Konferenzbeiträge / Atti / Proceedings

Building Simulation Applications BSA 2017

3rd IBPSA Italy conference
Bozen-Bolzano, 8th – 10th February 2017

Edited by
Giovanni Pernigotto, Francesco Patuzzi, Alessandro Prada, Vincenzo Corrado, Andrea Gasparella

bu,press
bozen
bolzano
university
press

Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Konferenzbeiträge / Atti / Proceedings

Building Simulation Applications BSA 2017

3rd IBPSA-Italy conference
Bozen-Bolzano, 8th–10th February 2017

Edited by
Giovanni Pernigotto, Francesco Patuzzi, Alessandro Prada,
Vincenzo Corrado, Andrea Gasparella

bu,press
bozen
bolzano
university
press

Scientific committee
Ian Beausoleil-Morrison, Carleton University, Canada
Jan L.M. Hensen, Technische Universiteit Eindhoven, The Netherlands
Gregor P. Henze, University of Colorado Boulder, USA
Ardeshir Mahdavi, Technische Universität Wien, Austria
Athanasios Tzempelikos, Purdue University, USA
Reinhard Radermacher, University of Maryland, USA
Francesco Asdrubali, Università degli Studi Roma Tre, Italy
Paolo Baggio, Università degli Studi di Trento, Italy
Maurizio Cellura, Università degli Studi di Palermo, Italy
Vincenzo Corrado, Politecnico di Torino, Italy
Andrea Gasparella, Free University of Bozen-Bolzano, Italy
Livio Mazzarella, Politecnico di Milano, Italy
Adolfo Palombo, Università degli Studi di Napoli Federico II, Italy

Students Tutoring Scientific Committee
Daniel Cóstola, University of Strathclyde, Scotland, UK
Pieter-Jan Hoes, Technische Universiteit Eindhoven, The Netherlands
Bruno Lee, Concordia University, Canada
Fabian Ochs, Universität Innsbruck, Austria
Matthias Schuss, Technische Universität Wien, Austria
Fabrizio Ascione, Università degli Studi di Napoli Federico II, Italy
Francesca Cappelletti, Università IUAV di Venezia, Italy
Gianpiero Evola, Università degli Studi di Catania, Italy
Francesco Patuzzi, Free University of Bozen-Bolzano, Italy
Giovanni Pernigotto, Free University of Bozen-Bolzano, Italy
Alessandro Prada, Università degli Studi di Trento, Italy

Organizing committee
Paolo Baggio, Università degli Studi di Trento, Italy
Marco Baratieri, Free University of Bozen-Bolzano, Italy
Francesca Cappelletti, Università IUAV di Venezia, Italy
Vincenzo Corrado, Politecnico di Torino, Italy
Andrea Gasparella, Free University of Bozen-Bolzano, Italy
Norbert Klammsteiner, Energytech G.m.b.H./S.r.l -Bozen, Italy
Fabian Ochs, Universität Innsbruck, Austria
Francesco Patuzzi, Free University of Bozen-Bolzano, Italy
Giovanni Pernigotto, Free University of Bozen-Bolzano, Italy
Alessandro Prada, Università degli Studi di Trento, Italy
Fabio Viero, Manens – Tifs, Italy

bu,press

Bozen-Bolzano University Press
Free University of Bozen-Bolzano
www.unibz.it/universitypress
2018

Cover design: DOC.bz

ISSN 2531-6702
ISBN 978-88-6046-136-0

This work—excluding the cover and the quotations—is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License.

Table of Contents

Preface 1

Urban Energy Computing: An Hourglass Model
Ardeshi Mahdavi, Neda Ghiassi 3

The Viability of Using Different Types of Recycled Plastic as Glazing in Windows
Islam A. Mashaly, Yussra Rashed, Salah El-Haggar, Khaled Nassar 13

Implications of Increasing Daylighting in Deep Energy Retrofitting in Norwegian Shopping Centres
Matthias Haase, Andreas Ampenberger 19

PV-PCM Integration in Glazed Buildings. Numerical Study Through MATLAB/TRNSYS Linked Model
Hagar Elarga, Francesco Goia, Ernesto Benini 27

Dynamic Simulation as a Tool for the Analysis of the Interactions Among the Controllers of HVAC Systems
Mara Magni, Jean Pierre Campana, Gian Luca Morini 37

The Benchmark of a New SIMULINK Library for Thermal Dynamic Simulation of Buildings
Jean Pierre Campana, Mara Magni, Matteo Dongellini, Luca Morini 45

