

## DEPARTMENT OF BUILDING STRUCTURES

Head of the Department:  
Professor Anton Puškár, PhD.

Tel.: + 421 2 59274 642  
Fax: + 421 2 52920 482  
E-mail: anton.puskar@stuba.sk

### I. STAFF

#### Professors

Beťko Bohumír, PhD.	+421 2 59274 434	bohumir.betko@stuba.sk
Bielek Milan, DSc.	+421 2 59274 444	milan.bielek@stuba.sk
Hraška Jozef, PhD.	+421 2 59274 458	jozef.hraska@stuba.sk
Ohrablo František, PhD.	+421 2 59274 456	frantisek.ohrablo@stuba.sk
Oláh Jozef, PhD.	+421 2 59274 463	jozef.olah@stuba.sk
Puškár Anton, PhD.	+421 2 59274 642	anton.puskar@stuba.sk
Tomašovič Peter, PhD.	+421 2 59274 436	peter.tomasovic@stuba.sk
Zajac Jozef, DSc.	+421 2 59274 451	jozef.zajac@stuba.sk

#### Professors Emeritus

Hykš Pavel, PhD.	+421 2 59274 462	pavel.hyks@stuba.sk
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#### Associate Professors

Adamská Gabriela, PhD.	+421 2 59274 435	gabriela.adamska@stuba.sk
Bielek Boris, PhD.	+421 2 59274 323	boris.bielek@stuba.sk
Fučila Jozef, PhD.	+421 2 59274 649	jozef.fucila@stuba.sk
Greško Dušan, PhD.	+421 2 59274 449	dusan.gresko@stuba.sk
Chmúrny Ivan, PhD.	+421 2 59274 402	ivan.chmurny@stuba.sk
Mikolai Imrich, PhD.	+421 2 59274 479	imrich.mikolai@stuba.sk
Turček Ivan, PhD.	+421 2 59274 441	ivan.turcek@stuba.sk
Žilinský Juraj, PhD.	+421 2 59274 461	juraj.zilinsky@stuba.sk

#### Senior Lecturers

Bacigalová Janka, PhD.	+421 2 59274 437	janka.bacigalova@stuba.sk
Buday Peter, PhD.	+421 2 59274 654	peter.buday@pobox.sk
Držka Milan, PhD.	+421 2 59274 447	milan.drzka@stuba.sk
Gašparovičová Viera, PhD	+421 2 59274 460	viera.gasparovicova@stuba.sk
Gieciová Mária, PhD	+421 2 59274 462	maria.gieciova@stuba.sk
Iskrová Alica	+421 2 59274 446	alica.iskrova@stuba.sk
Jakeš Erik, PhD	+421 2 59274 438	erik.jakes@stuba.sk
Jamnický Martin, PhD.	+421 2 59274 457	martin.jamnicky@stuba.sk
Králik Ján	+421 2 59274 607	jan.kralik@stuba.sk
Mend'an Rastislav, PhD.	+421 2 59274 397	rastislav.mendan@stuba.sk
Miklósiová Terézia, PhD.	+421 2 59274 433	terezia.miklosiova@stuba.sk
Minarovičová Katarína, PhD.	+421 2 59274 433	katarina.minarovicova@stuba.sk
Olbríimek Juraj, PhD.	+421 2 59274 450	juraj.olbrimek@stuba.sk
Pernišová Alena, PhD.	+421 2 59274 443	alena.pernisova@stuba.sk
Rabenseifer Roman, Dr. tech.	+421 2 59274 450	roman.rabenseifer@stuba.sk
Rychtáriková Monika, PhD.	+421 2 59274 456	monika.rychtarikova@stuba.sk
Straňák Zsolt	+421 2 59274 459	zsolt.stranak@stuba.sk
Šebestová Viera, PhD.	+421 2 59274 439	viera.sebestova@stuba.sk
Vargová Andrea, PhD.	+421 2 59274 443	andrea.vargova@stuba.sk

