The Manning Equation For Open Channel Flow Calculations

Open-Channel FlowFlow in Open ChannelsHydrology and Floodplain AnalysisHandbook of Hydraulics, Eighth EditionHydraulics of Open Channel FlowHydraulic Loss Coefficients for CulvertsManning Formula Tables for Solving Hydraulic Problems: Flow in pipesOpen Channel FlowHydraulic Loss Coefficients for CulvertsAustralian Rainfall and RunoffFluid Mechanics Fundamentals and ApplicationsAn Introduction to Hydrodynamics and Water WavesHydraulic ModelingHydraulics of Open Channel FlowEncyclopedia of Hydrology and Water ResourcesDesign Charts for Open-channel FlowDesign and Construction of Urban Stormwater Management SystemsOpen Channel HydraulicsFloods in a Changing ClimateHydraulics of Open Channel FlowOpen-channel HydraulicsProceedings of the International Conference on Hydrology and Water Resources, New Delhi, India, December 1993: Water-quality hydrologyThe Hydraulics of Open Channel FlowOpen Channel HydraulicsThe Bed-load Function for Sediment Transportation in Open Channel FlowsAdditional Tables for the Hydraulic Design of Pipes, Sewers and ChannelsUnsteady Flow in Open ChannelsOpen Channel HydraulicsHighway Drainage Guidelines: Guides for hydraulic analysis and design of open channelsManning FormulaChannel Flow ResistancePartially Full Pipe Flow Calculation SpreadsheetsA Regional Sanitary Sewerage System Plan for Southeastern WisconsinOpen-Channel FlowFlow Through Open ChannelsTreatment

WetlandsHydraulicsNumerical Modeling in Open Channel HydraulicsDesign of Fluid Thermal Systems, SI EditionFundamentals of Open Channel Flow

Open-Channel Flow

The fresh water supplies of the Earth are finite and as the world's population continues to grow humanity's thirst for this water seems unquenchable. Intense pressure is being exerted upon freshwater resources and a lack of adequate clean water is seen as one of the most serious global problems for the 21st century. Indeed it has been said that the next war will be fought over water, not oil. Human health and the health of supporting ecosystems increasingly depends upon our ability to find, control, manage and understand water. In a single volume, The Encyclopedia of Hydrology and Water Resources provides the reader with a comprehensive overview and understanding of the diverse field of hydrology. The intimate inclusion of material on water resources emphasizes the practical applications of this field, applications which are indispensable in any modern approach to the subject. This volume is a vital reference for all hydrologists, hydrogeologists and water engineers worldwide, whether they are concerned with the exploitation of new sources of water, the protection and management of existing reserves, or the science of surface water and groundwater flow. 114 eminent scientists from 17 countries worldwide have contributed to this authoritative volume. Superbly illustrated throughout, it includes almost 300 entries on a range of key
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topics, including arid and semi-arid zones, climates and climate change, floods and droughts, desertification, entropy, flow measurement, groundwater, hydrological cycle, hydrological models, infiltration, karst hydrology, paleohydrology, precipitation, remote sensing, river pollution prevention, rivers, lakes and seas, satellite hydrology, soil erosion, water treatment, water use, weather radar, and world water balance.

Flow in Open Channels

Hydrology and Floodplain Analysis

The design of a highway drainage channel to carry a given discharge is accomplished in two parts. The first part of the design involves the computation of a channel section which will carry the design discharge on the available slope. This chapter briefly discusses the principles of flow in open channels and the use of the Manning equation for computing the channel capacity. The second part of the design is the determination of the degree of protection required to prevent erosion in the drainage channel. This can be done by computing the velocity in the channel at the design discharge, using the Manning equation, and comparing the calculated velocity with that permissible for the type of channel lining used. A change in the type of channel lining will require a change in channel size unless both linings have the same roughness coefficient.

