

# Table of Contents

## Preface

## Editorial and Keynotes

### On the Evaluation of Behavioural Models of Buildings' Inhabitants

A. Mahdavi

3

## Chapter 1: Building Materials and Structures

### Thermal Performance Testing for Window with Vacuum Glazing

I. Chmúrny, D. Szabó and M. Jurigová

13

### Development of Prefabricated Timber-Steel-Concrete Ribbed Decks

K. Tavoussi, A. Fadaï, F. Riola-Parada and W. Winter

21

### Development of Timber-Wood Lightweight Concrete-Glass Composite for Multi-Story Façades

A. Fadaï, M. Rinnhofer and W. Winter

30

### Utilization of Waste Packaging Glass as Progressive Filler in Polymer Anchor Material Based on Epoxy Resin

T. Žlebek, J. Hodul and R. Drochytka

40

### Assessment of Color Degradation of Wood Plastic Composites in Outdoor Applications

J. Vercher, A. Diaz, M. Soriano and C. Lerma

48

### Evaluative Case Study in Lightweight Wooden Wall Research

D. Štaffenová, P. Ďurica, P. Juras and J. Rybárik

56

### Influence of High Temperatures on Concrete Pillars Confined with CFRP

J. Biosca, G. Fabra, J. Vercher, M. Soriano, G. Lopez and S. Tormo

64

### Case Study on Comparison of Joint Sealant Adhesive Properties Tested in Laboratory and *In Situ*

B. Nečasová, P. Liška and J. Šlanhof

72

### Grip Fixing Instead of Adhesive - Exterior Insulation Finishing Systems (EIFS) as a Sorted Recyclable Facade System with Reclosable Fastener Fixation

F. Oswald and R. Riewe

80

### Sustainable Materials with Potential Application as Core Materials in Vacuum Insulations

J. Zach, J. Hroudová and A. Korjenic

90

### Assessment of the Dynamic Temperature Profile in Fire Loaded Sandwich Structures Based on Wood in Comparison with Conventional Structural Systems

M. Rusinová, M. Kalousek and J. Šlanhof

98

## Chapter 2: Energy Performance of Buildings

### The Impact of Various Factors on the Energy Performance of Selected Types of Family Houses

D. Katunský and M. Farárik

109

### Building Physics and Building Simulation: An Integrated Approach to Educational Programs

A. Gasparella

117

### Development of Extreme Reference Years for Building Energy Simulation Scenarios

G. Pernigotto, A. Prada and A. Gasparella

129

### A Comparison of Three Evolutionary Algorithms for the Optimization of Building Design

A. Prada, A. Gasparella and P. Baggio

140

### Villa Castelli - Transformation of Historical Building into Nearly Zero Energy Building

P. Penna, O. Stuffer, A. Troi and V. Carì

148

<b>Uncertainties in Building Energy Certification: Two Case Studies Pertaining to Zoning</b> C. Berger, H. Teufl, U. Pont and A. Mahdavi	156
<b>The Potential of Descriptive Building Specifications as an Alternative to Detailed Normative Calculations</b> M. Marković, U. Pont and A. Mahdavi	164
<b>Evaluation of Prescriptive Indicators for Building Performance - A Ranking Based Approach</b> U. Pont and A. Mahdavi	172
<b>Performance Evaluation of a Building Integrated Photovoltaic/Thermal System Combined with Air-to-Water Heat Pump</b> S. Cinar, M. Krajčák and M. Arici	181
<b>On the Impact of Building Façades' Color on Thermal Building Performance and Outdoor Thermal Comfort</b> A. Azarnejhad and A. Mahdavi	189
<b>Simulation Study of Dry Floor Heating Systems</b> L. Horká and J. Hirs	196
<b>Thermal Performance of Konrad Frey's Prefabricated Low-Cost Loft House - A Case Study of a Pioneering Instance of Sustainable Architecture</b> M. Schuss, M. Taheri, U. Pont and A. Mahdavi	204
<b>Analyzing the Relation between Input Data and Key Performance Indicators for Building Energy Certificates: An Approach Using Algorithmic Modeling</b> B. Sommer, D. Minovski, U. Pont, M. Sommer-Nawara and A. Mahdavi	212
<b>Usability and Usefulness of Non-Conventional Building Performance Simulation Tools in Architectural Design Processes</b> E. Bazafkan, U. Pont and A. Mahdavi	219
<b>Recent Progress in the EVA Project: Evaluation of Visionary Architectural Concepts – State of the Art</b> B. Sommer, U. Pont, G. Moncayo, V. Sandor and A. Mahdavi	227
<b>The Return of Spatial Dimension into Architecture</b> Z. Kresevic and C. Volberg	237

