concept to the whole team and answer questions about the process.

## IDENTIFY WHERE PMC PROCESS WILL DIFFER.

Whenever a team is in unfamiliar territory, it's a good idea to identify how the terrain is likely to be different from what they're used to, and what might lie ahead. Structural design, scheduling, sequencing, roles and responsibilities can all differ when building off site. Use your modular consultant to help identify the differences and make sure they are communicated to the entire team.

## LOOK FOR TEAM ALIGNMENT.

All stakeholders including the owner, architect and design professionals, construction managers and general contractors should understand and be on-board with the modular approach. Team alignment and design co-ordination are critical to the success of this alternative project delivery method.

## CONCEPTUALIZE WITH PMC METHODOLOGY.

Once you have the team commitment to launch your project using this alternative project delivery method, the project will roll out much more effectively.

# COLLABORATE AT EVERY STAGE



Harnessing the expertise and insights of all the stakeholders in their relevant roles and collaboratively engaging in the process from concept and design through construction to final occupancy optimizes the project outcome. When building a project off-site, this is even more important as greater emphasis is placed on early decision making, roles and

responsibilities and project co-ordination. Bringing all the stakeholders together at every stage of the pre-construction phase will ensure multiple perspectives are addressed from the multiple disciplines so that concerns are dealt with and assumptions are clarified. The more complex or sophisticated the design, the more important teamwork becomes.

## INVITE RIGHT PEOPLE TO THE TABLE.

The team's composition will depend on who is involved with the project from the conceptual phase forward. It would usually mean a cross-functional team that includes the owner and/or owners' representative, the architect and design consultants, the construction manager, the general contractor and the modular building company. A team reaching for LEED Certification may also include a green building or energy consultant.

## APPOINT A COLLABORATION CHAMPION.

The role most important to coordinate and support the team's collaboration efforts is often determined by the contract method. It could be the owner, the architect or a construction manager.

# COLLABORATE AT EVERY STAGE

## ORGANIZE THE TEAM HORIZONTALLY, NOT VERTICALLY.

In traditional construction projects, information often flows from the top (owner/architect) to the bottom (modular building company). Allowing all parties to communicate with each other at the same table, encourages information flow between all members of the team. This leads to project innovation and creative problem solving.

## BUILD TRUST BETWEEN TEAM MEMBERS.

Trust is necessary to collaborate effectively. With trust comes also a willingness to listen to all perspectives, and a confidence that fellow members will deliver on their responsibilities.

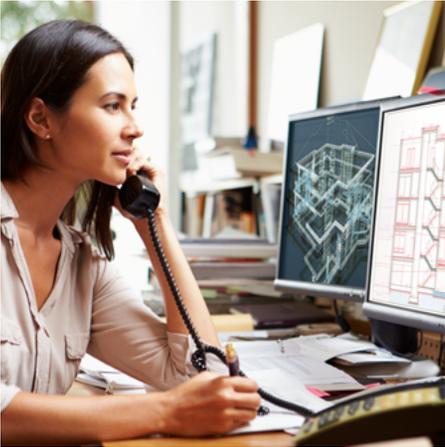
## FACILITATE COMMUNICATION, CO-ORDINATION & COOPERATION THROUGHOUT THE PROCESS.

One of the best ways to do this is through a clearly defined scope of work — who does what. (See Strategy 6).

## FORMALIZE “DESIGN ASSIST” WITH A PROJECT DEVELOPMENT AGREEMENT.

A separate contract between the modular company and owner or owner’s rep formally establishes the modular company as a source of design assistance only. This role aids in the development of a set of non-proprietary bid documents and guides project development during planning and design to achieve the desired schedule and budget outcomes.

# DESIGN WITH A MODULAR APPROACH IN MIND



Permanent Modular Construction (PMC) can match a conventionally built structure in building science, architectural design, life cycle durability and energy efficiency. That said, there are some design elements to consider as a result of this alternative process and these must be addressed early in the design development process. Since the devil is in the details, don't take short cuts or make assumptions without understanding these specifics.