Handbook of Hydraulics, Eighth Edition

A comprehensive treatment of open channel flow, Open Channel Flow: Numerical Methods and Computer Applications starts with basic principles and gradually advances to complete problems involving systems of channels with branches, controls, and outflows/ inflows that require the simultaneous solutions of systems of nonlinear algebraic equations coupl

Hydraulics of Open Channel Flow

Now in its third edition, "Hydrology and Floodplain Analysis" continues to offer a clear and up-to-date presentation of the fundamental concepts and design methods required to understand hydrology and floodplain analysis. It addresses the computational emphasis of modern hydrology and provides a balanced approach to important applications in watershed analysis, floodplain computation, flood control, urban hydrology, stormwater design, and computer modeling. Includes HEC-HMS, HEC-RAS, and SWMM models plus GIS and radar rainfall. The text is ideal for students taking an undergraduate or graduate course on hydrology, while the practicing engineer should value the book as a modern reference for hydrologic principles, flood frequency analysis, floodplain analysis, computer simulation, and hydrologic storm water design. Updated coverage in the third edition includes: "Three New Chapters" Chapter 1: Geographic Information Systems (GIS) Chapter 2: Use of NEXRAD Radar Data Chapter 3:

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Floodplain Management Issues in Hydrology A new, detailed case study of a complex watershed using GIS linked with radar technology. New tools and technologies used for watershed analysis, hydrologic modeling, and modern floodplain delineation. New examples and homework problems in each chapter.

Hydraulic Loss Coefficients for Culverts

This outstanding new book examines the planning, design, construction, and operation of wetlands used for water quality treatment. Treatment Wetlands is the first comprehensive book to systematically describe all aspects of this new technology. Topics include all major wetland configurations, wastewater sources, and combinations of climatic conditions. This complete reference contains detailed information on wetland ecology, wetland water quality, selection of appropriate technology, design for consistent performance, construction guidance, and operational control through effective monitoring. Design approaches that can be tailored to specific wetland treatment projects are also included. Rule-of-thumb methods, regression-based empirical design approaches, and rational methods are explained facilitating wetland design based on multi-parameter input conditions.

Manning Formula Tables for Solving Hydraulic Problems: Flow in pipes

Fully Updated Hydraulics Engineering Concepts, Methods, and Practices This thoroughly revised

resource offers comprehensive coverage of every aspect of hydraulics. Handbook of Hydraulics, Eighth Edition, features the latest data and computational modeling techniques and clearly explains cutting-edge methods, processes, and technologies. You will get more than 80 dependable tables and graphs, sample equations, and real-world examples. This single source for on-the-job hydraulics engineering information will save time and ensure accuracy in performing hydraulic calculations. Coverage includes:
•Fluid properties and hydraulic units •Hydrostatics •Fundamental concepts of fluid flow •Orifices, gates, and valves •Weirs •Pipes •Steady uniform flow in open channels •Open channels with non-uniform flow •High-velocity transitions •Wave motion and forces •Spatially variable and unsteady flow •Measurement of flowing water •Computational hydraulics •Physical and mathematical modeling of hydraulic structures

Open Channel Flow

The Manning equation is used for a wide variety of uniform open channel flow calculations, including gravity flow in pipes, the topic of this book. Gravity flow occurs in pipes for partially full flow, up to and including full pipe flow, as long as the pipe isn't pressurized. Equations for calculating area, wetted perimeter and hydraulic radius for partially full pipe flow are included in this book along with a brief review of the Manning equation and discussion of its use to calculate a) the flow rate in a given pipe (diameter, slope, & full pipe Manning roughness) at a specified depth of flow, b) the required diameter for a

specified flow rate at a target percent full in a given pipe, c) the normal depth (depth of flow) for a specified flow rate in a given pipe, d) the required pipe slope for a specified flow rate and depth of flow through a given pipe, and d) calculation of an experimentally determined value for the full pipe Manning roughness coefficient. This includes presentation and discussion of the equations for the calculations, example calculations, and spreadsheets to facilitate the calculations. Examples include calculation with both U.S. units and S.I. units.

