SLGS NEWSLETTER

SRI LANKAN GEOTECHNICAL SOCIETY

A Member Society of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE)

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A Message from the Editor

Dear Readers,

Annual General Meeting, Project Day 2016 and the Annual Conference of SLGS were held on 14th September 2016 At the CIDA Auditorium. In the morning session, nine commendable undergraduate research projects on geotechnical engineering competed for the prestigious best undergraduate research project award. In the afternoon session, five presentations were lined up for the annual conference. These presentations were based on contemporary geotechnical topics mainly research done at postgraduate level.

The abstracts of the SLGS project day presentations are given in page no 2 and 3 of the Newsletter. The abstracts of annual conference presentations are given in pages 4 and 5.

Newsletter also presents information on, Geo Forum on "Landslide Monitoring Including the use Tilt Sensors" conducted by Prof. Taro Uchimura of Saitama University on 10th October 2016 at the NBRO Auditorium.

The new committee elected at the AGM is also presented.

Dr(Eng). L. I. N. de Silva – Editor Newsletter
Email: nalinds@uom.lk

Contents

Mr. K. H. S. M. Sampath receiving his award from Prof. B. L. Tennekoon (top) and Ms. B. L. A. Isaka receiving her award from Dr. P. Ratnaweera (bottom).

SLGS Project Day 2016

The annual SLGS project day was held on 14th September 2016 at CIDA Auditorium. Nine commendable undergraduate projects competed for the best geotechnical project 2016 award. First place was awarded jointly for the following projects and each project received a cash price of Rs. 15000 and a certificate.

A Study on the Application of Poker Vibrator for Compacting Quarry Dust by K. H. S. M. Sampath, University of Moratuwa.

Analysis of Soil-nail Pullout Interaction in Lateritic Soil using Laboratory Models by B. L. A. Isaka and B. C. Madushanka, University of Ruhuna.

SLGS Executive Committee for the year 2016—2017

Details of the committee appointed for year 2016-2017 is presented below.

Prof. S A S Kulathilaka (President)

Eng. K L S Sahabandu (Vice President)

Eng. K S Senanayake (Past President)

Prof. B L Tennekoon (Past President)

Dr. J S M Fowze (Hony. Secretary)

Eng. K H V V Madushanka (Assistant Secretary)

Eng. W A A B Bandara (Treasurer)

Eng. R M Rathnasiri (Assistant Treasurer)

Dr. P Ratnaweera (Editor- Journal)

Dr. L I N De Silva (Editor- Newsletter)

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Dr. W A Karunawardena (Committee Member)

DR. U P Nawagamuwa (Committee Member)

Dr. N H Priyankara (Committee Member)

Eng. A L T C Samarasinghe (Committee Member)

Abstracts of SLGS Project Day 2016

Effect of Rainfall on Slope Failures in Unsaturated Soil

A. B. K. A. Lakmali and H. B. P. Raveendra
Department of Civil and Environmental Engineering, Faculty of Engineering, University of Ruhuna.

ABSTRACT: Slope failures and landslides in unsaturated soil are influenced by geologic, topographic and climatic factors. The main triggering factor for these slope failures in the unsaturated soil is the rainfall. Rainwater infiltration causes a loss of matric suction creating positive pore water pressures with the development of the perched water table. This paper discusses about the geotechnical properties, specially the shear strength parameters of unsaturated soil and how they get changed with the rainfall and the soaking effect. With the change of shear strength parameters of soil, the stability of slopes with unsaturated soil is varied. In this research study, the mechanism of slope failures in unsaturated soil, was studied considering the variation of shear strength parameters on moisture content of soil. The effective cohesion seems to be decreased by 85% and the friction angle by 28% after 6 days of continuous rainfall. Slope stability analysis was done using SLOPE/W software incorporating the results of seepage analysis done with SEEP/W software.

Optimization of Landfill Final Cover Based on Gas Exchangeable Properties of Soil

M. H. Samarakoon and E. B. S. Madushan
Department of Civil and Environmental Engineering, Faculty of Engineering, University of Ruhuna.

