

Geo-Institute 11th Annual Web Conference

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The Geo-Institute Earth Retaining Structures Technical Committee will live-stream a panel discussion on Owners', Agencies', Designers', and Contractors' Perspectives on Earth Retaining Structures on Thursday, December 10, at 11 AM EST. The discussion will cover:

Discussion #1: Owner's Perspective (presented by Derrick Dasenbrock, P.E., BC.GE., F.ASCE – Minnesota DOT)

It is important that built works function for their intended purpose and do so efficiently and safely. Earth retaining structures are some of the most common structures built for transportation facilities. Common permanent uses are bridge abutments and grade separation; temporary uses include shoring for cuts, trenches, and foundation excavation. Design for permanent sheeting, shoring, and other retaining structures is often specified by the owner, whereas temporary works are usually designed and installed by contractors. Strength and service design criteria should be purpose-driven. Tolerances should reflect actual design needs, reflect project risks, and be realistic—and when performance monitoring systems are used—measurable. Overly stringent requirements may escalate costs without benefit whereas overly loose constraints may result in poor performance and the need for costly retrofit or rework. This presentation will discuss considerations for developing informed tolerances and authoring appropriate design specifications with thoughts on applying the observational method.

Discussion #2: Agency's Perspective (Presented by James McKelvey, III, Ph.D., P.E., BC.GE, F.ASCE – Earth Engineering)

The deflection criteria of temporary shoring required by various agencies such as local municipalities state transportation departments and railroads varies greatly across the United States. Many agencies are silent on deflection criteria while others are quite stringent. Often times stringent deflection criteria required are the result of poor performance on past projects, particularly when shoring supports adjacent structures. In addition to the variance in deflection criteria, the requirements for design submittals and permits vary. This presentation will discuss the necessity of identifying required deflection criteria, possible approaches to soften requirements and provide examples of deflection criteria required by agencies across the country.

Discussion #3: Designer's Perspective (Presented by Wystan Carswell, Ph.D., P.E., M.ASCE – Haley & Aldrich)

Predicting lateral wall displacement due to excavation is an essential component to the successful design and construction of excavations. Lateral movements during construction can affect adjacent structures or utilities within the “zone of influence” of an excavation. These wall movements can be estimated based on several factors which include but are not limited to soil stratigraphy, wall stiffness, depth of excavation, number, stiffness and elevation of bracing levels, and excavation method and sequencing. During construction, surcharges, construction sequence, and construction methods can also impact wall displacement. Estimation of lateral wall movements during design is therefore a result of a series of assumptions, which may prove to be conservative or aggressive (or some combination thereof); consequently, measurement of lateral wall movements during construction is an important part of design verification. Measurements allow engineers to compare theoretical movements predicted from the design with actual performance of the system. For some project situations, the amount of unknown information (and therefore the number of assumptions required) may lead engineers to propose the Observational Method (first introduced by Ralph Peck) – an approach by which the design may change during construction as a result of the observation of how the excavation support system (or other structures) are behaving. While it can be used to “right-size” the design (avoiding excessively conservative systems), it can be difficult for project teams, owners, and permittees to approve due to the open-ended nature of the approach. This presentation will discuss the role of the Observational Method in evaluating excavation support wall movement, and scenarios for which it may be most beneficial for successfully delivering projects.

Discussion #4: Contractor's Perspective (Presented by Joel Dellaria, P.E., M.ASCE – Keller North America)

Deflection of earth retention systems is one of the most challenging parts of an earth retention design to get correct. In the design of most earth retention systems deflection is the only part of the design that is actively measured and tracked throughout the project. Deflection of earth retention systems have many sources including soil pressure, water pressures, construction sequencing/stages, vibrations from construction activities, construction surcharges from equipment or stockpiles, over excavation, ground/precipitation water management, changes in temperature and more. Expectations of performance vary widely from project to project. The scale and accuracy of monitoring systems also varies from project to project. Some projects have multiple systems using a combination of survey points (pre/post construction), inclinometers, water levels and the like while other projects might measure movement part way through construction from a point that may or may not be moving itself. Keys to building successful earth retention projects with reasonable costs require good communication between the project team, design team and the construction team to identify the project design risks, project risk tolerances, reasonable deflection criteria and effective ways to measure the project performance.