



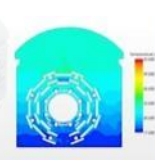
# Air management strategies in case of fire for MEDICIS

<https://indico.cern.ch/event/433272/>

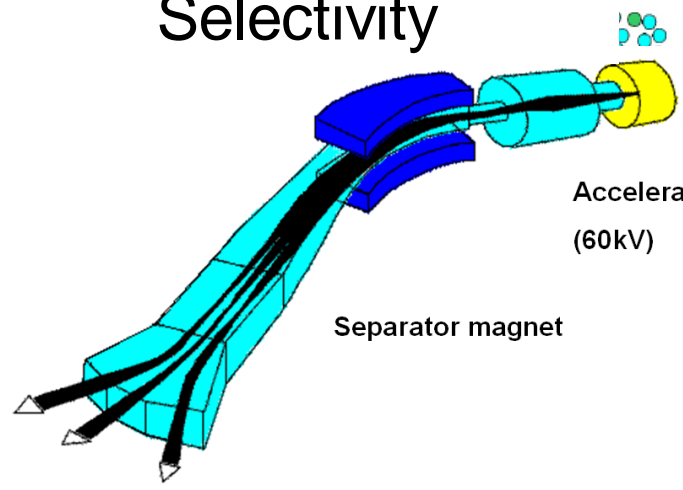


# OUTLINE

- ISOLDE and MEDICIS project introduction
- Presentation of MEDICIS ventilation

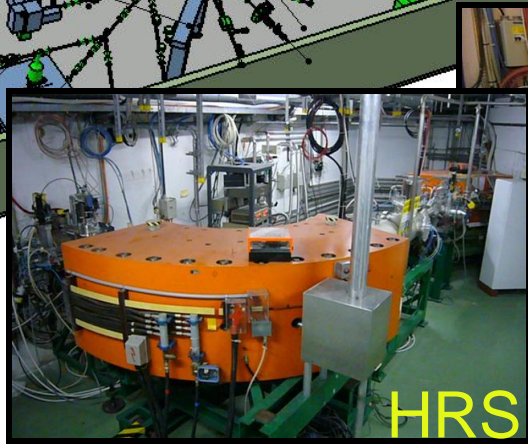
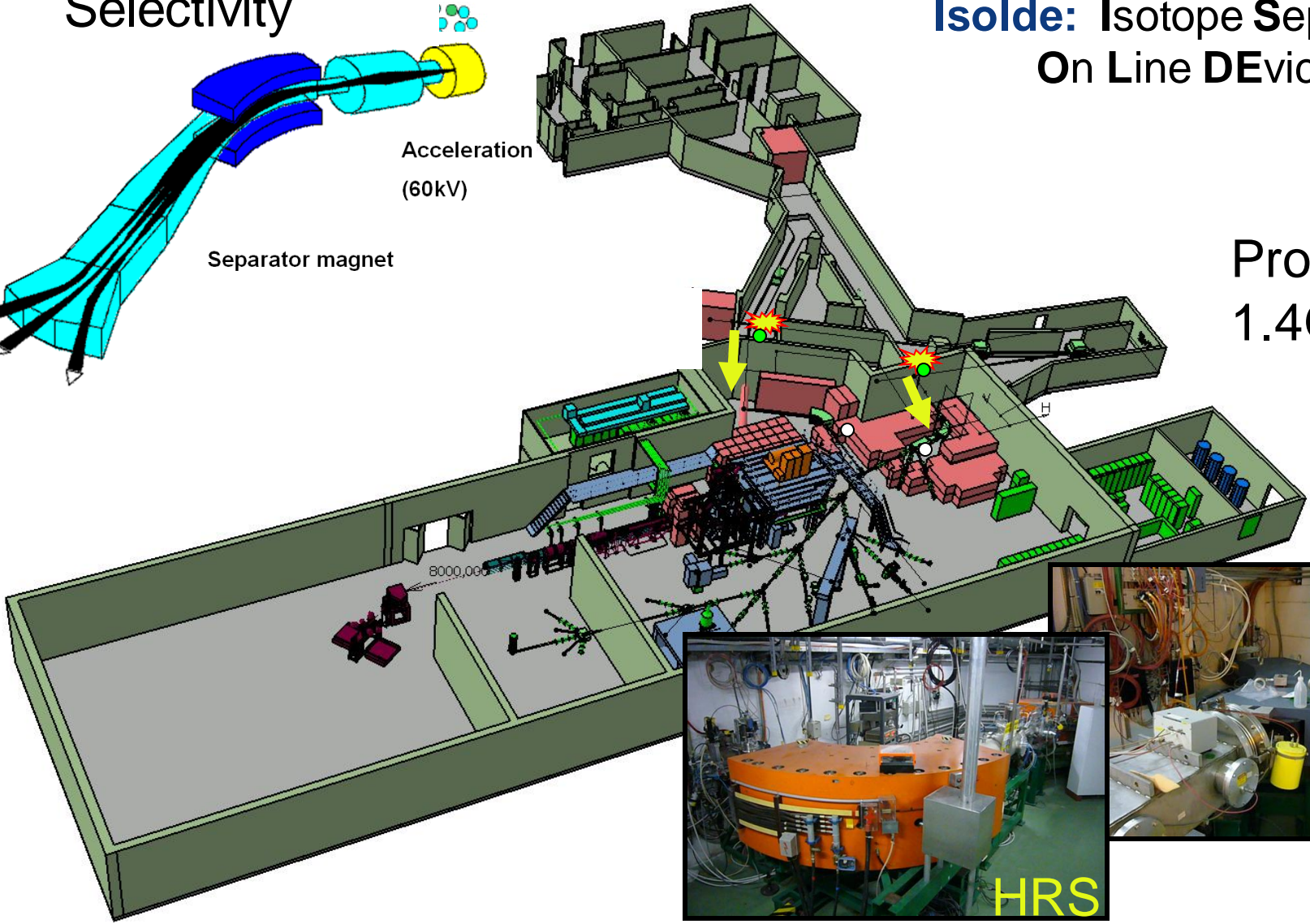