ABSTRACT: Solid waste inside the landfill undergoes complex sequence of reactions. These reactions can be mainly categorized into two groups namely aerobic and anaerobic. In both these reactions, carbon dioxide generates as one of the resultant gases. However in anaerobic condition, methane gas which is more critical for greenhouse effect produced and emitted to the atmosphere through final soil cover. Gas exchange through final cover soil is mainly governed by two gas transport mechanisms namely advection and diffusion. Hence it is very important to study the gas exchangeable properties of final cover soil of an engineered landfill. In this research study, the effect of compaction energy, grain size distribution and moisture content of final cover soil on gas transport parameters were studied. Based on the results it can be concluded that, in order to enhance the aerobic condition inside the landfill cover, it is important to compact the final cover soil in the dry side of optimum moisture content with intermediate particle range. Obtained results were compared with the existing gas transport models and results illustrated that findings of this research study agreed well with the existing models.

Analysis of Soil-nail Pullout Interaction in Lateritic Soil Using Laboratory Models

B. L. A. Isaka and B. C. Madushanka
Department of Civil and Environmental Engineering, Faculty of Engineering, University of Ruhuna.

ABSTRACT: Soil-nailing is an effective slope stabilizing technique and soil-nail interaction plays a vital role in designing soil-nailing structures. This study was carried out to determine the pullout resistance of a soil-nail and the load-displacement behaviour of a nail under pulling. Several pullout tests were conducted under different overburden pressures and different saturation conditions on steel bars embedded in compacted soil by preparing a laboratory model. Also the effect of grout interface on pullout resistance was evaluated by introducing a grout interface between nail and soil. Based on the laboratory experiments it was revealed that the experimental peak pullout forces were higher compared to that of the theoretical values and a multiplication factor within a range of 2.0-2.7 was resulted for the experimental to theoretical values. This difference was significant with a grout interface and the multiplication factor increases up to a range of 4.8-6.0. A two-dimensional PLAXIS model was used to validate and analyze the experimental data numerically.

Effect of Salinity on Consolidation of Peat

K. H. S. S. De Silva
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: Peat is a problematic geotechnical material, which could cause large settlements when subjected to loading because of the consolidation effect. In addition to the well known factors affecting consolidation of peat, Zhang and O'Kelly (2013) showed that addition of salt grains improves the primary consolidation rate of peat specimens. In this research, the impact of salinity of water for the rate of consolidation was analyzed. The samples were mixed prior to and after addition of salt to achieve identical samples. Kaolin clay samples were used as control specimen and those samples had no considerable effect on consolidation rate with the addition of salt grains. It was found that under similar conditions of one dimensional loading, consolidation rate of peat can be increased with the addition of salt. For quantitative analysis further experiments are required.

Comparison of Stone Column Design Methods

W. L. D. H. A. Perera
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: Use of stone columns is a ground improvement technique that can be applied when high embank-

ments are to be constructed on thick layers of soft soils. Stone columns installed in an appropriate pattern, reinforce the soft soil enhancing the shear strength and reducing the settlements. There are several methods for the analysis and design of stone columns. These designs come up with a factor of safety, which cannot be verified in the field. Comparison of Factor of Safety computed with different approaches will be useful in optimizing the design procedures. Designs done with limit equilibrium approach and finite element approach are compared in this research. GEOSLOPE - SLOPE/W software was used for the limit equilibrium approach and PLAXIS 2D software was used for the finite element analysis.

Finite Element Analysis of a Deep Excavation Supported by an Anchored Diaphragm Wall

H. M. C. N. Rathnayake
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: Two zoned excavation, 4m & 11m deep at ITC Hotel at Galle Face supported by an anchored diaphragm wall is reviewed through this research. This paper presents a back analysis for the excavated zone 1 using computer program PLAXIS based on finite element method & predict the settlement in zone 2 which is expected during excavation. The geotechnical parameters were selected based on the soil investigation report. All soil were modeled using "Mohr Coulomb soil model" and drained analysis were carried out. The lateral movement of the diaphragm wall, settlement of the ground calculated from the FEM analysis were compared with the actual field measurement taken by total station & inclinometers. Finally differences between field measurements and FEM analysis results were discussed and anticipated settlement for the zone 2 wall section was predicted. Some suggestions for the use of FEM model to simulate the deep excavation supported by anchored diaphragm wall are also presented .

