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| DEPARTMENT OF CONCRETE STRUCTURES AND BRIDGES |
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Head of the Department:
Prof. Juraj Bilčík, PhD.

Tel.: ++ 421 2 52494 275
Fax: ++ 421 2 52926 213
E-mail: bilcik@svf.stuba.sk

I. STAFF

Professors

Bilčík Juraj, PhD. +421 2 59274 546
Fillo Ľudovít, PhD. +421 2 59274 508

bilcik@svf.stuba.sk
fillo@svf.stuba.sk

Associate Professors

Bolha Ľubomír, PhD. +421 2 59274 387
Čabrák Milan, PhD. +421 2 59274 544
Gramblička Štefan, PhD. +421 2 59274 552
Halvoník Jaroslav, PhD. +421 2 59274 554
Hájek František, PhD. +421 2 59274 386
Harvan Ivan, PhD. +421 2 59274 557
Hudoba Igor, PhD. +421 2 59274 295
Chandoga Milan, PhD. +421 2 59274 549
Šoltész Július, PhD. +421 2 59274 384

bolha@svf.stuba.sk
cabrak@svf.stuba.sk
sgram@svf.stuba.sk
halvonik@svf.stuba.sk
frantisek.hajek@stuba.sk
harvan@svf.stuba.sk
hudoba@svf.stuba.sk
milan.chandoga@stuba.sk
soltesz@svf.stuba.sk

Senior Lecturers

Abrahoim Iyad, PhD. +421 2 59274 551
Bartók Andrej +421 2 59274 540
Bellová Mária, PhD. +421 2 59274 541
Ďuriš Dušan, PhD. +421 2 59274 382
Priechodský Vladimír, PhD. +421 2 59274 541
Rojko Ľuboš +421 2 59274 550

iyad.abrahoim@stuba.sk
bartok@svf.stuba.sk
bellova@svf.stuba.sk
duris@svf.stuba.sk
tvtri@napri.sk
lubos.rojko@stuba.sk

Doctoral Students

Borzovič Viktor +421 2 59274 385
Chlepko Peter +421 2 59274 503
Grešlík Pavol +421 2 59274 385
Olivová Katarína +421 2 59274 555
Repka Branislav +421 2 59274 503
Štrbková Marta +421 2 59274 555
Valach Pavol +421 2 59274 381

borzovic@svf.stuba.sk

Technical Staff

Benedikovičová Helena +421 2 59274 383
Gábrišová Anna +421 2 59274 505

helena.benedikovicova@stuba.sk
anna.gabrisova@stuba.sk

II. EQUIPMENT

II.1 Teaching and Research Laboratories

The Department has a separate laboratory facility located in the Trnávka - UNI research complex. We are able to test specimens made from

- concrete (reinforced, prestressed), mortar
- steel
- wood
- bricks

The laboratory is accredited for testing basic concrete mechanical properties.

The maximum size of the samples or structures for testing is up to 12 m in length and 4 m in height.

II.2 Special Measuring Instruments and Computers

The Department has a computer centre equipped with personal computers and an HP plotter, scanner and INTERNET connection. The teaching process is supported by state-of-the-art CAD-FEM systems.

The laboratory facility has:

- compression - testing machines with a loading capacity from 1.0 N to 6,000 kN
- tension - testing machines with a loading capacity from 1.0 N to 500 kN,
- a reinforced testing slab with anchorage holes (one hole has a 500 kN loading capacity, and the distance between the holes is 750 mm),
- a hydraulic loading system with hydraulic jacks (250 kN – 2,000 kN; the working pressure is 20 MPa),
- a stress gauge measuring PC centre with 64 channels with 4 wire connections,
- a universal measuring PC centre with 100 channels for stress gauges and 20 channels for displacement sensors.

