

# GEOTECHNICAL



## Index and Classification Properties of Soils

Unit weight :  $\gamma = \frac{W}{V}$

Dry unit weight :  $\gamma_d = \frac{G_s \gamma_w}{1+e}$

Moist unit weight :  $\gamma = \gamma_{dry} (1 + \omega)$

Saturated unit weight:  $\gamma_{sat} = \frac{(G_s + e) \gamma_w}{1+e}$

Zero air void unit weight:

$$\gamma_{zav} = \frac{G_s \gamma_w}{1+e}$$

Moisture content (water content)

$$\omega = \frac{W_w}{W_s}$$

Degree of saturation :  $s = \frac{\omega G_s}{e}$

Porosity :  $n = \frac{e}{1+e}$

Air void ratio =  $n (1 - s)$

where :  $W$  = total weight

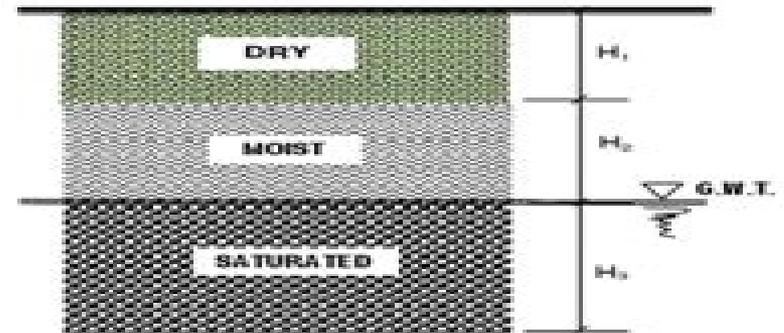
$V$  = volume

$G_s$  = specific gravity

$e$  = void ratio

$\gamma_w$  = unit weight of water

=  $9.81 \text{ kN/m}^3$  (  $1 \text{ gram/cm}^3$  )



Phases of Soil

G.W.T. = ground water table

# Geotechnical Engineering Formulas

**Yicheng Fang**



## **Geotechnical Engineering Formulas:**

Civil Engineering Formulas and Equations for Students PETER I. KATTAN,2025-03-23 This is a little book for students who wish to have the essential formulas and equations of geotechnical engineering in a single easily accessible source In about 40 pages the 100 most essential civil engineering formulas are listed Unlike other large books on this topic there is no need to go through hundreds of pages and thousands of formulas for the student to get the basic equations The author has searched several books on engineering formulas and tables and selected only those equations which are essential to the student The civil engineering formulas and equations listed in this book are useful for students and researchers in various fields including geotechnical engineering soil mechanics and foundation analysis etc Only the most elementary and basic topics are covered including formulas for Unified Soil Classification System Rock Classification System Physical Properties of Soils Index Parameters for Soils Soil Indices Engineering Properties of Soils Shear Strength of Cohesive Soils Shear Strength of Cohesionless Soils The Static Cone Penetration Test CPT California Bearing Ratio CBR Soil Permeability Expansive Soils Liquefaction of Soils Types of Footings Foundation Stability Analysis Eccentric Loading Allowable Bearing Pressures Settlement Analysis of Cohesive Soils Three Dimensional Settlement Analyses The Coefficient of Consolidation Settlement Analysis of Sands Standard Penetration Resistance Methods Piles Pile Testing and Pile Design Lateral Pressures on Retaining Walls This is the second book in this series and is dedicated to geotechnical engineering Other volumes will follow in other areas of civil engineering

Geotechnical Engineering V.N.S. Murthy,2002-10-25 A must have reference for any engineer involved with foundations piers and retaining walls this remarkably comprehensive volume illustrates soil characteristic concepts with examples that detail a wealth of practical considerations It covers the latest developments in the design of drilled pier foundations and mechanically stabilized earth retaining wall and explores a pioneering approach for predicting the nonlinear behavior of laterally loaded long vertical and batter piles As complete and authoritative as any volume on the subject it discusses soil formation index properties and classification soil permeability seepage and the effect of water on stress conditions stresses due to surface loads soil compressibility and consolidation and shear strength characteristics of soils While this book is a valuable teaching text for advanced students it is one that the practicing engineer will continually be taking off the shelf long after school lets out Just the quick reference it affords to a huge range of tests and the appendices filled with essential data makes it an essential addition to an civil engineering library

Geotechnical Engineering Calculations and Rules of Thumb Ruwan Abey Rajapakse,2011-04-08 Geotechnical Engineering Calculations and Rules of Thumb 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 Practical Guide to Geo-Engineering Milutin Srbulov,2014-04-07 This handy reference manual puts a wealth of ready to use information data and practical procedures within immediate reach of geo engineers and technicians whether they be in the field or office It assembles and organizes the most needed set of equations tables graphs and check lists on six major subfields of geo engineering investigations testing properties hazards structures and works This practical reference for the professional and others interested in the subject of ground engineering skips lengthy definitions to highlight best practice and methods proven most effective While reflecting codes and standards it also fills the gaps with non standard approaches when existing ones are skimpy on practical details or agreement Enhanced by 146 illustrations and 83 tables the Practical Guide to Geo Engineering points users to supporting information and data through its extensive reference list Audience This book is of interest to everyone involved in practical geo engineering

