Good afternoon. Today we will be discussing how geotechnical and structural engineers work together from a business perspective.

My name is Stephanie Slocum, and I am presenting on behalf of ASCE SEI’s Business Practices Committee. The principal role of the Business Practices Committee is to consider the issues that relate to the role of the structural engineer in the business environment and within the public at large. Committee membership is entirely comprised of practicing structural engineers, many of which are principals or owners in their firms. In my case, I am with Hope Furrer Associates, a woman owned structural consulting firm specializing in architectural projects based in the Baltimore, MD area.
Our goal today is to educate you on the geotechnical engineer and structural engineer business relationship from project conception through construction.

First we will discuss contractual relationships of geotechnical and structural engineers, followed by geotechnical RFP’s. We will talk about how to work with a soils report, including potential liabilities of deviating from the report. We will touch on collaboration during the foundation design process. Finally, we will conclude with the geotechnical and structural engineer interaction in the construction phase.
Let’s talk about common contractual relationships between geotechnical and structural engineer.

The first type is where the owner contracts the geotechnical consultant and an architect separately. The structural engineer is contracted to the architect.

The AIA documents state that the geotechnical report is an owner furnished item. Therefore, as you imagine this is a typical contract type in the building world. The contract between the geotechnical engineer and the owner is often a geotech-drafted services agreement. In these cases, the structural engineer will typically send out an RFP with specific requirements, which will be attached to the geotech’s service agreement. We will discuss those requirements in detail later in this presentation.
The second common contractual relationship is one in which all consultants are contracted to either the owner or GC.

Examples of project types where this is common are IPD or design-build architectural projects, developer work, and forensic investigations.

For the design-build and IPD agreements, the geotechnical engineer is often treated as a design consultant, using standard consultant forms such as DBIA Document No. 540 - Standard Form of Agreement Between Design-Builder and Design Consultant.

Since means and methods of construction and unforeseen conditions play a large part in foundation design methodology, this is the most comprehensive approach used in current practice. In this approach the assumptions made by both structural and geotechnical engineer are either confirmed or invalidated during pre-construction and construction.
The third common contractual relationship is one in which the structural engineer is either contracted to the geotechnical engineer or visa-versa.

This is common in the bridge world and may also occur on forensic projects. There are a number of standard contract forms that can be used as listed here.
For any of the three project types we just discussed, we’d like to touch on the unique risks and rewards if your firm provides both structural and geotechnical engineering services. Please raise your hand if your firm provides both services.

First, typically there are two separate contracts for these services.

There are greater insurance needs than providing only one service as a result of the potential for increased liability. This is because of greater potential risk and reward if both services are provided in house.

Now we’d like some audience participation. We’ve talked about the three contract types – geotech contracted to owner with an architect involved; all consultants contracted to the owner/GC, and the structural/geotech contracted to each other.
Now we’d like some audience participation. Of the three contract types, which do you prefer?

Would anyone like to comment as to why? We’d like one comment from the structural side and one from the geotech side.
IBC 1803 dictates when a soils report is required. Examples of conditions where a report would be required include areas of expansive soils, variable rock strata, and projects with seismic design categories C through F.
IBC also indicates minimum requirements for reports which you can see here.
Let’s say a geotechnical investigation is not technically required on your project. One example where this could occur are small renovations/additions to buildings where we may have existing drawings and/or a very old soils report.

In these conditions, the owner should be made of external geologic hazards such as sloughing, settlement, or soil failure. Financial risks related to prescriptive design being overly conservative; Project delays due to unforeseen conditions Operational risks due to long term maintenance issues (such as settlement).

For many projects, the return on investment for the geotechnical investigation is well worth the cost even if not technically required.

One example – we have a project with a small addition to an existing building. The existing building was built in the 1960’s on caissons, and original existing drawings showing the caisson locations, loads, boring information and foundation design criteria were available. Regardless, the owner did a geotechnical investigation which revealed that due to the low loads on the addition, we could use spread footings instead of caissons, which saved the owner more than 10 times the cost of the investigation just in foundation installation.
Now that we’ve established that a geotechnical investigation is needed, let’s discuss document references for creating an RFP.

The old AIA G-602 covered contractual issues and limited structural requirements but overlooked the geotechnical engineer’s needs. A new AIA document AIA C202-2015 does include a detailed list of items the geotechnical engineer must include in the report as well as a requirement for the geotechnical engineer to be available for consulting during the design process.

CASE #6-2 is comprehensive RFP list, developed by collaboration between geotechnical and structural engineers.

A survey of our committee members indicates that the consulting firms have created their own standard RFP based on their own experience and project type expertise. Let’s discuss some of the items that should be included in a well-written RFP.
The structural engineer should include in the RFP sufficient information for the Geotechnical Engineer to provide a proper Geotechnical Report that addresses the needs of the Structural Engineer.

This includes items such as those listed here. Items of emphasis include an accurate site plan with accurate loads. The RFP should include a check list of items needed, for example seismic site classification and lateral earth pressures for retaining wall design, so report expectations are clearly communicated.

