OMB No. 7946835219418

Checking Punching Shear Strength By The Aci Code

VF: Group Punching Shear Design Pad Foundation Design | Punching shear check Part 2. How to Check Punching Shear in SAFE CHECK PUNCHING SHEAR BY SAFE 2016 VF: Punching Shear Design CSI SAFE 2016 Punching Shear Tutorial - Example and Practical Theory Punching Shear Strength of Reinforced Concrete Slabs by Various Geometry Punches | Vlad Shekhovtsov Deep drawing press machine, Hydraulic press for sheet metal, TSINFA 5 Scheduling Hacks To Double Profits - Plus DNE Loophole And Downloadable Template Visualizing Punching Shear and Shear Stress! Why is Punching Shear Failure also called Two Way Shear? Punching shear of interior column How Engineers Solve the Problem of Punching Shear Failure fib MC2010 - Shear and punching shear provisions in fib MC2010 How to Read Structural Drawings | Beginners Guide on How to Read Structural Drawings Punching Shear Punching shear reinforcement Punching Shear | Two way Shear | Punching Shear in footing | Two way Shear in footing Punching shear design and verification according to Eurocode | Step-by-step tutorial Identifying, Evaluating, and Correcting Punching Shear Deficiencies in Flat Plate Construction Footing Design - How to Check the Shear Capacity per ACI 318 Punching Shear and Bearing Stress Calculate Punching Shear Real-World Design Considerations for Punching Shear in Flat Plate Slabs Punching Shear: Things Every Engineer Should Know Strengthening of slab-column connection against punching shear failure with FRP materials what is two-way shear in footings| punching shear in footing PSB® and PSB PLUS® – Overcome Punching Shear in Flat Slabs Two Way (Punching) Shear - Concept Explained and Flat Plate Example - CSA A23.3 (Canadian Code) Real-World Design Considerations for Punching Shear in Flat Plate Slabs

Select Proceedings of VCDRR 2021

Designers' Guide to EN 1992-1-1 and EN 1992-1-2. Eurocode 2: Design of Concrete Structures

High strength concrete FIP CEB Bulletin 197

Steel Designers' Manual

Properties, Testing, and Laboratory Exercises, Second Edition

(UHPC) ; Proceedings of the Second International Symposium on Ultra High Performance Concrete, Kassel, Germany, March 05 - 07, 2008

Recommendations for the Inspection, Maintenance and Management of Car Park Structures

Punching Shear in Reinforced Concrete Slabs
Characterization of the Punching Shear Capacity of Thin Ultra-high Performance Concrete Slabs
Ultra High Performance Concrete
Tubular Structures XII
Onshore Structural Design Calculations
Concrete Floors and Slabs
Technical Report
Technical report
Resilient Infrastructure
Effect of Fibers on the Punching Shear Strength of Reinforced Concrete Slabs
Power Plant and Energy Processing Facilities
Dimensions
Proceedings of the 9th fib International PhD Symposium in Civil Engineering : Karlsruhe Institute of Technology (KIT), 22 - 25 July 2012, Karlsruhe, Germany
Proceedings of the International Conference on Concrete Slabs Held at Dundee University, 3-6 April 1979

Checking Punching Shear Strength By The Aci Code ***OMB No. 7946835219418 edited by***

ANAYA CHAMBERS

Select Proceedings of VCDRR 2021 CRC Press
The purpose of this book is to provide a straightforward introduction to the principles and methods of design for concrete structures. It is directed primarily at students and young designers who require understanding of the basic theory and a concise guide to design procedures. The theory and practice described in the book are of a fundamental nature and will be of use internationally. Limit state concepts are used, and the calculations are in SI units throughout. The principal aim of the fifth edition has been to update the text to incorporate changes and amendments introduced in the 1997 version of BS8110 and to include new material such as pile cap design. A complete new chapter on composite construction has been introduced. Important equations that have been derived within the text are highlighted by an asterix adjacent to the equation number.
CRC Press
Objective of conference is to define knowledge and technologies needed to design and develop project processes and to produce high-quality, competitive, environment- and consumer-friendly structures and constructed facilities. This goal is clearly related to the development and (re)-use of quality materials, to

excellence in construction management and to reliable measurement and testing methods.
Designers' Guide to EN 1992-1-1 and EN 1992-1-2. Eurocode 2: Design of Concrete Structures KIT Scientific Publishing
Presentation of the latest scientific and engineering developments in the field of tubular steel structures. Covers key and emerging subjects of hollow structural sections, such as: static and fatigue behaviour of connections/joints, concrete filled hollow sections and composite tubular members, offshore structures, earthquake resistance,

