NB: Unofficial translation,
legally binding only in Finnish and Swedish

Government Decree on the Equipment and Supplies in Civil Defence Shelters

(409/2011)

Chapter 1

General provisions

Section 1

Requirements concerning the equipment and products for civil defence shelters

(1) This Decree lays down provisions on the requirements concerning the properties, functioning and methods of use of the equipment and products used in the construction and fitting out of the civil defence shelters referred to in section 4, paragraph 1, subparagraph f of the Rescue Service Equipment Act (10/2007), as well as on the information about the products, on the instructions for using, maintaining and installing the products and on the markings on the products.

(2) The party placing or releasing a piece of equipment referred to in section 6(1) of the Rescue Service Equipment Act on the market shall ensure that the requirements laid down for the equipment and products referred to in subsection 1 of this Decree are met.

Chapter 2

Common requirements

Section 2
Product markings

(1) The products shall be equipped with permanent markings.

(2) The markings shall contain at minimum:
1) the code VSS;
2) the name of the piece of equipment;
3) the name of the manufacturer and the year of manufacture;
4) the manufacturer's serial number.

Section 3
Service life and packaging of the equipment and supplies

(1) The intended service life of the equipment and supplies shall be at least 30 years when the storage and servicing instructions provided by the manufacturer or importer are observed. Pieces of equipment or their parts attached to concrete structures shall have an intended services life of at least 50 years

(2) The information concerning the surface area and volume required by the piece of equipment as packaged shall be indicated on the packaging.

Section 4
Conditions

The equipment and supplies in a civil defence shelter shall remain operational at an ambient temperature of between -30 °C and +70 °C and function properly when the temperature at the location of the equipment or supplies is between -20 °C and +40 °C. If, during sheltering, the temperature at the location of the equipment or supplies is 0 °C or above, the equipment or supplies shall function properly at a temperature of between 0 °C and +40 °C.

Section 5
Impact loading

Blast and gastight doors, blast hatches, gastight blast hatches, shut-off devices, wall sleeves, safety, pressure and exhaust air valves sewer shut-off valves, overpressure meters, supply air valves, leakage pumps, backup lighting fixtures, ground shock isolators, gas sensors and analysers, ventilation units and pre-filters shall withstand an impact on the platform on which they are attached in which the peak point velocity in any direction is 1.5 m/s and maximum acceleration 300 m/s^2.

Section 6
Weld joints

The weld joints of the equipment shall be made in accordance with standard SFS-EN 25817 or corresponding requirements so that they conform with weld class D. The weld class of the weld joints critically impacting the durability of the equipment shall conform to weld class C.

Section 7
Corrosion prevention

The equipment shall withstand climatic stress in accordance with the environmental stress categories given in Table 1 of Appendix 1, as laid down in standard SFS-EN ISO 12944-2.

Section 8
Instructions of use and manuals

The instructions on placing, installing, using, storaging and servicing the equipment and supplies shall be in both national languages. The instructions shall, among other things, describe how much space the product requires and, if necessary, a sample drawing of where to place the piece of equipment on the surrounding wall, how to reinforce of the surrounding structures and of the sizes and directions of the loads transferred from the piece of equipment shall be produced.

Chapter 3

Doors, hatches, shut-off devices, wall sleeves and the air intake duct of the civil defence shelter

Section 9
General

(1) The equipment for closing the doors, the hatches and the gastight shut-off devices shall be equipped with markings showing the ‘open’ and ‘closed’ positions. If necessary, they shall be equipped with sensors indicating the ‘open’ and ‘closed’ positions. The closing time of the doors, the hatches and the gastight shut-off devices may not be more than 1 minute.

(2) It shall also be possible to disassemble the parts keeping the door and hatch in place from inside the shelter with manual tools when the door or hatch has been permanently deformed.

Section 10
Blast and gastight doors

(1) The door (SO-1, SO-2 and SO-3) of a civil defence shelter shall open outwards and it shall be possible to open and close it from inside and outside the shelter by hand. The SO-1 and VO-3 doors shall be gastight. The closing time of the special doors of bedrock shelters or doors that are wider than 3,400 mm may not be more than 5 minutes.

(2) The doors shall meet the requirements laid down in Tables 2, 3 and 4 of Appendix 2. The doors shall be in accordance with the measurements given in Table 5 of Appendix 3.

(3) The shut-off devices shall tighten the door against the frame so that the gap between the door and the load-bearing surfaces of the frame is not more than 2 mm. The gap between a sliding door and the frame may not be more than 4 mm. The doors shall be in accordance with the measurements given in Table 5 of Appendix 3.

Section 11
Gastight blast hatches

(1) In bedrock shelters and category S2 civil defence shelters made of reinforced concrete the hatches (SL-3 and VL-3) shall open outwards and it shall be possible to open and close them from inside and outside the shelter by hand. Category VL-3 hatches shall also be gastight.

(2) In category S1 civil defence shelters, the emergency exit hatches (HS-1) shall open inwards and it shall be possible to open and close the hatches from inside the shelter by hand. The emergency exit hatches shall be pressure-tight and gastight.

(3) The loadings and minimum thicknesses of the hatches referred to in subsections 1 and 2 shall be in accordance with Tables 2-4 of Appendix 2. The shut-off device shall tighten the hatch door against the frame so that the gap between the hatch and the load-bearing surfaces of the frame is not more than 2 mm. The hatches shall be in accordance with the measurements laid down in Table 6 of Appendix 3.

