PÄÄSTEAMET
Estonian Rescue Board

SUMMARY OF STRUCTURAL FIRE SAFETY REQUIREMENTS

April 2017

FOREWORD

This summary has been prepared based on Minister of Internal Affairs Regulation No. 17 of 30th March 2017 "Fire safety requirements to buildings and requirements to firefighting water supply". In general, not all structural fire safety requirements have been described here, as this publication is only a reminder of the main requirements.

Minister of Internal Affairs Regulation No. 17 of 30th March 2017 "Fire safety requirements to buildings and requirements to firefighting water supply" entered into force on 7th April 2017. § 20 entered into force on 1st July 2017, subsections 4 and 5 of § 14 enter into force on 1st January 2018, subsection 3 of § 55 enters into force on 31st of March 2018.
The full text of the regulation can be found in Riigi Teataja: www.riigiteataja.ee

The standard series EVS 812 consists of eight standards:

- EVS 812-1 Fire safety of constructions - Part 1: Vocabulary
- EVS 812-2 Fire safety of constructions - Part 2: Ventilation systems
- EVS 812-3 Fire safety of constructions - Part 3: Heating systems
- EVS 812-4 Fire safety of constructions - Part 4: Fire safety of industrial buildings, storages and garages
- EVS 812-5 Fire safety of constructions - Part 5: Fire safety of oil terminals and gas stations
- EVS 812-6 Fire safety constructions - Part 6: Firefighting water supply
- EVS 812-7 Fire safety of constructions – Part 7: The fulfilment of essential requirement - Safety of construction works in case of fire in the course of design and building process
- EVS 812-8 Fire safety of constructions – Part 8: High-rise buildings

The standards can be found in Estonian Centre for Standardisation: www.evs.ee

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1. GENERAL REQUIREMENTS

The goal of fire safety requirements is to avoid a fire and fire danger in buildings. In order to meet this goal, the possibility of a fire must be taken into account during the design, construction and use of a building, at the same time considering the effects inside the building and outside it, including the fire and explosion risk caused by technical systems and devices in the building.

A fire is an uncontrolled combustion process taking place outside of a special fireplace, characterized by the emission of heat and smoke and danger to human life or health, property or environment.

A risk of fire is a combustion process taking place outside of a special fireplace, which does not pose a threat to human life or health, property or environment. Unimpeded development of such a process may result in fire.

Five important fire safety requirements have been imposed in order to avoid fire and fire danger; obeying these requirements during the design, construction and use of a building reduces the threat to human life or health, property or environment.

1.1. Important fire safety requirements

In case of a fire in a building:

- the load bearing capacity of the building must be sustained during established time;
- the formation and spread of fire and smoke in building must be restricted;
- the spread of fire to neighbouring buildings must be restricted;
- safe evacuation must be guaranteed;
- the safety and possible activities of rescue teams must be taken into account.

Important fire safety requirements are considered to be fulfilled, if:

- the building meets the limits stipulated in Minister of Internal Affairs regulation No. 17;
- the building meets contemporary technical norms;
- the building meets contemporary standards, or
- the fulfilling of important fire safety requirements is proofed analytically.

1.2. Analytical proof

Analytical proof must be used, if:

- there is a deviation from the limits stipulated in Minister of Internal Affairs regulation No. 17;
- there is a deviation from the solution in relevant technical norms or standards;
- a building of cultural value is altered and concessions from important fire safety requirements are wanted.

Analytical proof must be performed by a person with the professional certificate of fire safety expert level 6. If necessary, the fire safety expert shall involve persons from the specific field or competent persons to prepare the analysis.

1.2.1. Proof methods

- **Qualitative assessment** – based on statistics, experience, tests, R&D reports etc.
- **Quantitative analysis** – prediction method that usually includes modelling and expert assessment. The probabilities and effects of various risks are analysed numerically and the general risk of the project is calculated.
- A combination of the two abovementioned**.**
- Other – the reliability of other chosen methods must be proved before using them.

Analytical proof includes the documents of international organisations or professional associations or the manuals Estonian Rescue Board or other relevant documents.

1.3. Purposes of buildings

The buildings can be divided into the following categories according to the activities taking place inside them.

	Explanation
Purpose 1 (residential buildings)	Users are acquainted with the rooms inside the building; there are prerequisites for guaranteeing personal safety; permanent wakefulness cannot be presumed *Examples: Summerhouse, single house, terraced house, apartment building, auxiliary buildings.*
Purpose 2 (accommodation building)	Users cannot be presumed to be well acquainted with rooms, there are prerequisites for guaranteeing personal safety; permanent wakefulness cannot be presumed. *Examples: hotel, guesthouse, dormitory, sanatorium, spa.*
Purpose 3 (welfare and detention buildings)	Users cannot be presumed to be acquainted with rooms, there are limited or no prerequisites for guaranteeing personal safety. *Examples: nursing home, support home, orphanage, residential school, family health centre, hospital, jail, prison.*
Purpose 4 (building for gathering)	Users cannot be presumed to be well acquainted with rooms, there are prerequisites for guaranteeing personal safety; users are presumably awake. A building for gathering is a room or a group of rooms, which are within a fire compartment, which is meant for a large number of users. *Examples: school, kindergarten, store, animal hospital, sports building, nightclub, theatre, museum, library, church.*
Purpose 5 (offices)	Users are presumably acquainted with the rooms inside the building; there are prerequisites for guaranteeing personal safety users are presumably awake. *Examples: rescue service building, office building, air traffic control centre*
Purpose 6 (industrial buildings and warehouses**)**	Buildings and other rooms for production and/or storing and repair and maintenance of vehicles (electronics, etc.). *Examples: car workshop; boiler house; storage building of liquid fuel terminal, wood processing or chemical industry, drier, barn.*
Purpose 7 (garages**)**	Garages and parking buildings (excl. garages in other buildings).

Buildings with ≤ 10 users can be considered as equal to residential buildings in terms of the important fire safety requirements (KV 1). This concession does not apply to buildings with KV 6 or 7 nor buildings, which permanently contain people with limited mobility (physical, mental).

1.4. Fire hazard classes

In addition, buildings with KV 6 are divided into fire hazard classes.

	Explanation
Fire hazard class 1 (no fire hazard)	There is practically no fire hazard or it has very low probability. Specific fire load is < 300 MJ/m^2. *Examples:* *cold treatment of metals and machine building, including welding;* *wet processes of the leather, paper and food industry;* *factories of concrete, cement or bricks;* *warehouses for metal (non-combustible packaging);* *washing rooms.*
Fire hazard class 2 (flammable)	Fire hazard and the spread of fire have a high probability. The specific fire load of industrially treated or stored combustible materials is 300–1200 MJ/m^2. The specific fire load of treated or stored combustible materials is > 1200 MJ/m^2. The industrial treatment or storing involves flammable liquids with flash point > 55 °C or gases or solids with fine particles that are flammable to a lesser extent. *Examples:* *leather, textile, food, timber and furniture industries;* *thermal power plants and boiler houses;* *car repair and maintenance workshops;* *print houses.*
Fire hazard class 3 (flammable and explosive)	In addition to high fire danger, there is a danger of explosion, which may occur without the fire phase. The industrial treatment or storing involves flammable liquids with flash point < 55 °C. The industrial treatment or storing involves flammable liquids with flash point > 55 °C near flash point temperature or above it. *Examples:* *factories for explosives, Styrofoam, bitumen and Ruberoid;* *parts of timber and furniture factories that emit dust;* *mills and concentrated fodder factories and warehouses;* *peat factories and peat power plants;* *spray paint shops;* *warehouses for explosives.*

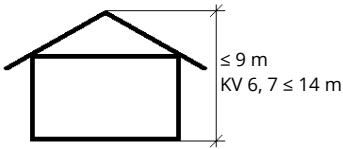
1.5. Fire safety classes

Buildings are divided into the following fire safety classes according to performance in fire:

- **TP1** (flameproof) – the load bearing structure of the building may not collapse in a fire during given time, whereby normally the load bearing structure of such a building does not collapse during a fire.
- **TP2** (fire stopping) – the load bearing structure of the building may not collapse in a fire during given time, whereby the given time is shorter than that of a fireproof building.
- **TP3** (susceptible to fire) – the fire resistance of the building's load bearing structure has not been determined, unless it affects the fire resistance of fire compartments.

The buildings of TP1 have no limits in terms of the number of floors, height, area and number of users.

1.5.1. Limits of TP3 buildings

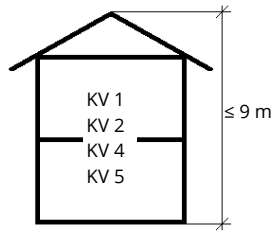


Area:

- ≤ 2400 m^2
- KV 3 ≤ 1200 m^2

Number of users:

- KV 2≤ 50 places
- KV 3 ≤ 10 places
- KV 4 ≤ 500 persons
- Pre-school institutions ≤ 50



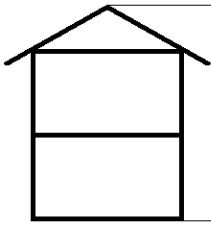
Area:

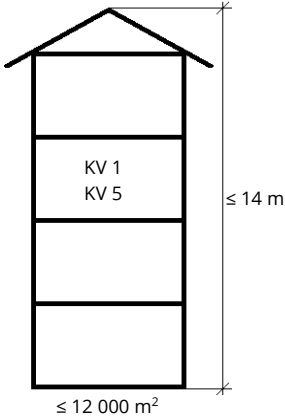
- ≤ 1600 m^2

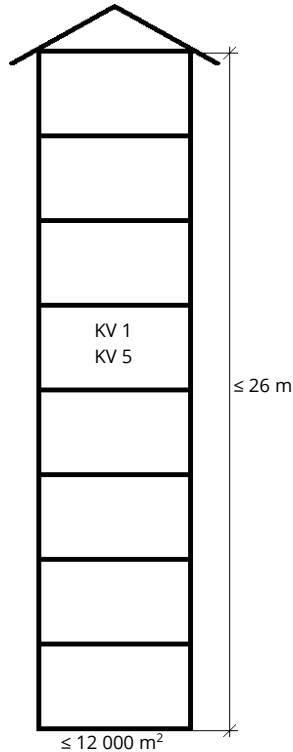
Number of users:

- KV 2≤ 10 places
- KV 4≤ 50 persons
- KV 5 ≤ 150 employees

1.5.2. Limits of TP2 buildings







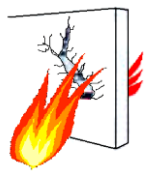
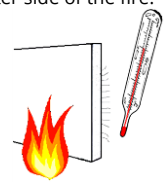
Number of users

One floor	KV 2	≤ 150 places
	KV 3	≤ 100 places
	Pre-school institution	≤ 100 places
Two floors	KV 2	≤ 50 places
	KV 3	≤ 25 places
	KV 4	≤ 250 persons
	Pre-school institution	≤ 50 places
	KV 6	≤ 50 employees

2. FIRE RESISTANCE, REACTION TO FIRE, SPECIFIC FIRE LOAD

2.1. Fire resistance

Fire resistance is the ability of the buildings' structure or part of the structure to preserve its load bearing capacity, integrity and thermal insulation in the event of a fire within a given time, expressed in minutes.

