

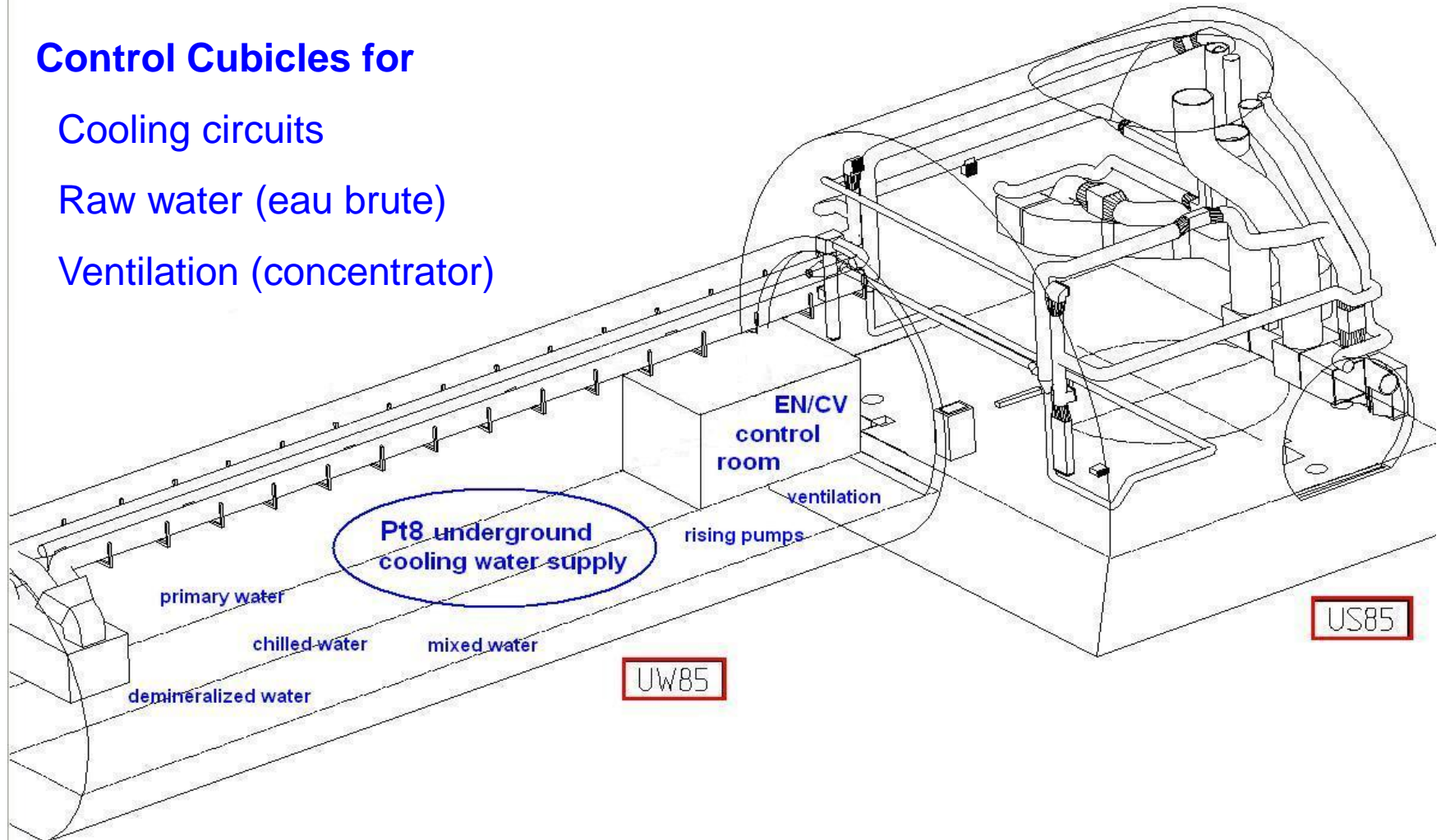
# UW pumping stations

## Control Cubicles for

Cooling circuits

Raw water (eau brute)

Ventilation (concentrator)