# Selectivity



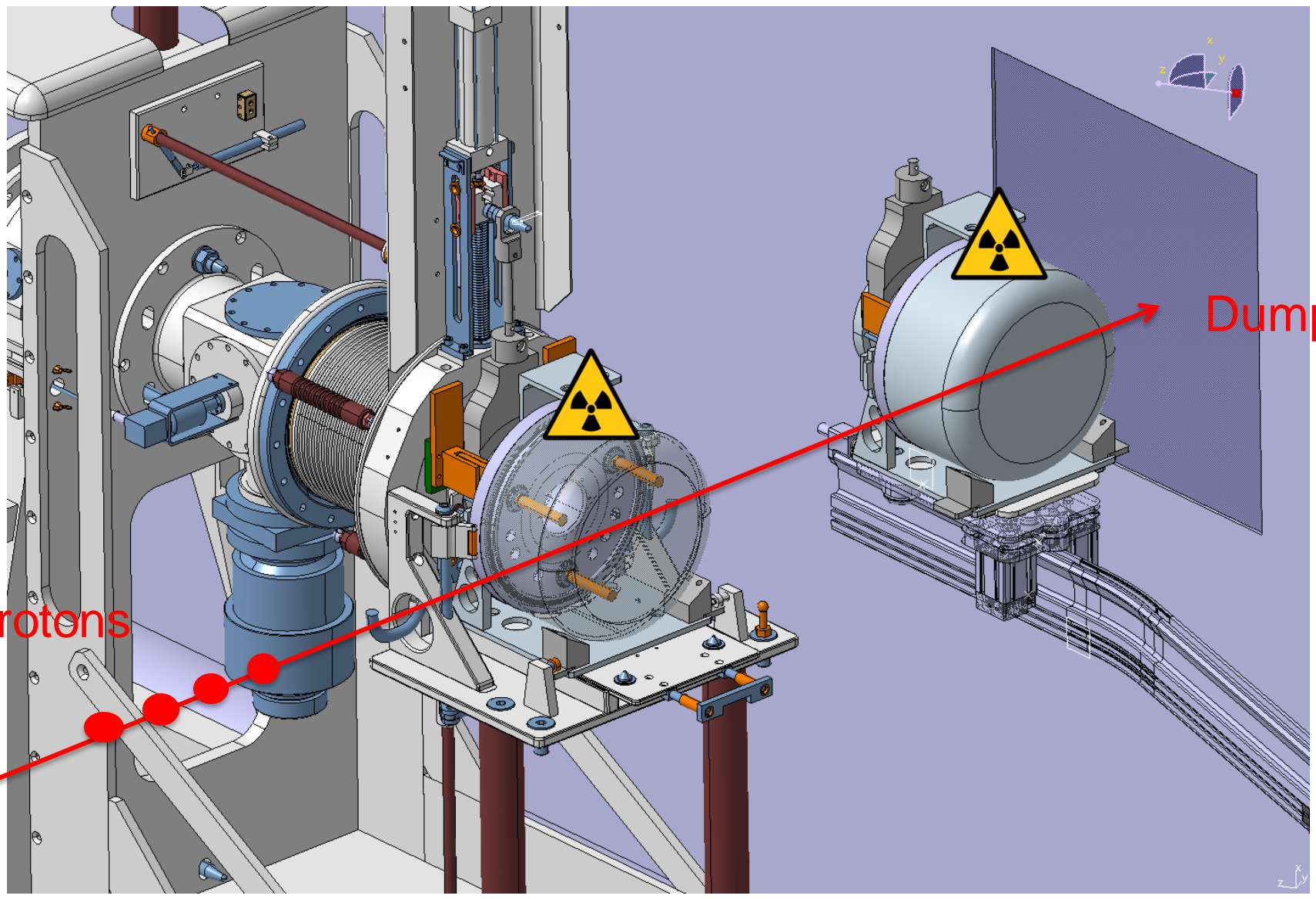
# Isolde: Isotope Separator On Line DEVICE

