

Geotechnical Aspects Of Landfill Design And Construction

Despite the importance of preserving the environment in our developing world, activity involving the extraction of natural resources and the disposal of waste continues to increase. Such operations need to be conducted in a carefully-controlled manner, protecting both the natural environment and the communities who live in the vicinity. Every four years the GREEN (Geotechnics Related to the Environment) symposia are held, recognizing the major contribution that geotechnical engineering makes towards achieving the afore-mentioned goals. The meeting provides an international forum for the exchange of ideas, experiences and innovations. The GREEN 4 meeting discussed engineered disposal of waste in landfills; land contaminated by waste disposal and fluid flows; industrial waste dumps from mineral mining and extraction; and environmental management. The book contains expertise from nineteen countries around the world, and provides an integrated view of the latest research and practice in waste disposal. New and evolving ideas, ongoing concerns and developments throughout the world are discussed.

The Loma Prieta earthquake struck the San Francisco area on October 17, 1989, causing 63 deaths and \$10 billion worth of damage. This book reviews existing research on the Loma Prieta quake and draws from it practical lessons that could be applied to other earthquake-prone areas of the country. The volume contains seven keynote papers presented at a symposium on the earthquake and includes an overview written by the committee offering recommendations to improve seismic safety and earthquake awareness in parts of the country susceptible to earthquakes.

Each number is the catalogue of a specific school or college of the University. Effective measurement of the composition and properties of petroleum is essential for its exploration, production, and refining; however, new technologies and methodologies are not adequately documented in much of the current literature. Analytical Methods in Petroleum Upstream Applications explores advances in the analytical methods and instrumentation that allow more accurate determination of the components, classes of compounds, properties, and features of petroleum and its fractions. Recognized experts explore a host of topics, including: A petroleum molecular composition continuity model as a context for other analytical measurements A modern modular sampling system for use in the lab or the process area to collect and control samples for subsequent analysis The importance of oil-in-water measurements and monitoring The chemical and physical properties of heavy oils, their fractions, and products from their upgrading Analytical measurements using gas chromatography and nuclear magnetic resonance (NMR) applications Asphaltene and heavy ends analysis Chemometrics and modeling approaches for understanding petroleum composition and properties to improve upstream, midstream, and downstream operations Due to the renaissance of gas and oil production in North America, interest has grown in analytical methods for a wide range of applications. The understanding provided in this text is designed to help chemists, geologists, and chemical and petroleum engineers make more accurate estimates of the crude value to specific refinery configurations, providing insight into optimum development and extraction schemes.

Using biotechnology to help control landfill processes can mitigate costs, shorten the time needed to process solid waste, and ease the typical ecological damage to the land

being used. This first-of-its-kind book provides regulators, designers, landfill owners, and operators with information that supports the utility of landfill bioreactors and provides design and operating criteria essential for the successful application of this technology. It pulls together laboratory, pilot, and full-scale experiences into one concise guide to designing and running municipal landfills as bioreactors. Landfill Bioreactor Design and Operation covers the history and background of landfill technology, research studies of actual bioreactor landfills, expected leachate and gas yields, specific design criteria, operation guidelines, and reuse of landfill sites to avoid having to establish new sites. For anyone looking for an alternative to large, wasteful landfill sites, this book provides a practical alternative to the problem.

The two-volume Handbook of Environmental Health, Fourth Edition provides a comprehensive but concise discussion of important environmental health areas, including energy, ecology and people, environmental epidemiology, risk assessment and risk management, environmental law, air quality management, food protection, insect control, rodent control, pe

- Mechanical properties of landfill waste - Compression of waste and implications for practice - Stress states in, and stiffness of, landfill waste
- Issues related to mineral liners
- Properties and testing of clay liners - Issues related to the use and specification of colliery spoil liners - The design and control of bentonite enriched soils
- Geosynthesis in landfill design - The stability of geosynthetic landfill lining systems - Performance testing of protection materials for geomembranes - Engineering properties and use of geosynthetic clay liners

In view of the great demand for information regarding landfills, a series of international reference books on landfilling of waste has been established. This book, the second volume, deals with lining and leachate collection. It consists of edited, selected contributions to the International Symposia on Sanitary Landfills held in Sardinia every second year.

