
M2D2015
P. Delgada/Portugal

Proceedings of the 6th International Conference on Mechanics and Materials in Design

Editors

J.F. Silva Gomes
FEUP/U.Porto
Portugal

Shaker A. Meguid
MADL/U.Toronto
Canada

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(2015)

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Editors Preface

M2D2015 is the sixth international gathering of a prestigious series of conferences coordinated by the International Scientific Committee of Mechanics and Materials in Design. This series of conferences are wholy devoted to advances in mechanics, materials, structural integrity and design. **M2D2015** is sponsored by the University of Porto, the University of Toronto and the University of Azores. The conference attracted over 320 participants with 423 accepted submissions from 42 countries out of 620 submissions. These papers were presented in July 26-30, 2015 in the magnificent city of Ponta Delgada, Azores. The conference themes which address novel and advanced topics in Mechanics and Materials in Design focused on analytical and numerical tools at all scales, testing and diagnostics, surface and interface engineering, tribology, mechanical design and prototyping, modes of failure, composite and engineered materials, biomechanics, energy and thermo-fluid systems, impact and crashworthiness and case studies.

We believe that the meeting offered our delegates a forum for the dissemination of their recent work in mechanics and materials and their applications in engineering design, fostered research that integrates mechanics and materials in the design process, and promoted exchange of ideas and international co-operation among scientists and engineers in this important field of engineering.

We are particularly indebted to the authors and special guests for their presentations. Each of the more than 423 contributions offered opportunities for thorough discussions with the authors. Particularly, we acknowledge the excellent contributions of the participants, their innovative ideas and research directions, the novel modeling and simulation techniques, and the invaluable critical comments. We are also indebted to the outstanding keynote speakers who highlighted the conference themes with their contributions and covered the main topics of the conference. We also take this opportunity to thank the members of the International Scientific Committee and the reviewers for their time, effort and helpful suggestions.

We offer our sincere gratitude to the symposia organisers for their efforts and valuable contributions to the success of the event, and the local organising committee for attending to the conference demands and delegates needs.

All in all, **M2D2015** was a great success and the credit must go to all the participants for their significant contributions and lively discussions, the keynote speakers for bridging the gap between the different disciplines and the organizing committee for an absolutely superb organization of the meeting in this magnificent city. To all of you, we offer our gratitude.

Given the rapidity with which science is advancing in all areas of mechanics and materials, the next conference in this series (Integrity, Reliability and Failure - IRF2016) will take place in Porto, Portugal in July 2016. Undoubtedly, we expect IRF2016 to be as stimulating and interesting as **M2D2015**, as evidenced by the excellent contributions offered in this current event. We look forward to seeing all of you in Porto in 2016.

Shaker A. Meguid and J.F. Silva Gomes

P. Delgada / Azores, July 2015

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SEM-American Society for Experimental Mechanics
BSSM-British Society for Strain Measurement
JSME-Japanese Society of Mechanical Engineering
IMEKO-International Measurement Confederation
AFM-Association Française de Mécanique
DYMAT-European Association for Dynamics of Materials
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M2D2015
P. Delgada/Portugal

6th International Conference on
MECHANICS AND MATERIALS IN DESIGN
P. Delgada/Azores, 26-30 July 2015

M2D2015
PROGRAM

University of Porto
University of Toronto
University of Azores

MAIN TOPICS

A - Analytical and Numerical Tools. *(Sessions: 2A-3A)*
B - Testing and Diagnostics. *(Sessions: 2B-3B)*
C - Surface and Interface Engineering. *(Sessions: 2C-3C)*
D – Civil Engineering Applications. *(Sessions: 2D-3D)*
F - Tribology, Gears and Transmissions. *(Session: 4F)*
G - Mechanical Design and Prototyping. *(Sessions: 5C-6C)*
H - Modes of Failure. *(Session: 1C)*
I - Composite & Advanced Materials. *(Sessions: 4B-6B)*
J - Nanotechnologies & Nanomaterials. *(Session: 1A)*
K – Biomechanical Applications. *(Sessions: 5D-6D)*
L - Energy and Thermo-Fluid Systems. *(Session: 7G)*
M - Impact and Crashworthiness. *(Sessions: 7D-8D)*
N - Case Studies. *(Session: 8D)*

THEMATIC SYMPOSIA

2. EXPERIMENTAL MECHANICS IN DESIGN, *by Hernani Lopes (ISEP/IPP, Portugal) and Jaime Monteiro (INEGI/U.Porto, Portugal) - Session: 1B.*

3. DYNAMICS, STABILITY AND CONTROL IN STRUCTURAL ENGINEERING: CASE STUDIES, *by Rui C. Barros (FEUP/U. Porto, Portugal) - Session: 7B*

4. ANALYSIS DESIGN & TESTING OF TOWERS AND POLES, *by Rui C. Barros (FEUP/U. Porto, Portugal) Session: 8B.*

5. DESIGN AND PRODUCT DEVELOPMENT, *by Jorge Lino (FEUP/U. Porto, Portugal) and Xavier de Carvalho (FEUP/U.Porto, Portugal) - Session: 4C.*

6. MECHANICAL BEHAVIOUR OF BIO-BASED MATERIALS, *by Nuno Dourado (CITAB/UTAD, Portugal) and Marcelo Moura (FEUP/U. Porto, Portugal) - Session: 5E.*

9. SYSTEMATIC INNOVATION AND LEAN APPROACH IN ENGINEERING, *by Helena V.G. Navas (FCT/UNL, Portugal) and Anabela Alves (U. Minho, Portugal) - Sessions: 5G-6G.*

10. SEISMIC BEHAVIOUR CHARACTERIZATION AND STRENGTHENING OF CONSTRUCTIONS, *by António Arêde (FEUP/U. Porto, Portugal), Humberto Varum (FEUP/U. Porto, Portugal), Hugo Rodrigues (ESTG/IPL, Portugal) and Aníbal Costa (DECivil/U. Aveiro, Portugal) - Session: 1D.*

11. MECHANICS AND MATERIALS IN DENTAL MEDICINE, *by J.C. Reis Campos (FMD/U. Porto, Portugal) and Mário A.P. Vaz (FEUP/U. Porto, Portugal) - Sessions: 4D-5D.*

12. OPTIMIZATION FOR SUSTAINABLE DEVELOPMENT, *by Carlos C. António (FEUP/U. Porto, Portugal) and Catarina F. Castro (FEUP/U. Porto, Portugal) - Sessions: 5A-6A.*

13. CARDIOVASCULAR AND ORTHOPEDIC MECHANICS DESIGN, *by Luísa C. Sousa (FEUP/U. Porto, Portugal) and Catarina F. Castro (FEUP/U. Porto, Portugal) - Session: 7E.*

17. MECHANICAL BEHAVIORS OF ADVANCED MATERIALS & STRUCTURES AT ALL SCALES, *by Yu Su (Beijing Institute of Technology, China) - Sessions: 1E-4E.*

18. MECHANICAL BEHAVIOR OF SOFT BIOMATERIALS, *by Renato N. Jorge (FEUP/U.Porto, Portugal), Pedro Martins (FEUP/U.Porto, Portugal) and Marco Parente (FEUP/U.Porto, Portugal) - Session: 8E.*

19. NON-DESTRUCTIVE INSPECTION TECHNIQUES FOR MATERIALS AND STRUCTURES, *by João Tavares (FEUP/U.Porto, Portugal), Luís Durão (ISEP/IPP, Portugal) and João Rebello (UFRJ, Brazil) - Sessions: 7C-8C.*

20. THERMAL COMFORT IN BUILDINGS, *by Marta Silva (U. Aveiro) and Mário Talaia (U. Aveiro, Portugal) - Session: 8G.*

21. TRIBOLOGY TRENDS FOR HIGHER EFFICIENCY AND RELIABILITY, *by Ramiro Martins (INEGI/U.Porto, Portugal), Jorge Castro (INEGI/U.Porto, Portugal), Armando Campos (INEGI/U.Porto, Portugal) and Jorge Seabra (INEGI/U.Porto, Portugal) - Sessions: 5F-6F.*

22. RECYCLING AND RE-USE OF INDUSTRIAL AND HOUSEHOLD WASTES INTO NEW COMPOSITE MATERIALS, *by A. Fiúza (CIGAR/U.Porto, Portugal) and M.C.S. Ribeiro (INEGI/U.Porto, Portugal) - Sessions: 7F-8F.*

23. QUALITY CONTROL AND METROLOGY IN ENGINEERING, *by José Barradas (CATIM, Portugal), José Carlos Sá (IPVC, Portugal) and José Oliveira (IPVC, Portugal) - Session: 1G.*

24. THERMODYNAMICS AND FLUIDS, *by Clito F. Afonso (FEUP/U.Porto, Portugal) - Session: 8G.*

25. COMPUTATIONAL MECHANICS IN DESIGN, *by Xiong Zhang (Tsinghua University, China) - Sessions: 1F-3F.*

26. FIBER BASED MATERIALS: DESIGN, DEVELOPMENT AND APPLICATIONS, *by Maria José Abreu (U. Minho, Portugal) and André Catarino (U. Minho, Portugal) Session: 4G.*

27. THIN FILMS AND COATINGS IN TRIBOLOGY, *by Albano Cavaleiro (FCTUC/U. Coimbra, Portugal) and Tomas Polcar (U. Southampton, U.K.) - Sessions: 2G-3G.*

28. ADVANCED DISCRETIZATION TECHNIQUES IN COMPUTATIONAL MECHANICS, *by Jorge Belinha (INEGI/U.Porto, Portugal) and Carla Roque (INEGI/U.Porto, Portugal) - Session: 4A.*

29. SAFETY IN WOOD MATERIALS, *by Elza Fonseca (IPB, Portugal) and Débora Ferreira (IPB, Portugal) - Session: 7A.*

31. FIRE AND STRUCTURAL ENGINEERING, *by P. Piloto (IPB, Portugal) and A. Meda (U. Rome, Italy) - Session: 8A.*

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PROGRAM

SUNDAY, 26 JULY 2015

15:00-18:00	**EARLY-BIRD REGISTRATION AND WELCOME DRINK**	**Lobby**

MONDAY, 27 JULY 2015

08:00-09:00	**REGISTRATION**	**Lobby**
09:00-09:30	**OPENING SESSION**	**Serreta**
09:30-10:15	**KEYNOTES SESSION - 1**	**Serreta & Auditorium**

A *(Room: Serreta)* *Chair: Prof. J.F. Silva Gomes (U.Porto, Portugal)*	**B** *(Room: Auditorium)* *Chair: Prof. Peter Hess (U. Heidelberg, Germany)*
Professor Shaker A. Meguid (University of Toronto, Canada) **ENERGY ABSORPTION IN AXIAL CRUSHING OF ULTRALIGHT STRUCTURES**	Professor Noritsugu Umehara (Nagoya University, Japan) **RECENT DEVELOPMENTS IN TRIBOLOGY FOR ENERGY SAVING IN SUSTAINABLE SOCIETY**

10:15-10:45	**COFFEE-BREAK**	**Lobby**
10:45-12:30	**PAPERS SESSION - 1**	**All Rooms**

1A *(Monchique-1)* Topic-J *Chair* *Shaker Meguid*	**1B** *(Monchique-2)* Symp-2 *Chair* *Jaime Monteiro*	**1C** *(Urzelina-1)* Topic-H *Chair* *José Maria Cirne*	**1D** *(Urzelina-2)* Symp-10 *Chair* *Hugo Rodrigues*	**1E** *(Auditorium)* Symp-17 *Chair* *Yu Su*	**1F** *(Serreta-1)* Symp-25 *Chair* *Xiong Zhang*	**1G** *(Serreta-2)* Symp-23 *Chair* *José Barradas*
Ref: 5549 HEAT-RESISTANT CELLULAR MATERIALS BASED ON COMPOSITE (GYSPUM-SILICA) BINDER. E.V. Voitovich, N.I. Kozhukhova, A.V. Cherevatova, I.V. Zhernovsky	Ref: 5357 A NEW METHOD FOR THE RECONSTRUCTION OF INCOMPLETE EXPERIMENTAL SPECTRAL RESPONSE MATRICES. José Antunes, Laurent Borsoi, Xavier Delaune, Philippe Piteau	Ref: 5442 A FULLY IMPLICIT COMPUTATIONAL APPROACH TO DYNAMIC DELAMINATION UNDER LARGE DISPLACEMENTS. Marco Paggi, Mauro Corrado, José Reinoso	Ref: 5536 SEISMIC REABILITATION OF BUILDINGS: STANDARDIZATION OF INFORMATION FOR BIM. Filipa Salvado, Maria João Silva, Paula Couto, Alvaro Azevedo	Ref: 5340 EXPERIMENTAL INVESTIGATION ON PROPAGATION OF ADIABATIC SHEAR BAND. Lu Ming, Tao Suo, Chao Zhang, Busheng Zhang, Fengbo Liu	Ref: 5369 A NEW TYPE OF HIGH-ORDER ELEMENTS BASED ON MESH-FREE GALERKIN FORMULATIONS. Yigang Wang, Dean Hu, Xu Han	Ref: 5376 STATISTICAL PROCESS CONTROL - THE IMPORTANCE OF USING CALIBRATED MEASUREMENT EQUIPMENT - CASE STUDY. José Barradas, Marta Mendes
Ref: 5585 DEVELOPMENT OF MODIFIED WETABILITY SURFACES ON METALLIC SUBSTRATES BY SHORT PULSE LASER MICROSTRUCTURING. R. Jagdheesh, J.J. Bqllesteros, A.V. Tur, J.L. Ocana	Ref: 5424 INVESTIGATION OF THERMAL AND MECHANICAL PROPERTIES OF QUENCHABLE HIGH STRENGTH STEELS IN HOT STAMPING. Anton Gorriño, Carlos Angulo, Maider Muro, Julian Izaga	Ref: 5755 STUDY ON THE MECHANICAL PERFORMANCE OF ALUMINUM ALLOY 6156 SKIN BUTT JOINTS WITH ELECTRON BEAM WELDING. Theano Examilioti, Nikolaos D. Alexopoulos, George Stefanou, Vasilis Stergiou, Stavros K. Kourkoulis	Ref: 5541 IN-PLANE SEISMIC BEHAVIOR OF A STRONG MASONRY INFILL. Milad Oliaee, Paolo Morandi, Guido Magenes	Ref: 5342 IMPACT RESPONSE OF FOAM FILLED CONCRETE USING A DROP HAMMER TEST SYSTEM. Yiping Liu, Zejia Liu, Zhenyu Jiang, Liqun Tang	Ref: 5374 AN ADAPTIVE COUPLING MOLECULAR DYNAMICS-SMOOTHED MOLECULAR DYNAMICS (MD-SMD) METHOD FOR NANO-MECHANICS. Niangfeng He, Yan Liu, Xiong Zhang	Ref: 5548 APROACH TO THE CALIBRATION OF CALLIPERS - ISO13385:2011 vs DIN862:1988 STANDARDS. Isabel Perfeito