Protons  
1.4GeV





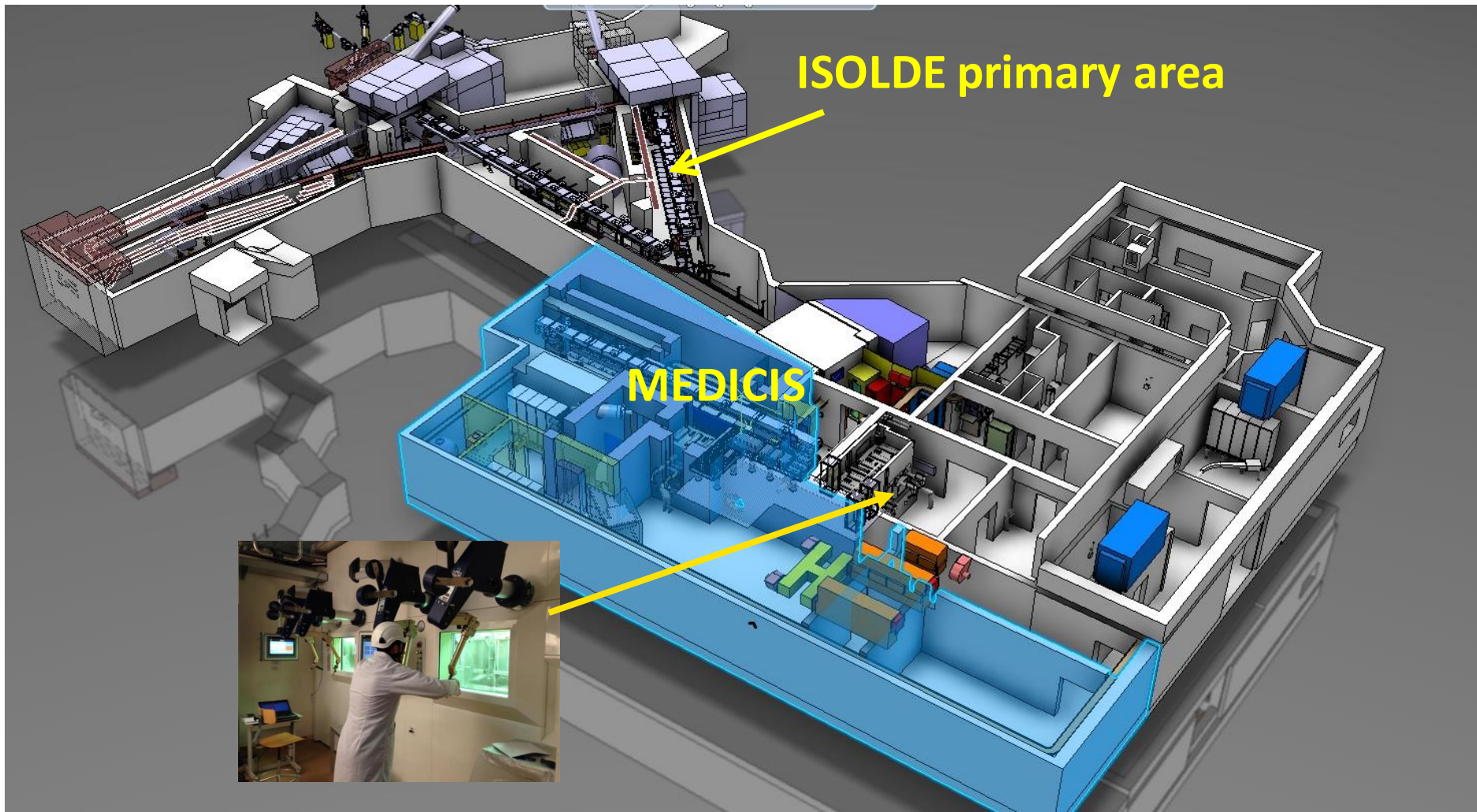
ATLAS UX15 Cavern



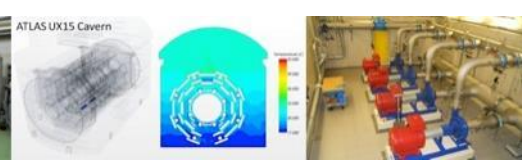
Protons

Dump



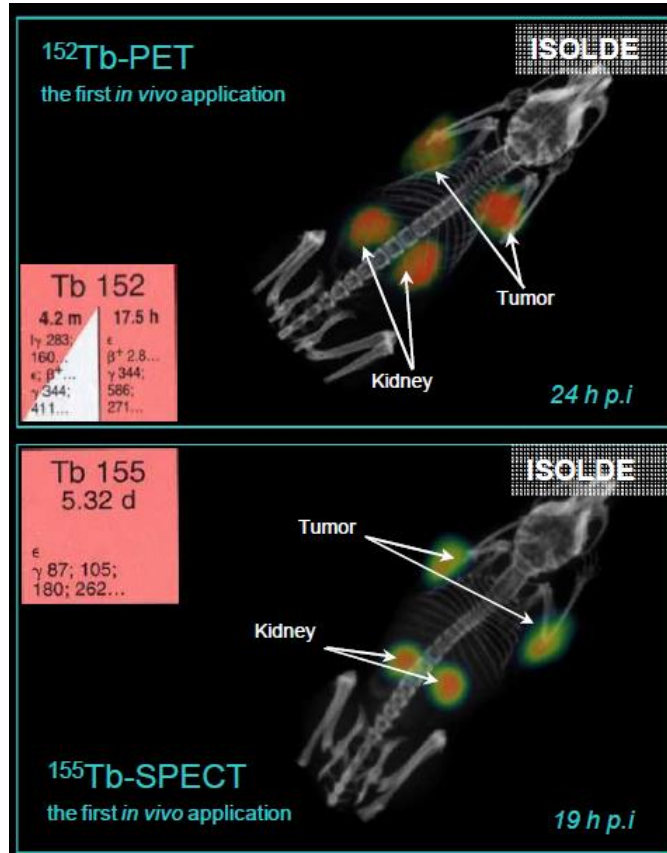
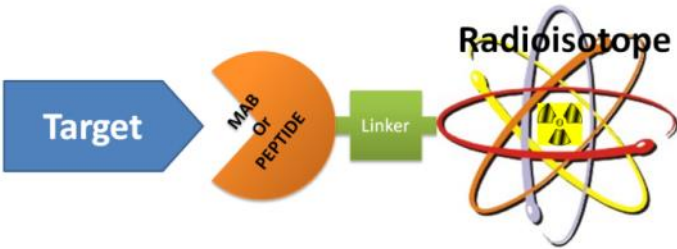


