Design/Build Projects –

Lessons Learned from the Contractor’s Perspective

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1.0 ABSTRACT

Railroads and public transportation agencies increasingly rely on alternate project-delivery methods to meet tight deadlines and budgets on large transportation infrastructure projects. Conventional design-bid-build is giving way to these other means of delivering more complex, expensive, and time-sensitive projects. Top among these methods is Design/Build.

In Design/Build, Owners solicit bids from Contractor/Engineer teams based on incomplete plans. The prospective Design/Builders bid to complete the design while simultaneously starting construction. This overlap can shave months or even years off the schedule.

Several recent projects illustrate this delivery method. The Alameda Corridor, a grade-separated railroad corridor through intensively-developed Los Angeles County, used Design/Build for its $780,000,000 Mid-Corridor Trench.

The Alameda Corridor Transportation Authority (ACTA) engaged The Tutor-Saliba Team to design and construct the Mid-Corridor Trench. The Tutor-Saliba Team, a joint venture of Tutor-Saliba Corporation, O&G Industries, Parsons, and HNTB Corporation (collectively known as ‘Contractor’), began construction in January 1999, and placed the facility in service in April 2002, on schedule and within budget.
ACTA, as the Owner, undoubtedly learned many lessons throughout the course of the Mid-Corridor Trench project and advanced the state-of-the-art of Design/Build procurement, contracts, and construction oversight. Our paper, however, will focus on the lessons learned from the Contractor’s perspective. We will include insights from the Alameda Corridor project and other Design/Build projects from our recent work experience.

For both Owners and Contractors, this understanding reveals the strengths (and weaknesses) of this project delivery method. It sheds light on the effects of Design/Build policies and practices on the cost and schedule of large infrastructure projects. Owners who understand the implications of their Design/Build procurement practices, contracts, oversight, management, and administration can be more effective in crafting their programs to meet project requirements.

2.0 INTRODUCTION

Publications and presentations on project delivery methods often discuss Design/Build. These discussions, however, typically focus on documents, procedures, and experiences from the Owner or Program Management Consultant’s perspective. While this viewpoint is good for understanding the ‘mechanics’ of Design/Build management, it sometimes discounts the experiences of the people and organizations that actually build the project…the Contractor. In order to successfully deliver a modern, complex, Design/Build
project, an Owner must understand the effects and implications of its decisions on the Contractor’s cost and schedule.

One could say that Design/Build is entering its second generation. According to the Design-Build Institute of America (DBIA), Design/Build will overtake conventional design-bid-build within the next few years as the project-delivery system of choice for major US infrastructure projects (see Figure 1). In other words, Owners or Engineers who have not already experienced working on a Design/Build project should anticipate one in their near-term future. We should all understand the Contractor’s perspective in order to effectively meet this challenge.

3.0 BACKGROUND

From where do our Design/Build ‘lessons learned’ come? We have combined our personal Design/Build construction experiences with those of Parsons’ experts and our Contractor partners. Our background includes a wide variety of our recent Design/Build projects, both rail and non-rail. The following is a list of these projects, along with their respective order-of-magnitude costs:

- $6000M - Inchon International Airport (Korea)
- $4000M - Lisbon International Airport (Portugal)
- $4000M - Bangkok Blue Line Metro (Thailand)
- $2600M - CKS Airport Taiwan Rail Line (Taiwan)
- $2500M - Athens International Airport (Greece)
• $1600M - Kuala Lumpur LRT (Malaysia)
• $1300M - I-15 Reconstruction Salt Lake (Utah)
• $1200M - TREX I-25/I-225/LRT (Colorado)
• $1100M - San Joaquin Hills Toll Road (California)
• $1000M - Tel Aviv Red Line LRT (Israel)
• $780M - Alameda Corridor Mid-Corridor Trench
  (California, see Figures 2 and 3)
• $400M - Jerusalem LRT First Line (Lebanon)
• $377M - WMATA Largo, Branch & NY Ave. Facilities (Washington DC)
• $322M - E470 Segments Two and Three (Colorado)
• $291M - Hiawatha Corridor LRT (Minnesota)
• $283M - Orange County SR 22 (California)
• $262M - Pasadena Blue Line LRT (California)
• $230M - E470 Segment Four (Colorado)
• $184M - US 60 Improvements (Arizona)
• $42M - US 68 Improvements (Arizona)
• $34M - El Portal Road Reconstruction (California)