**Geotechnical Engineering Calculations and Rules of Thumb** Ruwan Abey Rajapakse,2015-11-18 Geotechnical Engineering Calculations and Rules of Thumb Second Edition offers geotechnical civil and structural engineers a concise easy to understand approach to selecting the right formula and solving even most difficult calculations in geotechnical engineering A quick look up guide this book places formulas and calculations at the reader s finger tips In this book theories are explained in a nutshell and then the calculation is presented and solved in an illustrated step by step fashion In its first part the book covers the fundamentals of Geotechnical Engineering Soil investigation condition and theoretical concepts In the second part it addresses Shallow Foundations including bearing capacity elastic settlement foundation reinforcement grillage design footings geogrids tie and grade beams and drainage This session ends with a chapter on selecting foundation types The next part covers Earth Retaining Structures and contains chapters on its basic concepts and types gabion walls and reinforced earth walls The following part covers Geotechnical Engineering Strategies providing coverage of softwares instrumentation excavations raft design rock mechanics dip angle and strike rock stabilization equipment soil anchors tunnel design seismology geosynthetics and slurry cutoff walls The final part is on Pile Foundations including content on design on sandy soils clay soils pin piles negative skin friction caissons and pile clusters In this new and updated edition the author has incorporated new software calculation tools current techniques for foundation design liquefaction information seismic studies laboratory soil tests geophysical techniques new concepts for foundation design and Dam designs All calculations have been

updated to most current material characteristics available in the market Practicing Geotechnical Civil and Structural Engineers may find in this book an excellent companion to their day to day work benefiting from the clear and direct calculations examples and cases Civil Engineering students may find particular interest in the concise theory presented in the beginning of each chapter Calculations both in FPS and SI metric systems Convenient access to all needed calculations Access to concise theory that helps understand the calculations Case studies from around the world Includes new software calculation tools

**Numerical Methods in Geotechnical Engineering** Chandrakant S. Desai, John T. Christian, 1977

*Geotechnical Engineering Handbook* Braja M. Das, 2011 The Geotechnical Engineering Handbook brings together essential information related to the evaluation of engineering properties of soils design of foundations such as spread footings mat foundations piles and drilled shafts and fundamental principles of analyzing the stability of slopes and embankments retaining walls and other earth retaining structures The Handbook also covers soil dynamics and foundation vibration to analyze the behavior of foundations subjected to cyclic vertical sliding and rocking excitations and topics addressed in some detail include environmental geotechnology and foundations for railroad beds

*Geotechnical Risk and Safety* Yusuke Honjo, Makoto Suzuki, Takashi Hara, Feng Zhang, 2009-06-01 Communication of risks within a transparent and accountable framework is essential in view of increasing mobility and the complexity of the modern society and the field of geotechnical engineering does not form an exception As a result modern risk assessment and management are required in all aspects of geotechnical issues such as planning design construction of geotechnical structures mitigation of geo hazards management of large construction projects maintenance of structures and life cycle cost evaluation This volume discusses 1 Evaluation and control of uncertainties through investigation design and construction of geotechnical structures 2 Performance based specifications reliability based design and limit state design of geotechnical structures and design code developments 3 Risk assessment and management of geo hazards such as landslides earthquakes debris flow etc 4 Risk management issues concerning large geotechnical construction projects 5 Repair and maintenance strategies of geotechnical structures Intended for researchers and practitioners in geotechnical geological infrastructure and construction engineering

Geotechnical Engineering Bundle Brent Maxfield, 2008-10-03 Contains two titles that include Geotechnical Engineering Calculations and Rules of Thumb a guide to the formulas and calculation methods used in soil and geotechnical engineering and Engineering with MathCAD that demonstrates the power of MathCAD to create calculations for solving engineering problems

**Correlations of Soil and Rock Properties in Geotechnical Engineering** Jay Ameratunga, Nagaratnam Sivakugan, Braja M. Das, 2015-12-11 This book presents a one stop reference to the empirical correlations used extensively in geotechnical engineering Empirical correlations play a key role in geotechnical engineering designs and analysis Laboratory and in situ testing of soils can add significant cost to a civil engineering project By using appropriate empirical correlations it is possible to derive many design parameters thus limiting our reliance on these soil tests The authors have decades of

