

CONSULTANT OVERSIGHT

This chapter offers a roadmap and summarizes procedural elements in geotechnical oversight of Consultant-prepared deliverables critical to project delivery. It will assist the owner (Caltrans) in oversight of the projects to ensure that the consultant design meets Caltrans standards and project goals.

Three project delivery methods are presented in this chapter: Design-Bid-Build, with the special case of Local Assistance, Public-Private Partnership, and Design-Build.

DESIGN-BID-BUILD (DBB)

Definition

Design-Bid-Build (DBB) is the traditional delivery system for the public sector, in which an agency will use in-house staff (or consultants) to prepare plans and specifications that are then incorporated into a bid package. Contractors competitively bid the project based on these completed plans and specifications. The represented agency (Caltrans or Local) evaluates the bids received, and awards the contract to the lowest responsible and responsive bidder.

Characteristics

In Design-Bid-Build project delivery, design and construction are separate contracts. The consultant has total responsibility for the accuracy and completeness of the plans and related designs, specifications, estimates, reports and other such documents that may be required for the project. Assistance, cooperation and oversight by Caltrans will not relieve the consultant of this professional responsibility. The consultant-prepared preliminary and final Geotechnical Design or Foundation reports shall follow the latest versions of all applicable Caltrans guidelines and criteria including, but not limited to, the following publications in the Caltrans web pages:

- Geotechnical Services (METS/GS) - web page:
<http://www.dot.ca.gov/hq/esc/geotech/>;
- Office of Special Funded Projects (OSFP) web page:
<http://www.dot.ca.gov/hq/esc/osfp/osfp-manual/osfp-manual.htm> (including Section 2.3-Foundation Report);
- Division of Engineering Services Publications web page:
<http://www.dot.ca.gov/hq/esc/techpubs/> (including Bridge Memo to Designers and Seismic Design Criteria); and
- Highway Design Manual - Division of Design web page:
<http://www.dot.ca.gov/hq/oppd/hdm/hdmtoc.htm> (including Topic 113 - Geotechnical Design Report, and Topic 210 - Reinforced Earth Slopes and Earth Retaining Systems).

Purpose of Oversight

The purpose of the Design-Bid-Build oversight is to ensure that quality is designed and built into the project in accordance with the DBB contract and Department's guidelines and standards.

Scope of Oversight

The scope of Geotechnical oversight in DBB consists of all technical aspects of the Geotechnical deliverables in Design and Construction phases that require Geotechnical design input.

Procedure and Communication Protocol during Field Investigation, Design and Construction Phases

Foundation Reports (FR)

The prime consultant submits the reports initially as part of Type Selection Package to the District Project Manager (PM). As stated in Section 2.3 of the Office of Special Funded Projects (OSFP) guidelines, a Foundation Report (FR) or Preliminary Foundation Report (PFR) can be used during the early stages of a structure project, and shall be included as part of Type Selection submittal. Per OSFP requirements, a PFR with Advance Planning Study (APS) is not typically reviewed except for where there are unusual foundation requirements that have a major impact to the cost, scope, or schedule of the project, as determined by Caltrans OSFP. Prior to conducting boring explorations in the field, the consultants are encouraged to submit a boring plan for comment. The review procedure shall follow the same communication channels as FR review.

The District PM sends the complete package to OSFP. OSFP Liaison sends review request to METS/GS. METS/GS reviews the report and send comments to OSFP using the OSFP standard review form. OSFP sends comments back to the consultants. If approved by METS/GS, no further review is needed. If not approved, the consultant replies to Caltrans' review comments and resubmits report, typically with subsequent submittals, i.e., 65% (unchecked details), 90% (initial PS&E), intermediate and final PS&Es to OSFP. OSFP sends to MET/GS for review. A few iterations may be needed until the Foundation Report is approved.

During construction, if there are any technical issues, Cost Reduction Incentive Proposals (CRIPs), Construction Change Orders (CCOs) or claims related to foundations, the Structure Rep contacts OSFP, and OSFP contacts the consultant (the Engineer or Geologist of record) to obtain proposed solutions from the consultant. OSFP then sends consultant-proposed solutions to METS/GS for review and approval or concurrence. A few iterations may be needed until it is approved.

