Free download Engineering rock mass classification tunnelling foundations and landslides (Read Only)

rock mass classification methods are commonly used at the preliminary design stages of a construction project when there is very little information it forms the bases for design and estimation of the required amount and type of rock support and groundwater control measures encompassing nearly all aspects of rock mass classifications in detail civil engineering rock mass classification tunnelling foundations and landsides provides construction engineers and managers with extensive practical knowledge which is time tested in the projects in himalaya and other parts of the world in complex geological conditions rock mass classification is an essential element of feasibility studies for any near surface construction project prior to any excavation or disturbances made to earth written by an author team with over 50 years of experience in some of the most difficult mining regions of the world civil engineering rock mass classification tunnelling foundations and landsides provides construction engineers construction managers and mining engineers with the tools and methods to gather geotechnical data either from rock cuts drifts or core and process the information for subsequent analysis the goal is to use effective mapping techniques to obtain data can be used as input for any of the established rock classification systems the book covers all of the commonly used classification methods including barton s q and q systems bieniawski s rmr laubscher s mrmr and hoek s and gsi systems with this book in hand engineers will be able to gather geotechnical data either from rock cuts drifts or core and process the information for subsequent analysis rich with international case studies and worked out equations the focus of the book is on the practical gathering information for purposes of analysis and design identify the most significant parameters influencing the behaviour of a rock mass divide a particular rock mass formulation into groups of similar behaviour rock mass classes of varying quality provide a basis of understanding the characteristics of each rock mass class relate the experience of rock conditions at one site to the conditions and experience encountered at others derive quantitative data and guidelines for engineering design provide common basis for communication between engineers and geologists this is the first authoritative reference on rock mass classification consolidating into one handy source information once widely scattered throughout the literature it includes new previously unpublished material and case

histories presents the fundamental concepts of classification schemes and critically appraises their practical application in industrial projects such as tunneling and mining vast knowledge has been developed in the area of tunnelling in weak rocks over the years and this book bridges an important gap by bringing all the information together for the benefit of the tunnelling industry in particular tunnelling in poor conditions is a huge challenge for engineers and designers and this book tackles all typical problems headon topics covered include classification approach design approaches for site specific grounds a new invention on shielded tunnel boring machine case histories tunnel mechanics risk engineering and management culture based on extensive field research experiences in himalayan region and alps exclusive chapters on tunnelling hazards squeezing ground conditions a full detailed case study swelling ground conditions critical state rock mechanics etc supported by over 180 figures and 90 tables of data and test examples with solutions chapter headings and selected papers philosophy of quantitative classifications present day practice shear zone treatment in tunnels and foundations treatment for tunnels rock material uniaxial compression rock quality designation weighted joint density terzaghi s rock load theory modified terzaghi s theory for tunnels and caverns rock mass rating rmr applications of rmr prediction of ground conditions for tunnelling empirical approach rock mass quality q system the q system rock mass number inter relation between q and rmr rock mass index scale effect rate of tunnelling classification of ground job conditions for rate of tunnelling support system in caverns precautions strength enhancement of rock mass in tunnels residual strength parameters strength of discontinuities shear strength of joints shear strength of rock masses in slopes mohr coulomb strength parameters types of rock slope failures 3d wedge failure slope mass rating smr support me this practical guide describes the stage by stage development of a method for predicting the penetration rate pr and the advance rate ar for tunnel boring machines based on an expanded version of the q value qtbm the author analyzes 145 tbm tunnels that total 1 000km in length he then develops simple formulae to estimate pr and ar from the qtbm value and to back calculate qtbm from performance data the book quantitatively explains actual advance rates as high as five m hr for one day or as low as 0 005 m hr for several months it also covers logging methods empirical tbm tunnel support design and numerical verification of support rock mass classifications a practical approach in civil engineering was written in response to the many unanswered questions regarding this subject questions such as is classification reasonably reliable can it be successful in crisis management of geohazards can a single classification system be general for all rock structures is classification a scientific approach laborious field research was undertaken in the himalayan mountains by a team of scientists from the

central mining research institute cmri university of roorkee uor central soil and material research station csmrs u p irrigation research institute upiri and norwegian geotechnical institute ngi to answer these questions the results obtained from the research work were systematically compiled to produce this book which bears particular relevance to civil mining and petroleum engineers and geologists endorsements it is a handbook of rock engineering zhao jian school of civil structural engineering nanyang technological university singapore i came across your new book rock mass classification absolutely fantastic subodh k jain u s a tunnel design methods covers analytical numerical and empirical methods for the design of tunnels in soil and in rock the material is intended for design engineers looking for detailed methods for graduate students who are interested in tunnelling and for researchers working on various aspects of ground support interaction under static and seismic loading the book is divided into seven chapters covering fundamental concepts on ground and support behavior and on ground excavation support interaction and provides detailed information on analytical and numerical methods used for the design of tunnels with applications and on the latest developments on empirical methods the principles and formulations included are used throughout the book to provide insight into the response of tunnels under both simple and complex loading conditions thus providing the reader with fundamental understanding of tunnel behavior both authors have experience in tunnelling and have worked extensively in practice designing tunnels both in the united states and abroad and in research underground excavations in rock deals with the geotechnical aspects of the design of underground openings for mining and civil engineering processes a wide ranging and up to date review of experience of tunnelling contracts particularly those for sewerage and drainage tunnels the review is based on the 6th edition of the ice conditions of contract but it takes note of new forms of contract which are leading towards less adversarial contractual relations with the ever increasing developmental activities as diverse as the construction of dams roads tunnels underground powerhouses and storage facilities petroleum exploration and nuclear repositories a more comprehensive and updated understanding of rock mass is essential for civil engineers engineering geologists geophysicists and petroleum and mining engineers though some contents of this vast subject are included in undergraduate curriculum there are full fledged courses on rock mechanics rock engineer ing in postgraduate programmes in civil engineering and mining engineering much of the material presented in this book is also taught to geology and geophysics students in addition the book is suitable for short courses conducted for teachers practising engineers and engineering geologists this book with contributions from a number of authors with expertise and vast experience in various areas of rock engineering gives an in depth