## Details UW equipment (control room close to US cavern)

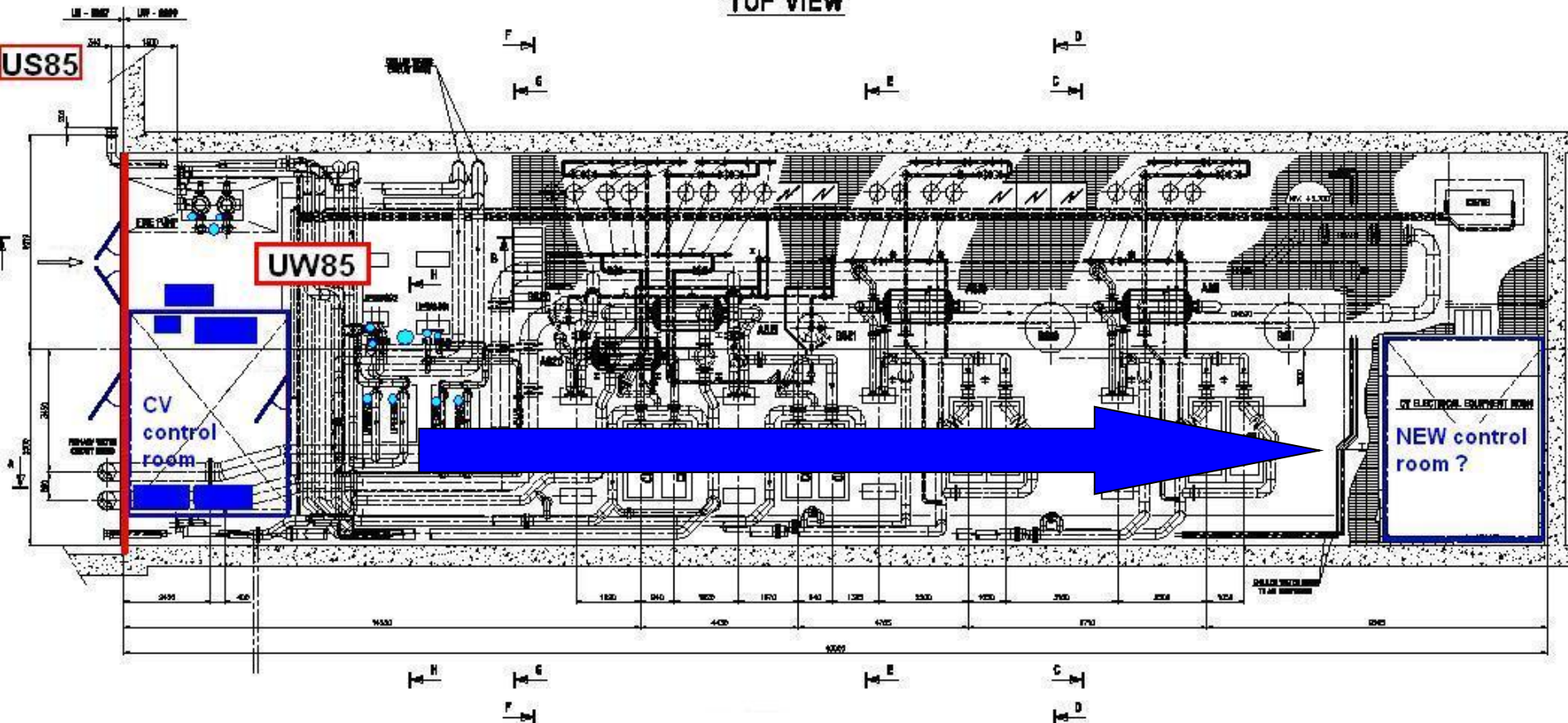
- **UW25 / UW85 (equal for UW45/65):**
- Cooling circuits control cubicle UIAO-210 (UIAO-810), Schneider PLC
- Raw water power cubicle FIAL-201 (FIAL-801)
- Ventilation concentrator UIAO-250 (UIAO-850), 2x Siemens PLC
- Vibration measurement UIAO-290 (UIAO-890), PLC