R (load bearing capacity)	E (integrity)	I (insulation)
Carries the required load during the period of fire influence without losing its stability.	Prevents the flames and hot gases from penetrating the side flanked by fire to the outer side of the fire.	Prevents the transmission of excess heat from the side flanked by fire to the outer side of the fire.
		

2.1.1. Fire resistance of load bearing structures

	TP1			TP2			TP3
	Specific fire load			Specific fire load			
	> 1200	600–1200	< 600	> 1200	600–1200	< 600	
≤ 2 floors	R 120[1]	R 90[1]	R 60[1]	R 30	R 30	R 30	-[4]
KV 2 or 3 and basement	R 120[2]	R 90[2]	R 60[2]	R 30	R 30	R 30	-[4]
3-8 floors	R 180[2]	R 120[2]	R 60[2]	X[3]	X[3]	X[3]	X[3]
3-8 floors, KV 1 or 5							
surface floors	R 180[2]	R 120[2]	R 60[2]	R 180[1]	R 120[1]	R 60[1]	X[3]
basements floors	R 180[2]	R 120[2]	R 60[2]	R 180[2]	R 120[2]	R 60[2]	X[3]
> 8 floors	R 240[2]	R 180[2]	R 120[2]	X[3]	X[3]	X[3]	X[3]
Floors below the first basement floor	R 240[2]	R 180[2]	R 120[2]	R 240[2]	R 180[2]	R 120[2]	R60[2]

[1]load bearing structure at least A2-s1,d0 or insulation material at least A2

[2]load bearing structure at least A2

[3]such a building is not allowed

[4]no requirements are set

2.1.2. Fire resistance of fire barriers

	TP1 or TP2 3-8 floors			TP2	TP3
	Specific fire load				
	> 1200	600–1200	< 600		
TTS on surface floors	EI 120	EI 90	EI 60	EI 30	EI 30
TTS in the attic	EI 30	EI 30	EI 30	EI 30	EI 30
TTS in the basement [1]	EI 120[1]	EI 90[1]	EI 60[1]	EI 60[1]	EI 30[1]
Walls and doors of KV 2 accommodation rooms	EI 15	EI 15	EI 15	EI 15	EI 15

[1]fire barrier made of at least A2-s1, d0 materials, excl. filling and the basement of a TP3 accommodation room

Fire resistance of KV 6 fire barriers

	TP1	TP2	TP3
Fire hazard class 1			
1, 2 or 3 TKT	EI 90	EI 90	EI 90
4 TKT	EI 60	EI 60	EI 60
Fire hazard class 2			
1, 2 or 3 TKT	EI 120	EI 120	EI 90
Fire hazard class 3			
1, 2, or 3 TKT	EI 120	EI 120	X[1]
4 TKT	EI 60	EI 60	X[1]

[1]such a building is not allowed

NOTE: Boundary area fire barrier from A1 materials.

If the fire barrier wall is pierced by a device that does not enable the sealing of the created opening with fire protection filling, a system preventing the spreading of the fire must be created.

- ≥ 4 m long intermediate space protected by an automatically activating sprinkler system or a
- water curtain composed of two sprinkling lines (gap between lines 0,5 m)
- sprinkling intensity ≥ 1 l/sec×m^2
- extinguishing time – fire resistance time, but ≥ 1 h

Fire resistance of KV 7 fire barriers

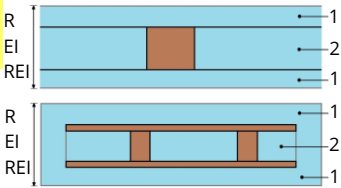
- in general, EI 60
- surface TP2 and ≤ 2000 m^2, EI 30
- standalone TP3 and ≤ 2400 m^2 and TTS ≤ 400 m^2, EI 30

Fire barrier made of at least A2-s1,d0 materials.

2.1.3. Encapsulation of the load bearing structure

Upon encapsulation of a bearing structure composed of combustible materials with a non-combustible cover material, it can be considered as a bearing structure composed of non-combustible materials. The required fire prevention capacity:

- $K_2$30, in case of R30 or R60 fire resistance
- $K_2$60, in case of ≥ R90 fire resistance



1 – cover material
2 – insulation material

Non-combustible material (reaction to fire either A or B)

Combustible material (reaction to fire either C or D)

2.2. Reaction to fire

Reaction to fire is the ability of a material to combust upon contact with fire; to spread fire; to emit heat, smoke, toxic gases and burning (hot) droplets.

Reaction to fire is divided as follows:

- A1 – does not react to fire (e.g. stone, concrete, glass, steel)
- A2 – very little smoke is released (e.g. mineral wool, plasterboard)
- B – combustible, very little smoke is released (e.g. painted plasterboard, wood treated with a fire retardant)
- C – small amount of smoke is released and quickly extinguishing burning droplets or pieces are created (e.g. plasterboard covered in paper)
- D – reacts to fire, can be a part of a fire (e.g. wood, tiles based on wood)
- E – usually participates in a fire (e.g. synthetic polymers)
- F – easily combustible or not defined

Materials with ratings of A1, A2 and B are considered non-combustible.

Additional classification, the creation of smoke:

- s1 – very little smoke is created
- s2 – small amounts of smoke are created
- s3 – does not meet the requirements of s1 or s2

Additional classification, the emitting of burning droplets/pieces:

- d0 – burning droplets/pieces do not occur
- d1 – burning droplets/pieces extinguish quickly
- d2 – does not meet the requirements of d0 or d1

The following subscripts are also used:

- L – pipe insulation
- ca – cable
- FL – flooring
- roof – roofing

2.2.1. Pipe insulation's reaction to fire

Exposed area > 20 %	$A2_L$-s1,d0 A2-s1,d0
Exposed area < 20 %	
surrounding area requirement B-s1,d0	B_L-s1,d0
surrounding area requirement C-s2,d1	C_L-s3,d0
surrounding area requirement D-s2,d2	D_L-s3,d0

2.2.2. Cable's reaction to fire

in general	E_{ca}
KV 1-5, height ≤ 26 m	D_{ca}-s2,d2
KV 1-5, height > 26 m	B_{ca}-s1,d0

2.2.3. Flammability of textile interior material*

KV 2, 3, or 4	SK 1
KV 2, 3 or 4 and is ATS and AKS	SK 2

SK 1 non-flammable	Difficult to ignite, extinguishes by itself, does not melt during fire	Cotton treated with fire retardant, wool, viscose, polyester, acrylic fibre, aramid fibre, PVA fibre and chloroforms
SK 2 flammable	Ignite and burn to the end	Wool, compressed cotton, polyamide, some modified acrylic fibres (polypropene)

*textile interior material – curtains, upholstery of soft furniture or chairs, rigs, mattresses, blankets, pillows and materials or fabrics made out of artificial fibres used as curtains

2.2.4. Reaction to fire of interior surfaces

KV 1, 2 **KV 2 or 3 interior corridor, TP3** **KV 3, TP3** **KV 4, < 600 MJ/m², ≤ 300 m²** **KV 4, < 600 MJ/m², > 300 m², TP3** **KV 5, TP1, TP3** **KV 6, fire hazard class 1, TP3** **Sauna**	wall, ceiling	D-s2,d2
KV 3, TP1, TP2, **KV 4, ≥ 600 MJ/m²** **KV 2 or 3 interior corridor, TP1, TP2** **Stairway or evacuation corridor, TP2, TP3**	wall, ceiling	B-s1,d0
Basement, TP2 **Technical space**	floor	D_{FL}-s1
KV 6, fire hazard class 2 and 3, TP1, TP2	wall, ceiling	B-s1,d0
KV 7	floor	$A2_{FL}$-s1
KV 4, < 600 MJ/m², > 300 m², TP1, TP2	wall, ceiling	C-s2,d1
KV 5, TP2	wall, ceiling	D-s2,d2[1]
KV 6, fire hazard class 1, TP1, TP2	wall, ceiling	D-s2,d2
	floor	D_{FL}-s1
KV 6, fire hazard class 2 and 3, TP3	wall, ceiling	D-s2,d2
	floor	$A2_{FL}$-s1
Stairway or evacuation corridor, TP1	wall, ceiling	A2-s1,d0
	floor	D_{FL}-s1
Basement, TP3	wall, ceiling	D-s2,d2
	floor	D_{FL}-s1
Basement, TP1	wall, ceiling	C-s2,d1
	floor	D_{FL}-s1
Used attic, TP2, TP3	floor	D_{FL}-s1
Used attic, TP1	floor	$A2_{FL}$-s1
Unused attic, TP1, TP2	floor	B-s1,d0
Boiler room	floor	$A2_{FL}$-s1

Reaction to fire can be lower (but at least D-s2,d2), if:

- risk of combustion or the spread of fire is significantly smaller or
- better evacuation than required is guaranteed or
- said part of the building is covered with AKS