Hydraulic Loss Coefficients for Culverts

Australian Rainfall and Runoff

This book is designed to serve senior-level engineering students taking a capstone design course in fluid and thermal systems design. It is built from the ground up with the needs and interests of practicing engineers in mind; the emphasis is on practical applications. The book begins with a discussion of design methodology, including the process of bidding to obtain a project, and project management techniques. The text continues with an introductory overview of fluid thermal systems (a pump and pumping system, a household air conditioner, a baseboard heater, a water slide, and a vacuum cleaner are among the examples given), and a review of the properties of fluids and the equations of fluid mechanics. The text then offers an in-depth discussion of piping systems, including the economics

of pipe size selection. Janna examines pumps (including net positive suction head considerations) and piping systems. He provides the reader with the ability to design an entire system for moving fluids that is efficient and cost-effective. Next, the book provides a review of basic heat transfer principles, and the analysis of heat exchangers, including double pipe, shell and tube, plate and frame cross flow heat exchangers. Design considerations for these exchangers are also discussed. The text concludes with a chapter of term projects that may be undertaken by teams of students. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Fluid Mechanics Fundamentals and Applications

Cengel and Cimbala's Fluid Mechanics Fundamentals and Applications, communicates directly with tomorrow's engineers in a simple yet precise manner. The text covers the basic principles and equations of fluid mechanics in the context of numerous and diverse real-world engineering examples. The text helps students develop an intuitive understanding of fluid mechanics by emphasizing the physics, using figures, numerous photographs and visual aids to reinforce the physics. The highly visual approach enhances the learning of Fluid mechanics by students. This text distinguishes itself from others by the way the material is presented - in a progressive order from simple to more difficult, building each

chapter upon foundations laid down in previous chapters. In this way, even the traditionally challenging aspects of fluid mechanics can be learned effectively. McGraw-Hill is also proud to offer ConnectPlus powered by Maple with the third edition of Cengel/Cimbabla, Fluid Mechanics. This innovative and powerful new system that helps your students learn more easily and gives you the ability to customize your homework problems and assign them simply and easily to your students. Problems are graded automatically, and the results are recorded immediately. Natural Math Notation allows for answer entry in many different forms, and the system allows for easy customization and authoring of exercises by the instructor.

An Introduction to Hydrodynamics and Water Waves

This book emphasizes the dynamics of the open channel flow by attempting to provide a complete framework of the basic equation of fluid motion which is used as a building block for the treatment of many practical problems. It provides up-to-date coverage of modern techniques while providing a more rigorous analytical foundation for those who require it. The structure follows a logical progression from a description and classification of open channel flows, through a development of the basic equations of motion for steady and unsteady flow, to an analysis of varied cases of flow.

Hydraulic Modeling

The book is intended for advanced undergraduates and first-year graduate students in the general fields of water resources and environmental engineering. It offers a selective presentation of some of the most common problems encountered by practicing engineers with the inclusion of recent research advances and personal computer applications.

Hydraulics of Open Channel Flow

Encyclopedia of Hydrology and Water Resources

Since the publication of its first edition in 1999, 'The Hydraulics of Open Channel Flow' has been praised by professionals, academics, students and researchers alike as the most practical modern textbook on open channel flow available. This new edition includes substantial new material on hydraulic modelling, in particular addressing unsteady open channel flows. There are also many new exercises and projects, including a major new revision assignment. This innovative textbook contains numerous examples and practical applications, and is fully illustrated with photographs. Dr Chanson introduces the basic principles of open channel flow and takes readers through the key topics of sediment transport, hydraulic modelling and the design of hydraulic structures. ·Comprehensive coverage of the basic principles of key application areas of the hydraulics of open channel flow ·New exercises and examples added to aid understanding ·Ideal for use by students

and lecturers in civil and environmental engineering

Design Charts for Open-channel Flow

Designed to serve as a textbook for students pursuing a BTech or BE program in civil engineering, the book aims to impart a clear understanding of the concepts of open channel hydraulics. The book would also be useful for postgraduate students of civil engineering and practising engineers. Beginning with an introductory chapter that classifies the flow into various categories, Flow Through Open Channels describes uniform flow, gradually varied flow, and rapid varied flow in great detail. The subsequent chapters provide a comprehensive coverage of channel transitions, spartially varied flow, and unsteady flow. A simplified introductory description of important topics such as flow in mobile bed channels and pollutant transport in open channels has also been included in the text. Solved examples with emphasis on numerical or approximate methods have been liberally used to explain the practical application of concepts learnt. Practice problems provided have been designed to enable the reader to apply his/her learning to a variety of situations and to urge the reader to think beyond the matter covered in the textbook. The lucid treatment in the book encourages self study and instills working knowledge of hydraulics in a student.