analysis of the multidimensional aspects of the subject the text covers a wide range of topics related to engineering behaviour of rocks and rock masses their classifications interpretation of geological mapping of joints through stereographic projection in situ stress measurements laboratory and field tests stability of rock slopes foundations of structures including dams and support systems for underground excavations the second edition has been enriched with new topics such as minimum overburden on pressure tunnels pressure around vertical cylindrical shaft thickness of steel lining and penetration rate from joint factor what distinguishes the text is the application of numerical methods to solve various problems by discrete element and equivalent material concepts interpretations of geomechanics modelling test data excavation methods ground improving methods and use of roadheaders and tbms the book provides an excellent understanding of how to solve problems in rock engineering and should immensely benefit students teachers professionals and designers alike the proceedings of the international conference tunnelling asia 2000 the papers cover such topics as rock mass classification rock mass analysis highway tunnels and underground storage as well as metro tunnelling a thorough knowledge of geology is essential in the design and construction of infrastructures for transport buildings and mining operations while an understanding of geology is also crucial for those working in urban territorial and environmental planning and in the prevention and mitigation of geohazards geological engineering provides an inte tunnel construction is expensive when compared to the construction of other engineering structures as such there is always the need to develop more sophisticated and effective methods of construction there are many long and large tunnels with various purposes in the world especially for highways railways water conveyance and energy production tunnels can be designed effectively by means of two and three dimensional numerical models ground structure interaction is one of the significant factors acting on economic and safe design this book presents recent data on tunnel engineering to improve the theory and practice of the construction of underground structures it provides an overview of tunneling technology and includes chapters that address analytical and numerical methods for rock load estimation and design support systems and advances in measurement systems for underground structures the book discusses the empirical analytical and numerical methods of tunneling practice worldwide rock engineering and rock mechanics structures in and on rock masses covers the most important topics and state of the art in the area of rock mechanics with an emphasis on structures in and on rock masses the 255 contributions including 6 keynote lectures from the 2014 isrm european rock mechanics symposium eurock 2014 vigo spain 27 29 ma rock engineering in difficult ground conditions soft rocks and karst contains the proceedings of the regional symposium of the international society for rock mechanics isrm which was held 29 to 31

october 2009 in cavtat near dubrovnik croatia it is a continuation of the successful series of regional isrm symposia for europe which began in 1 practical handbook of rock mass classification systems and modes of ground failure is a comprehensive yet concise guide to 16 of the most important rock classification systems and their failure modes the book discusses these systems in relation to the design of excavations and ground reinforcement support under passive active static and dynamic mining conditions this includes rock testing assessment surface and underground site investigation and any practical activity that deals with the physical and mechanical properties of rocks the book is an excellent professional reference for geoscientists technicians and geological engineers doing research and consulting in mining geological civil and petroleum resource fields rock characterisation modelling and engineering design methods contains the contributions presented at the 3rd isrm sinorock symposium shanghai china 1820 june 2013 the papers contribute to the further development of the overall rock engineering design process through the sequential linkage of the three themes of rock characterisation model the book provides a new global updated thorough clear and practical risk based approach to tunnelling design and construction methods and discusses detailed examples of solutions applied to relevant case histories it is organized in three sequential and integrated volumes volume 1 concept basic principles of design volume 2 construction methods equipment tools and materials volume 3 case histories and best practices the book covers all aspects of tunnelling giving useful and practical information about design volume 1 construction volume 2 and best practices volume 3 it provides the following features and benefits updated vision on tunnelling design tools materials and construction balanced mix of theory technology and applied experience different and harmonized points of view from academics professionals and contractors easy consultation in the form of a handbook risk oriented approach to tunnelling problems the tunnelling industry is amazingly widespread and increasingly important all over the world particularly in developing countries the possible audience of the book are engineers geologists designers constructors providers contractors public and private customers and in general technicians involved in the tunnelling and underground works industry it is also a suitable source of information for industry professionals senior undergraduate and graduate students researchers and academics this practical study comprises eighteen practical and field tested software packages on landslide in soil and rock and a further six on tunnels complete with source programs user manuals and worked examples using these software packages this book illustrates how geomaterials in hazardous areas can be analyzed for potential failure and how predictions based on realistic input data can be generated this volume presents a selection of chapters covering a wide range of tunneling engineering topics the scope was to present reviews of established methods and new approaches

