



ICOSADOS 2016

**7th INTERNATIONAL CONFERENCE
ON SAFETY AND DURABILITY OF STRUCTURES**

10th - 12th May 2016

**Universidade de Trás-os-Montes e Alto Douro
Vila Real | Portugal**



FCT

Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

7th International Conference on Safety and Durability of Structures

ICOSADOS 2016

May 10 - 12, 2016, UTAD, Portugal

Book of Abstracts

Editors:

Jorge Tiago Pinto
Andrzej Pawłowski

Anabela Paiva
Ulvis Skadin



ISBN: 978-989-20-6676-9

PREFACE

This book contains the abstracts of the papers presented in the 7th International Conference on Safety and Durability of Structures (ICOSADOS 2016), held in the University of Trás-os-Montes e Alto Douro (UTAD), city of Vila Real, Portugal, from 10th to 12th of May 2016.

A contribution in the internationalisation goal of ICOSADOS was achieved with this event taking into account that authors or members of the Scientific Committee of eight countries collaborated. These countries are Poland, Latvia, Portugal, UK, Italy, Mexico, France and Brazil.

There was also a significant participation of the industry which sponsored the conference and gave an important contribution for its success. The Civil Engineering students of UTAD also gave a relevant help in the organization of this conference.

In this conference there were four lectures presented by keynote speakers who are international references in the topics of safety and durability of structures. These keynote speakers are Professors Pawel Sniady (Wrocław University of Environmental and Life Sciences, Poland), Ulvis Skadins (Latvia University of Agriculture, Latvia), Jitendra Agarwal (University of Bristol, United Kingdom) and António Arêde (Engineering Faculty of University of Porto, Portugal).

The conference scope includes a wide range of safety and durability of structures topics such as:

- S1 - Degradation: diagnostics and evaluation methods
- S2 - Structural, physical and material characterisation
- S3 - Numerical modelling
- S4 - Natural and man-made risks
- S5 - Requirements and code provisions
- S6 - Assessment, conservation, repair and strengthening
- S7 - Case studies

The Editors are grateful to all authors, members of the scientific committee and other colleagues that make possible the publication of this book.

The Editors
Vila Real
2016

COMMITTEES

Honour Committee

António Fontainhas Fernandes, Rector of the University of Trás-os-Montes e Alto Douro
Rui Santos, President of the City Council of Vila Real
Carlos Trindade Moreira, Delegate of Ordem dos Engenheiros of district of Vila Real
José Boaventura Cunha, Dean of School of Sciences and Technology

Organising Committee

Jorge Tiago Pinto, chairman, University of Trás-os-Montes e Alto Douro (UTAD), Portugal
Andrzej Pawłowski, co-chairman, Wrocław University of Environmental and Life Sciences (WUELS), Poland
Ulvis Skadin, co-chairman, Latvia University of Agriculture (UA), Jelgava, Latvia
Anabela Paiva, UTAD, Portugal
Ana Briga de Sá, UTAD, Portugal
Cristina Matos, UTAD, Portugal
Cristina Reis, UTAD, Portugal
Francisco Pereira, UTAD, Portugal
Isabel Bentes, UTAD, Portugal
Maciej Orzechowski, WUELS, Poland
Sandra Pereira, UTAD, Portugal
Sandra Gusta, UA, Latvia
Silvija Strausa, UA, Latvia
Zofia Zięba, WUELS, Poland

Scientific Committee

Jorge Tiago Pinto, UTAD, Portugal - chairman
Jerzy Sobota, WUELS, Poland – co-chairman
Silvija Strausa, UA, Latvia – co-chairman
Ana Briga Sá, UTAD, Portugal
Anabela Paiva, UTAD, Portugal
Andrzej Pawłowski, WUELS, Poland
António Arêde, FEUP, Portugal
António Topa Gomes, FEUP, Portugal
António Sampaio Duarte, UM, Portugal
Artur Feio, ULUSIADA, Portugal
Carlos Afonso Teixeira, UTAD, Portugal
Carlos Rodrigues, ISEP, Portugal
Carlos Oliveira, IPVC, Portugal
Celeste Almeida, UFP, Portugal
Cristina Fael, UBI, Portugal

