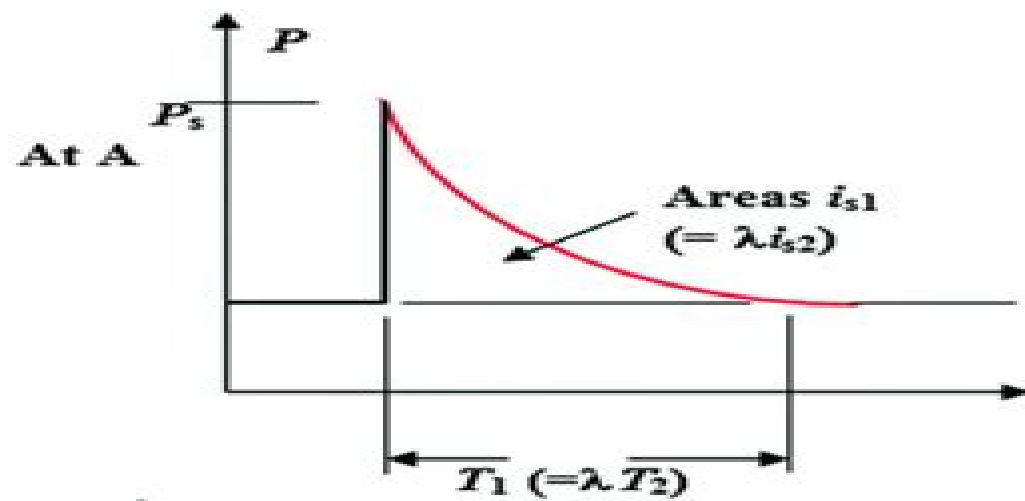
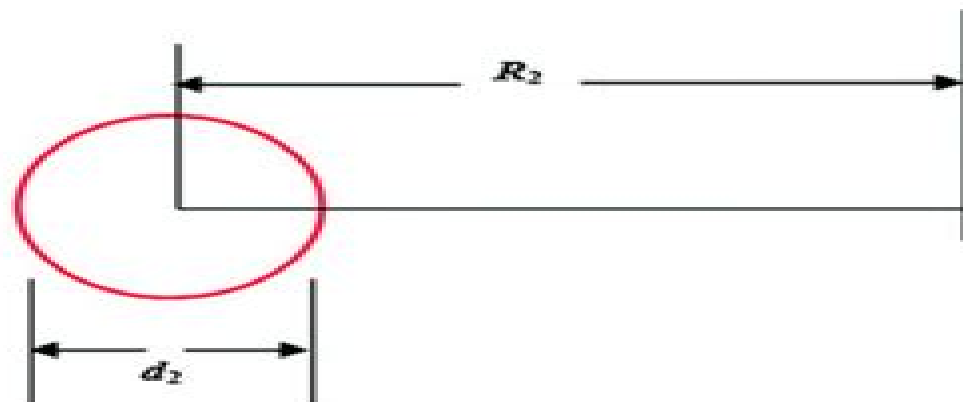


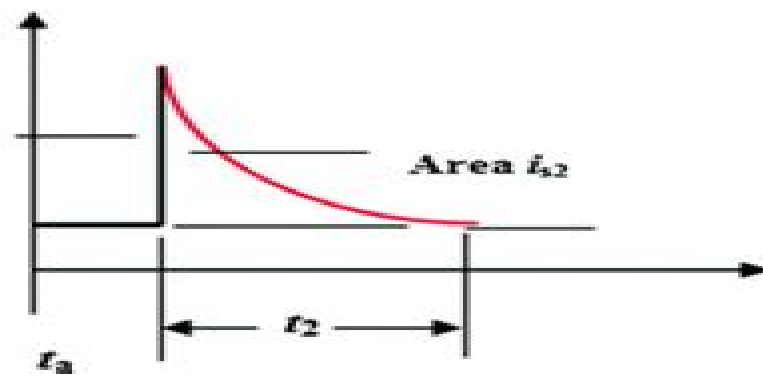
$$Z = R/W^{1/3}$$



$$t_{a1} = (\lambda t_{a2})$$



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# Hopkinson Cube Root Scaling

