

The Silesian University of Technology

No. 4/2018

# **THANKS TO ACEE REVIEWERS, 2018**

The ACEE editors would like to sincerely thank the following reviewers who dedicated their considerable time and expertise to the Journal during the year 2018.

# architecture

## Teresa ADAMCZYK-BOMERSBACH

Silesian University of Technology, Poland

CIVIL ENGINEERING

## Anna BAĆ

Wrocław University of Science and Technology, Poland

#### Adam BARTOSZEK

University of Silesia, Poland

## Iwona BENEK

Silesian University of Technology, Poland

## Joanna BOROWCZYK

Lodz University of Technology, Poland

## Agnieszka BUGNO-JANIK

Silesian University of Technology, Poland

## **Borys CYMBROWSKI**

Opole University, Poland

## Marek CZYŃSKI

West Pomeranian University of Technology in Szczecin, Poland

## Marek JANIK

Silesian University of Technology, Poland

## Maciej JANOWSKI

Poznan University of Technology, Poland

## Beata KOMAR

Silesian University of Technology, Poland

## Magdalena KOZIEŃ-WOŹNIAK

Cracow University of Technology, Poland

## Beata MAKOWSKA

Cracow University of Technology, Poland

## Leszek MALUGA

Wrocław University of Science and Technology, Poland

## Janusz MARCHWIŃSKI

University of Ecology and Management in Warsaw, Poland

## Katarzyna MAZUR-BELZYT

Silesian University of Technology, Poland

## Ryszard NAKONIECZNY

Silesian University of Technology, Poland

## Grzegorz NAWROT

Silesian University of Technology, Poland

## Piotr OBRACAJ

University of Science and Technology in Bydgoszcz, Poland

## Anna OSTAŃSKA

Lublin University of Technology, Poland

#### Alina PANCEWICZ

Silesian University of Technology, Poland

## Agata PIET

The University of Applied Sciences in Nysa, Poland

## Rafał RADZIEWICZ-WINNICKI

Silesian University of Technology, Poland

## Elżbieta RDZAWSKA-AUGUSTIN

Silesian University of Technology, Poland

## Aleksandra SAS-BOJARSKA

Gdańsk University of Technology, Poland

## Anna SAWICKA

Maria Curie Skłodowska University in Lublin, Poland

## Volodymyr SMOLIAK

Vinnytsia National Technical University, Ukraine

## Maria SOŁTYSIK

Gdańsk University of Technology, Poland

## Anna STANIEWSKA

Cracow University of Technology, Poland

## **Bogusław SZUBA**

The University of Applied Sciences in Nysa, Poland

## Michał TOMANEK

Silesian University of Technology, Poland

## Ewa WALA

Silesian University of Technology, Poland

## Dorota WINNICKA-JASŁOWSKA

Silesian University of Technology, Poland

## Anna Marta WŁODARCZYK

Technische Universität Berlin, Germany

#### Jan WRANA

Lublin University of Technology, Poland

## Marek WYSOCKI

Gdańsk University of Technology, Poland

## Joanna ZABAWA-KRZYPKOWSKA

Silesian University of Technology, Poland

#### Teresa ZBYRAD

Pedagogical University of Cracow, Poland

## Katarzyna ZIELONKO-JUNG

Gdańsk University of Technology, Poland

## Magdalena ŻMUDZIŃSKA-NOWAK

Silesian University of Technology, Poland

# **e**civil engineering

## Shingo ASAMOTO

Saitama University, Japan

## Maciei BATOG

Górażdże Cement SA (HeidelbergCement Group), Poland

## Piotr BĘTKOWSKI

Silesian University of Technology, Poland

## Jerzy BOCHEN

Silesian University of Technology, Poland

## Alexandra BOURDOT

ENS-Paris-Saclay, France

## Matthieu BRIFFAUT

Laboratoire 3SR, Universite Grenoble Aples, France

## Przemysław BUCZYŃSKI

Kielce University of Technology, Poland

## **Zbigniew GIERGICZNY**

Silesian University of Technology, Poland

## Bożena HOŁA

Wrocław University of Science and Technology, Poland

#### **Daniel HONFI**

RISE Research Institutes of Sweden

## Jordan HRISTOV

University of Chemical Technology and Metallurgy, Bulgaria

## Radosław JASIŃSKI

Silesian University of Technology, Poland

## Marcin KAMIŃSKI

Lodz University of Technology, Poland

## Łukasz KOŁODZIEJ

AGH University of Science and Technology, Poland

## Jan KUBICA

Silesian University of Technology, Poland

#### Yasir KHAN

Zhejiang University, China

## Renata KOTYNIA

Lodz University of Technology, Poland

## Maciej KOWAL

Lublin University of Technology, Poland

#### Janusz KOZUBAL

Wrocław University of Science and Technology, Poland

## Krzysztof KUCHTA

Cracow University of Technology, Poland

## Jarosław KUŹNIEWSKI

Wrocław University of Science and Technology, Poland

## Roman LEWANDOWSKI

Poznań University of Technology, Poland

