UNIVERSITY OF ŽILINA

TRANSCOM PROCEEDINGS 2015

11-th EUROPEAN CONFERENCE OF YOUNG RESEARCHERS AND SCIENTISTS

under the auspices of

Tatiana Čorejová
Rector of the University of Žilina

SECTION 9

SECURITY ENGINEERING
FORENSIC ENGINEERING

ŽILINA June 22 - 24, 2015
SLOVAK REPUBLIC

Edited by Veronika Oriešková, Michal Mokryš

ISBN: 978-80-554-1051-7
ISSN of Transcom Proceedings CD-Rom version: 1339-9799
ISSN of Transcom Proceedings online version: 1339-9829
(http://www.transcom-conference.com/transcom-archive)

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11th European conference of young researchers and scientists

TRANSCOM 2015, the 11th international conference of young European scientists, postgraduate students and their tutors, aims to establish and expand international contacts and co-operation. The main purpose of the conference is to provide young scientists with an encouraging and stimulating environment in which they present results of their research to the scientific community. TRANSCOM has been organised regularly every other year since 1995. Between 160 and 400 young researchers and scientists participate regularly in the event. The conference is organised for postgraduate students and young scientists up to the age of 35 and their tutors. Young workers are expected to present the results they had achieved.

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TRANSCOM 2015, 22-24 June 2015
University of Žilina, Žilina, Slovak Republic

Research Bases of Fire Risks

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Abstract. The authors describe the factors that affect the origin of the fire risks in terms of the cause, with regard to three conditions of the onset of fire, i.e. the oxidant, fuel and initiator. The paper is aimed to identify any risk of fire in terms of source of risk. The source of risk is mainly the human factor and other environment factors. The article proposes measures to reduce the identified risks.

Keywords: Fire risk, quantification, risk analysis.

1. Introduction

Fires occur in a particular environment (area), but the environment itself does not always cause the fire. The human factor is an important factor which causes fire. Therefore, the authors have decided to identify the risks.

2. The factors influencing the risk of fire

In everyday life people face multiple risks. The occurrence of risk in a particular environment is usually associated with negative impact on human, property or the environment. The fire risk is no exception. If it occurs with a certain probability in an environment (forest, enclosed space – house, office), then it has a negative impact (injuries or death, damage of property or environment).

In order to identify the fire risks, the risk factors affecting the actual fire must be determined. After studying the topic the authors agreed on two factors which have major impact on fire risks – human (anthropogenic) and environment (non anthropogenic) factor (see Fig. 1.) [13, 14, 15, 16]. Human factor can cause fire ignition or fail to prevent fire ignition and fire growth. For this reason, there are cases of fire ignition even in places where they would probably never occur if there were no human factor. The environment factor consists of set of characteristics such as the availability of the fuel (material), initiator, oxidant [8]. Also the mutual interaction of factors is the determinant of fire risk [9]. Thus the fire ignition is affected primarily by the human factor and secondarily by the environmental factor.

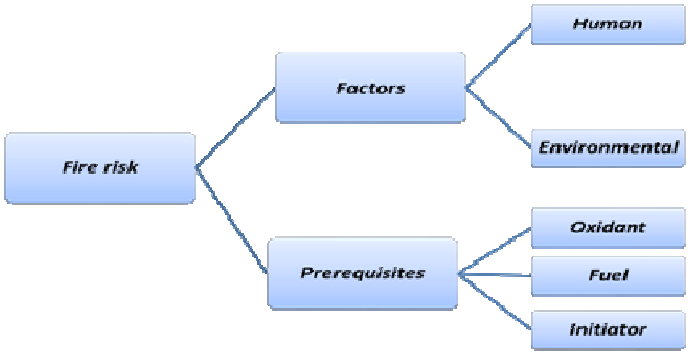

Fig. 1 Factors affecting fire risk

Human factor affects the fire initiation deliberately and also unintentionally [3]. Unintentional fires are caused by [13, 14, 15, 16]:

- negligence – failing to keep matches out of children's reach, neglecting regulations for electrical or gas wiring and equipment installation etc.,
- carelessness – incorrectly handling the open fire, burning dry vegetation, setting up fireplaces in the woods and close to them, violations of safety in industrial sites, carelessness in the use of electrical devices, placement of heating devices on combustible materials, improper storage of flammable substances especially in households near chimneys or heaters, smoking or other careless human behaviour,
- ignorance – inconsistent training of employees, employers, low public (citizens) awareness, lack of interest and others.

The environmental factor can significantly increase the fire risk, in particular with the parameters of the environment which may be affected by climatic changes – sharp rise in temperatures, periods of droughts, rainfall absence, airflow and others [10]. Of course the landform features and relief, the type and potential of the environment for fire risk can have significant impact on fire risk [3].

The initiation of fire is often influenced by the combination of the human and environmental factor. Of these two factors it is complicated to distinguish the one critical for the initiation of fire.

