Yorkshire and Humber

Institution of Civil Engineers

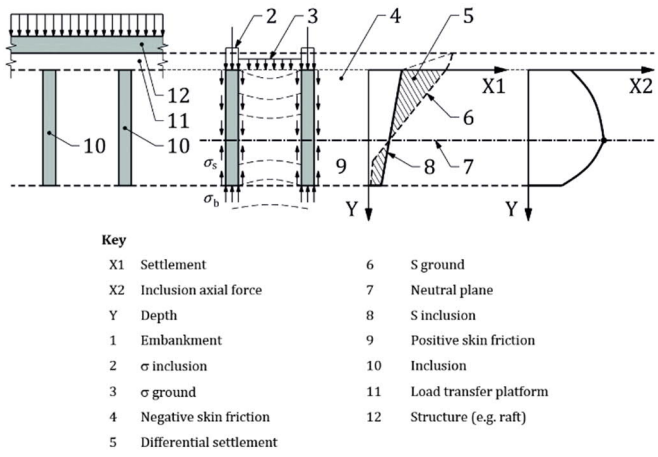
Yorkshire Geotechnical Group

Rigid Inclusions Ground Improvement – Design Insights

Tuesday, 11th January 2022, 18.00 - 19.30 – Online meeting
Speaker: Chris Raison, Raison Foster Associates

ABSTRACT

Ground improvement using rigid inclusion methods falls between the high vertical stiffness and low settlement behaviour of pile groups and piled rafts on the one side, and the lower stiffness and higher settlement of vibro stone columns on the other. The presentation will introduce and describe this method of ground improvement. It will show how rigid inclusion methods are part of a family of techniques; some have been in use since the early part of the 20th Century. Ground improvement using rigid inclusions has been used intermittently for a similar period of time, but the concept has really only been widely available in the UK over the last 20 years. The presentation will describe the more common construction methods, the main uses, and the types of ground model that are ideal for this ground improvement technique.



Key

X1	Settlement	6	S ground
X2	Inclusion axial force	7	Neutral plane
Y	Depth	8	S inclusion
1	Embankment	9	Positive skin friction
2	σ inclusion	10	Inclusion
3	σ ground	11	Load transfer platform
4	Negative skin friction	12	Structure (e.g. raft)
5	Differential settlement		

The presentation will show that current design based on black box FEA methods are opaque with regards to how rigid inclusions work. The FEA approach hides key mechanisms that control behaviour and performance. However, it is possible to use simplified spreadsheet methods together with 'off-the-shelf' design software which can provide a much better understanding of the mechanisms and identify risk areas.

Some examples of projects and designs will be given. If time allows, the presentation will describe how this form of ground improvement is likely to be covered by the Second-Generation BS EN 1997 British Standards currently under development.

Chris Raison is a founder member and Director of Raison Foster Associates providing specialist geotechnical advice and guidance, design calculations and reporting to the Piling and Ground Improvement industry, Main Contractors, Developers and Consulting Structural Engineers. Chris is actively involved within the geotechnical industry including technical presentations at BGA, MGS and regular attendance at informal evening meetings and symposiums. Currently he is serving as a committee member with the Association of Geotechnical Specialists, British Standards technical committee B/526 and is part of the Eurocodes TC250/SC7/WG1 working group dealing with the Second-Generation development of BS EN 1997 Eurocode 7.

This meeting will be held via Microsoft Teams – refer to the ICE or BGA websites for the link.

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