Intel SRR3 and SRR4 IT Office Buildings in Bengaluru : Shapoorji Pallonji E&C delivered these EPC projects using the top-down construction technology. The scope included interior fit-outs.

Best Practices in Delivery of EPC/E&C Projects

How mutual respect for and appreciation of diverse perspectives and ideas foster collaboration and lead to successful Design-Build project delivery

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The economic growth in India in recent years and the clients' increasing preference for a single-point responsibility under design-build, for their projects, have led to a surge in opportunities in public as well as private sectors for Indian EPC companies to participate in and contribute to this growth story. In 2016, the NITI Aayog directed all government agencies to expeditiously examine measures to substitute Item rate contracts to EPC (turnkey contracts) wherever appropriate. This policy change and guidelines thereof will further boost the projected share of design-build contracts in government projects in the years to come. Many states in India allow Design-Build procurement.

The Design-Build projects undertaken by Indian EPC companies so far have shown mixed results. While some of the projects have been successful, there are many examples where the final results varied from the planned arrangements for schedule, quality, budget and customer satisfaction.

To maximize the advantage of the design-build project delivery system in the Indian context, it is essential to understand the characteristics of the design-build contract, integration process of design and construction, contractual risks and restrictions, worldwide trend of design-build use and the project management process.

While the contractual and commercial risk management frameworks in EPC companies could be strengthened further, there is further scope for them to be appreciative of the unique role that designers can play in securing more Design-Build business. The execution teams also must appreciate the diverse perspectives and ideas that architects, designers bring to the table to address customers' special needs on Design-Build projects.

This article seeks to determine, analytically and without bias, the effectiveness of the current design-build processes being implemented and the project teams in project success. The article explores organizational practices regarding roles, team integration, team behavior, pricing arrangements, delivery methods and project performance in the design-build business. The article ultimately uses the constructs of team integration and group cohesiveness to better understand how the elements of a project delivery strategy relate to cost, schedule and quality performance.

Client and Project Selection for EPC

It is desirable for EPC companies to engage with Owners to choose the right project delivery system when planning a construction project. Factors that have a large bearing on the decision to propose the design-build model to a prospective client for a project include :-

- Owner's decision-making process; procurement system
- Owner's project management team's project management capability
- Complexity of the project
- Financial restriction
- Schedule constraint
- Technical challenge required for the project
- Site specific, local condition.

These factors have a significant bearing on the overall outcomes for the DB project during the execution phase. These aspects can come in handy while assessing the contractual risks associated with such client or project.

The application of design-build to an actual project involves selection of alternatives from all presented standpoints or categories. Naturally, the appropriate combination may vary according to the complexity, size and scale of the project as well as the objectives, experience and available resources of the owner and many other constraints.

The types of projects usually selected for D-B consideration include those that:

- Demand an expedited schedule and can be completed earlier than by normal procurement.
- Require minimum right of way acquisition and utility involvement.
- Do not require complex environmental permitting.
- Have a well-defined scope for all parties (design and construction).
- Have room for innovation in the design and/or construction effort.
- Are low in risk of unforeseen conditions.
- Have a low possibility for significant change during all phases of work.

An invariable prerequisite of design-build process is that the owner's needs are described precisely, and in a manner that can be interpreted and understood universally. The necessary research and investigation have to be done in a consultative and iterative process of design and review. This is absolutely essential where the design-builder is selected directly or on a negotiated basis. Government clients who are bound by the lowest price bid rule need to qualify entities of equal standing in order to have a fair competition amongst bidders for design-build jobs. In addition, sector. Quality and Cost based selection (QCBS) method can be explored for evaluating bids for design-build jobs in the government.

Mahatma Mandir – This Museum, designed and built by Shapoorji Pallonji E&C, depicts the complete life story of the Mahatma Gandhi through the use of modern exhibition technology viz., multimedia, audio guide, 3D Holography, etc., and not just static exhibits.