in construction practice and in digital technology tools like building information modeling the book is divided in four sections dealing with geological aspects of tunneling analysis and design new challenges in tunnel construction and tunneling in the digital era topics from site investigation and rock mass failure mechanisms analysis and design approaches and innovations in tunnel construction through digital tools are covered in 10 chapters the references provided will be useful for further reading proceedings of the 10th regional conference for africa on soil mechanics and foundation engineering and the 3rd international conference on tropical and residual soils held in maseru lesotho september 1991 are contained in two volumes the papers address geotechnical problems peculiar to africa and engineering solutions for local problems as well as data on the properties of african soils the increased use of underground space for transportation systems and the increasing complexity and constraints of constructing and maintaining above ground transportation infrastructure have prompted the need to develop this technical manual this fhwa manual is intended to be a single source technical manual providing guidelines for planning design construction and rehabilitation of road tunnels and encompasses various types of road tunnels p ix tunnels have a high degree of risk that needs to be assessed and managed underground works intersect and interact with natural materials incorporating their characteristics as structural components of their own stability for this reason geotechnical risk analyses are implemented at all phases of tunnel construction from design through to post c the special focus of this proceeding is to cover the areas of infrastructure engineering and sustainability management the state of the art information in infrastructure and sustainable issues in engineering covers earthquake bioremediation synergistic management timber engineering flood management and intelligent transport systems it provides precise information with regards to innovative research development in construction materials and structures in addition to a compilation of interdisciplinary finding combining nano materials and engineering the so called fourth dimension of a metropolis is the underground space beneath a city which typically includes structures such as tunnels which facilitate transport and provide gas water and other supplies underground space may also be utilised for living working and recreational facilities and industrial storage these volumes focus on underg geology is the science of earth s crust lithosphere consisting of rocks and soils while mining and mineralogical engineers are more interested in rocks their petrology formation and mineralogy civil engineers are equally interested in soils and rocks in their formations and also in their properties for civil engineering design and construction this book is so written that the subject can easily be taught by a civil engineering faculty member specialised in soil mechanics dexterously organized into four parts this book in part i chapters 1 to 11 deals with the formation of rocks and soils the

classification of soils lake deposits coastal deposits wind deposits along with marshes and bogs are described in part ii chapters 12 to 20 as the book advances it deals with the civil engineering problems connected with soils and rocks such as landslides rock slides mudflow earthquakes tsunami and other natural phenomena in part iii chapters 21 to 24 finally in part iv chapters 25 to 30 this text discusses the allied subjects like the origin and nature of cyclones rock mass classification and soil formation designed to serve as a textbook for the undergraduate students of civil engineering this book is equally useful for the practising civil engineers salient features displays plenty of figures to clarify the concepts includes chapter end review exercises to enhance the problem solving skills of the students summary at the end of each chapter brings into focus the essence of the chapter appendices at the end of the text supply extra information on important topics with the ever increasing developmental activities as diverse as the construction of dams roads tunnels underground powerhouses and storage facilities petroleum exploration and nuclear repositories a more comprehensive and updated understanding of rock mass is essential for civil engineers engineering geologists geophysicists and petroleum and mining engineers though some contents of this vast subject are included in under graduate curriculum there are full fledged courses on rock mechanics rock engineering in postgraduate programmes in civil engineering and mining engineering much of the material presented in this book is also taught to geology and geophysics students in addition the book is suitable for short courses conducted for teachers practising engineers and engineering geologists this book with contributions from a number of authors with expertise and vast experience in various areas of rock engineering gives an in depth analysis of the multidimensional aspects of the subject the text covers a wide range of topics related to engineering behaviour of rocks and rock masses their classifications interpretation of geological mapping of joints through stereographic projection in situ stress measurements laboratory and field tests stability of rock slopes foundations of structures including dams and support systems for underground excavations the third edition of the book is further enriched with the addition of a number of case histories in which the analyses and designs were carried out by adopting rock mass parameters as per rmr q or gsi the consequence of such an approach is critically examined with the adoption of parameters from joint factor excellent performance prediction has been demonstrated for anisotropic rocks and tunnel various expressions developed for kn and ks for different conditions are included for adoption in numerical analyses when dilatancy component is separated the scale effect on shear response is insignificant this edition provides a comprehensive understanding of rock mass response and enables students to tackle rock engineering problems more confidently and realistically and therefore it will be of immense benefit to

students teachers professionals and designers alike of geotechnical and geophysical pr operies 160 10 3 4 design of tunnel linings 1 61 10 4 instrumentation of the ctrl north downs tunnel 164 10 5 references 165 appendix i abbreviations and symbols 166 appendix 2 risk management 168 a2l introduction 168 a2 2 scope 168 a23 risk register 169 a21 1 when to use the risk register 169 a2 32 whalt is it 169 a2 3 3 assessment process 169 a2 3 4 key steps 169 a2 3 5 risk assessment qualitative or quantitative 171 a2 3 6 r anaingt risk 175 a2 4 references 17 developments in geographic information technology have raised the expectations of users a static map is no longer enough there is now demand for a dynamic representation time is of great importance when operating on real world geographical phenomena especially when these are dynamic researchers in the field of temporal geographical information systems tgis have been developing methods of incorporating time into geographical information systems spatio temporal analysis embodies spatial modelling spatio temporal modelling and spatial reasoning and data mining advances in spatio temporal analysis contributes to the field of spatio temporal analysis presenting innovative ideas and examples that reflect current progress and achievements this practical and design oriented book focuses on ground characterization and structural calculation as part of the active structural design methodology with a focus on rock tunnelling it offers a comprehensive rather than a topic based perspective deriving sound tunnel design criteria and methods from basic principles ground characterization includes excavations site investigation and in situ stress determination culminating in geotechnical classifications the book then deals with various construction methods and their appropriate calculations which range from constitutive models for the stress strain behaviour of an excavation and tunnel support elements to a full stress strain analysis methodology the heavily practical approach of the book draws on the authors twenty years of tunnelling experience in spain and south america it will help any young or established professional who wants to develop a career in the underground field across both civil engineering and geology as it incorporates the very fundamentals of tunneling design it can be used as a support for tunneling courses or as a textbook for master s and phd courses benjamín celada was chief tunnel engineer at hunosa and potasas de navarra s a before founding geocontrol s a he has also worked for twenty years as professor of underground works at the polytechnic mining university in madrid spain z t bieniawski directed the rock mechanics department of the council for scientific and industrial research in pretoria then taught at the pennsylvania state university for twenty years tunnel engineering is one of the oldest most interesting but also challenging engineering disciplines and demands not only theoretical knowledge but also practical experience in geology geomechanics structural design concrete construction machine technology construction process

