Pohjola Insurance

Grain dryer fire safety

Safety regulations S920, effective as of 1 April 2020

1 Purpose

These safety regulations contain instructions about the fire safety of grain dryers. The regulations must be followed, as they are based on regulations issued by the authorities and on instructions for use issued by equipment manufacturers. The safety regulations are intended for the users of grain drying machinery.. The regulations contain provisions concerning the structures, maintenance and use of grain dryers, the storage of flammable liquids as well as first-aid extinguishing equipment.

2 Obligation to comply with safety regulations

These safety regulations are part of the insurance contract. Both the policyholder and the insured must comply with the safety regulations and its provisions.

If the safety regulations are not complied with, the compensation may be reduced or completely denied, in accordance with the Insurance Contracts Act.

The policyholder must ensure that those responsible for work performance are familiar with the contents of these safety regulations.

3 Concepts

Grain dryer

A building or its fire compartment in which the grain drying machinery, its accessories as well as other equipment needed for handling the grain to be dried, moving it to storage and warehousing are located.

Grain drying machinery

A device used for drying grain, including heating devices and conveyors. The grain dryer machinery is hereinafter referred to as “dryer machinery”.

Warm air drying machinery

Fixed or movable equipment that uses air heated by a fixed or movable heating device for drying the object to be dried.

Cold air drying machinery

Fixed or movable equipment that uses air current generated by a fixed or movable fan for drying the object to be dried.

4 General information

A building permit is needed for the construction of a grain dryer. A building permit is usually also needed when making a material change in the grain dryer, such as extending an existing dryer or replacing the heating device of the drying machinery with a new, different heating device or when making material changes to the drying machinery. The fire authorities must be requested to inspect the grain dryer before it is taken into use. It is checked in the fire inspection that the installation and operating instructions as well as electrical and technical connection diagrams have been provided together with the heating device.

A fire inspection must also be conducted when a new heating device different from the earlier heating device is obtained for the drying machinery.

5 Structures and placement of the grain dryer

5.1 Fire class of the grain dryer

The provisions of Section E1 and some of the instructions of Section E2 of the National Building Code of Finland are applied to dryer buildings. A grain dryer building of maximum height 14 m can be made as a building complying with Section E1 and fire class P3. A dryer building higher than this must be made as a building complying with fire class P2 or P1.

5.2 Placement of a grain dryer

The grain dryer must usually be made as a separate building. A dryer situated at least at a distance from the nearest building that corresponds to the height of the dryer is considered a separate building. The distance must be at least 8 m if there is no fire compartment requirement. The dryer must be placed at least 15 m from a neighbour’s boundary. With the neighbour’s written consent, the dryer can be built closer, yet no more than 5 from the neighbour’s boundary. The grain dryer can be built in connection with another production or storage building or a garage, provided that it is separated from the rest of the building with a solid, at least EI-M60 class firewall-like wall. Premises differing from each other in terms of their purpose of use must be compartmented in new dryers according to their purpose of use.

The dryer may not be built in connection with an animal shelter.

5.3 Structure of grain drying machinery

The drying machinery must be made of non-combustible materials. Trailer drying machinery or cold air drying machinery can also be made of wood or materials with a corresponding ignitability class. The drying machinery's heating device can be operated using oil, wood or other corresponding solid fuel and equipped with a heat exchanger.

5.3.1 Electrical appliances

Electrical appliances of the drying machinery furnace must be approved for their purpose of use. Electrical installations on the dryer may only be made by an authorised, approved installation firm. The main distribution board of the grain dryer must be placed in a location with minimum accumulation of grain dust on the board surface. A separate lockable room or closet must be provided for the grain dryer's main distribution board, with at least 0.8 m of free space in front of the board. Unnecessary material or items may not be stored in the main distribution board space. The main distribution board need not be protected with a separate lockable room or closet if its IP class is 54 or better. Electrical connection diagrams for the drying machinery must be available on the main distribution board or on the adjacent wall. A main switch must be installed on the incoming electrical cable outside of the grain dryer, through which the entire grain dryer can be de-energised. The main switch need not be installed in a grain dryer with cold air drying machinery if the dryer is not equipped with an additional heating device.

5.3.2 Oil-fuelled heating device

The structure and operation of a heating device using oil as fuel must at least comply with the requirements set in Sections 4, 5 and 6 of Standard SFS 5623 for Class A heaters or the requirements of corresponding Finnish or international standards and regulations.

