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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 "Steel solutions for seismic retrofit and upgrade of existing constructions - STEELRETRO" and "High Strength Steel in Seismic Resistant Building Frames - HSS-SERF" projects are 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 Steel Bridges***

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

- ***New Technologies for Steel and Composite Bridges***

Keywords: friction stirs 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.
- Drafting of the National Annexes to EN 1998-1:2004, EN 1993-1-4, EN 1993-1-5, EN 1999-1-2, EN 1999-1-5, EN 1994-1-1, EN 1994-1-2.
- 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)
- PhD student Sorin Bordea (Strengthening of masonry and reinforced concrete structures with steel materials)
- PhD. student Nicolae Muntean (Welded and bolted connections realised using high-strength steel)
- 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)

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: 30.000 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: 16.956 EUR (Total value: 169.560 EUR)
3. 90CP/ I/ 2007 - 2009. *Structural assessment laboratory for large scale tests*, Financing authority: ANCS, Value: 1.422.000 RON (Total value: 1.998.000 RON)
4. RUUKKI / 2009 *Requirements for multi-storey buildings in seismic areas*, Financing authority / Beneficiary: RUUKKI, Value: 10.000 EUR (Total value: 10.000 EUR)

5. 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)
6. 534/ 2006 - 2009. *Evaluation of the steel structure of the Engine Room of the Iron Gate I Hydro Power Plant*, Financing authority/ Beneficiary: SC Energoproiect SA, SC Hidrotim SA, Value: 47.945 RON (Total value: 77.350 RON)
7. 300/ 2007 - 2009. *Drafting of the National Annex to EN 1993-1-4*, Financing authority/ Beneficiary: MDLPL (Ministry of Regional Development and Housing). Value: 85.000 RON (Total Value: 85.000 RON)
8. 301/ 2007 - 2009. *Drafting of the National Annex to EN 1993-1-5*, Financing authority / Beneficiary: MDLPL (Ministry of Regional Development and Housing). Value: 90.000 RON (Total Value: 90.000 RON)
9. 303/ 2007 - 2009. *Drafting of the National Annex to EN 1999-1-2*, Financing authority / Beneficiary: MDLPL (Ministry of Regional Development and Housing). Value: 65.000 RON (Total Value: 65.000 RON)
10. 594/ 2007 - 2009. *Drafting of the National Annex to EN 1998-1:2004*, Financing authority / Beneficiary: Technical University Of Civil Engineering Of Bucharest, Value: 1.600 RON (Total value: 8.000 RON)
11. 124(425)/ 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: - RON (Total value: 158.270 RON)
12. 125(426)/ 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: - RON (Total value: 123.760 RON)
13. 681(302) / 2007-2009. *Drafting of the National Annex to EN 1994-1-1 and EN 1994-1-2*, Financing authority/ Beneficiary: MDLPL (Ministry of Regional Development and Housing). Value: 78.000 RON (Total Value: 78.000 RON)
14. 683(304) / 2007-2009. *Drafting of the National Annex to EN 1999-1-5*, Financing authority / Beneficiary: MDLPL (Ministry of Regional Development and Housing). Value: 90.000 RON (Total Value: 90.000 RON)

BOOKS PUBLISHED

1. Frannsen, J. M, Kodur, V., Zaharia, R.: *Designing steel structures for fire safety*. CRC Press, Taylor & Francis Group, Balkema, London, UK, 2009, ISBN 978-0-415-54828-I, 162 pp.

PUBLISHED PAPERS

1. Dubina, D., Dinu, F., Stratan, A.: *Tower Centre International building in Bucharest. Part I: Structural design*. Steel Construction, 2009, Vol. 2 (4), ISSN 1867-0539, pp. 256-263
2. Zaharia, R., Pintea, D.: *Fire after earthquake analysis of steel moment resisting frames.* International Journal of Steel Structures, 2009, Vol 9, issue 4, ISSN 1598-2351, pp. 275-284
3. Bordea, S., Dubina, D.: *Retrofitting/upgrading of reinforced concrete elements with buckling restrained bracing elements*. Proceedings of the 11th WSEAS Int. Conf. On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009, ISBN 978-960-474-080-2, pp. 407-412
4. Crişan, A., Stratan, A.: *Overstrength Demands In Multistorey Eccentrically Braced Frames*. Proceedings of the 11th WSEAS Int. Conf. On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009, ISBN 978-960-474-080-2, pp. 401-406
5. Danku, G., Dubina, D.: *Numerical Simulation of Composite Steel-Concrete Eccentrically Braced Frames (EBF) under Cyclic Actions*. Proceedings of the 11th WSEAS Int. Conf. On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009, ISBN 978-960-474-080-2, pp. 413-418
6. Filip-Vacarescu, N., Dubina, D.: *Numerical Modelling of Centrically Braced Frames Equipped with Friction Dampers in the Bracings*. Proceedings of the 11th WSEAS Int. Conf. On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009, ISBN 978-960-474-080-2, pp. 381-386
7. Georgescu, M.: *Design of Modern steel Roofing via Improved Distortional Approach.* Proceedings of the 11th WSEAS Int. Conf. On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009, ISBN 978-960-474-080-2, pp. 541-546
8. Muntean, N., Stratan, A., Dubina, D.: *Strength and Ductility Performance of Welded Connections between High Strength and Mild Carbon Steel Components - Experimental Evaluation*. Proceedings of the 11th WSEAS Int. Conference On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009 ISBN 978-960-474-080-2, pp. 387-394

9. Neagu, C., Dubina, D., Dinu, F.: *Seismic performances of ductile shear wall frame systems.* Proceedings of the 11th WSEAS Int. Conf. On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009, ISBN 978-960-474-080-2, pp. 395-400

10. Pintea, D., Zaharia, R.: *Advanced method for the fire analysis of concrete partition walls*. Proceedings of the 11th WSEAS Int. Conf. On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009, ISBN 978-960-474-080-2, pp. 484-489

11. Zaharia, R., Pintea, D.: *Advanced method for design of composite columns subjected to fire.* Proceedings of the 11th WSEAS Int. Conf. On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009, ISBN 978-960-474-080-2, pp. 369-374

12. Zaharia, R., Pintea, D.: *Advanced method for fire analysis of structures after earthquake.* Proceedings of the 11th WSEAS Int. Conf. On Sustainability in Science Engineering (SSE09), Volume 2, Timisoara, May 27-29, 2009, ISBN 978-960-474-080-2, pp. 375-380

13. Zaharia, Raul, Pintea, D., *Dubina D.: Fire analysis of structures in seismic areas. Application of structural fire engineering*, ISBN 978-80-01-04266-3, pp. 586-594

14. Dubina, D., Bordea, S., Stratan, A.: *Performance Based Evaluation of a RC Frame strengthened with BRB Steel Braces*. Proc. of the International Conference on Protection of Historical Buildings PROHITECH 09, Rome, Italy, Ed. F.M. Mazzolani. CRC Press, ISBN 978-0-415-55803-7, pp. 1741-1746

15. Dogariu, A., Dubina, D.: *Performance based seismic evaluation of a non-seismic masonry building of metal sheathed walls - Part I: PBSE and intervention strategy*. Protection of historical Buildings, PROHITECH09 - ed. Mazzolani, 2009 Taylor and Francis Group, London, ISBN 978-0-415-55803-7, pp. 1009-1014

16. Dogariu, A., Dubina, D.: *Performance based seismic evaluation of a non-seismic masonry building of metal sheathed walls - Part II: Study case*. Protection of historical Buildings, PROHITECH09 - ed. Mazzolani, 2009 Taylor and Francis Group, London, ISBN 978-0-415-55803-7, pp. 1015-1020

17. Dogariu, A., Dubina, D., Campitiello, F., De Matteis, G.: *Experimentally based calibration of a FE Model for numerical analysis of masonry shear panels strengthened by metal sheathing.* Protection of historical Buildings, PROHITECH09 - ed. Mazzolani, 2009 Taylor and Francis Group, London, ISBN 978-0-415-55803-7, pp. 1133-1138

18. Nagy-Gyorgy, T., Stoian, V., Dan, D., Daescu, C., Demeter, I., Diaconu, D., Dogariu, A.: *Experimental assessment on shear strengthening of clay brick masonry walls using different techniques*. Protection of historical Buildings, PROHITECH09 - ed. Mazzolani, 2009 Taylor and Francis Group, London, ISBN 978-0-415-55803-7, pp. 1653-1658

19. Dinu, F., Dubina, D.: *Robustness of seismic resistant multistory frame buildings in case of accidental column loss scenarios*. Proc. Of International Conference, STESSA 2009, Behaviour of Steel Structures in Seismic Areas, ed. Taylor & Francis Group, London, ISBN 978-0-415-56326-0, pp. 741-748

20. Dinu F., Dubina D., Neagu C.: *A comparative analysis of performances of high strength steel dual frames of buckling restrained braces vs. dissipative shear walls*. Proc. of International Conference, STESSA 2009, Behaviour of Steel Structures in Seismic Areas, ed. Taylor & Francis Group, London, ISBN 978-0-415-56326-0, pp. 145-152

21. Dubina D., Grecea D., Stratan A., Muntean N.: *Performance of dual-steel connections of high strength components under monotonic and cyclic loading*. Proc. of the 6th Int. Conf. on Behaviour of Steel Structures in Seismic Areas, STESSA 2009, F.M. Mazzolani, J.M. Ricles & R. Sause (eds). Taylor & Francis Group, London, ISBN 13 978-0-415-56326-0, pp. 437-442

22. Mazzolani, F.M., Dubina, D. Mandara, A., Stratan, A.: *The effects of catastrophic earthquakes on urban habitat constructions.* Proc. of the Second International Workshop on Performance, Protection & Strengthening of Structures under Extreme Loading – PROTECT 2009, Shonan Village Center, Hayama, Japan, Ed. Y. Sonoda, N. Banthia, K. Fujikake. National Defense Academy Protect Workshop, ISBN 978-4-9904806-0-8, pp. 85-99

23. Dubina, D., Dinu, F., Stratan, A.: *Post-earthquake intervention procedure on dual eccentrically braced frames with removable links.* Fourth National Conference on Seismic Engineering, Bucharest, 18 December 2009 Ed. Conspress, Volume 2, ISBN 978-973-100-096-1, pp. 273-282

24. Dubina, D., Stratan, A., Dinu, F.: *Inconsistencies and problems in application of P100-1/2006 (EN 1998-1) provisions to design of multi-storey steel structures (in Romanian).* AICPS Review, 2009, ISSN 1454-928X, issue 2-3/2009, pp. 150-159

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
- Sorin Bordea: *Dual frame systems with buckling-restrained braces*, 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

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*.
- 1st award at the contest "Technical book 2009" organised by the General Association of the Engineers in Romania (AGIR) the book "Fire design of steel structures (in Romanian)" by Raul Zaharia.
- 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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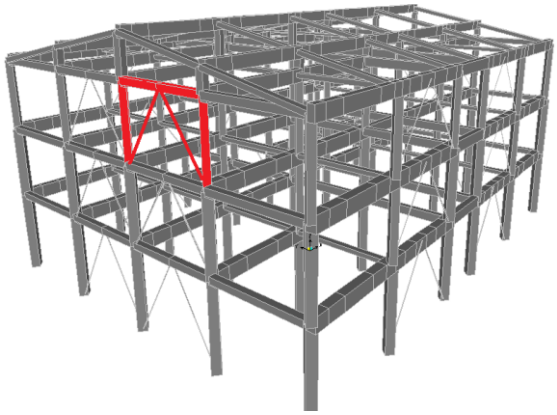
EXAMPLES

1. STEELRETRO project: *Steel solutions for seismic retrofit and upgrade of existing constructions*.

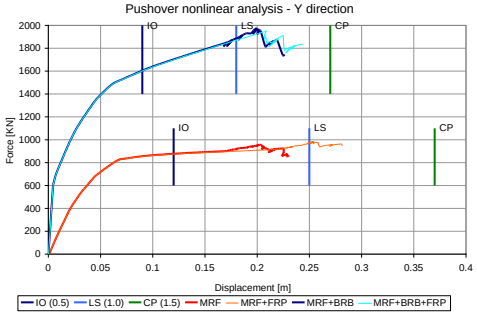
A case study was performed on historical building erected in Toscana, Italy in the first half of XXth century. The building has a reinforced concrete structure. The structure was regarded as a "benchmark structure", and different retrofitting systems based on steel material were applied. Static and dynamic nonlinear analysis was performed in order to evaluate the performances of an exiting RC frame building. The preliminary results have shown the structure is vulnerable and does not attain the seismic requirements. Therefore, it was decided to retrofit the structure with a BRB system. Additionally, a local confinement of concrete elements by means of FRP was envisaged.

Results have shown the initial structure MRF and initial structure with local retrofitting MRF + FRP have a limited ductility and does not attain the displacement demands for LS and CP levels. The benefit of local retrofitting is reduced. When the global retrofitting is accomplished MRF+BRB, the behaviour is much improved. The stiffness and strength increase and the structure attain the LS performance. The structure cannot attain the CP level, due to the failure of the concrete structure. The contribution of the local retrofitting is again very limited. Therefore, it is necessary to strengthen the columns and not only to confine them in order to fulfil the requirements for the three performance levels.

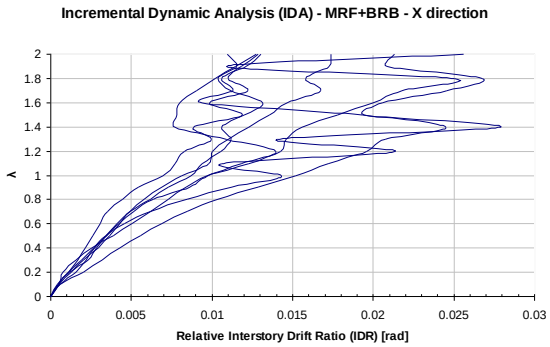
The analysis focused also on the evaluation of the behaviour factor q. The mean value of q factor was larger then the initial value considered in the analysis. Even so, the use of large q factor may not be recommended, as the deformation capacity supply of RC elements is reduced. Therefore, the retrofitting of existing RC frames with buckling restrained steel braces can be based of q factors amounting 3 – 3.5. If larger q factors are used, the strengthening of the concrete elements is necessary.



