

DECREE OF THE MINISTRY OF THE ENVIRONMENT ON THE STRUCTURES AND FIRE SAFETY OF CHIMNEYS

General

The starting point of the legislative reform relating to the design and construction of structures and fire safety of chimneys is to bring the statutes into conformity with the Land Use and Building Act. With regard to Part E3: Structures and fire safety, regulations and instructions regarding small chimneys (2007) of the National Building Code of Finland in force at the moment, it is handled by issuing a Decree of the Ministry of the Environment on the structures and fire safety of chimneys. The new Decree handles the design and construction of chimneys as well as the repair and alteration work on them and affecting them.

The Decree introduces a clarified model where, in addition to the chimney, which is an independent building element, the design, implementation and documentation of the implementation of the designs shall be affected so that the entity meets the requirements of the Land Use and Building Act. In connection with the design, it is possible to estimate for example the need for protection against the weather and conditions during the work as well as for the documentation of the construction phases to be covered by photographing the instructions for use and maintenance as well as for the inspection by a professional taking place prior to commissioning.

The design of a chimney as an entity shall create new possibilities to market, for example, in connection with prefabricated chimneys, comprehensive solutions to consumers. It shall become easier for the consumer, builder and the owner of a building to acquire a chimney if he is offered a comprehensive, safe solution.

The area of application would also include repair and alteration work with regard to work significant for fire and personal safety. Taking repair work into account in a very clear way is important as the amount of repair work increases as the building stock ages. Repair and alteration work include for example the construction of a new chimney in an existing building, the coating of the wall structures of the flues of a chimney or the installation of a new smoke flue inside an existing chimney as well as the exchange and alteration of a fireplace. In connection with the installation or construction of a fireplace it is also significant to ensure the interoperability of the fireplace and the chimney. The Decree enables case-by-case application at repair sites when we take into account existing solutions and use as well as, for example, any need for protection. Some instructions of the present Decree have been lifted to the level of a decree. Some mandatory regulations that have been on the level of a decree have, in turn, been changed into instructions of a recommendatory nature of which instruction material has been prepared.

Central interest groups have been heard at four stages. The hearings were arranged in connection with the meeting of the follow-up group of the Confederation of Finnish Construction Industries RTT (Follow-up Group TC-166) monitoring standardization on 9 November 2016 by gathering the comments of those present on the draft presented as well as the second time by asking the members of the same Follow-up Group for comments between 18 and 25 November 2016. In addition, the draft that existed was forwarded for comments to the Regional Rescue Associations in connection with a training event of the Finnish National

Rescue Association on 7 November 2016. After the consultation between 13 March and 27 April 2017 the further prepared draft Decree was forwarded for comments to the most central interest groups between 12 and 18 October 2017.

When the Decree enters into force, it shall replace Part 3: Structures and fire safety, regulations and instructions regarding small chimneys (2007) of the National Building Code of Finland in force at the moment, which shall remain in force by a transitional provision until 31 December 2017 in accordance with the Land Use and Building Act (958/2012).

The draft Decree has, in accordance with the Directive of the European Parliament and Council 2015/1535/EU, been in technical notification between 26 January and 27 April 2017 and it has been sent to the WTO for information. The draft Decree was forwarded for comments between 13 March and 27 April 2017. The draft for the instruction material was forwarded for comments simultaneously.

The Decree is meant to enter into force on 1 January 2018.

Present status

The Building Code and instructions

The regulation on building has been based on the Land Use and Building Act (132/1999), which entered into force on 1 January 2000, and on the Land Use and Building Decree (895/1999) issued thereunder as a government decree as well as on the National Building Code issued as decrees of the Ministry of the Environment. On the basis of the amendment made in the Land Use and Building Act in 2013, all parts of the National Building Code shall be amended so that the present regulations and instructions shall be in force by a transitional provision until the end of 2017 if they have not been amended before that. The Decree shall contain only mandatory regulations. In accordance with section 117 of the Land Use and Building Act, a building shall meet the essential requirements for structural strength and stability, fire safety, hygiene, health and environment, safety in use, noise abatement and energy economy and insulation as set by its intended use. Section 13 of the Land Use and Building Act provides for the obligation of said ministry to maintain the National Building Code of Finland.

The regulations and instructions for the design of the structures and fire safety of small chimneys have been published in Part E of the National Building Code of Finland. The regulations relate to the design and construction of small chimneys to be constructed in a building and in adjacent premises as well as to the repair and alteration work of small chimneys. Part E of the National Building Code in force was issued in 2007 and it contains the mandatory regulations as well as acceptable solutions in the form of instructions and reports.

The Decree of the Ministry of the Environment to be issued now contains only the mandatory requirements. In addition, a guide shall be published and later, where necessary, the recommendations of the Ministry of the Environment as an instruction. Also in solutions complying with the instructive material, the entity has to be designed and implemented in accordance with the design. In other words, the purpose of the publication of the instructive material is to make the designing easier, but not to replace it or to set obligations exceeding the Decree although some examples may be more far-reaching.

Right of issuance

Section 117 b of the Land Use and Building Act, Fire safety ([958/2012](#))

Background and aim

According to the summary made by the Emergency Services College and based on the information entered in the PRONTO data base by the rescue authority, there were altogether 779 cases of building fires or threats thereof relating to chimneys and fireplaces in 2016. The number of building fires or threats thereof in detached houses was 398 in 2016, so that in other than detached houses their number was 381 in 2016. In other words, about half of building fires or threats thereof relating to chimneys and fireplaces in 2016 happened in detached houses.

In comparison, a fault or disturbance in an electrical appliance or its installation or the neglect of its maintenance was estimated to have caused a fire 672 times in 2016. Of them, 172 cases took place in detached houses and 500 cases in other buildings.

A fault, disturbance or neglect of maintenance of a machine or an appliance was estimated to have caused a fire 584 times. Of them, 110 cases took place in detached houses and 474 cases in other buildings.

The total amount of property damage in buildings caused by building fires or threats thereof relating to chimneys and fireplaces was slightly under EUR 9 million in 2015 and the total amount of property in danger was about EUR 101 million. The average damage in detached houses was about EUR 8,000 and in other buildings about EUR 15,000.