III. TEACHING

III.1 Graduate Study

Obligatory subjects

| Subject | Semester | Hours Per Week | | Lecturer |
|---|----------|----------------|----------|----------------------|
| | | Lectures | Seminars | |
| Concrete and Masonry Members | 4 | 2 | 2 | Ľ. Fillo |
| Reinforced and Prestressed Concrete Members | 5 | 3 | 2 | Ľ. Fillo |
| Reinforced Concrete Structural Members | 5 | 3 | 3 | J. Halvoník |
| Reinforced Concrete Structural Systems | 6 | 3 | 3 | I. Harvan, M. Čabrák |
| Concrete Structures I | 6 | 3 | 2 | I. Hudoba |
| Concrete Structures | 6 | 3 | 2 | J. Bilčík |
| Concrete Structures II | 7 | 2 | 2 | I. Hudoba |

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|--|----|--------|------------------------|
| Prestressed Concrete | 7 | 2 - 2 | I. Harvan |
| Concrete Bridges | 8 | 4 - 1 | Ľ. Bolha |
| High-Rise and Long-Span Concrete Structures | 9 | 2 - 2 | I. Abrahoim |
| Lifespan and Repair of Concrete Structures | 10 | 2 - 2 | J. Bilčík, M. Chandoga |
| High-Rise Concrete Structures | 10 | 2 - 2 | Š. Gramblička |
| Execution of Concrete Structures | 10 | 2 - 2 | I. Hudoba, M. Chandoga |
| Preparation of the First Degree Thesis | 10 | 0 - 10 | F. Hájek |
| Reinforced Concrete Building Networks | 7 | 2 - 1 | F. Hájek |
| Special Problems in Concrete Structures II | 10 | 2 - 1 | I. Harvan |
| Reinforced Concrete Members | 1 | 6 | A. Bartók |
| Reinforced Concrete Structures | 1 | 12 | A. Bartók |
| World Language – English: CAD–FEM Computer – Aided Design of Concrete and Steel Structures | 7 | 2 | J. Šoltész |
| Reinforced Concrete Structures | 8 | 1 - 1 | J. Šoltész |

Optional Subjects

| Subject | Semester | Hours Per Week | | Lecturer |
|---|----------|----------------|----------|--------------------------|
| | | Lectures | Seminars | |
| Structural Analysis of Reconstructed/Retrofitted Structures | 10 | 2 - 1 | | J. Šoltész |
| Precast Concrete Structures | 7 | 2 - 1 | | M. Čabrák |
| Masonry Structures | 10 | 2 - 2 | | M. Čabrák |
| Time-Dependent (Rheological) Effects of Concrete Structures | 9 | 2 - 2 | | Ľ. Bolha |
| Concrete Bridges II | 9 | 2 - 2 | | Ľ. Bolha |
| PC Structural Analysis – FEM Models | 1 | 4 | | A. Bartók |
| Special Concrete Structures | 9 | 2 - 2 | | F. Hájek, M. Chandoga |
| Flat Plate Slabs | 9 | 2 - 2 | | F. Hájek |
| Experimental Testing of Concrete Structures | 10 | 2 - 2 | | V. Priechodský |

Recommended subjects

| Subject | Semester | Hours Per Week | | Lecturer |
|--|----------|----------------|----------|---------------|
| | | Lectures | Seminars | |
| Composite Structures | 9 | 2 - 2 | | Š. Gramblička |
| CAD–FEM Computer – Aided Design of Concrete and Steel Structures | 9 | 1 - 2 | | J. Šoltész |

IV. RESEARCH TARGETS

The research activities of the Department are targeted at new design methods for reinforced, prestressed and composite structures, methods of renovation of building structures and bridges and utilisation of high-performance and fibre concrete for concrete structures and precast elements.

V. RESEARCH PROJECTS

1. Unification of the Evaluation Methods for Mechanical and Physical Properties of High Performance Concrete and Fibre Concrete (2003-2005). Head of the Project: I. Hudoba
2. Theoretical Basis for Utilisation of New Materials in the Design and Renewal of Concrete Structures (2003 – 2005). Head of Project: J. Bilčík

VI. COOPERATION

VI.1 Cooperation in Slovakia

1. Cooling Towers Bohunice
2. VUIS - Bridges
3. ZIPP Bratislava
4. SSC Bratislava
5. Slovak Chamber of Civil Engineers
6. Doprastav Bratislava
7. Slovak Academy of Science
8. Dopravoprojekt Bratislava
9. VUJE Trnava
10. VUEZ Levice
11. Nuclear Regulatory Authority of the Slovak Republic
12. Slovak Electric Power Company
13. Vertical, Ltd.