Geotechnical Design Report (GDR)

The prime consultant submits the GDR in the PS&E Phase or the District Preliminary Geotechnical Report (DPGR) in PA&ED Phase as part of Design Package to the District Project Engineer (DPE). The consultants are encouraged to submit their DPGR in the PA&ED phase for review. Prior to conducting boring explorations in the field, the

consultants are encouraged to submit a boring plan for comment, and the review procedure shall follow the same communication channels as GDR review.

The District Project Engineer sends the DPGR or GDR to METS/GS for review.

METS/GS reviews the report and sends comments to District Project Engineer; the District Project Engineer then sends comments back to the consultants. If approved by METS/GS, no further review is needed. If not approved, the consultant replies to our review comments and resubmits report to District Project Engineer, who sends to METS/GS for review. A few iterations may be needed until the report is approved.

During construction, if there are any technical issues, Cost Reduction Incentive Proposals (CRIPs), Construction Change Orders (CCOs) or claims related to roadway geotechnical work, the District Resident Engineer contacts District Project Engineer, who contacts the consultant (the Engineer or Geologist of record) to obtain proposed solutions from the consultant, the District Project Engineer then sends consultant-proposed solutions to METS/GS for review and approval or concurrence. A few iterations may be needed until it is approved or concurred.

Review Status - Design-Bid-Build Jobs

This review status system is used to grade geotechnical reports, this grade should be the last comment in the review form.

(C1) Approved as Submitted- no further review of reports are needed, except for scope or design changes

(C2) Approved subject to OSFP/District Project Engineer Verification - optional for OSFP to send to GS/METS for another round of review after OSFP verification of the comments are addressed

(C3) Not Approved - resubmittal and review is required

(C4) Package Submitted not Complete

(C5) left blank to specify any other reasons not mentioned in the review status system

(C6) OSFP Type Selection – no approval or disapproval is needed at this stage

(C7) Field Review

(C8) Construction Meeting/Support

(C9) Pre-Construction Design Meeting

(C10) Preliminary Design - used for preliminary design purpose, including boring plans and preliminary analysis the consultants send for review and discussion

(CX) Cancelled

(CH) On Hold

Highlights for DBB Reviewer (Roadmap)

The consultant's prepared preliminary and final geotechnical Design or Foundation Reports shall follow the latest versions of all applicable Caltrans guidelines and criteria. Highlights of the geotechnical support are preliminary design, design and construction support for roadway and structures elements within a DBB project, including, but not limited to, the following.

Preliminary Report

Review of existing geotechnical data. If additional field investigation is needed, the consultant shall discuss the planned additional site investigation relating to potential need for entry permits, access road construction, lane closures etc. Preliminary geotechnical recommendations must include appropriate foundation types or roadway work options and, if possible, specific details such as anticipated pile lengths and bearing capacities, or roadway geotechnical design details. Identify pros and cons with risk considerations for each option.

Final Report

Consultant shall provide complete and concise geotechnical recommendations by addressing the topics in the applicable portions of Caltrans published guidelines. In cases where the most economical or constructible geotechnical solution is not recommended, consultant shall discuss alternative options and the reasons why those alternatives are not recommended. Construction considerations are specific notes intended for the State's specification writers, construction personnel and contractors. Construction considerations identify relevant Standard Specifications and important design criteria that were used in the geotechnical design. Construction considerations should identify subsurface conditions that will be encountered in the field during construction. Specific notes regarding the site geology should be included within the construction considerations section to ensure that both the intent of the geotechnical design is met and construction of the foundation or roadway is successful.

Construction Support

Construction support requires quick review turnaround, reviewers shall be prepared to review consultant proposed solutions with high priority. In case METS/GS are contacted by a Structure Rep or District Resident Engineer directly, refer them to the proper review process and communication channels for oversight project.

Review Iterations

During review process, informal technical discussions among reviewers and consultant may be arranged through OSFP/District Project Engineer, to assist the necessary official formal review process.

Local Assistance

Definition

Caltrans assists Local and Regional Agencies by ensuring specific program requirements are met, project applications are processed, and projects are delivered in accordance with Federal and State requirements. The design is provided by consultant.

