

Pursuant to Article 44a of the Law on Fire Protection ("RS Official Gazette", No. 111/09 and 20/15),  
The Minister of the Interior delivers

## **RULES**

### **on technical standards for the protection of industrial buildings from fire**

"RS Official Gazette", Issue 1 of January 3, 2018

#### I. INTRODUCTORY PROVISIONS

##### Article 1.

This ordinance regulates in more detail the special technical norms of fire safety for the construction, upgrading and reconstruction of industrial buildings.

In addition to the provisions of this Ordinance, the regulations referred to in the provisions of paragraph 1 of this Article shall also be governed by other regulations and standards which prescribe fire protection requirements for buildings, parts of buildings, equipment, installations and appliances.

##### Article 2

Industrial facility, within the meaning of this Rulebook, means an object or parts of an object used for production (manufacture, processing, breeding, preparation of production technology, control, distribution, etc.), convenient storage of raw materials, semi-finished products, products, tools and auxiliaries materials, storage of non-combustible goods in non-combustible packaging, associated sheds and similar parts of the facility that are in the function of production.

The industrial facility referred to in paragraph 1 of this Article shall also be considered to be the facility where the overhaul works are performed.

##### Article 3

If a part of an object referred to in Article 2 of this Rulebook is reconstructed or upgraded, and / or the installations, equipment and devices on those objects, the provisions of this Rulebook shall apply only to a part of the object and / or to installations, equipment and devices subject to reconstruction or upgrades.

The reconstruction or upgrading referred to in paragraph 1 of this Article shall not diminish the fire safety of the existing facility.

##### Article 4

The provisions of this regulation shall not apply to:

- 1) industrial facilities used only for the installation of technical facilities, which persons visit only occasionally for maintenance and inspection purposes;
- 2) industrial facilities that are open (such as covered outdoor facilities, etc.);
- 3) industrial facilities or plants for the production and / or distribution of energy;
- 4) parts of industrial facilities used mainly for administration, etc. and are segregated into a separate fire segment (eg front facilities).

The provisions of this Ordinance shall not apply to industrial facilities and installations regulated by special regulations.

#### II. DEFINITIONS

##### Article 5

Some terms and terms used in this policy have the following meanings:

- 1) auxiliary premises (offices, testing laboratories, development rooms, kitchens, restaurants, dressing rooms, toilets, etc.) are associated business premises that are connected to the production and storage area, or are separated by fire-resistant boundary structures;
- 2) Convenient storage is a room where raw materials, semi-finished products and products are stored for the needs of the technological production process, but for no longer than one day;
- 3) fire unit of the subject of fire protection is a fire unit formed by the subject in accordance with the provisions of the regulations governing the organization of fire protection according to the category of fire risk,

which must arrive at least 5 minutes from the moment of alarm at any time sites of intervention. The number of firefighters must be evenly distributed across shifts;

4) fire sector (PS) is a part of a building, separated from other parts of the building by horizontal and vertical fire resistant bulkheads, with one or more floors, which can be independently treated for some technological and organizational fire safety measures.

### III. ACCESS TO FIRE VEHICLES

#### Article 6

Each industrial facility must be provided with an access road constructed in accordance with the regulation governing this area.

The access road referred to in paragraph 1 of this Article must always be free and shall not allow the parking and stopping of other vehicles, or the erection of any other obstacles that impede fire intervention.

#### Article 7

Freestanding industrial structures with an area greater than  $5,000 \text{ m}^2$  and industrial structures in a row whose total floor base area is greater than  $5,000 \text{ m}^2$  must be provided with an access road on all sides of the facility (circular path).

### IV. CONSTRUCTION MEASURES FOR PREVENTING FIRE TRANSMISSION

#### Article 8

Industrial facilities must be constructed in such a way as to prevent the transmission of fire and explosion effects to neighbors' facilities.

The fulfillment of the requirements referred to in paragraph 1 of this Article shall be achieved by a safety distance and / or construction of a special wall towards the neighbor, which can prevent the transfer of explosive mixture, fires and effects of explosion (shock wave, flying fragments, etc.) to the neighboring facility.

The safety distance referred to in paragraph 2 of this Article shall be determined by the budget in accordance with Serbian or foreign regulations, which shall include the methodology of determination, with the approval of the competent fire protection authority, but may not be less than 9 m.

Industrial buildings where there is only a risk of transmission of fire must be placed at a safe distance from adjacent structures and the boundaries of the plot not less than 5 m.

By way of derogation from paragraph 4 of this Article, the distance may be smaller if the outer wall is without aperture, fire-resistant according to the calculation but not less than 60 min and made of non-combustible material.

#### Article 9

The combustible material (pallets, packaging, waste, etc.) must not be located less than 6 m from the wall of the building.

By way of derogation from paragraph 1 of this Article, the combustible material may be placed along the wall of the building without an opening made of non-combustible materials.

#### Article 10

Industrial facilities can be constructed as ground and multi-storey buildings, with or without underground floors.

Two-story industrial buildings that have fire access for both floors above ground and whose structural elements meet the fire resistance requirements of 90 minutes and are made of non-combustible building materials can be considered as ground-floor industrial buildings.

The fire sector in rooms wholly or partly below ground level (floor height 1 m below ground level) must not be more than  $1,000 \text{ m}^2$  on the basement level, and on each lower floor  $500 \text{ m}^2$  and must be separated by walls and other structures which are fire resistant for 90 min and are made of non-combustible building materials.

By way of derogation from paragraph 3 of this Article, areas may be enlarged in the case when these premises are allowed access by firefighters from the outside.

By way of derogation from paragraph 3 of this Article, the areas of fire sectors may be enlarged up to three times if stable fire extinguishing systems are provided on these floors.

## Article 11

The fire resistance of structural elements of an industrial building is determined by calculation.

Fire-resistant walls separating the fire compartments rise at least 0.5 m above the roof covering.

By way of derogation from paragraph 2 of this Article, other technical solutions may be applied which will reliably prevent the spread of fire across the roof.

The prevention of fire transmission at the boundary of the fire sectors in the outer wall zone shall be achieved by a horizontal intermittent distance of not less than 1 m or by a rib of 0.5 m length (measured from the façade) whose fire resistance is at least equal to the fire resistance of the wall referred to in paragraph 2. of this Article.

The prevention of fire transmission at the border of fire sectors in the zone of the outer wall shall be achieved by a vertical breaking distance of not less than 1 m, whose fire resistance is at least equal to the fire resistance of the wall referred to in paragraph 2 of this Article.

## V. EVACUATION ROADS

## Article 12

Industrial buildings with a surface area of more than 1,600 m<sup>2</sup> that have more than two floors in their composition must have at least two evacuation stairs, one of which may be an external evacuation staircase.

Evacuation of persons from basement and basement levels must be possible so that they can be safely carried out through stairways on two different sides, which have exits directly into an open space or into another fire sector.

Stairways on escape routes must be of non-combustible material.

## Article 13

The evacuation routes in industrial facilities include, first and foremost, the main aisles in the production premises and warehouses, exits from these premises, evacuation corridors, evacuation stairways and exits leading to the outer space.