STEELRETRO reference benchmark RC building model and BRB system distribution

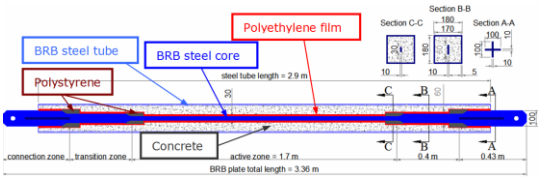


Pushover curves on Y direction



Relative interstorey drift vs. seismic multiplication factor λ on X direction

The two types of frames were tested monotonically and cyclically. Tests showed a very good behaviour of the retrofitted structure. The ductility of the structure was very much improved and the failure was caused by the failure of the steel brace in tension. The connections between the BRB and the RC elements performed very well. The workability of the system with pre-stressed ties was also tested. The connection devices used for installing BRB's within the frame took benefit from the friction resistant forces induced by the ties pretension and showed a very good behaviour. In fact, reduced slips were observed, with very small influence on the hysteretic loops of BRB system. The results recommend the application of this connecting system for such interventions. Moreover, in the case of multi-storey frames, such connecting systems also provide a beneficial confining effect at the frame joints, enhancing both strength and ductility of the MRF+BRB system.



Buckling restrained brace

Steps followed in order to build BRB elements

MRF + BRB under cyclic load

BRB-column connection

BRB-beam connection

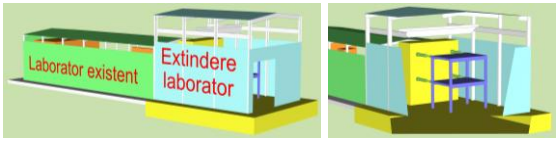
2. Structural assessment laboratory for large scale tests

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 will allow performing full-scale or close to full-scale tests on structures with 1-3 stories. The reaction wall will have a width of 5 m and a height of 6,5 m.

The new laboratory will be provided with two high capacity actuators (650/1015 kN), equipped 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 to perform 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.

The high capacity actuators and the steel structure for the reaction wall were installed in 2008. The strong floor and the foundations of the building were finalised in 2009. The building construction is provided for 2010.

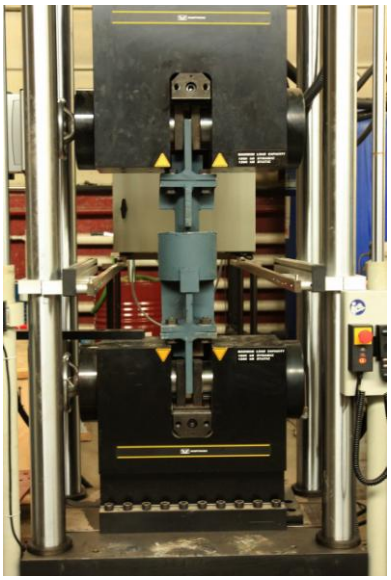


3D rendering of the existing and new laboratory

Reinforcement preparation for the strong floor

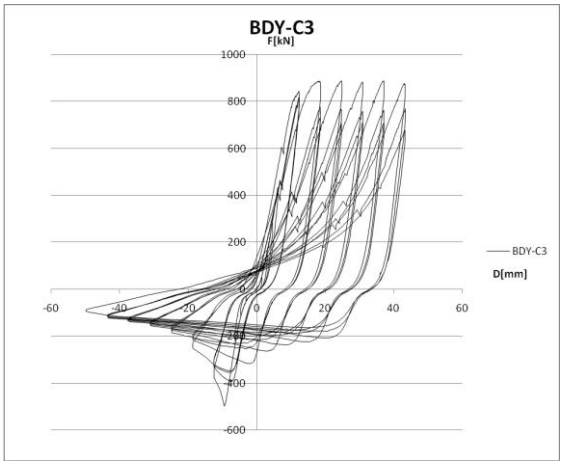
3. Concentrically braced frames with damper devices

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 damper device

Experimental testing of a brace with a damper device



Hysteretic response of a brace with a damper device

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 (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 Nicolae Muntean (Post-elastic capacity of Z purlins with overlapped joints)
- PhD. student Andrei Crisan (Cold-formed pallet racking systems)
- PhD. student Iulia Tuca (cold-formed floors)

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. 304/ 2007 - 2009. *Drafting of the National Annex to EN 1999-1-5*, Financing authority / Beneficiary: MDLPL (Ministry of Regional Development and Housing). Value: 90.000 RON (Total value: 90.000 RON)
2. 123(424)/ 2009 - 2010. Stability checks 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: - RON (Total value: 142.800 RON)
3. 65/2009. *Experimental investigation of ultimate capacity of pallet rack members.* Beneficiary: SC *Dexion HI-LO* Storage solutions SRL, Value: 8.568 EUR (Total Value: 21.420 EUR)
4. 678(299) / 2007-2009. *Drafting of the National Annex to EN 1993-1-3*, Financing authority / Beneficiary: MDLPL (Ministry of Regional Development and Housing). Value: 85.000 RON (Total Value: 85.000 RON)

PUBLISHED PAPERS

1. Dubina, D., Stratan, A., Nagy, Zs.: *Full – scale tests on cold-formed steel pitched-roof portal frames with bolted joints*. Advanced Steel Construction, 2009, Vol. 5 (2), ISSN 1816-112X, pp. 175-194
2. Ungureanu V., Dubina D., Kotełko M., Mania R.J.: *Plastic strength of thin-walled plated members - alternative solutions review, Part I. Numerical analysis.* Proceedings of the XIIth Symposium on Stability of Structures (ISBN 83-914019-6-0). Zakopane, Polonia, 07-11.09.2009, pp. 451-460.
3. Ungureanu V., Dubina D., Kotełko M., Mania R.J.: *Plastic strength of thin-walled plated members - alternative solutions review, Part II. Numerical vs. experimental comparisons.* Proceedings of the XIIth Symposium on Stability of Structures (ISBN 83-914019-6-0). Zakopane, Polonia, 07-11.09.2009, pp. 461-470.

ONGOING PhD THESES

- Andrei Crisan: *Stability of light gauge thin-walled structures for pallet rack systems,* PhD supervisor Prof. Dan Dubina
- Iulia Tuca: *Performance of dry floors realised from cold-formed steel members,* 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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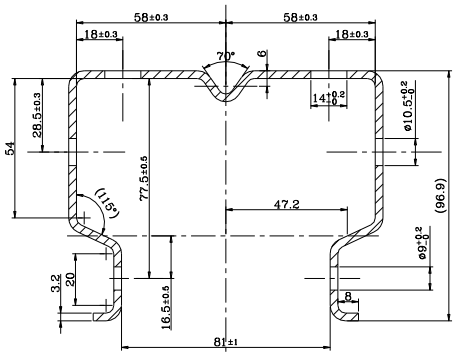
EXAMPLES

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

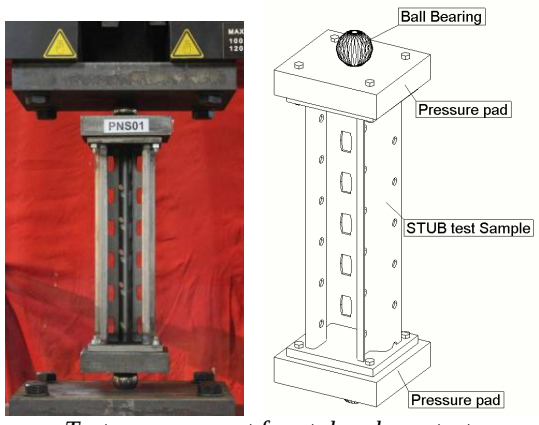
Stub column and distortional buckling column tests on the DEXION HI-LO pallet rack components carried out in accordance with the recommendations of EN 15512:2008 "*Steel static storage systems – Adjustable pallet racking systems – Principles for structural design*".

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 f_y and the ultimate strength f_u. All test specimens were measured in order to determine the geometric imperfections.



Upright sections P95x2.6 and UH125x3.2

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. The loading velocity at V_1=1 mm/min was applied, for quasi static loading conditions.



Test arrangement for stub column tests

Tested stub columns – brut section P95x2.6

Tested stub columns – net section UH125x3.2

Tested columns – net section UH125x3.2 – distortional buckling

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)
- PhD. student Iulia Tuca (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: 308.600 RON (Total value: 1.894.000)

2. AFFORDABLE HOUSE/ 2009-2010. *Affordable House.* Financing authority/ Beneficiary: Arcelor - Mittal. Value: 15.000 EUR (Total value: 25.000 EUR)

BOOKS PUBLISHED

1. Braganca, L., Koukkari, H., Blok, R., Gervasio, H., Veljkovic, M., Plewako, Z., Landolfo, R., Ungureanu, V., Silva, L.S. *Proceedings of Workshop Sustainability of Constructions: Integrated approach to life-time structural engineering. COST C25 Publication, Timisoara, Romania,* ISBN 978-973-638-428-8, 412 pp.

PUBLISHED PAPERS

1. Ciutina, A., Ungureanu, V.: *Family House: cold-formed steel framing and OSB cladding vs. masonry - LC Energy Approach*. Proceedings of Workshop Sustainability of Constructions: Integrated approach to life-time structural engineering. COST C25 Publication, Timisoara, Romania, ISBN 978-973-638-428-8, pp. 373-390

2. Ciutina, A., Ungureanu, V., Grecea, D., Dubina, D.: *Family House: cold-formed steel framing and OSB cladding vs. masonry - Case study*. Proceedings of Workshop Sustainability of Constructions: Integrated approach to life-time structural engineering. COST C25 Publication, Timisoara, Romania, ISBN 978-973-638-428-8, pp. 363-372

3. Dogariu, A., Dubina, D.: *Evaluation of performance of some metal based retrofitting techniques applied to masonry walls*. Proceedings of Workshop Sustainability of Constructions: Integrated approach to life-time structural engineering. COST C25 Publication, Timisoara, Romania, ISBN 978-973-638-428-8, pp. 105-112

4. Dogariu, A., Dubina, D.: *Performance based evaluation of seismic retrofitting techniques.* Proceedings of Workshop Sustainability of Constructions: Integrated approach to life-time structural engineering. COST C25 Publication, Timisoara, Romania, ISBN 978-973-638-428-8, pp. 80-87

5. Dubina, D., Grecea, D., Dogariu, A.: *Evaluation matters and upgrade Iron Gate I of the Danube Hydropower Station*. Proceedings of Workshop Sustainability of Constructions: Integrated approach to life-time structural engineering. COST C25 Publication, Timisoara, Romania, ISBN 978-973-638-428-8, pp. 133-140

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.
- Organisation of the International workshop: *Sustainability of Constructions - Integrated Approach to Life-Time Structural Engineering*, Timisoara, 23-24 October 2009. Cost Action C25.
- Invited lecture to the 10th Constructional Steelwork Day – TUCSA, 05.11.2009, Istanbul, Turkey – V. Ungureanu, A. Ciutina, D. Grecea & D. Dubina: Steel Structures & Sustainability.

ONGOING PhD THESES

- Iulia Tuca: *Performance of dry floors realised from cold-formed steel members*, 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
- Szitar Mirela: *Sustainable development*, PhD supervisor Prof. Daniel Grecea
- Mihai Mușiu: *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

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EXAMPLES

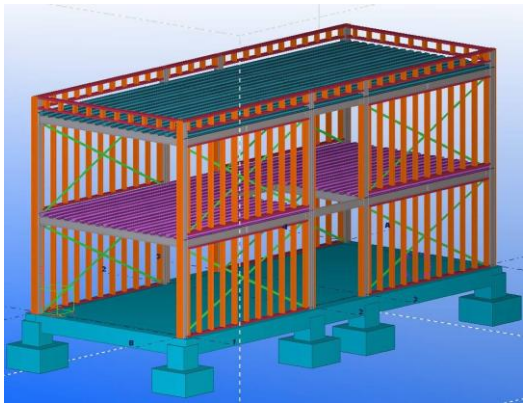
1. Innovative sustainable steel framing based affordable house solution for continental seismic areas.

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 is proposed, enabling flexible floor plan and modular construction, faster fabrication and erection times, with high solution diversity for flooring and envelope.

The architectural concept relies on the development of a rectangular footprint of 5.60m×13.40m, which gives a first module of 75m^2, for the one level unit. The house is a two storey building, with terrace roof, having a gross built area of 150m^2 and a usable area of 124.41m^2.

(a)



(b)

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

The proposed construction system consists of: (1) hot rolled framed steel structure; (2) secondary structure - cold-formed steel studs system; (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.

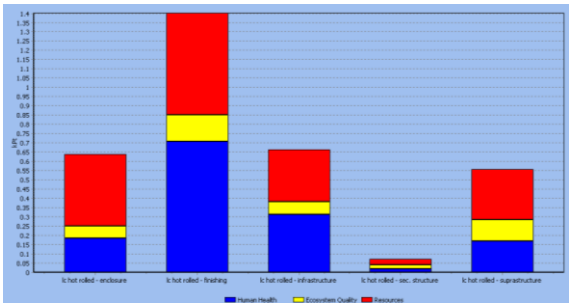
The achievement of thermo-energetic efficiency was another goal set by the design team. Several factors were taken into consideration: (1) Indoor temperature and air quality; (2) Thermal insulation; (3) Moisture protection; (3) Different heating and cooling systems; (4) Passive ventilation and shading; (5) The glazed terraces act as a buffer zone; (6) Skylights will be used to enhance cross ventilation for the one level house.

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.

In terms of structural performance, both the walls and the floor were designed based on stress skin design. It is very well known also that OSB panel solution used for walls and profiled steel sheeting used as floor decking are very effective as a shear diaphragm. Provided it is positively attached to the secondary members and main frames by mechanical fasteners or welding, it is extremely reliable and predictable and may be confidently used as a structural component.

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.

Figure from below emphasizes the impact of different constitutive elements in a single score. The chart shows very clear that the major impact is due to finishing elements while the less impact is for secondary structure. The "enclosure", "superstructure" and "infrastructure" are ranked almost equally.



Environmental impact per constructive element

A very important conclusion results from this fact, and namely that for a building not only the quantity of materials is important but mostly the processing of materials, in fact the latter being the responsible for the major impact on environment. Within the context of a sustainable development only the materials with "green" processing should promoted.