Section 12
Tightness of the gastight equipment

(1) The tightness of the gastight doors, hatches and shut-off devices shall be such that the leakage flow rate through the structure is not more than 0.2 dm^3/s for each square metre of the opening when the external overpressure is 150 Pa.

(2) In equipment equipped with seals the loading may not be transferred to the frame through the seal. The seal shall be made of chloroprene rubber or material with corresponding properties and it shall last until the end of its normal service life and be easily replaceable.

13 §
Shut-off devices for civil defence shelter wall sleeves

(1) The pressure-tight shut-off plates (IS-1, IS-3) and the gastight shut-off plates and valves (KS-3) shall withstand the static loads given in Table 2 of Appendix 2.

(2) The gastight shut-off plates and valves shall withstand the blast loads given in Table 4 of Appendix 2. The gastight shut-off plates shall withstand three times the blast loads laid down in Table 4 of Appendix 2.

(3) It shall be possible to close the wall sleeves from inside the shelter in a gastight manner. The structure of the shut-off device shall be such that in normal conditions, it can remain attached to the wall sleeve duct. A shut-off device with a mass of more than 20 kg shall have a lifting lug or it shall be hinged to the wall sleeve duct. The shut-off plate shall be hot-galvanised in accordance with standard SFS-EN ISO 1461.

(4) It shall be possible to use the gastight shut-off valve to control the air flowing through it.

Section 14
Wall sleeves

(1) The pressure-tight wall sleeves (LP-1 and LP-3) of the civil defence shelters and the wall sleeves of the gastight shut-off devices (KS-3) shall withstand the static loads given in Table 2 of Appendix 2.

(2) The wall sleeves of the gastight shut-off devices shall withstand the blast loads given in Table 4 of Appendix 2. The pressure-tight wall sleeves shall withstand three times the blast loads given in Table 4 of Appendix 2.

(3) The wall sleeve shall be tight. If the nominal size of the wall sleeve is more than 40 mm it shall be equipped with a flange ring. The wall sleeve shall be made of a pipe that is in accordance with standard SFS-EN 10220 or comparable requirements, as given in Table 8 of Appendix 3.

(4) The wall sleeves shall be hot-galvanised in accordance with standard SFS-EN ISO 1461 or with a corresponding method.

Section 15
Air intake ducts

(1) The properties of the air intake ducts (IP-1 and IP-2) shall be in accordance with standard SFS-EN 10220 or corresponding requirements, as laid down in Table 8 of Appendix 3.

(2) The air intake ducts shall withstand a vertical or horizontal load of 20 kN.

(3) The air intake ducts shall be hot-galvanised in accordance with standard SFS-EN ISO 1461.

Chapter 4

Pressure, safety, supply air and exhaust air valves, sewer shut-off valves and overpressure meters

Section 16

Category S1 relief valves

(1) The relief valves for category S1 civil defence shelters (YV-1) shall withstand the static loads given in Table 2 of Appendix 2.

(2) A relief valve open in a manner corresponding to an air flow of 85 dm^3/s shall withstand three times the blast loads given in Table 4 of Appendix 2.

(3) An open relief valve shall close as a result of the impact of an external blast shock. The size of the overpressure impulse flowing through the relief valve shall not exceed 10 Ns when the peak reflected pressure of the blast shock, as expressed in overpressure, is between 10 and 40 kPa, and 4 Ns when the peak reflected pressure, as expressed in overpressure is between 40 and 300 kPa. The leakage flow rate through a closed valve may not exceed 15 cm^3/s when the external overpressure is 150 Pa. The opening pressure of the relief valve shall be between 30 and 60 Pa. It shall be possible to close the relief valve from inside the shelter by hand.

(4) The leakage flow rate through a closed relief valve may not exceed 10 dm^3/s when the peak reflected pressure of the blast load, as expressed in overpressure, is 300 kPa.

(5) The characteristic curve of the relief valve shall be continuously rising. The combined flow resistance of the valve and a 300-mm-long straight wall sleeve duct may not exceed 95 Pa when the air flow is 54 dm^3/s. When the air flow is 65 dm^3/s, the flow resistance may not exceed 115 Pa. When the air flow corresponding to the rising part of the characteristic curve is at most 70 dm^3/s, the effect of the hysteresis phenomenon may not exceed 20 dm^3/s.

(6) It shall be possible to attach the relief valve to the flange of a wall sleeve duct with a nominal size of 160 mm the measurements of which are given in Table 8 of Appendix 3. The protrusion of the relief valve from the wall surface may not be more than 150 mm and its horizontal protrusion may not be more than 130 mm from the centre line of the wall sleeve duct.

Section 17

Pressure valves of category S2 shelters and bedrock shelters

(1) The pressure valves of category S2 shelters and bedrock shelters (PV-3) shall withstand the static loads given in Table 2 of Appendix 2.

(2) The pressure valve shall withstand three times the blast loads given in Table 4 of Appendix 2.

(3) The leakage flow rate through a closed pressure valve may not exceed 20 per cent of the valve's nominal air flow when the peak reflected pressure of the blast load, as expressed in overpressure, is 600 kPa.

(4) The pressure valve shall close as a result of the impact of an external underpressure of 10 kPa. The pressure valve shall remain open at a 1.2 times higher operating air flow.