technology and construction management the two volume handbuch des tunnel und stollenbaus has been the standard reference work for german speaking tunnellers in theory and practice for 30 years the new english edition is based on a revised and adapted version of the third german edition and reflects the latest state of knowledge the book is published in two volumes with the second volume covering both theoretical themes like design basics geological engineering structural design of tunnels and monitoring instrumentation and also the practical side of work on the construction site such as dewatering waterproofing and scheduling as well as questions of tendering award and contracts data management and process controlling as with volume i all chapters include practical examples this book comprises the peer reviewed proceedings of the 1st conference on georesources geomaterials geotechnologies and geoenvironment 4geo porto portugal on november 7 8 2019 the book interests all researchers practitioners and students in engineering geosciences geotechnics georesources materials engineering and earth and environmental sciences georesources geomaterials geotechnologies and geoenvironment are very topical subjects and therefore deserve a deeper reflection by academia practitioners and society that approach is vital to a correct sustainable resource management and an engineering design with nature within a geoethical framework georesources understood as geological hydrological and energetic resources are greatly important to society minerals rocks and water are resources that over time have assumed an important role in the technological development of communities given the increase in population and the increasing needs and intensification of their use it is very important to ensure their sustainable management geomaterials are functional geological materials artificially processed for the generality of the activities developed by societies the functional geomaterials may include rock clay granular materials treated soils and industrial waste geotechnologies are a very important tool for decision making supporting the collection mapping processing and analysis of data with geographical information systems and other geo techniques used in the most diverse fields including to support the monitoring and prediction of geohazards the geoenvironment is a transversal field that identifies continuous earth changes and to find solutions to the resulting socioeconomic and environmental changes climate change industrialization and anthropic activity are among others factors of pressure and alteration of the natural environment so minimizing impacts and emerging hazards and risks main topics include 1 geomaterials geotechnics and georesources2 geotechnologies engineering geosciences and geohazards3 geoenvironment water and climate change engineering technology is of crucial importance to the infrastructure on which modern societies depend and keeping abreast of the latest research and developments in the field is of vital importance this book presents the proceedings of hcet 2022 the 7th international

technical conference on frontiers of hydraulic and civil engineering technology originally due to be held in sanya china from 25 27 september 2022 but instead held as a fully virtual event on zoom due to continued uncertainty related to the covid 19 pandemic hcet is a platform for the dissemination of research results on the latest advances in the areas of hydraulic and civil engineering technology and environmental engineering and provides an opportunity for scientists researchers and engineers from around the world to exchange their findings discuss developments and possibly establish a basis for collaboration a total of 275 submissions were received from international contributors and all were subjected to a rigorous peer review process with each paper reviewed by a minimum of two experts papers were also checked for quality and plagiarism after which 163 papers were accepted for presentation and publication topics covered include the research and development of concrete structure design and analysis structural mechanics and structural engineering geological exploration and earthquake engineering building technology urban planning energy environment and advanced engineering science and applications the book offers a state of the art overview of recent developments and will be of interest to all those working in the fields of hydraulic and civil engineering technology economic mineralization the volume sets out to present various aspects of a very broad details of a narrow field of economic mineralization at a time when the competitively growing global economy and the pressing needs of the society are compelling economic geology to grow and pile of data is accumulating and opinions changing very rapidly the volume incorporates papers a resultant of information explosion and electrifying conceptual revolution in economic geology describing the new and exciting results and timely reviews integrating and immense amount of knowledge in the field of geology exploration mining environment economics geophysics and geochemistry that has bearing on economic mineralization the book imbibes sections on crustal evolution and economic mineralization economic mineralization of igneous application economic mineralization of sedimentary affiliation prospecting and exploration and mining economics and environments in all the five sections current concepts problems and probable trends of future research are highlighted this book will be an invaluable everlasting reference for both industry and academia specializing in economic mineralization and for those who need updated information and current research in the field it will be equally useful for advance level geology and mining students and research scholars throughout the world

Engineering Rock Mass Classification

2011-08-09

rock mass classification methods are commonly used at the preliminary design stages of a construction project when there is very little information it forms the bases for design and estimation of the required amount and type of rock support and groundwater control measures encompassing nearly all aspects of rock mass classifications in detail civil engineering rock mass classification tunnelling foundations and landsides provides construction engineers and managers with extensive practical knowledge which is time tested in the projects in himalaya and other parts of the world in complex geological conditions rock mass classification is an essential element of feasibility studies for any near surface construction project prior to any excavation or disturbances made to earth written by an author team with over 50 years of experience in some of the most difficult mining regions of the world civil engineering rock mass classification tunnelling foundations and landsides provides construction engineers construction managers and mining engineers with the tools and methods to gather geotechnical data either from rock cuts drifts or core and process the information for subsequent analysis the goal is to use effective mapping techniques to obtain data can be used as input for any of the established rock classification systems the book covers all of the commonly used classification methods including barton s q and q systems bieniawski s rmr laubscher s mrmr and hoek s and gsi systems with this book in hand engineers will be able to gather geotechnical data either from rock cuts drifts or core and process the information for subsequent analysis rich with international case studies and worked out equations the focus of the book is on the practical gathering information for purposes of analysis and design identify the most significant parameters influencing the behaviour of a rock mass divide a particular rock mass formulation into groups of similar behaviour rock mass classes of varying quality provide a basis of understanding the characteristics of each rock mass class relate the experience of rock conditions at one site to the conditions and experience encountered at others derive quantitative data and guidelines for engineering design provide common basis for communication between engineers and geologists