In comparison, the total amount of property damage in buildings caused by a building fire or a threat thereof relating to a fault or disturbance in an electrical appliance or its installation or neglect of its maintenance was slightly under EUR 14 million in 2015 and the amount of property in danger was about EUR 547 million. The average damage in detached houses was about EUR 30,000 and in other buildings about EUR 17,000.

The total amount of property damage in buildings caused by a building fire or a threat thereof relating to a fault or disturbance in an electrical appliance or neglect of its maintenance was slightly under EUR 10 million in 2015 and the amount of property in danger was about EUR 362 million. The average damage in detached houses was about EUR 10,000 and in other buildings about EUR 18,000.

Estimates of causes of ignition relating to chimneys and fireplaces by type in 2016:

Estimate of the cause of ignition of a fire	Total cases	Detached houses cases	Total - detached houses = other cases
Hot or glowing object or cinders	176	57	119
Soot fire	256	210	46
Sparks or embers from a fireplace or flue	105	45	60
Damage in the fireplace or flue	78	38	40
Insufficient safety distance	164	48	116
Total	779	398	381

The data are based on the summary compiled by the Emergency Services College from data entered in the PRONTO data base by rescue authorities. The costs are costs caused by the fire damage in the buildings, and they do not include costs incurred by society from rescue

operations or the maintenance of related readiness and other costs, which can be estimated to be significant. Nor are costs of damage to persons included in the amount of property damage.

The aim is to reduce the number of damage incidents due to the design and implementation of chimneys as well as those due to defects and mistakes in use and maintenance.

Decree on the structures and fire safety of chimneys

The aim of the total reformation of the National Building Code is to create mandatory requirements as well as instructive material on the most central aspects for design.

The requirements and recommendatory instructions relating to the design and implementation of the structures and fire safety of chimneys are separate in the future, for example:

- The Decree of the Ministry of the Environment on the structures and fire safety of chimneys contains the mandatory regulations
- The guide contains information on solutions
- The instruction of the Ministry of the Environment contains recommendations as well as data relating to uniform interpretations (to be drafted if necessary)

The Decree on chimneys shall be applied to the design and construction of chimneys as well as to the design and construction of repair and alteration work affecting them.

The Decree on chimneys contains no qualification requirements relating to designers. Matters relating to designers are provided in the amendment of the Land Use and Building Act (132/1999) (41/2014), which entered into force on 1 September 2014.

The Decree contains no references to standards. Prefabricated smoke flue products are subject to harmonized European product standards, on the basis of which the products in question are CE marked in accordance with the EU Construction Products Regulation. The standards are developed by CEN, and local authorities cannot through the standardization process influence the solutions or safety levels in them, but they can take part in the enquiry process when the standards are being prepared.

The Decree introduces a clarified model, where, in addition to the chimney, one must design, implement and document the implementation complying with the design as well as other matters affecting the chimney so that the entity fulfils the essential technical requirements contained in the Land Use and Building Act. The drafting of the documentation would be ensured by inspection document entries made by the person in charge in the inspection document as well as in its summary section.

The current requirement level shall remain the same for the most part. The requirements have been modernized to correspond to the procedures connected to the product approval of today. For some parts, matters existing as instructions in the present Decree have been raised to the decree level and, on the other hand, certain mandatory instruction-type texts now existing at the decree level have been moved to the instruction material as recommendatory instructions. Special attention has been paid to safety distances, heat insulation and penetration solutions of chimneys laid on site of bricks or built of steel and they have been specified and modernized. The topics have been arranged into their own sections in order to make the application of the Decree easier.

A rough distribution is that prefabricated CE marked chimneys would be subject to the Decree with the exception of paragraphs 4, 5 and 6. Chimneys laid on site would be governed by the

Decree with the exception of section 5. Chimneys built on site of metal would be governed by the Decree with the exception of section 4. Non-series produced chimneys that are manufactured elsewhere shall be governed by the Decree depending on the material as referred to above.

Detailed rationale

The Decree of the Ministry of the Environment on the Structures and Fire Safety of Chimneys

Section 1

Scope of application

This Decree shall apply to the design, construction and maintenance of chimneys the total thermal input to the fireplaces connected to which does not exceed 120 kW as well as to the design and construction of repair and alteration work on or affecting them.

The repair and alteration work shall include retrofitting of a chimney, repair or coating of a chimney or a smoke flue, exchange or alteration of a fireplace as well as the installation of a new smoke flue to a chimney or to a building element in another use.

The Decree would apply to the retrofitting and repair of chimneys or the design and implementation of repair work affecting them.

Typical repair and alteration work relating to the fire safety of chimneys includes the replacement of a fireplace or the addition of a new fireplace as well as additional heat insulation in the upper floor or the coating of the smoke flue of an existing chimney or its relining. The replacement of a fireplace may result in a situation where also the chimney has to be replaced if the temperature of the combustions gases conducted from the fireplace to the chimney is higher than before and the temperature class of the chimney is not sufficient. A change in the purpose of use of an individual room may also be an alteration work which requires that the suitability of the chimney is reviewed during the design even if no alteration work is done on the chimney or the fireplace connected to it.

In the case of repairs to existing chimneys there would be no need to start changing a previously approved solution unless this is necessary for example because of simultaneous changes to be made in the building or the use of the chimney which have significance in the effect of the chimney on the building or on the safety of a person.

Horizontally going smoke flues made by masonry are still sometimes used, although they are no longer made in accordance with present practice. It would be possible to repair a chimney laid on site with a liner for example in an old residential house whose use does not change or where no repairs or alterations affecting the chimney are or will be made even though the original chimney in the building were partly made with a horizontal flue. Also in cases like this, matters relating to safety and health as well as use and maintenance and their instructions have to be ensured. It would also be possible to repair original penetration solutions or leave them as they are if the information regarding their functionality with regard to fire safety and safety to persons is based on their use.

Installing a new flue in a structural element that has earlier been in another use would mean a situation where an existing chimney (a building element) has excessive flues (structural elements) which have been used for example as air shafts. In this case the entity should be designed and the compatibility of the solution with the requirements should be ensured in the design as well as in the implementation and the sufficiency of for example fire insulation and wall thickness should be ensured.