Characteristics

In general, a Local Assistance review is an advisory and courtesy review, but when Federal funds are involved, Caltrans approval is required. The procedure and review status criteria for DBB is generally followed. The consultant-prepared Preliminary and Final Geotechnical Design or Foundation reports shall follow the latest versions of all applicable Caltrans guidelines and criteria, including but not limited to, the following publications in the Caltrans web pages:

- Geotechnical Services (METS/GS) web page:
<http://www.dot.ca.gov/hq/esc/geotech/>;
- Office of Special Funded Projects (OSFP) web page:
<http://www.dot.ca.gov/hq/esc/osfp/osfp-manual/osfp-manual.htm> (including Section 2.3-Foundation Report);
- Division of Engineering Services Publications web page:
<http://www.dot.ca.gov/hq/esc/techpubs/> (including Bridge Memo to Designers and Seismic Design Criteria); and
- Highway Design Manual - Division of Design web page:
<http://www.dot.ca.gov/hq/oppd/hdm/hdmtoc.htm> (including Topic 113 - Geotechnical Design Report, and Topic 210 - Reinforced Earth Slopes and Earth Retaining Systems).

For Local Assistance advisory and courtesy review jobs, the review purpose, scope, procedure and communication protocol are the same as for Design-Bid-Build except for grading system listed below.

Review Status - Local Assistance Jobs

This system is used to grade geotechnical reports. This grade should be the last comment in the review form.

- (L1) Suggest to be Approved as Submitted
- (L2) Suggest to be Approved subject to SLA District Project Engineer Verification
- (L3) Suggest Not to be Approved (Resubmittal to METS/GS Suggested)
- (L4) Package Submitted not Complete
- (L5) – left for other reasons not mentioned here, need to specify
- (L6) Type Selection – SLA
- (L7) Field Review

(L8) Construction Meeting/Support

(L9) Pre-Construction Design Meeting

(L10) Preliminary Design

(LX) Cancelled

(LH) On Hold

Explanations: Please refer to previous section (Review Status - Design-Bid-Build Jobs)

PUBLIC PRIVATE PARTNERSHIPS (P3)

Definition

Public Private Partnerships are a delivery method for infrastructure projects that involves a contract between a public agency and a private party, in which the private party assumes substantial financial, technical and operational risks in the project. P3 agreements may be entered into to complete buildings, transportation projects, or to provide government services.

Characteristics

Public Private Partnerships allow a government entity to share the risks of a project with a private developer who may have more experience with a particular type of project, and who has developed strategies and innovative designs to address the project risks. The government can achieve a greater price certainty from P3s, because the contracts often have a maximum price. P3s that include financing can incentivize the developer to complete the project on time.

Common Characteristics of P3 projects include:

- Long-term contract arrangement between parties (typically a government agency, design and construction firms, and a financier)
- May include all or portions of the project phases, including Design, Construction, Finance and/or Operations and Maintenance
- Shared risk between the public and private sectors.
- Innovative financing for the project
- Contractual incentives and disincentives clearly defined from the start to ensure that the private sector partner meets obligations.

Benefits and drawbacks to state in P3

Benefits

- Transfer risks to private partner (see below)
- Greater price and schedule certainty
- Innovative design and construction
- Quicker access to financing
- Higher level of maintenance

Limitations

- Increased costs
- Greater possibility for unforeseen challenges
- Limits government flexibility
- New risks from complex procurement process
- Fewer bidders

Major risks often transferred from Agency to Developer in P3

- Financing - Changes in project costs, changes in estimated and actual inflation.
- Design and Construction - Interface of Design and Construction, endangered species, cultural resources, hazardous materials, utilities, and permit delays.
- Operation and Maintenance - Future standards or requirements change, facility is more costly or more complicated to maintain than anticipated.
- Revenue risks - Usage and tolls lower than predicted.

Caltrans P3 Program Guide

Caltrans has issued a draft Public-Private Partnerships Program Guide to serve as a procedure for selecting future P3 projects. The Program Guide defines Caltrans criteria for appropriate projects, namely that the risks (constructability, social impacts, geotechnical risks, public acceptance, financing, etc.) be defined well enough to choose only projects that are certain to provide innovation, transfer of risk, and financial feasibility for the Department and the public. Generally, projects nominated for P3 should have a completed environmental document so that risks and degree of public acceptance are known.