Vavrovič Boris, PhD.	+421 2 59274 397	boris.vavrovic@stuba.sk
<b>Research Fellows</b>		
Hermanská Beáta, PhD.	+421 2 59274 457	beata.hermanska@stuba.sk
Janák Milan, PhD.	+421 2 59274 459	milan.janak@stuba.sk
Janáková Ľubica	+421 2 59274 453	lubica.janakova@stuba.sk
Štujber Miloslav	+421 2 59274 465	miloslav.stujber@stuba.sk
<b>Doctoral Students</b>		
Dlhý Dušan	+421 2 59274 451	dusan.dlhy@stuba.sk
Frimmer Milan	+421 2 59274 655	frimmer@szm.sk
Hurta Peter	+421 2 59274 653	peter.hurta@stuba.sk
Janček Róbert	+421 2 59274 645	
Kajan Igor	+421 2 59274 654	igor79@pobox.sk
Marcík Andrej	+421 2 59274 653	marcik.andrej@zoznam.sk
Mikušová Miroslava	+421 2 59274 655	miroslava.mikusova@stuba.sk
Palko Milan	+421 2 59274 654	milan.palko@stuba.sk
Pavčeková Monika	+421 2 59274 645	
Podstavská Alžbeta	+421 2 59274 645	betka69@hotmail.com
Ponechal Radoslav	+421 2 59274 645	
Vjadová Monika	+421 2 59274 645	
Šallaiová Enikó	+421 2 59274 654	
Šmehyl Rastislav	+421 2 59274 654	smehyl@centrum.sk
Tkáč Ján	+421 2 59274 653	tkacj@pobox.sk
Turček Milan	+421 2 59274 654	
Žúdel Róbert	+421 2 59274 645	muldeero@centrum.sk
<b>Technical Staff</b>		
Lisýová Beáta	+421 2 59274 453	beata.lisyova@stuba.sk
Lukačovič Michal	+421 2 59274 422	michal.lukacovic@stuba.sk
Kochánková Soňa (secretary)	+421 2 59274 643	sona.kochankova@stuba.sk
Ordódyová Eva	+421 2 59274 664	eva.ordodyova@stuba.sk
Szabó Daniel	+421 2 59274 452	daniel.szabo@stuba.sk

## II. EQUIPMENT

### II.1 Teaching and Research Laboratories

- Large climatic chamber for synergistic research on heat transfer, vapour diffusion and air infiltration
- Acoustic chamber for experimental research on airborne sound and impact sound insulation
- Large pressure chamber for air infiltration research
- Rain chamber for research on water penetration through details of walls and roofs
- Solar chamber for the study of the energy balance of windows
- Physics laboratory for foundation engineering

### II.2 Special Measuring Instruments and Computers

- Testing equipment for research on the durability of materials
- PC - laboratory for CAD systems
- SUN Microsystem – UNIX laboratory for computer-aided building simulation

### II.3 Computer Software

The following state-of-the-art computer software is used in Computer Building Simulation classes:

- ASAP - a professional optical modelling program designed to calculate the performance of fully three-dimensional optical systems. The program originates from the Breault Research Organization, Inc. (<http://www.breault.com/>);
- ESP-r - a European thermal simulation reference program capable of integrated energy and environmental simulation of buildings. The program originates from the Energy Systems Research Unit of the University of Glasgow (<http://www.strath.ac.uk/Departments/ESRU/>);
- RADIANCE - lighting simulation and rendering system, which originates from the Lawrence Berkeley Laboratory (<http://radsite.lbl.gov/radiance/>).

## III. TEACHING

The Department covers the basic study areas necessary for a graduate of this discipline. The theory of building construction is based on a symbiosis of architecture, construction, and applied building physics. In the subjects of building construction, studio design typology, architectural design, thermodynamics, acoustics, daylighting, and the energy efficiency of buildings, students are directed towards the design of construction units, elements, and details by theoretical and experimental methods of reasoning.

