

REGULATION
OF THE MINISTER FOR INTERNAL AFFAIRS AND
ADMINISTRATION¹⁾

of <date of the regulation>

on technical requirements for protective structures and for their use and location²⁾

Pursuant to Article 115(1)(1) of the Civil Protection and Civil Defence Act of 5 December 2024 (Journal of Laws, item 1907), the following is hereby decreed:

Chapter 1

General provisions

Section 1. 1. The Regulation lays down technical requirements for protective structures and for their use and location.

2. The provisions of Chapters 1–17 shall apply to the design, construction, reconstruction and change in the use of protective structures or their parts, as well as to any relating construction equipment.

3. The provisions of Chapter 18 shall apply to the use of protective structures.

4. The provisions hereof shall be applied taking the state of the art into account, including the rules laid down in the Polish Standards.

5. The Polish Standards referred to in the technical requirements for protective structures specified in the Regulation have been listed in Annex 1 to the Regulation.

Section 2. For the purposes hereof, the following definitions shall apply:

- 1) ‘protection period’ shall mean a period of autonomy, during which persons in a protective structure are ensured conditions to survive without relying on the external environment;

¹⁾ The Minister for Internal Affairs and Administration heads the government department responsible for internal affairs pursuant to § 1(2)(2) of the Regulation of the Prime Minister of 25 July 2025 on the detailed scope of activities of the Minister for Interior Affairs and Administration (Journal of Laws [Dziennik Ustaw], item 999).

²⁾ This Regulation was notified to the European Commission on ... 2025 under 2025/...../PL, pursuant to Section ... of the Regulation of the Council of Ministers of 23 December 2002 on the functioning of the national system for notification of standards and legal acts (Journal of Laws, item 2039; and Journal of Laws of 2004, item 597), implementing Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (codification) (OJ L 241, 17.9.2015, p. 1).

- 2) 'calculated destruction factor' shall mean the means of destruction with specific parameters characterising the conditions of its impact on a protective structure, including the type and quantity of the explosive or the TNT equivalent and the conditions for the impact of the means of destruction;
- 3) 'protective layer' shall mean the layer of a protective structure, securing the protective zone against the inward penetration of destructive factors of a mechanical type and against their mechanical impact, in particular, against fragments of ammunition and against firing from small arms, and also against explosion pressure, which, depending on the resistance category of the protective structure, may include structural barriers, protective barriers, automatic explosion relief valves and topography or ground shielding;
- 4) 'hermetic layer' shall mean the layer of a bunker that protects it against the inward penetration of chemical, biological and radioactive contamination and against its spread to a clean zone inside the bunker, which, depending on the bunker's resistance category, may include airtight barriers, hermetic barriers and valves, flaps, bolts and installation conduits that are hermetically sealed;
- 5) 'protective vestibule' shall mean a room that protects the interior of a protective structure against the impact of certain destructive factors, in particular, of explosion, located at the entrance to the protective structure and equipped with external and internal protective doors;
- 6) 'airlock' shall mean a room or a system of several interconnected rooms that protect the bunker against the inward penetration of chemical, biological and radioactive contamination and against its spread to a clean zone inside the bunker, located at the entrance to the protective structure and equipped with hermetic or hermetically sealed protective doors;
- 7) 'protective barrier' shall mean a door, gate, hatch, manhole or other barrier which, depending on the resistance category of the protective structure, is resistant to explosion pressure;
- 8) 'hermetic barrier' shall mean a door, gate, hatch, manhole or other barrier which, in accordance with the designed overpressure in a bunker, has the required hermetic properties defined by the air permeability class or by the maximum air flow through the barrier at the expected overpressure;
- 9) 'validity class' shall mean the validity class of a hydro-engineering structure referred to in the provisions of law on technical requirements to be met by hydro-engineering structures and their location, issued pursuant to Article 7(2)(2) of the Construction Law Act of 7 July 1994 (Journal of Laws 2025, items 418 and 1080).

Chapter 2

Resistance categories of protective structures

Section 3. 1. A protective structure shall be designed and constructed in accordance with requirements concerning the load-bearing capacity, stability and resistance to mechanical and environmental impacts, including specific loads resulting from the expected resistance category and the adopted protective function of a facility, ensuring the safety of users and property and the compliance with Polish Standards for the design and calculations for structures, as well as with the expected resistance category and the adopted protective function of the structure.

2. The following resistance categories of protective structures are set out:

- 1) U-1 shelter – having protective functions against:
 - a) loads caused by debris and falling structural elements and equipment of the building facility;
 - b) fragments of ammunition, including bombs, missiles and grenades, and against firing from small arms;
- 2) U-2 shelter – meeting the requirements laid down for U-1 shelter, and, in addition, protecting against the penetrating gamma radiation of radioactive fallout, ensuring at least a 100-fold attenuation of the penetrating gamma radiation;
- 3) U-3 shelter – meeting the requirements laid down for U-2 shelter and, in addition, protecting against:
 - a) the impact of explosion causing, on the surface of the site, a maximum incident overpressure (P_{so}) of at least 60 kPa and a duration of the overpressure phase (t_+) 50 ms or a quasi-static load of at least 60 kN/m² affecting the protective layer,
 - b) the dynamic impact of the calculated destructive factor at a set distance of its impact, if such a requirement is defined for the protective structure;
- 4) S-1 bunker – having protective functions against:
 - a) the impact of explosion causing, on the surface of the site, a maximum incident overpressure (P_{so}) of at least 100 kPa and a duration of the overpressure phase (t_+) 100 ms or a quasi-static load of at least 100 kN/m² affecting the protective layer,
 - b) a shock affecting the structure and transmitted to equipment with a value of at least 12.5 g, where g is the value of gravitational acceleration;
 - c) loads caused by debris and falling structural elements of the nearest building facility on the outer layer of the building facility's barrier,
 - d) fragments of ammunition, including bombs, missiles and grenades, and against small arms gunfire,

- e) the penetrating gamma radiation from radioactive fallout, ensuring at least a 1000-fold attenuation of the penetrating gamma radiation,
 - f) the impact of fire within the building in which the bunker is located and of long-term fire in the area in which the bunker is located,
 - g) the contamination of the internal environment of a structure due to the impact of external biological, chemical or radioactive agents,
 - h) the dynamic impact of the calculated destructive factor at a set distance of its impact, if such a requirement is defined for the protective structure;
- 5) S-2 bunker – an underground bunker with protective functions set forth for S-1 bunker and, in addition, having protective functions against:
- a) the impact of explosion causing, on the surface of the site, a maximum incident overpressure (P_{so}) of at least 200 kPa and a duration of the overpressure phase (t_+) 150 ms or a quasi-static load of at least 200 kN/m² affecting the protective layer,
 - b) the penetrating gamma radiation from radioactive fallout; ensuring at least a 1500-fold attenuation of the penetrating gamma radiation;
- 6) S-3 bunker – an underground bunker with protective functions set forth for S-2 bunker and, in addition, having protective functions against the impact of explosion causing, on the surface of the site, a maximum incident overpressure (P_{so}) of at least 300 kPa and a duration of the overpressure phase (t_+) 200 ms or a quasi-static load of at least 300 kN/m², affecting the protective layer.

Chapter 3

Technical requirements for the location and construction of protective structures

Section 4. 1. A protective structure shall be located where it may provide shelter for the number of persons defined by the civil protection authority from among the population in danger in the planning area referred to in Article 90(2) of the Civil Protection and Civil Defence Act of 5 December 2024.

2. In the planning area, which is located within the boundaries of a settlement unit without ribbon development, the distance from the protective structure to the residence area of the population may not be greater than:

- 1) 500 m – in the case of an area located within the administrative boundaries of a municipality;
- 2) 1,000 m – in the case of an area located outside the administrative boundaries of a municipality.

3. The distance referred to in subparagraph 2 shall be determined taking into account the length of a radius from the entrance to the protective structure and including the expected paths of human movement.

4. The condition referred to in subparagraph 2 shall not apply to a place of human residence located in any area:

- 1) in which the probability of flooding is high and is at least 10%; or
- 2) which is at risk of flooding in the event of damage to or destruction of a hydro-engineering structure of priority class I and II that continuously impounds water and is located at a distance of up to:
 - a) 20 km from the expected place of damage to a hydro-engineering structure of priority class I that continuously impounds water,
 - b) 10 km from the expected place of damage to a hydro-engineering structure of priority class II that continuously impounds water

– according to a flood risk map made available in the 'Hydroportal' information system referred to in Article 332 of the Water Law Act of 20 July 2017 (Journal of Laws of 2025, item 960).

5. The minimum distances of protective structures from oil and petroleum product storage tanks, fuel handling tanks and pipeline systems at service stations, liquefied petroleum gas tanks, underground pipelines, and water supply, sewage, heating and power lines have been set out in Annex 2 to the Regulation.

Section 5. 1. A protective structure can be:

- 1) completely underground; or
- 2) partially underground, ensuring that the structure is covered or backfilled to maintain a minimum soil layer of 0.7 m above its roof; or
- 3) embedded within a building facility and located either in a basement or on the ground floor; or
- 4) independent.

2. A protective structure located in an area that is at a particular risk of flooding, as referred to in Article 16(34) of the Water Law Act of 20 July 2017, or in an area that is at a risk of flooding in the event of damage to or destruction of a hydro-engineering structure of priority class I, II, III and IV that continuously impounds water, or in an area of potential flooding shall:

- 1) be [considered] protected against flooding, if the projected water depth on site does not exceed 0.5 m and the floor level in the protective structure is no lower than 1 m below the ground level; or
- 2) be considered at risk of flooding – in cases other than that specified in point 1.

3. The water depth referred to in subparagraph 2 shall be determined using data from the 'Hydroportal' information system and, in the case of flooding, based on topographic features.

4. The area referred to in subparagraph 2 shall be determined using data from the 'Hydroportal' information system and, in the case of flooding, taking into consideration data from the hydrogeological databases referred to in Article 380(3) of the Water Law Act of 20 July 2017.

5. A protective structure shall be protected against rainwater and groundwater by way of:

- 1) adequate topography above and around the protective structure that allows water to flow to lower-laying areas;
- 2) placing the bottom of the slab or foundation bench at least 0.75 m above the maximum groundwater level unless effective waterproofing is provided;
- 3) installing waterproofing and damp-proofing or drainage systems in justified cases.

6. Ensuring that waterproofing and damp-proofing insulation complies with applicable requirements:

- 1) under conditions of groundwater contamination by salt and other aggressive chemicals;
- 2) in protective structures located partially in groundwater or flood-risk zones, provided that they maintain their protective properties despite surface scratches or construction element cracks with openings up to 1 mm.

7. The underground portion of the protective structure's building envelope shall be constructed in such a way as to prevent dampness, water infiltration and vapour condensation on interior bulkheads, using damp-proofing and thermal insulation where appropriate.

Chapter 4

Capacity and area requirements for protective structures

Section 6. 1. The capacity of a protective structure, meaning the maximum number of persons who can be inside the protective structure, shall be determined taking into account:

- 1) the minimum usable floor space per person;
- 2) the safety of the protected persons, including:
 - a) the availability of air in the protective structure, assuming that carbon dioxide levels may not exceed 2 % by volume and that oxygen content must be at least 18 % by volume,
 - b) the planned term of protection,
 - c) the number of emergency exits.

2. The net area per person in the protective structure shall ensure that people can rest and move safely within the protective structure, taking into account the intended number of seating and sleeping places, and shall not be less than 1 m² per person.

Chapter 5

Resistance requirements for protective structures

Section 7. 1. A protective structure shall be designed and constructed in such a way as to ensure that its resistance, according to its protective functions, provides for protection of human life and health or for protection of property.

2. The construction of a protective structure shall ensure that, in accordance with its protective functions, the load-bearing capacity of all structural elements under the impact of the projected loads is maintained within the limits set.

3. Bunkers and U-3 shelters shall be designed and constructed in such a way as to ensure that the structural resistance of a protective structure is maintained when the impact of explosion for a given resistance category acts as the load applied simultaneously to all elements of the protective layer, and also when the load applied to these elements acts in the opposite direction, and is at a level of at least 30 % of the load caused by the impact of explosion.

4. It is permissible to design the construction of a protective structure taking into account its dynamic response to accidental impacts, including an impact of explosion, based on the incident value (P_{so}) and the duration of the overpressure phase (t_+), as well as to impacts caused by debris and falling structural elements and equipment.

5. The detailed requirements for the calculation of the construction and resistance of a protective structure have been set out in Annex 3 to the Regulation.

Chapter 6

Fire safety

Section 8. 1. A protective structure shall be designed and constructed in such a manner as to limit the possibility of fire and, should it occur, to ensure that:

- 1) the load-bearing capacity of the protective structure is maintained for a specified period;
- 2) fire and smoke inside the protective structure is prevented from spreading;
- 3) fire is prevented from spreading outside the protective structure;
- 4) people can be evacuated or otherwise rescued;
- 5) rescue teams are provided with access and with appropriate measures to carry out their activities, and that their safety is taken into consideration.

2. A protective structure with a dual function meets the fire protection requirements appropriate for the purpose of the structure and for the functions relating to its use as a protective structure and as a facility intended for other purposes, as set out in the legislation issued pursuant to Article 13(1) and Article 13(3) of the Fire Protection Act of 24 August 1991 (Journal of Laws of 2025, item 188).

3. The fire load density, the fire and smoke performance classes and the reaction-to-fire classes shall be established in accordance with Polish Standards on:

- 1) fire load density of rooms and fire zones;
- 2) fire and smoke performance classes;
- 3) fire reaction classes of construction products (materials).

Section 9. 1. A protective structure shall function as a fire zone, separated by fire-resistant barriers to prevent fire from spreading into its interior for a defined period of no less than:

- 1) 60 minutes – for U-1 shelters and U-2 shelters, in which closed structures are used as protection against the expected destructive factors,
- 2) 120 minutes – for U-3 shelters,
- 3) 240 minutes – for bunkers

– when the impact of fire is defined in relation to the standard fire curve, and also to limit the spread of smoke.

2. External protective layers of a protective structure, except for U-1 and U-2 shelters, shall be made in a way ensuring that the interior of the structure is protected from environmental impacts posing a threat to human health and life for at least 360 minutes in the event of fire outside the structure at a constant temperature of 400 °C, including at the temperature at which the thermal insulation of the structural elements ensures that the temperature of 30 °C is not exceeded on the internal surfaces of the protective structure.

3. The fire load density in the protective structure's room intended for simultaneous occupancy by more than 15 persons shall not exceed 500 MJ/m².

4. A storage or technical room or a complex of such rooms in which the fire load density exceeds 500 MJ/m² shall be separated from the rest of the protective structure by fire-resistant walls and fire-separation ceilings of the fire resistance class referred to in Section 10(1).

5. Walls and ceilings of a protective structure and their cladding shall be made of materials and products classified as reaction-to-fire class A1 or A2 with additional classifications s1, d0 or s2, d0, and in the case of floors, A1_{fl} or A2_{fl} with additional classification s1.

6. The interior finishing elements and permanent fittings of a protective structure shall be made of materials and products classified as the following reaction-to-fire class:

- 1) A1 or A2, B and C with additional classification s1, d0;
- 2) A1_{fl} or A2_{fl}, B_{fl} and C_{fl} with additional classification s1 – for floors and floor coverings;
- 3) A1_L or A2_L and B_L with additional classification d0 – for thermal insulation of ventilation, water supply, sewage and heating lines.

Section 10. 1. Walls and ceilings that constitute the fire-separation elements of a protective structure shall have a fire resistance class of at least:

- 1) REI 60 – for U-1 shelters;
- 2) REI 120 – for U-2 and U-3 shelters;
- 3) REI 240 – for bunkers.

2. Communication and installation openings in the fire-separation elements shall:

- 1) have fire-resistant barriers or fire-resistant protections of fire resistance class EI or EIS no lower than that required for such elements; or
- 2) be constructed in such a way as to limit the spread of fire to the interior of a protective structure during a period no shorter than that resulting from the fire resistance class of these elements, taking into account solutions and products intended for protective structures.

3. Protective zones shall be separated within a protective structure, with a maximum capacity of:

- 1) 300 persons – for shelters;
- 2) 1,000 persons – for S-1 bunkers;
- 3) 2,000 persons – for S-2 bunkers;
- 4) 3,000 persons – for S-3 bunkers.

4. The protective zones referred to in subparagraph 3 shall be separated by elements with fire and mechanical resistance, relevant for the category of a protective structure, in a manner that prevents fire from spreading and ensures protection against the expected destructive factors in the event of failure of or damage to the protective layer or hermetic layer within one of the protective zones.

5. Rooms intended for human use, circulation routes inside a protective structure, protective vestibules and airlocks shall be equipped with emergency evacuation lighting, automatically activated after the loss of primary lighting source, with a backup power operating time of at least 3 hours and with an illumination level measured at floor level of at least 5 lx.

6. Electrical circuits shall be designed in such a manner as to ensure that their failure due to fire in one protective zone does not result in an interruption of power supply in another protective zone.

Section 11. 1. No spaces at risk of explosion or explosion hazard zones shall be located within the fire zone of a protective structure intended for human occupancy.

2. A technical room housing a power generator, a fuel storage tank supplying the power generator, a fuel pump or an electrical energy storage facility, including a battery energy storage system (BESS) with a capacity greater than 2 kWh shall be a separate fire zone separated by fire-resistant walls and fire-separation ceilings of the fire resistance class referred to in Section 10(1).

3. Fuel pumps shall be explosion-proof when liquid fuels with a flash point below 55 °C are used and when these pumps are located in an explosion hazard zone.

4. Electrical systems and equipment in a room containing a fuel tank and fuel pump shall be explosion-proof if the fuels stored are expected to produce explosive mixtures.

5. In a room containing a battery energy storage system (BESS) equipped with hydrogen afterburners or with batteries that do not emit hydrogen, the installed electrical infrastructure may be equivalent to that used in rooms without a risk of explosion.

Section 12. 1. The fuel infrastructure within a protective structure shall be installed exclusively in a technical room housing a fuel storage tank, fuel pump or power generator.

2. A shut-off valve shall be installed in any room containing a fuel storage tank and fuel pump, as well as at the point at which the fuel infrastructure enters the protective structure.

3. An inhalation valve of the fuel storage tank shall be equipped with devices that prevent fire from entering the tank.

4. The components of the fuel storage tank equipment that supplies fuel to the power generator shall enable fuel extraction outside the protective structure under fire conditions.

5. In a room containing an intermediate fuel storage tank, a catch basin, trough, or other sealed containment solution limiting spillage shall be installed, capable of accommodating and retaining 110 % of the tank's volume under fire conditions or other emergencies.

6. The intermediate fuel storage tank shall be equipped with a fuel level indicator.

7. The intermediate fuel storage tank shall be double-walled and vented to an external tank or air ejector, with an explosion protection mechanism when the tank is used for storing liquid fuels with a flash point below 55 °C or if explosive atmosphere zones exist.

8. The fuel storage tank may be mounted on the power generator only when it is used for storing liquid fuels with a flash point above 55 °C. These requirements do not apply to any power generator located outside the protective structure.

Section 13. 1. Each protective zone intended for occupancy by more than 10 persons shall have at least one exit that enables evacuation into an open area outside the predicted debris zone, or shall have an auxiliary exit.

2. A protective zone with a capacity of more than 50 persons shall have at least two exits that enable evacuation to an open area or to an adjacent protective zone, with at least one of these exits enabling evacuation outside the predicted debris zone or being an auxiliary exit. The protective zone to which people from the adjacent protective zone are to be evacuated shall have at least one emergency exit leading outside the predicted debris zone or an auxiliary exit.

