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RESEARCH CENTRE FOR MECHANICS OF MATERIALS AND STRUCTURES SAFETY – *CEMSIG*

GENERAL PRESENTATION

CEMSIG research centre was founded in 1999, and was accredited in 2001 by National University Research Council (CNCSIS) as Centre of Excellence. In 2006 it was reaccredited as Centre of Excellence, being the only such centre at the Politehnica University of Timisoara and one of the two excellence centres accredited in the field of engineering in Romania. The centre is actively involved in research at both national and European level. Significant research projects carried out in the past years include the European project (FP4) COPERNICUS "RECOs" - "Reliability of Moment Resistant Connections of Steel Building Frames in Seismic Areas", the World Banc/CNCSIS project "Reliability of Buildings Located in Strong Seismic Areas in Romania", the FP6 project "Earthquake protection of historical buildings by reversible mixed technologies" and, CEEX MATNANTECH "Structural systems and advanced technologies for structures from high-performance steels for buildings located in high-seismicity areas - STOPRISC". Currently the RFCS "High Strength Steel in Seismic Resistant Building Frames - HSS-SERF" projects is underway. The master courses "Advanced design of steel and composite structures" and "Structures" are closely connected to the CEMSIG research centre. Members of the research centre are actively involved in teaching and tutoring of master student research.

OBJECTIVES

CEMSIG research centre pursues development of the structure, competence and acting capability necessary to promote new technologies, research services, expertise, technical assistance and training of qualified specialists in the field of materials used in engineering structures, especially from the point of view of their mechanical characteristics that affect structural response and safety under static and dynamic loading. Research competence and capabilities are strengthened through a national and international partnership, especially through cooperation with universities in the frame of European Union Programmes. CEMSIG offers research services and technology transfer for industry partners, and supports doctoral and master activities by integrating them into research activities and providing the necessary financial and material support. The centre develops and diversifies the consulting activity and industry oriented research in

partnership with national and international private companies.

MAIN RESEARCH FIELDS

➤ ***Performance of steel, timber and composite steel-concrete structures under exceptional actions***

Keywords: steel, composite, structural systems, seismic, fire, impact, explosions, performance-based design, moment-resisting frames, concentrically braced frames, eccentrically braced frames, connections, ductile materials, high-performance steel

➤ ***Light gauge steel structures***

Keywords: thin-walled cold-formed elements, stability, shear walls, numerical simulations, connections, lightweight pitched roof portal frames

➤ ***Sustainable building design and technology***

Keywords: sustainability, environment, energy consumption, technological solutions, life-cycle

➤ ***Safety in operation and rehabilitation of existing highway and railway bridges***

Keywords: existing steel structures, verification, safety in operation, rehabilitation, fracture mechanics, fatigue

➤ ***New solution for composite bridges and new technologies for bridges***

Keywords: friction stir welding, aluminium alloys, embedded girders, modern composite bridges, lightweight bridges

Research in **PERFORMANCE OF STEEL, TIMBER AND COMPOSITE STEEL- CONCRETE STRUCTURES UNDER EXCEPTIONAL ACTIONS**

FIELD DESCRIPTION

Performance of steel and composite steel-concrete structures is addressed in terms of strength, stiffness, and ductility at global and local levels, including material behaviour. Exceptional actions refer to earthquakes and fire. Earthquake resistant design of structures improves continuously as a result of experimental and analytical research, as well as experience and observations gained after new earthquakes. One of the latest trends in seismic design of structures is the Performance-Based Design, which requires assurance of a set of controlled performance levels under a corresponding set of earthquake intensities.

Performance-Based Design aims at reducing both structural and non-structural damage under multiple performance objectives. Strengthening of historical buildings in seismic areas using reversible mixed technologies, mainly based on metal devices is a new research area addressed by the CEMSIG team. Analytical and experimental investigations on high-performance steel for use in earthquake-resistant structures are underway.

ACTIVITIES

- Use of high-performance steel for earthquake-resistant multistorey steel structures.
- Strengthening of existing masonry and reinforced concrete buildings with steel-based reversible mixed technologies.
- Fire resistance of steel and composite steel-concrete structures.
- Experimental investigation of reinforced concrete frames strengthened with buckling-restrained braces.
- Development of a structural assessment laboratory for large scale tests.
- Evaluation of safety of existing structures.

RESEARCH TEAM

- Prof. Dan Dubina, PhD., Dr.HC., FIStructE (Steel and composite steel-concrete structures and characterisation of their response under exceptional actions)
- Prof. Daniel Grecea, PhD (Performance-Based Design, beam-column joints in moment-resisting frames, rehabilitation of existing buildings)
- Assoc. prof. Raul Zaharia, PhD (Fire design, High-Performance Steel)
- Assoc. prof. Florea Dinu, PhD (Performance-Based Design, High-Performance Steel)
- Assoc. prof. Aurel Stratan, PhD (Earthquake-resistant steel structures, dual structures, eccentrically braced frames)
- Assoc. prof. Adrian Ciutina, PhD (Steel and composite structures)
- Lect. Dan Pintea, PhD (Fire design)
- Lect. Adrian Dogariu, PhD (Strengthening of masonry and reinforced concrete structures with steel materials, FEM analysis)
- Researcher Sorin Bordea (Strengthening of masonry and reinforced concrete structures with steel materials)
- Researcher Calin Neagu (Seismic performance of structures with steel plate shear walls)
- Researcher Gelu Danku (Plastic rotation capacity of composite steel-concrete members and connections)
- Researcher Norin Filip-Vacarescu (Seismic performance of steel concentrically braced frames equipped with friction dampers)

- PhD. student Cristian Vulcu (Robustness of composite multi-storey structures realised using high-strength steel under extreme actions)
- PhD. student Ana-Maria Pop (Development of connection database)
- PhD. Student Adriana Ioan (Seismic resistant re-centering eccentrically braced steel frames with removable bolted links)

RESEARCH OFFERS

- Monotonic and cyclic testing of materials and structural subassemblies
- Advanced static and dynamic analysis of structural systems
- Consulting and design
- Technical expertise for seismic strengthening of existing building structures
- Fire design of steel and composite steel-concrete structures

RESULTS

RESEARCH PROJECTS

1. RFSR-CT-2009-00024 / 2009-2012 *High Strength Steel in Seismic Resistant Building Frames - HSS-SERF*, Financing authority / Beneficiary: European Commission - Research Fund for Coal and Steel, Value: 40,000 EUR (Total value: 169,560 EUR) RFS2-CT-2011-00025/ 2011-2013 *Membrane action in fire design of composite slab with solid and cellular steel beams*, Beneficiary: European Union, Value: 5,000 EUR (Total value: 1,064,657 EUR)
2. 209-1-LU1-LEO 05-00219 / 2009-2011 *FRACOF+ Fire resistance assessment of partially protected composite floor*, Beneficiary: European Union, Value: 5,352 EUR (Total value: 22,300 EUR)
3. 425 (BC124) / 2009-2011. *Global structural analysis of steel structures according to SR EN 1993-1-1. Recommendations for design, commentary and worked examples*, Financing authority / Beneficiary: MDLPL (Ministry of Regional Development and Housing). Value: 31,654 RON (Total value: 158,270 RON)
4. 426 (BC125) / 2009-2011. *Analysis and design of joints in steel structures according to SR EN 1993-1-8. Recommendations for design, commentary and worked examples*, Financing authority / Beneficiary: MDLPL (Ministry of Regional Development and Housing). Value: 24,752 RON (Total value: 123,760 RON)
5. 76/2011. Numerical simulations and experimental testing of subassemblies from the 4S+P+17+E building in Bucharest, B-dul Corneliu Coposu, nr. 6-8, sector 3, Financing

authority / Beneficiary: DMA ARCHITECTURE.
Value: 111,600 RON (Total value: 111,600 RON)

6. BC79/04.07.2011. Testing and validation of tube braces and their connections from the Smart Park building in Bucharest, Financing authority / Beneficiary: SC Popp & Asociatii SRL Value: 19,667 RON (Total value: 78,667 RON).

PUBLISHED PAPERS

1. A. Ciutina, A. Stratan: *Cyclic performances of shear connectors*. 6th International Conference on Composite Construction in Steel and Concrete; Tabernash, ISBN 978-078441142-1, pp. 52-64.
2. A. Dogariu, D. Dubina: *Verificarea de rezistență și stabilitate a structurii metalice a centralelor eoliene*. Buletinul AICPS, ISSN 2067-4546, nr. 1-2/2011, pp. 72-90.
3. A. Ioan: *Seismic response of dual steel eccentrically braced frames with removable links*: The 2nd Conference of the Young Researchers, 17-18 November 2011, Bucharest, Romania. Scientific Journal - Mathematical Modelling in Civil Engineering, vol.7, no.4, pp. 101- 110, ISSN 2066 – 6926.
4. C. Neagu, F. Dinu, D. Dubina: *Criteria de performanță pentru structuri cu panouri disipative din oțel*. Buletinul AICPS, ISSN 2067-4546, nr. 1-2/2011, pp. 35-43.
5. C. Neagu, F. Dinu, D. Dubina: *Global performances of multistory frames of steel shear walls*. Proceedings 6th European Conference on Steel and Composite Structures. ISBN: 978-92-9147-103-4, pp. 1150-1156.
6. C. Neagu, F. Dinu, D. Dubina: *Seismic performance of steel plate shear wall structures*. Pollack Periodica, ISSN 1788-1994, 6(1), pp. 47-58.
7. C. Vulcu, A. Stratan, A. Ciutina, D. Dubina: *Beam-to-Column Joints for Seismic Resistant Dual-Steel Structures*, Pollak Periodica, Vol. 6, No. 2, ISSN 1788-1994, pp. 49–60.
8. C. Vulcu, A. Stratan, D. Dubina: *Evaluation Of Welded Beam-to-CFT Column Joints*, Proc. of the 6th European Conference on Steel and Composite Structures, EUROSTEEL 2011, Budapest, Hungary, 31 August – 2 September, 2011, ISBN 978-92-9147-103-4, pp 489-494.
9. C. Vulcu: *Beam-to-Column Welded Joints of CFT High Strength Steel RHS Columns*, Mathematical Modeling in Civil Engineering, ISSN 2066-6926, pp. 227-234.
10. D. Dubina, A. Stratan, F. Dinu: *Re-centring capacity of dual-steel frames*. Steel Construction. Design and Research, ISSN 1867-0520, 4(2), pp. 73-84.
11. D. Dubina, F. Dinu: *Climate change effects on the robustness of building stock*. Proceedings of the International Conference: Sustainability of Constructions – Towards a better built environment. 3-5 February 2011, Innsbruck, Austria. ISBN: 978-999957-816-0-6, pp. 395-400.
12. D. Dubina, F. Dinu: *Robustness based structural design: an integrated approach for multi-hazard risk mitigation*. 3rd International Workshop on Performance, Protection and Strengthening of Structures under Extreme Loading – PROTECT2011, 30.08-01.09.2011, Lugano, Switzerland, Trans Tech Publications, Applied Mechanics and Materials. ISBN: 1660-9336, pp. 770-777.
13. D. Dubina, S. Bordea, F. Dinu: *Experimental and numerical investigation of nonseismic reinforced concrete frames strengthened with concentric steel braces*. Computational Methods in Structural Dynamics and Earthquake Engineering, ISBN 978-94-007-0052-9, pp. 11.
14. D. Dubina: *Experimental evaluation of q-factor*. Proceedings of the 7th National Conference on Steel Structures, Volume 1, 1 oct. 2011, Volos, Grecia. ISBN: 978-973-625-849-7, pp. 103-122.
15. D. Dubina: *Thin-walled structures*. Steel Construction. Design and Research, ISSN 1867-0520, 4(2011), pp. 213-214.
16. D. Grecea, D. Dubina, N. Muntean: *Beam-to column joints of bolted extended end-plate. Influence of T-stub failure mode on the global performance*, EUROSTEEL 2011, 6th European Conference on Steel and Composite Structures, 31 Aug. – 2 Sept. 2011, Budapest, Hungary, ISBN 978-92-9147-103-4, pp. 201-206.
17. D. Pinte, R. Zaharia: *Algorithm and program for the temperature analysis in a fire compartment*. Recent researches in Artificial Intelligence, Knowledge Engineering and Data Bases - 10th Wseas International Conference on Artificial Intelligence, AIKED'11, ISBN 978-960-474-273-8, pp. 334-339.
18. F. Dinu, C. Neagu, D. Dubina: *Evaluation of dissipative capacity of steel frames of steel shear walls*. Computational Methods in Structural Dynamics and Earthquake Engineering, ISBN 978-94-007-0052-9.
19. G. Danku, A. Ciutina, D. Dubina: *Influence of shear connection on the development of plastic hinges in composite beams in shear or bending*. Proceedings 6th European Conference on Steel and Composite Structures. ISBN: 978-92-9147-103-4, pp. 1047-1053.

20. G. Danku, A. Ciutina, D. Dubina: *Modelarea articulățiilor plastice în elementele structurale compuse din otel-beton solicitate preponderent la forfecare sau încovoiere*. Buletinul AICPS, ISSN 2067-4546, nr. 1-2/2011, pp. 44-52.
 21. G. Danku, A. Ciutina, D. Dubina: *Plastic hinges in composite steel-concrete beams of moment resisting and eccentrically braced frames*. Proceedings 6th European Conference on Steel and Composite Structures. ISBN: 978-92-9147-103-4, pp. 1047-1052.
 22. G. Danku, D. Dubina: *Extensive study of plastic hinges in composite steel-concrete members subjected to shear and/or bending*. Pollack Periodica, ISSN 1788-1994, 6 (1), pp. 37-46.
 23. N. Filip-Vacarescu, A. Stratan, D. Dubina: *Behavior of concentrically braced frames with friction dampers*. Computational Methods in Structural Dynamics and Earthquake Engineering, ISBN 978-94-007-0052-9, pp. 15.
 24. N. Filip-Vacarescu, A. Stratan, D. Dubina: *Behaviour of concentrically braced frames with friction dampers*. Pollack Periodica, ISSN 1788-1994, Vol. 6, No. 3, pp. 59-71.
 25. N. Filip-Văcărescu, A. Stratan, D. Dubina: *Cadre metalice contravântuite centric dotate cu amortizori cu frecare*. Buletinul AICPS, ISSN 2067-4546, nr. 1-2/2011, pp. 184-197.
 26. R. Zaharia, D. Dubina, D. Pinte, S. Dan, D. Duma, O. Vassart, B. Zhao: *Evaluarea rezistenței la foc a planșelor compuse protejate parțial*. Orizonturi Universitare, Timisoara, 2011, ISBN 978-973-638-482-0
 27. R. Zaharia, D. Duma, O. Vassart, T. Gernay, J.M. Franssen: *Simplified method for temperature distribution in slim floor beams*. Application of structural fire engineering, Prague, 29.04.2011, ISBN 978-80-01-04798-9, pp. 11-16
 28. R. Zaharia, D. Duma, O. Vassart, T. Gernay, J.M. Franssen: *Simplified fire design for slim floor beams*. 6th European Conference on Steel and Composite Structures, Budapest, Hungary - EUROSTEEL 2011, 31.08-2.09.2011, ISBN 978-92-9147-103-4, pp. 1539-1544
 29. R. Zaharia: *Numerical analysis of slim floor slabs in fire*. Buletinul Institutului Politehnic din Iasi, ISSN 1224-3884, LVII, fasc. 2, pp. 167-173.
 30. R. Zaharia: *Numerical model for steel-concrete composite slabs in fire, considering the membrane effect*. Buletinul Institutului Politehnic din Iasi, ISSN 1224-3884, LIV, fasc. 3, pp. 142-148.
- PhD THESES**
- Calin Neagu: *Seismic performance of steel building frames of dissipative shear walls*, PhD supervisor Prof. Dan Dubina
 - Gelu Danku: *Development of plastic zones and evaluation of rotation capacity in composite steel-concrete members and connections*, PhD supervisor Prof. Dan Dubina
 - Nicolae Muntean: *Behaviour of connections of realised from high-strength steel subjected to seismic loading*, PhD supervisor Prof. Dan Dubina
 - Norin Filip-Vacarescu: *Seismic performance of steel centrally braced frames equipped with friction dampers*, PhD supervisor Prof. Dan Dubina
- ONGOING PhD THESES**
- Cristian Vulcu: *Robustness of composite multi-storey structures realised using high-strength steel under extreme actions*, PhD supervisor Prof. Dan Dubina
 - Iordan Gabriela: *Rehabilitation of historical buildings*, PhD supervisor Prof. Daniel Grecea
 - Ana-Maria Pop: *Development of connection database*, PhD supervisor Prof. Daniel Grecea
 - Tatuca Leia: *Passive systems for the protection of existing buildings*, PhD supervisor Prof. Daniel Grecea
 - Adriana Ioan: *Seismic resistant re-centering eccentrically braced steel frames with removable bolted links*, PhD supervisor Prof. Dan Dubina
- OTHER RESULTS**
- ERASMUS programmes promoting student and teaching staff mobility with University Blaise Pascal of Clermont-Ferrand, University of Naples, University of Salerno and University of Liege
 - Membership in the European Programme COST TU0601: *Robustness of Structures*.
 - Membership in Technical Committee TC10 "Structural Connections" of ECCS (*European Convention for Constructional Steelwork*) – Dan Dubina and Daniel Grecea.
 - Membership in Technical Committee TC13 "Seismic Design" of ECCS (*European Convention for Constructional Steelwork*) – Dan Dubina, Aurel Stratan and Florea Dinu.
 - Membership in Technical Committee TC3 "Fire Design" of ECCS (*European Convention for Constructional Steelwork*) – Raul Zaharia and Dan Pinte.

FURTHER DEVELOPMENTS

- Dual structures with removable dissipative members and re-centring capability
- Performance-based design of steel and composite structures
- Dissipative systems for strengthening of masonry and reinforced concrete buildings with metallic systems
- Development of analytical procedures for prediction of rotation capacity beam-column joints in moment-resisting frames
- Earthquake performance of steel structures realised from high-performance steel
- Seismic protection of structures using additional damping devices

CONTACT PERSONS

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EXAMPLES

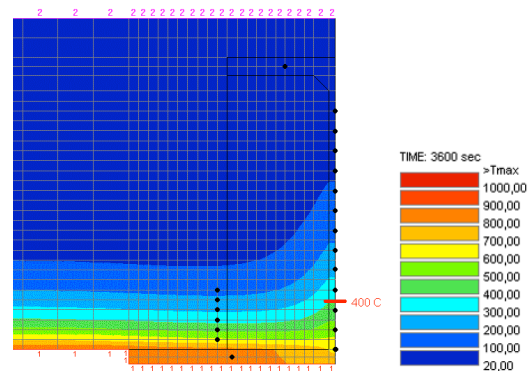
1. Simplified fire design for Slim Floor beams

The Slim Floor system is a fast and economical solution which combines prefabricated or casted concrete slabs with built-in steel beams. The particular feature of this system is the special kind of girder with a bottom flange which is wider than the upper flange, thus being possible to fit the floor slabs directly onto the bottom flange plate of the beam. The result is a reduced height of the slab and a considerable degree of fire resistance, without supplementary fire protection, considering that the steel beam, excepting for the bottom flange, is integrated in the concrete slab.