### **Chapter 3: Smart Buildings, Smart Cities**

<b>A Guideline for the Implementation of an Energy Management System in Facility Management Organisations</b> K. Hoffmann and K. Menzel	247
<b>Assessing Facility Maintenance Models for Data Centres: Status and Deficits of Current Facility Management and Maintenance Concepts</b> J. Bieser and K. Menzel	255
<b>Assessing Energy Profiles of Urban Neighborhoods: A Streamlined GIS-Based Approach</b> U. Pont, D. Latzer, R. Giffinger and A. Mahdavi	264
<b>Performance Enquiries Regarding Traditional and Contemporary Indonesian Architecture: A Holistic Approach</b> U. Pont, U. Herbig and A. Mahdavi	273
<b>Conserving the Paradise: Toward Sustainable Touristic Development in the Westmanggarai, Indonesia</b> U. Herbig, K.M. Valent, U. Pont and A. Mahdavi	282
<b>Generation Tool for Automated Thermal City Modelling</b> P. Nageler, T. Mach, R. Heimrath, H. Schranzhofer and C. Hochenauer	292

### **Chapter 4: Sustainable Buildings and Environmental Assessment**

<b>LCA-Based Design Support for a Senior Citizens' Residence</b> C. Di Noi, A. Mahdavi, M. Dalprà, A. Frattari, M. Costantini and U. Pont	303
<b>Hybrid Multi-Functional Buildings for Sustainable Development of Rural Areas</b> M. Babenko, M. Savytskyi, M. Schmidt, S. Vilčeková and E. Kridlova-Burdova	311
<b>A Visual Method for Detailed Analysis of Building Life Cycle Assessment Results</b> B. Kiss and Z. Szalay	319

<b>BIM-Based Material Passport (MP) as an Optimization Tool for Increasing the Recyclability of Buildings</b>	
M. Honic, I. Kovacic and H. Rechberger	327
<b>Assessment of the Life Cycle Energy Efficiency of a Primary School Building in Turkey</b>	
N. Moazzen, M.E. Karaguler and T. Ashrafi	335
<b>Approaches to Urban Weather Modeling: A Vienna Case Study</b>	
K. Hammerberg, M. Vuckovic and A. Mahdavi	344
<b>Simulation-Supported Early Stage Design Optimisation for a Case Study of Life Cycle Oriented Buildings</b>	
S. Eikemeier, A. Mahdavi and R. Wimmer	353
<b>Waste Prevention in the Prefabricated Building Sector</b>	
F. Kleemann, D. Laner and D. Laner	361
<b>Can we Quantify the Ecological Valency of Built Environments?</b>	
A. Mahdavi	369
<b>Subjective Evaluation of Sustainability and Attractiveness Criteria of Planned Buildings: A Case Study</b>	
U. Pont and A. Mahdavi	374

## **Chapter 5: Hygrothermal Performance of Buildings**

<b>Comparison between Glaser Method and Heat, Air and Moisture Transient Model for Moisture Migration in Building Envelopes</b>	
M. Libralato, O. Saro, A. de Angelis and S. Spinazzè	385
<b>Thermo-Hygral and Environmental Evaluation of Chosen Parts of an Ultra-Low-Energy Family Houses</b>	
P. Turcsanyi, A. Sedláková, E. Kridlova-Burdova and S. Vilčeková	393
<b>Predictive Performance of Hygro-Thermal Simulation Models: A Case Study</b>	
S. Aien, M. Taheri, S. Pinich, M. Schuss and A. Mahdavi	401

## **Chapter 6: Indoor Climate, Thermal Comfort and Ventilation**

<b>Initial Results of Monitoring the Temperature on the Facade of Office Building</b>	
P. Juras, R. Ponechal and D. Štaffenová	411
<b>Atmospheric Boundary Layer Wind Tunnel of Slovak University of Technology in Bratislava</b>	
D. Čehel'ová, M. Franek and B. Bielek	419
<b>A Review of the Impact of Vegetation in Solar Control towards Enhanced Thermal Comfort and Energy Performance in Buildings</b>	
D.A. Ayeni, O.O. Aluko and M.O. Adegbe	428
<b>Principal Solutions for Sustainable Adaptive Facades Providing Suitable Indoor Environment for Inhabitants</b>	
P. Hartman, D. Čehel'ová and B. Bielek	435
<b>Analysis of Night-Time Pre-Cooling in a School Building</b>	
M. Kovac and K. Kovacova	443
<b>Investigating Night Flushing Potential in a Multi-Storey, Open-Plan Office in Germany Using TRNLizard with TRNSYS 18</b>	
V. Hoang, E. Reisi and C. Frenzel	451
<b>Design of Fire Ventilation System for an Underground Car Park by CFD Simulations</b>	
M. Kmecová, P. Buday, J. Vojtaššák and M. Krajčík	459
<b>A Simulation and Monitoring Based Case Study Regarding the Dynamic Thermal Conditions in Non-Used Attic Space</b>	
R. Ponechal, R. Korenková and D. Štaffenová	467
<b>Evaluation of Indoor Climate in Big Lecture Hall</b>	
M. Budiaková	475
<b>Thermal Performance of School Buildings: A Case Study from Albania</b>	
E. Keco, U. Pont and A. Mahdavi	484