The structural element used could also be another structural element or a suitable structural element in another building element. Building element and structural element are established concepts. According to the publication of the Building Information Foundations RTS "Infra

2015, Rakennusosa -ja hankenimikkeistö, Määrämittausohje” [“Infra 2015, Building element and project nomenclature, Quantity Take-Off Guidelines”] “A building element is a permanent physical part of a construction which can be deemed conceptually independent. A building element comprises one or several structural elements.” According to the same publication “A structural element is a permanent physical part of a building element with an independent functional purpose.” The definition of a structural element is written in the draft for the Decree of the Ministry of the Environment on the Fire Safety of Buildings as definition No 23 ”a building element [means] a permanent part of a building, such as a wall, partition wall, floor, ceiling, beam, pillar, door, chimney or penetration, which may mean both separate building products with their joints or parts that consist of one or several products.”

Section 2

Definitions

In this Decree:

- 1) *Class A1 products* mean building products, materials or components used for building which do not contribute to fire;
- 2) *acid dew point* means the temperature at which corrosive acid from combustion gas containing sulphuric compounds or sulphur chlorides begin to condense on the inner surface of the smoke flue;
- 3) *pointing* means the packing of mortar in a joint that was left incomplete in connection with masonry;
- 4) *a system chimney* means a chimney specified in the harmonised product standard published in the Official Journal of the European Union;
- 5) *a gas fireplace* means a fireplace that uses natural gas or liquid petroleum gas or is equipped with a gas burner;
- 6) *mortar* means a mixture of binding agents, aggregate, water and air which may also contain additives, colouring agents and filling agents;
- 7) *a connecting flue pipe* means a separate channel belonging to a fireplace which connects the fireplace to the smoke flue through a connective flue or directly;
- 8) *a heating apparatus* means a device belonging to a building or located outside it where solid, liquid or gaseous substances are burnt and which is connected to the chimney of the building or to a separate chimney;
- 9) *temperature class (T-class)* means the class which indicates the product-specific highest allowed temperature of the combustion gases conducted to a chimney constructed of CE marked smoke flue products;
- 10) *a masonry fireplace* means a device built on site mainly of masonry components and mortar which uses solid fuel and which may also contain metallic or other fireproof parts or fireproof masonry components joined together in various ways;
- 11) *a masonry component* means a component of a specific shape intended to be used in a masonry structure;
- 12) *soot fire* means a situation where the ignition of soot collected in the smoke flue causes the flue to heat, which may damage the chimney;
- 13) *soot fire resistance class G* means the classification given to a smoke flue on the basis of a soot fire test relating to the CE marking (G = soot fire resistant) where the soot fire resistance is tested by conducting to the chimney gas of 1000 degrees centigrade in temperature for 30 minutes;
- 14) *a chimney laid on site* means a chimney laid on site mainly of bricks and mortar;
- 15) *a chimney built on site of metal* means a chimney built on site mainly of metal fittings and Class A1 heat insulation material;
- 16) *burnt brick* means a masonry component composed of clay or clayey materials, possibly also of sand, fuel or other additives and burned in a sufficiently high temperature in order to achieve a ceramic bond;
- 17) *clay mortar* means mortar containing mainly clay, water and sand but which may also contain additives;
- 18) *a smoke flue* means the channel and its walls used for extracting combustion gases produced in a fireplace along which the combustion products are conveyed to open air. A fireplace may be connected to a smoke flue with separate connective flues or connecting flue pipes;
- 19) *a chimney* means a usually vertical building element with one or several smoke flues where the thermal input to the fireplaces connected to it does not exceed 120 kW; a chimney may be prefabricated or a system chimney or laid on site or built on site of metal or an individual component (non-series produced) manufactured on site or elsewhere;
- 20) *a damper* means a device which can be used to close the flow of combustion gases and air formed by the smoke flue;
- 21) *a weather guard* means a structure on top of a chimney which protects the chimney from the effects of the weather;
- 22) *a prefabricated chimney* means a chimney defined in the harmonised product standard published in the Official Journal of the European Union;

23) *a fireplace* means a device in a building intended for the burning of solid, liquid or gaseous substances, the combustion gases from which are conducted through a chimney to open air. A heating apparatus in accordance with the definition of this Decree shall be a fireplace;

24) *thermal input to the fireplace* means the rate arrived at by multiplying the amount of fuel used by the fireplace within a given period of time, i.e., the mass flow rate (kg/s), with the lower, i.e., the net calorific value, of the fuel (kJ/kg) (in kW);

25) *a fire brick* means a ceramic masonry component capable of withstanding high temperatures and temperature changes and made by burning special clay and additives;

26) *draft* means the inherent ability of a chimney to conduct combustion gases to open air. The factors that affect the draft are the fireplace, the length and form as well as size of the connecting flue pipe, the height of the chimney, the airflow resistance of the smoke flue, the fluid mechanical properties of the top of the chimney and its placement as well as the prevailing temperature differences and the local airflow conditions caused by buildings and topography;

27) *water dew point* means the temperature at which the water vapour in the combustion gases starts to condense as water;

28) *a connective flue* means a separate part of a smoke flue between a fireplace and a chimney but not belonging to the chimney.

For some parts, the definitions have been modernized and certain necessary additions have been made. The definition of the temperature class has been supplemented with information that it means the highest product-specific temperature of combustion gases conducted to a chimney constructed of CE marked smoke flue products. The definitions have been supplemented with definitions of soot fire, a system chimney, a prefabricated chimney as well as a heating apparatus. The definition of soot fire resistance in force has been supplemented with information that it means soot fire resistance G relating to the CE marking. The definition built on site of steel has been changed to built on site of metal. The definition of a small chimney no longer contains the word small, because also the name of the Decree has been modernized by omitting the word small. The definition has been supplemented with information that the chimney may be prefabricated or laid on site or built of metal or manufactured as an individual (non-series produced) component on site or elsewhere.

All devices in the building meant for the burning of solid, liquid or gaseous substances whose combustion gases are conducted to the open air through a chimney would be fireplaces irrespective of what they are called. A fireplace would also mean for example heating devices, heat generators and grills burning solid, liquid or gaseous substances whose combustion gases are conducted to the open air.

Figure 1 of terms used would be omitted from the Decree but included in the instructional material.

Section 3

Design of a chimney

The principal designer, construction designer and specialist designer shall, in accordance with their respective duties, design the chimney with penetrations, its foundation or other substructure, brackets and vertical structure as well as chimney hatches and connective flues as well as connecting flue pipes and attachments so that the draft, structural durability, integrity and service life necessary for the operation of a fireplace connected to it are achieved. The chimney may not pose a risk of fire or explosion taking into account the fireplaces to be connected thereto and the fuels to be used in the fireplaces. The chimney shall sustain any loads directed thereat, weathering, deformations and stress resulting from freezing, thawing, temperature changes and compounds forming at the acid dew point.

