

**ADVISORY NOTES ON PLAXIS 2D CE V20**  
**FOR ELS AND STEADY-STATE SEEPAGE ANALYSIS**

- 1 Hydraulic boundary condition and seepage analysis
  - 1.1 The groundwater pressure distribution assumptions and related program settings are important in obtaining reliable results. Such assumptions should be based on the permeability of the in-situ soil/rock layers and hydraulic boundary conditions. Field permeability tests, typical permeability values or pumping tests and piezometric monitoring data to justify these assumptions.
  - 1.2 When the design required the use of free surface velocity or extreme velocity from the Plaxis analysis, the meshes of the interested areas should be refined to assure result accuracy. User should follow guideline 4.1 on “Effects of mesh size on accuracy of results.”
- 2 Check on capacity of structural elements
  - 2.1 Plaxis does not carry out design check of structural elements used in the model. Users must check the adequacy of these elements using relevant design codes accepted by Hong Kong authorities. If the design indicates stronger elements are required, the Plaxis model must be revised and re-analysis accordingly.
- 3 Wall/Soil interface
  - 3.1 The wall/soil interface ratio  $R_{inter}$  should not be unrealistically low to avoid numerical instability leading to non-convergence. The limiting values for  $R_{inter}$  should use values in Table 13 of Geoguide 1 (GEO, 1993).
- 4 Effects of mesh size on accuracy of results
  - 4.1 A minimum mesh density of “Medium with Enhanced Mesh Refinement” is recommended.
  - 4.2 The mesh/element size to be adopted in the analysis should be suitably fine so that further refinement of the mesh/element size would not generate a significant change in the analysis results. A finer mesh/element size may also be required at the areas of stress/flow concentration or zones of large deformation/hydraulic gradient. The variation of the mesh/element size over the computation domain should be optimized to avoid numerical instability (e.g. non-convergence) and to achieve adequate calculation accuracy.

## 5 Selection of Soil Models

- 5.1 Users should not use effective stress shear strength parameters ( $\phi'$  and  $c'$ ) to model undrained behaviour. Users should note that the use of effective strength parameters in a linear elastic perfect plastic model such as Mohr-Coulomb cannot give correct pore water pressures in undrained analysis.
- 5.2 Reference should be made to the report of the Committee of Inquiry on the Nicoll Highway collapse for advice on selection of appropriate soil models for soil-structure interaction analysis.

## 6 Requirement for convergence

- 6.1 Excavation is an unloading problem. Hence, the PLAXIS calculation for ELS works is a load-controlled analysis. Users should use the default setting where the "Arc-length control" function for iteration of calculation is activated. Under special circumstances of large shear strains and significant plasticity developing in the mesh elements, the user may deactivate the "Arc-length control" function to force the analysis to solve to convergence (see PLAXIS Manual under Iterative Procedure Control Parameters). In such a case, the user must check whether the shear strains generated in the mesh indicate development of a global failure mechanism. If the analysis has predicted a global failure mechanism, the user should re-activate the "Arc-length control" function and re-run the analysis. If there is no convergence, then the wall embedment depth should be increased.