## Mitigation options

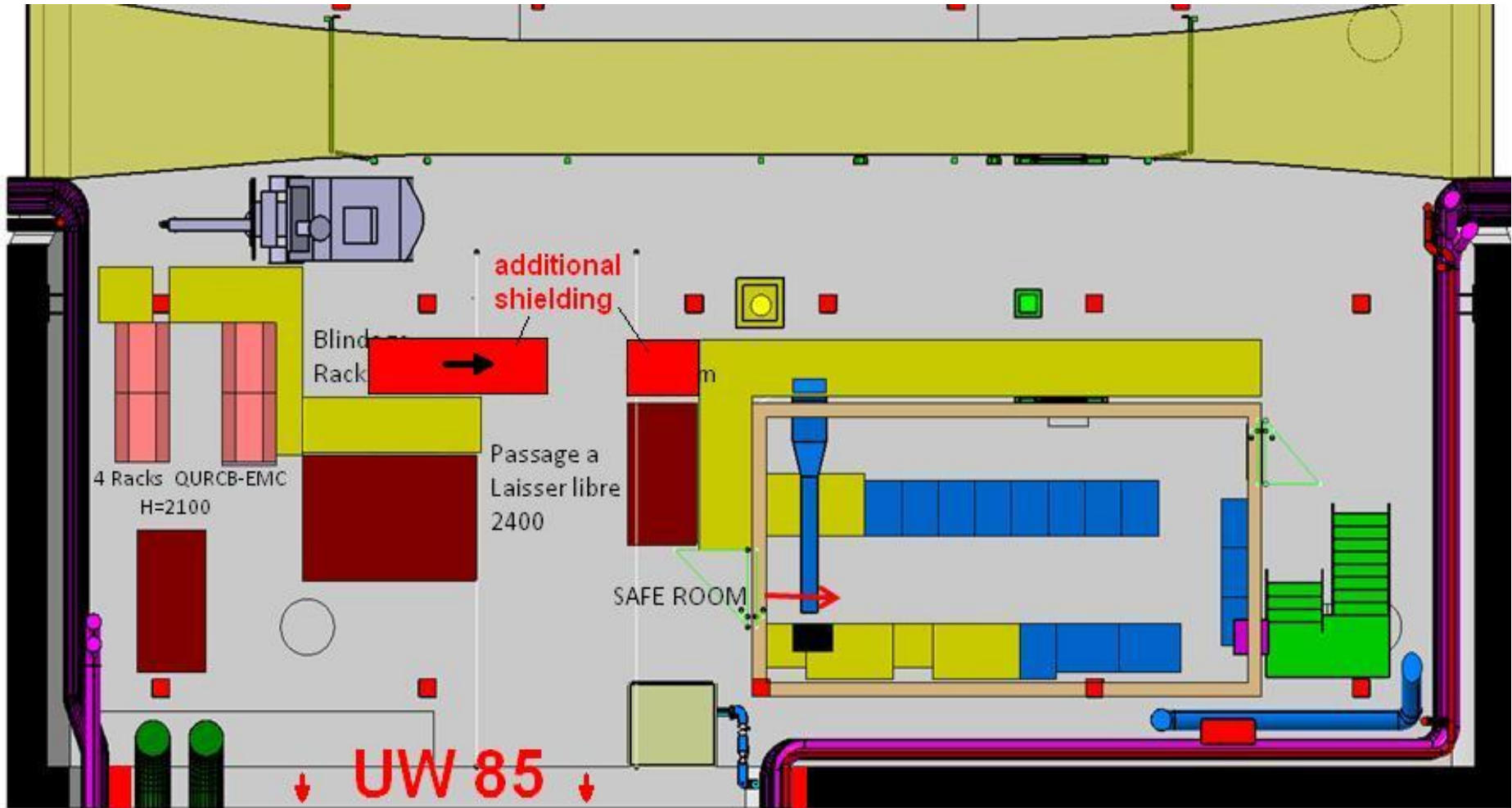
- Relocation of the control room to end of cavern (cost: ~120kCHF, time: 4-5 month) (security ? space ? no cooling during works ! Tests !)
- Additional shielding US cavern
- Rewiring of ventilation and vibration rack to surface (~15kCHF)
- Remote reset not possible for cooling equipment rack
- Remote reset possible for ventilation and vibration racks

