**K21045**
**SCP06/01**
**2023-12-01**

# Specific Certification Program Fire Protection Systems – Application

Fire Protection of life stock in stables based on watermist

Trust
Quality
Progress

# Preface

This specific certification program has been accepted by the Kiwa Board of Experts Fire Safety, in which all relevant parties in the field of Fire Protection Systems are represented. The Board of Experts also supervises the certification activities and where necessary requires the evaluation guideline to be revised. All references to Board of Experts in this evaluation guideline pertain to the above mentioned Board of Experts.

This certification program will be used by Kiwa in conjunction with the Kiwa Regulations for Certification within the context of Certification Scheme K21045 “Fire Protection Systems”.

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# Contents

# 1 Introduction

## 1.1 General

This specific certification program includes all relevant requirements which are employed by Kiwa when dealing with applications.

This specific certification program is a first version and shall be used in context with product certification scheme K21045 “Fire Protection Systems”.

In animal stables are flammable materials present and life stock.
Mostly caused by electrical defects can create a powerful stable fire.
Kiwa has drafted this initial type testing protocol to prove the effectives of fire protection systems in this typical scenario of a stable fire.

The following standards have been in scope in drafting this specific certification program:

- Annex A of EN 14972-1 of 2020 - Fixed firefighting systems - Water mist systems - Part 1: Design, installation, inspection and maintenance;
- EN 54-20 of 2016 - Fire detection and fire alarm systems - Part 20: Aspirating smoke detectors;
- ISO/TS 7240-30 - Fire detection and alarm systems - Part 30: Design, installation, commissioning and service of video fire detector systems.

Following annex A.2 of EN 14972-1 have the fire hazards been assessed for this scope:

| | | |
|---|---|---|
| a. | fuel | Class A material according to EN2:<br>1. bottom coverage like turf and feed;<br>2. wood construction roof;<br>3. isolation material roof;<br>4. cables for armatures and the armatures itself;<br><br>The market consultation showed that most stables have a concrete floors with concrete walls up to 2 meters topped with a roof construction. |
| b. | arrangements | 1. several bottom covers in a compacted situation with a height of about 5 cm.<br>2. wood crib<br>3. plate material under construction plate<br>4. wood crib |
| c. | size | 1.about 1 by 1 meter for testing<br>2. standard wood crib for testing of total flooding systems<br>3. standard dismission isolation plate material with a minimum of 1 $m^2$<br>4. standard wood crib for testing of total flooding systems |
| d. | obstructions | Non |
| e. | ignition | Electrical is most obvious.<br>For this test a n-heptane catalysator in a can with a minimum pre-burn standard for testing of total flooding systems |

Table 1.

Following annex A.4 of EN 14972-1 have the performance objectives been set for this scope:

| | Objective | |
|---|---|---|
| a. | structural integrity | Building > yes |
| b. | damage to sensitive equipment or systems | No |
| c. | smoke damage | Yes > life stock |
| d. | water damage | No |
| e. | visibility | No |
| f. | tenability | Yes |
| g. | flash-over prevention | n/a |

Table 2.

The defined set of test fires include:
a) the anticipated worst-case fires with respect to possible consequences;
b) fires of greatest challenge to the tested water mist system with respect to the particular application.

Note
In the drafting of this specific certification program have following considerations been addressed based on market consultation:

- The integration with existing watermist systems with the function to control the temperature in the stable for life stock;
- The integration with existing video surveillance systems with the function to observe the life stock in the stable;
- This integration is needed to make the return on investment better for the user(s) of these systems to influence the decision to make these investment to protect life stock;
- The primarily experience with a total flooding in stable(s) with this fire protection system is not averse on the population of the life stock.

## 1.2 Field of application / scope

The performance requirement for large fires in stables based on the typical hazard configuration as found today in these stables (Ordinary Hazard class stables).
The fire protection system shall meet the assessments for OH stable.
The fire protection system configuration in this specific certification program is based on a total flooding deluge watermist system.
The goal of the test is fire suppression.
Based on the results of this test protocol in this specific certification program is additional listing possible.

## 1.3 Acceptance of test reports provided by the supplier

See TIC scheme K21045.

## 1.4 Quality declaration

See TIC scheme K21045.

# 2 Terms and definitions

See TIC scheme K21045.

# 3 Procedure for granting a product certificate

See TIC scheme K21045.
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# 4 Setup of this specific certification program

## 4.1 General

This chapter contains the setup for the specification certification program.
For the performance of its certification work, Kiwa is bound to the requirements as included in EN-ISO/IEC 17065 “Conformity assessment - Requirements for bodies certifying products, processes and services” and certification scheme K21045.
This program describes a test plan for this typical fires scenario.
It describes the test requirements and/or laboratories to be used for the testing, identifies the tests to be performed and provides in minimal schedules for test activities.

# 5 Testing the performance of the system

## 5.1 Test protocol abstract for stable hazard configuration

The test objective is a stable fire.
The test room shall have the following minimum dimensions:

- minimal length 50 m,
- minimal width 10 m,
- minimal height 4 m.