Class A Laboratory as defined in ORaP 814.554



## Purposes of the medical isotopes produced in Medicis:

- imaging
- radiopharmacology



C. Muller et al.  
jnumed.112.107540v1



# OUTLINE

- ISOLDE and MEDICIS project introduction
- Presentation of MEDICIS ventilation



# CONFINEMENT BY PRESSURE HIERARCHY

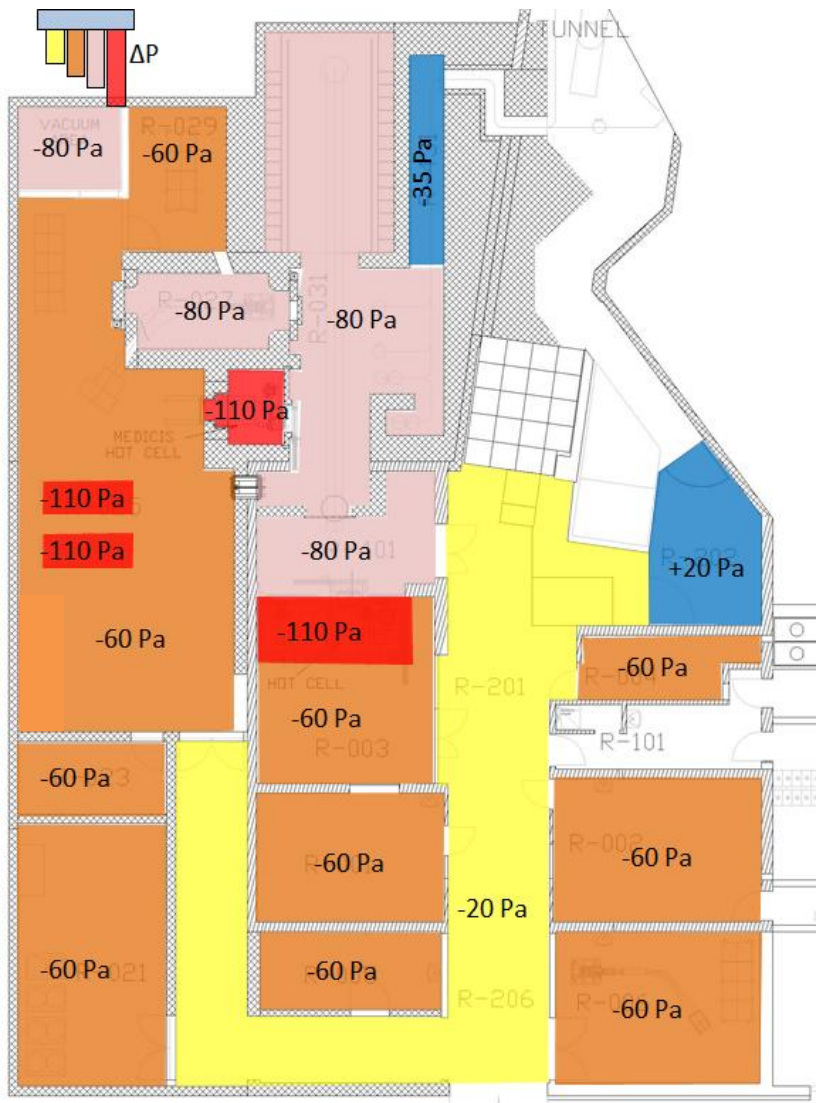
To reduce the contamination risk a pressure cascade keeps the preferential flows of air from low to high contamination rooms.

- **Dynamic confinement** of the laboratory with respect of the outdoors. To be kept as long as possible even during a fire scenario;
- Differential pressure between process enclosures (glove-boxes and hot-cells) and workplaces :  **$\Delta P \geq 50 \text{ Pa}$** ;
- **Differential pressure** among handling zones and storage zones;
- **Differential pressure** between transport zones and handling zones;
- **Differential pressure** between corridor, airlocks and ISOLDE Tunnel.





# PRESSURE HIERARCHY



ZONE	Activity	$\Delta p$ vs. Reference	Reference	$\Delta p$ vs. Outdoors
Yellow	transport of radioactive material, no handling	-20 Pa	Outdoors	-20 Pa
Orange	handling of radioactive material with collective protections	-40 Pa	Corridor	-60 Pa
Red	storage of contaminated material, presence of contamination expected	-20 Pa	Orange Zones	-80 Pa
Red	glove boxes or hot cells, confinement highly contaminated material	-50 Pa	Orange Zones	-110 Pa
Blue	Target Airlock Chamber R431	+40 Pa	Isolde Tunnel (-75Pa)	-35 Pa
Blue	Airlock chamber R202	+ 40 Pa	Corridor	+20 Pa



# AIR MANAGEMENT PRINCIPLES

## Supply

- Full fresh air (ie no recirculation);
- Duty and standby air handling units with automatic change-over;
- Minimum of 5 air changes per room.