If there are more evacuation routes, one of these routes may lead to another fire sector which must have exits directly outside or to an escape staircase with a safe exit outside.

A main passageway of at least 0.8 m wide should be accessible from each place of a production or storage area.

## Article 14

Evacuees must have at least one exit at each point in the production area so that the distance between the starting point and the exit is at most:

- 1) 35 m if the average interior height of the room is up to 5 m;
- 2) 50 m if the average interior height of the room is greater than 10 m.

If the fire sector from which the evacuation is carried out is equipped with a stable fire alarm system or a stable fire extinguishing system, then the distance between the starting point and the exit shall be at most:

- 1) 50 m if the average interior height of the room is up to 5 m;
- 2) 70 m if the average interior height of the room is greater than 10 m.

If the average interior height is between 5 m and 10 m, values can be obtained by interpolation.

Exceptional from st. 1 and 2 of this Article, if the space from which the evacuation is carried out is on the ground floor of an industrial building and is equipped with a stable fire alarm system, then the distance between the starting point and the exit is no more than 120 m, if the average interior height of the room is greater from 7 m.

## Article 15

Doors on the evacuation route must be swiveled so that they open in the evacuation direction, must not have a threshold, and must be of adequate width to ensure a safe evacuation of persons.

By way of derogation from paragraph 1 of this Article, another technical solution of the door may be allowed, depending on the needs of the technology, provided that it also ensures the safe evacuation of persons, or the installation of a revolving door referred to in paragraph 1 of this Article must be provided.

If the door referred to in paragraph 2 of this Article is foreseen at the final exit from the production or storage area, the door shall be opened at the signal of the fire alarm system and have a mechanism for electrical and mechanical door unlocking, or shall be provided with the installation of a swing door from paragraph 1 of this Article.

## YOU. TECHNOLOGICAL SAFETY MEASURES

## Article 16

Technological safety measures arising from the requirements of the technological process, which are significant in the process of determining the requirements of fire protection for the construction, materials, installations and equipping of protective systems and devices, etc., make the obligatory contents of the technical documentation for the construction and operation of the facility. The following must be defined: physicochemical characteristics and quantity of substances used in the technological process, hazard labels, method of handling these substances, method of storage, use and transport of these substances, type of technological process, assessment of fire hazards arising from the technological process and materials used or stored in them, analysis of essential process parameters, requirements for installation of equipment, installations and devices to monitor process parameters and determine their protective function, etc.

## Article 17

In industrial facilities where technological processes are carried out, in which the flammable and combustible liquids and flammable gases are used, stored, or produced in an amount and in such a way as to form a flammable or explosive atmosphere, special conditions laid down by law and special regulations governing it shall be provided. this area, in a manner appropriate to the technological process.

## Article 18

Raw materials, semi-finished products, products and auxiliary materials are disposed of in separate rooms (convenient warehouses) according to the technological design, which defines capacity, height of storage, manner and time of storage.

By way of derogation from paragraph 1 of this Article, raw materials, semi-finished products and finished products at which the intended phase of the technological process has been completed may be deposited on a specially designated surface in the space intended for production, for the duration and in the manner determined by the technological design, until they are transferred to the site. for the next stage of production or at the place provided for the disposal of finished products.

## Article 19

Roads and technological areas (convenient warehouses, product disposal areas, areas around machines and workplaces, assembly lines, etc.) must be marked on the floors.

In rooms or parts of large rooms where the presence of substances that can create an explosive mixture is expected, floors are constructed as electrically conductive and made of non-impact material.

## Article 20

Recharging of secondary batteries and battery installations (stationary batteries) must be carried out in a separate room of the industrial facility, meeting the requirements set out in the standard SRPS EN 50272-2.

Charging of secondary batteries and battery installations (traction batteries) used for electric industrial vehicles may also be carried out in the premises of an industrial facility, meeting the requirements set out in SRPS EN 62485-3.

## VII. VENTILATION AND HEATING SYSTEMS

## Article 21

The room for accommodation of boilers and heat generators in the building (solid and liquid fuel boilers, gas boilers, etc.) must meet the following conditions:

- 1) the walls and floor construction of a fire resistant room for 60 min must be constructed of non-combustible building materials;
- 2) the door at the entrance to the room is installed on the outside of the building, and in the case when entering the room from the building door must be fire resistant for 60 minutes;
- 3) the fuel storage space (solid, liquid or gaseous) must be located outside the facility or in the safe space of the facility.

The fuel storage space (solid, liquid or gaseous) must be outside the building or in a room whose walls, floor structure and doors are fire resistant for 90 minutes and are made of non-combustible building materials.

By way of derogation from paragraph 2 of this Article, when solid fuel is delivered by a conveyor from the storage area to the boiler, these rooms can be viewed as a unique space whose walls, floor structure and doors are fire resistant for 90 minutes and are made of non-combustible building materials.

By way of derogation from paragraph 1 of this Article, boilers and heat generators of power up to 50 kW may also be located in production and storage premises.

When the building envisages the construction of a room for the accommodation of boilers and heat generators, as well as rooms for the storage of fuel for which the technical requirements are laid down by special regulations, then the provisions of the special regulations governing this area shall apply.

When compressed natural gas (KPG) is used as a fuel for boilers, heat generators and technological processes, the plant components that make it must meet the following safety distances:

	<b>SOURCES OF DANGER</b>	
	<b>Storage bottles including gas delivery vehicle</b>	<b>Normal vents and vent valves</b>
	<b>SAFETY DISTANCES</b> [m]	
Objects	> 5	> 5
Public Roads	> 5	> 5
The boundary (fence) of the plant	> 2	> 5
Regulatory station	> 2	> 5
Internal roads and footpaths	> 3	> 5
Storage of other types of fuel	> 5	> 5
Access for service	> 2	-
Flammable matter	> 4	> 4

Elements of a compressed natural gas (KPG) plant shall be placed on a concrete plateau in a 2 m high fence and shall comply with the provisions of the special regulations governing this area.

The control station shall be installed within the boundaries of the compressed natural gas (KPG) plant, at a distance greater than 5 m from the facilities.

The terms SRPS EN 60079-10-1 shall apply to the concept of explosion hazard zones and sources of danger within the meaning of this Regulation.

Explosion hazard zones that can be created during normal operation of a natural gas compressed gas plant (KPG) for each element are:

<b>SOURCES OF DANGER</b>	<b>EXPLOSION DANGER AREA</b>	
	<b>Zone 2</b>	<b>Zone 1</b>
	<b>DISTANCES</b>	
Connection of piping with bottles	5 m in radius from the connection	NO
Ends of vent pipelines	15 m vertically, the shape of the compartment with a 60 ° angle	3 m in radius from the ends of the exhaust pipelines

#### Article 22

In the production areas, heat extraction surfaces (openings, doors or windows) installed in the upper third of the outer walls or openings located on the ceiling of the building must be provided, with an area of at least 2% of the space surface, as well as openings for fresh air supply in the lower third. of a total area of the same area but not less than 6 m<sup>2</sup>.