VI.2 International Cooperation

1. fib – TG1.1 Design Applications - L. Fillo, task group member representing Slovakia in CEN TC 250 – SC2 Eurocodes – Design of concrete structures - L. Fillo
2. CEN TC 250-SC2 Concrete Structures – L. Fillo, representing SK
3. Klokner Institute ČVUT Prague, Czech Republic
4. Faculty of Civil Engineering, VUT Brno, Czech Republic
5. ETH - Laboratory for Building Materials, ETH Zürich, Switzerland
6. Institut für Baustatik und Konstruktion, ETH Zürich, Switzerland
7. Baustoffinstitut, TU Munich, Germany
8. Institut für Massivbau und Baustofftechnologie, University of Leipzig, Germany
9. Katedra Budowy Mostow Politechniki Slaskiej, Gliwice, Poland
10. Department of Civil and Materials Engineering, University of Illinois at Chicago, USA
11. RIB Bausoftware, Stuttgart, Germany
12. Betosan, s.r.o., Prague, Czech Republic

13. Seidl & Partners, G.m.b.H., Regensburg, Germany
14. European Commission, DG Research, Brussels, Belgium
15. Imperial College for Science, Technology and Medicine, London, U.K.
16. St. Paul University, Brussels, Belgium
17. Fachhochschule Braunschweig – Wolfenbüttel, Germany
18. Institut für Massivbau, TU Darmstadt, Germany

VI.2.1 Visitors to the Department

1. prof. Hugo Corres Peireti, Madrid University, Spain – 9-12 Sep 04
2. Dr.-Ing. Richard Seidl, Seidl&Partner GmbH, Boelckestrasse 40, 93051 Regensburg, Germany

VI.2.2 Visits of Staff Members and Postgraduate Students to Foreign Institutions

1. Borzovič, V. – E.T.S.I Caminos, Canales y Puertos, Universidad Politécnica de Madrid, March – september 2004
2. L.Fillo - Meeting of *fib* –TG1.1 Design Applications - Avignon – 24 Apr 04
3. L.Fillo - Meeting of CEN TC 250 – SC2 Eurocodes – Paris 22-23 Mar 04
4. L.Fillo - Meeting of CEN TC 250 – SC2 Eurocodes – Budapest 15-16 Sep 04

VII. THESES

VII.1 Graduate Theses

| No. | Student's name | Title | Supervisor |
|-----|--------------------|--|-------------|
| 1. | Ivanová Zuzana | Cable-Stayed Footbridge at Tesco Store | J. Halvonik |
| 2. | Šebanová Katarína | Prestressed Bridge over Galvani Street | J. Halvonik |
| 3. | Bednár Boris | RC Structure of a Cylindrical Silo for Malt Germination | I. Hudoba |
| 4. | Nedeljak Tibor | RC Underground Tank for Water Retention | I. Hudoba |
| 5. | Arendárik Vladimír | Bridge Built by Cantilever Balanced Method with Use of Lightweight or HP Concrete | L. Bolha |
| 6. | Táčovský Martin | Segmental Bridge Built by Cantilever Balanced Method with Use of HPC | L. Bolha |
| 7. | Blesák Boris | Design and Optimization of Višňové Tunnel's Inner Lining | L. Rojko |
| 8. | Mittelmann Peter | Prestressed Concrete Tank for Liquefied Natural Gas | L. Fillo |
| 9. | Dvořáková Dana | Slovak Insurance Company Building: Cast-in-Place RC Construction with Bracing Cores and Flat Slabs | I. Harvan |
| 10. | Štrbková Marta | County Police Station Headquarters Building: Cast-in-Place RC Construction with Bracing Cores | I. Harvan |
| 11. | Kubáni Jozef | Hotel: Cast-in-Place RC Construction with Bracing Cores | I. Harvan |
| 12. | Hrajnoha Ján | Multipurpose Building: Cast-in-Place RC Construction | I. Abrahoim |