## Paweł ŁUKOWSKI

Warsaw University of Technology, Poland

## Marian ŁUPIEŻOWIEC

Silesian University of Technology, Poland

## Leszek MAŁYSZKO

University of Warmia and Mazury in Olsztyn, Poland

## Łukasz NOWAK

Wrocław University of Science and Technology, Poland

## Alicja PIASECKA-BELKHAYAT

Silesian University of Technology, Poland

## Tomasz PIOTROWSKI

Warsaw University of Technology, Poland

## Wioletta RACZKIEWICZ

Kielce University of Technology, Poland

## **Konrad RODACKI**

Cracow University of Technology, Poland

## Emmanuel ROZIÈRE

Ecole Centrale de Nantes, France

## Leonard RUNKIEWICZ

The Building Research Institute, Poland

## Giuseppe SCIUMÈ

University of Bordeaux, France

## Agnieszka SIEWIERA

West Pomeranian University of Technology, Poland

## Piotr SMARZEWSKI

Lublin University of Technology, Poland

## Oldřich SUCHARDA

VŠB - Technical University of Ostrava, Czech Republic

## Maciej URBAN

Cracow University of Technology, Poland

## Szczepan WOLIŃSKI

Rzeszów University of Technology, Poland

## Piotr WOYCIECHOWSKI

Warsaw University of Technology, Poland



## Marek BADURA

Wrocław University of Science and Technology, Poland

#### Piotr BARTKIEWICZ

Warsaw University of Technology, Poland

## Ulyana BASHUTSKA

Ukrainian National Forestry University, Lviv, Ukraine

## Lena BOJKO ZAPOROZHYE

National Technical University, Ukraine

## Janusz BUJAK

UTP University of Science and Technology Bydgoszcz, Poland

## Marta CHLUDZIŃSKA

Warsaw University of Technology, Poland

## **Tomasz CHOLEWA**

Lublin University of Technology, Poland

## Marek CHYC

Azoty Group Inc. Tarnów, Poland

## Lian-Pang Wei DAYEH

University, Taiwan

## Marcin DEBOWSKI

University of Warmia and Mazury in Olsztyn, Poland

## Mariusz DUDZIAK

Silesian University of Technology, Poland

## Urszula FILIPKOWSKA

University of Warmia and Mazury in Olsztyn, Poland

## Szymon FIRLAG

Warsaw University of Technology, Poland

## **Badri GECHBAIA**

Batumi Shota Rustaveli State University, Georgia

## Jacek GEBICKI

Gdansk University of Technology, Poland

## Elżbieta GRABIŃSKA

Silesian University of Technology, Poland

## Adam JARZĄBEK

Cracow University of Technology, Poland

## Andrzej JODŁOWSKI

Lodz University of Technology, Poland

## Gabriela KAMIŃSKA

Silesian University of Technology, Poland

## Alicja KICIŃSKA

AGH University of Science and Technology in Cracow, Poland

## Jakub KOLARIK

Technical University of Denmark

## Viktor KOVAL

Odessa Institute of Trade and Economics of Kyiv, National University of Trade and Economics, Ukraine

## Joanna KULCZYCKA

Mineral and Energy Economy Research Institute, Polish Academy of Science in Cracow, Poland

# Aleksandra LIPCZYŃSKA

University of California Berkeley's

Berkeley Educational Alliance for Research in Singapore Limited, Singapore

## Piotr LIS

Czestochowa University of Technology, Poland

## Zenon ŁOTOWSKI

Bialystok University of Technology, Poland

## Katarzyna MORACZEWSKA-MAJKUT

Silesian University of Technology, Poland

## Tadeusz PAJĄK

AGH University of Science and Technology in Cracow, Poland

## Agnieszka PALMOWSKA

Silesian University of Technology, Poland

## Janina PIEKUTIN

Bialystok University of Technology, Poland

## Lucyna PRZYWARA

University of Bielsko-Biala, Poland

## Ewa PUSZCZAŁO

Silesian University of Technology, Poland

## Wojciech RACHTAN

Engineering Services Szczecin, Poland

## Janusz RAK

Rzeszow University of Technology, Poland

## Joanna RODZIEWICZ

University of Warmia and Mazury in Olsztyn, Poland

## Wioletta ROGULA -KOZŁOWSKA

Institute of Environmental Engineering
Polish Academy of Sciences in Zabrze, Poland

#### Robert SEKRET

Czestochowa University of Technology, Poland

## Iwona SKOCZKO

Bialystok University of Technology, Poland

## Mirosław SKORBIŁOWICZ

Bialystok University of Technology, Poland

## Hiroaki SOMURA

Okayama University, Japan

## Marek SOZAŃSKI

Poznan University of Technology, Poland

## Hop Noo THEO

National University of Laos

## Andrzej URBANIAK

Poznan University of Technology, Poland

## Stanisław WACŁAWEK

Technical University of Liberec, Czech Republic

## Wojciech WEGRZYŃSKI

The Building Research Institute Warsaw, Poland

## Jarosław ZUWAŁA

Institute of Chemical Processing of Coal, Zabrze, Poland