An integrated design approach is key at this stage because this is where all the disciplines converge to take care of coordination between the unique structural requirements of modularization and other areas such as mechanical, electrical etc. The size and configuration of the modules are also important as they will be a result of the site access or transportation regulations. Module sizes and layout also determine foundation size and layout.

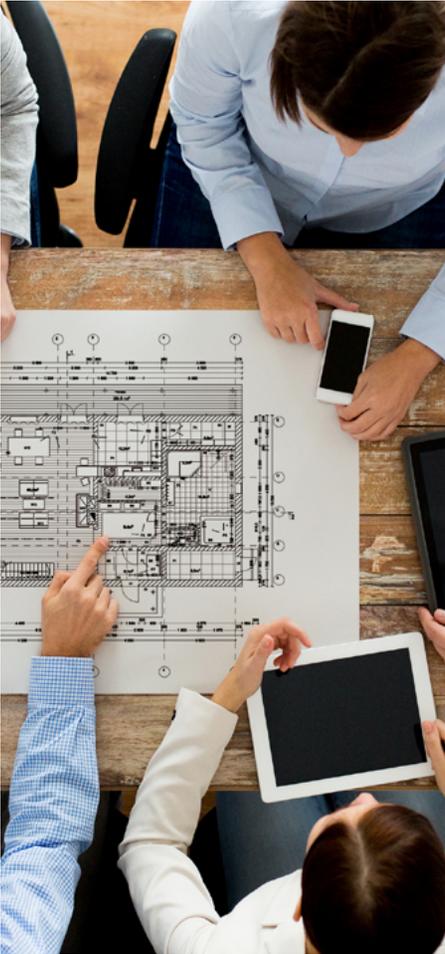
## FOLLOW BEST PRACTICES WHEN APPLYING A MODULAR DESIGN.

Numerous best practices and implementation guidelines are discussed in this Checklist, but in the context of Strategy 4, some overarching goals in design include: 1) complete construction at the modular plant to the highest degree possible and minimize the amount of site work, site activity and related construction hazards, 2) maximize the size of modules, 3) minimize the number of modules, and 4) find the most logical and practical modular layout for optimal efficiency in cost, design, transportation, site access, and foundation design.

## UNDERSTAND TRANSPORTATION AND SITE LOGISTICS.

The dimensions of the modules used in your building design are driven primarily by transportation regulations in the region(s) of travel from the plant to the site location. As these restrictions can vary, the module dimension is usually based on the most stringent location. Another possible factor in defining the module size may be access to the site.