Researches in *SAFETY IN OPERATION AND REHABILITATION OF EXISTING STEEL 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 steel 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).
- Lect. Dorel Bolduș PhD, (Verification and Rehabilitation of Steel bridge structures)
- Phd. Stud. Silvia Rominu, (Robustness of steel structures)

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

TECHNICAL PROJECTS

1. Contract 80/2009: Study and proposals for a bridge over the river Mures on the DJ 709E, km 3+160 – technical project. Director: Prof. Radu Bancila PhD; Team: Lect. Dorel Boldus PhD,Assoc. Prof. Edward Petzek PhD, Phd. Stud. Lucian Blaga.

PUBLISHED PAPERS

1. Băncilă, R., Petzek, E., Boldus, D., *„Pledoarie pentru mentinerea unor poduri de sosea cu vechime mare in exploatare, situate in parte de vest a tarii, ca monumente de arta inginereasca”,* Revista de Drumuri si Poduri, issues 68-69, 71-72, ISSN 1222-4235, pp. 26-30, pp. 38-41, pp. 11-16, pp. 14-19
2. Petzek E., Băncilă, R., *„Assessment of failures and malfunctions”* Proceedings of the joint workshop of the COST Actions TU0601 Robustness of Structures, ISBN 978-3-909386-29-1, pp. 9-20
3. Petzek E., Băncilă, R., *„Evaluation of Service Security of Steel Structures”,* Security and Reliability of Damaged Structures and Defective Materials, Springer, ISBN 978-90-481-2791-7, pp. 301, 2009
4. Petzek Edward, Bancila R., Schmitt V., *Criteria for the assessment of existing railway bridges*, COST C25. Sustenability of Construction, Timisoara, Sustenability of

Construction, Ed. Orizonturi Universitare, ISBN 978-973-638-428-8, pp. 64, 2009

5. Petzek Edward, Bancila R., Schmitt V., *Deconstruction of bridges*, COST C25. Sustenability of Construction, Timisoara, Sustenability of Construction, Ed. Orizonturi Universitare, ISBN 978-973-638-428-8, pp. 199, 2009
6. Rominu S, Ionita O.M., *"Robustness of Systems – Knowledge and Uncertainty"*, Proceedings of the International Conference Modern Technologies, Quality and Innovation – ModTech 2009, ISSN 2066-3919, pp.563-566

FURTHER DEVELOPMENTS

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

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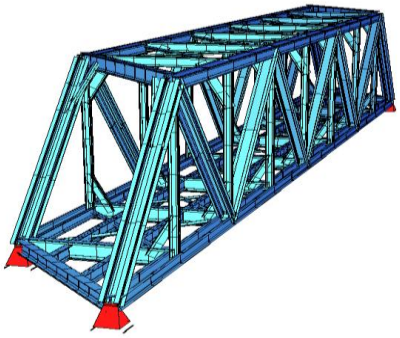
EXAMPLES

1. Bridge over the river Mures on the DJ 709E, km 3+160 – technical project

In the frame of this project, a study was made, to reveal the optimal solution for the proposed crossing. Three types of bridges were analyzed, regarding the constructive solution, costs, environmental impact and erection time.



Verification of existing bridges

Reparation of existing railway bridges

Technological aspects

Researches in NEW TECHNOLOGIES FOR STEEL AND COMPOSITE BRIDGES

FIELD DESCRIPTION

The team is involved in the research of the new welding technology Friction Stir Welding, the design of railway and road bridges with embedded steel girders and the design of new, efficient steel and composite bridges. The team is also involved in the design of new efficient steel and composite bridges, like railway, highway pedestrian and emergency lightweight bridges.

ACTIVITIES

- Experimental program about the fatigue resistance of the FS Weld.
- Choice of some FSW typical details for bridges.
- Application of different solution for bridge decks.
- 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 materials in bridge constructions – fiber-reinforced-polymers
- Emergency lightweight bridges

RESEARCH TEAM

- Prof. Radu Băncilă, PhD (steel welded structures)
- Assoc. Prof. Edward Petzek, PhD (modern technical solutions for composite bridges, fracture mechanics, choice of materials)
- Lect. Dorel Boldus, PhD (steel and composite bridges)
- Phd. Stud. Ramona Gabor (Friction Stir Welding, technology and welding procedure)
- PhD. Stud. Lucian Blaga (composite bridges)

RESEARCH OFFERS

- Welds analysis and design
- Design of welded steel structures especially aluminium bridges
- Design guide
- Technical solution and projects.
- Consulting
- Design examples for typical bridges
- Design of new steel bridges
- New materials in bridge construction.
- Consulting in the field of steel bridges
- Design examples for typical bridges

RESULTS

PUBLISHED PAPERS

1. Gabor R., Roos A., Dos Santos J., Bergmann L., *„Friction stir welding of AA 5083-H111 alloy“,* Proceedings of the 3rd International Conference Innovative technologies for joining advanced materials, ISSN 1844-4938, pp.51-56
2. Blaga L, *“Advantages and problems regarding the applications of glass fiber reinforced polymers”*, Proceedings of the Conferrence ModTech 2009. The New Face of TCMR, ISSN 2066-3919
3. Blaga L., *“GFRP emergency bridges. An ecological lightweight solution”, P*roceedings of the Workshop COST 25. Sustainabiliy of Constructions, ISBN 978-973-638-428-8, pp. 146-152

ONGOING PHD THESES

1. Ramona Gabor: *Applications of Friction Stir Welding in the field of civil engineering*, PhD supervisor Prof. Radu Bancila
2. Lucian Blaga: *Innovating materials in bridge construction. Study of fiber-reinforced-polymer lightweight bridges*, PhD supervisor Prof. Radu Bancila
3. Silvia Romina: *Robustness of structures*, PhD supervisor Prof. Radu Bancila
4. Alfred Schwalie: *Modern and efficient timber structures*, PhD supervisor Prof. Radu Bancila

FURTHER DEVELOPMENTS

- Design of an experimental program for studies of typical connections with FSW for bridge structures, especially bridge decks
- PhD Degree Application of FSW in the field of civil engineering (bridges)
- Design examples for composite structures and bridges according to Eurocodes
- Experimental program for the study and optimisation of connections for fiber-reinforced-polymer (FRP) profiles
- Design examples for steel structures and bridges according to Eurocodes

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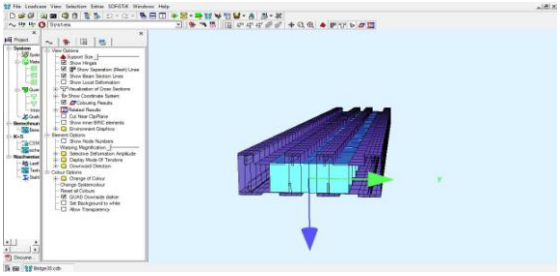
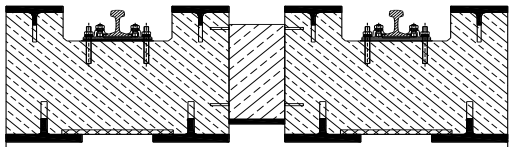
EXAMPLES

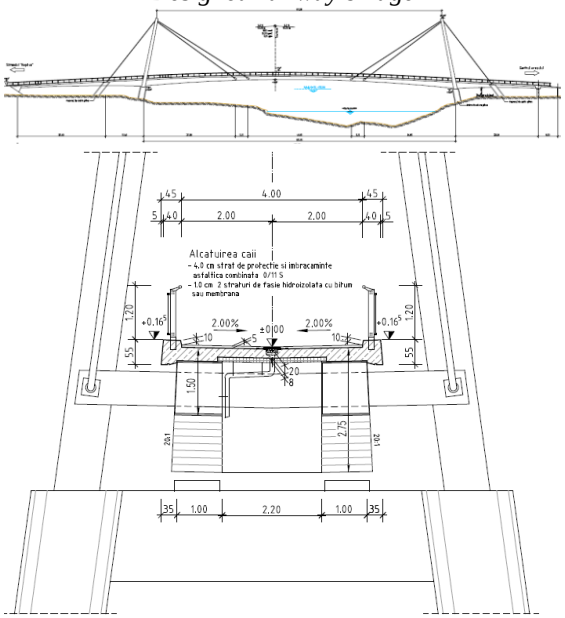
1. Composite railway and highway bridges with embedded steel girders

Composite railway and highway bridges with embedded steel girders have the following advantages: a better functional response, reduction of maintenance costs, minimization of noise and environmental problems. These structures have been adopted on the new railway lines, or for replacing the existing old bridges.





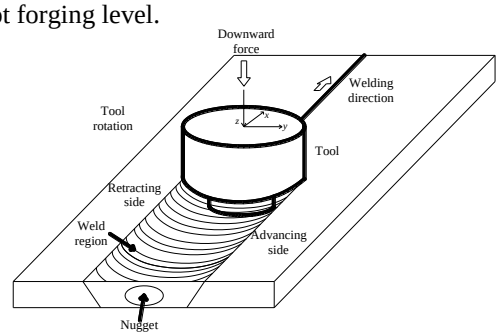
Designed railway bridge



New composite footbridge over the Mures in Arad

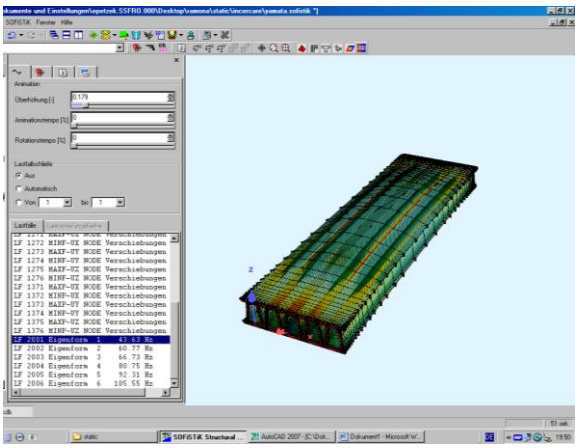
2. Friction stir welding (FSW)

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. Due to the high frictional forces between the wear resistant tool and the parent material the workpiece temperature rises to a hot forging level.



FSW process

The process was first time used to weld aluminium. We can actually say that it was invented for aluminium. From the first begin to weld aluminium elements (plates) with FSW seem to be very proper. FSW has several advantages over commonly used fusion welding techniques. Following from its relatively low process temperature, below the melting point, the method is suited for joining thin or difficult to weld materials. Because of the quality demonstrated in time and because of the price drop for aluminium productions, it became a suitable and an economic alternative to the usual bridge materials: structural steel and concrete.

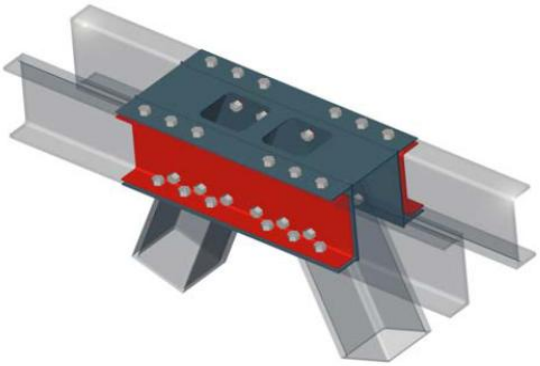


SOFISTIK analysis for an aluminum alloy bridge deck

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.

3. Lightweight emergency bridges

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



Steel shoe for GFRP connections

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

- ***Fatigue and fracture of materials***

Keywords: fatigue, fracture

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 Dănuţ CĂLUGĂR
- Eng. PhD student Vinicius PRECUPAŞ

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

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: 1.951.062 RON

PUBLISHED PAPERS

1. Adrian Ivan, Marin Ivan, Ioan Both, *Advanced analysis of a space structure retrofit for an ash-tank*, 7th International Conference On Earthquake Resistant Engineering Structures (ERES 2009), Limassol, CIPRU, 2009
2. Ionel Balcu, Adrian Ivan, Adina Segneanu, Corina Macarie, Zoltan Urmosi, Nadina Vlatanescu, *Study of multifunctional nanocomposites (porphyrin systems) used as corrosion inhibitors*, Proceedings of the 11th WSEAS International Conference on Sustainability in Science Engineering, Vol II, Timişoara, 2009
3. Ionel Balcu, Adrian Ivan, Adina Segneanu, Corina Macarie, Zoltan Urmosi, Bogdan Taranu, *Anticorrosive protection system based on*

phosphogypsum, Proceedings of the 11th WSEAS International Conference on Sustainability in Science Engineering, Vol II, Timişoara, 2009

CONTACT PERSONS

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E-mail: adrian.ivan@ct.upt.ro

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

Contract no. 24/2009, *Inspection, diagnosis, technical expertise and technical solutions to strengthen the supportive structures of 3 and 6 blocks silos Rovinari*, Beneficiary: S.C ISPE S.A. Bucharest, Value: 41.650 RON

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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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

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.

- **Flexural strengthening of RC beams using CFRP composites with different anchorage systems**

Keywords: Strengthening, RC beams, CFRP composites, anchorage systems.

- **Protection against corrosion of steel reinforcement in concrete, using porphyrins and metalloporphyrins**

Keywords: porphyrins, corrosion inhibitors, surface nanolayers

- **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.

- **Multifunctional nanocomposites for advanced materials mavoptel**

Keywords: Multifunctional nanocomposites, supramolecular architectures, optoelectrical, photochemical, electrochemical and biological properties.

- **The durability and strengthening of the existing bridges. Experimental researches on reinforcement and prestressed concreted**

Keywords: concrete bridges, experimental research, concrete, steel reinforcement, technical expertise.

- **Quality Checking used to Historical Building Repair**

Keywords: brick, mortars, concrete mechanical strength, freeze - thaw resistance.

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

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

- **New Efficient Building Materials Realised with Industrial Waste**

Keywords: industrial waste, fly ash, efficient building materials, environment protection, recycling

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E-mail: valeriu.stoian@ct.upt.ro

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

- Three laboratory tests on near full-scale precast RC wall panels strengthened by CFRP composites.
- 3 international and 1 national conferences attended with published papers.

RESEARCH TEAM

- István DEMETER, PhD Stud.
- 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 Stud.
- 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 and to make a classification of different test procedures based on their influence in increasing the columns' ductility and load bearing capacity.