The openings referred to in paragraph 1 of this Article must be opened or constructed in such a way as to ensure their easy opening.

### VIII. ELECTRICAL INSTALLATIONS

#### Article 23

If a high-voltage power plant is installed in an industrial facility, parts of the plant subject to fire must be located in a room separated from the other rooms by fire-resistant bulkheads for 90 min, as well as by a fire-resistant door for 30 min.

By way of derogation from paragraph 1 of this Article, an electric power plant with oil transformers of individual rated power up to 1,600 kVA and an electric power plant with dry transformers may be installed in a separate room or production space but in a way that does not endanger the safety of persons and provided that efficient fire protection measures.

#### Article 24

In addition to the regular electricity supply from the distribution network, the facilities must also provide a backup source of electricity supply for the following devices and systems:

- 1) safety lighting for evacuation roads (stairs, corridors, signs for faster evacuation, etc.);
- 2) pressure relief devices in the hydrant network, unless otherwise provided by a special regulation;
- 3) installation for smoke and heat exhaustion;
- 4) installation and devices for automatic detection and fire detection;
- 5) Installation and fire extinguishers.

The power supply to the devices and systems referred to in paragraph 1 of this Article shall be provided for the duration prescribed for the operation of the said systems, and in accordance with the technical regulations governing that type of system, but not less than 30 minutes.

#### Article 25

A backup source for the supply of electricity to the devices and systems referred to in Article 24 of this Rulebook shall be placed in a room whose walls, floors and doors are made of non-combustible building materials and are fire-resistant for the duration provided for the operation of the said systems, in accordance with the technical regulations governing this type of system more closely, but not less than 30 min.

The backup source referred to in paragraph 1 of this Article must be automatically switched on.

The room referred to in paragraph 1 of this Article must be well ventilated and not endangered by explosive atmospheres.

#### Article 26

The illumination of signs for directing the movement of persons and illuminating the floors of emergency routes must comply with the provisions of standards SRPS EN 1838, SRPS EN 60598-2-22 and SRPS EN 50172, which are closer to the device in this area.

#### Article 27

The electrical distribution of systems, appliances and installations operating in the fire mode must provide electricity for a period defined by the technical regulations governing that type of system, but not less than 30 minutes.

### IX. LIFTS

#### Article 28

The operation of the hydraulic lift and / or cargo platforms must be located in a separate room, which must be designed in such a way as to prevent the oil from leaking out of the room by removing the door sill, installing a technological vessel or other technical solution in order to keep the entire amount of oil in the event of spillage. rooms.

By way of derogation from paragraph 1 of this Article, another technical solution may be implemented providing protection against oil leakage.

### X. SPECIAL SYSTEMS AND MEASURES

#### Article 29

Industrial facilities must be provided with an external and internal hydrant network in accordance with a separate regulation.

By way of derogation from paragraph 1 of this Article, industrial facilities need not be provided with an internal hydrant network if the total area of the facility is less than  $150 \text{ m}^2$  and the design fire load is less than  $100 \text{ kWh} / \text{m}^2$ .

#### Article 30

In industrial facilities, depending on the type of technological process, the required number of mobile fire extinguishers must be provided, in accordance with the technical regulations and instructions of the manufacturer of the devices and equipment.

## XI. BUDGETARY DETERMINATION OF NECESSARY FIRE RESISTANCE STRUCTURE

### Article 31

In order to determine the fire resistance requirements of structural elements according to fire safety classes, the equivalent duration of fire  $t_a$  and the required fire resistance  $erft_F$  are calculated, depending on different fire scenarios and methods of proof.

Building structures for the separation of fire compartments and their load-bearing structures must, with regard to their load-bearing capacity, correspond to at least the equivalent duration of the fire or the fire resistance required for the budget.

The budgeted fire resistance is determined for each fire sector, where, to determine the equivalent duration of the fire, it is based on the average fire load and average ventilation conditions in the fire sector.

For multi-storey fire sectors, in addition to determining the equivalent fire duration in the fire sector, it is necessary to determine the equivalent fire duration  $t_{a, Ei}$  for each floor.

### Fire safety classes

#### Article 32

Individual building elements are classified in one of the following fire safety classes ( *SKb3* to *SKb1* ):

#### **SKb3 fire safety class**

High-demand building elements:

- 1) walls and floor structures separating the fire compartments;
- 2) load-bearing and stiffening elements, the failure of which can lead to the collapse of the load-bearing structure (load-bearing part of the structure, the whole structure) or the construction of the fire sector.

#### **SKb2 fire safety class**

Intermediate building elements:

- 1) structural elements, the failure of which can not lead to the collapse of the load-bearing structure (load-bearing part of the structure, the whole structure) or the construction of the fire sector, such as unfinished ceilings;
- 2) structural elements of a load-bearing roof structure, the failure of which can lead to the collapse of the rest of the roof structure of the fire sector;
- 3) fire resistant doors and other similar elements for closing openings in partition structures for which certain requirements regarding resistance are defined;
- 4) carrying an external wall with the possibility of fire outside;
- 5) a roof that has the potential for fire outside.

#### **SKb1 Fire Safety Class**

Low Required Building Elements:

- 1) structural elements of the load-bearing roof structure, if the failure of certain elements does not lead to the collapse of the rest of the roof structure of the fire sector.

Classification of the load-bearing roof structure is not necessary in the case where the roof is separated from the rest of the fire sector by fire and if there are no additional fire loads in the roof area so separated.

Classification of certain building elements into fire safety classes (eg internal non-load-partition walls within the fire sector, roofing of an object that does not represent the boundary of the fire sector (eg roof panels) and which has no possibility of fire outside, non-bearing external walls of the object that do not represent the boundary of the fire sector and where there is no possibility of fire outside, etc.) is not necessary within this proofing process.

### The data needed for the budget

#### Article 33

The following data are required to determine the required fire resistance of load-bearing structures and structures for the separation of fire sectors:

1) the purpose of certain parts of the building or fire sectors (eg surfaces of production area, storage area, traffic or free space, side premises, etc.);

2) structure of the building (eg boundary structures - type, layout and construction, number of floors of the fire sector, dimensions and position of the fire sector, etc.);

3) fire load in fire sectors (height of storage of goods, mass and energy value of combustible materials, burning property, fire load originating from unprotected materials, fire load in closed systems, etc.);

4) sizes that influence the calculation of the equivalent duration of fire (thermal damping of boundary structures - the property of penetration of heat, openings for heat dissipation - type, position and size, etc.);

5) other quantities that influence the calculation of the budgeted fire resistance (fire unit, stable fire alarm and fire extinguishing systems, etc.).

#### Article 34

The calculated fire resistance  $erft_F$  expressed in minutes is calculated by the equation:

$$erft_F = t_a \cdot \gamma \cdot \alpha_L$$

it is:

$t_a$  - equivalent duration of fire expressed in [min];

$\gamma$  - safety supplementary value for building structures of a particular fire safety class  $SK_b 3$ ,  $SK_b 2$  and  $SK_b 1$ ;

$\alpha_L$  - an additional value that considers limiting the spread of fire based on technical fire protection.