Cristina Matos, UTAD, Portugal
Cristina Reis, UTAD, Portugal
Daniel Oliveira, UM, Portugal
Débora Ferreira, IPB, Portugal
Eduardo Pereira, UM, Portugal
Eduardo Júlio, IST, Portugal
Edward Hutnik, WUELS, Poland
Enrico Spacone, University of Chieti-Pescara, Italy
Elza Fonseca, IPB, Portugal
Eugeniusz Hotała, WUT, Poland
Fátima Farinha, UAAlg, Portugal
Fernanda Rodrigues, UA, Portugal
Francisco Carvalho, Universidade Estadual Vale do Acaraú, Brazil
Fulvio Parisi, University of Naples Federico II, Italy
Giorgio Monti, Sapienza Università di Roma, Italy
Hugo Rodrigues, IPL, Portugal
Humberto Varum, FEUP, Portugal
Isabel Bentes, UTAD, Portugal
Isabel Torres, UC, Portugal
Jaan Miljan, EU, Estonia
Jan Kempinski, WUELS, Poland
Jerzy Hoła, WUT, Poland
Jitendra Agarwal, UB, UK
João Castro Gomes, UBI, Portugal
João Ferreira, IST, Portugal
João Lanzinha, UBI, Portugal
João Miranda Guedes, FEUP, Portugal
João Varajão, UM, Portugal
Jorge de Brito, IST, Portugal
José Correia da Silva, UEvora, Portugal
José Jara, University Michoacana San Nicolás de Hidalgo, Mexico
José Mendes da Silva, UC, Portugal
Kazimierz Rykaluk, WUELS, Poland
Krzysztof Parylak, WUELS, Poland
Luís Juvandes, FEUP, Portugal
Luís Prola, IPL, Portugal
Maciej Orzechowski, WUELS, Poland
Michelangelo Laterza, University of Basilicata, Italy
Nuno Cristelo, UTAD, Portugal
Paulina Faria, UNL, Portugal
Paulo Fernandes, IPL, Portugal
Paweł Śniady, WUELS, Poland
Rafik Belarbi, Universite de la Rochelle, France
Ricardo Bento, UTAD, Portugal
Romeu Vicente, UA, Portugal
Sandra Gusta, UA, Latvia
Sandra Pereira, UTAD, Portugal
Sofia Ribeiro, LNEC, Portugal
Sylwester Kobiela, WUELS, Poland
Tiago Miranda, UM, Portugal

Ulvis Skadins, UA, Latvia
Vitor Cunha, UM, Portugal
Wojciech Skowroński, WUELS, Poland
Zofia Zięba, WUELS, Poland

CONTENTS

S1 - DEGRADATION: DIAGNOSTICS AND EVALUATION METHODS 1

ANOMALY DIAGNOSIS IN CERAMIC CLADDINGS BY THERMOGRAPHY – A REVIEW 2

BEHAVIOUR OF COLD-FORMED STEEL SCREWED CONNECTIONS AT AMBIENT AND ELEVATED TEMPERATURES..... 3

CHLORIDE ASSESSMENT IN STRUCTURES INFLUENCES OF SAMPLING AND TEST LOCATION..... 4

CHLORIDE PENETRATION INTO CARBONATED CONCRETE..... 5

DAMAGES OF SMALL BUILDING OBJECTS AS A RESULT OF INSPECTION AND MAINTENANCE OMISSIONS 6

DUCTILITY AND DURABILITY OF STRAIN HARDENING CEMENTITIOUS COMPOSITES IN THE MARINE ENVIRONMENT..... 7

INFLUENCE OF DEFECTS ON RELIABILITY OF REINFORCED CONCRETE RETAINING WALL 8

INSPECTION TECHNIQUES INTO SPECIAL STRUCTURES..... 9

THE DIFFICULTIES OF A MARITIME WORK..... 10

S2 - STRUCTURAL, PHYSICAL AND MATERIAL CHARACTERISATION 11

A CONTRIBUTION FOR TABIQUE WALLS CHARACTERIZATION 12

A STUDY ABOUT PCM's INCORPORATION IN PASSIVE SOLAR SYSTEMS 13

AN ATTEMPT TO IDENTIFY THE BONDING BETWEEN CONCRETE LAYERS IN EXISTING ELEMENTS USING NON-DESTRUCTIVE TESTING METHODS AND THE ANN 14