[1]A three- or four-story building – B-s1,d0

2.2.5. Reaction to fire of outer wall

TP3, TP2	Outer surface of outer wall	D-d2
	Outer surface of vent slip	D-d2
	Inner surface of vent slip	D-s2,d2[1]
	Insulation system	D-d0
TP2, 3-8 floors, KV 1 or 5	Outer surface of outer wall	B-d0[2]
	Outer surface of vent slip	B-d0[2]
	Inner surface of vent slip	B-s1,d0[3]
	Insulation system	B-d0
TP2, KV 3	Outer surface of outer wall	B-d0[2]
	Outer surface of vent slip	B-d0[2]
	Inner surface of vent slip	B-s1,d0
	Insulation system	A2-d0[5]
TP1[6]	Outer surface of outer wall	B-d0[4]
	Outer surface of vent slip	B-d0[4]
	Inner surface of vent slip	B-s1,d0
	Insulation system	A2-d0[5]

[1]does not apply to TP3

[2]D-d2, if:
- spread of fire blocked on the surface of the wall
- A2 insulation material

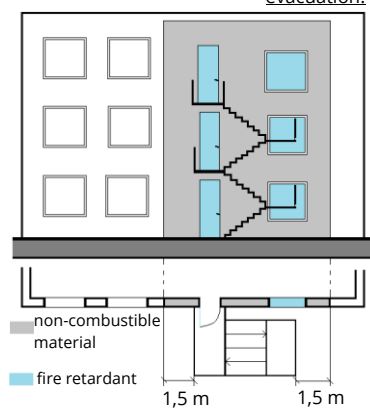
[3]D-s2,d2, if:
- 3-4 floors
- spread of fire obstructed in vent slip

[4]D-d2, if:
- ≤ 8 floors
- spread of fire blocked on the surface of the wall
- A2 insulation material

[5]B-d0, if:
- at a height of ≤ 22 m from the ground

[6]structure D-s2,d2, if:
- ≤ 2 floors and A2 insulation material or
- 3-8 floors, non-load bearing and A2 insulation material

If an external stairway is used for evacuation:

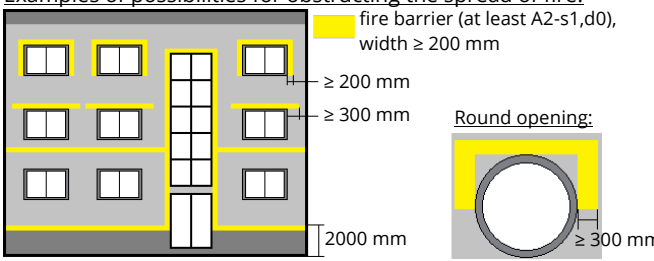


Note: stairs slope ≤ 45°

2.2.6. Insulation material of the outer wall

- non-combustible in general
- combustible material is allowed, if:
  - the product used does not allow the fire to reach the insulation material inside the device or
  - the spread of fire is obstructed and the material is placed to a height of up to 22 m from the ground
- the A2,d0 insulation system of the building of a > 2 floor TP1 healthcare- or welfare institution or kindergarten
- the A2,d0 insulation system of a > 3 floor TP1 school building

Examples of possibilities for obstructing the spread of fire:



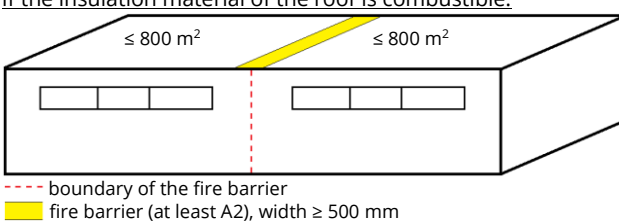
2.2.7. Reaction to fire of roofing

in general $B_{roof}(t_{2\text{-}4})$[1]

[1]there are no requirements, if:

- distance to neighbouring building ≥ 40 m
- building does not have a fireplace or
- building with a fireplace, the chimney solution according to section 4.5

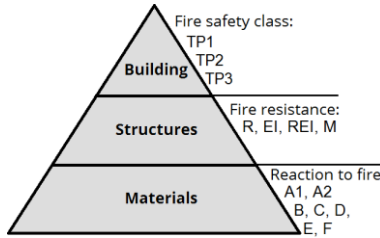
If the insulation material of the roof is combustible:



2.2.8. Reaction to fire of the floor of balconies, loggias and terraces

Building with ≤ 2 floors	D_{FL}-s1
Building with 3-8 floors	B_{FL}-s1
Building with a height of > 26 m	$A2_{FL}$-s1

A concise scheme of fire safety class, fire resistance and reaction to fire:



2.3. Specific fire load

Specific fire load is the gross amount of heat emitted from the floor per unit area while burning, which is released on the burning of all combustible materials in the room including the covering materials of walls, floors and ceilings (unit of measurement MJ/m^2).

Specific fire load groups:

- **> 1200** – e.g. a library with a repository; a warehouse space or archive, where combustible materials are stored.
- **600–1200** – e.g. a shop; exhibition hall; library without a repository; maintenance room for motor vehicles; basement of a residential building, which has storage spaces excl. a technical basement.
- **< 600** – e.g. a residential building, accommodation; healthcare- or welfare institution; detention facility; restaurant; office; school; gym; theatre and church

If the building or part of a building is equipped with AKS, the fire resistance requirements imposed on the bearing structure are of a range one lower.

The calculation of specific fire load:

$$E = \sum(m \times q) / A$$

3. AVERSION OF FIRE AND ITS DANGER

To reduce the damage caused by fire, the building is divided into fire compartments. A fire compartment is a room spanning one or more floors or a part of the building that is separated from other parts of a building so that the spread of fire into or out of said compartment is blocked during a certain time.

3.1. Fire compartments

Fire compartments are formed by:

- floors – in general every story is a separate fire compartment
- the purpose of use of rooms (section 3.1.1.)
- the area (section 3.1.2.)

3.1.1. By the purpose of use of rooms:

- evacuation route;
- evacuation stairway;
- apartment;
- solid fuel or electrically heated sauna, excl. in a living or accommodation space;
- storage space, specific burning stress > 600 MJ/m^2 and area ≥ 10 m^2;
- boiler room, total power > 25 kW (solid, liquid fuel), > 35 kW (gas);
- ventilation room;
- rescue team information point;
- the control centre for fire and rescue equipment of a high-rise building;
- firefighting support point;
- elevator shaft and -machinery room, excl. fireproof stairways equipped with AKS;
- garage, excl. dwellings with one apartment if the area < 60 m^2;
- blockade for restricting the spread of fire and smoke;
- the gap above the hanging ceiling of an evacuation route, where the amount of heat emitted upon the burning of cables is > 50 MJ/jm, is not covered with AKS;
- the gallery that connects different buildings;
- the attic, excl. attics of summer houses, garden houses and dwellings with one apartment;
- the electrical cabinet or room, rated current of the main circuit breaker > 100 A;
- the accommodation room of a KV 2 building.

3.1.2. By the area (TTS limit area, m^2):

General

	TP1	TP2	TP3
KV 2	1600	1600	800
KV 3	800	800	400
KV 4	2400	1600	800
KV 5	2400	1600[1]	800
Attic	800	800	400
Basement	800	800	400

[1]5-8 floors, 600 m^2

Purpose 6

	TP1			TP2		TP3
Number of floors	1	2-3	≥ 4	1	2	1
Fire hazard class 1						
I TKT	6000	4000	3000	4000	2000	2000[3]
II TKT	9000	6000	5000	5000	3000	3000[3]
III TKT	12000	8000	6000	6000	4000	4000[3]
IV TKT	Based on consideration				12000	12000
Fire hazard class 2						
I TKT	2000	1000	750	1000	X[1]	500[2]
II TKT	3000	1500	1200	2000	X[1]	1000[2]
III TKT	4000	2000	1500	3000	X[1]	1500[2]
IV TKT	8000	4000	3000	6000	X[1]	3000[2]
Fire hazard class 3						
I TKT	2000	1000	750	1000	X[1]	X[1]
II TKT	3000	1000	750	1500	X[1]	X[1]
III TKT	4000	2000	1500	2000	X[1]	X[1]
IV TKT	8000	4000	2500	4000	X[1]	X[1]

[1]such a building is not allowed

[2]may be increased by 50 %, if:

- non-combustible insulation material
- full metal building

[3]may be increased 3 times, if:

- load bearing structures, fire barriers A1
- insulation material at least A2
- walls and ceiling at least B1-s1,d0

NOTE: On basement floor–based on consideration

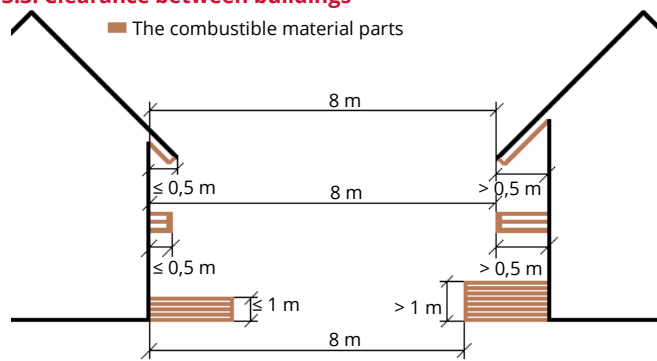
Purpose 7

	TP1		TP2		TP3	
	≤ 8 floors	Basement floors	≤ 2 floors	Basement floors	Stand-alone	As part of another building
I TKT	2000	1500	3000	1500	1000	400
II or III TKT	6000	3000	6000	3000	2000	1000
IV TKT	12 000	6000	8000	6000	6000	3000

3.2. Fire doors

- 50 % fire resistance of the fire resistance time of the fire barrier, but ≥ 30 min, excl. the door of an accommodation room or the door undergoing restauration of a culturally significant building
- if the area of the door is > 40 % of the area of the fire barrier, then a fire resistance of 100 % of the fire resistance time of the fire barrier
- if it is situated in a fire barrier separating the boundary area and the specific burning stress is > 1200 MJ/m^2, then a fire resistance of 100 % and the area ≤ 40 % of the fire barrier
- S_a or S_{200} smoke resistance
- the door with a smoke resistance of S_{200} of an evacuation route or -stairway
- equipped with a closing device, excl. apartments, technical rooms
- materials with a reaction to fire rating of at least B are used for installation or attachment