Ref: 5666 DESIGN SENSITIVITY ANALYSIS OF THERMAL CONDUCTIVITY OF NANOMATERIALS. Seonho Cho, Hong-Lae Jang, Hyun-Seok Kim, Youmie Park	Ref: 5495 TOLERANCE ANALYSIS OF THIN-WALL CFRP STRUCTURAL ELEMENTS USING TOMOGRAPHIC IMAGING. E. Casarejos, Pablo Aguiar, J.D. Barreiro, Pablo Izquierdo, A. Segade, José Vilan, P. Yanez, Alfredo Iglesias	Ref: 5757 SUPERPLASTIC DEFORMATION OF a/b BRASS UNDER FRICTION CONDITIONS. Alexey Moshkovich, Louisa Meshi, Lev Rapoport	Ref: 5594 CAPACITY CURVES FOR REINFORCED CONCRETE BUILDINGS DESIGNED IN ACCORDANCE WITH PORTUGUESE REGULATION. Maria João Silva	Ref: 5345 DOMAIN STABILITY IN SOFT FERROMAGNETIC NANOPLATELETS AND POLAR-VORTEX TRANSFORMATIONS CONTROLLED BY MECHANICAL LOADS. Qiang Sheng, Weijin Chen, Yue Zheng	Ref: 5388 INCOMPRESSIBLE MATERIAL POINT METHOD FOR FREE SURFACE FLOW. Fan Zhang, Xiong Zhang, YanPing Lian	Ref: 5574 IDEA MANAGEMENT SYSTEM - AN ESSENCIAL COMPONENT IN THE IMPROVEMENT OF QUALITY. Gilberto Santos, José Afonseca, Nuno Lopes, Manuel Doiro, M. Rui Alves
Ref: 5670 ADJOINT SENSITIVITY ANALYSIS OF CONSTANT TEMPERATURE MOLECULAR DYNAMICS. Hong-Lae Jang, Hyun-Seok Kim, Youmie Park, Seonho Cho	Ref: 5619 NUMERICAL AND EXPERIMENTAL ASSESSEMENT OF THE DISPLACEMENT FIELD ON PDMS SAMPLE. João Ribeiro, Hernani Lopes, Pedro Martins, Mário Vaz	---	Ref: 5729 HORIZONTAL LOAD-PATH EFFECTS IN RC COLUMNS UNDER BIAXIAL BENDING. Hugo Rodrigues, André Furtado, António Arêde, Humberto Varum	Ref: 5476 EXPERIMENTAL INVESTIGATION OF THE CONTACT STRENGTH OF POLYIMIDE AND GRAPHITE UNDER DIFFERENT TEMPERATURES. Hetong Liu, Qinwei Ma, Shaopeng Ma	Ref: 5396 DIFFERENTIAL QUADRATURE TIME FINITE ELEMENT METHOD FOR STRUCTURAL DYNAMICS. Yufeng Xing, Mingbo Qin, Jing Guo	Ref: 5672 EDUCATION FOR ENGINEERING STANDARDS | PRODUCT DEVELOPMENT AND QUALITY CONTROL: CASE STUDY. Cláudia Fernandes, Luís Rocha
Ref: 5754 REINFORCEMENT AT THE NANOSCALE OF CEMENTITOUS MATERIALS MADE FROM WHITE CEMENT WITH MULTIWALL CARBON NANOTUBES. Nikolaos D. Alexopoulos, Spyridoula Boutsioukou, Foteini Giannakopoulou, Zoi Metaxa, Stavros K. Kourkoulis	Ref: 5777 EXPERIMENTAL RESEARCH ON HOLE-EDGE STRESS CONCENTRATION OF LONG GLASS FIBER REINFORCED POLYPROPYLENE COMPOSITE. Xujing Yang, Shuyong Duan	---	Ref: 5730 MONOTONIC AND CYCLIC CHARACTERIZATION OF THE OUT-OF-PLANE BEHAVIOUR OF INFILL MASONRY WALLS. André Furtado, Hugo Rodrigues, António Arêde	Ref: 5356 MEASUREMENT OF TRACTION SLIP BASED ON IMAGE MORPHOLOGY ALGORITHM. Xi Shi Zhiliang He, Zhiliang He	Ref: 5400 TOPOLOGY OPTIMIZATION OF CONTINUUM STRUCTURES WITH UNCERTAINTY IN LOADING DIRECTION. Jie Liu, Guilin Wen, Xiaoyue Chen, Qixiang Qing	Ref: 5688 HOW TO ANALYSE AND JUDGE SHAFTS FOR SEALING APPLICATIONS. Frank Bauer, Werner Haas
Ref: 5761 FRICTION AND WEAR PROPERTIES OF CU-AL2O3-GR COMPOSITES PREPARED BY REACTION MILLING. Tao Yan, Gui-min Liu, Bin Li, Zhong-xu Yang	---	---		Ref: 5450 TAILORED WRINKLE PATTERNS ACHIEVED BY A MICROSTRUCTURED MEMBRANE. Dong Yan, Kai Zhang, Gengkai Hu	---	---

12:30-14:00 **LUNCH** **VIP Restaurant**

14:00-15:45 **PAPERS SESSION - 2** **All Rooms**

2A *(Monchique-1)* Topic-A *Chair* *Luisa Sousa*	**2B** *(Monchique-2)* Topic-B *Chair* *C. Pappalettere*	**2C** *(Urzelina-1)* Topic-C *Chair* *N. Umehara*	**2D** *(Urzelina-1)* Topic-D *Chair* *Mª João Barros*	**2E** *(Auditorium)* Symp-17 *Chair* *Yu Su*	**2F** *(Serreta-1)* Symp-25 *Chair* *Xu Han*	**2G** *(Serreta-2)* Symp-27 *Chair* *Albano Cavaleiro*
Ref: 5354 ANALYTICAL BUCKLING LOADS OF CONCRETE-FILLED STEEL TUBULAR COLUMNS WITH INTERLAYER SLIP. Simon Schnabl, Igor Planinc	Ref: 5382 EXPERIMENTAL ANALYSIS OF THE ORIGINS OF THE ANISOTROPY IN CYCLIC BEHAVIOR OF THE 2017 AA ALUMINUM ALLOY. Abdelghani May	Ref: 5362 SELECTION OF MATERIALS FOR IMPLANTS OF THE HUMAN HIP-JOINT AND TECHNOLOGY OF THEIR MACHINING WITH HIGH PRECISION AND QUALITY OF SPHERICAL SURFACES. Raul Turmanidze, Tamara Aptsiauri	Ref: 5347 BIM ENVIRONMENT IN THE MAINTENANCE OF BUILDINGS. A. Zita Sampaio, Diogo Simões	Ref: 5346 LARGE CONTROLLABILITY OF DOMAIN EVOLUTION IN FERROELECTRIC NANODOT VIA ISOTROPIC SURFACE CHARGE SCREENING. Weiming Xiong, Chenming Wu, Weijin Chen, Yue Zheng	Ref: 5402 SIZE EFFECT ANALYSIS OF COMPRESSIVE STRENGTH FOR RECYCLED CONCRETE USING THE BFEM ON MICROMECHANICS. Yijiang Peng, Jiwei Pu	Ref: 5423 SELF-ORGANIZED NANOCOMPOSITE WEAR RESISTANT TIALN COATING WITH SUPERIOR PROPERTIES. Juraj Todt, , Reinhard Pitonak, Arno Köpf, Ronald Weißenbacher, Jozef Keckes
Ref: 5391 MATHEMATICAL MODEL FOR EDDY CURRENT TESTING OF SURFACE FLAWS IN A TWO-LAYER METAL PLATE. Valentina Koliskina, Andrei Kolyshkin	Ref: 5404 INFLUENCE OF A WELDING DEFECT ON A HSLA S500MC STEEL PLATE: MICROSTRUCTURE AND RESIDUAL STRESS EVALUATION. Intissar Frih, Pierre-Antoine Adragna, Guillaume Montay	Ref: 5390 OPTIMISATION OF INTERFACE ROUGHNESS AND COATING THICKNESS TO MAXIMISE COATING-SUBSTRATE ADHESION. Mian H. Nazir, Zulfiqar Khan, Keith Stokes	Ref: 5348 BIM IN STRUCTURAL ANALYSES OF BUILDINGS. A. Zita Sampaio, Vitalino Azevedo	Ref: 5478 SIMULATION OF TENSILE FRACTURE OF GRAPHITE MATERIAL BASED ON THE DAMAGE EVOLUTION MEASURED BY DIGITAL IMAGE CORRELATION. Erqiang Zhao, Xiang Wang, Hongtao Wang, Shaopeng Ma	Ref: 5405 EXPERIMENTAL STUDIES AND OPTIMIZATION DESIGN OF CORRUGATED SANDWICH PANELS. Shujuan Hou, Xu Han, Qing Li	Ref: 5512 INSPECTION OF THE WEAR OF AN IMPELLER OF A CENTRIFUGAL PUMP COATED BY HARD METAL FOR PUMPING OF VINASSE UNDER CAVITATION. A.R. Augusto, J.T.N. Medeiros

Ref: 5411 EVALUATION OF THE NSIFs ON THE BASIS OF THE AVERAGED STRAIN ENERGY DENSITY UNDER MIXED MODE. Alberto Campagnolo, Filoppo Berto	Ref: 5433 A COMBINED STRUCTURAL HEALTH MONITORING AND WEIGH-IN-MOTION SYSTEM FOR RAILWAY BRIDGES. Peter Favai, Eugene Obrien, Ales Znidaric, Hans Van Loo, Przemyslaw Kolakowski, Mairead Ni Choine, Robert Corbally	Ref: 5398 FATIGUE IMPROVEMENT OF WELDED ELEMENTS BY ULTRASONIC IMPACT TREATMENT (UIT). Yuri Kudryavtsev	Ref: 5593 EXPERIMENTAL AND NUMERICAL ANALYSIS OF POST INSTALLED ADHESIVE ANCHORS. Masoud Babaei, Mojtaba Hosseini, Bijan Bastaee	Ref: 5331 NONLINEAR DYNAMIC CONTACT USING VARIATIONAL INEQUALITIES:THEORY AND APPLICATIONS. Shaker A. Meguid	Ref: 5416 DYNAMIC WETTING ON LYOPHILIC PILLAR-ARRAYED SURFACES. Quanzi Yuan	Ref: 5554 BIOTRIBOLOGICAL BEHAVIOR OF AG-ZRCXN1-X COATINGS AGAINST UHMWPE FOR JOINT PROSTHESES DEVICES. V.S. Calderon, J.C. Sanchez-Lopez, Albano Cavaleiro, Sandra Carvalho
Ref: 5456 QUASI-STATIC AND DYNAMIC SIMULATION OF SHEET METAL FORMING PROCESSES USING LINEAR AND QUADRATIC SOLID SHELL ELEMENTS. Peng Wang, Hocine Chalal, Farid Abed-Meraim	Ref: 5448 THE T2 MULTIVARIATE STATISTICAL CONTROL CHARTS CAPACITY WHEN APPLIED ON EQUIPMENTS CONTROL. Suzana Lampreia, Rui Parreira, Vitor Lobo	Ref: 5455 MODIFICATION OF METALLIC SURFACES BY DUPLEX TREATMENTS INVOLVING SEVERE PLASTIC DEFORMATION. Thierry Grosdidier, Youssef Samyh, Marc Novelli	Ref: 5611 STRESS/DISPLACEMENT ANALYSIS OF EBF WITH DOUBLE SHEAR PANEL WITH LOW YIELD STRENGTH STEEL. Sadegh Bakhtiari Morteza	Ref: 5332 ANALYSIS OF FREQUENCY-DEPENDENT BEHAVIORS IN FERROELECTRIC MATERIALS. Ning Liu, Yu Su	Ref: 5509 DEPENDENCE OF FRICTION FRONT PROPAGATION ON THE LOCAL STRESS STATE. Xiaoming Liu, Dandan Xu, Zhanli Liu, Zhuo Zhuang, Yueguang Wei	Ref: 5595 NI-TI-CU SHAPE MEMORY ALLOY INTERLAYERS SUPPORTING LOW-FRICTION W-S-C COATINGS. Mauro Callisti, Tomas Polcar
Ref: 5460 NUMERICAL PREDICTIONS OF DUCTILE FRACTURE LIMITS IN DEEP DRAWING PORCESSES. Hocine Chalal, Farid Abed-Meraim	Ref: 5461 SIMULATION AND EXPERIMENTS OF INSTRUMENTED MICRO-INDENTATION FOR THE DESIGN OF A NEW HIGH TEMPERATURE MICRO-INDENTER. Xiongjie Liu, Mohamed Rachik, Jerome Favergeon	Ref: 5489 ADHERENCE KINETICS OF A VISCOELASTIC GRIPPER STAMP WITH INHERENT SURFACE TACKINESS: A PRE-STUDY TO AN INDUSTRIAL APPLICATION. Umut Cakmak, Michael Fischlschweiger, Ingrid Graz, Zolton Major	Ref: 5617 ANALYSIS OF THE SUSCEPTIBILITY OF INFILLING MASONRY WALLS TO CRACK DUE TO VERTICAL DEFORMATION OF CONCRETE STRUCTURES. Rui Sousa, Hipólito Sousa	Ref: 5335 PREDICTION OF LARGE-AMPLITUDE NONLINEAR DYNAMIC RESPONSE OF THERMALLY BUCKLED COMPOSITE PLATES IN COMBINED ENVIRONMENTS. Liu Liu, Bing-Yang Lv, Qiong Guo, Ti-Ren He	Ref: 5520 ANALOGY TECHNIQUE OF MODE SHAPE PARTIAL SLOPE FOR LAUNCH VEHICLE. ZhongWen Pan, YongZhenh Lian	Ref: 5605 THE EFFECT OF CHROMIUM CONTENT ON CUTTING PERFORMANCE AND OXIDATION RESISTANCE OF TiAlCrN COATINGS. Martin Danek, Tomas Polcar
---	Ref: 5475 PULSED EDDY CURRENT AND TIME-FREQUENCY ANALYSIS IN DETECTING THE CORROSION DISTRIBUTION IN A MULTILAYER ALUMINUM PLATE. Aouni Lakis, Mohammad Hosseini, Mohammad Toorani, S. Sassi	---	---	Ref: 5336 THE MICROBUCKLING FAILURE OF DYNEEMA COMPOSITE BEAM. Guangyan Liu, Wei Zhu	---	---
---	Ref: 5485 APPLICATION OF ALTERNATIVE METHODS AT EARTHWORKS QUALITY CONTROL. Dominika Durekova, Katarina Zgutova, Martin Pitonak	---	---	---	---	---

15:45-16:15 **COFFEE-BREAK** **Lobby**

16:15-18:00 **PAPERS SESSION - 3** **All Rooms**

3A *(Monchique-1)* Topic-A *Chair* *Jurij Avsec*	**3B** *(Monchique-2)* Topic-B *Chair* *Mohammad Toorani*	**3C** *(Urzelina-1)* Topic-C *Chair* *Yuri Kudryavtsev*	**3D** *(Urzelina-2)* Topic-D *Chair* *Hipólito Sousa*	**3E** *(Auditorium)* Symp-17 *Chair* *Yu Su*	**3F** *(Serreta-1)* Symp-25 *Chair* *Yufeng Xing*	**3G** *(Serreta-2)* Symp-27 *Chair* *Tomas Polcar*
Ref: 5543 ANALYSIS OF PIPELINE VIBRATION FOR PRESSURE DRIVEN | ELECTROMAGNETIC AND COMBINED FLUID FLOW IN MACRO | MINI AND MICRO REGIME. Jurij Avsec, Urban Avsec	Ref: 5506 STUDY ON ANTI-SLIP CRITERION OF PRE-TIGHTENED STRUCTURE WITH VISCOELASTIC MATERIAL IN VIBRATION ENVIRONMENT. Jinpeng Wen, Fangmei Wang, Jiang Xue	Ref: 5494 EXPERIMENTAL CHARACTERIZATION AND NUMERICAL MODELLING OF DIRECT BONDING INTERFACE. Marina Voisin, Natacha Cocheteau, Aurélien Maurel-Pantel, Frédéric Lebon, Sonia Ait Zaid, Yves Salaun	Ref: 5676 INNOVATIVE SYSTEMS FOR EARTHQUAKE RESISTANT MASONRY ENCLOSURES IN RC BUILDINGS - INSYSME PRELIMINARY WORK AT UNIVERSITY OF MINHO. Luís M. Silva, Graça Vasconcelos, Paulo B. Lourenço	Ref: 5337 POLYNOMIAL STRESS FUNCTIONS FOR GENERAL 2D PROBLEMS. Yingtao Zhao, Tianbing Zhao, Huiming Yin	Ref: 5556 PARAMETRIC AND TOPOLOGICAL OPTIMIZATION OF DIFFERENT DESIGNS OF FLAT ENDS IN PRESSURE VESSELS. Bogdan Szybinski	Ref: 5699 BIOTRIBOLOGICAL BEHAVIOUR OF A-C:AG NANOCOMPOSITE COATINGS. Noora K. Mannien, Sandra Carvalho, Albano Cavaleiro