3. A protective zone with a capacity of more than 1,000 persons shall have at least two exits that enable evacuation outside the predicted debris zone, or at least two auxiliary exits.

4. In a protective structure intended for medical activities, the protective zone intended for persons with reduced mobility shall have at least one exit that enables evacuation to an open area outside the predicted debris zone and meets requirements for entrances to protective structures specified in Section (1) and (3)–(6), Section 15(1)–(5) and (9)–(10), and Section (16)–(19).

5. The exits referred to in subparagraphs 2–4 shall be constructed in such a way as to prevent them from being destroyed simultaneously by the impact of the destructive factor set.

Chapter 7

Requirements for entrances and circulation routes in protective structures

Section 14. 1. The entrance to a protective structure shall be located away from the predicted debris zones and from other hazards that could block the entrance or restrict access to the protective structure, in such a way as to prevent the two entrances from being destroyed by a single impact of a destructive factor set, and taking account of the potential use of the entrance by persons with disabilities.

2. A protective structure with a capacity of more than 300 persons shall be equipped with at least two entrances.

3. The entrance to a protective structure shall be constructed in a manner that protects it against the direct impact of external destructive factors.

4. The entrance to a protective structure, depending on its resilience category, shall consist of the following elements:

- 1) an entry passage;
- 2) a protective or hermetically sealed protective door – in the case of U-3 shelter and a bunker;
- 3) protective vestibule – in the case of:
 - a) U-3 shelter with a capacity of more than 300 persons,
 - b) S-1 bunker with a capacity of more than 300 persons,
 - c) S-2 and S-3 bunkers;
- 4) airlock – in the case of a bunker.

5. It is permissible to combine the functions of a protective vestibule and an airlock within a single room that is used as a hermetically sealed protective vestibule, provided that the hermetically sealed protective vestibule meets requirements applicable to a protective vestibule and an airlock, except for the case referred to in Section 17(4).

6. Entrances and other openings in the external protective layers of protective structures, except for U-1 shelters, for the purposes of protecting them against the penetrating gamma radiation from radioactive fallout, shall be constructed in such a way as to ensure that:

- 1) there are at least two right-angle bends in the path of penetrating radiation on the way leading to the protective zone – assuming that each right-angle bend in the path of penetrating radiation attenuates the radiation 10-fold, if the surface mass of the protective layers at a bend is at least 500 kg/m²; or
- 2) at least one right-angle bend in the path of penetrating radiation on the route leading to the protective zone and additional shields, including doors or hatches – assuming that a 10-fold attenuation of this radiation is provided by a shield with a thickness equal to half the thickness specified in Annex 3 to the Regulation.

Section 15. 1. Stairs leading to the entrance of a protective structure shall be constructed as fixed stairs with a usable width of at least 1.2 m for the flight and landing, and with a maximum step height of 0.19 m, in keeping with subparagraphs 4 and 6.

2. The useable width of the flight and landing of the stairs leading to the entrance to a protective structure intended for carrying out medical activities shall be at least 1.4 m, subject to the provisions of subparagraph 4.

3. A step width of the fixed stairs shall be calculated according to the following formula:

$$2h + s = 0.6 \text{ to } 0.65 \text{ m}$$

where:

h – step height,

s – step width.

4. The total useable width of the stairways and landings referred to in subparagraphs 1 and 2 shall be proportionate to the number of persons likely to be simultaneously present within the protective structure, with a minimum width of 0.6 m per 100 persons.

5. The number of steps in a single flight of stairs shall not exceed 18.

6. In protective structures with a capacity of up to 50 persons, intended for vertical internal communication and external evacuation, the following shall be permitted:

- 1) fixed stairs – with a useable width of the flight and landing of at least 0.8 m, and a step height of no more than 0.2 m, and with the number of steps in one flight of stairs not exceeding 20;
- 2) fan-shaped, interlocking or winding stairs – with a useable flight and landing width of at least 0.8 m and a step height of no more than 0.2 m.

7. The width of fan-shaped steps shall be at least 0.25 m, and for interlocking or winding stairs such a width shall be provided at the distance not exceeding 0.4 m from the handrail of the internal railing or the column constituting the concentric structure of the stairs.

8. The entrance to a protective structure in the form of a shaft or a slide may only be used for:

- 1) a protective structure with a useable floor area of up to 35 m² and a capacity of up to 10 persons, if the shaft meets the conditions referred to in Section 22(5);
- 2) a protective structure located in the underground mining workings.

9. Ramps intended for pedestrian traffic and for persons with disabilities shall be constructed in accordance with the legislation on technical requirements to be met by buildings and their location, issued pursuant to Article 7(2)(1) of the Construction Law Act of 7 July 1994.

10. Lifts or other technical devices enabling vertical transport for persons with mobility disabilities or other persons with reduced mobility may be used in the access zone to a protective structure instead of a ramp, if such devices:

- 1) do not affect the protective layers;

- 2) have a backup power source – for devices that require a power supply to operate.

Section 16. 1. The entry passage, depending on the resistance category of a protective structure, shall protect the entry or exit opening of the protective structure from the direct impact of certain destructive factors.

2. The entry passage shall meet the following requirements:

- 1) for U-3 shelters and for bunkers – its resistance to blast overpressure shall be at least 70 % of the overpressure assumed for the designated resistance level of the protective structure;
- 2) at least one wall and the ceiling shall be made of reinforced concrete class C25/30 with a thickness of at least 25 cm or with alternative solutions with an equivalent thickness h_E of at least 25 cm, as defined in Annex 3 to the Regulation, which shield the entry or exit opening of the protective structure from a direct impact of ammunition fragments and from firing from small arms;
- 3) its length shall correspond to:
 - a) respectively the width of the entry or exit opening and, in addition, at least 1.5 times the width of the entry or exit opening on each side of these openings, except for a blind-ended entry passage (half-passage), where the condition of length beyond the width of the opening is met only on the access side, and
 - b) the total of twice the width of the entry passage and the width of the protected entry or exit opening;
- 4) its width shall be at least 1.5 times the width of the entry or exit opening, and for a protective structure with a maximum capacity of 50 persons – at least 0.9 m;
- 5) its clear height shall be at least 2 m and, at the entry or exit opening, no lower than that required to open the door or the gate;
- 6) its entrances from open areas (outdoor areas) shall be secured against the intrusion of unmanned aerial vehicles by means of rolled steel nets or other equivalent protective solutions.

3. In an underground garage serving as a S-1 shelter or bunker, omission of the entry passage at the entrance to a protective structure is permitted, provided that the ramp, the ceiling above the ramp and the adjacent area are configured to ensure that the entry opening or the entrance gate is shielded from all sides against the direct impact of fragments of ammunition and firing from small arms, and on the condition that protective measures are in place to prevent the intrusion of unmanned aerial vehicles and mitigate the impact of other destructive factors, in accordance with the resistance category of a protective structure.

4. Where local conditions prevent securing the entrance in accordance with subparagraph 3, it is permissible to install a U-1 and U-2 shelter and to designate a protective zone within the portion of the

garage that offers protection against the direct impact of external destructive factors, including detached structural elements of the gate in the event of mechanical damage.

5. In a garage, U-1 and U-2 shelters with a protective zone not separated by walls from the unprotected portion of the garage shall have the boundary of the protective zone marked on the floor with horizontal lines 8–10 cm wide, spaced at intervals equal to the width of a single line, on the side of:

- 1) the protective zone – a green line;
- 2) the other unprotected portion of the facility – an orange line.

6. In U-1 and U-2 shelters in which doors or gates at the entrance are non-explosion-proof and exposed to a potential impact of explosion, the protective zone shall be located in an area shielded from the direct impact of external destructive factors, including detached door or gate components in the event of their mechanical failure or their intrusion in the protective structure as a result of explosion.

Section 17. 1. The protective vestibule shall, depending on the resistance category of a protective structure, separate the protective structure's interior from the external environment, protect it against any mechanical impact as a result of explosion, increase the hermetic properties of the entrance, provide for thermal insulation in case of fire, and attenuate the penetrating gamma radiation.

2. The external doors of the vestibule shall open outwards or slide inwards and shall be positioned in such a way as to ensure that the axis of the door opening is perpendicular to the axis of the entry passage, including a corridor, stairway or other circulation route or room forming part of that passage.

3. The internal door of the vestibule shall not be located directly opposite the external door.

4. If entering or exiting is planned during the direct impact of a destructive factor of a mechanical type, at least one protective vestibule shall be used, and in case of contamination, a hermetically sealed protective vestibule or a combination of the protective vestibule and airlock shall be used.

Section 18. 1. The airlock shall be located directly at the entrance to a protective structure and shall be constructed in such a way as to ensure that the interior of the protective structure is hermetically sealed and protected against chemical and biological contamination.

2. The airlock shall be equipped with a hermetic door and shall include a door status indicator or safeguards that prevent the internal and external doors from being opened simultaneously.

3. It is permitted that in a garage serving as S-1 bunker, instead of the airlock, a vestibule is located at the entrance to the protective zone, equipped with gates that meet the following requirements:

- 1) the outer gate shall provide the level of protection and resistance that is equal to that of protective doors;
- 2) the internal gate separating the vestibule from the garage shall be as airtight as hermetic doors.

Section 19. 1. A door leading to a protective structure, including the internal door of the protective vestibule and airlock, shall, within the clear opening of the frame, subject to subparagraphs 2 and 3, be at least:

- 1) 0.8 m wide;
- 2) 1.85 m high.

2. The total width within the clear opening of the frame of the door serving as the entrance to the protective structure shall be proportionate to the number of persons likely to be simultaneously present, with a minimum width of 0.4 m per 100 persons.

3. In a protective structure with a capacity of up to 300 persons, an entrance door with a minimum height of 1.8 m and a total width of at least 0.9 m shall be permitted for protective structures with a capacity of between 201 and 300 persons.

4. Doors to rooms in protective structures, including external and internal doors of protective vestibules and airlocks, shall, within the clear opening of the frame, be at least:

- 1) 0.6 m wide and 1.2 m high – for doors to expansion chambers for evacuation from protective structures;
- 2) 0.6 m wide and 0.6 m high or shall have a diameter of 0.6 m – for doors to expansion chambers other than those referred to in point 1;
- 3) 0.8 m wide and 1.8 m high – for doors to technical rooms other than those referred to in points 1 and 2;
- 4) 0.8 m wide and 2 m high – for doors to other rooms.

The doors leading to protective structures, including the external doors and internal doors of the vestibules and airlocks, shall open outwards or shall slide, and the door frame structure shall be supported at its entire circumference and anchored by steel anchors in the load-bearing wall.

6. The door threshold height for protective doors, hermetically sealed protective doors or hermetic doors shall not exceed 0.2 m. For a threshold higher than 0.02 m, measures such as movable ramps, landings or other solutions shall be implemented to ensure that persons with disabilities can use the doors.

7. In underground garages serving as U-1 or U-2 shelters, the installation of an external protective door is not required if a protective zone is established within the garage area that provides

shielding against the direct impact of external destructive factors, including detached structural elements of the door resulting from mechanical damage.

8. Technical requirements concerning the mechanical resistance of protective barriers, automatic explosion relief valves, airtightness of hermetic barriers and installation penetrations in protective structures have been specified in Annex 4 to the Regulation.

Section 20. 1. The width of passageways in a protective structure shall:

- 1) be at least 1.2 m, and in the case of passageways leading exclusively to technical rooms and passageways in protective structures with a capacity of up to 50 persons – at least 0.9 m;
- 2) enable efficient and safe movement of people within the protective structure;
- 3) in the case of protective structures intended for the protection of equipment, material supplies or other material goods – it is adequate for the purpose of the protective structure taking into account the type of equipment to be protected or the method for storing and transporting items.

2. The width of a passageway shall be calculated in proportion to the number of persons who may use it, with a minimum of 0.6 m per 100 persons, but may not be less than the width determined pursuant to subparagraph 1.

3. The height of a passageway shall be at least 2.2 m and the height of the local reduction shall be 2 m; the length of the reduced section of the road shall not be more than 1.5 m.

4. Doors leading to a passageway must not reduce the required width of that passageway when fully opened. The foregoing shall not apply to doors equipped with automatic closing mechanisms.

Chapter 8

Requirements for auxiliary exits from protective structures

Section 21. 1. An auxiliary exit from the protective structure shall meet the following requirements:

- 1) It shall be located outside the predicted debris zone, except for in the events referred to in Section 22(6)–(8);
- 2) it can be used for evacuating people from the facility using exits and routes other than those used as entrances and access routes to the protective structure.

2. The predicted debris zone shall be marked in accordance with the rules laid down in Annex 3 to the Regulation.

3. An auxiliary exit shall have a closing mechanism allowing for it to be opened manually by one person.

4. All above-ground and underground components of the protective structure leading to an auxiliary exit, excluding the roofing shielding the exit from precipitation, shall have mechanical resistance at least equivalent to that of the protective structure.

5. Depending on local conditions and the required resistance category of a protective structure, an auxiliary exit shall be connected with the protective zone by means of:

- 1) a vestibule to the emergency exit – for S-2 and S-3 bunkers, and also, when necessary, for U-3 shelters and S-1 bunkers;
- 2) a tunnel to the auxiliary exit leading outside the predicted debris zone – where the exit from the protective zone or from the vestibule to the auxiliary exit is located in the predicted debris zone;
- 3) a shaft or stairway leading to the auxiliary exit at ground level, located outside the projected debris zone – where the exit from the protective zone or from the vestibule to the auxiliary exit is below or above ground level.

6. In U-2 and U-3 shelters and in bunkers, the auxiliary exits shall be located in such a way as to provide the required protection against the penetrating gamma radiation, taking into account the conditions referred to in Section 14(6).

7. The exit leading from the protective zone to the auxiliary exit tunnel or auxiliary exit shaft, as well as the auxiliary exit from the auxiliary exit tunnel leading directly to open space, shall have the clear opening of at least 0.6 m in width and 1.2 m in height, subject to the provisions of Section 22(4).

8. The auxiliary exit from the protective zone leading directly to open area shall have the clear opening of at least 0.6 m in width and 1.2 m in height and shall be shielded by a entry passage meeting the requirements specified in Section 16(1) and (2).

Section 22. 1. The auxiliary exit vestibule shall provide the required protection of the interior of the protective structure against the external environment, in particular against any mechanical impact resulting from explosion, and shall meet the following requirements:

- 1) a threshold shall be 0.2 m high to prevent water from entering from an auxiliary exit shaft or from an auxiliary exit tunnel to the interior of the protective structure;
- 2) external and internal doors shall have the clear opening of at least 0.6 m in width and 1.2 m in height, meeting the requirements for protective barriers and hermetic barriers in the case of bunkers, in accordance with the resistance category of the protective structure, and shall open outwards or slide.

2. The auxiliary exit tunnel shall comply with the following requirements:

- 1) in cross section, it shall have a clear opening of at least:
 - a) 0.9 m in width and 1.2 m in height or 1 m in diameter in the case of a tunnel for evacuation from the protective zone with a capacity of up to 300 persons,
 - b) 1.2 m in width and at least 1.5 m in height in other cases;
- 2) it shall be separated from the rest of the protective structure by a dilation, if it is longer than 3 m;
- 3) its floor shall have a slope of at least 2 % towards the auxiliary exit.

3. The auxiliary exit vestibule can be located in the auxiliary exit tunnel section if the exit from the protective zone is closed with hermetically sealed protective doors.

4. The emergency exit shaft shall have a form of an enclosed staircase with internal doors and with doors leading directly to an open area, with a width of at least 0.8 m and a height of at least 1.8 m. The stairs in the shaft shall have a useable flight and landing width of at least 0.9 m and a step height of no more than 0.2 m, taking into account the conditions specified in Section 15(3) and (7).

5. The emergency exit shaft that can be used for evacuation from a protective zone with a capacity not exceeding 300 persons shall:

- 1) have the clear opening of at least 0.9 m in width;
- 2) be equipped with a ladder or with step irons and solutions ensuring conditions for exiting the protective structure by persons with disabilities;
- 3) be ended with:
 - a) a ground-level vent with openings in the side walls closed with grates measuring at least 0.6 m in width and 0.9 m in height, of which at least one opens inwards with a lock on the inside and serves as an auxiliary exit, while the others are fixed,
 - b) a hatch with the clear opening of at least 0.6 m in width and 0.8 m in height or with a diameter of at least 0.8 m, and in the existing protective structure – at least 0.6 m.

6. If it is not possible to locate an auxiliary exit outside the predicted debris zone, in particular when the distances between buildings are smaller than the distances defining the predicted debris zone, it is permissible to locate an auxiliary exit shaft with an above-ground vent or above-ground casing with a hatch in the side wall within the predicted debris zone, provided that the emergency exit shaft is constructed in such a way that the lower edge of the opening of the auxiliary exit shaft:

- 1) is raised above the maximum height of the debris field (h_{zag}), as determined in accordance with Annex 3 to the Regulation;
- 2) is located no higher than 4 m above ground level.

7. In the event referred to in subparagraph 6, in a protective structure with a capacity of up to 200 persons, located in a building with an external wall no higher than 16 m, it is permissible to locate an emergency exit shaft directly next to the external wall of the building and in such a way that the lower edge of the opening of the auxiliary exit is at a level of 1/4 of the height of the external wall of the building. Step irons shall be located on the outer wall starting from a height of 1.8 m from ground level to the exit level.

8. In shelters located on the underground floors of buildings in dense urban areas, where it is impossible to locate auxiliary exits outside the area of predicted debris zone, it is permissible to locate an auxiliary exit in the form of an emergency passage between the underground floors of adjacent buildings, which is marked on the wall as a place intended for the location of an opening in the wall

with dimensions of at least 0.6 m in width and 0.9 m in height, by way of dismantling part of the wall using hand tools, provided that such an auxiliary exit is not the only auxiliary exit.

9. At the bottom of the auxiliary exit shaft, and in the case of stairs, in the lower slab of the tunnel leading to the auxiliary exit, an individual drainage system shall be provided in accordance with ground and water conditions and shall be protected against reverse flow flooding.

Chapter 9

Requirements for primary function rooms, technical zones and social facilities, as well as ventilation requirements in protective structures

Section 23. 1. A protective structure with a useable floor area exceeding 35 m² and a capacity of more than 10 persons shall be divided into functional zones serving in particular the following services:

- 1) circulation function – serving to protect entry and exit routes, as well as entry and exit points;
- 2) primary function – serving directly to fulfil the essential protective function of the protective structure;
- 3) technical function – serving to safeguard the functioning of the equipment of a protective structure depending on the purpose of that structure;
- 4) social function – ensuring safe hygiene and sanitary conditions for protected persons in the protective structure depending on its capacity.

2. In a protective structure, each functional area shall be a separate room or a complex of rooms; however, the primary function and the social function may be combined within a single zone, provided that the requirements laid down for both functions are met simultaneously.

Section 24. 1. The primary function zone shall be prepared as:

- 1) sitting and sleeping places in the case of civil protection structures;
- 2) properly prepared rooms that meet the requirements according to the purpose of the protective structure.

2. The room with sitting and sleeping places within a protective structure shall have a minimum height of 2.2 m, and local depressions at locations designated for structural elements, cable routing or installation equipment shall have a minimum height of 2 m.

Section 25. 1. The number of sitting places in a protective structure for civil protection shall be at least 2/3 of the capacity of the protective structure.

2. If no sleeping places are designated within a protective structure, the number of sitting places shall correspond to the capacity of the protective structure.

