NATIONAL
UNIVERSITY OF PUBLIC SERVICE
Doctoral Council

AUTHOR'S PRESENTATION OF DOCTORAL (PhD) DISSERTATION

GERGŐ ÉRCES

doctoral (PhD) author's presentation and official referee's reports
of doctoral (PhD) dissertation titled:

Possibilities of Fire Protection Development of Buildings by Analyzing the Real Interaction of Complex Fire Protection Elements with Engineering Methods

Budapest
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Possibilities of Fire Protection Development of Buildings by Analyzing the Real Interaction of Complex Fire Protection Elements with Engineering Methods

Consultant:

Dr. László Bérczi BG., PhD.

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THE FORMULATION OF THE SCIENTIFIC PROBLEM

1. Modern fire protection used today does not fully cover the entire life cycle of a building by taking into account the effects that fire prevention – firefighting – fire investigation have on each other. We do not systematically deal with Life Cycle Assessment (LCA), as a result of which heterogeneous fire protection is fragmented both in space and time, forming white spots in the field of fire safety.

The fire protection concept created during the design phase of a building does not consistently follow the dynamically changing circumstances neither over time, nor in terms of the human, the fire, or the basic factor of the building, which can lead to an unstable equilibrium of fire protection. We do not create a comprehensive lifecycle concept in the case of the given building.

In addition to the above-mentioned temporal differentiation, the actors of fire protection also appear in a strongly dispersed manner and in varied composition, which does not always cover the necessary fire protection needs in the current life cycle phase. Due to spatial and temporal differentiation, one or more values of the building – human – fire triangle, which is a fundamental factor of fire protection, can also be pushed to the extreme, which may result in a fire.

2. Nowadays, in addition to traditional fire protection design, we increasingly use so-called engineering methods, but these are mostly computer-aided, software-assisted designs, which typically do not handle, and in many cases, hinder the development and long-term sustainability of complex fire protection. Based on my professional experience and on my research, a significant part of today's engineering methods does not form part of a comprehensive fire protection concept that provides complex solutions, does not necessarily make a way for design decisions, does not reflect a use-oriented approach, but prepares the implementation of technical solutions more favorable than the requirements of NFPC.

3. Fire protection planning, authority and administrative procedures of fire protection are carried out in virtual space. Administration is typically carried out electronically, which takes place in the form of an e-administration within the digital state. However, the procedures consist of static elements, and although they use the advances of technology, they do not use the potential in them. In addition to authority and administrative procedures, they do not add value to firefighting, and do give feedback about findings or information of the field of fire investigation.

The actors of fire protection only know static results, which in extreme cases can be as many as many actors are involved in a process. Opportunities coded in electronic systems are not exploited neither by the members of the civil society, nor by members of the professional society. No smart buildings are created in a complex way from a fire protection point of view, which would be a higher level of fire safety, even though the capability is integrated in applications. PDF, PDF/A file formats are not suitable for tracking dynamic changes; in the long run they need to be subjected to thematic modification in many cases, which, in my experience, does not take place in most of the times.

Based on the author's many years of experience, neither the professional nor the civilian fire protection actors have the required degree and number of required fire engineering competences in terms of quality.

RESEARCH OBJECTIVES

1. The author analyzes the role of fire protection actors in fire protection, and their role in the legislative procedure. Analyzes critical locations and times that can be identified throughout the complete lifecycle of heterogeneous fire protection. Examines the ways in which a building's full life-cycle fire protection concept can be set up by analyzing the fire protection life-cycle of buildings. Furthermore, examines the equilibrium states of the fire protection situation of buildings, looking for correlations based on extreme values in order to achieve the set-up of a stable equilibrium state.