Tunnel Design by Rock Mass Classifications

1979

this is the first authoritative reference on rock mass classification consolidating into one handy source information once widely scattered

throughout the literature it includes new previously unpublished material and case histories presents the fundamental concepts of classification schemes and critically appraises their practical application in industrial projects such as tunneling and mining

Engineering Rock Mass Classifications

1989-08-24

vast knowledge has been developed in the area of tunnelling in weak rocks over the years and this book bridges an important gap by bringing all the information together for the benefit of the tunnelling industry in particular tunnelling in poor conditions is a huge challenge for engineers and designers and this book tackles all typical problems headon topics covered include classification approach design approaches for site specific grounds a new invention on shielded tunnel boring machine case histories tunnel mechanics risk engineering and management culture based on extensive field research experiences in himalayan region and alps exclusive chapters on tunnelling hazards squeezing ground conditions a full detailed case study swelling ground conditions critical state rock mechanics etc supported by over 180 figures and 90 tables of data and test examples with solutions

Engineering Classification of Rock Masses for the Design of Tunnel Support

1974

chapter headings and selected papers philosophy of quantitative classifications present day practice shear zone treatment in tunnels and foundations treatment for tunnels rock material uniaxial compression rock quality designation weighted joint density terzaghi s rock load theory modified terzaghi s theory for tunnels and caverns rock mass rating rmr applications of rmr prediction of ground conditions for tunnelling empirical approach rock mass quality q system the q system rock mass number inter relation between q and rmr rock mass index scale effect rate of tunnelling classification of ground job conditions for rate of tunnelling support system in caverns precautions strength enhancement of rock mass in tunnels residual strength parameters strength of discontinuities shear strength of joints shear strength of rock masses in slopes mohr coulomb strength parameters types of rock slope failures 3d wedge failure slope mass rating smr support me

Engineering Classification of Rock Masses for the Design of Tunnel Support

1977

this practical guide describes the stage by stage development of a method for predicting the penetration rate pr and the advance rate ar for tunnel boring machines based on an expanded version of the q value qtbm the author analyzes 145 tbm tunnels that total 1 000km in length he then develops simple formulae to estimate pr and ar from the qtbm value and to back calculate qtbm from performance data the book quantitatively explains actual advance rates as high as five m hr for one day or as low as 0 005 m hr for several months it also covers logging methods empirical tbm tunnel support design and numerical verification of support

Tunnelling in Weak Rocks

2011-08-29

rock mass classifications a practical approach in civil engineering was written in response to the many unanswered questions regarding this subject questions such as is classification reasonably reliable can it be successful in crisis management of geohazards can a single classification system be general for all rock structures is classification a scientific approach laborious field research was undertaken in the himalayan mountains by a team of scientists from the central mining research institute cmri university of roorkee uor central soil and material research station csmrs u p irrigation research institute upiri and norwegian geotechnical institute ngi to answer these questions the results obtained from the research work were systematically compiled to produce this book which bears particular relevance to civil mining and petroleum engineers and geologists endorsements it is a handbook of rock engineering zhao jian school of civil structural engineering nanyang technological university singapore i came across your new book rock mass classification absolutely fantastic subodh k jain u s a

Rock Mass Classification

1999

tunnel design methods covers analytical numerical and empirical methods for the design of tunnels in soil and in rock the material is intended for design engineers looking for detailed methods for graduate students who are interested in tunnelling and for researchers

working on various aspects of ground support interaction under static and seismic loading the book is divided into seven chapters covering fundamental concepts on ground and support behavior and on ground excavation support interaction and provides detailed information on analytical and numerical methods used for the design of tunnels with applications and on the latest developments on empirical methods the principles and formulations included are used throughout the book to provide insight into the response of tunnels under both simple and complex loading conditions thus providing the reader with fundamental understanding of tunnel behavior both authors have experience in tunnelling and have worked extensively in practice designing tunnels both in the united states and abroad and in research

TBM Tunnelling in Jointed and Faulted Rock

2000-01-01

underground excavations in rock deals with the geotechnical aspects of the design of underground openings for mining and civil engineering processes

Proceedings of the International Workshop on Rock Mass Classification in Underground Mining

2007

a wide ranging and up to date review of experience of tunnelling contracts particularly those for sewerage and drainage tunnels the review is based on the 6th edition of the ice conditions of contract but it takes note of new forms of contract which are leading towards less adversarial contractual relations

Rock Mechanics Design in Mining and Tunneling

1984

with the ever increasing developmental activities as diverse as the construction of dams roads tunnels underground powerhouses and storage facilities petroleum exploration and nuclear repositories a more comprehensive and updated understanding of rock mass is essential for civil engineers engineering geologists geophysicists and petroleum and mining engineers though some contents of this vast subject are included in undergraduate curriculum there are full fledged courses on rock mechanics rock engineer ing in postgraduate programmes in civil engineering and mining engineering much of the material presented in this book is also taught to geology and geophysics students in

addition the book is suitable for short courses conducted for teachers practising engineers and engineering geologists this book with contributions from a number of authors with expertise and vast experience in various areas of rock engineering gives an in depth analysis of the multidimensional aspects of the subject the text covers a wide range of topics related to engineering behaviour of rocks and rock masses their classifications interpretation of geological mapping of joints through stereographic projection in situ stress measurements laboratory and field tests stability of rock slopes foundations of structures including dams and support systems for underground excavations the second edition has been enriched with new topics such as minimum overburden on pressure tunnels pressure around vertical cylindrical shaft thickness of steel lining and penetration rate from joint factor what distinguishes the text is the application of numerical methods to solve various problems by discrete element and equivalent material concepts interpretations of geomechanics modelling test data excavation methods ground improving methods and use of roadheaders and tbms the book provides an excellent understanding of how to solve problems in rock engineering and should immensely benefit students teachers professionals and designers alike