In the screening and selection process defined in the Program Guide, Department geotechnical professionals (along with specialists from other Department functional units) will evaluate the proposals before the project is accepted. The weighted evaluations of Department technical staff will be combined with scoring from financial review panels to choose the best proposals.

Oversight Practices during Geotechnical Investigation Phase

Purpose of Oversight

The Purpose of P3 is to transfer risks to the Developer that the Developer is better suited to mitigate than the Department. The traditional Department oversight role could transfer risk back on the Department, which is in conflict with the P3 model. P3 will, by definition, involve less Department oversight than Design-Bid-Build projects.

Scope of oversight

The scope of oversight will vary from project to project, depending on the nature of the project, the specific risks transferred to the Developer, and the Department's cumulative experience with P3.

Since the purpose of P3 is to transfer risk, according to the Caltrans program guide for P3, it is expected that P3 projects will be procured with a completed environmental document to identify and constrain the risks. Preliminary Geotechnical Investigations will not be subject to significant CT oversight, since the geotechnical risks will be transferred to the Developer.

Oversight Process

The process of oversight will vary from project to project, but is expected to be minimal in the Geotechnical Investigation Phase since the Department would transfer geotechnical risks to the Developer in most P3 projects.

Communications Protocol

The communications protocol will vary from project to project. Where oversight is limited, communications protocol may not be developed.

Oversight Practices during Geotechnical Design Phase

Purpose of Oversight

The Department's involvement in design is limited to ensuring that the design meets the standards (e.g., seismic standards) of the Department. The Developer shall perform design and construction work in accordance with best management practices (BMP), requirements in contract documents, Project Management Plan, all laws, and the requirements of all government approvals.

Scope of Oversight

The scope of oversight will vary from project to project. Geotechnical Staff should be involved in the development of Geotechnical provisions in the project contract to ensure that minimum standards will be met without extensive Department oversight.

Oversight Process

The process of geotechnical oversight on P3 projects will vary greatly from agreement to agreement. Comments to the Developer are made in reference to standards or to request clarification. The Department cannot make comments that indicate our preferences in design, but must clarify that Geotechnical standards laid out in the project contract are being met.

Communication Protocol - Review Protocol for Design

Since geotechnical risk and oversight will vary from project to project, a review protocol will be developed individually for each P3.

As an example, the design review process for the Presidio Parkway Phase 2 has been substantially the same as for any consultant-designed project. One difference is that structure designs are routed to the functional units through the District Design Manager to the District Design Office. The reviewers use a comment and response form, and all comments are reviewed before being presented to the Developer, to ensure that all comments are consistent with the terms of the P3 contract. A general outline of the design review process for the Presidio Parkway Phase 2 follows:

- The Developer submits the proposed design to CT Project Design District Division Chief. This varies from Design-Bid-Build projects, in which the design is often routed through Structures Design.

- The Project Design Project Engineer distributes the submitted design to Geotechnical and other functional unit Office Chiefs.
- The Geotechnical Office Chief distributes to appropriate staff (geologists, engineers) for review.
- Completed review is returned to Project Engineer.

Similar to Design-Bid-Build, the Department makes comments and reviews the response to comments. Before comments are returned to the Developer, the District Design Chief and functional unit office chiefs vet all comments to make sure they are consistent with the contract. If needed, Caltrans legal may be brought in.

Each P3 project will have its own communication protocol, depending on the specifics of the contract and the specific risks transferred to the Developer. It is critical that staff working on P3 projects have a good understanding of the specific contract requirements and communication protocol for their particular P3 project. Staff should communicate with their P3 project management team to understand the project technical specifications and standards and communication protocol.

Oversight Practices during Construction Phase

Purpose of Oversight

The purpose of P3 is to transfer risk to the Developer. Construction entails many risks and it is not cost-effective for the Department to assume these risks in a P3 contract. Therefore, oversight in construction is necessarily limited.

Scope of Oversight

It is expected that for any P3, the Developer will provide inspection during construction and that the Department's on-site inspection will be limited.

Inspection and Quality Assurance

Each P3 will develop its own inspection and QA/QC oversight requirements depending on the particulars of the project.

Oversight Processes

There are no defined construction oversight processes for P3. Each P3 project will develop its own construction oversight process, based on the preliminary investigations, and based on the risks explicitly transferred to the Developer and retained by the Department in the agreement.

