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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)
- Assist. 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)
- PhD. student Calin Neagu (Seismic performance of structures with steel plate shear walls)
- PhD. student Gelu Danku (Plastic rotation capacity of composite steel-concrete members and connections)
- PhD. student 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)

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. RFCS-CT-2007-00050 STEELRETRO/ 2007-2010 *Steel solutions for seismic retrofit and upgrade of existing constructions*, Financing authority / Beneficiary: European Commission - Research Fund for Coal and Steel, Value: 23,110 EUR (Total value: 87,600 EUR)
2. 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: 23,044 EUR (Total value: 169,560 EUR)
3. 90CP/I/ 2007-2010. *INSTRUCT - Structural assessment laboratory for large scale tests*, Financing authority: ANCS, Value: 118,073 RON (Total value: 1,998,000 RON)
4. 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)
5. 425 (BC124) / 2009-2010. *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: 158,270 RON (Total value: 158,270 RON)

6. 426 (BC125)/ 2009-2010. *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: 99,008 RON (Total value: 123,760 RON)
7. 149/02.12.2010 (145/20.12.2010). *Drafting of Romanian version of EN 15129:2009*, Financing authority/ Beneficiary: MDRT (Ministry of Regional Development and Tourism). Value: 5,205 RON (Total Value: 5,205 RON)

PUBLISHED PAPERS

1. C. Vulcu, A. Stratan, A. Ciutina, D. Dubină: *Simularea comportării unui model experimental pentru noduri de cadre etajate cu stâlpi din ţevi umplute cu beton şi grinzi dublu T*. The 12-th National Conference on Steel Structures, 26-27 November 2010, Timisoara, Romania, ISBN 978-973-638-464-6, pp. 237-248.
2. G. Danku, A. Ciutina, D. Dubină: *Formarea articulaţiilor plastice în grinzi cu secţiune compusă din oţel-beton în funcţie de gradul de interacţiune*. The 12-th National Conference on Steel Structures, 26-27 November 2010, Timisoara, Romania, ISBN 978-973-638-464-6, pp. 313-322.
3. G. Danku, A. Ciutina, D. Dubină: *Formarea articulaţiilor plastice în grinzi cu secţiune compusă din oţel-beton în funcţie de gradul de interacţiune*. The 12-th National Conference on Steel Structures, 26-27 November 2010, Timisoara, Romania, ISBN 978-973-638-464-6, pp. 313-322.
4. D. Dubină, F. Dinu, A. Stratan, A. Ciutina, M. Şumălan, D. Nunes: *Impactul schimbărilor climatice asupra siguranţei structurilor*. The 12-th National Conference on Steel Structures, 26-27 November 2010, Timisoara, Romania, ISBN 978-973-638-464-6, pp. 367-376.
5. F. Dinu, D. Dubina, A. Ciutina: *Robustness performance of seismic resistant building frames under abnormal loads*. Proceedings of the First International Conference on Structures and Architecture, ICSA 2010, Guimaraes, Portugal, 21-23 July 2010, ISBN 978-0-415-49249-2, pp. 171-179.
6. D. Dubina, A. Stratan, F. Dinu, D. Grecea, N. Muntean, C. Vulcu: *Application of high strength steel to seismic resistant multi-storey buildings*. COST Action C26 "Urban Habitat Constructions under Catastrophic Events" Proceedings, Naples, 16-18 September 2010, Mazzolani (Ed.), Taylor & Francis Group, London, ISBN 978-0-415-60685-1, pp. 355-363.
7. D. Dubina, D. Grecea, N. Muntean: *Strength and ductility of T-stub components in seismic resistant bolted beam-to-column joints*. Proc. of the 14th European Conference on Earthquake Engineering, August 30 – September 03, 2010, Ohrid, Republic of Macedonia. MAEE, ISBN: 978-608-65185-0-9, CD-ROM.
8. N. Muntean, D. Grecea, A. Dogariu, D. Dubina: *Strength and ductility of bolted T-stub macro-components under monotonic and cyclic loading*. Proceedings of the International Colloquium on Stability and Ductility of Steel Structures, SDSS'Rio 2010, 08-10 Sept. 2010, Rio de Janeiro, Brazil, ISBN 978-85-285-0137-7, pp. 223-230.
9. C. Vulcu, Th. Gernay, Zaharia R., JM Franssen: *Numerical modelling of membrane action of composite slabs in fire situation*, Sixth International Conference "Structures in Fire", East Lansing, Michigan, USA, 2-4 June, 2010, ISBN 978-1-60595-027, pp. 474-483.
10. E. Nigro, G. Cefarelli, F. Wald, M. Hajpal, Zaharia R., N. Lopes, P. Vila Real, L. Kwasniewski, Z. Dubrowicz, D. Panthousa, E. geda, D. Bacinskas, V. Griabniak, M. Heinisuo: *Evaluation of vulnerability of constructions*. Urban Habitat Constructions under Catastrophic Events, COST C26 Final Conference, Naples, Italy, 2010. ISBN 978-0-203-83362-9, pp. 219-226.
11. D. Bacinkas, E. Geda, V. Gribniak, G. Kaklauskas, G. Cefarelli, B. Faggiano, A. Ferraro, FM Mazzolani, E. Nigro, C. Couto, N. Lopes, P. Villa Real, M. Hajpal, A. Torok, M. Kaliske, L. Kwasniewski, D. Pintea, R. Zaharia: *Analyses of structures under fire*. Urban Habitat Constructions under Catastrophic Events, COST C26 Final Conference, Naples, Italy, 2010 ISBN 978-0-203-83362-9, pp. 111-138.
12. R. Zaharia, D. Pintea, D. Dubina: *Fire after earthquake*. Urban Habitat Constructions under Catastrophic Events, COST C26 Final Conference, Naples, Italy, 2010, ISBN 978-0-415-606-85-1, pp. 301-306.
13. D. Dubina, F. Dinu, A. Stratan: *Tower Centre International building in Bucharest. Part II: Performance based seismic evaluation and robustness*. Journal of Steel Construction. Design and Research. 3(1) 2010, ISSN 1867-0539, pp. 14-18.

14. F. Dinu, D. Dubina, C. Neagu: *Performance based design for robustness of steel building frames under extreme loads*. Conference on Engineering Research University of Pécs, Pollack Mihály Faculty of Engineering, Pécs, Hungary, Ed. P. Yvanyi, October 25-26, 2010. ISBN: 978-7298-40-0, pp. B71-B83
15. A. Plumier, R. Landolfo, D. Dubina: *Demands and recommendations for assessment and mitigation of risk under exceptional earthquakes*. COST Action C26 "Urban Habitat Constructions under Catastrophic Events" Final Report, Naples, 16-18 September 2010, Mazzolani (Ed.), Taylor & Francis Group, London, 16-18.09, 2010. ISBN: 978-0-415-60686-8, pp. 403-421
16. D. Dubina, A. Stratan, F. Dinu, D. Grecea, N. Muntean, C. Vulcu: *Application of high strength steel to seismic resistant multi-storey buildings*. COST Action C26 "Urban Habitat Constructions under Catastrophic Events" Proceedings, Naples, 16-18 September 2010, Mazzolani (Ed.), Taylor & Francis Group, London, 16-18.09, 2010. ISBN: 978-0-415-60685-1, pp. 355-363
17. F. Dinu, D. Dubina, A. Stratan: *Evaluation of re-centring capability of dual frames with removable dissipative members: case study for eccentrically braced frames with bolted links*. COST Action C26 "Urban Habitat Constructions under Catastrophic Events" Proceedings, Naples, 16-18 September 2010, Mazzolani (Ed.), Taylor & Francis Group, London, 16-18.09, 2010. ISBN: 978-0-415-60685-1, pp. 821-828
18. F. Dinu, D. Dubina, C. Neagu: *Direct design approach for seismic resistant steel frame buildings under extreme loading*. COST Action C26 "Urban Habitat Constructions under Catastrophic Events" Proceedings, Naples, 16-18 September 2010, Mazzolani (Ed.), Taylor & Francis Group, London, 16-18.09, 2010. ISBN: 978-0-415-60685-1, pp. 349-354
19. F. Dinu, D. Dubina, C. Neagu: *Effect of column loss on the robustness of a high rise steel building*. COST Action C26 "Urban Habitat Constructions under Catastrophic Events" Proceedings, Naples, 16-18 September 2010, Mazzolani (Ed.), Taylor & Francis Group, London, 16-18.09, 2010. ISBN: 978-0-415-60685-1, pp. 613-618
20. F. Dinu, D. Dubina, C. Neagu: *Experimental evaluation of q factor for dual steel frames with dissipative shear walls*. COST Action C26 "Urban Habitat Constructions under Catastrophic Events" Proceedings, Naples, 16-18 September 2010, Mazzolani (Ed.), Taylor & Francis Group, London, 16-18.09, 2010. ISBN: 978-0-415-60685-1, pp. 975-980
21. D. Dubina, S. Bordea: *Numerical and experimental evaluation of q factor for RC MRF strengthened with steel BRB*. COST Action C26 "Urban Habitat Constructions under Catastrophic Events" Proceedings, Naples, 16-18 September 2010, Mazzolani (Ed.), Taylor & Francis Group, London. , 16-18.09, 2010. ISBN: 978-0-415-60685-1, pp. 801-807
22. D. Dubina, A. Plumier, R. Landolfo: *General Report „Demands and recommendations for assessment and mitigation of risk under exceptional earthquakes*. COST Action C26 "Urban Habitat Constructions under Catastrophic Events" Proceedings, Naples, 16-18 September 2010, Mazzolani (Ed.), Taylor & Francis Group, London, 16-18.09, 2010. ISBN: 978-0-415-60685-1, pp. 403-421
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25. Dubina D.: *Dual-steel frames for multistory buildings in seismic areas*. Proc. of SDSS'Rio 2010, International Colloquium Stability and Ductility of Steel Structures, Rio de Janeiro, Brazil, Ed. E. Batista, P. Vellasco, L. de Lima, 8-10.09, 2010. ISBN: 978-85-285-0137-7, pp.
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29. D. Dubina, S. Bordea: *Experimental Investigation of Non-Seismic RC Frames Strengthened with BRB Steel Braces*. Proc. of the International Symposium "Steel Structures:Culture & Sustainability 2010, Istanbul, Turkey, Ed. N. Yardimci, A. Aydoner, Y. Gur'es, C. Yorgun, 21-23.09, 2010. ISBN: 978-975-92461-2-9, pp. 235-244
30. F. Dinu, D. Dubina, C. Neagu: *Ductility vs. overstrength in robustness based design of multi-story steel building frames under abnormal loadings*. Proc. of the International Symposium "Steel Structures: Culture & Sustainability 2010, Istanbul, Turkey, Ed. N. Yardimci, A. Aydoner, Y. Gur'es, C. Yorgun, 21-23.09, 2010. ISBN: 978-975-92461-2-9, pp. 171-178
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32. A. Dogariu, D. Dubina: *Finite Element Performance Based Evaluation of Seismically Retrofitted Masonry Buildings – Study Case*. Proceedings of the 3rd WSEAS International Conference on Finite Differences - Finite Elements-Finite Volumes-Boundary Elements (F-and-B '10), 20-22.04.10, 2010. ISBN: 978-960-474-180-9/1790-2769, pp. 264-269
33. A. Dogariu, F. Campitiello: *Calibration of a FE Model of Masonry Shear Panels strengthened by Metal Sheathing*. Proceedings of the 3rd WSEAS International Conference on Finite Differences - Finite Elements - Finite Volumes - Boundary Elements (F-and-B '10), 20-22.04.10, 2010. ISBN: 978-960-474-180-9/1790-2769, pp. 258-263
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PhD THESES

- Sorin Bordea: *Dual frame systems with buckling-restrained braces*, PhD supervisor Prof. Dan Dubina

ONGOING 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 centrically braced frames equipped with friction dampers*, PhD supervisor Prof. Dan Dubina
- 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

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 C26 (2006-2010): *Urban Habitat Constructions under Catastrophic Events*. Two members of the CEMSIG research center (Dan Dubina and Florea Dinu) are members in the management committee of the COST C26 programme.
- 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.

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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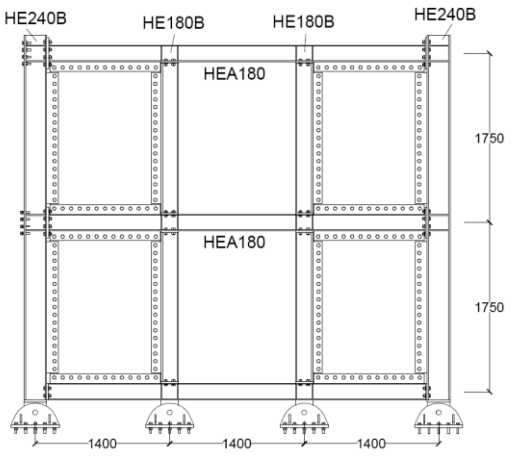
EXAMPLES

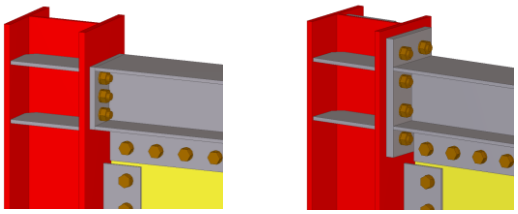
1. Multi-storey building frames with dissipative shear walls

In this research project is investigated the performances of dual SPSW structures. Due to the limitations of the testing capacity, the models were half-scaled. A total of 4 specimens were designed and fabricated, which included specimens with semi-rigid and rigid connections. Specimens were tested monotonically and cyclically.



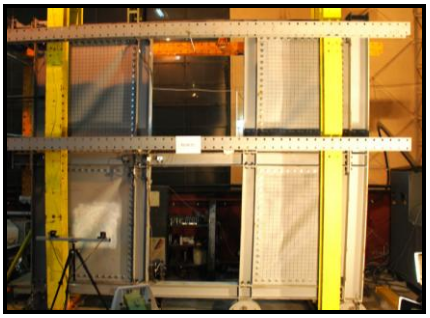
Specimen configuration

In order to evaluate the influence of beam-to-column connections on the response of the structure, two connection typologies were used, i.e. flush end plate bolted connections (semi-rigid) and extended end plate bolted connections (rigid). Rigid joints increased the "yield resistance" and the ultimate capacity of the structures.

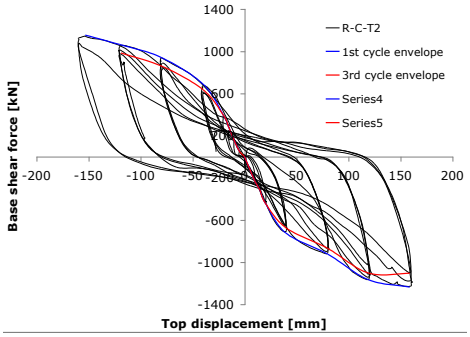


Semirigid connection *Rigid connection*

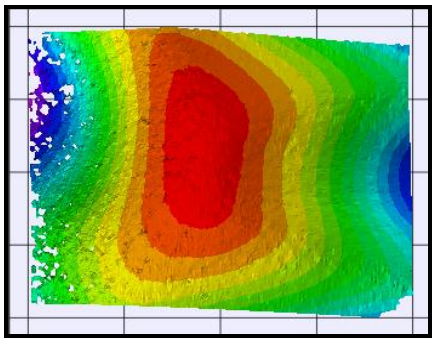
The initial stiffness was also improved when rigid beam-to-column connections are used. They reduce the pinching effect occurred at the load reversal and this contributes to the reduction of the intersorey drifts. In case of the semi-rigid connections, the degradation of the system due to repeated cycles is more important.



Tests on steel plate shear walls



Base shear force versus top dispalcement relationship for specimen R-C-T2

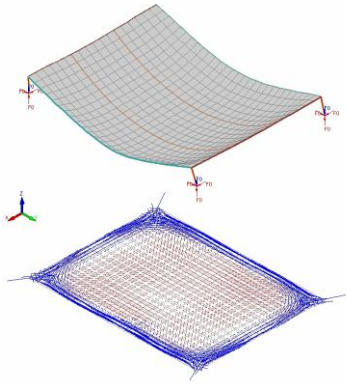


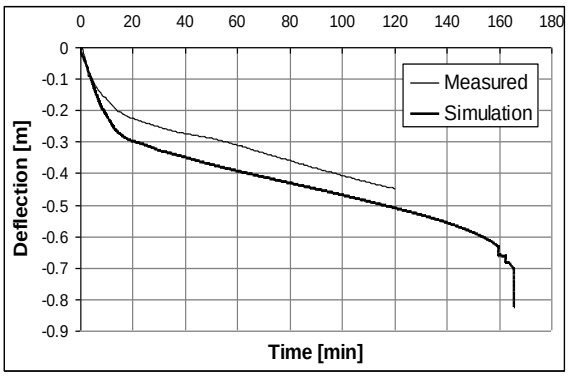
Initial imperfections for specimen R-C-T2 measured using an optical measurement system

Results obtained have shown that these systems are a very god option for lateral resisting systems. The behavior of the systems manifested through the behavior factor q is very close to the behavior resulted in the experimental program. These values (around 6) indicate SPSW structures exhibit a good dissipative behavior, similar to other dissipative structures, like for example moment resisting frames or buckling restrained braces and reflect the provisions from design codes where this system is included (e.g. AISC 2005, NBCC 2005).