3. Identification of risks

Everyone's activity can cause a negative event. To prevent negative events, the identification of risks is necessary. In this case the risks will be identified from several points of view. The first division in terms of causes of fire risks is divided into two groups – human and environment. The authors will further subdivide the human causes of risks into the risks caused by natural persons and risks caused by juristic persons [20, 21].

Risks caused by natural persons include citizens and also employees. The identified risks within this group are [13, 14, 15, 16]:

- ignoring the laws of the Slovak Republic (unprofessionally set up electrical wiring and gas pipelines, burning garden waste, dry grassland etc.),
- infringement of the general principles of handling an open fire (in time, during the activity and in places of elevated fire ignition risk – leaving burning fuel (fireplace) unattended etc.,
- improper handling of hazardous substances (flammable, combustion-promoting substances or substances capable of initializing the fire),
- invasion of foreign substances into the natural environment (creation of landfill sites, increase of the range of possible initiators and other),
- inability to recognize the illegality of one's behavior (leaving the initiator in the reach of children, persons with special educational needs etc.),
- mishandling of combustible substances and combustion-promoting substances (prone to spontaneous combustion – biological, chemical, mechanical).

Risks can be caused also by juristic persons (municipalities and enterprises) [13, 14, 15, 16]:

- insufficient fire protection of premises [7],
- failure to ensure the qualification of employees in management of hazardous substances and while using personal protective equipment,
- neglect of duty in the municipal documentation concerning fire protection,
- lack of examination of the medical fitness and especially the mental ability of employees to execute specific activities (activities with increased fire risk),
- ignoring the verbal or written warnings of employees.

In order to identify the risks in terms of impact on the environment, the very concept of environment must be characterized. The authors of this paper will distinguish the natural and man-

made environment. Subsequently the identification of risks in terms of the influence of environment can be carried out, whereby the following will be included [3]:

- sudden change of environmental parameters (long periods of drought, sudden temperature changes, lack of rainfall, electrostatic discharge etc.) [11, 18],
- the nature of the environment as the availability and specificity of the properties of the fuel, oxidant, initiator (excessive concentration of fuel in a small area, ignition point of the fuel, excessive concentration of the oxidant, permanent availability of the initiator) [1],
- low ability of the environment to resist fire ignition (constructions made of flammable materials, monoculture in forests and others) [2].

4. Measures aimed to reduce the fire risk

Fire hazard is a problem not only in Slovak Republic, but also all around the world. The previous chapters identified the fire risks and discussed the factors affecting them. Identifying the fire risks is essential in order to propose and adopt measures aimed to reduce these risks. The quantification of the reduction of the probability of fire development by means of specific actions in Slovak republic is missing. The actual measures do not have the same effect in different situations and their effects on the decrease of the fire risk interact. Measures concerning the identified risks in terms of natural persons (citizens and employees) are [20, 21]:

- filing a complaint to municipal authorities about the violation of regulations in the field of fire protection,
- proposing the removal of the deficiencies in the field of fire protection on the premises belonging to juristic person,
- fulfilling the obligation of the natural person to report every occurrence of fire in the facilities belonging to juristic person or elsewhere,
- giving impetus to the rights protection authorities (police forces of Slovak Republic, judicatures etc.).

Fire risks can be decreased by taking the following measures within the municipalities. These measures are proposed within the scope of the risks identified in terms of the juristic persons (municipalities and enterprises) [6, 20, 21]:

- removing (reducing, limiting) one of the three factors which affect the formation of the fire risk itself,
- organizing, executing and evaluating the controls in the field of fire-control on the part of the municipalities, juristic persons (natural persons – entrepreneurs) and state-level fire surveillance,
- ensuring regular training of the enforcement officers and the employees of juristic person, mainly the members of fire patrol of the juristic person and natural person – entrepreneur, the fire patrol of the workplace and the assisting fire patrols,
- developing and updating the documentation of fire-control in the municipality and in the office,
- establishing and regularly training a voluntary fire brigade in the municipality.

Measures aimed to identify the risk in terms of the environment:

- predicting and monitoring sudden changes of the parameters of the environment,
- enhancing the ability of the environment to resist fire ignition (i. e. constructing the buildings of fire-resistant materials, improving the resilience of the forst stand by planting mixed forest stand) [4, 9],
- reducing the concentration of fuel and changing the type of fuel in the given area (adjusting the surface of the terrain, creating fire protection zones and others) [5],
- changing the parameters of the environment (installing fixed firefighting systems, decreasing the concentration of flammable gases and others) [6, 12, 19].

5. Conclusion

With the increasing numbers of the intervention of the human factor to the natural and also man-made environment there is a rise in the probability of fire ignition. Šimák also includes the fires caused by human factor to the most problematic category [17]. The presented paper concludes that there is a need to tackle this issue in more detail – in terms of municipalities, enterprises and also in terms of the citizens themselves.

The authorities, which supervise the compliance with obligations which ensue from the public statutes of the Slovak Republic, should focus mainly on controlling the execution of these responsibilities.

Acknowledgement

This work was supported by the Slovak Research and Development Agency under the contract No. APVV-0727-12.

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