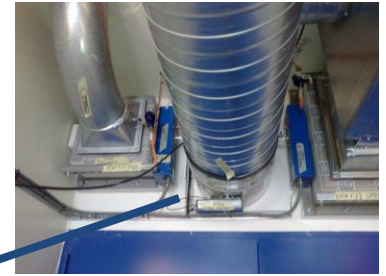
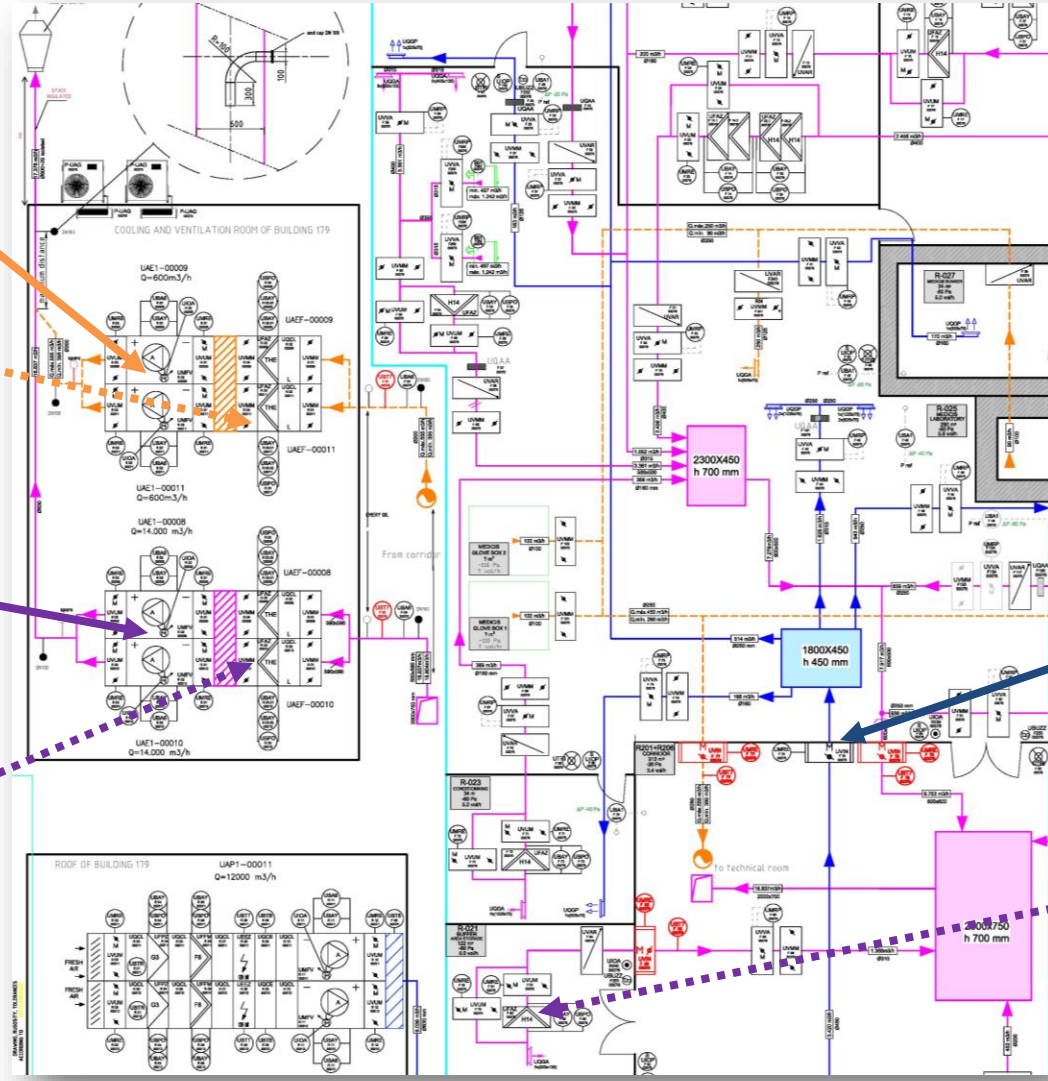
## Extraction

- Two separate and independent extraction systems for the:
  - Laboratory premises
  - Process enclosures (hot cells and glove boxes);
- Duty and standby extraction units with automatic change-over;
- One single stack for all the extracted air;
- Air sampling and monitoring before release into environment;
- Air filtered close to the contamination source;
- Final level of filtrations installed before the air release in atmosphere.



