Journal of Environmental Protection, Safety, Education and Management

2016, Number 7, Volume 4, date of issue 30th Juni 2016 ISSN 1339-5270 (print) ♦ 2453-9813 (on-line)

FIRE PROTECTION SYSTEM OF THE BUILDING FOR THE NATURAL SMOKE AND HEAT EXHAUST

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ABSTRACT

Goal of this report is to inform about one of the fire protection systems of the building serving for the natural smoke and heat exhaust in case of the fire which thus improves conditions for a safe evacuation and enables a simpler action for the fire brigade. Further it also exhausts hot gases from the building which occur during the fire. It uses so called „ stack effect" – by opening the flap in the spot or possibly belt air shaft there starts exhausting of the burned gases from the polluted area into the atmosphere outside of the building. Construction of the building is not being overheated , the fire is not being spread into the surrounding, the fire brigade locates the centre of the fire immediately – they minimalize the losses on lives and property.

KEY WORDS: *Fire, fire brigade action, protection system, stack effect, burned gases exhaust, escape zones*

INTRODUCTION

Equipment for a natural smoke and heat exhaust (fire protection equipment of the building) creates , in case of the fire , a layer with no smoke above the ground and thus improves the conditions for a safe evacuation and enables a simpler action of the fire brigade. Further it also exhausts hot gases from the building which occur during the fire. It uses so called „ stack effect" – by opening the flap in the spot or possibly belt air shaft there starts exhausting of the burned gases from the polluted area into the atmosphere outside of the building.
Construction of the building is not being overheated , the fire is not being spread into the surrounding, the fire brigade locates the centre of the fire immediately – they minimalize the losses on lives and property. It is important to provide for the sufficient fresh air inlet. Flaps are being opened with an independent circle of CO_2.

- Protection of human lives - exhausted smoke does not pollute escape zones.
- Quick identification of the fire centre and unproblematic fire brigade action.
- Building protection against overheating and consequential collapsing.
- Protection of the production technologies, products and supplies against burning due to the spreading fire.
- Lowering of the economic losses – quicker production commencement after the fire.

Equipment for the natural smoke and heat exhaust of the type SEP ZOKT flap is proposed as an automatic fire exhaust system according to the requirements of ČSN 73 0802, ČSN 730804 according to the French standards: NFS 61 – 937 and technical instructions No. 246 and 247. Equipment for the smoke and heat exhaust with a natural exhaustion according to STN EN 12101-2, from the system aluminium profiles of different producers. Test : reliability, opening at the snow and side wind loading, low temperature of the surrounding, heat resistance according to STN EN 12101-2 (EN 12101-3) classification according to STN EN 12101-2 for the gearing producer – classification, certification, certificate with a CE conformity mark . Certificate and test protocols are valid in the entire EU.

MAIN FUNCTIONS OF THE EQUIPMENT IN CASE OF THE FIRE

- To ventilate the premises with a fire risks with the gases exhaust via the roof deck (the last above-ground floors) and with a gases exhaust through the shafts (multi-storey buildings),
- To enable the people and animals escape from the building or to safe their lives in a different way,
- To ventilate the premises where the dominant measures are the height and length,
- To prevent from or to postpone a full fire spreading,
- To protect the building equipment and furnishing,
- To lower heat effects on the building construction during the fire,
- To lower damages caused by the fire.

PRODUCT IS BEING USED BASED ON THE FOLLOWING CONDITIONS

- Air shaft can be installed in the roof deck of the building only,
- Air shaft must be installed in such way so that the exhausted smoke would not have any impacts on the adjacent or neighbouring buildings,

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- Surface layer of the roof deck if it is produced from the flammable materials (degree of flammability C1, C2, C3 according to STN 73 0862) or the flammable materials are located close to it , must be protected against led or radiated heat (with a 0,5 m wide air shaft, 0,5 m wide layer of the material with the degree of flammability A, B according to STN 73 0862),
- Air shaft must be located minimally 4 m from all vertical borders of the fire zone,
- geometric area Ag must be with no obstacles 1 m under the air shaft and above it as well or it must be enlarged by the double cross-section of the obstacle,
- hand remote control is recommended to be installed as close as possible to the entrance (on the access or emergency road) into the premises with a minimal measure of the fire danger , or possible to be installed close to the maintenance room,
- air shaft is not determined for the premises with the aggressive atmosphere that could cause a loss of the air shaft functioning.

Equipment is constructed as an automatic equipment – running (opening) of smoke flaps in three different ways:

- hand opening (opening only) – operator,
- heat opening – entry from a subsidiary source (heat sensor),
- electro-signal – with an impulse from EPS(electric fire signalisation).

In frame of the correct functioning of ZODT , it is necessary to realise regular revisions yearly in accordance with the requirements of the Ordinance of the Ministry of Interior of CR (MV CR) No. 246/2001 (Ordinance of MV ČR No.21/1996 of Code).
These revisions can be realised by an authorised legal or physical entity only who is able to realise such activities based on the training from the producer.