#### Article 35

The equivalent fire duration  $t_a$  expressed in minutes is calculated by the equation:

$$t_a = q_R \cdot c \cdot w$$

it is:

$q_R$  - design fire load expressed in [ $\text{kWh} / \text{m}^2$ ];

$c$  - conversion factor expressed in [ $\text{min m}^2 / \text{kWh}$ ] is obtained from Table 2. This factor takes into account the influence of heat conduction properties of boundary structures (walls, floors, ceilings, glass);

$w$  - heat dissipation factor as a dimensionless corrective value that takes into account the influence of open surfaces or surfaces that can be opened on heat dissipation in the event of fire. It is assessed to what extent this can cause the temperature of the structures to be relieved. Effective openings in the walls and in the roof, as well as the relevant height of the fire sector, are important factors of influence.

#### Article 36

For multi-storey fire sectors, in addition to determining the equivalent fire duration in the fire sector  $t_a$ , it is also necessary to determine the equivalent fire duration  $t_{a, Ei}$  for each floor.

In order to determine the equivalent fire duration  $t_{a, Ei}$  of the observed floor, in addition to the calculated fire load  $q_{R, i}$ , it is necessary to consider the additional share of the calculated fire load  $q_{R, i-1}$  in the series of assumed fire spread from the floor  $i-1$  located below floor and :

$$t_{a, Ei} = c_i \cdot w_i \cdot (q_{R, i} + \beta_V \cdot q_{R, i-1})$$

it is:

$t_{a, Ei}$  - equivalent duration of fire on floor and expressed in [min];

$c_i$  - conversion factor expressed in [ $\text{min m}^2 / \text{kWh}$ ] which takes into account the influence of thermal conductivity properties of boundary structures on the floor and;

$w_i$  - heat removal factor for floor  $i$ ;

$q_{R, i}$  - budget fire load on floor *and* expressed in [ $\text{kWh} / \text{m}^2$ ];

$q_{R, i-1}$  - design fire load on floor *i-1* expressed in [ $\text{kWh} / \text{m}^2$ ];

$\beta_V$  - dimensionless factor for proportional consideration of design fire load  $q_{R, i-1}$  on floor *i*.

Without further proof, it can be assumed that  $\beta_V = 0.3$ .

In the case where  $t_{a, Ei} < t_{a, Ei-1}$  is obtained, then under the conditions referred to in Article 37 of this Ordinance it is necessary to take  $t_{a, Ei} = t_{a, Ei-1}$ .

#### Article 37

If a lower equivalent fire duration  $t_{a, Ei}$  is calculated for a floor than the equivalent fire duration  $t_a$  for the fire sector, then this less equivalent fire duration may only be applied if it is the highest floor of any part of the building.

If a higher equivalent fire duration  $t_{a, Ei}$  is calculated for a floor than the equivalent fire duration  $t_a$  for the fire sector, then the following rule applies to the floor above:

1) if the sum of the openings in the ceiling is  $\leq 2\%$  of the total area of the ceiling, then the greater is the equivalent fire duration  $t_{a, Ei}$  applicable only to the floor in question;

2) if the sum of the openings in the ceiling per floor is  $\geq 20\%$  of the total area of the ceiling, then the greater the equivalent fire duration  $t_{a, Ei}$  is applicable for the floor above;

3) at openings in the ceiling between the limit values specified in item. 1) and 2) of this Article, the equivalent fire duration  $t_{a, Ei}$  for the floor above is calculated by linear interpolation;

4) for openings  $> 20 \text{ m}^2$ , for floors above the fire duration  $t_{a, Ei}$  is equivalent.

#### Article 38

The design fire load  $q_R$  expressed in [ $\text{kWh} / \text{m}^2$ ] is determined from the design fire load of unprotected materials ( $q_{R, u}$ ) and the design fire load of protected materials in closed systems ( $q_{R, g}$ ):

$$q_R = q_{R, u} + q_{R, g}$$

It is adopted that the minimum budget fire load is  $q_R = 15 \text{ kWh} / \text{m}^2$ .

The design fire load  $q_{R, in}$  [ $\text{kWh} / \text{m}^2$ ] of unprotected materials, is calculated as follows:

$$q_{R, in} = \frac{\sum (M_i \cdot H_{ui} \cdot m_i)}{A_B}$$

it is:

$M_i$  - mass of individual unprotected material in [kg];

$H_{ui}$  - energy value of individual material in [ $\text{kWh} / \text{kg}$ ];

$m_i$  - combustion factor of individual combustible material;

$A_B$  - area of fire sector [ $\text{m}^2$ ]

Unprotected materials include all combustible systems, propulsion and storage materials, packaging, as well as combustible building materials including structural coverings, unless otherwise specified.

The calculated fire load  $q_{R,g}$  [kWh / m<sup>2</sup>] of protected materials is calculated as follows:

$$q_{R,g} = \frac{\sum (M_i \cdot H_{ui} \cdot m_i \cdot \psi_i)}{A_B}$$

it is:

$M_i$  - mass of individual protected material in [kg];

$H_{ui}$  - energy value of individual material in [kWh / kg];

$m_i$  - combustion factor of individual combustible material;

$A_B$  - area of fire sector [m<sup>2</sup>];

$\psi_i$  - combined supplementary value.

Protected materials means all combustible materials in closed systems (eg in pipelines or tanks made of sheet steel or other materials of similar characteristics).

The following combustible materials are not taken into account in the calculation:

- 1) materials to be treated or stored in such a condition that the expected effect of the fire prevents their burning (eg combustible materials which are constantly in the wet state);
- 2) combustible components of building structures, whereby a single layer or sheath of non-combustible building materials ensures that combustible parts do not contribute to fire for a time appropriate to the required fire resistance;
- 3) building elements of a roof-supporting structure made of combustible building materials, which are effectively separated within the fire sector from the rest of the fire sector by an intermediate structure (ceiling) made of non-combustible building materials, dimensioned at least for the fire safety class *SKb3* ;
- 4) gas propellants in pipelines (eg steel or other materials with similar fire properties), unless otherwise the minimum budget fire load from paragraph 2 of this Article is exceeded;
- 5) electrical cables and conductors including cable glands in switchgear blocks made of non-combustible materials.

When determining the area of fire sector  $A_B$ , free area openings and openings with lattice and sheet platforms for which the required fire resistance is not taken into account shall not be taken into account. The fire load on these surfaces is added to the floor area that can be counted.

In the case where the calculation is performed for each floor of the fire sectors with multiple floors then the surface of the fire instead of sector  $A_B$  takes a certain surface levels  $A_{Ei}$ .

#### Article 39

The combustion factor  $m$  is an additional value by which the fire load is multiplied by taking into account the fire properties of the combustible materials in an appropriate type, shape and distribution.

The combustion factor  $m$  and the energy value of the individual material  $H_{ui}$  are determined for each combustible material depending on the type of storage, density, storage height and humidity according to Table 1, which is printed with this Ordinance and forms an integral part thereof.