**J.W. Bull**



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**Rock Blasting and Explosives Engineering** Per-Anders Persson, Roger Holmberg, Jaimin Lee, 2018-05-04 Rock Blasting and Explosives Engineering covers the practical engineering aspects of many different kinds of rock blasting It includes a thorough analysis of the cost of the entire process of tunneling by drilling and blasting in comparison with full face boring Also covered are the fundamental sciences of rock mass and material strength the thermal decomposition burning shock initiation and detonation behavior of commercial and military explosives and systems for charging explosives into drillholes Functional descriptions of all current detonators and initiation systems are provided The book includes chapters on flyrock toxic fumes the safety of explosives and even explosives applied in metal working as a fine art Fundamental in its approach the text is based on the practical industrial experience of its authors It is supported by an abundance of tables diagrams and figures This combined textbook and handbook provides students practitioners and researchers in mining mechanical building construction geological and petroleum engineering with a source from which to gain a thorough understanding of the constructive use of explosives

**Design Against Blast** S. Syngellakis, 2013 Terrorist attacks and other destructive incidents caused by explosives have in recent years prompted considerable research and development into the protection of structures against blast loads For this objective to be achieved experiments have been performed and theoretical studies carried out to improve our assessments of the intensity as well as the space time distribution of the resulting blast pressure on the one hand and the consequences of an explosion to the exposed environment on the other This book aims to enhance awareness on and understanding of these topical issues through a collection of relevant Transactions of the Wessex Institute of Technology articles written by experts in the field The book starts with an overview of key physics based algorithms for blast and fragment environment characterisation structural response analyses and structural assessments with reference to a terrorist attack in an urban environment and the management of its inherent uncertainties A subsequent group of articles is concerned with the accurate definition of blast pressure which is an essential prerequisite to the reliable assessment of the consequences of an explosion Other papers are concerned with alternative methods for the determination of blast pressure based on experimental measurements or neural networks A final group of articles reports investigations on predicting the response of specific structural entities and their contents The book concludes with studies on the effectiveness of steel reinforced polymer in improving the performance of reinforced concrete columns and the failure mechanisms of seamless steel pipes used in nuclear industry

**Structural Design for Physical Security** Task Committee on Structural Design for Physical Security, 1999-01-01 Prepared by the Task Committee on Structural Design for Physical Security of the Structural Engineering Institute of ASCE This report provides guidance to structural engineers in the design of civil structures to resist the effects of terrorist bombings As dramatized by the bombings of the World Trade Center in New York City and the Murrah Building in Oklahoma City civil engineers today need guidance on designing structures to resist hostile acts The U S military

services and foreign embassy facilities developed requirements for their unique needs but these the documents are restricted Thus no widely available document exists to provide engineers with the technical data necessary to design civil structures for enhanced physical security The unrestricted government information included in this report is assembled collectively for the first time and rephrased for application to civilian facilities Topics include determination of the threat methods by which structural loadings are derived for the determined threat the behavior and selection of structural systems the design of structural components the design of security doors the design of utility openings and the retrofitting of existing structures This report transfers this technology to the civil sector and provides complete methods guidance and references for structural engineers challenged with a physical security problem      *Blast Effects on Buildings* Geoffrey Mays,1995 This guide is aimed at all engineers and architects involved in building design focusing on the importance of constructing buildings which minimise damage to people and property in the event of an explosion      **Handbook for Blast Resistant Design of Buildings** Donald O. Dusenberry,2010-01-26 Unique single reference supports functional and cost efficient designs of blast resistant buildings Now there s a single reference to which architects designers and engineers can turn for guidance on all the key elements of the design of blast resistant buildings that satisfy the new ASCE Standard for Blast Protection of Buildings as well as other ASCE ACI and AISC codes The Handbook for Blast Resistant Design of Buildings features contributions from some of the most knowledgeable and experienced consultants and researchers in blast resistant design This handbook is organized into four parts Part 1 Design Considerations sets forth basic principles examining general considerations in the design process risk analysis and reduction criteria for acceptable performance materials performance under the extraordinary blast environment and performance verification for technologies and solution methodologies Part 2 Blast Phenomena and Loading describes the explosion environment loading functions needed for blast response analysis and fragmentation and associated methods for effects analysis Part 3 System Analysis and Design explains the analysis and design considerations for structural building envelope component space site perimeter and building system designs Part 4 Blast Resistant Detailing addresses the use of concrete steel and masonry in new designs as well as retrofitting existing structures As the demand for blast resistant buildings continues to grow readers can turn to the Handbook for Blast Resistant Design of Buildings a unique single source of information to support competent functional and cost efficient designs      **Structures Under Shock and Impact XI** Norman Jones,C. A. Brebbia,2010 This text examines the interaction between blast pressure and surface or underground structures whether the blast is from civilian military dust and natural explosions or any other source      **BALLISTICS 2016** Clive Woodley,Ian Cullis,2016-05-22 Presents high level research on various caliber guns cannon mortars drones warheads shells bullets drills and other launchers and penetrants as well as their impact effects on natural and designed materials including large scale targets and body armors Provides new modeling and test data on projectile design and guidance propellants charges and explosives for military aerospace and civil engineering