2. Numerical modelling of membrane action of composite slabs in fire situation.

Membrane action in fire is now an intensively researched area, for which more improvement is always necessary. The research focuses on numerical simulations, done with the SAFIR program, in order to derive more simple models for representing the partially protected composite steel concrete slabs in fire situation. The influence of some critical parameters on the behaviour and fire resistance of composite slabs such as the amount of reinforcing steel, the thickness of the slab, the flexibility of the protected edge beams and the edge conditions were investigated. The numerical models were calibrated using the results of three full scale tests that have been performed in recent years.





Comparison between full scale test under ISO fire and numerical simulation

3. Structural assessment laboratory for large scale tests

The general purpose of the project is represented by the extension of the experimental capacity of the CEMSIG Research Centre laboratory by building a new experimental facility, composed by a reaction wall on a strong floor and a gantry crane sustained by a covered structure. This new facility allows performing full-scale or close to full-scale tests on structures with 1-3 stories. The reaction wall has a width of 5 m and a height of 6,5 m.

The new laboratory is equipped with two high capacity actuators (650/1015 kN), with a hydraulic unit and controllers. Together with the existing QUIRI actuators (of 500 kN and 1000 kN), the new devices will allow to built more complex experimental arrangements than those possible at present time, which will describe more accurately the stress and deflections of real structures. Furthermore, the four actuators will allow performing natural scale (1:1) testing on structures up to two storey (in case of space structures) and up to three stories (in case of plane models).

Additionally to the possibility to perform full-scale tests, the ensemble four actuators and controller will allow application of pseudo-dynamic tests. This type of testing has the advantage of reproducing the seismic response of a structure by combining the experimental testing of the structure

with numerical determination of dynamic forces acting on it.

In 2010, the extension of the existing laboratory was finished. The new facility for pseudo-dynamic testing is functional; the reaction wall, together with the strong floor are placed in the new part of the laboratory.

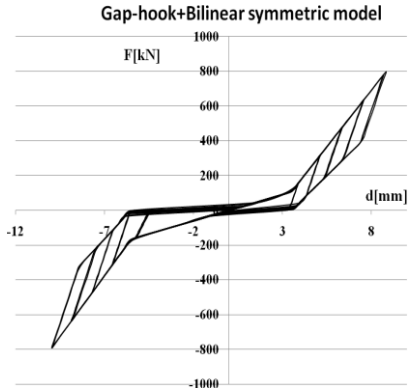
The new building of the laboratory

The strong floor and the reaction wall

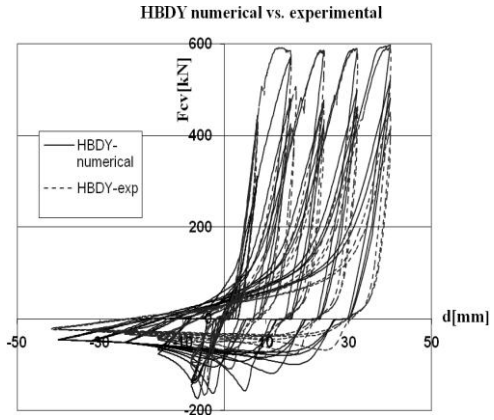
4. Concentrically braced frames with damper devices

The research addresses new systems for seismic protection of structures. The objective was to analyze seismic performance of dual steel frames (moment resisting frames and concentrically braced frames) with hysteretic friction dampers. The experimental program consisted in tests on individual dampers, tests on bare braces, and tests on brace-damper devices. Both monotonic and cyclic loading protocols were used.

Experimental testing of a brace with a damper device



Modelling of hysteretic response of damper device

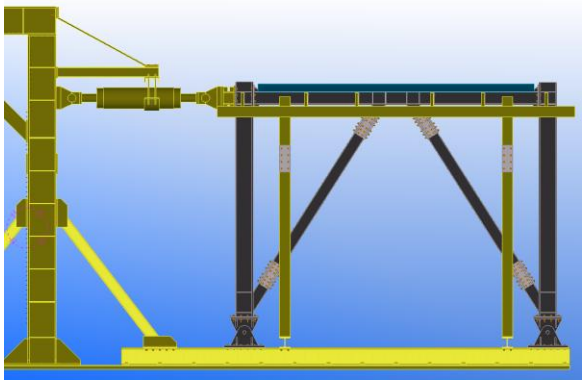


Comparison of experimental and numerical hysteretic response of a brace with a damper device

5. Plastic hinges in composite steel-concrete members subjected to shear and/or bending

The accuracy of concentrated plasticity models to be applied in the dissipative zones of composite steel-concrete beams in case of joints from Moment Resisting Frames (MRF), and in case of links from the Eccentric Braced Frames (EBF) is still a matter of discussion. A current practice, is not to install connectors in the expected plastic zones, and to consider a symmetric plastic hinge for the steel beam or link only. However, since the reinforcing bars are active although the connectors have been suppressed but also due to friction contact between the concrete slab and beam or link flange, the assumption of the "nominal symmetric" plastic hinge could be false.

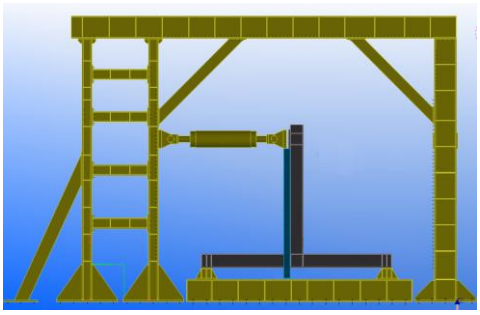
A number of tests, both on EBFs and MRFs beam-to-column joints, were performed in the CEMSIG lab to study the phenomena described above.



Experimental setup of the eccentrically braced frame

Failure mode of the steel link

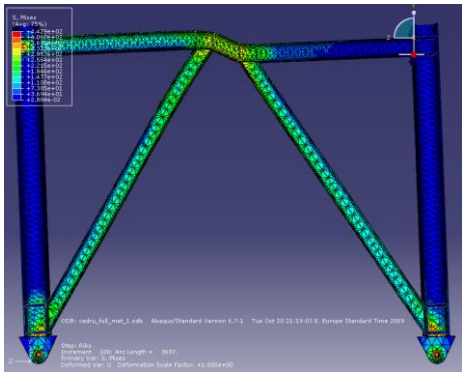
Failure mode of the detachable link (composite beam)



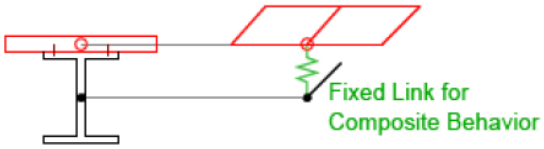
Experimental setup for the MRF joints

Failure mode of the composite beam in the RBS

The experimental tests were also simulated in the Abaqus FEM software, but a true model for the precise bahaviour of concrete is still needed. Thus an equivalent model for the composite beams was created, using SAP2000 software, in order to be used in further IDA analyses.



Numerical FE models of the eccentrically braced frame

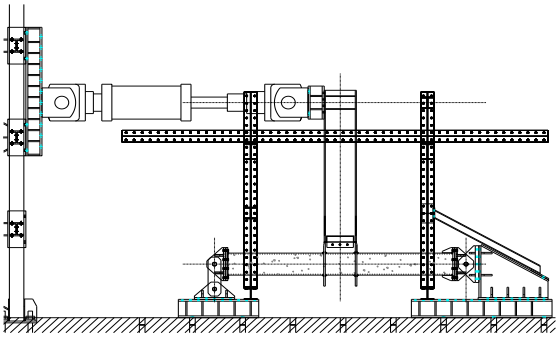


Composite beam's equivalent model from SAP2000

6. 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) Behavior of the connection; (4) Efficiency of the shot fired nails.

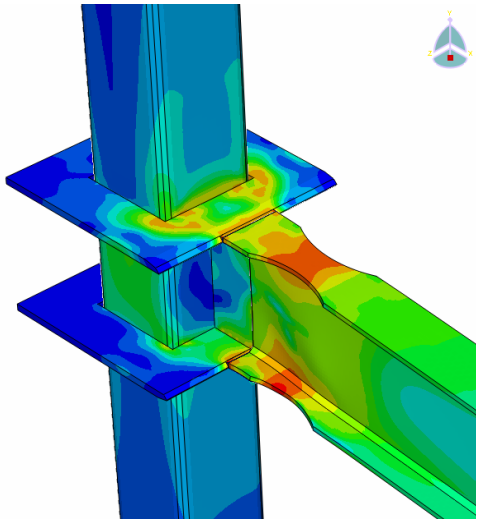
Experimental tests on large specimens will be performed in order to demonstrate that joint detailing (8 configurations) and welding technology perform adequately under seismic loading (reverse cyclic loading in the inelastic range). The main purpose is to obtain plastic deformations in the beam (8 specimens) 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 behavior 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 and identify weak spots in the experimental tests.



Stress distribution in the model of the RHS 300x12,5 S460 – RBS specimen

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 sensivity 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)
- PhD. student 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) / 2009-2010. Stability check of structural steel members *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: 114,240 RON (Total value: 142,800 RON)
2. 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)

PUBLISHED PAPERS

1. V. Ungureanu, M. Kotelko, Mania R.J., D. Dubina: *Plastic mechanisms database for thin-walled cold-formed steel members in compression and bending*. Thin-Walled Structures. 48(10-11), 2010, 818-826.
2. D. Dubina, V. Ungureanu: *Behaviour of multi-span cold-formed Z-purlins with bolted lapped connections*. Thin-Walled Structures. 48(10-11), 2010, 866-871.
3. D. Dubina, V. Ungureanu, Nagy Zs., Nunes L., Pernes P.: *Imperfections sensitivity analysis of pitched roof cold-formed steel portal frames*. Proceedings of the International Colloquium on Stability and Ductility of Steel Structures, SDSS'Rio 2010, 08-10 Sept. 2010, Rio de Janeiro, Brazil, ISBN: 978-85-285-0137-7, pp. 929-936.
4. A. Crisan, V. Ungureanu, D. Dubina: *Ultimate limit strength of perforated cold-formed steel sections*. Proceedings of the International Colloquium on Stability and Ductility of Steel Structures, SDSS'Rio 2010, 08-10 Sept. 2010, Rio de Janeiro, Brazil, ISBN: 978-85-285-0137-7. pp. 937-944.
5. M. Georgescu, V. Ungureanu: *Improved design model for thin-walled cold-formed purlins continously connected to sandwich panel roofing*. Proceedings of the First International Conference on Structures and Architecture, ICSA 2010, Guimaraes, Portugal, 21-23 July 2010, pp. 153-154+CD.
6. M. Georgescu, V. Ungureanu: *Improved TWCF system for industrial buildings*. Proceedings of the International Symposium "Steel Structures: Culture & Sustainability 2010". 21-23.09.2010, pp. 537-544.
7. I. Țuca, V. Ungureanu, A. Ciutina, D. Dubină: *Verificarea structurilor de planşeu la starea limită de serviciu pentru vibrații.* The 12-th National Conference on Steel Structures, 26-27 November 2010, Timisoara, Romania, pp. 111-120, ISBN 978-973-638-464-6.
8. A. Crişan, V. Ungureanu, D. Dubină: *Proiectarea şi verificarea structurilor pentru depozite paletizate.* The 12-th National Conference on Steel Structures, 26-27 November 2010, Timisoara, Romania, pp. 121-132, ISBN 978-973-638-464-6.
9. D. Dubina, V. Ungureanu, M. Georgescu, L. Fulop, R. Zaharia, I. Szabo, Zs. Nagy, A. Stratan, A. Ciutina: *Steel Structures Research School of Timisoara: Relevant contributions to research and design assisted by testing in cold-formed steel*. Lucrările seminarului „Construieşte cu STEEL" 2010, Ed. Mediamira, pp. 103-157, ISBN 978-973-713-271-0.
10. I. M. Cristutiu, D. Grecea, D. Dubina: *Influence of Connected Members Components on the Structural Performance of Bolted Beam-to-Column Joints of Pitched Roof Portal Frames*. Proc. of International Workshop: Global and Regional Environmental Protection, Timisoara, 26-28 Nov. 2010, ISBN: 978-606-554-210-5, pp. 201-204.
11. I. M. Cristutiu, D. Dubina: *Influence of member components on the structural performance of beam-to-column joints of pitched roof portal frames with class 3 and 4 sections*. Proceedings of the International Colloquium on Stability and Ductility of Steel Structures, SDSS'Rio 2010, 08-10 Sept. 2010, Rio de Janeiro, Brazil, ISBN: 978-85-285-0137-7, pp.191-198

ONGOING PhD THESES

- Andrei Crisan: *Stability of light gauge thin-walled structures for pallet rack systems*, PhD supervisor Prof. Dan Dubina
- 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.
- 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
- Shear walls from cold-formed steel cassettes
- Specific buckling curves for pallet racking members in compression and bending

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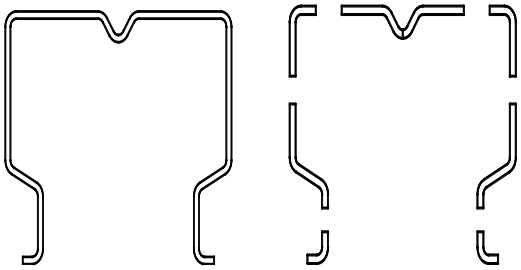
EXAMPLES

1. Testing Program on DEXION HI-LO structural components for pallet racking system: Stub column tests and Distortional buckling column tests.

Stub column and distortional buckling column tests on the DEXION HI-LO pallet rack components carried out in accordance with the recommendations of EN 15512:2008 "Steel static storage systems – Adjustable pallet racking systems – Principles for structural design".

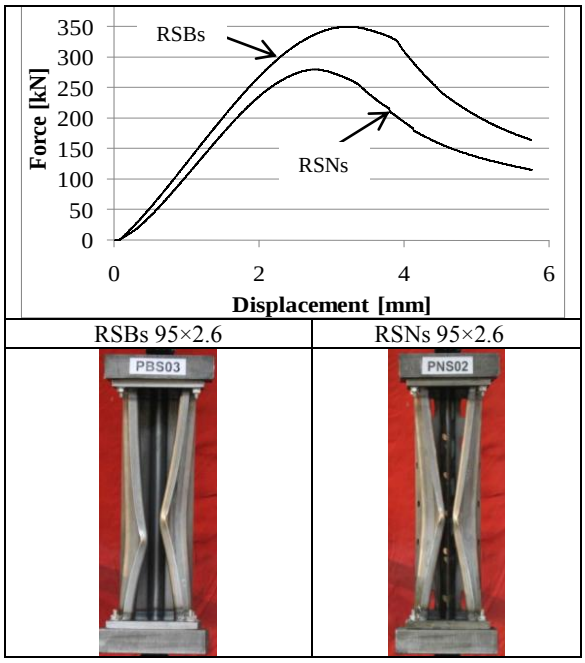
Experimental tests were carried out on two different upright sections, P95x2.6 and UH125x3.2, both with and without perforations have been performed. Tensile tests in accordance with EN10002-1, on coupons cut from base material were also made to determine the actual values of the yield strength fy and the ultimate strength fu. All test specimens were measured in order to determine the geometric imperfections.



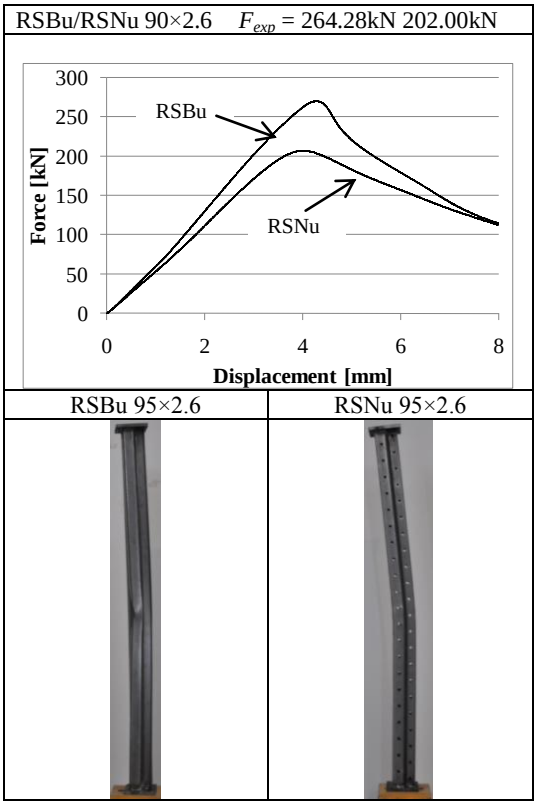
Specimen cross-section – brut and perforated

The specimens were tested with INSTRON 1000KN Dynamic Testing System. The equipment was connected to a computer controlling the experiment and making the readings during the test.