# Mitigation option: Relocation

TOP VIEW



# Mitigation option: Shielding in US



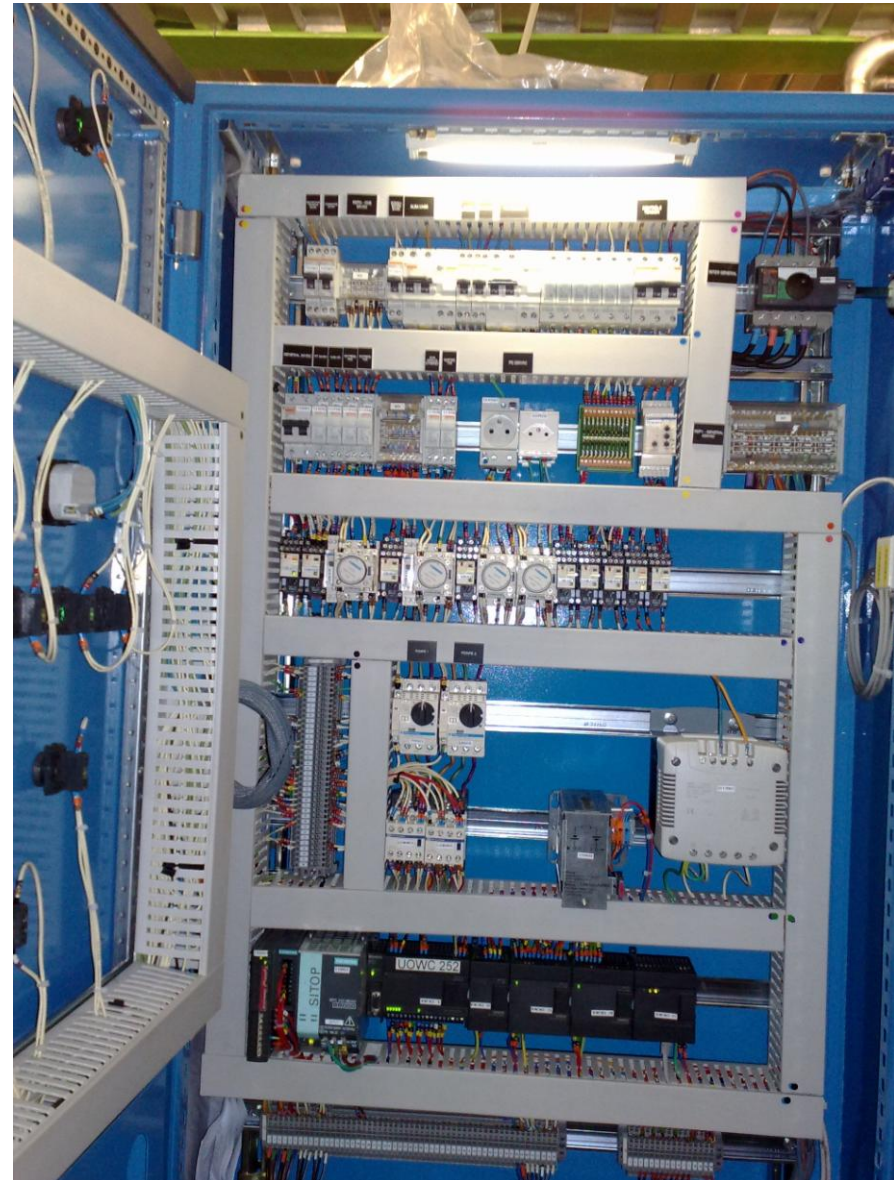
# US caverns 3rd floor Cryo stations

## Cryo Cooling Station

(mixed water circuit for  
Cryo racks cooling)

- Control Cubicle
- Electronic equipment







## Details US Cryo cooling stations (3rd floor)

- **US25 / US85 (equal for US45/65):**
- Control cubicle UIAO-252 (UIAO-852)
- Expansion tank controller PNEUMATEX (brain cube)
- Alarm transmission PLC S7-200