2. Examines the engineering and design methods that can be used with the help of computer-aided design in accordance with current legislation. Analyzes the adaptation of aggregated computer-aided design options and applicable software to the fire protection area. By building a virtual building with building information modeling, examines the balance of the building's fire protection situation by testing simulations based on innovative engineering methods. Compares the PDF/A version design created with the CAD software, with the BIM based IFC file extension design. Performs a real measurement experiment during an evacuation drill. Makes calculations for the planned virtual model on the basis of the relevant Fire Protection Technical Guidelines, in accordance with the requirements of the NFPC. Using a qualitative method (questionnaire), performs a deep analysis of the quality of the above quantitative results to verify the appropriateness of innovative engineering methods by comparing the measured, computed and computer simulated results.

3. Examines the order of the Hungarian fire protection authority and administrative procedures, the relevant systems of e-administration. Analyzes the potential of innovative fire protection systems of intelligent buildings created by innovative engineering methods, and how to develop a fire safety net. By defining the structure of a fire safety net, examines its integration into smart buildings and, in an extended way, its integration into smart cities. By analyzing authority and administrative fire protection procedures and putting them into smart systems, analyzes the developmental potential of fire protection aspects of the e-administration within the digital state.

RESEARCH HYPOTHESES

1. Assumes that by developing a comprehensive fire protection concept covering the entire life cycle of a building, an equilibrium of the fire protection status of buildings can be established by taking the basic building-man-fire parameters into consideration. According to his hypothesis, by analyzing the spatial and temporal effects heterogeneous fire protection actors have on each other throughout the whole life cycle, a complex fire protection can be developed with the application of modern electronic systems.

2. According to his assumption, instead of the so-called engineering methods utilized in the field of architectural fire protection today, with new, scientifically based, complex, use-oriented innovative engineering methods endowed with building information modeling and algorithmic design methodology, a more advanced, safer, sustainable complex fire protection can be created, which can be dynamically changed to meet social needs.

3. Based on his assumption, a virtual reality can be created by creating a stable fire equilibrium situation that extends over the entire life cycle of a smart building built with innovative engineering methods. He assumes that by using virtual reality, we can create a fire protection net that allows actors to occupy the same space in real time. Furthermore, he assumes that by extending the fire protection network and integrating it into the disaster management system and smart cities, fire protection of the highest quality, the most effective design and the longest sustainability yet can be achieved.

RESEARCH METHODS

In the development of content chapters, in line with the author's research plan, the following specific research methods are used:

a) Prepares a summary study based on the analysis of relevant national and international literature as well as his professional experience for the building fire protection net, and its version which is extended to smart buildings and cities.

b) Evaluates and organizes domestic and international legal regulations and relevant l literature.

c) Summarizes and compares the possibilities offered by engineering methods with the procedures of Hungarian fire protection authorities and administration.

d) Designs and virtually creates a BIM-based experimental nursery building with CAD software, and documents it in PDF/A and IFC file formats for comparative analysis.

e) Makes a measurement during a real-time evacuation drill executed with people of limited escape capabilities to analyze the evacuation.

f) Executes an evacuation calculation which is defined by the NFPC and based on FPTC requirements in order to verify the evacuation of the given experimental building, and to perform further analysis.

g) Imports the model of the virtual BIM experimental building into a computer-assisted simulation software, where he examines possible ways of use, and performs a simulation experiment to analyze the evacuation.

h) Evaluates the possibilities of BIM-based design and use by comparing the NFPC and FPTC-based, traditionally calculated on-site measured results with results of evacuations imitated by a computer simulation.

i) Applies a qualitative research method to improve the quality of the results obtained by quantitative methods. Asks the parents of preschool children through a non-representative questionnaire method about the most likely behavioral patterns their child would show during an evacuation or an escape.

j) The results of the qualitative method are modeled in another simulation in the virtual BIM model in order to obtain the most realistic result.

k) Carries out a summary and comparative analysis based on the measured results to form a new methodology for the developmental possibilities of fire protection development, and to define its tools.

l) Analyzes the implementation of the fire safety net, which can be created with the innovative engineering methods tested and developed by the methods above, on smart buildings, as well as the directions of its possible extension to smart cities.