The power of the grain drying machinery's heating device is primarily adjusted by changing the amount of oil input in ways presented in the heating device's maintenance and installation instructions so that the burner can operate continuously. The average temperature of the drying air entering the grain drying machinery may not exceed 100ºC in normal use. Unlike stated in Standard SFS 5623, the highest permitted temperature in the heating device's exhaust opening may not exceed 150ºC when measured from the hottest point of the air current. The heating device's fan must be equipped with such regulation and safety devices that it stops only when the temperature of the drying air from the heating device drops under 50ºC. According to Section 5.1 of Standard SFS 5623, the drying machinery's heating device must always be equipped with an explosion hatch.

5.3.3 Heating device heated using solid fuel

Notwithstanding the scope of Standard SFS 5623, a heating device heated using solid fuel must comply with the requirements set in Sections 5.1-5.5. and 5.7-5.8 for Class A heaters or the requirements of a Finnish or international standard or regulation with a corresponding safety level.

The average temperature of the drying air entering the grain drying machinery may not exceed 80ºC in normal use. Unlike stated in Standard SFS 5623, the highest permitted temperature in the heating device's exhaust opening may not exceed 150ºC when measured from the hottest point of the air current. The heating device's fan must be equipped with such regulation and safety devices that it stops only when the temperature of the drying air from the heating device drops under 50ºC. The hatches of the firebox and the ash cesspit must be equipped with a latch. It must be possible to admit combustion air into the firebox in such a way that the hatches of the firebox and ash cesspit can be kept closed during heating.

The heater must be equipped with a control device that directs heated air to a separate outgoing flue made of non-combustible material and prevents the flow of combustion air to the fire box in case the heater stops. In heating devices with automatic fuel feeding, the feeding must stop in case of failure and the feeder must be equipped with a back-fire prevention system. The drying air flue must be provided with a temperature gauge in the furnace space from which the drying air temperature can be read.

5.3.4 Cold air drying machinery's additional heat sources

A warm air heater, a movable warm air heater equipped with a heat exchanger or a diesel engine used to operate cold air drying machinery may be used as an additional heating device for cold air drying machinery under the following conditions:

Air warmed using a warm air heater or a movable warm air heater equipped with a heat exchanger may be directed to cold air drying machinery so that there is an air gap between the warm air flue and the cold air drying machinery's fan to prevent the formation of under-pressure in the air ducts of the additional heating device. The air gap must be located outdoors in an as dust-free place as possible.

The exhaust pipe of a diesel engine used as an additional heating device must be sealed and insulated in the vicinity of flammable structures. The interior covering of the diesel engine shelter and the engine supports must be made of non-combustible materials. The shelter must be located at least 3 m from the dryer building. The air duct entering the dryer must be made of non-combustible material or its inner side covered with non-combustible material. The diesel engine shelter bordering on the wall of the dryer or situated inside the dryer must be made of structural parts at least of Class EI60. The air duct entering the drying machinery must be made of non-combustible materials over a distance of at least 3 m from the engine.

The diesel engine must be equipped with an automatic stop device that is triggered in the absence of oil pressure or if the engine overheats.

The exhaust pipe of the diesel engine must be sealed and insulated in the vicinity of flammable structures. The end of the exhaust pipe must be located outside at a distance of at least 1,500 mm from flammable structures and at a sufficient height from the ground surface. The end of the exhaust pipe must be located sufficiently far away from the drying machinery's air intake openings. The engine

must be equipped with a metal bund into which any oil or fuel dripping from the engine is collected and from where it can easily be seen and removed. An electrical heating appliance can also be used as an additional heating device. The fan of the electrical heating appliance intended for use as an additional heating device for the cold air dryer, including its necessary control and safety devices, must fulfil the requirements of the relevant standards. The electrical heating appliance may not be located closer than 1,000 mm from the grain to be dried or other flammable material. Drying air must be taken from a dust-free place outside.

5.4 Placement of the grain drying machinery's heating device

The heating device in the grain dryer must be located in a space made of structural elements at least of Class EI60 and whose floor is made of non-combustible building materials. There must be no access from the space housing the heating device to any other part of the grain dryer. If only one wall of the heating device space borders on the rest of the dryer building, the wall against the dryer must be of Class EI60 while the building elements facing outside can be of Class EI30. If the wall of the heating device space against the dryer is located at least 1,000 mm from the dryer building, the wall can be of Class EI30. The surface layer on the inside of the door in the external wall of the heating device space must be of ignitability class 1 and fire spread class I. The openings and doors of the heating device space must be located at least 2 m from the dryer wall made of flammable material.

