



North Area Fire Safety Technical Review Meeting

Fire detection, protection, and voice alarm systems for underground facilities

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Scope of the systems presented hereafter:

Extraction from:

SPS North Area Fire Risk Assessment

Summary of prescriptions and recommendations

EDMS No: 2135860v1–April 2019

A. Arnalich, HSE-OHS-XP

02	Mandatory for life safety and environment protection Covers also property protection and continuity of operations	Underground areas	Integration of Fire Safety actions Upgrade or replace fire detection system to ensure early detection . Install a system capable of transmitting an alarm, along with a message containing safety instructions, to occupants anywhere in the North Area. This alarm shall be triggered upon fire detection, action on evacuation push buttons, CERN FB action out of CERN FB SCR/CCC or BIW (beam imminent warning) situations. Evacuation push buttons shall cover all premises. Integrate fire detection and evacuation push buttons with safety actions such as compartmentalization, ventilation stop and other machine functions according to a predefined fire protection logic.
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Outline

1. Areas to be protected
2. System architecture
3. Fire detection system
4. Fire protection system
5. Voice alarm system

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1. Areas to be protected

As mentioned in EDMS-1895523V1 page 9
(North Area Fire Risk Assesment, underground areas)

- TT81, TT82, TT83, TT84, TT85
- TDC2, TDC8, TDC85
- PA80, TA801, PGT802, TA802
- TCC2, ECN3, TCC8
- PA852, PP851,PT853, PT854



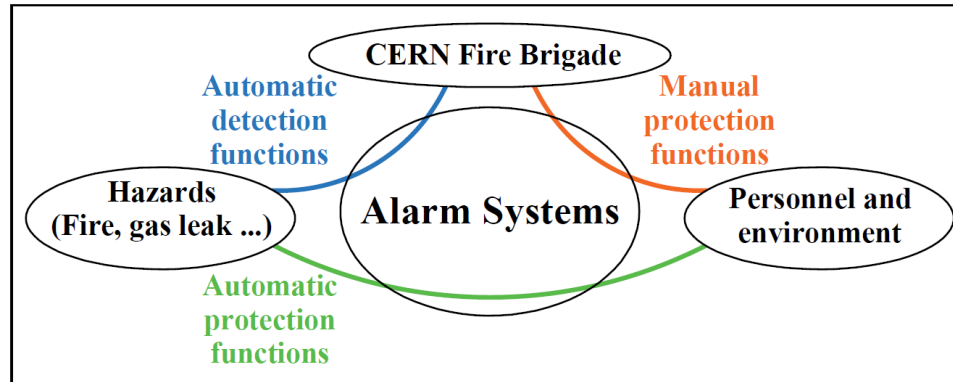
Outline

1. Areas to be protected
2. **System architecture**
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2. System architecture

CERN Alarm Systems are able to provide 3 types of functions:

- **Automatic detection functions:** To detect a hazard (as a fire or a gas leak) and trigger an alarm at CERN Fire Brigade for an immediate intervention
- **Automatic protection functions:** To detect a hazard (as a fire or a gas leak) and protect personnel and environment
- **Manual protection functions:** To trigger manually protection for personnel and environment

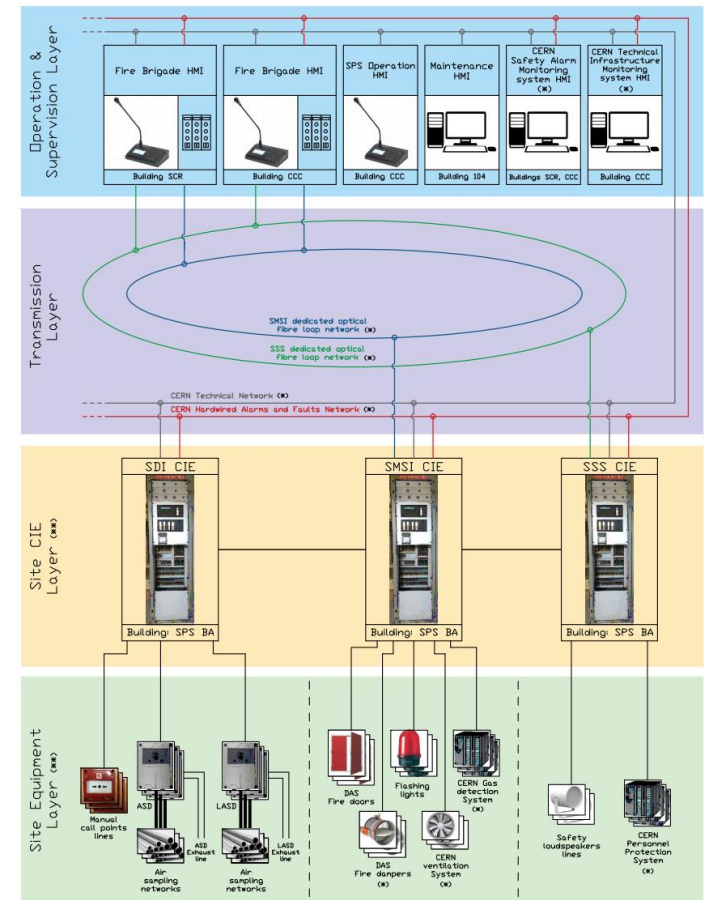


➔ [Paper WEPOR029](#)

2. System architecture

Fire safety system designed on the **same principles** and **as an extension** of the fire safety system installed in SPS Ring during LS2:

- Made of 3 subsystems: fire detection system, fire protection system, voice alarm system
- Organized in 4 layers
- Based as much as possible on standard components and installation rules



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3. Fire detection system

Specific constraints:

- Long distances (up to 700m from detector to last air sampling point)
- Radioactivity



Specific product development:

- Long Distance Aspirating Smoke Detector (LASD)
- Based on EN54 detectors

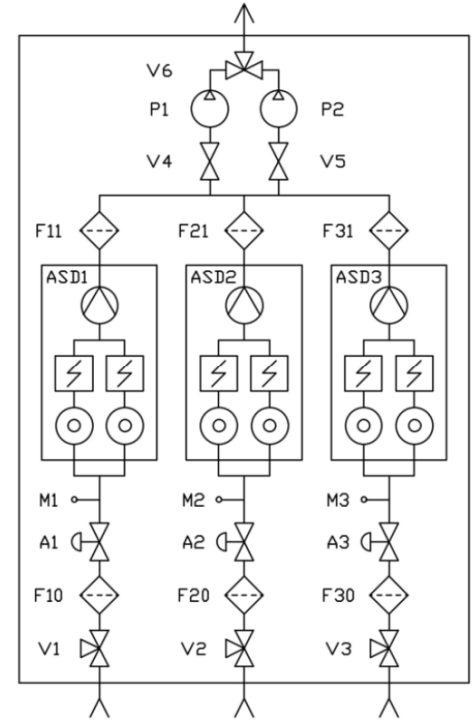
ICFSST'2020



➔ [Paper 20UK090117](#)



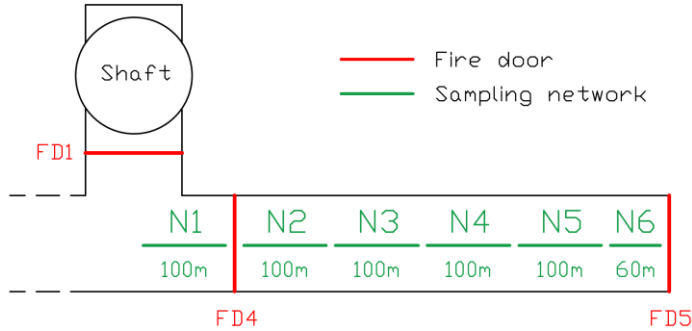
Exhaust line going to the top of the shaft (in the radiation controlled area)



Air sampling networks coming from underground areas

3. Fire detection system

Performances: example of SPS point 6:

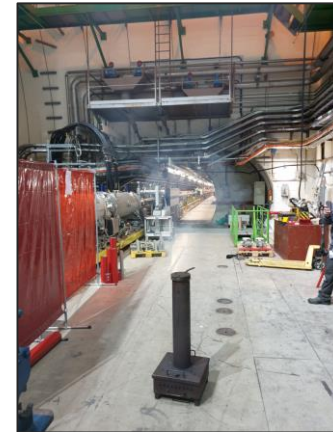


Network	Air speed (m/s)	Aspirating pressure (mbar)	Transport time (s)
N1	2.5	-255	114
N2	3	-200	121
N3	3	-255	184
N4	3.5	-200	145
N5	3.5	-255	236
N6	3.5	-252	164

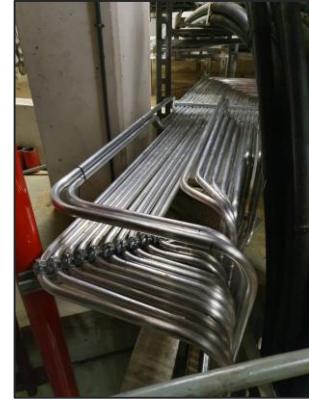
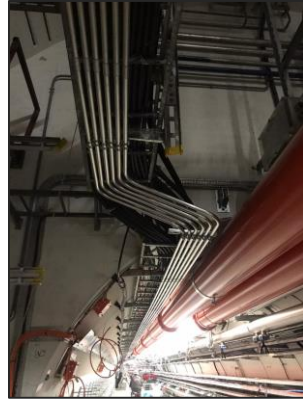
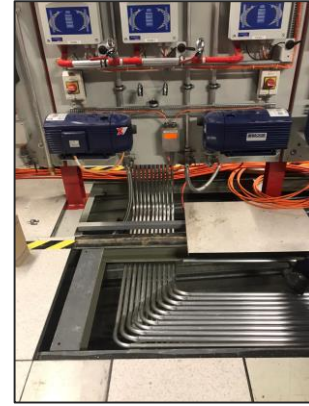
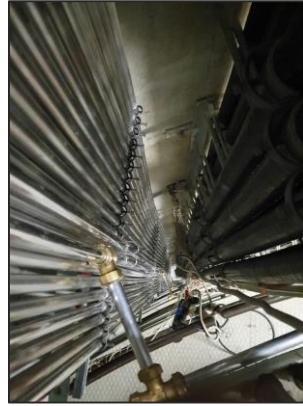
General detection performances:

- Fire Testing References (APSAD R7 rule)
- Tests done with beech logs or cardboard rolls

Detection time		
Min	Avg	Max
2 min	5 min	8 min



3. Fire detection system



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3. Fire protection system

Standard NF-SSI system:

- To manage 2 types of safety functions: compartmentalization, evacuation
- To monitor and control fire dampers and fire doors
- Possibility for fire brigade to trigger manually safety actions (evacuation and compartmentalization) from surface buildings, Safety Control Room (SCR), and CERN Control Center (CCC)



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3. Fire protection system

Standard EN-54 system:

- To broadcast pre-recorded messages in case of evacuation of Beam Imminent Warning
- To broadcast voice messages using microphones from surface buildings, Safety Control Room (SCR), and CERN Control Center (CCC)



Standard evacuation sound



BIW evacuation sound



Thank you for your attention !