BRIEF DESCRIPTION OF THE STUDY CARRIED OUT BY CHAPTERS

In the **first chapter** of the dissertation, the author analyzed the role of fire protection actors in fire protection and their roles in the legislative procedure. Has analyzed critical locations and times that can be identified throughout the life cycle of heterogeneous fire protection with Life Cycle Analysis. Analyzed through deduction the ways to create a fire protection concept for a building's entire life cycle by analyzing the fire protection life cycle of buildings. Based on analytical and evaluative research work, he drew the characteristics of the equilibrium state of the fire protection of buildings, identifying a relationship between the critical states of extreme values. Has developed a proposal for the realization of a long-term sustainable fire protection concept that is based on life cycle analysis.

In the **second chapter**, he examined and summarized the possible engineering and design methods which can be used with the help of computer-aided design, based on the current legislation. In the framework of a CAD-based process, by design method he analyzed the adaptation of aggregated computer-aided design options and applicable software to the fire protection area. By creating a virtually built 3D experimental building model, made with building information modeling, he examined the balance of the fire protection situation of the building by testing simulations based on innovative engineering methods. In the framework of a comparative analysis, he evaluated the PDF/A file design version of the CAD software, and the plan version created as a BIM-based IFC file. He made a real measurement experiment during evacuation drills. In accordance with the requirements of the NFPC, based on the relevant FPTC, he made manual calculations for the planned virtual model. Using a qualitative method (questionnaire), he carried out a deep analysis of the quality of the above quantitative results in order to prove the adequacy of innovative engineering methods by comparing results measured in practice with calculated and computer-simulated results. With a SWOT analysis he analyzed the characteristics of the new, innovative engineering method.

In the **third chapter** of the dissertation, the author examined and summarized the order of the Hungarian fire protection authority and administrative procedures and the relevant systems of e-administration from an engineering point of view. He analyzed the potential of new, innovative systems of smart buildings with intelligent fire protection systems. He elaborated the way to develop the fire protection net. By defining the structure of the fire protection net, he examined its integration into smart buildings and, in an extended way, its integration into smart cities. By analyzing procedures of fire protection authorities and administration and putting them into smart systems, he analyzed the possibility of developing the fire protection aspects of e-administration within the framework of the digital state. He has developed a proposal for the use of the fire protection net in the authority and administrative fire protection system of disaster management.

SUMMARIZED CONCLUSIONS

1. In the field of the development of a use-oriented, heterogenous fire protection concept that covers the entire life cycle of buildings, handles building fire-protection equilibrium and uncovers time units critical to fire protection units:

1.1. By organizing the fire protection actors in the civil and professional spheres, the spatial and temporal role of the actors involved in fire protection can be identified, which can be integrated into the fire protection life cycle analysis of buildings.

1.2. With a fire protection life cycle analysis integrated into the known general life cycle analysis of buildings the critical time intervals and critical locations of the fire protection situation can be identified and explored by examining actors of fire protection heterogeneous in space and time.

1.3. The author has identified and defined the methodology of life cycle analysis of a building for fire protection purposes, with which he has complemented the broad method of building life cycle analyses, typically used for energy purposes.

1.4. With the knowledge of critical places and time intervals, and with the introduction of the building-man-fire parameters the equilibrium state of the fire protection situation of the given building can be set up and predicted.

1.5. The author adapted the factors of the equilibrium state of the fire protection situation, and by defining the building-man-fire parameters, he was able to identify the fluctuations of the

equilibrium states of the fire protection situation towards the extreme values, i.e. the values of stable and unstable equilibrium states.

