EUROPEAN LABORATORY FOR PARTICLE PHYSICS

CERN – ST DIVISION

Technical note

CERN-ST-98-035
September 1998

Smoke Control and "Desenfumage" systems

J. Inigo-Golfin and P. Pepinster

Abstract

The intention of this technical note is to explain what a smoke control (SC) system is, and to what extent SC systems (and derivatives) are used at CERN. The role of ST Division in relation to these systems will be analysed, and some improvements suggested.

This note is particularly addressed to people with local safety responsibility (TSO, DSO, etc.) but it also might be of interest to the CERN user in general. The complete list of facilities, under the responsibility of ST, having any relation with the control of smoke can be found at the end of the note.

(Document available at: **http://alice.cern.ch/Preprints**)

1. Introduction

The present technical note reviews the concept of “desenfumage” (as termed in the French and French translated Swiss legal texts) and the smoke control systems, as referred to in North American legal texts. The reason for choosing these three national standards is obvious; the first two standards are those of the "Host Countries", whereas the third is one of the most complete “Fire Prevention” codes in the world.

The documents this technical note is based upon are listed in the References [8.].

In the absence of general guidelines provided by CERN’s safety authorities (neither for new facilities nor existing ones after refurbishment or up-grade), the decision whether to implement SC systems have been taken on a case-by-case basis. No criticism on any specific decision is made here, but the end-result today gives a picture of incoherence throughout CERN.

Being responsible for the design, installation and maintenance of such equipment at CERN, ST engineers feel that the void in the internal prescriptions and safety codes creates a frequent misunderstanding over the efficiency, the reliability and even the real functionality of the systems at tests and check-ups.

In this context, it must be stressed that the existence of a SC system in a particular building is a matter for the local responsible person and TSO to decide. In a new project, the project leader holds the responsibility. The role of ST Division is, in this case, limited to ensuring that the equipment works in accordance with the specification and following the tests during the commissioning.

In the following paragraph the reader will go through the main purposes of SC systems, how the functions are obtained from the hardware point of view, to finish up with some recommendations on how the handling of these systems could be improved.

2. Purpose of Smoke Control Systems

Smoke Control (SC) systems are intended to control the migration of smoke to maintain tenable conditions in protected areas.

They should be engineered for the specific occupancy and building design, and should be co-ordinated with other life (or property) safety systems, like sprinklers, so that they complement, rather than counteract, each other.

In particular SC systems are implemented to accomplish one or more of the following functions:

- Maintain tenable conditions in the means of egress (emergency exits) during the time required for evacuation.
- Control and reduce the migration of smoke from the fire area.

- Provide conditions outside the fire zone that will assist emergency personnel to conduct search and rescue operations and to locate and control the fire.
- Contribute to the protection of life and reduction of property loss.

Where SC systems are provided they should be activated during the early stages of the fire emergency to maintain a tenable environment in the areas to be protected, and should be functional during the evacuation of the areas protected by the system. Although SC systems are designed to control the migration of smoke into the protected areas, it should not be expected that such protected areas would be completely free of smoke.

3. Principles of Smoke Control

Smoke control can be achieved by supplying air to and exhausting air from the fire compartment, by means of two basic principles:

- Air pressure differences of sufficient magnitude across "barriers" will control smoke movement.
- Airflow in itself will control smoke if the average air velocity is of sufficient magnitude.

Dilution of the smoke is not a means of achieving smoke control. The primary means of controlling smoke movement is by creating air pressure differences across partitions, floors and other building components (barriers). The basic concept of building pressurisation is to establish a positive Δp in adjacent spaces with respect to the smoke zone. In this way, air moves into the smoke zone from adjacent areas and smoke is inhibited from dispersing throughout the building.

The extraction of the smoke is achieved by properly scouring the volume of the smoke zone by means of the mechanical extraction. In order for the smoke exhaust fan to be effective, makeup air must be provided, sufficiently diffused so as not to affect the flame or smoke.