Section 26. 1. In a protective structure intended for civil defence purposes, the number of sleeping places shall be at least $\frac{1}{3} + 4\%$ of the capacity of the protective structure.

2. Sleeping places shall be planned as far away as possible from internal noise sources.

3. In a shelter intended for short-term stays (under 24 hours), sleeping places are not required.

Section 27. The social function zone shall comprise:

- 1) sleeping places for the personnel of the protective structure;
- 2) washing facilities;
- 3) toilet facilities;
- 4) optionally, other facilities such as: kitchens, food storage rooms, dining rooms, dish washing rooms, medical offices, infirmaries, isolation rooms, clothes drying rooms, waste collection rooms, radio and television rooms – depending on the capacity and function of the protective structure.

Section 28. Washing facilities in protective structures used for civil defence purposes shall meet the following requirements:

- 1) be equipped with at least one washbasin per 50 persons;
- 2) serve as a vestibule to the toilet facilities;
- 3) the width of the passage between the rows of washbasins and the wall shall be at least 1.1 m, and between the rows of washbasins – at least 1.7 m.

Section 29. 1. Toilet facilities in protective structures used for civil defence purposes shall meet the following requirements:

- 1) at least one toilet bowl or one dry toilet not connected to the sewage system shall be provided for every 75 persons of the protective structure's capacity, but the number of dry toilets not connected to the sewage system shall not exceed a ratio of 3:1 in relation to toilet bowls connected to the sewage system;
- 2) shall be separate for men and women in the case of a protective structure with a capacity of more than 75 persons.

2. In protective structures with a capacity of up to 300 persons, it is permitted to provide only dry toilets not connected to the sewage system, provided that at least one toilet is available for every 50 persons.

Section 30. Storage areas for water, food, medicines, cleaning products, hygiene and personal protective products shall be located in a sitting and sleeping room or in separate rooms, and in bunkers with a capacity of more than 300 persons – in separate rooms.

§ 31. In bunkers with a capacity of more than 300 persons, the following additional rooms with the area proportionate to the capacity of the bunker, but not less than 8 m², shall be designated for social purposes:

- 1) a dedicated room for the personnel assigned to operate and maintain the protective structure;
- 2) a pre-medical first aid point;
- 3) an isolation room for the sick;
- 4) a storage room for food not requiring refrigeration, a designated point for heating meals, a dining room, and a dish-washing station;
- 5) a waste collection area.

Section 32. 1. The technical function zones shall be created, according to the purpose and function of a protective structure, for:

- 1) communication and IT system equipment;
- 2) ventilation system equipment;
- 3) water supply and sewage system equipment;
- 4) electricity supply equipment;
- 5) contamination detection equipment;
- 6) other equipment, if necessary due to the specific function of the protective structure.

2. Rooms housing the equipment referred to in subparagraph 1(4) shall be separated from other areas by fire-resistant walls with a minimum fire resistance class of EI 60 and shall be accessed through doors with a fire resistance class of no less than EI 30.

3. Conduits of systems leading to bunkers and passing through the external building envelope shall be protected against shearing caused by structural shocks, through the implementation of appropriate design solutions tailored to the resistance level of the protective structure.

4. Installation cables and shafts may not be routed through the ceiling of a protective structure, unless technical solutions appropriate to the resistance category of the protective structure have been implemented to ensure that the required protective functions are preserved, including the continuity of both the protective layer and the hermetic layer.

Section 33. 1. A protective structure shall be equipped with ventilation solutions tailored to its type, purpose and capacity.

2. Ventilation systems in all types of protective structures shall meet the following requirements:

- 1) outside the occupancy period, rooms shall be continuously ventilated at a rate sufficient to ensuring that the facility is maintained in an appropriate technical condition;
- 2) during the occupancy period, under uncontaminated external atmospheric conditions, the ventilation system shall ensure that clean air is supplied and stale air is removed in quantities

- appropriate to the capacity of the protective structure and hygiene requirements in order to enable the established number of persons to remain in the facility for an undefined period;
- 3) the relative air humidity in rooms shall not exceed 80 %, except in protective structures intended for short-term occupancy, where the specific nature of the facility makes it impossible or difficult to maintain this threshold;
 - 4) the ventilation system shall be protected against the penetration of fire gases in case of fire outside the protective zone or outside the protective structure;
 - 5) the building's chimney conduits shall not be utilised as ducts for supplying external air, but they can serve as exhaust ducts for gravity ventilation, provided that they are equipped with manual dampers or guillotine valves that allow for immediate shut-off of airflow when necessary.

Chapter 10

Specific requirements for ventilation systems in shelters

Section 34. 1. Shelters shall be equipped with either gravity ventilation systems or mechanical ventilation systems that are supported by backup power sources or manual drives for each fan.

2. The ventilation system within the protective zone shall maintain oxygen concentrations at a minimum of 18 % by volume and ensure that carbon dioxide concentrations do not exceed 2 % by volume.

3. Grates installed to protect the inlet openings of air intakes shall be constructed from materials classified as reaction-to-fire class A1 or A2-s1, d0.

4. Supply and exhaust openings shall be secured by the combined use of:

- 1) double bends in ventilation ducts in walls or double right-angle bends in ventilation ducts when routed through the ground in order to protect against the penetrating gamma radiation from radioactive fallout – for U-2 and U-3 shelters;
- 2) ventilation valves (dampers) enabling isolation of the room from the external atmosphere;
- 3) automatic explosion relief valves located in the protective layer – for U-3 shelters.

Section 35. The air intake shall be located at a distance of not less than:

- 1) 8 m from the exhaust gas ejector from the power generator, solid waste collection sites, liquid waste tanks, sewage vents and other similar sanitary household equipment that may emit unpleasant odour or cause air pollution, and from open storage areas containing combustible materials;
- 2) 4 m from the components of building facilities, including the finishing of their external walls, classified to a reaction-to-fire class other than A1 or A2 with additional classification s1 or s2.

Specific requirements for ventilation systems in bunkers

Section 36. Bunkers shall be equipped with a mechanical ventilation system, including filter ventilation unit, supported by back-up power sources or manual drivers for each fan, provided that the system allows for immediate hermetic shut-off through the use of manual or automatic shut-off valves or dampers.

Section 37. 1. The bunker ventilation system shall include:

- 1) an air inlet protected by an automatic explosion relief valve and, in S-2 and S-3 bunkers, by an expansion chamber;
- 2) dedusting filters;
- 3) a filter absorber;
- 4) shut-off valves or dampers;
- 5) a flow meter;
- 6) a fan with a manual and electric mechanism or with an electric drive alone in bunkers equipped with their own power sources;
- 7) air ducts or channels distributing clean air;
- 8) exhaust bunker flaps;
- 9) an air ejector that is protected by an automatic explosion relief valve;
- 10) depending on the bunker category and the term of protection set, additional equipment, including air regeneration, heat recovery and air conditioning systems.

2. The requirements for the filter ventilation system used in protective structures and for its components have been specified in Annex 5 to the Regulation.

3. Electronic control circuits for filter ventilation equipment, if applicable, shall be housed in shielded enclosures made of well-conductive or ferromagnetic materials to protect the integrated circuits against destruction caused by an electromagnetic pulse, and they shall be protected against mechanical shock impacts.

Section 38. 1. The air intake that forms part of the bunker's mechanical ventilation system shall be located outside the predicted debris zone:

- 1) in a manner that limits the possibility of smoke and fire gases affecting it in the event of fire in the building facility in which the bunker is located or in an adjacent building facility;
- 2) at a distance of no less than:
 - a) 8 m from the exhaust gas ejectors from power generators, solid waste collection sites, liquid waste tanks, sewage vents and other similar sanitary household equipment that may

emit unpleasant odour or cause air pollution, and from open storage areas containing combustible materials;

- b) 4 m from the components of building facilities, including the finishing of their external walls, classified to a reaction-to-fire class other than A1 or A2 with additional classification s1 or s2.

2. Bunkers with a capacity exceeding 300 persons shall be equipped with an additional, spare air intake to be located at the greatest possible distance from the air intake referred to in subparagraph 1.

3. In the case of compact design, which prevents the placement of air intakes outside the predicted debris zone or limits the possibility of constructing a ventilation system and maintaining acceptable air flow resistance in the ventilation system, it is permissible to install two air intakes (primary and auxiliary) in the predicted debris zone, provided that the air intakes are located as far as possible from the building and that they are located in such a way as to limit the possibility of their simultaneous destruction. The foregoing shall not apply to the bunker referred to in subparagraph 2.

Section 39. 1. The opening in the protective layer for ventilation purposes shall have an automatic explosion relief valve.

2. The ventilation system shall incorporate a solution that enables the temporary separation of the bunker from the external environment and that is capable of immediately blocking the supply of outside air in the event of fire affecting the air intake.

Section 40. 1. The air shall be supplied to a bunker through an expansion chamber, the volume of which shall be determined based on requirements for the ventilation system and for protection against the impacts of explosion. If the ventilation system is explosion-proof, the expansion chamber shall be optional.

2. The air from the expansion chamber shall be supplied to the filter ventilation unit through a ventilation duct with a fire reaction class of at least A1 or A2, d0, with the exception of ducts that are embedded in a manner that prevents fire from spreading and with the exception of flexible connecting elements and flexible ventilation ducts with a length not exceeding 4 m, which may have a fire reaction class of A1, A2, B, C or D-s1.

3. The dimensions of the filter ventilation chamber shall allow for the installation and operation of the filter ventilation unit while maintaining a minimum free space of 0.6 m in order to ensure access for operation and maintenance tasks.

4. Each protective zone in the bunker shall be equipped with a ventilation system with a separate air filter chamber and an air intake.

Section 41. 1. Bunkers shall be equipped with a ventilation system that ensures suitable conditions for human occupancy and work during the following operational periods:

- 1) the clean ventilation period during which there is no risk of contamination in the external environment and the outside air is supplied directly to the bunker without passing through filter absorbers;
- 2) the filter ventilation period during which there is a risk of contamination in the external environment and the air is supplied to the bunker through filter-ventilation devices that maintain an internal overpressure of at least 50 Pa;
- 3) the isolation period during which it is necessary to temporarily cut off the bunker from the external environment and during which an internal overpressure of at least 20 Pa is maintained, if a compressed air storage facility is provided within the bunker.

2. The isolation period may include the following phases:

- 1) the pre-regeneration phase during which it is not necessary to use the air regeneration devices to maintain an acceptable oxygen concentration of at least 18 % by volume and a carbon dioxide concentration of no more than 2 % by volume in the protective zone;
- 2) the regeneration phase during which, in order to maintain the oxygen and carbon dioxide concentrations within the ranges referred to in point 1, devices are used that regenerate air or supply air from a storage system in the form of cylinders or compressed air tanks used when the isolation period needs to be longer than the pre-regeneration phase.

3. During the filter ventilation period and the isolation period, the air pollution inside the protective zone designated to protect a set number of people is prevented and the oxygen and carbon dioxide concentrations are maintained in the protective zone at authorised levels for a defined period no shorter than:

- 1) 48 hours during the filter ventilation period;
- 2) 4 hours during the isolation period.

4. The required overpressure shall be maintained in the hermetically sealed zone in order to prevent contaminated air from entering into the interior of the bunker.

Section 42. 1. Ventilation ducts shall be made of materials classified as reaction-to-fire class:

- 1) A1 or A2, d0 or
- 2) A1_L or A2_L, d0 for ventilation ducts with insulation, constituting a single product.

2. On the external surface of the ventilation duct it is permitted to use thermal and acoustic insulation and other cladding of the ventilation duct classified as reaction-to-fire class:

- 1) A1_L or A2_L and B_L with additional classification d0 for layered insulation made of multiple products;
- 2) A1_L or A2_L and B_L with additional classification d0, but the insulation layer of layered elements shall be classified at least as reaction-to-fire class E for insulation constituting a product.

3. Ventilation ducts shall be classified at least to duct airtightness class B in accordance with the Polish Standards governing the resilience and airtightness of duct systems.

Section 43. 1. Bunkers shall be equipped with a ventilation system that:

- 1) during the clean ventilation period, supplies air in a minimum quantity of 20 m³/h per person; if the air is supplied by a separate mechanical ventilation system, the bunker's ventilation system shall have an air supply duct protected by an automatic explosion relief valve at the point at which the duct penetrates the protective layer, and shall be capable of being hermetically sealed during the filter ventilation period or the isolation period;
- 2) during the filter ventilation period, supplies air in a minimum quantity of 3 m³/h per person.

2. The air shall flow from the clean zone through the conventionally clean zone to the conventionally dirty zone and the dirty zone referred to in Section 46(1), and the bunker's exhaust overpressure flaps used for the ejection of stale air shall be placed in such a position that the stale air shall flow outside through the entrance vestibules.

3. Regardless of the air flow through the entrance vestibules, the air shall also flow from rooms in which the concentrations of chemicals are life-threatening or in which unpleasant odours are present, through the bunker's exhaust overpressure flaps and automatic explosion relief valves, to the outside.

Section 44. 1. The air ejector shall be located outside the predicted debris zone and an automatic explosion relief valve shall be installed at the point at which the ventilation duct penetrates the protective layer.

2. For bunkers located in particularly unfavourable conditions due to a high risk of fire or chemical contamination, especially at chemical plants, refineries and fuel depots, it shall be possible to regenerate the internal air or to supplement the breathing air from a storage system consisting of compressed air cylinders or tanks.

Section 45. 1. Hermetic valves shall be used at points at which ventilation ducts pass through building partitions serving as hermetic layers, also in the supply and exhaust openings of the ventilation systems; however, the shut-off dampers used in water supply networks or industrial valves other than bunker valves can also be used if they allow for immediate hermetic shut-off.

2. Fire dampers or other solutions and products preventing fire from spreading for a period no shorter than that resulting from the required fire resistance of fire-separation elements shall be used at the points at which ventilation ducts pass through building partitions separating the fire zones.

3. The ducts supplying air from the outside to the filter-ventilation device shall be marked yellow.

4. The ducts distributing clean air in rooms shall be marked light blue at the diffuser outlets.

Section 46. 1. Bunkers shall include clean zones, defined as rooms or complexes of rooms that maintain a uniform or similar microclimate in terms of physical, chemical, and bacteriological composition, with the following classification:

- 1) a clean zone – supplied with treated fresh air from air supply ducts, in which the microclimate comfort and air overpressure shall be maintained;
- 2) a semi-clean zone – ventilated with the air from the primary clean zone;
- 3) a semi-dirty zone – in which air pollution or environmental conditions such as elevated temperature, excessive noise, or increased concentrations of substances such as hydrogen or acid vapours in a battery room may exceed comfort thresholds but do not pose an immediate life-threatening risk;
- 4) a dirty zone – in which life-threatening concentrations of toxic, radioactive and biological warfare agents may be present, and which requires the use of personal protective equipment against contamination.

2. The clean zone shall include, in particular:

- 1) bunker chambers for human occupancy;
- 2) sitting and sleeping facilities;
- 3) premises intended for the provision of healthcare, including operating theatres, treatment rooms and doctors' offices;
- 4) storage rooms for water, food and medicines.

3. The semi-clean zone shall include:

- 1) toilet and washing facilities;
- 2) kitchen and canteen facilities;
- 3) storage rooms for equipment, spare parts, compressed air and other spaces of similar use;
- 4) technical rooms in which no harmful substances are emitted, such as the main fan room, electrical switchgears.

4. The semi-dirty zone shall include:

- 1) isolation rooms for the sick;
- 2) technical rooms in which substances harmful to health may be emitted, e.g. a battery room, a room for intermediate fuel storage tank, sewage pumping station, etc.;
- 3) holding rooms in which tools, hand-held equipment and open pre-packages containing substances harmful to health shall be stored;
- 4) dry toilets;
- 5) filter-ventilation chambers;
- 6) power generator rooms other than those referred to in paragraph 5(6).

5. The dirty zone shall include:

- 1) entrance and exit vestibules;
- 2) vestibules of the decontamination node for hygienic showers;
- 3) contaminated clothing storage room;
- 4) expansion chambers, silencer chamber and filters;
- 5) the waste collection site;
- 6) power generator rooms cooled using the outside air that may be contaminated.

6. Rooms with the same or similar microclimate characteristics shall, if possible, be grouped into functional units.

7. An airlock shall be located at the entrance to the dirty zone.

Section 47. 1. The power generator rooms shall be equipped with a mechanical supply and exhaust ventilation system.

2. The volume of air supplied shall be sufficient to meet the ventilation and combustion requirements, but the air supply for the ventilation of the power generator room shall not be less than the minimum specified by the power generator manufacturer.

3. For ventilation of the power generator room during the clean ventilation period and the filter ventilation period, the secondary air derived from the protective structure shall be used, with overpressure valves ensuring air flow to the power generator room and to supply and exhaust fans activated automatically when switched on.

4. During the isolation period, the air for ventilation of the power generator room shall be supplied via an external air intake that operates independently from the air intake for the bunker ventilation system, using welded steel pipes and connections to ensure airtightness.

5. The power generator exhaust pipes shall be made of welded steel and equipped with an automatic explosion relief valves, as well as thermally insulated to minimise heat gain within the generator unit rooms.

6. The combustion air intakes in the combustion engine and the air ejectors from the power generator rooms shall be protected by automatic explosion relief valves and expansion chambers.

Chapter 12

Requirements for water supply for human consumption and for sewage disposal in protective structures

Section 48. 1. Protective structures with a projected term of protection that exceeds 48 hours shall be supplied with water intended for human consumption, in a minimum quantity of 3 dm³ per person per day.

2. Regardless of the water supply from the water supply network in U-3 bunkers and shelters, in both cases with a capacity exceeding 300 people, an emergency water intake shall be provided in the form of a drilled well equipped with a submersible pump, located in a separate room inside the protective and hermetically sealed layer of the protective structure.

3. Inspection wells and other technical components of the emergency water intake located outside the protective and hermetically sealed layer of the protective structure shall have the mechanical resistance of the structure at least equivalent to that of the protective structure, and inspection manholes shall have the same resistance as the protective barriers listed in Annex 4 to the Regulation.

4. In protective structures equipped with an emergency water intake, a backup power supply shall be provided to ensure continued operation of water supply equipment in the event of external power failure, except in cases when the required supply of drinking water has been accumulated in tanks or containers. The backup power supply shall ensure the uninterrupted operation of water supply equipment and the supply of water throughout the term of protection, including continuous functionality for at least two hours.

Section 49. 1. In a protective structure with a capacity of more than 300 persons in which the projected term of protection is longer than 48 hours a water supply system shall be installed to ensure that the protective structure is supplied with water in accordance with its intended purpose, at least in accordance with the requirements set out in the Polish Standards concerning the design of water supply systems.

2. Water supply systems shall not be installed in ceilings or walls or through expansion chambers, air pre-treatment chambers, power generator rooms or fuel tank rooms.

3. Water pipes routed through building partitions that serve as protective barriers, hermetically sealed barriers, or fire-separation elements shall be constructed with penetrations that ensure mechanical resistance, gas tightness, and fire resistance consistent with that required for the respective barrier or partition.

4. In sections where water supply infrastructure passes through protective layers, the water supply system shall be equipped with shut-off valves or gate valves that can be located inside the protective structure.

5. In bunkers, the connection of the plumbing system to a water supply installation or network located outside the protective layer allows for relative movement of pipes, without damaging the connection, vertically and horizontally by:

- 1) 0.10 m for S-1 bunkers;
- 2) 0.18 m for S-2 bunkers;
- 3) 0.25 m for S-3 bunkers.