A New Methodological Approach for Estimating Energy Savings
due to Air Movement in Mixed-Mode Buildings
Francesco Babich, Malcolm Cook, Dennis Loveday, Rajan Rawal, Yash Shukla 53

On the Indoor Thermal Behavior of a Building with Cool Envelope Components
Anna Laura Pisello, Veronica Lucia Castaldo, Claudia Fabiani, Franco Cotana 61

How Microclimate Mitigation Affects Building Thermal-Energy Performance
in Residential Zero Energy Italian Settlements
Anna Laura Pisello, Veronica Lucia Castaldo, Claudia Fabiani,
Cristina Piselli, Franco Cotana, Mattheos Santamouris 69

Thermal Performance of Innovative Building Envelope Systems in Mediterranean Climate
Maurizio Detommaso, Gianpiero Evola, Antonio Gagliano, Luigi Marletta, Francesco Nocera 77

Pitfalls in Weather Data Management Strategies of Building Performance Simulation Tools
Livio Mazzarella, Martina Pasini 87

Comparison Among Different Green Buildings Assessment Tools: Application to a Case Study
Benedetta Mattoni, Francesco Asdrubali, *Giorgio Baldinelli, Francesco Bianchi,*
Fabio Bisegna, Luca Evangelisti, Paola Gori, Gianluca Grazieschi, Claudia Guattari 97

Integrated Numerical Analysis and Building Information Modeling for Cultural Heritage
Elena Gigliarelli, Filippo Calcerano, Michele Calvano, Francesco Ruperto, Mario Sacco, Luciano Cessari 105

Weather Scenario Generation for Stochastic Model Predictive Control
Using Vector Autoregressive Prediction
Samuel R. Currie, Gregor P. Henze 113

Historical Buildings in Protected Areas in Italy: A Re-Design Study of a Rural Building
Maurizio Cellura, Giuseppina Ciulla, Francesco Guarino, Sonia Longo 119

On the Cost-Optimal Design: Comparison of Quasi-Steady-State
and Dynamic Simplified Methods of Calculation of H/C Energy Needs
Ilaria Ballarini, Andrea Costantino, Domenico Dirutigliano,
Enrico Fabrizio, Simona Paduos, Vincenzo Corrado 129

Static and Dynamic Strategies for Improving Daylight Use in Side-Lit Classrooms: A Case Study
Vincenzo Costanzo, Gianpiero Evola, Luigi Marletta, Dario Panarelli 137

RC Building Modelling for Control Purposes: A Case Study
Erica Zavaglio, Mario Motta 145

Architectural Integration of Photovoltaics: Performance Evaluation of Curved Modules
Marco Lovati, Laura Maturi, David Moser 153

Validation of a PCM Simulation Tool in IDA ICE Dynamic Building Simulation Software
Using Experimental Data from Solar Test Boxes
Cristina Cornaro, Marco Pierro, Daniele Roncarati, Valerio Puggioni 159

Analysis of the Influence of Thermal Losses of the Recirculation Flow Loop
in a Residential Hot Water Solar System
Paolo Valdiserri 167

Calibration of the Energy Simulation Models using Tikhonov-Type Regularization:
Application to a Residential Building Apartment
Maja Miletić, Chiara Dipasquale, Roberto Fedrizzi 175

On-Site Measurements and Whole-Building Thermal Dynamic Simulation of a Semi-Confined Prefabricated
Building for Heritage Conservation
Francesca Frasca, Anna Maria Siani, Cristina Cornaro, ... 185

Comparison Between Simplified and Detailed Methods for the Calculation of Heating and Cooling Energy
Needs of Livestock Housing: A Case Study
Andrea Costantino, Ilaria Ballarini, Enrico Fabrizio 193

Effect of Blind Control Strategies on Energy Demand of Office Buildings and Melanopic Effect for Occupants
Daniel Plörer, Matthias Werner, Martin Hauer, David Geisler-Moroder 201

Introducing a Hybrid Energy-Use Model at the Urban Scale: The Case Study of Turin (Italy)
Marta Carozza, Guglielmina Mutani, Silvia Coccolo, Jérôme Kaempf 209

OpenBPS: A New Building Performance Simulation Tool
Livio Mazzarella, Martina Pasini 217