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

As results:

- superposition of the theoretical behaviour (from numerical modelling) with the real behaviour (from recorded test data)
- optimised strengthening procedures.

RESEARCH TEAM

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

Researches in *STRENGTHENING OF REINFORCED CONCRETE SLABS USING FRP COMPOSITE MATERIALS*

FIELD DESCRIPTION

The research program deals with FRP composite based solutions for strengthening/rehabilitation 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 Stud.
- Cosmin DĂESCU, Assist.

Researches in *FLEXURAL STRENGTHENING OF RC BEAMS USING CFRP COMPOSITES WITH DIFFERENT ANCHORAGE SYSTEMS*

FIELD DESCRIPTION

Since there is a real bond issue between the support layer (concrete) and the epoxy resin used to bond the CFRP fabric and lamellas, in most of the situations the failure of the strengthened element occurs due to debonding mechanism, long before the capacity of the composite material is reached. This phenomenon usually arises because of the lack of attention paid to the preparation of the support layer by neglecting the concrete's quality, by poor knowledge of technological requirements or by poor qualification of the workers who apply this strengthening technique.

In order to overcome this bond issue that could lead to important faults and reduced effect of strengthening intervention, a series of anchoring solutions (mechanisms) were proposed and experimentally tested in the laboratory-some of them in previous years and three of them in the year 2009.

ACTIVITIES AND RESULTS

Experimental tests on four RC beams: 1st flexural strengthened with one CFRP lamella, 50 mm width and 1.2 mm thickness, without anchors at the ends (R-1S-0), 2nd with one CFRP lamella, 50 mm width and 1.2 mm thickness, anchored on its entire length using distributed steel bolts chemically anchored in the concrete element (R-CA-1S) and 3rd with one CFRP lamella, 50 mm width and 1.2 mm thickness, anchored at both ends using CFRP anchor spikes (R-1S-AS).
Significant increase of load bearing capacity was obtained in all the cases when anchorage systems were used.

RESEARCH TEAM

- Dan DIACONU, PhD Stud.
- Tamás NAGY-GYÖRGY, PhD, Lect.
- Valeriu STOIAN, PhD, Prof.
- Codrut FLORUT, PhD Stud.
- Cosmin DĂESCU, Assist.

Researches in *PROTECTION AGAINST CORROSION OF STEEL REINFORCEMENT IN CONCRETE, USING PORPHYRINS AND METALLOPORPHYRINS*

FIELD DESCRIPTION

The abilities of porphyrins and derivatives to inhibit the steel corrosion are based on their properties to adsorb on the metal surface and to block the access of aggressive agents, both for the anodic and cathodic reactions. These properties were illustrated by potentiodynamic curves obtained on carbon steel in 1N H2SO4, indicating a decrease of the current

in the active region of the anodic polarization curve. The inhibiting effect was verified on steel fibers, directly by determining the mass loss of the metal and indirectly by measuring the hydrogen evolved in the cathodic reaction. The corrosion inhibition was between 35-88%.

ACTIVITIES AND RESULTS

Studies of corrosion inhibition using the polarization curves obtained on the potentiostat. Determination of the corrosion rate by mass loss in different aggressive solutions. Determination of the corrosion rate by measuring the hydrogen volume. Effect of porphyrinic corrosion inhibitors on the adherence of concrete on steel fibers.

RESEARCH TEAM

- Gheorghe FĂGĂDAR, PhD, Assoc. Prof.
- Corneliu BOB, PhD, Prof.
- Iosif BUCHMAN, PhD, Prof.
- Eugen JEBELEAN, PhD, Assoc. Prof.
- Sorin DAN, PhD, Lect.
- Cătălin BADEA, PhD, Lect.
- Liana IUREȘ, PhD, 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;
- Characteristic's verification;
- Establishing the optimal compositions
- Establishing the optimal compositions in the Ph.D. thesis.

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 *MULTIFUNCTIONAL NANO-COMPOSITS FOR ADVANCED MATERIALS*

FIELD DESCRIPTION

Nano-composits based on supramolecular architectures with optoelectric, photochemical, electrochemical and biological properties are studied- forerunners for the advanced materials.

ACTIVITIES AND RESULTS

Theoretical studies and experimental research concerning in the field of nano-composits for advanced materials.

RESEARCH TEAM

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

Researches in *THE DURABILITY AND STRENGTHENING OF THE EXISTING BRIDGES. EXPERIMENTAL RESEARCHES ON REINFORCEMENT AND PRESTRESSED CONCRETED*

FIELD DESCRIPTION

Non-destructive tests realized on infrastructure and structure of concrete bridges. Technical expertise realized on reinforcement and prestresed concrete bridges.

ACTIVITIES AND RESULTS

Research contract to made non-destructive tests on concrete from infrastructure and structure of 3 (three) concrete bridges which are existing on national roads from west country.
Research contract to elaborated 12 (twelve) technical expertise regarding roads on national roads from West Country.

RESEARCH TEAM

- Cornel Jiva, PhD, Prof.
- Eugen JEBELEAN, PhD, Assoc. Prof.
- Cătălin BADEA, PhD, Lect.

Researches in QUALITY CHECKING USED TO HISTORICAL BUILDING REPAIR

FIELD DESCRIPTION

Different material types were tested. These materials can be are used to repair historical buildings.

ACTIVITIES AND RESULTS

Physical and mechanical tests there were made on: brick, mortars, plate stones etc.
Supplying testing certificates were made for the tested characteristics to the contractors.

RESEARCH TEAM

- Iosif BUCHMAN, PhD, Prof.
- Cătălin BADEA, PhD, Lect.
- Liana IUREŞ, 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 NEW EFFICIENT BUILDIN MATERIALS REALISED WIRH INDUSTRIAL WASTE

FIELD DESCRIPTION

Laboratory testing of many different compositions realised with industrial waste in order to find the optimal compositions. The goals are to obtain new efficient building materials by recycling the industrial waste and to protect the environment.

ACTIVITIES AND RESULTS

There were obtained new materials which can be used like building materials. All experimental researches were made only into laboratory rooms.

RESEARCH TEAM

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

RESEARCH PROJECTS

1. CNCSIS BD - Scientific research/artistic creation scholarship for young PhD Students. Beneficiary: Sorin-Codruț FLORUȚ - PhD Student.

2. CNCSIS-UEFISCSU, PN-II, RU, TD-8, nr 2/02.10.2007: *RC walls strengthened by FRP composites.* Project coordinator: István DEMETER.

3. CNCSIS-UEFISCSU, PN-II, ID_1004 (Contract 621/2009) founded by the National University Research Council, Romania, coordinator Assoc. Prof. Ph. D. Civ. Eng. Daniel Dan

PUBLICATIONS

BOOKS

1. Stoian V., Nagy-György T., Dan D., Gergely J., Dăescu Al. C., Materiale compozite pentru construcții, Politehnica Publishing House, Timisoara, 2009, ISBN 978-973-625-948-7.
2. Buchman I., *Building Materials*, Ed. Politehnica Timişoara, 2009, ISBN 978-973-625-888-6.
3. Jebelean E. *Materials and Technologies*, Printed by Orizonturi Universitare Publish House, Timisoara, 2009, ISBN 978-973-638-441-7.
4. Bob C., Jebelean E., *Materials Science. Building Construction*, Printed by Orizonturi Universitare Publish House, Timisoara, 2009, ISBN 978-973-638-441-2.
5. Făgădar G., Badea C., Chemistry *Laboratory Working*, Printed by Tempus Publish House, Timisoara, 2009, ISBN 978-973-1958-10-1.

PUBLISHED PAPERS

1. Demeter, I., Nagy-György, T., Stoian, V., Dăescu, A. C., and Dan, D. (2009). *"Seismic retrofit of precast RC wall panels with cut-out openings using FRP composites."* Proc., 9th International Symposium on Fiber Reinforced Polymer Reinforcement for Concrete Structures, ISBN 978-0-9806755-0-4, The University of Adelaide, Paper No. 213.

2. Demeter, I., Nagy-György, T., and Stoian, V. (2009). *"Earthquake damaged precast RC wall panels with cut-out openings retrofitted by CFRP composites."* Proc., XIIIth Conference on Civil Engineering and Architecture, ISSN 1843-2123, EMT, pp. 104-111 (in Hungarian).

3. Demeter, I., Nagy-György, T., Stoian, V., Dăescu, A. C., and Dan, D. (2009). *"Precast RC wall panels with cut-out openings retrofitted by FRP composites."* Proc., 33rd IABSE Symposium, Sustainable Infrastructure Environment friendly,

Safe and Resource efficient, ISBN 978-3-85748-121-5, IABSE, pp. 462-463.

4. Demeter, I., Nagy-György, T., Stoian, V., Dăescu, A. C., and Dan, D. (2009). *"Precast RC wall panels with cut-out openings retrofitted by CFRP composites."* Proc., 11th National and 5th International Scientific Meeting, Planning, Design, Construction and Building Renewal (iNDiS 2009), ISBN 978-86-7892-221-3, University of Novi Sad, pp. 157-164.

5. Demeter, I., Nagy-György, T., Stoian, V., Dăescu, A. C., and Dan, D. (2009). *"Seismic strengthening of precast RC wall panels by CFRP composites."* Proc., 4th National Conference on Earthquake Engineering (4CNIS), ISBN 978-973-100-096-1, Technical University of Civil Engineering of Bucharest, Vol. 2, pp. 251-256 (in Romanian).

6. Dăescu C., Nagy-György T, *Experimental study on the strengthening procedures for reinforced concrete columns*, 11th WSEAS International Conference on Sustainability in Science Engineering (SSE '09), Timisoara, 2009, ISSN 1790-2769, ISBN 978-960-474-080-2, pp 490-495

7. Dăescu C., Nagy-György T, Dan D., *Investigation of RC columns strengthened for bending with different methods*, 13th International Conference in Civil Engineering and Architecture - EPKO 2009, Miercurea Ciuc, 2009, ISSN 1843-2123, pp 88-94

8. Dăescu C., Nagy-György T., Stoian V., Dan D., *Experimental study on the retrofitting procedures for RC columns*, 4th International Conference on The Concrete Future, Coimbra, Portugal, 2009, ISBN 978-981-08-3242-1, pp 119-128

9. Dăescu C., Nagy-György T., Stoian V., Dan D., *Experimental tests on concrete columns. Step-by-step consolidation procedures*, FRPRCS-9, Sydney, 2009, ISBN 978-0-9806755-0-4, pp 76 (4 pp. CD)

10. Stoian V., Dan D., Nagy-György T., Floruț S. C., Pruna L., *Structural rehabilitation and health monitoring of reinforced concrete chimneys*, SHMII-4, Zurich, 2009, ISBN 978-3-905594-52-2, pp 184 (6 pp. CD)

11. A. Fabian, D. Dan - *Further numerical analysis on composite steel concrete structural shear walls with steel encased profiles*, WSEAS – SSE'09 Timişoara 27-29 May, ISSN 1790-2769, ISBN 978-960-474-080-2, ISI Proceedings

12. D. Dan, V. Stoian, T. Nagy Gyorgy, I. Demeter - *Experimental Studies on Steel and Steel Concrete Composite Joints Under Symmetrical and Asymmetrical Loads*, STESSA'09, 16-20 august Philadelphia USA, ISBN 978-0-415-56326-0

13. A. Fabian, V. Stoian, D. Dan - *Numerical Analysis on Composite Steel Concrete Structural Shear Walls with Steel Encased Profiles*, STESSA'09, 16-20 august Philadelphia USA, ISBN 978-0-415-56326-0

14. D. Dan, V. Stoian, A. Fabian - *Numerical Analysis on Composite Steel Concrete Structural Shear Walls with Steel Encased Profiles,* Bulletin of The Polytechnic Institute of Iaşi / Constructions. Architecture Section, Issue 3/2009 ISSN 1224-3884 (IndexCopernicus DataBase)

15. D. Dan, V. Stoian, T. Nagy Gyorgy, A. Fabian, C. Dăescu, C. Floruț - *Experimental studies on steel and steel concrete composite joints under asymmetrical loads,* INDIS 2009 Planning, Design, Construction and Renewal in the construction industry, Novi Sad, Serbia, ISBN 978-86-7892-221-3

16. A. Fabian, V. Stoian, D. Dan - *Theoretical study on steel concrete structural shear walls with steel encased profiles. Comparison with traditional systems,* INDIS 2009 Planning, Design, Construction and Renewal in the construction industry, Novi Sad, Serbia, ISBN 978-86-7892-221-3

17. Florut Sorin-Codrut, Stoian Valeriu - *Strengthening of RC slabs with cut-out openings using FRP composite materials – preliminary aspects of research program,* Proceedings of the 11th WSEAS International Conference on Sustainability in Science Engineering (SSE '09), 27-29 May 2009, Timişoara, România, vol 2, pp. 496 - 501.