1.6. On the basis of sections 1.1-1.5. the author has proven that a comprehensive, use-oriented fire protection concept in a steady fire protection equilibrium state can be developed, covering the entire life cycle of buildings, for which he drew the basic methodology of its design. (Scientific result No.1)

2. In the field of the research of the methodology of computer software aided innovative architectural fire protection engineering design in accordance with relevant fire protection regulations:

2.1. The author has proved that the current use of so-called engineering methods in the field of fire protection does not handle the implementation of a comprehensive fire protection concept in a complex way, covering the entire life cycle of buildings. In many cases, engineering solutions are used to develop sub-tasks in a more specific way, typically more favorably than the relevant fire protection regulations, which causes the unified fire protection concept of some buildings to capsize.

2.2. Fire protection parameters required by the relevant fire protection legislation can be implemented and designed in a virtual model with the practical application of 3D capable, computer-aided, CAD-based Building Information Modeling (BIM), a designing and modeling software.

2.3. By using validated and verified fire engineering techniques entirely as a BIM model, evaluating and creating databases for the actual interactions of fire prevention-firefighting-fire investigation, and implementing use-oriented design methodologies they can produce more accurate results when designing, compared to currently used engineering techniques that are widespread.

2.4. Specially use-oriented application of software for assisting general fire protection engineering design, i.e. with the creation of databases based on qualitative analysis of quantitative results by a deeper quality analysis, a fire protection and reality-like modeling of unique architectural spaces can also be implemented with simulation processes.

2.5. Dynamically usable models with BIM-based fire protection requirements allow the use of fire protection algorithms that allow complex algorithmic design in the fire protection planning process.

2.6. On the basis of sections 2.1-2.5. the author has proven that with the use of dynamically manageable BIM models which are coded with algorithmic fire protection parameters and uniquely made with computer-assisted, validated, certified fire simulation software, a more precise, traceable, more transparent, and thus better quality, therefore from a fire protection point of view of a safer innovative method of engineering can be developed than the current engineering processes. (Scientific result No.2)

3. In the field of the innovative order of domestic fire protection authority and administrative procedures within the framework of the digital state and the relevant systems of e-administration, as well as the fire safety of smart buildings created by innovative engineering methods, the development of a network of fire protection in innovative systems, and in the research of the inclusion of smart cities in the program:

3.1. Using the innovative engineering method, long-term sustainable fire safety can be achieved for the entire life cycle of buildings, and the design information of this plan can be ported and dynamically transformed throughout the entire usage period.

3.2. Fire protection information encoded in BIM-based dynamic models created with innovative engineering techniques can be used to create smart buildings that are intelligent from a fire protection point of view, and have a new higher level of fire safety than the current one with a more comprehensive fire safety quality.

3.3. By creating a stable fire equilibrium situation complexly extended for the entire life cycle of a building that is smart from a fire protection point of view, a virtual reality can be created. With the electronic use of this virtual reality, a fire protection net can be set up.

3.4. In order to achieve an efficient, effective and long-term sustainable complex fire protection based on an engineering approach that meets the demands of the age, a high level of professional, university level training of fire engineers in both civil and professional fire protection fields is required.

3.5. The sum of virtual-based information equipped, 3D displayable, smart buildings created in the framework of the digital state, which form sensor equipped spaces, together with the 3D rendering of open spaces creates smart cities to which the fire net can be expanded, providing a new complex fire protection, fire prevention-firefighting-fire inspection, with the highest quality, most effective design and longest-term maintenance known to date.

3.6. Based on sections 3.1-3.5. the author concluded that the actors in the fire protection net with the appropriate fire protection engineering competence occupy the same space (virtual

reality) in real time, as a result of which a new, higher-quality fire protection can be created in the areas of design, execution, use, authority and administrative procedures, which can be integrated into today's comprehensive disaster management system. (Scientific result No.3)

NEW SCIENTIFIC RESULTS

Based on the hypotheses and objectives of the dissertation, the author **proposed the acceptance of the following new scientific results:**

1. He **discovered** that during the general life cycle analysis of buildings, the **life cycle analysis process of fire protection**, which is based on the analysis of the triple extreme values of building - human - fire parameters, is a useful tool for creating a **comprehensive, use-oriented fire protection concept**. He has proven that the process contributes to ensuring the fire safety status and **long-term sustainability** of a particular building.