Communications Protocol

No specific protocol for P3 construction has been defined. It will vary from project to project. It is critical that staff working on P3 projects have a good understanding of the specific contract requirements and communication protocol for their particular P3 project. Staff should communicate with their P3 project management team to understand the project technical specifications and standards.

DESIGN BUILD (DB)

Definition

Design-Build (DB) is a system of contracting under which one entity performs both architecture/engineering and construction under a single contract with the owner. In Design-Build, one entity is responsible for both design and construction. As a result, the agency has less direct control over the day-to-day details of design development, as both design and construction will have fixed obligations to meet a schedule and a price. The Design-Build process is depicted in a flow chart (see attachments).

Characteristics

The following are characteristics of DB project delivery:

Design

The Design-Build team is accountable for the design of the project. Any design errors or omissions discovered during construction are the responsibility of the Design-Build team to correct, thus transferring any design risk to the Design-Build team. This requires changes to Caltrans design bid-build contract administration procedures in that the Design-Builder, instead of Caltrans is the Engineer of Record.

Construction

Design-build allows fast-track of design and construction. Construction can begin as initial design packages are accepted, rather than waiting until the entire set of Plans, Specifications and Estimate (PS&E) are completed.

Innovation

Design-build permits designers and contractors to introduce new design and construction alternatives that are equal to or better than the contract requirements, while still adhering to all other contract requirements. These alternatives also allow contractors to optimize the design to match their capabilities and equipment.

Procurement

The Design-Build procurement differs from the standard Design-Bid-Build procurement process, but overall general procurement laws and regulations are still adhered to.

- **Short-Listing:** The owner (Caltrans) is able to short-list the most highly qualified teams. Only short-listed teams have the opportunity to submit price and technical proposals. Note: under our Design-Build authority, we are only allowed to pre-qualify the teams.
- **Best-Value or Low-Bid:** Design-build teams can be selected based on best-value (i.e. price and other factors) or low-bid (i.e. price alone)
- **Proposals:** Design-build teams submit technical proposals (usually on best value procurements only) in addition to price proposals.

In best-value contracting, the team's technical proposals are scored based on a variety of factors such as the proposed schedule approach to the project, and traffic management. In low-bid, technical proposals may be used to determine responsiveness. In order to be found responsive, "a bid must comply in all material respects with the Instructions to Proposers." This means that the bidder must be willing to comply with all of the essential requirements of the solicitation. If a bidder takes exception to any of these essential requirements in his bid, the bid will be rejected as non-responsive and award will be made to the next lowest bidder who is both responsive and responsible.

Payment

Design-build contracts are lump-sum contracts. Payment is based on percent completion for each activity.

Contracts

Design-build contracts use a different set of documents. Plans and specifications used in Design-Bid-Build to advertise the project for bids are replaced by the Request for Proposals (RFP). The RFP defines the design, management and construction requirements.

Oversight Practices - Locally Administered and Sponsored Projects

Purpose of oversight

The purpose of the oversight is to ensure that quality is designed and built into the project in accordance with the Design Build contract and Department's Geotechnical guidelines and standards.

Scope of oversight

The scope of the oversight consists of all technical aspects of the Geotechnical deliverables during the design and construction phases that require Geotechnical design input.

Oversight process

The process consists of partnering to bring the various parties together in a manner that creates an environment of open communication and trust. The process follows a framework laid out in the Cooperative Agreement communication protocol and described below.

Communication protocol

The protocol during the design and construction phases consists of open, face-to-face communication with the Design-Build team. A workshop should be initiated with all relevant parties involved in the Design-Build contract to go over the milestones and project deliverables, with the aim of setting up the roadmap for open, free flowing and effective communication. The workshop should be followed by a series of technical focus meetings with the Design-Build team to go over technical matters associated with high

risk and to resolve any fatal flaw issues. Open communication is the key to any partnering process. The protocol should include a series of jointly weekly meetings with the lead design and construction quality managers and the project manager(s). In addition, it is important to maximize the use of formal and informal over-the-shoulder design reviews with the fundamental understanding that over-the-shoulder design reviews are not synonymous with acceptance.

During the course of the oversight conducted by the geo-professionals assigned to the DB project, the geotechnical review comments are submitted to the Office of Special Funded Projects (OSFP).

