THOMASSON INDUSTRIAL SERVICES

ENGINEERING/ARCHITECTURAL/PROJECT MANAGEMENT
PLANNING & DESIGN; PROCUREMENT/CONSTRUCTION SUPPORT

Thomasson Industrial Services Newsletter

December 2022

The Thomasson Industrial Services (TIS) team began providing comprehensive engineering and architectural services for the industrial/manufacturing market, serving Owners and Design-Build Contractors, over a decade ago. The individual firms in the TIS alliance include I.C. Thomasson Associates, Inc. (founded, 1942) providing MEP FP ITS and process support engineering services; Design Innovation Architects (founded, 1989) working with Manous Design (founded, 1992) providing Architectural services; and Bennett & Pless (founded, 1964), providing Structural engineering. Each firm has several prior decades of relevant sector planning, design, and construction phase support experience. TIS has teamed with reputable site/civil engineering design firms to complete full site and facilities scope of services as appropriate to the project site location and to optimize the specific needs of the project and client.

Our team has been involved in numerous Design-Bid, then Build and Design-Build projects during that time frame; in multiple industrial, manufacturing and process sectors, including tile, tire, metals, food, aerospace/aviation, plastics, and automotive OEM and supply chain, including the EV sector. Our work includes distribution/warehouse facilities, including cold storage, and logistics centers; as well as headquarter offices, operations centers, ancillary offices, show rooms, and research and development centers associated with these manufacturing and processing facilities.

Projects completed include several ceramic/porcelain tile plant projects, a food-grade steel can manufacturing plant, a zinc oxide processing facility, multiple automotive tire manufacturing plant projects, food & beverage sector projects, a stranded wire manufacturing facility, and automotive assembly/OEM and supplier facilities, and a variety of other manufacturing and industrial sector projects.

TIS services offered include project management and consulting services related to the site search and selection process and due diligence phase services such as boundary and topographic surveying, management of geotechnical investigations and geothermal testing services. Our full planning, design and construction phase services include site/civil engineering, architectural, structural engineering, process mechanical and electrical support engineering, and facilities MEP (mechanical/hvac, electrical and piping/plumbing) engineering, fire protection engineering and low voltage/ITS engineering services. Our team can also provide central energy/power and utilities plant design, including Combined Heat & Power (CHP) plants; solar power projects; net zero projects; geothermal projects; and electrical power and distribution projects. Our work includes sustainability and renewable energy requirements as appropriate to the needs and requirements of our clientele.

We have developed several pertinent topics of discussion in this newsletter that should be of considerable interest. Included on the following pages are brief articles prepared by three of our key TIS leaders: a discussion contrasting and comparing Design-Bid-Build and Design-Build project delivery methods; an Integrated Design and Detailing Structural 3D model delivery approach, and a discussion involving an Industrial Systems Engineering (ISE) approach to warehouse planning. Additional articles on a variety of subjects relevant to the industrial/manufacturing sector are planned for 2023.

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I have recently retired, so please contact one of our leadership team below for more specific information and requests for qualifications and proposals for the planning and design of your projects.

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In has been my pleasure and privilege to work with many of you during my career over the past several decades. I and our entire team thank you for your interest and the opportunities provided.

Best Regards and Happy Holidays/Merry Christmas; wishing everyone a safe and prosperous New Year.

Hardeman (Hardy) Seaborn, P.E., PMP
Executive Director, Thomasson Industrial Services

COMPARISON OF DESIGN & CONSTRUCTION DELIVERY OF INDUSTRIAL/MANUFACTURING PROJECTS

The traditional approach of completing a design and bid package for the Owner and then awarding the construction of the Owner's project to a general contractor is the Design-Bid-Build project delivery method. Due to cost and schedule pressures, many projects are delivered under the Design-Build method which allows parallel phases and tasks completion versus the "end to end" series of designing the complete project (to obtain best clarity of project requirements and scope definition), then bidding the project for award, followed by project construction. The Owner may be willing to assume more cost risk as a trade-off to obtain less schedule risk (and potentially opportunity costs of a completed project) using the Design-Build approach, but this assumed risk management approach is predicated on a very well-defined project scope of work for the Design-Build approach. In either project design delivery method, the costs of the design team are a small fraction of the total project costs.