3.3. Clearance between buildings



The clearance has no requirements, if:

- the buildings are on the same plot and are of the same fire safety class **and**
- the total area of TP3 buildings is ≤ 400 m^2 **or**
- the total area of TP1 or TP2 buildings is ≤ 800 m^2

The clearance width can be < 4 m, if:

- the buildings are on separate neighbouring plots **and**
- small buildings (≤ 60 m^2 and ≤ 5 m high) **or**
- residential buildings with one or two apartments **and**
- the total area of TP3 building is ≤ 400 m^2 **or**
- the total area of TP1 or TP2 buildings is ≤ 800 m^2 **and**
- the outer wall of one of the buildings is a firewall **or**
- the outer walls of both buildings are EI-M 60

The clearance width can be 4–8 m, if:

- the buildings are on separate neighbouring plots **and**
- small buildings (≤ 60 m^2 and ≤ 5 m high) **or**
- residential buildings with one or two apartments **and**
- the total area of TP3 building is ≤ 400 m^2 **or**
- the total area of TP1 or TP2 buildings is ≤ 800 m^2 **and**
- the outer wall of one of the building is EI 60 **or**
- the outer walls of both buildings are EI 30

3.3.1. Firewall

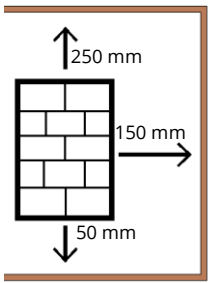
- ≥ 0.5 m above the highest wallside roof, excl. when the roof is EI 60
- ≥ 0.3 m above the outer wall, if the insulation material or the cover surface of the façade is of a combustible material
- is composed of at least A2 materials
- can endure mechanical load
- when built out of concrete or masonry, then the mechanical shock resistance does not have to be proved via testing

4. FIRE SAFETY OF THE HEATING SYSTEM AND VENTILATION

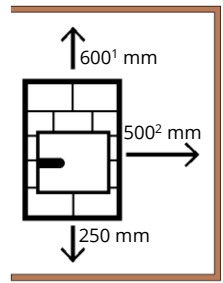
In general, the solid or liquid fuel or gas heating appliance must not be in the garage. The heating appliance can be in the garage, if the device is separated from the garage into its own fire compartment.

4.1. Safety distance of heating appliance and its components

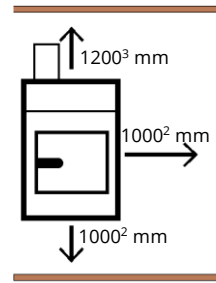
80-140 °C (hot) (furnace masonry)



140-350 °C (burning) (hearths, furnace doors)



350-600 °C (glowing) (metal connecting flue)



[1]in case of tempered steel heater 1000 mm
[2]can be reduced by 50% with a single protective screen;
can be reduced by 75% with a double protective screen
[3]can be reduced by 25% with a single protective screen;
can be reduced by 50% with a double protective screen

4.2. Connecting the heating appliance to the smoke flue

The use of a ventilation duct to direct the smoke to outside air is prohibited.

In general, each heating appliance must have its own smoke duct.

The connection of two heating appliances to one duct is allowed, if:

- they both function on under pressure;
- they are situated on the same floor;
- the same kind of fuel is burned in them;
- they are equipped with separate dampers;
- the distance between connections is ≥ 600 mm;
- the temperatures of output gases are ≤ 400 °C;
- they are situated in the same apartment or section of a building (in the same terraced house).

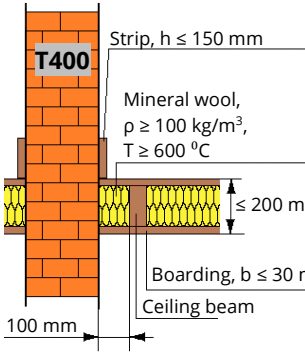
4.3. The attributes and marking of chimneys

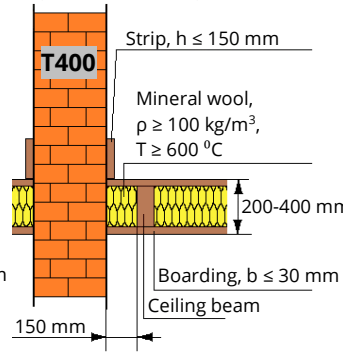
Temperature class	Shows what temperature smoke can be directed to the chimney. Standard classes: **T80, T100, T120, T140, T160, T200, T250, T300, T400, T450, T600**.		
Pressure class	**N1, N2** – under pressure. They are suitable for heating appliances functioning on solid fuels (fireplaces, furnaces, sauna heaters etc.). **N1** is suitable for residential spaces.	**P1, P2** – overpressure. They are suitable, if the heating appliance creates a working pressure of up to 200 Pa in the smoke duct.	**H1, H2** – high pressure. They are suitable, if the heating appliance creates a working pressure of up to 5000 Pa in the smoke duct.
Condensation resistance	**W** – to be used with heating appliances, if condensate is created (temperature of smoke gases < 150 °C). For example, central heating boilers and -stoves, furnaces and fireplaces with a waterscape etc. The chimneys must have the ability to collect and remove condensate	**D** – to be used without a waterscape and with heating appliances that do not create condensate (temperature of smoke gases > 150 °C). The chimney must be equipped with a chimney cup.	
Corrosive resistance	**1** – can conduct the smoke of a gas or oil heating appliance	**2** – can conduct the smoke of a gas or oil heating appliance, in addition, wood in open hearths	**3** – can conduct the smoke of all fuel types (gas, oil, wood in closed furnaces, coal, peat)
Soot fire resistance	**O** – is not resistant to soot fire. If the smoke does not contain solid, flammable and flying particles (e.g. gas, oil-heating appliance), then the chimney does not have to be resistant to soot fire.	**G** – resistant to soot fire. If the smoke may contain solid, flammable and flying particles (e.g. solid fuel appliances), then the chimney must be soot fire resistant.	

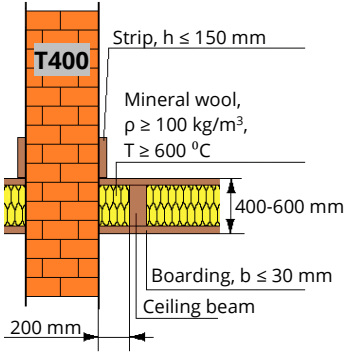
The connection duct has requirements similar to the smoke duct of the chimney.

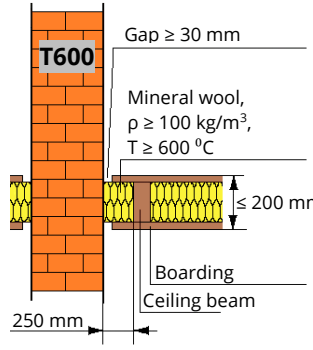
4.4. Chimney pass-throughs

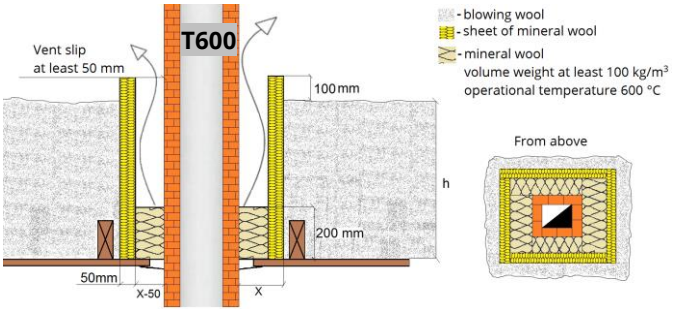
4.4.1. Vertical (intermediate ceiling or roof-ceiling)



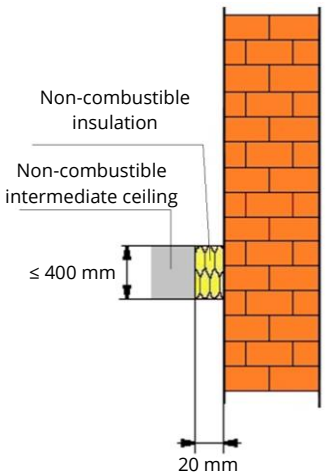


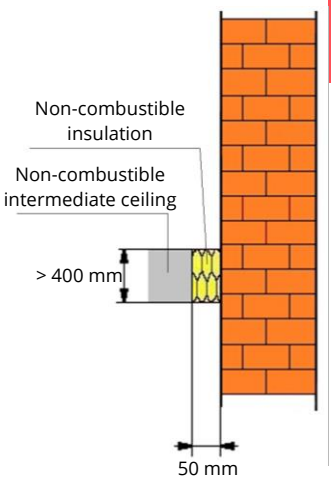




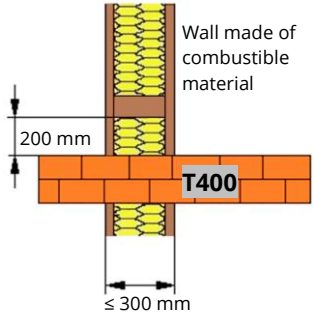


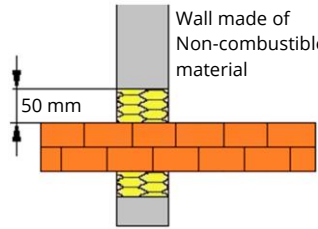
X – insulation required by the manufacturer for a pass-through of 200 mm. For a masonry chimney X = 250 mm.