To gather feedback on these projects, we sent out a seven-point questionnaire to Parsons’ Design/Build managers and those of our Contractor teammates. Questions in the poll were as follows:
1. What do Owners do that drive up the costs of Design/Build (D/B) projects?

2. What can Owners do to bring down the costs of D/B projects?

3. What are the top 3 advantages (benefits) of D/B from a Contractor’s perspective?

4. What advice would you give Owners to get the lowest bid/least claims/best schedule performance/highest quality on D/B projects?

5. What Owner attributes, policies, or approach(es) contributed to...
   a. your greatest D/B success?
   b. your greatest D/B failure?

6. What is the best way to handle each of the following, leading to the lowest possible bid price and best possible schedule?
   a. Utility relocations by D/B Contractor where design of these relocations isn’t complete at bid time.
   b. Soil and groundwater contamination & cleanup.
   c. Quality control (QC) and quality assurance (QA).

7. What is the single most important advice you’d give an Owner to assure the success of his/her D/B project?

Although the questions had considerable overlap, we wanted to ensure that we received the most complete responses possible. We then conducted a ‘non-scientific’ poll of the results. The comments below reflect data from approximately twenty different response answers. The following sections of this
paper discuss the ‘lessons learned’ from Design/Build projects as reflected in the responses to our poll.

4.0 WAYS THE OWNER CAN DRIVE UP COSTS

In what ways do Owners inadvertently drive up the costs of their Design/Build projects? They do it in a combination of ways that include poor attitude, inequitable risk allocation, missing or erroneous preliminary data, lack of flexibility, using the wrong people, poor organization, unwarranted and burdensome processes, and hostage-taking by third-party stakeholders.

Our respondents mentioned many times that having a poor attitude was a prime method of driving up costs. This includes poor partnering, an Owner’s staff that is not committed to the success of the project (more committed to processes, procedures, and individual agendas), and an excessive desire for control. The latter discourages the Contractor from exercising initiative to save the time and money that form the hallmark of good Design/Build projects.

Our experts noted risk allocation as another factor by which Owners can escalate costs. This includes both unfairly shifting risk from the Owner to the Design/Build Contractor and dictating liquidated damages that are unnecessarily high. In cases such as these the Contractor simply places a dollar value on these risks and passes these costs back to Owner.
Problems with the Owner’s Request for Proposal, preliminary plans, and technical provisions can include missing geotechnical and environmental data, right-of-way issues that the Owner has not resolved prior to the Notice-to-Proceed, poorly-defined or over-defined project scope, and withholding pertinent information from the Contractor.

An Owner’s lack of flexibility can drive up the cost of Design/Build projects by not allowing Alternate Technical Concepts. Design/Build teams often can shave significant costs off a project by applying Alternate Technical Concepts that have little or no negative effect on the function of the finished product. An Owner that stifles this process loses one of the most significant potential benefits of Design/Build. An Owner can also drive up costs by rigidly-defining the specifications and by not listening to Design/Build team comments. Negative ‘people’ factors include understaffed Owners and inexperienced staff on the Owner’s project management team. Organizational factors affecting the project are too much or not enough Owner oversight and not co-locating with the Contractor (same or adjacent building). And finally, Owner processes that drive up costs include micro-management of the Contractor and subjecting the project to onerous and time-consuming third-party reviews.