RSBs/RSNs95×2.6	F_{exp} = 336.85kN; 273.79kN

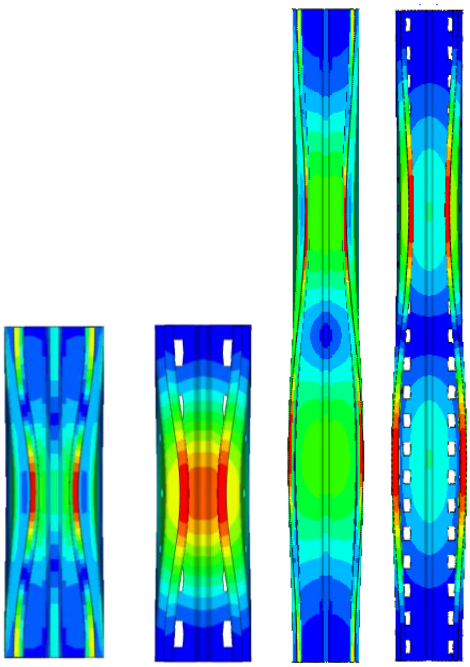


Stub column tests: experimental curves and failure modes



Test on upright: experimental curves and failure modes

Numerical models for the tested specimens were created using the finite element analysis software package ABAQUS/CAE v.6.7.1. The models were calibrated to replicate the real tests



Numerical simulations for the tested specimens

The slender member ultimate capacity in distortional-overall buckling could be evaluated numerically, by applying the presented ECBL approach, avoiding the complicate testing procedure. In fact, for a series of upright sections the imperfection factor, α, can be evaluated and after, used to apply the current buckling check formulae from design code EN1993-1-3.

In order to determine the interactive buckling modes, namely global flexural buckling with respect to minimum inertia moment axis coupled with distortional buckling, a series of FEA models were analyzed.

2. Full scale testing of a roof relevant zone built with sandwich panel plus TWCF Z purlins

Sandwich panel roofs are extremely frequent in the construction of industrial buildings. Nevertheless, the study on Z purlins stability (as elements continuously connected to panel layer at upper flange level and having a free bottom flange) is still un-concluded at international level. Ongoing researches exist in the field, performed by well known scientists and research teams.

On this line of interest, in the frame of CEMSIG some relevant testing is going on, trying to investigate torsional and distorsional instability of thin-walled cold-formed Z purlins under gravity and up-lift loading.

Full scale 3,0m x 12,0 m experimental setup

The experimental set-up is hereby presented, operating on a realistic scheme, very close to the real situation in practice. The value of linear spring stiffness K, at the level of bottom (free) level of the purlin was measured, further-on available for simplified method design, to the provisions of EC.3-1.3

Distributed load applied to tested specimen

Overlapping zone of the Z purlin: relevant detail

The on-going research is now aiming to study the diaphragm effect existing in such roofing systems and its possible role in the overall industrial building structure.

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

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. 31042/2007-2010 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: 279.413 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: 0 EUR (Total value: 78.300 EUR)

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1. D. Dubina, V. Ungureanu, A. Ciutina, I. Tuca, M. Mutiu: *Sustainable detached family house - case study*. Journal of Steel Construction. Design and Research. 3(1) 2010, ISSN: 1867-0539, pp. 154-162.
2. A. Ciutiną, I. Tuca, V. Ungureanu, D. Dubina: *Design of buildings including environmental impact*. Environmental Engineering and Management Journal. 9(8), 2010, pp. 1121-1131.
3. D. Dubina, V. Ungureanu, A. Ciutina, M. Mutiu, D. Grecea: *Innovative sustainable steel framing based affordable house solution for continental seismic areas*, Proc. of the 1st International Conference on Structures and Architecture, ICSA 2010, Guimaraes, Portugal, 21-23 July 2010, CRC Press, Taylor& Francis Group, ISBN: 978-0-415-49249-2, pp. 367-384.
4. Portioli F., Cascini L., Ungureanu V.: *Multi-criteria decision making methods in refurbishment, deconstruction and demolition of existing structures*. Proceedings of the International Symposium: COST C25 Sustainability of Construction: Integrated Approach to Life-time Structural Engineering, Malta, 23-25.07.2010, pp. 177-184.
5. L. Bragança, H. Koukkari, R. Blok, H. Gervásio, M. Veljkovic, Z. Plewako, R. Landolfo, V. Ungureanu: *Sustainability of*

Constructions. Integrated Approach to Life-time Structural Engineering. Proceedings of Improving the Quality of Suburban Building Stock, COST Action TU0701 – Mid Term Conference, Malta, 7-8 May 2010, pp. 601-614.

6. D. Dubina, V. Ungureanu, A. Ciutina, I. Tuca, M. Mutiu: *Sustainable single family house - case study*. Proceedings of the International Symposium "Steel Structures: Culture & Sustainability 2010". 21-23.09.2010, Istanbul, Turkey, Ed. N. Yardimci, A. Aydoner, Y. Gur'es, C. Yorgun, ISBN: 978-975-92461-2-9, pp. 603-612.
7. D. Dubina, V. Ungureanu, A. Ciutina, D. Grecea, I. Țuca, M. Șumălan: *Analiza factorilor de impact asupra mediului pentru un set de soluții constructive pentru clădiri de locuit*. Revista AICPS (ISSN: 2067-4546). 2-3/ 2010. pp. 1-15 (CD-ROM).
8. D. Dubina, A. Ciutina, V. Ungureanu: *Dezvoltarea durabilă în mediul construit*. Buletinul AGIR (ISSN: 1224-7928), nr. 2-3/2010, pp. 11-22.
9. M. Szitar, D. Grecea, A. Ciutina: *Dezvoltarea durabilă şi calitatea mediului construit – criterii şi sisteme de evaluare*. The 12-th National Conference on Steel Structures, 26-27 November 2010, Timisoara, Romania, pp. 143-154, ISBN 978-973-638-464-6.
10. I. Țuca, V. Ungureanu, A. Ciutina, D. Dubină: *Proiectarea integrată a construcțiilor – studiu de caz pentru o casă unifamilială*. The 12-th National Conference on Steel Structures, 26-27 November 2010, Timisoara, Romania, pp. 155-166, ISBN 978-973-638-464-6.
11. A. Ciutina, V. Ungureanu, M. Mutiu, D. Dubina, M. Sumalan: *Affordable steel framing house solution for seismic zones*. Proceedings of the International Workshop "Global and Regional Environmental Protection", Timisoara, Romania, 26-28.11.2010, pp. 197-201.
12. I. Tuca, A. Ciutina, V. Ungureanu, D. Dubina: *Sustainable housing case study: cold-formed steel framing vs. masonry*. Proceedings of the International Workshop "Global and Regional Environmental Protection", Timisoara, Romania, 26-28.11.2010, pp. 245-249.
13. M. Szitar, B. Havasi, D. Grecea: *Sustainable Development in Higher Education. The Built Environment Disciplines*. Proc. of International Workshop: Global and Regional Environmental Protection, Timisoara, 26-28 Nov. 2010, ISBN: 978-606-554-210-5, pp. 270-274.
14. M. Georgescu, V. Ungureanu: *Conversion of an existing steel industrial hall with crane into a multistorey office building*. Proceedings of the International Workshop "Global and Regional Environmental Protection", Timisoara, Romania, 26-28.11.2010, pp. 205-208.
15. V. Ungureanu, M. Georgescu: *Refurbishment of a multistory welded steel structure located in a seismic area*. Proceedings of the International Workshop "Global and Regional Environmental Protection", Timisoara, Romania, 26-28.11.2010, pp. 250-253.

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.

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

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. Innovative sustainable steel framing based affordable house solution for continental seismic areas.

Romania is characterized by a moderate to high seismic territory, a country with hot summers and cold winters with moderate to heavy snow, i.e. Romania covers a wide range of climatic, geotechnical and seismic conditions. In such circumstances robustness and sustainable design criteria have to be properly combined and applied in order to obtain an affordable house of good ratios between in-door-comfort and cost.

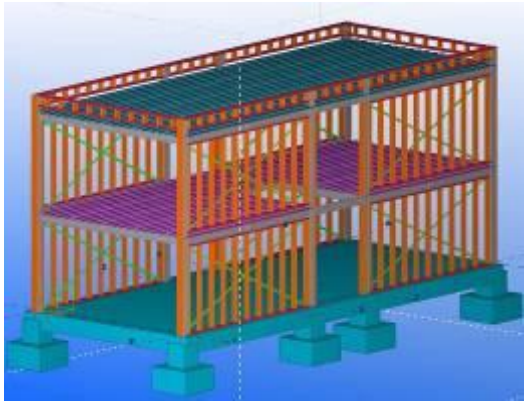
An innovative structure-envelope solution was proposed, enabling flexible floor plans and modular construction, faster fabrication and erection times, with high solution diversity for flooring and envelope. The proposed construction system consists of: (1) hot-rolled framed steel structure; (2) secondary structure – cold-formed steel studs; (3) various envelope systems; (4) floor structure – light concrete topping on trapezoidal steel deck; (5) double glazed loggias with PVC or aluminium frames; (6) foundations and slab / cast in place reinforced concrete; (7) terrace roof or pitched roof.

The architectural concept relies on the development of a rectangular footprint of 5.60m×13.40m, which gives a first module of 75m2, for the one level unit. The house is a two storey building, with terrace roof, having a gross built area of 150m2 and a usable area of 124.41m2.

The innovative aspect consists mainly in application of industrial building technologies to a house project (residential application). The basic assumption is that an affordable house, instead of experimenting with materials which have no track record, should rely on standard details and common technologies, available to most of the builders.

(a)

(b)



3D view of the house:
(a) architectural layout; (b) structural layout

The main aim was to perform a comparative life-cycle analysis of the above-described house in various solutions. On this purpose the building was designed in four different solutions, each of them having its own building system as follows:

(1) *Masonry structure;*
(2) *Wood framing;*
(3) *Cold-formed steel framing;*
(4) *Hot-rolled steel frames*.

All four structures have been designed following the above-described architectural plans. For all of these building systems a detailed analysis was performed and complete lists of materials were derived. The design considers the same location of the building and the same imposed and climatic loading. The buildings were designed in such a way to achieve similar indoor environment.

In order to quantify the environmental impact due to the construction process of this house, including the end-of-life process, a Life Cycle Assessment (LCA) was performed by using the SimaPro computer tool. On this purpose, in a first step, the inventory of the materials integrated in the building process was done. Secondly, for a rough completion of LCA, the end-of-life of integrated materials was estimated according to present conditions in Romania.

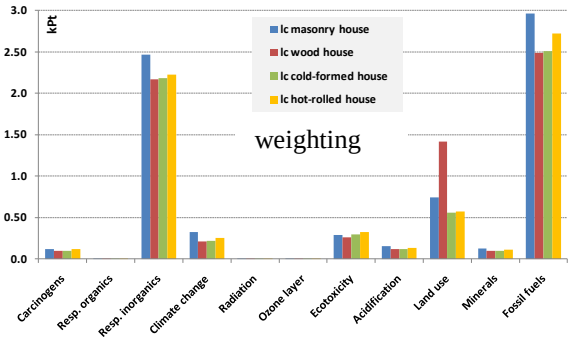
Several aspects were considered in order to underline the impact for different stages during life-cycle: (a) construction stage only; (b) construction stage and final disposal of materials; (c) construction stage, disposal and maintenance.

Figures below present all the stages of the life-cycle of buildings as a direct sum of the construction stage, the maintenance of the building for a life-time period of 50 years and the disposal at the end-of-life for different materials. As a general trend, the following impact categories are most affected:

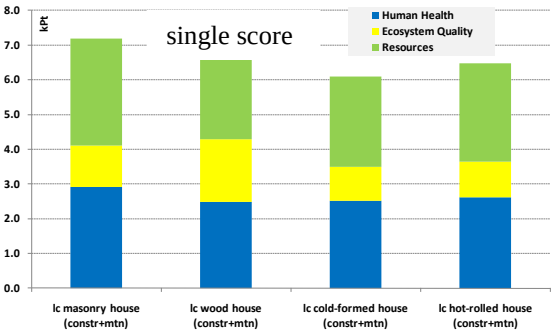
(i) fossil fuels and respiratory inorganic substances, climate change, mainly due to the manufacturing

processes which require large quantities of energy, which affect directly the fossil fuel reserves;

(ii) land use: due to damages drawn to land (wood exploitation, ballast pits etc.).



LC comparison on environmental impact for construction, including maintenance and end-of-life



LC comparison on environmental impact for construction, including maintenance and end-of-life

In a single score analysis and taking into account the boundary conditions, the metallic houses (6096 and 6481 eco-points, respectively) present an important advantage in front of masonry house (7192 eco-points), while the score for the wood house is about the average value corresponding to the impact of the other three solutions. Of course, many parameters (such as national or regional peculiarities, climatic zones or distance from the material distributors) may affect these results.

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

FIELD DESCRIPTION

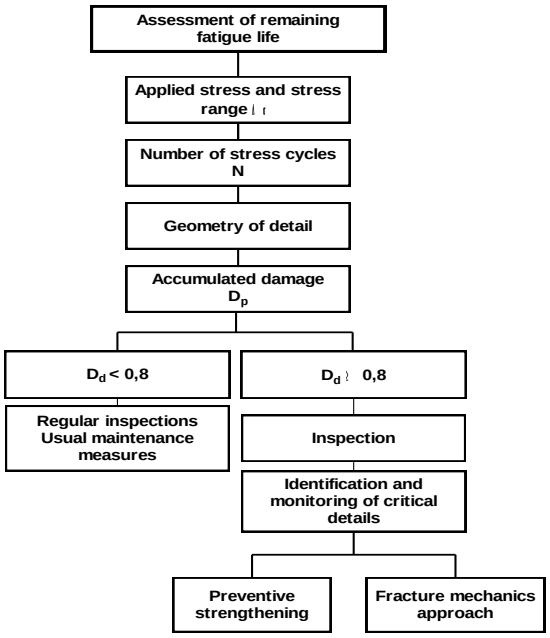
Rehabilitation and maintenance of existing steel bridges is one of the most important actual problems. The infrastructure in Romania and in other East – European countries has an average age of about seventy to ninety years. Many of these structures, particularly railway bridges, have already achieved 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 emphasised.

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)

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. Băncilă, R., Petzek, E., *„Verification principles of the existing railway bridges situated on the IV European Corridor in Romania”,* Engineering Research, Pollack, 978-7298-40-0, 2010
2. Petzek Edward, Băncilă Radu, Victor Schmitt, Nicu Muntean, Zoltan Plosz, *„Rehabilitation of an old historical steel bridge over the Mures river in the Danube basin and crossing alternatives for the tramway”,* 7th International Conference on bridges across the Danube, 978-954-724-014-4, 2010

3. Petzek Edward, Băncilă Radu, *“Criteria for the assessment of existing railway bridges”*, Construieste cu Steel, Seminar Cluj Napoca, 978-973-713-271-0, 2010.
4. Băncilă Radu, Petzek Edward, *“New life for an old historical steel bridge over the Mures river”,* European Convention for Constructional Steelwork AWARD, 2010. www.steelconstruct.com

OTHER RESULTS

- Membership in the European Committee: TC6 Fatigue and European Committee: Bridges – Radu Bancila and Edward Petzek.
- European ECCS Award for Steel Bridges 2010: Bridge Refurbishment – “New life for an old historical steel bridge over the Mures River in Savarsin, Romania, 2008” www.steelconstruct.com

ONGOING PhD THESES

- Silvia Rominu: *Contribution regarding the improvement of the robustness in the design and rehabilitation of structures,* PhD supervisor Prof. Radu Bancila
- Ana-Maria Butisca: *Study of the bearings capacity of the Danube Bridge King Carol I made by A. Saligny,* PhD supervisor Prof. Radu Bancila

FURTHER DEVELOPMENTS

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

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EXAMPLES

1. Bridge over the river Mures in Arad – technical project (collaboration with SSF-RO – structural office)

Verification of existing bridges

Reparation of existing highway bridges

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)
- Prof. Radu Băncilă, PhD (steel welded structures, composite structures)
- Researcher Ramona Gabor (Friction Stir Welding, technology and welding procedure)
- PhD. Stud. Lucian Blaga (monitoring of bridges)
- 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.

RESULTS

RESEARCH PROJECTS

1. RFSP-CT-2010-00024 *ECOBRIDGE Project*, Financing authority European Commission, Research Fund for Coal and Steel. Value: 50,000 EUR

PUBLISHED PAPERS

1. Petzek, E., Bancila, R., *„Efficient solutions for composite bridges“,* Proceedins of the International Scientific Conference CIBv 2010, Vol.2, ISSN 1843-6617.
2. Petzek, E., Bancila, R., Schmitt, V., *“Poduri compuse otel – beton pentru deschideri mici si mijlocii – solutii eficiente”*, Conferinta national de constructii metalice, editia a XII-a, ed. Orizonturi Universitare, ISBN 978-973-638-464-6, Timisoara, 2010.
3. Petzek, E., Bancila, R., Schmitt, V., Muntean, N, Toma, L., *“Solutii eficiente pentru poduri de deschideri mici si mijlocii”,* al XIII-lea Congres national de drumuri si poduri, ed. Media drumuri poduri, Poiana Brasov, 2010.
4. Petzek, E., Bancila, R., Schmitt, V., Plosz, Z., Török, L., *“Doua solutii pentru traversarea Muresului cu o pasarela hobanata”,* al XIII-lea Congres national de drumuri si poduri, ed. Media drumuri-poduri, Poiana Brasov, 2010.
5. Bancila, R., Petzek, E., *„ Proiect european de cercetare aplicata Ecobridge“,* Revista de drumuri si poduri nr. 88, 2010.
6. Petzek, E., Bancila, *“Demonstration of composite bridge with integral abutments”*, Berlin, 2010.