This makeup air is also of the utmost importance in what concerns the conditions in the smoke zone. A badly ventilated fire will produce poor combustion. This in turn will provoke the formation of cold, heavy gases, which will lose buoyancy, causing the smoke to descend and visibility to be reduced. A second effect of badly ventilated fires is the formation of toxic gases (mainly CO).

4. Smoke Control Systems

A usual classification within the SC systems is made between floor protection systems and shaft protection systems. Within the floor protection category, which is the one this document deals with, one has the possibility of using dedicated or non-dedicated systems to control smoke.

- Dedicated systems are those intended for the purpose of smoke control only

whereas

- non-dedicated systems are those which share components with other systems, such as the heating, ventilation and air-conditioning system (HVAC) of the building.

Each of these kinds of systems has its pros and cons. The relevant aspect to consider here is the system integrity. By this term, it is meant that the design, installation and maintenance of these systems must be such that the system will remain effective during at least the evacuation of the protected areas, if other considerations do not impose longer periods of time for maintaining the effectiveness of the system.

The most important items that should be considered here are:

Equipment materials and construction

The components (fans, actuators, etc.) must remain effective during a given length of time when the temperature of the smoke is equal to or below 400 °C. The exhaust conduits (ducts, connectors, fittings, etc.) must be in non-flammable materials (class M0, French standard). All these ratings of the materials must be properly documented by means of the proper certificates.

In the case of non-dedicated systems, consideration should be given to the construction of the unit, in case that filtering is necessary for the HVAC functionality. Filters could become easily clogged by particles carried away by the smoke during the early stages of the fire scenario, and the system performance would collapse.

Power supply

The power source must be reliable. The French standard actually imposes for this a so-called security (no-break) power source.

The wiring for the power of the exhaust fans (in the case of mechanical systems) must also be secured.

The arrangement of power distribution must be adequate (attention to emergency stops!) and the internal wiring is often required to bypass most of the protections usually provided for HVAC plants (eg thermal or over-current protection).

5. Smoke and Heat Vents

Another important element to consider within the SC systems is the smoke and heat vent. These elements are designed to draw hot gases and smoke out of a building in the event of fire. Such extraction helps to a safer and speedier extinguishing of fire and make evacuation easier. To illustrate the importance of venting, one must bear in mind that, other than the damages caused by the smoke, that the mixture of CO_2 and the oxygen of the air – and also all combustible materials present in the fire zone - becomes self-igniting, at temperatures around 550 °C (flash-over).

In addition to this, for concentrations of oxygen in the air below 12 % humans begin to have difficulties to move, and below 9 % loss of consciousness occurs.

Any opening in the roof will relieve some heat and smoke, but the experience shows that casual inclusion of skylights, windows, etc. cannot be relied on as adequate venting means.

Similar constraints to those applied to SC systems apply to heat and smoke vents. The materials of construction and methods of installation must be appropriate to resist the conditions such as extreme temperatures, wind, etc. Their efficiency can be reinforced by the installation of curtain boards, vertical barriers that limit the spread of heat and smoke beneath the ceiling.

The dimensioning and spacing of vents must comply with a series of criteria to be considered effective, amongst which are the following:

- Spacing is related to the size and layout of the building (ceiling height and depth of the smoke layer when curtain boards are not provided).
- Vent surface is related to building surface, height and expected fire growth rate.
- Their function must be wind independent. For this reason their "effective" surface must be calculated and their performance properly tested and documented.
- Makeup air means are required for the vents to function as intended.
- Materials must have the appropriate rating (fire resistance).
- Their response time is regulated.

6. The existing ST facilities

ST has a vast pool of HVAC equipment under the responsibility of both ST-CV and ST-TFM.

Many of these units are of the fan-coil type, that is a cooling means – chilled water or direct expansion cooling coil – and a fan or blower. These units typically use little or no outside air, just recirculate the air within the conditioned space, and for this reason are almost impossible to re-configure to the SC functionality.

A number of units (the main underground areas) run on all – or a high proportion of – outside air. These however show the particularity of serving radioactive areas, for which they are provided with very high efficiency filters. These filters, as mentioned above, would very rapidly clog and collapse the flow in case of fire, and therefore the use of these stations as SC systems is not foreseeable unless thorough modifications are made.

