Panel Discussion on the Use of Advanced Numerical Methods in Practice

Focus Problems

Static

Construction of a landfill in a soil deposit underlain by a soft clay, with a bridge nearby

Bridge deck supported by rows of three, 12” diameter piles. Spacing between rows=50’
Earthquake analysis of an existing bridge supported on a soil deposit involving a loose sand/silt layer by a set of piles.
Figure 1. Collapsed Approach Span to the Nishinomiya-ko Bridge on Route 5 of the Hanshin Expressway.
Objective

The objective here is to get the practitioners and researchers to exchange ideas, and in the process, identify issues that could be collaboratively addressed in the future with the intention of promoting the use of advanced methods in practice.

The discussions will be conducted in a positive tone: If you don’t have anything positive to say, you don’t say anything.
Researchers

What capabilities must the constitutive model have and why?

How will the parameters be determined?

Will the procedure you propose be more reliable than the simplified procedures that a practitioner might normally use?

Do you know if your procedure will yield accurate results? If not, what sort of research is needed in the future to confirm this?

Should we subject the procedures to benchmarking exercises before using them in practice?

Is your procedure the optimal method of analysis for the problem at hand or is it overkill?

Is the approach economically competitive relative to other approaches?

Given the state of current computer technology, can the analysis be done within a realistic time frame?

Would you advocate using the results of your analysis as a means of understanding mechanisms of deformation and failure or as firm numbers for use in design (i.e. to come up with actual design parameters like the diameter of a pile)?

(Note that one of your objectives is to convince the practitioner that your procedure will be more beneficial than the procedure they will otherwise use.)
Practitioners:

Present a method that you would normally use.

Please briefly discuss all of the steps (including what types of in situ and lab tests you would do, etc.)

Point out the aspects of your analysis that you are less confident about, and that where you wish you had a better method of analysis. For example, you have a two-dimensional problem, but you are making a 1-D approximation so that you can use Terzaghi’s consolidation theory, but you are not sure of the error involved in that approximation.

Discuss the following issues as well:

Would you rather use a simpler method that you are comfortable with and use a hefty factor of safety than to use a complex procedure that you are not comfortable with, but may be safer and save more money?

Would you rather be able to handle the analyses yourself than to hire another specialty company that specializes in advanced analysis methods to do the analysis?

(Note that one of your jobs is to point out the practical difficulties of using the procedure proposed by the researchers, so that they can start thinking about addressing those issues.)