Rock Mass Classification

1999-05-05

the proceedings of the international conference tunnelling asia 2000 the papers cover such topics as rock mass classification rock mass analysis highway tunnels and underground storage as well as metro tunnelling

Tunnel Design Methods

2023-09-12

a thorough knowledge of geology is essential in the design and construction of infrastructures for transport buildings and mining operations while an understanding of geology is also crucial for those working in urban territorial and environmental planning and in the prevention and mitigation of geohazards geological engineering provides an inte

Underground Excavations in Rock

1980-06-30

tunnel construction is expensive when compared to the construction of other engineering structures as such there is always the need to

develop more sophisticated and effective methods of construction there are many long and large tunnels with various purposes in the world especially for highways railways water conveyance and energy production tunnels can be designed effectively by means of two and three dimensional numerical models ground structure interaction is one of the significant factors acting on economic and safe design this book presents recent data on tunnel engineering to improve the theory and practice of the construction of underground structures it provides an overview of tunneling technology and includes chapters that address analytical and numerical methods for rock load estimation and design support systems and advances in measurement systems for underground structures the book discusses the empirical analytical and numerical methods of tunneling practice worldwide

Tunnelling Contracts and Site Investigation

1995-08-31

rock engineering and rock mechanics structures in and on rock masses covers the most important topics and state of the art in the area of rock mechanics with an emphasis on structures in and on rock masses the 255 contributions including 6 keynote lectures from the 2014 isrm european rock mechanics symposium eurock 2014 vigo spain 27 29 ma

Engineering in Rocks for Slopes, Foundations and Tunnels

2010-08

rock engineering in difficult ground conditions soft rocks and karst contains the proceedings of the regional symposium of the international society for rock mechanics isrm which was held 29 to 31 october 2009 in cavtat near dubrovnik croatia it is a continuation of the successful series of regional isrm symposia for europe which began in 1

Tunnelling Asia 2000: Proceedings New Delhi 2000

2020-09-29

practical handbook of rock mass classification systems and modes of ground failure is a comprehensive yet concise guide to 16 of the most important rock classification systems and their failure modes the book discusses these systems in relation to the design of excavations and ground reinforcement support under passive active static and dynamic

mining conditions this includes rock testing assessment surface and underground site investigation and any practical activity that deals with the physical and mechanical properties of rocks the book is an excellent professional reference for geoscientists technicians and geological engineers doing research and consulting in mining geological civil and petroleum resource fields

Geological Engineering

2011-07-06

rock characterisation modelling and engineering design methods contains the contributions presented at the 3rd isrm sinorock symposium shanghai china 1820 june 2013 the papers contribute to the further development of the overall rock engineering design process through the sequential linkage of the three themes of rock characterisation model

Theory and Practice of Tunnel Engineering

2022-05-25

the book provides a new global updated thorough clear and practical risk based approach to tunnelling design and construction methods and discusses detailed examples of solutions applied to relevant case histories it is organized in three sequential and integrated volumes volume 1 concept basic principles of design volume 2 construction methods equipment tools and materials volume 3 case histories and best practices the book covers all aspects of tunnelling giving useful and practical information about design volume 1 construction volume 2 and best practices volume 3 it provides the following features and benefits updated vision on tunnelling design tools materials and construction balanced mix of theory technology and applied experience different and harmonized points of view from academics professionals and contractors easy consultation in the form of a handbook risk oriented approach to tunnelling problems the tunnelling industry is amazingly widespread and increasingly important all over the world particularly in developing countries the possible audience of the book are engineers geologists designers constructors providers contractors public and private customers and in general technicians involved in the tunnelling and underground works industry it is also a suitable source of information for industry professionals senior undergraduate and graduate students researchers and academics

Rock Engineering and Rock Mechanics: Structures in and on Rock Masses

2014-05-12

this practical study comprises eighteen practical and field tested software packages on landslide in soil and rock and a further six on tunnels complete with source programs user manuals and worked examples using these software packages this book illustrates how geomaterials in hazardous areas can be analyzed for potential failure and how predictions based on realistic input data can be generated

Rock Engineering in Difficult Ground Conditions - Soft Rocks and Karst

2009-10-14

this volume presents a selection of chapters covering a wide range of tunneling engineering topics the scope was to present reviews of established methods and new approaches in construction practice and in digital technology tools like building information modeling the book is divided in four sections dealing with geological aspects of tunneling analysis and design new challenges in tunnel construction and tunneling in the digital era topics from site investigation and rock mass failure mechanisms analysis and design approaches and innovations in tunnel construction through digital tools are covered in 10 chapters the references provided will be useful for further reading

Tunnelling

1990

proceedings of the 10th regional conference for africa on soil mechanics and foundation engineering and the 3rd international conference on tropical and residual soils held in maseru lesotho september 1991 are contained in two volumes the papers address geotechnical problems peculiar to africa and engineering solutions for local problems as well as data on the properties of african soils

Practical Handbook of Rock Mass Classification Systems and Modes of Ground Failure

1992-06-10

the increased use of underground space for transportation systems and the increasing complexity and constraints of constructing and maintaining above ground transportation infrastructure have prompted the need to develop this technical manual this fhwa manual is intended to be a single source technical manual providing guidelines for planning design construction and rehabilitation of road tunnels and encompasses various types of road tunnels p ix