The adoption of combustion factors  $m < 0.2$  is not allowed.

#### Article 40

Over the combined supplementary value  $\psi$  and the reciprocal effect of unprotected and protected fire loads is taken into account.

The most unfavorable protected fire load is evaluated with the combined supplementary value  $\psi_i$ .

The combined additional values  $\psi_i$  is simplified may be adopted:

- 1) for the tank / system with the highest fire load  $\psi_i = 0.8$
- 2) for all other tanks / systems  $\psi_i = 0.55$

For fluids with an ignition point > 100 ° C (eg hydraulic oils, cutting or lubricating oils) used in machines (eg machine tools, presses, motors, compressors) and which do not heat above the ignition point when used, which is additionally protected by a budget fire load  $q_{R, in} \leq 45 \text{ kWh} / \text{m}^2$ , may be adopted:

- 1) for the tank / system with the highest fire load  $\psi_i = 0.8$ ;
- 2) for all other tanks / systems  $\psi_i = 0$ .

If the additional unprotected fire load is  $q_{R, in} > 45 \text{ kWh} / \text{m}^2$ , then  $\psi_i = 1$  is adopted .

#### Article 41

The conversion factor (  $c$  ) expressed in [ $\text{min m}^2 / \text{kWh}$ ] is given in Table 2, depending on the group of impacts of boundary structures.

Table 2.

<b>Conversion factor ( <math>c</math> )</b>	
$c$ [ $\text{min m}^2 / \text{kWh}$ ]	<b>Impact group of boundary structures<sup>a</sup></b>
0,15	I
0,20	II
0,25	III

<sup>a</sup> Border structures are classified according to heat conduction in case of fire as follows:

**Impact group I :**  
Building structures ie. construction materials with a high degree of heat conduction such as glass, aluminum, steel, etc.

**Impact Group II:**  
Building structures ie. medium-grade construction materials such as: concrete, lightweight concrete with a bulk mass > 1000 kg /  $\text{m}^3$ , such as e.g. silicate brick, building structures with mortar, building brick.

**Impact Group III:**  
Building structures ie. low heat conduction building materials such as: building materials with a mass of 1,000 kg /  $\text{m}^3$ , such as e.g. building materials for insulation, porous concrete, wood, lightweight building boards, lightweight concrete, insulation plaster, multi-layer building structures.

If the absorption effect of boundary structures is lost due to destruction in the development of a fire (fully developed fire),  $c = 0.15$  can be adopted .

#### Article 42

The heat dissipation factor  $w$  is a dimensionless corrective value that takes into account the influence of open surfaces or surfaces that can be opened to remove heat generated in the event of fire. It is assessed to what extent this can cause the temperature of the structures to be relieved. Effective openings in the walls and in the roof, as well as the relevant height of the fire sector, are important factors of influence.

In order to provide sufficient inlet air, it is necessary to provide for openings in the lower half or at least in the lower floors of the observed fire sector or the observed floor. These openings must be a total area of at least 6  $\text{m}^2$  and be open or constructed so that they can be easily opened during a fire intervention.

The heat dissipation factor  $w$  can be calculated or determined graphically.

For the calculated values when  $w < 0.5$  it is taken that  $w = 0.5$ .

The heat dissipation factor  $w$  depends in particular on the ratio of the surfaces of the vertical openings  $A_v$  or the surfaces of the horizontal openings  $A_h$  to the surface of the fire sector  $A_B$ , or in multi-storey fire sectors to the floor area  $A_{Ei}$ .

For multi-storey fire sectors, it is necessary to determine the heat removal factor  $w_{Ei}$  for each floor, where the openings relating to the surface of the base of the floor shall be calculated in accordance with Article 44. The floor area  $A_{Ei}$  shall be taken as the accounting sector. Heat dissipation through horizontal openings between floors is determined according to Art. 45 and 46 of this Rulebook.

The calculation only takes into account the relevant areas of horizontal openings in the ceiling above each floor within the fire sector. For floor and roof openings that become smaller from the bottom upwards, the smallest area is relevant for determining  $A_h$ . However, if the surfaces on the ceilings and on the roof from the bottom up are increasing, the area of the opening above the observed floor is relevant for determining  $A_h$ .

#### Article 43

Heat removal surfaces to be considered:

1) surfaces of openings in the roof or walls that are constantly existing and lead to free space, as well as openings in the ceilings of floors in the framework of evidence for floors with a minimum size of an individual free opening of  $1 \text{ m}^2$ ;

2) aperture surfaces equipped with smoke and heat extraction devices which automatically open in the event of smoke or heat in accordance with SRPS EN 12101-2;

3) the surfaces of doors and ventilation openings leading to a free space and from the outside may be opened without force, if an opening is provided;

4) surfaces of openings with glass, which are completely or partially destroyed by fire;

5) surfaces of openings, which are covered with materials or closed and which in case of fire are destroyed within a period of maximum 15 min.

Glasses whose destruction is not expected in the event of fire or which cannot be opened in the event of fire (eg fire resistant glass, armored glass, reinforced glass, safety glass, etc.) should not be counted as heat removal surfaces.

#### Article 44

The heat dissipation factor  $w$  is determined from the ratio of the values of  $a_v$  and  $a_h$ :

$$a_v = \frac{A_v}{A}$$

$$a_h = \frac{A_h}{A}$$

it is:

$A_v$  - surface of vertical openings in outer walls in  $[\text{m}^2]$ ;

$A_h$  - surface of horizontal openings in the roof ie. single-floor ceilings in  $[\text{m}^2]$ ;

$A$  - area of the respective fire sector ( $A_B, A_{Ei}$ ) in  $[\text{m}^2]$ .

If there are no horizontal heat dissipation surfaces or they are small ( $a_h \leq 0.005$ ) and the vertical heat dissipation surfaces are predominantly in the lower surface of the room,  $A_v$  is taken only:

$$A_v \leq 2 \cdot (A_{v,ub})$$

it is:

$A_{v,ub}$  the area of the vertical openings in the upper half of the outer walls in  $[\text{m}^2]$ .

The factor  $w$  is calculated from:

$$w = w_o \cdot a_w \geq 0,5$$

it is:

$w_o$  - factor that takes into account the horizontal and vertical surfaces for heat dissipation and is determined from the graphs Figure 1.