2. He **made a specific proposal** for the use of 3D, BIM-based, **innovative engineering methods** in the field of development and expansion of **fire protection technical guidelines** in compliance with the requirements of existing **fire protection regulations**. He also **proved** that the **innovative engineering methods** he proposed could be used successfully in algorithmic, use-oriented fire protection design in the case of the technical support of advanced fire protection engineering.

3. **Demonstrated and deduced** that the fire **protection net** that possesses dynamic building information by design along with the ability to collect information, create databases, and provide real-time information in a virtual environment, used in smart buildings and its extension on smart cities, along with the integration of smart cities into the program, serves the **high quality, long-term sustainable design of fire protection**. He has **proved and demonstrated** that the process can be adapted to be used by business organizations **for optimal operation of buildings**, as well as to support the **authority and administrative fire protection activities** of professional disaster management bodies.

RECOMMENDATIONS OF THE DISSERTATION

The author makes the following recommendations to the legislators and the measure users, the actors of complex fire protection for the use of the conclusions and scientific results of the dissertation:

1. In the general life cycle analysis of buildings, the life cycle analysis method for fire protection, based on the analysis of the extreme values of the building - human - fire triple

parameter, provides a useful method for creating a comprehensive, use-oriented fire protection concept which serves fire safety as the basis and the foundation for the fire protection situation and long-term sustainability of a given building.

2. The application of 3D, BIM-based, innovative engineering methods can be utilized in the field of development and expansion of fire protection technical regulations within the framework of the effective fire protection regulations, and it provides a useful method in algorithmic, use-oriented fire protection planning, primarily in the implementation of fire protection engineering activities to meet modern needs.

3. The fire protection net that possesses dynamic building information by design along with the ability to collect information, create databases, and provide real-time information in a virtual environment, used in smart buildings and its extension on smart cities, along with the integration of smart cities into the program, serves the high quality, long-term sustainable design of fire protection both for civilian use, the operation of buildings, and for the authority and administrative fire protection activities of professional disaster management bodies.

THE PRACTICAL APPLICABILITY OF THE RESEARCH RESULTS

The author recommends using the results of his research as follows:

1. The different parts of the dissertation can be used in the fire engineering processes and design, they form the basis for the development of technical processes based on engineering approach.

2. The conclusions and results of the dissertation can be used in the authority and administrative fire protection procedures of disaster management, integrated into the e-administration system.

3. Certain parts of the dissertation may be used in the preparation and revision of the fire protection technical guidelines, which serve as a principle and as a possible method for planning.

4. Some conclusions and results of the dissertation can be applied, primarily from the point of view of fire protection, in the elaboration of the BIM-based design methodology, the timely elaboration of its standardization procedure.

5. Different parts of the dissertation can be used in connection with the use of buildings, applications of building management systems, reviews, maintenance and periodic inspections.

6. During the implementation of the smart cities program, smart fire protection, a factor appearing as one of the pillars of general security can use the conclusions and results of the thesis.

7. The dissertation - after editing - is suitable for use as an educational material in the field of higher education, BSc, MSc level fire engineer training.

LIST OF PUBLICATIONS PREPARED BY THE PHD CANDIDATE RELATED TO THE TOPIC OF THE THESIS

LECTURED BOOK, APPLICATION, NOTE

Book chapter

[1] Érces G.: *Otthon jellegű létesítmények tűzvizsgálata*, In: Érces G., Kiss R., Nagy L. Z., Restás Á., in: Restás Á. (Szerk.) *Alkalmazott Tűzvizsgálat I*., Budapest: Dialóg Campus Kiadó, 2017. pp. 200., ISBN: 978-615-5680-26-7.