experience in geotechnical engineering as professional engineers or researchers The objective of this book is to present a critical evaluation of a wide range of empirical correlations reported in the literature along with typical values of soil parameters in the light of their experience and knowledge This book will be a one stop shop for the practising professionals geotechnical researchers and academics looking for specific correlations for estimating certain geotechnical parameters The empirical correlations in the forms of equations and charts and typical values are collated from extensive literature review and from the authors database Pile Design and Construction Rules of Thumb Ruwan Abey Rajapakse,2011-08-30 All objects and structures transfer their load either directly or indirectly to the earth The capacity of the earth to support such loads depends on the strength and stability of the supporting soil or rock materials Pile foundations are the part of a structure used to carry and transfer the load of the structure to the bearing ground located at some depth below ground surface There are many texts on pile foundations Generally these books are complicated and difficult to understand Easy to use and understand this book covers virtually every subject concerning pile design featuring techniques that do not appear in other books on the subject The book contains design methods with real life examples on pin piles battered piles concrete piles steel piles timber piles auger cast piles underpinning design seismic pile design negative skin friction and design of Bitumen coated piles for negative skin friction and many other subjects The book is packed with design examples case studies and after construction scenarios are presented for the reader s benefits This book enables the reader to come away with a complete and comprehensive understanding of the issues related to the design installation and construction of piles Handy guide for engineers preparing for professional engineer PE exam Numerous design examples for sandy soils clay soils and seismic loadings Methodologies and case studies for different pile types *Journal of Geotechnical Engineering* ,1995

**Geotechnical and Foundation Engineering** Robert W. Day,1999 This study presents practical aspects of geotechnical and foundation engineering with the emphasis on visual aspects It develops a project and uses it as an example for the way to conduct design and construction methods and procedures *Proceedings of GeoShanghai 2018 International Conference: Fundamentals of Soil Behaviours* Annan Zhou,Junliang Tao,Xiaoqiang Gu,Liangbo Hu,2018-05-10 This book is the second volume of the proceedings of the 4th GeoShanghai International Conference that was held on May 27 30 2018 The book entitled Fundamentals of Soil Behaviours presents the recent advances and technology in the understanding and modelling of fundamentals of soil s behaviours The subject of this book covers a wide range of topics related to soil behaviours in geotechnical engineering geoenvironmental engineering and transportation engineering The state of the art theories methodologies and findings in the related topics are included This book may benefit researchers and scientists from the academic fields of soil and rock mechanics geotechnical engineering geoenvironmental engineering transportation engineering geology mining and energy as well as practical engineers from industry Each of the papers included in this book received at least two positive peer reviews The editors would like to express their sincerest appreciation to all of the

anonymous reviewers all over the world for their diligent work      **An Introduction to Geotechnical Engineering** Robert D. Holtz, William D. Kovacs, Thomas C. Sheahan, 2011 Intended for use in the first of a two course sequence in geotechnical engineering usually taught to third and fourth year undergraduate civil engineering students An Introduction to Geotechnical Engineering offers a descriptive elementary introduction to geotechnical engineering with applications to civil engineering practice      Foundation Engineering Handbook Robert W. Day, 2006 Publisher Description      Transactions of the American Society of Civil Engineers American Society of Civil Engineers, 1929 Vols 29 30 contain papers of the International Engineering Congress Chicago 1893 v 54 pts A F papers of the International Engineering Congress St Louis 1904

Transactions of the American Society of Civil Engineers American Society of Civil Engineers, 1985      **Proceedings of the 2024 7th International Conference on Civil Architecture, Hydropower and Engineering Management (CAHEM 2024)** Yanjun Qiu, Weimin Feng, Zhiqiang Zhang, Fauziah Ahmad, 2025-01-31 This is an open access book The 2024 7th International Conference on Civil Architecture Hydropower and Engineering Management CAHEM 2024 will be held on September 27 29 2024 in Kunming China The conference aims to provide a platform for global scholars experts and industry practitioners to share research results and technological innovations and to promote the development of the field of civil construction hydropower development and engineering management With the acceleration of global urbanization and the increase in demand for infrastructure development civil construction and hydropower engineering are seeing significant opportunities and prospects In the future the industry will not only need to meet complex engineering challenges but also the requirements of sustainable development The application of new materials technologies and advanced management methods provides new possibilities to enhance the quality and efficiency of projects CAHEM 2024 will bring together research forces from all over the world to discuss cutting edge technologies and management experiences through keynote speeches oral presentations and poster presentations and to jointly promote technological advances and innovative applications in the industry      **Soil Testing Manual** Robert W. Day, 2001 The essential tool for geotechnical and soil engineering fieldwork Written by AIA award winning civil engineer Robert Day Soil Testing Manual gives engineers geologists contractors on site construction managers anyone who needs answers on the characteristics of soil a convenient complete source of today's most authoritative solutions This reader friendly guide simplifies each step of every process from selecting appropriate methods to analyzing your results Filled with handy tables charts diagrams and formulas that eliminate time wasting and frustrating searches and calculations this manual gives you better results in less time as you Get expert approaches to testing altered and disturbed soils Set up a mobile field lab with complete directions Use rip out sheets for on site reference and checks Get quick access to data on grading instrumentation technical methods procedure guidelines and preferred practices Draw authoritative conclusions on fill compaction Measure cohesiveness shear strength settlement permeability and other critical parameters Construct a subsoil profile

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