SAIEG presents a two-day seminar on

CONSTRUCTION MATERIALS

Venue: Salt Rock Hotel, 59 Basil Hulett Dr, Salt Rock, Dolphin Coast, KwaZulu-Natal

Date: Thursday 5 and Friday 6 March 2020

SAIEG
South African Institute for Engineering and Environmental Geologists

PRESENTATIONS

Dr Phil Paige-Green – Materials for low volume roads

Low volume roads (both paved and unpaved) dominate the international road networks in terms of total kilometres. However, their nature makes them both unsustainable, unpaved roads requiring replenishment of their imported gravel every few years and paved roads currently requiring materials that can be more cost-effectively utilised in more heavily trafficked roads in future. This presentation will cover the selection of optimum wearing course materials for unpaved roads as well as innovations in the use of local materials for low volume roads.

Dr Souleymane Diop – Aggregate Resources: Investigation of Crushed Stone Potential

Identifying good quality crushed aggregates is essential for constructing and maintaining what is literally the physical framework of infrastructure on which our society depends. In this presentation, I will use case studies from the Eastern Cape Province where satellite imagery was used in combination with detailed geotechnical desktop studies to identify the best potential crushed aggregate sites. The geotechnical study took into consideration the engineering properties of the underlying geology, terrain morphology, types of soils and the type of weathering that can be expected. All of this information was used to derive 'Quarry Potential Zones (QPZ)', which served as input in the interpretation of the satellite imagery. Areas with good outcrop and road access were selected and sampled for further geotechnical laboratory testing.

The current results show many areas of interest for good quality aggregate based on their physical characteristics, such as crushing strength, water absorption, resistance to impact, abrasion and

polishing. The results further show that there is a very strong correlation between identified QPZs and the measured geotechnical parameters.
The predictive capability of this new approach can be highly effective for characterizing the crushed aggregate potential of an area, and enable the identification of QPZs to be made on a more economical and rational basis.

Ms Bronwen Griffiths - Environmental permitting controls for the proclamation and re-opening of material sources (quarries and borrow pits)

The paper / presentation will aim to provide a high-level overview of environmental legislation of relevance to the development and future use of material used in construction – be this for a road or for civils. In addition, guidance on the roles and responsibilities of the key role-players in the process will be considered.

As such topics to be considered include – from legal controls, to possible stumbling blocks that may make an otherwise “perfect” site non-viable. These topics will be addressed as a series of questions which through their answers will help guide strategic material sourcing programmes, as well as allowing specific sites to be considered for their suitability. The questions guide the consideration of the potential for a site to be approved, plus indicating the combination of approvals needed for a specific site and/or activity.

- What is the legal status of the site?
- What materials do you need?
- How big a footprint do you need?
- How long do you need to mine for?
- What alternatives must be considered?
- What is / is not included in the “mine”?
- Water usage on a site
- Who does the site belong to?
- Exemptions applicable to state owned sites
- Is the site deemed “sensitive”?
- Closure of a mine and re-use of the site
- Can spoil be disposed of on the site?

The presentation dominantly indicates the needs of the mineral rights holder or applicant. I will indicate how these needs can be best served by a specialist such as engineering geologists, so as to provide a materials source that leads to a win-win scenario – providing sustainable material provision, whilst ensuring environmental impact is limited and adding value to local communities (if affected).

Dr Roderick Rankine - Aggregate requirements for concrete

The talk will cover the requirements of aggregates to make competent economical concrete and how to go about verifying that a previously unknown material will be suitable. The emphasis will be placed on the practical problems of obtaining samples that are as representative as possible for testing when there is no existing quarry or facilities to quarry, crush and screen materials. I will be making reference to real case studies including the Lesotho Highlands Water Project, Coega Harbour, nuclear power station and a mine in Botswana. The presentation will include a description of various tests that can be done and how to interpret results with reference to precedents elsewhere.

Dr Emile Horak - Asphalt aggregate requirements

Aggregates used in asphalt mixes are well described in a number of guidelines and recommendations. In the latest SABITA TG35 asphalt mix design guideline a strong reliance is placed on the volumetric packing of aggregates in the asphalt mix to provide structural strength via the stone or sand skeletons. In the same TG35 the fundamental basis of the Bailey method is promoted as assistance to incorporate such packing principles. The short comings of the Bailey method was overcome recently by successfully linking Binary Aggregate Packing (BAP) principles with the Bailey method ratios. The BAP is derived from work done originally in concrete mix design. Recent work on newly described Rational Bailey Ratios (RBR) enabled the articulation with BAP to enable the description of porosity. Porosity can be used as packing indicator as used by the Dominant Aggregate Size Range (DASR) method. The use of the RBR helped to unfold a broader application of the original principles of the Bailey method in asphalt design with various RBR parameters linked to strength characteristics as well as permeability and therefore durability of asphalt mixes.

Prof Louis van Rooy & Dr Robert Leyland - Use of basic igneous rocks in construction

This presentation will discuss the petrogenesis of dolerite and basalt and the distribution of these rocks in Africa. The influence of mineralogy and weathering on basalt durability will be discussed with specific reference to experiences with basalt as a construction material and host rock for tunnels. The properties of residual basalts will also be discussed. The weathering and durability considerations of dolerite will then be discussed specifically in road construction and testing of dolerite durability. The presentation will end with a discussion on the new draft COLTO specification of basic igneous rocks and what this will mean for material testing programs going forward.

Dr GV Price - Tillite

1. Geological Deposition
2. Tillite Distribution in Southern Africa
3. Engineering Properties
4. Uses as Construction Material
5. Structural
6. Dams
7. Roads
8. COLTO Minimum Requirements
9. Some problems
10. General to KZN

The tillite presentation will kick off with a brief description of what tillite is and how it formed geologically with some idea of its distribution in Southern Africa. Next will be a discussion on its engineering properties followed by some idea of its practical application in the building industry; roads (including bridges); dams (rockfill and rubble masonry); some minimum properties (COLTO); general problems that might arise when using tillite as a construction product; and a few closing stories with respect to its use in KZN and northern Wild Coast. Also included will be a brief reference to the two quarry site visits in the afternoon of 6 March 2020.

Dr GV Price - Quarry Visit

The site visit will include a dolerite quarry and a tillite quarry. It will be of a general nature. The focus will be on how these sites operate; quality of their stone; local problems; etc. ***Please note that you will need to bring your own PPE – exact requirements will be confirmed closer to the date.***