For ventilation and the intake of combustion air, the heating device space must be provided with two meshed openings of at least 600 cm2, one in the upper part and the other in the lower part of the space. The opening used for combustion air intake may not be provided with a closable hatch. The combustion air opening can also be provided separately. In that case, its cross-sectional area must be at least 1.5 times the cross-sectional area of the flue of the drying machinery furnace. The furnace space of a drying machinery furnace using more than 30 kg of oil per hour must have mechanical ventilation based on over-pressure. The heating device must be located in such a way that the device and the flue can be properly swept, cleaned and maintained.

The heating device may also be located outdoors at a distance of at least 4 m from the grain dryer or other building when protected against rain and with a shelter.

5.5 Drying air ducts

The air heated must be conducted to the heating device directly from the outside through a duct. The duct air intake opening must be located in a dust-free place at a height of at least 1,000 mm from the ground surface. The opening of the drying air duct must be equipped with a metal mesh with a mesh size of 10 mm x 10 ... - 15 mm x 15 mm and a wire thickness of at least 1 mm. The walls of the drying air duct must be made of non-combustible building material, such as galvanized steel plate, suitable for the purpose and withstanding dents and corrosion. The drying air duct must be impermeable. The drying air duct and the humid air exhaust duct from the drying machinery must be dimensioned so that adversely high back-pressure will not develop in the drying air duct.

5.6 Flues

Flues can be made according to the instructions of the National Building Code of Finland concerning flues even in cases where the power of the drying machinery furnace exceeds 120 kW. If the flue is located at a distance of at least 1.5 m from the non-combustible walls of the dryer building or at least 3 m from a wall made of combustible building materials, it need not fulfil the dimensioning instructions for flues in terms of the height at which it is located. The flue must be correctly dimensioned so that the necessary draught can be ensured in all circumstances. A steel flue must have a rain cap at its upper end. The structure of the rain cap must prevent the development of over-pressure inside the flue. The rain cap must be easily openable for duct cleaning if the flue cannot be cleaned from below.

The chimney and the chimney connectors and connection flues of the fireplace connected to it must be placed in such a way that their surface temperature does not endanger personal or fire safety.

The surface temperature of visible or easily touchable chimney parts may not exceed 80°C. The feed-through point of the intermediate floor or ceiling at the wall contact point must be insulated with at least 100 mm thick non-combustible building material.

5.7 Emergency exit route

There must be an openable window or hatch at the upper level of the grain dryer, with an opening at least 600 mm high and 500 mm wide so that the sum of its height and width is at least 1,500 mm. If the lower edge of the window or hatch is located at a height of over 3.5 from the ground surface, a fixed ladder must be provided for exit. The ladder must extend at least 1.2 m from the ground surface.

5.8 Movable grain drying machinery

Unlike the location of a fixed grain dryer, movable grain drying machinery can be placed in a shelter situated at least 4 m from other buildings. Movable grain drying machinery can also be operated in a machine or storage hall suitable for its use and emptied for the duration of use, or in some other building of minor value situated at least 8 m from the nearest building. The arrangements must be agreed with the municipal fire authority before starting use.

6 Storage of fuel oil

The oil tank and the suction and return pipe must comply with the Decree on Oil Heating Equipment and the provisions issued under it. A movable oil tank or separate tanks that may be equipped with a pump may also be used as the fuel tank in oil-heated equipment in the grain dryer. The tank must be located at least 3 m from the burner.

The oil pipes must be metal oil pipes or oil hoses reinforced with woven steel fibre or oil hoses intended for the transfer of oil. The oil hoses must be attached to the oil tank for the duration of use in such a way that they will not become loose.

7 First-aid extinguishing equipment

When using the drying machinery, a hand-held fire extinguisher at least of power class 43 A 233 BC must be available outside of the furnace room. When using solid fuel, a shovel and a container of sand of at least 0.1 m3 must be available in the furnace room for putting out the fire in the firebox. If water is not available close to the drying machinery, the fire safety inspector can require that there must be a vessel of at least 200 l full of water, and a water bucket, outside of the grain dryer in operation. In addition, a hand-held fire extinguisher at least of power class 43 A 233 BC must be available inside for the drying machinery. The extinguishers must be properly inspected and approved. Inspection must be indicated on the extinguisher.