Design-Bid-Build

Description

Design-Bid-Build (D-B-B) is considered the most traditional design and construction delivery model. Under this traditional approach to project delivery, the contracts for design and for construction are separately held by the Owner. The Contract for the Design by the Architect (or Architectural/Engineering (A/E) firm) and the Contract for Construction (the General Contractor) may be standard American institute of Architects (AIA) agreements or other suitable agreements that include the appropriate legal and contractual conditions and mutual concerns for both parties.

The Owner hires the Architect to include the engineering and other design disciplines necessary for the project and works with the design team to define and design the project through the Schematic Design, Design Development, and Construction Documents Phases. The Owner and Architect then invite bids by several, preferably pre-qualified, contractors. Once the bids are received, reviewed, and awarded to the General Contractor, the project is constructed with the involvement and oversight of the design team.

- **Pros**
  - Design team acts as the Trusted Advisor to the Client/Owner
  - Direct connection of design team to Owner
  - Design fully developed and vetted by owner and design team before release for contractor selection
  - Completed Design and general (e.g., not fabrication) detailing before contractor selection
  - Tighter, comprehensive bids by contractors before construction begins
  - With a well-developed design, the cost of the design fee can often be saved via the construction costs savings, versus other delivery methods due to the improved scope definition and detailing
  - Ability to evaluate design based on items that could save (or add) costs for the lifecycle of the facility

- Better oversight during construction by design team to ensure construction is meeting design intent
- Checks and balances between design and construction with separate contracts for the design team and the contractor(s)

- **Cons**
  - Typically, a longer schedule from beginning of design to completion of construction
    - Note, the design team can provide early release packages such as the site rough grading work if the Owner is okay with having separate construction contracts with potentially different contractors; in a Fast-Track, Multiple Bid Package approach, but the Owner has increased cost risk due to the timing of the bids received.
  - Total construction costs are not fully known until the competitive bidding is completed based on the completed design
  - Often creates a less-than-optimum dynamic between the design team and the contractor due to their independent project roles
    - Note, the team approach applies no matter the design delivery approach, as the A/E team takes on the role as "problem solvers, not "problem creators," with the Owner's long-term best interests in mind.

Design-Build

Description

The Design-Build (D-B) delivery is the simplest delivery method from a contracting standpoint for the Owner. There is a single contract with the Design-Builder (General Contractor) which includes the design team as sub-contract holders to the General Contractor. From a well-defined scope (provided by either a detailed program or bridging documents (preliminary drawings to establish the building size, complexity, and details)) the Design-Builder is selected to provide both the final design and construction of the project. The Design-Builder is tasked with providing and managing the design consultants as well as the sub-contractors for construction. Sub-contractors also often provide their discipline work as a design-build sub-contract to the Design-Builder's Prime Agreement. For example, the electrical sub-contractor may also provide the electrical engineering design for the project within his contract. However, this usually requires that the sub-contractors be selected early and committed to the General Contractor they are contracting under, so the competitive decision for that discipline has been completed.

- **Pros**
  - Potential schedule improvement over Design-Bid-Build from beginning of design to completion of construction
    - Note, without a very well-defined project scope in the program or bridging documents, the schedule may not be improved significantly due to prolonged design schedule requirements.