18. Floruț Sorin-Codruț, Stoian Valeriu, Nagy-György Tamás, Diaconu Dan - *Two-way RC slabs strengthened using composite materials - reference points of research program, testing procedure and instrumentation,* Annals of University of Oradea - Constructions and hydro-utility installations fascicle, Nov 2009, Oradea, România, vol XII, pp. 111-116

19. D. Diaconu, T. Nagy-Gyorgy, V. Stoian, D. Dan, S. C. Floruț, C. Al. Dăescu, I. Remeter - *Economic Assessment Of Different Shear Strengthening Methods For Clay Brick Masonry Walls, Protection of Historical Buildings,* PROHITECH 09, Rome, Italy 21-24 June 2009, 6pp. 1653-1658, vol. II, ISBN 978-0-415-55805-1 (for 2nd volume) 978-0-415-55803-7

20. T. Nagy-Gyorgy, V. Stoian, D. Dan, C. Al. Dăescu, I. Demeter, Diaconu Dan – *Experimental Assessment On Shear Strengthening Of Clay Brick Masonry Walls Using Different Techniques, Protection of Historical Buildings,* PROHITECH 09, Rome, Italy 21-24 June 2009, 6pp. 1275-1280, vol. II, ISBN 978-0-415-55805-1 (for 2nd volume) 978-0-415-55803-7

21. D. Diaconu, T. Nagy-Gyorgy, C. Al. Dăescu, V. Stoian, S. C. Floruț - *Rc Elements Strengthened With Frp Composite - Economical Study*, Proceedings of the 9th International Symposium on Fiber-Reinforced Polymer Reinforcement for Concrete Structures, Sydney, Australia 13-15 July 2009,4 pg. (abstract 1 pp.–63), ISBN 978-0-9806755-0-4

22. D. Diaconu, V. Stoian, S. C. Floruț - *Anchoring Solutions For CFRP Lamellas Used In Flexural Strngthening Of Rc Beams, Tehnologii Moderne pentru Mileniul III*, Oradea, Romania 5-7 November 2009, 8 pp. 89-96, ISSN 1454-4067

23. D. Diaconu, V. Stoian, S. C. Floruț - *Flexural Strngthening Of Rc Beams Using Cfrp Lamellas - Anchoring Solutions*, iNDiS 2009, Planning, Design, Construction and Renewal in the Civil Engineering, Novi Sad, Serbia 25-27 November 2009, 8 pp. 165-172, ISBN 978-86-7892-221-3

24. Buchman I., Ignaton E., *Technical and Economical Aspects of the Special Industrial Concrete from Romania*, Annals of DAAAM for 2009 & Proceedings of the 20th International DAAAM Symposium "Intelligent Manufacturing & Automation: Focus on Theory, Practice and Education" 25-28 November 2009, Vienna, Austria

25. Buchman I., Badea C., *The Caracteristics of Ultra High Performance Concrete*, Proceedings of the 11th WSEAS Conference on Sustainability in Science Engineering (SSE 09), Timişoara, Romania, 2009.

26. Bob Corneliu, *Sustanability of buildings-Plenary Lecture 4*, Proceedings of the 11th WSEAS Conference on Sustainability in Science Engineering (SSE 09), Timişoara, Romania, 2009.

27. Bob Corneliu, Liana Bob, S *Sustanability of New and strengthened Buildings*, Proceedings of the 11th WSEAS Conference on Sustainability in Science Engineering (SSE 09), Timişoara, Romania, 2009.

28. Bob Corneliu, Leidal Anras, Iures Liana, Buchman Iosif, Jebelean Eugen, Dan Sorin, Cătălin Badea, Bob Liana, *Aspects Regarding the Use of Self-Compacting Concretes*, Proceedings of the 11th WSEAS Conference on Sustainability in Science Engineering (SSE 09), Timişoara, Romania, 2009.

29. Enuica Cosmin, Bob Corneliu, Dan Sorin, Cătălin Badea, Gruin Aurelian, *Solutions for Bond Improving of Reinforced Concrete Columns Jacketing*, Proceedings of the 11th WSEAS Conference on Sustainability in Science Engineering (SSE 09), Timişoara, Romania, 2009.

30. Corneliu Bob, Sorin Dan, Cătălin Badea, Aurelian Gruin, Dimitri Pavlov, *Retrofitting of Historical Masonry Buildings in Seismic Zones, Sustainable Infrastructure Environment Friendly, Safe and Resource Efficient*, 33rd IABSE Symposium, Bangkok, Thailand, 9-11 september 2009.

31. Cătălin Badea, Corneliu Bob, Sorin Dan, Daniel Bogdanescu, *Reinforced columns concrete strengthening technology*, National Symposium of Concretes, Bucharest, Romania, 2009.

32. Balcu Ionel, Segneanu Adina, Mirica Marius, Iorga Mirela, Cătălin Badea, Fitigau Iuliana Firuta, *Iron oxides from electrofilter ash for water treatment (arsenic removal)*, International Conference on Materials Science and Engineering (BRAMAT 2009); Environmental Engineering and Management Journal, 8 (4): 895-900, 2009.

33. Timeea Iovan Steuerer, Cătălin Badea, Sorin Dan, Iures L., *The Obtaining Technology of Road Materials Prepared with fly Ash*, Annals of West University of Timisoara, Series of Chemistry, 18(2) 1-8, 2009.

34. Anca Ruxandra Stefancu, Cătălin Badea, F. Balcu, I. Buchman, *The Obtainig Technology of Paving Slabs Using fly Ash*, Annals of West University of Timisoara, Series of Chemistry, 18(2) 1-8, 2009.

35. Corneliu Bob, Gruin A., Marginean S. Dencsak P., Pop A, *Evaluation and Rehabilitation Solution Concerning A Composite Steel-Concrete Slab*, Annales of University of Oradea, 2009.

36. Iureș L., Bob C., *Theoretical considerations regarding the evaluation of drying shrinkage effect in concrete structures*, National Symposium of Concretes, Bucharest, Romania, 2009

PhD THESIS

1. IUREŞ Liana – *Contributions to the development of some special concretes*, Published by Politehnica, Timisoara, ISBN 978-973-625-918-0, 2009 (finished)
2. DĂESCU Cosmin - *Rehabilitation of structural elements using composite materials*. Advisor: Prof. Stoian V. (on-going)
3. DEMETER István - *RC wall panels strengthened by CFRP composites*. Advisor: Prof. Stoian V. (on-going)
4. FABIAN Alexandru - *Contribution To The Calculus Of The Structural Composite Steel-Concrete Shear Walls With Rigid Reinforcement.* Advisor: Prof. Stoian V. (on-going)
5. DIACONU Dan – *RC Structural elements reinforced with FRP composites*. PhD advisor: Valeriu STOIAN Prof., PhD. (on-going)
6. FLORUȚ Codruț - *Performance study of the elements subjected to bending strengthened with FRP composites*. PhD advisor: Valeriu STOIAN 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)
9. DENCSÁK Tamás – *Sustainability of constructions.* Advisor: Corneliu BOB, 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

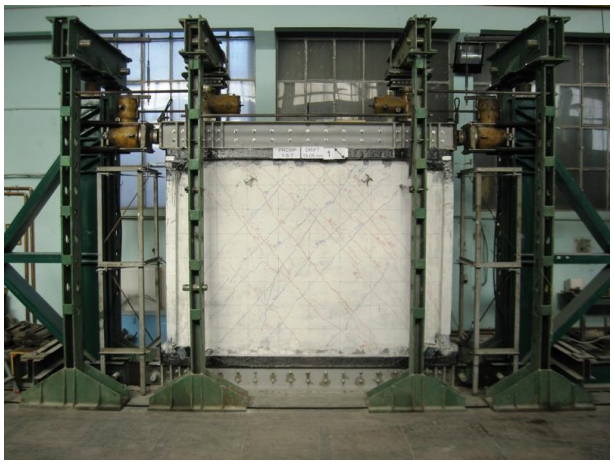
- Tests concerning the thermal conductivity of building materials and thermal insulation materials.

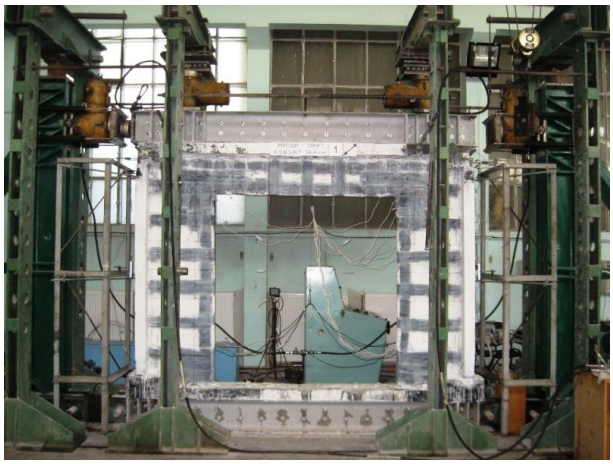
FURTHER DEVELOPMENTS

- The recorded experimental data from the wall tests will be processed and interpreted, analytical models will be developed.
- 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.
- In the field of structural rehabilitation of reinforced concrete and masonry structures new modern and efficient solutions are studied, tested and used in practice
- Behaviour and rehabilitation of masonry shear walls at seismic actions will be developed and new solutions will be studied
- New alternative methods for design of reinforced concrete structural elements are developed and proposed for different reinforced concrete structural elements
- Further optimization of composite steel-concrete building structures in seismic area will be performed
- Non-destructive research on concrete and steel reinforcement of structure and infrastructure bridges
- Bridges technical expertise
- Concrete dispersed reinforced with short fibers.

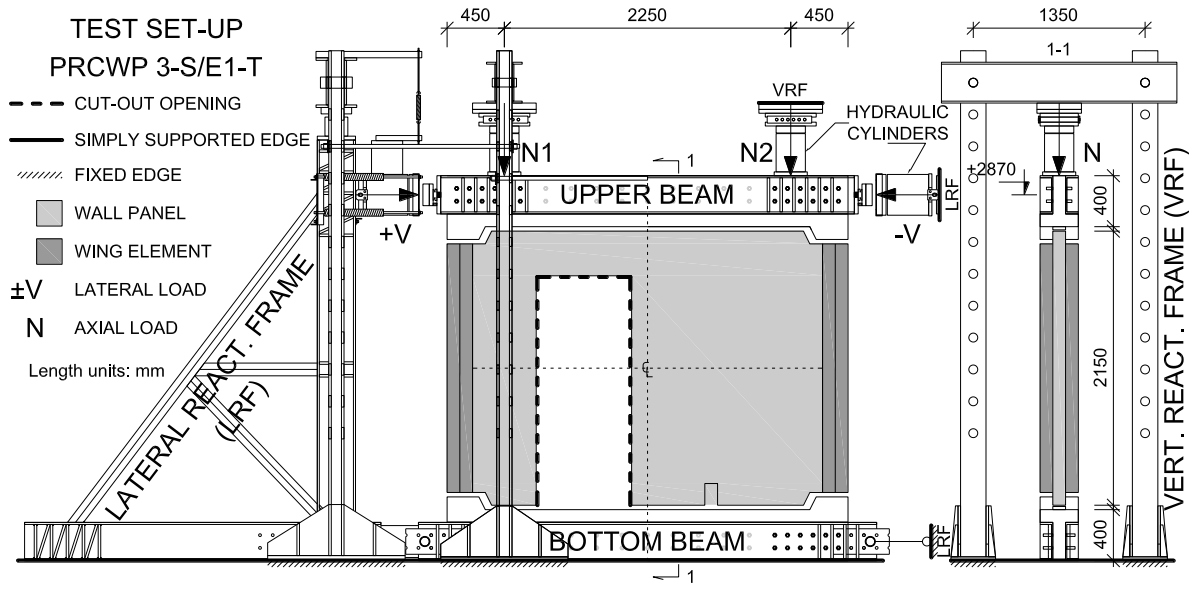
REMARKABLE ACHIEVEMENTS

1. Seismic Performance of Precast Reinforced Concrete Wall Panels Retrofitted by Carbon Fiber Reinforced Polymer (CFRP) Composites – Ongoing research

