ERGO FIREFIGHTER – ASSESSMENT OF COMFORT AND ERGONOMICS OF PROTECTIVE CLOTHING FOR FIREFIGHTERS VS. NORMATIVE REQUIREMENTS IN VARIOUS EUROPEAN COUNTRIES

BACKGROUND
As firefighters are considered to be one of the most dangerous professions, an appropriate and comfortable protective clothing is essential. Working in a fire environment in unnatural conditions requires a highly specialised protective clothing. The firefighter personal protective clothing is designed to ensure protection against a number of factors, inter alia: damp, low and high temperatures, flame, and (at the basic level) against the effects of hazardous chemicals, biological contamination and mechanical injury (Rogulski et al., 2016). Therefore, appropriate materials must be used to provide such a thorough protection.

In order to protect not only others, but also themselves, firefighters must be fully concentrated on their tasks, otherwise they run a risk of making mistakes during a firefighting operation. The optimal conditions for such type of work could be ensured by the so-called thermal comfort, characterized by a thermally neutral state of the body. Firefighters may be more prone to mistakes when feeling a lack of thermal comfort.

Tochihara et al. (2005) reported that 48.7% (of a questionnaire study on 792 firefighters) had experienced a feeling of being very ill because of the heat during the previous summer. The frequency of heat illness rose as the protective clothing scored lower in terms of heat, dampness, and weight. Huang et al. (2012), according to a survey conducted among 1201 firefighters, reported that a large percentage of firefighters experienced a mobility discomfort during firefighting actions. 45% of respondents were recorded for the experience of overheating during firefighting, a small percentage of firefighters experienced a firefighter protective clothing (FPC) crack and suffered a burn, whilst the largest group - 59% of respondents complained about being “excessively hot while wearing FPC at work”. In conclusion, firefighters were generally unsatisfied with their protective clothing.

Therefore, a pressing need has been identified to address the issue of the firefighter thermal comfort perception.

References:
OBJECTIVES
- Assessment of subjective perception of thermal comfort, physiological strain and ergonomics among firefighters wearing protective clothing in various European countries, based on literature research
- Analysis of potential smart wearable solutions to be applied in the protective clothing intended for firefighters in order to improve their safety and comfort
- Analysis of the requirements that must be met by the firefighter protective clothing in different countries in Europe. A summary of fabrics used for an optimal thermal performance of the clothing

TARGET GROUPS
Researchers, stakeholders, professionals in OSH, manufacturers

DELIVERABLES
- Final report (also an interim report or short report in the participants’ national languages);
- Brochure (brief summary) to be distributed among manufacturers, firefighters and policy makers;
- Publication in high impact factor journals

RESEARCH METHODS
- Comprehensive literature study regarding the assessment of subjective feelings about thermal comfort of firefighters and ergonomics of protective clothing for firefighters
- Comprehensive literature study regarding normative requirements for firefighters’ clothing in European countries
- Summary of the results about subjective feelings and normative requirements.

SCIENTIFIC RELEVANCE
The analysis and a list of solutions in use will allow for a broader view on the problem of thermal discomfort of firefighters during activities carried out in a special clothing. They can also contribute to aligning the requirements for special clothing for firefighters throughout Europe.
Moreover, further research directions on smart wearable solutions for firefighters’ protective clothing will be indicated, taking into account firefighters’ needs, normative requirements, as well as safety aspects regarding predicted utility conditions.

PRACTICAL AND SOCIETAL RELEVANCE
- Increased knowledge on the problem of thermal discomfort perception by firefighters during rescue operations.
- Alignment of clothing requirements for firefighters in Europe.
- Increased awareness of the influence of the fabric, materials and smart solutions used in special clothing for firefighters on thermal comfort of firefighters and ergonomics of their protective clothing.

PROJECT LEADER
Central Institute for Labour Protection – National Research Institute (CIOP-PIB)
Magdalena Młynarczyk (m.mlynarczyk@ciop.pl)

PROJECT PARTICIPANTS
Finnish Institute of Occupational Health (FIOH)
Sirkka Rissanen (sirkka.rissanen@ttl.fi) and Kirsi Jussila (kirsi.jussila@ttl.fi)
Instituto Nacional de Seguridad y Salud en el Trabajo (INSST)
Manuel Gómez Martín (mgomezm@inssbt.meyss.es)