Section 18

Supply air valves

(1) It shall be possible to connect the supply air valve (TV-3) of the civil defence shelter with a duct measuring 160 mm in diameter and that meets the requirements laid down in standard SFS-EN 1506.

(2) The supply air valve shall withstand the blast loads given in Table 4 of Appendix 2.

(3) At an increasing air flow, the flow resistance curve of the supply air valve shall be continuously rising. The flow resistance of a supply air valve installed at the end of a duct may not exceed 60 Pa when the air flow is 25 dm^3/s. When the air flow is 25 dm^3/s, the flow resistance shall be at least 20 Pa.

(4) The supply air valve shall direct the supply air into the shelter so that the throw length, as determined in accordance with standard SFS-EN 12238 is, at an air flow of 25 dm^3/s, at least 1.0 m on both sides of the duct when measured from the centre line of the duct and so that the air flow end velocity is 0.5 m/s.

Section 19
Exhaust air valves

(1) The category S1 exhaust air valve (KV-1) shall withstand the static loads given in Table 2 of Appendix 2. It shall be possible to attach the exhaust air valves to a wall sleeve duct measuring 160 mm in diameter the measurements of which are given in Table 8 of Appendix 3.

(2) The leakage flow rate through a closed exhaust air valve may not exceed 15 cm^3/s when the external pressure is 150 Pa. It shall be possible to open and close the exhaust air valve from inside the civil defence shelter by hand.

(3) A closed exhaust air valve shall withstand a static overpressure of 20 kPa from both sides.

Section 20
Sewer shut-off valves

(1) The sewer shut-off valve (VSV-1, VSV-3) and its joints shall withstand the static loads given in Table 2 of Appendix 2.

(2) The leakage flow rate through a closed shut-off valve may not exceed 15 cm^3/s when the external pressure is 150 Pa. It shall be possible to open and close the shut-off valve from inside the civil defence shelter by hand.

Section 21
Overpressure meters

(1) The overpressure meter (YM-3) of a civil defence shelter shall be connected with a measurement tube measuring 10 mm in outer diameter and leading out of the civil defence shelter, using a connection made of chloroprene rubber or a material with corresponding properties.

(2) The overpressure meter shall have markings indicating the quality of the measuring liquid. The density of the measuring liquid shall be at least 0.75 kg/dm^3 and not more than 0.85 kg/dm^3 and it may not be easily volatile.

(3) The overpressure meter shall withstand the static loads given in Table 2 of Appendix 2 and three times the blast loads given in Table 4 of Appendix 2.

(4) The overpressure meter shall show the pressure differential between an underpressure of 100 Pa and an overpressure of 500 Pa. In static measurements, the inaccuracy of the overpressure meter may not be more than ± 10 Pa between an underpressure of 100 Pa and an overpressure of 100 Pa. The inaccuracy may not be more than ± 30 Pa when the overpressure is more than 100 Pa and not more than 500 Pa. It shall be possible to adjust the zero point of the overpressure meter by at least 25 Pa.

Chapter 5

Water tank, waste container, toilet facilities, airlock tent and bunk beds

Section 22
Separate water tanks

(1) The water tank of a civil defence shelter (VS-3) shall meet the material requirements laid down for food containers. The water tank shall be equipped with a device suitable for water distribution.

(2) The volume of the tank may not exceed 1,500 litres and, when empty, its mass may not exceed 100 kg. It shall be possible to carry the empty tank through a door that has an aperture of 900 x 2,000 mm. The floor area required by the water tank may not exceed 1.3 m^2/1000 l. It shall be possible to store empty tanks with a volume of less than 200 litres inside one another.

(3) The water tank shall withstand the stress resulting from the dropping of a vertically positioned water-filled tank or a set of vertically positioned water-filled tanks from a height of 200 mm onto a hard platform after the tank has been stored as filled at a temperature of +20 °C and relative humidity of 95 per cent for 14 days.

(4) When full, the water tank shall remain in an upright position when subjected to a horizontal static force of 1 N/l in which the minimum is 150 N and the maximum 400 N. The impact point shall be at the upper edge of the tank or at a maximum height of 1,500 mm from the floor surface.

(5) A water tank filled with water shall withstand an impact that may be caused by an action such as the pressing of the tip of a steel bar measuring 75 mm in length and 10 mm in thickness horizontally against the outer surface of the lower edge of the tank at a force of 200 N.

Section 23
Waste containers

(1) The waste container of a civil defence shelter (JS-3) shall be equipped with carrying handles. The mass of a water-filled waste container shall not exceed 110 kg and it shall be possible to carry the container through a door that has an aperture of 900 x 2,000 mm. It shall be possible to store the empty waste containers inside one another.

(2) The waste container shall withstand the stress resulting from the dropping of a vertically positioned water-filled container from a height of 200 mm onto a hard platform after the container has been stored as filled at a temperature of +20 °C and relative humidity of 95 per cent for 14 days.

(3) A water-filled waste container shall withstand an impact that may be caused by an action such as the pressing of the tip of a steel bar measuring 75 mm in length and 10 mm in thickness horizontally against the outer surface of the lower edge of the container at a force of 200 N.

Section 24
Dry toilet fixtures

(1) The volume of the dry toilet fixture of a civil defence shelter (KK-3) shall be at least 30 litres. There shall be at least 16 bags for each dry toilet fixture and the accessories for sealing the bags.