Finally, an important number of units falls within the rooftop extractor fan category. In this case it is worth noting that most of these units have been conceived as HVAC systems, and they do not comply with most of the requirements necessary for SC or "desenfumage" equipment.

Most of the ST facilities are many years old, and no SC functionality was foreseen at the time of the installation. Other facilities, though more recent, have not been engineered for the purpose of managing fire scenarios. Unfortunately, these units are, by their construction, difficult - if not impossible - to adapt.

The annex provides the list of units that are labelled as SC systems. Their real smoke control capabilities are evaluated in terms of the parameters discussed above. This evaluation shows that sometimes their classification as SC systems could be criticised - if not completely inadequate.

7. Conclusions

The authors strongly recommend that the local safety responsible persons study the list below, and analyse the status of each building, in the light of the present report. The result of this analysis could be documented in the next report of the annual safety inspection. If modification is under consideration, the person is advised to contact the fire protection service within TIS-GS, for a definition of the need. ST will be available, following the result of the analysis, to study which measures can in pratice be applied to each specific case. However, it is important to point out that a re-definition of the need might have a financial consequence for which ST cannot be of any help.

It is also worth warning readers against over-enthusiastic expectations from the normal ventilation and air-conditioning systems, which must be considered purely as such and nothing more. As already explained, dedicated smoke control systems, their components and installation practice are completely different from a standard ventilation system.

Finally, ST would like to suggest that a guideline for the implementation of SC systems be made available, within the library of safety documents provided by the TIS commission.

8. References

1. National Fire Prevention Association (NFPA) Standards, Kansas, Missouri, Nov. 1997

2. Règles relatives à la conception et à l'installation d'exutoires de fumée et de chaleur, Assemblée plénière des sociétés d'assurances contre l'incendie et les risques divers, Mai 1980

3. Arrêté du 5 août 1992, pour l'application des articles R. 235-4-8 et R.235-4-15 du code du travail, fixant les dispositions pour la prévention des incendies et le désenfumage de certains lieux de travail (mod. Par arr. 22 Sept. 1995, JO 3 Oct.)

4. IT-246 Relative au désenfumage dans les établissements recevant du public

5. IT-247 Relative aux mécanismes de déclenchement des dispositifs de fermeture résistant au feu et de désenfumage

6. La protection Incendie en Ventilation et Conditionnement d'air, Jiri PTACEK, Centre Scientifique et Technique de la Construction, Bruxelles, 1978

7. Fire Venting of Sprinklered Buildings, Fire Journal, March 1984

8. Evacuateur de chaleur et de fumée (ECF), SPI, Zurich, 1978

9. Désenfumage et exutoires de chaleur, W. Halpaat, R.G.S. N. 14, Mai 1982

Annex 1

The SPS ventilation system

An interesting case to study is that of the upgrade of the SPS main ring air conditioning, whose first phase has been completed during the last winter shut-down.

Although not originally conceived for a SC or smoke extraction functionality (absolute filters at the discharge points), the modifications needed to adapt the system to extract smoke were simple and inexpensive.

The second aspect addressed in the case of the SPS was the necessity of a remote control system, due to the large distances involved.

In the past, all supply and extraction points had their own independent local control system, which enabled the operation of the air conditioning system. This however was extremely inefficient for a fire scenario, for which several people needed to be sent around to the 10 different points, some more than 1.5 km apart from each other, to locally commute to the SC mode. Let alone the possibility of errors in the handling of the system by non-specialists, the time and number of people needed for this operation were considered unacceptable.

This too has been successfully completed during the past shut-down, and the whole system can now be controlled from the TCR.

However, it is important to stress that this does not make a SC system of the SPS air conditioning. In particular, some aspects like the performance of the system, or the control over the direction of the flow are put to the question, as in several points of the SPS ring some modifications were introduced during the 80s. The excavation of the ECAs 4 and 5, and the installation of a dump in PP1 have severely affected the operation of the system. As a result, the ring is strongly influenced by the outside wind conditions (direction and velocity).