Ref: 5596 NEW CONCEPTS FOR THE DESIGN OF FUTURE FRACTURE RESISTANT AND DAMAGE TOLERANT COMPOSITES. Otmar Kolednik, Masoud Sistaninia, Josef Predan, Dieter Fischer	Ref: 5535 ACOUSTIC EMISSIONS IN TITANIUM GRADE 5 DURING UNIAXIAL FATIGUE TESTING. Claudia Barile, Caterina Casavola, Giovanni Pappalettera, Carmine Pappalettere	Ref: 5510 A TRIBOLOGICAL ASSESSMENT OF PEEK SURFACE MODIFIED BY FEMTOSECOND LASER TREATMENT. Sabrina Hammouti, Alina Pascale-Hamri, Cyril Mauclair, Stéphane Benayoun, Stéphane Valette	Ref: 5689 PUSHOVER ANALYSIS APPLICATION FOR DAMAGE ASSESSEMENT IN CRITICAL SECTION OF RIENFORCED CONCRETE FRAME. Aghilès Nekmouche, Mohand Hamizi, Said Boukais, Naceur Eddine Hannachi	Ref: 5394 MECHANICAL BEHAVIOUR OF TAPE SPRINGS USED IN THE DEPLOYMENT OF REFLECTORS AROUND A SOLAR PANEL. Florence Dewalque, Jean-Paul Collette, Olivier Brüls	Ref: 5600 NON-STOCHASTIC PROCESS MODEL FOR TIME-VARYING UNCERTAINTY ANALYSIS AND CORRESPONDING NON-RANDOM VIBRATION THEORY. Chao Jiang, Bingyu Ni	Ref: 5702 SELF-ADAPTIVE THIN FILMS FOR MECHANICAL ENGINEERING. Tomas Polcar, Albano Cavaleiro
Ref: 5639 A ROTARY DRAW BENDING OF RECTAGULAR TUBES: EXPERIMENTS AND NUMERICAL ANALYSES. Simone Ancellotti, Matteo Benedetti, Virgilio Fontanari, Marco Tassan, Stefano Slaghenaufi	Ref: 5552 INFLUENCE OF THE GROWING ANGLE ON THE FATIGUE STRENGTH OF EOS MARAGING STEEL PRODUCED BY ADDITIVE METAL MACHINE. Dario Croccolo, Massimiliano De Agostinis, Stefano Fini, Giorgio Olmi, Snezana Kostic, Aleksandar Vranic	Ref: 5531 IMPROVEMENT OF MECHANICAL AND SURFACE PROPERTIES OF METALLIC ALLOYS BY LASER SHOCK PROCESSING. José Ocana, Juan Porro, Carlos Correa, Marcos Diaz, Leonardo Lara, David Peral	Ref: 5741 A SIMULATOR FOR OPTIMIZING ROLLER-COMPACTED CONCRETE MIX DESIGNS. Silvia R. Garcia, Carlos Padilla, Luis De la Rosa	Ref: 5406 MODELLING THE YIELD STRENGTH AND DUCTILITY IN COMPOSITE NANOTWINNED COPPER. Linli Zhu, Xiang Guo	Ref: 5662 REFACTORIZATION OF PRINCIPAL SUBMATRICES AND ITS APPLICATION TO TOPOLOGICAL OPTIMIZATION. Ren Yang, Qi Song, Mingsen Su, Hao Zhou, Pu Chen	Ref: 5713 LUBRICIOUS TiSi(V)N FILMS FOR HIGH TEMPERATURE APPLICATIONS WITH CONTROLLED RELEASE OF THE LUBRICIOUS AGENT DEPOSITED BY DEEP OSCILLATION MAGNETRON SPUTTERING (DOMS) MODE. Filipe Fernandes, João C. Oliveira, Tomas Polcar, Albano Cavaleiro
---	Ref: 5566 LIMITS OF ULTRASONIC WAVES PROPAGATION IN CONCRETE: APPLICATION OF WATERMAN & TRUELL MODEL. Abdelaziz Boudchicha, M.S. Othmani Marabout, Jean-Louis Gallias, Norbert Renault	Ref: 5626 EFFECT OF ALTERNATING ELECTRIC FIELD INTENSITY ON ADHESION OF THERMOPLASTIC RESIN. Motoyuki Murashima, Noritsugu Umehara, Hiroyuki Kousaka	Ref: 5753 RESEARCH OF MESO DAMAGE AND FRACTURE OF CONCRETE PAVEMENT BASED ON EXTENDED FINITE ELEMENT METHOD. Chengcheng Chen, Junqing Liu	Ref: 5421 MECHANICAL RESPONSE OF NANOSCALE MATERIALS INDUCED BY ELASTIC INSTABILITY. Duc Tam Ho, Sung Youb Kim	Ref: 5673 SHAPE DESIGN SENSITIVITY ANALYSIS OF DYNAMIC CRACK PROPAGATION USING PERIDYNAMICS. Jae-Hyun Kim, Song-Hyun Cha, Hyun-Seok Kim, Seonho Cho	Ref: 5763 NOVEL MATERIALS IN FLUID FILM BEARING DESIGN. Sergei Glavatskih
---	Ref: 5568 DAMAGE DETECTION OF A BRIDGE. Milan Sokol, Michal Venglar, Aroch Rudolf, Michal Fabry	---	---	Ref: 5452 PEAK LOAD ESTIMATION OF PRE-CRACKED PLAIN CONCRETE BEAMS IN MIXED-MODE FRACTURE. Xiang Guo, Ray K.L. Su, Ben Young	---	---
---	Ref: 5678 CARACTERIZATION OF TENSILE AND FRACTURE TOUGHNESS OF A P11 EX-SERVICE STEEL BY SMALL PUNCH TEST. Nuno M.A. Ribeiro, António Correia da Cruz, Afonso Sousa Leite, Manuel A.R. Gomes	---	---	---	---	---
---	Ref: 5756 TEST AND ANALYSIS OF A SHORT-SPAN RAILWAY BRIDGE. Tomasz Kaminski, Jan Bien	---	---	---	---	---

14:00-19:00 **POSTERS SESSION - 1** **Lobby**

TOPICS: A, C, D, J ; SYMPOSIA: 2, 10, 17, 25, 27

Topic: A

Ref: 5371
EXPERIMENTAL INVESTIGATION AND NUMERICAL SIMULATION OF THE EXTRUSION DRILLING AND TAPPING PROCESSES. Sigitas Kilikevicius, Ramunas Cesnavicius, Povilas Krasauskas

Ref: 5481
SIMULATION OF SURFACE CORROSION DAMAGE OF AERONAUTICAL ALUMINUM ALLOY 2024 WITH ARTIFICIAL SURFACE DEFECTS. Paraskevas Papanikos, Nikolaos Alexopoulos, Constantinos Stergiou, Vasilis Sagias

Ref: 5482
STRESS INTENSITY FACTORS FOR AN ANISOTROPIC ELASTIC CYLINDER WITH A CRACK. Takeshi Tane, Takeshi Uchida, Toru Sasaki, Hiriki Hamano

Ref: 5483
SIMILAR ANALYSIS FOR PIEZOELECTRIC MATERIAL AND ANISOTROPIC MATERIAL WITH AN ELLIPTICAL CAVITY AND ITS APPLICATION. EVALUATION OF ELECTRICAL FIELDS BASED ON SIMILARITY. Toru Sasaki, Takeshi Tane, Toshimi Kondo

Ref: 5545
STRESS CONCENTRATION AT SHARP AND ROUNDED V-NOTCHES IN ORTHOTROPIC PLATES. Mykhaylo Savruk, Andrzed Kazberuk, Marta Kosior-Kazberuk

Ref: 5692
NUMERICAL STUDY OF STEEL PLATE REINFORCED CONCRETE WALLS BEHAVIOR. Ali Kezmane, Luca Placidi, Mohand Hamizi, Said Boukais, Naceur Hannachi

Ref: 5725
ISOGEOMETRIC ANALYSIS OF STRESS INTENSITY FACTORS FOR CURVED CRACK PROBLEMS. Minho Yoon, Myung-Jin Choi, Seonho Cho

Topics: C & D
Ref: 5612
A STUDY ON CRACKING IN RBS JOINTS IN MOMENT RESISTING FRAMES. Sadegh Bakhtiari Somayeh, Sadegh Bakhtiari Morteza
Ref: 5726
FULL-SCALE TESTS OF TEMPORARY STEEL (FOOT) BRIDGES. Marcela Karmazinova, Jindrich J. Melcher, Milan Pilgr, Michal Strba
Ref: 5765
IN-PLANE AND OUT-OF PLANE EXPERIMENTAL CHARACTERIZATION OF RC MASONRY INFILLED FRAMES. Farhad Akhoundi, Graça Vasconcelos, Paulo B. Lourenço, Carlos Palha, Luis Silva

Topic: J
Ref: 5380
MECHANICAL PROPERTIES OF HMX AND RDX CRYSTALS DETERMINED BY NANOINDENTATION TEST. Xin-Jie Wang, Yan-Qing Wu, Feng-Lei Huang
Ref: 5550
DIMENSIONAL INTERVAL AND CRITICAL SIZES OF NON-LEGAND NANO- AND MICRO- PARTICLES. A.N. Kharkhardin, V.V. Strokova, N.I. Kozhukhova
Ref: 5564
DETERMINATION OF BASIC CHARACTERISTICS OF PROTECTIVE LAYERS BASED ON POLYMERIC NANOFIBERS. Pedra Ticha, Alexey Sveshnikov, Pavel Demo, Michal Havrlik, Martin Cernohorsky
Ref: 5724
SHAPE DESIGN SENSITIVITY ANALYSIS OF MOLECULAR DYNAMICS FOR NANOSCALE LATTICE STRUCTURES. Hong-Lae Jang, Song-Hyun Cha, Youmie Park, Seonho Cho
Ref: 5727
NANOSCALE SELECTIVE NOISE REMOVAL AND EXTRACTION OF INTRINSIC GEOMETRY FROM AFM EXPERIMENTAL DATA. Hong-Lae Jang, Hyun-Seok Kim, Youmie Park, Seonho Cho
Ref: 5762
THE EFFECT OF LA ON PROPERTIES OF AL2O3/CU COMPOSITES. Gui-min Liu, Tao Yan, Zhong-xu Yang, Bin Li

Symp: 2
Ref: 5409
PRECISION INSPECTION OF FLATNESS BY MOIRÉ INTERFEROMETRY. Meguellati Said
Ref: 5582
CRAFT SHOES DEVELOPMENT: POETICS OF CREATION TO MAKING PROCESSES. Castori Souza

Symp: 10
Ref: 5505
AN OVERVIEW THROUGH PORTUGUESE SEISMIC DESIGN REGULATION AND THE NEW EUROCODES. Maria João Silva
Ref: 5588
COST-BENEFIT ANALYSIS FOR SEISMIC REABILITATION OF BUILDINGS. Filipa Salvado, Maria João Silva
Ref: 5677
SEISMIC REINFORCEMENT OF CONCRETE BUILDINGS. M. Tavares da Silva, Maria João Silva
Ref: 5750
APPLICATION OF LIGTH STEEL FRAMING IN SEISMIC REHABILITATION. Raquel Fernandes, Maria João Silva
Ref: 5774
SEISMIC BEHAVIOUR OF PORTUGUESE RAMMED EARTH BUILDINGS. Ricardo Barros, Humberto Varum, Hugo Rodrigues, Mariana Correia, Graça Vasconcelos, Paulo Lourenço

Symp: 17
Ref: 5392
ABNORMAL FRACTURE IN TITANIUM ALLOY TA6V. Thomas Paris, Aymeric Migliarini
Ref: 5463
FRACTURE TOUGHNESS OF HDPE EVALUATED BY FATIGUE AND NOTCH PRECRACKING. Luis Iglésias, Thais Sequeira, Marysilvia Costa, Celio Costa
Ref: 5503
THEORETICAL AND EXPERIMENTAL STUDY OF PIEZOELECTRIC CANTILEVER BIMORPH DYNAMIC CHARACTERISTICS BY ELECTROMECHANICAL EQUIVALENT REPLACEMENT. Hongzhuang Zhang, Shijun Luo, Jiangtian Shi

Symp: 25 & 27
Ref: 5703
ARTIFICIAL NEURAL NETWORK: A MODULAR APPROACH. Catarina F. Castro
Ref: 5723
ADJOINT DESIGN SENSITIVITY ANALYSIS OF DYNAMIC CRACK PROPAGATION USING PERIDYNAMIC THEORY. Jae-Hyun Kim, Song-Hyun Cha, Seonho Cho
Ref: 5587
TRIBOLOGICAL PERFORMANCE OF MODIFIED W-S COATINGS IN RUBBER MOULDING APPLICATIONS. Anatoliy Manaia, Geet Raju, Albano Cavaleiro, Tomas Polcar

19:30-22:00	**WELCOME DINNER**	**VIP Restaurant**

TUESDAY, 28 JULY 2015

08:00-12:00 **POSTERS SESSION -2** **Lobby**

TOPICS: F, I ; SYMPOSIA: 5, 26

Topic: F
Ref: 5353
EFFECT OF SURFACTANT ON SURFACE MODIFICATION OF CaCO3 NANOPARTICLES FOR LUBRICANT APPLICATION. EunMin Song, DoWon Kim, JongChoo Lim
Ref: 5425
POSSIBILITY OF REDUCING THE EFFECTIVE EQUIVALENT MISALIGNMENT IN HELICAL GEARS BY A DISC-TYPE LARGE WHEEL CENTRE. Maciej Krasinski
Ref: 5437
DEVELOPMENT OF A SYSTEM OF FIXING FOR RECTIFYING THE INTERNAL DIAMETER OF GEARS. Marlon Intriago, Alessandra Montenegro
Ref: 5449
PREPARATION OF ENVIRONMENTAL FRIENDLY BENZENE-FREE METAL SULFONATE SURFACTANT FOR LUBRICANT ADDITIVE FORMULATION. EunMin Song, DoWon Kim, ByungJo Kim, JongChoo Lim
Ref: 5562
PROCESS FOR TREATMENT SURFACE BY USING GRANULAR VIBRO-IMPACT. Khaled Hamouda, A.P. Babichevb
Ref: 5577
FRICTION AND WEAR CHARACTERISTICS OF MAGNETORHEOLOGICAL ELASTOMER UNDER VIBRATING CONDITION. Chenglong Lian, Kwang-Hee Lee, Chul Hee, Eun Sang

Topic: I
Ref: 5422
INVESTIGATION OF LOCALLY RESONANT ABSORPTION OF PHONONIC GLASS. Meng Chen, Meng Dan, Yuren Wang, Heng Jiang, Yafei Feng
Ref: 5435
SPECIAL CLASS OF QUASI-ISOTROPIC LAMINATES FOR AEROSPACE APPLICATIONS. Biranchi N. Panda, M. Raju Bahubalendruni, Bhusan Biswal
Ref: 5493
SHEAR THICKENING FLUIDS IMPREGNATED SPACER FABRICS FOR ENERGY ABSORBING SYSTEMS. Lukasz Wierzbicki, Marcin Leonowicz, Malysa Maria
Ref: 5508
WALL-SLIP AS A PHENOMENON ATTENDING PROCESSING OF HIGHLY POWDER PARTICLE FILLED POLYMER MELTS. Daniel Sanetrnik, Berenika Hausnerová, Eva Hnatkova
Ref: 5518
VISCOELASTIC ANALYSIS OF THE PRE-STRESSED DOUBLE-RINGS UNDER THE STATE OF CONSTANT TEMPERATURE DISPERSION. Min Yang, Shenglai Chen
Ref: 5547
MECHANICAL PROPERTIES OF ALLOYS | SIO2 AND AUTOMATED SYSTEM OF ANISOTROPY VISUALIZATION. Anatoliy Onanko, Georgiy Prodayvoda, Yriy Onanko, Aleksandr Shabatura, Galina Onanko, Artue Onischenko
Ref: 5573
ANALYSIS OF LONG-TERM INFLUENCE OF CHLORIDE AGGRESSIVE ENVIRONMENT ON THE UHPC. Radka Pernicova, Daniel Dobias
Ref: 5634
NOVEL COMPOSITE ALLOY FOR COMBUSTION ENGINE PISTONS. Jozef Zurek, Zenon Slawinski, Antoni Jankowski
Ref: 5637
RHEOLOGY-SIMULATION OF SHORT FIBRE REINFORCED CONCRETE CASTING. Heiko Herrmann, Aarne Lees, Michael Krause, Marcel Padilla, Emiliano Pastorelli
Ref: 5659
MICROSTRUCTURE EVOLUTION AND MECHANICAL PROPERTIES OF COLD DRAWN HYPEREUTECTOID STEEL WIRE. Zifei Ni, Lili Yao, Huafang Ni
Ref: 5697
COMPARATIVE STUDY BETWEEN GEOPOLYMERS ENABLED WITH SODIUM AND POTASSIUM HYDROXIDES. Rozineide Boca Santa, Humberto Gracher Riela, Nivaldo Cabral Kuhnen
Ref: 5708
STUDY OF THE INCORPORATION OF MINERAL ADDITIVES AND CARBON FIBER ON THE DURABILITY AND PERFORMANCE OF A MORTAR FOR REHABILITATION WORKS. Djihen Benchiheub, Chahinez Amouri, Hacene Houari
Ref: 5737
OPTIMIZATION OF COMPOSITES FEEDSTOCKS WITH MWCNT NANOREINFORCENT. T.J. Ferreira, M.T. Vieira

Symp: 5 & 26
Ref: 5561
STUDY OF TRIBOLOGICAL BEHAVIOUR OF PEEK REINFORCED WITH DIFFERENT TYPES OF FIBRES. Enrique Casarejos, Miguel Castro, António Collazo, Maria Perez, Abraham Segade, José Vilan

09:30-10:15 **KEYNOTES SESSION - 2** **Serreta & Auditorium**

A	B
(Room: Serreta)	*(Room: Auditorium)*
Chair: Prof. Sergei Mileiko (RAS, Russia)	*Chair: Prof. S.A. Meguid (U. Toronto, Canada)*
Professor Peter Hess (University of Heidelberg, Germany)	Professor Ng Teng Yong (NTU, Singapore)
ON THE USE OF GUIDED WAVES IN NONDESTRUCTIVE DIAGNOSTICS AND FAILURE ANALYSIS	**EXTREME INSULATORS FOR EXTREME ENVIRONMENTS: UNDERSTANDING THE PROPERTIES OFULTRALIGHT AEROGELS AND 2D MATERIALS**

