

Briefing: Ciria guide C760: guidance on embedded retaining wall design

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This paper details key aspects of the update of the Construction Industry Research and Information Association's good practice on embedded retaining walls (C760). The authors of C760 provide an overview of the new guidance on the selection and design of vertical embedded retaining walls that satisfy the requirements of Eurocodes. The guidance also covers temporary and permanent cantilevers, and anchored, single-propped and multi-propped retaining walls that are supported by embedment in soft soils, stiff clays and other competent soils and soft rocks. C760 addresses the technical and construction issues relating to the selection of appropriate wall types and construction sequence to achieve a satisfactory design. It clarifies areas of ambiguity and common misunderstandings when applying the Eurocodes to the design of embedded retaining walls and presents a clear, unambiguous method for the application of the observational method.

Notation

E	elastic modulus of the reinforcement
I	second moment of area of the reinforced-concrete section
K_e	in situ earth pressure coefficient, K_e/K_0

Introduction

An earth-retaining wall is required to withstand forces exerted by a vertical or near-vertical ground surface. An embedded retaining wall is one that penetrates and obtains some lateral support from the ground at its base.

The bending capacity of such a wall typically plays a significant role in the support of the retained material, particularly if it is free-standing. The wall may also be supported by structural members such as props, berms, ground anchors and slabs, and it may form part of a larger structure.

C760 (Gaba *et al.*, 2017) provides guidance on the selection and design of vertical embedded retaining walls in compliance with the principles in the Eurocodes. It covers all types of retaining walls, including sheet pile walls, king post walls, contiguous bored pile walls, secant bored pile walls and diaphragm walls.

It is possible to make economies in embedded retaining walls by selecting an appropriate wall type and support system for the envisaged construction method, construction sequence and long-term use. It is important to adopt a clear, unambiguous design method and to follow appropriate good practice of ground investigation, laboratory and field testing and design analysis, and utilise good-quality case study data. C760 provides guidance on all these points.

Construction Industry Research and Information Association and ground engineering

Whether it is designing and constructing embedded retaining walls for some of the world's most iconic (and not so iconic) infrastructure or designing and constructing levees to protect vulnerable communities from flooding, Construction Industry Research and Information Association's (Ciria) good practice guidance documents are used for a variety of construction and civil engineering schemes.

From everyday construction projects to once-in-a-lifetime major infrastructure schemes, enabling practitioners to design, construct and manage better has been the role of Ciria's research since the inception of the organisation in 1967. The very first research and development work Ciria commissioned was on a series of practical piling guides, leading to the PG Piling series, which became the industry standard for the decades that followed.

Research that Ciria undertakes in the area of ground engineering is steered by the Ciria Ground Engineering Advisory Panel before the wider industry is approached to support its development. Ciria also provides secretariat services to the client-led Geotechnical Asset Owners Forum, which helps position Ciria to identify and develop guidance that meets their particular needs.

Ciria's ground engineering research is a part of Ciria's civil engineering infrastructure programme of good practice guidance research, which is now heavily influenced by the 'digital transformation' and the profound opportunities afforded to the

Ciria Guide Embedded Retaining Walls

Andrew Bond, Andrew Harris



Ciria Guide Embedded Retaining Walls:

Guidance on Embedded Retaining Wall Design Clare Drake, 2016-11 **Embedded Retaining Walls** ASIM AUTOR GABA, BRIAN AUTOR SIMPSON, WILLIAM AUTOR POWRIE, DAVID AUTOR BEADMAN, 2003 This publication replaces the CIRIA report from 1984 R104 Design of retaining walls embedded in stiff clays It provides best practice guidance on the selection and design of vertical embedded retaining walls Specification for Piling and Embedded Retaining Walls Institution of Civil Engineers (Great Britain), Great Britain. Highways Agency, 1996 The ICE Specifications for Piling published in 1988 provided a standard document for the range of different piling construction techniques commonly used in the UK Here this specification includes significant changes and covers embedded retaining walls *Earth Retaining Structures and Stability Analysis* Kasinathan Muthukkumaran, Balunaini Umashankar, N. Kumar Pitchumani, 2023-02-14 This book comprises the select peer reviewed proceedings of the Indian Geotechnical Conference IGC 2021 The contents focus on Geotechnics for Infrastructure Development and Innovative Applications This book covers topics geotechnical challenges in tunnel construction related performance of temporary secant pile wall soil nail walls rock fill embankment dams performance of MSE wall stability analysis dynamic stability and landslide simulations landslide early warning system among others This book is of interest to those in academia and industry This book is of interest to those in academia and industry ICE Manual of Geotechnical Engineering Volume 2 Hilary Skinner, D G Toll, Kelvin Higgins, Mike Brown, John Burland, 2023-11-17 ICE Manual of Geotechnical Engineering Second edition brings together an exceptional breadth of material to provide a definitive reference on geotechnical engineering solutions Written and edited by leading specialists each chapter provides contemporary guidance and best practice knowledge for civil and structural engineers in the field Steel Designers' Manual SCI (Steel Construction Institute), 2016-06-27 In 2010 the then current European national standards for building and construction were replaced by the EN Eurocodes a set of pan European model building codes developed by the European Committee for Standardization The Eurocodes are a series of 10 European Standards EN 1990 EN 1999 that provide a common approach for the design of buildings other civil engineering works and construction products The design standards embodied in these Eurocodes will be used for all European public works and are set to become the de facto standard for the private sector in Europe with probable adoption in many other countries This classic manual on structural steelwork design was first published in 1955 since when it has sold many tens of thousands of copies worldwide For the seventh edition of the Steel Designers Manual all chapters have been comprehensively reviewed revised to ensure they reflect current approaches and best practice and brought in to compliance with EN 1993 Design of Steel Structures the so called Eurocode 3 *The Essential Guide to the ICE Specification for Piling and Embedded Retaining Walls* Federation of Piling Specialists, 1999 First published in 1996 this updated guide provides practical advice on the use of ICE Institute of Civil Engineers specifications and includes a detailed commentary on each section with references to specific clauses Technology Industrial Arts

Decoding Eurocode 7 Andrew Bond, Andrew Harris, 2008-08-29 Decoding Eurocode 7 provides a detailed examination of Eurocode 7 Parts 1 and 2 and an overview of the associated European and International standards The detail of the code is set out in summary tables and diagrams with extensive Fully annotated worked examples demonstrate how to apply it to real designs Flow diagrams explain how reliability is introduced into design and mind maps gather related information into a coherent framework Written by authors who specialise in lecturing on the subject Decoding Eurocode 7 explains the key principles and application rules of Eurocode 7 in a logical and simple manner Invaluable for practitioners as well as for high level students and researchers working in geotechnical fields

Earth Pressure and Earth-Retaining Structures Chris R.I. Clayton, 2014-05-28 Effectively Calculate the Pressures of Soil When it comes to designing and constructing retaining structures that are safe and durable understanding the interaction between soil and structure is at the foundation of it all Laying down the groundwork for the non specialists looking to gain an understanding of the background and issues surrounding g

Geotechnical Engineering Handbook, Elements and Structures Ulrich Smolczyk, 2003-05-06 Volume 3 of this Handbook deals with foundations It presents spread foundations starting with basic designs right up the necessary proofs The section on pile foundations covers possible types of piles and their design together with their load bearing capacity suitability sample loads and testing A further chapter explains the use manufacture and calculation of caissons illustrated by real life examples There is comprehensive coverage of the possibilities for stabilising excavations together with the relevant area of application while another section is devoted to the useful application of trench walls Shore protection is treated in a special contribution covering sheet pile walls while all types of slope protection and retainments are described in detail with excellent illustrations Two further contributions are devoted to the special topics of machine foundations and foundations in subsidence regions The entire book is an indispensable aid in the planning and execution of all types of foundations found in practice whether for academics or practitioners

Geotechnical Aspects of Underground Construction in Soft Ground Mohammed Elshafie, Giulia Viggiani, Robert Mair, 2021-05-11 Geotechnical Aspects of Underground Construction in Soft Ground comprises a collection of 112 papers four general reports on the symposium themes the Fujita Lecture three Special Lectures and the Bright Spark Lecture presented at the Tenth International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground held in Cambridge United Kingdom 27 29 June 2022 The symposium is the latest in a series which began in New Delhi in 1994 and was followed by symposia in London 1996 Tokyo 1999 Toulouse 2002 Amsterdam 2005 Shanghai 2008 Rome 2011 Seoul 2014 and Sao Paulo 2017 This was organised by the Geotechnical Research Group at the University of Cambridge under the auspices of the Technical Committee TC204 of the International Society for Soil Mechanics and Geotechnical Engineering ISSMGE Geotechnical Aspects of Underground Construction in Soft Ground includes contributions from more than 25 countries on research design and construction of underground works in soft ground The contributions cover Field case studies Sensing technologies and monitoring for