The chimney and its surrounding premises shall be designed and constructed so that the chimney and its flues can be cleaned and its integrity and condition inspected. In designing a repair of a chimney, the condition of the chimney to be repaired as well as the products to be used in its construction and the properties of the combustion gases to be conducted thereto shall be taken into account.

The design shall present the products to be used in the construction, the installation instructions of the chimney and the fireplace to be connected thereto, the information needed in the instructions for use and maintenance as well as the interoperability with the temperature of the combustion gases to be conducted from the fireplace to the chimney, the principles for penetrations with information on the sealing of the joints as

well as the safety distances and cleaning. The drainage of condensate condensing at the water dew point shall be presented in the design if condensation can occur.

The design of a chimney is expected to be made so that it fulfils the requirements required by the Decree and based on the essential technical requirements of the Land Use and Building Act, because a chimney always has to be designed case-by-case taking into account the characteristics of its site.

In the design, it would be an obligation to design also the draft of the chimney so that the draft required by the fireplace connected to it will be reached. In practice, the draft may also be excessive for the functioning of the fireplace connected to it, in which case it should be possible to restrict the draft, because a non-restricted draft may be for example double or triple compared to the draft suitable for the functioning of the fireplace, in which case the temperature of the combustion gases may rise drastically and increase the risk for damage. The draft can be restricted for example with fireplace regulators or with a damper.

The design should present also the products used. The draft Decree of the Ministry of the Environment for the fire safety of buildings includes a definition of a product as follows: "29) a product [means] a building product, material or component used for building;"

The content requirements of the design list the most central matters affecting the end result. The safety distances have to be sufficient to ensure personal and fire safety. The most central aspect relating to ensuring interoperability is to ensure the sufficiency of the fire class of the chimney for the temperatures conducted to it.

The vertical structure of the chimney makes an efficient conduction of the combustion gases out of the building possible so that a good draft is formed. The vertical structure also helps the cleaning. For a special reason, a chimney may also deviate from the vertical structure. In this case, special attention has to be paid in the design to the support of the chimney, the need for sweeping hatches, the rounding of bending parts as well as to the danger of the cracking of the chimney due to thermal expansion, eccentric load or another reason.

For example in chimney repairs where a new smoke flue manufactured for example from the austenitic non-corrosive steel referred to in the harmonized product standard EN 1856-2 is installed inside an old one or an old smoke flue is coated, the condition of the chimney to be repaired as well as the risks of wetting and corrosion of the flue by the combustion gases from the fireplace connected to it is taken into account when selecting the material.

When planning the height of the chimney, attention would be paid to combustible structures and holes at a distance of under 8 metres as well as elevations in the ceiling structures in accordance with fire safety regulations on buildings.

Section 4

Chimney laid on site

The minimum wall thickness of a chimney laid on site of bricks shall be 120 mm when the total thermal input to the fireplaces connected to one smoke flue does not exceed 60 kW, and a minimum of 230 mm when the thermal input to the fireplaces connected to one smoke flue does not exceed 60-120 kW. The parts of the external wall inside a building shall be coated with a Class A1 filler up to the level of roofing. The parts of the chimney visible in room premises, which have struck, may be left uncoated. When the total thermal input to the fireplaces connected to one smoke flue does not exceed 60 kW, pointing may be applied instead of striking.

The parts of the chimney where the temperature of the combustion gases may rise above 350 degrees Celsius shall be laid using flexible mortar which sustains the loads directed at the joint as well as the stress resulting from temperature changes. Weathering mortar shall be used in laying the external parts of the chimney.

The top of a masonry chimney shall be protected against the effects of weather. The weather guard shall be manufactured of Class A1 products.

The basic requirements of a chimney laid on site would remain almost the same as in the decree in force at present. A separate requirement for the thickness of the wall of the chimney would be introduced if the total thermal input to the fireplaces connected to the chimney would be 60-

120 kW. A similar requirement has already been in force in Part E Small smoke flues of the National Building Code of Finland issued in 1976.

Further information on the materials would be available in a separate guide and, where necessary, in an instruction of the Ministry of the Environment. A weather guard means for example a so-called chimney cap made of metal or a collar, which is cast of concrete and is larger than the measurements of the chimney and guides the rain water outside the chimney. The collar, which guides rain water outside the chimney, can further be equipped with a chimney cap, which gives additional protection if the chimney is not used for long periods.

There is long-term experience of chimneys laid on site and they have a long history in Finland and they are not known to be prone to damage when their use, service and maintenance are at the ordinary level. The earlier regulations of the National Building Code E3 Small smoke flues (1976), E3 Small smoke flues (1988) and E3 The structures and fire safety of small chimneys (2007) have enabled the construction of chimneys laid on site. The requirements of products used for a chimney have, for the most part, been the same already for decades so that we can consider that chimneys built on site in the above manner fulfil the requirements of good building practice of section 117, subsection 5 of the Land Use and Building Act. Chimneys have been laid on site for at least decades before the entry into force of the first building regulations.

Special attention has been paid to, and more specified requirements have been presented for, penetrations and safety distances as well as to products used in the vicinity of the chimney. In parts visible to room premises, it would be possible to leave the brick surface visible. When the total thermal input to the fireplaces connected to one smoke flue does not exceed 60 kW, pointing could be applied instead of striking.

The purpose is to compile instructions relating to selecting the products to be used in the guidance material.

Section 5

Chimney built on site of metal

The material of the smoke flue of a chimney built on site of metal shall be steel or cast iron with a wall thickness of at least 4 mm and the material of the outer steel casing of the heat insulation of the smoke flue shall be at least 0.5 mm thick if the suitability of other products for the intended purpose of use has not been indicated in the design.

The inner casing of the chimney shall be encased with continuous 100-mm thick Class A1 heat insulation in at least two overlapping layers, the highest usage temperature of which is at least 600 degrees centigrade and the thermal conductivity in the average temperature of 600 degrees centigrade does not exceed 0.19 Watts/metre * Kelvin (W/(m * K)).