In addition to this fact, the question of the rating of the equipment should be also addressed. The transmission belts and motor powering the fan are contained in the same enclosure of the fan, which could lead to very fast degradation of the system's performance in the case that hot gases are being extracted. Also, to this date, there is no secured power supply available, although considerable efforts are being made to make this available within the year.

All these unresolved questions give a fair idea of how difficult (and expensive) the re-engineering of an existing system is.

Annex 2

ST smoke control systems

Site	Bldg	Responsible Group	Equipment	Description	Secured Power Supply	Material Rating M0 / 400°C / 2h	Airflow path adapted to SC functionality	SC system certified
L1	2155	ST-CV	UAT2-153	EXTRACTION - DESENFUMAGE SD1	Y	Y	Y	Y
L1	2155	ST-CV	UAT2-154	EXTRACTION - DESENFUMAGE SD1	Y	Y	Y	Y
L1	2155	ST-CV	UICN-101	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L1	2180	ST-CV	UAED-110	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L1	2180	ST-CV	UAED-111	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L1	2180	ST-CV	UAT1-112	EXTRACTION - DESENFUMAGE SU1	Y	Y	Y	Y
L1	2180	ST-CV	UAT1-113	EXTRACTION - DESENFUMAGE SU1	Y	Y	Y	Y
L1	2180	ST-CV	UICN-102	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L2	2255	ST-CV	UAT2-251	EXTRACTION - DESENFUMAGE SD2	Y	Y	Y	Y
L2	2255	ST-CV	UAT2-252	EXTRACTION - DESENFUMAGE SD2	Y	Y	Y	Y
L2	2255	ST-CV	UAT2-253	EXTRACTION - DESENFUMAGE SD2	Y	Y	Y	Y
L2	2255	ST-CV	UAT2-254	EXTRACTION - DESENFUMAGE SD2	Y	Y	Y	Y
L2	2255	ST-CV	UAT2-255	EXTRACTION - DESENFUMAGE SD2	Y	Y	Y	Y
L2	2255	ST-CV	UAT2-256	EXTRACTION - DESENFUMAGE SD2	Y	Y	Y	Y
L2	2255	ST-CV	UICN-201	COFFRET POMPIER DESENFUMAGE SD2	Y	Y	Y	Y
L2	2280	ST-CV	UAT1-216	EXTRACTION - DESENFUMAGE SU2	Y	Y	Y	Y
L2	2280	ST-CV	UAT1-217	EXTRACTION - DESENFUMAGE SU2	Y	Y	Y	Y
L2	2280	ST-CV	UAT1-218	EXTRACTION - DESENFUMAGE SU2	Y	Y	Y	Y
L2	2280	ST-CV	UAT1-219	EXTRACTION - DESENFUMAGE SU2	Y	Y	Y	Y
L2	2280	ST-CV	UAT1-220	EXTRACTION - DESENFUMAGE SU2	Y	Y	Y	Y
L2	2280	ST-CV	UAT1-221	EXTRACTION - DESENFUMAGE SU2	Y	Y	Y	Y
L2	2280	ST-CV	UICN-202	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L2	2282	ST-CV	UAED-242	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L2	2282	ST-CV	UAED-243	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L2	2282	ST-CV	UAT1-244	EXTRACTION - DESENFUMAGE SUX2	Y	Y	Y	Y
L2	2282	ST-CV	UAT1-245	EXTRACTION - DESENFUMAGE SUX2	Y	Y	Y	Y
L2	2282	ST-CV	UICN-203	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L2	2285	ST-CV	UAT2-261	EXTRACTION - DESENFUMAGE SX2	Y	Y	Y	Y
L2	2285	ST-CV	UAT2-262	EXTRACTION - DESENFUMAGE SX2	Y	Y	Y	Y
L2	2285	ST-CV	UAT2-263	EXTRACTION - DESENFUMAGE SX2	Y	Y	Y	Y
L2	2285	ST-CV	UAT2-264	EXTRACTION - DESENFUMAGE SX2	Y	Y	Y	Y
L2	2285	ST-CV	UAT2-265	EXTRACTION - DESENFUMAGE SX2	Y	Y	Y	Y