Design and Construction of Urban Stormwater Management Systems

Open Channel Hydraulics

Floods in a Changing Climate

Practitioners in water engineering rely on a thorough understanding of shallow water flows in order to safeguard our habitat, while at the same time sustaining the water environment. This book proposes a unified theoretical framework for the different types of shallow flow, providing a coherent approach to interpret the behaviour of such flows, and highlighting the similarities and differences. Every major topic in the book is accompanied by worked examples illustrating the theoretical concepts. Practical examples, showcasing inspiring research and engineering applications from the past and present, provide insight into how the theory developed. The book is also supplemented by a range of online resources, available at www.cambridge.org/battjes, including problem sets and computer codes. A solutions manual is available for instructors. This book is intended for students and professionals working in environmental water systems, in areas such as coasts, rivers, harbours, drainage, and irrigation canals.

Hydraulics of Open Channel Flow

Open Channel Flow, 2nd edition is written for senior-level undergraduate and graduate courses on steady and unsteady open-channel flow. The book is comprised of two parts: Part I covers steady flow and

Part II describes unsteady flow. The second edition features considerable emphasis on the presentation of modern methods for computer analyses; full coverage of unsteady flow; inclusion of typical computer programs; new problem sets and a complete solution manual for instructors.

Open-channel Hydraulics

Proceedings of the International Conference on Hydrology and Water Resources, New Delhi, India, December 1993: Water-quality hydrology

The Hydraulics of Open Channel Flow

Open Channel Hydraulics

The four volumes in this set cover major aspects of hydrology and water resources, including surface water hydrology, subsurface water hydrology, water quality hydrology, and water resources planning management. The books reflect the water resources technology as practised in India and the Indian subcontinent which should be of value to water resources professionals in the West.

The Bed-load Function for Sediment Transportation in Open Channel Flows

"Culverts are designed and constructed to be hydraulically efficient, such that they are able to pass flood flows without overtopping the road embankment. Flow passing through a culvert typically experiences an increase in velocity, relative to the approach channel flow, due to reductions in cross-sectional flow area. Increased flow velocity can cause additional outlet erosion as well as be a problem for many types of migratory species. In addition to migratory species, resident fish such as juvenile salmon can also be affected by culverts. Juvenile salmon move up and down streams as population pressures and food sources change. If high velocities in culverts provide barriers to this movement, food sources and population may be limited. Other fish species may have requirements similar to those of juvenile salmon or may require upstream movement for spawning. Research in the area of culvert hydraulics has centered on concrete box culverts and circular corrugated metal pipe culverts. The hydraulic analyses of these culvert types have been well defined for conventional installations, but not for environmentally sensitive and nontraditional culverts. It is desirable to design and construct some culvert crossings to minimize their impact on the natural environment. Culverts are now being designed to maintain natural velocities and minimize turbulence to allow migratory species to pass through the culvert barrel. Such designs may add baffles on the invert, bury the culvert invert, or use bottomless culverts to provide for a natural stream invert. Other designs use larger and wider culverts to reduce the amount of contraction and acceleration. In order to design these

culverts that minimize impacts to the natural stream environment, designers need the associated hydraulic equations and loss coefficients to be evaluated and made more accurate. In NCHRP Project 15-24, Utah State University conducted physical, numerical, and computer modeling to refine existing hydraulic relationships and develop new ones for analysis and design of culverts for conventional and nontraditional, environmentally sensitive installations"--Foreword.