The proposal makes it possible to build a metal chimney on site of certain products and with certain material thickness. At present, only one set of requirements is given and if one wants to use other products, it requires that the matter is clarified in the design. Earlier, the regulations of the National Building Code of Finland E3 Small smoke flues (1976), E3 Small smoke flues (1988) and E3 The structures and fire safety of small chimneys (2007) have enabled the use of a metal chimney built on site. The requirements of products used for a chimney have, for the most part, been the same already for decades and they are not known to be prone to accidents when their use, service and maintenance are at the ordinary level, so that chimneys built on site in the above manner can be deemed to fulfil the requirements of good building practice of section 117, subsection 5 of the Land Use and Building Act. Special attention has been paid to, and more specified requirements have been presented for, penetrations and safety distances as well as for products to be used as insulators of the chimney and in the vicinity of the chimney.

The thickness of the wall of a steel or cast-iron chimney to be built on site is at least 4 mm and also a smoke flue made of austenitic stainless steel referred to for example in the uniform European product standard EN 1856-2, with a wall-thickness of at least 1 mm, could still be used if the suitability of the chosen material for the intended purpose is shown in the design. It would also be possible to use CE marked products suitable for the intended purpose as long as the requirements relating to the suitability are presented in the designs.

At present, the thermal insulation of the smoke flues of a metal chimney built on site is required to keep its form as well as not to sinter or melt also in case of a soot fire. In accordance with the instruction in force at present, the insulation suitable as thermal insulation of smoke flues is Class A1 mineral wool, which endures a temperature of over 1,000 degrees centigrade without deformations. Because of the present regulations relating to the approval of products, the mandatory requirements have been modernized.

Three requirements are presented for thermal insulation. The thermal insulation chosen has to be a Class A1 product and its highest usage temperature has to be 600 degrees centigrade and its thermal conductivity at an average temperature of 600 degrees centigrade may not exceed 0.19 watts/metre · Kelvin (W/(m · K)).

It would be required that the thermal conductivity is indicated at the temperature corresponding to the usage temperature class of the chimney, because this procedure would eliminate insulations whose properties change so that it is not possible to determine their thermal conductivity value at said usage temperature.

The aim of these requirements has been to modernize the requirements relating to the safety level and to ensure the long-term durability of the thermal insulation as well as its deformation resistance and sufficient soot-fire resistance. In the highest usage temperature test one criterion is that the deformation may not exceed five per cent at a determined load. Another important criterion in this context is that there is no self-heating, which causes the fibre structure to sinter or compress. According to a comment from a manufacturer of insulation on the draft during the comment round "the products meeting the requirements (EN 14303, point 4.3.2) keep their form also at a temperature of 1,000 degrees centigrade, so that it is no longer necessary to mention the temperature of 1,000 degrees centigrade as a separate criterion. All manufacturers of mineral wool have also such products for which the manufacturer indicates a highest usage temperature of at least 600 degrees centigrade." Also VTT Expert Services Oy supported the requirement levels of the highest temperature and heat conductivity in a preparatory study ordered from it.

The thermal insulation of a metal chimney built on site can also be ceramic insulation when its properties can be indicated.

The Decree uses the expression "a chimney built on site of metal". The purpose here is to differentiate a chimney built of metal on site or a non-series produced chimney built elsewhere of metal from chimneys constructed on site of pre-fabricated modules.

Section 6

Safety distances and penetrations of chimneys laid and built on site as well as of other non-series produced chimneys

An expansion gap of at least 20 millimetres shall be left between a chimney laid or built on site or a non-series produced chimney manufactured elsewhere and a building element and it shall be filled with a Class A1 product suitable for the purpose. When determining the width of the expansion gap, the deformations according to the service state of the adjacent structures in relation to the chimney shall be taken into account in the structural design. A ventilation gap of at least 50 mm shall be left between the heat-insulated wall and the chimney even if the necessary safety distance or the expansion gap were smaller.

The building elements and products manufactured of other than Class A1 products shall be at a distance of at least 100 mm from the external wall of the chimney. The penetrations through intermediate or top floors or through a wall as well as a joint of a wall shall be mounted with an at least 100-mm thick heat-insulating layer of a suitable Class A1 product. If the thickness of the masonry wall of a chimney is at least 230 mm and the total thermal input to the fireplaces connected to one smoke flue does not exceed 60 kW, the 100-mm distance referred to above and the heat insulating layer made of Class A1 product shall not be necessary.

The heat insulation around the penetration shall be of a Class A1 product and its thickness at most 200 mm at the width of 200 mm unless the suitability of another solution is indicated with test results or with a calculation method verified on the basis of tests. The width shall be measured from the external surface of the heat insulation in accordance with subsection 2. The area shall be protected of trash and other combustible loose material.

The design of a non-series produced metal chimney or a chimney built of Class A1 products suitable for the purpose of use shall be governed also by the provisions of sections 4 and 5.

A masonry fireplace built on site and a chimney built on site of steel would have clear requirements for safety distances as well as products used in the vicinity of the chimney and the minimum requirements for penetrations.

Special attention has been paid to the elimination of risk situations caused by heat transfer resulting from an exceptionally long continuous burning by requiring clear safety distances as well as thickness and quality of insulation in the immediate vicinity of the chimney as well as requiring that a ventilation gap of at least 50 mm be left between the heat-insulated wall and the chimney even if the necessary safety distance or the expansion gap were smaller.

The effect of the amount of the binding agent in the Class A1 penetration insulation products has been studied by the Fire Laboratory of the Technical University of Tampere. According to the study report "The effect of the burning of the binding agent of the penetration insulation products of a chimney on fire safety, Palo 2466/2016", the safe amount of the binding agent would be at most 2.5 kg/m³. It is possible to use as thermal insulation of the penetrations also ceramic insulation when their properties can be indicated.

It would also be possible to implement the chimney as a non-series produced "unique" chimney by applying the Decree.

Section 7

Damper

A chimney shall be equipped with a damper if the fireplace connected to it is not a gas fireplace or a fireplace with a continuous fuel feed. If the fireplace connected to the chimney or its connecting flue pipe or connective flue is equipped with a damper, the chimney need not be equipped with a damper.

The damper shall be replaceable or its service life shall be the same as of the chimney. The carbon monoxide forming in the fireplace must have access to open air through the chimney also in a situation where the damper has been closed after the use of the fireplace.