Rock Characterisation, Modelling and Engineering Design Methods

2013-05-17

tunnels have a high degree of risk that needs to be assessed and managed underground works intersect and interact with natural materials incorporating their characteristics as structural components of their own stability for this reason geotechnical risk analyses are implemented at all phases of tunnel construction from design through to post c

Handbook on Tunnels and Underground Works

2022-02-23

the special focus of this proceeding is to cover the areas of infrastructure engineering and sustainability management the state of the art information in infrastructure and sustainable issues in engineering covers earthquake bioremediation synergistic management timber engineering flood management and intelligent transport systems it provides precise information with regards to innovative research development in construction materials and structures in addition to a compilation of interdisciplinary finding combining nano materials and engineering

Software for Engineering Control of Landslide and Tunnelling Hazards

2002-01-01

the so called fourth dimension of a metropolis is the underground space beneath a city which typically includes structures such as tunnels which facilitate transport and provide gas water and other supplies underground space may also be utilised for living working and recreational facilities and industrial storage these volumes focus on underg

Tunnel Engineering

2020-03-18

geology is the science of earth s crust lithosphere consisting of rocks and soils while mining and mineralogical engineers are more interested in rocks their petrology formation and mineralogy civil engineers are equally interested in soils and rocks in their formations and also in their properties for civil engineering design and construction this book is so written that the subject can easily be taught by a civil engineering faculty member specialised in soil mechanics dexterously organized into four parts this book in part i chapters 1 to 11 deals with the formation of rocks and soils the classification of soils lake deposits coastal deposits wind deposits along with marshes and bogs are described in part ii chapters 12 to 20 as the book advances it deals with the civil engineering problems connected with soils and rocks such as landslides rock slides mudflow earthquakes tsunami and other natural phenomena in part iii chapters 21 to 24 finally in part iv chapters 25 to 30 this text discusses the allied subjects like the origin and nature of cyclones rock mass classification and soil formation designed to serve as a textbook for the undergraduate students of civil engineering this book is equally useful for the practising civil engineers salient features displays plenty of figures to clarify the concepts includes chapter end review exercises to enhance the problem solving skills of the students summary at the end of each chapter brings into focus the essence of the chapter appendices at the end of the text supply extra information on important topics

Geotechnics in the African Environment, volume 1

2022-05-13

with the ever increasing developmental activities as diverse as the construction of dams roads tunnels underground powerhouses and storage facilities petroleum exploration and nuclear repositories a more comprehensive and updated understanding of rock mass is essential for civil engineers engineering geologists geophysicists and petroleum and mining engineers though some contents of this vast subject are included in under graduate curriculum there are full fledged courses on rock mechanics rock engineering in postgraduate programmes in civil engineering and mining engineering much of the material presented in this book is also taught to geology and geophysics students in addition the book is suitable for short courses conducted for teachers practising engineers and engineering geologists this book with

contributions from a number of authors with expertise and vast experience in various areas of rock engineering gives an in depth analysis of the multidimensional aspects of the subject the text covers a wide range of topics related to engineering behaviour of rocks and rock masses their classifications interpretation of geological mapping of joints through stereographic projection in situ stress measurements laboratory and field tests stability of rock slopes foundations of structures including dams and support systems for underground excavations the third edition of the book is further enriched with the addition of a number of case histories in which the analyses and designs were carried out by adopting rock mass parameters as per rmr q or gsi the consequence of such an approach is critically examined with the adoption of parameters from joint factor excellent performance prediction has been demonstrated for anisotropic rocks and tunnel various expressions developed for kn and ks for different conditions are included for adoption in numerical analyses when dilatancy component is separated the scale effect on shear response is insignificant this edition provides a comprehensive understanding of rock mass response and enables students to tackle rock engineering problems more confidently and realistically and therefore it will be of immense benefit to students teachers professionals and designers alike

Technical Manual for Design and Construction of Road Tunnels--civil Elements

2010

of geotechnical and geophysical pr operies 160 10 3 4 design of tunnel linings 1 61 10 4 instrumentation of the ctrl north downs tunnel 164 10 5 references 165 appendix i abbreviations and symbols 166 appendix 2 risk management 168 a2l introduction 168 a2 2 scope 168 a23 risk register 169 a21 1 when to use the risk register 169 a2 32 whalt is it 169 a2 3 3 assessment process 169 a2 3 4 key steps 169 a2 3 5 risk assessment qualitative or quantitative 171 a2 3 6 r anaingt risk 175 a2 4 references 17

Geotechnical Risk in Rock Tunnels

2006-06-08

developments in geographic information technology have raised the expectations of users a static map is no longer enough there is now demand for a dynamic representation time is of great importance when operating on real world geographical phenomena especially when these are dynamic researchers in the field of temporal geographical

information systems tgis have been developing methods of incorporating time into geographical information systems spatio temporal analysis embodies spatial modelling spatio temporal modelling and spatial reasoning and data mining advances in spatio temporal analysis contributes to the field of spatio temporal analysis presenting innovative ideas and examples that reflect current progress and achievements