6. The water supply system shall be equipped with discharge and venting valves allowing for the water to be discharged completely from the system. In protective structures located in buildings, the constant flow or circulation of water in the water supply system of the protective structure shall be ensured through the adequate connection to the system in the building.

7. A protective structure with a capacity of more than 300 persons and the projected term of protection longer than 48 hours shall be equipped with a hot water supply system.

8. Subject to the provisions of subparagraph 9, the hot water supply system shall ensure that water is available at tap points at a temperature no lower than 55 °C and no higher than 60 °C, and shall support disinfection using chemical or physical methods, including periodic thermal disinfection, without compromising the durability of the system or the integrity of its components.

9. In order to perform the thermal disinfection referred to in subparagraph 8, water temperature at tap points shall be maintained between 70 °C and 80 °C.

10. The water supply system shall be marked:

- 1) blue for the cold water supply system;
- 2) red for the hot water supply system.

11. Protective structures shall be equipped with drainage systems in case of water supply failure or flooding.

Section 50. 1. The sewage system in protective structures shall meet the requirements set forth at least in the Polish Standards concerning such systems.

2. Separate sewage systems that are not connected within the protective structure's perimeter shall be installed for urban waste water, heated process water and for special sanitary treatment facilities.

3. Domestic waste water shall be discharged to sewage facilities, and in the absence of such facilities, to non-drainage tanks located outside the protective structure.

4. Sewage drains in protective structures shall be equipped with devices which are installed in the inspection wells to prevent the reverse flow of domestic waste water and to safeguard interior premises against flooding, and which comply with at least the minimum requirements specified in the applicable Polish Standard concerning anti-flood devices in buildings.

5. Flaps protecting against a reverse flow of domestic sewage shall be made of stainless steel.

6. Collective traps shall be installed in the inspection wells in an immediate vicinity of the devices protecting against a reverse flow of domestic sewage.

7. Dry traps shall be used for floor drains in sanitary rooms and shower trays.

8. Sewage systems shall not be installed in ceilings or walls or through expansion chambers, air pre-treatment chambers, power generator rooms or fuel tank rooms.

9. Sewage system pipes routed through building partitions that serve as protective barriers, hermetically sealed barriers or fire-separation elements shall be constructed with penetrations that ensure mechanical resistance, gas tightness, and fire resistance consistent with that required for the respective barrier or partition.

10. The venting pipes that form part of the sewage system shall be routed:

- 1) to the sanitary room within a protective structure through a carbon filter, which is used at the end of the sewage system's venting; or
- 2) outside the protective structure, through a culvert in the external wall, an gas-tight valve and an automatic explosion relief valve, a connection box, and a ventilation duct terminating above ground level over the protective structure at a horizontal distance of no less than 8 m from the nearest air intake.

11. Individual drainage system shall be located at the entrance to the protective structure and at the auxiliary exit, in accordance with the soil and water conditions, protected against a reverse flow.

12. The sewage system may be installed in protective structures where gravity flow of sewage is not possible during a short period, provided that a sewage pumping station is installed in accordance with the requirements of the applicable Polish Standard concerning the design of sewage pumping stations in gravity drainage systems inside the buildings.

13. In S-2 i S-3 bunkers, the sewage system connections shall be additionally protected by an automatic explosion relief valve or three expansion manholes connected in series, located outside a bunker and protecting the infrastructure inside a bunker against the explosion pressure.

14. The manholes, referred to in paragraph 13, shall have an internal diameter of at least 1 m, reinforced concrete covers, and explosion-proof inspection hatches, but the sewage system hatches shall have a minimum strength of 200 kN/m² protected from the top with concrete plates.

15. The design of the manholes referred to in paragraph 13 and their covers shall have a mechanical strength adapted to the bunker's resistance to the impact of explosion pressure.

Chapter 13

Requirements for power supply of protective structures

§ 51. 1. Protective structures shall be equipped with an electrical system that shall meet at least the requirements specified in the applicable Polish Standards concerning such systems and in the provisions of this chapter.

2. The electrical system shall include:

- 1) electrical system connectors that allow disconnection from the power grid and located in an accessible place and protected against damage, weather conditions, interference of unauthorised persons, as well as the impact of bomb fragments and missiles;

- 2) a separate protective and neutral conductor in distribution and reception circuits;
- 3) residual current protective devices supplementing the basic protection against electric shock and fire hazards, causing under fault conditions an automatic disconnection of the power supply;
- 4) overcurrent circuit breakers in reception circuits;
- 5) the principle of security selectivity;
- 6) the principle of routing electrical wiring in straight lines, parallel to the edges of walls and ceilings;
- 7) electrical wiring featuring conductors made exclusively of copper, if their cross-section does not exceed 10 mm²;
- 8) surge protection devices;
- 9) separated circuits for: lighting, general-purpose sockets, fans, heating equipment, IT equipment, circuits for receiving devices that require individual protection, a circuit for external systems in the access area to the external door;
- 10) the main power switch located inside the protective structure.

3. Electrical installations shall be laid on the surface of walls or ceilings.

4. Electrical wiring, except for the necessary conduits, shall not be routed inside the structure of the walls, ceilings or foundation slabs.

5. In a bunker, electrical wiring that passes through external structural barriers forming part of the protective layers shall be protected against shearing due to structural shocks by adopting appropriate design solutions adapted to its resistance.

6. Installation conduits in external walls and ceilings shall be shielded against the direct impact of destructive factors, in particular, debris and penetrating gamma radiation of radioactive fallout.

7. Emergency lighting or other solution to provide electrical lighting in the event of a disconnection of primary power supply shall be provided as an auxiliary measure in case of an emergency.

8. Lighting systems in protective structures shall be designed and installed at least in accordance with the requirements laid down in the applicable Polish Standards concerning general and emergency lighting.

9. The provisions of paragraphs 7 and 8 shall not apply to shelters with a capacity not exceeding 150 persons, subject to the provisions of Section 10(5).

Section 52. 1. In shelters with a capacity of more than 300 persons, auxiliary power supply shall be provided by power generators.

2. The power generator shall ensure operation of all equipment necessary for the functioning of the protective structure.

3. The power generator room shall be located:

- 1) within the protective layer; or
- 2) in a separate protective structure intended for the power generator that supplies one or more protective structures with electricity, constituting a fire zone separated by fire-separation elements with a minimum fire resistance class of REI 120.

4. If an external fuel storage tank or external fuel pump is used, their design shall allow fuel to be drawn under fire conditions on the surface through the use of:

- 1) a fuel storage tank or pump sump located completely underground, with a minimum 1.5 m thick layer of soil fill;
- 2) an inspection hatch to the fuel storage tank or to the pump well with a resistance required for protective and hermetic barriers;
- 3) a fuel storage tank inhalation valve secured with a metal basket filled with aggregate with a diameter of 0.03–0.06 m or an inhalation valve with a flame arrester.

5. A fuel line shall be equipped with a shut-off valve located in an easily accessible place in the power generator room.

6. A power generator installed in a protective structure shall meet the following requirements:

- 1) it shall be designed to operate without disruption at an ambient temperature between 5 °C and 50 °C, and in the case of power generators with a cooling system other than water cooling – at an ambient temperature between –10 °C and 50 °C;
- 2) it shall have a high degree of gas tightness, i.e. it shall not emit exhaust into the room and it shall not use ambient air;
- 3) the volume of its operation shall not exceed 110 dB(A) at a distance of 1 m from the power generator;
- 4) it shall be suitable for cooling during the isolation period;
- 5) it shall be adapted for connection to flexible supply, water, and air discharge lines in such a manner as to provide protection against the effects of sudden movements of the protective structure in the ground.

7. Water from the proprietary water intake, air from the outside or other solutions shall be used for cooling the power generator located in a protective structure, provided that the impenetrability of contaminated air and air shock wave overpressure from outside into the protective structure is ensured.

8. A protective structure can be connected simultaneously to photovoltaic installations and small wind turbines.

Heating requirements for protective structures

Section 53. 1. Protective structures shall be equipped with heating systems to ensure that the following conditions are maintained in rooms:

- 1) the air temperature must be at least 16 °C in rooms intended for human occupancy, during the operation of the protective structure;
- 2) the air humidity must not exceed 80 %, also outside the operation of the protective structure.

2. For protective structures with the planned term of protection shorter than 48 hours, it shall not be necessary to maintain the air temperature and humidity at the required levels.

3. Protective structures may be heated:

- 1) electrically by wall-mounted heaters, ventilation system heaters, and in facilities in which it is difficult to maintain the set air temperature, by wall-mounted infra-red heaters;
- 2) by central heating from a heat substation or from an in-house or external boiler room;
- 3) by a system using heat pumps.

4. In the case of water heating, the following additional requirements shall be met:

- 1) shut-off valves shall be installed on the supply and return in an easily accessible place within the protective structure;
- 2) water heating systems shall be installed on the surface of the walls at a maximum height of 0.5 m from the floor of the room or in the insulating layer of the floor;
- 3) water heating systems shall not be routed through ceilings, expansion chambers and air pre-treatment chambers, with the exception of components constructed of steel tubes of class PN16 in accordance with the applicable Polish Standard concerning the definition and selection of PN, which may pass through ceilings provided that valves or shut-off valves are installed within the protective structure at the points where the system penetrates protective layers;
- 4) components of water heating systems with surface temperatures exceeding 90 °C shall be protected against accidental human contact.

5. Heating system components routed through building partitions that serve as protective barriers, hermetically sealed barriers, or fire-separation elements shall be constructed with conduits that ensure mechanical resistance, gas tightness, and fire resistance consistent with that required for the respective barrier or partition.

6. The protective structure shall not have:

- 1) gas systems;
- 2) fuel installations, systems of process steam or compressed gases and liquids, with the exception of internal infrastructure of the protective structures;

3) pass-through systems other than those used for the purposes of a protective structure, with the exception of installations routed in steel casing pipes of class PN16 in accordance with the applicable Polish Standard on the definition and selection of PN, or placed in installations within shafts whose mechanical resistance is not lower than that of the protective structure.

7. In shelters, the operation of interior building installations that are technically difficult to relocate outside the shelter envelope shall be permitted, excluding gas installations, provided that their presence does not damage or compromise the integrity of the protective layer.

Chapter 15

Requirements for protection against the impacts of natural disasters

Section 54. The construction of a protective structure, including all protective measures applied to its openings, shall ensure resistance to wind loads exerting a pressure of no less than 2 kPa on the external surfaces.

Chapter 16

Technical requirements for underground structures used for transport purposes

Section 55. 1. Protective structures in underground rail transport systems, in particular, completely underground metro, tram and railway facilities shall be designed and constructed in compliance with technical requirements for protective structures set out in Annex 6 to the Regulation and in matters not regulated by that Annex, in accordance with the provisions of the Regulation.

2. The protective structures referred to in paragraph 1 shall be designed in keeping with requirements set out in legal regulations issued pursuant to Article 7(2)(2) of the Construction Law Act of 7 July 1994, concerning:

- 1) technical requirements to be met by underground railway structures and their location, for underground metro structures;
- 2) technical requirements to be met by railway structures and their location, for underground railway facilities;
- 3) technical requirements for public roads, for underground tramway facilities.

Section 56. 1. Protective structures in underground road transport systems, defined as situated completely underground road tunnel structures, shall be designed and constructed in a manner ensuring compliance with the technical requirements for protective structures specified in Annex 7 to the Regulation, and in matters not regulated in that Annex, in accordance with the provisions of the Regulation.

2. The protective structures referred to in paragraph 1 shall be designed in keeping with legal regulations issued pursuant to Article 7(2)(2) of the Construction Law Act of 7 July 1994, concerning technical requirements for public roads.

Chapter 17

Accessibility requirements for persons with special needs

Section 57. 1. Protective structures shall be constructed with consideration for persons with special needs, in particular, for ensuring protection for the number of individuals with motor disabilities as specified by the civil protection authority.

2. Access to protective structures for persons with special needs, in particular persons with motor disabilities, shall be ensured through:

- 1) the use, as appropriate, of equipment enabling vertical transport, including lifting equipment, ramps located outside the protection areas, access ramps for wheelchairs, stretchers, evacuation chairs or other technical solutions enabling access;
- 2) the construction of stairs leading to the protective structure in such a way that persons with special needs can enter the protective structure with assistance of other persons;
- 3) the designing of room layouts in such a way that persons with special needs can have access to washing facilities, toilets, water and meal distribution areas, and, depending on the protection period, to sitting or sleeping places;
- 4) the construction of an emergency exit to an open space or an auxiliary exit in such a way that persons with special needs can be evacuated with assistance of other persons or rescue teams.

3. The accessibility of protective structures for persons with disabilities shall be indicated by an information sign in accordance with the model provided for in Annex 8 to the Regulation. The sign shall be installed outside the protective structure in accordance with the marking requirements referred to in Section 65(2).

Chapter 18

Technical conditions for the use of protective structures

Section 58. 1. A protective structure shall be used in such a way as to ensure that:

- 1) fire safety requirements are complied with in accordance with the provisions of the Regulation and of the fire protection regulations;
- 2) the protective structure along with its protective and hermetic layers are kept in a proper technical condition;
- 3) the systems and equipment located therein functions properly;
- 4) the proper hygiene and sanitary condition is kept;

5) persons with special needs are provided with unrestricted access to the protective structure in the case of protective structures designated as accessible to such persons.

2. The protective structure shall be equipped with the following equipment, which shall be maintained in a proper condition:

- 1) equipment for the detection and measurement of carbon monoxide and carbon dioxide concentrations in the air – electronic signalling devices;
- 2) equipment for the measurement of air temperature and humidity – a hygrograph with thermometer;
- 3) equipment for receiving hazard messages as part of the hazard notification, warning and alert system:
 - a) a radio receiver operating in the 87.5–108 MHz VHF band shall be provided, equipped with the option of battery or rechargeable battery power supply and with the option of connecting to an external antenna installed outside the protective structure to ensure reliable reception of messages in cases where adequate radio signal reception is not possible inside the protective structure; or
 - b) a receiver for messages other than the radio receiver referred to in point (a), or a dedicated communication system, defined by the civil protection authority in accordance with civil protection needs.

3. The protective structure, in accordance with its specific requirements, intended use and resistance category, shall be equipped with control and measurement equipment for the measurement of:

- 1) overpressure – differential manometers;
- 2) radioactive contamination – dosimetric instruments;
- 3) chemical contamination – chemical identification or signalling devices.

4. The requirements for control and measurement equipment used in protective structures for detecting and measuring contamination have been specified in Annex 9 to the Regulation.

Section 59. 1. During the period in which a protective structure is not used for civil protection, hereinafter referred to as the ‘normal period’, permanent ventilation of the premises, either through gravity or mechanical ventilation, with the maintenance of indoor air relative humidity at no more than 80 %, shall be ensured, except in protective structures whose specific characteristics prevent or significantly hinder compliance with this humidity threshold.

2. During the normal period, manual gate valves on sewer drains shall be maintained in the ‘closed’ position to prevent flooding caused by reverse flow of domestic sewage. This provision shall not apply to a protective structure with a dual function which is in use during the normal period.

Section 60. 1. In a protective structure with a dual function, some elements of the filter ventilation system, including filters and filter absorbers, and other consumables whose useful life after unpacking is short under normal conditions or which must be stored in their original packaging, can be stored in the protective structure in a place secured against access of unauthorised persons and kept ready for installation as part of the activities involved in preparing the protective structure for use.

2. The following items may not be removed from the protective structure:

- 1) all necessary connections and installation levels necessary to restore the operational functionality of the protective structure during the preparation of the protective structure for use, including the air intakes and the ducts supplying air from the outside;
- 2) components of auxiliary exits, including above-ground chimneys and hatches;
- 3) elements of the protective and hermetic layers, including protective barriers, airtight barriers, exhaust bunker flaps and automatic explosion relief valves.

Section 61. In protective structures, technical and circulation areas may be considered areas with restricted access of personnel designated to supervise or operate the protective structure. Such zones shall then be marked with an information sign in accordance with the model provided for in Annex 10 to the Regulation.

Section 62. 1. If the protective structure is occupied during the protection period, it is unacceptable to use:

- 1) interior fittings and furnishings made of combustible plastics whose thermal decomposition products are highly toxic, such as polyvinyl chloride (PVC) and polyurethane foams, except in designated seating or sleeping areas;
- 2) suspended ceilings and floors raised above electrical systems;
- 3) gas installations and appliances;
- 4) flammable gas tanks.

2. During the protection period, the number of persons in a protective structure shall be appropriate to the capacity of the protective structure.

Section 63. 1. Ongoing maintenance of protective structures during the ready-to-use period shall be provided at least once a month, and otherwise, as necessary. The scope of ongoing maintenance services includes:

- 1) checking the technical condition of the elements of the protective structure and its equipment, and qualifying these for replacement or repair;
- 2) regular use of equipment, temperature and humidity measurements, verification of the sanitary and hygienic condition, and of the ventilation system;

3) keeping an equipment maintenance log – for a protective structure maintained in the operational readiness.

2. Ongoing maintenance tasks shall be performed in accordance with the state of the art and with the operation and maintenance manual, and also with operating procedures for the equipment installed in the protective structure, issued by its manufacturers.

§ 64. 1. A protective structure shall be maintained as necessary and this shall include tasks aiming at keeping it in a proper technical condition, without changing its technical parameters, in particular:

- 1) protecting building components, systems and equipment against excessive wear and tear and corrosion;
- 2) performing minor repairs and troubleshooting;
- 3) replacing components of systems and equipment on a regular basis in accordance with operating procedures and with the operation and maintenance manual.

2. In order to protect the protective structure against devastation and theft and from access by unauthorised persons, it shall be equipped with permanent locks. This provision shall not apply to a protective structure with a dual function which is in use during the normal period.

Section 65. 1. A protective structure shall be marked with the international civil protection identification sign in accordance with the model set out in Annex 11 to the Regulation. This sign shall be affixed:

- 1) in a visible location near the entrance or driveway – for protective structures;
- 2) in a visible location on the front wall, to the right of the main entrance, at a height of the upper edge of the entrance door or above, at a distance of no less than 0.5 m from the door, and at the entrance door leading directly to the protective structure, as well as above a gate or other opening used as an access road to the protective structure or next to the gate or such an opening – for buildings containing protective structures.

2. The international civil protection identification sign shall meet all of the following requirements:

- 1) the sign shall be at least 0.2 m wide and high;
- 2) the materials of which it is made, including the print, shall be resistant to weather conditions, in particular water and UV radiation;
- 3) the sign shall be permanently fixed to the surface.

3. A protective structure shall be marked with the E021 safety sign in accordance with the Polish Standard concerning safety colours and safety signs with the marking ‘BUNKER’ or ‘SHELTER’, depending on the type of the protective structure. The sign shall be installed outside the protective structure in accordance with the marking requirements referred to in paragraph 2.

Chapter 19

Final provision

Section 66. The Regulation shall enter into force 14 days after its publication.