Determination of Age of Municipal Solid Waste Through Soil Tests

J.Thirojan
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: The evaluation of the geotechnical properties of MSW is difficult due to heterogeneous nature and the changes in such properties due to degradation. Therefore, the variation of geotechnical properties of MSW with fill age has to be studied. MSW with known age were collected from Kallundai and Karadiyana dump sites. The particle size distribution, specific gravity, Atterberg limit, proctor compaction, permeability and direct shear tests were conducted on nine samples in order to obtain the variation of geotechnical properties with age of MSW. The particle sizes, gravel percentage, liquid limit, plastic limit, plasticity index, optimum moisture content, hydraulic conductivity and friction angle show decreasing trend, while sand percentage, silt and clay percentage, specific gravity, maximum dry density, waste homogeneity and cohesion show increasing trend with fill age. Some of the data were obtained from published literatures in order to compare the results of the current study. This paper highlights the importance of giving due recognition to the variation of geotechnical properties of MSW with fill age when designing.

A Study on the Application of Poker Vibrator for Compacting Quarry Dust

K. H. S. M. Sampath
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: Quarry dust is widely used as a filling material to achieve higher bearing strength and to minimize the settlements underneath foundations, especially when the water table is encountered. Practical approaches suggest that a poker vibrator can be used to achieve higher degree of compaction easily, when the ground water table is above the excavation level. However, currently there is no proper procedure to follow the filling process. Thus it is attempted in the current study to carry out a sequent of experiments and determine what the optimum methods are, which can be adopted to achieve higher degrees of compaction. Here, the research was basically focused on determining an optimum time of application, preferable layer thicknesses and optimum patterns of applying poker vibrator, in order to achieve acceptable degrees of compaction.

Experimental Investigation on Strength and Deformation Characteristics of Crushed Concrete Aggregate

R. K. S. R. Ratnayake
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: One of the major construction and demolition waste is scrap concrete which can be recycled and reused. This study is focused on strength and deformation characteristics of crushed concrete and its potential for geotechnical backfill applications. Study was done with a series of CD triaxial tests and found that the friction angle is 32^0 and cohesion is 130 kN/m^2 . Also it is found that the maximum dry density is 1850 kg/m^3 at optimum moisture content of 13% and CBR is 118.6. Concluding, experiments shows that Cruched Concrete) CC) has considerable shear strength characteristics which makes it a potential backfill material in terms of strength and deformation characteristics.

The annual conference of SLGS was held on the 14th September at the CIDA auditorium. Five presentations on contemporary geotechnical topics were presented at the conference by practicing engineers. The abstracts of the presentations done at the annual conference are given below.

Study of Pullout Resistance of Soil Nails in Tropical Residual Soils

W. E. P. Ranjan Kumara
Central Engineering Consultancy Bureau, Sri Lanka.
S. A. S. Kulathilaka
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: The pullout resistances in soil nailing designs are mostly estimated using available empirical formulae or theoretical formulations. Occasionally these are revised through pullout tests done at early stages of the design. In Sri Lanka pullout tests are mostly done as proof tests after completion of a project. With the actual length of the nail the pullout resistance exceeds the tensile strength and such nails will never be subjected loads close to their pullout capacity. In this project eight nails were done with short grouted lengths and all the nails were completely pullout after subjecting to a three loading/unloading/reloading cycles. The shear strength parameters of the soil forming the slope were obtained by testing undisturbed samples under both natural and saturated conditions. These parameters were used in currently available design formulae to estimate a pullout resistance which was then compared with the experimentally determine value. The experimental value was found to be generally greater than the estimated value. The diameter of the pulled out grouted body was found to 20% more than the nominal diameter. When the effects of ; matric suction (estimated), possible dilation effects and increase of diameter were accounted the two values became much closer.

Evaluation of Mode of Failure of Usgala Siyabalangamuwa Dam

S. K. Hewagama
Irrigation Department, Sri Lanka
L. I. N. De Silva
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: In this study, the probable cause for failure of Usgala Siyabalangamuwa tank was investigated. Back analysis of the stability of dam under steady state and rapid drawdown conditions were carried out using the sub surface characteristics obtained from geotechnical investigation carried out at the dam. Results of the analysis showed that the section at chainage 891.5 m is weaker than the section at 998 m. But, the failure of dam was taken place from 860 m to 1,100 m in 2008 inclusive of 998 m. When soil mass at 891.5 m is moving towards the toe of the embankment, the adjacent soil mass was also accompanied due to shearing force. This may be the cause of failure of the full stretch. The type of material at cross section of 998 m is clayey sand to silty sand which consists of finer particle with high cohesion, may also be a reason for the higher stability. The most important lesson learnt is that rapid drawdown should not be allowed in earthen dams.