The smoke flue may not act as the air supply route for indoor air.

The purpose of the damper is to prevent the loss of stored heat and to prevent the smoke flue from acting as an air supply route. According to the present instructions, a hole of about 3% shall be left in the damper to ensure the removal of carbon monoxide gases also in a situation where the damper has been closed too soon after the use of the fireplace. The damper can also be used to regulate the draft needed by the fireplace.

The chimney can be equipped with a damper even if the fireplace or its connecting flue pipe or connective flue is equipped with a damper and the removal of carbon monoxide gases to open air can be ensured through the chimney also in a situation where the damper has been closed after use.

The smoke flue should not act as the air supply route for indoor air, because then the impurities from the burning that have travelled with the combustion gases to the surfaces of the smoke flue may be transferred to indoor air. These impurities include for example micro particles.

Section 8

Soot fire

Smoke flues, the combustion gases conducted to which may cause soot or pitch deposits, shall tolerate cleaning to remove the deposits of soot and pitch. The chimney shall be soot fire resistant.

The soot fire resistance of a chimney laid on site of burnt brick in accordance with this Decree or of a chimney built on site of metal in accordance with section 5 or of a non-series produced chimney manufactured elsewhere need not be separately indicated when the material used in the smoke flue of a metal chimney is cast iron or

steel with a wall thickness of at least four millimetres. The soot fire resistance of CE marked chimneys and smoke flues shall be of classification G.

After a soot fire incident, the owner of the building shall ensure that the structure of the chimney and fireplace as well as the fire safety and security of persons are inspected and the necessary repair measures are carried out prior to continuing the use.

By requiring soot fire resistance, the aim is to ensure that the soot fire does not cause more extensive damage. In a soot fire, the wall of the chimney acts as a partitioning structure like, for example, the wall between apartments in an ordinary high-rise. The chimney may be damaged beyond repair in a soot fire and therefore it should be inspected and, where necessary, repaired before continuing the use. The responsibility to attend to this would lie with the owner of the building.

In accordance with the requirements of the Decree, the soot fire resistance of a chimney laid on site of burnt brick or of a chimney built on site of metal or of a non-series produced chimney manufactured elsewhere need not be separately indicated when the material used in the smoke flue of a metal chimney is cast iron or steel with a wall thickness of at least four millimetres. There is long-term experience of the chimneys mentioned above and they are known to be soot fire resistant, so that the chimneys laid and built on site in the above manner can be deemed to fulfil the requirements of good building practice of section 117, subsection 5 of the Land Use and Building Act also in this respect.

The obligation to inspect the structure and fire safety of a chimney after a soot fire incident would apply to all chimneys referred to in this Decree.

Section 9

Interoperability of a fireplace and a chimney

A chimney and the connecting flue pipes and connective flues with joints of the fireplace to be connected thereto shall form an entity that is fire safe and secure for persons as well as functional. The party engaging in a construction project shall ensure that the chimney is built and repaired according to the design.

In order to ensure the interoperability of a chimney and a fireplace, the design shall state the highest temperature of the combustion gases conducted from the fireplace to the chimney. The heat resistance to combustion gases of a fireplace using solid fuel as well as of the chimney of a sauna heater and of the connecting flue pipes and connective flues shall be at least in accordance with temperature class T600. The fireplace to be connected to the chimney may be prefabricated or laid or built on site.

The heat resistance in accordance with class T600 can be demonstrated by masonry the chimney in accordance with this Decree of burnt brick or by building a metal chimney in accordance with section 5 on site where the material of the smoke flue is cast iron or steel with a wall thickness of at least four millimetres.

The highest combustion gas temperature of prefabricated chimneys can be reasonably ascertained in advance. The temperatures of combustion gases conducted to a heat-storing chimney laid on site and equipped with fireplace doors can, when the fireplace is used correctly, be considered so low that they need not be separately verified.

Heat-storing fireplaces often have also a summer or ignition damper and special attention has to be paid to its use and on instructions on its use, because the temperatures of the combustion gases may rise high during the season when the fireplace is used for heating, if the fire is burnt with the summer or ignition damper open without the circulation of the combustion gases. During the heating season, the summer or ignition damper may be used at the ignition stage, but it has to be closed as soon as there is a draft in the smoke flue, because the combustion gas temperatures can rise high if the burning lasts long and large quantities are burnt. On the other hand, the heating is non-efficient if the storage capacity of a heat-storing fireplace is not utilized. There is a possibility for mistakes in the use of the summer or ignition damper in fireplaces laid on site and in heat-storing pre-fabricated fireplaces with a summer or ignition damper. The possibility for mistakes rises if the fireplace is in premises where the user changes, in which case the significance of the availability of usage and maintenance instructions in turn increases. The penetrations of the chimney should be designed with solutions of at least the temperature class of the chimney.

The requirement of at least the temperature class T600 is based on the knowledge that, in Finland, it is possible to use also fireplaces the design temperature of combustion gases from which is so high that even a Class T600 chimney is not always sufficiently safe. In such a case the chimney and its smoke flue have to be designed separately and its suitability for the intended use has to be shown in some other way. For example, it is possible, with eurocodes, to design chimneys for fireplaces the combustion gas temperatures from which are so high that Class T600 is not sufficient.

The highest combustion gas temperatures from the fireplace to the chimney should always be indicated so that the interoperability of the fireplace and the chimney can be ascertained. The requirement to indicate would also apply to a situation where the chimney has to comply with Class T600 according to subsection 2 of the section.

The penetrations of the chimney and the safety distances should be designed in accordance with the temperature class of the chimney. In other words, for example, the penetration of the chimney of a fireplace using solid fuel as well as of a sauna heater should always be designed at least in accordance with Class T600.

Generally taken it would always be possible to choose a chimney of at least Class T600 and thus ensure that any fireplace could safely be connected to it later on the highest temperature of whose combustion gases is such that a Class T600 chimney is suitable.

The party engaging in a construction project would be obligated to ensure that the chimney is built in accordance with the design. The duty of care could be fulfilled for example by agreeing that the task in question is assigned to the responsible supervisor and by ensuring that he makes the necessary entries of attendance to the task in the inspection document and in its summary section.

Section 10

Surface temperatures and placement

The chimney and the connecting flue pipes and connective flues as well as the chimney hatches of the fireplace to be connected thereto shall be designed so that their surface temperatures do not cause danger to fire safety or the security of persons.