### III.1 Graduate Study

Subjects	Semester	Hours Per Week		Lecturer
		Lectures	Seminars	
Technical Drawing	1	0 – 2		Gieciová
Building Construction I.	2	2 – 2		Adamská, Šebestová
Building Construction II.	3	2 – 2		Gieciová, Žilinský
Building Construction III.	4	2 – 2		Zajac, Bacigalová
Building Construction IV.	5	2 – 2		Ohrablo, Oláh
Building Construction V.	6	2 – 2		Puškár, Polák
Thermal Engineering of Buildings I.	4	2 – 2		Beřko, Chmúrny
Design Studio I.	4	0 – 3		Rabenseifer, ARC
Design Studio II.	5	0 – 2		Miklósiová, ARC
Design Studio III.	6	0 – 3		Miklósiová
Building Acoustics and Illumination I.	5	2 – 2		Tomašovič
Building Construction VI.	7	2 – 2		Jakeš
Design Studio VII.	10	0 – 5		Držka
Energy Effectiveness of Buildings	8	2 – 2		Bielek
Computer Graphics	9	1 – 3		Jamnický, Štujber
Industrial and Engineering Construction	9	0 – 4		Turček
Renewal and Modernization of Buildings	10	2 – 2		Turček, Puškár

Fire Safety of Buildings	7	1 – 2	Mikolai
Design Studio IV.	7	0 – 5	Šebestová
Design Studio V.	8	0 – 5	Šebestová
Design Studio VI.	9	0 – 5	Držka
Design Studio VII.	10	0 – 5	Držka
Computer-Aided Design	8	2-3	Jamnický
Internships	8		Držka
Special Architectural Design	9	2 – 2	Hraška
Building Defects and Reconstructions	9	2 – 2	Greško
Special Seminar I.	9	0 – 2	Adamská
Special Seminar II.	10	0 – 2	Adamská
Solar Energy Gains and Illumination of Buildings	10	2 – 1	Hraška
Design of Architectural Structures	10	2 – 1	Minarovičová
Thermal Engineering of Buildings II.	9	2 – 1	Beťko, Chmúrny
Aerodynamics and Hydrodynamics	9	2 – 1	Bielek
Low-Energy Architecture	10	2 – 1	Hraška
Computer Building Simulation	9	1 – 2	Hraška, Janák
Urban and Building Acoustics	10	2 – 1	Tomašovič
Fire Safety of Buildings	10	2 – 1	Mikolai, Olbřímek

### III.2 Postgraduate Study

Subjects	Semester	Hours Per Semester	Lecturer
Alternative and Renewable Energy Sources	1	2	Bielek
Slovak Energy-Saving Programs	1	2	Chmúrny
Construction Energy Standards and Codes	1	4	Chmúrny
Theory of Low-Energy Housing	2	2	Bielek
Basement and Foundation Details from the Point of View of Energy Savings	2	2	Turček
Non-Transparent Building Envelope	2	2	Puškár
Transparent Building Envelope	2	2	Puškár
The Role of Flat Roofs in Building Energy Consumption	2	2	Oláh
The Effect of Brickwork Moisture upon Increases in			

Heat Transmission Losses	2	2	Adamská
Heat Regeneration in Energy-Efficient Buildings	2	0,5	Hraška
Architectural Design of Houses from the Point of View of Energy Savings	2	2	Hykš
Durability of Materials and Construction from the Point of View of Energy Savings	2	1	Ohrablo

#### IV. RESEARCH TARGETS

The Department of Building Structures (DBS) at the Faculty of Civil Engineering of the Slovak University of Technology is one of the leading Slovak facilities devoted to building research and development. It assists in the research of the Faculty of Civil Engineering, students, the building industry, the regulatory community and others interested in building and construction practice.

The mission statement of the DBS says: *“Identify, develop, and deploy sustainable and energy-efficient building system technologies by forming partnerships between university sources and industry for analysis, well-characterized experiments, technological development, and market outreach”*.

The scientific and research activity of the Department is aimed at the problems of thermal comfort, heat and humidity transfer through the walls and roofs of buildings and their joints, sound transmission in buildings, room and urban acoustics, the theory of daylighting and the solar energy of buildings, air infiltration and the effect of driven rain on walls and roofs of buildings and their joints, the total energy effectiveness of buildings, the durability of building materials, diagnoses, and building reconstruction.