**5.0 WAYS THE OWNER CAN REDUCE COSTS**

Now that we’re aware of the factors that drive up project costs, what can Owners do to reduce Design/Build project costs? Responses to our poll
repeatedly said they can reduce costs by ‘doing their homework’ and by utilizing proper partnering, flexibility, risk allocation, and processes (most of the same factors above that drive up costs when Owners act otherwise).

Proper ‘homework’ preparation includes developing sound geotechnical and environmental data prior to the bid phase, understanding the project costs before bid and establishing a realistic budget (not relying on the Best and Final Offer system to bring the price into the budget range), and simplifying the Request-for-Proposal documents. Providing ‘red-line’ versions of Request-for-Proposal addenda, furthermore, assists the Contractor tremendously during the final phases of the bidding process when time is critical.

Partnering received many favorable comments, including the need to include third-party stakeholders in the process. The best time to initiate partnering is at the beginning of the project. By starting early, all the major players will have the opportunity to meet and begin the communication process in a non-stressful environment prior to the onset of the typical project challenges.

Not shackling the Contractor with inflexible specifications can be a significant asset, as can keeping the preliminary or initial design very general and to a level of not more than 10 or 15%. The Owner should also encourage the Contractor to develop and come forth with Alternate Technical Concepts that could help save both time and money.
Finally, the principle behind good risk allocation is that the risk should go to the group that can best manage that particular risk.

6.0 ADVICE TO OWNERS FOR ACHIEVING THE BEST RESULTS

What advice did our Design/Build managers and Contractor partners wish to give to Owners to help them achieve the best results in managing project schedule, quality, claims and other aspects of a Design/Build job? As before, our experts recommended appropriate Owner concepts of attitude, process and procedure, and risk.

The Owner should be fair, equitable, and professional in all dealings with the Contractor. Good contract documents are essential, not just a ‘cut and paste’ effort from earlier design-bid-build projects (a sure recipe for disaster). To solicit responsive high-quality bids from prospective Design/Build teams, the Owner should first consider pre-qualifying a select group. Following the prequalifications, the Owner should issue clear and concise Request-for-Proposal documents to the Design/Build teams and offer a stipend to the resulting unsuccessful bidders. The stipend, while typically covering only a minor part of the Contractor’s costs, will usually significantly enhance the efforts the teams are willing to put into the bid response. Lastly, the Owner should hold the successful Design/Build team accountable to ‘performance-based’ requirements.
An adequate contingency that the Owner judiciously manages will help absorb unforeseen project costs and provide the needed flexibility to the project team when unforeseen opportunities and situations arise. The Owner should also consider adopting an Owner-Controlled Insurance Program. If work will take place adjacent to a live railroad, the Owner may also consider implementing its own Railroad-Protective Liability Insurance policy to cover its own forces and those of the Contractor.

7.0 TOP THREE ADVANTAGES OR BENEFITS OF DESIGN/BUILD

What are the top three advantages of Design/Build projects? Our experts commented on benefits from enhanced constructibility, schedule control, and the ability to take on large, complex, schedule-driven projects.

Enhanced constructibility results from design development coupled with the Contractor’s concurrent ‘over the shoulder’ reviews of Designer’s work. This allows the Contractor/Designer to put forth cost-effective and constructible plans and specifications and also to develop a set of ‘means and methods’ that matches the Contractor’s past experience, ability, and available equipment.

One of the most significant advantages of Design/Build is that this method delivers completed projects faster. Design/Build also gives Contractors the ability to better handle large, complex time-sensitive projects due to their
enhanced control over the schedule and the contract option to construct parts of the work ‘at-risk’ where practical. Design/Build, furthermore, allows both the Owner and the Contractor to react to unforeseen obstacles and developments on the project by making adjustments before the project reaches the 100% design and Approved for Construction stage of design. This saves the cost of redoing large parts of the design and/or the constructed work.