The safety distances of prefabricated chimneys and flue products shall be determined by testing or by a calculation method verified on the basis of tests. The non-overlapping joints between the chimney elements may not be placed inside the structures at the structure penetration points.

The placement or protection of a chimney shall be presented in the designs so that the placement of movables in its immediate proximity is not possible especially in a store room or closet. The height of the chimney measured from the roofing shall be at least 0.8 metres at the roof ridge. With regard to roofing not belonging to the Class B Roof (t2), the height shall be at least 1.5 metres. The height of a chimney on a pane of roof shall be added with 0.1 metres for each metre of pane calculated from the ridge if the suitability of another solution is not indicated in the designs.

Other structures may not be supported against or attached to a chimney, and pipes, cables or other devices not belonging to the operation of the chimney may not be fitted thereto.

The surface temperature has earlier in part E3 of 1976 relating to chimneys been +70 degrees centigrade for parts inside the building with a continuous maximum load of a fireplace connected to it. In the corresponding part of the 1988 National Building Code the surface temperature for parts inside the building has been +80 degrees centigrade with a continuous maximum load of a fireplace connected to it. In the part of the National Building Code in force the surface temperature could be visible and in the parts of the chimney that are easily touchable at most +80 degrees centigrade. For example in the steam rooms of a sauna there could be higher surface temperatures in cases where fire security is not endangered. With regard to building elements with combustible products there was a uniform instruction in 1976 and 1988 that their surface temperature could not exceed +80 degrees centigrade.

In Part E3 in force the instruction reads that the surface temperature of a structure near the chimney and constructed of a building product other than Class A1 would not exceed +85 degrees centigrade.

Almost identical instructions on surface temperatures have existed for decades, so that at least higher surface temperatures than the values above could not be considered to comply with good building practice unless the surface temperatures have separately been indicated in the designs as sufficiently low for personal and fire safety.

The surface temperature can also be estimated on the basis of the surface material of the chimney, because heat conductivity varies greatly in different materials. For example, the heat conductivity of steel is 47-50W/mK, brick 0.35-0.50W/mK, block of lightweight aggregate concrete 0.20-0.25W/mK and concrete 0.4-1.7W/mK. Thus the burning effect of smooth steel appears at a lower temperature than that of brick.

The surface temperatures could also have different temperature values project-specifically, at least momentarily and locally, as long as that has been taken into account in the designs so that personal and fire safety are not endangered. In some cases it is well founded for the party engaging in a construction project to require lower surface temperature values or protection against contact when the surface temperatures mentioned earlier are possible.

The choice of a safe surface temperature is, among other things, effected inter alia by the surface material to be touched, the quality of the surface and the time of touching. In random touches the reaction time depends for example on the age and physical condition of the person. Small children have a longer reaction time than an adult, and therefore it is well-founded in some cases to require even a very low surface temperature or protection to the easily touchable lower sections and easily reachable hot surfaces of the chimney.

The suitable surface temperature may be assessed for example on the basis of the International Standard EN ISO 13732-1 (Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces.) According to the standard in question the range of the threshold values of burns with regard to smooth uncoated metal is between 64-69 degrees centigrade when the contact time is one second. With stone or ceramic material and glass the range of the fire damage threshold for a touch of one second is 80-85 degrees centigrade. With stone or ceramic material and glass, the range of the threshold values of burns for a one-second contact is 80-85 degrees centigrade.

Buildings have also other easily touchable surfaces, whose surface temperatures may be high. As a comparison, we can look at the requirements of electric stoves, because nearly every household has one. According to comparative studies of electric stoves [Sähköliesien vertailututkimukset] 2004–2005: Performance, energy efficiency, safety of use and usage characteristics (Reports and guides of the TTS Institute No 19 (2005)), an electric stove has to meet the safety requirements of European standard SFS-EN 60 335-2-6. In addition to electric safety, the standard contains usage safety requirements for surface temperatures, vertical stability and mechanical protection as well as mechanical strength. The standard has been in force since 1992.

In a test performed according to the standard the temperature of the front surfaces of the stove may not, depending on the material, increase more than 60–100 degrees in a usage situation complying with the standard. The smallest temperature increase is allowed for metal surfaces as well as for painted metal surfaces and the highest for plastic surfaces. Other surface alternatives are glassy enamelled metal surfaces as well as glass surfaces and ceramic surfaces.

EN 60 335-1 (Household and similar electrical appliances - Safety, Part 1: General requirements) also determines the highest allowed temperature increases for handles, knobs, grips and corresponding parts which are held in the hand only for a short time (for example switches). In a usage situation complying with the standard, the temperature of the selectors of the stove, the grip and safety latch of the oven may not, depending on the material, increase more than 35–60 degrees. The smallest temperature increase is allowed for metal and the highest for plastic, rubber or wood. The other materials mentioned are porcelain or glass-like material.

The protective distances of pre-fabricated smoke flue products are established with temperature and soot fire resistance tests complying with harmonised European product standards. The safety distances of prefabricated chimneys and flue products should be determined by testing or by a calculation method verified on the basis of tests.

The joints between chimney elements should not be placed at the structure penetration points. The tightness of a chimney laid on site is implemented with careful work and suitable materials.

With regard to system chimneys, EN standard 15287-1 + A1 (Chimneys. Design, installation and commissioning of chimneys. Part 1. Chimneys for non-roomsealed heating appliances) mentions at point 4.3.13 (Joints) that joints have to be made in accordance with the instructions of the manufacturer and the design of the chimney has to be implemented so that the joints of a system chimney are not placed at the penetrations or on the floor.

A chimney is meant to operate independently and therefore it should not support other structures or pipes, cables or other devices not belonging to its operation should not be fitted thereto. For example, a smoke aspirator is a device ensuring the operation of the chimney, so that installations relating to it would still be possible as well as also for example in chimneys storing heat in water installations relating to that when their suitability can be properly indicated.

Section 11

Commissioning as well as instructions for use and maintenance

Prior to the commissioning of a chimney, the party engaging in the construction project shall ensure that the suitability and interoperability of the chimney and the fireplace as well as the compliance of the installations with the designs have been inspected. The person performing the inspection shall make an entry in the construction inspection document as well as its summary regarding the interoperability and compliance of the installations with the designs.