Slim Floor system

The composite action is usually neglected in the calculation of the plastic design bending moment. The beams may be then calculated as steel elements and not as composite steel-concrete elements, taking into account also, of course, the reinforcement above the bottom flange, if it is provided. On the other hand, due to the presence of the concrete, the temperatures in the steel beams are not uniform, and a proper temperature distribution should be considered when calculating the fire resistance. In order to propose a simple method to evaluate the temperatures in a Slim Floor system exposed to ISO fire, a parametric study was done, based on numerical simulations. The aim was to determine the temperature in different points from the cross-section by means of simple equations, and to find a simple analytical method to calculate the plastic design bending moment in fire situation.



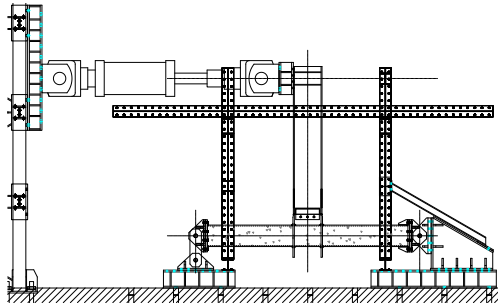
Temperature distribution - points analysed on the cross-section

2. Welded beam-to-column joints in moment-resisting dual-steel frames (HSS-SERF project)

The objective of the experimental tests is the pre-qualification by tests of welded connections in moment resisting frames and dual braced frames designed using the dual-steel concept. Within the experimental program, the following parameters are to be investigated: (1) Dual steel concept (two combinations of HSS/MCS); (2) Composite steel-concrete action of the concrete filled high strength steel tubes; (3) Behaviour of the connection; (4) Efficiency of the shot fired nails.

Experimental tests on large specimens will be performed in order to demonstrate that joint detailing (8 configurations) and welding technology perform adequately under seismic loading (reverse

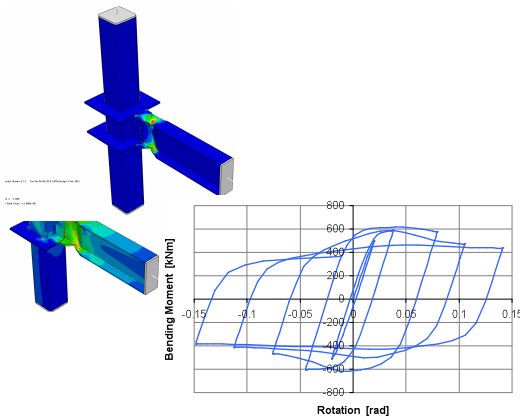
cyclic loading in the inelastic range). The main purpose is to obtain plastic deformations in the beam (8 specimens) and in the connection zone (8 specimens).



Experimental setup of the joint specimen

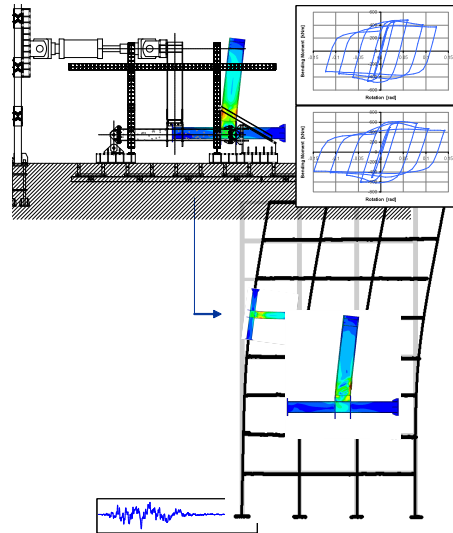
For the experimental tests on beam-to-column joints, the shot fired nails will be used for load introduction and also to improve the behaviour of the column panel zone by a better bond between concrete and steel.

FEM analysis using ABAQUS software was performed in order to validate the design of joints, to identify weak spots in the experimental tests and to assess the behaviour under cyclic loading.



Stress distribution, plastic strain and moment-rotation hysteretic loops – RBS specimens

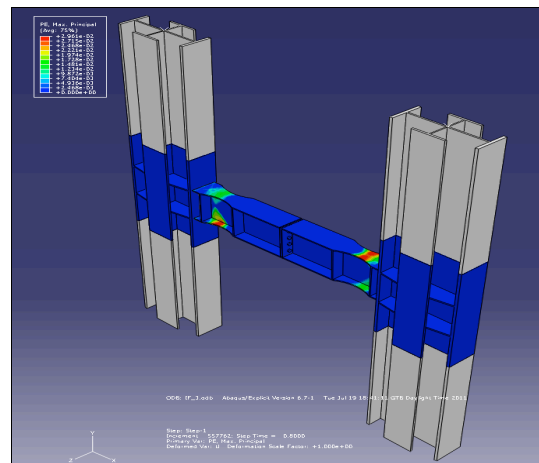
Seismic performance and robustness analyses of the structures will be performed, using joint characteristics obtained from experimental tests and numerical simulations.



Research overview: experimental investigation, numerical simulations and evaluation of the seismic performance and robustness

3. Reduced beam section connections for steel frames

Beam ends of MR frames are typically designed for plastic hinge development under seismic action. Seismic design code P100-1/2006 requires such detailing and hierarchy of components that plastic deformations of the welds should be avoided. This may be accomplished by reducing the beam section at a certain distance from the column face - reduced beam section connection.



Numerical simulation results: maximum principal stress

The research program aimed at evaluating the performances of reduced beam section connections for multi story steel frame with short beams. When beams are short, reduced beam section zone is under the combined action of bending moment and shear force, which might reduce the plastic deformation capacity.

The research program employed numerical analysis and experimental test on different full scale beam to column sub-assemblies.

In the second part of the program, four full scale beam-column sub-assemblies will be tested under cyclic loading to validate the reduced beam section detail and to evaluate the plastic rotation capacity of such joints.



Test set-up

Research in **LIGHT GAUGE STEEL STRUCTURES**

FIELD DESCRIPTION

Light-gauge steel profiles are class 3 and 4 welded sections and cold-formed members and sheeting. Beside the classical structural problems characterising hot-rolled profiles, light-gauge steel sections are prone to local instability phenomena, involving reduction in section strength, poor post-elastic capacity and ductility, and high sensitivity to geometrical imperfections. However, these materials have important technical and economical advantages, and the sector of light-gauge steel structures is one of the most dynamic in the field. In order to promote light-gauge steel structures, instability problems and connecting technology and performance have to be carefully managed. These problems are even more important in case of structures located in seismic areas, such as Romania.

The research activity on light-gauge profiles is focused in three main directions: (1) buckling of members under compression and/or bending; (2) performances of structures made of light-gauge profiles under earthquake loading and (3) the promotion of new structural solutions where the advantages of light-gauge profiles can be fully exploited.

ACTIVITIES

- Seismic performance of pitched-roof portal frames with elements of class 3 and 4 cross-sections.

- FE modelling of the buckling phenomenon for compression and bending members
- FE investigations on the seismic performance of light-gauge steel houses
- Evaluation of post-elastic strength and ductility of cold-formed steel members and joints.
- Experimental and numerical evaluation of structural components for pallet racking system.

RESEARCH TEAM

- Prof. Dan Dubina, PhD., Dr.HC., FIStructE (Light gauge steel structures)
- Assoc. prof. Mircea Georgescu, PhD, MIStructE, (Stability of cold-formed steel members)
- Assoc. prof. Raul Zaharia, PhD (Connections in cold-formed steel structures)
- Assoc. prof. Daniel-Viorel Ungureanu, PhD (Stability of cold-formed steel members)
- Lect. Ionel-Mircea Cristutiu, PhD (Lightweight steel portal frames)
- Researcher Andrei Crisan (Cold-formed pallet racking systems)
- PhD. student Iulia Tuca (Retrofitting with light steel structures)

RESEARCH OFFERS

- Advanced stability and nonlinear static and dynamic analysis of thin-walled steel members and structures
- Buckling and material testing
- Testing of structural subassemblies and connections
- Full-scale testing

RESULTS

RESEARCH PROJECTS

1. 424 (BC123) / 2009-2011. Stability check of structural steel members *according to SR EN 1993-1-1. Recommendations for design, commentary and worked examples*, Financing authority / Beneficiary: MDRT (Ministry of Regional Development and Tourism). Value: 28,560 RON (Total value: 142,800 RON)
2. 479 (Bc 04)/ 2011-2012. *National Annex for application of EN 1993-1-6*. Financing authority / Beneficiary: MDRT (Ministry of Regional Development and Tourism). Value: 76,434.84 RON (Total value: 100,440 RON)
3. 480 (Bc 05)/ 2011-2012. *National Annex for application of EN 1993-1-12*. Financing authority / Beneficiary: MDRT (Ministry of Regional Development and Tourism). Value: 76,434.84 RON (Total value: 100,440 RON)
4. 481 (Bc 06)/ 2011-2012. *National Annex for application of EN 1999-1-4*. Financing authority

- / Beneficiary: MDRT (Ministry of Regional Development and Tourism). Value: 101,913.12 RON (Total value: 133,920 RON)
5. 11/09.08.2010 (2010-2013) *Stability of steel frames made of elements with variable sections: influence of imperfections and lateral restraints*. Financing authority / Beneficiary: MECTS (Ministry of Education Research and Innovation). Value: 74,106 RON (Total value: 616,197 RON)
 6. 65/01.07.2009 (2009-2011) Experimental testing of structural components for pallet rack storage solutions. Financing authority / Beneficiary: SC Dexion HI-LO Storage Solutions SRL. Value: 51,367 RON (Total value: 26,661 RON)
- PUBLISHED PAPERS**
1. A. Crisan, V. Ungureanu, D. Dubina: *Behaviour of cold-formed perforated sections in compression. Part 1 – experimental investigations*. 6th International Conference on Thin Walled Structures, Timișoara, Romania, 4-6 septembrie 2011, VOLUM 2. ISBN: 978-92-9147-102-7, pp. 795-804,
 2. A. Crisan, V. Ungureanu, D. Dubina: *Ultimate Limit Strength of Pallet Racks Uprights*. Pollack Periodica, ISSN 1788-1994, pp. 3-16.
 3. A. Crisan, V. Ungureanu, Dan Dubina: *Behaviour of cold-formed perforated sections in compression. Part 2 – numerical investigation*. 6th International Conference on Thin Walled Structures, Timișoara, Romania, 4-6 septembrie 2011, VOLUM 2. ISBN: 978-92-9147-102-7, pp. 805-902.
 4. A. Dogariu, D. Dubină: *Verificarea de rezistență și stabilitate a structurii metalice a centralelor eoliene*. Buletinul AICPS, ISSN 2067-4546, nr. 1-2/2011, pp. 72-90.
 5. D. Dubina, V. Ungureanu, A. Crisan: *Interactive Buckling of Cold-Formed Steel Sections Applied in Pallet Rack Upright Members*. Annual Seminar in Aarhus, Denmark, 12-13 October 2011, VOLUM 1. ISBN: 978-951-784-556-4, pp. 3-18.
 6. D. Dubina, V. Ungureanu, A. Crișan: *Interactive Buckling Strength of Perforated Cold-Formed Steel Sections*. Proceedings 6th European Conference on Steel and Composite Structures. ISBN: 978-92-9147-103-4, pp. 129-135.
 7. D. Dubina, V. Ungureanu, A. Crisan: *Proiectarea și verificarea structurilor pentru depozite paletizate*. Buletinul AICPS, ISSN 2067-4546, nr. 1-2/2011, pp. 172-183.
 8. D.L. Nunes, I.M. Cristutiu: *Advanced nonlinear analysis of single storey steel frames made by elements with variable cross section*, Mathematical Modelling in Civil Engineering, Scientific Journal, Vol 7, No.4, Dec. 2011.
 9. I.M. Cristutiu, D.L. Nunes, A. Dogariu: *Buckling of laterally restrained steel structural elements with variable cross section considering initial imperfections*. Proceedings of EUROSTEEL 2011, August 31 - September 2, 2011, Budapest, Hungary.
 10. I.M. Cristutiu, D.L. Nunes, A. Dogariu: *Experimental study on laterally restrained steel columns with variable I cross sections*, Proceedings of the 2011 World Congress on Advances in Structural Engineering and mechanics ASEM11, Seoul, Korea.
 11. I.M. Cristutiu, D.L. Nunes: *Influence of lateral restraints on the behaviour of thin walled welded elements with variable cross section*, Proceedings of the 6th International Conference on Thin Walled Structures, September 05-07, 2011, Timisoara, Romania.
 12. I.M. Cristutiu, D.L. Nunes: *Local and global stability of single storey frames made of welded plate elements with tapered web*, Acta Technica Napocensis: Civil Engineering & Architecture Vol. 54 No.1 (2011).
 13. M. Georgescu, V. Ungureanu, D. Dubina: *Diphragm effect in sandwich panel roofing - Experimental approach* -EUROSTEEL 2011-6th European Conference on Steel and Composite Structures, Budapest, Hungary, 2011, vol. A, pp.165-170.
 14. M. Georgescu, V. Ungureanu: *Full scale experimental arrangement for assessing the lateral-torsional stability of Z purlins continuously connected to sandwich panel roofs* 6th International Conference on Thin-walled Structures – Recent Research Advances and Trends, Timisoara / Romania, 5-7.09.2011 pp. 1065-1072.
 15. M. Kotelko, V. Ungureanu, D. Dubina, M. Macdonald: *Plastic strength of thin-walled plated members—Alternative solutions review*, Thin-Walled Structures 49(5), ISSN 0263-8231, 636-644.
 16. Zs. Nagy, D. Dubina, V. Ungureanu: *Application of component method – Bolted joints for low rise multi-storey cold-formed steel framed structures*. Proceedings of the 6th European Conference on Steel and Composite Structures. ISBN: 978-92-9147-103-4, pp. 273-278.
- PhD THESES**
- Andrei Crisan: *Stability of light gauge thin-walled structures for pallet rack systems*, PhD supervisor Prof. Dan Dubina
- ONGOING PhD THESES**
- Iulia Tuca: *Retrofitting of precast concrete buildings using light steel structures*, PhD supervisor Prof. Dan Dubina

OTHER RESULTS

- Membership in Technical Committee TC7 "Cold Formed Thin Walled Sheet Steel in Building" of ECCS (*European Convention for Constructional Steelwork*) – Dan Dubina and Viorel Ungureanu and Mircea Georgescu.
- Membership in Technical Committee TC8 "Structural Stability" of ECCS (*European Convention for Constructional Steelwork*) – Dan Dubina.

FURTHER DEVELOPMENTS

- Influence of residual stresses on the ultimate capacity of cold-formed steel members
- Strength and ductility of thin-walled steel sections and structural systems under monotonic and cyclic loading
- Built-up cold-formed steel beams with corrugated web
- Post-elastic capacity of Z purlins with overlapped joints
- Diaphragm effect of sandwich panel roofing: full scale testing Shear walls from cold-formed steel cassettes
- Specific buckling curves for pallet racking members in compression and bending

CONTACT PERSONS

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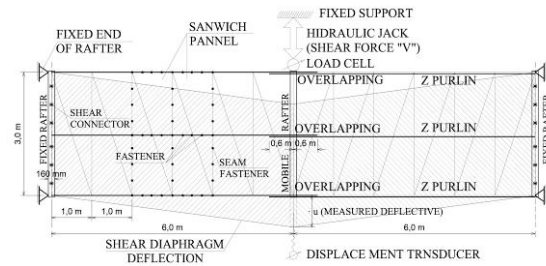
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EXAMPLES

1. Full scale testing on diaphragm effect induced by sandwich panel roofing supported by overlapping Z purlins

Sandwich panels are very frequently used in practice as roofing elements, owing to their well known advantages in terms of erection speed and simplicity. As a matter of fact, many investors and constructors specifically ask for the use of this particular solution when planning an industrial building. On this line of interest, evaluating as many components as possible from panel overall behavior within the roofing system is of major importance in authors' opinion, leading to a realistic design. Therefore, the presented research is focusing on the diaphragm effect

produced at the roof level by the employed panels, connected to thin walled cold formed Z purlins by means of self screwing, self tapping fasteners.

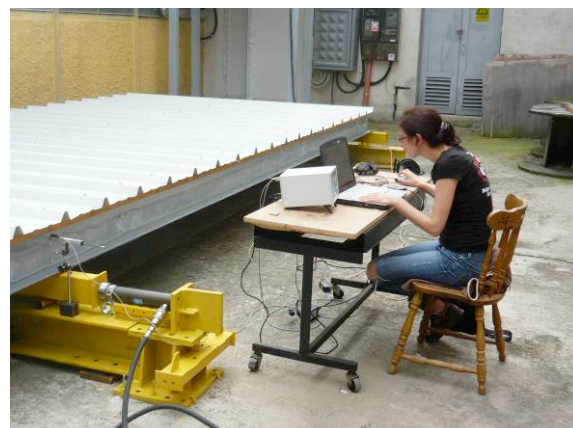


Full scale arrangement (scheme and practice)

An experimental arrangement is proposed by the authors, aiming to evaluate the relevant components of the studied panel (made of sandwich elements, Z profiles and hot rolled steel profiles) which influence roofing behavior and in-plane stiffness.

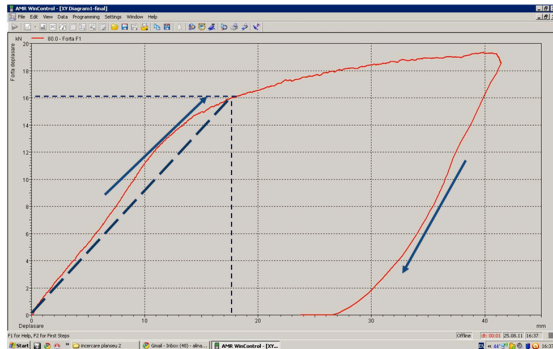


Experimental equipment used by testing



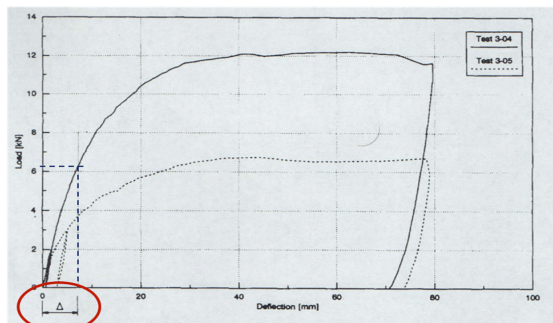
Data acquisition process by testing

Some beneficial results might come out if relevant diaphragm effect is proved to exist, allowing for roof bracing reduction or to account for stiffer building structure in design.



Force-displacement plot obtained by testing

The force-displacement curve plotted by testing has been compared to similar results produced by other researchers:



Similar plot by Baehre & Ladwein

The research procedures and testing are going on with a view to demonstrate sandwich panel role and contribution to the roofing diaphragm effect.

2. Testing program – Ultimate capacity of beam-column elements with tapered web applying different type of lateral restraints.