applications Over 250 presentations in two printed volumes plus searchable CD This book makes available original ballistics technology from around the world on a wide variety of weapons and their effects including the design and trajectory stability control of dozens of projectiles ranging from shells to missiles The book's authors discuss the efficacy and development of propellants munitions and igniters and offer new approaches for modeling and testing Also investigated in Volume 1 are shielding and protection strategies for individual persons and other targets Volume 2 offers research on the mechanical behavior of multiple types of explosives as well as impact and penetration data from projectile effects on surfaces ranging from natural phenomena such as water and soils to metallic plating and material engineered armors Papers in these volumes were presented at a conference organized by the National Defense Industrial Association NDIA with the International Ballistics Society

**Structural Modeling and Experimental Techniques, Second Edition** Harry G. Harris, Gajanan Sabnis, 1999-03-30 Structural Modeling and Experimental Techniques presents a current treatment of structural modeling for applications in design research education and product development Providing numerous case studies throughout the book emphasizes modeling the behavior of reinforced and prestressed concrete and masonry structures Structural Modeling and Experimental Techniques Concentrates on the modeling of the true inelastic behavior of structures Provides case histories detailing applications of the modeling techniques to real structures Discusses the historical background of model analysis and similitude principles governing the design testing and interpretation of models Evaluates the limitations and benefits of elastic models Analyzes materials for reinforced concrete masonry and steel models Assesses the critical nature of scale effects of model testing Describes selected laboratory techniques and loading methods Contains material on errors as well as the accuracy and reliability of physical modeling Examines dynamic similitude and modeling techniques for studying dynamic loading of structures Covers actual applications of structural modeling This book serves students in model analysis and experimental methods professionals manufacturing and testing structural models as well as professionals testing large or full scale structures since the instrumentation techniques and overall approaches for testing large structures are very similar to those used in small scale modeling work

**Granular Materials Under Shock and Blast Loading** Padmanabha Vivek, T. G. Sitharam, 2019-10-31 This volume discusses the fundamental dynamic behaviour of granular materials in particular cohesionless sand when subjected to shock and blast wave loading The contents of the book are mainly divided into three parts based on the type of loading imparted to the granular materials Shock wave loading step pulse Air blast loading Friedlander wave Buried blast loading It provides a comprehensive review of the available testing methods along with the necessary diagnostic measurements for material characterization making it useful for researchers working in the area of blast protection and Impact engineering

**30th International Symposium on Shock Waves 2** Gabi Ben-Dor, Oren Sadot, Ozer Igra, 2017-08-01 These proceedings collect the papers presented at the 30th International Symposium on Shock Waves ISSW30 which was held in Tel Aviv Israel from July 19 to July 24 2015 The Symposium was organized by Ortra Ltd

The ISSW30 focused on the state of knowledge of the following areas Nozzle Flow Supersonic and Hypersonic Flows with Shocks Supersonic Jets Chemical Kinetics Chemical Reacting Flows Detonation Combustion Ignition Shock Wave Reflection and Interaction Shock Wave Interaction with Obstacles Shock Wave Interaction with Porous Media Shock Wave Interaction with Granular Media Shock Wave Interaction with Dusty Media Plasma Magnetohydrodynamics Re entry to Earth Atmosphere Shock Waves in Rarefied Gases Shock Waves in Condensed Matter Solids and Liquids Shock Waves in Dense Gases Shock Wave Focusing Richtmyer Meshkov Instability Shock Boundary Layer Interaction Multiphase Flow Blast Waves Facilities Flow Visualization and Numerical Methods The two volumes serve as a reference for the participants of the ISSW30 and anyone interested in these fields