- Able to fast track delivery with early release design packages for site, foundations, building framing, et al.
- Benefit of contractor input on constructability and system selection during the design process which aids in overall costs and schedule.
- Single point of contractual responsibility and billing
- Fewer Construction Administration services are typically required, which may slightly lower the design team's fees

- **Cons**
  - Without a well-defined scope, the Owner is at risk to pay a premium for delivery of the project due to contingency funds to cover project "unknowns"
  - The type of project (e.g., a heavy manufacturing/processing plant versus a warehouse or distribution center) should factor into the decision-making process for Design-Build versus the traditional completed design approach. A more complex project inadequately defined will increase the risk for more change orders due to the inherent compressed timeframe of the design phase of a Design-Build project approach. This occurs particularly when the Owner's processes/functions that are to be located within the facility require detailed integration into the site and facility design requirements, and the risk increases when those process requirements are still a "work in progress" at construction award.
  - Without a well-defined scope, the schedule may not see much of a benefit or shortening and could be similar to a Design-Bid-Build schedule due to the protracted "design corrections" required; thus, losing that potential advantage.
  - Often construction begins without the full project cost being known due to the full project requirements being still under development, which can cause additional costs as change orders may become prevalent.
  - Can produce a Guaranteed Maximum Price (GMP) during the DD design phase with contractor assisting the design team on materials and systems selection
  - Separation of design team from the Owner, which could cause the Owner's wishes not to be completely communicated to the design team. (Note: Depending on the contractor and the relationship with the Owner and A/E, sometimes this does not have to become a major issue. Our team has worked under D-B contractors for many years and has been able to work well with satisfactory results.
  - Can create a decentralized design team if the Design-Builder has their sub-contractors provide their discipline work via the Design-Build approach as well.
  - Less construction administration – meaning less oversight of the construction by the design team to ensure the construction is meeting the design intent
  - Design team is working for the contractor in lieu of being the Owner's Agent (Trusted Advisor)

Design-Construction Manager at Risk

Description

Design-Construction Manager at Risk delivery can potentially be viewed as a hybrid between Design-Bid-Build and Design-Build and is often considered a preferred project delivery method. (The Integrated Project Delivery (IPD) approach is another teaming method and will be the subject of a future article.) The Owner separately holds the design and construction contracts, like the Design-Bid-Build approach, but the Construction Manager (General Contractor) is brought on board early in the process similar to the Design-Build approach.

The Construction Manager provides Pre-Construction Services including construction cost estimating, value engineering, scheduling, and constructability reviews to the for the Owner. The Architect and Construction Manager work closely together to establish scope, complexity, budget, and schedule for the project, as a negotiated "select team" for the Owner. The Construction Manager can provide a Guaranteed Maximum Price (GMP) for the project like the Design-Bid-Build scenario. Finally, competition is still achieved with this delivery method as the Construction Manager can require multiple bids for each discipline. The design team provides the same services during construction as the Design-Bid-Build delivery method, and the Owner's Agent or Trusted Advisor relationship is not subverted, as may occur in the Design-Build approach.

- **Pros**
  - Design team as Trusted Advisor to the Owner
  - Direct connection of design team to owner
  - Early Contractor Selection
  - Potential to shorten schedule from beginning of design through completion of construction
  - Selection of contractor based on qualifications, general conditions, fees, overhead and profit, versus just low bid award
  - Contractor works with design team to maintain schedule and budget
  - Benefit of contractor's review of constructability and system selection early in the process
  - Can produce a GMP during the Design Development (DD) design phase with contractor assisting the design team on materials and systems selection
  - Subcontractors are still required to bid, thus maintaining the competition for the work
  - Ability to fast-track delivery with early release packages under the general contractor's scope
  - Tighter bids by contractors before construction begins due to closer work with design team and design team finishing their portions of the design for bidding
  - With a well-developed design, the entire cost of the design fee can often be saved via reduced construction costs, versus a design-build approach.

  - Ability to evaluate design based on items that could add or save costs for the lifecycle of the facility; related, change orders are more typically a result of an Owner making prudent scope decisions to improve the project
  - Better oversight during construction by design team to ensure construction is meeting design intent
  - Checks and balances between design and construction with separate contracts for the design team and the contractor(s)
- **Cons**
  - With fast tracking, begin construction before complete cost is well known or understood
  - Loss of full competition between general contractors, but this is a small cost compared to the sub-contractors, which typically make up about 90% of the construction costs.
  - If a GC self-performs certain trade work, they can be required to compete with other sub-contractors in an “open book” approach for bids comparisons and evaluations.