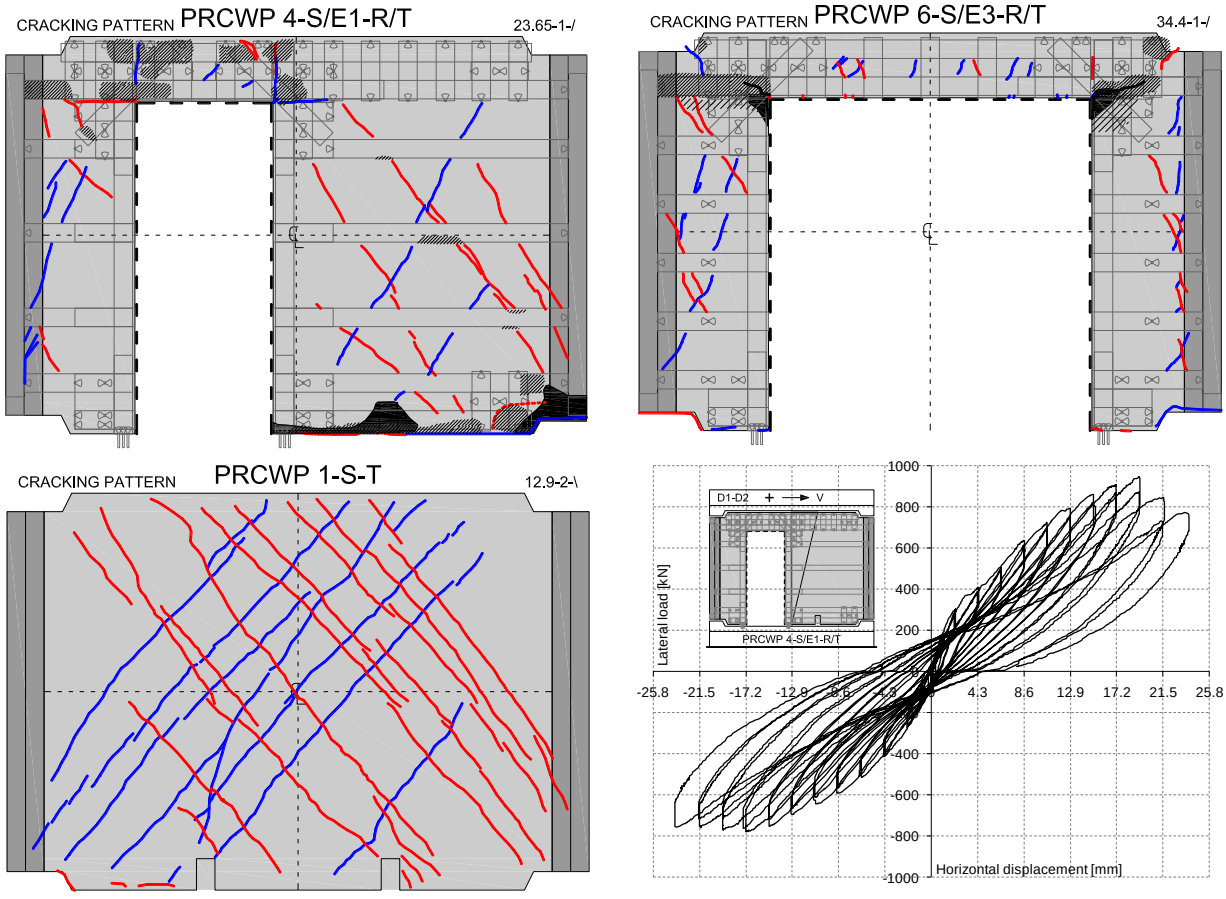




Experimental elements

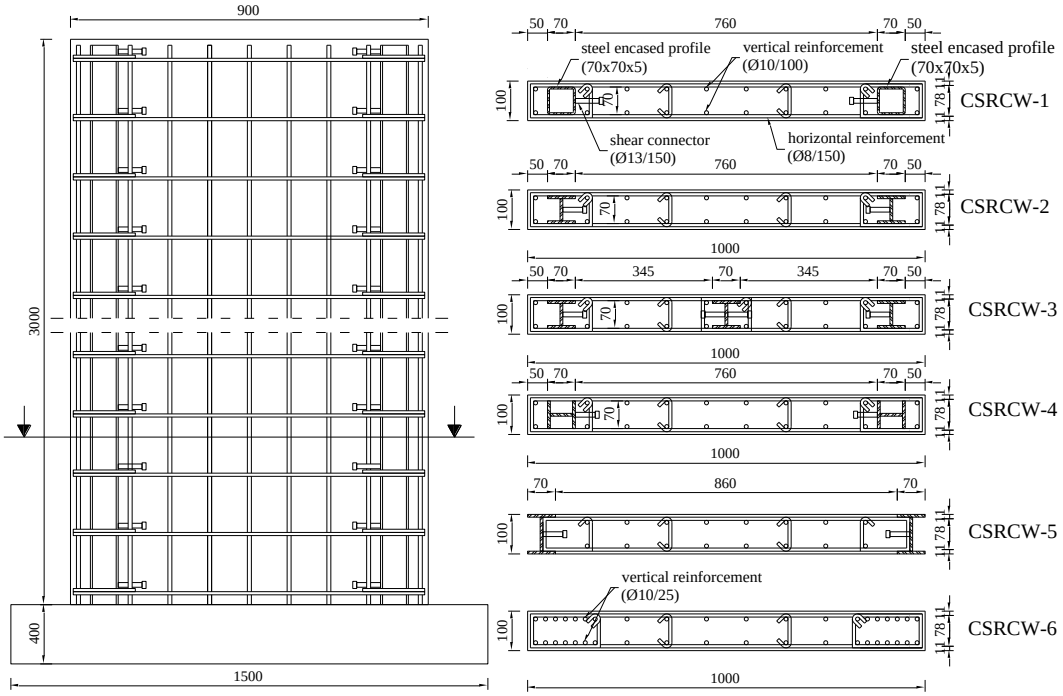


Experimental test set-up

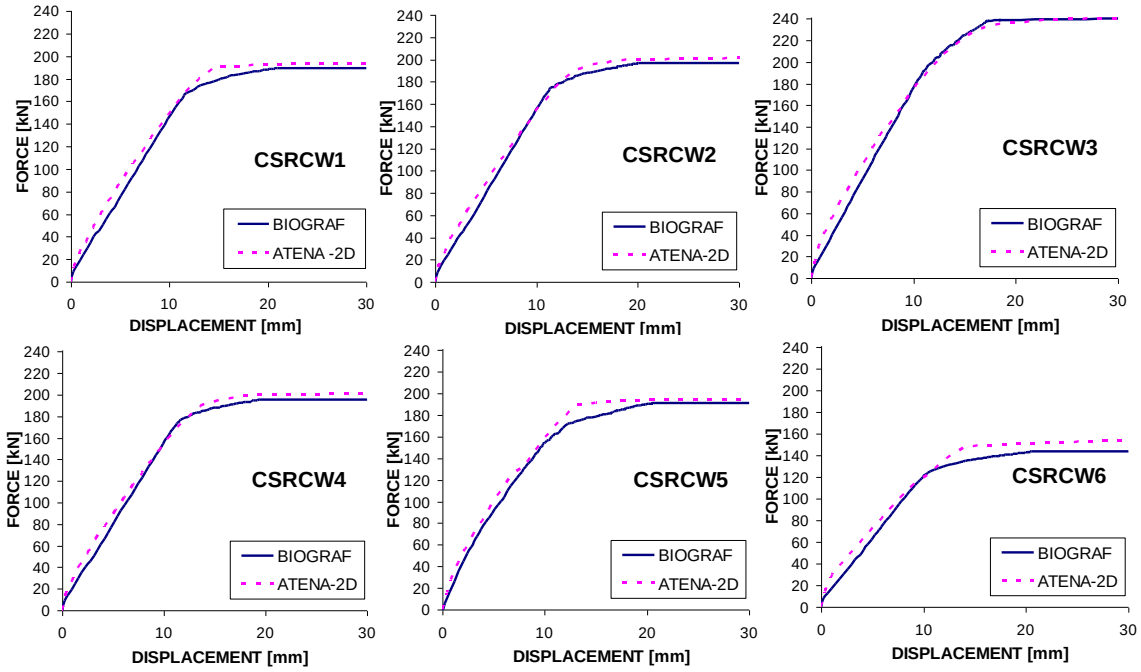


Crack pattern, failure details and one of the load-displacement diagrams.

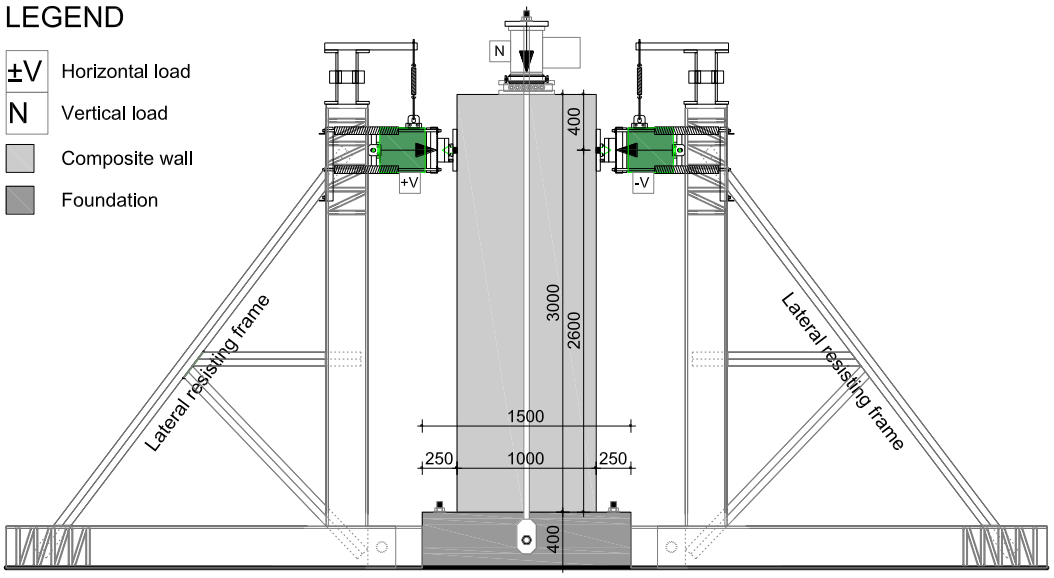
2. Experimental and theoretical approaches on composite steel-concrete structural shear walls with steel encased profiles



Details of the steel concrete composite elements



Comparative load displacement curves

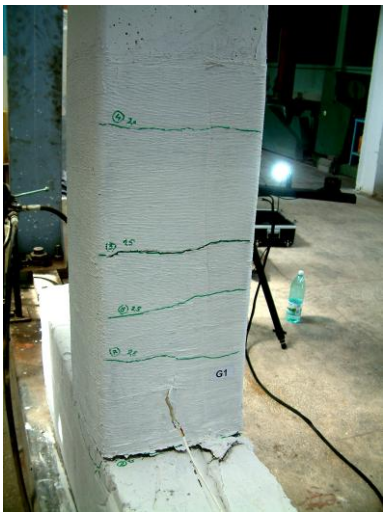


The proposed test set-up

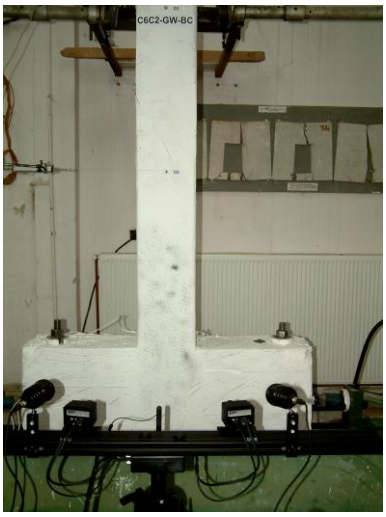
Instrumentation and manufacturing process of shear walls

General view of testing frame and distribution of cracks during testing

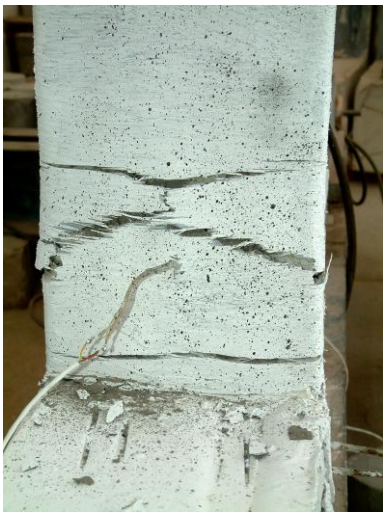
3. Structural strengthening of RC columns



C2M-GW-BC

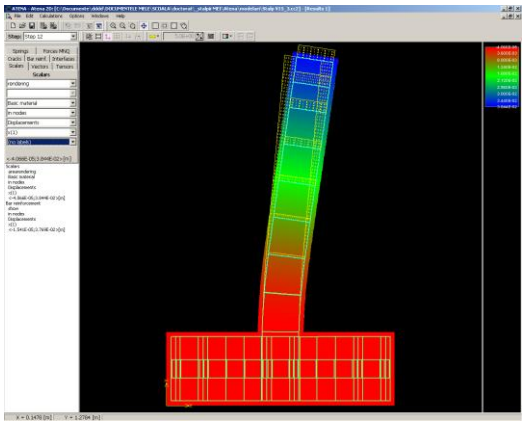


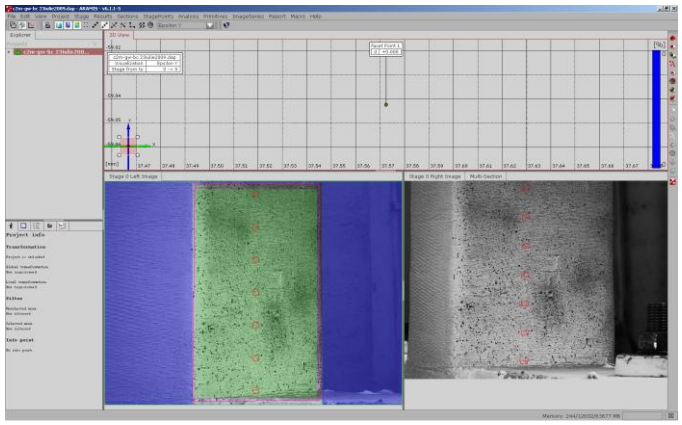
C6C2-GW-BC



C7C2-BM+GW

Experimental tests





Numerical modelling using Atena2D and the photometric strain measurement

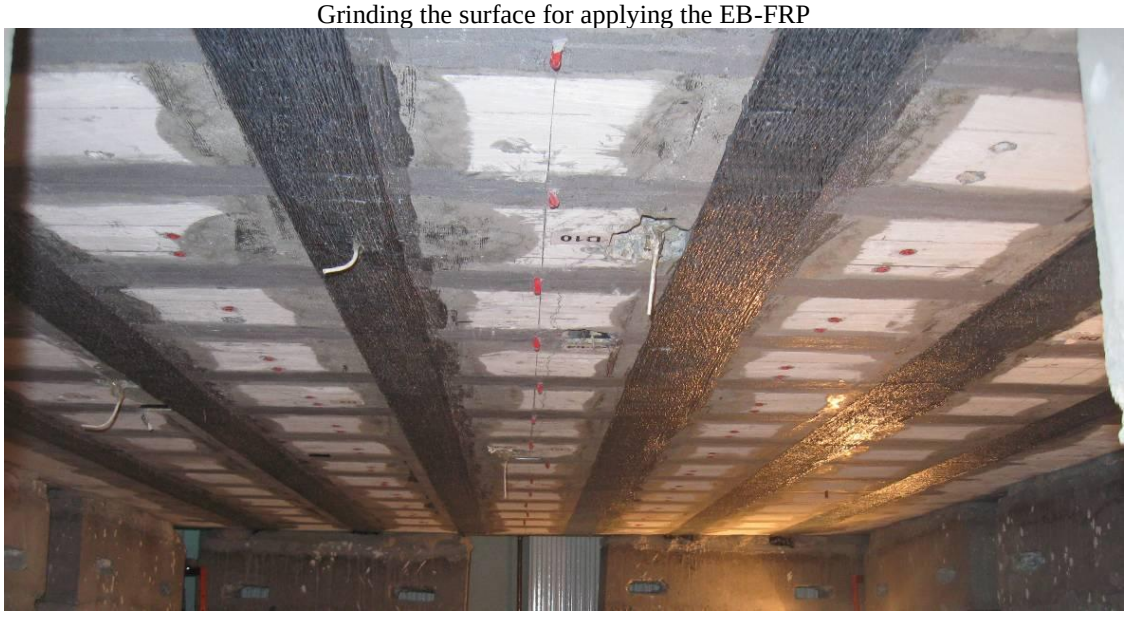
4. Strengthening of reinforced concrete elements using FRP composite materials

The preliminary results prove the effectiveness of the proposed strengthening solution, the full slab showing an increase in ultimate capacity of about 60%.