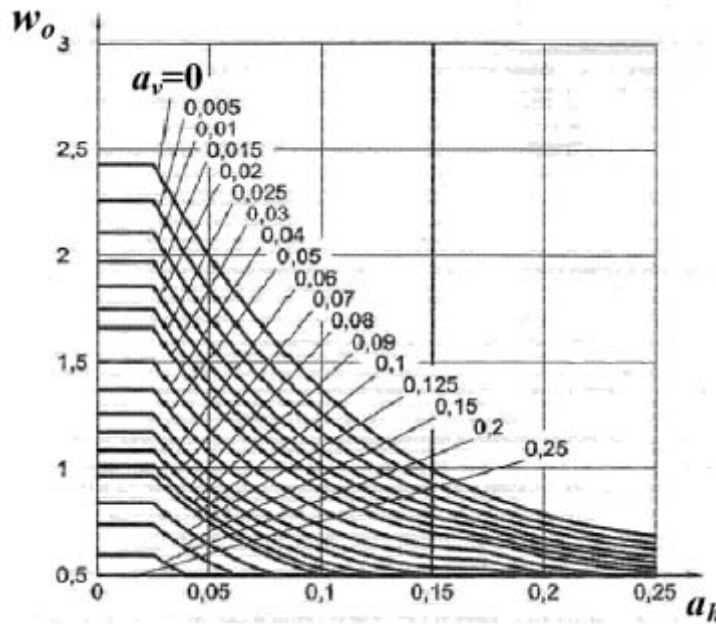
$a_w$  - factor taking into account the mean height  $h$  of a particular fire sector;

$h$  is the average interior height of a particular fire sector, that is, the interior height of the floor in [m];

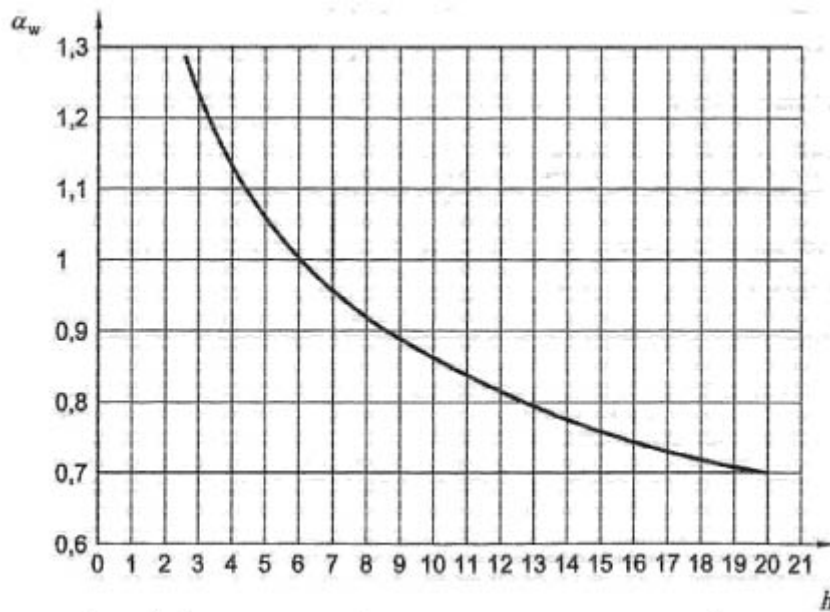
The factor  $a_w$  is calculated using formula or graphs. Figure 2:

$$a_w = \left(\frac{6,0}{h}\right)^{0,3}$$

When determining the values of  $w_o$  and  $a_w$  from the graphs in Figures 1 and 2, interpolation is allowed.



Слика 1. Фактор  $w_o$  у зависности од  $a_v$  и  $a_h$



Слика 2. Фактор  $a_w$  за утицај просечне унутрашње висине на  $w$  фактор

**Multi-storey fire compartments with openings <20% on ceiling and roof**

Areas for heat removal in multi-storey fire compartments are surfaces intended to be opened. This condition is fulfilled without specific proof for the heat removal surfaces given in Article 43, paragraph 1, item. 1) and 2) of this regulation.

Since the heat removal in such rooms is carried out by convection, in addition to the heat removal surfaces, it is necessary to provide openings for the supply of fresh air in the lower part of the space, independent of the heat extraction.

For multi-storey fire sectors, openings in ceilings can be counted as horizontal openings for heat dissipation for individual floors if all the ceilings are of the same size and placed one above the other and if there are at least two large openings of the same size on the roof.

By way of derogation from paragraph 3 of this Article, openings which are not placed one above the other, or which are positioned in a displaced position, may be counted if they are evenly distributed above the ceilings and in the roof area. Evenly spaced openings are considered openings arranged in such a way that there is at least one opening per  $400 \text{ m}^2$  in the surfaces lying one above the other.

If all floors have the same height of floors or if more floors have a higher height, then the heat dissipation factor shall be determined according to the equation referred to in Article 44 of this Ordinance.

If the height  $h_{i+1}$  of the plane above  $i+1$  is equal to half the height  $h_i$  and the observed plane ( $h_{i+1} = 0.5 h_i$ ), then the heat dissipation factor  $w$  and the observed plane should be increased by 25%. At values of  $0.5 < h_{i+1} / h_i < 1.0$  it can be interpolated.

If there are no evenly spaced openings, then, when determining the heat dissipation factor, the relevant surface of the horizontal openings is reduced by 0.8, ie the openings  $A_{vi}$  and 0.8 are taken into account in the calculation  $A_{hi}$  that must be in relation to the floor area  $A_{Ei}$ .

### Multi-storey fire compartments with openings $\geq 20\%$ in ceilings and on roofs directly above each other

#### Article 46

The distance between the floor of a particular floor and the lower edge of the roof may be taken as the relevant height for determining the factor  $a_w$  according to Article 44 of this Rulebook.

For fire sectors where floor structures have no classified fire resistance, no calculation is made for a single floor, but a calculation is made for a single-storey fire sector, where the fire load and the roof opening area are observed relative to the base area of the fire sector. In this case, the height of the fire sector corresponds to the distance between the base surface and the roof.

#### Article 47

The safety supplementary value  $\gamma$  is determined from Table 3. Depending on the fire safety class  $SK_b 3$ ,  $SK_b 2$  and  $SK_b 1$  of the construction structure and the corresponding surfaces.

Complementary value for surfaces other than those given in Table 3 can be obtained by linear interpolation.

**Table 3.**

SECURITY ADDITIONAL VALUE ( $\gamma$ )						
1	2	3	4	5	6	7
Area of the fire sector [m <sup>2</sup> ]	Single-storey building			Fire sectors are upstairs		
	$SK_b 3$	$SK_b 2$	$SK_b 1$	$SK_b 3$	$SK_b 2$	$SK_b 1$
$\leq 2.500$	1,00	0,60	0,50	1.25	0.90	0,50
5.000	1,05	0,60	0,50	1,35	1,00	0,60
10.000	1,10	0,70	0,50	1,45	1,10	0,70
20.000	1,20	0,80	0,50	1,55	1,20	0,80
30.000	1,25	0,90	0,50	1,60	1,25	0,90
60.000	1,35	1,00	0,55	-	-	-

120.000	1,50	1,10	0,60	-	-	-
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## Article 48

The added value of  $a_L$  is to consider limiting the spread of fires in the fire sector on the basis of infrastructure in terms of technical fire protection, such as fire fighting units, automatic stable fire alarm and fire extinguishing systems.

The additional value is obtained according to Table 4. as a product of the numbers in columns 1, 2 and 3. If there are no measures for columns 1 to 3, a value of 1.0 is taken.

Table 4.