10:15-10:45 **COFFEE-BREAK** **Lobby**

10:45-12:30 **PAPERS SESSION - 4** **All Rooms**

4A *(Monchique-1)* Symp-28 *Chair Jorge Belinha*	**4B** *(Monchique-2)* Topic-I *Chair D. Croccolo*	**4C** *(Urzelina-1)* Symp-5 *Chair Jorge Lino*	**4D** *(Urzelina-2)* Symp-11 *Chair J. Reis Campos*	**4E** *(Auditorium)* Symp-17 *Chair Yu Su*	**4F** *(Serreta-1)* Topic-F *Chair Klaus Kunze*	**4G** *(Serreta-2)* Symp-26 *Chair Mª José Abreu*
Ref: 5349 AN ISOGEOMETRIC 2D PLATE FORMULATION BASED ON LAGRANGIAN AND B-SPLINE INTERPOLATION FUNCTIONS FOR GEOMETRIC LINEAR AND NONLINEAR ANALYSES. Vinzenz Sattinger, Daniel Supanz	Ref: 5377 COMPOSITION AND STRUCTURE OF BIMODAL WC-Co MATERIALS RELATED TO MECHANICAL PROPERTIES AND ABRASIVE WEAR. Der-Liang Yung, Maksim Antonov, Irina Hussainova, Renno Veinthal, Sture Hogmark	Ref: 5355 ADDITIVE MANUFACTURING IN THE DEVELOPMENT OF AN INTRAMEDULLARY NAIL: STUDY OF CLINICAL CASE. Maria G. Fernandes, Fernando Alves, Elza Fonseca	Ref: 5716 THE APPLICATION OF GRAPHENE IN REMOVABLE PROSTHESIS. Patrícia Leite, Patrícia Fonseca, J.C. Reis Campos, Maria Helena Figueiral	Ref: 5463 FRACTURE TOUGHNESS OF HDPE EVALUATED BY FATIGUE AND NOTCH PRECRACKING. Luis Iglésias, Thais Sequeira, Marysilvia Costa, Celio Costa	Ref: 5395 A STUDY ON TRIBOLOGICAL BEHAVIOUR OF a-C:H COATINGS UNDER LUBRICATED CONDITIONS UP TO 250 °C. Rolf Waesche, Manfred Hartelt, Roman Ehrke	Ref: 5429 USING ULTRASONIC IR THERMOGRAPHY FOR DETECTING DEFECTS IN MILITARY-ORIENTED POLYARAMIDE MATERIALS. Waldemar Swiderski, Daria Derusova, Monika Pracht, Vladimir Vavilov
Ref: 5358 A QUASI USER-INDEPENDENT MESHLESS METHOD FOR THE ANALYSIS OF PLATES. Carla Roque, Pedro Martins	Ref: 5383 MICROPARTICLES OF CORK AS REINFORCEMENT MATERIAL IN BRITTLE STRUCTURAL ADHESIVES. Ana Barbosa, Lucas Silva, Andreas Oechsner, Joana Abenojar, Juan Carlos del Real	Ref: 5445 SALMON CHALLENGE METHOD (SCM): MECHANICAL CREATIVITY IN NEW PRODUCT DEVELOPMENT. Iko Avital, Gedalya Mazor	Ref: 5722 BIOMECHANICAL ANALYSIS OF FULL-ARCH IMPLANT-SUPPORTED REHABILITATIONS WITH DIFFERENT DESIGNS. Maria Inês Barahona, J.C. Reis Campos, Nuno V. Ramos, Mário Vaz, Maria Helena Figueiral, André Correia	Ref: 5473 NONLINEAR DYNAMIC CHARACTERISTICS AND OPTIMAL CONTROL OF SHAPE MEMORY POLYMER WINGS SUBJECTED TO STOCHASTIC EXCITATION. Jia Xu, Yingxiao Kong, Zhiwen Zhu	Ref: 5434 TRIBOLOGICAL BEHAVIOUR OF DUCTILE CAST IRON-STEEL PAIR FOR WORM GEARING. Vigilio Fontanari, Matteo Benedetti, Christian Girardi, Lorenzo Giordanino	Ref: 5457 EXPERIMENTAL INVESTIGATION ON THE PROPERTIES AND PERFORMANCE OF SELF-COMPACTING CONCRETE WITH VEGETABLE AND SYNTHETIC FIBERS. Ahmed Belkadi, Abdelhamid Guettala, Chahinez Amouri, Hacene Houari
Ref: 5427 THE NONLINEAR ANALYSIS OF PLATES USING THE NATURAL NEIGHBOUR RADIAL POINT INTERPOLATION METHOD. Jorge Belinha, Lucia Dinis, Renato Jorge	Ref: 5439 VOXEL MODELING OF POROUS CERAMICS FOR BENDING DISK STRENGTH TEST. Natalia Dolganina, Oleg Kudryavtsev, Sergei B. Sapozhnikov	Ref: 5567 DEVELOPMENT OF A PROJECT AND MANUFACTURE METHODOLOGY FOR TITANIUM ALLOYS JOINT PROSTHESES. João Leite, Jorge Lino Alves, Rui Neto, Teresa Duarte	Ref: 5731 FATIGUE TEST ON A 3-ELEMENT IMPLANT BRIDGE COMBINING A CONVENTIONAL AND A DYNAMIC ABUTMENT. José Ferreira, Marta Oliveira, Nannan Song, Margarida Machado, André Correia, Ana Reis	Ref: 5487 TEMPERATURE AND TIME DEPENDENT BEHAVIOUR OF Z2CN18.10 STAINLESS STEEL UNDER UNIAXIAL LOADING. Gang Chen	Ref: 5533 ON THE LUBRICATION CAPABILITY OF RAPESEED OIL. Constantin Georgescu, Liviu Solea, George Cristea, Lonena Deleanu	Ref: 5526 THEORY AND SIMULATION OF SHORT FIBRE REINFORCED COMPOSITES. Heiko Herrmann, , Aarne Lees, Emiliano Pastorelli
Ref: 5471 FROM CAD MODELS TO THE EMBEDDED SOLIDS IN THE EXTENDED FINITE ELEMENT METHOD. Frédéric Duboeuf, Eric Bechet	Ref: 5462 POST-CRACKING BEHAVIOUR OF BASALT FIBRE REINFORCED CONCRETE. Marta Kosior-Kazberuk, Julita Krassowska	Ref: 5580 CONSIDERATIONS ABOUT THE INFLUENCE OF THE GEOMETRICAL DEVIATIONS ON THE CLEARANCES OF MECHANICAL ASSEMBLIES. António Mourão	Ref: 5732 SURFACE CHARACTERIZATION OF A NEW CERAMIC DENTAL IMPLANT. Mónica Miranda, Tiago Marques, André Correia, Fábio Lobo, Maria Helena Fernandes, Célia Miranda, Filipe Araújo	Ref: 5504 DYNAMIC CHARACTERISTICS AND CONTROL OF ROTARY PRECISION POSITIONING DEVICE DRIVING BY IMPACT FORCE OF PIEZOELECTRIC BIMORPHS. Hongzhuang Zhang, Shijun Luo, Jiangtian Shi	Ref: 5540 INFLUENCE OF ARAMID FIBERS ON TRIBOLOGICAL BEHAVIOR OF PBT. Mihail Botan, Constantin Georgescu, George Cristea, Lorena Deleanu	Ref: 5565 ANALYSIS OF DOUBLE FACE FINISHED COTTON PROPERTIES FOR BED SHEET APLICATIONS. Filipe Rodrigues , Maria José Abreu, Graça Soares
Ref: 5571 THE NON-LINEAR NUMERICAL ANALYSIS USING MESHLESS METHODS. Jorge Belinha, Lucia Dinis, Renato Jorge	Ref: 5464 MAGNETOMECHANICAL PROPERTIES OF TERFENOL-D BASED COMPOSITES. Mariusz Hasiak, Jerzy Kaleta, Rafal Mech	Ref: 5606 AGILE MANUFACTURING PRACTICES FOR NEW PRODUCT DEVELOPMENT. Vanessa Braz, Marco Leite	Ref: 5734 BIOMECHANICS AND OVERDENTURES. Margarida Sampaio Fernandes, Paula Vaz, Patrícia Fonseca, J.C. Reis Campos, Maria Helena Figueiral	Ref: 5652 TEXTILE REINFORCED MORTAR SYSTEM AS A MEANS FOR CONFINEMENT OF MASONRY STRUCTURES EXPOSED TO ELEVATED TEMPERATURES. Theofanis Krevaikas	Ref: 5620 DEVELOPMENT AND TRIBOLOGICAL CHARACTERISATION OF COMPOSITE TRIBO-PATCHES. Manuela Andrich, Klaus Kunze, Niels Modler, Robert Kupfer, Dieter Lehmann, Hans-Joachim Scheibe, Jayashree Bijwe	Ref: 5636 APPLICATION OF JUTE FIBER ON AUTO VEHICLES INSTRUMENTS PANEL FRAME. Gilmar C. Silva, José R.G. Carneiro, Pedro P. Brito, Luiz O. Ghelli, Fernando Almeida, Raphael F. Batista
---	Ref: 5486 RHEOLOGICAL PROPERTIES OF ASPHALT MIXTURES WITH ADDITIVES. Juraj Sramek, Erika Sramekova, Dominika Durekova	---	Ref: 5738 AESTHETIC DESIGNS IN REMOVABLE PARTIAL DENTURES. Francisco Gois, Margarida Sampaio Fernandes, Patrícia Fonseca, Bruno Henriques, João Sampaio Fernandes	Ref: 5654 DEFORMATION AND FRACTURE OF MMC WITH PHASE TRANSFORMATIONS IN MATRIX. Sergei N. Kulkov	Ref: 5691 ONE APPLICATION OF THE INTERNATIONAL TERMINOLOGICAL STANDARD BDS ISO 10825 FOR THE DAMAGE IDENTIFICA-TION ON THE TEETH OF GEAR TRANSMISSIONS. Valentin Abadjiev, Georgi Dimchev, Emilia Abadjieva, Dimitar Karastoyanov	---

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12:30-14:00 **LUNCH** **VIP Restaurant**

14:00-15:45 **PAPERS SESSION - 5** **All Rooms**

5A *(Monchique-1)* Symp-12 *Chair* *Carlos C. António*	**5B** *(Monchique-2)* Topic-I *Chair* *Elzbieta Pieczyska*	**5C** *(Urzelina-1)* Topic-G *Chair* *António Mourão*	**5D** *(Urzelina-2)* Sym-11 + Top-K *Chair* *J. Reis Campos*	**5E** *(Auditorium)* Symp-6 *Chair* *Marcelo Moura*	**5F** *(Serreta-1)* Symp-21 *Chair* *Ramiro Martins*	**5G** *(Serreta-2)* Symp-9 *Chair* *Helena Navas*
Ref: 5360 OPTIMIZATION OF FGM SANDWICH BEAM USING IMPERIALIST COMPETITIVE ALGORITHM. Saeed Kamarian, Mahmoud Shakeri	Ref: 5522 SYNERGY IN COMPOSITES. Sergei Mileiko *(Invited Paper)*	Ref: 5426 INVESTIGATIONS OF STRUCTURAL STRENGTH AND OPERATING PROPERTIES OF WAVE-RING GASKETS. Andrzej Trojnacki, Bogdan Szybinski	Ref: 5758 PREFORMED COMPOSITE RESIN CROWNS VS STAINLESS STEEL CROWNS IN PRIMARY DENTITION - IN VITRO STUDY. Cátia C. Silva, Artur Miler, Nuno V. Ramos, Mário Vaz, Cristina C. Silva, J.C. Reis Campos	Ref: 5719 NUMERICAL AND EXPERIMENTAL CHARACTERIZATION OF STEEL - WOOD DOWELED JOINTS UNDER QUASI-STATIC LOADING. Nuno Dourado, Marcelo F.S.F. Moura, Abílio Jesus, José Xavier	Ref: 5361 CHEMICALLY COMPATIBILISED PAI-PTFE ANTI-FRICTION COATINGS WITH A HIGH WEAR RESISTANCE. Dieter Lehmann, Michaela Gedan-Smolka, Anne Marschner, Gert Heinrich, Rainer Franke, Ingrid Haase, Klaus Kunze	Ref: 5468 CLEANER PRODUCTION: AN STRATEGY FOR IMPROVEMENT AND RISKS PREVENTION TOWARDS SUSTAINABLE DEVELOPMENT. Gilberto Santos, Manuel Rebelo, Rui Silva
Ref: 5412 OPTIMIZATION OF AIRCRAFT STRUCTURES WITH USE OF BIOMIMETIC STRUCTURAL OPTIMIZATION METHOD. Michal Nowak, Krzysztof Brudlo, Hubert Hausa, Robert Roszak	Ref: 5539 INFLUENCE OF HYDROPHOBIC ADDITIVES ON SUSCEPTIBILITY TO THE FORMATION OF EFFLORESCENCE ON CONCRETE ELEMENTS. Radka Pernicova	Ref: 5432 COMPRESSIVE PROPERTY CHARACTERIZATION OF FDM PRINTED CELLULAR STRUCTURES. Biranchi N. Panda, Marco Leite, André Carvalho, Bhusan Biswal	Ref: 5759 DESIGN AND DEVELOPMENT OF AN INNOVATIVE TEMPOROMANDIBULAR JOINT PROSTHESIS. Michel Mesnard, António Ramos	Ref: 5720 BIOCIDAL PROPERTIES OF NANOTEXTILES DOPED WITH FUNGICIDES AGAINST DRY ROT FUNGUS SERPULA LACRYMANS. Monika Terebesyova, Pavla Ryparova, Petr Kuklik	Ref: 5381 CHEMICALLY MODIFIED POLY(TETRAFLUOROETHYLENE) AS ADDITIVE IN LUBRICANTS FOR CONVEYOR SYSTEMS. Thorsten Hoffmann, Dieter Lehmann, Martin Anders, Thorsten Schmidt, Markus Michael	Ref: 5576 SYSTEMATIC INNOVATION AND LEAN APPROACH APPLIED TO PNEUMATIC TESTS OF AIRCRAFT COMPONENTS. Diogo Campos, Teresa Morgado, Helena Navas
Ref: 5417 DESIGN INTEGRITY AND OPERATIONAL SAFETY OPTIMIZATION TECHNIQUES. Soliman Mahmoud	Ref: 5551 EVALUATION OF CONTAMINATED MORTARS WITH ZINC BY ELETROCHEMICAL IMPEDANCE SPECTROSCOPY. Caroline Venâncio, Janaíde Rocha, Malik Cheriaf	Ref: 5444 MOTORCYCLE APPLICATION OF MULTI-TUBULAR CHASSIS CFRP-CFRP. Miguel Gonzalez, Montserrat Sanchez, Rafael Weyler, Mike Blundell	Ref: 5328 RISK FACTORS POSTURAL OF THE BACKPACK SCHOOL FOR PRIMARY SCHOOL CHILDREN IN MAPUTO-MOZAMBIQUE. Lina Zacaria, Alberto Graziano	Ref: 5497 DETERMINATION OF MODE I FRACTURE TOUGHNESS OF CORTICAL HUMAN BONE USING THE DCB TEST. Marcelo F.S.F. Moura, Filipe G.A. Silva, Nuno Dourado, José Xavier, Fábio A.M. Pereira, José J.L. Morais, Maria I.R. Dias, Paulo J. Lourenço, Fernando M. Judas	Ref: 5586 NOVEL BISMUTH-BASED TRIBOLOGICAL COATINGS FOR HIGH PERFORMANCE INTERNAL COMBUSTION ENGINE BEARING APPLICATIONS. Ignacio Tudela, Yi Zhang, Madan Pal, Andrew Cobley, Ian Kerr	Ref: 5579 LEAN MAINTENANCE MANAGEMENT ACTIVITIES IN AN OIL TERMINAL: CASE STUDY. Tiago Palmeira, Marco Maia, Teresa Morgado, Helena Navas
Ref: 5446 IDENTIFICATION OF MATERIAL AND SHAPE BASED ON EIGENVALUES AND TRACES OF EIGENMODES. Cristian Barbarosie, Anca-Maria Toader	Ref: 5555 MORPHING COMPOSITE STRUCTURES FOR ADAPTIVE HIGH LIFT DEVICES. Alessandro Airoldi, Paolo Panichelli, Alessandro Gilardelli, Giuseppe Quaranta, Gioseppe Sala	Ref: 5465 A NEW MOLD DESIGN FOR QUALIFICATION OF POWDER/BINDER SEPARATION IN PIM TECHNOLOGY. Jakub Huba, Berenika Hausnerová	Ref: 5330 ANALYSIS OF LOWER LIMBS EXPLOSIVE FORCE IN EX-PLAYERS MEN AND WOMEN BASKETBALL MAPUTO CITY: A COMPARATIVE STUDY. Alberto Graziano, Anicêncio Fabião	---	Ref: 5598 IRREVERSIBLE EFFECTS ON GREASE STRUCTURE DUE TO FRICTION ENERGY. Erik Kuhn	Ref: 5631 AN INITIATION OF A LEAN JOURNEY IN A CLOTHING COMPANY. Rúben Eira, Laura C. Maia, Anabela C. Alves, Celina P. Leão
---	Ref: 5563 STUDY OF CFRP-PEEK BONE PLATES: TEST AND FEM ANALYSIS. M. Castro, P. Aguiar, A. Barreiro, J.D. Barreiro, E. Casarejos, A. Gonzalez, A. Iglesias, P. Izquierdo, M.C. Pérez, A. Segade, M. Vila, J.A. Vilán, P. Yañez	---	Ref: 5418 INTRA-OPERATOR RELIABILITY OF PHASE VELOCITY MEASUREMENTS OF FLEXURAL ACOUSTIC WAVES IN THE HUMAN TIBIA IN VIVO. Florian Vogl, Karin Schnüriger, Hans Gerber, William R. Taylor	---	Ref: 5680 LOAD DISTRIBUTION IN HELICAL GEARS INCLUDING ELASTIC AND FRICTION EFFECTS. Pedro M.T. Marques, Ramiro Martins, Jorge H.O. Seabra	Ref: 5649 THE CUSUM VERSUS MCUSUM MODIFIED CONTROL CHARTS WHEN APPLIED ON DIESEL ENGINES PARAMETERS CONTROL. Suzana Lampreia, Rui Parreira, José Requeijo, Vitor Lobo
---	Ref: 5776 THREE DIMENSIONAL SYNTHETIC MICROSTRUCTURE GENERATION FOR SOLID OXIDE FUEL CELL ELECTRODE. Safa Koç, Fethi Yücel, Selahattin Çelik, Serkan Toros, Bora Timurkutluk	---	Ref: 5431 SOME FUNCTIONS IN DANDELION FLOWER HEAD AND SEED HEAD. Seiichi Sudo, Maki Sato	---	---	---