Prediction of 4-days Soaked CBR Using Index Properties for Sri Lankan Soils

K. V. S. D. Jayamali
Geotech (Pvt) Ltd, No. 13/1, Pepiliyana Mawatha, Kohuwala, Nugegoda, Sri Lanka.
U. P. Nawagamuwa
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: CBR plays a significant role in road and highway constructions, as it is an important parameter used to evaluate the strength of sub grade and sub base soils for design of flexible pavements. Since it is difficult to get a representative CBR value, many correlations have been developed by various researchers over the world to predict the values. Although, these are not in good agreement with local soils, as they were found for soils in their locality. Hence, a study was carried out to develop empirical correlations between CBR and index properties those best suit for local soils, using the data obtained from Atterberg Limits and sieve analysis tests together with compaction parameters. The new correlations were established using the method of regression analysis in the form of equations as functions of soil index properties. Finally, several laboratory tests were conducted to compare with the results of regression equations, in order to validate the developed correlations.

Establishment of Fundamental Characteristics of Unsaturated Sri Lankan Residual Soils

N. Vasanthan
Geotechnical Engineering Division, National Building Research Organization
S. A. S. Kulathilaka.
Department of Civil Engineering, University of Moratuwa.

ABSTRACT: Slope failure in tropical climates frequently occurs due to excessive rainfall. Heavy infiltration cause destruction of matric suctions, development of perched water table conditions and rise of ground water table. In order to understand the threshold values of rainfall leading to instability it is necessary to model this process with a reason-

Abstracts of SLGS Annual Conference – 2016 (contd..)

able accuracy. Basic characteristics of Sri Lankan residual soil formations such as Soil Water Characteristic Curves (SWCC), permeability function and unsaturated shear strength parameters are essential factors in these analyses. These characteristics have not been established for typical residual soils forming slopes in Sri Lanka.

Undisturbed samples of soil obtained from the failed slope at Welipenna in the Southern Expressway were used in this study. Detailed experimental studies have been conducted at the NBRO laboratory to establish the characteristics of un-saturated Sri Lankan residual soils. Direct shear tests were done by modifying the conventional apparatus by incorpo-rating a miniature tensiometer which allows for the simple and direct measurement of soil matric suction during shear-ing. Permeability function for both wetting and drying phases were also investigated on undisturbed samples. The paper highlights the importance of these studies and pre-sents laboratory test results obtained.

Reduction of Dome Stresses in Stupas by Using Geogrids

T.G.R.L Ariyaratne, L.C Kurukulasuriya
Department of Civil Engineering, University of Peradeniya, Sri Lanka.

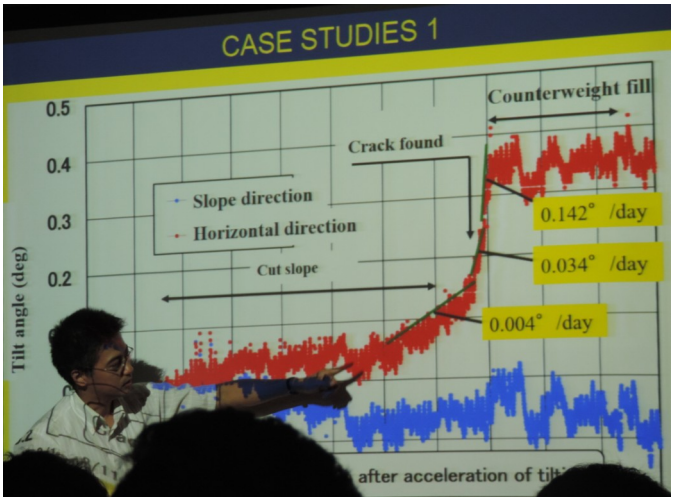
ABSTRACT: Stupas are monumental structures which are built by the ancients to honour Lord Buddha. There are more architectural aspects in stupas and mainly built by burnt bricks and currently reinforced concrete are used. In fact, considering the structural behavior of the stupas, there are mainly three stresses that can be iden-tified and those are vertical, hoop and radial stresses. This study intends to construct the stupas by using com-pacted gravel soil with geo-grids. The gravel can only acquire compressive stresses and geogrids are placed as horizontal layers and induced tensile stresses are transformed to the geo-grids. SAP2000 and Plaxis software are used to identify the stress behavior in stupas with and without geo-grids.