**MINISTER FOR INTERNAL AFFAIRS
AND ADMINISTRATION**

in agreement with the:

**MINISTER FOR FINANCE AND
ECONOMY**

MINISTER FOR INFRASTRUCTURE

**LIST OF POLISH STANDARDS REFERRED TO IN THE TECHNICAL REQUIREMENTS FOR
PROTECTIVE STRUCTURES**

Item	Section under which the standard is cited	Standard no.*	Standard title (scope of reference)
1	Section 3(1) Annex 3	PN-EN 1990** PN-EN 1991** PN-EN 1992** PN-EN 1993** PN-EN 1994** PN-EN 1995** PN-EN 1996** PN-EN 1997** PN-EN 1998** PN-EN 1999**	Eurocode: Basis of Structural Design Eurocode 1: Actions on Structures Eurocode 2: Design of Concrete Structures Eurocode 3: Design of Steel Structures Eurocode 4: Design of Composite Steel and Concrete Structures Eurocode 5: Design of Timber Structures Eurocode 6: Design of Masonry Structures Eurocode 7: Geotechnical Design Eurocode 8: Design of Structures for Earthquake Resistance Eurocode 9: Design of Aluminium Structures (all parts of standards)
2	Section 8(3)	PN-EN 13501-1:2019-02	Fire classification of construction products and building elements – Part 1: Classification based on data from fire reaction tests
		PN-EN 13501-2:2023-09	Fire classification of construction products and building elements – Part 2: Classification using data from fire resistance tests, excluding ventilation system
		PN-EN 13501-3+A1:2010	Fire classification of construction products and building elements – Part 3: Classification using data from fire resistance tests on products and elements used in building service installations: fire-resistant ducts and shut-off fire dampers
		PN-B-02852:2001	Fire protection of buildings – Calculation of fire load density and determination of the relative duration of a fire (for the part concerning the fire load density – point 2)
3	Section 42(3)	PN-EN 1507:2007	Ventilation for buildings – Sheet metal air ducts with rectangular section – Requirements for strength and airtightness
		PN-EN 12237:2005	Ventilation for buildings – Ductwork – Strength and airtightness of circular sheet metal ducts
4	Section 49(1)	PN-B-01706:1992	Water supply systems – design requirements (points 2.1; 2.3; 2.4.1; 2.4.3-2.4.5; 3.1.1-3.1.3; 3.1.5; 3.1.7; 3.2.2; 3.2.3; 3.3; 4.1; 4.2 and 4.4–4.5)

5	Section 50(1)	PN-EN 12056-1:2002	Gravity drainage systems inside buildings – Part 1: General and performance requirements (points 4 and 5)
		PN-EN 12056-2:2002	Gravity drainage systems inside buildings – Part 2: Sanitary sewage system – Layout design and calculations (points 4–6)
		PN-EN 12056-5:2002	Gravity drainage systems inside buildings – Part 5: Installation and testing, instructions for operation, maintenance and use (points 5–9)
		PN-EN 12109:2003	Vacuum drainage systems inside buildings (points 5, 7 and 8)
6	Section 50(4)	PN-EN 13564-1:2004	Anti-flooding devices for buildings – Part 1: Specifications
7	Section 50(12)	PN-EN 12056-4:2002	Gravity drainage systems inside buildings – Part 4: Waste water lifting plants – Layout design and calculation (points 4–6)
8	Section 51(1)	PN-HD 308 S-2:2007	Identification of cores in cables and flexible cords
		PN-HD 60364-4-41:2017-09	Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock
		PN-E-05010:1991	Electric installation voltage ranges in building structures
		PN-EN IEC 61936-1:2022-04	Electrical power installations with a voltage greater than 1 kV AC and 1.5 kV DC – Part 1: AC
		PN-EN 50522:2022-12	Earthing of alternating current electrical power installations with voltage exceeding 1 kV
		PN-E-08501:1988	Electrical equipment – Tables and safety signs
		PN-EN 50310:2012 PN-EN 50310:2016-09	Equipotential bonding networks in buildings and other structures with telecommunications systems
		PN-HD 60364-1:2010	Low-voltage electrical systems – Part 1: Basic requirements, establishment of general characteristics, definitions
		PN-HD 60364-4-41:2017-09	Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock
		PN-HD 60364-4-42:2011 PN-HD 60364-4-42:2011/ A1:2015-01 PN-HD 60364-4-42:2011/ A11:2022-05	Low-voltage electrical installations – Part 4-42: Protection for safety – Protection against thermal effects
		PN-HD 60364-4-43:2012 PN-HD 60364-4-43:2024-04	Low-voltage electrical installations – Part 4-43: Protection for safety – Protection against overcurrent
PN-HD 60364-4-442:2012	Low-voltage electrical installations – Part 4-442: Protection for safety – Protection of low-voltage installations against temporary overvoltages due to earth faults in the high-voltage system and due to faults in the low voltage system		

	PN-HD 60364-4-443:2016-03	Low-voltage electrical systems – Part: 4-443: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances – Protection against transient overvoltages of atmospheric origin or due to switching
	PN-HD 60364-4-444:2012	Low-voltage electrical installations – Part 4-444: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances
	PN-IEC 60364-4-45:1999	Electrical installations of buildings – Protection for safety – Protection against undervoltage
	PN-HD 60364-5-51:2011 PN-HD 60364-5-51:2011/ A11:2014-01 PN-HD 60364-5-51:2011/ A12:2017-10	Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment – Common rules
	PN-HD 60364-5-52:2011 PN-HD 60364-5-52:2011/ A11:2018-12 PN-HD 60364-5-52:2011/ A12:2023-04	Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems
	PN-HD 60364-5-53:2022-10	Low-voltage electrical installations – Part 5-53: Selection and installation of electrical equipment – Switchgear and control gear
	PN-HD 60364-5-54:2011 PN-HD 60364-5-54:2011/ A11:2017-11 PN-HD 60364-5-54:2011/ A1:2023-04	Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors
	PN-HD 60364-5-551:2010 PN-HD 60364-5-551:2010/ A11:2016-06	Low-voltage electrical installations – Part 5-55: Selection and erection of electrical equipment – Other equipment – Clause 551: Low-voltage power generators
	PN-HD 60364-5-559:2012 PN-HD 60364-5-559:2012/ A11:2017-10	Low-voltage electrical installations – Part 5-559: Selection and installation of electrical equipment – Lighting fixtures and lighting installations
	PN-HD 60364-5-56:2019-01	Low-voltage electrical installations – Part 5-56: Selection and erection of electrical equipment – Safety services
	PN-HD 60364-6:2016-07 PN-HD 60364-6:2016-07/ A11:2017-10 PN-HD 60364-6:2016-07/ A12:2017-11	Low-voltage electrical systems – Part 6: Checking
	PN-HD 60364-7-701:2025-02	Low-voltage electrical installations – Part 7-701: Requirements for special installations or locations – Locations containing a bath or shower
	PN-HD 60364-7-706:2007 PN-HD 60364-7-706:2007/ A1:2021-03	Low-voltage electrical installations – Part 7-706: Requirements for special installations or locations – Conductive spaces and restrictions to

			freedom of movement
		PN-HD 60364-7-715:2012 PN-HD 60364-7-715:2012/ A11:2017-10	Low-voltage electrical installations – Part 7-715: Requirements on special systems or locations – Extra-low-voltage lighting installations
		PN-EN IEC 60445:2022-04	Basic safety principles for man-machine interface, marking and identification – Identification of device terminals and conductor terminations and conductors
		PN-EN 60529:2003 PN-EN 60529:2003/A2:2014-07	Degrees of protection provided by enclosures (IP code)
		PN-EN 61140:2016-07	Protection against electric shocks – Common aspects for installations and equipment
		PN-EN IEC 61293:2020-09	Marking of electrical equipment with ratings related to electrical supply – Safety requirements
9	Section 51(8)	PN-EN 1838:2025-05	Lighting application – Emergency lighting
		PN-EN 50172:2025-04	Emergency escape lighting systems
		PN-EN 12464-1:2012	Light and lighting – Lighting of work places – Part 1: Indoor work places
10	Section 53(4) (3) and (6)(3)	PN-EN 1333:2008	Flanges and their connections – Pipeline components – Definition and selection of PN
11	Section 65(3)	PN-EN ISO 7010:2020-07	Graphical symbols – Safety colours and safety signs – Registered safety signs
12	Annex 3	PN-EN ISO 14688-1:2018-05	Geotechnical investigation and testing – Determination and classification of soils – Part 1: Identification and description
13	point I.5 of Annex 4	PN-EN 12207 PN-EN 12207:2001 PN-EN 12207:2017-01	Windows and doors – Air permeability – Classification
	point II.7 of Annex 4	PN-EN 10220:2005	Seamless and welded steel tubes – Dimensions and masses per unit length
	point II.7 of Annex 4	PN-EN ISO 1461:2023-02	Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods
14	paragraph 11 of Annex 5	PN-EN ISO 16890-4:2023-01	Particulate air filters for general ventilation – Part 4: Method of conditioning for determining minimum fractional efficiency
	paragraph 12 (1) of Annex 5	PN-EN 1822-1:2019-05	High efficiency air filters (EPA, HEPA and ULPA) – Part 1: Classification, performance testing, marking
	paragraph 12 (3) of Annex 5	PN-EN ISO 1924-2:2010	Paper and board – Determination of tensile properties – Part 2: Constant rate of elongation method (20 mm/min)
	paragraph 12 (4) of Annex 5	PN-EN ISO 535:2023-10	Paper and board – Determination of water absorptiveness – Cobb method

* Where an undated Polish Standard is referred to, the most recent standard shall be used.

** Polish Design Standards introducing the European Standards for the Design of Structures – Eurocodes, approved and published in the Polish language, shall be used for the design of structures if they cover all the necessary aspects related

to the design of that structure (they constitute a complete set of standards enabling design). As a minimum, the design of any type of structure requires the use of PN-EN 1990 and EN 1991.

MINIMUM DISTANCES OF PROTECTIVE STRUCTURES FROM CRUDE OIL AND PETROLEUM
PRODUCT STORAGE TANKS, FUEL HANDLING TANKS AND PIPELINE SYSTEMS AT SERVICE
STATIONS, LIQUEFIED PETROLEUM GAS TANKS, UNDERGROUND PIPELINES, AND WATER
SUPPLY, SEWAGE, HEATING AND POWER LINES

Table 1. Minimum distances between protective structures and tanks intended for the storage of crude oil and petroleum products other than liquefied petroleum gas, as well as between protective structures and tanks or technological pipelines located at liquid fuel stations not intended for the storage of liquefied petroleum gas

Item	Facility (tank or pipeline)	Distance of the protective structure from the facility [m]	
		bunker	shelter
1	Floating roof ground tank for crude oil storage	100	150
2	Solid roof ground tank for storage of class I and II petroleum products	60	80
3	Floating roof ground tank for storage of class I and II petroleum products	30	40
4	Above-ground tank with horizontal main axis for storage of class I and II petroleum products	15	25
5	Solid roof ground tank designated for storage of class III petroleum products	15	20
6	Above-ground tank with horizontal main axis for storage of class III petroleum products	10	15
7	Underground tank with horizontal main axis for storage of class I and II petroleum products	15	
8	Tanks or technological pipelines located at liquid fuel stations not intended for the storage of liquefied petroleum gas	10	

Table 2. Minimum distance between a protective structure and a LPG tank

Item	Nominal tank capacity [m ³]	Distance between a protective structure to a liquefied petroleum gas tank depending on the location of the tank [m]			
		bunker		shelter	
		above-ground tank	underground tank	above-ground tank	underground tank
1	up to 3	3	1	10	10
2	from 3 to 5	5	2.5	10	10
3	from 5 to 7	7.5	3	10	10
4	from 7 to 10	10	5	20	10
5	from 10 to 40	20	10	40	10
6	from 40 to 65	30	15	60	15
7	from 65 to 100	40	20	80	20
8	from 100 to 250	60	30	100	30
9	from 250 to 500	100	35	150	35
10	from 500 to 1,000	150	35	200	45
11	from 1,000 to 3,000	200	35	300	50
12	over 3,000	300	35	300	60

Table 3. Minimum distance between a protective structure and an underground gas pipeline (irrespective of the technology of pipeline construction)

Nominal pipeline pressure [MPa]								
below 0.5	from 0.5 to 1.2		from 1.2 to 2.5		above 2.5			
Gas pipeline diameter [mm]								
–	up to 300	over 300	up to 300	over 300	up to 300	over 300 up to 500	over 500 up to 800	over 800
distance [m] from S-2 and S-3 shelter								
1	15	20	20	25	20	35	50	50
distance [m] from S-1 bunker and from a shelter								
3	30	40	40	50	40	70	100	150

Table 4. Minimum distance between an independent protective structure and water supply pipelines

Item	Pipeline diameter [mm]	Distance between an independent protective structure and a water supply or sewage pipeline [m]	
		independent bunker	independent shelter
1	from 100 to 300	1.0	2
2	over 300 to 500	2.5	5
3	over 500	4	8

Table 5. Minimum distance between an independent protective structure and sewage pipelines

Item	Pipeline diameter [mm]	Distance between an independent protective structure and a water supply or sewage pipeline [m]	
		independent bunker	independent shelter
1	over 150	2.5	3.5

Table 6. Minimum distance between an independent protective structure and heating system pipelines

Item	Pipeline diameter [mm]	Distance between an independent protective structure and a heating system pipeline [m]	
		independent bunker	independent shelter
1	up to 150	1	2
2	from 150 to 500	2	3
3	over 500	4	5

Table 7. Minimum distance between an independent protective structure and power grid lines

Item	Rated voltage [kV]	Distance between an independent protective structure and power grid lines [m]			
		independent bunker		independent shelter	
		from overhead lines*	from ground cables	from overhead lines*	from ground cables
1	1 or more, less than 15	4	1	4	1
2	15 or more, less than 30	8	3	8	3
3	30 or more, less than 110	8	3	8	3
4	110 or more	10	5	10	5

* For a distance from the extreme cables to the nearest entrance or auxiliary exit

DETAILED REQUIREMENTS FOR CALCULATION OF CONSTRUCTION
AND RESISTANCE OF PROTECTIVE STRUCTURES

I. MATERIALS and their properties

1. The protective structure shall be made of reinforced concrete, steel or composite materials, taking into account the protective properties of the ground, which, depending on the resistance category of the protective structure, provide for the required protection and durability during the projected service life.

2. In U-1 and U-2 shelters, external walls and ceilings may be constructed of timber, brick or other materials, provided that the required resistance and protection are ensured in accordance with the shelter's resistance category.

3. In U-3 shelters and in bunkers which are reconditioned, it is permissible for external walls and ceilings to be constructed from masonry, provided that the required structural resistance and protective performance are ensured in accordance with the designated resistance category of the protective structure and that the protective zone is protected against a potential risk of secondary debris resulting from masonry fragmentation.

4. Reinforced concrete structures of protective buildings shall be constructed using concrete of at least class C25/30 for shelters, and at least class C30/37 for bunkers, in accordance with the applicable Polish Standard concerning the design of concrete structures.

5. The walls and ceilings forming the external elements of the protective structure, when constructed as reinforced concrete components, shall be reinforced with steel bars of a minimum tensile strength of 500 MPa, and ductility class B or C for shelters, and ductility class C for bunkers, in accordance with the applicable Polish Standard concerning the design of concrete structures.

6. In protective structures designed to withstand explosion, it is permissible to take into account the dynamic properties of the construction materials, including the effect of the deformation velocity on their strength, using the dynamic reinforcement factor (DIF) determined on the basis of experimental studies carried out by research institutes or universities.

7. For reinforced concrete structural elements, the dynamic reinforcement factor (DIF) can be determined on the basis of data in the table:

Load type	Concrete	Steel reinforcements	
	$\frac{f_{ck,dyn}}{f_{ck}}$	$\frac{f_{yk,dyn}}{f_{yk}}$	$\frac{k_{dyn} f_{yk,dyn}}{k \cdot f_{yk}}$
bending	1.25	1.20	1.05
shearing	1.00	1.10	–
compression	1.15	1.10	–

Notes:

f_{ck} – characteristic cylindrical resistance to compression of concrete

$f_{ck,dyn}$ – characteristic dynamic cylindrical resistance to compression of concrete

f_{yk} – characteristic yield point of reinforcement

$f_{yk,dyn}$ – characteristic dynamic yield point of reinforcement

$$k = (f_t / f_y)_k$$

Note: The design strength of materials shall take into account partial factors for materials at the load-bearing limits for exceptional design situations and the value $(f_t / f_y)_k$ according to Annex C – in accordance with the applicable Polish Standard concerning the design of concrete structures.

8. For steel structural elements made of structural steel, the dynamic reinforcement factor (DIF) can be determined on the basis of data in the table:

Load type	Structural steel	
	$\frac{f_{y,dyn}}{f_y} 1)$	$\frac{f_{u,dyn}}{f_u}$
bending	1.20	1.05
shearing	1.20	1.05
compression	1.10	–

Notes:

F_y – plasticity limit

$f_{y,dyn}$ – dynamic yield point

f_u – tensile strength

$F_{u,dyn}$ – dynamic tensile strength

¹⁾ For structural steel with $f_y \leq 355$ MPa, an increase by an average static growth factor of 1.10 is permitted.

Note: The calculated strength of materials shall take into account partial factors for materials in load-capacity limits for the calculation of an exceptional situation, in accordance with the applicable Polish Standard concerning the design of steel structures.

II. BASIC DESIGN PRINCIPLES

1. Protective structures shall be designed and constructed in such a way that the loads that may act on them during construction and operation shall not lead to:

- 1) the entire structure or its part being destroyed;
- 2) movements and deformations of unacceptable size;
- 3) parts of the structure, connections, or installed equipment being damaged as a result of significant movements of structural elements;
- 4) destruction to an extent disproportionate to its cause, as a result of an accident.

2. The design of a protective structure shall meet the conditions necessary to ensure that neither the load-bearing thresholds nor the serviceability limit are exceeded in any individual element or in the structure as a whole.

3. Safety conditions of a structure, as referred to in paragraph 2, shall be met if the structure complies with the Polish Standards concerning the design and calculation standards and with requirements set out in this annex.

4. Standards other than those referred to in paragraph 3 can be adhered to provided that the requirements set out in paragraphs 5–10 are met.

5. The load-bearing threshold shall be deemed to be exceeded if the structure presents a threat to the safety of individuals in and around the protective structure or if it poses a risk of damage to equipment or property stored therein.

6. The usability limit shall be deemed to be exceeded if the usability requirements for the structure are not met in both transitional and permanent calculation situations. In such situations, the protective structure may experience:

- 1) local damage, including cracks that may adversely affect the usability, durability and appearance of the structure, its parts and of adjacent non-structural parts of the structure;
- 2) deformations or displacements that adversely affect the quality of the structure and its usability, including the functioning of machinery and equipment, as well as damage to non-structural parts of the structure and its finishing elements;
- 3) vibrations that are annoying to individuals or cause damage to the structure, its equipment and stored items, as well as limit its use for intended purpose.

7. As regards the usability of protective structures in areas subject to the influence of mining operations, the requirements of paragraph 6 shall not apply to those deformations, damages, and vibrations of the structure that result from the impacts caused by mining operations.

8. In areas subject to the impacts of mining operations, relevant structure safeguards shall be applied, depending on the threat resulting from the projected impacts caused by mining operations, understood as forced displacement and deformation, as well as ground vibrations.

9. The load-bearing structures of the designed protective structures shall be calculated for the following loads:

- 1) normal – as defined in the applicable Polish Standards for the design and calculation of structures;
- 2) exceptional – as specified in this annex.

10. Calculations of the load-bearing structure in an exceptional situation shall be carried out for at least three of the following alternative load cases:

- 1) load from debris;
- 2) load from the impact of explosion causing overpressure on the surface of the site as a result of the incident;
- 3) load from the impact of explosion causing on the surface of the site a negative pressure as a result of the incident amounting to 30 % of the overpressure set.