Material accepted for international or national scientific applications (study)

[2] Érces G.: *A komplex tűzvédelem vizsgálata mérnöki módszerekkel történő tűzvizsgálat alkalmazásával* pp. 40-59., In: Kátai-Urbán L., Horváth H., Ronyecz L. (szerk.) Konferencia kiadvány „Katasztrófavédelmi díj" Tudományos konferencia 2015. c. tudományos rendezvényen elhangzott előadásokhoz, Budapest, BM OKF, 2015, pp. 112. (1st prize)

[3] Érces G.: Tűzvédelmi háló, *Védelem Tudomány*, I. (4) 2016., pp. 472-496. (1. díj.)

[4] Érces G.: Katasztrófavédelmi háló, *Rendvédelem Tudományos Folyóirat* (on-line), VII. 1. (2018), pp. 68-102. (special award)

In a foreign, foreign language journal

[5] Érces G. – Restás Á.: Importance and procedure of building life cycle assessment, *Ecoterra: Journal of environmental research and protection* 14:(2) pp. 2-9. (2017)

[6] Érces G., Restás Á.: The Assessment of the Buildings Life Cycle in the view of Fire Protection, *Zeszyty Naukowe SGSP*, 2017, 61: (1) pp. 57-69.

In a foreign language journal published in Hungary

[7] Érces G. - Bérczi L. - Rácz S.: The effects of the actively used reactive and passive fire protection systems in the view of buildings LCA with innovative fire protection methods, *Műszaki Katonai Közlöny*, XXVIII. 4 pp. 47-58. (2018)

In a standard journal in Hungarian

[8] Érces G.: Épületek életciklus elemzése a tűzvédelemben, *Műszaki Katonai Közlöny*, XXVI. (2) 2016., pp. 221-232.

[9] Érces G., Bérczi L.: A 2017. évi tűzvizsgálati eljárások tapasztalatainak összegzése a mérnöki és kriminalisztikai alapokon nyugvó módszerek értékelésével., *Védelem Tudomány*, III. (1) 2018. pp. 1-19.

[10] Érces G.: Aktívan alkalmazott passzív tűzvédelmi rendszerek hatása az épületek tűzvédelmi életciklusában, *Védelem Tudomány*, I. (4) 2016. pp. 13-29.

[11] Érces G.: Az aktív és a passzív rendszerek megbízhatósága I., *Védelem Tudomány*, III. (2) 2018. pp. 1-22.

[12] Érces G.: Az aktív és a passzív rendszerek megbízhatósága II., *Védelem Tudomány*, III. (3) 2018. pp. 1-22.

[13] Érces G., - Vass Gy.: Veszélyes Ipari Üzemek Tűzvédelme Ipari Üzemek Fenntartható Tűzbiztonságának Fejlesztési Lehetőségei a Komplex Tűzvédelem Tekintetében Műszaki Katonai Közlöny XXVIII. 4 (2018) pp. 2-22.

[14] Érces G. - Komjáthy L.: Mérnöki módszerek szerepe a felszín alatti vasútvonalak tűzvédelmi helyzetének alakulásában, Hadmérnök XIII. 4 (2018), pp. 190-198.

NON-LECTURED PROFESSIONAL ARTICLES

Hungarian article

[15] Érces G., Restás Á.: A komplex tűzvédelem fejlesztése – mérnöki módszerek a tűzvizsgálatban, *Védelem – Katasztrófa – Tűz – és Polgári Védelmi Szemle*, 2016, 23: (1) pp. 19-23.