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| 13. | Bôtoš Jozef | Hotel: Cast-in-Place RC Wall Construction | I. Abrahoim |
| 14. | Duffala Marek | Autosalon, Rožnavská St.: Cast-in-Place RC Construction | I. Abrahoim |
| 15. | Oršulová Edita | Bearing Structure of a Tall Building | Š. Gramblička |
| 16. | Pálka Peter | The Multispan Cable – Stayed Bridge at Považská Bystrica | M. Chandoga |
| 17. | Piroška Karol | The Application of Pre-Tensioned Beams in a Multispan Bridge | M. Chandoga |
| 18. | Drobec Jozef | Cable-Stayed Bridge for High Speed Construction | M. Chandoga |
| 19. | Buday Ondrej | Prefabricated Viaduct | M. Chandoga |
| 20. | Ján Pavlovič | Static Solution of an Administrative Building | J. Bilčík |
| 21. | Bóna Peter | Seismic Design of a High Rise Building With Interaction of Subsoil | J. Šoltész |
| 22. | Kupkovičová Zuzana | Design of Floor Slab of a Shopping Center or Production Facility | J.Šoltész |
| 23. | Beľko Ľudovít | Circular Plan of a Hotel, In-situ Concrete Structure | A. Bartók |
| 24. | Gaál Attila | High-Rise Apartment Block, In-situ Concrete Wall Structure with Stiffened Core | A. Bartók |
| 25. | Kysel Martin | Oil Plant Control Center, In-situ Concrete Wall Structure with Long-Span Roof Subjected to Blast Loading | A. Bartók |
| 26. | Repka Branislav | Reinforced Retaining Wall | F. Hájek |
| 27. | Ochránek Michal | Large Flat-Plate Monolithic Construction | F. Hájek |
| 28. | Tildi Marek | Composite Concrete Construction with Precast Slabs | F. Hájek |

VIII. OTHER ACTIVITIES

VIII.1 Special Lectures

Special Course for Building Supervisors:

Theme of the Lectures: The Principles of the Provision and Control of Concreting Processes

VIII.2 Commercial Activities for Firms and Institutions

1. BILČÍK, J.: Bond Strength of Grout and Foundations at Slovnaft Bratislava, June 2004
2. BOLHA, Ľ.: M8 Motorway – Duna – Bridge at Dunaújváros, Hungary. Independent Control Structural Analysis. Client: FŐMTERV Budapest, February – March, 2004
3. BOLHA, Ľ.: Loading Test Project of Bridge SO – 215 over Papez River on D1 Highway. Client: Inžinierske stavby, a.s., Šaľa, October, 2004
4. FILLO, Ľ.: Expo Torroja – Exhibition of the Great Spanish Engineer, Architect and Scientist, 9-24 Sep 04
5. HALVONIK, J. – BENKO, V.: Commentary on STN EN 1990, Basis of Structural Design for Ministry of Construction and Regional Development of the Slovak Republic, December 2004

6. HUDOBA, I.: Project: Service Life Evaluation of Fibre-Reinforced Concrete Containers, Contracting Institution: VÚJE, com. Trnava
7. ROJKO, Ľ. – BILČÍK, J.: Evaluation of Crack Width in the Branisko Tunnel's Inner Lining. Expert report, Bratislava, May 2004
8. ROJKO, Ľ. – BILČÍK, J.: Determination of Causes and Design of Repair of Cracks in Concrete Pavement in the Branisko Tunnel. Expert report, Bratislava, October 2004