High strength concrete FIP CEB Bulletin 197

FIB - International Federation for Structural Concrete
Bridge deck deterioration in the northern Midwest creates significant costs to state Departments of Transportation (DOT's) in the region. The fundamental cause of the problem is low tensile strength and water permeable reinforced concrete resulting in deck cracking and ultimately reinforcing bar corrosion. Portland Cement Polymer Concrete (PCPC) combined with a design approach tailored to its advantages could virtually eliminate early deck deterioration and the associated costs providing an alternative asset management path for bridge decks. Bridge decks would no longer have to be removed from their substructure every fifteen years and replaced. The results would be higher quality, longer lasting bridge decks with lower life cycle costs. This project will demonstrate the feasibility and methodology of such a strategy. This project will develop a strategy that combines innovative concrete materials, novel design and cost analysis that enhances the longevity and reduces the life cycle cost of highway bridge decks. The project is expected to show significant life-cycle cost advantages to using a high performance bridge deck material.
Steel Designers' Manual Butterworth-Heinemann
The recent worldwide boom in industrial construction and the corresponding billions of dollars spent every year in industrial, oil, gas, and petrochemical and power generation project, has created fierce competition for these projects. Strong management and technical competence will bring your projects in on time and on budget. An in-depth explorat
Properties, Testing, and Laboratory Exercises, Second Edition CRC Press
This study summarizes experimental results of the punching shear behavior of reinforced concrete slab-column connections containing fiber reinforcement. Fiber reinforcement is particularly attractive and beneficial for concrete, especially where shear stresses are involved. Tests are reported on simply supported slab specimens loaded through a stub column to study the effect of several parameters, namely, type, volume, fraction, and aspect ratio of fibers. The experimental tests on reinforced concrete slabs showed that fiber reinforcement can contribute significantly to the enhancement of punching shear strength and ductility of concrete structural members. This increase is function of the fiber volume and fiber type. A simple empirical relationship describing the effect of steel fibers on the punching shear strength of slab-column connections is derived based on the results of this test and other experimental results reported in technical literature.

(UHPC) ; Proceedings of the Second International Symposium on Ultra High Performance Concrete, Kassel, Germany, March 05 - 07, 2008 Springer Nature
Applies to the design of building and civil engineering structures in plain, reinforced and pre-stressed concrete. The code (for convenience referred to as EC2) is written in several parts: EN 1992 - 1 - 1; EN 1992 - 1 - 2; EN 1992 - 2; and EN 1992 - 3.
Recommendations for the Inspection, Maintenance and Management of Car Park Structures Elsevier
To assess the two-way shear resistance, or punching shear strength, of reinforced concrete slabs, code provisions fitted from experimental data are typically employed. The experimental data forming the bases of these provisions have generally consisted of isolated slab-column connection tests that seek to represent the negative moment region of a flat plate slab. This research is focused on exploring the variation in the punching performance of slab-column connections when the typical testing conditions used to investigate isolated slab specimen are varied in a manner that produces alternative sectional loading conditions within the column connection region. To accomplish this, an innovative testing apparatus is introduced that permits alternative combinations of slab bending moment to out-of-plane shear force ratios to be applied to the slab-column connection. Results are presented from an experimental program conducted at the Ferguson Structural Engineering Laboratory (FSEL) of The University of Texas at Austin and an analysis is presented comparing the results from the tests with estimations made from current standards, the Critical Crack Shear Theory (CSCT), and also from numerical models. The data obtained from the experimental program are used to scrutinize current design and analysis procedures, and to shed light on the significance of the sectional loading conditions in the light of flat plate connection shear resisting performance.
Punching Shear in Reinforced Concrete Slabs PHI Learning Pvt. Ltd.
"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 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 Steel Designers' Manual continues to provide, in one volume, the essential knowledge for the design of conventional steelwork. Key Features: Fully revised to comply with the new EUROCODE standards Packed full of tables, analytical design information and worked examples Contributors number leading academics, consulting engineers and fabricators 'A must for anyone involved in steel design' - Journal of Constructional Steel Research"--

Characterization of the Punching Shear Capacity of Thin Ultra-high Performance Concrete Slabs

Thomas Telford
- Bridge type, behaviour and appearance David Bennett, David Bennett Associates · History of bridge development · Bridge form · Behaviour - Loads and load distribution Mike Ryall, University of