(2) The dry toilet fixture shall withstand a vertical load and stress of 1,500 N resulting from the dropping of a vertically positioned water-filled fixture from a height of 200 mm onto a hard platform after the water-filled fixture has been kept at a temperature of +20 °C and relative humidity of 95 per cent for 14 days.

Section 25
Dry toilet cabins

(1) The toilet cabins (KH-3) shall be erected on the floor without side supports or floor or ceiling fastenings. The measurements of the toilet cabins shall be as laid down in Table 9 of Appendix 3.

(2) The material of the dry toilet cabins shall be non-flammable, as laid down in IMO Resolution A.471 (XII) or corresponding requirements.

(3) Two persons shall be able to make a toilet cabin or a set of toilets ready for use in a maximum of 20 minutes. It shall be possible to connect the toilet cabins with the exhaust air duct or the relief valve.

(4) The side, back and front walls and the ceiling of a toilet cabin or a set of toilets shall form a single space at the top of the toilet from which the air can escape. The toilet shall have a floor-level flow opening measuring between 10 and 20 mm in width.

Section 26
Airlock tent

(1) The airlock tent of a category S1 civil defence shelter (ST-1) shall be attached tightly to the wall surrounding the blast door so that the exhaust air flows out through the airlock tent and the relief valves. It shall be possible to install the airlock tent in a maximum of 20 minutes.

(2) The operating positions of the airlock tent shall be as follows:
1) readiness position in which the airlock tent may not interfere with the entry into the shelter;
2) filtering and sealed position; it shall be possible to convert the airlock tent from the readiness position to the filtering and sealed position in 2 minutes. It shall be possible for three persons to be inside the airlock tent at the same time when the tent is in the filtering or sealed position. The lower part of the airlock tent shall be tight so that the air flowing in from outside at a velocity of 1 m/s at the height of the threshold of an open blast door cannot enter the shelter space; and
3) bypass position in which the airlock tent may not cause any detectable airflow resistance.

(3) The material of the airlock tent shall be non-flammable, as laid down in IMO Resolution A.471 (XII) or corresponding requirements.

(4) At the wall attachment point, the airlock tent shall be 1,650 mm or 1,900 mm in width, 2,150 mm in height and not more than 1,300 mm in depth.

(5) When the outward air flow is between 15 and 80 dm^3/s, there shall be an underpressure of between 10 and 50 Pa in the airlock tent.

(6) When the outward air flow passing through the airlock tent is 20 dm^3/s, the ventilation coefficient of the combined space of the airlock tent and the door recess shall be at least 15 l/h.

(7) When the outward air flow passing through the airlock tent is 20 dm^3/s, the underpressure may, in relation to the shelter space, be less than 3 Pa for a maximum of 5 seconds. The doorway between the airlock tent and the shelter space shall close automatically when a person passes through it.

Section 27
Bunk beds in a civil defence shelter

(1) The bunk bed in a civil defence shelter (VV-3) shall have three levels and the storage space that it requires when in a storage package shall not be more than 0.2 m^2. The bunk bed frame shall be moisture-resistant and made of a non-flammable material, as laid down in IMO Resolution A.471 (XII) or corresponding requirements. The frame shall serve as the mattress. The measurements are given in Table 7 of Appendix 2.

(2) It shall be possible to make the bunk bed ready for use in 10 minutes.

(3) The bunk bed in a civil defence shelter shall withstand the stress resulting from the bunk bed being dropped onto a hard platform from a height of 200 mm, with each bunk having a load of 80 kg.

(4) A fully loaded bunk bed shall remain in an upright position when subjected to a horizontal force of 400 N. The impact point shall be at the level of the uppermost bunk, separately at the end and in the middle of the bunk.

Chapter 6

Leakage pumps, backup lighting, ground shock isolators and gas sensors

Section 28
Leakage pump powered by an internal combustion engine for category S2 shelters and bedrock shelters

(1) The leakage pumps powered by an internal combustion engine (PMP-3) for category S2 shelters and bedrock shelters shall have both a manual and an electric start. The pump shall be connected with a 12 V battery and a constant voltage charger.

(2) The internal combustion engine powering the pump shall be reliable and allow the pump to be used for at least 500 hours at its nominal operating point, except for short service interruptions.

(3) The internal combustion engine powering the pump shall be cooled with water or the air removed from the shelter.

(4) The tank for the liquid fuel of the leakage pump engine shall be dimensioned for at least 6 hours' operations. The backup tanks shall be dimensioned for 7 days' operations.

Section 29
Backup and emergency lighting

(1) The generator of the internal combustion engine of the ventilation unit shall serve as the power supply for backup lighting of category S2 civil defence shelters (VAL-3). A battery equipped with a constant voltage charger connected with the electricity network shall be used as the power supply for emergency lighting.

(2) The electricity network of the backup and emergency lighting shall be equipped with wall sockets.

(3) There shall be a control centre for controlling and monitoring the backup and emergency lighting and it shall be possible to connect five lighting groups with it.

(4) The luminous power of the backup lighting lamps shall be 40 lumens. The luminous power of the emergency lighting lamps shall be 40 lumens. The emergency lighting battery shall be designed for an uninterrupted use of at least 5 hours.

(5) The luminous power of the backup and emergency lighting fixtures of a category S1 ventilation unit (IVL-1) shall be 40 lumens. The lighting fixture shall function when the shelter blower is rotated by hand. The generator of the ventilation unit shall be used as the power supply for the backup and emergency lighting fixtures and the lighting fixtures shall be detachable.