##### **Main research areas covered by the Department of Building Structures at the present time:**

1. Climate Model - Slovak Test Reference Year for use in a dynamic simulation program for predicting building energy consumption
2. Precise new methods and models for natural ventilation analysis
3. Development of a dynamic simulation method for mathematical modelling of thermal building performance
4. Physical quantification of passive solar systems as components of solar architecture in a theory for developing low-energy houses
5. Design of a structural system with future parameters (year 2010):
  - optimisation of static criteria
  - optimisation of technology
  - application of energy-efficient construction elements
  - development of joint function systems with the inclusion of a high degree of know-how and technical facilities
6. Research on degrading factors which affect the durability and reliability of selected residential and commercial building structures
7. Research on the properties of structural materials
8. Developments and research in system engineering

9. Analysis of comfort parameters - criteria for thermal engineering, energy balance and technical equipment of buildings
10. Analysis of the creation of acoustical criteria in the noise protection of buildings
11. Analysis of the creation of criteria for daylight design systems and artificial lighting in building interiors

## **V. RESEARCH PROJECTS**

1. VEGA 1/0314/03 – Theory, experiment, simulation and structural design of double transparent facades of intelligent buildings
2. VEGA 1/0308/03 – Simulation of buildings in the Slovak climate conditions
3. VEGA 1/0317/03 – Building envelopes for challenging indoor functions
4. VEGA 1/8323/01 – Acoustic and thermal comfort analysis of multipurpose halls
5. 5th FP: 5 RP/ERK 6-CT/1999-20001 – Energy in a Built Environment
6. 5th FP: 5 RP/G1RT-CT-01- 05038 – PeBBu NAS – Performance-Based Building
7. MVTS 1 / 7138 / 20 – Collaboration of Austrian, Hungarian, German and Slovak institutions of higher education in the redevelopment of rural areas
8. APVT-20-044202 – The ecological quality of a built environment
9. VEGA 1/2146/05 – Establishment of measuring methods, assessments and criteria for classrooms from the viewpoint of the presence of additional sound sources
10. APVT-20-014904 – Simulations of indoor and external building environments in the fields of aerodynamics, thermodynamics and acoustics

## **VI. COOPERATION**

### **VI.1 Cooperation in Slovakia**

1. Ministry of Building and Regional Development of the Slovak Republic, Bratislava
2. Ministry of the Environment of the Slovak Republic, Bratislava
3. Slovak Institute of Technical Standardization, Bratislava
4. TASUS, Bratislava
5. TU Košice
6. TU Zvolen
7. University of Agriculture, Nitra
8. VVUPS NOVA, Bratislava
9. Lignotesting, Bratislava
10. Nováky Chemical Works, Nováky
11. Alufinal, Žiar nad Hronom
12. Priemstav, Bratislava
13. Nitrasklo, Nitra
14. Drevina Turany, Turany
15. Matador, Púchov

### **VI.2 International Cooperation**

1. TU Vienna, Austria
2. Wolfen WIRN, Austria
3. ČVUT Prague, Czech Republic

4. VUT Brno, Czech Republic
5. KEB Berlin, Germany
6. IFT Rosenheim, Germany
7. Planungsinstitut für ländliche Siedlung, Stuttgart, Germany
8. TU Budapest, Hungary
9. TU Győr, Hungary
10. CE Haifa, Israel
11. TU Eindhoven, The Netherlands
12. TU Delft, The Netherlands
13. KU LEUVEN, Belgium
14. MISI Moscow, Russia
15. TU Kharcow, Ukraine
16. University of Strathclyde, United Kingdom

### **VI.2.1 Visitors to the Department**

- Assoc. Prof. Dipl.-Ing. G. Konieczny, Konieczny Architekten, Stuttgart, Germany, 3 days
- Prof. Dr.-techn. E. Panzhauser, University of Technology in Vienna, Austria, 2 days
- Prof. A. Stachowicz, University of Technology in Krakow, Poland, 3 days
- Prof. J. Witzany, University of Technology in Prague, Czech Republic, 3 days
- Assoc. Prof. M. Vlček, University of Technology in Brno, Czech Republic, 3 days
- Assoc. Prof. A. Materna, University of Technology in Ostrava, Czech Republic, 3 days
- Assoc. Prof. Dr. Sárvári Géza, Institute of Civil Engineering DE MFK, Debrecen, Hungary, 3 days