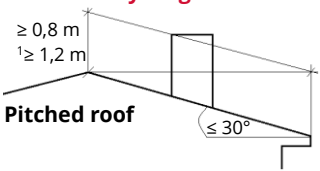


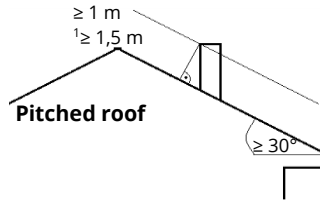
4.4.2. Horizontal (from the wall)



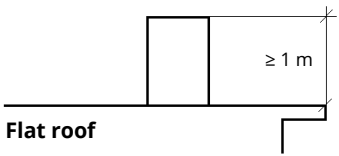


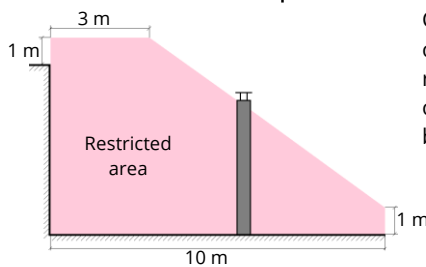
4.5. Chimney height





[1]In case of a combustible roofing material, a spark arrester with mesh dimensions 10 × 10 mm must be used.

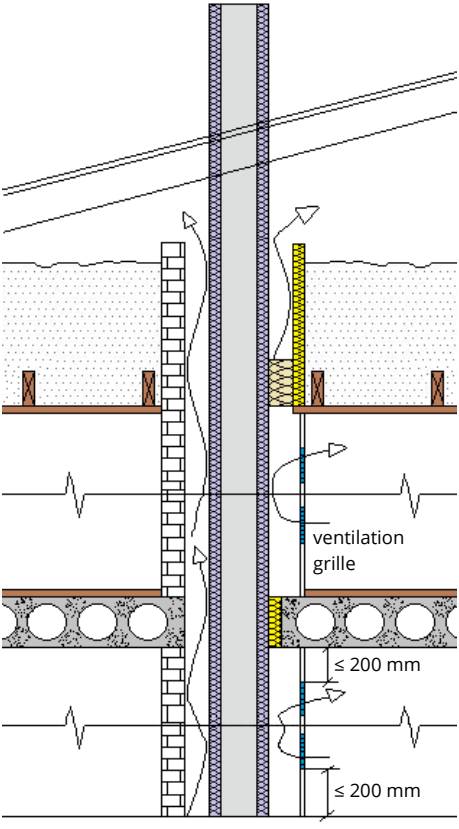




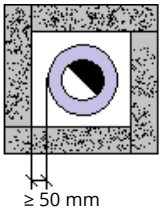
Chimney height from obstacles within a 10 m radius (parts of the same or neighbouring buildings).

4.6. Installation of chimney into a shaft

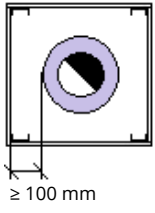
A metal chimney can be installed into a shaft made of non-combustible material.



Shaft made of class A material



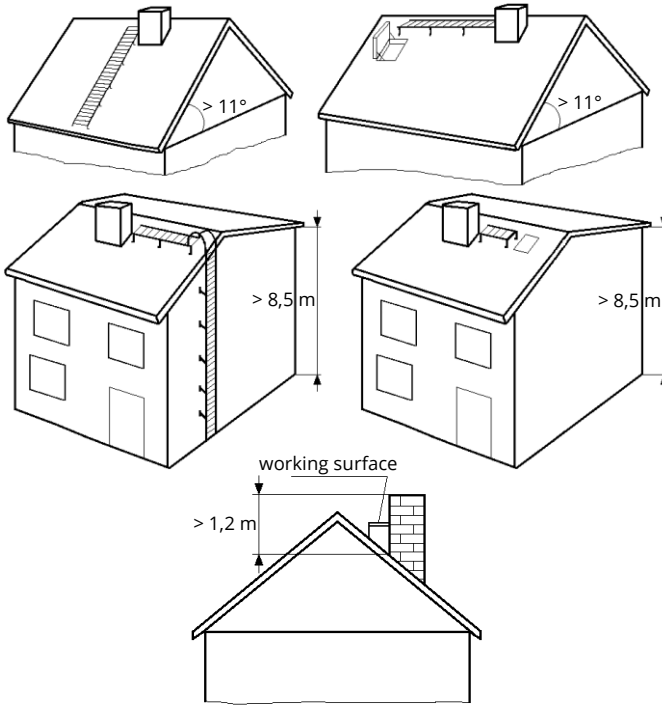
Shaft made of class B material



4.7. Access to chimney

Safe access to the chimney must be available for maintenance.

- fixed
- available all year round



4.8. Ventilation system fire safety

4.8.1. Materials

- at least A2-s1,d0 materials, excl. small parts which do not foster the spread of fire
- exhaust duct of a dwelling with one apartment made of at least D materials
- exhaust duct of a dwelling with one apartment made of flexible duct or bellow tube, excl. kitchen exhaust duct

Kitchen exhaust duct of a residential building:

- in a shaft or
- EI 15 and A2-s1,d0
- flexible duct for joining air cleaner and exhaust duct

Air cleaner's duct in a large kitchen*:

- in a EI 60 ja A2-s1,d0 shaft or
- EI 60 ja A2-s1,d0

Wall thicknesses of a duct made of sheet metal[1]

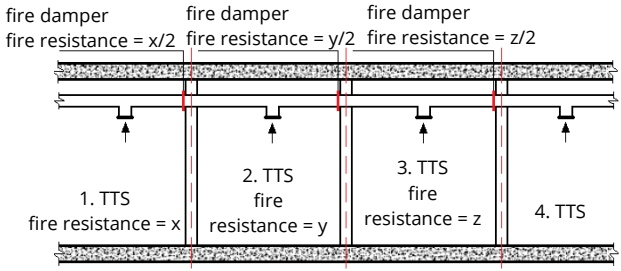
	Minimum sheet thickness, mm	
	Steel	Aluminium
Duct with rectangular cross-section		
Longer edge ≤ 300 mm	0,5	0,7
Longer edge 300-800 mm	0,7	0,9
Longer edge > 800 mm	0,9	1,2
Duct with round cross-section		
Diameter ≤ 400 mm	0,5	0,5
Diameter 400-800	0,7	0,8
Diameter > 800 mm	0,9	1,0

[1]local exhaust duct in a large kitchen– steel, thickness ≥ 1.2 mm

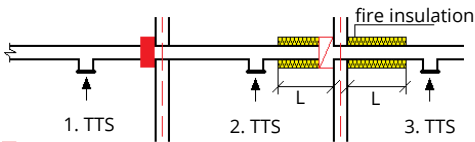
*large kitchen – a kitchen in a professional catering company or in a diner of an organization, includes food preparation heating devices with thermal power above 25 kW

4.8.2. Stopping the spread of fire

Fire damper with normal closing temperature of 70 °C ± 5 °C are used to stop the spread of fire.



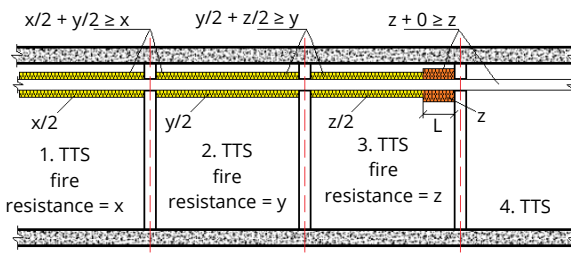
If the insulation properties (I) of a fire damper do not meet the requirements, fire insulation must be installed. The insulation performance requirement is not applied, if the cross-section of the duct is ≤ 200 cm^2.



a fire damper meeting the requirements of impermeability and insulation

a fire damper meeting the requirements of impermeability

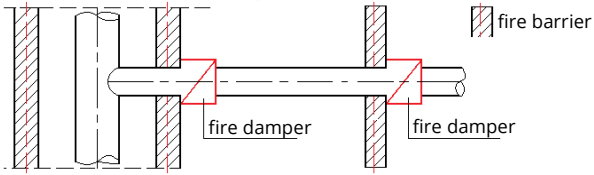
If the ventilation duct does not open to the fire compartment, fire insulation can be used.

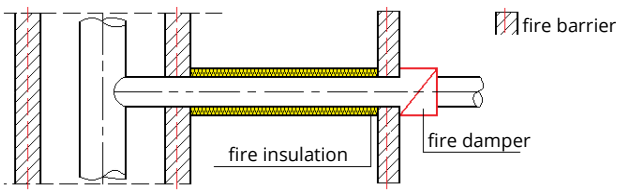


Length of the insulated duct zone (L)

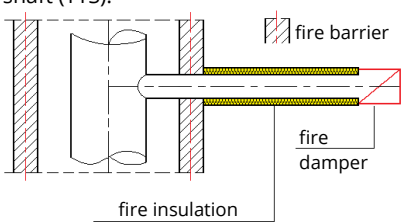
Fire resistance of TTS	Longer edge of the rectangular duct or diameter of a round duct	
	≤ 300 mm	> 300 mm
30 min	L ≥ 0,5 m	L ≥ 1,0 m
60 min	L ≥ 1,0 m	L ≥ 2,0 m
90-120 min	L ≥ 2,0 m	L ≥ 4,0 m
240 min	L ≥ 4,0 m	L ≥ 4,0 m

The fire damper is installed on the connection duct before the shaft (TTS) or fire insulation is installed on the connection duct passing through another fire compartment.





Fire insulation is installed to the wall between the fire damper and shaft (TTS).



4.8.3. Stopping the spread of flue gases

Smoke damper are used in the initial stages of a fire to stop the spread of smoke.

A smoke damper can, *inter alia*, include:

- air valve – the spread of smoke can be effectively stopped by inlet and exhaust cap, valves and their connection ducts. Airflow through throttle ≤ 42 dm^3/s in case of a pressure drop 100 Pa between two nearest rooms. The air valve can be removed using a special tool.
- air gate – a rising air inlet or exhaust duct.
- vertical rise ≥ 2.5 m and diameter or longer edge 10 % of the length of air gate.
- fire damper controlled by smoke detector or ATS – ATS is used to control the fire damper along at least the whole fire compartment.