Section 30
Ground shock isolators

(1) The purpose of the ground shock isolator (TVA-3) is to lessen the impact on the equipment and structures resulting from ground shocks.

(2) The ground shock isolators shall dampen the running vibration and withstand the loads generated during the stay in the shelter and the stress normally arising during long periods.

(3) The ground shock isolators shall withstand the following maximum shock movements of their attachment platforms, which are directed at them from random directions:
1) transfer velocity 1.5 m/s;
2) transfer 25 mm/s; and
3) acceleration 300 m/s^2.

Section 31
Gas sensing equipment

(1) It shall be possible to connect the gas sensing equipment (KIL-3) to the ventilation system of the civil defence shelter.

(2) The gas sensing device, which shall consist of a sensor, a sample-taking device, a central unit and a remote alarm device shall show the type of alarm and the approximate gas level in real time.

(3) The gas sensing device shall withstand a blast load entering through the air sample pipes, as specified in Table 4 of Appendix 2.

(4) The gas sensing device shall give an indication of the chemical warfare agents or other dangerous chemicals contained in the air sample and sound an alarm if the gas concentration is too high.

The alarm response time may not be more than 10 seconds. The alarm shall end when the gas concentration falls below the alarm limit.

(5) The alarm limits of the gas sensing device [mg/m^3] shall be as follows:
1) sarin 0.1;
2) soman 0.1;
3) VX 0.04;
4) lewisite 2;
5) mustard gas 2;
6) nitrogen mustard gas 3;
7) hydrogen cyanide 20;
8) cyanogen chloride 20;
9) chlorine 30;
10) sulphur dioxide 270;
11) ammonia 210.

(6) The gas sensing device shall remain operational after the power supply from the electricity network is disrupted. The supply power of the sensing device may not be more than 30 W and that of a separate central unit more than 10 W for each sensing device connected to it.

(7) In addition to the dust filter, the gas sensing device may not have other regularly replaceable parts exposed to wear and tear.

(8) The operating condition of the gas sensing equipment shall be inspected at least once a year.

(9) The technology of the gas sensing device shall be such that using it does not require any separate calibrations after it has been installed and put into use.

Chapter 7

Category S1 ventilation units

Section 32
General

(1) The ventilation unit (IVL-1) comprises a pressure valve, a pre-filter, a special filter, a shelter blower, an air flow meter, connecting parts and a backup lighting fixture.

(2) It shall be possible to operate the ventilation unit using an electric motor or by hand.

(3) The ventilation unit shall have a lockable box for instructions and maintenance equipment. The ventilation unit shall be measured so that its special filter is interchangeable with the special filter of another ventilation unit.

(4) It shall be possible to attach the ventilation unit to the flange of a wall sleeve duct measuring 160 mm in nominal size; the measurements of the flange are given in Table 8 of Appendix 3. The fastenings of the ventilation unit shall allow the inward bending of the shelter walls by at least 60 mm.

(5) The pressure valve shall withstand three times the blast loads given in Table 4 of Appendix 2. The special filter, the shelter blower and the connecting parts shall withstand the blast loads given in Table 4 of Appendix 2.

Section 33
Pressure valves and pre-filters

(1) The pressure valve and the pre-filter (PV-1) shall be connected so that they form a single unit. The pre-filter shall meet the requirements given in Appendix 4.

(2) The pressure valve shall have two connections sealed with M10 plug and a separate water discharge screw.

(3) The pressure valve shall close as a result of the impact of an external blast shock. The size of the overpressure impulse flowing through the pressure valve shall not exceed 20 Ns when the peak reflected pressure of the blast shock, as expressed in overpressure, is between 10 and 40 kPa and 8 Ns when the peak reflected pressure, as expressed in overpressure is between 40 and 300 kPa.

(4) The leakage flow rate through a closed pressure valve may not exceed 25 dm^3/s when the peak reflected pressure of the blast load, as expressed in overpressure, is 300 kPa.

(5) The pressure valve shall close as a result of the impact of an external underpressure of 10 kPa. A closed pressure valve shall withstand the static loads given in Table 2 of Appendix 2.

(6) The leakage flow rate through a closed pressure valve may not exceed 10 cm^3/s when the external overpressure is 150 Pa or 20 cm^3/s when the internal underpressure is 1,500 Pa. It shall be possible to close the pressure valve by hand.

(7) The flow resistance created by the pressure valve may not exceed 120 Pa when the air flow is 135 dm^3/s. The valve shall remain open when the air flow is 270 dm^3/s.

Section 34
Special filters

(1) The special filter (ES-1) shall comprise the particle and gas filter parts. The requirements concerning the additional markings and filtering capacity of the special filters are given in Appendix 4. The special filters shall withstand the blast loads given in Table 4 of Appendix 2.

(2) The total resistance of the special filter may not exceed 800 Pa when the nominal air flow is 40 dm^3/s.

Section 35
Shelter blowers and air flow meters

(1) The shelter blower (SP-1) shall comprise the blower part, an air flow meter and the joint supporting structure for the blower and the special filter. It shall be possible to adjust the air flow of the shelter blower and the selected settings shall remain unchanged. The shelter blower shall meet the requirements given in Appendix 5.

(2) The hand-crank rotating speed shall be at least 25 and not more than 45 rounds per minute at the nominal operating points. The hand-crank shall be positioned transversely to the rotator. The height of the hand-crank shaft from the floor shall be at least 1,000 mm and not more than 1,100 mm.