INVESTIGATION OF HIGH TEMPERATURE CREEP OF STRUCTURAL STEEL....	15
ASSESSMENT OF TIMBER-STEEL CONNECTION IN TERMS OF CORRECT DESIGN AND CONSTRUCTION - PRELIMINARY TESTS.....	16
CFRP FIRE BEHAVIOUR – PASSIVE FIRE PROTECTION MATERIALS.....	17
DAMAGE TOLERANT ENGINEERED CEMENTITIOUS COMPOSITES WITH SUPER-ELASTIC REINFORCEMENT.....	18
DURABILITY ANALYSIS OF RC SEWER AFTER LONG TIME SERVICE.....	19
FATIGUE BEHAVIOUR OF OLD MASONRY ARCH BRIDGES.....	20
INVESTIGATION OF HIGH TEMPERATURE CREEP OF STRUCTURAL STEEL....	21
PASSIVE SOLAR SYSTEM APPLIED IN TROMBE WALLS.....	22
SAFETY AND DURABILITY IMPROVEMENT OF ACOUSTIC PLATE FOAM GYPSUM USING MULTILAYER BOARD.....	23
STABILITY OF PARTIALLY ENCASED COLUMNS UNDER FIRE.....	24
TENSILE STRAIN HARDENING OF A METAKAOLIN-BASED FIBRE REINFORCED COMPOSITE.....	25
TEST RESULTS AND THEORETICAL STUDY OF MOMENT RESISTING CONNECTIONS.....	26
THERMAL MODEL FOR CHARRING RATE CALCULATION IN WOODEN CELLULAR SLABS UNDER FIRE.....	27
ULTRA-HIGH DURABLE CONCRETE: A WAY TOWARDS SAFE AND DURABLE STRUCTURES.....	28
WATER ABSORBING GECOMPOSITE INFLUENCE ON ROOT SYSTEMS OF PLANTS USED IN GEOTECHNICAL BIOENGINEERING.....	29
S3 - NUMERICAL MODELLING.....	31
APPLICATION OF FINITE DIFFERENCE METHOD IN DYNAMICS OF MULTI-SPAN BRIDGE GIRDERS SUBJECTED TO VARIOUS TYPES OF MOVING LOAD.....	32

COMPUTATIONAL FLUID DYNAMICS ANALYSIS ON INFLUENCE OF THE ROUGHNESS OF VERTICAL ELEMENTS IN FLOW BEHAVIOR.....	33
EVALUATION OF THE SEISMIC VULNERABILITY OF A RC BUILDING CONSIDERING THE MASONRY INFILL WALLS OUT-OF-PLANE BEHAVIOUR – NUMERICAL STUDY	34
FINITE ELEMENT MODELING AND SENSITIVITY OF TRADITIONAL PORTUGUESE ADOBE MASONRY	35
THE INFLUENCE OF THE LEVEL OF GEOMETRICAL IDEALIZATION ON STATIC RESPONSE OF THE STRUCTURE BY EXAMPLE OF TIMBER TRUSS OF THE ROOF OF MEDIEVAL CHURCH.....	36
VULNERABILITY ASSESSMENT OF REAL-WORLD WATER DISTRIBUTION NETWORKS USING THE <i>TV-WPN</i> INFORMATICS TOOL	37
S4 - NATURAL AND MAN-MADE RISKS	39
EVALUATION OF DESIGN SOLUTIONS APPLIED ON THE MODERNISED SECTION OF ODRA RIVER EMBANKMENT IN THE CONDITIONS OF EXPLOITATION OF THE MALCZYCE BARRAGE	40
SLOPES STABILITY OF HYDROTECHNICAL EARTH STRUCTURES IN THE CONDITIONS OF RAPID WATER LEVEL CHANGES	41
EFFECTIVENESS OF RETENTION BOWLS	42
WATER TO ENERGY NEXUS IN CENTRALIZED WASTEWATER INFRASTRUCTURES.....	43
S5 - REQUIREMENTS AND CODE PROVISIONS.....	45
AN EXAMPLE OF CODE VERIFICATION OF TRADITIONAL TIMBER STRUCTURAL ELEMENTS	46
APPLICATION OF EUROCODES 0 AND 1 - COMPARISON WITH SIA 260 AND 261 SWISS STANDARDS.....	47
LOCAL CRUSHING OF CONCRETE WALLS ACCORDING TO EUROCODES AND FORMER LATVIAN BUILDING NORMS.....	48