Surrey · Brief history of loading specifications · Current code specification · Load distribution concepts · Influence lines - Analysis Professor R Narayanan, Consulting Engineer · Simple beam analysis · Distribution co-efficients · Grillage method · Finite elements · Box girder analysis: steel and concrete · Dynamics - Design of reinforced concrete bridges Dr Paul Jackson, Gifford and Partners · Right slab · Skew slab · Beam and slab · Box - Design of prestressed concrete bridges Nigel Hewson, Hyder Consulting · Pretensioned beams · Beam and slab · Pseduo slab · Post tensioned concrete beams · Box girders - Design of steel bridges Gerry Parke and John Harding, University of Surrey · Plate girders · Box girders · Orthotropic plates · Trusses - Design of composite bridges David Collings, Robert Benaim and Associates · Steel beam and concrete · Steel box and concrete · Timber and concrete - Design of arch bridges Professor Clive Melbourne, University of Salford · Analysis · Masonry · Concrete · Steel · Timber - Seismic analysis of design Professor Elnashai, Imperial College of Science, Technology and Medicine · Modes of failure in previous earthquakes · Conceptual design issues · Brief review of seismic design codes - Cable stayed bridges - Daniel Farquhar, Mott Macdonald · Analysis · Design · Construction - Suspension bridges Vardaman Jones and John Howells, High Point Rendel · Analysis · Design · Construction - Moving bridges Charles Birnstiel, Consulting engineer · History · Types · Special problems - Substructures Peter Lindsell, Peter Lindsell and Associates · Abutments · Piers - Other structural elements Robert Broome et al, WS Atkins · Parapets · Bearings · Expansion joints - Protection Mike Mulheren, University of Surrey · Drainage · Waterproofing · Protective coating/systems for concrete · Painting system for steel · Weathering steel · Scour protection · Impact protection - Management systems and strategies Perrie Vassie, Transport Research Laboratory · Inspection · Assessment · Testing · Rate of deterioration · Optimal maintenance programme · Prioritisation · Whole life costing · Risk analysis - Inspection, monitoring, and assessment Charles Abdunur, Laboratoire Central Des Ponts et Chaussées · Main causes of deterioration · Investigation methods · Structural evaluation tests · Stages of structural assessment · Preparing for recalculation - Repair and Strengthening John Darby, Consulting Engineer · Repair of concrete structures · Metal structures · Masonry structures · Replacement of structures

Ultra High Performance Concrete John Wiley & Sons

Punching is considered to be one of the most difficult problems in structural concrete design and mechanical models or theoretical analyses were developed rather late in the history of concrete research attempts. This fib Bulletin reviews the development of design models and theoretical analyses since the CEB Bulletin 168 Punching Shear in Reinforced Concrete - State-of-the-Art Report published in 1985. The role of the concrete tensile strength was specially addressed. In this respect the present bulletin is also following-up the CEB Bulletin 237 Concrete Tension and Size Effects - Utilisation of concrete tension in structural concrete design and relevance of size effect - Contributions from CEB Task Group 2.7 published in 1997. Apart from new

theoretical developments a comprehensive databank for comparisons with experimental evidence is included. About 400 punching tests were critically reviewed and evaluated in a consistent manner. This is thought to be the first step towards a generally agreed selection of reliable tests. The evident value of such a data bank is illustrated by comparisons carried out between the data and some of the analytical proposals as well as empirical code formulas. List of contents : (1) Introduction, (2) Code equations, (3) Mechanical models for punching, (4) New developments for mechanical models, (5) Numerical investigations, (7) Comparison of mechanical models and test results of slabs without shear reinforcement, (8) Comparison of code rules and tests of flat slabs without shear reinforcement, (9) Comparison of codes, models and tests of flat slabs with shear reinforcement, (10) Experimental investigations, (11) Summary and conclusions, References, Appendices : (I) Databank on slabs without shear reinforcement, (II) Databank on slabs with shear reinforcement, (III) Comparison of test data with code rules, (IV) Comparison of test data with selected models, (V) Notations.