**8.0 OWNER ACTIONS LEADING TO SIGNIFICANT DESIGN/BUILD SUCCESSES**

What Owner actions led to the greatest Design/Build success? Our responses included partnering, Owner commitment to the project, and a ‘hands-off’ approach by the Owner.

Partnering includes open and honest, albeit sometimes heated, communications between the Owner and Contractor staff, and a quick resolution of disputed issues. We may often take ‘Owner commitment’ as a given, but several of our experts commented that a few Owners are more committed to their own processes, procedures, and individual agendas than to the success of the project. Commitment to the success of the project itself is crucial for the success of the Design/Build approach.
Accepting a ‘hands-off’ policy may be tough for some Owners to accept, but it has led to success on many projects. Providing the Design/Builder with the latitude to be the innovator can yield significant benefits to all parties.

9.0 OWNER ACTIONS LEADING TO SIGNIFICANT DESIGN/BUILD FAILURES

What Owner actions led to the greatest Design/Build failures? Our responses included uncommitted third parties, a lack of partnering, too much redundant Owner oversight and review, and a weak or inexperienced Owner staff.

Whether stakeholders or not, uncommitted and/or uninterested third parties often have the ability to damage or kill a project through their actions or inactions. This can include not providing sufficient personnel to the project, taking too much time to review plans or continued rejection of plans, unrealistic expectations for betterments, withholding critical information, inflexibility, and other similar behaviors. Utility companies and adjacent municipalities are often among these uncommitted third parties.

The lack of project partnering (or partnering that begins too late in the project), an ‘everybody for himself’ Owner attitude, excessive Owner oversight and design review, and an Owner staff not appropriate for the particular Design/Build project all have had negative impacts on some projects.


10.0 PRODUCTIVE METHODS TO RELOCATE UTILITIES

What are the most productive ways to deal with utility relocations on a Design/Build project? Methods included in our responses were early investigations, developing preliminary designs and agreements at an early stage, commitments from utilities, and risk sharing. Conflicts with utilities were one of three major obstacles, according to our respondents, that surface time and again on most Design/Build projects.

The Owner should conduct substantial pre-bid investigations of utilities that include research, meetings with representatives of the utility firms, mapping, and pot-holing. Preliminary design should be part of the process the Owner uses to arrive at Memoranda of Understanding with the utility companies. The Memoranda should define the scope of the work and methods for addressing both unknown utilities and betterments. One way to better facilitate these agreements would be to include the utilities in the project early-on via the partnering process.

The Owner can reduce the Contractor's bid prices, claims and delays by dealing fairly with the Contractor over utilities during the pre-bid phase of the project. Dealing fairly includes using ‘allowance bid items’ that equitably split the cost of unforeseen work, and by establishing risk-sharing contingency funds.
11.0 PRODUCTIVE METHODS TO RESPOND TO GROUND CONTAMINATION

What are the most productive ways to respond to ground contamination on a Design/Build project? Our respondents suggested conducting groundwater investigations on a pre-bid basis, including an allowance bid item and/or risk-sharing contingency fund to fairly divide costs for unforeseen work, and by establishing a clear, fair means for addressing overruns in the quantities of contaminants.

Soil and groundwater contamination seem to be standard features on all large modern projects. This is especially the case on projects that transect older urban and industrial zones. By making all the known information available to prospective Contractors prior to the bid process, the Owner gives the potential winning team a head start in developing remediation appropriate to the level of contamination. Further, the Owner can establish an equitable means for paying for the anticipated environmental work, such as a unit-priced bid item or a risk-sharing fund. For unanticipated environmental work, including overruns of cleanup quantities, the Owner can outline methods in the pre-bid documents such as 90%/10% shared expenses. This may preclude the Contractor from attaching large contingencies to the bid and at the same time can establish competitive unit-bid prices.
12.0 PRODUCTIVE METHODS TO OVERSEE QUALITY CONTROL/ASSURANCE

How should the Owner address quality control (QC) and quality assurance (QA) on Design/Build projects? Our experts all responded that these programs should remain with the Contractor, with only a limited oversight role by the Owner. The Owner must strike a balance between the desire to have a responsible level of oversight and the need to let the Contractor stay responsible and accountable for the quality of the work. The Owner should also establish a clear, detailed QC/QA program that has all the necessary approvals prior to contract award.