Three specimens of each configuration were tested, finally resulting in a number of six experimental tests. The difference between the tests, for each specimen, was the provided type of lateral restraints. Three of the specimens had 8 mm tapered web (C1-8) and the other three were designed with 6 mm tapered web (C2-6). The types of lateral restraints considered for each specimen configuration were: (NR) – no restraints, (LR) – lateral restraints; and (TR) – torsional restraints respectively. Lateral restraints (LR) were provided by thin walled cold formed “Zed” purlins (Z150/1.5 mm), while in the case of torsional restraints (TR) supplementary L50x50x5 fly braces were provided at the compressed flange.



Test arrangement for beam-column tests



Failure of the specimen with 8 mm tapered web

Research in SUSTAINABLE BUILDING DESIGN AND TECHNOLOGY

FIELD DESCRIPTION

The theory of sustainability is relatively new and in continuous development. The increased interest for sustainability in civil engineering had determined a series of measures and specific actions, such as the reduction and even elimination of some polluting methods or materials. The sustainability of civil engineering structures starts first with a so-called “integrated design” through which are searched the best eco-friendly safe structural solutions. The research is focused in finding ways for using the smallest amount of energy for powering the buildings, use of regenerative energy, avoidance of materials that cannot be used after demolition or cannot be assimilated by the environment. The re-equilibration of the ecological balance is done through the design solution. In this way the integrated design in civil engineering represent a safe-economic-sustainable solution, in which the preservation in good conditions of the environment is part of the conceiving process.

ACTIVITIES

- Requirements on building performance and sustainability
- Methods of Performance-based and sustainable design and construction
- Social, cultural and economic aspects in sustainability evaluation
- Clean and lean construction processes
- Performance – based design approach vs. Robustness – based design approach for new and existing buildings subjected to extreme actions
- Sustainable design procedures: interactive and holistic design methods and decision-making tools
- Steel energy-related infrastructures and equipment with a practice oriented approach

RESEARCH TEAM

- Prof. Dan Dubina, PhD., Dr.HC., FISTructE (sustainability of constructions, degradation models, life-time structural engineering)
- Prof. Daniel Grecea, PhD (sustainability of constructions, LCA databases)
- Assoc. prof. Daniel-Viorel Ungureanu, PhD (life-cycle performance, design for durability, demolition and deconstruction, life-time structural engineering)
- Assoc. prof. Adrian Ciutina, PhD (sustainability of constructions, life cycle assessment – LCA, methodologies)
- Assoc. prof. Mircea Georgescu, PhD, MISTructE, (sustainability of constructions, life cycle assessment, construction rating)
- PhD. student Iulia Tuca (sustainability of constructions)
- PhD. student Alexandru Botici (sustainability of constructions)
- PhD. student Mirela Szitar (sustainability of constructions)
- PhD. student Ana-Maria Pop (sustainability of constructions)

RESEARCH OFFERS

- Consulting for sustainable design of buildings
- Life-cycle assessment (LCA)
- Life-cycle cost analysis (LCC)
- Case studies

RESULTS**RESEARCH PROJECTS**

1. 31042/2007-2011 PNCDI2 – PROACTEX. *Structural systems and innovative technologies for protection of buildings under extreme actions taking into account sustainable design criteria.* Financing authority / Beneficiary: ANCS-CNMP. Value: 55,882 RON (Total value: 1,141,606 RON)
2. RFCS-RFS-PR-09075 2010-2013. *SB STEEL: Sustainable building in steel.* Financing authority / Beneficiary: European Commission - Research Fund for Coal and Steel, Value: 31,000 EUR (Total value: 78,300 EUR)
3. 3-002/2011, 2011-2012. *INSPIRE - Integrated strategies and policy instruments for retrofitting buildings to reduce primary energy use and GHG emissions.* Financing authority / Beneficiary: MECTS, Value: 464,400 RON (Total value: 774,000 RON)

PUBLISHED PAPERS

1. M. Georgescu, V. Ungureanu: *Sustainability assessment of a multistory steel structure located in a seismic area.* Proceedings of the COST C25 Seminar, Innsbruck, January 2011.
2. M. Georgescu: *Long span cantilever steel structure-EUROSTEEL 2011 - 6.th European Conference on Steel and Composite Structures, Budapest, Hungary, 2011, vol. C, pp.2157-2162.*
3. D. Grecea, M. Szitar: *Politics for sustainable development – key documents, Proc. of the Int. Conf. Sustainability of Constructions Towards a Better Built Environment, Final Conference of the COST Action C25, 3-5 February 2011, Innsbruck, Austria p. 9-16, ISBN 978-99957-816-0-6*
4. M. Szitar, D. Grecea: *Sustainable building assesment tools and quality of the built environment, Proc. of the Int. Conf. Sustainability of Constructions Towards a Better Built Environment, Final Conference of the COST Action C25, 3-5 February 2011, Innsbruck, Austria p. 9-16, ISBN 978-99957-816-0-6*
5. D. Grecea, V. Ungureanu: *Sustainable policies and approaches: the Romanian case, Integrated Approach towards Sustainable Constructions, Summary Report of the Cooperative Activities, COST Action C25: Sustainability of Constructions, p. 142-147, ISBN 978-99957-816-1-3*
6. V. Ungureanu, A. Ciutina, I. Tuca, D. Dubina, D. Grecea, L.A. Fulop: *Structural and Environmental Performance of Steel Framed Houses: A Case Study, Integrated Approach towards Sustainable Constructions, Summary Report of the Cooperative Activities, COST Action C25: Sustainability of Constructions, p. 395-428, ISBN 978-99957-816-1-3*
7. A.A. Botici, V. Ungureanu, A.M. Botici, D. Dubina: *Interventii structurale pentru reabilitarea functionala a blocurilor de locuinte din panouri mari prefabricate.* Revista AICPS Review 3/2011, ISSN 2067-4546, 3/2011, pp. 53-67.
8. A. Ciutina, V. Ungureanu, D. Dubina, F. Dinu: *Integrated design of buildings.* Proceedings of the International Conference: Sustainability of Constructions – Towards a better built environment. ISBN: 978-999957-816-0-6, pp. 235-246.
9. V. Ungureanu, A. Ciutina, D. Dubina: *Life cycle analysis of a steel framed building in Romania.* Proceedings of the International Conference: Sustainability of Constructions – Towards a better built environment. ISBN: 978-999957-816-0-6, pp. 341-350.
10. I. Tuca, A. Ciutina, V. Ungureanu, D. Dubina: *Solutions for thermal renovation of precast concrete wall panels – Case study.* Proceedings

of the Final Conference in Innsbruck - Sustainability of Constructions Towards a better built environment, COST Action C25, Innsbruck, Austria. ISBN: 978-99957-816-0-6, pp. 509-518.

11. V. Ungureanu, A. Ciutina, D. Dubina: Sustainable steel framed building – Case study. Proceedings 6th European Conference on Steel and Composite Structures. ISBN: 978-92-9147-103-4, pp. 1971-1976.
12. V. Ungureanu, A. Ciutina, D. Dubina: *Analyses of sustainability and environmental impacts of steel framed buildings – example from practice in Romania*. Proceedings of the 9th Nordic Symposium on Building Physics. Volume 3. ISBN: 978-952-15-2576-6, pp. 1347-1354.

OTHER RESULTS

- Membership in the European Programme COST C25: Sustainability of Constructions - Integrated Approach to Life-time Structural Engineering. Two members of the CEMSIG research center (Dan Dubina and Viorel Ungureanu) are members in the management committee of the COST C25 programme.
- Vice-chairman of Working Group WG3: "Life-time Structural Engineering" of COST C25- Viorel Ungureanu.
- Membership in Technical Committee TC14 "Sustainability and Eco-Efficiency of Steel Buildings" of ECCS (*European Convention for Constructional Steelwork*) – Viorel Ungureanu and Daniel Grecea.

PhD THESES

- Mihai Muțiu: *Structural configurations, functional and technical-economical parameters of steel-framed buildings*, PhD supervisor Prof. Dan Dubina

ONGOING PhD THESES

- Iulia Tuca: *Retrofitting of precast concrete buildings using light steel structures*, PhD supervisor Prof. Dan Dubina
- Mircea Sumalan: *Durability and sustainability of steel houses*, PhD supervisor Prof. Dan Dubina
- Dan Stoian: *Structural and functional solutions for "passive" houses*, PhD supervisor Prof. Dan Dubina
- Mirela Szitar: *Collective versus individual housing in the framework of sustainable development in the Banat plane*, PhD supervisor Prof. Daniel Grecea
- Popov Miodrag: *New envelopes for retrofitting of existing buildings*, PhD supervisor Prof. Daniel Grecea

FURTHER DEVELOPMENTS

- Verification methods for durability of steel constructions
- Demolition and deconstruction of buildings
- Sustainable construction assessment and classification system

CONTACT PERSONS

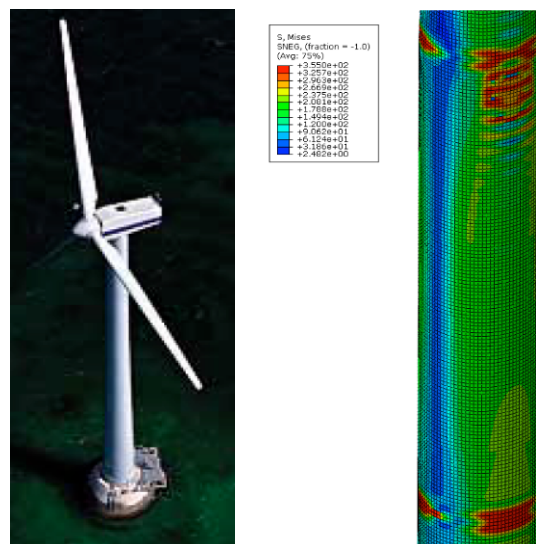
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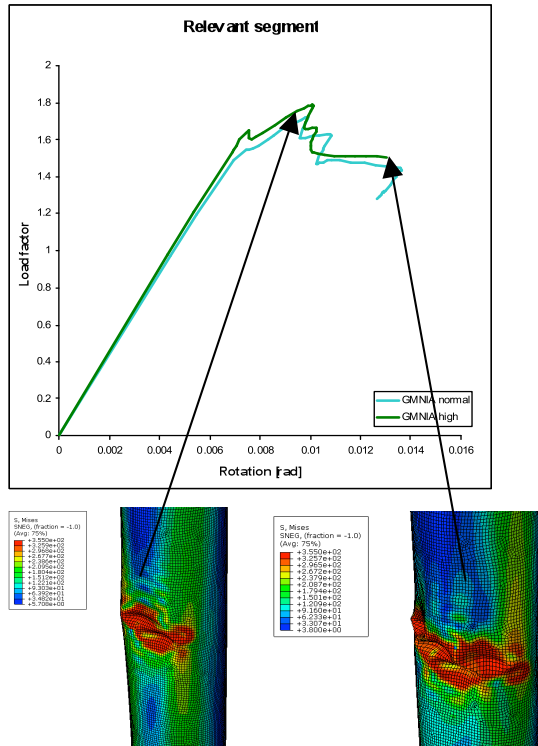
EXAMPLES

1. Wind steel towers: Design by FEM and technological features.

In the European context for promoting non-conventional energy systems, Romania is currently in the first line related to the wind – energy production capacity growing.



Tubular steel wind tower
 (a) general layout; (b) GMNIA FEM analysis results.



Finite element results using GMNIA with different amplitude of imperfection

Currently there are several areas in the country where are in various stages of realization wind parks and farms. The applied solutions for supporting structures are exclusively based on the use of tubular towers equipped with horizontal rotor and most of them are patent solutions. To be apply in Romania all these solutions involves their adaptation to land conditions, climate and seismic loads.

The studies have been focus to summarizes the design principles and consider how the various loading conditions are taken into account when designing the supporting towers according to the European standard IEC61400. Are elaborated study cases in which is detailed and explained the procedure to check the strength and stability of this type of structure in accordance with EN 1993-1-6.

2. Long span cantilever structure suspended on a rocky hill

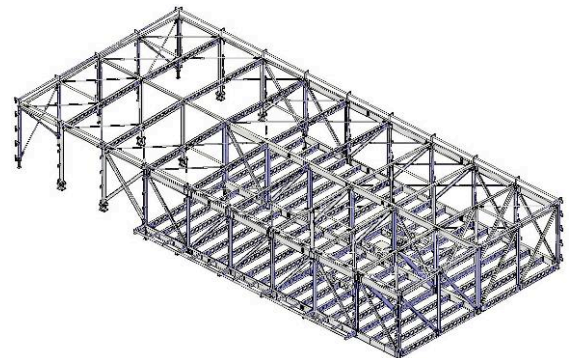
The object of the research is an industrial building, part of a vineyard, located in a rocky zone of Arad County Romania, famous for wine production.

The investor and architect requirements included two distinct zones merged into the building, i.e. a grape processing zone (industrial function) plus a zone with a role of show-room for wine (commercial function). This division has led to locate the building at a height of 14.00 m, partially supported by the rocky wall of the hill at one end, while the other end is supported by a reinforced concrete rectangular tower, built near the hill. The show room zone of the

building goes beyond the support tower, being located into a cantilever zone of the structure, having a span of 10,0 m. Thus, most of the building lies in air, creating an impression of “suspension”.



Scale model of assembly



3D image of upper building structure



Present stage of construction

Such distribution of functions, geometry and support system (somehow similar to a bridge) imposed a

longitudinal steel structure of lattice girder type, in order to be able to withstand required loading and allow for deflection control, especially at the top of the cantilever zone. The paper describes some of the problems confronted by the structural engineer during the design phase, also influenced by architectural concepts.



Cantilever of upper building (10,0 m)

Researches in SAFETY IN OPERATION AND REHABILITATION OF EXISTING HIGHWAY AND RAILWAY BRIDGES

FIELD DESCRIPTION

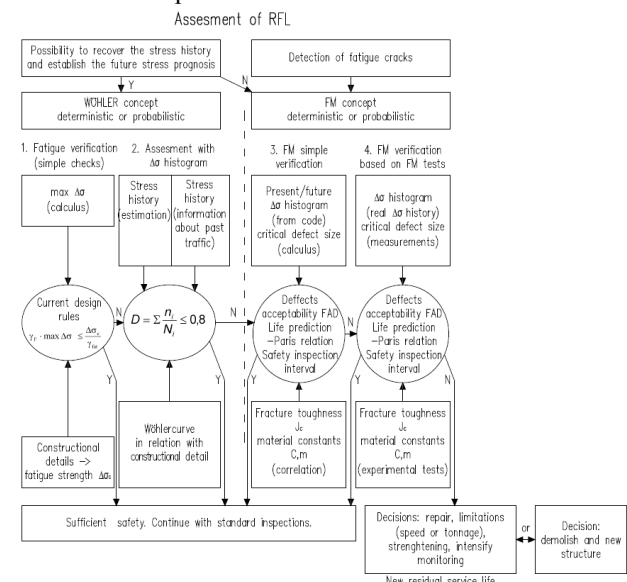
Rehabilitation and maintenance of existing steel bridges is one of the most important actual problems. The infrastructure in Romania and in other East – European countries has an average age of about seventy to ninety years. Many of these structures, particularly railway bridges, have already achieved an age of ninety, hundred or even more years and are still in operation after damages, several phases of repair and strengthening. To maintain these structures is one of the most important tasks of our society. Today, the budget of the administration and the owners (i.e. the railways and highway companies) get smaller. In consequence it is necessary to invest the available money where there will be the greatest benefit. Therefore, those responsible for the decisions need information about the safety of the structure, the remaining life, the costs for maintenance etc. Nobody will take the responsibility for failure of a structure as a result of budget restrictions. During service, bridges are subject to wear. In the last decades the initial volume of traffic has increased.

The present tendency to raise the speed on the main lines to a level of $v \leq 160$ km / h (European corridors) must be emphasized.

There is a big variety of structural types. Most of the bridges are simple supported girders (rarely continuous); depending on the cross section there are deck or trough bridges. The majorities of them are plate or truss girder bridges; other constructive systems like twin girders or embedded girders can also be noticed.

Therefore many bridges require an inspection. The examination should consider the age of the bridge and all repairs, the extent and location of any defects etc. A continuous maintenance, which generally must increase in time, is important in order to assure the safety in operation of the existing structures. The classical fatigue concept is based on the assumption that a constructive element has no defects or cracks. However, discontinuities and cracks in the components of structures are unavoidable, basically because of the material fabrication and the erection of structures. It is very clear that the kind of fatigue cracks, which are initiated by structural non-homogeneity (possible non-metallic inclusions or other impurities), surface defects (including corrosion) and the stress factor, are present in the old riveted structures.

However, from the overall examination of a large number of bridges many defects can be pointed out. The defects are widespread, having a heterogeneous character from the point of view of location, development and development tendency; their amplification was also due to the climate and polluting factors that caused the reduction of the cross section due to corrosion. Statistically, in 283 from among 1090 welded bridges cracks were detected and repaired.



The presence of cracks in structural elements modifies essentially their fracture behavior. Fracture, assimilated in this case as crack dimensions growth process under external loadings, will be strongly influenced by the deformation capacity of material. The FM approach has acceleration in damage increase; with increasing damage a smaller stress

range contribute to the damage increase. Along with the classical method of damage accumulation, a new approach based on the fracture mechanics principles is proposed.

ACTIVITIES

- Processing of experimental crack growth rate for riveted and welded details.
- Fracture mechanics approach based on FM experimental tests in order to establish the crack growth rate.
- Procedure to assess the safety in operation of existing steel bridges – riveted and welded bridges.
- Solutions for rehabilitation of existing highway and railway bridges.

RESEARCH TEAM

- Prof. Radu Băncilă, PhD, (Steel and composite steel-concrete structures and verification of existing steel structures.)
- Assoc. Prof. Edward Petzek PhD, (Steel and composite bridge structures. Verification of existing bridges and assessment of safety in operation of existing steel structures based on FM principles, strengthening and renewing of existing railway bridges).
- Phd. Stud. Silvia Rominu, (Robustness of steel structures)
- Phd. Stud. Anamaria Butisca (Verification of steel bridges)
- Phd. Stud. Luiza Toma (Verification of steel bridges, strengthening and renewing of existing railway bridges)

RESEARCH OFFERS

- Verification of existing steel structures based on modern methods.
- Estimation of the present safety of existing steel railway and highway steel bridges based on fracture mechanics principles.
- Critical details – fracture mechanics models, remaining service life analysis.
- Consulting and rehabilitation of steel bridges.
- Low cost superstructure for the renewal of the existing one.

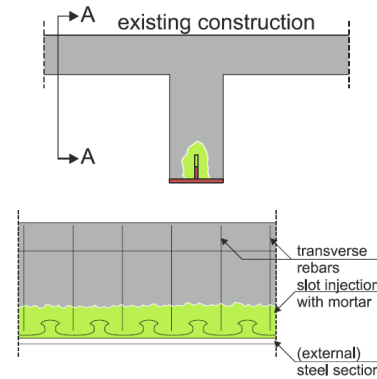
RESULTS

PUBLISHED PAPERS

1. E. Petzek, R. Bancila: *Ertüchtigung der genieteten Stahlbrücken am Beispiel von zwei Straßenbrücken über den Fluss Marosch in Rumänien*, Revista, Stahlbau 2, 2011, pag. 112 – 127, ed. Ernst & Sohn a Wiley Company, Verlag für Architektur und technische Wissenschaften GmbH & Co. KG, Berlin, ISSN 0038-9145.
2. E. Petzek, R. Bancila: Railway / Book 1", ISBN 979-953-307-634-7" chapter „General

principles regarding the rehabilitation of existing railway bridges“, 31 pages.

