

OPTIMUM USE OF MATERIAL

Dirk Heyer, Dr Ing
Technische Universität München
Email: Dirk.Heyer@bv.tu-muenchen.de

ABSTRACT

The optimum use of mineral building materials in earthworks constructions will attain a substantial meaning in the upcoming years. Key words such as sustainability in civil engineering, preservation of resources and efficient use of materials describe important environmentally referred objectives of politics. We should take advantage of this situation for our aims. It is essential to develop building procedures, building methods and building materials, which make it possible to avoid mineral waste to large extent, and use to all excavated soils, recycled building materials and industrial by-products extensively. Hence also geosynthetics will gain importance, since their use can lead to a substantial reduction of mineral building materials.

In order to achieve these objectives, it is necessary that both environmentally referred interests and construction interests must be merged and a building material flow management must be established. Current innovations in the highway construction regulations, introduced in Germany recently, take these topics into account.

Different research projects have dealt with the following specified topics, which served the above mentioned objects:

- Use of weak rocks for earthworks
- Disaggregation and processing of materials excavated from tunnel sites
- Use of geosynthetics for saving natural mineral embankment construction materials
- Applicability of soils containing mineral impurities, of recycled building materials, demolition waste and industrial by-products.

In a case study at Munich airport the use of organic soils in earthwork constructions is presently tested.

NATIONAL APPROACHES AND SOIL CLASSIFICATIONS IN EUROPE, AN OVERVIEW

Jean-Pierre Magnan
Laboratoire Central des Ponts et Chaussées
Email: jean-pierre.magnan@lcpc.fr

ABSTRACT

The technical rules for earthworks in Europe have always been defined on a national basis. The recent creation by CEN of a new Technical Committee TC 396 on Earthworks offers new perspectives for the development and harmonisation of earthworks practice in Europe. A partial survey of national practices was done in 2008, as a preliminary study for the creation of the TC. The conclusions of this survey are reported in this presentation. They may be summarised as follows:

- In the surveyed countries, recommendations are given for excavation and embankment compaction using a classification for site won materials (soils and rocks) imported materials and refer to acceptability rules;
- In each country, the classification is based on laboratory test made at the time of extraction, sometimes complemented at the time of compaction. It has been developed to suit the requirements of handling earthworks materials to construct embankments using defined compaction methods or procedures to produce the desired end product;
- The mechanical properties of the “end-product” (earth-structure) are defined in terms of deformation modulus classes, associated with density requirements for each type of material;
- Unacceptable materials in the natural state may be processed by mechanical, chemical or other means to render the material acceptable;

Compaction may be defined either by specifying the method of compaction or by specifying the required density of the compaction material. In both cases, compaction requirements are the way to obtain the required mechanical properties and durability of the embankment as an earth-structure.

GEOTECHNICAL RISK AND PERFORMANCE

Dr John Perry
Mott MacDonald Ltd
Email: John.Perry@mottmac.com

ABSTRACT

This Paper discusses the various influences controlling risk and performance from new build to the in-service aspects of the transport infrastructure geotechnical asset of which earthworks are the major part. It focuses on the risks associated with earthworks during construction and when subject to aging. Compaction specifications, their origins and past supporting research results are described and the advantages and disadvantages of the end-product and the method specification give an insight on the development of earthworks design, construction and contracts. Recommendations are given based on modern practice and current contractual arrangements. Monitoring performance is critical to the management of geotechnical assets and the establishment of IT based methods in the UK is discussed. The risk assessment of earthworks is considered and reference made to established methods. Recent research on influences on risk show the wider and currently less predictable effects on earthworks of vegetation and climate change. The potential for deterioration models and whole life costing is given to complete a 'cradle to grave' review of aspects of earthworks risk and performance.

MEASURING AND MITIGATION OF ENVIRONMENTAL IMPACT OF EARTHWORKS

Nick O’Riordan, Alan Phear
Arup
Email: nick.oriordan@arup.com

ABSTRACT

Considerable progress has been made in the assessment, management and maintenance of existing earthworks and in the selection of methods of construction of new earthworks. Techniques involving multi-criteria analysis, carbon-footprinting and life cycle assessment of competing schemes provide transparent methodologies for use in environmental impact assessment. This review paper provides examples of use of the various techniques, and in particular concentrates on areas of innovation including:

- Reuse of excavated tunnel spoil
- Methods of ground treatment to minimise earthwork impact (e.g. in situ soil strengthening, green walls etc)
- Combining performance-based design, under environmental load cases such as earthquake and flood, with carbon footprint and cost analyses

RAILWAY EARTH ASSET MANAGEMENT AND STABILISATION – GREAT BRITAIN

Derek Butcher

Network Rail

Email: Derek.Butcher@networkrail.co.uk

ABSTRACT

Most of the British Overground railway is between 100 and 150 years old. It was constructed by Victorian Engineers before modern methods of design and construction were developed. This presentation outlines the risks associated with running a railway on or in old earth assets and how these are mitigated, and how a least impact approach on users is adopted. The British weather plays a large part in the asset management of the railway and the presentation will show how the earth asset management process is robust and cost effective and will present a number of examples of innovative techniques and will highlight a number of firsts in terms of works adjacent to running railways.