IX. PUBLICATIONS

IX.1 Journals

- [1] BILČÍK, J.: Intelligent Concrete? ABS-Architektúra, Stavebníctvo, Bývanie, Vol. XI. 2004, No.7, pp. 80 - 83 (in Slovak)
- [2] ČABRÁK, M. – SZABAD, Z.: Contribution to the Solution of Structural Aspects of Masonry Load-Bearing Pillars by Reinforcement of Masonry. Slovak Journal of Civil Engineering, Vol. XI, 2003/1, pp. 6 - 10
- [3] ĎURIŠ, D. - CHANDOGA, M. - HALVONIK, J.: Numerical and Experimental Monitoring of the Shear Resistance of a Segmental Structure. Slovak Journal of Civil Engineering, Vol. XI, 2003, No.2, pp. 20 –25
- [4] FILLO, Ľ.: Expo Torroja. Stavba, Vol. 7, 2004, p.18 (in Slovak)
- [5] FILLO, Ľ. - HALVONIK, J.: Design of Concrete Structures – Prestress. BETÓN, Vol. 4, 2004, No.1, pp. 42 - 47 (in Slovak)
- [6] GRAMBLIČKA, Š: Strengthening Reinforced Concrete Floors and Roof Structures. Stavba, No. 10, 2004 (in Slovak)
- [7] HÁJEK, F.: External Installation of Panel Buildings from the Point of View of a Structural Engineer, Stavba, Vol. 4, 2004, pp. 42 - 46 (in Slovak)
- [8] HÁJEK, F.: Prevalent Failures of Panel Building's Balconies and Loggias, Stavba, Vol. 10, 2004, pp. 39 – 43 (in Slovak)
- [9] HALVONIK, J. – BELLOVÁ, M.: Introduction of EN 1992 – 1 – 1: "Design of Concrete Structures" for Practice–Fatigue, Light and Weight Aggregate Concrete. BETON: Technologie *Konstrukce * Sanace, Vol. 4, Prague (Czech Republic) 2004, No. 2, pp. 38 – 42 (in Slovak)

IX.2 Books and Textbooks

- [1] ČABRÁK, M.: Static Problems of Clay Brick Masonry Structures. In: ŽILINSKÝ, J., et al.: Selected Problems in the Design and Verification of External Walls – 2004. Bratislava, ES STU, 2004, pp. 49-68 (in Slovak)
- [2] FILLO, Ľ., et al.: EUROCODE 2 United European Codes for the Design of Structures. Bratislava STU: 11/2004, 266 pp. (in Slovak)
- [3] HARVAN, I.: Punching. In: European Codes for the Design of Concrete Structures, EN 1992 Design of Concrete Structures, Bratislava, STU, 2004, pp. 137-158 (in Slovak)