Site	Bldg	Responsible Group	Equipment	Description	Secured Power Supply	Material Rating M0 / 400°C / 2h	Airflow path adapted to SC functionality	SC system certified
L2	2285	ST-CV	UAT2-266	EXTRACTION - DESENFUMAGE SX2	Y	Y	Y	Y
L2	2285	ST-CV	UICN-204	COFFRET POMPIER DESENFUMAGE	Y	Y	Y	Y
L3	2355	ST-CV	UAT2-351	EXTRACTION - DESENFUMAGE SD32	Y	Y	Y	Y
L3	2355	ST-CV	UAT2-352	EXTRACTION - DESENFUMAGE SD32	Y	Y	Y	Y
L3	2355	ST-CV	UIAN-301	COFFRET POMPIER DESENFUMAGE (INTERIEUR BAT.)	Y	Y	Y	Y
L3	2355	ST-CV	UICN-301	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L3	2380	ST-CV	UAT1-308	EXTRACTION - DESENFUMAGE SU32	Y	Y	Y	Y
L3	2380	ST-CV	UAT1-309	EXTRACTION - DESENFUMAGE SU32	Y	Y	Y	Y
L3	2380	ST-CV	UICN-302	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L3	2395	ST-CV	UAED-334	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L3	2395	ST-CV	UAED-335	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L3	2395	ST-CV	UICN-303	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L4	2455	ST-CV	UAT2-451	EXTRACTION - DESENFUMAGE SD4	Y	Y	Y	Y
L4	2455	ST-CV	UAT2-452	EXTRACTION - DESENFUMAGE SD4	Y	Y	Y	Y
L4	2455	ST-CV	UAT2-453	EXTRACTION - DESENFUMAGE SD4	Y	Y	Y	Y
L4	2455	ST-CV	UAT2-454	EXTRACTION - DESENFUMAGE SD4	Y	Y	Y	Y
L4	2455	ST-CV	UAT2-455	EXTRACTION - DESENFUMAGE SD4	Y	Y	Y	Y
L4	2455	ST-CV	UAT2-456	EXTRACTION - DESENFUMAGE SD4	Y	Y	Y	Y
L4	2455	ST-CV	UICN-401	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L4	2480	ST-CV	UAED-412	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L4	2480	ST-CV	UAED-413	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L4	2480	ST-CV	UAT1-414	EXTRACTION - DESENFUMAGE SU4	Y	Y	Y	Y
L4	2480	ST-CV	UAT1-415	EXTRACTION - DESENFUMAGE SU4	Y	Y	Y	Y
L4	2480	ST-CV	UAT1-416	EXTRACTION - DESENFUMAGE SU4	Y	Y	Y	Y
L4	2480	ST-CV	UAT1-417	EXTRACTION - DESENFUMAGE SU4	Y	Y	Y	Y
L4	2480	ST-CV	UICN-402	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L4	2485	ST-CV	UAT2-465	EXTRACTION - DESENFUMAGE SX4	Y	Y	Y	Y
L4	2485	ST-CV	UAT2-466	EXTRACTION - DESENFUMAGE SX4	Y	Y	Y	Y
L4	2485	ST-CV	UAT2-467	EXTRACTION - DESENFUMAGE SX4	Y	Y	Y	Y
L4	2485	ST-CV	UAT2-468	EXTRACTION - DESENFUMAGE SX4	Y	Y	Y	Y
L4	2485	ST-CV	UAT2-469	EXTRACTION - DESENFUMAGE SX4	Y	Y	Y	Y
L4	2485	ST-CV	UAT2-470	EXTRACTION - DESENFUMAGE SX4	Y	Y	Y	Y
L4	2485	ST-CV	UIAN-404	COFFRET POMPIER DESENFUMAGE (INTERIEUR BAT.)	Y	Y	Y	Y
L4	2485	ST-CV	UICN-404	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y