underground construction in soft ground Physical and numerical modelling of tunnels and deep excavations in soft ground Seismic response of underground infrastructure in soft ground Design and application of ground improvement for underground construction Ground movements interaction with existing structures and mitigation measures The general reports give an overview of the papers submitted to the symposium covered in four technical sessions The proceedings include the written version of the five invited lectures covering topics ranging from developments in geotechnical aspects of underground construction tunnelling and groundwater interaction short and long term effects the influence of earth pressure balance shield tunnelling on pre convergence and segmental liner loading field observations modelling and implications on design Similar to previous editions *Geotechnical Aspects of Underground Construction in Soft Ground* represents a valuable source of reference on the current practice of analysis design and construction of tunnels and deep excavations in soft ground The book is particularly aimed at academics and professionals interested in geotechnical and underground engineering

Geotechnical Engineering Challenges to Meet Current and Emerging Needs of Society Nuno

Guerra, Manuel Matos Fernandes, Cristiana Ferreira, António Gomes Correia, Alexandre Pinto, Pedro Sêco Pinto, 2024-09-17 *Geotechnical Engineering Challenges to Meet Current and Emerging Needs of Society* includes the papers presented at the XVIII European Conference on Soil Mechanics and Geotechnical Engineering Lisbon Portugal August 26 to 30th 2024 The papers aim to contribute to a better understanding of problems and solutions of geotechnical nature as well as to a more adequate management of natural resources Case studies are included to better disseminate the success and failure of Geotechnical Engineering practice The peer reviewed articles of these proceedings address the six main topics New developments on structural design Geohazards Risk analysis and safety evaluation Current and new construction methods Environment water and energy Future city world vision With contributions from academic researchers and industry practitioners from Europe and abroad this collection of conference articles features an interesting and wide ranging combination of innovation emerging technologies and case histories and will be of interest to academics and professionals in Soil Mechanics and Geotechnical Engineering

Geotechnical Aspects of Underground Construction in Soft Ground Arsenio Negro, Marlísio O. Cecílio Jr., 2017-11-23 *Geotechnical Aspects of Underground Construction in Soft Ground* comprises the second Fujita lecture three keynote lectures and the regular papers presented at the Ninth International Symposium on Geotechnical Aspects of Underground Construction in Soft Ground IS Sao Paulo 2017 Sao Paulo Brazil 4 6 April 2017 The Symposium was organized by the Brazilian Tunnelling Committee CBT of the Brazilian Geotechnical Society ABMS under the auspices of the Technical Committee TC204 of the International Society for Soil Mechanics and Geotechnical Engineering ISSMGE The contributions cover a wide range of topics Deep Excavations Interaction with Adjacent Structures Mechanized Excavations Sequential Excavations Physical Modelling and Field Tests Case Histories *Geotechnical Aspects of Underground Construction in Soft Ground* is particularly aimed at academics and professionals interested or involved in geotechnical and

underground engineering Similarly to previous editions the contributions are a valuable source of reference on the current practice on the analysis design and construction of tunnels deep excavations and large underground structures with particular emphasis on the development effects and control of ground movements their interaction with existing structures mitigation measures and risk management IS Sao Paulo 2017 is the latest in a series of ISSMGE s TC204 symposia which began in New Delhi 1993 followed by symposia in London 1996 Tokyo 1999 Toulouse 2002 Amsterdam 2005 Shanghai 2008 Rome 2011 and Seoul 2014

ICE Manual of Geotechnical Engineering Volume 1 Hilary Skinner,D G Toll,Kelvin Higgins,Mike Brown,John Burland,2023-11-17 ICE Manual of Geotechnical Engineering Second edition brings together an exceptional breadth of material to provide a definitive reference on geotechnical engineering solutions Written and edited by leading specialists each chapter provides contemporary guidance and best practice knowledge for civil and structural engineers in the field

The Observational Method in Civil Engineering Alan Powderham,Anthony O'Brien,2020-09-28 The Observational Method OM is a natural and powerful technique that maximises economy while assuring safety Its key features are highlighted in The Observational Method in Civil Engineering through twelve case histories from major infrastructure projects They cover protection of adjacent structures including buildings and railway systems bored and jacked tunnels shafts and cofferdams retaining walls embankments deep foundations ground improvement and groundwater control They illustrate how the OM can achieve more effective collaboration between the client and the design and construction teams as well as how it can enhance the industry s ability to learn from experience thus improving future practice and stimulating innovation Despite these advantages the OM is significantly underused The book demonstrates how the full potential of the OM can overcome a wide range of concerns and constraints Other chapters address the advantages and limitations of the OM the key role of progressive modification the art of achieving agreement and the commercial and contractual environment The book will appeal to a range of construction professionals including civil structural and geotechnical engineers contractors and owners It will also be of interest to students and researchers