IX.3 Conferences

- [1] BARTÓK, A. – FILLO, Ľ. – ROJKO, Ľ.: Punching Slabs without Shear Reinforcement (EN 1992-1-1), In: Concrete Days 2004, Bratislava, September 2004, pp. 107 - 112 (in Slovak)
- [2] BARTÓK, A. - FILLO, Ľ. - ROJKO, Ľ.: Punching Prestressed and FRC Slabs without Shear Reinforcement In: 11th Concrete Days 2004, Hradec Králove, December 2004, pp. 107 - 112 (in Slovak)
- [3] BILČÍK, J. - HALVONIK, J.: Strengthening a 150 m Concrete Chimney with Post - Tensioning. In: Proceedings of 14th REPAIR 2004 International Symposium, Brno 2004, pp. 105 – 109 (in Slovak)
- [4] BILČÍK, J.: Concrete – It Depends on What We Can Produce from It. In: Proceedings of the International Cement 2004 Conference, Stará Lesná, 2004, pp. W-1 – W-9 (in Slovak)
- [5] BILČÍK, J.: Materials Based on EN 1992-1-1. In: Proceedings of the Eurocodes 0-1-2 Seminar, Bratislava 2004, pp. 25 - 39 (in Slovak)
- [6] BILČÍK, J.: Durability Based on EN 1992-1-1. In: Proceedings of the Eurocodes 0-1-2 Seminar, Bratislava 2004, pp. 49 - 59 (in Slovak)
- [7] BELLOVÁ, M.: Masonry Design with the Application of Various Kinds of Mortar. In: Concrete Days 2004. Bratislava, September 2004, pp. 153 – 158 (in Slovak)
- [8] BELLOVÁ, M.: Structural Detailing Principles According to European Standards. In: Concrete Days 2004. Bratislava, September 2004, pp. 421 – 428 (in Slovak)
- [9] BELLOVÁ, M.: Structural Principles in Reinforced Concrete According to European Standards. In: Life Cycle Assessment, Behaviour, and Properties of Concrete and Concrete Structures. Brno (Czech Republic), November 2004, pp. 24 – 30
- [10] BELLOVÁ, M.: Structural Principles – Detailing of Reinforcement. Common European Standards for the Design of Load – Bearing Structures of Buildings. EN 1992 – 1 – 1 Design of Concrete Structures. Bratislava, November 2004, pp. 203 – 214 (in Slovak)
- [11] BELLOVÁ, M.: Detailing of Members. Common European Standards for the Design of Load – Bearing Structures of Buildings. EN 1992 – 1 – 1 Design of Concrete Structures. Bratislava, November 2004, pp. 215 – 222 (in Slovak)
- [12] BOLHA, Ľ.: Analysis of Cause of Failure of a Bridge Ledge. In: Concrete Days 2004. Bratislava, September, 2004 (in Slovak)
- [13] ČABRÁK, M. - SZABAD, Z.: Effect of the Design of Masonry Load-Bearing Structures Made with a Thin Layer of Mortar in Their Bed Joints. In: Third Conference on Masonry and Combined Structures 2004. Czech Republic, Brno, October 2004, pp. 98-103 (in Slovak)
- [14] ČABRÁK, M.: Contemporary and Future States of the Design of Masonry Structures in the Slovak Republic. In: Proceedings of Concrete Days 2004. Bratislava, September 2004, pp. 146-152 (in Slovak)
- [15] ĎURIŠ, D.: Automation of the Evaluation of Measured Results. In: Concrete Days 2004. Bratislava, September 2004, pp. 315 – 319 (in Slovak)

- [16] FILLO, Ľ. - CHLEPKO, P.: Design of Compressed Concrete Members and Buildings. In: Concrete Days 2004. Bratislava, September 2004, pp. 297-302 (in Slovak)
- [17] GRAMBLIČKA, Š. – VALACH, P.: Design of Composite Steel-Reinforced Concrete Columns According to EN-1994-1-1. In: Proceedings of Concrete Days, Bratislava 2004, pp. 203 – 208 (in Slovak)
- [18] GRAMBLIČKA, Š. – CHANDOGA, M. - VALACH, P. - ČERNĀNSKÝ, Ľ.: Failures and Reconstruction of Precast Bearing Structure of a Tower Silo. In: Proceedings of Concrete Days, Bratislava 2004, pp. 331 – 336 (in Slovak)
- [19] GRAMBLIČKA, Š.: Failures of Reinforced Concrete of Bearing Structures. In: Proceedings of Failures of Bearing Structures, Piešťany 2004, pp. 61 – 66 (in Slovak)
- [20] HÁJEK, F.: Specific Diagnoses of Panel Buildings, In: Proceedings of the Concrete Days 2004, Bratislava, pp. 401 – 402 (in Slovak)
- [21] HALVONIK, J. – CHANDOGA, M.: Interactive Design of Prestressed Precast Bridge Beams made from High Performance Concrete. In: Proceedings *fib* 2004 Symposium in Avignon 2004, pp. 47 – 54
- [22] HALVONIK, J. – CHANDOGA, M.: Stress-Strain Monitoring of Precast Prestressed Bridge Beams. In: Proceedings of Czech Concrete Days 2004, pp. 384 – 392 (in Slovak)
- [23] HALVONIK, J. – BENKO, V.: Basis of Structural Design. In: Proceedings of Common European Standards for Structural Design - EN 1990, Bratislava 2004, pp. 37 – 54 (in Slovak)
- [24] HALVONIK, J. – BENKO, V.: Load Combinations for Buildings. In: Proceedings of Common European Standards for Structural Design - EN 1990, Bratislava 2004, pp. 25 – 36 (in Slovak)
- [25] HALVONIK, J.: Load Combinations for Buildings. In: Proceedings of Common European Standards for Structural Design - EN 1990, Bratislava 2004, pp.157 – 171
- [26] HALVONIK, J.: Shear. In: Proceedings of Common European Standards for Structural Design - EN 1992, Bratislava 2004, pp.117 – 128
- [27] HALVONIK, J.: Fatigue. In: Proceedings of Common European Standards for Structural Design - EN 1992, Bratislava 2004, pp.165 – 174
- [28] HALVONIK, J.: Service Limit States. In: Proceedings of Common European Standards for Structural Design - EN 1992, Bratislava 2004, pp.175 – 188
- [29] HALVONIK, J.: Lightweight Aggregate Concrete Structures. In: Proceedings of Common European Standards for Structural Design - EN 1992, Bratislava 2004, pp. 233 – 242
- [30] HARVAN, I.: Punching in Foundations without Shear Reinforcement under Eurocode 2 (EN 1992-1-1) In: Proceedings of Concrete Days 2004, Bratislava, STU, 2004, pp. 93-98 (in Slovak)
- [31] HARVAN, I.: Punching in Flat Slabs under the Effect of a Bending Moment under Eurocode 2 (EN 1992-1-1) In: Proceedings of Concrete Days 2004, Bratislava, STU, 2004, pp. 99-106 (in Slovak)
- [32] HUDOBA, Ľ. - BAGLEY, K. - GREŠLÍK, P.: A Complete Tension – Softening Diagram as the Parameter for Non-Linear Modeling of Fibre-Reinforced Cement Composite