Some glimpses of the annual conference 2016

Eng. Ranjan Kumara (top left), Eng. T. G. R. L. Ariyaratne (top middle), Eng. K. V. S. D. Jayamali (top right) and Eng. S. K. Hewagama (bottom) making their presentations at the annual conference 2016.

Geo Forum on "Landslide Monitoring Including the use Tilt Sensors" by Prof. Taro Uchimura, *Saitama University, Japan*

Prof. Taro Uchimura of Saitama University conducted a Geo Forum at NBRO on 10th October on his experience in using tilt sensors in landslide Monitoring in Japan, China, Taiwan and Australia.



Prof. Taro Uchimura conducting the Geo Forum at NBRO

A section of the participants at Geoforum

Forthcoming Conferences

- 5th International Conference on Geotechnical Engineering and Soil Mechanics, November 14-16, 2016, Tehran, Iran, www.igs.ir.
- Geotec Hanoi 2016, November 24-25, 2016, Hanoi, Vietnam, www.geotechn.vn.
- International Conference on Forensic Geotechnical Engineering, December 08- 10, 2016, Karnataka, India.
- Advances in Laboratory Testing and Modelling of Soils and Shales, January 18-20, 2017, Switzerland, http://atmss.epfl.ch.
- International Conference on New Challenges In Geotechnical Engineering, ICNCGE-2017, January 23, 2017, National University, Lahore, Punjab, Pakistan, http://www.pges-pak.org/.
- 9th International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground, IS - São Paulo 2017, April 4-6, 2017, Sao- Paulo, Brazil, http://www.is-saopaulo.com.
- GeoMEast 2017, July 15-19, 2017, Sharm El-Sheikh,,Egypt, http://www.geomeast2017.org/.
- BCRRA 2017 - Tenth International Conference on the Bearing Capacity of Roads, Railways and Airfields, June 28-30, 2017, ATHENS, Greece, http://www.bcrra2017.com/.
- PBD-III Vancouver 2017 - The 3rd International Conference on Performance Based Design in Earthquake Geotechnical Engineering, July 16-19, 2017, British Columbia, Canada, http://pbdiiivancouver.com/.
- ICSMGE 2017 - 19th International Conference on Soil Mechanics and Geotechnical Engineering, September 17-21, 2017, Coex Convention Center, Seoul, Korea, http://www.icsmge2017.org.
- 4th International Symposium on Cone Penetration Testing (CPT'18), June 21-22, 2018, Delft, Netherlands, www.cpt18.org.
- The 7th International Conference on Unsaturated Soils (UNSAT2018), August 3-5, 2018 , The Hong Kong University of Science and Technology (HKUST), Hong Kong, http://www.unsat2018.org.
- 7 ICEGE 2019 - International Conference on Earthquake Geotechnical Engineering, 16th-20th June 2019, Rome, Italy, Email: agi@associazionegeotecnica.it.
- ISDCG 2019 – 7th International Symposium on Deformation Characteristics of Geomaterials, 26th - 29th June 2019, Glasgow, UK.
- XVI Asian Regional Conference on Soil Mechanics and Geotechnical Engineering, 21st - 25th October 2019, Taiwan, Taipei.

Forthcoming Events of SLGS

It was proposed during the last AGM to organize a half-a-day industry sessions on R&D activities related to Geotechnical Engineering on a quarterly basis. The industry representatives will be given the opportunity to present their work at the event. The opportunity will be given on a first come first served basis. Any interested parties can contact the president of SLGS through the following email address.
athula.kulathilaka@yahoo.com

SLGS and ISSMGE Membership Fees

SLGS members are kindly requested to pay the membership arrears at your earliest. A notice indicating due fees is attached.

Please inform any changes in the contact details.

Membership Admission Fee	Rs. 200/=
Annual Membership Fee	Rs. 300/=
ISSMGE Fee	Rs. 1000/=

The SLGS Newsletter comes to you in volumes of four fascicles issued in February, May, August and November in each year. If you prefer to receive the newsletter by email, please send your email address to the editor, newsletter

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