The spread of smoke must be restricted:

- between the accommodation rooms of buildings with KV 2
- between the wards of buildings with KV 3, S-marked valves shall be used
- in rooms for persons with restricted capacities whose possibilities for leaving the house are worse than usual
- between apartments
- between the fire compartments in a KV 3 building with > 25 bed places
- between the fire compartments in day care centre for > 25 persons
- between the fire compartments in a KV 2 building with > 50 bed places

5. FIRE SAFETY INSTALLATION

The fire resistance of the power cables of the fire safety installation and their fixings must ensure fire safety installation's power supply during the required operating time.

5.1. Autonomous fire detector

- in at least one room used for living in an apartment or house
- in each accommodation room in a KV 2 building with ≤ 10 accommodation spaces
- in KV 3 building rooms with ≤ 10 bed places, excl. sanitary rooms
- in each room in a KV 4 building with ≤ 300 m^2, excl. sanitary rooms
- in each room in a KV 5 building with ≤ 750 m^2, excl. sanitary rooms

Connected to the electrical system and equipped with batteries, excl. KV 1 and 5.

5.2. ATS (detection zone precision)

- KV 2 building with > 10 accommodation spaces
- KV 3 building with > 10 bed places
- KV 4 building with > 300 m^2
- KV 5 building with > 750 m^2
- > 60 m^2 closed garage in a storied building or KV 2, 3, 4 or 5 building
- KV 6 building:
  - fire hazard class 1, TP3, TTS > 2000 m^2
  - fire hazard class 1, 1 floor, TP2, TTS > 4000 m^2
  - fire hazard class 1, 2 floors, TP2, TTS > 2000 m^2
  - fire hazard class 1, 1 floor, TP1, TTS > 6000 m^2
  - fire hazard class 1, 2-3 floors, TP1, TTS > 4000 m^2
  - fire hazard class 1, ≥ 4 floors, TP1, TTS > 3000 m^2
  - fire hazard class 2, TP3, TTS > 500 m^2
  - fire hazard class 2 or 3, 1 floor, TP2, TTS > 1000 m^2
  - fire hazard class 2 or 3, 1 floor, TP1, TTS > 2000 m^2
  - fire hazard class 2 or 3, 2-3 floors, TP1, TTS > 1000 m^2
  - fire hazard class 2 or 3, ≥ 4 floors, TP1, TTS > 750 m^2
- KV 7 building:
  - part of another building, TP3, TTS > 400 m^2
  - standalone, TP3, TTS > 1000 m^2
  - basement floor, TP1, TP2, TTS > 1500 m^2
  - 1-2 floors, TP2, TTS > 3000 m^2
  - ≤ 8 floors, TP1, TTS > 2000 m^2

5.3. Addressed ATS (detector or room precision)

- KV 2 building with > 100 accommodation spaces
- KV 3 building with > 50 bed places
- KV 4 building with > 500 users
- building with > 8 floors
- TP2 building with 5–8 floors
- underground garage with several floors or parking basement
- building with > 20 detection zones

5.4. Escape route lighting

5.4.1. Operating time one hour

- KV 2 building, excl. building with < 11 accommodation places
- KV 3 building not used around the clock
- KV 4 building, excl. single-storey catering building with ≤ 50 seats and commercial building ≤ 300 m^2 with exits directly to the outside
- KV 6 building, if > 50 people work (at the same time)
- KV 5 building, if area > 300 m^2
- garage for motor vehicles or parking house without compartments > 1000 m^2
- evacuation route
- common areas of evacuation routes
- rescue team information point

5.4.2. Operating time three hours

- KV 3 building used around the clock
- buildings of international passenger terminals
- building with > 9 floors, excl. residential building
- underground garage with several floors or basement
- other underground buildings

5.5. Open area lighting

- Operating time one hour
- open area with > 10 persons (at the same time) or > 60 m^2
- > 10 m^2 toilet or dressing room, excl. residential building
- toilet or dressing room for persons with mobility disabilities, excl. residential building
- moving stairway or moving footpath
- steam room or other sauna rooms used publicly

5.6. Wet rising main

- buildings where furthest point to floor entrance > 50 m
- building with > 4 floors
- basement with several floors
- KV 7 building with several floors

Information sign on the wall near inlet.

5.7. Firefighting hose system

KV 6 building, if specific fire load is > 600 MJ/m^2:

- fire hazard class 2, TP3, TTS > 1000 m^2
- fire hazard class 2, 1 floor, TP2, TTS > 2000 m^2
- fire hazard class 2 or 3, 1 floor, TP1, TTS > 3000 m^2
- fire hazard class 2, 2-3 floors, TP1, TTS > 1500 m^2
- fire hazard class 2, ≥ 4 floors, TP1, TTS > 1200 m^2
- fire hazard class 3, 1 floor, TP2, TTS > 1500 m^2
- fire hazard class 3, 2-3 floors, TP1, TTS > 1000 m^2
- fire hazard class 3, ≥ 4 floors, TP1, TTS > 750 m^2

Required water flow ≥ 2,5 l/s.

5.8. Automated firefighting system

- building in which TTS through ≥ 3 floors, excl. TTS evacuation stairway or residential building with one or two apartments
- KV 3 building with > 4 floors, excl. the part where the application of AKS is dangerous or disturbs the providing of vital services
- TP2 or TP3 building that exceeds the limits for the number of floors, height, area or number of users (sections 1.5.1. and 1.5.2.)
- building that exceeds the TTS limit area (section 3.1.2.)
- TP2 building with 5-8 floors, excl. cases when the load bearing structure is at least A2-s1,d0
- stairway of a TP2 building with 3–4 floors, if the inner surface is D-s2,d2
- basement with several floors
- KV 6 building:
  - fire hazard class 1, TP3, TTS > 4000 m^2
  - fire hazard class 1, 1 floor, TP2, TTS > 6000 m^2
  - fire hazard class 1, 2 floors, TP2, TTS > 4000 m^2
  - fire hazard class 1, 1 floor, TP1, TTS > 12 000 m^2
  - fire hazard class 1, 2-3 floors, TP1, TTS > 8000 m^2

- fire hazard class 1, ≥ 4 floors, TP1, TTS > 6000 m^2
- fire hazard class 2, TP3, TTS > 1500 m^2
- fire hazard class 2, 1 floor, TP2, TTS > 3000 m^2
- fire hazard class 2 or 3, 1 floor, TP1, TTS > 4000 m^2
- fire hazard class 2 or 3, 2-3 floors, TP1, TTS > 2000 m^2
- fire hazard class 2 or 3, ≥ 4 floors, TP1, TTS > 1500 m^2
- fire hazard class 3, 1 floor, TP2, TTS > 2000 m^2

- KV 7 building:
  - part of another building, TP3, TTS > 1000 m^2
  - standalone, TP3, TTS > 2000 m^2
  - basement floor, TP1, TP2, TTS > 3000 m^2
  - 1-2 floors, TP2, or ≤ 8 floors, TP1 TTS > 6000 m^2
- a lowly guarded room with large area or high specific fire load, in which a fire has started, may danger the surroundings or cause large property damage or destroy thing of cultural value

If AKS is installed to a building in which it is not required, then the following concessions can be made:

- TTS limit area, but not in a KV 2 or 3 building
- length of the exit route, but not in a KV 2 or 3 building
- number of users, but not in a KV 2 or 3 building
- fire resistance of the load bearing structures
- fire resistance of the TTS structures
- reaction to fire of structures
- clearance between the buildings

In case of applying > 2 concessions, analytical proof must be performed.

5.9. Smoke and heat removal

It must be possible to remove heat and smoke from all the rooms using one or two of the following methods:

- window, hatch or door in the upper third of the room, which can be opened or safely broken from the floor within hand's reach; a window that can be safely broken is allowed only on the first floor.
- smoke hatch or window that can be opened using remote control
- exhaust fan
- creating overpressure in the room that is to be kept smoke-free

Stairway of a two-floor building:

- easily openable window or hatch in the upper part of the stairway
- total effective smoke removal area ≥ 0.5 m^2

Stairway of a 3–8 floor building:

- easily openable window or hatch in the upper part of the stairway
- total effective smoke removal area ≥ 1 m^2
- window or hatch must be openable without entering the smoke environment.

Fresh air supply must be granted to the TTS stairway.
Smoke from the basement cannot be guided to the stairway used for evacuation or to rescue team entrance.

5.10. Lightning protection

- KV 1, 2, 4, 5 or 6 building which has the highest point > 15 m higher than the surrounding buildings
- TP2 or TP3 KV 2 or 4 building, but not when the load bearing structure is A1 or A2
- KV 3 building
- KV 6 building with fire hazard class 2 or 3
- KV 4 open building with > 200 users
- Building for keeping > 100 animals

5.10.1. Protection class (if risk analysis is not performed)

KV 6 building with fire hazard class 3 Air traffic control centre	protection class I
KV 3 building with patients around the clock Alarm centre building KV 6 building with fire hazard class 2 Building with the height of > 100 m Radio or TV mast	protection class II
KV 2 building with > 60 accommodation spaces KV 4 building Stadium or sports hall for > 200 spectator seats KV 5 building > 2000 m^2 KV 6 building with fire hazard class 1 Building for keeping > 100 animals Building with height > 26 m	protection class III
Other buildings in which lightning protection is required	protection class IV

6. ENSURING EVACUATION

Evacuation is the forced movement of the building's users to a safe place in case of a fire, fire danger or other danger.

The safe place is inside the building or outside it and it protects persons from fire, smoke and heat and other possible dangers until the danger is removed or the persons are rescued.

Evacuation types:

- mass evacuation – all people immediately leave the building
- evacuation in stages– step-by-step withdrawal from fire source
- passive evacuation – people remain in place and wait for rescue

From the standpoint of evacuation, an **evacuation area** is uniform part of the building from which the withdrawal begins. It may form part of a fire compartment, but it may consist of several fire compartments.

6.1. Evacuation exit

Door leading directly outside from the evacuation area or a room inside building which can be used for evacuation into a safe place in case of a fire.

- must be located sparsely
- marked, excl. for rooms in KV 1 buildings not used publicly

Distance between exits in gathering rooms:
$L_E \geq 1{,}5 \times P^{0,5}$

6.1.1. Number of exits

The evacuation area must have at least two evacuation exits.