This book is the first edited compilation of selected, refereed papers submitted to ERTEP 2007. The selected papers either dealt with technologies or scientific work and policy findings that address specific environmental problems affecting humanity in general, but more specifically, people and ecosystems in developing countries. It was not necessary for the work to have been done in a developing country, but the findings and results must be appropriate or applicable to a developing country setting. It is acknowledged that environmental research, technology applications and policy implementation have been demonstrated to improve environmental sustainability and protection in several developed economies. The main argument of the book is that similar gains can be achieved in developing economies and economies in transition. The book is organized into six chapters along some of the key themes discussed at the conference: Environmental Health Management, Sustainable Energy and Fuel, Water Treatment, Purification and Protection, Mining and Environment, Soil Stabilization, and Environmental Monitoring. It is hoped that the contents of the book will provide an insight into some of the environmental and health management challenges confronting the developing world and the steps being taken to address them.

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The Handbook of Environmental Health-Pollutant Interactions in Air, Water, and Soil includes Nine Chapters on a variety of topics basically following a standard chapter outline where applicable with the exception of Chapters 8 and 9. The outline is as follows: 1. Background and status 2. Scientific, technological and general information 3. Statement of Integrating and blending traditional theory with particle-energy-field theory, this book provides a

framework for the analysis of soil behaviour under varied environmental conditions. This book explains the why and how of geotechnical engineering in an environmental context. Using both SI and Imperial units, the authors cover: rock mechanics soil mechanics and hydrogeology soil properties and classifications and issues relating to contaminated land. Students of civil, geotechnical and environmental engineering and practitioners unfamiliar with the particle-energy-field concept, will find that this book's novel approach helps to clarify the complex theory behind geotechnics.

The development of the use of polymeric materials in the form of geosynthetics has brought about major changes in the civil engineering industry. Geosynthetics are available in a wide range of compositions appropriate to different applications and environments. Over the past three to four decades, civil engineers have grown increasingly interested

The book comprises selected proceedings of the 2016 annual conference of the Indian Geotechnical Society. The technical papers presented on the theme "Geotechnical Characterisation and Geoenvironmental Engineering" highlight the modified geotechnical properties of soil admixed industrial waste and also the characteristics of soil with different pore fluid under varying test conditions. The major topics covered are (i) characterisation of soils, rocks and synthesised materials and (ii) geoenvironmental engineering and behaviour of unsaturated soil. This book will prove a valuable reference for researchers and practicing engineers alike.

This publication contains the papers presented at the 15th European Conference on Soil Mechanics and Geotechnical Engineering (ECSMGE), held in Athens, Greece. Considerable progress has been made in recent decades in understanding the engineering behavior of those hard soils and weak rocks that clearly fall into either the field of soil or of rock mechanics, and there have been important developments in design and construction methods to cope with them. Progress would be even more desirable, however, for those materials which fall into the 'grey' area between soils and rocks. They present particular challenges due to their diversity, the difficulties and problems arising in their identification and classification, their sampling and testing and in the establishment of suitable models to adequately describe their behavior. The publication aims to provide an updated overview of the existing worldwide knowledge of the geological features, engineering properties and behavior of such hard soils and weak rocks, with particular reference to the design and construction methods and problems associated with these materials. Part 4 was published post-conference and includes Conference Reports. The contributions to this volume examine: geotechnical hazard acknowledging the diversity of local ground conditions and environmental factors which play a decisive role in designing engineering structures in Danubian countries.

Earth scientists and geotechnical engineers are increasingly challenged to solve environmental problems related to waste disposal facilities and cleanup of contaminated sites. The effort has given rise to a new discipline of specialists in the field of environmental geotechnology. To be effective, environmental geotechnologists must not only be armed with the traditional knowledge of fields such as geology and civil engineering, but also be knowledgeable of principles of hydrogeology, chemistry, and biological processes. In addition, the environmental geotechnologist must be completely up to date on the often complex cadre of local and national regulations, must comprehend the often complex legal issues and sometimes mind-boggling financial implications of a project, and must be able to communicate effectively with a host of other technical specialists, regulatory officials, attorneys, local land owners, journalists, and others. The field of environmental geotechnology will no doubt continue to offer unique challenges. The purpose of this book is to summarize the current state of practice in the field of environmental geotechnology. Part One covers broadly

applicable principles such as hydrogeology, geochemistry, and contaminant transport in soil and rock. Part Two describes in detail the underlying principles for design and construction of new waste disposal facilities. Part Three covers techniques for site remediation. Finally, Part Four addresses the methodologies for monitoring. The topics of 'waste disposal' and 'site remediation' are extraordinarily broad.