Pricing Arrangements for EPC Contracts

One of the most important distinctions between design-build and other methods of contracting is that in the former the contractor and architect/designer form a contracting team instead of having parallel contracts with the owner. The generated single point of responsibility also allows new bases of payment, and incentives and risk sharing become, in fact, a fundamental part of the team approach. On the other hand, innovative strategies for compensation are also needed since the parties to design-build often enter into contract so early as regards design that they are not able to define the exact amount of money needed to compensate the design-builder's costs and efforts in relation to the project.

It is therefore important for the EPC companies that are interacting with the clients to assess the situation for every case and arrive at the most suitable cost model that would suit the design-build project delivery system. The factors governing the choice of the cost model include (i) the level of design information available at the time of bidding, (ii) the client's need for the knowledge of end cost, (iii) the client's willingness to handle administrative burden for bill certifications, (iv) the risk that will be carried by the design-builder and (v) the type of project.

Prevalent models

- Fixed Price
- Cost-Plus-Fee
- Guaranteed Maximum Price

Besides being alternatives, the pricing arrangements also complement each other. This can be seen firstly from the GMP system, which leans toward the cost-plus-fee approach. Moreover, the different systems can also be used even in the same project at different stages. It is rather normal that the owner and the (prospective) design-builder enter into a contract that is based on the pure cost-plus-fee arrangement in order to carry out the design needed to estimate the project costs. After this has been done and the design and estimate have been accepted by the owner, the parties agree upon a guaranteed maximum price for the design-

A Multi-Level Car Park of 2,200 cars capacity, designed and built using pre-engineered structural steel

builder's services and continue as partners to complete the project. Sometimes it even happens that when design has been completed and construction is proceeding at full speed and the costs of the project can be estimated accurately enough, the parties give up the GMP system and agree upon a fixed price in order to avoid some administrative burden.

Risk Management on EPC Projects

The Design-Build project delivery turns out to be a risky system for both owners and contractors unless the risks are properly identified, analyzed, and managed throughout the bid preparation and project execution stages. Appropriate identification, allocation, management and mitigation of project risks are essential for the success of design-build projects.

Design and build projects have additional stages such as the preplanning and design and post-operative stages compared to traditional construction projects. As a result, contractors are faced with a higher chance of project risk probability and impacts. The risks that were to be assumed by the original employer may be transferred to the design and build contractors by means of a written agreement. Risk Management involves appropriate handling of risks after evaluation and analysis to minimize the impact of risks.

In ideal risk management, a prioritization process is followed whereby the risks with the greatest loss and the greatest probability of occurring are handled first, and risk with lower probability of occurrence and lower loss are handled later.

Proactive risk management doesn't necessarily mean avoiding projects that could incur a high level of risk. Formal risk management makes sure we go into such projects with our eyes open, so that we know what kinds of things that could go wrong, and we've done our best to make sure those factors won't prevent the ultimate success of the project. The main objective of risk management is to protect the continuity of operations also in case some threatening risk becomes a reality.

In the Indian context, time overrun and cost overrun, delay in obtaining permits and sanctions, lack of information from the employer, lack of co-ordination amongst team members, and variations to the original scope are the biggest risks in design and build projects.

In order to manage contractual risks on DB projects, the following suggestions are made:-

1) Understand the employer briefing that includes all the employer's needs, requirements and specifications. This gives a clear picture for the stakeholders to implement the work on site and will result in better execution of the project.
2) The Design-builder should have adequate arrangement in place to ensure proper works supervision during the construction period to demonstrate work progress and compliance to specifications.
3) Pre-qualification of Service Providers and Implementing code of practice would ensure that the D&B contractor and consultants so appointed are well-equipped and have sufficient experience in D&B projects.
4) Time invested by the Employer and the D&B team in a series of valuable management meetings during the early stages of the project can help to establish and prioritize the actual needs of the employer.
5) With the selection of the D&B arrangement, where one team is responsible from the concept to completion, greater potential and opportunity exists to practice effective project management.

A 150-keys five Star Hotel project for a hospitality major – designed and built by Shapoorji Pallonji E&C

A Medical College campus at Koraput, Odisha – designed and built for the Govt. of Odisha

6) An effective communication process incorporates the construction programme into the design process. The coordinated flow of related information amongst all parties with regard to changes in design and requirement by authorities helps to reduce design problems.