The principal designer shall ensure that information that is material with regard to the use and maintenance of the chimney and the fireplace to be connected thereto has been transferred to the instructions for the use and maintenance of the building.

The purpose is to ensure that the chimney and matters affecting it have been implemented according to the design and that the chimney does not cause danger to persons or fire security. The party engaging in the construction project should ensure that the necessary entries are made in the inspection document as well as in its summary section. The person performing the inspection and making the inspection entry can be, for example, the responsible supervisor of the construction work or another educated professional who masters the characteristics of chimneys and fireplaces, such as a competent sweeper. The certification entries relating to the inspection document procedure complying with the Land Use Act and the Building Act should cover the matters to the extent of this Decree.

For example photographs taken of work stages being covered make it easier to assess compliance with the designs of the implementation as well as the timing and implementation of measures relating to use and maintenance.

Matters relating to use and maintenance can also be presented with permanent signs or in another well-preserved way in addition to the use and maintenance instruction. The easily noticeable instructive material relating to correct use is especially important at sites where the user changes. For example time-share apartments are typically targets where the user changes often. Fixed, easily noticeable instructions are useful in all facilities that have a chimney to remove the combustion gases produced in a fireplace.

In order to ensure that the use and maintenance instruction of a fireplace is preserved, it would be good to add the information relating to it in the use and maintenance instruction of the chimney. The purpose of this procedure would be to reduce the risk of damage due to the faulty use of the fireplace caused by the lack of a use and maintenance instruction.

The maintenance and repair work done can be documented in the use and maintenance instruction. For example information of sweeping and the sweeper as well as its time is essential for safe use.

Section 12

Entry into force

This Decree enters into force on 1 January 2018.

The provisions in force upon the entry into force of this Decree shall be applied to a project pending upon the entry into force of this Decree.

The Decree would be applied to projects that become pending on or after 1 January 2018.

Economic effects

The proposal for the Decree has no significant economic effects, effects on the status of households or on undertakings, or effects on the general economic development, the national economy or public economy.

Because the aim is to reduce damage incidents due to defects in the design and implementation of chimneys as well as in their use and maintenance, the effects are estimated to be somewhat positive for the national economy and significantly positive for individual households when damage does not occur or the effects of a possible damage are restricted. This aspect may also influence the amount of damages payable by insurance companies as well as costs incurred by society from rescue operations or the maintenance of preparedness for them and for other costs. In total the amount of these costs can be estimated to be significant. Also the costs due to personal damage will be reduced if some personal damage is eliminated.

Effects on the operation of the authorities

The proposal for the Decree is not estimated to have effects on the tasks or operations of State authorities. The Decree may have slight positive effects on the tasks or operating procedures of municipal authorities, because building inspection work will become easier because of the exact decree and, on the other hand, if the number of damage incidents is reduced, this will also have a reducing effect on the work of rescue associations.

Environmental effects

The proposal applies to the structures and fire safety of chimneys. A chimney is used only to conduct combustion gases from a fireplace out of a building. The proposal does therefore not, in addition to decreasing environmental emissions, have other direct environmental effects. In addition to decreasing environmental emissions from building fires, the proposal has no other direct environmental effects.

Societal effects

The societal effect of the proposal for a Decree of the Ministry of the Environment on the Structures and Fire Safety of Chimneys is based on the goals to improve the fire safety of buildings and to reduce the number of fire deaths as well as to reduce property damage due to fires by eliminating fires relating to chimneys.

The proposal for the Decree is not estimated to have significant effects on health, because the requirements relating thereto do not become stricter. There may be some positive effects on health when the chimney is designed to function as part of the entity of the building and so that its draft is suitable for the operation of the fireplace, so that the number of micro particles is less than that from incomplete burning. In addition to the risk of fire, a special danger relates to the risk that carbon monoxide is conducted indoors from the fireplace. In connection with the use

or ignition of the fireplace, it may also release smoke indoors if there is no draft in the chimney and especially if the draft, due to pressure relations, is inwards into the building. The combustion gases from the chimney cause detriment in the immediate vicinity or the combustion gases may migrate to supply air through ventilation if these matters are not taken into account in the design. These issues also belong to the design of the ventilation technology of the building. The healthiness of buildings is ensured by good design and implementation.

In order to eliminate the risk of carbon monoxide, the proposal requires that the carbon monoxide gases forming in the fireplace have to be able to go up the chimney to open air also in a situation when the damper is closed.

The proposal also requires that the smoke flue has to be also sufficiently tight from the perspective of health. The chimney as well as the connective flues and connecting flue pipes should be designed and constructed so that a sufficient draft and tightness are achieved. The chimney should extend above the roof or otherwise so high with regard to the building that sufficient fire safety and draft are achieved. This would at the same time reduce the risk of smoke being conducted to yards as well as to intake-air holes of ventilation. This would, at the same time, reduce the risk of smoke being conducted to yard areas as well as to supply air inlets of ventilation.

According to the proposal, the chimney and its surrounding premises should also be designed and constructed so that the chimney can be cleaned and its integrity and condition inspected. This way it is possible to avoid for example the smoke flues from becoming blocked and the possible risk of carbon monoxide resulting therefrom as well as the risk of a soot fire caused by material accumulated in the smoke flue. The chimney and the connective flues and connecting flue pipes of the fireplace connected to it should be placed so that their surface temperature does not cause danger to the safety of persons.

The proposal for the Decree is estimated to have an effect also on the operation of those using buildings for example in buildings where wood is used for heating. The effects mainly relate to the operation and ease of use as well as to the simplification of the acquisition of a chimney and to ensuring its safe use.

The proposal for the Decree is not estimated to have any effects on employment.

The proposal for the Decree may have effects on business activities, because there will be new possibilities to market comprehensive solutions to consumers for example in the context of prefabricated smoke flue products. For the consumer it will become easier to acquire a chimney if he is offered a comprehensive safe solution with its design.

The proposal for the Decree is not estimated to have any effects on the data protection or data security of citizens or undertakings.

The proposal for the Decree is not estimated to have any gender impact.

Comments

The proposal for the Decree was available for comments from 13 May to 28 April.

Legislative inspection

The proposal for the Decree has not been checked in the Unit of Legislative Inspection of the Law Drafting Department of the Ministry of Justice because of the heavy workload of the Unit of Legislative Inspection.