The test room is at least 500 m2 and 2.000 m3.
These dimensions can be scaled up for the test.
The walls of this test room are made from materials with a class A according to EN13501-2.

## 5.2 Igniter fuel specifications

The igniter used for the pre-burning purpose in this protocol shall be a commercial grade n-Heptane (further revered to as “heptane”)

| **Commercial grade n-Heptane criteria** | | |
|---|---|---|
| **Part** | **Specific part** | **Remark / number** |
| Distillation | Initial boiling point | 90 °C minimum |
| | Dry point | 100 °C maximum |
| Density | at 15,6 °C | 700 ± 50 kg/m3 |
| MSDS | CAS # | 142-82-5 |
| | EINECS # | 205-563-8 |

## 5.3 General test conditions

At the time of actuation of the system, the amount of oxygen within the enclosure at the level of the crib shall not be more than 0,5 % (volume fraction) lower than the normal atmospheric oxygen concentration. During the test, the oxygen concentration shall not change more than 1,5 % (volume fraction) due to fire products.

## 5.4 Fire cells ground level (1 min)

The fuel for the fire cell for this test at ground level are following:

- Section 1; hay with specification xxx; 5 cm thick after been rolled with a 5 kg roller; humidity xx %;
- Section 2; peat with specification xxx; 5 cm thick after been rolled with a 5 kg roller; humidity xx %;
- Section 3; food granulate with specification xxx; humidity xx%.

The igniter fuel per section is 1 liter heptane what is sprinkled at one end of the section on the hay, peat and food granulate about 1 minute before testing. The igniter fuel shall be allowed to burn freely for a total pre-burn time of 1 min +10 sec.

## 5.5 Fire cells 60 cm above ground level - wood crib (2 min)

The fuel for the fire cell for this test at 0.6 meter above ground level is following:
Crib igniter fuel Ignition of the crib is achieved by burning 1,5 l of heptane on a 12,5 l layer of water in a square steel pan 0,25 m2 in area, 100 mm in height and with a wall thickness of 6 mm. Fire configuration and placement The wood crib is to consist of four layers of six, approximately 40 mm × 40 mm by 450 mm ± 50 mm long, kiln spruce or fir lumber having a moisture content between 9 % and 13 %. Place the alternate layers of wood members at right angles to one another. Evenly space the individual wood members in each layer forming a square determined by the specified length of the wood members. Staple or nail together the wood members forming

the outside edges of the crib. The crib shall be pre-burned on a stand supporting the crib. The distance from the bottom of the crib to the top of the pan holding the igniter fuel shall be 300 mm. The bottom of the crib shall be 600 mm above the floor.
Centre the crib with the bottom of the crib approximately 300 mm above the top of the pan on a test stand constructed so as to allow for the bottom of the crib to be exposed to the atmosphere. The pre-burning shall not be influenced by weather conditions such as rain, wind, sun, etc. The maximum wind speed in the proximity of the fire shall be 3 m/s. If necessary, adequate means for protection against wind, etc. may be used. Record the weather conditions including location of pre-burn, air temperature, humidity, and wind speed.
Ignite the heptane and allow the crib to burn freely. The crib shall be allowed to burn freely for a total pre-burn time of 2 min +10 sec.

## 5.6 Fire cells 2 meter above ground level – EPS materail (30 sec)

The fuel for the fire cell for this test at 2 meter above ground level is following:
2 plates of EPS isolation material with minimal of 2% polystyrene with the dimensions 120 x 60 x 5 cm. These plates are mounted mechanically on the bottom of a plate with a class A according to EN13501-2. The combination of these plates have been conditioned at ambient room conditions for at least 24 hours.

The igniter fuel per plate is heptane in a test can with following dimensions:

- inner diameter of 80 mm to 82 mm,
- wall thickness of 5 mm to 6 mm,
- height of 100 mm to 110 mm.

The can shall be filled with heptane up to a height of 50 mm to 55 mm.
The can is positioned 20 cm under the surface of the EPS plate at one of the corners. The outside of the test can is 10 cm poisoned from the corner of the plate.

The igniter fuel in the test cans shall be allowed to burn freely for a total pre-burn time of 30 seconds +5 sec.

## 5.7 Fire cells 3,5 meter above ground level – fire class B

The fuel for the fire cell for this test at 3,5 meter above ground level is following:

The igniter fuel per plate is heptane in a test can with following dimensions:

- inner diameter of 80 mm to 82 mm,
- wall thickness of 5 mm to 6 mm,
- height of 100 mm to 110 mm.

The can shall be filled with heptane up to a height of 50 mm to 55 mm.
The can is positioned 20 cm under the surface of a steel plate of minimal 3 mm thickness and a square outside dimension of 20 by 20 cm.

The igniter fuel in the test cans shall be allowed to burn freely for a total pre-burn time of 15 seconds +5 sec.

## 5.8 Protocol

The fire protection system components shall be arranged in accordance with the supplier's specifications.
The fire shall be ignited for each test and have a free burning time as is specified.

During the test shall determine if the effectiveness of the applicable fire detection system that is tested in addition with the fire protection system itself.

After the end of the activation of the fire protection agent shall remain active for at least 15 / 30 / 60 minutes in the protected compartment.