Tubular Structures XII

FIB - Féd. Int. du Béton

Horath effectively combines principles and theory with practical applications to provide a solid understanding of the characteristics of materials used in today’s machines, devices, structures, and consumer products. Straightforward, nonmathematical coverage uncovers the basic premises of materials science and mechanical behavior as they relate to all types of materials: ferrous and nonferrous metals; polymers and elastomers; wood and wood products; ceramics and glass; cement, concrete, and asphalt; composites; adhesives and coatings; and fuels and lubricants. An examination of the chemistry of materials illuminates the common properties important to material applications and how they may be created, reduced, and altered for the design and development of additional materials. Clearly written with an applied, problem-solving approach, the Second Edition is a sound introduction to materials technology. Strong coverage of the destructive and nondestructive evaluation of material properties builds the groundwork for inspection processes and testing techniques, such as tensile, creep, compression, shear, bend or flexure, hardness, impact, and fatigue. Laboratory assignments support the text with numerous hands-on exercises that develop skills in industry-sanctioned testing procedures, data collection, reporting and graphing, and determining additional appropriate tests. Additional supplementary resource materials for instructors and students are available for download here.

Onshore Structural Design Calculations

Thomas Telford

A statistical regression analysis was conducted on 146 selected test results from the literature to evaluate the basic ACI318 two-way shear strength equation, which has not changed since 1963. The basic ACI318 shear equation was established based on a statistical analysis of test results on scaled slab samples that were believed to have failed in shear. Only slabs with square columns, sheared on four sides and without shear reinforcement were needed in this study, resulting in 146 selected test results from

1956 to 2014. The study included slabs with normal and high strength concrete. This study presents new equations for slab punching shear capacity. The effect of several parameters on the punching shear strength is also discussed in this study. A simplified practical punching shear equation is also proposed based on statistical analysis of the experimental results from the database. The new proposed equations include the reinforcement ratio of the slab and the cubic root of the concrete strength. The study also showed that including the reinforcement ratio in the punching shear equation increases its accuracy. The new proposed equations are valid for normal and high strength concrete slabs.
Concrete Floors and Slabs Thomas Telford
Punching shear of structural concrete slabsTechnical reportFIB - Féd. Int. du Béton

Technical Report

Waveland Press
Foundation structures, their testing, and modeling are a wide area to research. A lot of different concrete elements are tested and modeled in the world. Analysis of interaction between the foundation structures and the subsoil has been developed for many years. For the determination of stress in foundation structure, it is needed to determine the influence of the stiffness, respectively, the pliability of subsoil to structural internal forces, and vice versa, how the stiffness of the foundation structure affects the resulting subsidence. This chapter deals with experimental tests of concrete foundation slabs. Tests are carried out at the steel test frame structure by dimension 2 × 2.5 × 5 m, which is placed open air at the Faculty of Civil Engineering in Ostrava. Tested slabs are by dimension 2 × 2 m and have different thickness between 100 and 200 mm. A lot of physical quantities are tested in those experiments and experiments are then multidisciplinary because geotechnical, acoustic, strain gauges, and deformation measurements are conducted. This chapter addresses especially with punching shear analysis and maximum punching resistance. A number of experimental tests of concrete foundation slabs were carried out. Slabs classically reinforced, prestressed, or FRC were tested, but slabs were not reinforced with shear reinforcement. During the experiment, the interaction between the concrete foundation and the subsoil was monitored. Most of the slabs were disrupted by punching shear. If the slab was disrupted by punching shear, dimension and shape of the punching failure were monitored and measured, and results were compared between them. Last but not the least, results from the experiment and results according to design methods used in EC2 are compared in this chapter. The maximum shear design force according to EC2 was lower than the one from the experiment.
Technical report fib Fédération internationale du béton
Tubular Structures XVI contains the latest scientific and engineering developments in the field of tubular steel structures, as presented at the 16th International Symposium on Tubular Structures (ISTS16, Melbourne, Australia, 4-6 December 2017). The International Symposium on Tubular Structures (ISTS) has a long-standing reputation for being the principal showcase for manufactured tubing and the prime international forum for presentation

and discussion of research, developments and applications in this field. Various key and emerging subjects in the field of hollow structural sections are covered, such as: special applications and case studies, static and fatigue behaviour of connections/joints, concrete-filled and composite tubular members and offshore structures, earthquake and dynamic resistance, specification and standard developments, material properties and section forming, stainless and high-strength steel structures, fire, impact and blast response. Research and development issues presented in this topical book are applicable to buildings, bridges, offshore structures, cranes, trusses and towers. Tubular Structures XVI is thus a pertinent reference source for architects, civil and mechanical engineers, designers, steel fabricators and contractors, manufacturers of hollow sections or related construction products, trade associations involved with tubing, owners or developers of tubular structures, steel specification committees, academics and research students all around the world.