**Similarity Methods in Engineering Dynamics** P.S. Westine, F.T. Dodge, W.E. Baker, 2012-12-02 Here is the second revised and updated edition of probably the most practical sourcebook on similarity methods and modeling techniques available Written by leading authorities who incorporate many of the latest advances in the field this new work maps out techniques for modeling as well as instrumentation and data analysis for an extremely wide array of problems in engineering dynamics This practical reference uses experimental test data on various engineering problems demonstrating exactly how and why these similarity methods work The problems involve spread of oil slicks explosive cratering car crashes space vehicle heat exchange explosive forming and more The spectrum of topics covered and number of examples are far greater than in other texts Of particular importance are the dissimilar material modeling techniques which bring new versatility and freedom to the modeler in structural dynamics The book also contains a clear in depth discussion of the theory underlying modeling and includes alternate methods for developing model laws The work will undoubtedly prove invaluable to every professional involved in testing or design of dynamic experiments

Numerical Analysis and Modelling of Composite Materials J.W. Bull, 2012-12-06 Composite materials are increasingly used in many applications because they offer the engineer a range of advantages over traditional materials They are often used in situations where a specified level of performance is required but where the cost of testing the materials under the extremes of those specifications is very high In order to solve this problem engineers are turning to computer Modelling to evaluate the materials under the range of conditions they are likely to encounter Many of these analyses are carried out in isolation and yet the evaluation of a range of composites can be carried out using the same basic principles In this new book the editor has brought together an international panel of authors each of whom is working on the analysis and Modelling of composite materials The overage of the book is deliberately wide to illustrate that similar principles and methods can be used to model and evaluate a wide range of materials It is also hoped that by bringing together this range of topics the insight gained in the study of one composite can be recognized and utilized in the study of others Professional engineers involved in the specification and testing of composite material structures will find this book an invaluable resource in the course of their work It will also be of interest to those industrial and academic engineers involved in the design development manufacture

and applications of composite materials      **Blast Effects** Isabelle Sochet, 2017-12-22 This book compiles a variety of experimental data on blast waves The book begins with an introductory chapter and proceeds to the topic of blast wave phenomenology with a discussion on Rankine Hugoniot equations and the Friedlander equation used to describe the pressure time history of a blast wave Additional topics include arrival time measurement the initiation of detonation by exploding wires a discussion of TNT equivalency and small scale experiments Gaseous and high explosive detonations are covered as well The topics and experiments covered were chosen based on the comparison of used scale sizes from small to large Each characteristic parameter of blast waves is analyzed and expressed versus scaled distance in terms of energy and mass Finally the appendix compiles a number of polynomial laws that will prove indispensable for engineers and researchers

Evaluation of the Effects and Consequences of Major Accidents in Industrial Plants Joaquim Casal, 2007-12-08 Evaluation of the Effects and Consequences of Major Accidents in Industrial Plants analyzes the different major accidents which can occur in process plants and during the transportation of hazardous materials The main features of fires explosions and toxic releases are discussed and a set of mathematical models allowing the prediction of their effects and consequences are explained With a practical approach the models are applied to simple illustrative examples as well as to more complex real cases The use of these calculations in the frame of Quantitative Risk Analysis is also treated Evaluation of the effects of major accidents in industrial installations covers the following topics general introduction source term fire accidents vapour cloud explosions BLEVEs and vessel explosions atmospheric dispersion of toxic or flammable clouds vulnerability and quantitative risk analysis This book is a useful tool for engineering professionals as well as an interesting reference for teaching at graduate and post graduate levels Both the essential aspects and the calculations related to the diverse accidents are discussed The prediction of effects and consequences is performed with a practical approach Recent contributions from literature have been included Subjects of increasing importance have been included an extensive analysis of BLEVEs for example or the atmospheric dispersion of pathogenic agents      Fluid Mechanics for Industrial Safety and Environmental Protection T.K. Fannelöp, 2013-05-20 Applications of the science of fluid mechanics to the new and expanding fields of industrial safety and environmental protection are discussed in this volume The material is organized in accordance with the chain of events in real accidents starting with the loss of containment of hazardous fluids going on to the spreading and mixing processes in water or air and ending with the damage loads caused by explosions fires or toxic content To develop solutions relevant to the wide range of problems considered it is necessary to draw on material from various branches of fluid mechanics i e from the engineering fields aero and gas and hydrodynamics hydraulics heat transfer and two phase flows as well as from geophysics environmental flows boundary layer meteorology The relevant solutions are developed from the fundamental equations but are kept simple for transparency and understanding To achieve this the simplifications offered by scaling similarity and entrainment concepts are used extensively Many of the solutions are novel but have been confirmed by