III. LOAD FROM DEBRIS

1. The structure of a protective building located beneath a building or within an area of anticipated debris accumulation shall be designed to ensure that the load-bearing threshold is maintained for all structural elements when subjected to equivalent loads resulting from debris accumulation, which may arise from the partial or complete collapse of the building situated above or in the vicinity of the protective structure, leading to its burial under debris, hereinafter referred to as the 'load from debris'.

2. The projected debris zone shall be taken to be the area situated at a distance from the outer wall of the building defined by the radius of the projected debris (r_{zag}) calculated according to the formula:

$$r_{zag} = \frac{h_b}{3}, \text{ for } h_b \leq 90 \text{ m}$$
$$r_{zag} = 30 + \frac{h_b - 90}{6}, \text{ for } h_b > 90 \text{ m}$$

where:

h_b – the height of the building shall be measured from the average ground level at the external wall of the building to the upper surface of the highest ceiling or to the highest point of the flat roof or roof structure, excluding wooden attics from the height calculation.

3. The maximum debris height (h_{zag}) in the predicted debris zone, depending on the distance from the external wall of the building from which the predicted debris zone is determined, adopted to determine the height of the auxiliary exit above the predicted debris height, is calculated according to the formula:

$$h_{zag} = 0.75(r_{zag} - x)$$

where:

r_{zag} – a radius of the predicted debris zone [m],

x – a distance from the outer wall of the building [m]; the scope of application: $5 \text{ m} \leq x \leq r_{zag}$.

4. The load from debris shall be included in the structural (static) calculations for the protective structure as an exceptional impact (A).

5. In the calculation of the structural (static) loads from debris, it is permissible to take into account the protective properties of the ground in the case of protective structures located below the ground level where the thickness of the ground layer above the ceiling is at least 2 m.

6. In a bunker and in U-3 shelter, the load from debris is taken into account in structural (static) calculations only if the value of the load from debris affecting the external partition of the protective structure is greater than the values of the quasi-static load from the impact of explosion adopted for the calculations. In other cases, without the need to make calculations, it is assumed that the construction of a bunker or a U-3 shelter ensures the transfer of equivalent loads from debris.

7. The load from debris affecting the ceiling or flat roof is assumed to be a vertical static load, evenly distributed over the surface of the ceiling, flat roof or ground within the area of the predicted debris zone.

8. The load from debris affecting the walls is assumed to be a horizontal load caused by soil pressure resulting from the load, as determined in accordance with the applicable Polish Standard for geotechnical design.

9. The calculated value of the load from debris ($A_{d,zag}$) affecting the protective structure is adopted as the maximum value from the determined values of loads from debris or the most unfavourable one for the protective structure, which, depending on the location and position of the protective structure, may include the loads from debris from:

- 1) a building situated above a protective structure or next to a protective structure; or
- 2) a neighbouring building for which the predicted debris zone includes a protective structure wholly or in part.

10. The maximum value of the load from debris ($A_{d,zag}$) shall be calculated according to the following formula:

$$A_{d,zag} = \max(q_b, q_{s,i} \cdot \eta_{s,i}, \dots, q_{s,j} \cdot \eta_{s,j}) \cdot i$$

where:

q_b – the load from debris from a building or part thereof situated above a protective structure or next to a protective structure [kN/m²],

$q_{s,i}$ – the load from debris of the neighbouring building i , the forecast zone of which includes the protective structure wholly or in part [kN/m²],

$\eta_{s,i}$ – reduction factor for load from debris of the adjacent building i [-],

j – number of neighbouring buildings whose predicted debris zone includes the protective structure wholly or in part [-].

11. The load from debris of a given building (q) shall be calculated according to the following formula:

$$q = 1.5 \sqrt{h_k} \cdot q_{kon}$$

where:

h_k – the height of the building structure [m] measured from the level of the highest point of the horizontal ceiling at the upper edge of the ceiling or flat roof of a protective structure to the level of the upper surface of the highest ceiling or flat roof of the building,

q_{kon} – the representative value of fixed loads (including its structural load) and useful loads on floors above the protective structure [kN/m²] calculated, subject to the provisions of para. 12 and 13, according to the formula:

$$q_{kon} = \frac{\sum g_k + \sum \Psi_2 \cdot q_k}{n}$$

where:

g_k – fixed load on floors above the protective structure, determined in accordance with the applicable Polish Standard concerning the basic design of structures [kN/m²],

Ψ_2 – a factor of the quasi-permanent value of a variable impact determined in accordance with Polish Standards [-],

q_k – a useful load of floors above the protective structure, determined in accordance with the applicable Polish Standard concerning the basic design of structures [kN/m²],

n – the number of floors above the protective structure.

12. In the case of a single-floor building, the value of q_{kon} shall be the value corresponding to the sum of the fixed loads imposed by the structure located above the protective structure.

13. In the absence of load data for a neighbouring building, the value of q_{kon} shall be derived from data provided in the table:

Load category of the ceiling surface in the building ¹⁾	Number of floors above the protective structure	Minimum value q_{kon}
A, B, C, D, E, F, G	1 ²⁾	5 kN/m ²

A, B, C1	up to and including 4	10 kN/m ²
	from 5 to 40 inclusive	15 kN/m ²
	over 40	20 kN/m ²
C2, C3, C4, C5, D1, D	up to and including 4	15 kN/m ²
	over 4	20 kN/m ²
E	1 ³⁾	15 kN/m ²
	over 1	20 kN/m ²
F and G	up to and including 4	15 kN/m ²
	over 4	20 kN/m ²
Notes:		
1) Surface load category in accordance with the Polish Standard concerning the basics of structural design.		
2) The height of the building shall not exceed 6 m.		
3) The height of the building is no more than 15 m.		

14. For buildings with a storey height of up to 3.5 m, the value of the load from debris (q) can be determined on the basis of the curves in diagram 1, depending on the number of storeys in the building in question and its value q_{kon} .



15. When an adjacent building is located at a distance greater than $0.7 \times r_{zag}$ from the protective structure, the resulting debris load may be reduced either by applying a designated reduction factor $\eta_s = 0.5$ or by using load values derived from computer simulations based on the finite element method, modelling the scenario of the total collapse of the neighbouring building.

16. Where neighbouring building plots are currently undeveloped, the load from debris shall be determined if the local zoning plan, zoning decisions or general development plan specify the maximum permitted building height or the number of storeys that can be built.

17. In the case referred to in paragraph 16, the load from debris of the neighbouring building shall be calculated assuming:

- 1) the number of storeys in the neighbouring building and the possible location in relation to the protective structure, which is the most unfavourable from the point of view of the impact of the load from debris – based on data specified in the local zoning plan, zoning decisions or general development plan;
- 2) value $q_{kon} = 15 \text{ kN/m}^2$;
- 3) the floor height of up to 3.5 m – where only the permissible building height is specified in the data referred to in point 1.

IV. Resistance to fragment impact

1. The protective function against ammunition fragments and against firing from small arms shall be considered fulfilled when:

- 1) the external elements of the protective structure that prevent penetration constitute a protective layer made of:
 - a) reinforced concrete or of concrete of class C25/30 – with a thickness of at least 25 cm; or
 - b) steel – with a thickness of at least 3 cm; or
 - c) solid brick on cement mortar or cement and lime mortar – with a thickness of at least 38 cm; or
 - d) solid silicate blocks on cement mortar or cement and lime mortar – with a thickness of at least 36 cm; or
- 2) the protective structure is located below the ground level.

2. If the external structural elements of the protective structure have more than one protective layer, all of the protective layers together shall meet the condition of equivalent thickness $h_E \geq 25 \text{ cm}$, which is calculated according to the formula:

$$h = \sum(h \times)$$

where:

- h – the thickness of the protective layer i with a minimum value of not less than h_{min} ,
 – reduction coefficient of the protective layer i .

3. The reduction coefficients R_x and the minimum values for thickness h_{min} are set out in the table:

Item	Type of material or structure		Reduction coefficient R_x	Minimum thickness of the protective layer h_{min} [cm]
1	Reinforced concrete or concrete with resistance corresponding to class	C16/20	0.917	12
2	concrete class	C20/25	0.943	12
3	concrete class	C25/30	1	12
4	concrete class	C30/37	1.032	12

5	concrete class	C35/40	1.1	12
6	concrete class	C40/50	1.138	12
7	solid brick or solid silicate block wall with cement or cement and lime mortar		0.703	12
8	steel		3.667	0.6
9	sand or sandy clay		0.267	50 ¹⁾
10	loamy sand		0.228	50
11	soil with unknown parameters		0.189	50
¹⁾ In the case of multiple protective soil layers, a single layer with a minimum thickness of 10 cm is permitted, provided that the total combined thickness of all soil layers is no less than 50 cm.				

4. The use of structural elements or protective shields made of alternative materials or with different thickness in a protective structure is permitted, provided that scientific studies or real-world tests conducted by research institutes or universities confirm that their protective performance is no inferior to that of a reinforced concrete element with a thickness of 25 cm made of concrete class C25/30.

V. Protection against the penetrating gamma radiation

1. The protective effect of a protective structure against penetrating gamma radiation from radioactive fallout is determined by the attenuation factor of this radiation, hereinafter referred to as the 'K factor' that indicates how many times lower the radiation intensity is inside the protective structure compared to the radiation intensity measured outside, at a height of 1.0 m above ground level.

2. In calculating the K factor, three directions of penetrating gamma radiation from radioactive fallout shall be taken into account:

- 1) vertical;
- 2) horizontal;
- 3) through the entry route, the auxiliary exit route and through the installation openings.

3. An appropriate K-factor value shall be ensured by the external components of the protective structure (horizontal and vertical barriers), provided that the required attenuation of gamma radiation is achieved by shielding elements made of reinforced concrete with a density of 2,500 kg/m³ and the following thickness:

- 1) for K = 100 – at least 40 cm;
- 2) for K = 200 – at least 46 cm;
- 3) for K = 500 – at least 54 cm;
- 4) for K = 1,000 – at least 60 cm;
- 5) for K = 1,500 – at least 64 cm.

4. Where the external components of a protective structure comprise multiple protective layers, the combined layers shall provide for the required gamma radiation attenuation factor (K), provided that their total equivalent thickness h_{EG} is no less than the values specified in paragraph 3.

5. The equivalent thickness h_{EG} shall be calculated according to the formula:

$$h_{EG} = \frac{\sum \rho_i \times h_i}{2500}$$

where:

h_i – the thickness i -of the protective layer [m],

ρ_i – the density i -of the protective layer [kg/m³]; for soils of unspecified density $\rho_{\text{and}} \leq 1,600$ kg/m³.

6. Entrances, auxiliary exits and other openings in the protective layers of bunkers shall be constructed in such a way as to ensure the required radiation attenuation factor (K), in accordance with the assumed resistance category, using:

- 1) the right-angle bends in the path of penetrating radiation on the way leading to the protective zone – assuming that each bend in the path of penetrating radiation attenuates the radiation 10-fold, if the surface mass of the protective layers at a bend is at least 500 kg/m²;
- 2) at least one right-angle bend in the path of penetrating radiation on the route leading to the protective zone and additional shields, including doors or hatches – assuming that a 10-fold attenuation of this radiation is provided by a shield made of reinforced concrete with a density of 2,500 kg/m³ and a thickness of at least 20 cm, or another shield of an equivalent thickness, determined in accordance with paragraphs 4 and 5.

VI. Shock

1. Bunkers shall be designed and constructed, taking into account the shock phenomenon, depending on the intended resistance category of the protective structure.

2. Inertial loads acting on the bunker structure shall be verified in multi-storey bunkers at least in the vertical direction using one of the following methods:

- 1) simplified method using the following formula:

$$q_a = \pm m \times g \times K_a$$

where:

q_a – inertial load caused by a shock in the vertical direction [N/m²],

m – mass [kg/m²],

g – acceleration due to gravity [m/s²],

K_a – coefficient adopted depending on the bunker's resistance category:

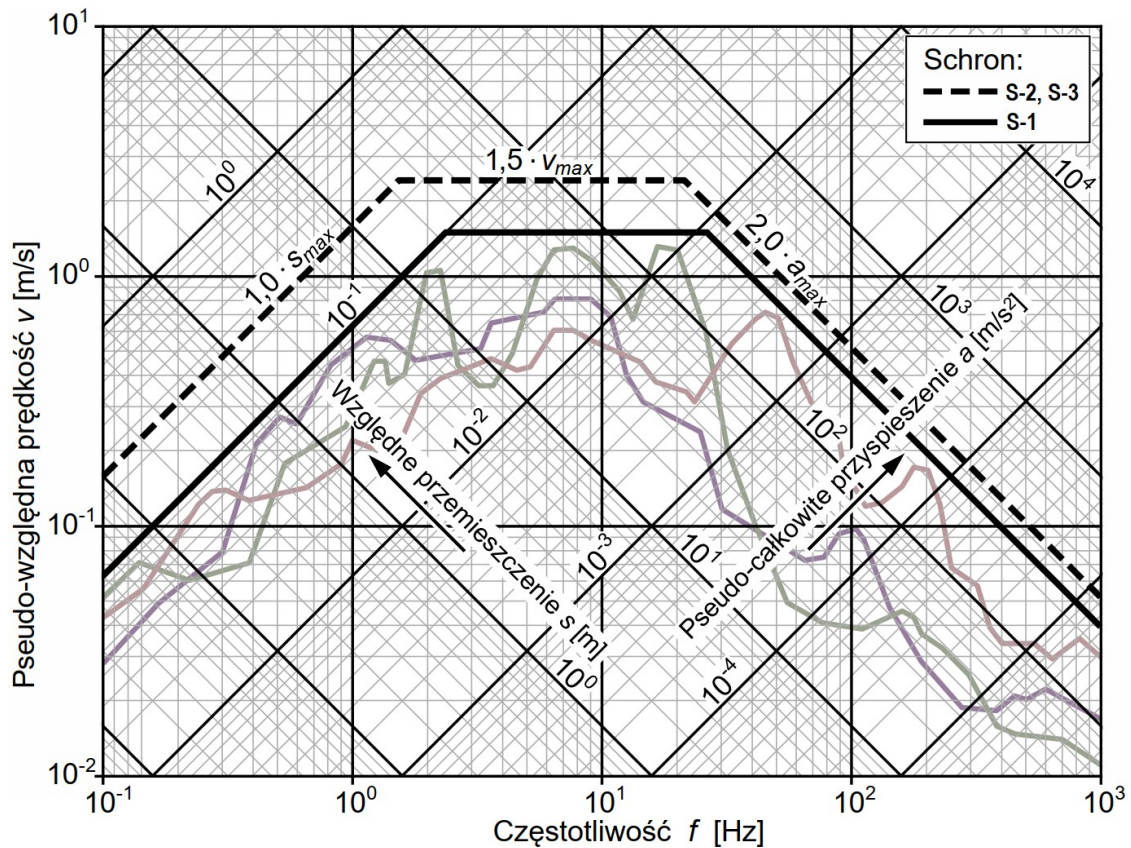
– S-1 bunker: $K_a = [1.5 \div 2.5]$,

– S-2 bunker: $K_a = [2.5 \div 3.5]$,

– S-3 bunker: $K_a = [3.5 \div 4.5]$.

Note: K_a of higher value is recommended when the ratio of the longer (l_x) to the shorter (l_y) meets the condition $\frac{l_x}{l_y} \geq 1.5$;

- 2) spectrum response methods using the diagram:



3. The interior bunker equipment components, including the installation elements, with a mass greater than 10kg, shall be secured against displacement that could endanger user safety as a result of a shock of at least 12.5g, where g represents the gravitational acceleration.

4. The fixings of the bunker equipment elements referred to in paragraph 3 shall be calculated on the basis of forces acting at the centre of mass, using one of the following methods:

- 1) simplified method using the following formula:

$$F_a = \pm m \times 25g$$

where:

F_a – a vertical shock inertia force [N],

m – mass [kg],

g – acceleration due to gravity [m/s²];

- 2) the spectrum response methods using the diagram referred to in paragraph 2(2).

5. The components of the installation necessary to maintain the protective function of the bunker shall be resistant to an acceleration of at least 25g.

VII. Resistance to the impact of explosion

Structural analyses of protective structures for loads resulting from the effects of explosion causing over-pressure on the surface of the ground as a result of the incident can be performed using one of the following methods:

- 1) the replacement static load method;
- 2) the method of dynamic analysis of the structure, including the use of advanced calculation methods.

VIII. The replacement static load method

1. Replacement static loads (A_d) on structural elements shall be assumed in accordance with the conditions of dynamic explosion pressure on a protective structure, including the conditions of its location and positioning, the conditions of its depth in the ground and the hydrogeological conditions.

2. The load from explosion pressure q_{in} is assumed according to the resistance category of the protective structure based on the quasi-static value specified in the provisions of Section 3(2) of the Regulation.

3. Where a protective structure is completely below ground level and the soil cover above the ceiling is at least 2 m thick, the load q_w may be reduced, subject to paragraph 4, by the reduction factor calculated according to the formula:

$$n_i = \exp \left[\frac{-2 K_0 \tan \Phi (a+1) b L^2}{a L^2} \right]$$

where:

n_i – the reduction factor (e.g. force, stress, pressure),

K_0 – the ground pressure coefficient determined in accordance with the Polish Standards,

Φ – the angle of internal ground friction,

a – the ratio of length to span of the ceiling L of the protective structure,

b – the ratio of the depth of the protective structure's ceiling below ground level to the span of the ceiling L ,

L – a span of the protective structure's ceiling; in the case of a ceiling characterised by a diameter D , the span corresponds to the relationship $L = 2/3D$.

4. The reduction factor n_i shall not apply if the thickness of the earth layer covering the ceiling H_{obs} is less than the thickness resulting from the following equation:

$$H_{obs} \leq 0.2 \times L$$

where:

L – a span of the protective structure ceiling [m].

5. The calculations shall account for the scenario of an exceptional load acting simultaneously on all structural elements exposed to overpressure (including ceilings, foundations, entrance structures, protective vestibules, emergency exit shafts, and protective or hermetically sealed protective doors), including where pressure is forced inward, also the entrance components, protective vestibule, ventilation shaft, and emergency exit elements.