PHD THESES

1. Ramona Gabor: *Applications of Friction Stir Welding in the field of civil engineering*, PhD supervisor Prof. Radu Bancila, 2010.

ONGOING PHD THESES

2. Lucian Blaga: *Innovating materials in bridge construction. Study of fiber-reinforced-polymer lightweight bridges*, PhD supervisor Prof. Radu Bancila

3. 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.

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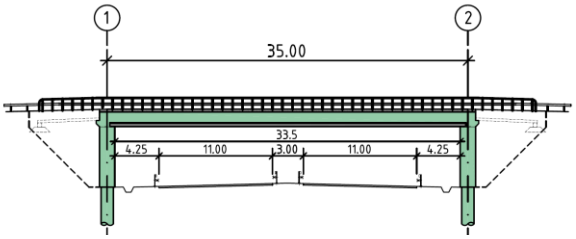
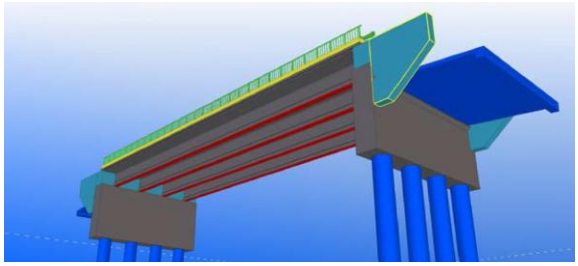
EXAMPLES

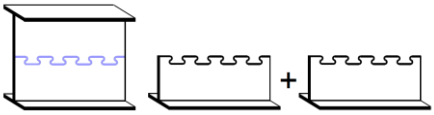
1. Composite highway bridges with embedded steel girders

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.



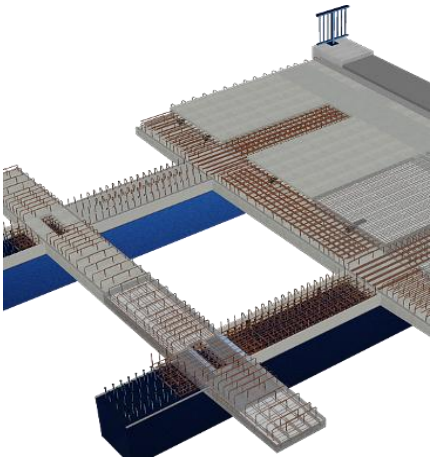


Technical solution for highway bridge - SSF



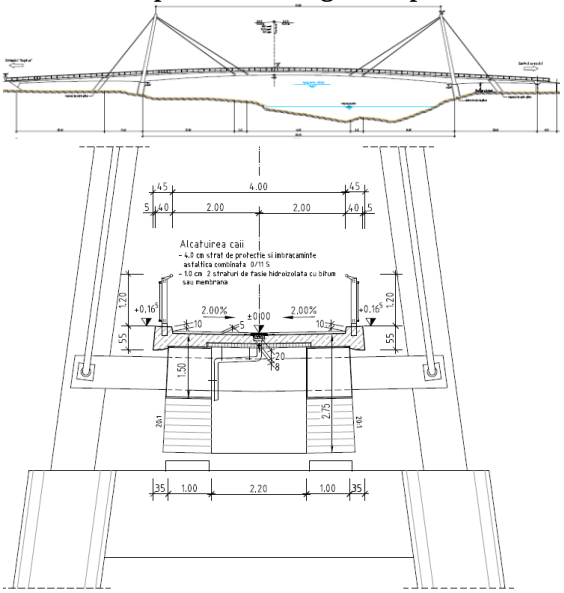
Cutting technology of steel girder

2. Composite bridges – Rapid solutions VTR®



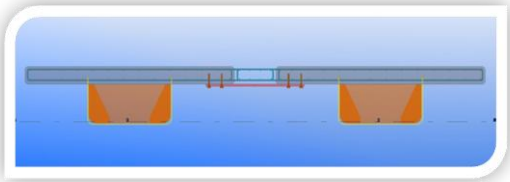
SSF Solution

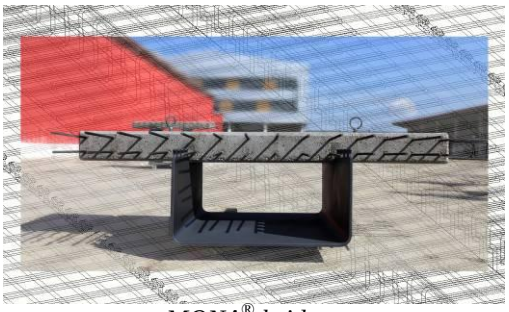
3. Composite footbridge with precast slab



New composite footbridge over the Mures in Arad

4. Modular temporary bridges MONA®

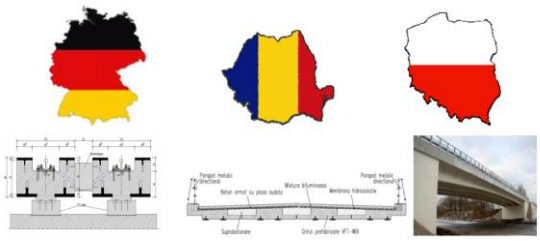




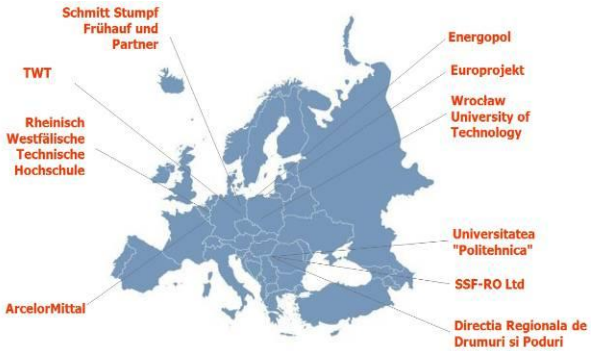
MONA® bridges

5. 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.

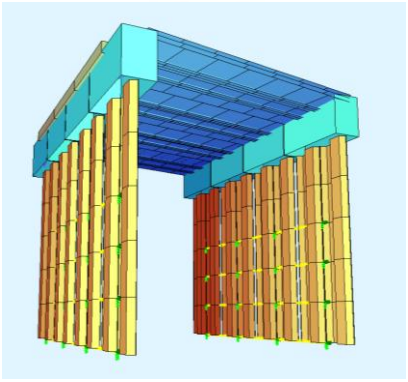


The bridges will be instrumented with a variety of strain gages, displacement sensors, and thermocouples to monitor and help in the assessment of structural behaviour, for future application of integral abutment bridges and/or composite dowels. The project focuses on cost efficient, competitive composite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



Composite Composite bridge with integral abutments and Precobeam girders in Romania

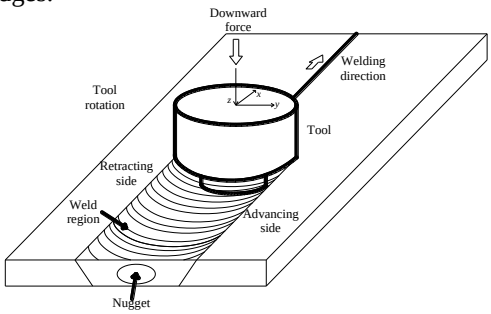
The bridge is situated on the National Highway DN 79A Km 60+627, near to the village Manerau in the Arad County.



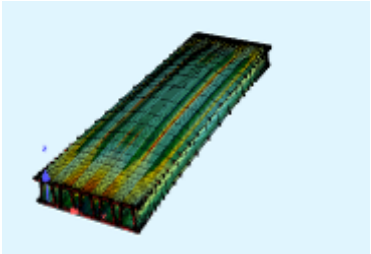
Calculation FEM model - Sofistik

6. 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.



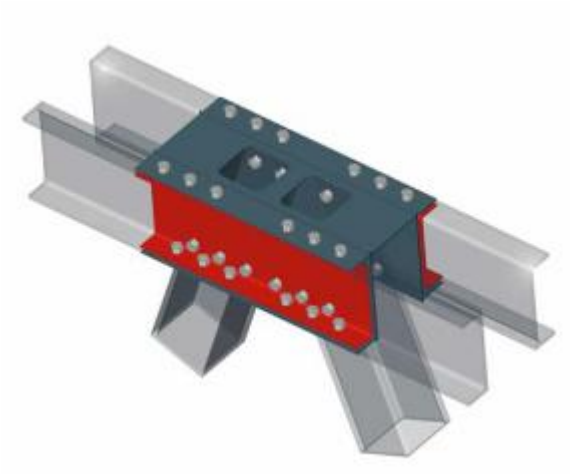
FSW process



7. 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.

SOFISTIK analysis for an aluminum alloy bridge deck



Steel shoe for GFRP connections

NATIONAL RESEARCH CENTRE IN CIVIL ENGINEERING AND FATIGUE – *CNCCO*

GENERAL PRESENTATION

CNCCO - This research centre has been created in 2002, as a consequence of a grant co-financed by the Romanian Government and the World Bank. It is a multi-user research centre. We are in relations of partnership with the Technical University of Civil Engineering Bucharest, Technical University of Iaşi, Technical University of Cluj-Napoca, "Eftimie Murgu" University of Reşiţa, "Lucian Blaga" University of Sibiu, University of Petroşani.

OBJECTIVES

CNCCO - The main objective of the centre is the developing of highly qualified human resources for higher education and scientific research.
Special attention is given to youth training, by attracting students to major research programs performed by our experienced team, in which they are making use of our high-performance research infrastructure,
CNCCO - offers research, expertise, consulting design and testing services for structures and materials used in civil and mechanical engineering.

MAIN RESEARCH FIELDS

- *Nonlinear analysis of structures*

Keywords: nonlinear, static, dynamics, stability, rigid, steel structures, maintenance

- *Computational Methods, Computer Aided Design, Computer Aided Engineering*

Keywords: finite elements, boundary elements, design, CAD, CAE, training center

- *Earthquake Engineering*

Keywords: multistory steel frames, earthquake, global performance, ductility, beam-to-column connections, reliability, bearing capacity, safety, damaged elements, seismic events, maintenance

Researches in *NONLINEAR ANALYSIS OF STRUCTURES*

FIELD DESCRIPTION

Nonlinear elastic and elastic-plastic analysis of structures under static and dynamic loads is treated. The influence of beam-to-column joint flexibility on the structural behaviour is evaluated. Post critical analysis is performed. Several connection

types are taken in consideration. An optimum response of the entire structure is the final goal.

ACTIVITIES

- Intensive numerical and experimental investigations were performed on the behaviour of steel frames, plane plates and shells in both pre and post-buckling domains
- Experimental tests were performed in order to find the mechanical characteristics of materials

RESEARCH TEAM

- Prof. PhD. Eng. Marin IVAN
- Prof. PhD. Eng. Mircea IEREMIA
- Ass. Prof. PhD. Eng. Adrian IVAN
- PhD student Eng. Ioan BOTH
- PhD student Eng. Viorel POPA-ALBU
- Eng. PhD student Dănuț CĂLUGĂR
- Eng. PhD student Vinicius PRECUPAȘ

RESEARCH OFFERS

- Advanced static and dynamic finite element analysis of civil engineering structures
- Expertise, consulting, design checking services
- Design activities for steel, concrete and timber structures
- Experimental testing services

RESULTS

PUBLISHED PAPERS

1. Adrian Ivan, Marin Ivan, Ioan Both, *Comparison of FEA and Experimental Results for a Steel Frame Connection*, WSEAS Transactions on Applied and Theoretical Mechanics, 2010
2. Adrian Ivan, Marin Ivan, Ioan Both, *Strenghthening of Steel Frame Connection and Finite Element Analysis Results*, WSEAS Conference Recent Advances in Finite Differences - Finite Elements - Finite Volumes - Boundary Elements, Bucuresti, 2010, ISBN 978-960-474-180-9
3. Ioan Both, Marin Ivan, Adrian Ivan, *Analysis of a Suspension Crossing for a Pipeline Using Finite Element Method. Influence of Elasticity Modulus*, WSEAS Conference Recent Advances in Finite Differences - Finite Elements - Finite Volumes - Boundary Elements, Bucuresti, 2010, ISBN 978-960-474-180-9
4. Horia Mateiu, Alin Murariu, Adrian Ivan, *Reinforcement Assessment of Welded Frames for Metallic Structures*, WSEAS Conference Recent Advances in Finite Differences - Finite Elements-Finite Volumes-Boundary Elements, Bucuresti, 2010, ISBN 978-960-474-180-9
5. Ioan Both, Adrian Ivan, *Analysis of a Steel Structure in a Power Station*, International Conference on Mathematical Models for Engineering Science, 2010, Tenerife, Spania

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Researches in *COMPUTATIONAL METHODS, COMPUTER AIDED DESIGN, COMPUTER AIDED ENGINEERING*

FIELD DESCRIPTION

Finite element models together with CAD tools are highly required in order to obtain optimal structural solutions. The problem is important for both civil and mechanical engineering. The next step in this domain consists in the development of some expert systems for design and expertise.

ACTIVITIES

- Developing of small computer programs dedicated to specific civil engineering problems
- Creating interfaces between large specialized computer programs and the ones previously mentioned
- Testing of the new versions of complex computer programs for accuracy
- Developing numerical procedures to evaluate the bearing capacity of the damaged structures

RESEARCH TEAM

- Ass. Prof. PhD. Eng. Adrian IVAN
- Eng. PhD student Ioan BOTH
- Prof. PhD. Eng. Mircea IEREMIA
- Prof. PhD. Eng. Marin IVAN
- As. Eng. PhD student Eugen DOGARIU
- Eng. PhD student Dănuț CĂLUGĂR

RESEARCH OFFERS

- Consulting, design, training services
- CAD/CAE services
- Finite element analysis software checking

RESEARCH PROJECTS

TECOMET- *An expert software for steel structures evaluation, diagnosis and rehabilitation*

FURTHER DEVELOPMENTS

- Testing of the new versions of complex computer programs for accuracy
- Developing numerical procedures to evaluate the bearing capacity of the damaged structures

CONTACT PERSON

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Fax: +40-256-403931
E-mail: adrian.ivan@ct.upt.ro

Researches in *EARTHQUAKE ENGINEERING*

FIELD DESCRIPTION

The main objectives of the range are: keeping the safety of the new civil engineering works through designing, cladding and maintenance, assessment of the residual bearing capacity of damaged elements of a structure, recovering the initial bearing capacity of the damaged structures to resist to the new seismic events, new resistant systems for the high-raised steel buildings.

ACTIVITIES

- Linear and non-linear dynamic response analysis of civil engineering structures subjected to seismic loads
- New seismic protection solutions for structures (base isolation, dampers)
- Evaluation of the bearing capacity of the strengthened structures

RESEARCH TEAM

- Prof. PhD. Eng. Marin IVAN
- Prof. PhD. Eng. Mircea IEREMIA
- Prof. PhD. Eng. Zoe REGEP
- Ass. prof. PhD. Eng. Adrian IVAN
- Eng. PhD student Ioan BOTH

RESEARCH OFFERS

- Non-linear dynamic response analysis of civil engineering structures subjected to seismic loads
- Expertise, consulting, design checking services

RESEARCH PROJECTS

Complex project-partnership, Contract no. 31099/ 2007: *Modern technology for enhancing the durability of steel structures*, Beneficiary: National Center for Project Management, Bucharest, Value: 1,275,995 RON

CONTACT PERSONS

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RESEARCH CENTRE FOR MATERIALS AND STRUCTURES (*MAST)*

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 materials, concrete, cement, reinforcement, masonry materials.

- Lab studies concerning the composition of the self-compacting concrete

Keywords: Cement, aggregates, additives, technology, physico-mechancial characteristics, optimal composition.

- 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, CO_2 emission, new building sustainable materials.

- Robustness of Reinforced Concrete Structures

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

CONTACT

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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, as such structural elements can transfer large lateral loads at low displacements. Up to the present, extensive experimental research was conducted on the flexural behaviour of the RC walls subjected to reversed cyclic lateral loads, which substantiated the elements' good performance and resulted in design and detailing provisions. More recently the research efforts were directed toward the shear behaviour, as many earthquake reconnaissance reports exhibited shear distress and failure in RC walls, instead of the expected flexural one. The upgrade of existing RC structures by externally bonded CFRP composites was proven to be effective for structural members in various loading conditions, however there are still unaddressed behavioural aspects regarding the strengthening system's efficiency in reversed cyclic applications.