Resilient Infrastructure ASTM International

- Scope - Responsibilities - Statutory requirements - Developing a long term inspection and maintenance strategy - Inspections and structural appraisals - Maintenance, repair and upgrading or replacement - Health and safety of personnel on site - Reporting the structural appraisal - References - Appendix: Structural deterioration, design deficiencies and safety

Effect of Fibers on the Punching Shear Strength of Reinforced Concrete Slabs Elsevier

Concrete is a global material that underwrites commercial wellbeing and social development. There is no substitute that can be used on the same engineering scale and its sustainability, expolitation and further development are imperatives to creating and maintaing a healthy economy and environment worldwide. The pressure for change and improvement of performance is relentless and necessary. Concrete must keep evolving to satisfy the increasing demands of all its users.

Power Plant and Energy Processing Facilities New Age International

Master's Thesis from the year 2018 in the subject Engineering - Civil Engineering, grade: very good, Mekelle University (Ethiopian Institute of Technology), course: Msc in structural engineering, language: English, abstract: This thesis presents study of punching shear capacity of flat slab-column junctions. A three dimensional nonlinear finite element program based on 8 node solid elements was used to carry out the nonlinear analysis of flat-slab models with and without gabion-mesh. The effect of gabion arrangements for punching and the ultimate load prediction for each was presented in this thesis. The results obtained from abaqus were compared to code prediction results, and the failure mode also compared to experimental and code predicted failure modes. The predicted mode of failure and other responses are in a good correlation to euro code predicted values. In addition to punching gabion has greater resistance to flexure by increasing the stiffness of the slab. Finally it is concluded that using hexagonal gabion mesh at tension part is easy, effective and can solve construction difficulty of drop panels and one layer gabion can reduce 10mm of slab thickness. Punching strength is a critical

point in the design of flat slabs and due to the lack of a theoretical method capable of explaining this phenomenon, empirical formulations presented by codes of practice are still the most used method to check the punching resistance of slab-column connections. Flat slab is a reinforced concrete slab supported directly by concrete columns without the use of beams. This type of slab is appropriate for most floor situations and also for irregular column layouts. Because of its aesthetic view, simplicity for construction, reduction of foundation cost, this becomes very common and competitive structural system for cast-in-place slabs in buildings. Flat plates allow easy and flexible partitioning of space and reduce the overall height of tall buildings. But since the load is directly transferred from slab to column due to high localized force at the column punching effect or punching shear failure is critical. This type of failure is catastrophic because no visible signs are shown prior to failure. To increase the punching resistance of the flat slab several methods have been used, such as drop panel, column capital, column head and shear reinforcements such as shear stud and stirrups. In our country Ethiopia the first three mechanisms are used to increase the resistance of punching shear in flat slabs but shear reinforcements are being used in other countries such as America and British.

Dimensions kassel university press GmbH fib Bulletin 81 reports the latest information available to researchers and practitioners on the analysis, design and experimental evidence of punching shear of structural concrete slabs. It follows previous efforts by the International Federation for Structural Concrete (fib) and its predecessor the Euro-International Committee for Concrete (CEB), through CEB Bulletin 168, Punching Shear in Reinforced Concrete (1985) and fibBulletin 12, Punching of structural concrete slabs (2001), and an international symposium sponsored by the punching shear subcommittee of ACI Committee 445 (Shear and Torsion) and held in Kansas City, Mo., USA, in 2005. This bulletin contains 18 papers that were presented in three sessions as part of an international symposium held in Philadelphia, Pa., USA, on October 25, 2016. The symposium was co-organized by the punching shear sub-committee of ACI 445 and by fib Working Party 2.2.3 (Punching and Shear in Slabs) with the objectives of not only disseminating information on this important design subject but also promoting harmonization among the various design theories and treatment of key aspects of punching shear design. The papers are organized in the same order they were presented in the symposium. The symposium honored Professor Emeritus Neil M. Hawkins (University of Illinois at Urbana-Champaign, USA), whose contributions through the years in the field of punching shear of structural concrete slabs have been paramount. The papers cover key aspects related to punching shear of structural concrete slabs under different loading conditions, the study of size effect on punching capacity of slabs, the effect of slab reinforcement ratio on the response and failure mode of slabs, without and with shear reinforcement, and its implications for the design and formulation in codes of practice, an examination of different analytical tools to predict the punching shear response of slabs, the study of the post-punching response of concrete slabs, the evaluation

of design provisions in modern codes based on recent experimental evidence and new punching shear theories, and an overview of the combined efforts undertaken jointly by ACI 445 and fib WP 2.2.3 to generate test result databanks for the evaluation and calibration of punching shear design recommendations in North American and international codes of practice.