One evacuation exit and route is allowed in the following cases:

- building with ≤ 8 floors, if the evacuation area is KV 1
- KV 1 building with ≤ 16 floors, if the area under the building is ≤ 450 m^2
- KV 5 or 6 building, if closed net area ≤ 500 m^2
- KV 2, 3 or 4 building for ≤ 10 users, if the users are not in danger

If there is only one evacuation exit, there must be an emergency exit.

6.2. Emergency exit

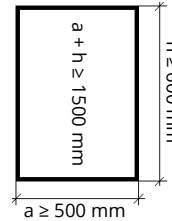
Emergency exit is an exit that does not meet the criteria of an evacuation exit but which can be used for evacuation in case of a fire.

Marked, excl. for KV 1:

A window or balcony is used as an emergency exit. Recommended text: *„Hädaväljapääs“*

Exit with stationary ladder. Recommended text: *„Evakuatsiooniredel“*

Dimensions:

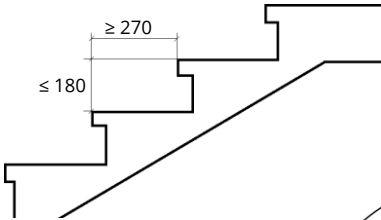


6.3. Evacuation route

Evacuation route is passage inside the building that can be passed freely and safely and which starts from emergency exit and ends in a safe place.

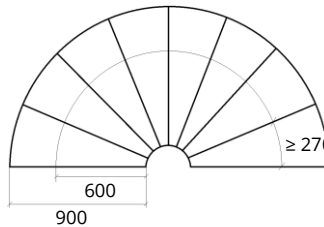
- marked, easily accessible and usable
- no elevated floor points are allowed in KV 3 buildings
- may not be obstructed
- may not pass through technical equipment or other technical rooms
- is formed as a separate fire compartment
- reaction to fire of interior surfaces according to section 2.2.4.
- inclination of stairs and dimensions of treads and half-pieces must ensure safe evacuation
- in KV 3 buildings or educational building the central opening of spiral stairs ≥ 1000 mm and tread depth > 150 mm
- stairs with > 3 treads must have a handrail:
  - upper edge at the height of ≥ 1000 mm
  - distance between posts ≤ 110 mm
- stairs and half-pieces in evacuation routes in TP1 building with > 2 floors must be made of at least A2-s1,d0 materials and have fire resistance:
  - R 30 in rooms with specific fire load ≤ 600 MJ/m^2
  - R 60 in rooms with specific fire load > 600 MJ/m^2
- fire resistance R 60 of structures in evacuation routes in TP2 building with 3–8 floors and stairway and half-piece

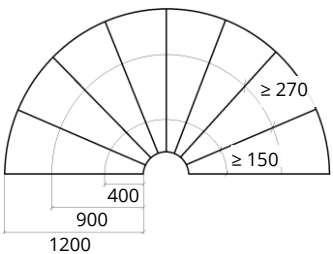
Dimensions of stairs



3–18 treads in on stair run

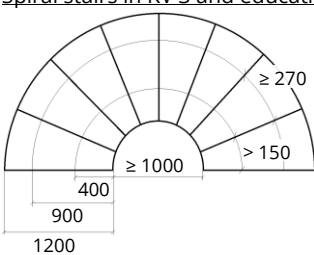
In case of a 900 mm wide spiral stairs, the tread depth is measured at 600 mm from the narrow side.





If the width of spiral stairs ≥ 900 mm, then the tread depth is measured at 900 mm from the narrow side.
If the width of spiral stairs ≥ 1200 mm, then tread depth ≥ 150 mm is measured 400 mm from the narrow side.

Spiral stairs in KV 3 and educational buildings



Diameter of central opening ≥ 1000 mm

Tread depth > 150 mm and ≥ 270 mm, measured at 400 mm and 900 mm, respectively, from the narrow side.

6.3.1. Dimensions

Width:

- in general ≥ 1200 mm
- ≤ 2 floors and in buildings with > 2 apartments ≥ 900 mm
- KV 3 building: depends on use, number of persons and dimensions of used mobility support devices and evacuation devices
- in evacuation areas with ≤ 60 users, one of them may be ≥ 900 mm
- in KV 6 buildings without permanent workspaces or single workspaces the passage or stairs can be ≥ 800 mm

Total width of the interior corridor leading to evacuation route and evacuation exit, if it is for > 120 persons:

$\sum a = 1200 + [(n - 120) / 60) \times 400]$

Height:

- in general ≥ 2100 mm
- in basement ≥ 1900 mm

No obstacles are allowed in height.

6.4. Exit route

Exit route is a passable free route from any point on the building's floor to evacuation exit

- marked
- may not pass through technical equipment or other technical rooms

6.4.1. Dimensions

Width:

- in evacuation area ≥ 800 mm
- in common use areas: requirements of evacuation routes
- KV 3 building – depending on the purpose of rooms

Height:

- requirements of evacuation routes

Length (m):

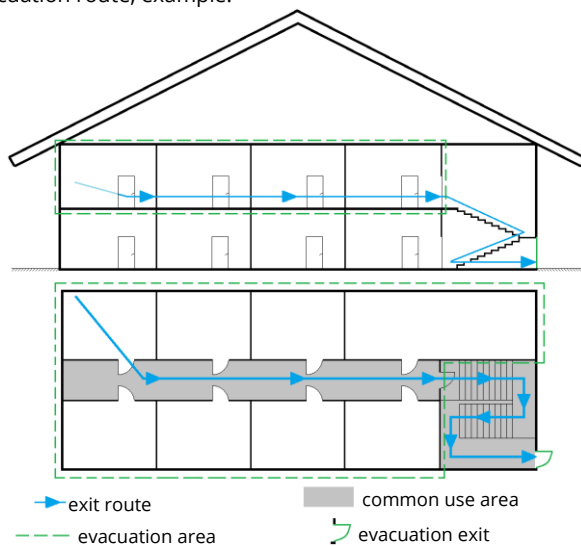
From the furthest point of the evacuation area to the evacuation exit or other fire compartment.

Purpose 1 or 5	
in general	30
≥ 2 evacuation exits	45
Purpose 2 or 3	30
Purpose 4	
in general	45
classroom, lecture hall	30
pub, bar, restaurant	30
shopping centre, department	30
Purpose 6 or 7	45

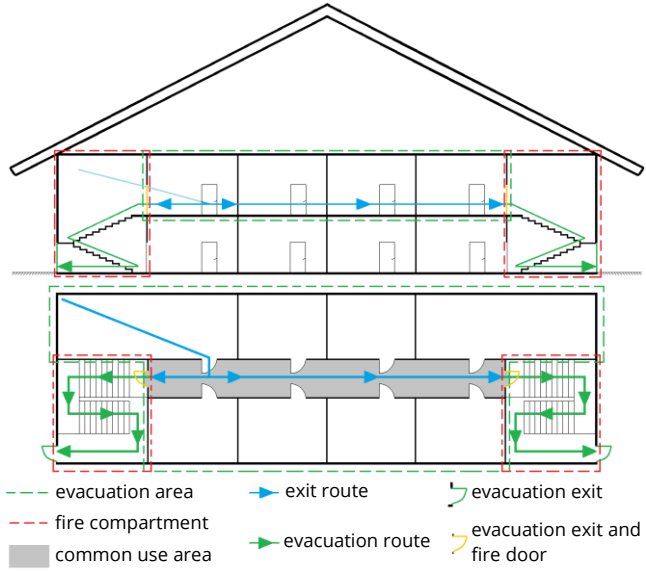
Exit route may be longer:

- 20 %, if the exit route is located on the first floor and emergency exits lead directly on the ground
- 50 %, if the building has ATS
- according to presented calculations, if the building has AKS or automatically triggered SE

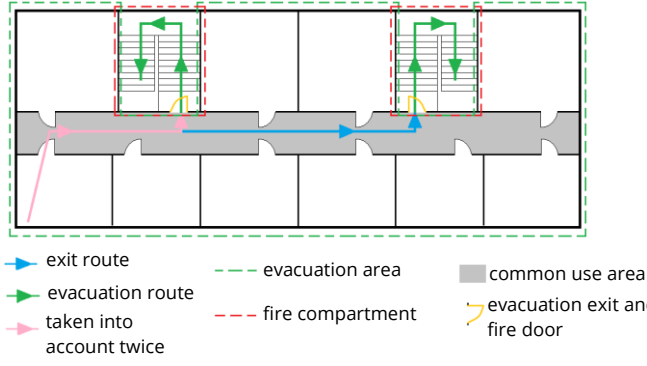
The length of the exit route does not exceed limits, there is no evacuation route, example:



The length of the exit route exceeds the limit, evacuation route is required, example:



If different exit routes to two different evacuation exits have a common part, then the length of the common part is taken into account twice.



6.5. Doors on evacuation routes and exit routes

- must be installed in a way to facilitate quick evacuation
- must open at least 90°
- must open in the direction of evacuation, excl. for the door for < 30 persons
- the door that opens towards the stairway may not make the evacuation route narrower and hinder evacuation
- threshold height ≤ 25 mm

6.5.1. Dimensions

Clear opening width:

- width of evacuation route
- interior door in general ≥ 850 mm
- entrance door, connecting route door ≥ 850 mm
- if > 60 persons, then ≥ 1050 mm

Clear opening height:

- in general ≥ 2000 mm
- in basement ≥ 1800 mm

The dimensions can be decreased by the size of the doorjamb, excl. for cases proofed analytically.

6.6. Door hardware of evacuation routes and exit routes

The opening movement may not be in reverse direction to the evacuation direction.

6.6.1. Panic-prevention hardware

- for the evacuation of ≥ 150 persons.

Horizontal bar meeting the standard EN 1125.

6.6.2. Escape hardware

- for the evacuation of 30–150 persons

Escape hardware with a latch or pushbutton meeting the standard EN 179.