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

- Ing. B. Hermanská, PhD, visit at TU Manchester, 4 days  
 Prof. Ing. J. Hraška, PhD, visit at TU Manchester, 4 days  
 Ing. K. Minarovičová, PhD, visit at TU Manchester, 4 days  
 Ing. J. Olbřímek, PhD, visit at TU Manchester, 4 days  
 Ing. B. Hermanská, PhD, visit at TU Porto, 5 days  
 Prof. Ing. J. Hraška, PhD, visit at TU Porto, 5 days  
 Ing. J. Olbřímek, PhD, visit at TU Porto, 5 days  
 Dr.-techn. Ing. arch. R. Rabenseifer, research stay at the Planungsinstitut für ländliche Siedlung, Stuttgart, Germany, 18 months  
 Ing. B. Hermanská, PhD, visit at KU Leuven, 7 days  
 Ing. M. Rychtáriková, PhD., visit at TU Delft, 7 days

## **VII. THESES**

### **VII.1 Graduate Theses**

Every year, approximately 60 - 80 students are engaged in fulfilling the requirements of their dissertations. The supervisors of the diploma projects are the professors, associate professors and assistant professors of the Department.

The diploma theses cover:

- General project documentation for residential, public, cultural, sports, industrial and agricultural buildings and facilities

- Reconstruction of buildings
- Theoretical analysis and design of the envelope and interior construction of buildings

## **VIII. OTHER ACTIVITIES**

### **VIII.1 Special Lectures**

IT-based environmental simulation courses started under the EU – TEMPUS scheme as part of the Joint European Project 09909-95:

The project is aimed at developing and introducing building performance simulation courses that are integrated and highly interdisciplinary in their content and fully compatible with, and equivalent to, courses at EU universities. Furthermore, newly-developed courses have also been adopted at EU partner universities. The courses have been given at all the participating institutions since the summer term, 1997.

### **VIII.2 Commercial Activities for Firms and Institutions**

Thanks to its computer and laboratory equipment, the Department of Building Structures meets the highest quality standards for the tasks it performs, particularly in the area of the precise measurement and computer simulation of buildings. Among its most important clients are:

1. The Ministry of Building and Public Works of the Slovak Republic, Bratislava
2. The Ministry of the Environment of the Slovak Republic, Bratislava
3. The Slovak Institute of Technical Standardization, Bratislava
4. TASUS, Bratislava
5. VVUPS NOVA, Bratislava
6. Lignotesting, Bratislava
7. Chemical Works of Nováky, Nováky
8. Alufinal, Žiar nad Hronom
9. Priemstav, Bratislava
10. HUECK-Slovakia, Bratislava
11. Glaverbel Czech, Kryry, Czech Republic
12. Nitrasklo, Nitra
13. Drevina Turany, Turany
14. Matador, Púchov
15. Jančina Architecture Office, Bratislava
16. Závodný Architecture Office, Bratislava

## **IX. PUBLICATIONS**

### **IX.1 Journals**

- [1] BEŤKO, B.: Additional Insulation of Buildings – Requirements, Systems, Constructions. In: Practical Textbook of Technical Requirements for Construction. Verlag Dashöfer s.r.o., pp. 1–32
- [2] DRŽKA, M.: Balconies - Defects and Maintenance. In: DOM a BYT, vol. 10, 2004, No. 6, pp. 17-21