laboratory experiments The material in the book has been used as a teaching text on Master s level but the content will be useful also for practising engineers and scientists engaged in safety and environmental impact The problems considered have been encountered in consultancy work for industry and government agencies The coherent presentation and the fundamental basis for analytical developments makes the material accessible also to readers not acquainted with the field

**Explosion Hazards and Evaluation** W.E. Baker,P.A. Cox,J.J. Kulesz,R.A. Strehlow,P.S. Westine,2012-12-02 Explosion Hazards and Evaluation presents the principles and applications of explosion hazards evaluation The text is organized into nine chapters Chapters 1 and 2 discuss the energy release processes which generate accidental explosions and the resulting development of pressure and shock waves in a surrounding atmosphere The manner in which the free field waves are modified in interacting with structures or other objects in their paths is discussed in Chapter 3 Structural response to blast loading and non penetrating impact is covered in two chapters with Chapter 4 including simplified analysis methods and Chapter 5 including numerical methods Chapter 6 includes a rather comprehensive treatment of generation of fragments and missiles in explosions and the flight and effects of impact of these objects Chapter 7 considers thermal radiation of large chemical explosions Explosions may or may not cause damage or casualty and various damage criteria have been developed for structures vehicles and people These criteria are presented in Chapter 8 General procedures for both the postmortem evaluation of accidental explosions and for design for blast and impact resistance are reviewed in Chapter 9 Engineers scientists and plant safety personnel will find the book very useful

*Handbook of Shock Waves, Three Volume Set* Gabi Ben-Dor,Ozer Igra,Tov Elperin,2000-10-18 The Handbook of Shock Waves contains a comprehensive structured coverage of research topics related to shock wave phenomena including shock waves in gases liquids solids and space Shock waves represent an extremely important physical phenomena which appears to be of special practical importance in three major fields compressible flow aerodynamics materials science and astrophysics Shock waves comprise a phenomenon that occurs when pressure builds to force a reaction i e sonic boom that occurs when a jet breaks the speed of sound This Handbook contains experimental theoretical and numerical results which never before appeared under one cover the first handbook of its kind The Handbook of Shock Waves is intended for researchers and engineers active in shock wave related fields Additionally R D establishments applied science research laboratories and scientific and engineering libraries both in universities and government institutions As well as undergraduate and graduate students in fluid mechanics gas dynamics and physics Key Features Ben Dor is known as one of the founders of the field of shock waves Covers a broad spectrum of shock wave research topics Provides a comprehensive description of various shock wave related subjects First handbook ever to include under one separate cover experimental theoretical and numerical results

*Guidelines for Evaluating Process Plant Buildings for External Explosions and Fires* CCPS (Center for Chemical Process Safety),2010-09-09 Dedicated to the Memory and Spirit of Donald F Othmer Though there are many industry practices for building design and siting they do not



always apply to all sectors of the industry or ensure consistent levels of safety This practical book written by the same author as API Recommended Practice 752 provides the details to implement the recommended practice Management of Hazards Associated with Location of Process Plant Buildings Its contents include safety guidelines on fire and explosion risks to process plant buildings as a result of events external to the building which can apply across the spectrum of industries and to conditions at any site The book also offers guidance on assessing screening and managing risks associated with building design and siting Two appendices give extensive coverage of explosion and fire phenomena and effects and principles of blast resistant design **NOLTR** ,1964 History of Shock Waves, Explosions and Impact Peter O. K. Krehl,2008-09-24 This unique and encyclopedic reference work describes the evolution of the physics of modern shock wave and detonation from the earlier and classical percussion The history of this complex process is first reviewed in a general survey Subsequently the subject is treated in more detail and the book is richly illustrated in the form of a picture gallery This book is ideal for everyone professionally interested in shock wave phenomena