(3) The shelter blower shall remain operational for 1,000 hours at the nominal operating point.

(4) The shelter blower shall be equipped with a three-phase electric motor.

(5) Using the air flow meter of the shelter blower, it shall be possible to determine the size of the air flow in the filtering and bypass mode with an accuracy of 10 per cent.

Section 36
Connecting parts of the ventilation unit

(1) The connecting parts of the ventilation unit are as follows: the flexible connecting parts between the shut-off valve or pre-filter and the special filter, and between the special filter and the shelter blower, and the bypass air tube replacing the special filter. It shall be possible to attach the connecting parts without tools.

(2) The connecting parts shall withstand an external static overpressure of 10 kPa and an internal static overpressure of 30 kPa.

(3) The flexible connecting parts shall withstand a movement of 10 mm in random direction. The leakage flow rate through the flexible connecting parts may not exceed 10 cm^3/s when the internal overpressure is 150 Pa or 20 cm^3/s when the internal underpressure is 1,500 Pa.

(4) The flexible connecting parts shall be made of chloroprene rubber or a material with corresponding properties.

Chapter 9

Ventilation units powered by an internal combustion engine

Section 37

General

(1) The ventilation unit powered by an internal combustion engine (IVL-3) comprises the special filters, the electric motor and the internal combustion engine of the shelter blower, air flow meters and the other measuring and control equipment. The connecting ducts, connecting parts and the shut-off equipment are also components of the ventilation unit.

(2) The ventilation unit shall have a lockable box for instructions and maintenance equipment. The ventilation unit shall be designed for an uninterrupted use of 7 days.

(3) The ventilation unit shall withstand the blast loads given in Table 4 of Appendix 2.

Section 38
Special filters

(1) The special filter (ES-3) comprises the particle and gas filter part. The special filter shall meet the requirements given in Appendix 4. The special filter shall withstand the blast loads given in Table 4 of Appendix 2.

(2) The total resistance of the special filter (ES-3) may not exceed 1,500 Pa, corresponding to the filter's nominal air flow. The minimum air flow through the special filter shall be 170 dm^3/s.

Section 39

Shelter blowers

(1) The shelter blower shall meet the requirements given in Appendix 5.

(2) The internal combustion engine of the shelter blower shall remain operational for 500 hours at the blower's nominal operating point.

(3) The blower's internal combustion engine shall have an electric start. There shall be a battery for starting the engine and the battery shall be measured so that the engine can be started after the battery has been loaded with the emergency lighting for an uninterrupted period of 5 hours.

(4) The internal combustion engine shall be equipped with an alternating current charger. The device shall have an electric connection for backup lighting and a gas sensing device.

(5) The cooling of the internal combustion engine shall be by means of the air discharged from the shelter. The tank for the liquid fuel of the internal combustion engine shall be dimensioned for at least 6 hours' operations. The backup tanks shall be dimensioned for 7 days' operations of the internal combustion engine.

Section 40
Connecting ducts and connecting parts of the ventilation unit

(1) The following ducts serve as connecting ducts: the air distribution duct, which distributes the air to the special filters, the air collecting duct, which channels the air from special filters to the shelter blower, and the bypass air duct, which directs the air past the special filters to the shelter blower. The ducts shall withstand an external static overpressure of 10 kPa and an internal static overpressure of 30 kPa.

(2) The flexible connecting part shall be made of chloroprene rubber or a material with corresponding properties.

(3) The tightness of the air distribution duct and the flexible connecting parts connected to it shall be such that an overpressure of 10 kPa inside the duct changes by a maximum of 10 per cent within a period of 5 minutes.

(4) The flexible connecting parts shall withstand undamaged an external static overpressure of 10 kPa and an internal static overpressure of 20 kPa and a movement of 20 mm in random direction.

Section 41
Air flow meters

(1) Using the air flow meter of the ventilation unit, it shall be possible to determine the size of the air flow in bypass mode with an accuracy of 10 per cent.

(2) Using the air flow meters of the special filters, it shall be possible to determine the size of the air flow in filter mode with an accuracy of 10 per cent.

(3) The special filters shall have a separate measuring device that can measure the flow resistance of the particle filter part.

Section 42
Control and shut-off device

(1) The ventilation unit shall have the necessary gastight shut-off equipment that can direct the air flow coming from the fresh air duct to special filters or directly to the shelter space.

(2) There shall be an air flow control device for each special filter. It shall be possible to lock the device to the assigned settings.

(3) The tightness of the shut-off device shall be such that the leakage flow rate from the fresh air duct is not more than 10 cm^3/s when the internal underpressure is 2,000 Pa.

(4) The seals of the shut-off equipment shall be made of chloroprene rubber or a material with corresponding properties.

Section 43
Pre-filters

The pre-filter (ESIS-3) shall meet the requirements given in Appendix 4. The pre-filter shall withstand the blast loads given in Table 4 of Appendix 2 in the direction of the air flow. The flow resistance of the pre-filter shall not be more than 100 Pa.

Section 44
Entry into force

(1) This Decree enters into force on 20 .

(2) This Decree repeals the Ministry of the Interior Decree on Equipment and Supplies for Civil Defence Shelters (660/2005).

(3) Measures necessary for the implementation of this Decree may be undertaken before the Decree's entry into force.