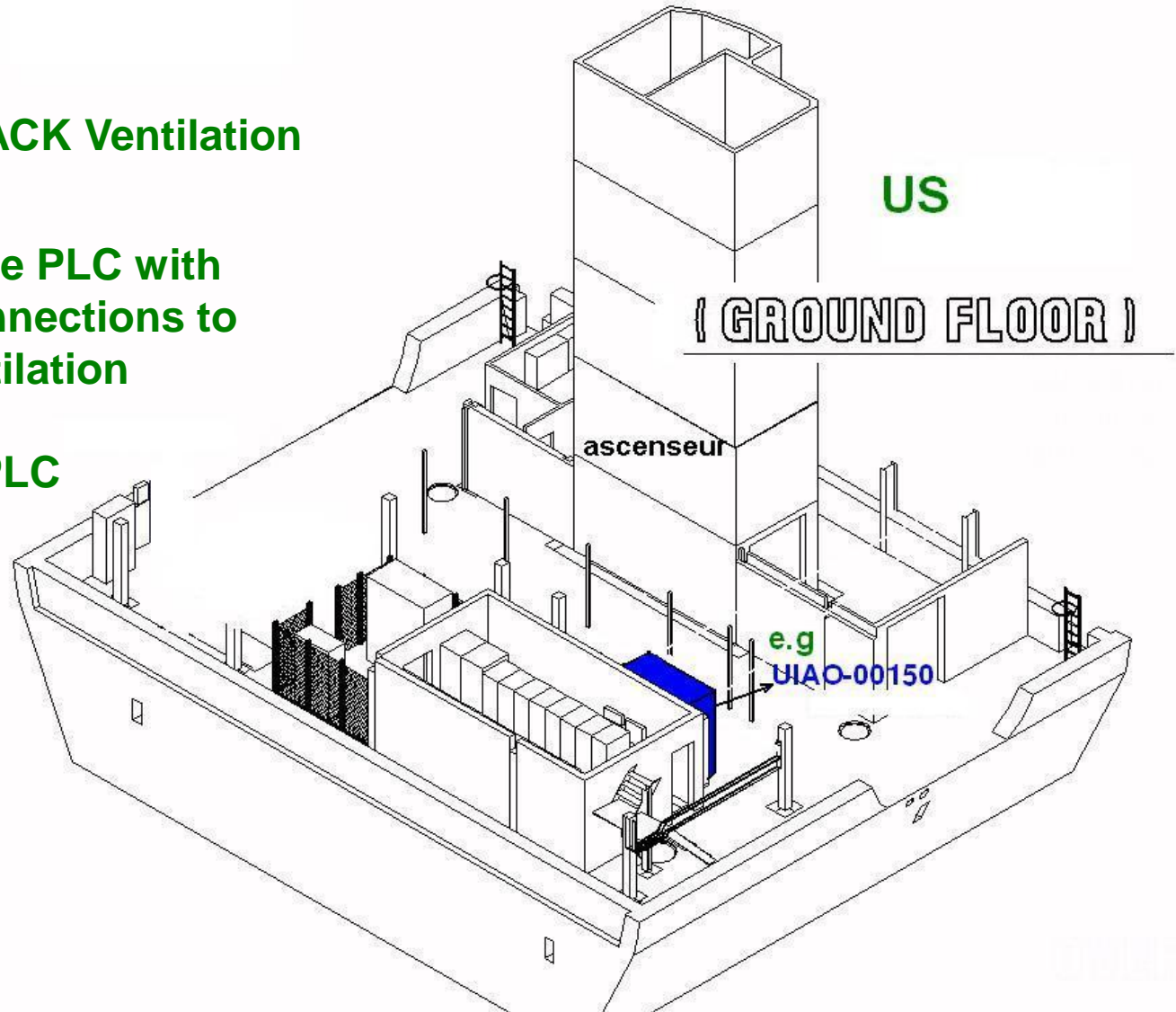
## Mitigation options

- Relocation to UW cavern (cost: ~60kCHF, time: 2 month)  
(space ?) (needs piping, new pumps)
- Remote reset not possible for cooling equipment (how works Pneumatex controller ?)  
(but evtl. to discuss cooling conditions with Cryogenics)
- Remote reset possible for Alarm transmission PLC

# US/UJ cavern Ventilation Concentrators

## Concentrator RACK Ventilation

- Control Cubicle PLC with hard wired connections to US UJ RR ventilation
- Concentrator PLC on Profibus to S7-200 ventilation UA/UL/UJ