Additional Tables for the Hydraulic Design of Pipes, Sewers and Channels

This textbook introduces the basic principles of open channel flow and then develops the key topics of sediment transport, hydraulic modelling and the design of hydraulic structures. It contains numerous examples including practical applications and is fully illustrated with line drawings and photographs. Exercises are spread throughout, concluding with major assignments which combine the knowledge gained from the book. A supporting website hosts further exercises together with the shareware software Hydroculv.

Unsteady Flow in Open Channels

Prepared byØtheØTask Committee of the Urban Water Resources Research Council of ASCE. Copublished by ASCE and the Water Environment Federation. Design and Construction of Urban Stormwater Management Systems presents a comprehensive examination of the issues involved in

engineering urban stormwater systems. This Manual?which updates relevant portions of Design and Construction of Sanitary and Storm Sewers, MOP 37?reflects the many changes taking place in the field, such as the use of microcomputers and the need to control the quality of runoff as well as the quantity. Chapters are prepared by authors with experience and expertise in the particular subject area. The Manual aids the practicing engineer by presenting a brief summary of currently accepted procedures relating to the following areas: financial services; regulations;Ø surveys and investigations;Ø design concepts and master planning;Ø hydrology and water quality;Ø storm drainage hydraulics; andØ computer modeling.

Open Channel Hydraulics

This book emphasizes the dynamics of the open channel flow by attempting to provide a complete framework of the basic equation of fluid motion which is used as a building block for the treatment of many practical problems. It provides up-to-date coverage of modern techniques while providing a more rigorous analytical foundation for those who require it. The structure follows a logical progression from a description and classification of open channel flows, through a development of the basic equations of motion for steady and unsteady flow, to an analysis of varied cases of flow.

Highway Drainage Guidelines: Guides for hydraulic analysis and design of open

channels

Open Channel Hydraulics is written for undergraduate and graduate civil engineering students, and practicing engineers. Written in clear and simple language, it introduces and explains all the main topics required for courses on open channel flows, using numerous worked examples to illustrate the key points. With coverage of both introduction to flows, practical guidance to the design of open channels, and more advanced topics such as bridge hydraulics and the problem of scour, Professor Akan's book offers an unparalleled user-friendly study of this important subject ·Clear and simple style suited for undergraduates and graduates alike ·Many solved problems and worked examples ·Practical and accessible guide to key aspects of open channel flow

Manning Formula

The aim of these tables is to overcome limitations in the existing Hydraulics Research "Tables for the Hydraulic Design of Pipes and Sewers". The current edition of the tables is limited to pipe diameters of two metres and to a couple of pipe shapes. The additional tables which are designed to be used in conjunction with the existing 5th edition of "Tables for the Hydraulic Design of Pipes and Sewers" would extend the diameter to 20m. New interpolation procedures for part-full pipes and pipes of other cross-sectional shapes, other than circular and one particular form of egg-shape can be determined.

Channel Flow Resistance

Open channel hydraulics has always been a very interesting domain of scienti c and engineering activity because of the great importance of water for human l- ing. The free surface ow, which takes place in the oceans, seas and rivers, can be still regarded as one of the most complex physical processes in the environment. The rst source of dif culties is the proper recognition of physical ow processes and their mathematical description. The second one is related to the solution of the derived equations. The equations arising in hydrodynamics are rather comp- cated and, except some much idealized cases, their solution requires application of the numerical methods. For this reason the great progress in open channel ow modeling that took place during last 40 years paralleled the progress in computer technique, informatics and numerical methods. It is well known that even ty- cal hydraulic engineering problems need applications of computer codes. Thus, we witness a rapid development of ready-made packages, which are widely d- seminated and offered for engineers. However, it seems necessary for their users to be familiar with some fundamentals of numerical methods and computational techniques applied for solving the problems of interest. This is helpful for many r- sons. The ready-made packages can be effectively and safely applied on condition that the users know their possibilities and limitations. For instance, such knowledge is indispensable to distinguish in the obtained solutions the effects coming from the considered physical processes and

those caused by numerical artifacts.