An aerial photo of an industrial process site and facilities project, originally designed under the traditional D-B-B approach, is shown below. It is noteworthy that the warehouse expansion is now being completed with our TIS team using the Design-Build method. Please let us know how the Thomasson Industrial Services team may be of service in assisting with your projects!

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Strategies for Accelerating Structural Steel Projects

As we have all experienced, construction projects are under increasing pressure to be completed faster and more economically. For many projects, structural steel is the material of choice, but the standard procedure to design, detail, order, fabricate and erect steel can result in scheduling challenges. Bennett & Pless, the structural engineering partner in the Thomasson Industrial Services group, has developed a specialized steel delivery system to help mitigate these obstacles, which Owners, Developers, and Construction Managers may utilize to accelerate the normal construction schedule.

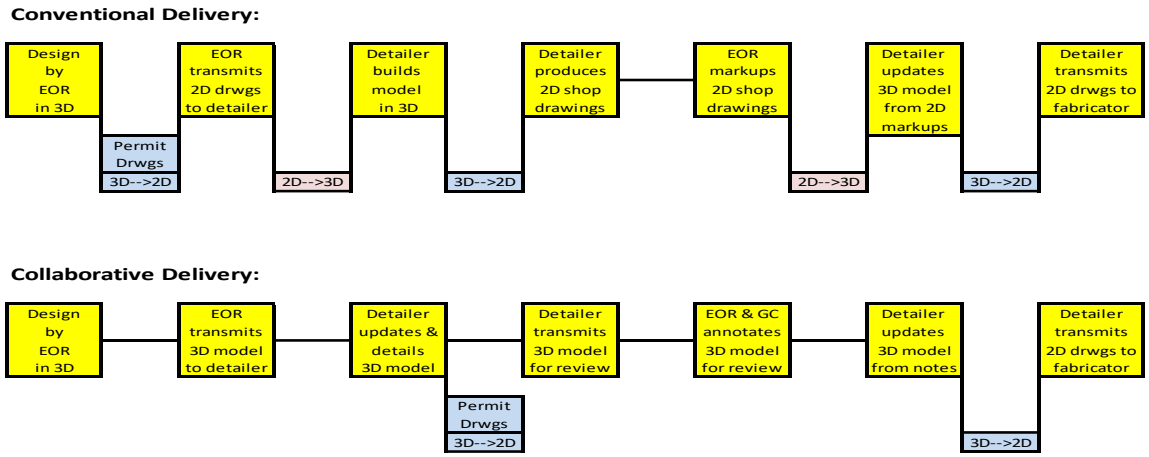
We call this approach "Integrated Design and Detailing", or IDD for short. In this procedure, Bennett & Pless teams with a steel detailer at the onset of the project. The 3D analysis and design model created by the structural engineer becomes the shared model with the steel detailer. The shared model and close collaboration between the engineer and detailer allow both operations to progress in parallel, allowing for a shorter overall design schedule and a tighter QA/QC feedback loop between engineering and detailing. In most cases, the drawings submitted for permitting of the steel package are created by the steel detailer.

Since the Structural Engineer of Record (SEOR) is in responsible charge of the development of the steel detailing package, the SEOR can apply their PE Seal to the steel detailing drawings. Another benefit is that the submittal review of the steel detailing package occurs during the design process.

In summary of our IDD approach benefits:

- Bennett & Pless builds the 3D BIM model to use in analysis and design of structure.
- As sections of the structure are completed, the BIM model is shared with our steel detailing partner and imported into our software package.
- Review of steel detailing is expedited using on-screen review available to the entire team (Owner, General Contractors or CM's, Sub-Contractors, Erector, Architect and Engineers).
- Eliminates multiple printings of the 2D drawings for review. Usually only printed for submission for Permit, and final record drawings.
- Connection design for both erection transfer forces, and final forces performed by both Bennett & Pless and the structural detailing partner.
- Erection sheets (E-Sheets) and detail sheets produced by detailing partner are stamped by SEOR (Bennett & Pless) and submitted for permitting.
- Steel detailing services can also include material lists, material tracking, CNC coding, fabrication shop and jobsite observations, and steel brokerage

The comparative schedule flow chart below provides additional details.



