

Effective practices for geotechnical provisions in design-build procurement

Dan Brown, Robert Thompson
Dan Brown & Assoc.



Topics

- Geotechnical designer requirements
- Performance based specifications
- Prescriptive components
- Pre-bid geotechnical data
- Alternative Technical Concepts (ATC's)



Important Things for D-B

- ***Schedule***
- ***Risks***
- ***Costs***



NCHRP 429 – Geotechnical Information Practices in Design-Build

Describes effective practices in geotechnical procurement, design, and quality management

- *Qualifications & experience of D-B geotechnical team is key to quality*
- *Use over-the-shoulder reviews to expedite schedule*
- *Weight geotechnical factors appropriately to the importance for project success*
- *Use ATC's to allow bidders to reduce risk*



Geotechnical Designer Requirements

- Make the lead Geotech EOR a “key person”
- Include Geotech items as a significant contributor to the technical scoring
- Quality: require the Geotech EOR to review and approve:
 - Foundation work plans
 - that construction has been completed in a manner consistent with the design.



Geotech RFP Items

- Put all the Geotech related things in one place in the document (e.g., not buried in the structures section)
- Require submittal of a Geotech work plan & data report
- Require foundation load testing for performance verification
- Allow for Alternative Technical Concepts



Performance based specifications

Owner describes the expected outcome without prescribing a specific approach or design

- Fosters innovation
 - Allow the Contractor to select means and methods
- Reduces potential claims
- Requires performance verification



Performance based specifications

Agency should:

- Set realistic expectations; overly stringent performance requirements cost time and money that will be reflected in the bid cost
- Clearly define performance measurement requirements
- Use best value selection for optional items



Prescriptive Requirements?

Some items are best prescribed:

- Slope stability issues
- Environmental issues
- Karstic features
- Sensitive adjacent structures
- Other unusual items for which the risks are hard to anticipate and quantify during bidding



Pre-bid geotechnical data

- Forms the basis of the D-B Team's design, schedule and bid
- May be < 25% of the quantity of information required for final design
- D-B Team must address the limitations in the provided information at bid time



Pre-bid geotechnical information

- Quality and timeliness of basic information is critical
 - Stratigraphy and coverage
 - Emphasis on basic soil and rock material properties
 - Limitations of pre-bid foundation tests
 - Historical information is of great value!
 - Don't try to provide design parameters

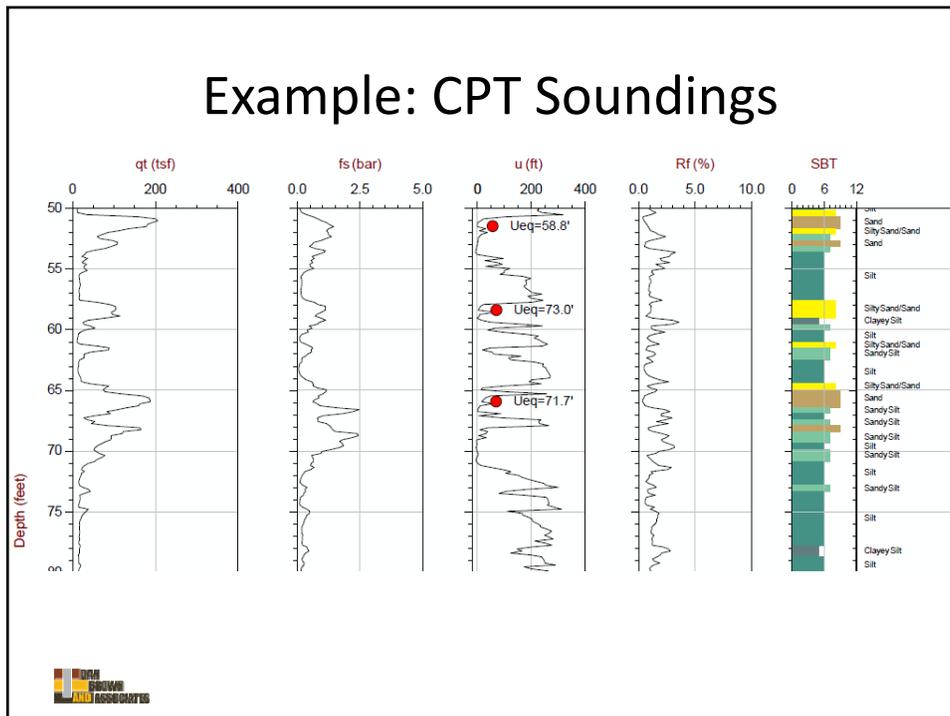


Stratigraphy and Coverage

- Need *thorough* program of borings or soundings for pre-bid estimating
 - More routine borings (and/or cpt soundings)
 - Provide surveyed information for 3D modeling
 - Provide rock core samples for examination by bidders

