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TECHNIQUE OF DETERMINATION OF CALCULATION SIZES OF FIRE RISKS ON PRODUCTIVE OBJECTS

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There are the problems of determining the estimated values of fire risk are considered in the article, accordingly to the method approved by the EMERCOM of Russia a different approach was proposed to determining the fire risk. The materials was used on the number of fires in the world and taking into account these data and a different approach to determining the quantities of fire risks, formula of dependence between the permissible value of the individual fire risk at the Federal Law № 123 and its estimated value were derived.

Keywords: *fire safety, fire risks, methodology, acceptable fire risk, social fire risk*

Present methodologies of determination of calculation sizes of fire risks suppose determination of sizes of fire risks on productive objects. But on territory of productive objects, as a rule, building of other functional fire hazard are situated, such as: warehouse building, open storages; dining-rooms, buffets, polyclinics; building of plant managements, administratively-domestic corps of productions and organizations, Attendant productive enterprises on agreements (repair, service and other), building of guard of enterprises; statement, dispatching offices and etc.

They are not taken at the calculation of fire risks in methodology of determination of calculation sizes of fire risks on productive objects (further is methodology), although when an enterprise decides to execute the calculation of fire risks, at a calculation it is necessary to take into account fire risks of all objects, located in territory of enterprise. Consequently, at a calculation it is necessary to use two methodologies (by methodology of determination of calculation sizes for productive objects and methodology of determination of calculation sizes of fire risks for the objects of different functional fire hazard), that increases a volume and time of calculations. If there was one methodology, taking into account fire risks of all objects on territory of productive enterprise, it would be more comfortable to the consumer which will have less expense and expert organization, which will execute one calculation.

It is necessary clearly to explain, how more comfortable to execute the analysis of enterprise, if it consists of a few productions, building. Possibility of the use of exist-

ent documents is not foreseen in methodology on the object of defense. Maybe, many calculations are already done in the portable radio declarations of industrial safety, plans of liquidation of emergency situations, emergency overflows and etc. Similarly it is not painted: how to inflict the fields of dangerous factors of fire graphically; order of determination of number of people, getting in the area of defeat of GPP.

A type of fire risks is a potential fire risk – in Technical regulation "About the requirements of fire safety" (further is Technical regulation), not certain, and he is not foreseen in methodology. It is necessary to determine conditional hit of man probabilities at the calculation of this risk, it is necessary to calculate for this purpose: probabilities of evacuation on evacuation ways; time of ways of evacuation; probability of effective work of hard wares on providing of safety of people in every apartment during realization of every scenario of fire; time from the beginning of realization of every scenario of fire to blocking of evacuation ways as a result of distribution on them dangerous factors of fire, having maximum legitimate for people values (time of blocking of evacuation Ways. Estimated time of evacuation of people from every apartment at every scenario of fire; time domain from the beginning of realization of every scenario of fire to beginning of evacuation of people from an apartment et cetera [2]. It is large work.

A social fire risk is a degree of danger on Technical regulation, conducing to death of group of people as a result of influence of dangerous factors of fire [1]. Only the group of people, being in a dwelling area, is taken into account in methodology as death of group of people. But groups of people are possible, being and in the territory of enterprise, other (not dwelling) area, for example to the area of rest or on passing roads outside dwelling areas and etc. The location of group of people, which are in threatens danger, is not certain on determination of social fire risk in Technical regulation. On methodology foreseen only the average number is 10 persons at a location in dwelling (by a tendon) area. There can be a situation, when on certain dwelling territory there will be a maximal amount of people (we will assume during a mass holiday) and a fire and action on this territory of dangerous factor of fire will happen at this time. Or such amount of people can be in other area (to the area of recreation (rest), productive area (we will assume a working commission during work, during construction-works), id est. not only in a dwelling area). And this territory did not enter in the area of social risk and a social fire risk is not certain there, because the average number of people during

twenty-four hours there are less 10. Such situations are not taken into account. Similarly recommendations are not indicated in methodology, if calculated fire risks is exceeded by possible firemen risks.