ADDITIONAL VALUE ( $a_L$ )			
Fire unit		Fire protection systems	
Number of firefighters <sup>a</sup>	1	2	3
	Influence of fire department	Impact of stable fire alarm systems	Impact of stable fire extinguishing systems
	Numerical values of impact factors		
13	0,90	0,90	0,60
17	0,85		
21	0,80		
25	0,70		
33	0,60		
a The number of firefighters must be evenly distributed across shifts			

If the overall rating of the measures in Table 4.  $a_L \leq 0.85$ , then the corrective value  $a_L$  may be reduced to:

- 1) 80% at  $q_R \leq 45 \text{ kWh / m}^2$  ;
- 2) 90% at  $q_R \leq 100 \text{ kWh / m}^2$  .

### Classification of budget required fire resistance

## Article 49

The *budgeted* required fire resistance  $erft_F$  is classified according to the nominal required fire resistance as follows:

- 1)  $0 < erft_F \leq 15$  min without requirement for fire resistance;
- 2)  $15 < erft_F \leq 30$  min low fire resistance - 30 min resistance class;
- 3)  $30 < erft_F \leq 60$  min higher fire resistance - resistance class 60 min;
- 4)  $60 < erft_F \leq 90$  min High fire resistance - 90 min resistance class.

The fire resistance of the structural members according to the fire safety classes must correspond to at least the required fire resistance of not more than 90 minutes.

If from the budget for the fire safety class *SKb3* , the required required fire resistance exceeds 90 min, then the calculation procedure is repeated with the corrected data required for the calculation referred to in Article 33 of this Regulation.

## Article 50

This Rulebook shall enter into force on the eighth day after its publication in the Official Gazette of the Republic of Serbia.

No. 01-11977 / 17-3

In Belgrade, December 28, 2017

Minister,

Dr. **Nebojša Stefanović**, s.r.

Table 1.

<b>CHARACTERISTICS OF FUEL MATERIALS</b>				
<b>Number</b>	<b>Material type and method of storage</b>	<b>Storage density [%]</b>	<b>m is a factor</b>	<b>Thermal power H<sub>c</sub> [kWh/kg]</b>
<b>1. WOOD AND WOOD BASED MATERIALS</b>				
<b>1.1</b>	<b>Softwood</b>			
1.1.1	boards / boards	50	1,0	4,8
		70	0,8	
1.1.2	beam 40 mm x 40 mm	50	1,0	4,8
1.1.3	beam 100 mm x 100 mm	50	0,7	4,8
		90	0,5	
1.1.4	beam 200 mm x 200 mm (thickly stacked)	50	0,3	4,8
		95	0,2	
1.1.5	beam 500 mm x 500 mm (thickly stacked)	50	0,2	4,8
		98	0,2	
1.1.6	round wood (without bark) 150–300 mm in diameter	50	0,7	4,8
1.1.7	wooden wool, pressed into individual balls	8	1,0	4,8
		60	0,2	
<b>1.2</b>	<b>Particle boards, osb boards, etc., stacked one on top of the other</b>	99	0,2	4,8
<b>1.3</b>	<b>Plywood</b>			
1.3.1	horizontal densely stacked	-	0,2	4,8
1.3.2	horizontal densely stacked on wooden pallets	-	0,8	4,8
<b>1.4</b>	<b>Small furniture made of wood based material, unpacked</b>	15	1,2	4,8
<b>1.5</b>	<b>Baskets</b>	10	1,5	4,8
<b>2. PAPER, PAPERBOARD</b>				
<b>2.1.</b>	<b>Writing and printing paper</b>			
2.1.1	Large-format paper in a "package" on wooden pallets	100	0,2	-
2.1.2	large size paper, vertically and horizontally stacked, standing separately on the floor	100	0,5	-

2.1.3	in narrow rolls, vertically and horizontally stacked on wooden pallets	75	0,2	-
2.1.4	books (shelving)	100	-	4,2
<b>2.2</b>	<b>Cardboard (colored or unpainted)</b>			
2.2.1	cut, stacked on wooden pallets	100	0,2	-
2.2.2	in narrow rolls, vertically and horizontally stacked on wooden pallets	75	0,2	4,2
2.2.3	unbroken, horizontally stacked, including corrugated cardboard	20	0,4	4,2
2.2.4	container, empty, stacked on top of one another	6	1,8	4,2
<b>2.3</b>	<b>Old and used paper</b>			
2.3.1	including cardboard pressed in bales	-	0,2	-
2.3.2	old paper, loose, unbroken	3	2,0	-
<b>2.4</b>	<b>Sanitary crepe paper</b>			
2.4.1	in a roll, in a bag	95	1,9	-
2.4.2	in large rolls	80	1,3	3,7
<b>3. TEXTILE PRODUCTS</b>				
<b>3.1</b>	<b>Waste material</b>			
3.1.1	pressed in the ball of cotton, polyamide and polyacrylonitrile fibers	-	0,8	-
3.1.2	oil-soaked cleaning sponge in an open tin container	10	0,7	-
3.1.3	clothes of all kinds of fibers, hanging	10-30	0,7	-
<b>3.2</b>	<b>Cotton</b>			
3.2.1	tissue	-	0,4	4,3
3.2.2	fibers pressed into the balam	-	0,2	4,3
<b>3.3</b>	<b>Polyacrylonitrile fibers pressed into the bale</b>			
3.3.1	fibers, a mixture of polyamide fibers, wool as well as cotton	-	0,8	8,2
3.3.2	fibers, modified with 35% vinyl chloride	-	0,2	6,6
<b>3.4</b>	<b>Polyamide fiber extruded into bark</b>			
3.4.1		-	1,1	7,9
<b>3.5</b>	<b>Sheep's wool</b>			
3.5.1	pressed into a balam	-	0,2	5,8
3.5.2	stress	10	0,8	5,8
<b>3.6</b>	<b>Carpets (floor coverings)</b>			
3.6.1	felt of all types of fibers, horizontally densely stacked on wooden pallets	-	1,1	-
3.6.2	felt, all types of fibers, horizontally densely arranged	-	0,2	6,0
3.6.3	raw material without lining, horizontally rarely stacked	-	1,5	6,0
<b>4. SYNTHETIC MATERIALS</b>				
<b>4.1</b>	<b>Epoxy resin, without reinforcement, in liquid state</b>	80	0,6	9,1
<b>4.2</b>	<b>Ethylene-propylene-diene measuring instruments and instruments (mineral part 20%), stored in cartons</b>	30-90	0,4	-
<b>4.3</b>	<b>Phenolic resin</b>			
4.3.1	glass mineral wool boards	100	0,7	6,0
<b>4.4</b>	<b>Polyamide</b>			