7) Effective and decisive actions in the event of deviation from plans to recover the situation are vital to prevent the project from being disrupted. Should there be a situation where there are changes to the scope by the employer, the impact of the change on the project in terms of time, costs and quality must be communicated and understood by the employer.

While the allocation of risk for design errors and omissions is established already in the definition of design-build, there are many other risks that have therefore been borne by Owners under the traditional form of project delivery. The risks may also be reassigned or shared by the owner and design-builder. From the viewpoint of cost, schedule and quality performance aspects, it is appropriate to assign individual risk to the party best able to handle and minimize that risk taking into account the unique circumstances of the project. Risk assignment decisions are usually based on a cost-benefit analysis, with some risks handled by obtaining insurance or through other third party risk management techniques. For each risk that the owner hands over to the design-builder, there will be a corresponding cost. In some cases, the costs are covered by contingencies built into the contract price; in other cases, there is a gain (or loss) in control by one of the parties.

Appropriate risk allocation is up to the project and parties, and therefore, the parties should consider it case by case. The design-builder is not necessarily in the best position to control or manage risk related to unforeseen site conditions, hazardous materials, governmental interference and "force majeure" events.

Shapoorji Pallonji E&C designed & built 18 Super-Multi-Specialty Hospitals in various districts for the Govt. of West Bengal. The combined capacity of these hospitals is 5,500 beds

Completed EPC Project Evaluation

Some D+B projects end with a bang and others with a whimper. Whichever way a D+B project ends, it is important to analyse and take positive feedbacks so that same mistake is not made elsewhere. At the same time, proper documentation needs to be done and all files need to be archived for future reference.

D+B Project feedback and evaluation will guide EPC companies into improvements on existing products and services as well

as guidelines or suggestions for handling future end eavours. Even on a Design-Build project that failed, the positives need to be identified.

D+B Projects can promote learning, which can lead to greater understanding of the talent that the EPC companies' workforce possesses. It is also important to analyse the leadership skills of key personnel involved in the D+B projects.

Team Integration For EPC Projects

From an organizational perspective, team integration is the degree to which the core design and construction team members are brought together for a common purpose. A highly integrated team will leverage the expertise of individual team members to improve the value provided in the project delivery process.

Integrated teams and development of a cohesive environment are the key factors for achieving success on design-build projects. The key stakeholders within the company can influence these factors through their project delivery decisions. Three critical elements are strongly suggested for EPC companies that would enable more effective integration and cohesion. Developing a team able to deliver the desired project results is suggested through: early involvement of the core team, expertise-driven selection of team members and cost transparency in accounting.

The development of a cohesive group is critical to the assembly of successful project teams. Alongside with planning an approach towards integration, an ongoing commitment to aligning a cohesive project team is essential to delivering a successful project. The behaviors most associated with cohesive groups are a shared commitment to project goals, timely and effective communication and strong team chemistry.

Conflict Resolution in EPC

It is highly desirable that all members of the design-build team understand that the project's success is dependent on the ability of the team members to work collaboratively and to trust that each member is committed to working in the best interests of the project. Further, it is important that D+B Project should be staffed with individuals that are educated and experienced in the implementation of design-build best practices, and whose personalities are well-suited to the collaborative nature of the design-build process. However, conflict is unavoidable during the course of interactions between members of the design-build team. In essence, conflict is a type of risk, because, left unresolved, it could jeopardize the future of the D+B project. The Project Manager of a D+B Project will need to address the need for cooperation while understanding that there may be a degree of competition involved at the root of a conflict. Conflict is often the result of uncertainty or miscommunication.

Rajiv Gandhi International Cricket Stadium & Sports Complex at Dehradun – A 25,000 seats capacity stadium, designed and built using precast technology

Three major approaches to conflict resolution include a consensus approach, smoothing, and the dictatorial approach. A consensus' approach means taking the issue to the people and brings the issue to a vote or unofficially gets opinions from everyone and makes a decision.

