limitstate

analysis & design software for engineers

LS-G-AN0
Software: LimitState:GEO 3.0c
Date: November 2012

Application Note - Setting up and solving problems in LimitState:GEO

1 Recommended Procedure

1. Draw or import geometry (from .dxf).
2. Create materials and assign to **Zones**.
3. Consider if there are any modified properties on e.g. soil/structure interfaces (including tension **Cutoff**). Create materials as appropriate and assign to relevant **Boundaries**.
4. Assign boundary conditions (e.g. *Fixed*, *Symmetry*).
5. Set external loads and assign values. If partial factors are to be used then assign loads as *Permanent*/*Variable*/*Accidental* and set **Loading Type** to *Favourable*/*Unfavourable*/*Neutral*.
6. Set **Loading Type** for **Solids** to *Favourable*/*Unfavourable*/*Neutral* if required . (Default is *Neutral*).
7. Set the Analysis type depending on whether it is required to undertake a **Factor Load(s)** or **Factor Strength(s)** analysis (i.e. to find the factor of safety on load or on material strength).
8. If a **Factor Load(s)** analysis is selected, assign **Adequacy** to external loads and/or material self weight and/or seismic acceleration according to requirements (normally to one or more unfavourable loadings).
9. Set required **Scenario** (i.e. define Partial Factors on actions and strengths). For simple use, select *Unity*.
10. Set required **Nodal Density** (check using **Analyse - Preview Nodes**).
11. Solve.
12. Check that identified mechanism does not intersect domain boundaries. If this is the case, modify the domain dimensions as appropriate and re-run.
13. The software will return the solution **Adequacy factor**:
    - For a **Factor Load(s)** analysis , the **Adequacy factor** is the factor by which the loads/acceleration defined in Step 8 must be multiplied to cause collapse by the mechanism identified. An *Unstable* result indicates collapse will occur without the applied load. A *Locked* result indicates that collapse will not occur for any value of the loads/accelerations.
    - For a **Factor Strength(s)** analysis , the **Adequacy factor** is the factor by which the material strengths must be reduced to cause collapse by the mechanism identified.
14. If required, re-run the analysis using a higher nodal density to check convergence of solution. A higher nodal density can be set using **Nodal Density**, by adjusting the **Baseline Nodal Spacing** in individual **Solids**/**Boundaries**.

2 Performing specific design checks

Find factor on applied load

- Select the **Factor Load(s)** analysis mode.
- Apply adequacy to the relevant load (set load to a value of 1.0 if actual collapse load required).
- Choose *Unity* scenario.
- Solve.
- The **Adequacy factor** is the factor on the specified load.

Find factor on strength

- Select the **Factor Strength(s)** analysis mode.
- It is not necessary to apply adequacy to any actions. (If applied then it is ignored for this analysis.)
- Choose *Unity* scenario.
- Solve.
- The **Adequacy factor** is the factor on the material strengths.

Check design to a code e.g. Eurocode DA1/2

- Select the **Factor Load(s)** analysis mode.
- Apply adequacy to any unfavourable action (load, self weight and/or acceleration) relevant to the stability problem to be studied.
- In the **Scenario Manager** select or set appropriate Partial Factor set for the Code in question.
- Solve.
- If the **Adequacy factor** ≥ 1.0 , the design complies with the requirements of the code.
- If the **Adequacy factor** < 1.0 , the design does not comply with the requirements of the code.

Notes:

1. In this process partial factors are pre-applied before solve.
2. It is also possible to use the **Factor Strength(s)** analysis mode if desired.

All results are subject to specified solution accuracy controls, e.g. nodal density.

For more information: www.limitstate.com/geo