Site	Bldg	Responsible Group	Equipment	Description	Secured Power Supply	Material Rating M0 / 400°C / 2h	Airflow path adapted to SC functionality	SC system certified
L5	2555	ST-CV	UAT2-551	EXTRACTION - DESENFUMAGE SD5	Y	Y	Y	Y
L5	2555	ST-CV	UAT2-552	EXTRACTION - DESENFUMAGE SD5	Y	Y	Y	Y
L5	2580	ST-CV	UAED-511	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L5	2580	ST-CV	UAED-512	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L5	2580	ST-CV	UAT1-513	EXTRACTION - DESENFUMAGE SU5	Y	Y	Y	Y
L5	2580	ST-CV	UAT1-514	EXTRACTION - DESENFUMAGE SU5	Y	Y	Y	Y
L5	2580	ST-CV	UICN-502	COFFRET POMPIER DESENFUMAGE (INTERIEUR BAT.)	Y	Y	Y	Y
L6	2655	ST-CV	UAT2-651	EXTRACTION - DESENFUMAGE SD6	Y	Y	Y	Y
L6	2655	ST-CV	UAT2-652	EXTRACTION - DESENFUMAGE SD6	Y	Y	Y	Y
L6	2655	ST-CV	UAT2-653	EXTRACTION - DESENFUMAGE SD6	Y	Y	Y	Y
L6	2655	ST-CV	UAT2-654	EXTRACTION - DESENFUMAGE SD6	Y	Y	Y	Y
L6	2655	ST-CV	UAT2-655	EXTRACTION - DESENFUMAGE SD6	Y	Y	Y	Y
L6	2655	ST-CV	UAT2-656	EXTRACTION - DESENFUMAGE SD6	Y	Y	Y	Y
L6	2655	ST-CV	UICN-601	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L6	2680	ST-CV	UAED-612	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L6	2680	ST-CV	UAED-613	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L6	2680	ST-CV	UAT1-614	EXTRACTION - DESENFUMAGE SU6	Y	Y	Y	Y
L6	2680	ST-CV	UAT1-615	EXTRACTION - DESENFUMAGE SU6	Y	Y	Y	Y
L6	2680	ST-CV	UAT1-616	EXTRACTION - DESENFUMAGE SU6	Y	Y	Y	Y
L6	2680	ST-CV	UAT1-617	EXTRACTION - DESENFUMAGE SU6	Y	Y	Y	Y
L6	2680	ST-CV	UICN-602	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L6	2685	ST-CV	UAT2-665	EXTRACTION - DESENFUMAGE SX6	Y	Y	Y	Y
L6	2685	ST-CV	UAT2-666	EXTRACTION - DESENFUMAGE SX6	Y	Y	Y	Y
L6	2685	ST-CV	UAT2-667	EXTRACTION - DESENFUMAGE SX6	Y	Y	Y	Y
L6	2685	ST-CV	UAT2-668	EXTRACTION - DESENFUMAGE SX6	Y	Y	Y	Y
L6	2685	ST-CV	UAT2-669	EXTRACTION - DESENFUMAGE SX6	Y	Y	Y	Y
L6	2685	ST-CV	UAT2-670	EXTRACTION - DESENFUMAGE SX6	Y	Y	Y	Y
L6	2685	ST-CV	UICN-604	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L7	2755	ST-CV	UAT2-751	EXTRACTION - DESENFUMAGE SD7	Y	Y	Y	Y
L7	2755	ST-CV	UAT2-752	EXTRACTION - DESENFUMAGE SD7	Y	Y	Y	Y
L7	2755	ST-CV	UICN-701	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L7	2780	ST-CV	UAED-711	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L7	2780	ST-CV	UAED-712	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L7	2780	ST-CV	UAT1-713	EXTRACTION - DESENFUMAGE SU7	Y	Y	Y	Y