15:45-16:15 **COFFEE-BREAK** **Lobby**

16:15-18:00 **PAPERS SESSION - 6** **All Rooms**

6A *(Monchique-1)* Symp-12 *Chair Carlos C. António*	**6B** *(Monchique-2)* Topic-I *Chair Jerzy Kaleta*	**6C** *(Urzelina-1)* Topic-G *Chair António Mourão*	**6D** *(Urzelina-2)* Topic-K *Chair Mário A.P. Vaz*	**6E** *(Auditorium)*	**6F** *(Serreta-1)* Symp-21 *Chair Ramiro Martins*	**6G** *(Serreta-2)* Symp-9 *Chair Helena Navas*
Ref: 5644 MULTIOBJECTIVE OPTIMIZATION AS ALTERNATIVE SEARCH OF SUSTAINABLE COMPOSITE STRUCTURES. Carlos C. António. *(Invited Paper)*	Ref: 5597 THERMOFORMING OF THERMOPLASTIC WOVEN COMPOSITES: MODELLING AND VALIDATION. Martin Machado, Michael Fischlschweiger, Zoltan Major	Ref: 5517 DESIGN AND SIMULATION OF A POLYMERIC 3D PRINTED FALL ARREST SYSTEM FOR CLIMBING. Martin Reiter, Matei Miron, Zoltan Major	Ref: 5479 FINITE ELEMENT EVALUATION OF THE MECHANICAL BEHAVIOUR OF A DETAILED FOOT/FOOTWEAR MODEL. Zoi Koutkalaki, Panagiotis Papagiannis, Philip Azariadis, Paraskevas Papanikos	---	Ref: 5746 ROLLING BEARING WEAR IN WIND TURBINES. Beatriz Graça, Ramiro Martins, Jorge H.O. Seabra	Ref: 5650 A PRATICAL MODEL TO EVALUATE COMPETETIVENESS. Nuno Cavaco, Virgílio Machado
Ref: 5528 SUSTAINABLE SOLUTIONS UNDER THE AXIOMATIC DESIGN PRINCIPLES: THE NEED FOR RESILIENCE. João Fradinho, António Santos, António Gonçalves-Coelho, António Mourão	Ref: 5601 THERMOMECHANICAL ANALYSIS OF SHAPE MEMORY POLYURETHANE PU-SMP. Elzbieta Pieczyska, Maria Staszczak, Michal Maj, K. Kowalczyk-Gajewska, M. Cristea, H. Tobushi, S. Hayashi	Ref: 5557 TESTS AND COMPUTER SIMULATIONS OF ELECTRIC BUSES. Miloslav Kepka, Stanislav Spirk	Ref: 5630 PLASTICITY EFFECTS DURING THE 4-POINT BENDING OF INTRAMEDULLARY LEG LENGTHENING IMPLANTS WITH TELESCOPIC STRUCTURES. Mikko Kanerva, Zahra Besharat, Ryan Livingston, Harri Hallila, Mark Rutland	---	Ref: 5747 COMBINED SURFACE CONTACT FATIGUE AND WEAR IN SPUR GEARS. José A. Brandão, Jorge H.O. Seabra, Manuel J.D. Castro, Ramiro Martins	Ref: 5679 LEAN COMPANIES IN THE TRACK OF SUSTAINABILITY. M. Florentina Abreu, Anabela C. Alves
Ref: 5602 MULTIOBJECTIVE DESIGN OF AUTOMOBILE COMPOSITE APPLICATIONS BASED ON FEASIBILITY ROBUSTNESS. Carlos C. António, Luísa Hoffbauer	Ref: 5607 COST AND TECHNICAL PERFORMANCE AND ENVIRONMENTAL IMPACT AS SIMULTANEOUS CONSTRAINTS FOR THE SELECTION OF COMPOSITE MATERIALS IN THE EARLY DESIGN STAGES OF AIRCRAFT STRUCTURES. Elcin Calado, Marco Leite, Arlindo Silva	Ref: 5712 APPLICATION OF BAYESIAN UPDATING AND STOCHASTIC FINITE ELEMENT METHOD TO THE LOAD AND RESISTANCE FACTOR DESIGN (LRFD) OF A ROUND BAR HAVING RANDOM GEOMETRY. Yuji Nakasone, Shun Miyazaki	Ref: 5655 POROSITY AND MECHANICAL PROPERTIES OF ZIRCONIUM CERAMICS. Sergei N. Kulkov, Ekaterina S. Kalatur, Svetlana P. Buyakova	---	Ref: 5748 WIND TURBINE GEAR OILS PERFORMANCE EVALUATION. Ramiro Martins, Carlos M.C.G. Fernandes, Jorge H.O. Seabra	Ref: 5687 LEAN SOLUTIONS APPLIED IN THE BELVER HYDROELECTRIC CENTRAL - EDP_132. Pedro Gaspar, Teresa Morgado, Francisco Freitas
Ref: 5668 ISOGEOMETRIC CONFIGURATION DESIGN OPTIMIZATION OF HEAT CONDUCTION PROBLEMS USING BOUNDARY INTEGRAL EQUATION. Minho Yoon, Myung-Jin Choi, Seonho Cho	Ref: 5624 ANALYSIS OF THE STRESS FIELD IN PHOTOVOLTAIC MODULES DUE TO IMPACT LOADINGS. Mauro Corrado, Andrea Infuso, Marco Paggi	Ref: 5768 AXIOMATIC DESIGN BASED ASSESSMENT OF OFFSHORE WIND TURBINE SUPPORT STRUCTURES. Konstantinos Salonitis, Athanasios Kolios	Ref: 5773 BIOMECHANICS OF THE HUMAN STOMACH AFTER BARIATRIC SURGERY. Noor M. Shamlooh, Roustem Miftahof	---	Ref: 5751 FRICTION TORQUE OF POLYMER GREASES WITH DIFFERENT THICKENER CONTENT. David Gonçalves, Samuel Pinho, Armando Campos, Beatriz Graça, Jorge H.O. Seabra	Ref: 5690 INNOVATIVE APPROACH FOR CONTROL AND AUTOMATIZATION OF MICROCLADDING PROCESS. Jorge M.S.P. Torres, Teresa Morgado, Helena V.G. Navas
---	Ref: 5707 MECHANICAL BEHAVIOR THROUGH TRIAXIAL TEST OF SAND SLAG TREATED BY GRANUTATED SLAG. Hayet Cherfa, Nacera Saoudi, Khedidla Ait Mokhtar, Abd Elmounim Younsi, François Duhaime	---	---	---	Ref: 5752 FORMULATION | RHEOLOGY AND THERMAL AGING OF POLYMER GREASES. David Gonçalves, Armando Campos, Beatriz Graça, Jorge H.O. Seabra	Ref: 5735 TRIZ AS AN AMPLIFIER FOR CORPORATE CREATIVITY AND CORPORATE INNOVATION ABILITY. Barbara Gronauer
---	Ref: 5718 SPARK PLASMA SINTERING OF ALPHA- AND BETA- SIALON. Kiyotaka Matsuura, Toko Tokunaga	---	---	---	---	---

14:00-19:00 **POSTERS SESSION - 3** **Lobby**

TOPICS: B, G, H, K ; SYMPOSIA: 6, 19, 21

Topic: B
Ref: 5372
STUDY OF WELDING LINE UNRIPPING TEST OF METAL BELLOWS. Zhongbin Tang, Yulong Liu, Tao Suo, Qiong Deng
Ref: 5466
ANALYSIS OF THE AIRCRAFT OPERATION IN THE CONTEXT OF SAFETY AND EFFECTIVENESS. Jozef Zurek, Antoni Jankowski, Jan Rajchel
Ref: 5544
REMARKS TO TESTING OF STRENGTH AND FATIGUE LIFE. Miloslav Kepka, Jan Chvojan
Ref: 5581
INFLUENCY OF HEAT TREATMENT IN THE MECHANICAL PROPERTIES AT HIGH TEMPERATURES OF P91 STEEL-PIPE WELDED JOINTS. Tatiane Chuvas, António Correia da Cruz, Manuel Gomes, Maria Cindra Fonseca
Ref: 5645
VANE SEGMENT CASTING GEOMETRY IMPACT ON THE STRESS IN THE AIRFOIL SURFACE LAYER. Pawel Kocurek, Pawel Rokicki, Rafal Cygan, Jacek Nawrocki, Andrze Nowotnik, Jan Sieniawski
Ref: 5653
HEAT TREATMENT EFFECT ON MICROSTRUCTURE AND PROPERTIES OF SINGLE CRYSTAL CMSX-4® NICKEL-BASED SUPERALLOY. Andrzej Nowotnik, Pawel Rokicki, Grzegorz Jakubowicz, Daniel Kurkowski, Grazyna Mrowka-Nowotnik, Malgorzata Wierzbinska, Jan Sieniawski, Jacek Nawrocki
Ref: 5674
FATIGUE BEHAVIOR AND CUMULATIVE DAMAGE OF NOTCHED GFR COMPOSITES. Alessio Carofalo, Vito Dattoma, Riccardo Nobile, Fania Palano, Francesco Panella
Ref: 5693
INVESTIGATION OF THE MECHANICAL BEHAVIOUR OF ZIRCONIUM ALLOY AT DIFFERENT STRAIN RATES USING SUB-SIZE TENSILE SPECIMENS. Pavel Konopik, Martin Rund, Jan Dzugan
Ref: 5775
TOOL CONDITION MONITORING IN DRILLING BASED ON SPINDLE AND FEED MOTOR CURRENT. Alfonso González, David Rodríguez, Justo García Sanz-Calcedo, Inocente Cambero, José Herrera

Topic: G
Ref: 5352
SMALL-SCALE STRAIGHT-BLADED DARRIEUS VERTICAL AXIS WIND TURBINE. Rafael de Almeida Alves, Carlos Alberto Gallo
Ref: 5454
LIFE CYCLE ANALYSIS (LCA) AND RELIABILITY TECHNIQUES IN INDUSTRIAL DESIGN PROJECTS. Justo Calcedo, David Salgado, Alfonso Gonzalez, Inocente Rivero, José Herrera
Ref: 5603
CONSIDERATIONS ON OPERATION OF A TURBOJET ENGINE WITH THE 'BYPASS' DESIGN. Miroslaw Kowalski
Ref: 5760
SPATIAL FACE RACK DRIVES: MATHEMATICAL MODELS FOR SYNTHESIS AND SOFTWARE ILLUSTRATIONS. Emilia Abadjieva

Topic: H
Ref: 5410
THREE-DIMENSIONAL EFFECTS ON WELDED LAP JOINTS UNDER TENSILE-SHEAR LOADING. Filippo Berto, Alberto Campagnolo
Ref: 5667
EVALUATION OF STAINLESS STEEL PLATES OF HEAT EXCHANGER DAMAGE. H. Abdel-Aleem, B. Zaghloul, S.A. Khodir

Topic: K
Ref: 5584
MEASUREMENT OF INPUT ACOUSTIC IMPEDANCE OF HUMAN AUDITORY SYSTEM. Daniel Carmona, Leonardo Molisani, Maria Bellini
Ref: 5696
ANALYSIS OF THE CORE STABILITY TO IMPROVE SINGLE LEG STANCE (CASE STUDY). Ana Couto, Mário Vaz, Sara Morais

Symp: 6
Ref: 5618
NUMERICAL SIMULATION OF WALL DEFORMATION IN AN ANEURYSM MODEL. João Ribeiro, Rui Lima, Hernani Lopes, Mário Vaz, J.F. Silva Gomes

Symp:19
Ref: 5407
MAGNETIC CHARACTERIZATION BY EDDY CURRENT TESTING TO EVALUATE THE AGED MICROSTRUCTURE OF REFORMER FURNACE TUBES. João Rebello, M. Arenas, M.C.L. Areiza, L.H. Almeida, R. Sacramento, G.R. Pereira
Ref: 5420
MEASUREMENT OF RESIDUAL STRESSES IN WELDED ELEMENTS AND STRUCTURES BY ULTRASONIC METHOD. Yuri Kudryavtsev, Jacob Kleiman, Lana Potapova
Ref: 5447
MINIATURIZED SAMPLES CREEP TEST AS A NON DESTRUCTIVE SOLUTION. Heloisa Furtado, Fernanda Santos, Luiz Almeida, Luisa Coutino
Ref: 5532
INFLUENCE OF SUPERALLOY CASTING STRUCTURE ON PROPAGATION OF ULTRASONIC WAVE. Jacek Nawrocki, Kamil Gancarczyk, Wojciech Manaj, Robert Albrecht, Rafal Cygan, Krzysztof Krupa, Jan Sieniawski
Ref: 5661
EVALUATION OF FATIGUE PROPERTIES OF NICKEL BASED SUPERALLOY MAR 247 WITH ALUMINIDE COATING AND CRACK DETECTION BY NON-DESTRUCTIVE TECHNIQUES. Dominik Kukla

Symp: 21
Ref: 5675
MACHINED SURFACE ANALYSIS AT HIGH CUTTING SPEED USING CARBIDE DRILL IN A AL-SI ALLOY. Paulo S. Martins, José R.G. Carneiro, Gilmar C. Silva, Pedro P. Brito

19:30-24:00 **CONFERENCE BANQUET** **Coliseu Micaelense**

WEDNESDAY, 29 JULY 2015

08:00-12:00 **POSTERS SESSION - 4** **Lobby**

TOPICS: L, M, N ; SYMPOSIA: 3, 4, 13, 18, 20, 22, 24, 29, 31

Symp: L, M & N
Ref: 5378
CFD CONTRIBUTION TO OPTIMIZE THE LOCATION OF POLLUTANT EQUIPMENT IN VENTILATED ROOMS. Rui Pitarma, Miguel Lourenço, João Ramos
Ref: 5656
EVALUATION OF THE EFFECTS OF HIGH SPEED TRUCK CRASH INTO A BRIDGE COLUMN. Zdenek Vintr, Pavel Manas, Miroslav Vala
Ref: 5663
INTERACTION OF FLOWING LIQUID WITH DEFORMABLE BOUNDARY BY COUPLING SPH TO FE. Ludek Hyncik
Ref: 5657
NUMERICAL AND EXPERIMENTAL TESTING OF ANTI SHOCK PANELS. Grzegorz Slawinski, Tadeusz Niezgoda, Pawel Dziewulski, Pawel Bogusz, Marek Swierczewski
Ref: 5658
NUMERICAL AND EXPERIMENTAL TESTING OF SELECTED CRASH CUSHION AND ROAD BARRIER. Tadeusz Niezgoda, Pawel Dziewulski, Wieslaw Barnat, Andrzej Kiczko, Grzegorz Slawinski, Slawomir Dzienis
Ref: 5514
ANALYSIS ON DYNAMIC BALANCE OF SUSPENDED BASKET IN CENTRIFUGAL TEST WITH CUBICAL CONTAINER. Shenglai Chen, Changchun Zhu
Ref: 5515
MECHANICAL PROPERTY RESEARCH OF DIFFERENT MATERIAL AND DIFFERENT SECTION SHAPE SUPPORTING RING. Zhang-hua Tang, Sheng-lai Chen
Ref: 5570
QUALITATIVE ANALYSIS ON THE PROTECTION OF INDUSTRIAL DESIGN IN EUROPE. Lourdes Liso

Symp: 3 & 4
Ref: 5513
A PIEZOELECTRIC BERNOULLI-EULER BEAM THEORY CONSIDERING MODERATELY CONDUCTIVE AND INDUCTIVE ELECTRODES. Juergen Schoeftner, Gerda Buchberger
Ref: 5604
ANAYSIS OF UNSTEADY OPERATION OF AIRCRAFT ENGINES AFTER SUCTION OF GUNPOWDER COMBUSTION GAS FROM MISSIILE ENGINES. Miroslaw Kowalski

