

GTD 2015/001

Use of new geotechnical products or techniques on Roads & Maritime projects

Summary:	Audience:
This technical direction has been issued to raise the awareness of potential risks associated with the use of new geotechnical products, processes or techniques on Roads & Maritime projects without appropriate review and approval.	<ul style="list-style-type: none">• Project Managers• Contract Managers• Technical Officers• Surveillance Officers

Issue

New geotechnical products and techniques are emerging on the market regularly. Incorporation of these geotechnical products or techniques in Roads & Maritime works without appropriate assessment presents unacceptably high technical risks and reputational risks to Roads & Maritime.

Background

Innovative geotechnical products and techniques emerge on the market frequently. The suppliers often claim superior performance to existing similar products in terms of technical capability or economics. Roads & Maritime project managers or contract managers may be contacted by suppliers with an intention to allow their products to be incorporated in Roads & Maritime projects.

Some of these products do have legitimate benefits but others may not. The assessment of such products and techniques requires specialist knowledge.

Comments

Whilst it is important to acknowledge the contributions of innovative products and techniques in Roads & Maritime projects, it is equally important to recognise their limitations before being integrated into Roads & Maritime infrastructure.

Some of these products and techniques may perform well where they are developed but they may not perform as well in the harsh Australian conditions. Significant modification may be needed to accommodate the differences.

Approvals:

Owner:	Principal Engineer, Pavements and Geotechnical	Review Date:	12 months after Approval date
Authorised by:	Chief Engineer, Engineering Services Chris Harrison	Effective Date:	17 July 2015
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Some products and techniques may work well in some geological conditions but could become problematic, let alone dangerous, if the condition of application is not well understood.

Inaccessible structures in major projects often require 100-year design life and durability is a key measure against this criteria. Some products may perform well in the short term but could deteriorate when subjected to unfavourable environmental conditions. The cost to repair these structures under established traffic often outweighs the apparent initial savings.

It is not possible to list all the possibilities but the examples in Annexure A will serve to highlight the varied nature of the risks from these products and techniques.

Roads & Maritime encourages suppliers to meet specification requirements, or where appropriate, conditional use on a project may be given if one or two specification requirements are not met. Alternatively, a new specification may be prepared to ensure that a new product can be procured without limiting supply to one company.

Roads & Maritime has an innovative product evaluation scheme for unique pavement materials, and this will be extended to geotechnical products in the future.

Actions

All new geotechnical products and techniques proposed for use in construction and maintenance projects must be submitted to Pavements & Geotechnical Section for assessment and approval prior to being specified.

All proposals from contractors for use of new products or techniques must be submitted to Pavements & Geotechnical Section for assessment and approval prior to being accepted for use.

New geotechnical products and techniques approved for use, together with the conditions of use, will be listed on the Roads & Maritime Register of Materials on the Roads & Maritime website.

For further technical advice please contact the Principal Engineer, Pavements & Geotechnical (George Vorobieff) on 02 8837 0580.

This Technical Direction is not a direction under any existing contract. Any direction required will be issued by the Principal's Authorised Person to the Contractor.

ANNEXURE A

Examples of Impacts from New Geotechnical Products and Techniques

In recent years Roads & Maritime has experienced impacts on projects from using new geotechnical techniques without sufficient assessment of the efficacy of the new geotechnical techniques. Some of the problems may not become immediately apparent and the issue of durability may lead to problems beyond the completion of construction.

The following are selected examples to demonstrate some of the impacts. The list is by no means exhaustive.

Example 1 - Ballistic nails for slope stabilisation

The claim: Nails are ballistically fired into the ground, negating the need for drilling and grouting. This allows more rapid installation and stabilisation of slope batters.

Issues:

- not suitable for all ground conditions,
- refusal often occurs in stiff materials or solid inclusions in the ground resulting in limited penetration and hence limited capacity for stabilisation.
- insitu load tests also confirmed limited adhesion capacity for stabilisation.
- there are significant Work Health Safety (WHS) issues with potential to inflict serious injuries from deflected nails.

Comments: This slope stabilisation technique is not recommended in Roads & Maritime projects.

Example 2 - Geosynthetic products

These products include geotextiles, high strength geosynthetic reinforcements; fibreglass products and the like.

The Claim: light weight, low cost, high strength, chemically inert and durable

Issues: many of these products are developed in the northern hemisphere and tested under different conditions from those of the Australian.

The ambient operation temperatures in Australia for example are quite a few degrees higher than those in Europe and this is sufficient to upset and invalidate the documented test results.

Geosynthetic materials are also known for their creep characteristics with potential for creep rupture failure. This must be conservatively estimated.

Geosynthetic materials can have high short term strength compatible with that of steel. However some are susceptible to degradation in unfavourable ground conditions, such as hydrolysis of high strength polyester fabric on exposure to moisture.

Engineering Services Branch has recently assessed a glass fibre reinforced product and found suggestion of degradation from alkaline solution. Further testing is also proposed to verify the quantum of the problem. Protective sheathing is mandated to avoid the problem before the product can be considered for Roads & Maritime projects.

Comments: geosynthetic products need to be assessed on a case by case basis and design assumptions need to be checked for Australian conditions.

Example 3 - Recycled crushed concrete materials

The Claim: environmentally friendly, abundant and economical, durable

The issues: The materials are mildly alkaline. When used in conjunction with steel reinforcement or polyester products in reinforced earth structures, they create an unfavourable environment for these inclusions and significantly reduce their life expectancy.

Comments: recycled crushed concrete is not to be used in reinforced soil structures with steel or polyester reinforcement products under Roads & Maritime specification R57.

Example 4 - No fines concrete block walls

The Claim: relatively light weight, easy to install, porous negating a need for drainage

The issues: these products are often unreinforced. Strength between particles are derived from limited bond between hard points of particles and they are therefore susceptible to uncontrolled cracking on differential ground movements.

There are separate risks associated with the porous characteristics. The porous nature of the product encourages flow through the structure. Even if the ground water is mildly aggressive, the structure could deteriorate rapidly at the base where it is highly stressed. On the other hand, it is not uncommon to have blockage by the fine particles in soils. As there is no recourse to flushing in the design, substantial hydrostatic load could develop behind the structure, consuming and jeopardising the retention capacity of the structure.

These walls generally do not have the 100-year design life which is required for permanent structures in Roads & Maritime infrastructure.

Comments: these walls are not recommended to be used as permanent structures in Roads & Maritime infrastructure.

Example 5 - Sonic coring for site investigation

The Claim: Fast and economical continuous rock core recovery without the need for drilling water,

The issues: significant disturbance of the core samples resulted from this drilling technique has led to incorrect classification of the rock for engineering purposes. The incorrect ground interpretation has led to excessive pile design, and has resulted in project prolongation due to requirements for additional ground investigation.

Comments: the rock cores recovered by this technique require specialist experience for interpretation. Sufficient number of independent conventional diamond cored holes must also be undertaken for calibration purposes.