Site	Bldg	Responsible Group	Equipment	Description	Secured Power Supply	Material Rating M0 / 400°C / 2h	Airflow path adapted to SC functionality	SC system certified
L7	2780	ST-CV	UAT1-714	EXTRACTION - DESENFUMAGE SU7	Y	Y	Y	Y
L7	2780	ST-CV	UICN-702	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L8	2855	ST-CV	UAT2-851	EXTRACTION - DESENFUMAGE SD8	Y	Y	Y	Y
L8	2855	ST-CV	UAT2-852	EXTRACTION - DESENFUMAGE SD8	Y	Y	Y	Y
L8	2855	ST-CV	UAT2-853	EXTRACTION - DESENFUMAGE SD8	Y	Y	Y	Y
L8	2855	ST-CV	UAT2-854	EXTRACTION - DESENFUMAGE SD8	Y	Y	Y	Y
L8	2855	ST-CV	UAT2-855	EXTRACTION - DESENFUMAGE SD8	Y	Y	Y	Y
L8	2855	ST-CV	UAT2-856	EXTRACTION - DESENFUMAGE SD8	Y	Y	Y	Y
L8	2855	ST-CV	UICN-801	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L8	2880	ST-CV	UAED-809	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L8	2880	ST-CV	UAED-810	DESENFUMAGE ZONES ACCESSIBLES	Y	Y	Y	Y
L8	2880	ST-CV	UAT1-811	EXTRACTION - DESENFUMAGE SU8	Y	Y	Y	Y
L8	2880	ST-CV	UAT1-812	EXTRACTION - DESENFUMAGE SU8	Y	Y	Y	Y
L8	2880	ST-CV	UAT1-813	EXTRACTION - DESENFUMAGE SU8	Y	Y	Y	Y
L8	2880	ST-CV	UAT1-814	EXTRACTION - DESENFUMAGE SU8	Y	Y	Y	Y
L8	2880	ST-CV	UICN-802	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L8	2882	ST-CV	UAT1-836	EXTRACTION - DESENFUMAGE SUX8	Y	Y	Y	Y
L8	2882	ST-CV	UAT1-837	EXTRACTION - DESENFUMAGE SUX8	Y	Y	Y	Y
L8	2882	ST-CV	UICN-803	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
L8	2885	ST-CV	UAT2-865	EXTRACTION - DESENFUMAGE SX8	Y	Y	Y	Y
L8	2885	ST-CV	UAT2-866	EXTRACTION - DESENFUMAGE SX8	Y	Y	Y	Y
L8	2885	ST-CV	UAT2-867	EXTRACTION - DESENFUMAGE SX8	Y	Y	Y	Y
L8	2885	ST-CV	UAT2-868	EXTRACTION - DESENFUMAGE SX8	Y	Y	Y	Y
L8	2885	ST-CV	UAT2-869	EXTRACTION - DESENFUMAGE SX8	Y	Y	Y	Y
L8	2885	ST-CV	UAT2-870	EXTRACTION - DESENFUMAGE SX8	Y	Y	Y	Y
L8	2885	ST-CV	UIAN-804	COFFRET EXTRACTION DESEMFUMAGE SX8	Y	Y	Y	Y
L8	2885	ST-CV	UICN-804	COFFRET POMPIER DESENFUMAGE (EXTERIEUR BAT.)	Y	Y	Y	Y
M	40	ST-MC		EXUTOIRES DE DESENFUMAGE	Y	Y	Y	Y
M	154	ST-TFM	V2-0024	EXTRACTION TOITURE DU HALL	N	N	Y	N
M	188	ST-TFM	V2-0141	EXTRACTION NIVEAU 705 (SUR FAÇADE)	Y	N	Y	N
M	191	ST-CV	H2-0021	EXTRACTION GAZ HALL CHAMBRE	Y	Y	N	N
M	193	ST-CV	V1-00246	EXTRACTEUR DESENFUMAGE N2 HALL ANNEAU	Y	N	Y	N
M	193	ST-CV	V1-00248	EXTRACTEUR DESENFUMAGE N4 HALL ANNEAU	Y	N	Y	N