InCIEC 2013

2014-01-09

this practical and design oriented book focuses on ground characterization and structural calculation as part of the active structural design methodology with a focus on rock tunnelling it offers a comprehensive rather than a topic based perspective deriving sound tunnel design criteria and methods from basic principles ground characterization includes excavations site investigation and in situ stress determination culminating in geotechnical classifications the book then deals with various construction methods and their appropriate calculations which range from constitutive models for the stress strain behaviour of an excavation and tunnel support elements to a full stress strain analysis methodology the heavily practical approach of the book draws on the authors twenty years of tunnelling experience in spain and south america it will help any young or established professional who wants to develop a career in the underground field across both civil engineering and geology as it incorporates the very fundamentals of tunneling design it can be used as a support for tunneling courses or as a textbook for master s and phd courses benjamín celada was chief tunnel engineer at hunosa and potasas de navarra s a before founding geocontrol s a he has also worked for twenty years as professor of underground works at the polytechnic mining university in madrid spain z t bieniawski directed the rock mechanics department of the council for scientific and industrial research in pretoria then taught at the pennsylvania state university for twenty years

Underground Space - The 4th Dimension of Metropolises, Three Volume Set +CD-ROM

2007-05-11

tunnel engineering is one of the oldest most interesting but also challenging engineering disciplines and demands not only theoretical knowledge but also practical experience in geology geomechanics structural design concrete construction machine technology

construction process technology and construction management the two volume handbuch des tunnel und stollenbaus has been the standard reference work for german speaking tunnellers in theory and practice for 30 years the new english edition is based on a revised and adapted version of the third german edition and reflects the latest state of knowledge the book is published in two volumes with the second volume covering both theoretical themes like design basics geological engineering structural design of tunnels and monitoring instrumentation and also the practical side of work on the construction site such as dewatering waterproofing and scheduling as well as questions of tendering award and contracts data management and process controlling as with volume i all chapters include practical examples

ENGINEERING GEOLOGY FOR CIVIL ENGINEERS

2011-12-24

this book comprises the peer reviewed proceedings of the 1st conference on georesources geomaterials geotechnologies and geoenvironment 4geo porto portugal on november 7 8 2019 the book interests all researchers practitioners and students in engineering geosciences geotechnics georesources materials engineering and earth and environmental sciences georesources geomaterials geotechnologies and geoenvironment are very topical subjects and therefore deserve a deeper reflection by academia practitioners and society that approach is vital to a correct sustainable resource management and an engineering design with nature within a geoethical framework georesources understood as geological hydrological and energetic resources are greatly important to society minerals rocks and water are resources that over time have assumed an important role in the technological development of communities given the increase in population and the increasing needs and intensification of their use it is very important to ensure their sustainable management geomaterials are functional geological materials artificially processed for the generality of the activities developed by societies the functional geomaterials may include rock clay granular materials treated soils and industrial waste geotechnologies are a very important tool for decision making supporting the collection mapping processing and analysis of data with geographical information systems and other geo techniques used in the most diverse fields including to support the monitoring and prediction of geohazards the geoenvironment is a transversal field that identifies continuous earth changes and to find solutions to the resulting socioeconomic and environmental changes climate change industrialization and anthropic activity are among others factors of pressure and alteration of the natural environment so minimizing impacts and emerging hazards and risks main

topics include 1 geomaterials geotechnics and georesources2 geotechnologies engineering geosciences and geohazards3 geoenvironment water and climate change

ENGINEERING IN ROCKS FOR SLOPES, FOUNDATIONS AND TUNNELS

2014-01-01

engineering technology is of crucial importance to the infrastructure on which modern societies depend and keeping abreast of the latest research and developments in the field is of vital importance this book presents the proceedings of hcet 2022 the 7th international technical conference on frontiers of hydraulic and civil engineering technology originally due to be held in sanya china from 25 27 september 2022 but instead held as a fully virtual event on zoom due to continued uncertainty related to the covid 19 pandemic hcet is a platform for the dissemination of research results on the latest advances in the areas of hydraulic and civil engineering technology and environmental engineering and provides an opportunity for scientists researchers and engineers from around the world to exchange their findings discuss developments and possibly establish a basis for collaboration a total of 275 submissions were received from international contributors and all were subjected to a rigorous peer review process with each paper reviewed by a minimum of two experts papers were also checked for quality and plagiarism after which 163 papers were accepted for presentation and publication topics covered include the research and development of concrete structure design and analysis structural mechanics and structural engineering geological exploration and earthquake engineering building technology urban planning energy environment and advanced engineering science and applications the book offers a state of the art overview of recent developments and will be of interest to all those working in the fields of hydraulic and civil engineering technology

Tunnel Lining Design Guide

2004

economic mineralization the volume sets out to present various aspects of a very broad details of a narrow field of economic mineralization at a time when the competitively growing global economy and the pressing needs of the society are compelling economic geology to grow and pile of data is accumulating and opinions changing very rapidly the volume incorporates papers a resultant of information explosion and electrifying conceptual revolution in economic geology describing

the new and exciting results and timely reviews integrating and immense amount of knowledge in the field of geology exploration mining environment economics geophysics and geochemistry that has bearing on economic mineralization the book imbibes sections on crustal evolution and economic mineralization economic mineralization of igneous application economic mineralization of sedimentary affiliation prospecting and exploration and mining economics and environments in all the five sections current concepts problems and probable trends of future research are highlighted this book will be an invaluable everlasting reference for both industry and academia specializing in economic mineralization and for those who need updated information and current research in the field it will be equally useful for advance level geology and mining students and research scholars throughout the world

Advances in Spatio-Temporal Analysis

2007-08-23

Ground Characterization and Structural Analyses for Tunnel Design

2019-08-06

Handbook of Tunnel Engineering II

2014-01-22

Advances in Geoengineering, Geotechnologies, and Geoenvironment for Earth Systems and Sustainable Georesources Management

2023-05-27

Hydraulic and Civil Engineering Technology VII

2022-12-23

Economic Mineralization

2009-07-01

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