ACTIVITIES AND RESULTS

-quasi-static cyclic laboratory tests on near full-scale precast RC wall panels concluded
-experimental data processed and seismic performance analysis conducted in terms of strength, displacement, stiffness and energy dissipation
-3 international (fib Congress, 14ECEE, ICSA) and 2 national conferences attended with published papers

RESEARCH TEAM

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

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

-Literature review
-Theoretical study of the composite steel-concrete shear walls
-Preparing of testing frame, manufacturing of experimental elements, testing of composite shear walls subjected to cyclic applied loads.

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.
- Codrut FLORUT, PhD Stud.

Researches in STRUCTURAL *STRENGTHENING OF REINFORCED CONCRETE COLUMNS*

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, 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 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 *LAB STUDIES CONCERNING THE COMPOSITION OF THE SELF COMPACTING CONCRETE*

FIELD DESCRIPTION

Laboratory testing on different compositions of self compacting concrete, in order to find the optimal compositions.

ACTIVITIES AND RESULTS

- The testing of different compositions of self compacting concretes;
- Characteristics' verification;
- Establishing the optimal compositions for preparation and application in Romania.

RESEARCH TEAM

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

ACTIVITIES AND RESULTS

- The testing of different compositions of sustainable building materials;
- Characteristics verification;
- Establishing the optimal compositions for preparation and application in Romania.

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 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 621/2009-2010) 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. Buchman I., Building Materials,Part II, Ed. Politehnica Timişoara, 2010, ISBN: 978-973-625-888-6, 978-606-554-197-9(II).
2. Iureş L, Badea C, Buchman I, Bob C, Jebelean E, Materiale de construcţii - Lucrări practice, Ed. Eurostampa Timişoara ,ISBN 978-973-687-992-0
3. Iures L., Betoane speciale pentru constructii, Ed. Eurostampa Timisoara, 2010, ISBN: 978-606-569-099-8

PUBLISHED PAPERS

1. Demeter, I., Nagy-György, T., Stoian, V., Dăescu, A. C., and Dan, D. (2010). "Seismic performance of precast RC wall panels with cut-out openings retrofitted by externally bonded CFRP composites." Proc., 3rd fib International Congress and PCI Convention & Bridge Conference (fib 2010), PCI, Paper No. 593.

2. Demeter, I., Nagy-György, T., Stoian, V., Dăescu, A. C., and Dan, D. (2010). "Seismic performance of precast RC wall panels with cut-out openings" Proc., 14th European Conference on Earthquake Engineering (14ECEE), ISBN 978-608-65185-1-6, MAEE, Paper No. 1004.

3. Demeter, I., Nagy-György, T., Stoian, V., Dăescu, A. C., and Dan, D. (2010). "FRP composites for seismic retrofitting of RC wall panels with cut-out openings" Proc., First International Conference on Structures and Architecture (ICSA2010), ISBN 978-0-415-49249-2, CRC Press, Balkema, Taylor & Francis, Paper No. 240, pp. 1902-1908.

4. Dan D., Stoian V., Nagy-György T., Fabian A., Dăescu C., Floruț C., Demeter I. "The behaviour of steel and steel concrete composite joints" First International Conference on Structures and Architecture (ICSA2010), Guimaraes, Portugal, July 2010, ISBN 978-0-415-49249-2

5. Dan D., Stoian V., Nagy-György T., Floruț C., Pruna L, Structural analysis, rehabilitation and further development of health monitoring program concerning two reinforced concrete chimneys, 34th International IABSE Symposium, Venice, Italy, 2010, ISBN 978-3-85748-122-2, pp 656-657 (+7 CD)

6. Demeter I., Nagy-György T., Stoian V., Dan D., Dăescu A. C. (2010). "Strengthening strategies using FRP composites for precast RC wall panels with wide cut-out openings" Supplement No. 1 to the Annals of University of Oradea, Constructions and Hydro-Utility Installations, ISSN 1454-4067, University of Oradea, Vol. 13-2, pp. 83-90.

7. Demeter I., Nagy-György T., Dăescu A. C., Stoian V., Dan D. (2010). "Strengthening strategies using FRP composites for precast RC wall panels with cut-out openings" Proc., Building Services, Mechanical and Building Industry Days, ISBN 978-963-473-423-9, University of Debrecen, pp. 680-688, (in Hungarian).

8. Floruț S.C., Stoian V., Nagy-György T., Dan D., Diaconu D., Combined NSMR-FRP and EB-FRP Technique Applied for Retrofitting of RC Slabs, Structural Faults and Repair-2010, 13th International Conference, 15-17 June, 2010, Edinburgh, 113, ISBN 0-947644-66-0

9. Floruț S.C., Stoian V., Nagy-György T., Dan D., Diaconu D., Retrofitting of two-way RC slabs with and without cut-out openings by using FRP composite materials, Latest trends on Engineering Mechanics, Structures, Engineering Geology, 3rd WSEAS International Conference on Engineering Mechanics, Structures, Engineering Geology (EMESEG '10), International Conference on Geography and Geology 2010 (WORLDGEO '10), 22-24 Iul 2010 Corfu, Greece, pp 245-250, ISSN: 1792-4294, ISBN: 978-960-474-203-5

10. Floruț S.C., Stoian V., Dan D., Nagy-György T., Diaconu D., Efficiency assessment of CFR strengthening solution applied on two RC slabs, Analele Universităţii din Oradea - Fascicula "Construcţii şi Instalaţii Hidroedilitare", 5-6 Nov 2010, Oradea, România, XIII-2 Supl 1, pp 113-120, ISSN: 1454 - 4067

11. Floruț S.C., Stoian V., Dan D., Nagy-György T., Diaconu D., Experimental investigations of the behavior of RC slabs retrofitted with CFRP materials, Analele Universităţii din Oradea - Fascicula "Construcţii şi Instalaţii Hidroedilitare", 5-6 Nov 2010, Oradea, România, XIII-2, pp 43-50, ISSN: 1454 - 4067

12. Floruț S. C., Stoian V., Diaconu D., Dan D., Experimental investigations of the behavior of RC slabs retrofitted by a mixed NSMR-FRP and EB-FRP technique, SMAR 2011 Dubai First

Middle East Conference on Smart Monitoring, Assessment and Rehabilitation of Civil Structures, 8-10 Feb 2011 Dubai, EAU-167/7e, ISBN: 978-3-905594-58-4

13. Nagy-György T., Stoian V., Dan D., Strength and Economic Assessment of Different Retrofitting Methods for Shear Deficient Masonry Walls of Heritage Structures, Third International Workshop on Civil Structural Health Monitoring (CSHM-3), Ottawa, Canada, 2010, ISBN 978-0-88865-883-8, pp 161-17

14. Buchman I, Ignaton E, High Performance Concretes from Romania, Annals of DAAAM for 2010 &Proceedings of the 21th International DAAAM Symposium "Intelligent Manufacturing &Automation: Focus on Interdisciplinary Solutions", 21-23 October 2010, Zadar, Croatia, p. 0259-0260, ISSN 1726-9679, ISBN 978-3-901509-73-5.

15. Buchman I, Ignaton E, Reactive Powders Concrete, Annals of DAAAM for 2010 &Proceedings of the 21th International DAAAM Symposium "Intelligent Manufacturing &Automation: Focus on Interdisciplinary Solutions", 21-23 October 2010, Zadar, Croatia, p. 0261-0262, ISSN 1726-9679, ISBN 978-3-901509-73-5.

16. Iures L., Bob C., The Future Concrete: Self - Compacting Concrete, Buletinul Institutului Politehnic din IASI, Tomul LIII (LVII), Fasc. 1-2, Constructii,. Arhitectura

17. Iures L., Bob C., Theoretical Considerations and Lab Determinations Regarding Concrete Shrinkage, Analele Univ. Oradea,Fasc. Construcţii şi Instalaţii Hidroidilitare, Editura Univ. din Oradea, 2010, Vol. XIII-2

18. Iures L., Bob C., Badea C., Self compacting concrete as sustainable material, WSEAS International Conference on Engineering Mechanics, Structures and Engineering Geology, TUNSIA, 3-6 May 2010, ISSN: 1790-5095 ISBN: 978-960-474-187-8

19. Badea C., Bob C., Iures L., Waste Materials Used for Building Construction, WSEAS International Conference on Engineering Mechanics, Structures and Engineering Geology, TUNSIA, 3-6 May 2010, ISSN: 1790-5095 ISBN: 978-960-474-187-8

PhD THESIS

1. DEMETER István - RC wall panels strengthened by CFRP composites. Advisor: Prof. Stoian V. (on-going)
2. FABIAN Alexandru - Contribution To The Calculus Of The Structural Composite Steel-Concrete Shear Walls With Rigid Reinforcement. Advisor: Prof. Stoian V. (on-going)
3. DĂESCU Cosmin - Rehabilitation of structural elements using composite materials. Advisor: Prof. Stoian V. (on-going)
4. FLORUŢ Codruţ - Performance study of the elements subjected to bending strengthened with FRP composites. PhD advisor: Valeriu STOIAN Prof., PhD. (on-going)
5. DIACONU Dan – RC Structural elements reinforced with FRP composites. PhD advisor: Valeriu STOIAN Prof., PhD. (on-going)
6. DENCSÁK Tamás – Sustainability of constructions. Advisor: Corneliu BOB, Prof., PhD. (on-going)
7. BEREVOESCU Luiza – Contribution in hygrothermal 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

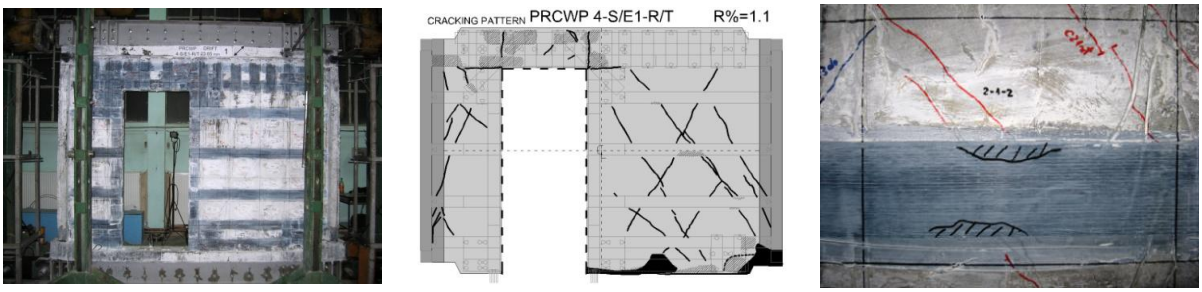
- Quasi-static cyclic testing of CFRP-EBR retrofitted precast RC walls weakened by cut-out openings exhibited a series of behavioural aspects that are important to be accounted for in future applications. Following the data processing and interpretation, a database of experimental tests on the seismic response of RC walls will be established and a survey of the post-earthquake field reports will be

undertaken in order to corroborate the findings of the current research.

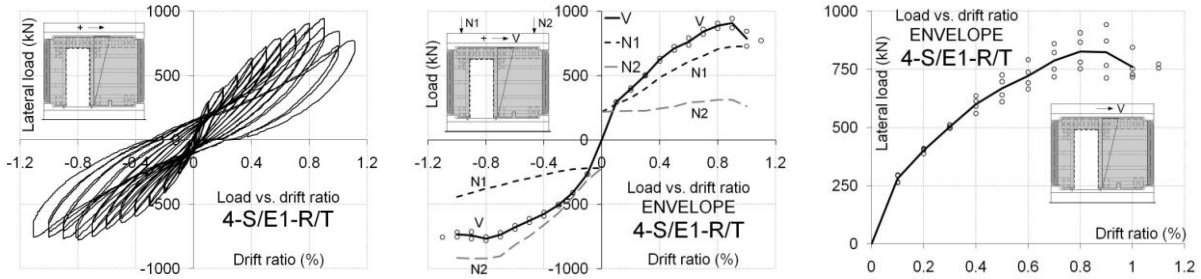
- In the field of construction materials will be developed new materials like high performance concrete, high performance concrete additives, fly-ash, phosphogypsum, self-compacting concrete, etc.
- Non-destructive research on concrete and steel reinforcement of structure and infras tructure bridges.
- 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

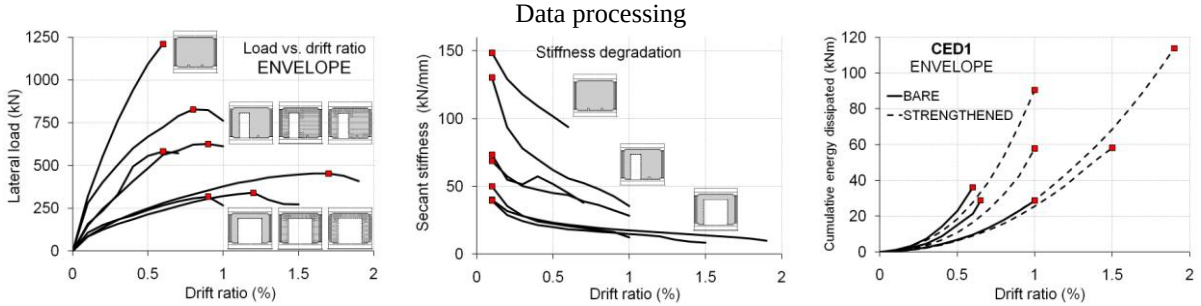
1. Seismic Performance of Precast Reinforced Concrete Walls Retrofitted by Externally Bonded Carbon Fiber Reinforced Polymer (CFRP-EBR) Composites – Ongoing research