ATLAS UX15 Cavern

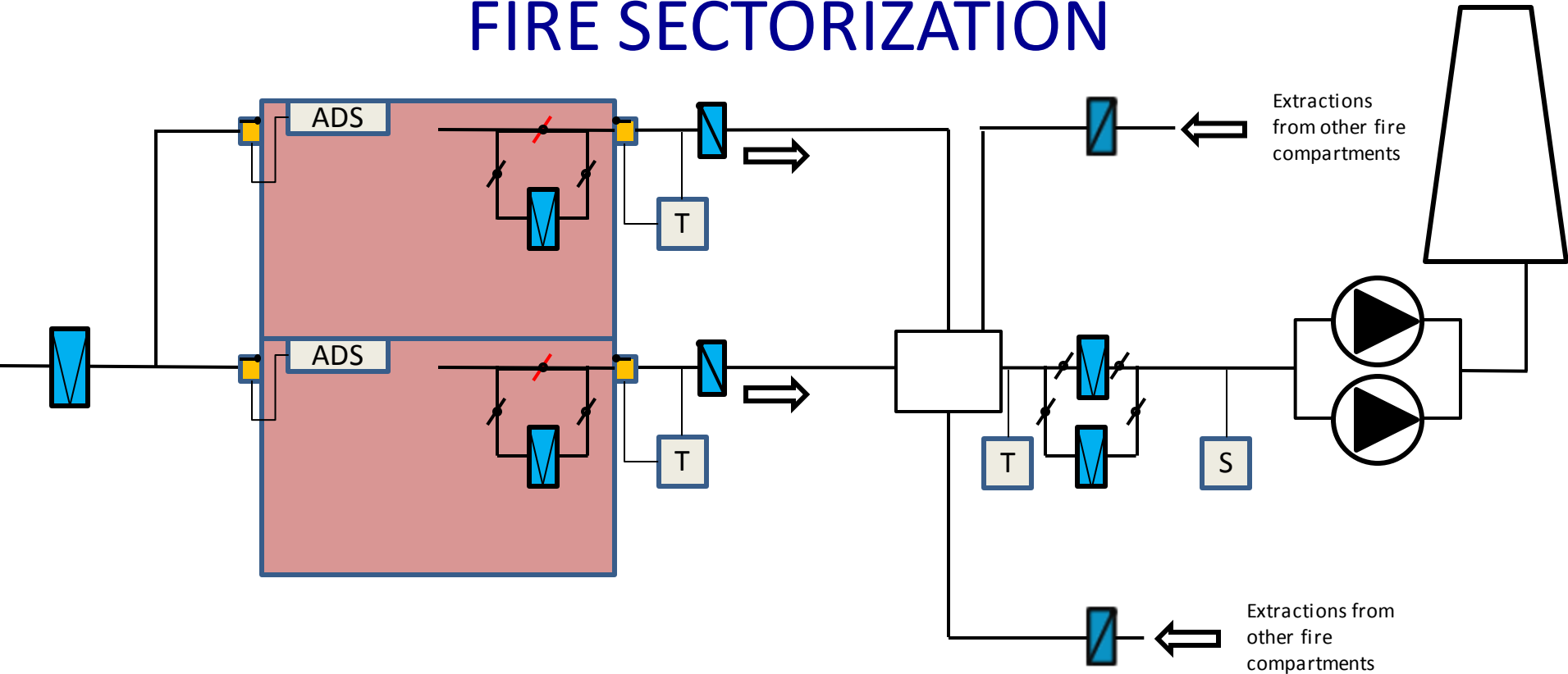
# PROCESS & INSTRUMENTS DIAGRAM







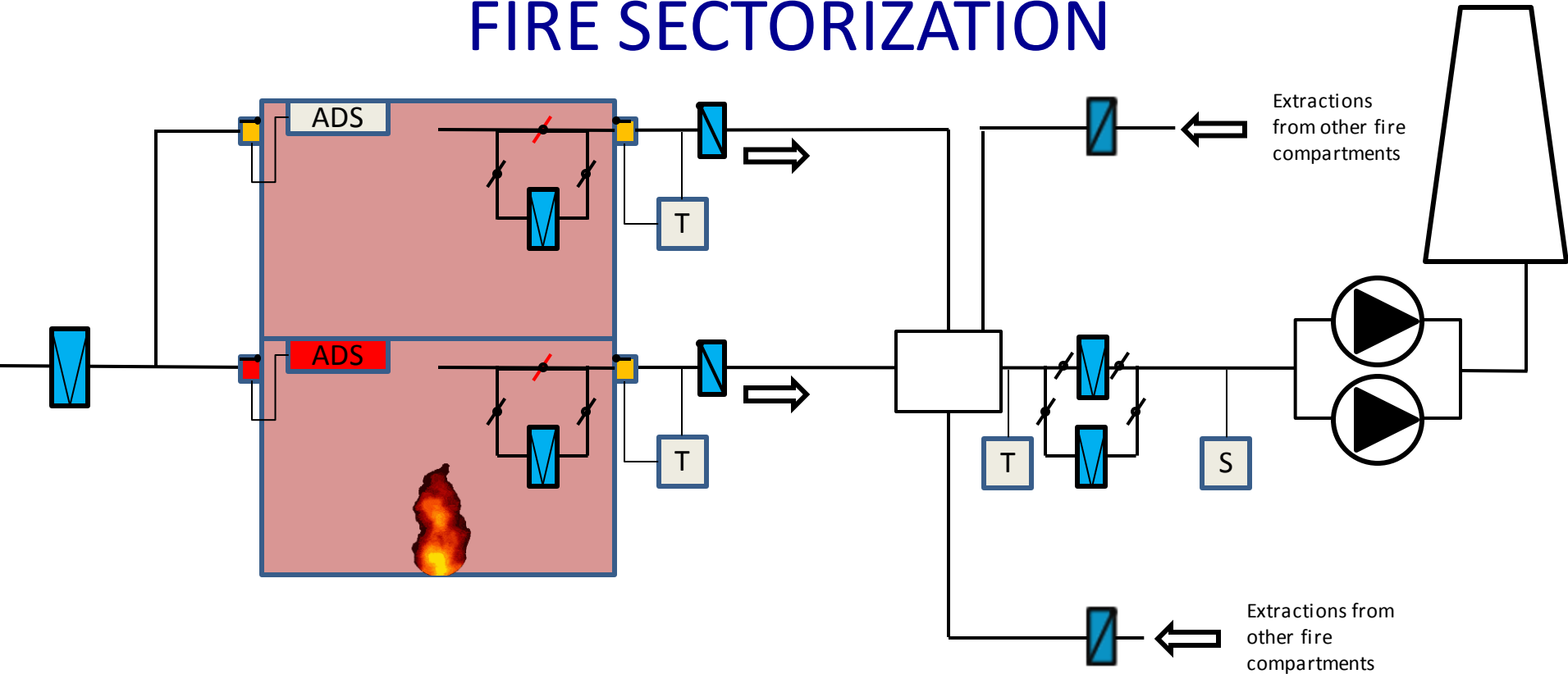
# FIRE SECTORIZATION



- ADS Automatic Detection System
- T Temp transmitter
- S Smoke detector
- Fire damper
- Filter
- Fan
- Check damper