Other approach of calculation of individual fire risks is offered taking into Account these basic remarks in relation to methodology and similarly for simplification, greater availability and approaching to the real situation, – to base a calculation on statistical data on fires in the objects of defense. Basic (statistical) data are offered as an example, collected and worked out in a book [3]. It is suggested to take into account three types of individual fire risks: risk to perish at the fire of R_1, perish from the fire of R_2 and appear in the conditions of fire R_3.

Calculations are executed in connection with statistical information on the amount of fires, people, victims from fires(to initial information) and show the real risk and matter-position – fire situation on this object of defense in the subject of the Russian Federation in a certain period of years.

Mean value of risks for Russia in 2002: on the index of risk of R_1 Russia approximately in the middle of the entire examined countries, and on R_2 ($6{,}8 \times 10^{-2}$) and R_3 ($11{,}7 \times 10^{-5}$) the greatest risk exists in Russia. [3]. *It testifies to the subzero organizational system of fire safety in Russia, because there people perish and perish at fires and from fires more all in the world.* Comparison was made in 80 countries of the world, where lived 75 % population of planet id est indexes are fully objective. But risk appearing in the conditions of fire in Russia higher, than in the world in 1,4 time, at the calculation of risks of Russia as compared to general risks in the world, risk to perish at a fire in Russia higher in 8,5 time, risk to perish from a fire during a year higher in 11,5 time. Authors of aforesaid book named a situation with fires as compared to other countries of crisis.

But the indexes of risks of the world countries do not correspond to the indexes of possible risks on Technical regulation in these formulas. Although, probably, such comparisons improper, because the sizes of risks were determined on different methodologies.

We will work out the new formulas of calculation of individual fire risks on principle of formulas of calculation of individual fire risks on an aforenamed book. A primary purpose is to bring over formulas of fire risks in accordance with possible fire

risks in technical regulation. Other aim is – to workout more accessible methodology of determination of calculation sizes of fire risks, corresponding to the new normatively-legal acts of The Russian Federation.

Risk for a man to run into the fire of R_1 in Russia

R_1 = *fire/man* – this formula is certain as a result of study of risk concept, present literature on risks. A fire risk is quantitative description of marketability of fire hazard [3].

We will choose for the level of possible risk the actual level of risk of Japan and Tunis : $0{,}5x10^{-3}$. These countries stand on a 14th-16th place on risks among 80 countries (on principle a 1 place is the most subzero risk, the last place is the highest risk). While Russia stands on a 40 place from 80 countries. Id est it is that level, which it is possible to aim.

Afterwards, if succeeded, we will assume, over the years to attain diminishing Russia to the level of risk of Japan, it will be possible to set the "new slat" of risk toward his diminishing. We will define dependence between the risk of Japan and Tunis ($0{,}5x10^{-3}$) and possible risk level on Technical regulation ($1x10^{-6}$):

$0{,}5x10^{-3} – (1x10^{-6})$;

$(1x10^{-6}) / (0{,}5x10^{-3}) = 0{,}002 = 2x10^{-3}$.

This dependence determines a difference between the level of possible risk and actual risk which we must aim to set on Technical regulation. We will show out the formula of calculation of fireman risk from this logic:

$$R_1 = [2x10^{-3} (N/I)],$$

where N is an amount of fires in a year, I is an amount of people, resident, or being in the area of risk.

A risk level in Russia will be equal to the possible risk on Technical regulation On this formula under reaching the level of risk of Japan, Tunis, standing on a 14-16 place from 80 countries – one millionth. Similarly on this formula we can compare the got value with operating Technical regulation, id est. they are already comparable.

We will take as an example one of subjects of the Russian Federation and we will define the size of fire risk. For this purpose we use data, analogical to data in Fig. 1 [3].