4.4.1	roll foil	30	1,4	8,1
<b>4.5</b>	<b>Polycarbodimide</b>			
4.5.1	16.8 kg / m <sup>3</sup> hard foam	100	0,2	8,6
<b>4.6</b>	<b>Polyester resin - unsaturated</b>			
4.6.1	glass-walled tensile products (pipes, profiles, moldings, etc.), not densely complex	5-25	1,1	5,3
4.6.2	glass walled products (pipes, profiles, moldings, etc.) reinforced with thick fibers	90	0,9	5,3
4.6.3	glass-walled tensile products (pipes, profiles, moldings, etc.), with foam thermal insulation	5-10	1,1	-
<b>4.7</b>	<b>Polyolefin</b>			
4.7.1	polyethylene - granulate in bags	-	0,8	12,2
4.7.2	polyethylene - container inside is non-flammable contents or parts stacked on top of one another or spilled	10	0,8	12,2
4.7.3	polyethylene - roll foil	30	1,1	12,2
4.7.4	polypropylene - parts in cartons	15	0,8	-
4.7.5	polypropylene - granulate in pockets, dense	-	1,2	12,8
4.7.6	polypropylene - granulate in bags, on wooden pallets	80	1,3	-
4.7.7	polypropylene - pipes	10	0,8	12,2
4.7.8	polypropylene - copolymer in cartons	30-90	1,1	-
<b>4.8</b>	<b>Polystyrene</b>			
4.8.1	ABS - parts in cardboard boxes	10	0,9	-
4.8.2	thin strips, foamed polystyrene in an open container	10	2,1	11,0
4.8.3	PS-hard foam (density 20 kg / m <sup>2</sup> )	100	0,4	11,0
4.8.4	PS-hard foam (density 23 kg / m <sup>2</sup> )	100	0,9	11,0
<b>4.9.</b>	<b>Polyurethane</b>			
4.9.1	PUR hard foam (density 36 kg / m <sup>2</sup> )	100	0,3	6,7
4.9.2	PUR-soft foam (density 36 kg / m <sup>2</sup> ) in wire baskets	90	1,2	6,4
4.9.3	PUR-soft foam (density 36 kg / m <sup>2</sup> ) with wooden structure (upholstered furniture)	50	1,4	-
<b>4.10.</b>	<b>Polyvinyl chloride-PVC</b>			
4.10.1	PVC-U - parts in wire baskets	30	0,4	5,0
4.10.2	PVC-U - parts in cardboard boxes (hard paper)	30-90	0,4	-
4.10.3	PVC-U - pipes on wooden pallets, horizontally stacked	10	0,4	-
4.10.4	PVC-U - pipes, horizontally stacked	10	0,2	5,0
4.10.5	PVC-P - parts in wire baskets	10	0,7	5,0
<b>4.11</b>	<b>Polymethyl methacrylate</b>	100	-	6,9
<b>5. SOLID FUEL</b>				

<b>5.1</b>	<b>Brown coal briquettes, sprinkled or stacked</b>	50	0,3	5,8
<b>5.2</b>	<b>Coke</b>			
5.2.1	soft to the point	60	0,2	8,1
5.2.2	for wood (parts of wood 35%), softly sanded	60	0,2	-
<b>6. combustible fluids stored in drums at temperatures below the boiling point, <i>m</i> FACTOR DEFINED BURNING WITH LIMITED air supply</b>				
<b>6.1</b>	<b>Acetone</b>	100	-	8,0
<b>6.2</b>	<b>Gasoline</b>	100	0,7	11,9
<b>6.3</b>	<b>Benzene</b>	100	-	11,1
<b>6.4</b>	<b>Chlorobenzene</b>	100	0,5	11,2
<b>6.5</b>	<b>Cyclohexane</b>	100	0,6	12,1
<b>6.6</b>	<b>Diesel, light fuel oil</b>	100	0,7	11,7
<b>6.7</b>	<b>Dimethylformamide</b>	100	1,8	6,1
<b>6.8</b>	<b>Petroleum</b>	100	-	11,6
<b>6.9</b>	<b>Ethyl alcohol - ethanol</b>	100	-	7,5
<b>6.10</b>	<b>Glycol</b>	100	1,9	4,6
<b>6.11</b>	<b>Isopropyl alcohol - isopropanol</b>	100	1,1	7,5
<b>6.12</b>	<b>Kerosene</b>	100	-	12,0
<b>6.13</b>	<b>Engine and machine oil</b>	100	0,6	9,8
<b>6.14</b>	<b>Methanol</b>	100	1,0	5,4
<b>6.15</b>	<b>Nitro Thinner</b>	100	1,0	7,5
<b>6.16</b>	<b>Oil</b>	100	-	12,1
<b>6.17</b>	<b>Cleaning gasoline</b>	100	-	11,9
<b>6.18</b>	<b>Heavy fuel oil</b>	100	0,7	11,4
<b>6.19</b>	<b>Silicone</b>	100	0,2	8,9
<b>6.20</b>	<b>Turpentine</b>	100	0,6	11,5
<b>6.21</b>	<b>Toluene</b>	-	-	11,3
<b>6.22</b>	<b>Xylene</b>	-	-	-
<b>7. RUBBER AND BITUMENS</b>				
<b>7.1</b>	<b>Tire</b>			
7.1.1	pulling rubber bands in layers	100	0,2	12,2
7.1.2	self-adhesive breathable tape	20	0,8	5,8
7.1.3	rubber vehicle tires, sparsely distributed	10	0,4	12,2
7.1.4	rubber tires for vehicles on wooden pallets	10	0,6	-
<b>7.2</b>	<b>Bitumens</b>			
7.2.1	bitumen blocks	100	0,6	9,8
7.2.2	roof membranes	60	0,5	8,0
<b>8. FOOD</b>				
<b>8.1</b>	<b>Rye flour in small paper bags, thickly folded</b>	-	1,0	-

<b>8.2</b>	<b>Food grease</b>			
8.2.1	margarine with at least 15% water	10	0,2	9,0
8.2.2	margarine with at least 15% water stored on wooden pallets	40-60	1,6	-
<b>8.3</b>	<b>Sugar in small paper bags, thickly stacked</b>	-	0,2	-
<b>9. ELECTRICAL PRODUCTS</b>				
<b>9.1</b>	<b>PVC insulated cables - bundles on metal supports</b>	30-90	0,5	5.0 <sup>a</sup>
<b>10. OTHER</b>				
<b>10.1</b>	<b>Work shoes with leather and polyurethane soles, in cardboard packaging</b>	100	0,9	-
<b>10.2</b>	<b>Lime ammonium nitrate in polyester bags, thickly coated</b>	90	0,2	0,6
<b>10.3</b>	<b>Lime ammonium nitrate in polyester bags, thickly stacked on wooden pallets</b>	80	1,2	-
<b>10.4</b>	<b>Leather folded</b>	5-15	1,2	5,3
<b>10.5</b>	<b>Grease in an open container</b>	100	0,5	11,5
<b>10.6</b>	<b>Audio cassettes and floppies</b>			
10.6.1	unfixed, slightly roughly complex	80	1,6	-
10.6.2	polycarbonate housing and polyester strips, not thickly coated	80	0,4	-
10.6.3	polycarbonate housing and polyester strips in cardboard box	100	0,2	-
<b>10.7</b>	<b>Dispersive colors in plastic pans on wooden pallets</b>	80	0,05	-
<sup>a</sup> Applies only to fuel components NOTE: Table taken from DIN 18230-3				