BR470 WORKING PLATFORMS FOR TRACKED PLANT

Use of 'structural geosynthetic reinforcement' – A BRE review seven years on

The guide to good practice, Working platforms for tracked plant, was prepared by BRE under the direction of an FPS Steering group, and was published in June 2004 as Report BR470. Available evidence indicates that the guide has proved satisfactory in its principal objective of improving safety by promoting the implementation of minimum design, installation and maintenance standards. However, some concerns have been expressed about the way in which the effect of 'structural geosynthetic reinforcement' is evaluated and it has been pointed out that the contribution of geosynthetics can be represented in ways other than that depicted in the guide. Pending a full review of the guide, BRE has reviewed this one issue and its findings are summarised here.

The performance of working platforms reinforced with geosynthetics is complex and a wide variety of geosynthetics with very different properties may be utilised. In addition, there are several possible failure mechanisms along with the commonly considered punching-type failure. It is therefore unlikely that a single simple design method can be developed which will have a universal application and which will preserve both safety and economy. The calculation method in the guide for geosynthetic reinforced working platforms has two stages. The second stage of the calculation, which in many cases will be the decisive consideration in determining the depth of the platform, applies a control on how much contribution can be obtained from the inclusion of geosynthetic reinforcement.

BR470 acknowledges that there will be many situations in which alternative design approaches are acceptable. In section 3.1 it is stated 'On some sites, where it may be more economic, or where particularly difficult conditions are encountered that are not covered by this guide, a more sophisticated approach is warranted.' In practice a number of other approaches have been adopted for the design of geogrid reinforced working platforms. These include the load spread model which is based on an assumed redistribution of the applied load through the reinforced platform, the bearing capacity improvement model in which it is assumed that a reinforced working platform has the effect of increasing the bearing capacity of the subgrade by a certain multiple and the load factor model which is based on an experimentally determined relationship between the bearing capacity of reinforced and unreinforced platforms.

Such alternative methods should only be used in situations for which they have been validated by past experience and by appropriate experimental testing. Experimental laboratory testing should be carried out at an appropriate scale. For example, the load should be applied through a loading plate of suitable shape and of a size commensurate with the geosynthetics and the particle size distribution of the granular material used to represent the platform. Ideally the overall scale of the test should be able to incorporate materials used in platform construction and a plate width or diameter of at least 0.3 m is recommended. A test enclosure should be of sufficient size to ensure that boundary effects are not significant. Measurements should include real-time monitoring to demonstrate the development and distribution of internal stresses and strains within the platform and subgrade. The measurement of lateral strain within the geosynthetics would be of particular value. The application of the experimental results to a particular design approach should be undertaken by a competent person.

Geosynthetic reinforcement for a working platform should be designed by a competent person and a number of issues need to be considered including the position, extent, type, stiffness and strength of the reinforcement. Another critical feature in design calculations is the assignment of design values to ground properties, geosynthetic reinforcement and loading conditions and, since most calculation methods are likely to have an element of empiricism, it is important that design values incorporate factors which have been found to be appropriate for the particular method of calculation.

Manufacturers of geosynthetic products may have wide experience of the behaviour of their products in working platforms and be able to offer a cost-effective design. Where a geogrid reinforced working platform is designed by the geosynthetic manufacturer it is particularly important to identify clearly where responsibility lies for the design, placement and operation of the platform. The basis of the design calculations should be stated and reference made to credible research that validates the method.

The guide emphasises that the results of calculations should be critically appraised by a competent person. Furthermore, all forms of guidance can only be effective in so far as they are actually followed and careful supervision, control and monitoring of the platform on site under appropriate contractual arrangements are essential during placement of the platform and in its subsequent use. A particular consideration for a reinforced working platform is the vulnerability of the geosynthetic reinforcement to damage due not only to inadvertent site activities involving excavations through the platform but also to the piling operation itself.

Summary

1. BR 470 has proved satisfactory in its principal objective of improving safety.

2. BRE has reviewed the single point about the use of alternative methods to represent the contribution of geosynthetics instead of that depicted in the guide.

3. In principle, BR 470 can embrace alternative approaches to the design of mechanically stabilised working platforms providing:

   a) the objective of safety is preserved,

   b) alternative approaches are based on credible and representative research which is interpreted and formulated according to the geotechnical discipline and validated by well documented case studies,

   c) a person competent in both geotechnical engineering and geosynthetics is made responsible for the design.

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