6. The impact on the protective structure ceiling shall be taken as the vertical characteristic load q_{k1} with a value at least equal to:

1) in the case of a protective structure ceiling above which an underground storey exists with a reinforced concrete ceiling at least 22 cm thick, which is located below or at the level of the adjacent ground:

$$q_{k1} = 0.8 \times q_w$$

2) in the case of the roof of a protective structure under the conditions referred to in paragraphs 3 and 4:

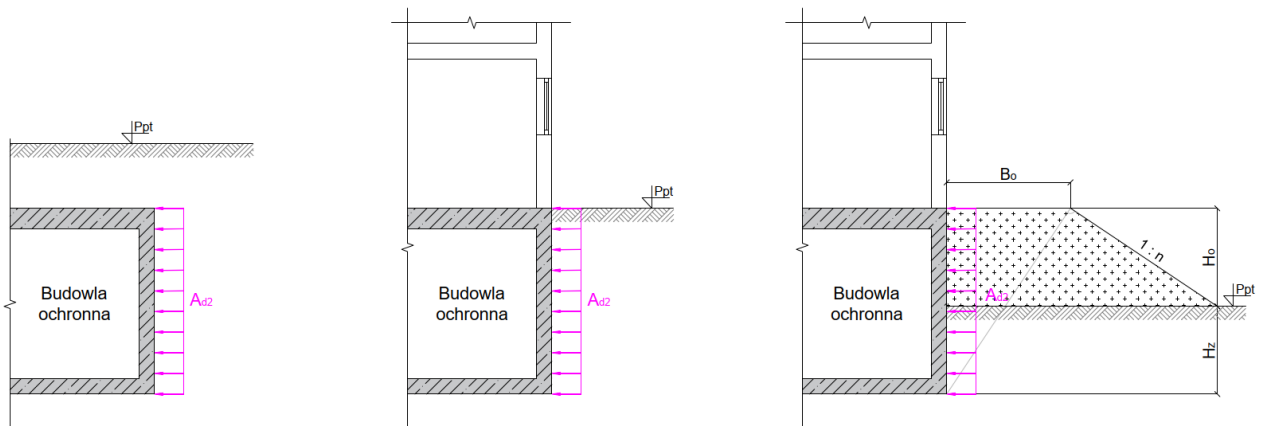
$$q_{k1} = n_i \times q_w$$

3) in cases other than those referred to in points 1 and 2:

$$q_{k1} = q_w$$

7. The impact on the outer walls of the protective structure shall be taken as a horizontal characteristic load q_{k2} with a value at least equal to:

1) in the case of a wall or its parts that are adjacent to the ground, including an embankment ground shaped in such a way as to meet the condition $B_o \geq (H_z + H_o)/n$:



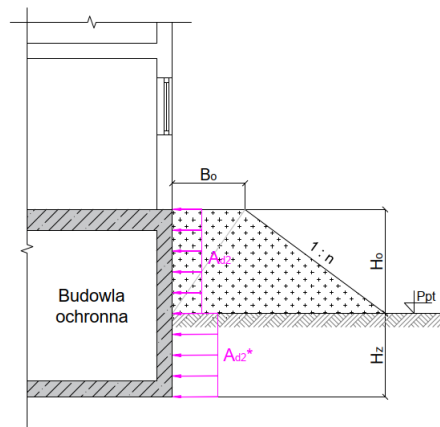
$$q_{k2} = q_w \times K_g$$

where:

K_g – soil pressure coefficient according to the table:

Soil characteristics	Coefficient K_g
Coarse land ¹⁾ with moisture content ²⁾ $S_r \leq 0.8$	0.5
Fine-grained soil ¹⁾ with a consistency index $I_C \leq 0.5$	0.6
Soils with a moisture content of $S_r > 0.8$ Rocks and very coarse land ¹⁾ Non-developed made ground Organic land Other land	1
Notes: ¹⁾ According to the land classification set out in the Polish Standard concerning the designation and classification of land ²⁾ The degree of humidity determined on the basis of the equation: $S_r = \frac{w}{w_r}$ where: w – soil moisture, w _r – the moisture content of the total saturation of the pores of the ground with water.	

- 2) in the case of a wall or part thereof adjacent to made ground which, above the level of the adjacent land (*Ppt*), is shaped in a manner corresponding to the condition $0.6\text{ m} < B_o < (H_z + H_o)/n$:



- a) for the part of the wall adjacent to the made ground:

$$q_{k2} = q_w \times K_g$$

where:

K_g – the lateral earth pressure coefficient according to the table in point 1,

- b) for the part of the wall below the level of the adjoining land (*Ppt*):

$$q_{k2}^{\dot{c}} = q_w \times K_g \times K_o$$

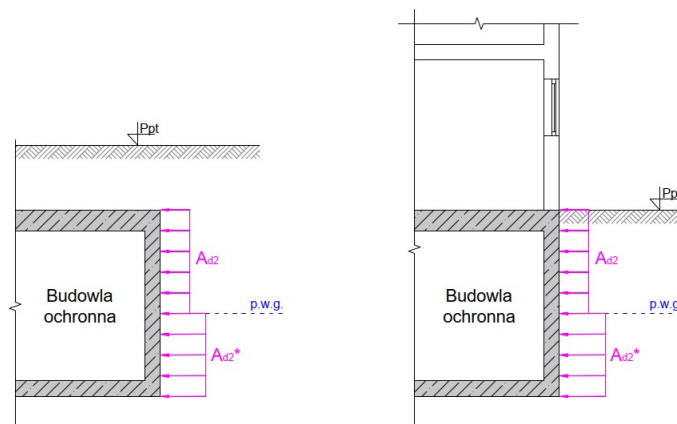
where:

K_g – the lateral earth pressure coefficient according to the table in point 1,

K_o – the reflection coefficient depending on the slope of the embankment according to the table:

Slope gradient of the embankment (1:n)	1:5	1:4	1:3	1:2
Coefficient K_o	1.0	1.1	1.2	1.3

- 3) for a wall or part thereof located below the groundwater level (GWL):



- a) for a part of the wall above groundwater level:

$$q_{k2} = 1.2 \times q_w \times K_g$$

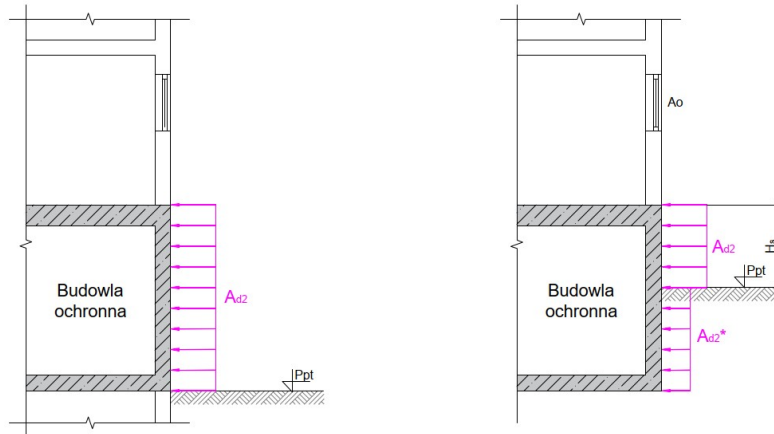
where:

K_g – the lateral earth pressure coefficient according to the table in point 1,

- b) for a part of the wall below ground water level:

$$q_{k2}^i = q_w$$

- 4) for a wall or part thereof that is wholly or partly above the level of the adjacent land (Ppt):



- a) for a wall located entirely above Ppt or part of a wall above Ppt , when its height $H_s > 1.5$ m or when $H_s \leq 1.5$ m and the area of openings in the external wall of the building $A_o \leq 10\%$ in relation to the area of the external wall of the building:

$$q_{k2} = 2 \times q_w + \frac{6 \times q_w^2}{q_w + 720}$$

where:

K_g – the lateral earth pressure coefficient according to the table in point 1,

- b) for the part of the wall above Ppt , when its height $H_s \leq 1.5$ m and the area of openings in the external wall of the building $A_o > 10\%$ in relation to the area of the external wall of the building:

$$q_{k2} = q_w + \frac{2.5 \times q_w^2}{q_w + 720}$$

- c) for the part of the wall below Ppt :

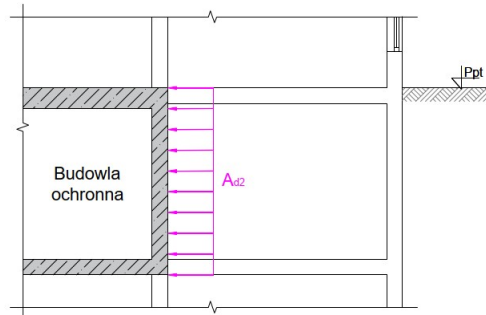
$$q_{k2}^i = q_{k2} \times K_g$$

where:

q_{k2} – designated according to letter a or b, respectively, according to the conditions for the construction of the part of the wall above Ppt ,

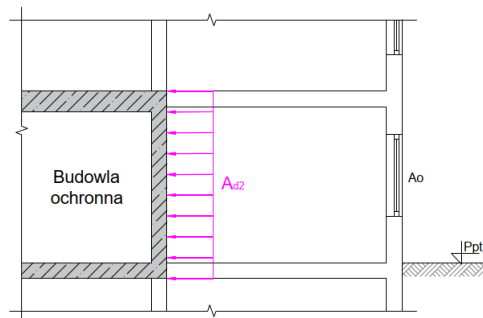
K_g – the lateral earth pressure coefficient according to the table in point 1;

- 5) in the case of a wall adjacent to a room in an underground storey, where the ceiling is located below the level of the adjacent ground (*Ppt*) or at the same level:



$$q_{k2} = 0.8 \times q_w$$

- 6) for the wall adjacent to the room on an above-ground storey:



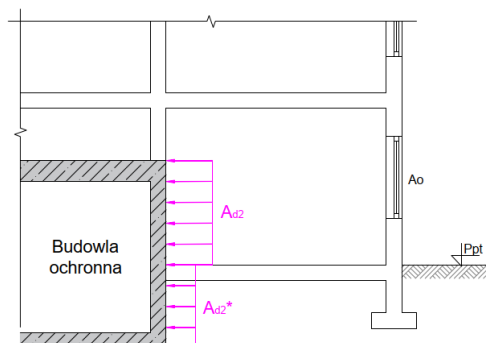
- a) for the wall adjacent to the room with the area of openings in the external wall of the building $A_o \geq 50\%$ in relation to the area of the external wall of the building:

$$q_{k2} = 2 \times q_w + \frac{6 \times q_w^2}{q_w + 720}$$

- b) for the wall adjacent to the room with the area of openings in the external wall of the building $A_o < 50\%$ in relation to the area of the external wall of the building:

$$q_{k2} = q_w + \frac{2.5 \times q_w^2}{q_w + 720}$$

- 7) in the case of a wall partially buried in the ground and partially adjacent to a room on the above-ground or first underground storey:



- a) for the part of the wall adjacent to the room with the surface of the openings in the external wall of the building $A_o \geq 50 \%$ in relation to the area of the external wall of the building:

$$q_{k2} = 2 \times q_w + \frac{6 \times q_w^2}{q_w + 720}$$

- b) for the part of the wall adjacent to the room with the surface of the openings in the external wall of the building $A_o < 50 \%$ in relation to the area of the external wall of the building:

$$q_{k2} = q_w + \frac{2.5 \times q_w^2}{q_w + 720}$$

- c) for the part of the wall below the floor of the room and adjacent to the ground:

$$q_{k2}^i = q_{k2} \times K_g$$

where:

q_{k2} – designated in accordance with pt. a) or b), respectively, according to the conditions for the construction of the part of the wall above the floor of the room,

K_g – the lateral earth pressure coefficient according to the table in point 1.

8. The impact on the external walls of the protective structure at the entrance and emergency exit, as well as on the structural barriers used therein, is assumed to be a characteristic horizontal load q_{k3} with a value equal to at least:

$$q_{k3} = q_w \times K_w$$

where:

K_w – the reflection coefficient depending on the conditions of the placement and shape of the space at the entrance or at the auxiliary exit, as appropriate, according to the table:

Item	Location of the entrance to the protective structure or an auxiliary exit	Coefficient K_w
1	the entrance from an enclosed space (corridor or room) on an underground floor whose ceiling is located below the level of the adjacent ground (<i>Ppt</i>) or at the same level as the adjacent ground	0.8
2	the entrance from an enclosed space (corridor or room) on the first underground floor with a floor recessed at least 1.5 m below ground level, with $A_o < 50 \%$	1.3
3	the entrance or an auxiliary exit from the stairs leading directly from the outside, covered by the ceiling and having a form of a pass-through entrance	1.3
4	the entrance directly from the stairway in the building at $A_{ok} \geq 50 \%$	2.0
5	the entrance or an auxiliary exit from stairs leading directly from outside, located at the end of a dead-end space (half-pass-through), with ramps located opposite the entrance or directly from the stairways in the building at $A_{ok} < 50 \%$	2.3
6	the auxiliary exit with an auxiliary exit tunnel ending in a shaft with an above-ground chimney	1.8

Notes:

A_{ok} – the area of openings in the stairway enclosure in relation to the area of walls and ceilings forming the stairway enclosure [%],

A_o – the area of openings in the external wall of the building relative to the surface of the external wall of the building [%].

9. The load acting on the internal walls of the protective vestibule is assumed to be 20 % less than the load acting on the external walls of the entrance to the protective structure or emergency exit where the vestibule is located.

10. The load on the ceiling, walls and bottom plate of a back-up tunnel or ramp shall be taken as a vertical and horizontal load, respectively, with the load values determined on the basis of paragraphs 6 and 7.

11. The load caused by explosion pressure into the interior of the spare exit shafts and the inlet sampling shafts shall be assumed as horizontal and vertical (perpendicular to the plane of the shafts) characteristic loads q_{k4} , respectively, with a value at least equal to:

$$q_{k4} = q_w \times K_o$$

where:

K_o – a coefficient of rebound conditions:

- 1) in the case of an auxiliary exit with an escape hatch: $K_o = 1.6$;
- 2) in the case of a backup outlet connected to an air intake:
 - a) for U-3 shelter and S-1 bunker: $K_o = 1.8$,
 - b) for S-2 and S-3 bunkers: $K_o = 1.65$.

12. The impact on the emergency exit window or air intake or exhaust window is assumed to be:

1) horizontal characteristic load q_{k5} with a value equal to:

a) from the side of the explosion impact:

$$q_{k5} = q_w + \frac{2.5 \times q_w^2}{q_w + 720}$$

b) from sites other than those referred to in point (a):

$$q_{k5} = 1.2 \times q_w$$

2) characteristic vertical load q_{k1} with a value equal to:

$$q_{k5} = 1.2 \times q_w$$

13. The effects on columns, internal and external walls shall be determined according to the ceiling load.

14. The impact on the foundations of a protective structure is assumed to be a vertical load which shall be calculated in accordance with the applicable Polish Standard concerning geotechnical design, based on the ground resistance load, depending on the vertical replacement load on the ceiling, walls and columns, on the rigidity of the foundation and on hydrogeological conditions. If a rock or very coarse soil is present under the foundation, the resistance forces are increased by a coefficient of 1.2.

15. The load capacity of the structure, or its individual structural elements, shall be verified quasi-statically by using a static replacement load having the value of:

$$A_d = \varphi_{dyn} \times q_k$$

where:

φ_{dyn} – the dynamic coefficient appropriate to the rigidity of the structure [-],

Q_k – the characteristic value of the quasi-static impact [kN/m²] as defined in Section 3(2) of the Regulation.

16. For protective structures made of concrete structural elements, the dynamic coefficient φ_{dyn} shall be:

- 1) when calculating the load-bearing capacity of structures $\varphi_{dyn}=1.20$, except in the cases referred to in point 2;
- 2) when calculating shears and punctures $\varphi_{dyn}=2.0$, where the effect of stiffness of the supports on the values of shearing forces and the redistribution of internal forces in a scratched state is not taken into account in the calculation.

IX. dynamic structure analysis method

1. The dynamic analysis of the structure shall be conducted on the basis of the loads assigned to the category of protective structures defined by the following dynamic values: the pressure resulting from the action of the incident wave P_{so} and the duration of the overpressure phase t_+ .

2. The dynamic response of the load-bearing elements of the protective structure, determined on the basis of analysis, shall include at least:

- 1) a maximum displacement of structural elements;
- 2) angles of rotation on supports;
- 3) permanent deformations resulting from the cessation of explosive impact.

3. The load affecting the external structure of the protective building or the protective layer of soil, depending on the duration of the load and the location of the building in relation to the centre of the explosion and the dynamic characteristics of the structural elements, shall be determined on the basis of the reflected wave pressure (P_r) and the positive impulse of the reflected wave (i_r).

4. In calculations for layer and beam elements, the dynamic response criterion for reinforced concrete structural elements is based on a rotation angle limit of $\theta < 4^\circ$ at each support and a displacement ratio coefficient of $\mu < 4$, calculated according to the following formula:

$$\mu = \frac{X_m}{X_E}$$

where:

X_m – a maximum deflection of the structural component under dynamic load,

X_E – a maximum spring deflection of the structural element.

5. It is permissible to calculate the stress on structural elements of protective structures using numerical methods, provided that the dynamic nature of the load and the dynamic response of the structure to the assumed loads resulting from the resistance category of the protective structure or caused by the calculated destructive factor are taken into account.

6. The calculation of the resistance of the structural element of the protection plane to a calculated destructive factor is carried out taking into account the characteristics of the actions associated with the application of the respective destructive agent.

7. Calculations of the partition's resistance to the calculated destructive factor are performed using recognised numerical or analytical methods, taking into account the global and local response of the protective structure.

TECHNICAL REQUIREMENTS CONCERNING THE MECHANICAL RESISTANCE OF
PROTECTIVE BARRIERS, AUTOMATIC EXPLOSION RELIEF VALVES, AIRTIGHTNESS OF
HERMETIC BARRIERS AND INSTALLATION CONDUITS IN PROTECTIVE STRUCTURES

I. Requirements for protective, hermetic and hermetically sealed protective barriers

1. Protective and hermetically sealed protective barriers, depending on the resistance category of the protective structure, must be resistant to explosion pressure as specified in Table 1.

Table 1. Required resistance of protective and hermetically sealed protective barriers to explosion pressure

Protection structure resistance category	Barrier resistance to incident overpressure ^{1), 3)} [MPa]	Barrier resistance to reflected overpressure ^{2), 3)} [MPa]
1	2	3
U-3 shelter	≥0.06	≥0.12
S-1 bunker	≥0.1	≥0,2
S-2 bunker	≥0,2	≥0,4
S-3 bunker	≥0,3	≥0,6
Notes: 1) Value determined on the basis of physical measurement in test studies. 2) Value determined on the basis of physical measurement in test studies or adopted for the calculation of barrier resistance. 3) Value for pressure duration of at least 20 ms.		

2. Resistance values in column 2 and 3 are applicable alternatively.

3. Permissible stress in the jacket of protective doors and hermetically sealed protective doors accepted for the calculation of barrier resistance referred to in column 3 shall not exceed 75 % of the yield point. Where the stress is limited to 75 % of the yield point, a partial safety coefficient of 1.0 can be applied to the yield point.

4. Protective and hermetically sealed protective barriers must have locking elements and fastening elements in the supporting structure of the protective building, including frame anchors, ensuring mechanical resistance to external negative pressure of at least 20 % of the expected explosion-induced overpressure.

5. A hermetic barrier, including a gas-tight valve, must be of such a gas-tightness that the maximum flow due to a lack of tightness does not exceed 0.2 dm³/s per square metre of sealed opening at an external overpressure of 150 Pa, or of a gas-tightness corresponding to a permeability class of 4 or D, determined in accordance with the applicable Polish Standard concerning air permeability of windows and doors.

6. The load acting on the airtight component of the hermetic barrier shall not be transmitted to the supporting frame via the sealing element.

7. The hermetic barrier shall be equipped with a gasket made of chloroprene rubber or a material with equivalent properties, resistant to continuous use under normal operating conditions and installed in a manner that allows for its replacement.

II. Basic requirements for automatic explosion relief valves and installation penetrations used in protective structures

1. An automatic explosion relief valve, depending on the resistance category of the protective structure, must be resistant to explosion pressure as specified in Table 2.

Table 2. Basic requirements for automatic explosion relief valves

Resistance Category of Protective Structure	Valve resistance to incident overpressure ^{1), 3)} [MPa]	Valve resistance to reflected overpressure ^{2), 3)} [MPa]
1	2	3
U-3 shelter	≥0,09	≥0,18
S-1 bunker	≥0,15	≥0,3
S-2 bunker	≥0,3	≥0,6
S-3 bunker	≥0,45	≥0,9

Notes:

1) Value determined on the basis of physical measurement in test studies.

2) Value determined on the basis of physical measurement in test studies or adopted for the calculation of barrier resistance.

3) Value for pressure duration of at least 20 ms.