The impact of food waste content on the municipal solid waste friction angle was studied. Using reconstituted fresh MSW specimens with different food waste content (0, 40, 58, and 80%), 48 small-scale (100-mm-diameter) direct shear tests and 12 large-scale (430 mm \times 430 mm) direct shear tests were performed. A stress-controlled large-scale direct shear test device allowing approximately 170-mm sample horizontal displacement was designed and used. At both testing scales, the mobilized internal friction angle of MSW decreased considerably as food waste content increased. As food waste content increased from 0 to 40% and from 40 to 80%, the mobilized internal friction angles (estimated using the mobilized peak (ultimate) shear strengths of the small-scale direct shear tests) decreased from 39 to 31° and from 31 to 7°, respectively, while those of large-scale tests decreased from 36 to 26° and from 26 to 15°, respectively. Most friction angle measurements produced in this study fell within the range of those previously reported for MSW.

Design, Construction, and Monitoring of Landfills A New Edition of the reference book more professionals are turning to— Like its successful first edition, this updated Second Edition of *Design, Construction, and Monitoring of Landfills* provides easy access to the current theory and practice of landfill engineering. Using an integrated, multidisciplinary approach, it serves as the ideal desk reference for environmental, civil, and geotechnical engineers, hydrogeologists, and others involved in hazardous and non-hazardous waste disposal. This new edition features material on landfill operation, the latest advances in waste handling, and new liner and cover technologies. This book offers a wealth of state-of-the-art information, such as: Landfill site selection methods Maintaining quality control during construction The economic analysis of landfills The fundamentals of landfill monitoring Attenuation: how it works, factors affecting it, the design of attenuation landfills Strategies for dealing with leachate, gas, and storm water How to estimate the costs of construction, operation, final closure, and long-term monitoring of landfills No other single source offers as much time- and money-saving information on landfills as *Design, Construction, and Monitoring of Landfills* by Amalendu Bagchi. For government agencies, consulting firms, environmental engineers, and others involved in waste management, it is sure to become a standard reference. Of related interest... *Statistical Methods for Groundwater Monitoring* Robert Gibbons 1994 (0-471-58707-9) 256 pp. *Waste Containment Systems; Waste Stabilization and Landfills: Design and Evaluation* Hari D. Sharma and Sangeeta P. Lewis 1994 (0-471-57536-4) 528 pp.

Ground improvement has been one of the most dynamic and rapidly evolving areas of geotechnical engineering and construction over the past 40 years. The need to develop sites with marginal soils has made ground improvement an increasingly important core component of geotechnical engineering curricula. *Fundamentals of Ground Improvement Engineering* addresses the most effective and latest cutting-edge techniques for ground improvement. Key ground improvement methods are introduced that provide readers with a thorough understanding of the theory, design principles, and

construction approaches that underpin each method. Major topics are compaction, permeation grouting, vibratory methods, soil mixing, stabilization and solidification, cutoff walls, dewatering, consolidation, geosynthetics, jet grouting, ground freezing, compaction grouting, and earth retention. The book is ideal for undergraduate and graduate-level university students, as well as practitioners seeking fundamental background in these techniques. The numerous problems, with worked examples, photographs, schematics, charts and graphs make it an excellent reference and teaching tool.

By combining integrated solid waste management with the traditional coverage of landfills, this new edition offers the first comprehensive guide to managing the entire solid waste cycle, from collection, to recycling, to eventual disposal. * Includes new material on source reduction, recycling, composting, contamination soil remediation, incineration, and medical waste management. * Presents up-to-date chapters on bioreactor landfills, wetland mitigation, and landfill remediation. * Offers comprehensive coverage of the role of geotechnical engineering in a wide variety of environmental issues.

This text comprises of 57 papers on: roads, railways and embankments; reinforced slopes and retaining walls; hydraulic applications; environmental applications; geosynthetic testing; and IGS chapter reports.

Increasing environmental awareness has emphasized the many engineering situations in which there are potential environmental impacts. This text provides a guide for engineers who are likely to be involved in such situations.

Geotechnical Engineering Calculations Manual offers geotechnical, civil and structural engineers a concise, easy-to-understand approach the formulas and calculation methods used in of soil and geotechnical engineering. A one stop guide to the foundation design, pile foundation design, earth retaining structures, soil stabilization techniques and computer software, this book places calculations for almost all aspects of geotechnical engineering at your finger tips. In this book, theories is explained in a nutshell and then the calculation is presented and solved in an illustrated, step-by-step fashion. All calculations are provided in both fps and SI units. The manual includes topics such as shallow foundations, deep foundations, earth retaining structures, rock mechanics and tunnelling. In this book, the author's done all the heavy number-crunching for you, so you get instant, ready-to-apply data on activities such as: hard ground tunnelling, soft ground tunnelling, reinforced earth retaining walls, geotechnical aspects of wetland mitigation and geotechnical aspects of landfill design. • Easy-to-understand approach the formulas and calculations • Covers calculations for foundation, earthworks and/or pavement subgrades • Provides common codes for working with computer software • All calculations are provided in both US and SI units