Testing frame and test set-up

Cutting the slits for NSMR-FRP

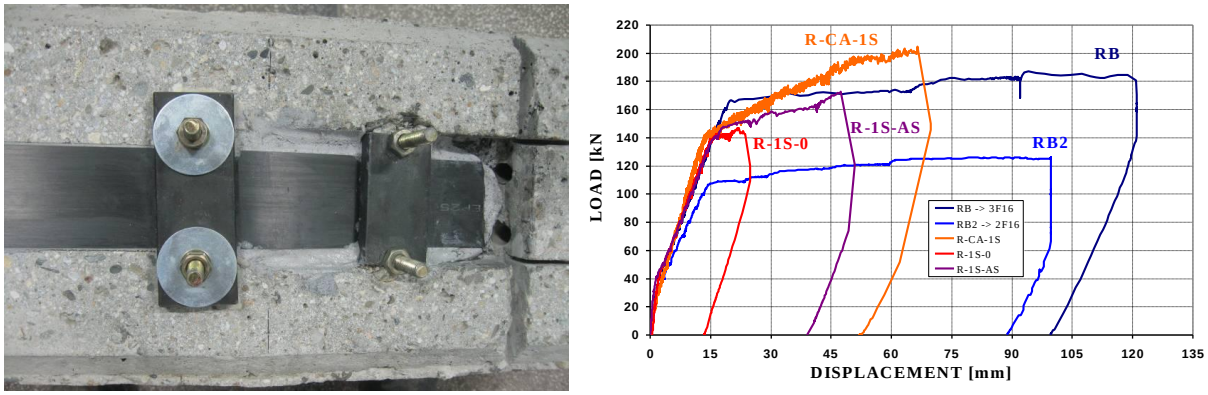
Grinding the surface for applying the EB-FRP



Element without cut-out after strengthening

Bottom surface after failure

4. Flexural strengthening of RC beams using CFRP composites with different anchorage systems



R-1S-AS anchoring system and the load-displacement diagrams

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 MLPTL (authorization number 1019.04.08/2006) 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 looses in the transport and distribution systems of water and thermal energy

Keywords: pipes, networks, hydraulic analysis, dimensioning, 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 simulation, 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. EIE/07/202/S12.466282/ 2009, *Initiative of Low Energy Training in Europe*, Beneficiary: UE, 78.000 Euro
2. Contract no. 56 / 2009, *Thermal rehabilitation of block of flats in Timisoara*, Beneficiary: S.C. IPROTIM Timişoara, 34.986 RON
3. Contract no. 59 / 2009, *Initial tests of pipe system types for sanitary installations produced by SC TEVO Timisoara*, Beneficiary: INCERC Timisoara, Value: 5.520 RON
4. Contract no. 63 / 2009, *Assistance, specialty consultancies and effectuations of pressure proofs for heating-, sanitary- and gas installations*, Beneficiary: S.C. INSTGAT Timisoara, Value: 5.712 RON
5. Contract no. 89 / 2009, *Initial tests of pipe system for electrical installations produced by SC TEVO Timisoara*, Beneficiary: INCERC Timisoara, Value: 4.000 RON
6. Contract no. 0406 / 2003 phase 2009, *Professional perfecting program of engineers for building services, in order to obtain the certification as energetically auditor in buildings*, Beneficiary AIIR Timisoara, Value: 14.250 RON
7. Contract no. 72 / 2009, *Technical consultancy regarding the thermographs of 75 blocks of Timisoara*, Beneficiary: S.C. DOSET IMPEX S.R.L. Timisoara, Value: 7,497 RON
8. Contract no. 101 / 2009, *Thermal rehabilitation of block of flats in Arad town*, Beneficiary: SC APA PLUS '97 Arad, 13.369 RON

BOOKS

1. Retezan, A., Sârbu, I., Borza, I., Cinca, M. (ed.) Proceedings of the International Conference "*Building Equipment and Ambient Comfort*", Politehnica Publishing House, Timişoara, 2009, ISBN 973-625-305-8, 528 pages.
2. Sârbu Ioan, "*Computer aided design of building services*", Politehnica Publishing House, Timisoara, 2009, 245 pages.
3. Bancea Olga, "*Industrial ventilating systems"*, Politehnica Publishing House, 2009, ISBN 978-973-625-800-8, 200 pages.

PUBLISHED PAPERS

1. Sârbu, I., Bancea, O., *Analysis of thermal and olfactory comfort in closed spaces*, WSEAS Transaction on Heat and Mass Transfer nr.4, 2009, ISSN 1790-5044, pp. 65-74
2. Sârbu, I., Bancea, O., Cinca, M., *Influence of forward temperature on energy consumption in central heating systems*, WSEAS Transaction on Heat and Mass Transfer nr.4, 2009, ISSN 1790-5044, pp. 45-54
3. Sârbu, I., Bancea, O., *Environment global protection to the polluting action of refrigerant*, WSEAS Transaction on Environment and Development, nr.5, 2009, ISSN 1790-5079, pp. 425-434
4. Sârbu, I., Sebarchievici, C., *Heat pumps use in buildings heating – cooling systems*, 15th Int. Conference on Building Services, Mechanical and Building Industry days, Debrecen,

Hungary, 2009, ISBN 978-963-473-313-3, pp. 129-141
5. Sârbu, I., *Optimal design of water supply networks in buildings,* Technical Bulletin of Debrecen University, ISSN 1587-9801, 2009, pp. 75-82
6. Sârbu, I., Valea, E., *Influence of flow temperature on pumping head in central heating systems,* Energetica no. 4, ISSN 1453-2360, 2009, pp. 240-242
7. Bancea, O., *Comfort assurance with cooling and ventilating gravitational systems,* International Conference "Building installation and ambient comfort" Timisoara, ISSN 1842-9491, 2009, pp. 245-249
8. Bancea, O., Dorhoi S., *Air conditioning in reversible system of residential buildings,* International Conference "Building installation and ambient comfort" Timisoara, ISSN 1842-9491, 2009, pp. 250-256
9. Sârbu, I., Bura, H., *Ensuring the vaporization thermal power of mechanical compression heat pumps,* 15th Internat. Conference Building Services, Mechanical and Building Industry days, Debrecen Hungary, 2009, ISBN 978-963-473-313-3, pp. 153-159
10. Brata, S., Jura, C., *Performability of thermal networks with multiple sources supply,* Tehnica Instalatiilor nr.7[70]/2009, ISSN 1582-6244, 2009, pp. 22-24
11. Brata, S., *The influence of solar load in establishing the annual heat necessity of buildings,* International Conference "Building installation and ambient comfort" Timisoara, ISSN 1842-9491, 2008, pp. 225-232
12. Iosif, A., *Numerically solution of the Poisson equation by particular form of Navier-Stokes flow equation,* International Conference "Building installation and ambient comfort" Timişoara, ISSN 1842-9491, 2009, pp. 452-461
13. Retezan, A., Barata, S., Dună, S., *Aspects on the geothermal water transportation*, 15 th Internat. Conf., Building Services, Mechanical and Building Industry days, Debrecen Hungary, 2009, ISBN 978-963-473-313-3, pp. 77-82
14. Retezan, A., Sârbu, I., Doboşi, I.S., *Energetically sustainability – approach manner,* 44th National Conference "Building Services" Sinaia, ISBN 978-973-755-527-4, 2009, pp. 429-434
15. Sârbu, I., Sebarchievici, C., *Energetically economy in buildings with use of photovoltaic panels,* 44th National Conference "Building Services" Sinaia, ISBN 978-973-755-527-4, 2009, pp. 141-148.

CERTIFIED LABORATORY

National Building Services Laboratory, abilities by MLPTL (authorization number 1019.04.08/2006).

PhD RESEARCH ACTIVITIES

1. *Prof.dr.eng.eur.eng. Ioan SÂRBU*, supervisor in the field of *Civil Engineering*

PhD students:
- Marius ADAM: *Comfort and energetically 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
- 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 economy, Optimization, modeling and numerical simulations*
- Prof. dr. eng. Ioan Borza: *Electrical installations, Lightening systems, Energy economy*

- 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 for thermal network*
- 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, Unconventional energies*
- Lecturer dr. eng. Anton Iosif: *Hydraulic, Air and water pollution reducing systems, Numerically models 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 economy*
- Assist. eng. Cristian Păcurar: *Optimizing the heating systems, Energy management in buildings*
- Assist. eng. Florin Lăcătuș: *Electrical installations, Lightening systems*

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RESEARCH TEAM: GEOTECHNICAL ENGINEERING

GENERAL PRESENTATION

MAIN RESEARCH FIELDS

- Studies and research regarding investigation of ground in laboratory and site

Keywords: laboratory device, data processing, geotechnical investigation

- Studies and research concerning isolation and protection solutions for buildings against vibrations transmitted by the soil

Keywords: isolation, buildings, vibration, soil

- Studies regarding slipping processes of soil massifs and consolidation solutions

Keywords: instability, site investigation, consolidation methods

- Execution technologies of foundation works based on vibration technique, horizontal drilling

Keywords: under-crossing, drilling, vibration technique

MAIN ACTIVITIES

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

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

FIELD DESCRIPTION

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

ACTIVITIES

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

RESEARCH TEAM

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

Researches in *EXPLOITATION OF SOME INDUSTRIAL WASTES IN CONSTRUCTIONS*

FIELD DESCRIPTION

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

ACTIVITIES

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

RESEARCH TEAM

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

RESEARCH PROJECTS

1. *Technical consultance for the execution of some scouting works on foundation grounds and the realization of geotechnical documentation*, Beneficiary: S.C. ATELIER A Arad, Value: 2.975 RON Team: Teach. Assist. dr. eng. Cristina VOICU, Prof. dr. eng. Virgil HAIDA
2. *Geotechnical study – Purge station and collecting drain, loc. Fârliug, jud. Caraş-Severin*, Beneficiary: S.C. PROMETEUS D S.R.L. Timisoara, Value: 9.250 RON, Team: Assoc. prof. dr. eng. P. Pantea
3. *Geotechnical engineering works on the treatment station for residual waters AQUATIM Timisoara*, Beneficiary: PWT WASSER AND ABWASSER TEHNIC GERMANIA, Value: 5.950 RON, Team: Assoc. prof. dr. eng. P. Pantea
4. *Geotechnical investigations and studies for Baza Sportiva nr.2 Politehnica University Timişoara*, Beneficiary: Universitatea Politehnica Timisoara, Value: 3.500 RON, Team: Assoc. prof. dr. eng. P. Pantea
5. *Geotechnical studies and investigations on the Sanovita Career, jud. Timiş*, Beneficiary: SC TRUST CONSTRUCTII REDLINGER SA Timişoara Value: 3.500 RON, Team: Assoc. prof. dr. eng. P. Pantea

PUBLICATIONS

PUBLISHED PAPERS

1. G. Belea, Monica Mirea –*Computer assisted graphics and technical drawing*, The 3 rd International Conference on Engineering Graphics and Design, ICEGD, 2009 12 - 13 Iunie, ACTA TECHNICA NAPOCENSIS, Cluj Napoca, Romania, 4 pp.
2. Peptan Carmen, Voicu Cristina Otilia – *Constructive aspects of foundations from curved thin plates*, Trends in European agricultural Development USAMVBT, 4 pp.
3. Peptan Carmen, Voicu Cristina Otilia – *Caractheristic aspects of interaction structure - foundation - foundation soil for constructions type hall with large spans*, Trends in European agricultural Development USAMVBT, 6 pp.
4. Marin M., Roman O., Roman Luiza – *Gedynamic study for the evaluation on the inpact of tall buildings above nearby areas, in case of earthquakes*, Sustenability in science engineering. Proceedings of the 11 th WSEAS International Conference, Timisoara, 5 pp.
5. Monica Mirea, Cristina Otilia Voicu – *Experimental laboratory studies concerning the influence of foundation hole punching on the soil*, Sustenability in science engineering. Proceedings of the 11 th WSEAS International Conference, Timisoara, 5 pp.
6. Marin M., Roman Luiza, Ciopec Alexandra, Roman O.– *Stability of soil masses*, Workshop "LANDSLIDE RISK MITIGATION - CHALLENGE and STRATEGY" Iasi Romania, 5 pp.
7. Ciopec Alexandra, Roman Luiza, Roman O.– *Stabilization of an unstable slope on DN67D with drilled colums*, Workshop "LANDSLIDE RISK MITIGATION - CHALLENGE and STRATEGY" Iasi Romania, 9 pp.
8. Voicu Cristina, Mirea Monica – *Causes of a landslide and the technical consolidation solution*, Workshop "LANDSLIDE RISK MITIGATION - CHALLENGE and STRATEGY" Iasi Romania, 7 pp. Peptan Carmen, Haida V. – *Efficiency of calculus for foundations elastically embedded in soil*, Sustainability in science engineering. Proceedings of the 11 th WSEAS International Conference, Timisoara, pp. 299-304
9. Peptan Carmen, Haida V. - *Theoretical studies concerning the interaction with soil of rigid foundations elastically embeded in soil*, Sustainability in science engineering. Proceedings of the 11 th WSEAS International Conference, Timisoara, pp. 534-540

BOOKS

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
"Contributions regarding the study of some influence factors upon technical state of roads in Banat area"
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. Octavian ROMAN presented the thesis in September 2009
"Contributions regardingsome particularitis of earthquake hazard of Timisoara placement"

2. Eng. Hatam Hamed Rasool presented the thesis in May 2009
"Researches regarding solutions and procedures for industrial foundations works"

3. Eng. Valentin Ighian
"Considerations regarding study of the foundation solutions on piles"

4. Eng. Cornel Cimpoieru
"Contributions to the study of some consolidation technologies of landslides"

5. Eng. Relu Victor Bejenariu
"Studies regarding consolidation solutions for special constructions"

6. Eng.Dumitru Banciu
"Research on causes of the degradation of foundations and the implementation of consolidation solutions"

7. Eng. Ion Paulescu
"Considerations on waterproofing basements for Constructions"

8. Eng. Vladimir Gheorghe Stanciu
"Considerations on the relationship between architecture and resistance structure in civil constructions"

9. Eng. Bassan Ali Alhaj
"Solutions and research on strengthening the buildings affected during operation"

10. Eng. Roberta Gridan
"Using of modern methods of surveying for the pursuit of the behavior of special buildings"

11. Eng. Gheorghe Margineantu Manda
"Considerations on the rehabilitation of building foundations"

12. Eng. Maria Floarea Brebu
"Contributions regarding the topogeodetical evaluation of displacements and deformations of buildings"