Behaviour and failure details

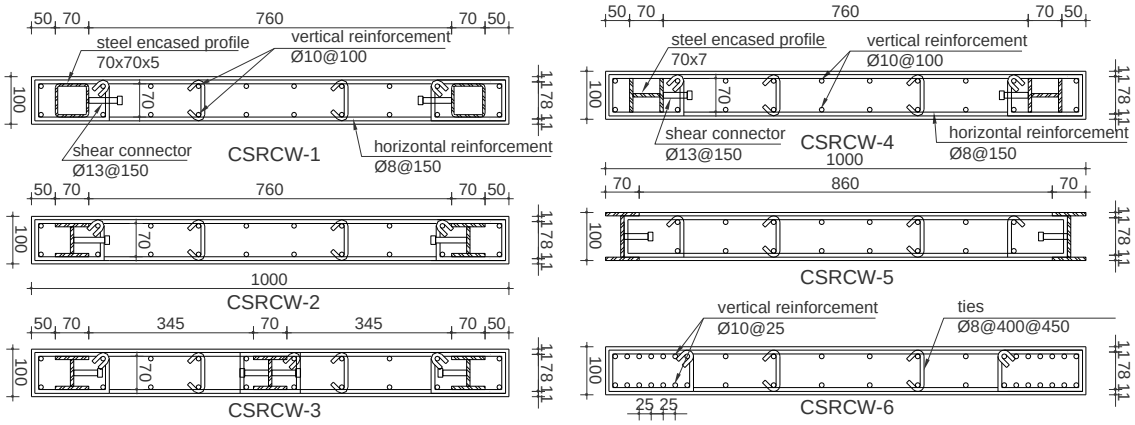


Data processing



Seismic performance analysis

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



Details of the steel concrete composite elements

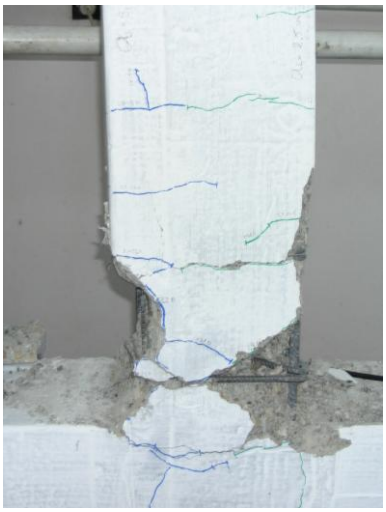
CSRCW1

CSRCW5

Elements failure

3. Structural strengthening of RC columns

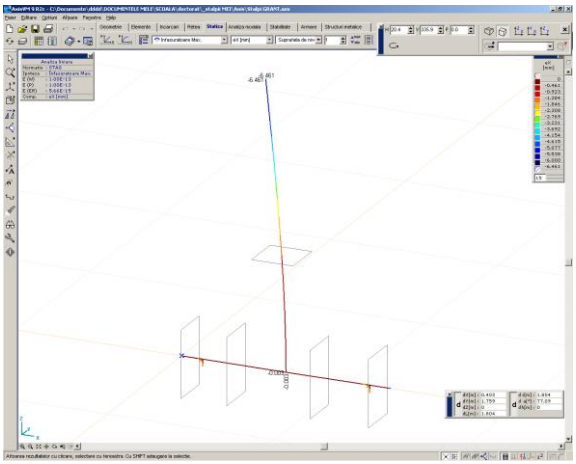
C1M



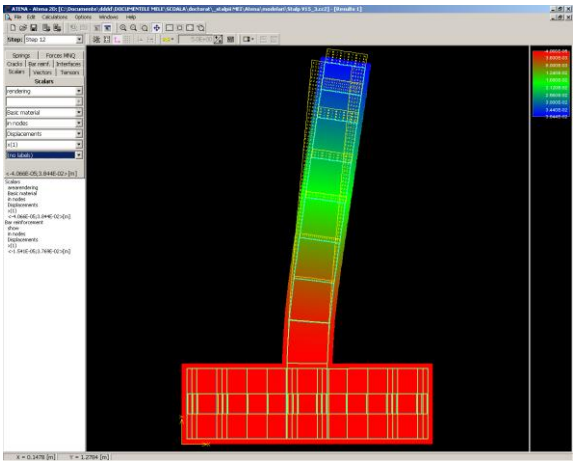
C1C

C2M-GW-BC

- Numerical modelling using AxisVM and Atena2D

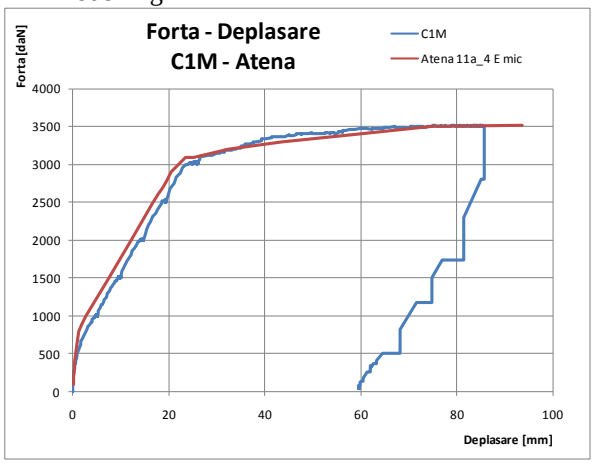


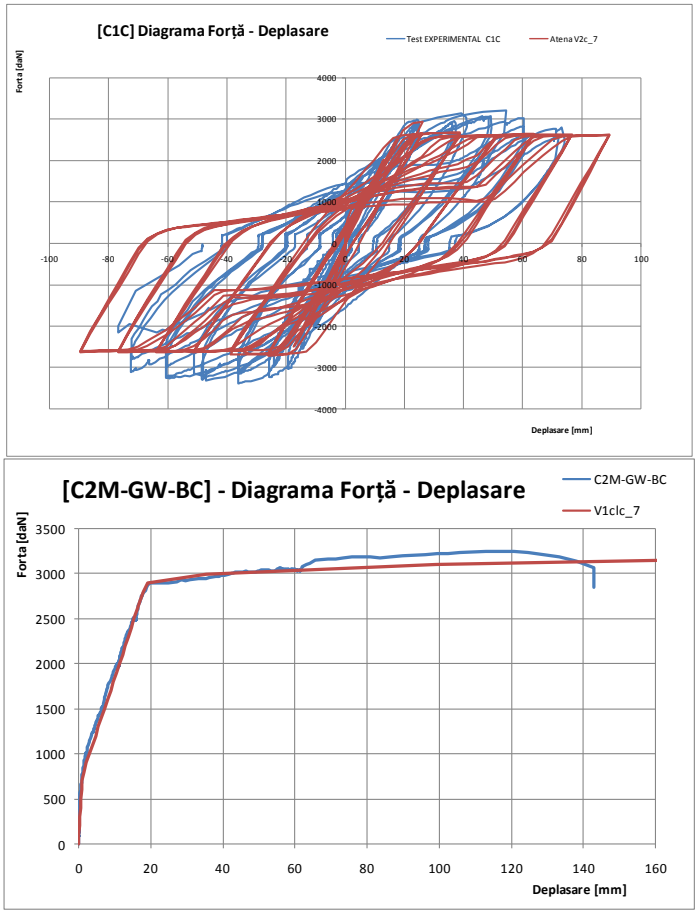
AxisVM



Atena2D

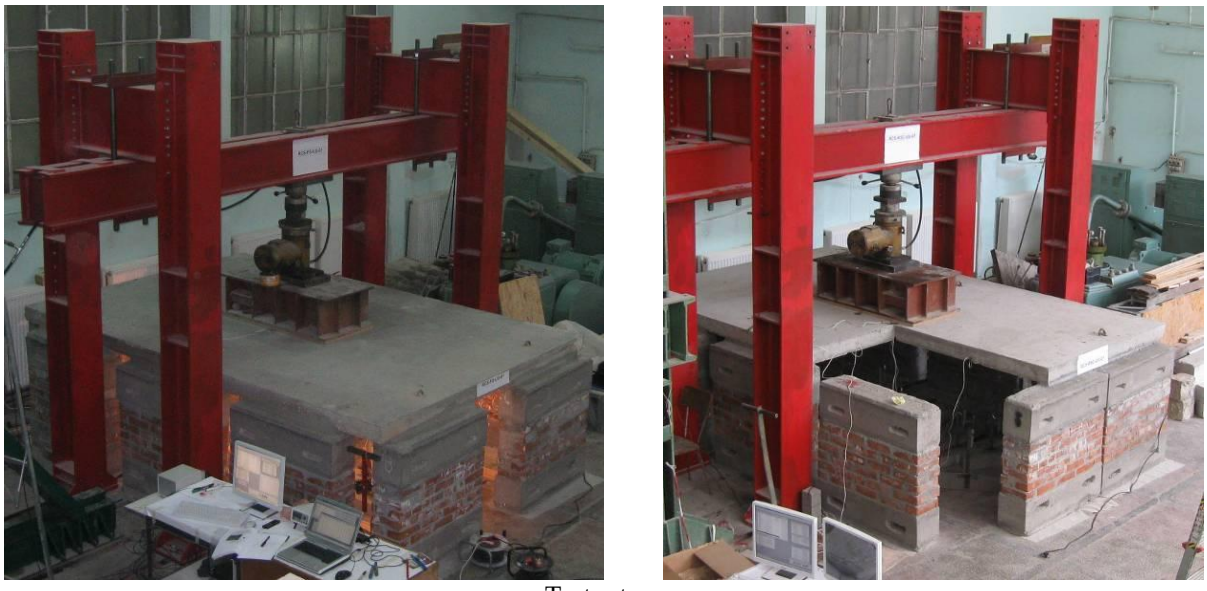
- Overlapping of lab tests with FE modelling in ATENA



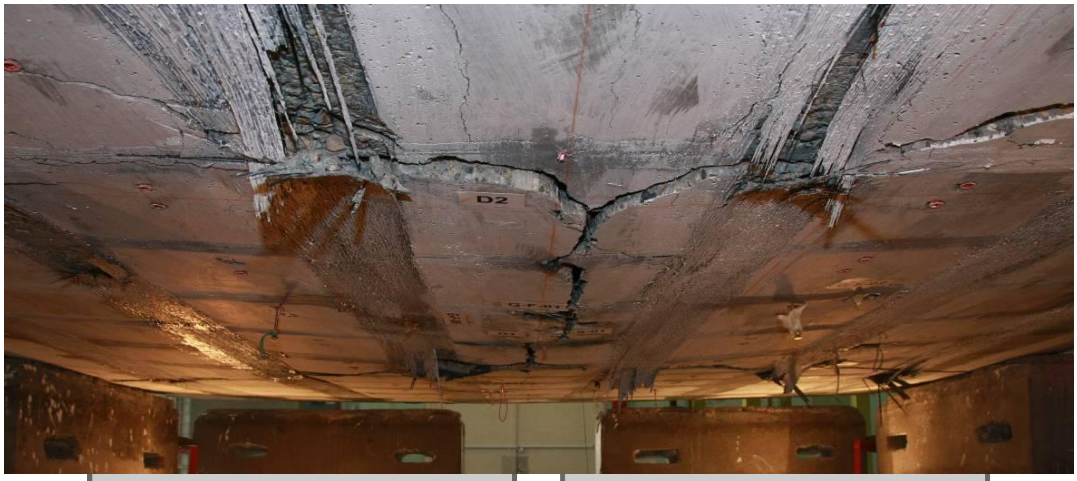


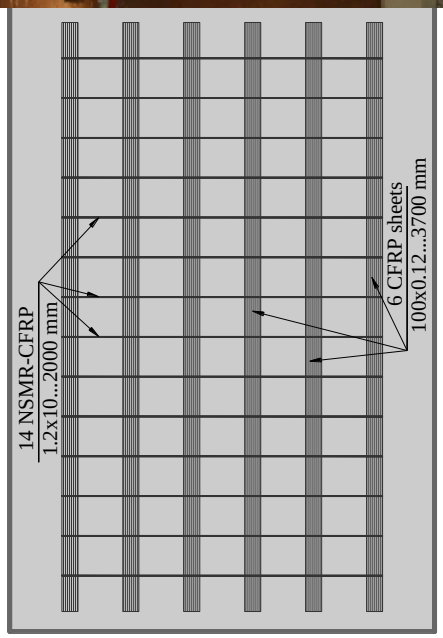
4. Strengthening of reinforced concrete elements using FRP composite materials

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.

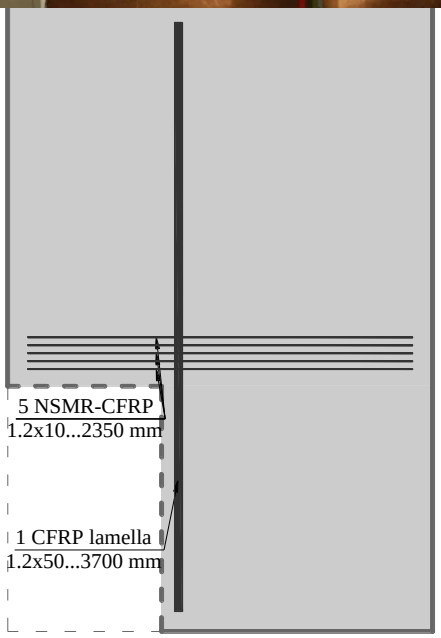


Test set-up



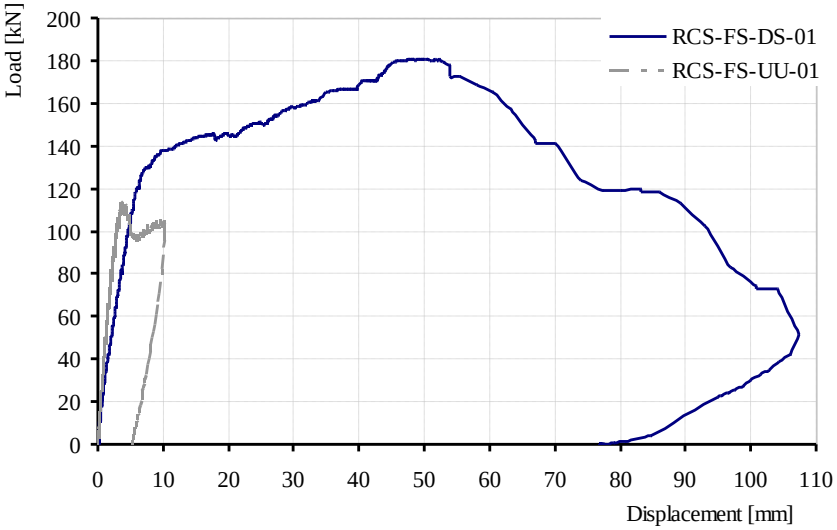


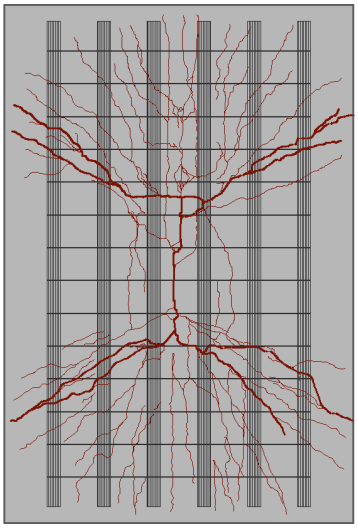
RCS-FS-DS-01

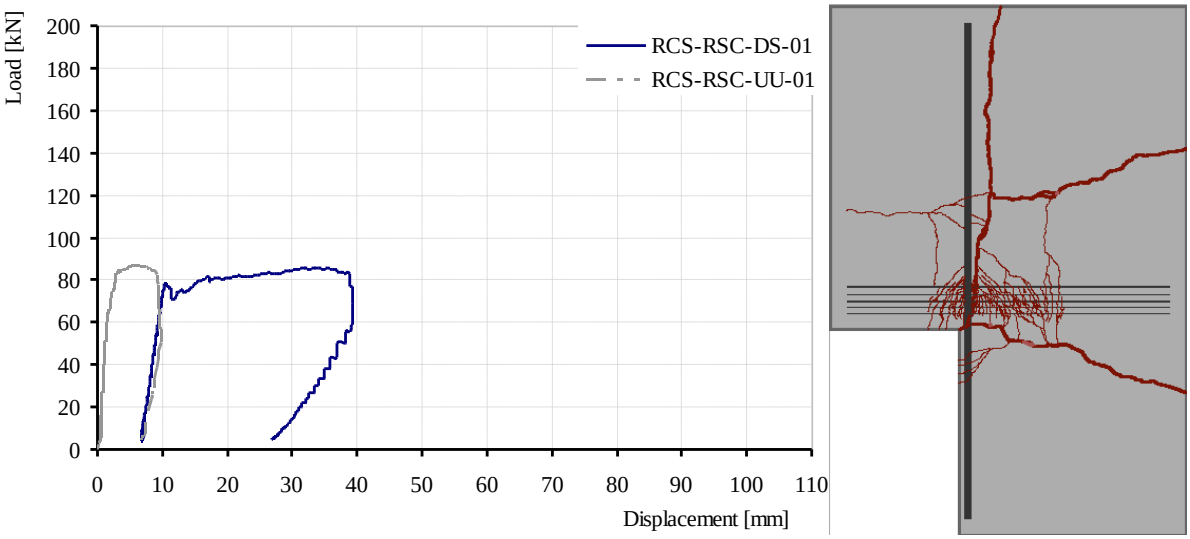


RCS-RSC-DS-01

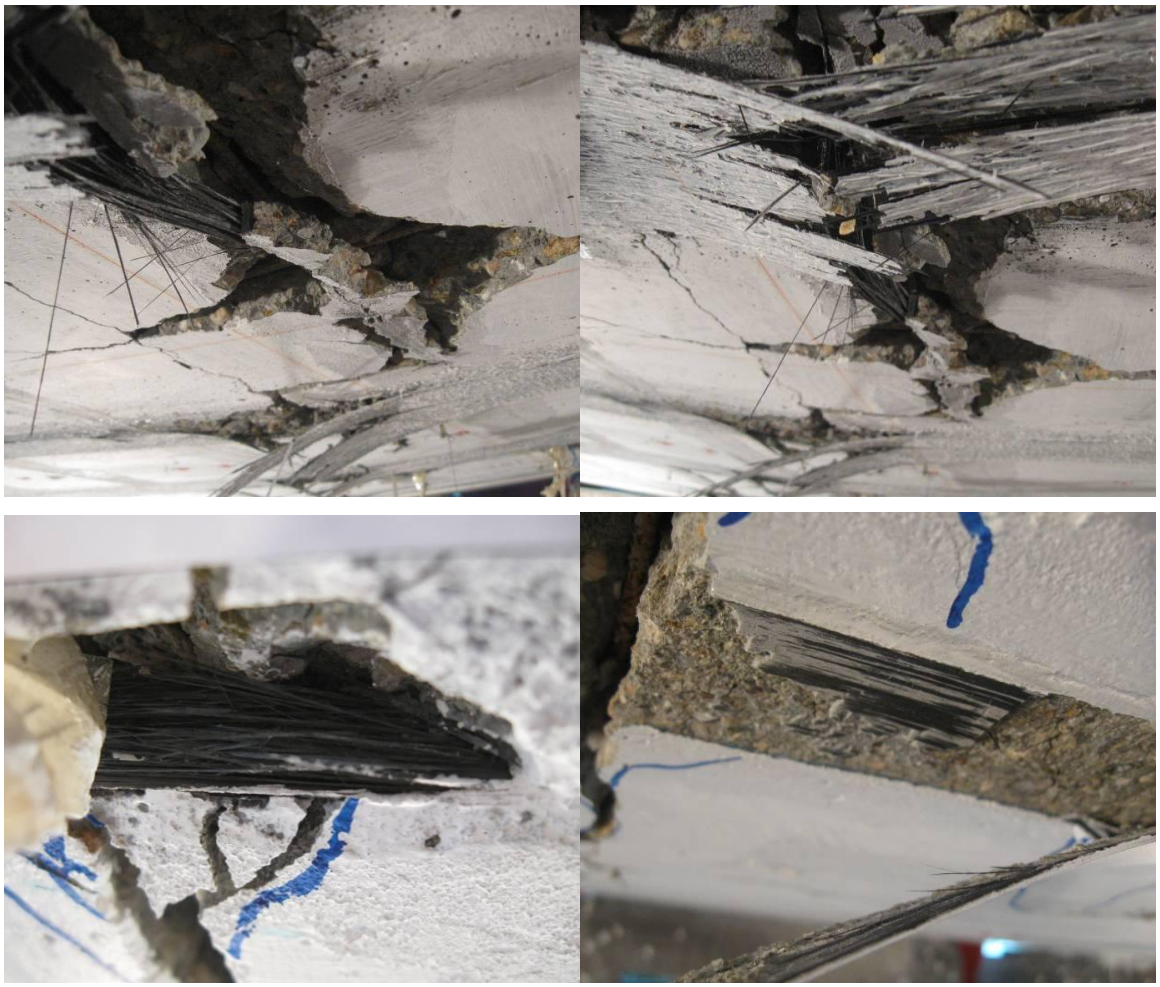
Strengthening layout







Behaviour of the elements



Failure details

RESEARCH CENTRE FOR BUILDING SERVICES

GENERAL PRESENTATION

In the Department of Building Services is functioning the Research Center for Building Services (CCIC), approved by CNCSIS 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. E/07/202/S12.466282 / 2010, *Initiative of Low Energy Training in Europe*, Beneficiary: UE, 30,000 Euro
2. Contract no. 21 / 2010, *Revision and fusion of the Norms I13 and I138/1-2002: design, execution and maintenance of central heating systems*, Beneficiary: MDRL, 14,280 RON
3. Contract no. 22 / 2010, *Guidelines regarding the energetically inspection of boilers and heating systems of buildings*, Beneficiary: MDRL, Value: 13,804 RON
4. Contract no. 23 / 2010, *Guidelines regarding the inspection of air conditioning systems in buildings*, Beneficiary: MDRL, Value: 28,560 RON
5. Contract no. 58 / 2010, *Specialized consultancy and tests for sanitary, refrigerating, heating, natural gases and electrical installations*, Beneficiary: FLEXIK AUTOMATION Timisoara, Value: 5,712 RON
6. Contract no. 0406 / 2003 phase 2010, *Professional perfecting program of engineers for building services, in order to obtain the certification as energetically auditor in buildings*, Beneficiary AIIR Timisoara, Value: 77,050 RON
7. Contract no. 109 / 2010, *Specialized consultancy and tests for sanitary, refrigerating, heating, natural gases and*

electrical installations, Beneficiary: S.C. INSTGAT S.R.L. Timisoara, Value: 5,952 RON