3. A.M. Butisca, S. Rominu, L. Blaga, R. Gabor: *Study of behavior in times of the Bridge “King Carol I” over the Danube*, Proceedings of 15th International Conference Modern Technologies, Quality and Innovation New face of TMCR Chisinau, Moldova pp.149-153 ISSN:2069-6736.



New solutions: strengthening of existing structures with additional steel sections – external reinforcement

PhD THESES

- Silvia Rominu: *Contribution regarding the improvement of the robustness in the design and rehabilitation of structures*, PhD supervisor Prof. Radu Bancila

OTHER RESULTS

- Membership in the European Committee: TC6 Fatigue and European Committee: Bridges – Radu Bancila and Edward Petzek.
- Membership in the European Programme COST TU0601: *Robustness of Structures*.

ONGOING PhD THESES

- Ana-Maria Butisca: *Study of the bearings capacity of the Danube Bridge King Carol I made by A. Saligny*, PhD supervisor Prof. Radu Bancila
- Luiza Ana-Maria Toma: *Durability increasing of existing bridge structures using innovative strengthening solutions based on additional steel sections – external reinforcement*, PhD supervisor Prof. Radu Bancila

FURTHER DEVELOPMENTS

- Editing an handbook for the verification and rehabilitation of existing bridges

CONTACT PERSONS

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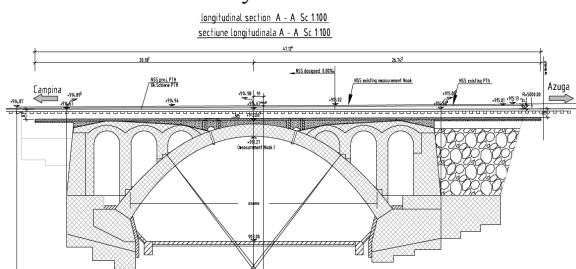
EXAMPLES

1. Technical solutions for rehabilitation of old arch bridges

Masonry arch bridges are the oldest structure type for bridges. There are many of such structures still in operation. These structures were designed using empirical rules for loads which lower value than the present ones. The technical condition of these bridges, after more than 100 years of continuous operation is in some cases unsatisfactory; even in this conditions they are in normal function. These structures are technical monuments of the engineering knowledge.

General aspects regarding the rehabilitation of some old structures, like:

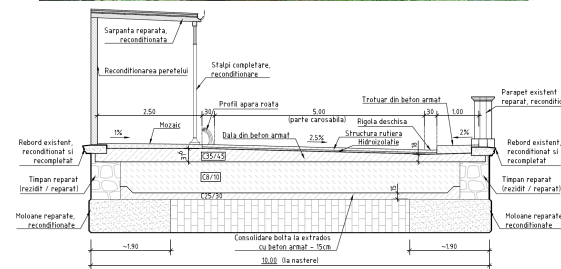
- An old railway concrete arch bridge on the main railway line Bucharest – Brasov, erected in two-stages: the upstream one in 1880, the downstream one was constructed in 1944, together with the track doubling. Due to the fact that the Campina - Predeal railway route crosses the sub-Carpathians area and the southern part of the Southern Carpathians it was necessary to adapt it to the difficult geographical conditions; actually this section is the most complicated part from the whole Romanian route.
- A historical masonry bridge in the Spa Center of BAILE HERCULANE (founded during the Austrian Empire) built in 1865. The curved bridge has two spans with the clearance of 16,5 m, respective 12,5 m in is made by an old combined masonry.



General view – Railway arch bridge

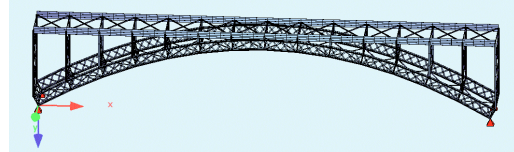


Before and after rehabilitation



The old historical highway bridge in Herculane

- An iron footbridge built in 1837 in the same Spa Center of BAILE HERCULANE. The bridge is in present in a bad technical condition. The rehabilitation project was carefully realized in order to maintain the original character of the structure which has an emblematical value for the city.



The footbridge in Herculane: general view and calculus model



Technological aspects

Researches in NEW SOLUTION FOR COMPOSITE BRIDGES AND NEW TECHNOLOGIES FOR BRIDGES

FIELD DESCRIPTION

The bridges are vital structures for the transport infrastructure. Composite bridges become a popular solution in many countries and a real alternative to concrete bridges. The team is involved in the research of new, efficient composite bridges like railway, highway pedestrian and temporary bridges together with the structural office SSF Ingenieure. These bridge solutions combine more important aspects: reduced costs, fast and simple erection, durability and robustness, low maintenance costs and an appealing aesthetical aspect.

ACTIVITIES

- Experimental program about the fatigue resistance of the dowels.
- Choice of typical details for bridges.
- Design guide for bridges with embedded girders.
- Study of efficient new highway and railway bridge solutions.
- Efficient pedestrian crossings (footbridges).
- Application of the Eurocode principles in the design of new structures
- Innovative solutions in bridge constructions
- Temporary bridges MONA®
- Choice of some FSW typical details for bridges.
- Application of different solution for bridge decks.
- Innovative materials in bridge constructions – fiber-reinforced-polymers
- Emergency lightweight bridges

RESEARCH TEAM

- Ass. Prof. Edward Petzek, PhD (modern technical solutions for composite bridges, choice of materials, concrete dowels)
- Prof. Radu Băncilă, PhD (steel welded structures, composite structures)

- PhD. Stud. Lucian Blaga (monitoring of bridges)
- PhD.Stud. Luiza Toma (composite bridges)

RESEARCH OFFERS

- Design of composite bridges.
- Design guide.
- Technical solution and projects.
- Consulting.
- Design examples for typical bridges
- Design of new bridges
- New innovative solutions in bridge construction.
- Consulting in the field of bridges.
- Design examples for typical bridges.
- Design of integral bridges.
- New innovative solutions in bridge construction.

RESULTS

RESEARCH PROJECTS

1. RFSP-CT-2010-00024 *ECOBIDGE Project*, Financing authority EUROPEAN COMMISSION, Research Fund for Coal and Steel. Value: 50,000 EUR

PUBLISHED PAPERS

1. E. Petzek, R. Bancila, V. Schmitt: *Romanian experience in new efficient solutions for composite bridges*, Proceedings of the International Scientific Conference Eurosteel 2011, vol B, ISBN 978-92-9147-103-4.
2. E. Petzek, R. Bancila, V. Schmitt, L. Toma: *Pod de autostrada intr-o solutie moderna si cu durata scurta de exectie*, Zilele Academice Timisene, Infrastructuri eficiente pentru transporturi terestre, ISBN 2247-3807.

ONGOING PHD THESES

- Lucian Blaga: *Innovating materials in bridge construction. Study of fiber-reinforced-polymer lightweight bridges*, PhD supervisor Prof. Radu Bancila
- Alfred Schwalie: *Modern and efficient timber structures*, PhD supervisor Prof. Radu Bancila

OTHER RESULTS

- Membership in the European Committee: Bridges – Radu Bancila and Edward Petzek.

FURTHER DEVELOPMENTS

- Design examples for composite structures and bridges according to Eurocodes
- Short construction time, to save costs for traffic control measures.
- Minimised traffic disturbance for maintenance.

CONTACT PERSONS

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 "Politehnica" University of Timișoara
 Faculty of Civil Engineering
 Dept. of Steel Structures and Structural Mechanics

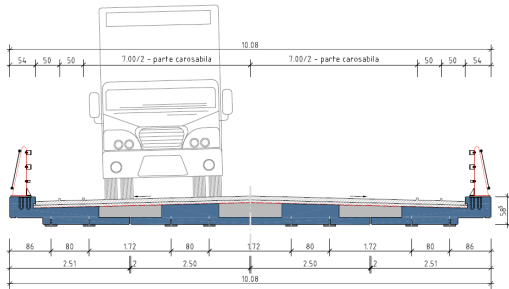
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Prof. **Radu Băncilă PhD**
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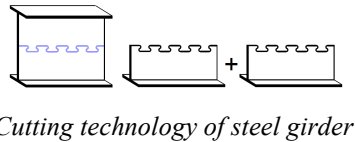
EXAMPLES

1. Composite highway and railway bridges with embedded steel girders

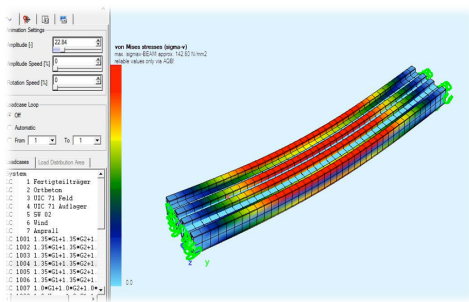
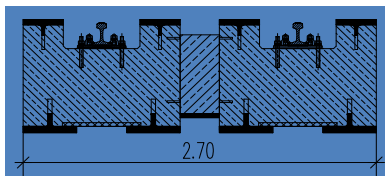
Composite highway bridges with embedded steel girders have the following advantages: a better functional response, reduction of maintenance costs, minimization of noise and environmental problems.



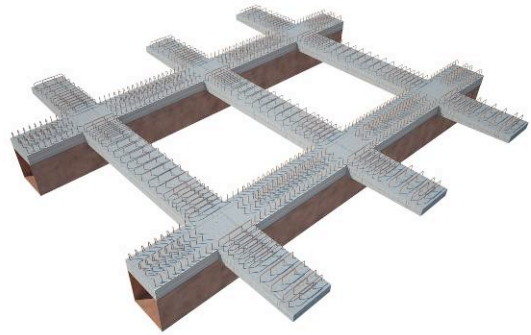
Technical solution for highway modular bridge - SSF



Cutting technology of steel girder



2. Composite bridges – Rapid solutions VTR®



SSF Solution

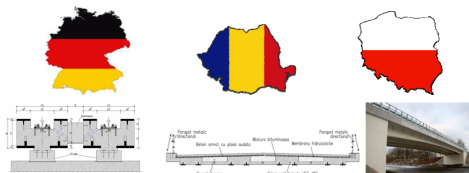
3. Modular temporary bridges MONA®



MONA® bridges

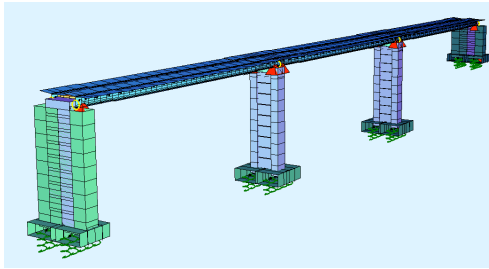
4. Researches in Ecobridge - ECONomical BRIDGE solutions based on innovative composite dowels and integrated abutments

The objective of this project is the construction of three composite bridges with integral abutments and/or innovative form of shear transmission – composite dowels. The targeted countries are: Germany, Romania and Poland.

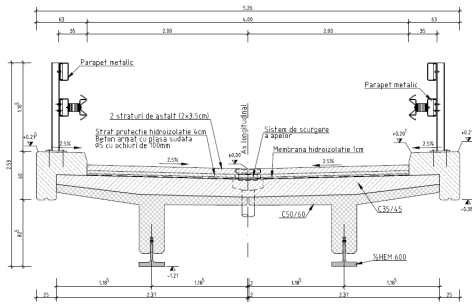


The bridges will be instrumented with a variety of strain gages, displacement sensors, and thermocouples to monitor and help in the assessment of structural behaviour, for future application of integral abutment bridges and/or composite dowels. The project focuses on cost efficient, competitive composite bridges with special regard to environmental friendly and sustainable design.

Composite Composite bridge with integral abutments and Precobeam girders in Romania



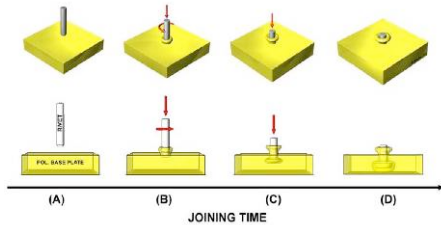
Calculation FEM model - Sofistik



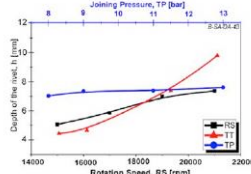
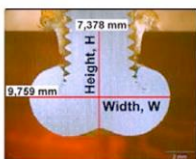
Bridge in Francesti

5. Friction stir welding (FSW)

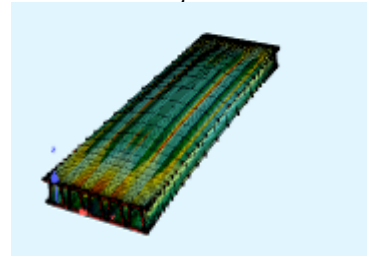
FSW is a welding procedure that takes place in solid state which is based on the heating of the materials through friction and plastic deformation realized at the interaction between the non-consumable pin tools which is rotating at surface of the joined elements. Using FS welds to aluminium bridge erection provide us light structures – the dead load is reduced, no additional weight from rivets or screws, with good corrosion behaviour in contact with salt (used against frozen road bed during the winter time), the worst enemy of steel bridges.



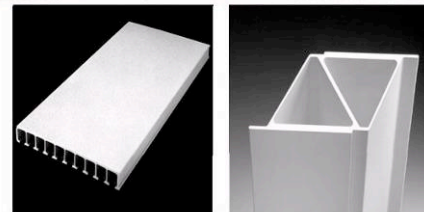
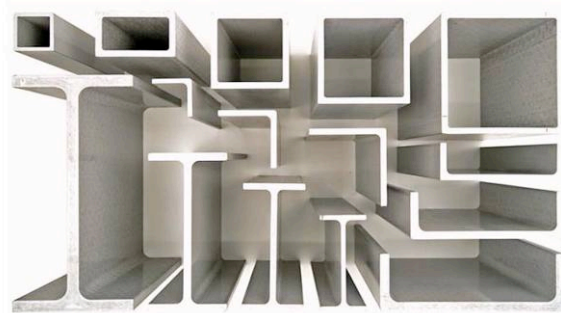
PEI/AA2024-T351¹



FSW process



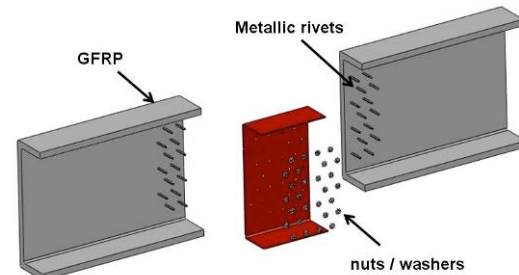
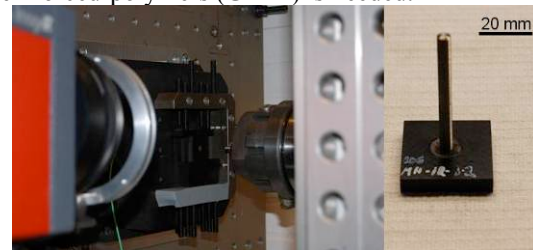
SOFISTIK analysis for an aluminum alloy bridge deck



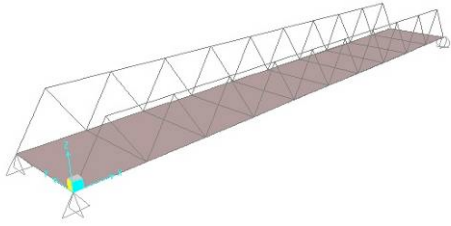
Pultruded structural shapes used in bridge constructions

6. Lightweight emergency bridges

Lightweight emergency bridges are also an important issue. Therefore, the team is proposing several optimized solutions for different spans, applicable in the case of natural disaster or other catastrophes. Therefore, a study and optimization of the connections for aluminum and glass-fiber-reinforced-polymers (GFRP) is needed.



Steel shoe for GFRP connections



RESEARCH CENTRE FOR RETROFITTING OF CONSTRUCTIONS (RECO)

GENERAL PRESENTATION

The research centre for materials and structures was founded in 2000. Significant realizations of the centre were obtained in the field of new materials, structural design and rehabilitation of different constructions types: reinforced and prestressed concrete, composite steel-concrete, FRP composites, masonry and timber.

Researches are in close relation with practice and the present and future needs of construction industry.

MAIN RESEARCH FIELDS

- **Seismic Performance of Precast Reinforced Concrete Wall Panels Retrofitted by Carbon Fiber Reinforced Polymer (CFRP) Composites**

Keywords: RC, precast wall panel, seismic retrofit, cut-out opening, externally bonded CFRP.

- **Innovative Structural Systems Using Steel-Concrete Composite Materials and Fiber Reinforced Polymer Composites**

Keywords: composite construction, numerical analysis, seismic behaviour, high-rise buildings.

- **Structural strengthening of RC columns**

Keywords: columns, FRP, rehabilitation, ductility, experimental tests.

- **Strengthening of reinforced concrete slabs using FRP composite materials**

Keywords: RC slabs, cut-out openings, strengthening, FRP composite materials.

- **Checking the quality of the construction materials using destructive and non-destructive methods**

Keywords: Physico-mechanical characteristics, aggregates, concrete, cement, reinforcement, masonry materials.

- **Obtaining and Characteristics of Ultra High Performance Concrete**

Keywords: silica fume, superplasticizer, steel fibers, technology, density, strength.

- **Sustainable constructions, building materials and technologies**

Keywords: Industrial recycled wastes, CO₂ emission, new building sustainable materials, LCA, sustainability, evaluation models.

- **Concrete carbonation and CO₂ uptake**

Keywords: CO₂ emissions, CO₂ uptake, accelerated carbonation, image processing, phenolphthalein indicator, XRD, SEM.

- **Robustness of Reinforced Concrete Structures**

Keywords: robustness; reinforced concrete framed structures, static non-linear plastic analysis, FEM analysis, structural ductility.

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Researches in SEISMIC PERFORMANCE OF PRECAST RC WALL PANELS RETROFITTED BY CFRP COMPOSITES

FIELD DESCRIPTION

Experimental investigations in the field of seismic performance of RC walls are of particular interest for the earthquake engineering community. The seismic performance of reinforced concrete wall structural systems was reportedly satisfactory as opposed to the performance of frame systems. Structural alterations by doorway cut-outs impair the seismic performance of a reinforced concrete wall member. The objectives of the research program are to investigate the seismic performance of the precast reinforced concrete walls, assess the weakening effects caused by doorway cut-outs and reveal the effects of the seismic retrofit by

externally bonded carbon FRPs. Numerical modelling was carried out for the tested RC walls in order to compare the behaviour of each tested and modelled wall. Comparison between the used softwares for numerical modelling will also be approached.