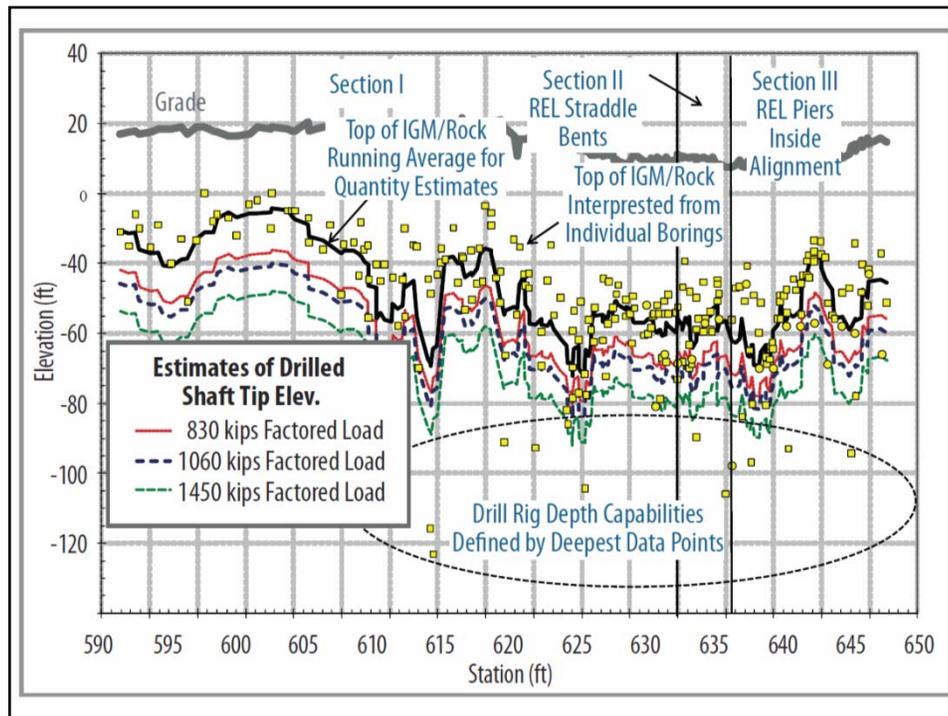


Example: CPT Soundings



Need basic material properties

- SPT hammer energy measurements
- Groundwater levels
- Pavement section data
- Electronic files for CPTu, or GINT logs
- Borings to sufficient depth
- Lab tests on “*Undisturbed*” samples
- Follow Agency’s Geotechnical Manual



Pre-bid load tests

Difficult to do this effectively:

- Must address the range of possible solutions
- Consider alternates to Owner's concept
- Subject to low-bidders means and methods
- Best employed to address most important unknowns (which is often constructability)

Timing of pre-bid geotechnical data

- Late data is of very limited usefulness!
- Causes confusion & inefficient design!
- Estimators throw money into the bid for last minute surprises!



Importance of high-quality pre-bid geotechnical data

Typical Problems:

- No SPT hammer energy measurements
- No groundwater level data
- No pavement section data
- Geotechnical data input into Gint format but electronic files not provided to D-B Teams
- CPTu electronic files not provided
- Investigation does not extend deep enough



Risks & differing site conditions (DSC)

- DSC provisions contribute to a fair and equitable allocation of risk on design-build projects
- Provides a means to address risks and reduce contingency costs
- *Usually* (but not always) included on public works D-B projects



Risks and DSC

Agency should:

- Provide ***all*** available geotechnical information in a data report
- Describe background geology and known conditions
- Avoid exculpatory language and overly broad descriptions



Risks and DSC

D-B team should:

- Document the basis for design and construction (escrow)
- Evaluate the impact of reasonable variations in ground conditions
- Develop contingency provisions in construction plans and schedule



Risks and DSC:

Geotechnical Baseline Reports (GBR)

- Defines basis for bid and allocates risks
- ASCE guidance in “Geotechnical Baseline Reports for Construction Suggested Guidelines” Essex (2007)
 - The Technical Committee on Geotechnical Reports of the Underground Technology Research Council



Differing site conditions and application of baseline geo reports

- Baseline does not eliminate DSC but more clearly defines when DSC occurs
- Example baselines: rock elevations, thickness of soft alluvium, groundwater elevations
- Approach to some high risk items may be prescriptively defined; for example landslide stabilization measures or contaminated soil



Alternative Technical Concept (ATC)

- Fosters innovation from D-B process
- Potential to lower costs/improve schedule
- May represent unfamiliar technology to owner agency
- Potential challenge with performance verification



Alternative Technical Concept (ATC)

Agency should:

- Maintain confidentiality
- Talk early and often. Talk one-on-one
- Require performance testing of concepts; demonstrate effectiveness prior to construction



Alternative Technical Concept (ATC)

D-B team should:

- Consider risks and allocation
- Provide examples and experience
- Plan for performance testing of concepts; demonstrate effectiveness prior to construction



Alternative Technical Concept (ATC)

Examples:

- Base grouting of drilled shafts to enhance capacity
- Reliance on long term pile setup
- Use of equipment that is not covered in specifications
- Innovative ground improvement techniques



Summary

1. Give the Geotech EOR the responsibility and the leverage to control the design and construction of geotechnical aspects
2. Use performance based specifications with accountability
3. Use prescriptive solutions where high risks are difficult to quantify during bid



Summary

4. Provide thorough coverage of borings / soundings in prebid investigation
5. Use ATC's to encourage innovation and generate value and reduce risks