A Comparative Study of Computational Algorithms
Used in the Automatic Generation of Reduced-Order Models from CFD Simulations
Thibault Marzullo, Sajjad Yousefian, Marcus M. Keane, Marco Geron, Rory F.D. Monaghan 225

Comparison of Direct Radiation Split Algorithms for Energy Simulation of Buildings
Giorgio Lupato, Marco Manzan, Stefano Cirilli 233

Introduction of a New Dynamic Simulation Screening Tool to Support Early-Stage Building Design
Marco Picco, Giorgio Ghisalberti, Gaetano Fabio Graziano, Marco Marengo 241

On the Influence of Storage Size and Management on the Consumption
of Air Source Heat Pumps in High Performance Buildings
Elena Bee, Alessandro Prada, Paolo Baggio 249

Energy Refurbishment of Social Housing Stock in Italy:
Analysis of Some Scenarios from the Impact of Climate Change to Occupant Behaviour
Leone Pierangioli, Cristina Carletti, Gianfranco Cellai, Fabio Sciurpi 257

Analysis of Simplified Lumped-Capacitance Models to Simulate Thermal Behaviour of Buildings
Jacopo Vivian, Angelo Zarrella, Giuseppe Emmi, Michele De Carli 265

Measurement of the Impact of Buildings on Meteorological Variables
Dasaraden Mauree, Laurent Deschamps, Paul Bequelin, Pierre Loesch, Jean-Louis Scartezzini 273

Improving Local Wind Estimation for the Automated Control of Blinds
Dasaraden Mauree, Ali Motamed, Laurent Deschamps, Jean-Louis Scartezzini 279

Modelling of Complex Fenestration Systems – Validation Results by Long-Term Measured Data
Martin Hauer, Michael Grobbauer, Stefan Holper, Daniel Plörer 285

Cooling Energy Needs in Non-Residential Buildings Located in Mediterranean Area:
A Revision of the Quasi-Steady Procedure
Roberto Bruno, Natale Arcuri, Cristina Carpino 293

Steady-State and Transient Simulation of a Radiant Heating System
Fabian Ochs, Mara Magni, Michele Bianchi Janetti, Dietmar Siegele 301

Comparison Between Energy-Optimized and Cost-Optimized Design of
Multi-Family Buildings Through Automated Optimization
Maria Ferrara, Elisa Sirombo, Enrico Fabrizio 309

Effective Building Modelling for Energy Performance Contracting
Alberto Giretti, Massimo Lemma, Miquel Casals, Marcel Macarulla, Alba Fuertes, Rory Jones 317

Integrated Energy Modelling to Support District Cooling Optimisation: Methodological Approach
Francesco Passerini, Andrea Bassani, Pietro De Cinque,
Raymond Sterling, Jesus Febres, Anna Magrini, Andrea Costa, Marcus M. Keane 325

The Development and Verification of a Computational Tool for the Evaluation of the Visual Accessibility of Architectural Spaces
Dawid Wolosiuk, Harald Hofstätter, Ardeshir Mahdavi 333

The Diversity Challenge in Models of Occupants' Presence in Buildings
Ardeshir Mahdavi, Farhang Tahmasebi, William O'Brien, H. Burak Gunay..... 339

Accounting for the Diversity of Use Patterns in Representations of Office Plug Loads in Building Performance Simulation
Ardeshir Mahdavi, Farhang Tahmasebi 345

A Comparison Between Numerical Methods for Evaluating Ground-Coupled Heat Pump Systems Performance
Angelo Zarrella, Roberto Zecchin, Diego Guzzon, Michele De Carli, Giuseppe Emmi, Michele Quaggia..... 351

Data Transfer from BIM to Building Performance Simulation Tools: A Case Study
Mirjana Bucevac, Ulrich Pont, Sigrun Swoboda, Ardeshir Mahdavi..... 359

A Comparison of the Performance of Two- and Three-Dimensional Thermal Bridge Assessment for Typical Construction Joints
Ulrich Pont, Ardeshir Mahdavi..... 367

Comparison Between Simulated and In-Situ Measured Speech Intelligibility in the Multilingual Context of the Free University of Bozen-Bolzano
Simone Torresin, Chiara Visentin, Nicola Prodi, Francesca Cappelletti, Andrea Gasparella 375

Simulation-Assisted Monitoring-Based Performance Evaluation of a Historically Relevant Architectural Design
Matthias Schuss, Ulrich Pont, Mahnameh Taheri, Christoph Lindner, Ardeshir Mahdavi..... 385