Symp: 13 & 18
Ref: 5629
RECONSTRUCTING STENOTIC CAROTID MODELS FROM ULTRASOUND IMAGES. Helena Henriques, Catarina Castro, Luisa Costa, Carlos C. António, Rosa Santos, Pedro Castro, Elsa Azevedo
Ref: 5651
EFFECT OF ANNEALING ON THE CORROSION RATE OF A NOVEL METALLIC AMALGAMATE FOR BIODEGRADABLE STENTS. Jennifer Frattolin, Luca Gottellini, Ranjan Roy, Olivier Bertrand, Rosaire Mongrain
Ref: 5366
INTRINSIC MECHANICAL PARAMETER ANALYSIS IN DIFFERENT SCAFFOLDS FOR CARTILAGE TISSUE ENGINEERING. Cátia Bandeiras, António Completo, António Ramos
Ref: 5709
COMPOSITE MATERIALS AND BOVINE CORTICAL BONE DRILLING: THERMAL EXPERIMENTAL ANALYSIS. Maria Fernandes, Elza Fonseca, Renato N. Jorge, Mário Vaz, Maria Isabel Dias

Symp: 20 & 24
Ref: 5386
REPLACEMENT OF AN OLD CHP FOR A NEW ONE ON THE TOURISTIC SECTOR: ENERGETIC AND ECONOMIC ANALISYS. Clito Afonso
Ref: 5414
COMPARATIVE STUDY OF THE LEARNING PROCESS BETWEEN A COLD AND A HOT ENVIRONMENT. Mário Talaia, Marta Silva

Symp: 22, 29 & 31
Ref: 5393
NOVEL CERAMIC TILES PRODUCED WITH WOOD WASTE. Rui Novais, M.P. Seabra, João Labrincha
Ref: 5628
TENSILE STRENGTH OF PINE AND ASH WOODS - EXPERIMENTAL AND NUMERICAL STUDY. Débora Ferreira, Elza Fonseca, Cristiana Pinto, Paula Borges
Ref: 5711
BALANCED SUMMATION MODEL FOR THE CALCULATION OF THE FIRE RESISTANCE OF PARTIALLY ENCASED STEEL SECTIONS: NEW PROPOSALS. Paulo Piloto, David Almeida, Ana Ramos-Gavilan, Luís Mesquita
Ref: 5743
TIMBER COVERED BRIDGES ON THE SLOVAK TERRITORY. Ivan Balaz, Zuzana Kamenicka, Yvona Kolekova

08:45-09:30 **KEYNOTES SESSION - 3** **Serreta & Auditorium**

A *(Room: Serreta-1)* *Chair: Prof. Mário Vaz (U.Porto, Portugal)*	**B** *(Room: Auditorium)* *Chair: Prof. S.A. Meguid (U. Toronto, Canada)*
Professor J.C. Reis Campos (University of Porto, Portugal) **MECHANICS AND MATERIALS APPLICATIONS IN PROSTHODONTICS AND DENTAL MEDICINE. CHALLENGES AND OPPORTUNITIES**	Professor Han Xu (Unan University, China) **CONVEX-MODEL-BASED NON-PROBABILISTIC UNCERTAINTY ANALYSIS AND RELIABILITY DESIGN FOR COMPLEX STRUCTURES**

09:30-11:00	PAPERS SESSION - 7					All Rooms
7A *(Monchique-1)* Symp-29 *Chairs: Elza Fonseca & Débora Ferreira*	**7B** *(Monchique-2)* Symp-3 *Chair Rui C. Barros*	**7C** *(Urzelina-1)* Symp-19 *Chair João Rebello*	**7D** *(Urzelina-2)* Topic-M *Chair Wojciech Mocko*	**7E** *(Auditorium)* Symp-13 *Chairs: Luisa Sousa & Catarina Castro*	**7F** *(Serreta-1)* Symp-22 *Chair António Fiúza*	**7G** *(Serreta-2)* Topic-L *Chair Clito Afonso*
Ref: 5592 IMPLEMENTATION OF NON-METALLIC MEMBRANES INTO STEEL SUPPORTING STRUCTURES. David Jermoljev, Josef Machacek	Ref: 5401 THE NETWORK DYNAMIC STABILITY OF FLOATING AIRPORT WITH FLEXIBLE CONNECTORS BASED ON AMPLITUDE DEATH MECHANISM. Daolin Xu, H.C. Zhang, S.Y. Xia, E.R. Qi, J.J. Hu, Y.S. Wu	Ref: 5370 GAMMA-RADIATED POLYETHYLENE ANALYZED BY ULTRASONIC NDE. Carla Marinho, Rafael Freitas, João Rebello, Marysilvia Costa, Celio Costa	Ref: 5363 APPLICATION OF THE DIGITAL IMAGE CORRELATION METHOD FOR DETERMINING TRUE STRESS-STRAIN CURVES OF COMMERCIALLY PURE TITANIUM UNDER DYNAMIC LOADING CONDITIONS. Wojciech Mocko, Adam Brodecki	Ref: 5430 EXPLORING ULTRASOUND IMAGES OF THE CAROTID ARTERIES USING NEURAL NETWORK TOOLS. Catarina Castro, Carlos C. António, Luisa Sousa, Helena Henriques, Rosa Santos, Pedro Castro, Elsa Azevedo	Ref: 5373 NOVEL CERAMIC PRODUCTS BASED ON INDUSTRIAL WASTES. L. Buruberri, Rui Novais, M.P. Seabra, João Labrincha	Ref: 5365 EXPERIMENTAL STUDY AND ENERGY BALANCE CALCULATION OF VENTILATED CERAMIC TILE ROOF IN MEDITERRANEAN CLIMATE. João Ramos, Luis Almeida, Rui Pitarma
Ref: 5599 FIRE RESISTANCE OF CELLULAR WOODEN SLABS WITH RECTANGULAR AND CIRCULAR PERFORATIONS. David Couto, Elza Fonseca, Paulo Piloto, Jorge Meireles, Luísa Barreira, Débora Ferreira	Ref: 5408 ANTI-CONTROLLING NEIMARK-SACKER BIFURCATION IN A TYPE OF CENTRIFUGAL GOVERNOR SYSTEM UNDER WEAK IMPULSE EXCITATION. Huidong Xu, Guilin Wen, Zengyao Lv, Shan Yin	Ref: 5419 HIGH TEMPERATURE STRAIN GAGES USES FOR RESIDUAL LIFE PREDICTION. Fernanda Santos, Heloisa Furtado, Luiz H. Almeida	Ref: 5379 DYNAMIC RESPONSES OF AN INDIVIDUAL RDX ENERGETIC PARTICLE IN RESPONSE TO IMPACT LOADING. Yan-Qing Wu, Mingyang Wang, Fenglei Huang, Ming Huang	Ref: 5589 DEVELOPMENT OF A NOVEL BIODEGRADABLE METALLIC STENT USING COLD SPRAY. Rosaire Mongrain, Rajib Barua, Jennifer Frattolin, Luca Gottelini, Stephen Yue, Olivier Bertrand	Ref: 5496 RECYCLING OF Nd-Fe-B SINTERED MAGNETS USING HDDR PROCESS. Mateusz Szymanski, Bartosz Michalski, Marcin Leonowicz, Zbigniew Miazga	Ref: 5501 THE EXPLOITATION OF ULTRA LOW-ENTHALPY GEOTHERMAL ENERGY IN ORC PROCESS IN COMBINATION WITH RES AND HEAT PUMP. Urska Novosel, Jurij Avsec, Ivana Trselic, Sonja Novak
Ref: 5627 FIRE BEHAVIOUR OF TABIQUE WALL - EXPERIMENTAL AND NUMERICAL STUDY. Débora Ferreira, Alexandre Araújo, Elza Fonseca, Paulo Piloto	Ref: 5440 DESIGN OF A QUASI-ZERO-STIFFNESS ISOLATOR WITH CAM-ROLLER-SPRING MECHANISM AND EXPERIMENTAL TESTS. Jiaxi Zhou, Daolin Xu, Yi Wang	Ref: 5498 DAMAGE ASSESSMENT IN COMPOSITE LAMINATES: A FRACTAL APPROACH. Jorge Silva, João Matos, Stella Abreu, João Tavares, Luis Durão	Ref: 5453 THE PROTECTING DESIGN FOR BOMB-BORNE RECORDING APPARATUS. Jiaqiao Jiang	Ref: 5764 WALL SHEAR STRESS NUMERICAL STUDY OF PATIENT-SPECIFIC LEFT CORONARY BIFURCATION BASED ON COMPUTED TOMOGRAPHY. Sónia I.S. Pinto, João B.L.M. Campos	Ref: 5546 RECYCLING OF END-OF-LIFE LIQUID CRYSTAL DISPLAYS: MATERIALS ASSESSMENT AND INDIUM RECOVERY. Fátima Pedrosa, Nuno Rosa, Fernanda Margarido, Carlos Nogueira	Ref: 5524 ADDED MASS EFFECTS ON THE NATURAL FREQUENCIES OF MARINE CURRENT TURBINE BLADES. Clara Tiago, J.A.C. Campos, João Baltazar
Ref: 5686 CONSIDERATE SDT METHODS FOR SAFETY ASSESSMENT OF HISTORIC TIMBER. Milos Drdacky, Michal Kloiber	Ref: 5778 SEMI-ACTIVE CONTROL OF BUILDING STRUCTURES USING A NEURO-FUZZY CONTROLLER WITH ACCELERATION FEEDBACK. M. Braz-César, K. Oliveira, Rui C. Barros	Ref: 5613 MULTIFRACTAL ANALYSES OF WELD DEFECTS PATTERNS OBTAINED FROM D-SCAN IMAGES. Lindberg Gonçalves, Elineudo Moura	Ref: 5469 PERFORATION RESISTANCE OF ALUMINUM / POLYETHYLENE SANDWICH STRUCTURE. Ming-ming Xu, Guang-yan Huang, Shun-shan Feng, G.J. McShane, W.J.Stronge	Ref: 5608 BIOMECHANICAL STUDY OF CERVICAL SPINE WITH PATOLOGY. Tatiana Teixeira, Luísa Sousa, Marco Parente, Renato Jorge, João Gonçalves, Rolando Freitas	Ref: 5558 EVALUATION OF MAIN ALUMINIUM ALLOYS IN NON-FERROUS FRACTION OF AUTO-SHREDDER RECYCLING PROCESS. Fernanda Margarido, Carlos Nogueira, R. Novais, F. Durão, Carlos Guimarães, Maria Trancoso, Paula Oliveira, Fátima Pedrosa, Ana Gonçalves	Ref: 5542 ECO-ENERGY ANALYSIS OF HYDROGEN PRODUCTION AND USE OF DISTRICT HEATING IN COMBINATION WITH SLOWENIAN NUCLEAR POWERPLANT. Jurij Avsec, Urska Novosel
Ref: 5717 DETERMINATION OF CHARACTERISTIC VALUES IN NBR 7190: 1997 FOR DESIGN AND FIRE SAFETY IN WOOD MATERIALS: HITS AND MISSES. Carlos Matos	---	Ref: 5525 STRENGTH ANALYSIS OF COMPOSITE STRUCTURES USING FINITE FRACTURE MECHANICS. Pedro Camanho, Albertino Arteiro	Ref: 5534 EXPERIMENTAL RESULTS ON BALLISTIC PLATES WITH STRATIFIED ARAMID FABRICS. Catalin Pirvu, Lonena Deleanu, Simona Badea, Marcel Istrate	Ref: 5609 BIOMECHANICAL STUDY OF IDIOPATHIC SCOLIOSIS. Liliana Reis, Luísa Sousa, Marco Parente, Renato Jorge, João Gonçalves, Rolando Freitas	Ref: 5704 UTILIZATION OF WASTE MATERIALS TO IMPROVE ASPHALT MIXTURES PERFORMANCE. Sara Fernandes, Liliana Costa, Hugo Silva, Joel Oliveira	Ref: 5679 FLUID STRUCTURE INTERACTION MODELLING OF WIND TURBINE BLADES BASED ON COMPUTATIONAL FLUID DYNAMICS AND FINITE ELEMENT METHOD. Athanasios Kolios, Lin Wang
Ref: 5742 LATERAL TORSIONAL STABILITY OF TIMBER BEAMS. Ivan Balaz, Yvona Kolekova	---	Ref: 5745 FRACTURE TOUGHNESS AND CRACK RESISTANCE CURVES IN THE LONGITUDINAL COMPRESSIVE FAILURE OF POLYMER COMPOSITES. Giuseppe Catalanotti, José Xavier, Pedro Camanho	Ref: 5770 EFFECT OF DAMAGES PROMOTED BY BENDING LOADS ON THE IMPACT STRENGTH. Ana P. Amaro, Paulo N.B. Reis, Maria A. Neto, José M. Cirne	---	---	---

11:00-11:30	COFFEE-BREAK	Lobby

11:30-13:00 | **PAPERS SESSION - 8** | **All Rooms**

8A *(Monchique-1)* Symp-31 *Chairs: Paulo Piloto & Alberto Meda*	8B *(Monchique-2)* Symp-4 *Chair Rui C. Barros*	8C *(Urzelina-1)* Symp-19 *Chair João Rebello*	8D *(Urzelina-2)* Topics – M&N *Chair N. Alexopoulos*	8E *(Auditorium)* Symp-18 *Chair Pedro Martins*	8F *(Serreta-1)* Symp-22 *Chair António Fiúza*	8G *(Serreta-2)* Symp-20 & 24 *Chair Marta Silva*
Ref: 5490 FIRE ANALYSIS OF REINFORCED CONCRETE PRECAST TUNNEL LINING CONSIDERING THE SPALLING EFFECT. N. Bettini, R. Felicetti, G. Lilliu, A. Meda, P. Riva	Ref: 5681 ANALYSIS AND DESIGN OF THE PRINCIPAL AUXILARY TESTING STRUCTURE OF A TOWER TESTING STATION IN PORTUGAL - PART I. Fabio Paiva, Jorge Henriques, Rui C. Barros	Ref: 5642 QUANTITATIVE DETECTION OF CONTACT FAILURES IN COMPOSITES USING INFRARED THERMOGRAPHYAND THE RECIPROCITY FUNCTIONAL APPROACH. Luiz Abreu, Marcelo Colaço, Helcio Orlande, Carlos Alves	Ref: 5660 COMPARISON OF IMPACT BEHAVIOUR OF BUILDING STRUCTURAL STEELS OBTAINED BY TWO DIFFERENT SET-UPS USING SHPB TECHNIQUE. Leopold Kruszka, Wojciech Mocko	Ref: 5350 THE HUMAN UTERUS AS A SOFT BIOLOGICAL SHELL. Roustem Miftahof	Ref: 5705 A MECHANICAL ANALYSIS OF ASPHALT RECYCLED MIXTURES PRODUCED WITH HIGH RECYCLING RATES. Liliana Abreu, Joel Oliveira, Hugo Silva, Daniela Palha, Paulo Fonseca	Ref: 5413 CONFORT AREA FOR AN IMPROVED LEARNING PROCESS IN HOT ENVIRONMENT. Marta Silva, Mário Talaia
Ref: 5428 IMPACT OF MODEL UNCERTAINTY ON STEEL BEAM STRUCTURAL SAFETY EVALUATION FOR FIRE CONDITIONS. Mariusz Maslak	Ref: 5682 ANALYSIS AND DESIGN OF THE PRINCIPAL AUXILARY TESTING STRUCTURE OF A TOWER TESTING STATION IN PORTUGAL - PART II. Fabio Paiva, Jorge Henriques, Rui C. Barros	Ref: 5664 EVALUATION OF ULTRASONIC DISSIMILAR BONDS BY ULTRASONIC TESTING IMMERSION METHOD: C- SCOPE MODE. H. Abdel-Aleem, S.A. Khodir	Ref: 5715 TEMPERATURE DEPENDENDENCY OF DYNAMICALLY LOADED POLYURETHANE FOAM. Eva Kasparek, Robert Scheidemann, Mike Weber, Holger Völzke	Ref: 5375 RUPTURE OF BREAST IMPLANTS: A MECHANICAL ANALYSIS MEASURED BY UNIAXIAL TENSILE TEST. Nilza Ramião, Pedro Martins, António A. Fernandes, Maria Barroso, Diana Santos	Ref: 5706 MECHANICAL ANALYSIS OF ASPHALT MIXTURES PRODUCED WITH WASTE PLASTIC MODIFIED BINDERS. Liliana M.B Costa, Sara Fernandes, Hugo Silva, Joel Oliveira, Ricardo Miranda	Ref: 5610 THERMAL MASS NUMERICAL STUDY - ANALYSIS OF SOME FACTORS INVOLVED AND THEIR IMPORTANCE. Hipólito Sousa, Fernando Sousa, Rui Sousa
Ref: 5640 THE BEHAVIOR OF OSB BOARD´S FIRE PROTECTION COATING UNDER THE NOMINAL FIRE. Petr Kuklik, Magdalena Charvatova	Ref: 5683 ANALYSIS AND DESIGN OF THE SECONDARY AUXILARY TESTING STRUCTURE OF A TOWER TESTING STATION IN PORTUGAL - PART I. Fabio Paiva, Jorge Henriques, Rui C. Barros	Ref: 5695 MEASUREMENT OF THE FATIGUE CRACK DEPTHS IN ALUMINIUM PLATES. Artur L. Ribeiro, Helena G. Ramos, Jerónimo Pasadas, Tiago Jorge Rocha	Ref: 5441 FAILURE ANALYSIS OF MAIN LANDING GEAR IN CIVILIAN AIRCRAFT. Arie Bussiba, Meir Kendler	Ref: 5572 USING EVOLUTIONARY OPTIMIZATION TO DETERMINE THE MECHANICAL PROPERTIES OF BIOMATERIALS. Pedro Martins, Carla Roque, Renato Jorge	Ref: 5721 DUCTILITY IMPROVEMENT OF AL ALLOYS BY HETEROMORPHIC DIE EXTRUSION. Kiyotaka Matsuura, Toko Tokunaga	Ref: 5384 THE INFLUENCE OF THE LOCATION OF A THERMOELECTRIC COOLER SYSTEM ON REFRIGERATION CABINS UPON INSIDE AIR TEMPERATURES AND VELOCITIES. Clito Afonso
Ref: 5710 BENDING RESISTANCE OF PARTIALLY ENCASED BEAMS AT ELEVATED TEMPERATURE: ADVANCED CALCULATION MODEL. Paulo Piloto, David Almeida, Ana Ramos-Gavilan, Luís Mesquita	Ref: 5684 ANALYSIS AND DESIGN OF THE SECONDARY AUXILARY TESTING STRUCTURE OF A TOWER TESTING STATION IN PORTUGAL - PART II. Fabio Paiva, Jorge Henriques, Rui C. Barros	Ref: 5701 USING A MOUSE IN ECT DETECTORS. Helena G. Ramos, Artur L. Ribeiro, Tiago J. Rocha, Dário J. Pasadas	Ref: 5529 3D FEM ANALYSIS OF PRECAST CONCRETE APARTMENT BUILDINGS UNDER MINING TREMORS: A CASE STUDY. Piotr Berkowski, Jacek Baranski	Ref: 5641 STEM CELLS MECHANICS ON REGENERATIVE PROCEDURES: A PRELIMINARY COMPUTATIONAL STUDY OF THE ACTIN NETWORK ACTIVE BEHAVIOUR. João p. Ferreira, Marco Parente, Renato N. Jorge	Ref: 5739 SUSTAINABILITY IMPROVEMENT OF A COMPOSITE MATERIALS - INDUSTRY THROUGH RECYCLING AND RE-ENGINEERING PROCESS APPROACHES. M.C.S. Ribeiro, António Fiúza, A.C.M. Castro, F.J.G. Silva, J.P. Meixedo, M.L. Dinis, M.R. Alvim	Ref: 5521 PREDICTION OF UNSTEADY SHEET CAVITATION ON MARINE CURRENT TURBINES WITH A BOUNDARY ELEMENT METHOD. João Baltazar, J.A.C. Campos
Ref: 5733 A PRELIMINARY INVESTIGATION ON THE FAILURE OF PRESTRESSED MEMBERS UNDER NATURAL FIRES. Natasa Kalaba, Patrick Bamonte, Roberto Felicetti	Ref: 5685 ANALYSIS AND DESIGN OF THE UNIVERSAL BASE OF A TOWER TESTING STATION IN PORTUGAL. Fabio Paiva, Jorge Henriques, Rui C. Barros	---	---	---	Ref: 5771 COMPOSITE BINDERS OF URBAN WASTE GLASS-METAKAOLIN CHEMICALLY ACTIVATED, EFFECT OF THE TYPE OF ALKALINE AGENT. D.E. Ortega-Zavala, L.Y. Gomez-Zamorano, J.I. Escalante-Garcia	---