# DESIGN WITH A MODULAR APPROACH IN MIND



## DEVELOP A MODULAR LAYOUT.

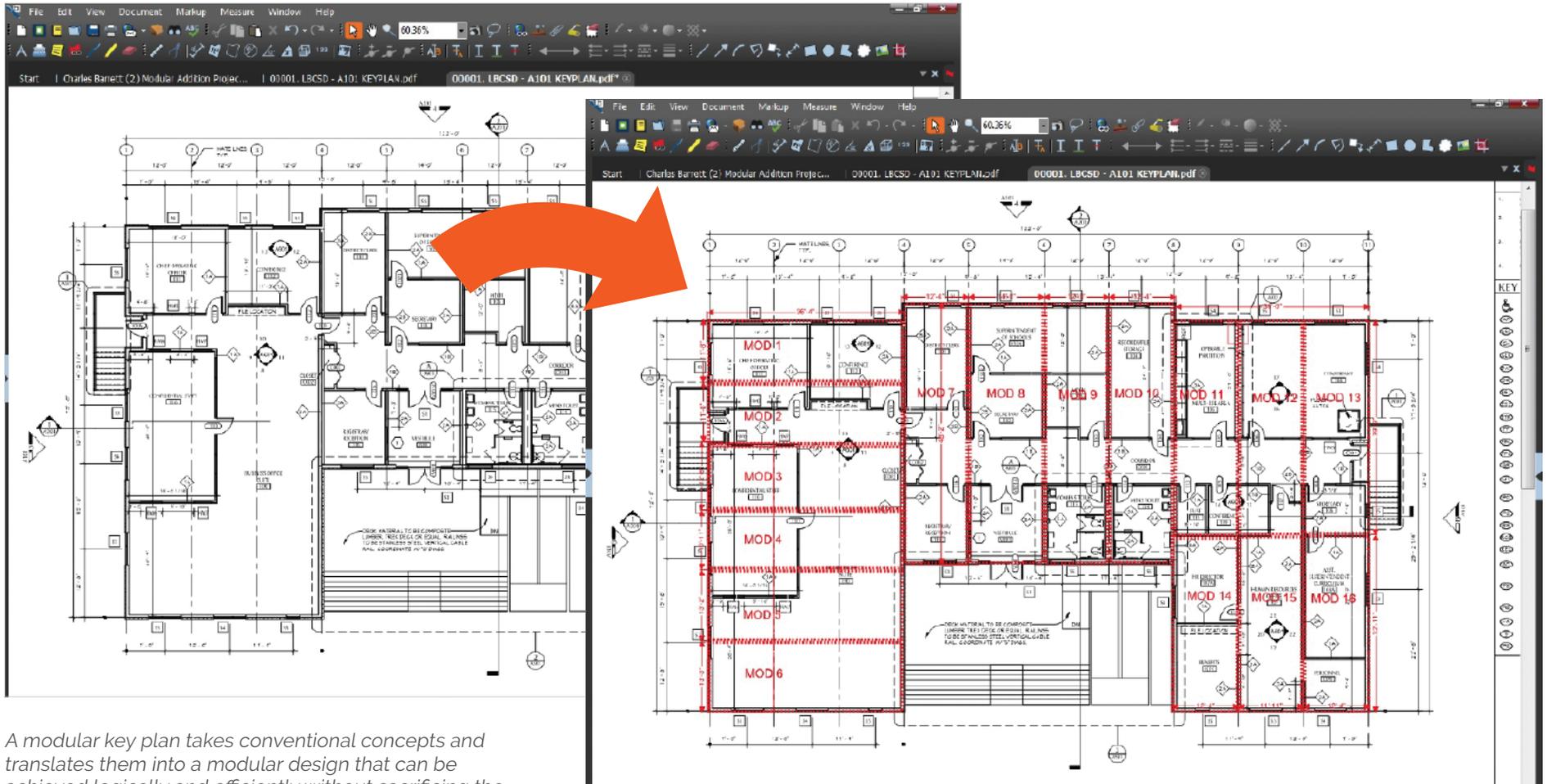
Early on, team members should overlay a modular plan on the owner's concept layout. This will reveal value engineering opportunities that could save time and money. An example might be shifting a window, door or plumbing fixture to keep it off the preferred modular split line so it can be preinstalled at the plant instead of on site. The team can then evaluate if the change is desirable.



## SCHEDULE THE PROJECT TO BUILD OFF SITE AND ON SITE CONCURRENTLY.

Clearly, one of the primary factors in accelerating your schedule is the ability to build the facility in a controlled environment, while developing the site at the same time. Taking advantage of this ability along with benefits such as less downtime during construction, can shorten a schedule by as much as 50%.

## DESIGN WITH A MODULAR APPROACH IN MIND



A modular key plan takes conventional concepts and translates them into a modular design that can be achieved logically and efficiently without sacrificing the owner or architect's original vision.

# UNDERSTAND THAT TIMING IS EVERYTHING



One of the key outcomes to building off site is the accelerated construction schedule – projects can be completed 30 to 50 percent faster than when constructed using conventional methods. Schedule efficiencies can be lost however, if the team doesn't

understand the sequencing and pay close attention to the timing required to hit necessary milestone dates - from initial design all the way through to site readiness. Team cooperation and communication play a significant role here.