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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. *Realization of the services of field studies and technical expertises for modernizations and rehabilitations of roads and streets*, Beneficiary: S.C. TRISKELE S.R.L., Value: 23.800 RO, Team: Prof. dr. eng. I. COSTESCU, as. ing. C. Costescu
2. *Realization of the geotechnical study services for „Modernization of DC 110 Curtea – Homojdia"* Beneficiary: Curtea Mayor, Value: 19.040 RON, Team: Prof. dr. eng. I. COSTESCU, as. ing. C. Costescu
3. *Technical assistance for the rehabilitation of the road DN6 Lugoj – Timişoara*, Beneficiary: FCC CONSTRUCTION, Value: 10.710 RON, Team: Prof dr. eng. F. BELC, Prof dr. eng. G. Lucaci.
4. *Physical and mechanical tests on rocks and natural aggregates from the Patars Carrier* Beneficiary: S.C. HENGLMIN S.R.L. Timisoara, Value: 7.000 RON, Team: Prof dr. eng. F. BELC, Prof dr. eng. G. Lucaci, Tehn. M. BITEA.
5. *Laboratory tests on asfaltic mixtures from the Autonomous Direction of Roads Arad* Beneficiary: S.C. RADM ARAD, Team: Prof dr. eng. F. BELC, Prof dr. eng. G. Lucaci Value: 11.900 RON
6. *Laboratory and field tests for the verification of the quality of embankment and road structure works done by SC GRUPUL PORTUGHEZ DE CONSTRUCŢII SRL*, Beneficiary: MONTE ADRIANO ENGENHARIA e CONSTRUCTO S.A. Portugalia Suc. Bucuresti, Team: Prof. dr. eng. G. Lucaci, Prof dr. eng. F. Belc, Value: 93.450 RON
7. *Technical expertise: Alternative technical solution for the realization of the road structure by enlarging the carriage way on DN19 Oradea – Satu Mare* Beneficiary: STRABAG Bucuresti, Team: Prof. dr. eng. G. Lucaci, Prof dr. eng. F. Belc, dr. ing. O. Roman, Value: 53.550 RON
8. *Valorification of industrial railways – CPV 793/1000-7*, Beneficiary: RATT, Timisoara, Team: Beneficiary: STRABAG Bucuresti, Team: Conf. dr. eng. A. Herman, Value: 90.000 RON
9. *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, I. Cotuna, Liliana Stelea, *Quality conditions for asphalt and asphalt binders stipulated in the european standards*, Roads and Bridges Magazin, pp. 10 – 17
2. G. Lucaci, *Numerical analysis of rail - subgrade system*, Sustenability in science engineering. Proceedings of the 11 th WSEAS International Conference, Timisoara, nr. 124, pp. 51-57
3. F. Belc, G. Lucaci, *New trends in Designing Road Resistance Structures*, Sustenability in science engineering. Proceedings of the 11 th WSEAS International Conference, Timisoara, pp. 108-114
4. Costescu C., Belc F. – *Comments of the Calculation of Flexible and Semirigid Road Pavements in Romania*, Sustenability in science engineering. Proceedings of the 11 th WSEAS International Conference, Timisoara, pp. 201-207
5. Costescu I., Stelea Liliana– *Determination of the evolution laws for the surfaces of Ro-LTPP section*, Sustenability in science engineering. Proceedings of the 11 th WSEAS International Conference, Timisoara, pp. 218-214
6. Costescu I., Simion H., Andris C. - *Bitufor (a hot mix asphalt overlay with steel) - new technology implemented in Romania*, Sustenability in science engineering. Proceedings of the 11 th

WSEAS International Conference, Timisoara, pp. 289–293

7. Lucaci G., Marc P., Baera Cornelia, Tirtea Alina, Gruin A., Pavlou D. – *Optimization of Design Parameters for Pipelines*, The second WSEAS International Conference on Engineering Mechanics, Structures and Engineering Geology (EMESEG'09) Rhodes Pavlou D.G., Lucaci G., Vlacharis N., Tirtea Alina, Gruin A., Baera Cornelia, Dan D. - *Pre-stress plate on elastic foundation under impact loading*, The 4th IASME/WSEAS International Conference on Continuum Mechanics (CM'09) Cambridge U.K., pp. 126-131
8. Dosa A., Ungureanu V.V., Botis M.F., Herman A.I. - *A 3 D simplified model for non linear stability analysis of the continous welded rail track*, Annals of DAAAM for 2009 Proceedings of the 26th International DAAAM Symposium, Viena, Austria, pp. 65-69.

BOOKS

1. *Belc F. – Calculus and design of the overland communication ways. Basic Elements.* Ed. Solness, ISBN 978-973-729-149-3

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*

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RESEARCH TEAM: SURVEYING, CADASTRE

GENERAL PRESENTATION

MAIN RESEARCH FIELDS

- **Monitoring problems**

Keywords: monitoring
Keywords: surveying, modern technologies

- **Geo-Spatial modeling for Land Measurements**

Keywords: spatial, modeling

- **Using Geographic Information System (GIS) for urban development**

Keywords: GIS, urban

- **Database for urban administration-conception, development, management**

Keywords: database, urban, administration

- **Special applications of Photogrammetric Exploitation**

Keywords: photogrammetry, exploitation

- **Surveying Engineering and Cadastre**

Keywords: surveying

- **Improving methods for monitoring land movements in mining areas**
- *Keywords*: monitoring, land movement, mining

Researches in

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

FIELD DESCRIPTION

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

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

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

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

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

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

ACTIVITIES

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

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

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

RESEARCH TEAM

- Assoc.prof. 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/14.09.2009- *Development of a large scale tests laboratory* (2007-2009), Beneficiary: ANCS, Value: 1 302 517,54 Lei/2009
2. Contract no.182/2008-2010 – *Elaboration of data basis for the use of the geospatial information with a view to the administration of the cemeteries from Timisoara – data acquisition and updating.* Beneficiary: Town Hall of Timisoara, Value: 38000,00 Lei/2009.
3. Contract no. 18/26.01.2009 – *Cadastral studies and execution for PUZl, parcel Cc 568/1/13, Moşniţa Nouă, Timiş county*, Beneficiary: S.C. PSG Group Timişoara, Value 2023 Lei/2009
4. *Surveying engineering project for S.C. Holcim (Romania)* S.A., Beneficiary: S.C.Holcim (Romania) S.A. Bucuresti, Arad agency, Value: 19040 Lei/2009

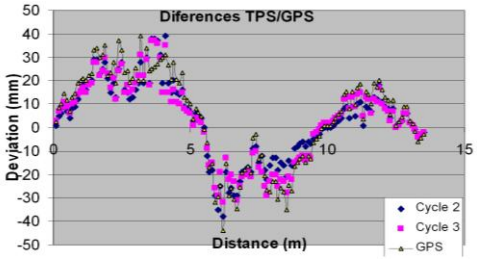
CERTIFIED LABORATORY

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

ACHIEVEMENTS AND FURTHER DEVELOPMENT

- Monitoring settlements for engineering projects

Studied structure and instruments



Displacements measured by GPS and Total Station

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

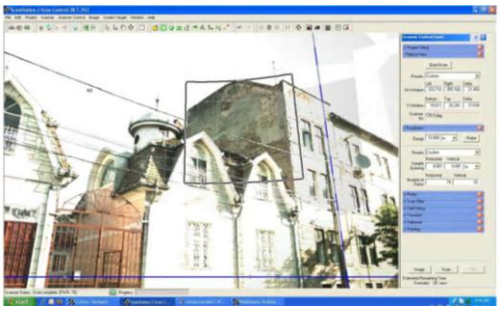
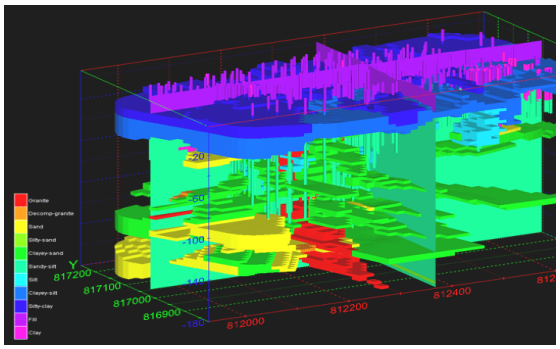


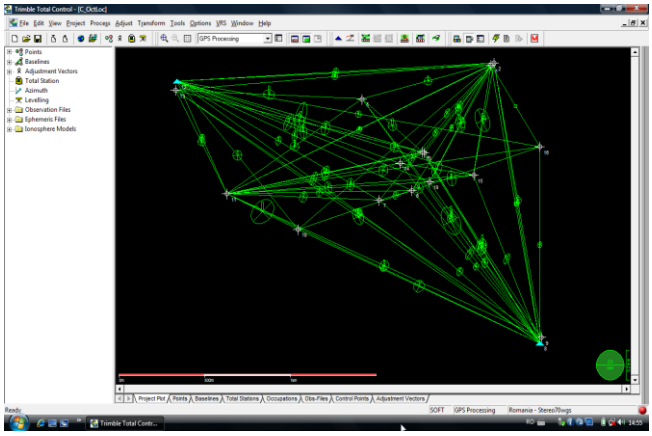
Image rectifying of plane vignette

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

Digital collected data – urban cadastre



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



GPS monitoring network
Zero measurement in the monitoring stations in the mining area of Maleia-E. M. Livezeni
(Processing stage)

PUBLISHED PAPERS

1. Sturza Mihaela, *Dimensionality of spatial data*, International Symposium, University "1 Decembrie 1918" Alba Iulia, RevCad - Journal of Geodesy and Cadastre, May 2009, pp. 241-244, ISSN 1583-2279
2. Sturza Mihaela, *Effective Management of Spatial Data in Order to Achieve Urban Planning*, BENA Conference, September 2009, Tirana, Albania
3. Sturza Mihaela, *The Influence of Deformations in Selecting Cartographic Projections*, BENA Conference, September 2009, Tirana, Albania
4. Grecea Carmen, Alina Bălă, *Geospatial information-modern tool for an efficient administration of cemeteries in Timisoara*, International Symposium, University "1 Decembrie 1918" Alba Iulia, RevCad - Journal of Geodesy and Cadastre, May 2009, pp. 141-148, ISSN 1583-2279
5. Grecea Carmen, *Geodetic Engineering - Important Tool for Romanian Seismicity Study*, WSEAS Conference: Sustainability in Science Engineering, May 2009, Timisoara, Romania, pp. 102-108, ISBN 978-960-474-080-2
6. Grecea Carmen, *Modern Concepts of Urban Cadastre*, WSEAS Conference: Sustainability in Science Engineering, May 2009, Timisoara, Romania, pp. 114-120, ISBN 978-960-474-080-2
7. Grecea Carmen, *Geodetic Education at the "Politehnica" University of Timisoara-Romania*, FIG Commission 2-Conference "Navigating the Future of Surveying Education", Vienna, Austria, 26-28 February, ISSN 0029-9650
8. Grecea Carmen, Ioan Ienciu, M. Popa, Luciana Oprea, S. Varvara, *Topographic Surveys to Re-Integrate Waste-Rock Into The Natural Cycle*, BENA Conference, May 2009, Alba Iulia, Romania
9. Grecea Carmen, Luciana Oprea, Ioan Ienciu, Daniela Popa, *Protection and Inlusion of Nature Reserve Areas Into the Romanian*, BENA Conference, May 2009, Alba Iulia, Romania
10. Grecea Carmen, Ioan Ienciu, Levente Dimen, Alina Corina Bălă, Oprea Luciana, *Impact of Surveying Engeering on the Environmental Protection Problems*, BENA Conference, June 2009, Istanbul, Turkey
11. Grecea Carmen, Ioan Ienciu, Levente Dimen, Nicolae Luduşan, T. Borşan, Luciana Oprea, *Dynamics of the Rill and Gully Erosion Using GIS Tehnologies*, BENA Conference, June 2009, Istanbul, Turkey
12. Grecea Carmen, Ioan Ienciu, Levente Dimen, Alina Corina Bălă, Oprea Luciana, *Cadastral Support for an Efficient Town Planning in Timisoara, Romania* BENA Conference, September 2009, Tirana, Albania
13. Cosmin Muşat, Sorin Herban, *Geoinformation System for Interdisciplinary Planning Landslides Areas*, WSEAS Conference: Sustainability in Science Engineering, May 2009, Timisoara, pp. 257-262, ISBN 978-960-474-080-2
14. Cosmin Muşat, Sorin Herban, *Study Reverse Engineering of Historical Architecture from Timisoara Based on 3D Laser Point Technologies*, BENA Conference, September 2009, Tirana, Albania
15. Herban Sorin, *Measuring and determinate dynamic deformation of constructions using modern technologies and techniques*, International Symposium, University "1 Decembrie

1918" Alba Iulia, RevCad - Journal of Geodesy and Cadastre, May 2009, pp. 201-209, ISSN 1583-2279

16. Sorin Herban, Carmen Grecea, Cosmin Muşat, *Using a Geographic Information System (GIS) to Modeling, Manage and Develop Urban Data from Timisoara City*, BENA Conference, September 2009, Tirana, Albania

17. Sorin Herban, Cosmin Muşat, *Measuring and Determinate the Dynamic Deformation of Construction Using Modern Technologies and Tehniques*, BENA Conference, September 2009, Tirana, Albania

18. Viorica David, *New developments in photogrammetry*, International Symposium, University "1 Decembrie 1918" Alba Iulia, RevCad - Journal of Geodesy and Cadastre, May 2009, pp. 289-292, ISSN 1583-2279

19. Viorica David, *Generation of Digital Terrain Model for a Flood Area*, BENA Conference, September 2009, Tirana, Albania

20. Viorica David, *Hazard Mapping for the Natural Disasters*, BENA Conference, September 2009, Tirana, Albania.

21. Viorica David, *Some aspects on the characteristics of Digital Terrain Model*, Scientific Bulletin UTCB, No 2, June 2009, pp. 33-40, ISSN 1224-628X

22. Alina Bălă, *Improvement of the monitoring methods of surfaces movements, situated in the mining zones*, International Symposium, University "1 Decembrie 1918" Alba Iulia, RevCad - Journal of Geodesy and Cadastre, May 2009, pp. 301-304, ISSN 1583-2279

BOOKS

1. Grecea Carmen; Sturza Mihaela; Muşat Cosmin, *Complemente de Măsurători Terestre*, vol. 1, Editura Politehnica Timişoara, ISBN 978-973-625-829-9

2. Grecea Carmen; Sturza Mihaela; Muşat Cosmin, Herban Sorin, Bălă Alina *Complemente de Măsurători Terestre*, vol. 2, Editura Politehnica Timişoara, ISBN 978-973-625-830-5

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