- [3] FUČILA, J.: Double Skin Transparent Facade. In: STAVBA, vol. VII, 2004, No. 8, pp. 55–57
- [4] GIECIOVÁ, M.: Buildings Acceptable to Man and the Environment. In: STAVBA, vol. VII, 2004, Nos. 7-8, pp. 54-56
- [5] GREŠKO, D.: Defects and Maintenance of Substructure Waterproofing. In: STAVBA, vol. 10, 2004, pp. 52-53
- [6] HRAŠKA, J.: Windows as Electrical Radiators. In: STAVBA, vol. 7, 2004, No. 5, pp. 54–55
- [7] HRAŠKA, J.: Pitched Roof Constructions and Overheating of Attic Spaces. In: Building Annual 2005
- [8] CHMÚRNÝ, I., BUDAY, P.: Effect of Thermal Bridges on the Thermal Performance of Buildings. In: Thermal Protection of Buildings, vol. 7, 2004, No. 2, pp. 20-22
- [9] JAKEŠ, E.: Window Constructions. In: Do-It-Yourself, vol. 10, 2004
- [10] JAMNICKÝ, M.: Winter Gardens. In: Do-It-Yourself, vol. 7, 2004, No. 6, pp. 1-5
- [11] JANÁK, M.: Current State in the Modelling and Computer Simulation of a Building's Indoor Climate. In: Slovak Journal of Civil Engineering, 2001/4 (published in 2004)
- [12] KRÁLIK, J.: Calculating the Temperature of Double Skin Transparent Facades with Shading. In: Stavební obzor 1/2004, vol.13, Prague 2004, ČR, pp. 12-14
- [13] MENĎAN, R.: Shape Factor of a Family House and Thermal Heating Needs. In: STAVBA, 9/2004, vol. VII, pp. 52–54
- [14] MIKLÓŠIOVÁ, T.: External Stairs. In: STAVBA, vol. VII, 2004, No. 11, pp. 37-39
- [15] MINAROVIČOVÁ, K. : Evaluation of the Acoustic Properties of Homogeneous and Composite Elements Applied to Partition Walls and Doors. In: Slovak Journal of Civil Engineering, vol. XI, 2003, No.3, pp. 36-39 (published in 2004)
- [16] MINAROVIČOVÁ, K., VARGOVÁ, A.: Research on the Physical Properties of Building Envelopes. In: STAVBA, vol. VII, 2004, No. 11, pp. 30-33
- [17] OHRABLO, F.: Speedways and Driveways. In: International Conference Exhibition Bulletin, SvF STU Bratislava, 2004
- [18] OHRABLO, F., MOTYKOVÁ, A. : Nice and Good Roof, Requirements for a Roof Structure. In: Pekné bývanie, No. 2/2004, Bratislava, 2004
- [19] OLÁH, J.: Reconstruction of the Tower Roofs of St. Francis Xavier Church in Trenčín. In: EUROSTAV, vol. 10, 1/2004, Bratislava 2004, pp. 45-47
- [20] PERNIŠOVÁ, A.: Fences. In: STAVBA, 2004, vol. VII, Nos. 7-8, pp. 57-59
- [21] PUŠKÁR, A., MENĎAN, R., VAVROVIČ, B.: Roof Lighting and Its Connection to Each Layer of Roof. In: Building Annual 2005, JAGA GROUP, Bratislava pp.80-85
- [22] PUŠKÁR, A., ŽÚDEL, R.: Glass in an External Wall. In: Facades, vol. 2, Bratislava 2004, II/6, pp.26-28
- [23] RYCHTÁRIKOVÁ, M., et al.: *Evaluation of a Modern Catholic Church Using the Ray-Tracing Method*, Slovak Journal of Civil Engineering, vol. XI, 2003, No. 3, pp.21-25

- [24] TOMAŠOVIČ, P., ŠTUIBER, M.: Log House Constructions and Their Sound-Insulating Properties. In: Building Materials, vol. X, 2004, No. 6, pp. 33–35
- [25] VARGOVÁ, A.: Bionic Design – Design of an Optimal Architectural and Structural Environment. In: STAVBA, vol. VII, 2004, Nos. 7-8, pp.52-53
- [26] ZAJAC, J.: Industrial Building Design. In: STAVBA, 2004, Vol. VII, No. 1, pp.34-35
- [27] ŽILINSKÝ, J.: Basic Requirements for External Walls / or The Basics of External Walls. In: Stavajte s nami, , 4/2004, vol. III, Bratislava 2004, pp. 2-5