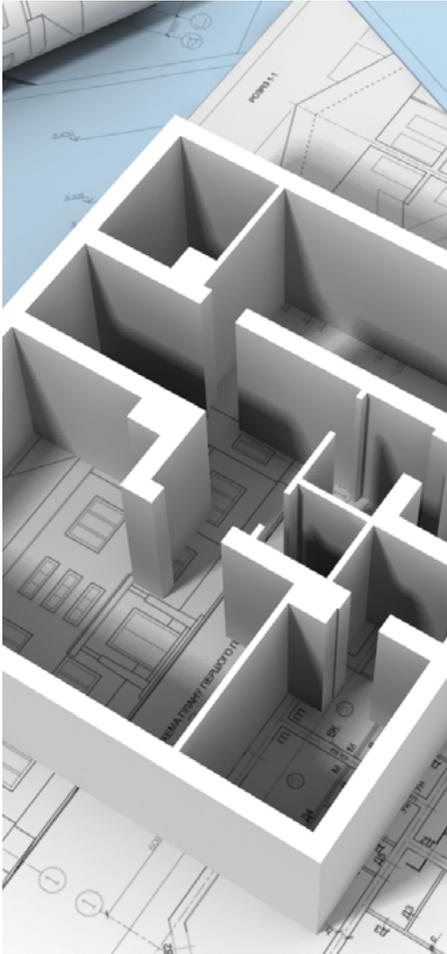
## ALLOW ENOUGH TIME FOR FULL DESIGN DEVELOPMENT UP FRONT.

PMC projects may require more upfront design work than their conventional counterparts because of the compressed schedules. Set a realistic but firm deadline for document design, submittals and approvals and communicate that requirement to all the stakeholders. Make sure everyone stays within the allotted schedules. Fabrication of the building at the plant does not start until the design is done and approvals received.

## EARLIER DECISION MAKING IS NEEDED.

One of the most challenging aspects in the switch from on-site to off-site construction is the attention to detail that is required early in the process. In conventional linear construction, there is often time to make design changes or revise fixtures, millwork or colors during construction. However, this should not occur during off-site manufacturing. Thus, paint color decisions may be needed before foundations are even in. While this requires more disciplined decision making, the benefit is that changes (and change orders) are minimized while costs and schedules are more readily controlled.

# UNDERSTAND THAT TIMING IS EVERYTHING



## FREEZE THE MODULAR FOOTPRINT.

One of the first decisions generally requested will be to freeze the footprint of the building. As you learned in Strategy 4, a modular key plan is developed from the agreed layout and the structural design can then be completed. When working with non-combustible construction for example, structural steel is always on the critical path.

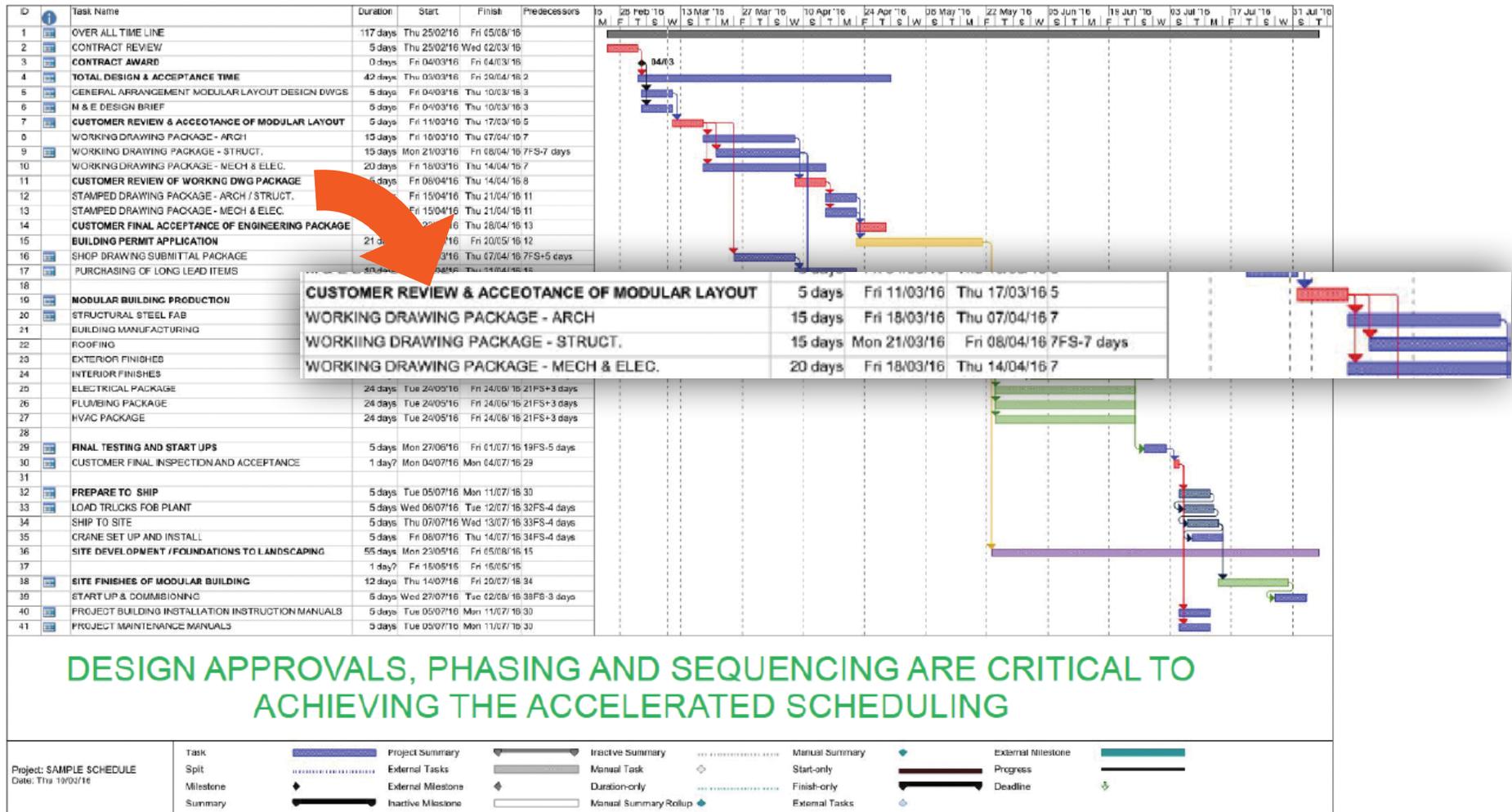
## STREAMLINE THE APPROVALS PROCESS.