S6 - ASSESSMENT, CONSERVATION, REPAIR AND STRENGTHENING...49

A SIMPLIFIED PROCEDURE FOR RISK ASSESSMENT OF CULTURAL HERITAGE:
DEFINITION AND APPLICATION TO RELIGIOUS ARCHITECTURE50

CLOSE-TO-FAILURE STATE OF MASONRY STRUCTURE DURING
CONSTRUCTION WORKS IN A SINGLE FAMILY HOUSE51

DEVELOPMENT OF RETROFITTING SOLUTIONS: "BRIDGE" REPAIR CRACKING
TECHNIQUE - EXPERIMENTAL CAMPAIGN52

EXPERIMENTAL STUDY OF REPAIR AND RETROFIT PROCEDURES TO
DAMAGED RC COLUMNS53

FAIR-FACED CONCRETE AND *ANTI-GRAFFITI* PROTECTION54

FEATURES OF TECHNOLOGICAL PROCESS IN THE DOME DESIGN
RESTORATION OF ORTHODOX CHURCHES55

IMPACT OF SKYLIGHT THERMAL PROPERTIES ON THE OVERALL ENERGY
EFFICIENCY OF SUSTAINABLE BUILDINGS56

INFLUENCE OF IMPACT STRENGTH FOR POSSIBILITY OF USAGE AND REPAIR
OF STEEL STRUCTURES.....57

REFURBISHMENT AND MAINTENANCE STRATEGIES FOR SOCIAL HOUSING 58

RENOVATION OF RESIDENTIAL BUILDING59

S7 - CASE STUDIES61

AN INSIGHT OF THE TRADITIONAL PORTUGUESE FOREST HOUSES62

CAPPING CONCEPT OF MSW LANDFILL WITH STEEP SLOPES ON LIMITED PLOT
OF LAND – A CASE STUDY63

LIGHT STEEL FRAMING: CHARACTERISTICS, ADVANTAGES AND
DISADVANTAGES OF ITS IMPLEMENTATION. CASE OF STUDY64

BEHAVIOUR OF COLD-FORMED STEEL SCREWED CONNECTIONS AT AMBIENT AND ELEVATED TEMPERATURES

Rui Dias^{1, a}, Armandino Parente^{1, b}, Luís Mesquita^{2, c}, Paulo Piloto^{3, d}

¹IPB, Campus Sta. Apolónia, ap. 1134, 5301-857 Bragança, Portugal

²ISISE, IPB, Campus Sta. Apolónia, ap. 1134, 5301-857 Bragança, Portugal

³LAETA-INEGI, IPB, Campus Sta. Apolónia, ap. 1134, 5301-857 Bragança, Portugal

^arui_paulinho_93@hotmail.com, ^barmandino_parente@hotmail.com,

^clmesquita@ipb.pt, ^dppiloto@ipb.pt

Keywords: Screwed connections, Cold-formed steel sheet, Elevated temperatures, Experimental tests, Finite element modelling.

ABSTRACT

The application of cold-formed steel structural members in steel construction, and in particular building construction, has a number of advantages that includes its high structural efficiency compared to the member weight. These sections are usually obtained by thin cold-formed sheets and have slender cross-sections. Although the member resistance is affected by local and distortional buckling instability phenomena, one can reduce these effects by local restraints to the partition walls panels or the building envelop panels, by means of self-drilling or self-tapping screws. Additionally the building erection phase is faster due to the ease steel-to-steel connection between structural members by means of self-drilling screws.

The design of cold-formed sections and their connection elements must be performed at room temperature and also in an accidental fire situation, for which the connection strength design value must be determined at elevated temperatures. At room temperature, bolted shear connections from bearing type category must be verified against shear and bearing failure modes. This methodology differs from that presented in EN1993-1-3, which provides the design resistances of connections for cold-formed members and sheeting. At elevated temperatures the Annex D from EN 1993-1-2 specifies the fire design resistance of bolts loaded in shear as a function of its ambient temperature resistance (from EN1993-1-8) and a reduction factor determined for the appropriate bolt temperature.

This work presents a study of the behaviour of cold-formed thin steel sheeting screwed connections at room temperature and elevated temperatures. The shear and bearing failure modes are analysed experimentally by means of a parametric analysis, considering: (i) different elevated temperature values; (ii) cold-formed steel grades; (iii) board effect of the screw position; (iv) and different steel sheet thicknesses.

The set of experimental results are used for calibration and verification of the numerical model developed by the finite element method in the software Ansys. The numerical method is used for a wider parametric analysis about cold-formed screwed connections at elevated temperatures. The numerical and experimental results are compared with the simplified calculation method presented in the European standards.

Event Sponsors:



TEKLA





ISBN: 978-989-20-6676-9