## IX.2 Books and Textbooks

- [1] ADAMSKÁ, G., MINAROVÍČOVÁ, K., VARGOVÁ, A. : Building Construction I. Bratislava: ES STU, 2004 (in Slovak)
- [1] BACIGALOVÁ, J.: Thermal Insulations. In: Practical Textbook of Technical Requirements for Construction, Verlag Dashöfer s.r.o., Bratislava 2004 (in Slovak)
- [2] HRAŠKA, J. et al: Daylighting and Insulation of Buildings. In: Practical Textbook of Technical Requirements for Construction, Bratislava : Verlag Dashofer, 2004, pp. 36 and 74 (in Slovak)
- [3] CHMÚRNÝ, I.: Building Physics. Script for Licensed Surveyors. ÚSZ SvF STU, Bratislava 2004 (in Slovak)
- [4] JAMNICKÝ, M.: Computer Graphics for the Planning of Buildings. Bratislava: ES STU, 2004 (in Slovak)
- [5] MIKOLAI, I. Fire Protection of Buildings and Eurocodes. In: Selected Problems of External Walls: Design and Review – 2004, pp. 24–48, STU Bratislava, November 2004 (in Slovak)
- [6] TOMAŠOVIČ, P.: Sound Insulation Properties of Hollow Brick Masonry. Building Acoustics Viewpoints. Evaluation and Standard Requirements. In: Selected Problems of External Walls Design and Review – 2004, SvF STU Bratislava, 2004 pp.88-109 (in Slovak)
- [7] ZAJAC, J.: Acoustical Properties of Building Constructions and Materials. Bratislava, STU 2004 (in Slovak)

## IX.3 Conferences

- [1] BEŤKO, B.: Thermal Protection of Wood Constructions. In.: Proceedings of 5th conference with international participation on “Defects and Reconstructions of Building Envelopes and Roofs”. Podbanské, March 2004, pp. 19–22
- [2] BIELEK, M., BIELEK, B.: Laboratory Experimental Base for Low-Energy Ecological Design of Sustainable Buildings. In : Proceedings of 7th Polish Research – Technical Conference on the Problems of Design, Construction and Use of Low-Energy Housing ENERGOPOM 2004, Cracow – Zakopane, Poland, 2004, pp.147-157
- [3] BUDAY, P.: The Effect of Thermal Bridges on Overall Building Heat Losses. In: Proceedings of 5th international conference on the “Indoor Climate of Buildings 2004”, Štrbské Pleso, November 2004

- [4] DRŽKA, M.: New Requirements for the Construction of Multifunctional Buildings. In: Proceedings of 29th Épületszerkezettani Konferencia, Debrecén – Nyíregyháza, Hungary, 2004, pp. 46-50
- [5] FRIMMER, M., BIELEK, M.: Anchoring Systems of Double Skin Facades – Development and Numerical Modelling of the Physical Problems of Anchors. In : Proceedings of 7th Polish Research – Technical Conference on the Problems of Design, Construction and Use of Low-Energy Housing ENERGOPOM' 2004, Cracow – Zakopane, Poland, 2004, pp. 331-338
- [6] GAŠPAROVIČOVÁ, V.: The Impact of Sound-Insulating Material in Floors. In: Proceedings of 9th International acoustic seminar on “Noise and Vibrations in Practice”, Kočovce, June 2004, pp. 5-8
- [7] GIECIOVÁ, M.: Semi-Detached Family Houses. In: Proceedings of international conference on “Planning, Architectural and Technical Aspects of Countryside Innovations”, Bratislava, December 2004
- [8] HRAŠKA, J.: Solar and Daylight Rights in Slovakia – Their Meaning for Energy and Urban Design. In: Proceedings of 38th Architectural Science Association ANZAScA Conference on “Contexts of Architecture”, University of Tasmania in Launceston, November 2004, pp. 265–269
- [9] CHMÚRNÝ, I.: Thermal Performance of Buildings with Advanced Glazing. In: Proceedings of 5th international “Indoor Climate 2004” Conference, SSTP Bratislava, 2004 pp. 277-280
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