Benefiting from compressed scheduling may require realigning your traditional submittals process. It is common for submittals to be made to the client for approval as they are required (rather than gathering them all together for one major submittal). This is due to the shortened construction time. In general, long lead items need to be pre-ordered and often they are 6-week items, not 16-week items.

## BEYOND PRE-CONSTRUCTION.

While this document provides best-practice strategies leading up to fabrication, delivery and installation, good planning and choreography of the entire project from design to occupancy will ensure a timely, successful outcome.

# UNDERSTAND THAT TIMING IS EVERYTHING



DESIGN APPROVALS, PHASING AND SEQUENCING ARE CRITICAL TO ACHIEVING THE ACCELERATED SCHEDULING

This sample schedule shows the accelerated construction schedule. This is one of the most attractive aspects of off-site construction. But this benefit can only be realized if approvals, phasing and sequencing are well planned and rehearsed.



# CLEARLY DEFINE EVERYONE'S SCOPE OF WORK



A specification determines what products, systems and assemblies are to be used. A scope of work defines who does what to complete the project. This document should be created initially at the pricing stage to assign responsibilities as well as ensure all costs are captured. A detailed checklist can dramatically reduce any potential of scope gaps, overlaps

and prevents finger pointing between stakeholders. A scope of work document can be modified by the parties throughout the negotiation and execution processes as agreed, but should be the document that ultimately defines the roles and responsibilities of all participants.

## IS THERE A STANDARD SCOPE OF WORK FOR OFF-SITE CONSTRUCTION?

No, the role of a modular company depends on their preferences, resources and capabilities and the desires of the team. That said, modular companies often provide some type of design/design assist, procurement, building fabrication, transportation, setting on foundations and final installation/assembly ready for occupancy. GC's typically deliver foundations, site development and service connections. Sometimes GC's will receive the modules and complete final assembly pr site build a portion of the project (see below)...

## SCOPE OF WORK DOCUMENT SHOULD SUIT WHAT THE TEAM HAS AGREED TO.

The delineation of responsibility for all aspects of the project should occur early on during the design and pricing stages. Identify, agree on and communicate what the modular building company will do off site and on site, and what the architect, engineers, general contractor and any other contractors will do. This delineation identifies everything from design through final commissioning and occupancy. The document becomes a checklist for all to use as a guide to finish the project on time, and on budget.