- Elements, In: Proceedings of the Czech and Slovak EXPERIMENT'04 Conference, Brno 2004, pp. 227 - 233 (in Slovak)
- [33] HUDOBA, I.: Curing of Concrete, In: Proceeding of the Conference on Concrete Days 2004, Bratislava 2004, pp.264 - 268 (in Slovak)
- [34] CHANDOGA, M. – HALVONIK, J.: Interactive Design of Prestressed Precast Beams from High Performance Concrete, In: Proceedings of Concrete Structures: The Challenge of Creativity, Avignon, France, April 26 – 28, pp. 272 – 274
- [35] CHANDOGA, M. – FABO, P. – JAROŠEVIČ, A.: The Smart Tendons – a New Approach to Prestressing. In: Proceedings of Concrete Structures: The Challenge of Creativity, Avignon, France, April 26 – 28, pp. 286 – 288
- [36] CHANDOGA, M. – KOCANDA, J. – ČERVEŇANSKÝ, J.: External Prestressing of a 150 m Tall Chimney ENO, In: Proceedings of Concrete Days 2004 Conference, pp. 353 – 361 (in Slovak)
- [37] CHANDOGA, M. – JAROŠEVIČ, A. – FABO, P.: Force Measurement of Prestressed Tendons, In: Poster of Second Workshop on "Durability of Post – Tensioned Tendons", Organized by ETH Zurich, *fib*, IABSE, Zurich 10 – 12. October 2004
- [38] CHANDOGA, M. – JAROŠEVIČ, A. – FABO, P.: EM – METHOD System for Assessment of Durability of Prestressed Steel, In: Poster of Cost 534 Workshop "NDT Assessment and New Systems in Prestressed Concrete Structures", European Science Foundation, Zurich, 13 October 2004
- [39] ROJKO Ľ. - ČULÍK, P.: Višňové Highway Tunnel, Design for New Austrian Tunnelling Method, Podbanské 2004, pp. 34 – 39 (in Slovak)
- [40] ROJKO Ľ. - ŠTEFKO, P.: Steinhaus Highway Tunnel - Tunnel under Difficult Geological Conditions, Podbanské 2004, pp. 123 – 128 (in Slovak)
- [41] ŠOLTÉSZ, J. – BÓNA, P: Contribution to Seismic Analysis of Structures With Interaction of Subsoil, Concrete Days 2004, Bratislava 2004, pp. 289 – 296 (in Slovak)