We have employed this technique on numerous projects and have found that many months can be removed from the start of the design process to the cutting of the ribbon.

The Thomasson Industrial Services team would welcome the opportunity to demonstrate how the IDD approach can best help you; please let us know how our team may be of service in assisting with your projects!

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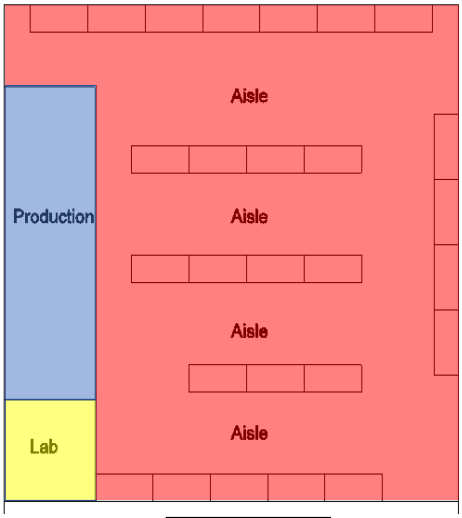
Warehousing: An Industrial Systems Engineer's Take on Space

Many assume only the large, complex manufacturers can justify the use of an Industrial Systems Engineer (ISE). One small start-up company in the Nashville, TN area was investigating the lease of a second building, but an assessment and quick redesign of their warehouse avoided this cost.

The company was based in a 10,000 square foot facility and believed there was a need to add a minimum of 2,500 square feet. The smallest space they could locate was 5,000 square feet. TIS's Industrial Systems Engineer was able to perform an assessment along with a redesign of the layout to eliminate this need. Warehouses tend to be an afterthought in the design process. These are looked upon as simple storage areas. Most companies just see how much space is leftover after the processes are installed; this becomes the "warehouse". Unfortunately, this can be a huge source of waste. Wasted square footage and excess inventory are just two examples of waste not to mention things like added material handling equipment and labor. While this business did not have a huge inventory issue, they did have wasted space.

The company had been outsourcing some of the assembly and packaging of their product. At times of high demand, they would even utilize some of the office space. The business was growing and looking to add prototyping area to the lab as well. The thought was to lease a 5,000 square foot facility to relocate the current warehousing and assembly; then, utilize the open space for a prototype lab. One of the pitfalls, the additional cost burden of the lease would be a sunk cost. No matter what happened with the business, this cost would remain; also, about 50% of the added square footage would be wasted space. Having an Industrial Systems Engineer review the current footprint along with the necessary inventory (raw and finished goods), wasted space and minimal additional inventory were identified.

Within a week, a new footprint was designed using available racking.



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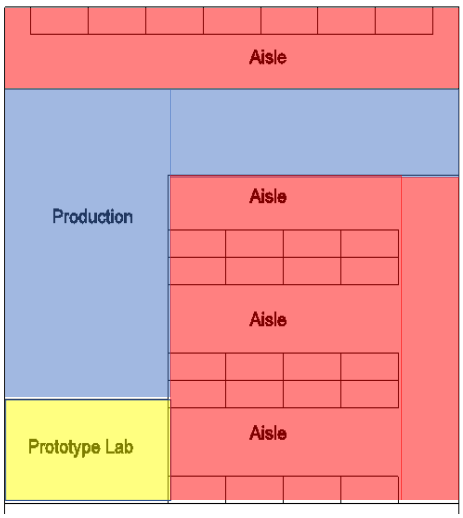

AFTER

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Aisleways were reduced freeing valuable square footage. The new design included a footprint for the prototype area which was much smaller than originally planned but still addressed the full needs for the lab.

This is just one example of how Industrial Systems Engineers can facilitate improvements. Having an ISE review expansion and equipment plans in addition to current processes can lead to significant gains.

Please let us know how the Thomasson Industrial Services team may be of service in assisting with your projects!

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