This volume is a compilation on issues related to sustainable practices in geo-environmental engineering, particularly as applying to developing nations such as India. While, the developed world has already developed some solutions such as landfills, developments in landfills, barriers and liners in the North America and waste-to-energy and waste incineration in Europe, developing countries like India are trying to figure out ways which suit the present condition without compromising the future needs and comforts. This volume presents case studies on the various problems and solutions adopted for different sites. Although a common approach for all the problems is not feasible or recommend, this collection aims to provide a compendium on the current efforts underway and to help achieve common ground for the

practitioners and researchers involved. The works included here give insight to the possible development of resilient and sustainable structures (like offshore wind turbines) and energy geotechnics. The book covers topics such as liners and barrier systems, use of recycled and waste materials, waste management and hazard assessment, sustainable infrastructure, and sustainability and the environment. The contents of this book will be useful to researchers and professionals working in geo-environmental engineering. The book will also be useful to policy makers interested in understanding geotechnical concerns related to sustainable development. Landfills will remain a vital component of waste management strategy. Geotechnical consideration in landfill design is related to the effectiveness of waste containment while minimising potential migration of waste materials. Generally, geotechnical aspects are related to factors such as permeability, settlement and slope stability and structural strength of landfill component such as impermeable base and side, leachate collection system, engineered soil barrier, proper underlying geology, and proper impermeable cover. However, the effectiveness of landfill is controlled by the geotechnical properties of these components particularly its permeability.

The aim of the book is to equip the student and practicing engineer with the basic knowledge needed for the geotechnical design of waste facilities, the closure and improvement of waste facilities, and construction on waste.

Geoenvironmental Engineering covers the application of basic geological and hydrological science, including soil and rock mechanics and groundwater hydrology, to any number of different environmental problems. * Includes end-of-chapter summaries, design examples and worked-out numerical problems, and problem questions. * Offers thorough coverage of the role of geotechnical engineering in a wide variety of environmental issues. * Addresses such issues as remediation of in-situ hazardous waste, the monitoring and control of groundwater pollution, and the creation and management of landfills and other above-ground and in-situ waste containment systems.

"Advances in Environmental Geotechnics" presents the latest developments in this interdisciplinary field. The topics covered include basic and advanced theories for modeling of geoenvironmental phenomena, testing and monitoring for geoenvironmental engineering, municipal solid wastes and landfill engineering, sludge and dredged soils, geotechnical reuse of industrial wastes, contaminated land and remediation technology, applications of geosynthetics in geoenvironmental engineering, geoenvironmental risk assessment, management and sustainability, ecological techniques and case histories. This proceedings includes papers authored by core members of ISSMGE TC5 (International Society of Soil Mechanics and Geotechnical Engineering---Environmental Geotechnics) and geoenvironmental researchers from more than 20 countries and regions. It is a valuable reference for geoenvironmental and geotechnical engineers as well as civil engineers. Yunmin Chen, Xiaowu Tang, and Liangtong Zhan are Professors at the Department of Civil Engineering of Zhejiang University, China.

The First Southern African Geotechnical Conference was organised by the Geotechnical Division of the South African Institution of Civil Engineering (SAICE) under the auspices of the International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) and took place at Sun City, South Africa on 5 and 6 May 2016. More than 60 papers were rec
Solid waste management is a global concern, and landfilling remains the predominant management method in most areas of the world. This book provides a comprehensive view of state-of-the-art methods to manage landfills more sustainably, drawing upon more than two decades of research, design, and operational experiences at operating sites across the world. Sustainable landfills implement one or multiple technologies to control and enhance the degradation of waste materials to realize a multitude of potential benefits during or shortly after the landfill's operating phase. This book presents detailed approaches in the development,

design, operation, and monitoring of sustainable landfills. Case studies showcasing the benefits and challenges of sustainable landfill technologies are also provided to give the reader additional context. The intent of the book is to serve as a reference guide for regulatory personnel, a practical tool for designers and engineers to build on for site-specific applications of sustainable landfill technologies, and a comprehensive resource for researchers who are continuing to explore new and better ways to more sustainably manage waste materials. Following the structure of previous editions, Volume 2 of this Sixth Edition proceeds through four individual chapters on geomembranes, geosynthetic clay liners, geofoam and geocomposites. The two volumes must accompany one another. Volume 1 contains geosynthetics, geotextiles, geogrids and geonets. The two volumes must accompany one another. All are polymeric materials used for myriad applications in geotechnical, geoenvironmental, transportation, hydraulic and private development applications. The technology has become a worldwide enterprise with approximate \$5B material sales in the 35-years since first being introduced. In addition to describing and illustrating the various materials; the most important test methods and design examples are included as pertains to specific application areas. This latest edition differs from previous ones in that sustainability is addressed throughout, new material variations are presented, new applications are included and references are updated accordingly. Each chapter includes problems for which a solutions manual is available.