Geotechnical Support for Design-Build Projects

Geotechnical support within a DB project consists of preliminary design, design and construction support for roadway and structures elements as follows:

Review of the Geotechnical Investigation

The major issue during the procurement stage of a project relates to how much geotechnical data will be provided to the proposers to allow them to submit competitive pricing without excessive contingencies to cover the risks of uncertainties. This particular issue is exacerbated because most public owners select DB project delivery to accelerate the delivery of a particular project (Songer and Molenaar 1996). As a result, it is often impossible to include extensive geotechnical investigations completed as part of the RFP development process.

Given the background above, it is imperative that the review of the geotechnical investigation by the department oversight geo-professional(s) is performed in close communication with the DB team. Co-location is recommended, where financially feasible, due to the fast pace of design and construction in DB projects and a real need for communicating the design and construction elements in an efficient and timely manner.

Review of Feasibility of Design Concepts

During the preliminary engineering phase of the DB project, design concepts should be articulated and discussed with the owner and the administrator of the DB project. It is crucial that the department oversight geo-professional is engaged with the DB team throughout the phase and reviews the feasibility of the design concepts.

Review of Geotechnical Contract Provisions

In an era of dwindling public funds, Design-Build contracts are becoming increasingly popular for infrastructure projects. Subsurface conditions and their influence on earthwork, foundations, and underground construction are widely recognized as being a major area of risk exposure to all parties to the contract. One of the key functions of Design-Build contract documents is to define the allocation of risk between the owner and the Design-Build contractor.

All geotechnical elements of the contract documents must be fully integrated, including the foundation design criteria, geotechnical reports, plans, and technical specifications.

Contract documents should clearly establish performance criteria and quality control requirements, and should also limit the application of technologies which pose higher than acceptable risk of performance problems. However, overly prescriptive constraints may discourage the Design-Build contractor's use of innovative and cost-saving approaches, and should generally be avoided.

The procurement process may include provisions for confidential Alternative Technical Concept (ATC) proposals. Acceptance of an ATC can be greatly facilitated by documented historical performance and proof of concept geotechnical programs such as load tests, earthwork test sections, or additional subsurface exploration. Given the above, the review of geotechnical contract provisions is very important to the successful delivery of the DB project.

Geotechnical Alternative Technical Concepts

An Alternative Technical Concept (ATC) is a procedure in which the Design-Builders are asked to furnish alternative design solutions for features of work designated by the agency in its DB Request for Proposals (RFP)

The geotechnical staff should be engaged in enhanced communication in the procurement phase. Toward that goal, confidential one-on-one meetings are conducted to clarify request for proposal intent and to present potential alternative technical concepts (ATC). The objective is for utilizing confidential pre-approved ATCs to enhance innovation in geotechnical design and subsurface construction means and methods.

Review of Geotechnical Design Plans and other Geotechnical Submittals

The submittals consist of geotechnical deliverables for the roadway and structures corresponding to the Geotechnical Design Reports (GDR) and the Foundation Reports (FR). The review should cover both technical (i.e. engineering calculations and methodologies) and non technical (i.e. content and format) aspects of the geotechnical submittals. It must also include the special provisions and the project plans.

Key Concepts

Geotechnical Risks

A geotechnical risk is something associated with the ground that might happen and that would lead to adverse consequences for the project. The 'something that might happen' may also be called a geotechnical hazard. The geotechnical risk may be measured as the product of the likelihood of the geotechnical hazard occurring and the consequences to the project. Geotechnical risks can be categorized as follows.

Project Management

These risks are usually associated with the non-geo-professionals making high level decisions who do not appreciate the importance of geotechnical risks.

Contractual

The quality of the site investigation report, and how it is communicated, plays a pivotal role in the way contractual geotechnical risks can develop in projects, particularly with respect to claims based on ‘unforeseen’ ground conditions.

Analytical

The engineering analysis and the assumptions made during design can be source of geotechnical risks.

Properties

The engineering properties used in design may not be reliable and may not be representative.

Geological

Geological Risk is variability in the 3D distribution of geological units and variability in the geological characteristics. There can be both spatial and temporal uncertainty with some hazards.

When there is an absence of knowledge of what might be in the ground in which the project is being built (and this happens regularly on major projects around the world), a hazard to the project is created because of the possibility of encountering an unforeseen ground condition that might adversely affect the project.