8. Contract no. 135 / 2010, *Specialized consultancy and tests for sanitary, refrigerating, heating, natural gases and electrical installations*, Beneficiary: SC PALUNI SRL Timişoara, 5,952 RON
9. Contract no. 69 / 2010, *Studies and elaboration of documents in order to obtain the technical agreement for ecological flexible PVC pipes*, Beneficiary: INCERC Timişoara, 6,247 RON.

BOOKS

1. Retezan, A., Sârbu, I., Borza, I., Cinca, M., Doboşi, I., (ed.) Proceedings of the International Conference "*Building Equipment and Ambient Comfort*", Politehnica Publishing House, Timişoara, 2010, ISSN 1842-9491, 604 pages.
2. Sârbu I., "*Numerical modelings and optimizations in building services*", Politehnica Publishing House, Timisoara, 2010, ISBN 978-606-554-033-0, 256 pages.
3. Sârbu I., Sebarchievici C., "*Heat pumps"*, Politehnica Publishing House, 2010, ISBN 978-606-554-089-7, 216 pages.

PUBLISHED PAPERS

1. Sârbu, I., *Optimization of water distribution networks*, Proceedings of the Romanian Academy, Series A – Technical Sciences, vol.11(4), 2010, ISSN 1454-9069, pp. 330-339
2. Sârbu, I., Sebarchievici, C., *Use advisability of heat for buildings heating and cooling*, 5th IASME/WSEAS Int. Conf. on Energy & Environment, Cambridge, UK, 2010, ISBN 978-960-474-159-5/1790-5095, pp. 106-111
3. Sârbu, I., *Energetically analysis of unbalanced central heating systems*, 5th IASME/WSEAS Int. Conf. on Energy & Environment, Cambridge, UK, 2010, ISBN 978-960-474-159-5/1790-5095, pp. 112-117
4. Iosif, A., Sârbu, I., *Simulation of velocities and pressures distribution on blade of pump-turbine runner*, , 7th WSEAS Int. Conf. on Fluid Mechanics, Cambridge, UK, 2010, ISBN 978-960-474-158-8/1790-5095, pp. 190-195
5. Sârbu, I., Valea, E., *Upgrading of a heating plant for energy savings*, , 4th WSEAS Int. Conf. on Energy planning, saving, Environmental education and Renewable Energy Sources, Kantaoui, Sousse, Tunisia, 2010, ISBN 978-960-474-187-8/1790-5095, pp. 24-29
6. Sârbu, I., *Energy efficiency of low temperature central heating systems*, 4th WSEAS Int. Conf. on Energy planning, saving, Environmental education and Renewable Energy Sources, Kantaoui, Sousse, Tunisia, 2010, ISBN 978-960-474-187-8/1790-5095, pp. 30-35
7. Sârbu, I., Pelivan, D., *Monoblock flow/return manifolds with separating diaphragm for heat carrier distribution in hot water boiler rooms*, 8th IASME/WSEAS Int. Conf. on Heat Transfer, Thermal Eng. And Environment, Taipei, Taiwan, 2010, ISBN 978-960-474-215-8/1792-4596, pp. 97-101
8. Sârbu, I., Iosif A., *Numerical analysis of velocity and temperature field in concentric annular tube for laminar forced heat convection*, 8th IASME/WSEAS Int. Conf. on Heat Transfer, Thermal Eng. And Environment, Taipei, Taiwan, 2010, ISBN 978-960-474-215-8/1792-4596, pp. 102-107
9. Sârbu, I., *Optimization model of water supply networks design*, 8th IASME/WSEAS Int. Conf. on Fluid Mechanics & Aerodynamics, Heat Transfer And Environment, Taipei, Taiwan, 2010, ISBN 978-960-474-215-8/1792-4596, pp. 108-113
10. Sârbu, I., Sebarchievici, C., *Simulation and control of indoor air quality in buildings*, 8th WSEAS Int. Conf. on Environment, Ecosystems and Development, Vouliagmeni, Athens, Greece, 2010, ISBN 978-960-474-225-8/1792-4596, pp. 119-124
11. Sârbu, I., Bura, H., *Vaporization thermal power assurance for vertical closed-loop ground-coupled heat pump systems*, , 8th WSEAS Int. Conf. on Environment, Ecosystems and Development, Vouliagmeni, Athens, Greece, 2010, ISBN 978-960-474-225-8/1792-4596, pp. 125-130
12. Sârbu, I., Sebarchievici, C., *Heat pumps – Efficient heating and cooling solution for buildings*, WSEAS Transaction on Heat and Mass Transfer, vol. 5(2), 2010, ISBN 1790-5079, pp. 31-40
13. Sârbu, I., *Energetical optimization of central heating systems*, WSEAS Transaction on Heat and Mass Transfer, vol. 5(2), 2010, ISBN 1790-5079, pp. 41-51
14. Iosif, A., Sârbu, I., *Computing of cavitation characteristics and sensitivity curves for Francis pump-turbine*, WSEAS Transaction on fluid Mechanics, vol. 5(2), 2010, ISBN 1790 - 5087, pp. 55-56

15. Sârbu, I., Valea, E., *Upgrading of heat plant in central heating systems,* WSEAS Transaction on Heat and Mass Transfer, vol. 5(3), 2010, ISBN 1790 - 5079, pp. 113-122
16. Sârbu, I., *Energy analysis of low temperature heating systems, ,* WSEAS Transaction on Heat and Mass Transfer, vol. 5(3), 2010, ISBN 1790 - 5079, pp. 123-132
17. Iosif, A., Sârbu, I., *Numerical simulation of hydrodynamic field from pump-turbine runner,* ARPN Journal of Engineering and Applied Sciences, vol. 5(9), 2010, ISBN 1819 - 6608, pp. 16-21
18. Bancea, O., Cinca, M., *Burning efficiency of liquid fuel in heating systems with condensing boilers,* Scientific Bulletin of the University "Gh. Asachi" Iasi, vol. 52(66), 2010, ISSN 8567-5103, pp. 52-59
19. Bancea, O., *Indoor air humidity reducing through ventilation – comfort requirement,* International Conference "Building services and ambient comfort" Timişoara, 2010, ISSN1842-9491, pp. 242-248
20. Bancea, O., Retezan, A., *Sustainability as main support of energy efficiency,* Int. Conf. Building Services and Energy Saving, Iasi, 2010, ISBN 978-973-8955-95-0, pp. 15-21
21. Bancea, O., Adam, M., *Aspects of heating and cooling in residential buildings with low energy consume,* International Conference "Building services and ambient comfort" Timişoara, 2010, ISSN1842-9491, pp. 266-272
22. Bancea, O., Cinca, M., *Calculus program for heating supply systems,* Int. Conf. HTTB – High Rise Towers and Tall Buildings, Munich, Germany, 2010, ISSN 1588-5678, pp. 132-139
23. Cinca, M., Bancea, O., *Study concerning the reduce of energy consume and the buildings comfort increase,* Int. Conf. HTTB – High Rise Towers and Tall Buildings, Munich, Germany, 2010, ISSN 1588-5678, pp. 150-156
24. Sârbu, I., Valea, E., *Comparative characterization of plastic tubes for building installations,* Metalurgia International, vol. XV(9), 2010, ISSN 1582-2214, pp. 11-18
25. Sârbu, I., Valea, E., *Porous metallic surfaces for enhanced boiling heat transfer,* Metalurgia International, vol. XV(9), 2010, ISSN 1582-2214, pp. 87-94
26. Sârbu, I., Sebarchievici, C., *Energy savings for buildings using photovoltaic panels,* Proc. of the 6th Int. Symposium about Forming and Design in Mechanical Eng., Palic, Serbia, 2010, ISBN 978-86-7892-278-7, pp. 371-374
27. Iosif, A., Sârbu, I., *Computation of velocities and pressures on blade of pump-turbine runner,* PCH Noticias & SHP News Magazine, vol. 12(44), 2010, ISSN 1676-0220, pp. 14-17
28. Valea, E., Sârbu, I., *Techniques for heat transfer intensification by globular vaporizing,* Romanian Journal of Civil Engineering, vol. 1(2), 2010, ISSN 2068-3987, pp. 79-87
29. Sârbu, I., Sebarchievici, C., Stănilă, B., *New efficient technologies to place the water supply pipes,* Instalatorul, no. 18(5), 2010, ISSN 1223-7418, pp. 28-30
30. Sârbu, I., Adam, M., *Using of solar energy for heating and domestic hot water preparation,* International Conference "Building services and ambient comfort" Timişoara, 2010, ISSN 1842-9491, pp. 111-127
31. Sârbu, I., Sebarchievici, C., *Ensuring the cooling power for vertical-loop ground-coupled heat pumps,* International Conference "Building services and ambient comfort" Timişoara, 2010, ISSN1842-9491, pp. 145-161
32. Sârbu, I., Sebarchievici, C., Stănilă, B., *A new technology for water supply pipes implementation,* International Conference "Building services and ambient comfort" Timişoara, 2010, ISSN1842-9491, pp. 345-351
33. Iosif, A., Iosif, L., *Analytical and numerical solutions of Poisson equations for electrostatic potential problems,* International Conference "Building services and ambient comfort" Timişoara, 2010, ISSN1842-9491, pp. 507-517
34. Brata, S., Chiriac, F., Bistran, I., Dobosi, I., Plokker, W., Hogeling, J., Van Dam, P., *Software Tools for EPBD Implementation – Comparison between thr Romanian and Dutch Methodology,* Clima 2010, 10th REHVA World Congress "Sustainable Energy Use in Buildings, Antalya, Turkey, vol. 3, ISSN 156-366-878-245- 7/852, 2010, pp. 78-89
35. Sârbu, I., Valea, E., Sebarchievici, C., *Using of recovered thermal energy from refrigerating systems,* Energetica, no. 58(6), 2010, ISSN 1453-2360, pp. 301-305
36. Sârbu, I., Valea, E., *Heating pump systems coupled with the ground in closed circuit,* Energetica, no. 58(7), 2010, ISSN 1453-2360, pp. 342-347
37. Sârbu, I., Ostafe, G., *Optimal design of water supply networks,* Bulletin of University of Oradea, Construction and Hydro-utility Installations Fasc. No. 131, 2010, ISSN 1454-4067, pp. 359-368
38. Dorhoi, S., Borza, I., Cinca, M., *Comparison between analytical calculation and*

experimental evaluation of environmental comfort for classrooms with mixed ventilation in winter season, Int. Conf. Building Services, Mechanical and Building Industry Days, Debrecen, Hungary, 2010, ISBN 978-963-473-421-5, pp. 8-14

39. Dorhoi, S., Borza, I., Cinca, M., *Loading strategy for measuring relative humidity and temperature gradient for winter season in ventilated classrooms, 6th WSEAS Int. Conf. on energy, environment, ecosystems and Sustainable Development, Timisoara, 2010, ISBN 978-960-474-237-0, pp. 5-12*.

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:

- Ionut CERBU: *Theoretical and experimental contribution to rehabilitate and modernizing electrical installations in civil and industrial buildings*

3. *Prof.dr.eng. Adrian RETEZAN*, supervisor in the field of *Civil Engineering*

PhD students:

- Dragos MIHAILA: *Considerations regarding aspects of ambient medium in the conditions of energetically consume reducing for building services.*
- Diana Sindia VLAIA: *Energetically and environment protection aspects in ISU (Inspection for Urgent Situations) activities.*

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, Lightening systems, Energy savings*
- Assoc. prof. dr. eng. Olga Bancea: *Thermal comfort, Modern air conditioning systems, Unconventional energies*
- Assoc. prof. dr. eng. Silviana Brata: *Thermo-technique 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 modelings and simulations*
- Assist. dr. eng. Ladislau Kardos: *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, Lightening systems*
- Assist. eng. Călin Sebarchievici: *Renewable energy utilization, Buildings energy*

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

CONTACT PERSONS

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Fax: +40-256-403987
E-mail: ioan.sarbu@ct.upt.ro

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. *Studies regarding the soil permeability for a waste deposit in Ghizela*, Beneficiary: S.C. CONFORT S.A., Value: 51894 RON , Team : Assoc. prof. dr. eng. Petru Pantea, Teach. Assist. dr. eng.Monica Mirea, Prof. dr. eng. Marin Marin
2. *Geotechnical investigations and study for rehabilitation and consolidation for a county road,km 40 +450* , Beneficiary:S.C. TRISKELE S.R.L., Value:6076 RON, Team:Teach. Assist. Cristina Voicu, Teach. Assist. 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
4. *Evaluation report for Timisoara South By-Pass,*, Beneficiary: SEARCH CORPORATION S.R.L., Value: 4820RON, Team: Assoc. prof. dr. eng. Gheorghe Belea

PUBLICATIONS

PUBLISHED PAPERS

1. Marin M, Roman O.G.– *Earhtquake hazard for Timisoara City,* AGIR Bulletin, 2010
2. Dogariu A., Ungureanu V., Dubina Dan, Marin M. – *Verification of the sustains pilots for lighting installations for stadiums*, The 12th National Conference for Metal Structures, November 2010.
3. Georgescu M., Marin M., Craciun I., – *Metal structure roof for the "Conventions and Exhibitions Center",Rm. Vilcea*, The 12th National Conference for Metal Structures.
4. Haida V., Voicu Cristina, Mirea Monica – *Study of the instability phenomena on the DN 67J and the consolidation solutions,* The 13th National Congress for Roads and Bridges, Brasov, September 2010.
5. Ciopec Alexandra, Costescu C., – *Study and monitoring for a unstable slope on a national road route*, The 13th National Congress for Road and Bridges, Brasov, Septembrie 2010.
6. Voicu Cristina, Mirea Monica, Peptan Carmen– *Aspects on the improvement of foundation concerning depth vibrothrusting*, Research journal of Agricultural Science, vol 43(3)1-910.
7. Carmen Peptan, Livia Birliba, Mirea Monica, Ienciu Anisoara – *Measures of protection and consolidation of railway slopes during the operation period for rehabilitation railway line strech*,Research Journal of Agricultural Science, vol. 43(3)1-907.
8. Mirea Monica, Voicu Cristina, Peptan Carmen – *Foundations realized in punched holes for buildings,* Research Journal of Agricultural Science, vol. 43(3)-908.
9. Peptan Carmen, Birliba Livia, Voicu Cristina, Ienciu Anisoara. – *Considerations concerning the rehabilitation of the railway linefrom the Hungarian border to Simeria City,* Research Journal of Agricultural Science, vol. 43(3)1-909.
10. Ciopec Alexandra, Mirea Monica, Voicu Cristina, Costescu C.- *Alternative energy resources: Foundation solution for wind turbines*, Maritime University Constanta Annals, vol.13.
11. Mirea Monica, Ciopec Alexandra, Voicu Cristina, Costescu C.- *Foundations realized in punched holes with low impact upon environment*, Maritime University Constanta Annals, vol.13, 6.
12. Voicu Cristina, Mirea Monica, VoicuV.,- *Experimental studies regarding the use of slag furnance in construction,* BENA Conference,Timisoara, 26th-28th November.
13. Haida V.,Voicu Cristina, Mirea Monica –*The impact of aground sliding upon the built up environment,* BENA Conference, 26th-28th November.