Bio-Based and Recycled-Waste Materials in Buildings: A Study of Energy Performance of Hemp-Lime Concrete and Recycled-PET Façades for Office Facilities in France *and Italy*
Chadi Maalouf, Carlo Ingrao, Flavio Scrucca, Tala Moussa, Caterina Tricase, Francesco Asdrubali..... 393

Case Study for Energy Efficiency Measures of Buildings on an Urban Scale
Domenico Dirutigliano, Mark-Alexander Brüntjen, Christian Fliegner, Jérôme Frisch, Vincenzo Corrado, Christoph van Treeck 403

Investigating the Suitability of the WRF Model for Improving Prediction of Urban Climate Boundary Conditions
Kristopher Hammerberg, Oscar Brousse, Ardeshir Mahdavi..... 411

On the Global Performance of Offices with Different Complex Fenestration Systems
Anna Maria Atzeri, Francesca Cappelletti, Athanasios Tzempelikos, Andrea Gasparella..... 421

Sensitivity of WRF/Urban Simulations to Urban Morphology Parameters: A Case Study in the City of Bolzano
Gianluca Pappaccogli, Lorenzo Giovannini, Francesca Cappelletti, Dino Zardi..... 433

Numerical Analysis of Thermal Bridges in Dynamic Conditions
Alessandra Romagnoli, Costanzo Di Perna, Davide Barbaresi, Elisa Di Giuseppe 441

Building Integrated Photovoltaics/Thermal (BIPV/T) System: A New Dynamic Simulation Model and a Case Study
Andreas Athienitis, Giovanni Barone, Annamaria Buonomano, Adolfo Palombo 449

Buildings Integrated Phase Change Materials: Modelling and Validation of a Novel Tool for the Energy Performance Analysis
Giovanni Avagliano, Annamaria Buonomano, Maurizio Cellura, Vasken Dermardiros, Francesco Guarino, Adolfo Palombo 459

From Energy Signature to Cluster Analysis: Comparison Between Different Clustering Algorithms
Lorenza Pistore, Giovanni Pernigotto, Francesca Cappelletti, Piercarlo Romagnoni, Andrea Gasparella 469

The Building Information Model and the IFC Standard: Analysis of the Characteristics Necessary for the Acoustic and Energy Simulation of Buildings
Costantino Carlo Mastino, Roberto Baccoli, Andrea Frattolillo, Martino Marini, Antonino Di Bella, Valerio Da Pos 479

Mapping Savings in Energy Demand by Heat Recovery for European Countries Under Consideration of Humidity Control
Stefanie Tafelmeier, Giovanni Pernigotto, Andrea Gasparella..... 487

Calibrated Simulation Models for Indoor Comfort Assessment: The Case of a Healthcare Facility in Vienna
Luca Zaniboni, Giovanni Pernigotto, Matthias Schuß, Kristina Kiesel, Andrea Gasparella, Ardeshir Mahdavi 497

Temporal and Spatial Predictability of Occupants' Presences in a Library Building
Ki Uhn Ahn, Won Jun Suh, Cheol Soo Park 505

Stochastic Multi-Criteria Decision Making of Energy Recovery Ventilation Systems using Cumulative Prospect Theory
Young Jin Kim 513

Proposing a Life Cycle Energy Efficiency Index for Comparative Assessment of Insulation Materials' Performance
Hashem Amini Toosi, Ali Vakili-Ardebili, Nasim Hasheminejad 521

Development of a Design Numerical Model of a Hybrid Cooler
Matteo D'Antoni, Roberto Fedrizzi 529

Selecting Roller Shades Properties Based on Glare Mitigation, Energy Performance and Connection to the Outdoors
Iason Konstantzos, Athanasios Tzempelikos 539

Dynamic Simulation of the Influence of Fenestration on Buildings Energy Consumption. A Comparison Between Northern and Southern Europe
Angelo Spena, Viola Iaria, Carlo Mazzenga 547

A New Control Strategy for Variable Refrigerant Flow Systems
Xiaojie Lin, Yunho Hwang, Reinhard Radermacher, Byungsoon Kim 557

Development of an Energy Performance Benchmark Using Quantitative Analysis of Energy Consumption of Office Buildings
HyeGi Kim, SunSook Kim 565

Parametric Technical and Economic Analysis of Thermal Comfort and Productivity in Industrial Buildings
Mariantonietta Tarantini, Giovanni Pernigotto, Fabian Ochs, Andrea Gasparella 573