In a DB project delivery, the geotechnical risks are distributed between the Design-Builder and the owner. To assess the risks associated with the DB project, the following questions need to be answered:

- Will the geotechnical aspects of the site be a major factor in the project design process?
- How much time is available for geotechnical investigations and preliminary geotechnical engineering?
- How uncertain are the subsurface conditions on the project site?
- What are the critical geotechnical variables that must be known for the DOT to develop a preliminary design for funding and bidding purposes?
- What are the critical geotechnical variables that must be known for the Design-Builder to complete a workable design?
- Can the geotechnical risk be shared with the design builder to reduce project costs?
- Is there flexibility in the procurement and contracting process to enable the Design-Builder to advance the geotechnical investigation before finalizing a price?

One of the cited advantages of DB project delivery is that the owner is no longer liable for design errors and omissions. However, that is only if the owner was not the source of the design error. If a Design-Builder’s design concept during the proposal process is ultimately inadequate because it was based on the owner’s design input information—

such as a boring log or specification of a particular type of foundation (e.g., spread footings instead of deep foundations) then the question of responsibility is no longer clear.

Differing Site Conditions

A Differing Site Conditions (DSC) Clause is a contract clause designed to give a contractor cost and time relief for (1) subsurface or latent physical conditions encountered at the site differing materially from those indicated in the contract; or (2) unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract (23 CFR 635.109). The Federal Highway Administration (FHWA) mandates the use of a DSC clause for Design-Bid-Build projects on federal-aid highway projects, unless the use of such a clause is contrary to state law (23 CFR 635.109). The DSC clause provides broad relief to a contractor for physical conditions that materially differ from those anticipated by the contract. FHWA does not, however, have the same mandate for DB projects. Instead, it encourages state DOTs to use this clause when appropriate for the risk and responsibilities that are shared with the Design-Builder. On DBB projects, the risk of differing site conditions is almost always the responsibility of the owner. On DB projects the risk of differing site conditions is not as clear. The DB contract may be awarded before either the owner or the design builder makes a full geotechnical site investigation

Warranty Provisions

Some DB contracts include warranty provisions for some items of work. Contract language should specify the warranty period and the enforcement process, including a detailed description of the measures that will be used to determine warranty compliance. These measures are typically maximum levels of various distress types that, when exceeded during the warranty period, require correction by the Design-Builder. Some warranty provisions also include specific corrective action for each distress type. The inspection procedure for determining warranty compliance should be clearly outlined and include provisions for notification so that a Design-Builder representative can observe the warranty inspections. A process for dispute of warranty inspection findings should also be included. Use of warranty provisions does not remove the need for an effective Design-Builder QC system. On projects where the warranty does not provide coverage for the anticipated life of the warranted product, some level of agency acceptance is still required. The requirements for warranties on DB projects are covered under 23 CFR 635.413.

When the uncertainties associated with the geotechnical aspects of a typical Design-Bid-Build project are translated to a Design-Build project, the perception that the agency may be forced to accept inferior quality can become an overwhelmingly powerful force inside the project team. Problems associated with geotechnical design manifest themselves in some cases, months or years after the completion of the construction of the project. DOTs

have and should have in their tool box a mechanism to safeguard the quality of the geotechnical assets during their design life. One of these mechanisms is the use of warranty.

Partnering with Geotechnical Issues

NCHRP Synthesis 376 (2008) describes the design phase of a DB project as “the phase where the ultimate quality of the constructed facility is quantified through the production of construction documents.” A 2004 study of DB quality management stated, “Quality cannot be assumed into the project. It must be designed and built into the project in accordance with the DB contract itself”(Gransberg and Molenaar, 2004).

Achieving high-quality design demands information-rich and frank communication between the owner and the Design-Builder’s staff during the design phase (Ernzen et al., 2000; Beard et al., 2001). Partnering is one tool that has been used to enhance communications on DB projects (Allen et al., 2002), and DBIA’s Manual of Policy Statements states, “DBIA advocates both formal and informal project partnering and considers the partnering philosophy to be at the foundation of Design-Build delivery” (DBIA, 1998).