If items such as multiple foundation options or geotechnical consulting during design are desired, this should be included in the RFP.
The geotechnical engineer should then provide to the structural engineer clear foundation system recommendations and responses to lists of items the structural engineer has provided.
Let’s break for another question to make sure everyone is still awake.

Geotechnical and structural engineers, are you getting what geotechnical investigation process?

Would anyone like to comment on how the process could be improved? I’d like to take one comment from the geotech side and one from the structural side.
So now we have a geotechnical report, what next?

SE’s should review and detail and verify information requested has been included. Even with a well written RFP and dialogue between the engineers, most reports warrant at least a phone call to discuss questions and clarify recommendations.

Structural engineers should not deviate from the report. Any change to the report or additional information provided should be issued via a supplemental letter or addendum. Further, as a best practice the geotechnical engineer should review and comment on the completed foundation design drawings and specifications related to foundations. This should be stated up-front in the RFP.

A previous presenter discussed liabilities related to unexpected field conditions, a few of which we’ve listed here. The key is that both the structural and geotechnical engineers need to educate the owner on potential risks and levels of uncertainty related to subsurface conditions and the owner should provide guidance on acceptable risk levels, preferably prior to any borings being done. Many owners that do not routinely undertake construction projects don’t understand that the soil side of a project has much more uncertainty and possible variation than the superstructure. The amount of knowledge and the confidence in that knowledge can be limited by budgets for soil investigation. Even with a larger budget and investigation program, there can be variations in the subsurface conditions from what is assumed.
We will briefly touch on collaboration of the geotechnical and structural engineers during foundation design. If you are interested in exploring this topic in-depth, the next session will cover this in detail from the perspective of the young professionals group.

Most of the members of our committee work in the building world, where unfortunately due to specialization and the need to limit liability of consulting firms, the current reality is that there is limited collaboration occurring between the geotech and structural engineers. We’d certainly like to see this change, and that’s not to say that we’ve had very collaborative experiences on some projects. However, in most cases limited collaboration is the norm.

In the case of more complex soil conditions (expansive or collapsible soils, high ground water, proprietary foundation systems, etc.) there may be a discussion between the geotechnical and structural engineers so that the design methodology is consistent with the design assumptions.

We’ve also found that collaboration levels do not seem to vary as greatly as we expected them to by region. The project type, soil uncertainties of the area, and existing relationships between the geotechnical and structural engineers play the largest roles in how much collaboration occurs. For example, in the expansive soils of Texas you are unlikely to see much collaboration. More collaboration tends to occur in California or Colorado where IPD is more common.
Now let’s move into the construction phase and talk about the responsibilities related to installation of the foundations after design is complete.

First, we have a earthwork and/or foundation contractor, who has his own least-cost interpretation of the contract documents and geotechnical report. Unless both the structural and geotechnical engineers remain involved during construction the foundation is built based on the contractor’s interpretation of the design drawings.

Because of this reality, engineering consulting firms use language in their contract documents and reports that attempts to limit their liability because of construction means and methods and unforeseen conditions. In many cases there is risk unwillingly taken on by the foundation subcontractors out of economic need or ignorance.

What, therefore is the engineer’s responsibility during construction? Typically the geotechnical engineer will do field observation and field testing.

The structural engineer is limited to field observations only.

Third party inspectors are the owner’s agent and thus have the responsibility to protect the owner’s interest. They do not take on any liability for the design.
Let’s get into some specifics about the liabilities of inspections versus observations.

Inspection is a comprehensive and detailed examination of all the construction work in progress relative to the design shown on the contract documents. Conversely, observation is the general review of the project at appropriate intervals during construction. Observation does not involve detailed inspections to provide exhaustive or continuous project review. In order to help control future liability arising from construction phase services, the scope of work in the contract should clearly define the role intended to be fulfilled and maybe even more importantly, include express exclusions of the services that will not be provided.

What an engineer does and says while on a project may also affect liability. Even when a contract is limited to “observation”, that limited scope can be usurped if the engineer starts directing the means and methods of the contractor or holds himself out as an inspector. It is essential that the engineer not exceed the scope of services defined in the contract.

There are many reasons why the geotechnical engineer of record should be actively involved in the project from start to finish. No one knows more about the local subsurface conditions and their impact on construction. The recommendations in the final-geotechnical-engineering report are provisional until the geotechnical engineer can
observe actual subsurface conditions during construction. If observed conditions differ from those inferred to exist, the geotechnical engineer can quickly modify the provisional recommendations with little or no impact on budget or schedule. If the geotechnical engineer of record is not allowed to perform on-site observation of subsurface conditions the geotechnical-engineering service will remain incomplete, significantly increasing the owner’s risk as well as the structural engineer of record.
Recap

- Contractual Relationships
- Geotechnical RFP's
- Working with a soils report
- Foundation design
- Construction Phase
I would like to thank you on behalf of the Business Practices committee for attending this presentation. We now open the floor for questions.