BOOKS

1.Belea G., - GADT- Graphics Assisted by the Computer and Technical Drawing, Ed. Politehnica 2010, 150 pag.

2.Peptan Carmen, Voicu Cristina Otilia, Haida V.- Special Foundations, Ed. Politehnica, 2010, ISBN 978-606-554-133-7, 386 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 geo-synthetics 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 BABAUCA
"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 Cimpoieru
"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: Rehabilitation of a road pavement on DN 19, Satu-Mare-Oradea. Realization of the resistance structure on two sectors: km 83+700…91+200 and km 75+896…83+700,* Beneficiary: S.C. STRABAG S.R.L. Bucuresti , Value: 23800 RON Team : Prof. dr. eng. Florin Belc, Prof. Dr. eng. Gheorghe Lucaci
2. *Technical valuations for the roads in Satu-Mare City,"* Beneficiary: Satu-Mare City Mayory, Value: 60000 RON Team : Prof. dr. eng. Gheorghe Lucaci, Prof. dr. eng. Florin Belc, Eng. Paul Marc
3. *Geotechnical studies for roads and streets* Beneficiary: S.C. TRISKELE S.R.L., Value:23380 RON, Team: Prof dr. eng. Ion Costescu, Eng. Betea Stefan, Assist dr. eng. Ciprian Costescu
4. *Field and laboratory studies regarding the physical and mechanical characteristics of soils used in road embankments* Beneficiary: S.C. INVEST S.A. Timisoara, Team: Teaching Assist. Dr. eng. Cornel BANCEA, Value : 17,000 RON

PUBLICATIONS

PUBLISHED PAPERS

1. F. Belc, Costescu C., - *Aspects of sustainable developments on the road field,* BENA Conference, Timisoara, 26-28 November ,
2. Lucaci G., Belc F., - *Protecting the environment through promoting cold road technologies,* BENA Conference, Timisoara, 26-28 November
3. Belc F.,- *Asphalts produced at lower temperatures than the classic asphalts,* Roads and Bridges Magazine , vol.101.
4. Marc P., Lucaci G., Costescu C., Belc F.– *Experimental studies regarding the thermo-phisical properties of the asphalts,* The 13th National Congress of Roads and Bridges, Brasov, September 2010.
5. Georgescu M., Radu M., Tudor B., Grisic G., Belc F., Lucaci G., Racanel C., Simion H.,– *Modified, Aditivates bitumens with indigenous polymeric system. CAPS-AND Amino-Aminic-Compounds for the realize of the performed road pavement,* The 13th National Congress for Roads and Bridges, Brasov, September 2010.
6. Herman A. I., - *BConsiderations on the safety of dangerous transports,* BENA Conference, Timisoara 26-28 November
7. Costescu C., Ciopec Alexandra – *Considerations regarding the causes and consolidation solutions for a landslide on DJ 665* , The 13th National Congress for Roads and Bridges, Brasov, September.
8. Ianosev Mihaela, Costescu C., Ianosev M. – *Particularities regarding the rehabilitation works for national road DN 6 between the Mehadia and Domasnea km 388+ 100…km 408+895,* The 13th National Congress for Roads and Bridges, Brasov, September 2010.

BOOKS

1. *Lucaci G.,Belc F, Bancea C., Costescu C. – Roads. Design elements.*, Ed. Politehnica, ISBN 978-606-554-049-1,317 pag.

PHD STUDENTS

Scientific coordinator: Prof.dr eng. Ion COSTESCU

1. Eng. Marc Paul Teodor
"Contributions to the conception and realization of some high performance road structures"

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.BotaClaudiu
Research field: Civil Engineering

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RESEARCH TEAM: SURVEYING, CADASTRE

GENERAL PRESENTATION

MAIN RESEARCH FIELDS

- Geographic Information System (GIS) for urban development

Keywords: GIS, urban

- Surveying Engineering and Cadastre

Keywords: surveying

- Database for urban administration management

Keywords: database, urban, administration

- Monitoring problems

Keywords: monitoring, surveying, modern technologies

- Geo-Spatial modeling for Land Measurements

Keywords: spatial, modeling

- Special applications of Photogrammetric Exploitation

Keywords: photogrammetry, exploitation

- 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

- ***IMPROVEMENT OF THE ROMANIAN GEODETIC CONTROL NETWORK***
- ***DESIGN, ANALYSIS AND MANAGEMENT OF GEODETIC AND CADASTRAL DATA***
- ***AUTOMATION AND MONITORING LAND MEASUREMENTS***
- ***GEODETIC EVALUATION OF CRUSTAL MOVEMENTS IN BANAT AREA***
- ***USING INTERGRAPH TECHNOLOGY FOR GIS DEVELOPMENT***
- ***SETTING UP DATABASES 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 Timisoara area. These are used for developing cadastral applications, topographic engineering projects, urbanistic 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. Ph. D. Carmen GRECEA
- Lecturer Ph.D. Mihaela STURZA
- Lecturer Ph.D. Sorin HERBAN
- Lecturer Ph. D. Cosmin MUSAT
- Assist.Ph. D. Viorica DAVID
- Assist.Ph. D. Alina BALA
- Ing. Claudiu BOTA

RESEARCH PROJECTS/CONTRACTS

1. Contract no. 90 CP/ I/ 14.09.2007- Development of a large scale tests laboratory (2007-2010), Beneficiary: ANCS, Value: 118.073 Lei/2010

2. Contract no.182/2008-2010 – Structural systems and technologic solutions for buildings protection in the context of sustainable development, Beneficiary: CNMP, Value: 279.413 Lei/2010.

3. 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, 153.210 Lei/2010

FIELD DESCRIPTION

Contract POSDRU ID 63140

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,

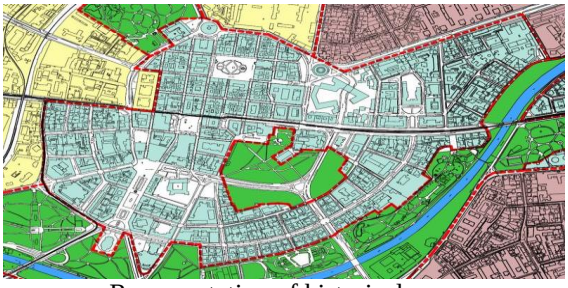
wishing to ensure the interoperability between the different eLearning environments used by partner universities.

CERTIFIED LABORATORY

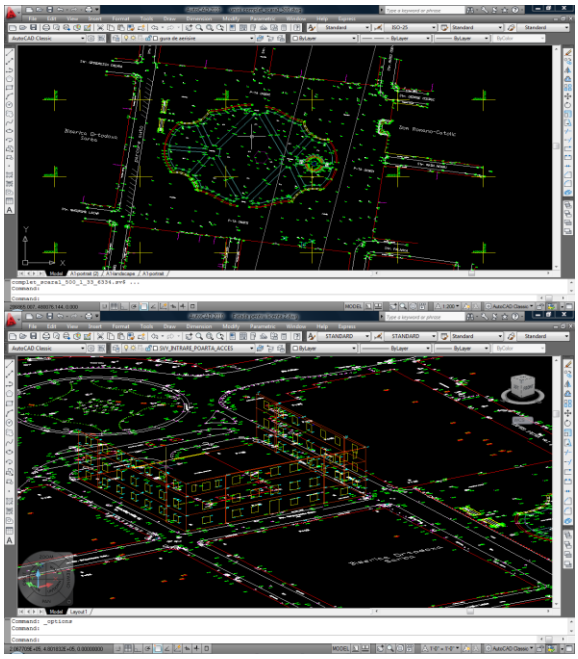
- Land Measurement and Cadastre Laboratory, abilities by National Agency of Cadastre and Real Estate
- Research Laboratory for Cadastral works automation and GIS - Registered Research Laboratory - RRL_Intergraph

ACHIEVEMENTS AND FURTHER DEVELOPMENT

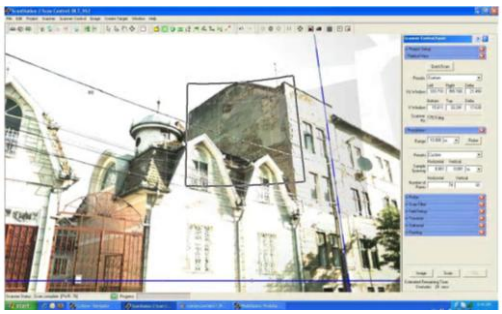
- Interdisciplinary collaboration for systematization and management of construction and architecture works



Representation of historical area



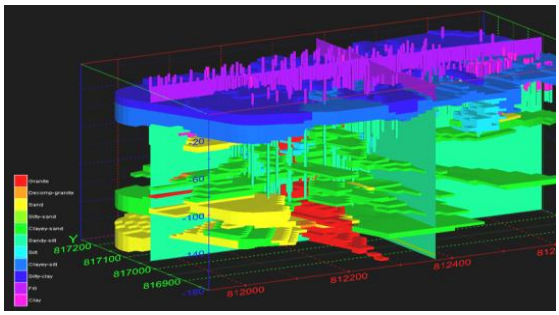
Difference between 2D and 3D representation



- 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

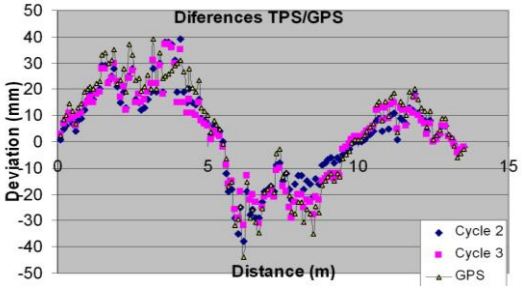
- Immovable information for urban Cadastre in Timisoara



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

- Satellite Imagine for monitoring network. Mining area of Maleia-E. M. Livezeni

- Land boundary scheme



- Monitoring settlements for engineering projects

PUBLISHED PAPERS

1. Grecea Carmen, Bălă Alina, Herban Sorin, *Cadastral Requirements for Urban Administration, Key Component for an Efficient Town Planning*, BENA Conference, November 2010, pp.133-136, Timişoara, Romania, ISBN – 978 – 606 – 554 – 210 – 5; ISBN – 978 – 606 – 554 – 212 – 9.
2. Grecea Carmen, *Geoinformation Support – Impact on Urban Planning, Environment and Society*, 3rd WSEAS International Conference on Urban Planning and Transportation (UPT 10), pp.136-142, Corfu, Greece, ISSN: 1792-4286, ISBN: 978-960-474-204-2.
3. Grecea Carmen, Bălă Alina Corina, Bota Ioan Claudiu, *Spatial Planning – Modern Tool of Urban Management and Control*, RevCad no. 10, 2010 – Journal of Geodesy and Cadastre, pp. 91-99, May 2010, Alba Iulia, Romania, ISSN 1583-2279.
4. Herban Sorin, Grecea Carmen, Aureliu Bârlă, *Using the Laser Scanning for Research and Conservation of Cultural Heritage Sites Case Study: Ulmetum Citadel*, BENA Conference, November 2010, pp.137-140, Timişoara, Romania, ISBN – 978 – 606 – 554 – 210 – 5; ISBN – 978 – 606 – 554 – 212 – 9.
5. Bălă Alina Corina, Grecea Carmen, Brebu Floarea Maria, David Viorica, Bota Ioan Claudiu, *Monitoring Mining Dumps Models to Determinate with Environmental Protection*, BENA Conference, November 2010, Timişoara, Romania, ISBN – 978 – 606 – 554 – 210 – 5; ISBN – 978 – 606 – 554 – 212 – 9.
6. Brebu Floarea Maria, Marin Marin, Bălă Alina Corina, *Monitoring of the Building Energy in Connection with the Requirements of the Sustainable Urban Development and of the Environmental Protection*, BENA Conference, November 2010, Timişoara, Romania, ISBN – 978 – 606 – 554 – 210 – 5; ISBN – 978 – 606 – 554 – 212 – 9.
7. Bota Claudiu Ioan, Bălă Alina Corina, Brebu Floarea Maria, *The accuracy of geodetic*

measurements using virtual reference stations, RevCad no. 10, 2010 – Journal of Geodesy and Cadastre, pp. 31-35, May 2010, Alba Iulia, Romania, ISSN 1583-2279.

8. Bălă Alina Corina, Brebu Floarea Maria, Grecea Carmen, *Impact of Geodetic Studies and Measurements on the Preservation and Reabilitation of Forestry Heritage*, Research Journal of Agricultural Science, vol.42 (3) 1-908 (2010), pp. 397-403, April 2010, USAMVB, Timişoara, Romania, ISSN 2066 – 1843.
9. David Viorica, Sturza Mihaela, *Crop area estimation with remote sensing*, Research Journal of Agricultural Science, vol.42 (3) 1 – 908 (2010), pp.531-534, April 2010, USAMVB, Timişoara, Romania, ISSN 2066-1843.
10. David Viorica, Sturza Mihaela, *The Integration of Digital Photogrammetric Datasets in GIS*, RevCad no.10, 2010 – Journal of Geodesy and Cadastre, pp. 53-56, May 2010, Alba Iulia, Romania, ISSN 1583-2279.
11. Sturza Mihaela, David Viorica, *Using GIS Technology in urban areas in the context of durable development*, Research Journal of Agricultural Science, vol.42 (3) 1 – 908 (2010), pp.870-879, April 2010, USAMVB, Timişoara, Romania, ISSN 2066-1843.
12. Sturza Mihaela, David Viorica, *Cartography - a necessity of our days*, RevCad no.10, 2010 – Journal of Geodesy and Cadastre, pp. 171-176, May 2010, Alba Iulia, Romania, ISSN 1583-2279.
13. David Viorica, Sturza Mihaela, Bălă Alina, *Creation of geodatabase on the implementation IACS – LPIS in Romania*, BENA Conference, November 2010, Timişoara, Romania, ISBN – 978 – 606 – 554 – 210 – 5; ISBN – 978 – 606 – 554 – 212 – 9.
14. Herban Sorin, *Research and studies of Land Information System in some European countries – Efficient tool to understand and manage Urban Development in Romania*, 3rd WSEAS International Conference on Urban Planning and Transportation (UPT 10), pp.117-123, Corfu, Greece.
15. Herban Sorin, Grecea Carmen, Muşat Cosmin Constantin, *The Importance of Topographical Works for Buildings Rehabilitation and Maintenance in the Urban Planning*, Research Journal Of Agricultural Sciences, vol.42 (3) 1 – 908 (2010), pp. 587-595, April 2010, USAMVB, Timişoara, Romania, ISSN 2066-1843.
16. Herban Sorin, Bota Claudiu, *Measuring and determinate the dynamic deformation of constructions using modern technologies and techniques*, Analele Universitații din Oradea Fascicula Constructii şi Instalatii Hidroedilitare, Vol. XIII-2, Supliment 2, pp. 137-144, November 2010, Oradea, Romania, I.S.S.N. 1454 – 4067,
17. Herban Sorin, Muşat Cosmin Constantin, *Determinate dynamic deformation of construction using the integrated system Leica 1200*, RevCad no.10, 2010 – Journal of Geodesy and Cadastre, pp.113-119, May 2010, Alba Iulia, Romania, ISSN 1583-2279.
18. Muşat Cosmin Constantin, Herban Sorin, *The Use of 3D Laser Point Technologies for Monitoring Historical and Architectural Structures*, RevCad no.10, 2010 – Journal of Geodesy and Cadastre, pp.145-153, May 2010, Alba Iulia, Romania, ISSN 1583-2279.
19. Claudiu Ioan Bota, Herban Sorin, Muşat Cosmin Constantin, *Using the Laser Scanning for Research and Conservation of Cultural Heritage Sites Case Study: Ulmetum Citadel*, BENA Conference, November 2010, Timişoara, Romania, ISBN – 978 – 606 – 554 – 210 – 5; ISBN – 978 – 606 – 554 – 212 – 9.
20. Muşat Cosmin Constantin, Herban Sorin, *Comparative Overview of Cadastre and Land Information Systems in Some Countries from Europe a Efficient Tool to Understand and Manage Urban Development*, BENA Conference, November 2010, Timişoara, Romania, ISBN – 978 – 606 – 554 – 210 – 5; ISBN – 978 – 606 – 554 – 212 – 9.
21. Claudiu Ioan Bota, Herban Sorin, Muşat Cosmin Constantin, *Studying the Movement of Buildings and Development Models to Determinate the Real Settlements*, BENA Conference, November 2010, Timişoara, Romania, ISBN – 978 – 606 – 554 – 210 – 5; ISBN – 978 – 606 – 554 – 212 – 9.
22. Gridan Maria Roberta, Jianu Sergiu, Grecea Carmen, *Implication of Forestry Cadastre in the National Strategy of Environmental Protection*, BENA Conference, pp.208-212, November 2010, Timişoara, Romania, ISBN – 978 – 606

BOOKS

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