ACTIVITIES AND RESULTS

- the experimental data was processed and seismic performance analysis was conducted - a database of laboratory tests on RC walls was assembled
- analytical modelling was carried out and numerical modelling commenced.

RESEARCH TEAM

- István DEMETER, PhD Candidate
- Tamás NAGY-GYÖRGY, PhD, Lect.
- Valeriu STOIAN, PhD, Prof.
- Cosmin DĂESCU, Assist.
- Daniel DAN, PhD, Assoc. Prof.
- Carla TODUȚ, PhD Student
- Bianca PASC, MSc Student

Researches in INNOVATIVE STRUCTURAL SYSTEMS USING STEEL-CONCRETE COMPOSITES AND FRP COMPOSITES

FIELD DESCRIPTION

In the last years, the use of the composite steel-concrete structures extended a lot in common design and practice. This solution is ideal for multi-storey buildings, which require a higher degree of detailing in common design. Recent earthquakes revealed an inadequate structural behaviour of these types of structures, this meaning that an extensive research program is required in the field of composite elements. This task continues a program of experimental testing on composite steel-concrete joints that have a unique structure. The proposed joints are to be tested for asymmetrical loads. One part of the project is dedicated for the study of the structural composite steel-concrete shear walls in multi-storey buildings.

ACTIVITIES AND RESULTS

- Experimental study of the composite steel-concrete shear walls
- Theoretical and experimental study of the composite steel-concrete shear walls retrofitted using FRP composites

RESEARCH TEAM

- Daniel DAN, PhD, Assoc. Prof.
- Valeriu STOIAN, PhD, Prof.
- Alexandru FABIAN, PhD Stud.
- István DEMETER, PhD Candidate
- Tamás NAGY-GYÖRGY, PhD, Lect.
- Cosmin DĂESCU, Assist.
- Codruț FLORUȚ, PhD Stud.

Researches in STRUCTURAL STRENGTHENING OF REINFORCED CONCRETE ELEMENTS

FIELD DESCRIPTION

The goal is to be able to establish the most efficient method to be used for the rehabilitation of the concrete columns. I want to establish a FE modelling procedure for the consolidated concrete columns, using the ATENA software

ACTIVITIES AND RESULTS

- 20 laboratory tests on RC columns strengthened by FRP composites and NSM bars, including:
 - Numerical modelling
 - Preparation of the specimens
 - Experimental testing
 - Data recording (strains, forces and displacements)
 - Photometric strain measurement
 - Comparison between the lab tests and the FE model

As results:

- force - displacement diagrams for each tested column
- ductility modification for each consolidation procedure
- superposition of the theoretical behaviour (from numerical modelling) with the real behaviour (from recorded test data)
- optimised consolidation procedures

RESEARCH TEAM

- Cosmin DĂESCU, Assist.
- Valeriu STOIAN, PhD, Prof.
- Tamás NAGY-GYÖRGY, PhD, Lect.
- Daniel DAN, PhD, Assoc. Prof.
- István DEMETER, PhD Candidate

Researches in STRENGTHENING OF REINFORCED CONCRETE SLABS USING FRP COMPOSITE MATERIALS

FIELD DESCRIPTION

The research activity deals with FRP composite based solutions for retrofitting of reinforced concrete slabs with and without cut-out openings. In many situations, openings are needed in slabs, in places that were not considered during the structural design of a building. This need emerges mostly due to a series of changes in functionality. There is also the case in which for slabs with or without cut-outs, due to changes in functionality or in destination, the loads to which the slabs are subjected become much higher. In either one of these previously mentioned situations, the slab's overall behaviour becomes deficient, both as stiffness and strength.

Traditional techniques can be used for strengthening slabs in these situations, but in many cases these techniques are quite cumbersome and

time consuming. It was proven by previous theoretical and experimental research programs that FRP composite materials are suitable for strengthening some slabs with or without cut-out openings, providing several important advantages, in respect with traditional techniques. However, the number of such research programs is quite limited, and so, a great deal of questions are still left without complete answers. Thus, the future need of research in this field is obvious.

ACTIVITIES AND RESULTS

The first phase of the experimental program involves tests on four large scale elements. All the elements were rectangular, with dimensions of 2650x3950x120 mm. They were tested in horizontal position, being simply supported along the edges and loaded gravitationally. The first element is a plane slab without cut-out opening, serving as reference, while in each of the other three elements cut-out was created. These openings were created in rectangular and circular shape in the corner of the second and third slab, while on one of the short edges of the fourth slab, a large rectangular cut-out was sawn in. All of the elements will be tested unstrengthened up to a prescribed level, and then they will be strengthened and retested up to failure. A mixed strengthening solution that involves the use of both NSMR-FRP (Near Surface Mounted Reinforcement) and EB-FRP (Externally Bonded) techniques was proposed. The experimental program is in progress, up to now, the full slab (the one without cut-out opening) being tested in both unstrengthened and strengthened situations. These tests have validated the proposed solution, the rehabilitated element failing at a load level 60% higher than in the unstrengthened situation.

RESEARCH TEAM

- Codruț FLORUȚ, PhD Stud.
- Valeriu STOIAN, PhD, Prof.
- Tamás NAGY-GYÖRGY, PhD, Lect.
- Dan DIACONU, PhD Stud.
- Daniel DAN, PhD, Assoc. Prof.
- István DEMETER, PhD Candidate
- Cosmin DĂESCU, Assist.

Researches in CHECKING THE QUALITY OF THE CONSTRUCTION MATERIALS USING DESTRUCTIVE AND NONDESTRUCTIVE METHODS

FIELD DESCRIPTION

Quality verification of: concrete, road concrete, aggregates, cement, reinforcement, ceramic materials-delivered by different contractors

ACTIVITIES AND RESULTS

- Establishing the density and resistances of concretes.
- Establishing the physical and mechanical characteristics of cements.
- Establishing the freeze-thaw resistance of aggregates.
- Establishing of mechanical characteristic of the reinforcement.
- Establishing the density and compression resistances of the ceramic elements for masonries.
- Supplying testing certificates were made for the tested characteristics to the contractors.

RESEARCH TEAM

- Iosif BUCHMAN, PhD, Prof.
- Cătălin BADEA, PhD, Lect.
- Eugen JEBELEAN, PhD, Assoc. Prof.
- Liana IUREȘ, Ph.D, Assist.

Researches in OBTAINING AND CHARACTERISTICS OF ULTRA HIGH PERFORMANCE CONCRETE

FIELD DESCRIPTION

Obtaining technology was researched. The target was the optimum composition obtaining for an Ultra High Performance Concrete

ACTIVITIES AND RESULTS

The researches directions were to concrete composition checking. There were established the density and compressive strength. The results confirm that an ultra high performance concrete was obtained with indigenous materials (without superplasticizer). This concrete is in Special Concrete Industry category and can replace Reactive Powder Concrete.

RESEARCH TEAM

- Iosif BUCHMAN, PhD, Prof.
- Cătălin BADEA, PhD, Lect.

Researches in SUSTAINABLE CONSTRUCTIONS, BUILDING MATERIALS AND TECHNOLOGIES

FIELD DESCRIPTION

Laboratory testing on different compositions of sustainable new building materials and sustainable constructions. The aim is to evaluate the level sustainability of new and existing constructions and different rehabilitation solutions, considering the environmental, economic and social dimensions of sustainable development, in order to be able to choose the optimum solutions.

ACTIVITIES AND RESULTS

- The testing of different compositions of sustainable building materials;
- Characteristics verification;
- Establishing the optimal compositions for preparation and application in Romania.
- Development of two evaluation models: the specific model is flexible target oriented evaluation tool, applicable on different civil engineer works with only quantitative parameters; the global model is a developed for entire residential buildings, based on a scoring system. Both models results in a sustainability index.

RESEARCH TEAM

- Corneliu BOB, PhD, Prof.
- Iosif BUCHMAN, PhD, Prof.
- Eugen JEBELEAN, PhD, Assoc. Prof.
- Cătălin BADEA, PhD, Lect.
- Liana IUREȘ, PhD, Assist.

Researches in CONCRETE CARBONATION AND CO₂ UPTAKE**FIELD DESCRIPTION**

The aim of the research is to determine the amount of CO₂ that can be absorbed by concrete structures during service life through carbonation. In this way the carbon footprint of concrete can be enhanced.

ACTIVITIES AND RESULTS

- Preparation and curing of 7 concrete mixes;
- Accelerated carbonation tests in artificial environment;
- X-ray diffraction, phenolphthalein test and image processing to determine the carbonation depth;
- Drying and weighting of samples to measure the CO₂ uptake;
- Thermogravimetric analysis for the determination of carbonated CaO.

RESEARCH TEAM

- Corneliu BOB, PhD, Prof.
- Iosif BUCHMAN, PhD, Prof.
- Eugen JEBELEAN, PhD, Assoc. Prof.
- Cătălin BADEA, PhD, Lect.
- Liana IUREȘ, PhD, Assist.
- Tamas DENCSAK, PhD Student
- Ionel BALCU, PhD, CS III (INCDEMC)

Researches in ROBUSTNESS OF REINFORCED CONCRETE STRUCTURES**FIELD DESCRIPTION**

Design for robustness of structures represents an actual problem around the world. The problem is synonymous with the “Progressive collapse of structures” due to the loss of some structural elements at different accidental loads, like explosions, blasting, accidents, etc.

The present design codes take into account the subject but not explicitly. Present researches, both theoretical and experimental, are done on different structural types and materials in order to provide, finally, rules for design robust structures.

The researches on robustness of reinforced concrete structures involve analysis of the behaviour in the plastic range and ductile behaviour, at non-linear loads.

ACTIVITIES AND RESULTS

- Introduction to the robustness of structures;
- Analysis and design of a reinforced concrete framed structure;
- Elastic and plastic analysis;
- Non-linear static analysis using FEM

RESEARCH TEAM

- Sorin DAN, PhD, Lect. (UPT);
- Jean-Pierre JASPART, Prof. (ULg)
- Jean-Francois DEMONCEAU, PhD., Assist. (ULg).

RESEARCH PROJECTS

1. CNCSIS-UEFISCSU, PN-II, ID_1004 (Contract 621/2009-2011) founded by the National University Research Council, Romania, coordinator Assoc. Prof. Ph. D. Civ. Eng. Daniel Dan
2. Post-doctoral research contract with University of Liege, Belgium, ArGEnCo Department, coordinator, Sorin Dan, PhD, Lect.

PUBLICATIONS**BOOKS**

1. Demeter, I. (2011) Seismic retrofit of precast RC walls by externally bonded CFRP composites, PhD Thesis, Politehnica University of Timisoara, ISBN 978-606-554-338-6.
2. Buchman I., Building Materials-synthetic presentation, Ed. Politehnica Timișoara, 2011, ISBN: 978-606-554-395-9.
3. Catalin Badea, Eugen Jebelean, Corneliu Bob, Iosif Buchman, Liana Iures, Materiale de construcții - proceduri de laborator, Ed. Eurostampa Timișoara, 978-606-569-214-5
4. Catalin Badea, Liana Iures, Materiale de construcții pentru instalații – lucrări practice, Ed. Eurostampa Timișoara, 978-606-569-223-7

PUBLISHED PAPERS

1. Demeter, I., Nagy-György, T., Dăescu, A. C., Stoian, V., and Dan, D. (2011). “Strengthening strategies using FRP composites for precast RC wall panels with cut-out openings” Int. Rev. Appl. Sci. Eng., 2 (2011) 1, 19–24, (ISSN 2062-0810).
2. Demeter, I. and Nagy-György, T. (2011). “Database of RC Walls Seismic Laboratory Tests” Proc., 15th International Conference on Civil

Engineering and Architecture, Hungarian Technical Scientific Society of Transylvania (EMT), pp. 94-101, ISSN 1843-2123, (in Hungarian).

3. Demeter, I. Nagy-György, T. and Stoian V. (2011) "Database of RC structural wall seismic test programs" Proc., 7th Central European Congress on Concrete Engineering (CCC2011): Innovative materials and technologies for concrete structures, Hungarian Group of fib, pp. 339-342.

4. Dan D., Stoian V., Nagy-György T., Dăescu C., Demeter I., Comparative Study Regarding The Behaviour Of Steel And Steel Concrete Composite Joints, SS11, Cyprus, 2011

5. Floruț C., Stoian V., Nagy-György T., Dan D., Diaconu D, Experimental Evaluation of FRP Retrofitting System for Two-Way R Slabs, The 7th Central European Congress on Concrete engineering, Balatonfüred, Hungary, 2011, ISBN 978-963-313-036-0, pp 421-424

6. Buchman I, Ignaton E, The chemical resistance of an ultra-high performance concrete, Annals of DAAAM for 2011&Proceedings of the 22ND International DAAAM Symposium "Intelligent Manufacturing&Automation: Power of Knowledge and Creativity" 23-26TH November 2011, Viena, Austria, p. 0197-0198, ISSN 1726-9679, ISBN 978-3-901509-83-4.

7. Bob C., Dencsak T., Balcu I., Sustianbility of RC structures, Proceedings of fib Symposium, Concrete Engineering for Excellence and Efficiency, Prague, Czech Republic, 8-10 June, 2011, ISBN: 978-80-87158-29-6, pp.1033-1037.

8. Dencsak T., Bob C., Consideration of the CO₂ uptake through carbonation in the life-cycle assessment of RC structures, Proceedings of the 7th CCC Congress. Innovative Materials and Technologies for Concrete Structures, 2011, pp. 199-203.

9. Bob C., Bob L., Toadere M., Some Ideas for Extending the Useful Life of Structures, IABSE-IASS Symposium: Taller, Longer, Lighter, 20-23 Sept. 2011.

PhD THESIS

1. DEMETER István – Seismic retrofit of precast RC walls by externally bonded CFRP composites. Advisor: Prof dr ing Stoian V. (completed).
2. FABIAN Alexandru - Contribution To The Calculus Of The Structural Composite Steel-Concrete Shear Walls With Rigid Reinforcement. Advisor: Prof. Stoian V. (completed)

3. DĂESCU Cosmin - Rehabilitation of structural elements using composite materials. Advisor: Prof. Stoian V. (completed)

4. FLORUȚ Codruț - Performance study of the elements subjected to bending strengthened with FRP composites. PhD advisor: Valeriu STOIAN Prof., PhD. (completed)

5. DIACONU Dan – RC Structural elements reinforced with FRP composites. PhD advisor: Valeriu STOIAN Prof., PhD. (completed)

6. DENCŞÁK Tamás – Sustainability of constructions. Advisor: Corneliu BOB, Prof., PhD. (on-going)

7. BEREVOESCU Luiza – Contribution in hydrothermal rehabilitation of the residential buildings. Advisor: Valeriu STOIAN Prof., PhD. (on-going)

8. CAPOTESCU Valentin – Theory of military architecture. Advisor: Valeriu STOIAN Prof., PhD. (on-going)

CERTIFIED LABORATORIES

REINFORCED CONCRETE LABORATORY

- Tests concerning behaviour of the reinforced concrete and prestressed elements and structures under service loads
- Tests concerning durability of concrete and/or prestressed elements.

MATERIALS LABORATORY

- Tests concerning mechanical, physical and chemical characteristics of building materials (building stone, sand and aggregates, mineral binders, mortars and concretes, bricks and tiles, building timber)
- Non-destructive tests concerning concrete resistances.

BUILDINGS LABORATORY

- Tests concerning the thermal conductivity of building materials and thermal insulation materials.

FURTHER DEVELOPMENTS

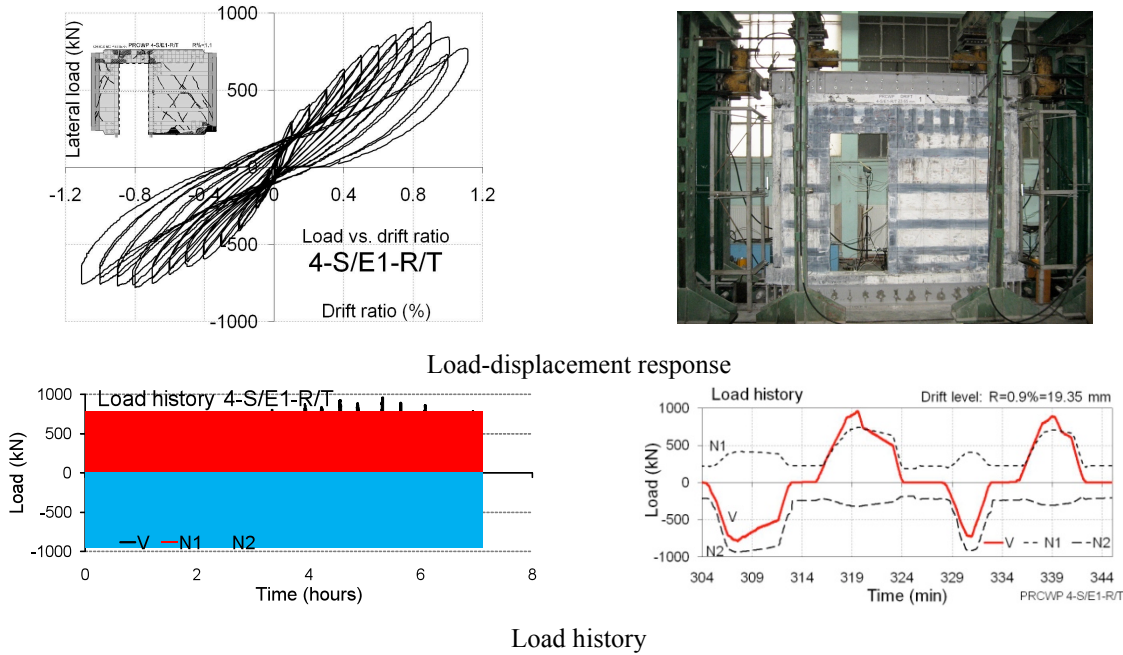
Quasi-static cyclic testing of CFRP-EBR retrofitted precast RC walls weakened by cut-out openings; numerical modelling. experimental program for a new series of RC walls.

In the field of construction materials will be developed new materials like high performance concrete, high performance concrete additives, fly-ash, phosphogypsum, self-compacting concrete, etc.

