STABLE INSTALLATIONS FOR FIRE PROTECTION ON THE FACILITY OF THE PRIMARY SCHOOL "STANČIĆ MILAN - UČA", KUMANE

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INTRODUCTION

One of the basic risks that occur in people's lives are fires. Fire protection implies a detailed analysis and study of fire and its accompanying effects, as well as the development, testing and application of adequate protection systems. Depending on the purpose of the facility, it is chosen whether the system will also include devices for automatic fire extinguishing or only fire detection and alarm.

FIRE RISK AND FIRE PROTECTION

The concept of fire risk

By applying the Euroalarm procedure for calculating the fire risk, two parameters are determined: the fire risk of the building structure:

$$R_o = \frac{[(P_o \times C) + P_k] \times B \times L \times S}{W \times R_i}$$

and the fire risk of the building contents:

$$R_S = H \times D \times F$$

Fire protection methods

Fire protection methods are divided into: preventive and educational protection; passive protection and active.

STABLE FIRE PROTECTION INSTALLATIONS

Stable installations for fire protection are systems for detection, alarm, i.e. fire alarm and fire extinguishing, as well as detection of explosive gases and heat dissipation systems. The time of fire detection and the beginning of its extinguishing is directly related to the damage that will occur due to the effects of fire, and especially due to the loss of human lives. The fire detection, alarm and extinguishing system should provide early detection of fire inside the building, to adequately warn everyone in the building and to start extinguishing the fire.

FIRE PROTECTION SYSTEM ON THE FACILITY OF THE PRIMARY SCHOOL "STANČIĆ MILAN - UČA", KUMANE

Elementary school "Stančić Milan - Uča" is located in Trg slobode 4, in Kumane, where the main entrance to the building is. The Voluntary Fire Brigade "Brusin Sredoje" is in the immediate vicinity of the school. The total area of the building is 2458.68 m2, which consists of a basement, ground floor with hall and two floors. Using the Euroalarm method, according to formula, the calculation of the fire risk of the building is performed.

Table 1. Coefficient of fire content P_o

Degree of danger	kg of wood / m²	MJ/m²	P_o
1	0-15	0-251	1.0
2	16-30	252-502	1.2
3	31-60	503-1004	1.4
4	61-120	1005-2009	1.6
5	121-240	2010-4019	2.0
6	241-480	4020-8038	2.4
7	481-960	8039-16077	2.8
8	961-1920	16078-32154	3.4
9	1921-3840	32155-64309	3.9
10	>3841	64310	4.0

Table 2. Combustion coefficient in relation to the hazard class C

Degree of danger	Fire hazard class	C
1	VI	1.0
2	V	1.0
3	IV	1.0
4	III	1.2
5	II	1.4
6	I	1.6

Table 3. Coefficient of fire load of materials installed in the construction of the building Pk

Degree of danger	kg of wood / m²	MJ/m²	Pk
1	0-25	0-419	0
2	26-50	435-837	0.2
3	51-100	845-1675	0.4
4	101-250	1691-4187	0.6
5	251-500	4203-8373	0.8

Table 4. Fire sector coefficient B

Degree of danger	Object characteristics	B
1	- fire sector up to 1500 m² - room height up to 10 m - maximum 3 floors	1.0
2	- fire sector 1500-3000 m² - 4-8 floors - room height 10-25 m - one floor in the basement	1.3
3	- fire sector 3000-10000 m² - more than 8 floors - room height over 25 m - more than 2 floors in the basement	1.6
4	- fire sector over 10000 m²	2.0

Table 5. Coefficient of delay in the beginning of extinguishing a fire brigade L

	Starting extinguishing the fire	10'	10-20'	20-30'	30'
	Distance	1k m	1-6 km	6-11 km	11 km
Type of fire brigade	Professional industrial unit	1.0	1.1	1.3	1.5
	Voluntary industrial unit	1.1	1.2	1.4	1.6
	Territorial professional unit	1.0	1.1	1.2	1.4
	Territorial voluntary unit with permanent duty	1.1	1.2	1.3	1.5
	Territorial voluntary unit without permanent duty	1.3	1.4	1.6	1.8