Response of Piled Buildings to the Construction of Deep Excavations M. Korff,IOS Press,2013-06-13 Deep excavations in densely populated urban areas around the world pose specific challenges due to the increasingly complex conditions in which they are undertaken The construction of underground car parks cellar storage areas and major infrastructure in deep excavations helps to preserve the quality of space above ground Despite the considerable effort that goes into their design and construction such projects often encounter problems such as damage to existing structures delays and cost overruns This book presents the results of an extensive research project conducted at the University of Cambridge in cooperation with the Netherlands Centre of Underground Construction COB and Deltares the Dutch Institute for water subsurface and infrastructure issues The study gained insight into mechanisms of soil structure interaction for piled buildings adjacent to deep excavations and resulted in suggestions for designing and monitoring deep excavations in urban areas with soft soil

conditions Monitoring data of the construction of three deep excavations for the North South metro line in Amsterdam the Netherlands have been used to validate the methods described This book aims to contribute to the reduction of failure costs in the building industry and in underground construction in particular **Temporary Works Part Two** Ray

Filip,2025-06-12 Temporary Works Part Two Further Principles of Design and Construction provides authoritative and comprehensive guidance on key areas of temporary works for practising engineers Building on the successful format of Temporary Works Principles of Design and Construction the book provides 18 entirely new chapters *Soil Mechanics* Graham Barnes,2017-09-16 Now in its fourth edition this popular textbook provides students with a clear understanding of the nature of soil and its behaviour offering an insight into the application of principles to engineering solutions It clearly relates theory to practice using a wide range of case studies and dozens of worked examples to show students how to tackle specific problems A comprehensive companion website offers worked solutions to the exercises in the book video interviews with practising engineers and a lecturer testbank With its comprehensive coverage and accessible writing style this book is ideal for students of all levels on courses in geotechnical engineering civil engineering highway engineering environmental engineering and environmental management and is also a handy guide for practitioners New to this Edition Brand new case studies from around the world demonstrating real life situations and solutions Over 100 worked examples giving an insight into how engineers tackle specific problems A companion website providing an integrated series of video interviews with practising engineers An extensive online testbank of questions for lecturers to use alongside the book *Engineering of Glacial Deposits* Barry G. Clarke,2017-07-14 At some time 30% of the world s land mass was covered by glaciers leaving substantial deposits of glacial soils under major conurbations in Europe North and South America New Zealand Europe and Russia For instance 60% of the UK has been affected leaving significant glacial deposits under major conurbations where two thirds of the population live Glacial soils are composite soils with significant variations in composition and properties and are recognised as challenging soils to deal with Understanding the environment in which they were formed and how this affects their behaviour are critical because they do not always conform to classic theories of soil mechanics This book is aimed at designers and contractors working in the construction and extractive industries to help them mitigate construction hazards on with or in glacial deposits These soils increase risks to critical infrastructure which in the UK includes the majority of the road and rail network coastal defences such as the fastest eroding coastline in Europe and most of the water supply reservoirs It brings together many years of experience of research into the behaviour of glacial deposits drawing upon published and unpublished case studies from industry It draws on recent developments in understanding of the geological processes and the impact they have upon the engineering properties construction processes and performance of geotechnical structures Unlike other books on glaciation it brings together all the relevant disciplines in earth sciences and engineering to make it directly relevant to the construction industry **Soil Mechanics** William Powrie,2002-06-01 The aim of this book is

to encourage students to develop an understanding of the fundamentals of soil mechanics It builds a robust and adaptable framework of ideas to support and accommodate the more complex problems and analytical procedures that confront the practising geotechnical engineer Soil Mechanics Concepts and Applications covers the soil mechanics and geotechnical engineering topics typically included in university courses in civil engineering and related subjects Physical rather than mathematical arguments are used in the core sections wherever possible New features for the second edition include an accompanying website containing the lecturers solutions manual a revised chapter on soil strength and soil behaviour separating the basic and more advanced material to aid understanding a major new section on shallow foundations subject to combined vertical horizontal and moment loading revisions to the material on retaining walls foundations and filter design to account for new research findings and bring it into line with the design philosophy espoused by EC7 More than 50 worked examples including case histories Learning objectives key points and example questions

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