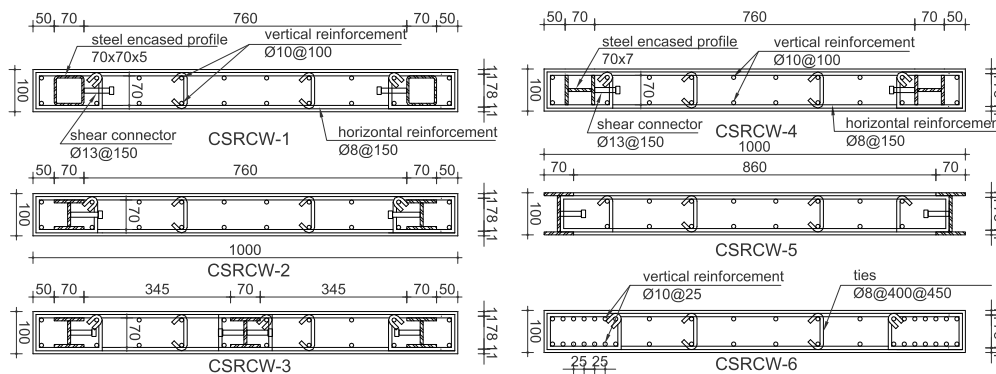
- Non-destructive research on concrete and steel reinforcement of structure and infras structure bridges.
- Bridges technical expertise
- Concrete dispersed reinforced with short fibers
- The research team will focus on the analysis of frame structures in case of an accidental design situation due to the loss of one ground storey column. The study of the structural behaviour will allow presenting some conclusions for design of robust reinforced concrete structures

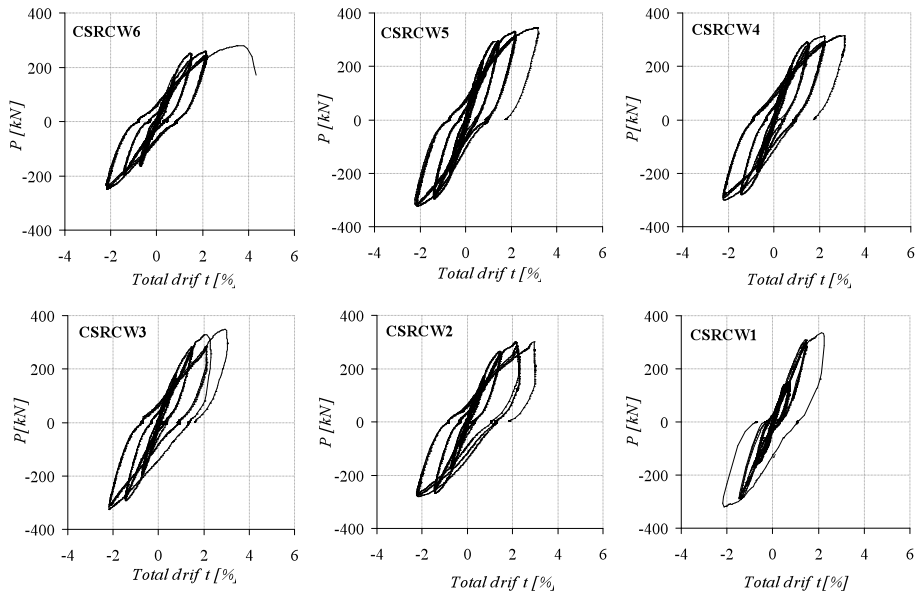
REMARKABLE ACHIEVEMENTS

1. Seismic Performance of Precast Reinforced Concrete Walls Retrofitted by Externally Bonded Carbon Fiber Reinforced Polymer (CFRP-EBR) Composites – Ongoing research



2. Experimental and theoretical approaches on composite steel-concrete structural shear walls with steel encased profiles





Elements behaviour

3. Structural strengthening of RC columns



CIM

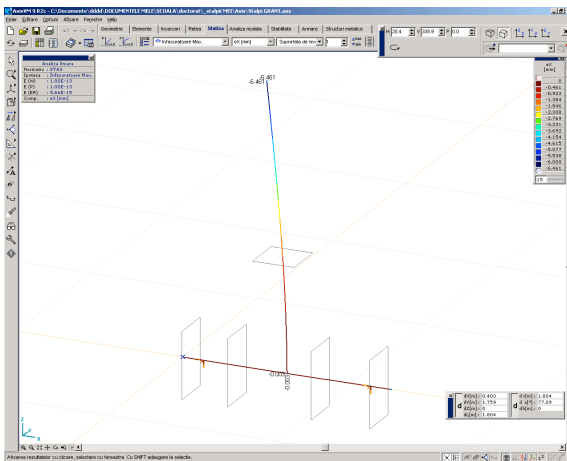


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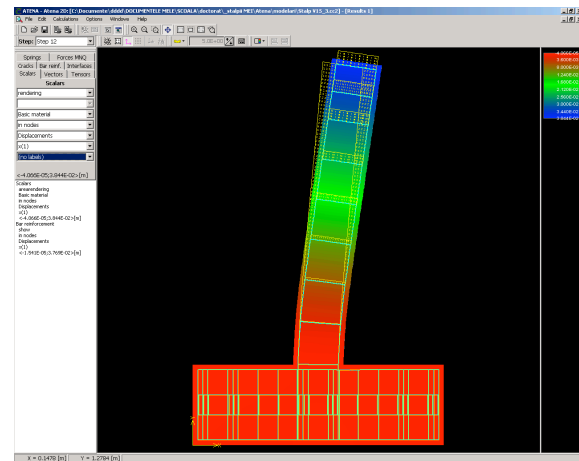


C2M-GW-BC

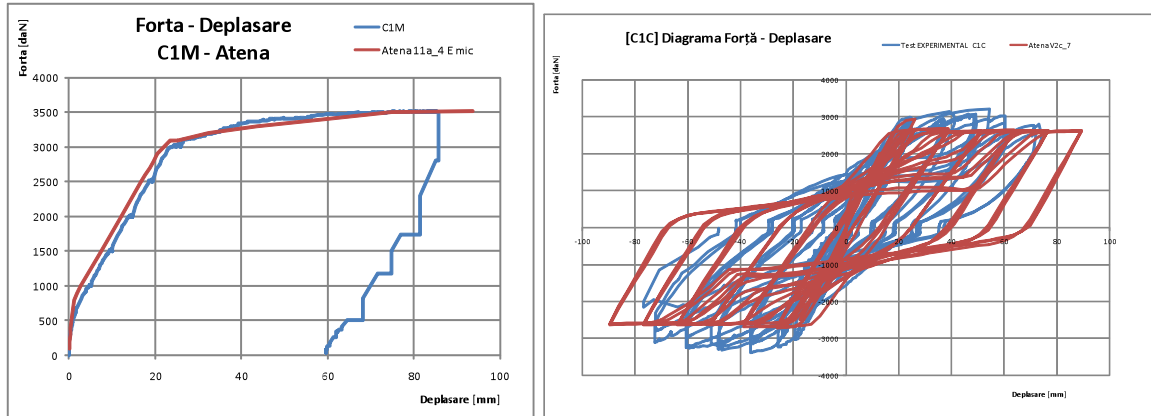
- Failure details



AxisVM



Atena2D



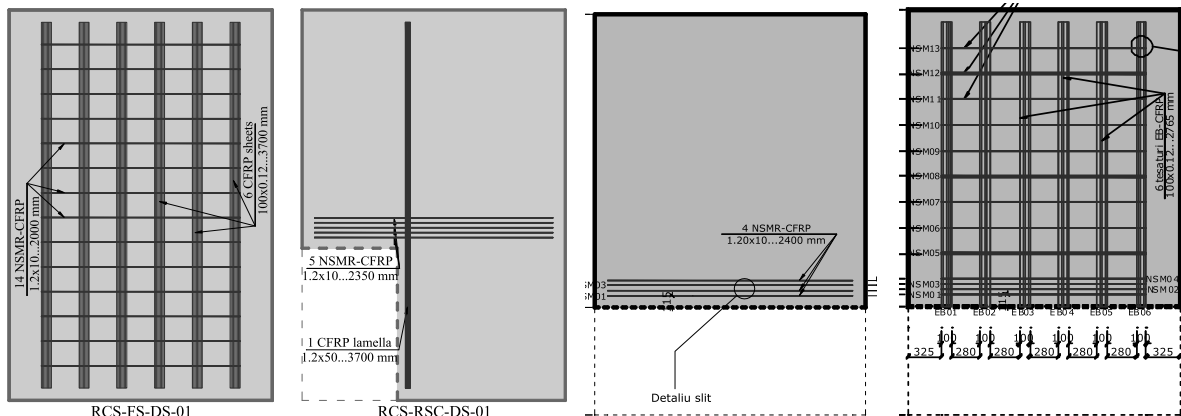
- Overlapping of lab tests with FE modelling in ATENA

4. Strengthening of reinforced concrete elements using FRP composite materials

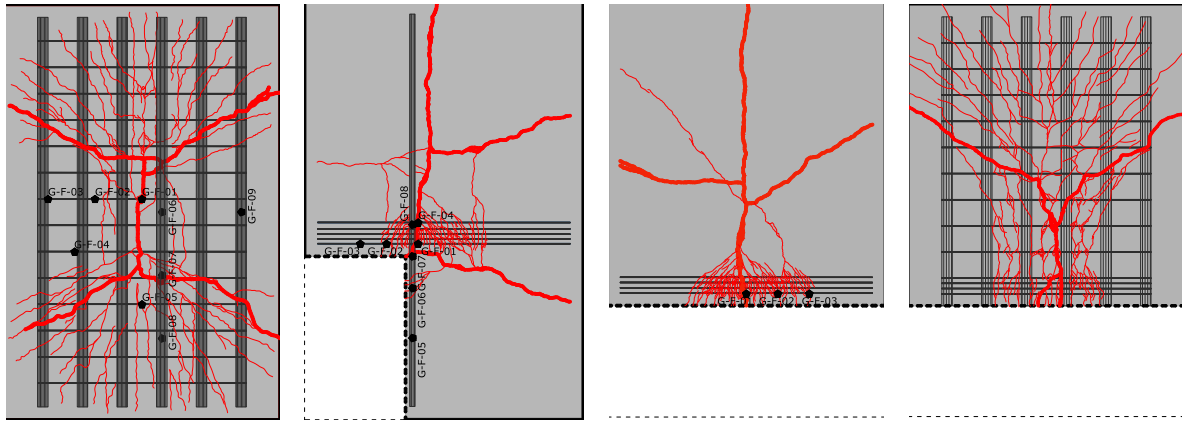
In these research activities, CFRP elements are used for retrofitting of reinforced concrete slabs. A mixed NSMR-FRP (Near Surface Mounted Reinforcement) and EB-FRP (Externally Bonded) technique is applied. The preliminary results prove the effectiveness of the proposed strengthening solution, the full slab showing an increase in ultimate capacity of about 60%. For the slab with a rectangular cut-out, the capacity is restored.



Test set-up

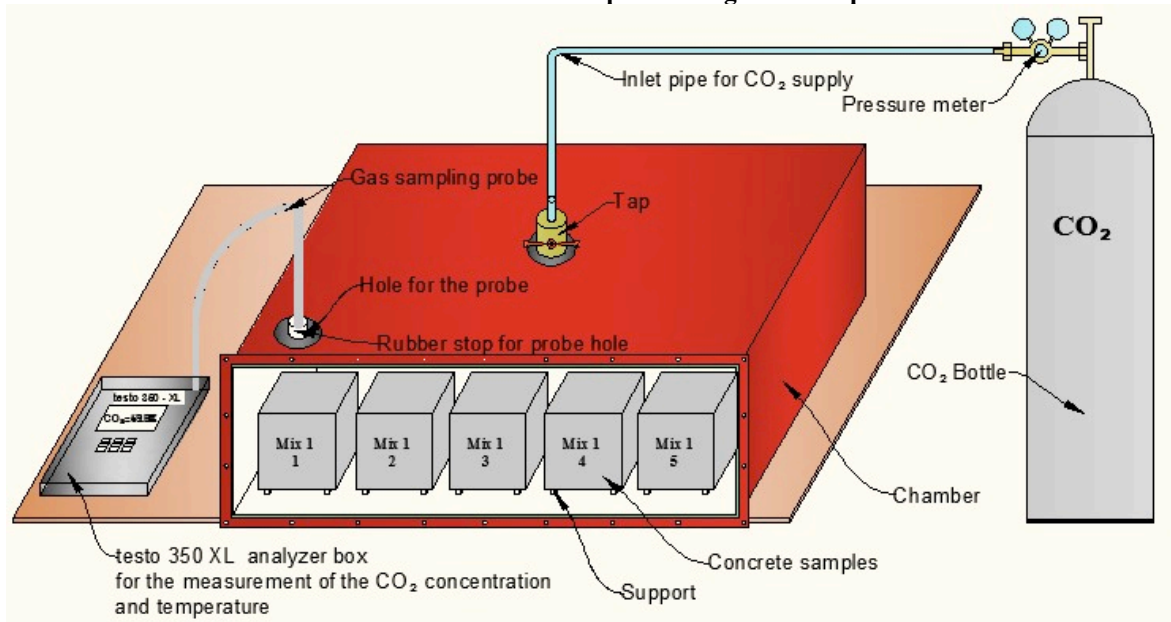


Strengthening layout

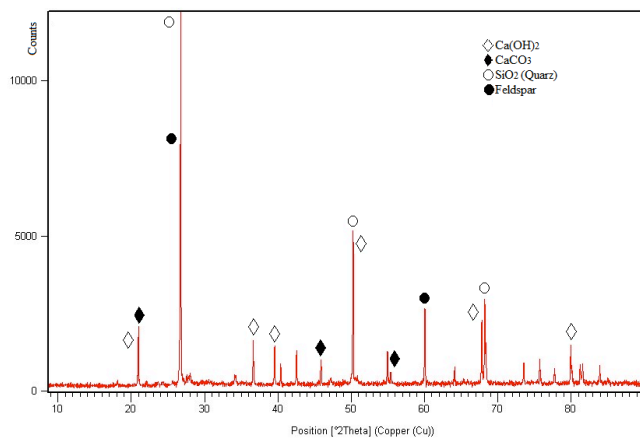
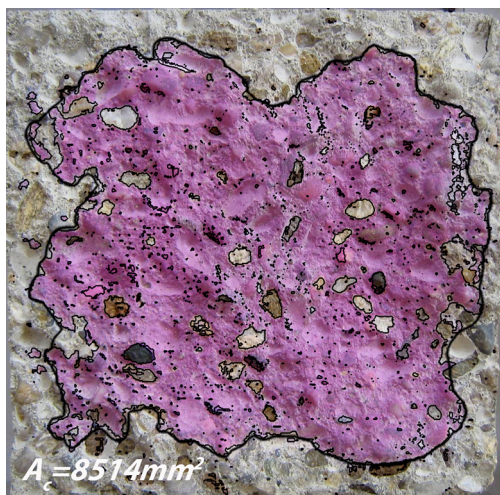


Behaviour of the elements

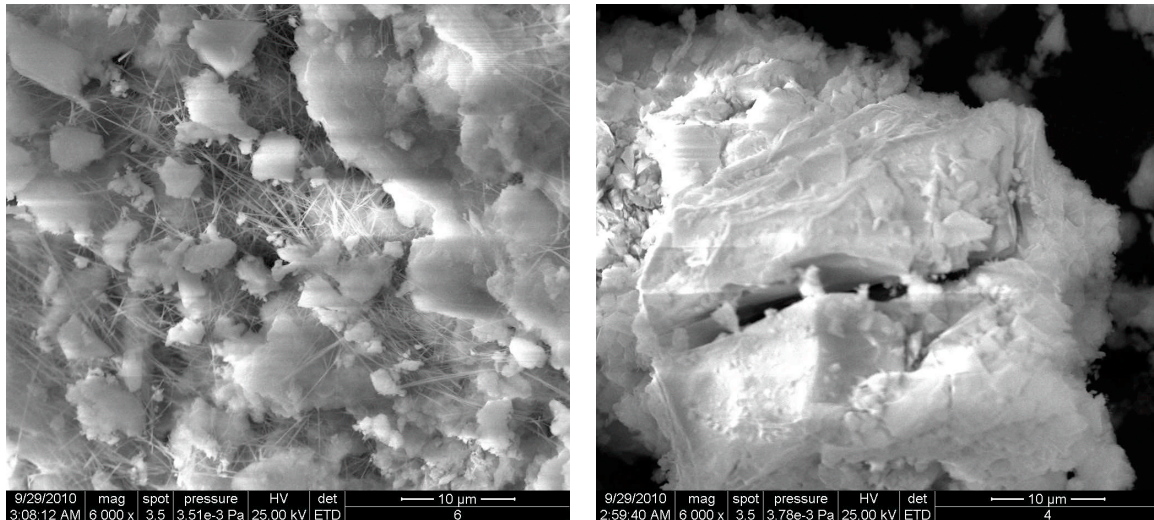
5. Determination of concrete carbonation and CO₂ uptake using different procedures



Accelerated carbonation setup



Carbonation profile by image processing



SEM image of the concrete microstructure

RESEARCH CENTRE FOR BUILDING SERVICES

GENERAL PRESENTATION

In the Department of Building Services is functioning the Research Center for Building Services (CCIC), approved by CNCIS in the year 2001 (certify with the number 57/CC-C) and the National Building Services Laboratory, abilities by the Romanian Government - State Inspectorate for Buildings (reauthorization number 2119.10.08/2010 series ISC L01) to effect technical agreements for products, proceeds and equipments for building services.

The Research Center for Building Services is structured in three compartments: *Sanitary Installations and Gases* (coordinator Prof. Dr. eng. Adrian Retezan), *Thermal Installations* (coordinator Prof. Dr. eng. eur. eng. Ioan Sârbu), *Electrical Installations and Automation* (coordinator Prof. Dr. eng. Ioan Borza).

OBJECTIVES

The objectives of CCIC are the improvement of the complex specialization activities for building services, contributing with the obtained results to their perfection/modernization, efficiencies, renewing and to raise the qualification level of their members.

MAIN RESEARCH FIELDS

➤ ambient comfort
Keywords: comfort, heating, ventilation, water supply, electrical energy, temperature, humidity, air velocity

➤ buildings energy

Keywords: energy economy, energy management, heat transfer, buildings envelop, installations systems, certification energetically audit, thermal rehabilitation

➤ reducing energetically consumptions and losses in the transport and distribution systems of water and thermal energy

Keywords: pipes, networks, hydraulic analysis, design, optimization, numerical modeling and simulation, recovery systems

➤ utilization of renewable energy resources

Keywords: unconventional energies, solar energy, thermal energy

➤ computational methods, computer assisted design

Keywords: numerical simulations, dimensioning programs, planning methods, energetically analysis's

➤ technical agreements for installations

Keywords: components, technical agreement, heating systems, cooling systems, lightening, water distribution

ACTIVITIES

➤ Tests and proofs for sanitary, heating, ventilation, conditioning, cooling and electrical installations, based on collaboration contracts with firms in this domain

➤ Tests and elaborate of documentation in order to obtain the technical agreements for products and equipments for installations

- Initialization and sustaining a program for preparing specialists to by authorized auditors in buildings energy
- Organizing the conference with international participation “Building Services and Ambient Comfort”
- Participation to national and international scientific manifestations

RESULTS

RESEARCH PROJECTS/CONTRACTS

1. Contract no. 21 / 2010/2011, *Revision and fusion of the Norms I13 and I138/1-2002: design, execution and maintenance of central heating systems*, Beneficiary: MDRL, 14,280 RON
2. Contract no. 22 / 2010/2011, *Guidelines regarding the energetically inspection of boilers and heating systems of buildings*, Beneficiary: MDRL, Value: 13,804 RON
3. Contract no. 23 / 2010/2011, *Guidelines regarding the inspection of air conditioning systems in buildings*, Beneficiary: MDRL, Value: 28,560 RON
4. Contract no. 129 / 2011, *Studies and researches in order to obtain the technical agreement for flexible pipes produced by SC Prima Plus Arad*, Beneficiary: SC PRIMA PLUS Arad, Value: 4,960 RON.