Geotechnical Investigation and Improvement of Ground Conditions covers practical information on ground improvement and site investigation, considering rock properties and engineering geology and its relation to construction. The book covers geotechnical investigation for construction projects, including classic case studies with geotechnical significance. Additional sections cover soil compaction, soil stabilization, drainage and dewatering, grouting methods, the stone column method, geotextiles, fabrics and earth reinforcement, miscellaneous methods and tools for ground improvement, geotechnical investigation for construction projects, and forensic geotechnical engineering. Final sections present a series of site-specific case studies. Dedicated to ground improvement techniques and geotechnical site investigation Provides practical guidance on site-specific geotechnical investigation and the subsequent interpretation of data Presents site-specific case studies with geotechnical significance Includes site investigation of soils and rocks Gives field-oriented information and guidance Focuses on actual, state-of-the-art design/construction procedures as opposed to a discussion of solid waste management issues and to general descriptions and/or conceptual designs. Provides an integrated package of analytical tools, design equations, and step-by-step construction procedures for all elements of a landfill, giving the reader a better sense of the necessary site investigation, planning, analysis, and organization that go into a landfill design and construction project. The characteristics of landfill containment envelopes and their design/construction are treated in detail. Physico-chemical and engineering properties of solid waste that are relevant and important to landfill design and construction are tabulated and described. Includes explanation of how to evaluate and assess potential problems that affect landfill performance such as sideslope stability, settlement, containment effectiveness, and erosion control. Discusses vertical landfill expansion; how leachate moves across a liner or barrier under both advection and diffusion; compares the containment effectiveness of different liner systems to the combined advective-diffusive transport of dissolved leachate solutes. Includes a detailed explanation with numerical examples and calculations of how to design a gas collection and piping system in a landfill—including the collection and handling of condensate in the gas. Detailed installation and inspection guidelines are provided for both earthen and geosynthetic liner/cover systems—comparing the relative advantages and limitations of each. For professional training courses in Geotechnical and Geoenvironmental Engineering.

This book presents 09 keynote and invited lectures and 177 technical papers from the 4th International Conference on Geotechnics for Sustainable Infrastructure Development, held on 28-29 Nov 2019 in Hanoi, Vietnam. The papers come from 35 countries of the five different continents, and are grouped in six conference themes: 1) Deep Foundations; 2) Tunnelling and Underground Spaces; 3) Ground Improvement; 4) Landslide and Erosion; 5) Geotechnical Modelling and Monitoring; and 6) Coastal Foundation Engineering. The keynote lectures are devoted by Prof. Harry Poulos (Australia), Prof. Adam Bezuijen (Belgium), Prof. Delwyn Fredlund (Canada), Prof. Lidija Zdravkovic (UK), Prof. Masaki Kitazume (Japan), and Prof. Mark Randolph (Australia). Four invited lectures are given by Prof. Charles Ng, ISSMGE President, Prof. Eun Chul Shin, ISSMGE Vice-President for Asia, Prof. Norikazu Shimizu (Japan), and Dr. Kenji Mori (Japan).

Solid Waste Landfilling: Concepts, Processes, Technology provides information on technologies that promote stabilization and minimize environmental impacts in landfills. As the main challenges in waste management are the reduction and proper treatment of waste and the appropriate use of waste streams, the book satisfies the needs of a modern landfill, covering waste pre-treatment, in situ treatment, long-term behavior, closure, aftercare, environmental impact and sustainability. It is written for practitioners who need specific information on landfill construction and operation, but is also ideal for those concerned about the possible return of these sites to landscapes and their subsequent uses for future generations. Includes input by international contributors from a vast number of disciplines Provides worldwide approaches and technologies Showcases the interdisciplinary nature of the topic Focuses on sustainability, covering the lifecycle of landfills under the concept of minimizing environmental impact Presents knowledge of the legal framework and economic aspects of landfilling

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