<b>Comparison of Measured and Calculated Air Changes due to Single Sided Window Openings - A Case Study</b> M. Schuss, A. Balmus, F. Tahmasebi and A. Mahdavi	492
<b>Analysis of Thermal Comfort and Air Quality in the Kindergarten Hart - A Case Study of a Unique Sustainable Building Design</b> M. Schuss, M. Taheri, U. Pont and A. Mahdavi	500

## **Chapter 7: Daylighting and Insolation**

<b>Evaluation of Indoor Daylight Focused on the Human Circadian System</b> P. Hartman, L. Maňková, P. Hanuliak and J. Hraška	511
<b>Suitability Evaluation of Visual Indicators on Glass Walls and Doors for Visually Impaired People</b> M. Maringer, N. Hauck and A. Mahdavi	519
<b>Visual Impairment, Adaptation Luminance, and Glare: An Empirical Investigation</b> N. Hauck, F. Buser and A. Mahdavi	527

## **Chapter 8: Acoustics and Noise Protection**

<b>Characterization of Noise in Eating Establishments Based on Psychoacoustic Parameters</b> O. Çakir, Z. Sevinç and M.E. Ilal	539
<b>Low Frequency Noise Level Assessment in Vienna</b> M. Vanca, J. Lechleitner and A. Mahdavi	547
<b>A Cell-Based Method to Support Hospital Refurbishment</b> G. Wurzer, U.M. Coraglia, U. Pont, C. Weber, W.E. Lorenz and A. Mahdavi	553
<b>Exploring the Potential of Simulation Model Calibration an Acoustical Retrofit Case Study</b> N. Jakic, K. Kiesel and A. Mahdavi	561

## **Chapter 9: Building Monitoring and Automation**

<b>Experimental Quantification of Air Permeability of Building Envelope with Installed Controlled Ventilation System - Case Study</b> B. Bielek and D. Szabó	571
<b>Monitoring of the Airflow around the Facade of an Office Building</b> P. Juras and R. Ponechal	579
<b>Communication Analysis of Hardware-in-the-Loop Test Method for Heat Pumps and Chillers</b> J. Weyr, T. Schoberer and W. Stutterecker	587
<b>Calibration of Thermal Analysis Models and Thermal Sensors in a Homogeneous Building Enclosure</b> E. Gil, C. Lerma, S. Llop, Á. Mas and J. Vercher	597
<b>Hygrothermal Analysis of Mineral Wool Insulated Building Constructions Based on <i>In Situ</i> Measurements</b> B. Nagy, D. Szagri and D. Bakonyi	605
<b>Monitoring the Effective Ambient and Sky Temperature Based on Infrared Sensor for Advanced Thermal Calculations</b> R. Slávik and M. Čekon	613
<b>Comparison of the Energy Performance of a Heat Pump under Various Conditions by Using a Hardware-in-the-Loop (HIL) Test Method</b> T. Schoberer, J. Weyr, G. Steindl, G. Görtler and W. Stutterecker	622
<b>Application of a Low-Cost Strain Monitoring System Based on Internet of Things to the Structural Analysis of Physical Models</b> E. Gil, F. Gómez, Á. Mas, J. Vercher, C. Lerma and J. Lopez	633
<b>A Web Based Data Processing Concept for Building Diagnostics and Performance Evaluation</b> M. Schuss, F. Tahmasebi and A. Mahdavi	641

<b>Simulation Study of a Novel Solar Thermal Seasonal Heat Storage System Based on Stable Supercooled PCM for Space Heating and Domestic Hot Water Supply of Single Family Houses</b>	
C. Moser, G. Englmaier, H. Schranzhofer and A. Heinz	650
<b>Efficiency Increase of Solar Heated Buildings by Thermal Activation of Construction Elements</b>	
W. Lerch, R. Heimrath, A. Heinz, T. Mach, C. Fink and T. Ramschak	659
<b>Modeling of Radiators with Mass Flow Control</b>	
O. Šikula, P. Charvát, L. Adjlout and O. Ladjedel	667