6.6.3. Other hardware

- for the evacuation ≤ 30 persons familiar with the building
- for buildings equal to KV 1 buildings

Other hardware openable without a key (e.g., turn buttons).

Label next to the opening device:

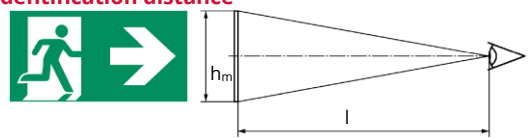
6.7. Marking

- On the wall – lower edge of the mark ≥ 1.5 m height
- In the ceiling – lower edge of the mark ≥ 2.1 m height (1.9 m in basement)

The mark is placed to a well-lit place to avoid covering it with structures or objects (for example, furniture, advertisements, etc.).

	Movement direction: ▪ move right/left	On corridor walls Above adjacent doors At change of direction
	Movement direction: ▪ move down	Above stairs/ramps
	Movement direction: ▪ move straight ahead Change of level: ▪ move ahead and up Above the door: ▪ move straight through	In a corridor leading to a door In open areas Above doors Above stairs/ramps
	Change of level: ▪ move down and right/left	On stairway half-pieces
	Change of level: ▪ move up and right/left In open area: ▪ move right/left straight across	On stairway half-pieces In open areas
	Final exit	Above a door leading straight out of the building

6.7.1. Identification distance



- mark with external lighting, z = 100
- mark with internal lighting, z = 200

Identification distance:
$l = z \times h_m$

7. ENSURING THE SAFETY OF RESCUE WORKS AND RESCUE TEAMS

7.1. Access routes

Rescue equipment must be able to access the near vicinity of the buildings entrances, emergency exits and rescue team entrances.
In case of a building with one apartment < 50 m main entrance.

- width of access route ≥ 3.5 m
- access route's load bearing capacity ≥ 25 t
- 5–8 metres from building with ≥ 4 floors
- a circuit road is recommended
- dead-end streets ≤ 150 m and with a possibility to turn around, the turning radius of a rescue car is 12 m
- gate width ≥ 4 m and height ≥ 4,5 m

7.2. Entrance to the building

Access must be guaranteed to:

- basement floors
- floors above the ground
- attic
- roof

This mark is used on the entrance nearest to the ATS central device

7.2.1. Access to basement floor

- from outside, excl. for residential buildings with ≤ 2 apartments
- separate from the evacuation routes and stairways of floors above the ground, excl. for residential buildings with ≤ 2 apartments
- if ≥ 2 TTS-s, then at least one entrance per limit area

7.2.2. Access to attic, attic height ≥ 600 mm

- hatch dimensions at least 600 × 800 mm
- fixed ladder for the hatch

7.2.3. Access to roof, building height ≥ 8.5 m

- immediately from the stairway
- through the attic
- permanent fixed outdoor fire ladder
- in case of a building with an attic, one entrance per 100 m
- in case of a building with a roof-ceiling, one entrance per 1000 m^2
- hatch dimensions at least 600 × 800 mm

7.2.4. Outdoor fire ladder

- made of metal in TP1 buildings
- made of metal in TP2 or TP3 buildings
- width ≥ 700 mm
- distance between rungs ≤ 300 mm
- height difference 10–20 m: curved back protection at every 0.7 metres or rail for safety belt
- height difference > 20 m: inclination 6:1 and intermediate platform with handrails in every 8 metres

7.3. Rescue team information point

A building with ATS must have a rescue team information point.
Each building must have only one information point, which:

- must be located on rescue team entrance route
- must be marked
- if possible, be located near the front door and directly accessible from the outside

Information point must include:

- information boards of fire safety installations
- ATS control devices
- SE control devices
- building operational map
- diagrams and drawings necessary for rescue work
- information about providing additional water
- information about back-up generators or solar panels

The drawings shall include:

- location diagrams of the fire safety installations
- floor plans
- fire compartments and fillings with fire resistance time

If possible, one floor should be represented on one page.

7.4. Building operational map

- in buildings with own check reporting liability
- in buildings with ≥ 10 floors
- in buildings of cultural value
- in buildings which are for keeping monuments

BUILDING OPERATIONAL MAP	
Building's address	
Version No. (date and year of last revision)	
Building's purpose	
Purposes of different rooms in the building and their location	
Number of floors above the ground	
Number of floors below the ground	
Height from ground	
Fire safety class	
Locations of ATS central device and repeater panels	
Smoke removal activation level	☐ level 1 ☐ level 2 ☐ level 3 ☐ level 4
Firefighting water supply system in the building	YES/NO
External supply of the water supply system in the building	YES/NO
Wet/dry rising main	YES/NO
Sprinkler system	YES/NO
External supply of the sprinkler system	YES/NO
Fire lift	YES/NO
Distance to nearest fire water point, address	
Location of the gathering point of evacuees	
Location where to switch off the building's power supply Power company's name, contact person	
Additional dangers	
Other specifications	
Building's contact person and mobile phone number	
Valuable items/devices needing protection	YES/NO

If there is no information point, then the building operational map shall be:

- on the rescue team's access route near the entrance
- in an easily openable box
- box must be marked

8. FIREFIGHTING WATER SUPPLY

8.1. Flow rate and fire duration

	Q_0 (l/s)	t (h)
KV 1–5 (≤ 8 floors and specific fire load ≤ 600)		
≤ 800 m^2	10	3[1]
> 800 – 1600 m^2	15	3[1]
> 1600 – 2400 m^2	20	3[1]
protected with AKS	20	2[1]
KV 4 (≤ 8 floors and specific fire load > 600)		
≤ 800 m^2	20	3[1]
> 800 – 1600 m^2	25	3[1]
> 1600 – 2400 m^2	30	3[1]
protected with AKS	30	2[1]
KV 1–5 high-rise building ≤ 50 m		
< 25 000 m^3	20	6
25 000 – 50 000 m^3	25	6
> 50 000 m^3	30	6
KV 1–5 high-rise building> 50 m		
< 25 000 m^3	25	6
25 000 – 50 000 m^3	30	6
> 50 000 m^3	40	6
KV 6, fire hazard class 1		
< 12 000 m^2	10	2
protected with AKS	10	2
KV 6, fire hazard class 2 and KV 7		
< 2 000 m^2	20	3
> 2 000 – 3 000 m^2	25	3
> 3 000 – 4 000 m^2	30	3
protected with AKS	30	2
KV 6, fire hazard class 3		
< 2 000 m^2	20	6
> 2 000 – 3 000 m^2	25	6
> 3 000 – 4 000 m^2	30	6
protected with AKS	30	4

Amount of firefighting water:
$V = 3,6 \times Q_0 \times t$

[1]1can be reduced to one hour, if:

- new firefighting water source
- closed container (tank)

8.2. Distance

- fire hydrant ≥ 1.5 m from the building
- fire hydrant ≤ 2.5 m from the edge of the road
- natural or artificial water point ≥ 30 m building
- ≤ 100 m from the building
- distances between fire hydrants on common water system's distribution pipes ≤ 200 m

The location of water point is measured from the tactically logical access route of the rescue team; there may be more than one of these. It must be taken into account that fire may start in any part of the building.

8.3. Specialties

In case of a residential building with up to two floors in residential area:

- distance of water point ≤ 150 m

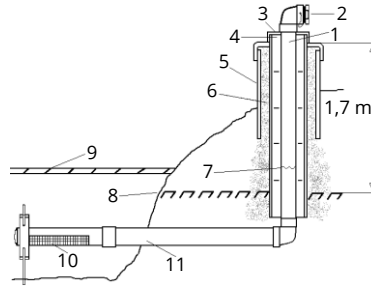
In case of rebuilding or extension of building with up to two floors in a summer house or gardening association area with no fire water supply:

- Distance of water point 10-150 m
- Amount of fire water 10 m^3

Concessions can be made to the existence, distance and water amount of the water point, if the suitability of the solution is proofed analytically.

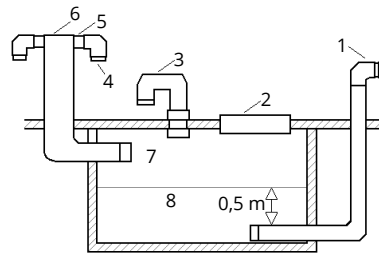
8.4. Dry hydrant

1 – 150 mm pipe
2 – junction STORZ 5“ with cover cap
3 – 250 mm pipe
4 – 100 mm insulation
5– 380 mm pipe with cover
6 – earth filling
7 – water level in pipe
8 – freezing depth
9 – ice cover
10 – sieve, opening area ≈ 940 cm^2
11 – 200 mm suction pipe



8.5. Tank

1 – dry hydrant
2 – maintenance hatch
3 – ventilation fixture
4 – 80 mm pipe with DN 80 junction
5 – non-return valve DN 80
6 – 100 mm filling pipes
7 – firefighting water
8 – does not count towards the amount of firefighting water



8.6. Information sign

- reflective
- 1,5–2 m high from the ground
- 1–1,5 m from the water point

ABBREVIATIONS

KV – purpose
TTS – fire compartment
TKT – fire protection level
K – fire protection of cover material, protects the material behind the cover from combusting or carbonizing during a given time
AKS – automated firefighting system
E – specific fire load (MJ/m^2)
m – amount of combustible material (kg)
q – calorific value of combustible material (MJ/kg)
A – area (m^2)
S – smoke permeation limit. Reduces or eliminates the transfer of gases or smoke from one side to another.
M – impact resistance and mechanical effect, resistance to mechanical effects
h – height (mm)
ρ – volume weight, density (kg/m^3)
T – working temperature (°C)
b – thickness (mm)
L – length of isolated duct (m)
ATS – automatic (reactive) fire detection and alarm system
L_E – distance (m) between entrances (doors) in gathering rooms
P – internal diameter of room (m)
a – width (mm)
∑a – total width (mm)
n – number of persons (pcs)
SE – smoke removal system
l – identification distance (m)
h_m – mark's height (m)
z – efficiency of illuminated mark
Q_0 – nominal flow rate of firefighting water for one fire (l/s)
t – estimated duration of fire (h)
V – amount of firefighting water (m^3)

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