13:00-15:00 | **LUNCH & CONFERENCE CLOSURE** | **VIP Restaurant**

VIP Executive Azores Hotel
(Floor-2)
Location of M2D2015 conference Rooms

M2D2015 PROGRAM

P. Delgada, 26-30 July 2015

Time	SUNDAY 26July	MONDAY 27July	TUESDAY 28July	WEDNESDAY 29July	THUR 30July
08:00		REGISTRATION	REGISTRATION & POSTERS SESSION (2) Topics: F, I / Symp: 5, 26	REGISTRATION & POSTERS SESSION (4) L, M, N / 3, 4, 13, 18, 20, 22, 24, 29, 31	
09:00		OPENING SESSION		KEYNOTE 3-A Prof. J. Reis Campos / KEYNOTE 3-B Prof. Han Xu	
		KEYNOTE 1-A Prof. S.A. Meguid / KEYNOTE 1-B Prof. N. Umehra	KEYNOTE 2-A Prof. Peter Hess / KEYNOTE 2-B Prof. Ng Teng Yong	Session 7A (Symp-29) / Session 7B (Symp-03) / Session 7C (Symp-19) / Session 7D (Topic-M) / Session 7E (Symp-13) / Session 7F (Symp-22) / Session 7G (Topic-L)	
10:00		COFFEE-BREAK	COFFEE-BREAK		
11:00		Session 1A (Topic-J) / Session 1B (Symp-02) / Session 1C (Topic-H) / Session 1D (Symp-10) / Session 1E (Symp-17) / Session 1F (Symp-25) / Session 1G (Symp-23)	Session 4A (Symp-28) / Session 4B (Topic-I) / Session 4C (Symp-05) / Session 4D (Symp-11) / Session 4E (Symp-17) / Session 4F (Topic-F) / Session 4G (Symp-26)	COFFEE-BREAK	
12:00				Session 8A (Symp-31) / Session 8B (Symp-04) / Session 8C (Symp-19) / Session 8D (T-M+T-N) / Session 8E (Symp-18) / Session 8F (Symp-22) / Session 8G (S-20+S-24)	
13:00		LUNCH	LUNCH	LUNCH & CONFERENCE CLOSURE	
14:00		Session 2A (Topic-A) / Session 2B (Topic-B) / Session 2C (Topic-C) / Session 2D (Topic-D) / Session 2E (Symp-17) / Session 2F (Symp-25) / Session 2G (Symp-27)	Session 5A (Symp-12) / Session 5B (Topic-I) / Session 5C (Topic-G) / Session 5D (S-11 + T-K) / Session 5E (Symp-06) / Session 5F (Symp-21) / Session 5G (Symp-9)		
15:00	EARLY-BIRD REGISTRATION				TECHNICAL VISITS AND EXCURSIONS
16:00		COFFEE-BREAK	COFFEE-BREAK		
17:00		Session 3A (Topic-A) / Session 3B (Topic-B) / Session 3C (Topic-C) / Session 3D (Topic-D) / Session 3E (Symp-17) / Session 3F (Symp-25) / Session 3G (Symp-27)	Session 6A (Symp-12) / Session 6B (Topic-I) / Session 6C (Topic-G) / Session 6D (Topic-K) / Session 6E (void) / Session 6F (Symp-21) / Session 6G (Symp-9)		
18:00		POSTERS SESSION (1) Topics: A, C, D, J / Symp: 2, 10, 17, 25, 27	POSTERS SESSION (3) Topics: B, G, H, K / Symp: 19, 21		
19:00		WELCOME DINNER	CONFERENCE BANQUET		

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PAPER REF: 5627

FIRE BEHAVIOUR OF TABIQUE WALL - EXPERIMENTAL AND NUMERICAL STUDY

Débora Ferreira[1(*)], Alexandre Araújo[1], Elza Fonseca[1], Paulo Piloto[1]

[1]High School of Technology and Management, Polytechnic Institute of Bragança, Bragança, Portugal
[(*)]*Email:* debora@ipb.pt

ABSTRACT

This paper presents a study on the behaviour of *tabique* walls, concerning its fire resistance. Current work is based on the experimental analysis of real scale *tabique* wall panels. Such wall panels were made in pine wood with an earth-based mortar finishing. In order to assess thickness effect of the earth-based mortar on the fire resistance of the wall, three specimens were tested with different mortar thicknesses of 15, 10 and 5 mm. The experimental specimens were tested in a fire-resistance furnace according to the ISO 834 standard fire curve. Fire resistance of test elements is expressed as the time during which the appropriate criteria have been satisfied so that one can predict the time before collapse, increasing both people and property safety. The obtained results are of great importance as they improve the knowledge on the behaviour of *tabique* walls subjected to fire conditions. Two performance criteria were verified: the integrity and the insulation criteria. A numerical model was developed in order to assess the *tabique* wall behaviour under fire conditions, which was validated using experimental results.

Keywords: fire, integrity criteria, insulation criteria, *tabique* construction, traditional building techniques, rehabilitation

INTRODUCTION

In the historic centres of the north of Portugal, part of the existing buildings are old constructions that were built using techniques that currently have fallen in disuse due to the technological progress in the construction sector. Nevertheless, this building solution should be analysed particularly as regards to structural and thermal properties.

The use of basic local materials such as wood, earth and stone has evolved to more complex solutions related to huge negative impacts on the environment. In recent decades, the sustainable construction concept has been developed based on the principles of recycling and maximizing resources, protecting and stimulating the creation of healthy environment, leading to the reduction of the environmental impact of the construction sector. In order to support the different stakeholders in the above referred sector, research projects and knowledge dissemination on sustainable development construction have been conducted.

The *tabique* is one of the main Portuguese traditional building techniques, which was extremely relevant until the beginning of the 20th century before the introduction of the reinforced concrete technique, based on raw materials such as earth and wood. The *tabique* building technique consists of using natural, non-processed building materials and simple procedures. It does not require highly advanced technological processes and sophisticated

equipment or facilities. In general, a *tabique* wall is composed by a simple timber structure covered with an earth-based material. The timber frame elements are nailed to each other and the most common timber frame solution is formed by vertical boards linked to each other by horizontal elements. In general, both materials are locally available in abundance, can be recycled, and are consequently more sustainable.

Some research studies have highlighted the alarming deterioration level of this type of construction and the urgent need for restoration actions (Pinto, 2010; Cunha, 2014). There is still a lack of scientific publications on this subject as technical building aspects related to the *tabique* construction need to be assessed in order to become available to the technical community.

This concern, along with the fact that there is still a lack of investigation in this field, motivated the current work. The main goal is to study experimentally and numerically the behaviour of the *tabique* wall subjected to fire conditions using different earth-based mortar thicknesses. These studies are of great importance in order to improve the rehabilitation action in buildings with a significant state of deterioration.

The manufacture of *tabique* walls relies on a lightweight timber structure assembled with pine planks placed vertically on which horizontal battens are nailed on both sides (Araújo, 2014). An experimental programme was performed in order to evaluate the earth-based mortar thickness effect, so that three wall panels with different mortar layer thicknesses of 15 mm, 10 mm, and 5 mm were tested.

TABIQUE WALL PANELS CONSTRUTION AND INSTRUMENTATION

The construction system of the *tabique* walls is based on a lightweight wooden structure. The manufacture of current *tabique* wall panels relies on a timber structure assembled with pine planks (170×25 mm^2) placed vertically on which horizontal battens (30×25 mm^2) separated 37 mm are nailed on both sides (Araújo, 2014). In order to evaluate the earth-based mortar thickness effect, three specimens (nominal dimensions: 990×975 mm^2) with different mortar layer thicknesses (th, refer to Fig. 1) of 15 mm, 10 mm, and 5 mm were tested. Once the earth-based mortar has been applied, the specimens remained in hygrometric controlled conditions in the laboratory for 30 days and dried naturally.

The thermal behaviour of *tabique* wall panels exposed to the fire action was evaluated using several thermocouples meant for measuring both internal and external temperatures of the wall. The entire procedure is based on existing standard (EN 1364-1, 1999). The main goal of this study is to assess the behaviour of the earth-based mortar layer that protects the timber structure which constitutes the *tabique* wall. Hence, thermocouples were placed at different depths (17.5 mm, 42.5 mm and 67.5 mm from unexposed surface) in order to obtain temperature records inside the mortar (TA) and in wood (TM). The unexposed surface was also analysed with disk thermocouples (TD) (Fig. 1), and by an infrared thermography (IR) camera.

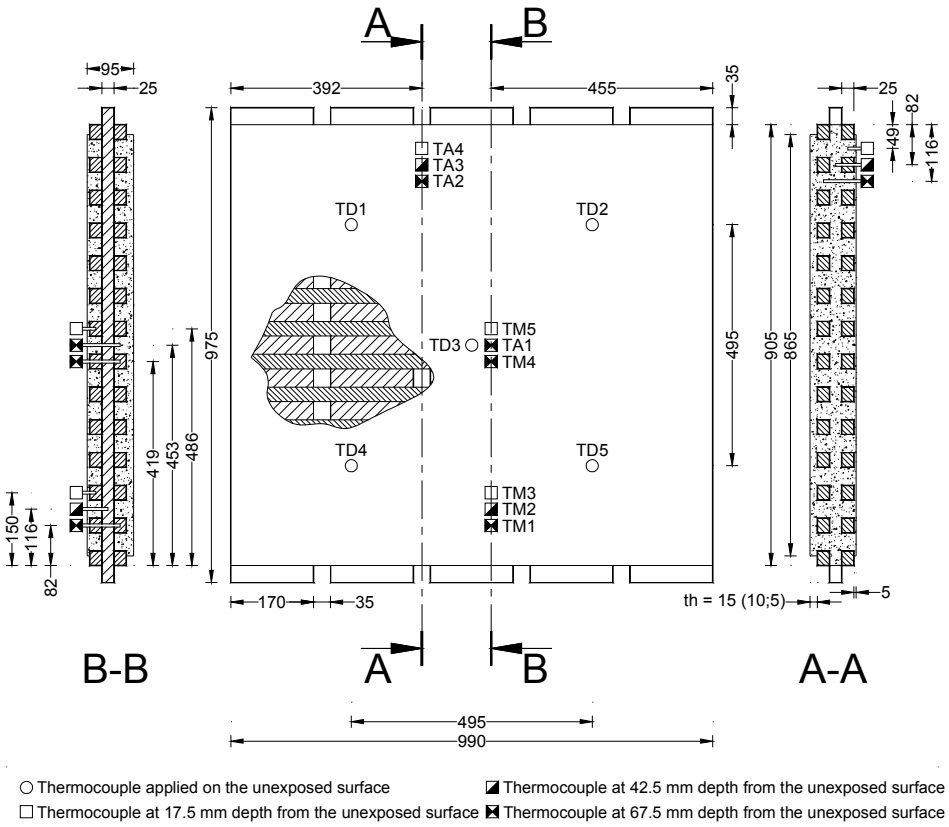


Fig. 1 - Wall panels geometry and thermocouples location (dimensions in mm)

EXPERIMENTAL TESTS

The specimens were tested in a fire-resistance furnace (Fig. 2) according to the ISO 834 standard fire curve. During the tests, the integrity of the wall panels was evaluated throughout the cotton pads test and gap gauges, as well as monitoring the test specimen regarding evidence of sustained flaming. However, there was a significant amount of smoke release from burning wood at final stage of the test, see Fig. 3. The insulation was also evaluated during experiments by assessing the unexposed surface temperature (EN 1362-1, 1999).

Fig. 2 - Experimental set up of *tabique* wall panel

Fig. 3 - Smoke release

The experimental tests had different duration. The first tested sample was the wall panel with th = 15 mm. The lack of knowledge on *tabique* fire behaviour and the smoke release from the burning timber, which could point to the structure collapse, led to the breakdown 35 min after test start. Fig. 4 shows the wall panel when the furnace door was opened; one can observe that earth-based mortar did not collapse and that the horizontal battens elements were burning due to the small spaces created near the anchorage points of the wall panel. For a better perception of the horizontal battens the earth-based mortar was removed on the fire exposed surface, see Fig. 5. One can realize that the timber did not suffer a great damage; however a char layer was created around the battens.

Fig. 4 - *Tabique* wall panel at the end of the test (th = 15 mm)

Fig. 5 - Timber structure after the test (th = 15 mm)

The second wall panel test (th = 10 mm) was conducted during 60 min, without attaining both the insulation and integrity criteria. One can observe that throughout the experiment the recorded temperatures on unexposed surface were below 90°C. Fig. 6 shows the timber structure burning during the test. Fig. 7 shows the time instant when the furnace door was opened and the wall panel was in flame.

Fig. 6 - Flame and wood combustion

Fig. 7 - *Tabique* wall panel at the door opening

At the end of the experiment, the flames were extinguished and the *tabique* wall panel cooled (Fig. 8). The final aspect of the timber structure can be observed in Fig. 9, which shows the

complete carbonization of horizontal (battens) and vertical timber elements of the *tabique* wall panel.

Fig. 8 - Earth-based mortar crack

Fig. 9 - Timber structure after the test (th = 10 mm)

The latter wall panel (th = 5 mm) was tested during 15 min. When the furnace door was opened and the *tabique* wall panel was cooled using water sprays, the fire exposed surface revealed a phenomenon known as "spalling". The earth-based mortar layer separated rapidly from the wooden structure due to the thermal shock generated by the water particles in contact with the hot surface. Fig. 10 shows the last aspect of the *tabique* wall panel at the end of the test and Fig. 11 shows the timber structure after removing the earth-based mortar layer. One can observe that the wooden structure remained intact.