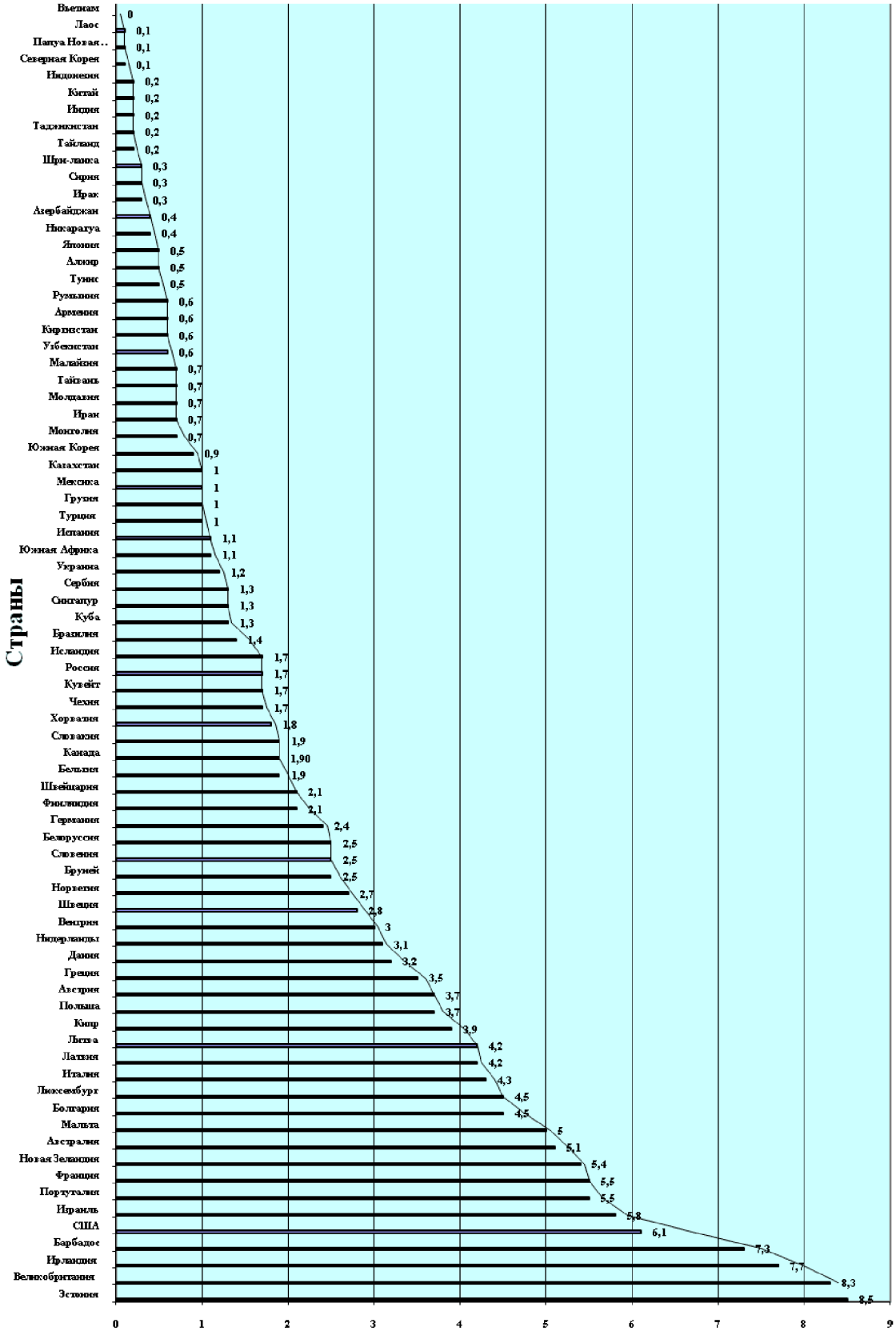

Figure 1. Quantity of fires in the world countries
in a year on 1000 persons of the population