# FIRE SECTORIZATION

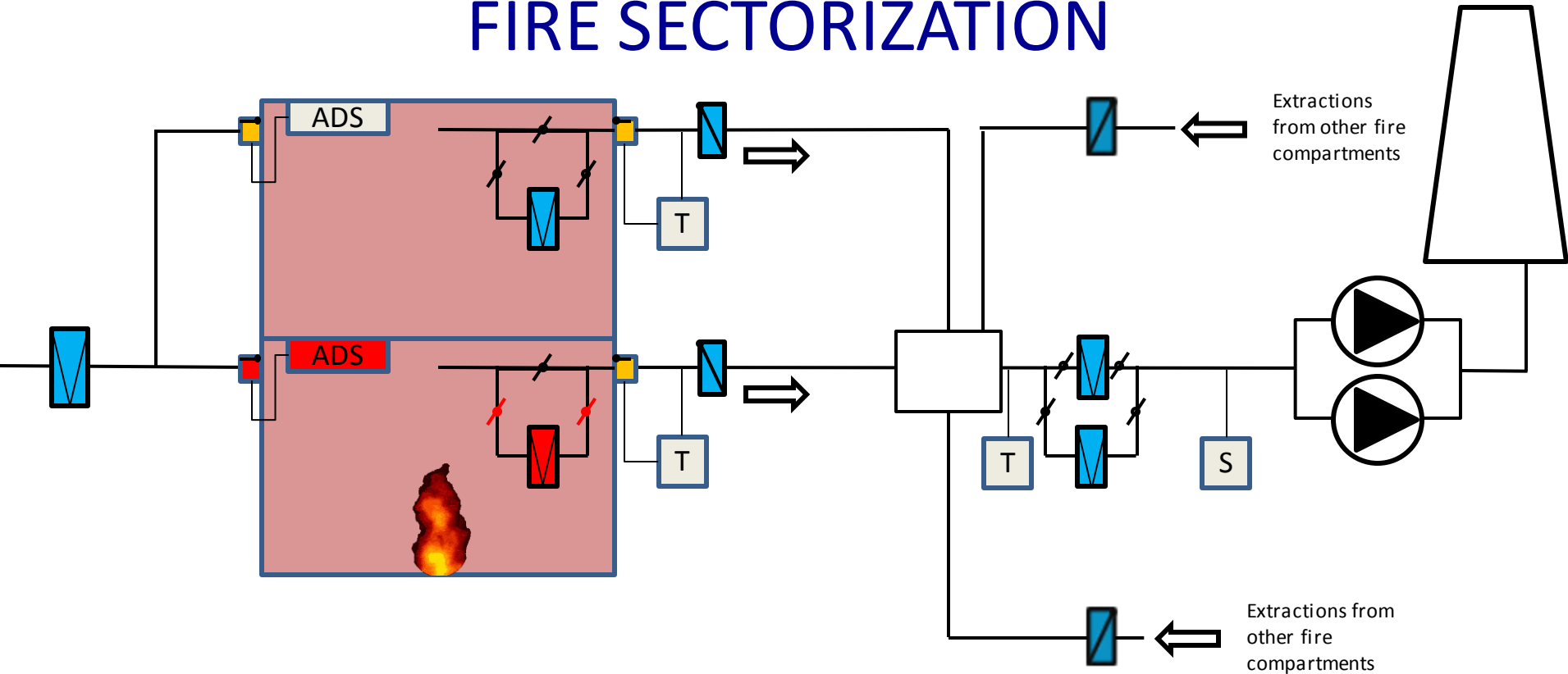


## Fire detection:

- Allow workers to go out of the fire sector (temporization of supply fire damper);
- Close the supply fire damper (no O<sub>2</sub> supply);
- Continue extraction to keep the confinement in place.