BOOKS

1. Retezan, A., Sârbu, I., Borza, I., Cinca, M., Doboși, I., (ed.) *Proceedings of the International Conference “Building Equipment and Ambient Comfort”*, Politehnica Publishing House, Timișoara, 2011, ISSN 1842-9491, 687 pages.
2. Valea E. St., “*Heating installations*”, Politehnica Publishing House, Timisoara, 2011, ISBN 978-606-554-303-4, 125 pages.
3. Porteous C.D., Orosa J.A., Bacaloni A., Sârbu I. Sebarchievic, C. s.a., “*Chemistry, Emission Control, Radioactive Pollution and Indoor Air Quality*”, In Tech , Austria , 2011, ISBN 978-953-307-316-3, 680 pages.

PUBLISHED PAPERS

1. Sârbu, I., Iosif, A., *Application of dual reciprocity method to laminar forced heat convection in concentric annular tube*, Proceedings of the Romanian Academy, Series A – Technical Sciences, vol.12(1), 2011, ISSN 1454-9069, pp. 30-39
2. Sârbu, I., Valea, E., *Correlation for boiling heat transfer on porous surfaces tubes*,

Proceedings of the Romanian Academy, Series A – Technical Sciences, vol.12(4), 2011, ISSN 1454-9069, pp. 332-338

3. Sârbu, I., Valea, E., *Analysis of looped water distribution networks using variation formulations*, Metalurgia International - vol.XVI(1), 2011, ISSN 1582-2214, pp. 48-53
4. Iosif, A., Sârbu, I., *Numerical modeling of two dimensional heat transfer using boundary element method*, Metalurgia International - vol.XVI(1), 2011, ISSN 1582-2214, pp. 59-64
5. Sârbu, I., Popina, O., *Numerical analysis with finite and boundary elements of thermal fields in steady state regime*, Journal of Engineering and Applied Sciences, vol. 6(2), 2011, ISSN 1819-6608, pp. 13-23
6. Sârbu, I., Sebarchievic, C., *Effects analysis of additional thermal protection for retrofitted buildings*, Journal of Engineering and Applied Sciences, vol. 6(6), 2011, ISSN 1819-6608, pp. 31-42
7. Mihon, L., Negoitescu, A., Tokar, A., Ostoia, D., *Motor and Vehicle Optimization Process Modelling by Using the AVL Cruise in Standard Applications*, Annals of Faculty Engineering Hunedoara-International Journal of Engineering, vol. IX , 2011, ISSN 1584-2673, pp. 83-86
8. Mihon, L., Negoitescu, A., Tokar, A., *Pollutant Emissions Exhausted by a Spark Ignition Engine Operating with Conventional and Non-conventional Fuels*, International Federation of Automotive Engineering Societies (FISITA), vol. 19, 2011, ISSN 1842-4074, pp. 20-23
9. Sârbu, I., *Analysis with boundary elements of heat conductivity in steady state*, 8th WSEAS Int. Conf. on Heat and Mass Transfer, Puerto Morelos, Mexico, 2011, ISBN 978-960-474-268-4/1792-7773, pp. 57-62
10. Valea, E., Sârbu, I., *Correlation for boiling heat transfer on porous surfaces tube*, 8th WSEAS Int. Conf. on Heat and Mass Transfer, Puerto Morelos, Mexico, 2011, ISBN 978-960-474-268-4/1792-7773, pp. 63-67
11. Sârbu, I., Valea, E., *Nodal analysis models of water supply networks*, 8th WSEAS Int. Conf. on Heat and Mass Transfer, Puerto Morelos, Mexico, 2011, ISBN 978-960-474-268-4/1792-7773, pp. 68-73
12. Sârbu, I., Sebarchievic, C., *Effects analysis of building thermal rehabilitation*, 6th IASME/WSEAS Int. Conf. on Energy & Environment, Cambridge, UK, 2011, ISBN 978-960-474-159-5/1790-8230, pp. 75-80

13. Sârbu, I., Adam, M., *Solar heating/cooling and domestic hot-water systems*, 6th IASME/WSEAS Int. Conf. on Energy & Environment, Cambridge, UK, 2011, ISBN 978-960-474-159-5/1790-8230, pp. 69-74
14. Sârbu, I., Sebarchievici, C., *Olfactory comfort assurance in enclosed spaces*, International Journal of Energy and Environment, vol. 5(3), 2011, ISSN 1109-9577, pp. 377-384
15. Sârbu, I., Bura, H., *Thermal tests on borehole heat exchangers for ground-coupled heat pump systems*, International Journal of Energy and Environment, vol. 5(3), 2011, ISSN 1109-9577, pp. 385-393
16. Sârbu, I., *Numerical modeling of two dimensional heat transfer in steady state regime*, International Journal of Energy and Environment, vol. 5(3), 2011, ISSN 1109-9577, pp. 435-443
17. Sârbu, I., Valea, E., *Correlations for enhanced boiling heat transfer on modified surfaces tubes*, International Journal of Energy and Environment, vol. 5(3), 2011, ISSN 1109-9577, pp. 444-451
18. Sârbu, I., Valea, E., *Nodal analysis of looped water supply networks*, International Journal of Energy and Environment, vol. 5(3), 2011, ISSN 1109-9577, pp. 452-461
19. Sârbu, I., Adam, M., *Applications of solar energy for domestic hot-water and buildings*, International Journal of Energy, vol. 5(2), 2011, ISSN 1998-4316, pp. 34-42
20. Sârbu, I., Sebarchievici, C., *Thermal rehabilitation of buildings*, International Journal of Energy, vol. 5(2), 2011, ISSN 1998-4316, pp. 43-53
21. Sârbu, I., Sebarchievici, C., Popa, S., *Solar cooling systems*, 20th International Conference "Building services and ambient comfort" Timișoara, 2011, ISSN1842-9491, pp. 310-323
22. Sârbu, I., Caragea, A., *Geothermal energy*, 20th International Conference "Building services and ambient comfort" Timișoara, 2011, ISSN1842-9491, pp. 334-348
23. Valea, E., Sârbu, I., *Environmental protection by ecological deposit of ash and slag for coal power plant*, 20th International Conference "Building services and ambient comfort" Timișoara, 2011, ISSN1842-9491, pp. 24-33
24. Păcurar, C., Retezan, A., Mocofan, A., *Standards analysis regarding ambient comfort*, 20th International Conference "Building services and ambient comfort" Timișoara, 2011, ISSN1842-9491, pp. 15-24
25. Bancea, O., Adam, M., *Comfort and energy saving realized through hybrid ventilation*, 20th International Conference "Building services and ambient comfort" Timișoara, 2011, ISSN1842-9491, pp. 183-192
26. Bancea, O., *Considerations regarding the ventilation systems for smoke evacuation*, 20th International Conference "Building services and ambient comfort" Timișoara, 2011, ISSN1842-9491, pp. 201-208
27. Babescu, M., Borza, I., Lăcătușu, F., Gana, O., *Based wind energy conservation system*, 20th International Conference "Building services and ambient comfort" Timișoara, 2011, ISSN1842-9491, pp. 223-247
28. Retezan, A., Sebarchievici, C., Balasz, A., *Unconventional energy – viable solutions for buildings energetic*, 20th International Conference "Building services and ambient comfort" Timișoara, 2011, ISSN1842-9491, pp. 408-419
29. Iosif, A., *Analytical and numerical analysis of velocity and temperature fields in a circular cross-section duct for the laminar forced heat convection*, 20th International Conference "Building services and ambient comfort" Timișoara, 2011, ISSN1842-9491, pp. 420-432
30. Negoitescu, A., Tokar, A., Mihon, L., *The impact on greenhouse gasses emissions of the production of electric energy used by electric vehicles*, 23rd JUMV International Automotive Conference Science and Motor Vehicles, 2011, ISBN 978-86-80941-34-9, pp. 1-7
31. Brata, S., *Assessment in terms of energy efficiency and comfort for the semi-passive house*, COST Action C25 Sustainability of Constructions, Conference Innsbruck, 2011, ISBN 978-99957-816-1-3, pp. 303-306
32. Păcurar, C., Retezan, A., *Case study of environmental comfort in a classroom*, 42nd International Congress and Exhibition for Heating, Refrigeration and Air-conditioning, Belgrad, Serbia, 2011, ISBN 638-897-1-3, pp. 82-89
33. Dorhoi, S., Borza, I., *Assessment in terms of energy efficiency and comfort for the semi-passive house*, COST Action C25 Sustainability of Constructions, Conference Innsbruck, 2011, ISBN 978-99957-816-1-3, pp. 307-313
34. Păcurar, C., Retezan, A., *Study of environmental comfort in education building based on the determination of subject and object*, Int. Conf. Building Services and Energy Saving, Univ. "Gh. Asachi" Iasi, 2011, ISBN 978-973-8955-95-0, pp. 79-88

35. Babescu, M., Borza, I., Lăcătușu, F., *Maximizing of power output and flattening of fluctuation on a wind power system*, Conference Modern Science and Energy, Cluj-Napoca, 2011, ISBN 2066-4125, pp. 11-24
36. Babescu, M., Borza, I., Gana, O., Lăcătușu, F., *Fundamental problems in the control of wind power systems – part I and II*, Int. Conf. Building Services and Energy Saving, Univ. "Gh. Asachi" Iasi, 2011, ISBN 978-973-8955-95-0, pp. 201-220
37. Retezan, A., Retezan, R., *Energy saving as source of energy*, Building Services Engineering Journal (Technical Univ. of Cluj-Napoca), 2011, ISBN 2247-4390, pp. 13-16
38. Borza, I., Lăcătușu, D., Lăcătușu, F., *Utilisation of intermittent flow for heat supply in central heating systems*, Building Services Engineering Journal (Technical Univ. of Cluj-Napoca), 2011, ISBN 2247-4390, pp. 35-40
39. Borza, I., Valea, E., *Monitoring of the thermal power plants gaseous noxious*, Conference - Building Services for the Beginning of the third Millennium, Sinaia, 2011, ISBN 978-973-755-755-1, pp. 19-25
40. Babescu, M., Borza, I., Lăcătușu, F., Gana, O., *Flattening of fluctuations of the energy generated in network and maximizing of energy for a wind power system*, Conference - Building Services for the Beginning of the third Millennium, Sinaia, 2011, ISBN 978-973-755-755-1, pp. 542-554

CERTIFIED LABORATORY

National Building Services Laboratory, abilities by the Romanian Government - State Inspectorate for Buildings (reauthorization number 2119.10.08/2010 - series ISC L01).

PHD RESEARCH ACTIVITIES

1. *Prof.dr.eng.eur.eng. Ioan SÂRBU*, supervisor in the field of *Civil Engineering*
PhD students:
 - Alin CARAGEA: *Efficient utilization of energy in building services systems and renewable sources revaluation.*
 - Marius ADAM: *Comfort and energy efficiency assurance in buildings by using renewable resources.*
2. *Prof.dr.eng. Ioan BORZA*, supervisor in the field of *Civil Engineering*
PhD student:
 - Ștefan PAVEL: *Contributions regarding the modernizing and optimizing of energetically consume in medical institutions*

- Florin LĂCĂTUȘU: *Optimizations of energetically consume in building services with high comfort degree*
 - Deian JIFCU: *Study contributions to biogas producing from biomass*
 - Claudiu SILVĂȘAN: *Contributions to the efficiency of architectural lightning in the view of an ecological approach*
3. *Prof.dr.eng. Adrian RETEZAN*, supervisor in the field of *Civil Engineering*
PhD students:
 - Dragoș MIHĂILĂ: *Considerations regarding aspects of ambient medium in the conditions of energetically consume reducing for building services.*

FURTHER DEVELOPMENTS

- to continue solving some research and designing themes, as well as with national research institutions and through collaborations with companies from our country
- realization of the research program "Annual energetically consumptions of heating, cooling and warm water supply in buildings" included in the professional – scientific collaboration program with U.T.E. Budapest, University of Beograd.
- creation of informatics system of type Internet at surrounding level and of some expert systems in the domain of installations for buildings, that will allow to promote specific information's for Romania and for countries that use already this systems development, complete and modernizing of the research base in order to achieve increased perform ability and competitively.

RESEARCH TEAM

- Prof. dr. eng. Adrian Retezan: *Ambient comfort, Water treatment, Environment protection*
- Prof. dr. eng. eur. eng. Ioan Sârbu: *Buildings energy, Energy savings, Optimizations modelings and numerical simulations*
- Prof. dr. eng. Ioan Borza: *Electrical installations, Lightning systems, Energy savings*
- Assoc. prof. dr. eng. Olga Bancea: *Thermal comfort, Modern air conditioning systems, Unconventional energies*
- Assoc. prof. dr. eng. Silvana Brata: *Thermotechnique for installations and buildings, Buildings energy, Hydraulic of thermal networks*
- Assoc. prof. dr. eng. Mihai Cinca: *Thermal comfort, Heat recovering in industrial processes, Applications for informatically calculus*

- Lecturer dr. eng. Emilian Valea: *Thermal comfort, Energetically balances, Renewable energies*
- Lecturer dr. eng. Anton Iosif: *Hydraulic, Air and water pollution reducing systems, Numerical modeling and simulations*
- Lecturer dr. eng. Adriana Tokar: *Water and heat supply of buildings, Water treatment, Environment protection*
- Assist. eng. Gabriel Ostafe: *Thermo technique for installations and buildings, Energy savings*
- Assist. eng. Cristian Păcurar: *Optimization of heating systems, Energy management in buildings*
- Assist. eng. Florin Lăcătuș: *Electrical installations, Lightning systems*
- Assist. eng. Călin Sebarchievici: *Renewable energy utilization, Buildings energy*

- Assist. eng. Marius Adam: *Ambient comfort and air conditioning, Buildings energy and heat recovering.*

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RESEARCH TEAM: GEOTECHNICAL ENGINEERING

GENERAL PRESENTATION

MAIN RESEARCH FIELDS

- Studies and research regarding investigation of ground in laboratory and site
Keywords: laboratory device, data processing, geotechnical investigation
- Studies and research concerning isolation and protection solutions for buildings against vibrations transmitted by the soil
Keywords: isolation, buildings, vibration, soil
- Studies regarding slipping processes of soil massifs and consolidation solutions
Keywords: instability, site investigation, consolidation methods
- Execution technologies of foundation works based on vibration technique, horizontal drilling
Keywords: under-crossing, drilling, vibration technique

MAIN ACTIVITIES

- Investigation of the foundation ground and verification of the fills compaction
- Exploitation of some industrial wastes in constructions.

Researches in *INVESTIGATION OF THE FOUNDATION GROUND AND VERIFICATION OF THE FILLS COMPACTION*

FIELD DESCRIPTION

Except studies and laboratory tests, for geotechnical investigation works, there have been applied some efficient techniques of “in situ” investigations like: dynamic penetration, cone penetration, load plate tests and so on.

ACTIVITIES

- Geotechnical investigations were carried out for establishing the foundation conditions for constructions on difficult soils
- Verification of the quality of the compaction for fills under floors
- Construction and rehabilitation of the roads

RESEARCH TEAM

- Prof. dr. eng. Virgil HAIDA: *Foundations in special conditions*
- Teach. Assist. dr. eng. Monica MIREA: *Laboratory and field geotechnical tests*
- Assoc. prof. dr. eng. Petru PANTEA: *Laboratory and field geotechnical tests*

Researches in *EXPLOITATION OF SOME INDUSTRIAL WASTES IN CONSTRUCTIONS*

FIELD DESCRIPTION

The research theme from above pursued the study and determination of the physical and mechanical characteristics of the fly ashes for reducing the pollution of the environment and for using this kind of material in the embankment works.

ACTIVITIES

The laboratory tests carried out on fly ash samples, prepared using different formulas regarding water: fly ash ratio, respectively water; fly ash-clay ratio showed greater resistances of the tested samples. In this manner, the use of these wastes is recommended that have a special efficiency for different construction works, especially for roads.

RESEARCH TEAM

- Assoc. prof. dr. eng. Ion BOGDAN: *Improvement of weak foundation soils*
- Assoc. prof. dr. eng. Ioan Petru BOLDUREAN: *Foundations in special conditions*
- Assist. eng. Alexandra CIOPEC: *Laboratory and field geotechnical tests*

RESEARCH PROJECTS

1. *Technical expertise for the area between Ferdinand Boulevard and Traian Street-administration area by Constanta Mayory.*, Beneficiary: CONSTANTA MAYORY, Value: 184760 RON, Team: Assoc. prof. dr. eng. Petru Pantea, Lect. dr. eng. Monica Mirea, Prof. dr. eng. Marin Marin
2. *Technical assistance for foundation soil research and technical documentation*, Beneficiary: S.C.ATELIER A ARAD., Value: 2046 RON, Team: Lect. Cristina Voicu, Lect. Monica Mirea
3. *Evaluation report for expropriation on Lugoj – Deva Highway*, Beneficiary: S.C. PROMETER M&G S.R.L., Value: 28080 RON, Team: Assoc. prof. dr. eng. Gheorghe Belea

BOOKS

1. *Marin Marin, Mirea Monica- Foundation systems for buildings*, Ed. Mirton, 2011, ISBN 978-973-52-1187-5, 978-973-638-490-5, 456 pag

PHD STUDENTS

Scientific coordinator: Prof. dr. eng. Virgil HAIDA

1. Eng. Marian Daniel GAINA
 “Contributions regarding the study of some efficient technologies of execution for embankments of land communication ways”

2.. Eng. Valeria SMARANDA
 “Contributions regarding the study of roads stability and resistance in Gorj county”

3. Eng. Aurelian BORDOS
 “Contributions regarding the study of behavior in exploitation of slopes on difficult soils”

4. Eng. Ciprian COSTESCU presented the thesis
 “Contributions regarding the study of some influence factors upon technical state of roads in Banat area” in June 2010

5. Eng. Mihaela Cecilia CHEZAN
 “Contributions regarding the efficiency of cadastral works in construction field”

6. Eng. Adrian Ciprian MAYER
 “Contributions regarding the behavior in time of railway embankments”

7. Eng. Valentin Sorin VLADASEL
 “Contributions regarding the study of some consolidation solutions for foundations and foundation ground”

8. Eng. Luiza PIESZ
 “Contributions regarding the study of geosynthetics reinforced embankments stability”

9. Eng. Marius LUCACIU
 “Contributions regarding the study of some realization solutions for road structures on difficult soils”

10. Eng. Nicolae Ion BABUCA
 “Contributions regarding the efficiency of survey works in constructions field”

Scientific coordinator: Prof. dr. eng. Marin MARIN

1. Eng. Valentin Ighian
 “Considerations regarding study of the foundation solutions on piles “

2. Eng. Cornel Cimpoiaru
 “Contributions to the study of some consolidation technologies of landslides”

3. Eng. Relu Victor Bejenariu
 “Studies regarding consolidation solutions for special constructions”

4. Eng. Dumitru Banciu
 “Research on causes of the degradation of foundations and the implementation of consolidation solutions”

5. Eng. Ion Paulescu
 “Considerations on waterproofing basements for Constructions”

6. Eng. Vladimir Gheorghe Stanciu
 “Considerations on the relationship between architecture and resistance structure in civil constructions”

7. Eng. Bassan Ali Alhaj
 “Solutions and research on strengthening the buildings affected during operation”

8. Eng. Roberta Gridan
 “Using of modern methods of surveying for the pursuit of the behavior of special buildings”

9. Eng. Gheorghe Margineantu Manda
 “Considerations on the rehabilitation of building foundations”

10. Eng. Maria Floarea Brebu
 “Contributions regarding the topogeodezical evaluation of displacements and deformations of buildings”

11. Eng. Beatrice Clara Vilceanu

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RESEARCH TEAM: ROADS AND RAILWAYS

GENERAL PRESENTATION

MAIN RESEARCH FIELDS

➤ Study and research concerning the use of local materials in building and maintenance of roads
Keywords: maintenance of roads, building roads, local materials, road structures.