8 Maintenance and upkeep of the drying machinery

8.1 Use

It is for the user to make sure that the equipment and its immediate surroundings are in the condition required by use and that the use of the equipment will not cause any personal injury or environmental or property damage. When moving a fixed piece of equipment to another installation place, it must always be cleaned before it is taken into use.

8.2 Sweeping and cleaning of the fireplace and flues

The grain dryer's heating device, including flues, connecting ducts and chimney connectors, must be swept and cleaned once a year. The equipment and the related flues and warm air ducts must have a structure that allows them to be easily swept using ordinary sweeping tools or those delivered together with the equipment. The equipment must be provided with the necessary sweeping and cleaning hatches. In unclear cases, the number of sweeping times is decided by the rescue authorities.

8.3 Equipment maintenance and winter overhaul

Basic maintenance on the drying machinery is performed in autumn after the drying season according to the manufacturer's maintenance instructions. The drying machinery must be thoroughly cleaned for the winter. A special brush is available from the factory for cleaning the elevator pipe. Output openings are closed but cleaning hatches are kept open. However, the elevator's lower hatches are kept closed so that rodents cannot damage the belt.

Lubrication is performed according to operating instructions. The condition of the firebox and flue is checked. Waste from the flue and the other set of tubes can be pulled back the lowermost squared casing. If possible, the chimney must be closed for winter. The drying machinery must be kept as dry as possible all the time. The oil pipe shut-off valves are closed and the oil tank filled.

8.4 Maintenance before the drying season

The grain dryer's electrical equipment and wires are checked before the drying season. The condition and cleanliness of the grain drying machinery's heating device and its flues and connecting ducts are checked and any deficiencies corrected. Oil and electrical equipment may only be repaired by a professional. The tightness and condition of the elevator belts and V-belts is checked. The cold air drying machinery's diesel engine and its equipment are checked before the start of the drying season.

Extinguishing equipment is checked.

The oil burner is serviced and the operation of the drying machinery equipment checked with a test run.

9 Hot work

Welding, flame cutting and grinding work must, where possible, be performed outside of the dryer. If such repair tasks have to be performed indoors, the object of the work must be cleaned and wetted, and sufficient fire extinguishing equipment must be provided on site. Repair work may not be carried out when the grain drying machinery is in operation. When performing hot work, separate hot work safety regulations S621 must be complied with.

10 Supervision during use

The grain dryer, the drying machinery and the furnace room as well as the immediate surroundings of the dryer must be kept clean. Unnecessary combustible material, especially waste oils, must be removed from the grain dryer. The grain dryer must be kept as dust-free as possible. Especially electric motors and other electrical equipment must be cleaned sufficiently often. Smoking in the grain dryer is strictly prohibited. The use of open fire in the grain dryer is prohibited. During the drying, the operating instructions provided by the manufacturer must be followed and the operation of the drying machinery's heating device monitored in particular. The temperature of the combustion gases in the chimney connector may not exceed 350ºC with the highest permitted loading of the drying machinery furnace, or fall under 170ºC when the drying air temperature rises by 40ºC.

When stopping the drying machinery furnace, the fan may only be stopped when the temperature of the drying air coming from the drying machinery furnace has dropped to under 35ºC. The electric circuit of the drying air fan may only have a switch by means of which the drying air fan can be kept in operation after the temperature of the drying air has dropped under the aforementioned limit and the fan can be used when the burner is not in operation. In addition, the operator must at first supervise the operation of the drying machinery after the start-up of automatically monitored grain drying machinery.

An automatic alarm must be triggered in automatically supervised grain drying machinery if a key function in running grain drying machinery stops, e.g. the burner goes off or the temperature threshold values are exceeded.

The burner shuts down due to a power failure. Before re-starting the burner after a power failure, the temperature in the firebox must drop sufficiently low in order to avoid the danger of explosion.

If the elevator belt of a continuous dryer stops when the motor is running, the danger of fire will result. The belt must be provided with an under-speed preventer.

Monitoring must be continuous when a solid fuel heating boiler is used. For further information on the fire safety of grain drying machinery, see the machinery manufacturers' installation, operating and maintenance instructions. Practical advice in the fire safety of grain dryers is provided by the municipal rescue authority.

Pohjola Insurance Ltd, Business ID 1458359-3

Helsinki, Gebhardinaukio 1, 00013 OP, Finland
Domicile: Helsinki, main line of business: insurance
Regulatory authority: Financial Supervisory Authority, www.fiva.fi

Pohjola Insurance