# FIRE SECTORIZATION

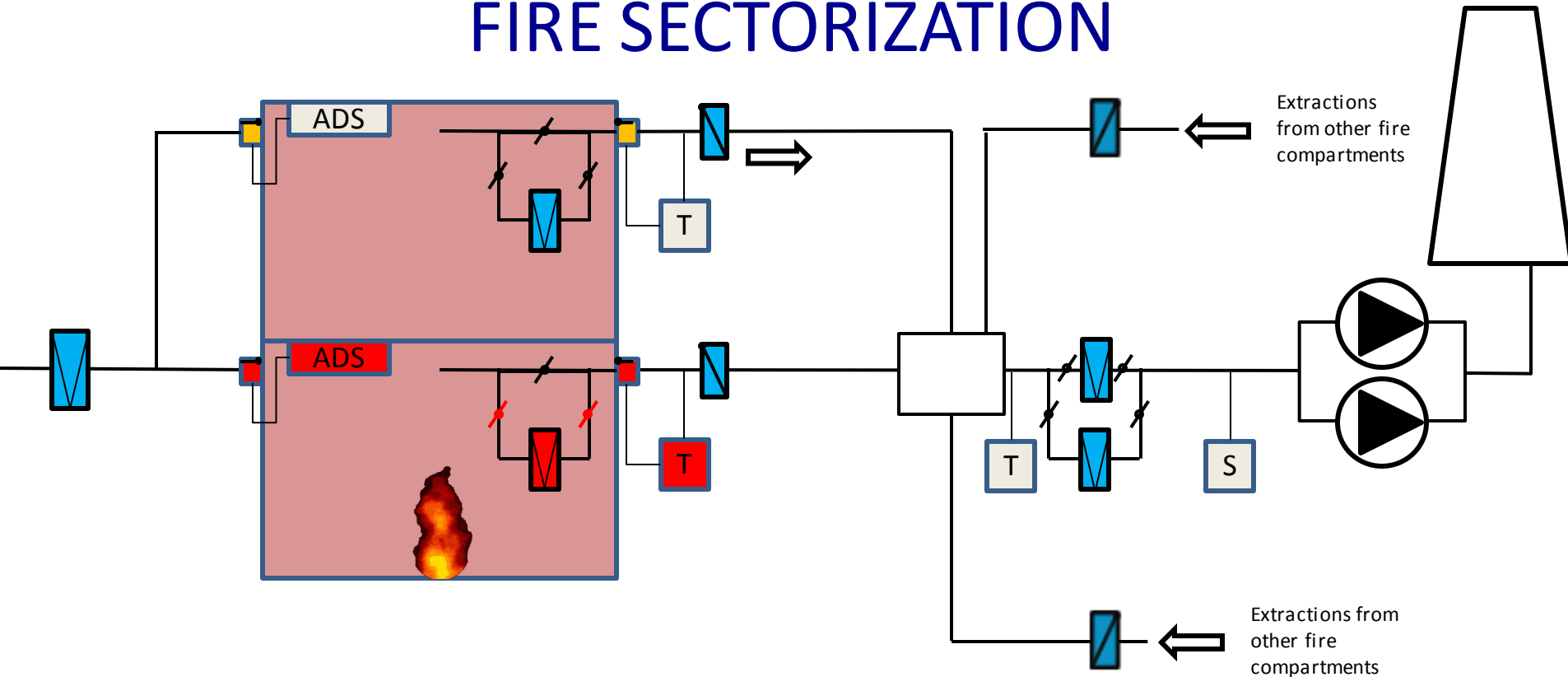


First level of filtration clogged (detection using differential pressure switch):

- Bypass the first level of filtration
- Extraction continues



# FIRE SECTORIZATION



High temperature detected after the extraction fire damper:

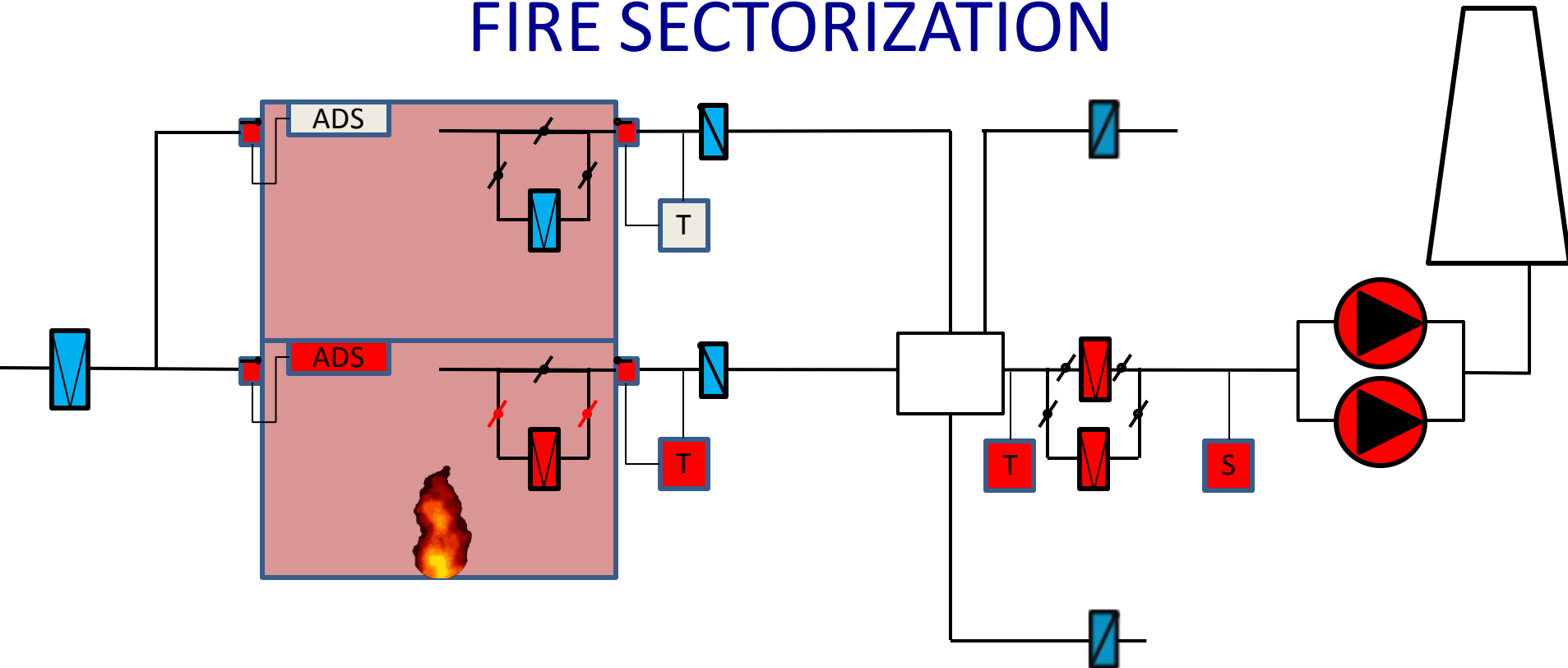
- The extraction fire damper closes
- The ventilation in the fire sector is stopped and the fire sector is isolated

The dynamic confinement of a fire tends to delay the moment when is necessary to completely isolate the fire sector and keep the building in a safe state before the intervention of the fire brigade





# FIRE SECTORIZATION



The stop of the entire laboratory ventilation will occur if:

- Last level of filtration clogged or;
- Rupture of the last level of filtration or;
- High temperature detected before the last level of filtration. The dilution effect reduces the risk.



QUESTIONS?

THANK YOU FOR YOUR ATTENTION