During this period the fire cell shall be monitored for signs of active fire and signs of spontaneous activation, based on the temperature measurements in the vicinity of the fire cell.

After this period the fire cell shall be inspected visually for signs of active fire or signs of renewed activation in the test room without the presence of the fire protection agent.
Any signs of fire shall be described in the report.
The temperature of the fire cell and room shall be recorded.

Visible fire is considered as a sign of spontaneous activation, but solely smoke is not.

The result of the assessment and tests shall be declared in the attachment of the product certificate.

## 5.9 Test protocol detail

The test is carried out in a sufficient air-tight room. Doors and windows shall be closed. However, a limited “open” area, for example small gaps/notches between wall and ceiling may be present. Any forced ventilation system or apparatus/system that will affect the density in the room, shall be shut down during the activation of the fire protection systems.
The test shall be based on the configuration of the supplier specifications.

The test of the fire extinguishing effect shall be made under the following conditions.

| With regard to | Requirement/ Function | Unit | Tolerance |
|---|---|---|---|
| Fire class to EN2 | According Fire Class A | N/A | N/A |
| Thermal energy/power | According test protocol | N/A | N/A |
| Burning time due to catalyst | According test protocol | Minutes | See protocol |
| Catalyst | Heptane | N/A | N/A |
| Relative humidity in the room, before the fire, measured with a hygrometer | 60 | % | ± 20% |
| Ambient temperature before | According test protocol | °C | According test protocol |
| Temperature in the test room | Ambient<br>Note: According test procedure. Otherwise determined using at least 2 thermocouples on the ceiling with ΔT 10 sec recording using a data logger | °C | 5, N/A for ambient |
| Dimensions of the test room | According test protocol | m and $m^3$ | - 0 / + XX |
| Ventilation during the pre-burning time and free burning time, using constant measurement | Adequate ventilation | N/A | N/A |
| “Open” area or leakage area and position during extinguishing | According test protocol | % in $m^2$ | -0.1 / +0 |
| Air flow through the room | Non-forced (Natural), <3 | m/s | -1 / +0 |
| Oxygen level in the room | According test protocol | % O2 | According test protocol |
| Closing of the test room after igniting the fire | According test protocol | s | N/A |
| Required amount of fire extinguishing agent | Supplier’s design formula | gram/$m^3$ | Supplier’s design formula |
| Extinguishing time | According test protocol | s | According test protocol |
| Monitoring time | According test protocol | s | According test protocol |
| Agent discharge | According test protocol | s | According test protocol |
| Weight / volume of agent to determine the density / flux | During the fire test | litres | ± 5% |
| Activation fire protection system | Supplier’s system | N/A | N/A |
| **Instrumentation** | | | |
| Weighing scale | Measurement (Incremental) from approx. 0 till approx. 75 | Kg | ± 0.005 |
| Oxygen meter | Measurement from | % O2 | ± 0.1 |

| With regard to | Requirement/ Function | Unit | Tolerance |
|---|---|---|---|
| | approx. 0 till approx. 25 | | |
| Recorder | Logging temperature with sample rate of 1 per 5 seconds | °C | ± 5% |
| Thermocouples | The use of K type thermocouples (Ni-CrNi), diameter 1 mm, is recommended. | N/A | N/A |

"Open" areas are generally allowed as, for example, small gaps/notches between wall and ceiling but not as, for example, open ventilation piping or a hole/opening in a wall or ceiling.

- Open ventilation piping or a hole/opening in a wall or ceiling are to be considered as a an defect regarding the architectural and/or technical design of the room.
- Small gaps/notches between wall and ceiling are to be considered as a an defect regarding the architectural finishing of the room.

## 5.10 Mandatory registrations during the test

Mandatory registrations during the test in seconds are:

- Time of activation of the heptane
- Pre burning time (catalyst / igniter)
- Free burning time
- Time of initial activation of the fire protection system
- End of the suppletion of the fire protection media
- Time at which the flames are extinguished (if possible)
- Soak time of the total flooding system

There shall be adequate ventilation during the pre-burning and free burning time and the oxygen concentration in the test room shall be maintained. If this cannot be guaranteed then during the activation the oxygen percentage at the level of the source of fuel shall not deviate more than 0.5 vol% from the normal percentage under ambient conditions and the oxygen percentage shall be measured with a calibrated oxygen gauge using a sensor at the same level as the source of fuel.

# 6 Factory Production Control Fire Protection Components by Kiwa

See TIC- scheme K21045.

# 7 Inspection of Fire Protection Systems by Kiwa

See TIC- scheme K21045.

# 8 Marking

## 8.1 General

See TIC scheme K21045.

## 8.2 Certification mark

See TIC scheme K21045.

# 9 Requirements in respect of the quality system

See TIC scheme K21045.

# 10 Summary of tests and inspections

See TIC scheme K21045.

# 11 Agreements on the implementation of certification

See TIC scheme K21045.

# 12 Titles of standards

## 12.1 Public law rules

See TIC scheme K21045.

## 12.2 Standards / normative documents

See TIC scheme K21045.

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