## WHAT ABOUT HYBRID CONSTRUCTION?

PMC structures often comprise only part of a project. For example, a multi-story residence may have conventionally built retail shops at street level (with parking below) while the upper-level apartments are built at a plant. Or a school gymnasium or cafeteria may be conventionally built while classroom wings are built off site. Roles and responsibilities can get quite complex. Scopes of work need to be clearly defined.



# CLEARLY DEFINE EVERYONE'S SCOPE OF WORK

SCOPE OF WORK DELINEATION		PROJECT:				
RESPONSIBILITY MATRIX						
DESCRIPTION	Design	Owner	Modular Company	General Contractor	Status	COMMENTS
<b>Division 0 – Modular Construction</b>						
<b>Building (see also all other Divisions)</b>						
Modular Building			X			
<b>Transportation</b>						
Transportation to the site			X			
Inspect building modules on arrival				X		
<b>Installation</b>						
Modular set up (crane)			X			
Remove temp weather protection			X			
Install modular units on foundation			X			Foundations by GC
Weld modular units to base plates			X			Base plates supply & install by GC
Bolt modular units together			X			
Exterior mate line seams			X			
Interior mate line seams			X			
Supply & install HVAC roof top curbs			X			
Remove trash generated by modules			X			Dumpster provided by GC
Verify, inspect, ship loose items				X		
<b>Division 1 – General Requirements</b>						
<b>Architecture/Engineering and Testing</b>						
Architectural drawings & submittals	X		X			Shop dwgs & submittals by MC
Civil engineering drawings	X					
Structural engineering drawings			X			
MEP engineering drawings	X		X			Ductwork drawings & submittals by MC
Surveying	X					
SWPPP Planning/Design	X					
HVAC testing & balancing			X			
Plumbing testing	X		X			
Concrete testing				X		
Third party state sealed drawings			X			For permit submittal by Architect
<b>Permits, Fees</b>						
Building permits			X	X		Third party drawings by MC
Site permit				X		
Transport permit			X			

This sample scope of work shows how every activity is itemized in a "matrix" or "checklist" and is assigned to someone. Look for tasks that no one is taking responsibility for and tasks that more than one stakeholder could perform. This will help avoid gaps and overlap.



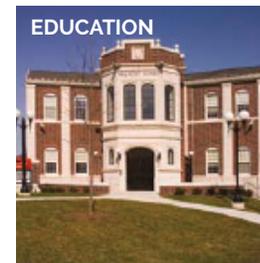
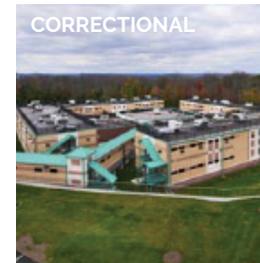
# MODLOGIQ (FORMERLY NRB USA)



WE ARE UNIQUE. WE “BUILD TOGETHER” FOR PERFECT FIT AND FINISH.

MODLOGIQ, formerly NRB USA, is an established and reputable leader in off-site commercial modular construction. We provide a faster, more sustainable alternative project delivery method. From innovative design engineering through off-site fabrication in our controlled environment to final on-site

completion, MODLOGIQ builds modular buildings of impressive design, finish and performance. Our projects range in size and scope, and include applications in the educational, retail, commercial, healthcare, residence, industrial and institutional construction markets.



FOLLOW THE LOGIQ



# SMART OFF-SITE CONSTRUCTION PROCESS



*Smart Off-site Construction* goes beyond conventional modular construction. After building the entire structure off-site in a controlled environment, MODLOGIQ then **pre-assembles on the manufacturing floor to prove constructability of interior and exterior finishes and systems such as sophisticated MEPs**. This is the next logical step in the evolution of modular, off-site construction. Customers who “follow the logic” are rewarded with hassle-free execution at the site and peace of mind knowing their project will be completed more quickly, efficiently and easily than with conventional modular construction.



# OFF-SITE CONSTRUCTION

## CHECKLIST FOR PROJECT SUCCESS

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