Smoothing is essentially sticking with what you do, agree on and glossing over or putting aside whatever causes conflict. It is not an active way of resolution and can be used only for minor conflicts.

When the project is close to the finish line, or time is of the essence, you may be forced to take the dictatorial approach, which does not please many, but keeps the project on course.

Best Practices

Based on past experience and the study of the prevailing processes for Design-Build in the EPC organisations, certain Best Practices and Guiding Principles have emerged.

Suggested Best Practices for the Marketing Phase of EPC Projects

- DB should conduct a proactive and objective assessment of the unique needs of the Owner's project and organization before deciding to propose design-build to such Owner.
- DB should facilitate or comply with a procurement plan that enhances collaboration and other benefits of design-build and is in harmony with the reasons based on which the Owner chose the design-build delivery system.
- DB should demonstrate compliance with Owner-defined performance requirements and submit realistic and balanced cost proposals.

Suggested Best Practices for the Contracting Phase of EPC Projects

- Contracts used on design-build projects should be fair, balanced and clear, and should promote the collaborative aspects inherent in the design-build process.
- The contract between the owner and design-builder should address the unique aspects of the design-build process, including expected standards of care for design services.

A manufacturing facility for nutrition supplements and beauty products for a global manufacturing major - designed and built by Shapoorji Pallonji E&C

- The contracts between the design-builder and its team members should address the unique aspects of the design-build process.

Suggested Best Practices for the Execution Phase of EPC Projects

- All design-build team members should be educated and trained in the design-build process, and be knowledgeable of the differences between design-build and other delivery systems.
- The project team should establish logistics and infrastructure to support integrated project delivery.
- The project team, at the outset of the project, should establish processes to facilitate timely and effective communication, collaboration, and issue resolution.
- The project team should focus on the design management and commissioning/ turnover processes and ensure that there is alignment among the team as to how to execute these processes.

Many contractors or execution team members who are well-versed with conventional contracting are resistant to Design-Build because it causes them to feel insecure and sometimes out of control. However, if the mission is clear, then team members are more likely to see the value of the change and how it helps the organization accomplish the mission. This will create a culture that welcomes change when warranted.

Suggested Mission Imperatives for EPC companies to be successful at Design-Build projects

- Strengthen capabilities for in-house design, value engineering and design management
- Train execution staff on the technical modalities and behavioral aspects to develop collaborative approach
- Implement robust processes for evaluating DB projects performance and use the learnings to drive improvements in the delivery process
- Evaluate staff performance based on their contributions towards making design-build projects successful; Align rewards with overall project success
- Develop the Project Controller model. A Project Controller is involved at all stages of the lifecycle of a DB project – from contract finalization through execution till project closure to improve accountability on costing and profitability

Conclusion

To be successful design-build entities, EPC companies need to structure the design-build teams, including the designers, constructors and key sub-consultants and specialty sub-contractors, as early in the process as possible, and encourage collaboration within the design-build team as well as full and open communication between the design-build team and clients.

The primary benefit of the suggested best practices to the EPC companies is to provide a repeatable process for making highly effective, early project delivery decisions. The best practices will allow the top management and other stakeholders owners to select clients, projects, delivery methods, pricing arrangements, risk management mechanisms, project teams, execution methods and conflict management techniques that offer the greatest likelihood of success. A second benefit to the EPC companies will be to help them with a transparent decision-making process regarding design-build delivery, as well as assurance of cost and schedule savings, attainment of best value for the capital, and quality outcomes.

Underlying both of these benefits is an enhanced understanding of how team integration and group cohesion affect project success in the Design-Build business.

While the findings and suggestions in this article are generally applicable to all EPC companies, there could be specific issues unique to the line of business that govern decision-making for design-build. Such peculiarities of the line of business need to be taken into account while working out specific strategies for client selection, project selection, bid approach, risk management, pricing arrangements, composition of team, execution approach, type of project, competition, client preferences, etc. The strategies may vary based on the sector and segment under consideration and also depend on the opportunity available.