Table 6. Fire sector width coefficient S

Minimum width of the fire sector (m)	Fire sector width coefficient S
Up to 20	1.0
20-40	1.1
40-60	1.2
over 60	1.3

Table 7. Coefficient of resistance of load-bearing structure W

Fire resistance (min)	kg of wood / m²	MJ/m³	W
Up to 30	-	-	1.0
30	37	619	1.3
60	60	1004	1.5
90	80	1339	1.6
120	115	1925	1.8
180	155	2595	1.9
240	180	3014	2.0

Table 8. Fire risk reduction coefficient Ri

Risk assessment	Circumstances affecting risk assessment	Ri
The biggest	- high flammability of the material and storage with larger gaps - rapid spread of fire is expected - there are a number of possible ignition sources in the technological process or during storage	1.0
Normal	- flammability is not extremely high, and storage is at a distance that allows manipulation - normal speed of fire spread is expected - there are normal ignition sources in the technological process or during storage	1.3
Smaller than normal	- lower flammability - partial storage (25-50%) of flammable goods in non-combustible packaging - storage of flammable goods without gaps - rapid spread of fire is not expected - for ground floor halls with an area of less than 3000 m² - for a building where there is smoke and heat removal	1.6
Slight	- low probability of ignition due to goods in boxes made of sheet metal or other similar materials, as well as from very dense storage - very slight development of fire is expected	2.0

Table 9. Coefficient of danger to humans H

| Type of threat	H
No danger to persons	1.0
There is danger for people, but they can save themselves	2.0
There is a danger for people, and evacuation is difficult (very smoky, large number of people, multi-storey building, rapid development of fire, the presence of immobile people, the sick, children, the elderly)	3.0

Table 10. Asset value ratio D

Concentration of values	D
The contents of the object are of little value or little prone to destruction	1.0
The content represents a value of $ 400 / m2 or $ 300,000 per fire sector and is prone to destruction	2.0
The loss is irreparable (cultural goods, etc.) or the destruction indirectly endangers the existence of the population (loss greater than 400 USD / m2 or 300000 USD per fire sector)	3.0

Table 11. Smoke hazard ratio F

Circumstances leading to smoke	F
There is no special danger of smoking and corrosion	1.0
More than 20% of the total weight of all combustible substances cause smoke or emit toxic combustion products or the rooms are without windows	1.5
More than 50% of the total weight of all combustible substances consists of materials that create smoke or emit toxic combustion products or more than 20% of the total weight of all combustible substances consists of materials that emit highly corrosive gases	2.0

Based on the obtained values for Ro=1.1733 and Rs=3 , the data obtained on the Fire Risk Diagram is given, from which it can be seen whether and which system needs to be installed.
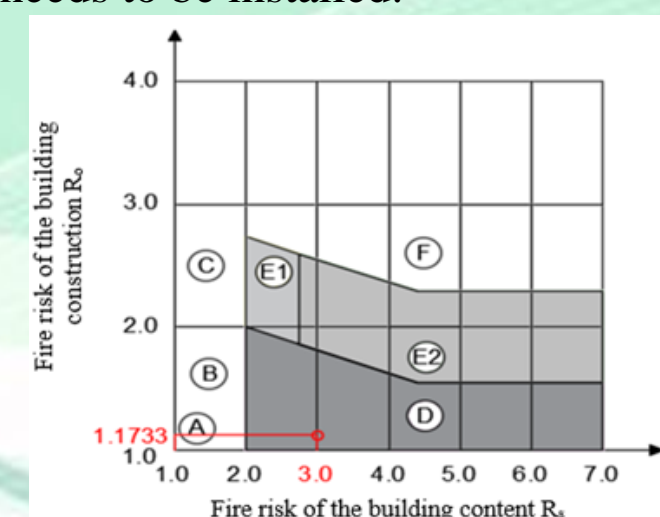
According to the Fire Risk Diagram, it can be concluded that fire alarm systems need to be installed in the building of the Elementary School "Stančić Milan - Uča".