Partially Full Pipe Flow Calculation Spreadsheets

A Regional Sanitary Sewerage System Plan for Southeastern Wisconsin

Exposes You to Current Industry-Standard Tools Open channel flow is covered in essentially all civil and environmental engineering programs, usually by final-year undergraduate or graduate students studying water resources. Fundamentals of Open Channel Flow outlines current theory along with clear and fully solved examples that illustrate the concepts and are geared to a first course in open channel flow. It highlights the practical computational tools students can use to solve problems, such as spreadsheet applications and the HEC-RAS program. It assumes a foundation in fluid mechanics, then adopts a deliberately logical sequence through energy, momentum, friction, gradually varied flow (first qualitative, then quantitative), and the basics of sediment transport. Taps into Your Innate Ability to Understand Complex Concepts Visually Open channel flow can be understood through just a few simple equations, graphs, and computational tools. For students, the book comes with downloadable animations that illustrate basic concepts visually with synchronous graphical presentation of fundamental relationships. For instructors, PowerPoint slides and solutions to end-of-chapter problems are provided.

Delivers simple but powerful software animations Conveys material in three ways (analytical, graphical, computational/empirical) to aid multiple types of learners and improve overall accessibility Includes new fundamental equation for alternate depths Discusses flow transients supported by animations and calculations Emphasizes applications of common and useful computational tools Developed by an author who has been teaching open channel flow to university students for the past fifteen years, Fundamentals of Open Channel Flow provides you with a detailed explanation of the basics of open channel flow using examples and animation, and offers expert guidance on the practical application of graphical and computational tools.

Open-Channel Flow

Please note that the content of this book primarily consists of articles available from Wikipedia or other free sources online. The Manning formula, known also as the Gauckler-Manning formula, or Gauckler-Manning-Strickler formula in Europe, is an empirical formula for open channel flow, or free-surface flow driven by gravity. It was first presented by the French engineer Philippe Gauckler in 1867, and later re-developed by the Irish engineer Robert Manning in 1890. The discharge formula, $Q = A V$, can be used to manipulate Gauckler-Manning's equation by substitution for V. Solving for Q then allows an estimate of the volumetric flow rate (discharge) without knowing the limiting or actual flow velocity.

Flow Through Open Channels

Flood inundation models enable us to make hazard predictions for floodplains, mitigating increasing flood fatalities and losses. This book provides an understanding of hydraulic modelling and floodplain dynamics, with a key focus on state-of-the-art remote sensing data, and methods to estimate and communicate uncertainty. Academic researchers in the fields of hydrology, climate change, environmental science and natural hazards, and professionals and policy-makers working in flood risk mitigation, hydraulic engineering and remote sensing will find this an invaluable resource. This volume is the third in a collection of four books on flood disaster management theory and practice within the context of anthropogenic climate change. The others are: Floods in a Changing Climate: Extreme Precipitation by Ramesh Teegavarapu, Floods in a Changing Climate: Hydrological Modeling by P. P. Mujumdar and D. Nagesh Kumar and Floods in a Changing Climate: Risk Management by Slodoban Simonović.

Treatment Wetlands

Open-Channel Hydraulics, originally published in 1959, deals with the design for flow in open channels and their related structures. Covering both theory and practice, it attempts to bridge the gap that generally exists between the two. Theory is introduced first and is then applied to design problems. In many cases the application of theory is illustrated with practical examples. Theory is frequently simplified by adopting

theoretically less rigorous treatments with sound concepts, by avoiding use of advanced mathematical manipulations, or by replacing such manipulations with practical numerical procedures. To facilitate understanding of the subject matter, the treatment is mostly based on the condition of one- or two-dimensional flow. The book deals mainly with American practice but also includes related information from many countries throughout the world. Material is divided into five main sections for an orderly and logical treatment of the subject: Basic Principles. Uniform Flow, Varied Flow, Rapidly Varied Flow, and Unsteady Flow. There are 67 illustrative examples, 282 illustrations, 319 problems, and 810 references. This classic textbook was the first English-language book on the subject in two decades. Open-Channel Hydraulics is a valuable text for students of engineering mechanics. hydraulics. civil. agricultural. sanitary. and mechanical engineering, and a helpful compendium for practicing engineers. Dr. Ven Te Chow was a Professor of Hydraulic Engineering and led the hydraulic engineering research and teaching programs at the University of Illinois. Through many years of experience as a teacher, engineer, researcher, writer. lecturer, and consultant, he became an internationally recognized leader in the fields of hydraulics, hydrology and hydraulic engineering. Dr. Ven Te Chow authored two technical books and more than 60 articles and papers in scientific an engineering magazines and journals. He was a member of lAHR, ASCE, AGU, AAAS, SEE, and Sigma Xi, and had been Chairman of the American Geophysical Union's Permanent Research Committee on Runoff.