CONTROLS

Equipment itself for the natural smoke and heat exhaust has been proposed as the automatic fire exhaustion. Entire system can be controlled by hands or by a system of electric fire signalisation. System enables smoke flaps opening in case of the fire.

SYSTEM ACTIVATION

Opening is realised through a pressure medium of CO_2 which has been supplied into each control box in a form of compressed little bombs with a certain weight. Activation of smoke flap is realised by breaking of a glass on the control box for a certain smoke zone. By running a firing pin lever „ OPENING „ a pin causes a puncture of a filling lid of CO_2 and the compressed medium will bring the smoke flaps under pressure. By running of the firing pin lever , a tag „ OUT OF OPERATION „ will occur which is hidden with the door and a limiter will prevent from the delivery of the medium into the system.

SYSTEM CLOSURE

System closure is being realised through the second compressed medium of CO_2 being delivered into each control box in the form of compressed little bombs with a certain weight. Closing of the smoke flap (smoke section) will be realised through the firing pin lever running with a sign „CLOSURE“. Running of the firing pin lever with this sign causes that the pin will puncture the lid of the CO_2 filling and the compressed medium will bring the pistons of the smoke flap for the certain smoke section under pressure and thus the entire section will be closed.
To activate the system again , we release the firing pin lever „ OPENING“ and it will be moved to its original place and a new little bomb will be installed (with a relative weight). And thus the entire system will be active again.

CONTROL ROOM OPERATION

Control box of the equipment for the smoke and heat exhaust located close to the entrance door or in the space of a hydrant boxes has been equipped with a pressure vessel with CO_2. Gas CO_2 is led from the control box to the single self-opening equipments in the roof through a separate copper pipe system.

PNEUMATIC – ACTIVATION OF A SMOKE FLAP FROM A SUBSIDIARY SOURCE

Subsidiary source – a heat trigger is being placed under the roof deck of a certain smoke section and it will control certain number of smoke flaps. Automatic running starts with melting of a heat safety devise made from an eutectic alloy set for

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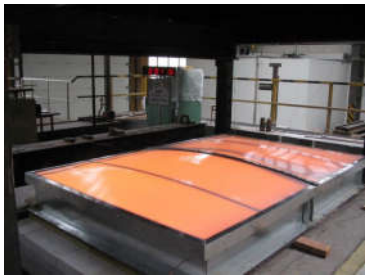
the working temperature of 93°C (68° or 141°C) and with a firing pin release which punctures the lid of CO_2 filling , and thus the compressed medium will bring the piping from the heat sensor to the smoke flap including a piston under pressure.

AUTOMATIC – ACTIVATION OF A SMOKE FLAP THROUGH ELECTROSIGNAL – WITH AN IMPULSE FROM EPS

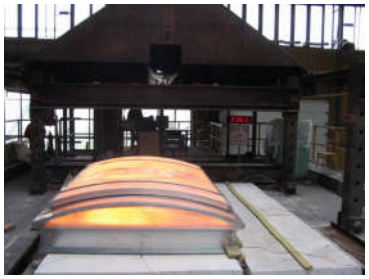
Automatic activation of smoke flaps is being realised through the electro-signal from EPS (it is necessary to bring an impulsive voltage of 24V, 0.15 A) which has been addressed according to the smoke sections (each smoke section creates a separate smoke exhaust zone). It operates opening of the equipment for the smoke and heat exhaust including door opening for the fresh air inlet.

Estimated life time of ZODT (is up to 25 years) depending on a building location, external and internal surrounding and a correct installation. Regular cleaning during this period of time can help to keep an optimal light permeability. Polycarbonate should never been used for the panels of a dark colour or with a sealing of a dark colour because it could lead to the increase of temperature thus causing softening, deformation and damaging. Polycarbonate plates must be isolated from the panels with a plastizol layer with a tape or a suitable sealing.



Picture No. 1, SEP ZOKT flap after starting the resistance against heat according to the CSN EN 12101-2 in a testing room.

Picture No. 2, air shaft VARASS with SEP ZOKT window during a test of the resistance against snow loading according to the CSN EN 12101-2 in a testing room.



Picture No. 3, air shaft VARASS with SEP ZOKT window after 5 minutes of testing resistance against heat according to the CSN EN 12101-2 in a testing room.

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Picture No. 4, air shaft VARASS with SEP ZOKT window after the activation during testing the resistance against heat according to the CSN EN 12101-2 in a testing room.

CONCLUSION

Roof air shaft SEP ZOKT flap is determined for a natural smoke and heat exhaust to create a smoke-free layer during fire above the ground in such way so that it offtakes the smoke and thus improves the conditions for a safe escape, people and animal rescue and property saving and enables to eliminate fire in its early stage. It also offtakes hot gases released from the fire in the stage of the fire development. In the normal operation conditions , it serves for the natural backlighting. Equipment is determined for the installation into the roof deck of the building.

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