ISSUED IN THE PUBLICATION OF AN INTERNATIONAL PROFESSIONAL CONFERENCE

Lectured foreign language lecture

[16] Kátai-Urbán L., Érces G., Sibalin I., Vass Gy.: *Risk assessment in the field of disaster management in Hungary*, In: Branko Savic (szerk.) 13. МЕЂУНАРОДНО САВЕТОВАЊЕ РИЗИК И БЕЗБЕДНОСНИ ИНЖЕЊЕРИНГ ЗБОРНИК РАДОВА. Konferencia helye, ideje: Kopaonik, Szerbia, 2018.01.09-2018.01.11. Novi Sad: Visoka Technicka Skola (VTS), 2018. pp. 340-345. (ISBN:978-86-6211-112-8)

[17] Érces G. – Restás Á.: *Infocommunication Based Development Opportunities in the System of Complex Fire Protection*, In: Branko Savić, Verica Milanko, Mirjana Laban, Eva Mračkova, Restás Ágoston, Branka Petrović (szerk.) Book of Preceedings: МЕЂУНАРОДНА НАУЧНА КОНФЕРЕНЦИЈА БЕЗБЕДНОСНИ ИНЖЕЊЕРИНГ. 530 p., ISBN:978-86-6211-106-7

ISSUED IN THE PUBLICATION OF A NATIONAL PROFESSIONAL CONFERENCE

Foreign language lecture

[18] Érces G.: Engineering methods in fire investigation, *Védelem Tudomány*, I. (2) 2016., pp. 74-92.

Hungarian lecture

[19] Érces G., Restás Á.: *Komplex tűzvédelem mérnöki módszerekkel* pp. 152-156., In: Restás Á., Urbán A. (szerk.) Katasztrófavédelem 2015, Budapest, BM OKF, 2015, pp. 192.

[20] Érces G., Restás Á.: *Épületek tűzvédelmi életciklus elemzése* pp. 122-127., In: Restás Á., Urbán A. (szerk.) Tűzoltó Szakmai Napok 2016, Budapest, BM OKF, 2016, pp. 186.

THE DOCTORAL CANDIDATE'S PROFESSIONAL AND ACADEMIC BIOGRAPHY

Name: Gergő Érces

Place of birth, date: Budapest, 23 August, 1984

Studies:

In 2003, he began his university studies at the Faculty of Architecture of Budapest University of Technology and Economics with a five-year undivided training, where he earned a university degree in 2009 as a certified architect.

In 2011, he earned a postgraduate degree as Fire Protection Engineer at the Fire and Disaster Management Institute of Szent István University's Ybl Miklós Faculty of Building Science.

in October 2018, he earned a degree from the National Public Service University's Military Technical Doctoral School, and in November 2018, he proposed a thesis draft which was unanimously recommended by the 17 people with PhD degrees present in the workshop for further process with minor, non-substantial changes, and without further workshop discussions.

In 2013, he became a dangerous goods delivery agent (ADR, RID), and in 2015, he obtained an NQR qualification in pyrotechnic warehouse management and product management.

Language skills:

During his high school studies, he took a 'C' type language exam in English and German.

Professional career:

As of September 2009, he served as a public servant at the Department of Real Estate Maintenance of the Municipal Fire Department.

Between January 1, 2010 and March, 2012, he was a key executive as a professional firefighter at the Fire and Intervention Analysis Department of the Municipal Fire Department.

Between March 2012 and November 2017, he was a key executive of fire prevention at the Department of Public Administration of the Budapest Disaster Management Directorate.

Since November 2017, he has served as an Assistant Professor at the Department of Fire Protection and Rescue of the National University of Public Service's Institute of Disaster Management.

Awards, recognitions:

In 2015, with his scientific work, he won the first prize of the Disaster Prevention Award 2015 in the Fire Protection section.

In 2016, he won the first prize at the national scientific competition, the Dr. Imre Balogh Memorial Contest, with his work entitled ’Fire Protection Net’.

In 2017, he won a special prize with his study, the ’Disaster Management Net’ in the competition entitled ’The Challenge of the New Millenium - Digital, Infocommunicational Skills’, announced by the Scientific Council of Home Affairs.

Budapest, 30 January, 2019

Gergő Érces maj.