APPENDIX 1

Table 1. Codes and protection and corrosivity categories for civil defence shelter equipment

Piece of equipment	Code	Protection categories	Corrosivity categories
Blast and gastight door	SO-1	S1	C2
Blast door	SO-2	S2	C3
Blast door	SO-3	S1, S2, S3	C3
Gastight door	VO-3	S1, S2, S3	C3
Blast hatch	HS-1	S1	C3
Blast hatch	SL-2	S1, S2	C3
Blast hatch	SL-3	S1, S2, S3	C3
Gastight hatch	VL-3	S1, S2, S3	C1
Shut-off device	IS-1	S1	C1
Shut-off device	IS-3	S1, S2, S3	C1
Gastight shut-off device	KS-3	S1, S2, S3	C1
Wall sleeve	LP-1	S1	C3
Wall sleeve	LP-3	S1, S2, S3	C3
Gastight wall sleeve	LP-KS3	S1, S2, S3	C3
Air intake duct	IP-2	S1, S2-tb	C3
Relief valve	YV-1	S1	C1
Pressure valve	PV-3	S1, S2, S3	C3
Supply air valve	TV-3	S1, S2, S3	C1
Exhaust air valve	KV-1	S1	C1
Sewer shut-off valve	VSV-1	S1	C3
Sewer shut-off valve	VSV-3	S1, S2, S3	C3
Overpressure meter	YM-3	S1, S2, S3	C1
Water tank	VS-3	S1, S2, S3	C1
Waste container	JS-3	S1, S2, S3	C1
Dry toilet fixture	KK-3	S1, S2, S3	C1
Dry toilet cabin	KH-3	S1, S2, S3	C1
Airlock tent	ST-1	S1	C1
Civil defence shelter bunk bed	VV-3	S1, S2, S3	C1
Leakage pump	PMP-3	S1, S2, S3	C1
Backup lighting fixture	VAL-3	S1, S2, S3	C1
Ground shock isolator	TVA-3	S1, S2, S3	C1
Gas sensor	KIL-3	S1, S2, S3	C1
Ventilation unit	IVL-1	S1	C2
Ventilation unit	IVL-3	S1, S2, S3	C2
Pre-filter	ESIS-3	S1, S2, S3	C3

APPENDIX 2

Table 2. Static loads of the equipment dimensioned for pressure loads

Name of equipment	Load			Minimum thickness
	Overpressure	One-sided	Underpressure	
	kN/m^2	kN/m^2	kN/m^2	mm
SO-1, HS-1	200	100	20	20
YV-1, PV-1, VSV-1, LP-1	300	-	20	-
IS-1	300	-	20	6
SO-2, SL-2	400	200	1)	30
SO-3, SL-3	600	300	1)	30
PV-3, VSV-3, LP-3	600	-	30	-
IS-3	600	-	30	12
YM-3	600	-	30	-
VO-3, VL-3	100	50	20	20
KS-3, LP-KS3	100	-	20	6
KV-1	20	-	20	-

Table 3 shows the coefficient n that the pressure loads of the bedrock shelters and the category S3 reinforced-concrete shelters given in Table 2 are multiplied by to produce the recoil coefficient.

Table 3. Recoil coefficient

Specific vibration period T, ms	Coefficient n
less than 7	-0.1
7...17	-0.10—0.04 (T—7)
more than 17	-0.5

Table 4. Blast loads directed at the equipment

Name of equipment	Reflected pressure	Duration of pressure peak	Duration of load/ impulse	Size of impulse
	kPa	ms	ms	Pas
SO-1	200	-	500	-
Connecting parts of ST-1, ES-1, SP-1,IV	150	-	10	700
KS-3, IVL- 3, ES-3, KIL-3	150	-	10	700
ESIS-3	100	-	10	400
IS-1, PV-1, YV-1, LP-1	300	20	500	-
IS-3, PV-3, YM-3, LP-3	600	20	500	-
TV-1	30	-	20	400

When the strength of the parts securing the door, the hatch and the shut-off device is calculated for the pressure loads given in Table 2 of Appendix 2, the tension may not be more than 75 per cent of the yield strength. When the pressure load calculations are made, a partial safety factor of 1.0 may be used for the yield strength.

APPENDIX 3

Table 5. Standard door measurements

Doors
900 mm x 2,000 mm
1,200 mm x 2,000 mm
1,500 mm x 2,000 mm
1,900 mm x 2,000 mm
2,400 mm x 2,500 mm
2,900 mm x 3,200 mm
3,400 mm x 4,200 mm

Table 6. Standard hatch measurements

Hatches
600 mm x 800 mm
700 mm x 1200 mm

Table 7. Standard measurements for civil defence shelter bunk beds

Minimum bunk width	700 mm
Minimum bunk length	1,900 mm
Minimum height from the floor of the bottom bunk	200—300 mm
Minimum vertical distance between bunks	500—650 mm
Maximum height from the floor of the uppermost bunk	1,400—1,500 mm

Table 8. Standard measurements for the wall sleeve ducts of the gastight shut-off device

Nominal size of shut-off device	Attachment flange hole distribution, mm	Attachment flange hole number/diameter, mm	Minimum thickness of wall sleeve duct, mm
100	151	4/12	3.6
160 [1)]	205	8/12	4
200	267	8/12	4.5
250	319	8/12	5
300	371	12/12	5.6
350	428	12/14	5.6
400	479	12/14	6.3
500	580	16/14	6.3
600	740	16/19	6.3
800	940	16/23	6.3

1) wall sleeve standard flange. The diameters of the wall sleeve ducts shall conform to series 1 of standard SFS 2007 and the wall thicknesses to the recommended wall thicknesses given in standard SFS 2007.

