UTP University of Science and Technology in Bydgoszcz
Faculty of Civil and Environmental Engineering and Architecture
Department of Building Engineering and Building Physics
Al. Prof. S. Kaliskiego 7, 85-796 Bydgoszcz

EXPRESSIONS OF INTERESTS (EOI)

1. Research Group Heading

Group of Advanced Research of Materials and Mass Transfer

UTP University of Science and Technology in Bydgoszcz
Faculty of Civil and Environmental Engineering and Architecture
Department of Building Engineering and Building Physics
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85-796 Bydgoszcz
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2. Name of the Group's Leader with a Short BIO

Wesołowska Maria, e-mail.: marysia@utp.edu.pl

Diplomas and scientific degrees

- 1991 - MsC in Construction, specialising in Construction Engineering and Management, UTP University of Science and Technology in Bydgoszcz in Bydgoszcz. Thesis title: Underground fresh water tank
- 1996/1997 - 2-semester studies in Environment Protection, UTP University of Science and Technology in Bydgoszcz.
- 2000 - PhD in Technical Sciences, Building Physics, University of Technology in Łódź, Department of Construction, Architecture and Environment Engineering.
  PhD thesis: Influence of external electromagnetic field on kinetics of humidity process and drying of ceramic composite.
- 2008/2009 - 2-semester aftergraduate studies in Energetic Audit of Buildings and Installations, University of Warmia and Masuria in Olsztyn

My scientific and research interests focused on building physics. Before the doctoral thesis I led laboratory and field researches concerning thermal and humidity issues in external partitions as well as moistening and drying processes of ceramic materials in building. In my doctoral thesis I examined the influence of external magnetic field on kinetics of moistening and drying of ceramic composite. Problems undertaken in the work made it clear that a cyclic wall moistening is immanently associated with concentration of soluble mineral salts. My tests made on historical buildings in Bydgoszcz showed that historical lime mortars arrest most salts in their microstructure, thus limiting crystallization process in bricks. Introduction of contemporary material solutions for mortars usually leads to crystallization of salts in bricks, what causes efflorescence. After a few years, in places where efflorescence appeared, surface damage follows. As a consequence of damage, water enters the wall interior. This observation turned my interests to research concerning material system of face walls. The main scientific aim of my research is preventing appearing of efflorescence on face walls. I developed of method for testing the face wall resistance

to driving rain. It was proposed an own method of evaluation of face wall resistance to rain water penetration in rainwater chamber, which has a possibility of controlling both amount of rainwater as well as wind pressure.

3. Names of the Group's Members, and Their Research Areas/Interest's

Kaczmarek Anna, anna.kaczmarek@utp.edu.pl

Durability and aesthetics of contemporary facing wall, preventing of efflorescence on facing walls, impact of the environment on durability and aesthetics of facing wall.

4. Leading Research Topic of the Group

- Compatibility of masonry material as a element conditioning mass transport.
- Influence of mortar properties on integrity of facing walls
- Influence of technological properties on the change structure of mortars formed in the joint.

5. Best Realizations of the Main Research Topic (Brief Characteristics or Destription)

In 2006 We started cooperation with the Lime Industry Association, resulting in execution of the project titled „Influence of mortar content on efflorescence appearing on face clinker walls". During this project a test field station was created in order to evaluate the long-term environment influence on face walls. During this project, there was created a field research station for evaluation of long-term environmental influence on face walls including eight different test walls. This station enabled observation possibilities for efflorescence evolution depending on their mortar content in different wall areas, evaluation of wall shape impact on efflorescence intensity, microstructure changes in clinker and mortars, resulting from long-term exposition to climate in Bydgoszcz.

6. General Expression of Interests

Building Physics, mass transfer in facing wall

7. Specific Interests and Additional Topics of Extended Interest

- Durability and aesthetics of contemporary facing wall.
- Preventing of efflorescence on facing walls
- Impact of climate on durability and aesthetics of facing wall.
- Integrity of masonry

8. Other Important Characteristics of the Group

The Group has "Laboratory of Advanced Research of Materials, Heat and Mass Flow Processes":

(1) Station for evaluation of building material microstructure, equipped with mercury porosimeter for definition of: total pore volume, pore size distribution, percentage porosity, density, transport properties, pore sinuosity, compressibility and other pore measurements with diameters within 0,003÷360µm.

(2) Station for research of thermal and humidity properties, equipped with climate chamber for evaluation of sorption properties and preparation of samples for tests in assumed humidity conditions, TCA 300 DTX apparatus for definition of thermal

conductivity within the range of λ= 0,01÷1,0 W/mK, a dryer and scale-dryer for evaluation of humidity and dynamics of building material drying.

(3) Station for research of building materials durability (thin layer plasters, paint coatings, rolled materials), equipped with a QUV test chamber simulating stimulated destructive action of sunrays on various materials. The chamber has an additional options for water shower and water condensation on samples.

(4) Station for tests of wall resistance to driving rain – custom-made test chamber simulating conditions corresponding to situation of violent rain with wind pressure characteristic to Polish climate zones, enabling to evaluate tightness of elevation layer, compatibility of material sets, technological correctness of solution.

(5) Station for computer simulation of building partitions and their junctions equipped with simulation programs for heat-humidity analysis of partitions in Polish climate conditions (WUFI Pro 5, WUFI 2D)

(6) Station for field research, equipped with a plate apparatus for partition thermal parameter measurements with heat flux density sensors.

9. Main Group's Achievements

- Determining the optimum solution of substrate with contact of facing walls.
- Demonstration of clinker microstructure changes depending on the type of mortar after prolonged influence of the external environment.
- Method for microstructure homogeneity, consisting in comparison of microstructure of mortar formed in standard beams and mortar formed in the joint of aggregated samples
- Testing the face wall resistance to driving rain
- Compound of mortar which creates joints characterized with high susceptibility to water penetration into face wall interior

10. Best Selected Publications and/or Other Relevant Accomplishments

(1) Kaczmarek A. Wesołowska M. The microstructure of selected mortars undergoing long-term influence of external environment. Procedia Engineering 161 (2016), s.931-936, http://dx.doi.org/10.1016/j.proeng.2016.08.569.

(2) Kaczmarek A., Wesołowska M.: Selected Factors Determining Appearing of Efflorescences on Facial Walls. Materials Science Forum, Vol. 865, s.183-189 doi:10.4028/www.scientific.net/MSF.865.183 Online: 2016-08-10. © 2016 Trans Tech Publications, Switzerland.

(3) Wesołowska M., Kaczmarek A.,: Changes of Clinker Microstructure After Long-Term Influence of External Environment. Procedia Engineering 161 (2016), s.: 337-342, http://dx.doi.org/10.1016/j.proeng.2016.08.569

(4) Wesołowska M.: Influence of selected mortars on the integrity of facing walls. Brick and Block Masonry. Trends, Innovations and Challenges, red. C. Modena, F. da Porto & M.R. Valluzzi, Taylor & Francis Group 2016, s.581-587.

(5) Wesołowska M., Kaczmarek A.: Efflorescence formation on external masonry walls – a long-term exposure study Brick and Block Masonry. Trends, Innovations and Challenges, red. C. Modena, F. da Porto & M.R. Valluzzi, Taylor & Francis Group 2016, s. 575-580.