➤ Study of the operational behaviour of road structures and determination of certain reinforcements or rehabilitation solutions
Keywords: road structures, road investigation, technical condition, index for the technical condition, bearing capacity, dimensioning

MAIN ACTIVITIES

- Investigation of technical condition on the rehabilitated national road sections for assessing the operational behaviour and for determining the possible intervention solutions
- Laboratory tests on different road materials used in building and the maintenance of roads

Researches in *THE INVESTIGATION OF THE TECHNICAL CONDITION ON THE REHABILITATED NATIONAL ROAD SECTIONS FOR ASSESSING THE OPERATIONAL BEHAVIOUR AND FOR DETERMINING THE POSSIBLE INTERVENTION SOLUTIONS*

FIELD DESCRIPTION

The field description follows the determination of the technical condition indices on the investigated sections and of the causes which produced the possible degradations. These data are quantified to determine the efficient intervention solutions.

ACTIVITIES AND RESULTS

The activity of assessing the condition indices is realized every year and the results lead to the evaluation of time interval when the maintenance intervention should be applied.

RESEARCH TEAM

- Prof. dr. eng. Ion COSTESCU: *road materials, realization technologies*

- Prof. dr. eng. Gheorghe LUCACI: *road structures, asphalt mixtures, road maintenance*
- Prof. dr. eng. Florin BELC: *road materials, road structures, operation behaviour*
- Chemist dr. Ileana STELEA: *asphalt mixtures, road investigations, operation behaviour*

LABORATORY TESTS ON DIFFERENT ROAD MATERIALS USED IN BUILDING AND THE MAINTENANCE OF ROADS

FIELD DESCRIPTION

Laboratory tests are realized on different road materials (natural aggregates, binders, asphalt mixtures, cement concrete, cement stabilized aggregates) at the request of road contractors.

ACTIVITIES AND RESULTS

The results are offered to the beneficiaries through test reports and sometimes technical assistance is supplied for improving the site works.

RESEARCH TEAM

- Prof. dr. eng. Ion COSTESCU: *tests on asphalt mixtures and bituminous binders*
- Prof. dr. eng. Florin BELC: *tests on natural aggregates and stabilized materials*
- Lecturer dr. eng. Cornel BANCEA: *tests on stabilized soils and compaction on site*

RESEARCH PROJECTS

1. *Technical report for DN 79* Beneficiary: S.C. ASTAL DI SPA ITALIA , Value: 55180 RON Team : Prof. dr. eng. Florin Belc, Prof. Dr. eng. Gheorghe Lucaci
2. *Technical expertise for the roads in Satu-Mare City,* Beneficiary: Satu-Mare City Mayory, Value: 71400 RON Team : Prof. dr. eng. Gheorghe Lucaci, Prof. dr. eng. Florin Belc,
3. *Geotechnical studies for roads and streets modernization in Timis County* Beneficiary: S.C. TRISKELE S.R.L., Value:24800 RON, Team: Prof dr. eng. Ion Costescu, Teach. Assist dr. eng. Ciprian Costescu
4. *Technical expertise: Analisis of the quality for natural aggregates produced in Bata and Patars exploitation for asphalt preparation.,* Beneficiary: S.C. PORR CONSTRUCT S.R.L. Team: Prof. dr. eng. Gheorghe LUCACI, Prof. Dr. eng. Value : 54560 RON

PUBLICATIONS

PUBLISHED PAPERS

1. Belc F., Lucaci G., Andrei R., Padure Florica, Capitanu Camelia, Fodor Georgeta ., - *Theme Strategique "Qualite des Infrastructures*

Routieres". The 24th World Road Congress , Mexico City, 2011 ,

2. Lucaci G., - *PGestion du patrimoine routier dans le contexte du development et adaption aux changement climatiques.,* BThe 24th World Road Congress , Mexico City, 2011
3. Marc P., Costescu C., - *AModelation of the temperature distribution for asphalts for testing laboratory application.* The 12th Academic Days Timisoara , 2011
4. Lucaci G., - *Modern roads a challenge for sustainable development,* The 12th Academic Days Timisoara

PHD STUDENTS

Scientific coordinator: Prof. dr. eng. Ion COSTESCU

1. Eng. Marc Paul Teodor presented the thesis

"Contributions to the conception and realization of some high performance road structures" in December 2011.

2. Eng. Marius BANICA presented the thesis in June 2009

"Contributions regarding the technical state improvement for the roads from Gorj County"

3. Eng. Stelea Liliana

"Special asphalt mixtures "

4. Eng Mihaela IOVANOV

"Contributions regarding usage of the efficient technologies for roads realization"

5. Eng Romulus KOMOZ

"Contributions to the improvement of the urban roads management"

6. Eng Liviu TUDOR

"Contributions to the study and realizations of modern technologies for roads building"

7. Eng. Ionut VESA

Research field: Civil Engineering

8. Eng. Morar Tudor

Research field: Civil Engineering

9. Eng. Bota Claudiu

Research field: Civil Engineering

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RESEARCH TEAM: SURVEYING, CADASTRE

GENERAL PRESENTATION

MAIN RESEARCH FIELDS

- **Monitoring problems**
Keywords: monitoring, surveying, modern technologies
- **Geo-Spatial modeling for Land Measurements**
Keywords: spatial, modeling
- **Using Geographic Information System (GIS) for urban development**
Keywords: GIS, urban
- **Database for constructions and communication ways: implementation and management**
Keywords: database, management
- **Implementing applied geophysics methods in constructions**
Keywords: geophysics
- **Database for urban administration-conception, development, management**
Keywords: database, urban, administration
- **Special applications of Photogrammetric Exploitation**
Keywords: photogrammetry, exploitation
- **Surveying Engineering and Cadastre**
Keywords: surveying
- **Improving methods for monitoring land movements in mining areas**
Keywords: monitoring, land movement, mining
- **Risk assessment for landslides; risk maps; digital terrain model**
Keywords: landslides, maps, risk

Researches in

- **DESIGN, ANALYSIS AND MANAGEMENT OF GEODETIC AND CADASTRAL DATA**
- **DEVELOPMENT OF THE ROMANIAN GEODETIC CONTROL NETWORK USING PERMANENT GPS STATIONS**
- **AUTOMATION AND MONITORING LAND MEASUREMENTS USING INTERGRAPH TECHNOLOGY FOR GIS DEVELOPMENT**
- **SETTING UP DATA BASE FOR URBAN ADMINISTRATION MANAGEMENT**

FIELD DESCRIPTION

Geodetic support and cadastre contributes widely not only to scientific purposes, but also to the economic development of a country, mainly in land planning, in real estate transactions and in land reforms. Moreover, the digital cadastral map is a precious tool for all management and planning projects. It supports data related to properties, land and natural resources as well.

The modern cadastre is primarily concerned with detailed information at the individual land parcel level. It should serve the needs both, of the individual and of the community.

Benefits out of its application refer to: asset management; conveyance; credit security; demographic analysis; development control; emergency planning and management; environmental impact assessment; housing transactions and land market analysis; land and property ownership; land and property taxation; land reform; monitoring statistical data; physical planning; property management; public communication; site location; site management and protection.

In order to facilitate its management, Information System solution (GIS) for integrating data related to land use and urban networks will offer necessary tools for spatial analysis.

For a better accuracy and a real evaluation of the geodetic measurements, there have been established a number of permanent GPS stations on different locations of the Romanian territory; they provide accurate planimetric and altimetric information, leading to the improvement of the national control network.

With GPS geodesy can be defined the time and locate the area of increased geophysical activity by mapping crustal deformation, seismicity, and other factors. Integration of these spatial data with crustal seismicity, surface geology, and topography through a Geographic Information System (GIS) approach places critical constraints on the geodynamic settings for identifying the distribution, geometry, and type of active crustal faults, for elucidating the spatial relationship between the crustal structures and natural disasters.

ACTIVITIES

The measurements, evaluation and analysis are performed in order to increase the characteristics of the reference network for permanent stations using control points from Timișoara area. These are used for developing cadastral applications, topographic

engineering projects, urban evaluation and land management monitoring.

Today, the Cadastral GIS offers specialized functionality for each stage of processing including the digital map creation, plotting cadastral and topographical plans, generating and combining geo-referenced data in order to obtain a validated relational geo-database.

GIS as modern technology of analysis and graphical-textual database processing method is a very important element in cadastre and also in environment resources management.

RESEARCH TEAM

- Assoc. prof. PhD. Carmen GRECEA
- Lecturer PhD. Sorin Ioan HERBAN
- Lecturer PhD. Cosmin Constantin MUŞAT
- Assist. PhD. Viorica DAVID
- Assist. PhD. Alina Corina BĂLĂ
- PhD. Student Maria Roberta GRIDAN
- PhD. Student Clara – Beatrice VÎLCEANU



RESEARCH PROJECTS/CONTRACTS

1. Contract no.182/2008-2011 – *Elaboration of data basis for the use of the geospatial information with a view to the administration of the cemeteries from Timișoara – data acquisition and updating.* Beneficiary: Town Hall of Timișoara, Value: 38.000,00;
2. Contract no.174/2010... – *Researches and experimentations regarding the growth of performance for the FRANCIS FVM CHE turbines in Brădișor – intermediate phase,* Total Value 173.600;
3. Contract no.135/2011- *Studies and topographic surveys needed for the expertise of the pump foundations from CET Centre and CET South, Timișoara,* Total Value 9.709;
4. Contract POSDRU ID 63140 – *Online university cooperation network for providing higher competences in geodesy (Rețea de colaborare universitară online în scopul dezvoltării capacității de a furniza competențe superioare în domeniul geodeziei),* Total

Value: 9.888.027 lei; UPT Value from project: 1.093.914 lei.

FIELD DESCRIPTION

The objective of this project is to build an academic collaboration network between four universities in Romania for students aiming to provide:

- open educational resources in the field of geodesy
- tools available and accessible to all students,

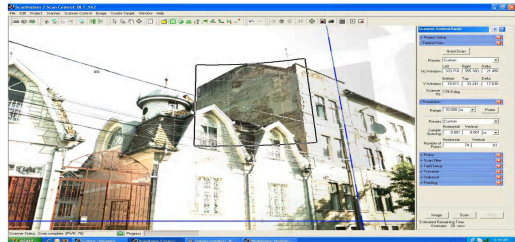
wishing to ensure the interoperability between the different eLearning environments used by partner universities.

CERTIFIED LABORATORY

- Land Measurement and Cadastre Laboratory, abilities by National Agency of Cadastre and Real Estate (authorization B nr.973/15.12.2009)
- Research Laboratory for Cadastral works automation and GIS - Registered Research Laboratory - RRL_Intergraph

ACHIEVEMENTS AND FURTHER DEVELOPMENT

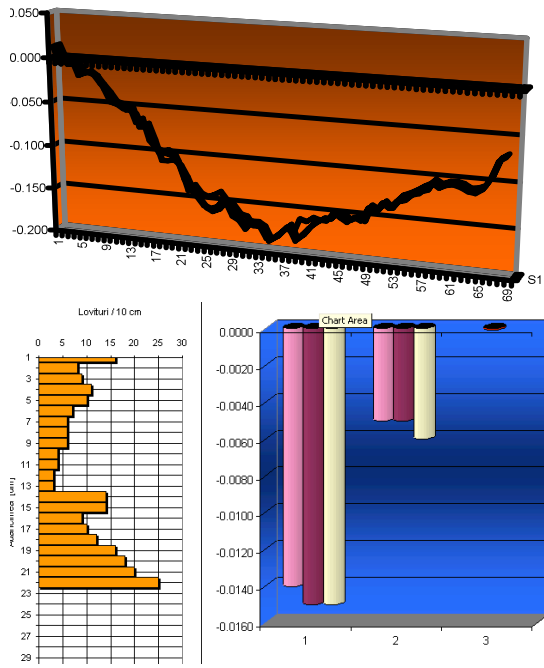
- Monitoring settlements for engineering projects
- Interdisciplinary collaboration for systematization and management of construction and architecture works



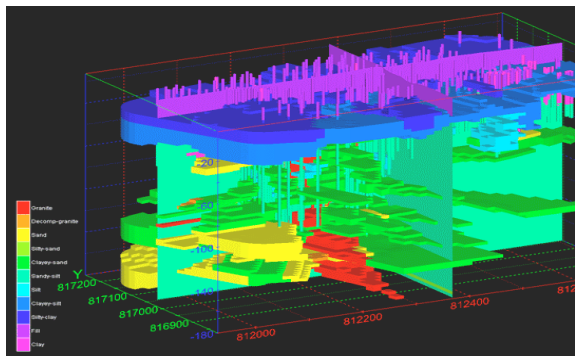
- Studies and geodetic solutions for future evaluations and monitoring crustal movements
- Using spatial technologies for improving accuracy in cadastral applications
- Data basis for urban GIS



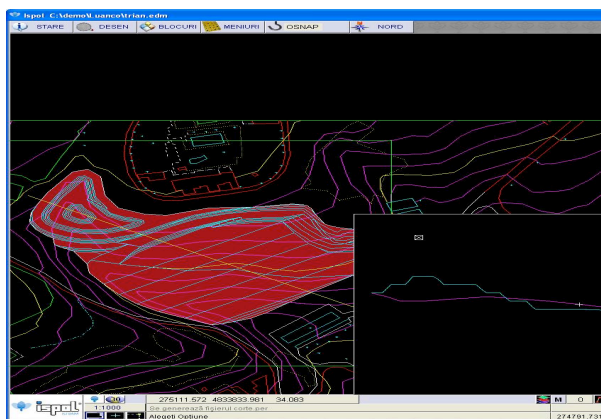
urban cadastre



Instant settlements



- Using Intergraph technology for development of the Registered Research Laboratory (RRL)



Displacement modeling for risk area represented by Digital Model of the Terrain (DTM)

PUBLISHED PAPERS

1. Grecea Carmen, Gridan Maria Roberta, *Geospatial Technology for 3D City and Urban Modelling*, RevCad, vol.11, 2011 – Journal of Geodesy and Cadastre, pp. 69-75, May 2011, Alba Iulia, Romania, ISSN 1583-2279.
2. I. Ienciu, M. Popa, Grecea Carmen, L. Oprea S. Varvara, *Topographic Surveys to Re-integrate Waste-rock into the Natural Cycle*, The Journal of Environmental Protection and Ecology (JEPE),12 (No 4, 2011), ISSN – 1311-5065. ISI – paper 1925 (<http://www.jepe-journal.info/>) journal content
3. L. Oprea, I. Ienciu, Grecea Carmen, D. Popa, *Protection and inclusion of Nature reserve Areas into the Romanian General Cadastre*, The Journal of Environmental Protection and Ecology (JEPE), 12 (No 4, 2011), ISSN – 1311-5065. ISI – paper 1935 (<http://www.jepe-journal.info/>) journal content
4. Grecea Carmen, Herban Sorin, Mușat Cosmin Constantin, *Possible evaluation and monitoring of agricultural potential on border areas*, Research Journal of Agricultural Science, May 2011, Timișoara, Romania, ISSN 2066-1843, vol. 43 (3) 1 – 529 (2011), pp. 351-357.
5. Grecea Carmen, *Romanian Road Network and GIS, a necessity to engendering sustainable development*, Research Journal Of Agricultural Sciences, vol. 43 (3) 1 – 529 (2011), pp. 362 – 367, May 2011, USAMVB, Timișoara, Romania, ISSN 2066-1843.
6. Herban Sorin, Vilceanu Clara Beatrice, *The Impact of Geodetic and Topographic Monitoring on Landslides Risk Assessment*, RevCad, vol.11, 2011 – Journal of Geodesy and Cadastre, pp. 85-90, May 2011, Alba Iulia, Romania, ISSN 1583-2279.
7. Gridan Roberta Maria, Bălă Alina Corina, Grecea Carmen, *DAM Monitoring - a modern method in environmental engineering*, Research Journal of Agricultural Science, May 2011, Timișoara, Romania, ISSN 2066-1843, vol. 43 (3) 1 – 529 (2011), pp. 358-362.
8. Brebu Floarea Maria, Gridan Roberta Maria, Bălă Alina Corina, *Monitoring of Special Buildings in Connection with Requirements of the Sustainable Development*, Research Journal of Agricultural Science, May 2011, Timișoara, Romania, ISSN 2066-1843, vol. 43 (3) 1 – 529 (2011), pp. 269-275.

9. Brebu Floarea Maria, Bălă Alina Corina, *Monitoring of special construction using 3D laser scanning*, Scientific Bulletin of The Politehnica University of Timisoara, Transactions on Hydrotechnics, vol. no. 56(70)2, ISSN 1224-6042, pp. 71-75.
10. Brebu Floarea Maria, Gridan Roberta Maria, Bălă Alina Corina, *Monitoring of Special Buildings in Connection with Requirements of Environmental Protection*, RevCad, vol.11, 2011 – Journal of Geodesy and Cadastre, pp. 31-35, May 2011, Alba Iulia, Romania, ISSN 1583-2279.
11. Vilceanu Clara Beatrice, Herban Sorin, Mușat Cosmin Constantin, *The correlation between the surveying profession and sustainable development*, Research Journal of Agricultural Science, May 2011, Timișoara, Romania, ISSN 2066-1843, vol. 43 (3) 1 – 529 (2011), pp. 522-529.
12. Vilceanu Clara Beatrice, Herban Sorin, *3D modelling using terrestrial Leica C 10 Scanstation*, Scientific Bulletin of The Politehnica University of Timișoara, Transactions on Hydrotechnics, vol. no. 56(70)2, ISSN 1224-6042, pp. 95-98.
3. Grecea Carmen, Herban Ioan Sorin, Mușat Cosmin Constantin, Bălă Alina Corina, David Viorica, Jianu Sergiu Flavius, Gridan Maria Roberta, *New technologies used for conservation of cultural heritages sites*, GIS Open 2011, ISBN 978-963-9883-75-8, pp. 211.
14. Gridan Maria Roberta, Grecea Carmen, Herban Ioan Sorin, Mușat Cosmin Constantin, Bălă Alina Corina, *Geospatial Information - Modern Tool for Efficient Inventorying the Game on a Hunting Territory*, GIS Open 2011, ISBN 978-963-9883-75-8, pp. 217.

BOOKS

1. Lucaci Gheorghe, Grecea Carmen, *70 de ani de învățământ superior de construcții în Timișoara*, Monografie, Ed. Orizonturi Universitare, ISBN 978-973-638-488-2

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