Hydraulics

A clear, up-to-date presentation of the principles of flow in open channels A fundamental knowledge of flow in open channels is essential for the planning and design of systems to manage water resources. Open-Channel Flow conveys this knowledge through the use of practical problems that can be solved either analytically or by simple numerical methods that do not require the use of computer software. This completely up-to-date text includes several features not found in any other book on the subject. It derives one- dimensional equations of motion using both a simplified approach and a rigorous approach, and it explains the distinction between the momentum and mechanical energy equations. The author places great emphasis on identifying the types and locations of the control sections that are essential in analyzing flow profiles, and he includes a section on recently recognized nonunique flow profiles. Offering numerous worked examples that are helpful in understanding the basic principles and their practical applications, this book: * Presents the latest computational methods for profiling spatially varied and unsteady flow * Includes end-of-section exercises that measure and build understanding * Fully explains governing equations in algebraic and differential form * Brings sluice-gate analysis completely up to date * Covers artificial channel controls such as weirs, spillways, and gates, and special topics such as transitions in supercritical flow and flow through culverts Written in metric units throughout, this excellent learning tool for senior- and graduate-level

students in civil and environmental engineering programs is also a useful reference for practicing civil and environmental engineers.

Numerical Modeling in Open Channel Hydraulics

"Culverts are designed and constructed to be hydraulically efficient, such that they are able to pass flood flows without overtopping the road embankment. Flow passing through a culvert typically experiences an increase in velocity, relative to the approach channel flow, due to reductions in cross-sectional flow area. Increased flow velocity can cause additional outlet erosion as well as be a problem for many types of migratory species. In addition to migratory species, resident fish such as juvenile salmon can also be affected by culverts. Juvenile salmon move up and down streams as population pressures and food sources change. If high velocities in culverts provide barriers to this movement, food sources and population may be limited. Other fish species may have requirements similar to those of juvenile salmon or may require upstream movement for spawning. Research in the area of culvert hydraulics has centered on concrete box culverts and circular corrugated metal pipe culverts. The hydraulic analyses of these culvert types have been well defined for conventional installations, but not for environmentally sensitive and nontraditional culverts. It is desirable to design and construct some culvert crossings to minimize their impact on the natural environment. Culverts are now being designed to

maintain natural velocities and minimize turbulence to allow migratory species to pass through the culvert barrel. Such designs may add baffles on the invert, bury the culvert invert, or use bottomless culverts to provide for a natural stream invert. Other designs use larger and wider culverts to reduce the amount of contraction and acceleration. In order to design these culverts that minimize impacts to the natural stream environment, designers need the associated hydraulic equations and loss coefficients to be evaluated and made more accurate. In NCHRP Project 15-24, Utah State University conducted physical, numerical, and computer modeling to refine existing hydraulic relationships and develop new ones for analysis and design of culverts for conventional and nontraditional, environmentally sensitive installations"--Foreword.

Design of Fluid Thermal Systems, SI Edition

Fundamentals of Open Channel Flow

Volume 1 (comprised of 8 booklets in folder) documents procedures for flood estimation, and provides guidance for designers in their choice of methods. The companion volume, Volume 2, (a CD-ROM) contains chiefly maps of rainfall data.

ROMANCE ACTION & ADVENTURE MYSTERY & THRILLER BIOGRAPHIES & HISTORY CHILDREN'S YOUNG ADULT FANTASY HISTORICAL FICTION HORROR LITERARY FICTION NON-FICTION SCIENCE FICTION