Table 9. Standard measurements for civil defence shelter dry toilet cabins

Width	700 mm
Depth	1,000 mm
Height	2,000 mm
Height of the partition wall between toilet units	1,800 mm

APPENDIX 4

1. Properties of the pre-filter

The separation efficiency of the filtering material of the pre-filter shall be in accordance with filter grade G4, as laid down in standard EN779. At the nominal air flow of the pre-filter, the effective flow rate corresponding to the effective filter surface may not exceed 0.7 m/s.

The pre-filter shall withstand separate immersion in 0.5 N hydrochloric acid and 0.5 N ammonia for 5 hours at a temperature of +20 ºC. The filter part of the pre-filter shall be replaceable.

2. Properties of the pre-filter

2.1 Additional markings

- nominal air flow and the corresponding nominal resistance
- arrow indicating the air flow direction
- original mass, with an accuracy of ±0.2 kg
- to be kept unopened and sealed in the operating position

2.2 Particle filter separation efficiency

The separation efficiency of the particle filter shall be in accordance with filter grade H13, as laid down in standard SFS-EN 1822. The separation efficiency of a ready-to-use special filter may be determined in accordance with standard SFS 5332. When determined in this manner, the total separation efficiency shall be at least 99.99 per cent.

The material of the particle filter shall withstand separate immersion in 0.5 N hydrochloric acid and 0.5 N ammonia for 5 hours at a temperature of +20 ºC. The loss of the filtering material mass caused by the chemicals may not exceed 2 per cent of the original mass.

The filtering material of the particle filter shall meet the following minimum tensile strength requirements: 0.8 N/mm (when dry) and 0.35 N/mm (after being moistened with water for 24 hours), as laid down in standard ISO 1924.

The material of the particle filter shall be moisture-repellent so that the amount of water absorbed by is no more than 10 g for each square metre, as laid down in standard ISO 533-1976.

Table 10. Requirements for special filter

special filter		ES-3
maximum mass, kg	50 kg	600 kg
diameter or side length	600 mm	900 mm
minimum thickness of the metal casing		1 mm
total height	370 mm	-
nominal size of the connecting sleeve	160 mm	-
connecting sleeve protrusion	30 mm	-

Other requirements for the special filter

1) The connecting sleeves of the supply and exhaust side of the ES-1 special filter shall be at the medium line of the filter.
2) The casing shall withstand an external static overpressure of 10 kPa and an internal static overpressure of 30 kPa.
3) The tightness of the ready-to-use special filter shall be such that a test overpressure of 10 kPa inside the filter shall not change more than 2.5 per cent within a period of 5 minutes.
4) The special filter shall withstand, undamaged, the stress caused by 2 minutes of shaking when the maximum acceleration is about 100 m/s2 and frequency about 25 Hz.

Table 11. Retention capacity of a ready-to-use special filter with dry carbon for chemical warfare agents and other harmful gases. The capacity requirement is given as kg of the gas/filter nominal flow.

Name of chemical warfare agent	Gas concentration	Penetration limit	Capacity kg/dm^3/s
	Volume %	mg/m³	ES-1,ES-3
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	0.05

With a maximum of one chemical warfare agent and one harmful gas, the retention capacity may be 10 per cent below the above-mentioned levels.

The special filter shall remove from the air the radioactive methylene iodide (131 ICH3) so that the separation effect of the filter with dry carbon is at least 99.999 per cent and with wet carbon, after 20 hour of balancing, 95 per cent.

When the retention capacity and separation effect of the special filter are determined, the temperature of the air entering the filter shall be +20 ^{0}C and the relative humidity 80 per cent. The humidity of the carbon in the filter may be no more than 5 per cent, as calculated from dry carbon.

The special filter shall be kept in an airtight casing and sealed.

The carbon layer shall be even. Leaks from the edges and entry of carbon dust into filtered air shall be prevented.

APPENDIX 5

3. Shelter blower and air flow meter

3.1 Additional marking of the shelter blower:
- nominal air flows and corresponding total pressure differentials
- quality and amount of gearbox oils
- recommended oil change interval

3.2 Performance of the ventilation unit shelter blower

	Filtering mode			Bypass mode			Bypass mode with motor 2)	
Name of device	Minimum air flow	Total pressure	Maximum power requirement	Minimum air flow	Total pressure	Maximum power requirement	Minimum air flow	Total pressure
	dm³/s	Pa	W	dm³/s	Pa	W	dm³/s	Pa
IVL-1 1)	40	1,000	120	135	500	135	170	800
IVL-3	340	500	-	1,000	1,000		-	-

1) For IVL-1, the table shows the total blower pressure and for other equipment, it shows the total pressure available for external pressure losses.
2) In the bypass mode, the IVL-1 device has separate nominal operating points for manual and electric use; in the filter mode, both have the same nominal operating point.

3.4 Noise level requirements for category S1 ventilation unit

The noise level requirements apply to the noise generated during both electrical and manual use at different operating points of the blower.

The sound power level shall be determined in accordance with standard ISO 3741. The sound power level of the ventilation unit may not exceed the value L_{WA} = 75 dB. The noise level shall be determined in the frequency area 63-8,000 Hz.