Fig. 10 - *Tabique* wall panel after opening the furnace door

Fig. 11 - Timber structure after the test (th = 5 mm)

NUMERICAL ANALYSIS

A 2D finite model (8 nodes Plane 77 elements) was developed for nonlinear transient thermal analysis, using Ansys software. Two different sections, AA and BB as shown in Fig. 1, were modelled in numerical simulation. Particular attention was given to the non-linearity due to

the thermal properties dependence of wood and earth-based mortar material used in *tabique* walls (Araújo, 2014).

The following figures represent the obtained temperature patterns for each section (AA and BB, see Fig. 1) in the last time step for *tabique* wall panels with th = 15 mm (Fig. 12 and Fig. 13), th = 10 mm (Fig. 14 and Fig. 15) and th = 5 mm (Fig. 16 and Fig. 17), respectively. The grey colour is associated with burned timber, in which the temperature criterion exceeds 300°C.

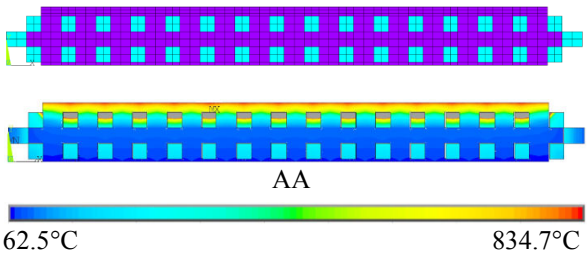


Fig. 12 - Numerical results in section AA – *tabique* wall panel with th = 15 mm, t = 35 min

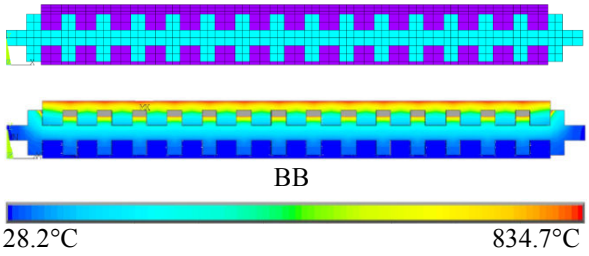


Fig. 13 - Numerical results in section BB – *tabique* wall panel th = 15 mm, t = 35 min

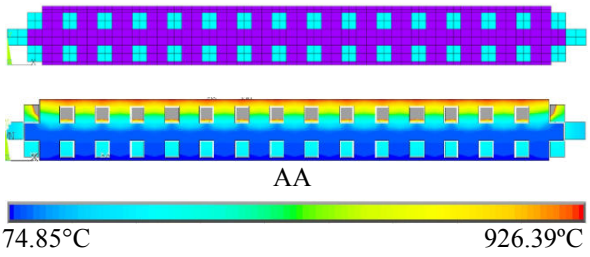


Fig. 14 - Numerical results in section AA – *tabique* wall panel with th = 10 mm, t = 60 min

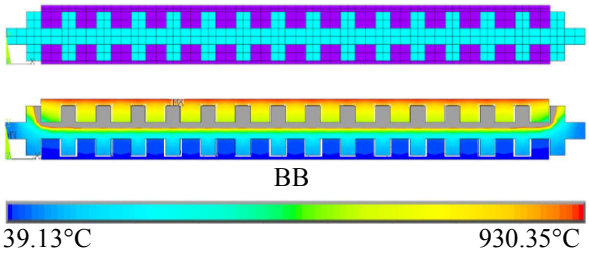


Fig. 15 - Numerical results in section BB – *tabique* wall panel with th = 10 mm, t = 60 min

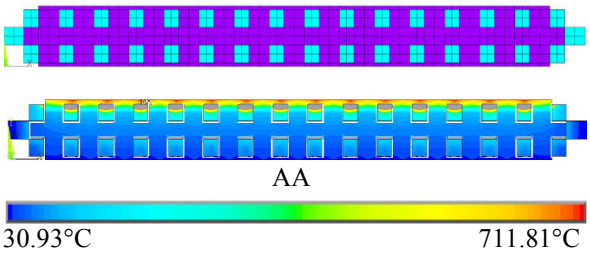


Fig. 16 - Numerical results in section AA – *tabique* wall panel with th = 5 mm, t = 15 min

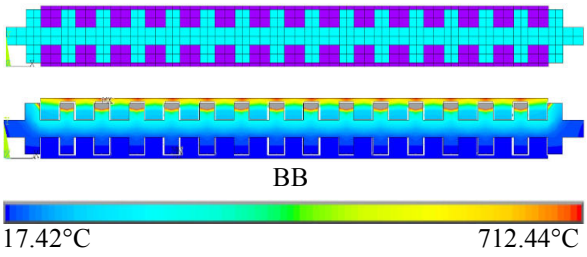


Fig. 17 - Numerical results in section BB – *tabique* wall panel with th = 5 mm, t = 15 min

RESULTS

The graphs below (Fig. 18 to Fig. 23) show the time-temperature evolution from experimental fire exposure (T_e) and the corresponding numerical results (T_n) in *tabique* wall panels with 15, 10 and 5 mm mortar thickness, both for thermocouples located on wooden structure (TM) and on earth-based mortar (TA).

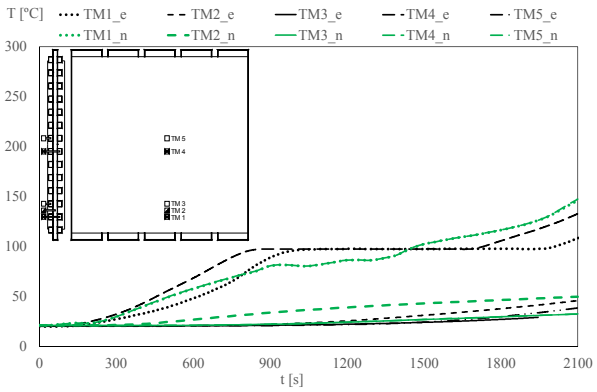


Fig. 18 - Time-temperature history on wood structure, *tabique* wall panel with th = 15 mm

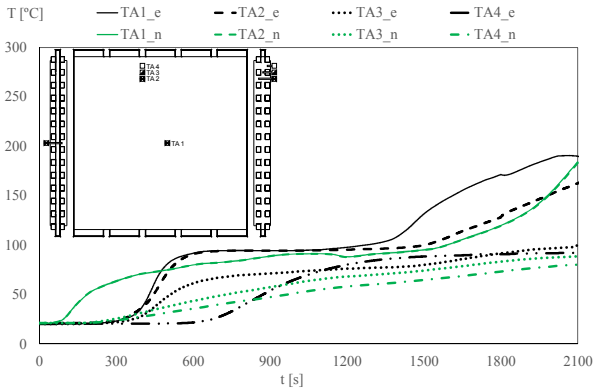


Fig. 19 - Time-temperature history on earth-based material, *tabique* wall panel with th = 15 mm

Regarding the wall panel with a 15 mm thick mortar layer (Fig. 18), it can be seen that thermocouples TM1 and TM4 (which are placed on wood at 67.5 mm depth from the unexposed fire surface) recorded the highest temperatures of approximately 100°C. Concerning the thermocouples located near the unexposed surface (17.5 mm deep), the temperature remained nearly unchanged. For earth-based mortar (Fig. 19), the higher temperatures of about 180°C were recorded near to the fire exposed side. The lowest temperature (about 80°C) was registered at 17.5 mm depth in the mortar.

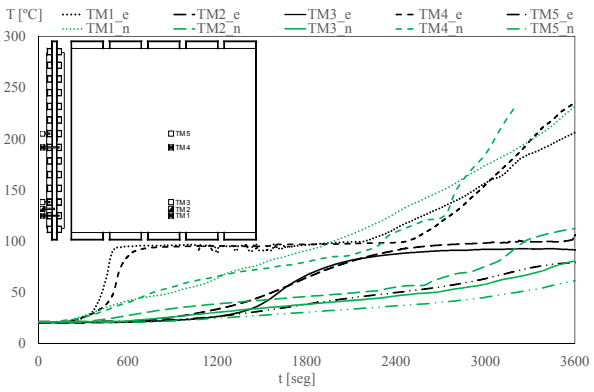


Fig. 20 - Time-temperature history on wood structure, *tabique* wall panel with th = 10 mm

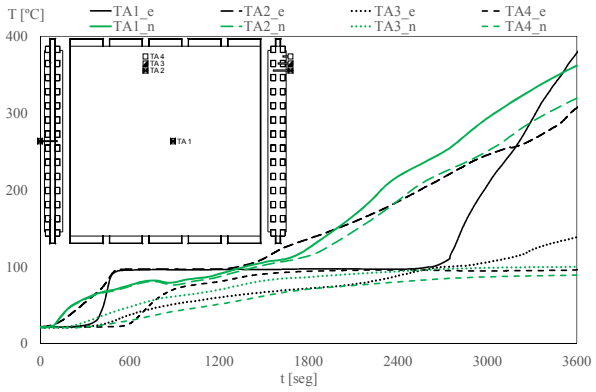


Fig. 21 - Time-temperature history on wood structure, *tabique* wall panel with th = 10 mm

For *tabique* wall panel with 10 mm thick mortar layer (Fig. 20), it can be seen that thermocouples TM1 and TM4 recorded the highest temperatures of approximately 240°C. For t = 2100 s the same temperature of approximately 100ºC was recorded in both *tabique* wall panels with 15 mm and 10 mm of mortar thickness. Regarding the thermocouples located near the unexposed surface, 17.5 mm deep, the temperature remained practically unchanged until t = 1200 s, increasing to around 100ºC at the end of test. As regards earth-based mortar (Fig. 21), the higher temperatures of about 380°C were recorded near to the fire exposed side for t = 3600 s, but for t = 2100 s it recorded 180ºC which is the same temperature as registered with 15 mm of mortar thickness. The lowest temperature (about 100°C) was recorded at 17.5 mm depth in the mortar.

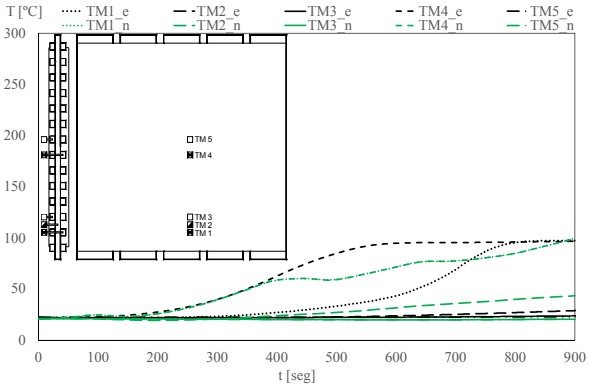


Fig. 22 - Time-temperature history on wood structure, *tabique* wall panel with th = 5 mm

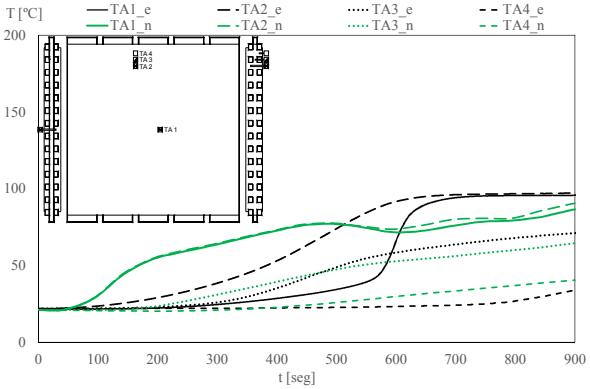
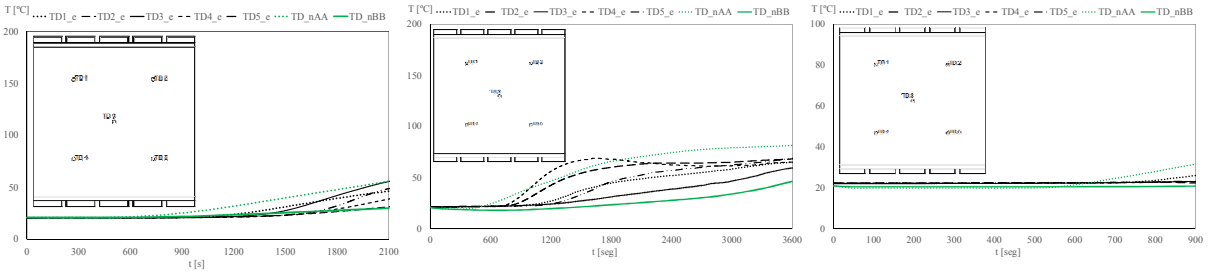


Fig. 23 - Time-temperature history on wood structure, *tabique* wall panel with th = 5 mm

Concerning the 5 mm thick mortar layer, it can be seen in Fig. 22 that thermocouples TM1 and TM4 recorded the highest temperatures of approximately 100°C. Regarding the thermocouples located near the unexposed surface, 17.5 mm deep, the temperature remained practically unchanged. With reference to earth-based mortar (Fig. 23), the higher temperatures of about 80°C were recorded near to the fire exposed side. The lowest temperature (about 50°C) was registered at 17.5 mm depth in the mortar.

As regards the numerical simulation, the time-temperature evolution of both earth-based mortar and timber are in accordance with the experimental results. The possibility of numerically reproduce the material moisture release level estimated by the thermocouples TM1 and TM4 has been demonstrated. Some discrepancies between experimental and numerical results may be justified due to the *tabique* wall panel performance and the instrumentation which can be influenced by some internal cracking, by the thermocouples displacement, or even lack of material homogeneity. In general, good agreement was found between the numerical and the experimental results, mainly at the final stage of the experiments.

Fig. 24 shows the temperatures recorded in the thermocouples applied on the unexposed surface of *tabique* wall panels and Fig. 25 depicts the results measured with infrared thermography (IR) at time t = 900 s.

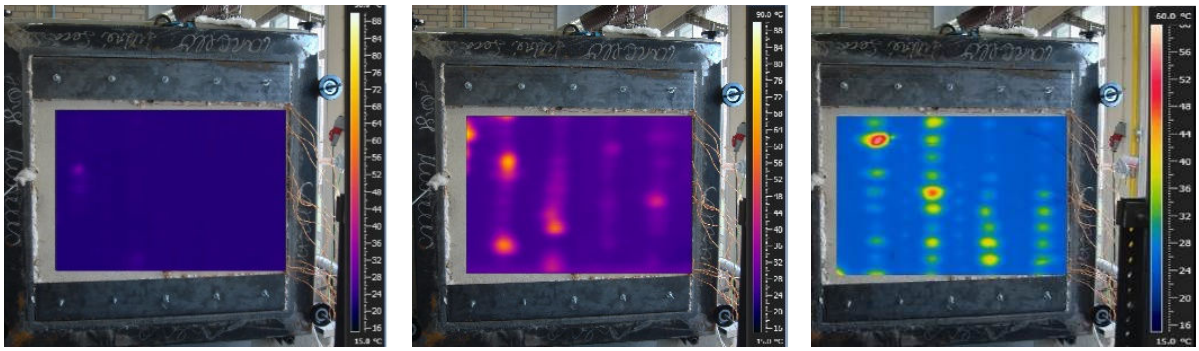


15 mm thick mortar layer 10 mm thick mortar layer 5 mm thick mortar layer

Fig. 24 - Time-temperature history in *tabique* wall panels on TD (unexposed surface) thermocouples

From the analysis of Fig. 24 one can observe that the temperatures of the unexposed surface remained practically unchanged at around 21ºC until t = 900 s. However the wood insulation effect was visible as well as the effect of the different earth-mortar thicknesses considered, see

Fig. 25. At time t = 3600 s, the surface temperature increased up to 80ºC, which means the insulation criteria was fully verified since the average temperature increase in relation to the initial average temperature did not exceed 140°C. Moreover, the maximum temperature at any point of the unexposed surface did not surpass the final temperature of 180°C. Therefore, it can be concluded that the earth-based mortar acted as a fire exposure protecting layer for the wooden structure improving the overall fire performance of this building element.



15 mm thick mortar layer 10 mm thick mortar layer 5 mm thick mortar layer

Fig. 25 - Infrared thermograph patterns of *tabique* wall panels (t = 900 s)

CONCLUSIONS

Experimental results allow the authors to point out that both performance criteria (insulation and integrity) defined according to the European standard for fire resistance tests were fulfilled for the whole test duration of the three *tabique* wall panels.

The insulation criteria verification was conducted according to the relation between the average temperature increase and the average initial temperature, which was not higher than 140°C. Moreover, the maximum temperature at any point of the unexposed surface did not exceed the final temperature of 180°C, above the initial average.

The integrity criteria was observed throughout the experiments by employing a cotton wool pads saturated in ethyl alcohol. No flame or ignitions of the cotton have been identified. However, a significant amount of smoke release from burning wood was noticed at final stage of the test.

The earth-based mortar acted as a fire protection layer to the wooden structure improving significantly the fire resistance of this building construction element.

The numerical temperatures show good agreement with experimental results. The numerical models were validated experimentally, so it was possible to calibrate and adjust the material properties used in *tabique* wall panels performed.

The obtained results have proved to be persuasive both at experimental and numerical levels, since they allow to improve the knowledge on *tabique* walls behaviour subjected to fire conditions and one can predict the time before collapse, increasing both people and property safety.

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