Risk to Perish at a Fire for the Bashkortostan Republic

The Bashkortostan republic stands in this list on 12th place, id est as compared to other subjects in Bashkortostan situation is quite good, but if to compare to the entire countries of the world, it is not so. It is necessary to aspire to diminishing of risks in the Bashkortostan Republic as in all Russia. We will choose the level of possible risk the actual level of risk of the Krasnodar edge, standing on a 8th place on the level of risks in Russia of $1x10^{-3}$. Id est. it is that level when it is possible to aim. Afterwards, we will assume, if The Bashkortostan Republic can attain diminishing of risk to the level of risk of the Krasnodar edge, it will be possible to set the "new slat" of risk toward his diminishing.

We will show out a formula on the same logic:

$1x10^{-3} – 1x10^{-6}$;

$(1x10^{-6}) / (1x10^{-3}) = 1x10^{-3}$;

$R_1 = [1x10^{-3} (N/I)]$.

Determination of Other Types of Fire Risks

Risk to perish from the fire of R_2 for Russia. We will choose the level of possible risk actual level of risk of Armenia, Slovakia, Laos, Sweden, Malaysia, Norway of $0,5x10^{-2}$. These countries stand on 32-41th places on risk among 80 countries. While Russia stands on the last place from 80 countries. Id est. it is a that level which it is possible to aim:

$0,5x10^{-2} – 1x10^{-6}$;

$(1x10^{-6}) / (1x10^{-2}) = 1x10^{-4}$;

$R_2 = [1x10^{-4} (N/I)]$.

Risk to perish from the fire of R_2 for the Bashkortostan Republic. Because data are not present on risks in the subjects of the Russian Federation, it is just to accept the formula of calculation of risk for Russia the same and for The Bashkortostan Republic:

$R_2 = [1x10^{-4} (N/I)]$.

Risk to appear in the conditions of fire of R_3 for Russia. We will choose the level of possible risk actual level of risk of New Zealand and Greece $1x10^{-5}$. These co-untries stand on a 14th-16th place on risks among 80 countries (on principle a 1 place is the

most subzero risk, the last place is the highest risk). While Russia stands on the last from 80 countries.

$1x10^{-5} – 1x10^{-6}$;

$(1x10^{-6}) / (1x10^{-5}) = 0,1$;

$R_3 = [0,1(N/I)]$.

Risk to appear in the conditions of fire of R_3 for the Bashkortostan republic. The Bashkortostan Republic stands in this list on a 13th place from 87 subjects of the Russian Federation, id est on comparison with other subjects in Bashkortostan situation is quite good, but if to compare to the entire countries of the world, it not so.

We will choose the level of possible risk actual level of risk Moscow, standing on a 7th place on the level of risks in Russia – $5,7x10^{-5}$. Id est. it is that level which it is possible to aim:

$5,7x10^{-5} – 1x10^{-6}$;

$(5,7x10^{-5}) / (1x10^{-5}) = 5,7$;

$R_3 = [5,7N/I)]$.

Many divisions of appendixes to methodology become superfluous at the acceptance of approach of calculation of fire risks . The process of calculation of fire risks is far simplified and more accessible persons interested to expect him, works out large problems:

– monopolism of units of the specialized organizations, engaging in the calculations of fire risks;

– obligatory application of powerful computer technique, (in methodology her application is obligatory at determination of the fields of dangerous factors of fire for every scenario of fire.

– "floating" calculation of fire risks: frequently erroneous difficult calculations, sometimes incomprehensible computer calculation programs in powerful computers, which origin always is not known and for today there is not the checking and verification of these calculations system; a calculation will be more exact on the basis of really Occurring fires in region, Russia, world taking into account the close to development of our society of situation;

– to impossibility of application of methodology for any direction of development of national economy, object of any functional fire hazard, building or territory; in

the new approach the calculation of risks depends on statistics of fires, real situations in surroundings, real objects.

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