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**glossary of dental clinical terms american dental association** - Apr 13 2023

web code on dental procedures and nomenclature cdt code a listing of dental procedure codes and their descriptive terms published by the american dental association ada used for recording dental services on the patient record as well as for reporting dental services and procedures to dental benefit plans

**code on nomenclature cdt code american dental association** - Feb 11 2023

web 2024 march cmc meeting information ada members benefit from free coding assistance the purpose of the cdt code is to achieve uniformity consistency and specificity in accurately reporting dental treatment one use of the cdt code is to provide for the efficient processing of dental claims

**cdt 2023 updates have arrived delta dental** - Jan 30 2022

web oct 31 2022 by delta dental the american dental association s cdt procedure codes and nomenclature have been updated for 2023 the cdt updates include 29 new codes including seven post publication inclusions in cdt 2022 two code deletions and 14 nomenclature and description revisions

*ada cdt 2023 updates american dental coders association* - Mar 12 2023

web feb 16 2023 ada cdt 2023 updates february 16 2023 by admin codes in this section relate to a radiographic survey of the whole mouth intended to display the crowns and roots of all teeth periapical areas interproximal areas and alveolar bone including edentulous areas the nomenclature and descriptors of four intraoral comprehensive

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web learn about the latest changes in cdt procedure codes and nomenclature for 2023 with this handy summary from delta dental find out what s new deleted and revised in this pdf document

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web dental procedure codes listed in numeric order are as published in cdt 2022 american dental association this recommendation 1 complements the ada s online comprehensive claim form completion instructions at ada org en publications cdt ada dental claim form 2

cdt 2022 procedure coding options procedure codes and - Jan 10 2023

web dental professionals are obligated to use the most accurate procedure code available cdt procedure codes are risk and diagnosis based not product based before specific procedure code suggestions are made to facilitate best coverage under a policy necessary dental medical data must be documented in box 35 remarks

**coding education american dental association ada** - Jun 15 2023

web the american dental association with support from organizations on the code maintenance committee and others in the

dental community has developed a variety of educational material this information within the following list of topics is available online for anyone to download read or view videos

**codes for most frequently reported dental procedures** - Apr 01 2022

web claims in the dental office and the processing of those claims in the claims office neither the code on dental procedures and nomenclature march 1976 nor the codes for most frequently reported procedures is intended as a representation of the practice of dentistry or of any dental specialty it is simply an administrative aid

*frequent general questions regarding dental procedure codes* - Sep 06 2022

web the code on dental procedures and nomenclature cdt code provides dentists a means to consistently document services delivered to the patient there is no fee information in the cdt code note every dentist should be aware of the following guidance regarding fees for services

**dental ada codes 2023 current dental terminology** - Nov 08 2022

web jan 13 2023 removal of impacted tooth soft tissue 300 00 d7230 removal of impacted tooth partially bony 450 00 d7240 removal of impacted tooth completely bony 500 00 d7250 surgical removal of residual tooth roots cutting procedure 300 00 miscellaneous d9970 enamel microabrasion smoothing filing of a tooth

**guidelines for selecting cdt procedure codes voco dental** - Jun 03 2022

web after reading the full nomenclature and descriptor select the code that matches the procedure delivered to the patient if there is no applicable code document the service using an unspecified by report 999 code and include a clear and appropriate narrative

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web the standard cda dental codes list below is grouped into the following categories diagnostic preventative restorative endodontics periodontics prosthodontics removable misc prosthodontics fixed oral surgery orthodontics

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that begins with the letter d the procedure code and ends with four digits the nomenclature

**cdt 2023 ready for pre order american dental association** - Dec 09 2022

web jul 18 2022 all cdt code changes will become effective on jan 1 2023 cdt 2023 is the complete upcoming edition of the most up to date codes and descriptors and the coding companion kit compiles hundreds of frequently asked

current dental terminology ada s cdt dental codes find a code - Aug 17 2023

web oct 17 2023 the current dental terminology cdt code set is maintained by the american dental association accurate recording and reporting dental treatment is supported by a set of codes that have a consistent format and are at the appropriate level of specificity to adequately encompass commonly accepted dental procedures

*american dental association cdt 2022 code on dental* - Sep 18 2023

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