That said, our respondents said that different groups within the Design/Build team should conduct the QC/QA efforts in order to ensure an independent evaluation of the quality of the project. While the Contractors themselves normally run the QC program, either the Contractor/Designer or an independent quality-consulting firm will typically oversee the QA effort, with the two quality departments reporting to different project managers. The Owner’s role in contrast may be that of ‘Oversight Engineers’ that can make comments and observations to the Contractor without actually stopping work in progress.

Our experts also expressed the need for the Owner to develop a clear and detailed quality program, pre-bid, and for the Contractor to write a detailed,
comprehensive Quality Management Plan. The Plan should have all the appropriate approvals from the Owner’s team and affiliates, third-party stakeholders, government agencies, and manufacturers prior to the beginning of construction.

13.0 MOST IMPORTANT ADVICE FOR OWNER TO ASSURE SUCCESS ON PROJECT.

What is the most important advice our experts offered for Owners to assure the success of their Design/Build projects? Their answers were: good ‘homework’ with information sharing, realistic financial expectations, partnering, and proper team selection.

Homework up-front included hiring the best possible geotechnical and environmental firms to provide early, pre-bid data on the project. The planning and acquisition of rights-of-way prior to the Notice-to-Proceed will also speed the successful project, as will the development of concise yet complete contract documents.

The Owner should not expect that Design/Build bids would be lower than those of projects using the traditional design-bid-build process. That may occur, but more likely the bids will be the same or slightly higher. The Owner needs to know the project costs up front and plan for a reasonable contingency. Without contingency funds, it will be much more difficult to
maneuver around unforeseen ‘potholes’ that will surely come along during the project.

The Owner may expect a normal or only somewhat-lower number of change orders, although the resulting costs may be lower because the Contractor can often rework the design prior to the 100% completion level. The Owner should consider giving stipends to the unsuccessful Design/Build bidders in order to obtain quality technical and cost proposals, and decide at the beginning on the appropriate balance between cost, schedule, and quality. The Owner needs to communicate its expectation on this to its team.

Partnering, as before, was a common theme our experts stressed throughout their responses. An Owner that does not know how to properly run the partnering process should hire a good facilitator who does…and share the cost with the Design/Build Contractor.

Selection of the proper Design/Build team is paramount to project success. The winning bidder should have a competitive price, an excellent technical proposal, and experience on projects of comparable scope and size. An Owner that awards a major Design/Build project based solely on the lowest bid may regret that decision very soon after the Notice-to-Proceed.
14.0 CONCLUSION

Design/Build is a tool that with proper application can dramatically reduce the delivery time of large, complex, schedule-driven projects. Like any tool, however, one can also misuse and abuse it. Owners should understand the Design/Build process and make an informed decision before selecting this project-delivery method. An Owner that selects Design/Build should be aware of the implications of its decisions and actions through a good understanding of the consequences from the Contractor's perspective. We've attempted here to explore some of the basic Contractor 'lessons-learned,' from the Alameda Corridor Mid-Corridor Trench and other recent Design/Build projects, in an attempt to lay a foundation for this understanding. Experienced Design/Build consultants and Contractors are available to further explore specific issues, and Owners should consult them for additional information. By following these principles an Owner can maximize the chances of finishing the project 'on-time' and 'on-budget'.

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Figure 1. Design Build Trends (courtesy Design-Build Institute of America).
Figure 2. Alameda Corridor Mid-Corridor Trench - Under Construction.
Figure 3. Alameda Corridor Mid-Corridor Trench - Nearly Complete.