2. Resistance values in columns 2 and 3 are applicable alternatively.

3. The reflected overpressure acting on an automatic explosion relief valve of specified resistance shall not cause damage to any of its components, including the mounting assembly, under single-pressure activation conditions.

4. The automatic explosion relief valve must close under the impact of an external pressure impulse passing through the valve, with a value not exceeding:

- 1) 300 Ns per 1 m³/s of the nominal air flow with a reflected pressure peak of 10 to 80 kPa;
- 2) 150 Ns per 1 m³/s of nominal air flow with a reflected pressure peak of 80 to 600 kPa.

5. The automatic explosion relief valve shall close under an external negative pressure of 10 kPa and shall remain open at an airflow rate of at least 1.2 times the nominal operating value.

6. The airflow resistance of the automatic explosion relief valve shall not exceed:

- 1) 150 Pa – at a nominal flow rate of 150 m³/h,
- 2) 350 Pa – at a nominal flow rate of 900 m³/h

– whereas for other flow rates, the maximum flow resistance values shall be determined proportionally.

7. Wall conduits shall be constructed using sleeve pipes conforming to the applicable Polish Standard concerning dimensions and weight of steel pipes that are terminated with flanges protected by hot-dip galvanising, in accordance with the applicable Polish Standard concerning zinc coatings applied to steel and cast iron products by the immersion method.

8. Conduits made of steel pipes shall have a strength equivalent to that of a load of 20 kN applied in the vertical or horizontal direction.

9. The air resistance at the conduit can be greater than 70 Pa at a flow rate of 1,000 m³/h.

REQUIREMENTS FOR FILTER VENTILATION SYSTEMS USED IN PROTECTIVE STRUCTURES
AND FOR THEIR COMPONENTS

1. The total filter absorber resistance shall not exceed:

- 1) 800 Pa at a nominal flow rate of 300 m³/h; or
- 2) 1,400 Pa at a nominal flow rate of 620 m³/h

– whereas for other flow rates, the maximum flow resistance values shall be determined proportionally.

2. Flow resistance in the filter ventilation system must not exceed:

- 1) 600 Pa during the clean ventilation period;
- 2) 1,400 Pa during the filter ventilation period.

3. The service life of filter absorbers is as follows:

- 1) in a filter ventilation unit – at least 5 years;
- 2) in original packaging – at least 10 years.

4. The airflow of the fan in the filter ventilation unit shall be continuously adjustable (stepless) and shall be maintained at the set value during operation.

5. The filter ventilation device must be capable of operating during the filter ventilation period for at least twice the projected term of protection, but not less than 48 hours.

6. The filter ventilation system shall include a differential manometer for measuring overpressure with an accuracy of up to 10 %.

7. The filter ventilation unit must be designed in such a way that it can be operated manually in the event of power failure.

8. A manual drive shall not be required for filter ventilation units intended for protective structures equipped with a back-up power source.

9. The connecting elements forming part of the filter ventilation system shall be capable of withstanding an external static overpressure of 2 kPa and an internal static overpressure of 3 kPa.

10. Flexible connecting elements forming part of the filter ventilation system shall be capable of compensating displacements of at least 100 mm in any direction.

11. The filter materials of the pre-filter shall meet at least the requirements for class ePM₁₀ in accordance with the applicable Polish Standard concerning the determination of the minimum fractional performance of particulate air filters for general ventilation. At the nominal airflow rate through the pre-filter, the effective flow velocity calculated based on the effective filter area shall not exceed 0.7 m/s.

12. A particulate filter shall meet the following requirements:

- 1) the separation efficiency of the filter shall meet or exceed the requirements for filter class H13, in accordance with the Polish Standard concerning the classification, performance testing and marking of high-efficiency air filters. The filter shall be characterised by a minimum total efficiency of 99.95 %;

- 2) the filter materials shall be resistant to separate dissolution in hydrochloric acid (0.5 N) and ammonia (0.5 N) at a temperature of +20 °C for a duration of 5 hours. The loss in weight of the filter materials under these conditions shall not exceed 2 % of their original weight;
- 3) the filter materials shall exhibit a minimum tensile strength of 0.8 N/mm in a dry state and at least 0.35 N/mm after 24 hours of exposure to water, in accordance with the Polish Standard governing the determination of tensile properties of paper and cardboard;
- 4) the filter materials shall exhibit moisture repellency such that water absorption shall not exceed 10 g per square metre, as determined by the Cobb absorptiveness test in accordance with the Polish Standard for measuring water absorptiveness of paper and cardboard.

13. A filter absorber shall meet the following requirements:

- 1) the casing shall be capable of withstanding an external static overpressure of 10 kPa and an internal static overpressure of 30 kPa;
- 2) the tightness of the finished special filter shall be such that, under a test internal overpressure of 10 kPa, the pressure variation does not exceed 2.5 % over a period of five minutes;
- 3) the special filter shall be capable of withstanding mechanical stresses induced by two-minute vibrations at a maximum acceleration of approximately 100 m/s² and a frequency of approximately 25 Hz, without incurring damage;
- 4) the special filter containing a dry carbon sorbent shall exhibit retention capacities for warfare gases and other harmful gases as specified in Table 1. For a maximum of one warfare gas and one harmful gas, the retention capacity may be up to 10 % lower than the values indicated in Table 1;
- 5) the filter absorber shall remove radioactive methyl iodide (¹³¹ CH₃I) from the air in such a way that after 20 hours of equilibration the separation rate of the filter shall at least be 99.999 % with dry carbon, and 95 % with wet carbon;
- 6) the filter absorber shall be tightly closed and sealed;
- 7) the construction of the filter absorber shall be designed to prevent the release of carbon dust into the filtered air.

Table 1. Retention capacity of the finished special filter containing a dry carbon sorbent for warfare and other harmful gases

Warfare gas or other harmful gas	Gas concentration by volume [%]	Capacity threshold [mg/m³]	Capacity [kg/dm³/s]
chloropicrin	0.2	2	0.125
cyanogen chloride	0.2	20	0.015
hydrogen cyanide	0.2	11	0.02
chlorine	0.2	1,5	0.038
sulphur dioxide	0.2	13	0.025
ammonia	0.2	18	0.005

14. When determining the retention capacity and separation rate of the filter absorber, the temperature of the air entering the filter absorber shall be maintained at +20 °C, and the relative humidity shall be 80 %. The moisture content of the carbon in the filter shall not exceed 5 %, calculated on a dry carbon basis.

TECHNICAL REQUIREMENTS FOR PROTECTIVE STRUCTURES WITHIN UNDERGROUND RAIL
TRANSPORT SYSTEMS

1. Protective structures within underground rail transport systems shall be designed and constructed to meet the resistance and capacity category specified by the competent civil protection authority.

2. Protective structures within underground rail transport systems shall be located, in particular, in passenger-serving areas such as platforms, stops, underground passages or other designated spaces, as well as in technical zones, including technological voids or in separated tunnel sections, and for railway lines of national interest or those of defence significance, as referred to in the Rail Transport Act of 28 March 2006 (Journal of Laws 2025, item 1234), with due consideration for ensuring the continuity and safety of train operations.

3. A protective structure connected to the section of the tunnel running beneath a riverbed shall be separated in such a manner as to ensure that it is protected against flooding in the event of damage to or failure of the tunnel segment located under the riverbed.

4. Protective structures shall be protected against the impact and penetration of pressurised groundwater through the use of waterproofing systems or equivalent protective solutions.

5. A bunker shall constitute a designated fire zone, separated with the use of fire protection measures designed to prevent fire from spreading into its interior for a minimum duration of 120 minutes when the impact of fire is defined by the standard fire curve, and also to limit the spread of smoke.

6. Walls and ceilings that constitute the fire-separation elements shall have a fire resistance class of at least REI 120.

7. When determining the capacity of the protective zone, the requirements for the maximum capacity of the shelter's protective zone set out in Section 10(3)(1) of the Regulation shall not apply.

8. In U-1 and U-2 shelters, a lift leading to the protective zone may be installed provided that its construction does not interfere with the protective layer, and any shaft present at the level of the protective zone shall be secured by a door with a fire resistance class of EI 60 or higher.

9. In U-1 or U-2 shelters, in which the protective zone is not physically separated by walls from the other unprotected areas of the facility, the boundary of the protective zone shall be marked on the floor using two horizontal lines, each 8–10 cm wide. The lines shall be spaced apart by a distance equal to the width of a single line, measured at the side of:

- 1) the protecting zone – a green line;
- 2) the remaining unprotected part of the facility – an orange line.

The marking of the protective zone boundary may be carried out as part of the preparation of the protective structure for operational use.

10. The tunnel, serving as an emergency exit, shall be equipped with emergency evacuation lighting installed along the evacuation walkway. The lighting shall be activated automatically in case of failure of the main lighting system, ensuring an illumination level of no less than 1 lx and continuous operation for at least 3 hours.

11. Where the tunnel forms part of an auxiliary exit, it shall be possible to activate the escape stairs from the platform to the tunnel, positioned outside the stopping zone of the rail vehicle, and to implement solutions allowing for the power supply to the third rail or overhead line to be disconnected.

12. The vestibule of the auxiliary exit leading to the tunnel referred to in paragraph 10 shall be constructed without a threshold.

13. The ventilation system of a protective structure shall use air from the tunnel if the air supplied to the protective structure provides for adequate ventilation conditions for the set number of persons during the projected term of protection.

14. Where the location in a protective structure of infrastructure for:

- 1) the supply of water intended for human consumption,
- 2) the discharge or collection of sewage,
- 3) the ventilation and maintenance of an oxygen concentration of at least 18 % in volume and a carbon dioxide concentration of no more than 2.0 % during the protection period no shorter than 48 hours

– shall limit the use of the underground facility of the rail transport system under normal operating conditions, it is permissible to make connections allowing for further distribution of such an infrastructure.

15. Shelters forming part of the protective structure located in a tunnel shall meet the following requirements:

- 1) at least one toilet bowl or one dry toilet not connected to the sewage system shall be provided for every 100 persons of the capacity, but the number of dry toilets not connected to the sewage system shall not exceed a ratio of 3:1 in relation to toilet bowls connected to the sewage system;
- 2) they shall be separate for men and women – in the case of a protective structure with a capacity of more than 100 persons.

16. For protective structures with a capacity of up to 300 persons, it is permissible to apply only non-quantified dry provisions.

17. In toilets and in locations in which dry toilets can be installed, mechanical ventilation shall be provided to remove air from the room into the tunnel through a gas absorber assuming that the volume of air removed shall be 50 m³/h per toilet.

18. In a protective structure where the ambient temperature is not expected to fall below 16 °C during the planned protection period, the installation of a heating system is not required.

19. In a protective structure in which, during the planned term of protection, the ambient temperature is not expected to fall below 10 °C at platform level and 5 °C at check-in hall level, the installation of a heating system shall not be required.

20. A protective structure shall include a designated first aid point for medical treatment. It can be located in welfare rooms for workers, provided it is equipped with electrical installations and a wash basin connected to the drainage system.

21. the electrical installations within the protective structure shall be configured to allow connection of emergency power supply equipment.

22. The protective structure shall be equipped with telephone services powered by an emergency power supply.

TECHNICAL REQUIEREMENTS FOR PROTECTIVE STRUCTURES WITHIN UNDERGROUND ROAD
TRANSPORT SYSTEMS

1. Protective structures within underground road transport systems shall be designed and constructed to meet the resistance and capacity category specified by the competent civil protection authority, however:

- 1) the tunnel tube intended for road traffic, or any designated part thereof, shall meet the technical requirements applicable to a protective structure classified as U-1 shelter;
- 2) Areas other than those specified in point 1, such as escape lanes, technical zones not used for traffic purposes or to ensure the proper functioning of the tunnel, technical or escape passages between the tunnel lanes, with a useable area of at least 30 m² – meet the technical requirements set out for U-2 shelters.

2. In a single-lane tunnel, a protective structure shall be located in a space not to be used for traffic management or in a space that ensures the proper functioning of the road tunnel.

3. In a two-way tunnel, U-1 shelter includes no more than one tunnel lane intended for traffic management.

4. A protective structure connected to the section of the tunnel running beneath a riverbed shall be separated in such a manner as to ensure that it is protected against flooding in the event of damage to or failure of the tunnel segment located under the riverbed.

5. A bunker shall constitute a designated fire zone, separated with the use of fire protection measures designed to prevent fire from spreading into its interior for a minimum duration of 120 minutes when the impact of fire is defined by the standard fire curve, and also to limit the spread of smoke.

6. Walls and ceilings that constitute the fire-separation elements shall have a fire resistance class of at least REI 120.

7. When determining the capacity of the protective zone, the requirements for the maximum capacity of the shelter's protective zone set out in Section 10(3)(1) of the Regulation shall not apply.

8. In a road tunnel, containing a protective structure, signals and barriers shall be installed before the entry into the tunnel, which shall allow the tunnel or part of it to remain closed as part of the preparation of the protective structure for use in such a way as to ensure that the structure fulfils its protective function in an emergency situation.

9. A shelter in a tunnel tube may have a passage designed, which shall be constructed as part of the preparation of the protective structure for use in a manner that guarantees that the protective structure will fulfil its protective function in an emergency situation.

10. Where local conditions prevent the construction of a dedicated passage, it is permissible to establish protective zones within U-1 or U-2 shelter in a separate section of a road tunnel, provided that this section ensures protection against the direct effects of external destructive factors.

11. In U-1 or U-2 shelter, in which the protective zone is not physically separated by walls from other unprotected areas of the facility, the boundary of the protective zone shall be marked on the floor using two horizontal lines, each 8–10 cm wide. The lines shall be spaced apart by a distance equal to the width of a single line, measured at the side of:

- 1) the protecting zone – a green line;
- 2) the remaining unprotected part of the facility – an orange line.

The marking of the protective zone boundary may be carried out as part of the preparation of the protective structure for operational use.

12. In the approach zone to the protective structure, measures shall be implemented to reduce a risk of impact and damage caused by unmanned aerial vehicles.

13. The ventilation system of a protective structure shall use air from the tunnel if the air supplied to the protective structure provides for adequate ventilation conditions for the set number of persons during the projected protection period.

14. Where the location in a protective structure of infrastructure for:

- 1) the supply of water intended for human consumption,
- 2) the discharge or collection of sewage,
- 3) the ventilation and for maintaining a concentration of oxygen by volume of at least 18 % and a concentration of carbon dioxide of not more than 2.0 % during protection of not less than 48 hours

– limits the use of the underground facility of the road transport system under normal operating conditions, it is permissible to make connections allowing for further distribution of such an infrastructure.

15. In a shelter, water intended for human consumption shall be obtained from the water supply system or through the implementation of solutions ensuring the suitability of water for human consumption, including the water treatment facilities. In shelters with the protection period of up to 48 hours, the use of bottled water is permitted.

16. The domestic hot water supply system may include storage water heaters, as well as hot water heating and storage devices.

17. For protective structures with a capacity of up to 300 persons, it is permissible to apply only dry toilets not connected to the sewage system.

18. In toilets and in locations in which dry toilets can be installed, mechanical ventilation shall be provided to remove air from the room into the tunnel through a gas absorber assuming that the volume of air removed will be 50 m³/h per toilet.

19. In U-1 or U-2 shelter constructed within a tunnel tube, it is permissible to provide for conditions that enable the maintenance of body temperature as part of ensuring designated areas for the temporary warming of sheltered persons. This can be achieved by using:

- 1) heat radiators;
- 2) temporary curtains limiting heat losses.

20. A protective structure shall include a designated first aid point for medical treatment, which can be located in emergency call points, provided that they are equipped with electrical installations and wash basins connected to the drainage system.

21. The electrical installations within the protective structure shall be configured to allow connection of emergency power supply equipment.

22. The protective structure shall be equipped with telephone services powered by an emergency power supply.

**MODEL SIGN INDICATING THE ACCESSIBILITY OF PROTECTIVE STRUCTURES
FOR PERSONS WITH DISABILITIES**



Description:

The sign indicating the accessibility of a protective structure for persons with disabilities shall consist of a black image (CMYK 0, 0, 0, 100) depicting a side view of a person seated in a wheelchair, positioned on a white background (CMYK 0, 0, 0, 0).

REQUIREMENTS FOR CONTROL AND MEASUREMENT EQUIPMENT USED IN PROTECTIVE STRUCTURES FOR DETECTING AND MEASURING CONTAMINATION

1. Control and measurement equipment used for detecting and measuring contamination must be compatible with the bunker's filter ventilation system.

2. Control and measurement equipment used for detecting and measuring contamination must display a type of alarm and an approximate concentration level of the contaminant (agent) in real time.

3. Control and measurement equipment used for detecting and measuring contamination shall be capable of withstanding a pressure wave of 150 kPa transmitted through the air intake duct.

4. Control and measurement equipment used for detecting and measuring contamination shall be capable of operating in the event of power failure.

5. A single detection element within the control and measurement equipment used for detecting and measuring contamination shall consume no more than 30 W of power. A separate central unit shall consume no more than 10 W per connected detection element.

6. Control and measurement equipment used for detecting and measuring chemical contamination shall monitor, detect, sample and identify all chemicals listed in the table.

7. Control and measurement equipment used for detecting and measuring chemical contamination shall activate a signal when the concentration of a chemical substance exceeds the AEGL-3 value for a 10-minute exposure, as specified in the reference table for each listed substance.

Table. AEGL-3 concentration values for a 10-minute exposure for chemicals

Chemical substance	AEGL-3 – 10 min [mg/m³]
sarin	0.38
cyclosarin	0.38
VX	0.029
lewisite	3.9
sulphur yperite	3.9
nitrogen mustard	2.2
chlorine	145
ammonia	1.881
tabun	0.76

8. Control and measurement equipment used for detecting and measuring contamination shall not have any parts that are subject to regular replacement, with the exception of a dust filter.

9. Control and measurement equipment used for detecting and measuring contamination must be designed in such a way that its use shall not require separate calibration after installation and commissioning.

10. Control and measurement equipment used for detecting and measuring radioactive contamination shall detect and measure the intensity of gamma, X-ray, alpha, beta and neutron radiation.

11. Control and measurement equipment used for detecting and measuring radioactive contamination shall detect, measure and monitor gamma and X-ray radiation doses and cumulative doses.

12. The measurement of gamma radiation dose shall cover a dose rate range from 0.01 $\mu\text{Sv/h}$ to 10 Sv/h and an energy range from 50 keV to 1.5 MeV.

13. Control and measurement equipment used for detecting and measuring radioactive contamination shall be installed outside the protective structure, in air intake ducts or at the main entrances to the protective structure.

14. The use of portable control and measurement equipment shall be permitted for the detection and measurement of radioactive contamination.

15. The selectivity of control and measurement equipment used for detecting and measuring radioactive contamination can be increased by using identification sensors that identify radionuclides and classify them into appropriate nuclide groups.

MODEL SIGN INDICATING A RESTRICTED ACCESS AREA FOR PERSONNEL DESIGNATED TO SUPERVISE AND OPERATE THE PROTECTIVE STRUCTURE



Description:

The sign indicating a restricted access area intended for personnel designated to supervise and operate the protective structure shall consist of a image depicting a red crossed-out circle (CMYK 0, 100, 100, 0) and a black silhouette of a person with an arm extended in a gesture prohibiting entry (CMYK 0, 0, 0, 100), placed on a white background (CMYK 0, 0, 0, 0).

MODEL INTERNATIONAL CIVIL PROTECTION IDENTIFICATION SIGN



Description:

The international civil protection identification sign consists of a blue equilateral triangle (CMYK 88, 63, 11, 25) on an orange background (CMYK 0, 50, 96, 0).