Partnering, if used successfully in transportation projects, will lead to confidence building and improvement in the quality of the geotechnical products. Its central concept is to bring the various parties to a construction contract together and create an environment of open communication and trust. “Open communications is the key to any partnering process” (Ernzen et al., 2000).

A study of the Texas DOT’s early DBB partnering program found that partnering provided an effective means to control both cost and time growth (Gransberg et al., 1999). Similar research on NAVFAC’s DB partnering process reached the same conclusions and demonstrated the benefits of applying partnering principles to DB projects (Allen et al., 2002).

Design-Build by its nature lends itself to the partnering concept. The partnering concept ideas of increased communication, alignment of goals, and development of a dispute resolution system fit perfectly with Design-Build’s overarching theme of single-point responsibility for the owner.

Increased pressure because of the schedule compression typical of most Design-Build projects makes partnering a vital necessity (Ernzen et al., 2000). Typically, a partnering workshop held at the outset of a DB project is an important first step in establishing the lines of communication and introducing the key staff in the project.

Roles and Responsibilities

It is vital to the long-term success of the DB project that everyone understands his/her roles and responsibilities. The roles and responsibilities of the geo-professional oversight staff are primarily to conduct technical oversight on all aspects of geotechnical analysis and design.

The geo-professional oversight staff is expected to ensure that a proposed project meets the design criteria and can be developed for construction. The geo-professional oversight should be available in a matter of hours or days, not weeks, to answer questions and provide feedback during the process. It is important to operate under a partnering environment with over-the-shoulder reviews. The geo-professional will be approving or concurring the design, and the Design-Builder will have the responsibility for ensuring the project proposal is correct. The Design-Builder will likewise have the responsibility for correcting any mistakes made in the proposal process, unless the mistakes are the result of an unclear RFP. DB is often used on large, fast-paced projects, which can create challenges for conducting Quality Assurance (QA). Coordination and communication between the Design-Builder and the agency is essential for effective quality management. By working together within a well-defined QA program and Quality Management Plan, the agency and Design-Builder can meet the goal of delivering a high quality project.

Caltrans Oversight Quality Management Plan

There is no Caltrans Oversight Quality Management Plan at the present time. The Department's Geotechnical Services 2012 Quality Management Plan is tailored for in-house projects, and does not include consultant design oversight work.

Appropriate Number of Design Reviews

The number of design reviews depends both on the quality of the consultant-prepared geotechnical deliverables and the quality and caliber of the oversight geo-professional. In a DB project it is important to maximize the number of over-the-shoulder reviews during the course of the usually fast-paced DB project when appropriate. Given that the over-the-shoulder reviews are not considered official reviews and hence are not considered acceptance, it is important that a minimum of two official reviews are performed.

Staffing of the DB Oversight Team

The ultimate independent quality assurance is the responsibility of the owner hence it is very important that the Department (owner) incorporates strategies in its Oversight Quality Management Plan to ensure the high quality of its geo-professional staff.

The following elements are critical to the geotechnical quality assurance and successful delivery of a DB project:

- Requiring the Design-Builder's staff to include highly qualified and experienced geotechnical personnel;
- Assigning the agency's most qualified geotechnical personnel to DB project oversight.

Foundation Testing

The role of Caltrans Geotechnical Services and its scope of work including the time required for the task involved should be clear and articulated in the DB contract.

Independent Quality Assurance (IQA) vs. Quality Assurance (QA)

Independent Quality Assurance in the context of a DB project is required when an independent private oversight firm conducts the QA for the geotechnical aspects of the DB project per the Cooperative agreement between the Department (owner) and the local transportation authority. IQA consists of technical oversight independent of the QA to ensure that the contract provisions and design are per the Department's design guidelines. IQA activities must be in close coordination with the QA and the DB design teams.

Resource Monitoring

The resources required for a DB project vary with projects and their complexities. Lack of proper resources both in terms of the high quality of oversight professionals and number of staff will lead to unnecessary and unacceptable risks for the Department.

It is important that proper charging and proper coding is used in the DB project.

Administered and Sponsored By Caltrans

All elements incorporated in the above cited sections corresponding to DB projects apply to this section. OSFP (Office of Special Funded Projects) is no longer involved, instead the Department's HQ's Office of Structure Design will assume the role of coordination and submittals of the design oversight deliverables.

Attachment

Design Build Process Flow Chart

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