Site	Bldg	Responsible Group	Equipment	Description	Secured Power Supply	Material Rating M0 / 400°C / 2h	Airflow path adapted to SC functionality	SC system certified
M	193	ST-CV	CW2-0367/0374	CLIMATISATION HALL	Y	N	Y	N
M	2001	ST-CV	CV1-0114/0115	CLIMATISATION TUNNEL KLYSTRON	Y	N	Y	N
M	2002	ST-CV	CW2-417	CLIMATISATION LABORATOIRE LUMIERE	Y	N	Y	N
M	2003	ST-CV	V1-00184	EXTRACTION DESENFUMAGE LINAC/EPA	Y	N	Y	N
M	2008	ST-CV	CV1-0118/0119	CLIMATISATION HALL EQUIPEMENT / SALLE CONTROLE	Y	N	Y	N
M	212	ST-TFM	W1-00107	DESENFUMAGE SALLE DE RELAYAGE	N	Y	Y	N
M	272	ST-CV	W2-0065	VENTILATION HALL (SUR LE TOIT)	N	Y	N	N
M	273	ST-CV	V2-0163	VENTILATION HALL (SUR LE TOIT)	N	Y	N	N
M	350	ST-CV	V1-00158	DESENFUMAGE PS (TOIT ST 3)	Y	N	Y	N
M	350	ST-CV	V1-00159	DESENFUMAGE PS (TOIT ST 4)	Y	N	Y	N
M	350	ST-CV	V1-00160	DESENFUMAGE PS (TOIT ST 5)	Y	N	Y	N
M	350	ST-CV	V1-00161	DESENFUMAGE PS (TOIT ST 6)	Y	N	Y	N
M	350	ST-CV	V1-00162	DESENFUMAGE PS (TOIT ST 7)	Y	N	Y	N
M	350	ST-CV	V1-00163	DESENFUMAGE PS (TOIT ST 8)	Y	N	Y	N
M	351	ST-CV	V2-00285	VENTILATION LOCAL TECHNIQUE LINAC A PLOMB	Y	N	Y	N
M	354	ST-CV	W1-00101	EXTRACTION DESENFUMAGE	Y	N	Y	N
M	361	ST-CV	CV1-00089	CLIMATISATION TUNNEL TRANSFERT	Y	N	Y	N
M	361	ST-CV	W1-00057	DESENFUMAGE	N	N	Y	N
M	363	ST-CV	W1-00070	DESENFUMAGE	N	N	Y	N
M	513	ST-CV	CV1-0085/0088	PREPARATION AIR FROID / CLIMATISATION STOCKAGE	Y	N	Y	N
M	513	ST-CV	CW2-0255	CLIMATISATION LOCAL UPS	Y	N	Y	N
M	513	ST-CV	V2-0090	EXTRACTION CONVERTISSEURS	Y	N	Y	N
P	888	ST-CV	V2-00171	EXTRACTION DESENFUMAGE (TOIT)	N	N	Y	N
P	900	ST-CV	V1-00224	EXTRACTION FUMEES TUNNEL ECN3	N	N	Y	N
P	900	ST-CV	V1-00225	EXTRACTION FUMEES TUNNEL TTC8	N	N	Y	N
P	900	ST-CV	V1-00226	EXTRACTION FUMEES TUNNEL GHN 300	N	N	Y	N
P4	921	ST-CV	V1-00166	EXTRACTION BHA4 DESENFUMAGE (TOIT)	Y	Y	Y	Y
P5	899	ST-CV	W1-00104	EXTRACTION DESENFUMAGE ECA5	Y	Y	Y	Y
P5	899	ST-CV	W1-00105	EXTRACTION DESENFUMAGE ECX5 (TOIT)	Y	Y	Y	Y

Nota :
ST is in charge of some 2'500 ventilation and air conditionning systems, of wich only the 162 above are specifically concerned for a SC functionality. Sadly, of these 162, only 131 fully meet the requirements, nowadays imposed by the different standardisation bodies in the world, to be labelled as SC systems.
In particular, all the heat vents, in experimental halls and surface buildings need to be considered with the highest care when regarding their smoke extraction capabilities.