UJ56

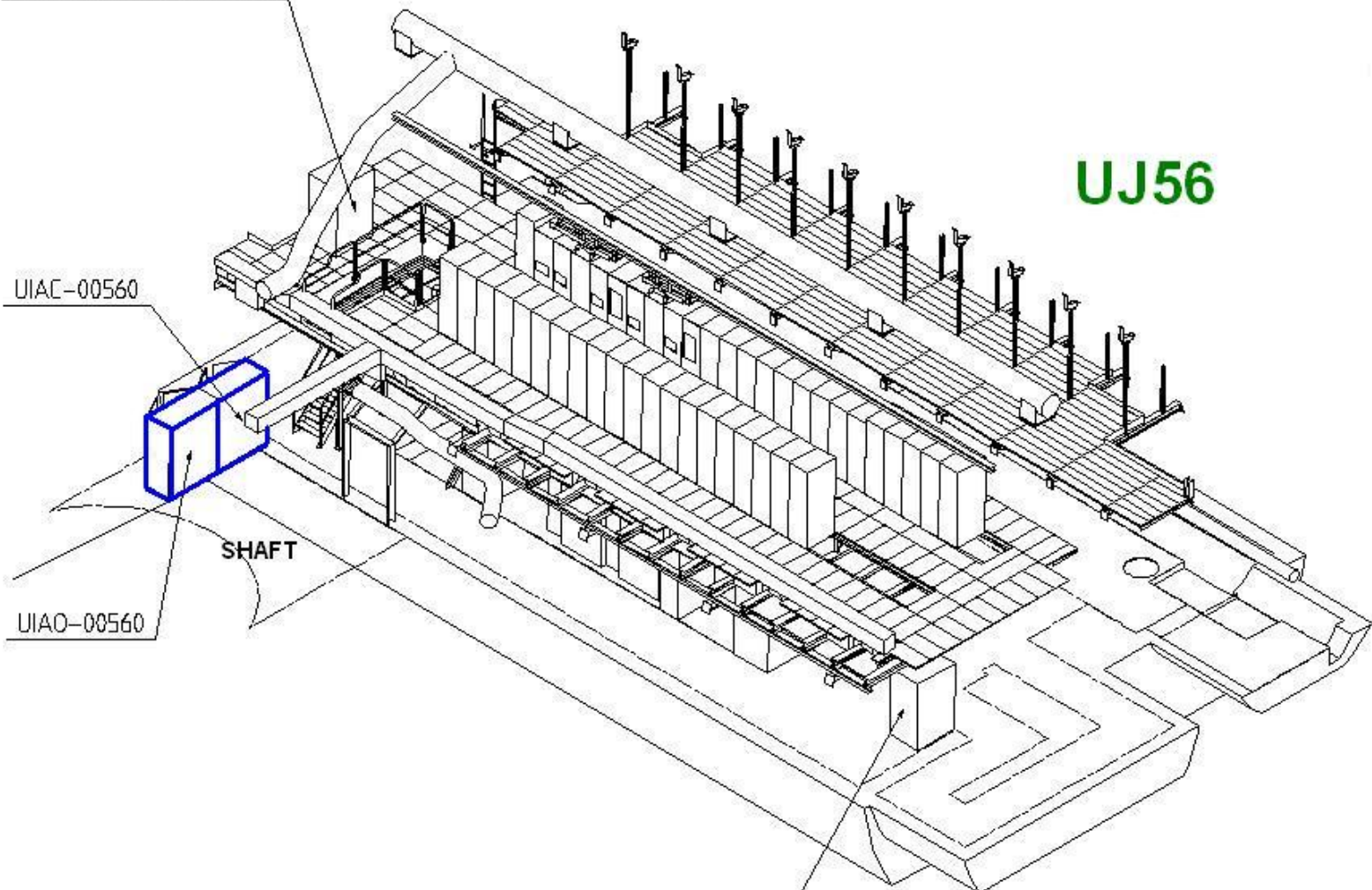
UAUQ-01556-UJ56-UJ56

UIAC-00560

SHAFT

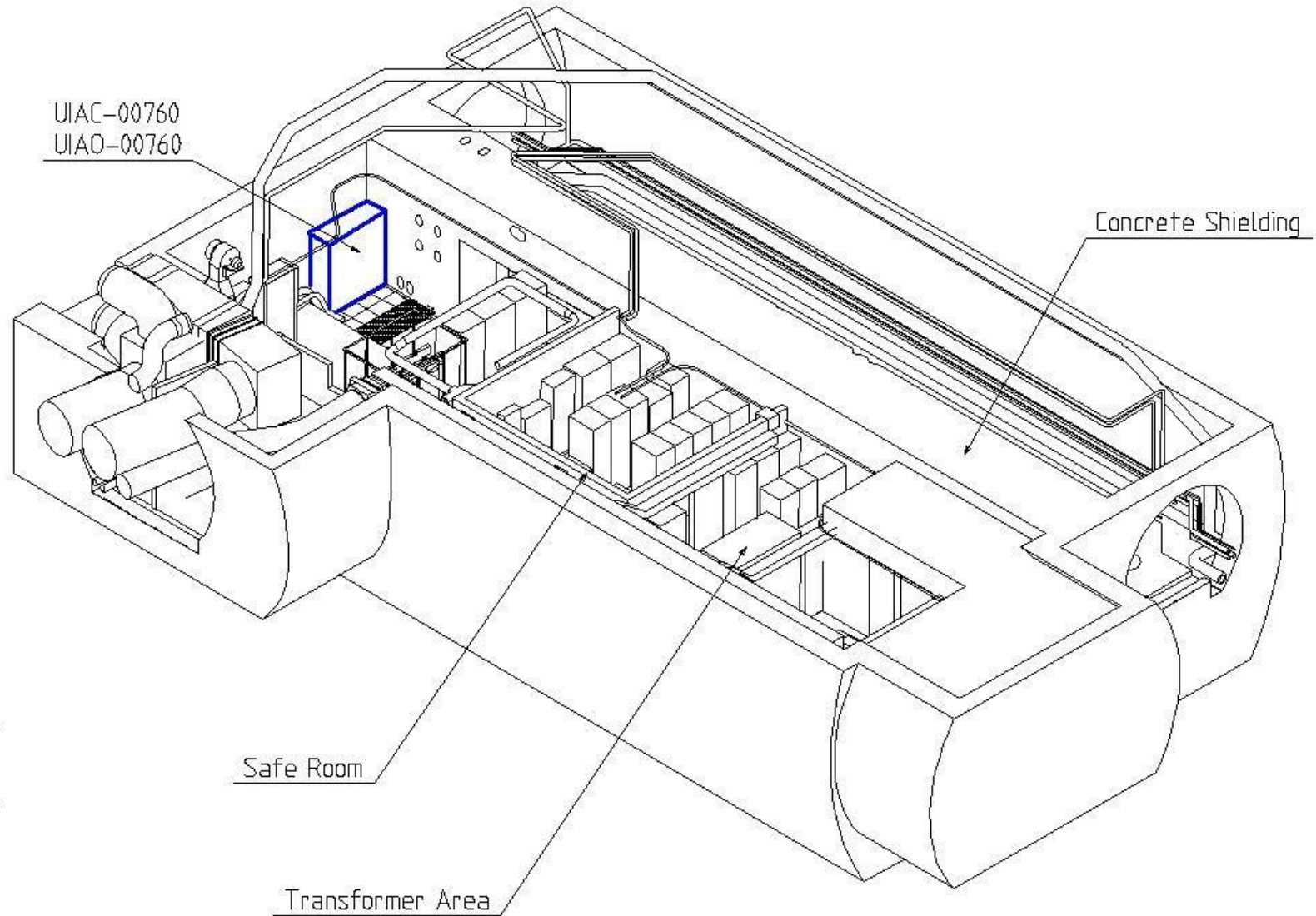
UIAO-00560

UAUQ-01557-UJ56-UJ56



UJ76

GROUND FLOOR



## Details US/UJ cavern ventilation Concentrators

- **US15 : Control cubicle UIAO-150**

Local US ventilation PLC, RR13 / RR17 ventilation (hard-wired) and Profibus concentrator for ventilation UJ14/UJ16, UL, UA (S7-200 PLCs)

- **UJ56 : Control cubicle UIAO-560**

Local UJ ventilation PLC, RR53 / RR57 ventilation (hard-wired) and Profibus concentrator for ventilation UJ53/57 (S7-200 PLCs)

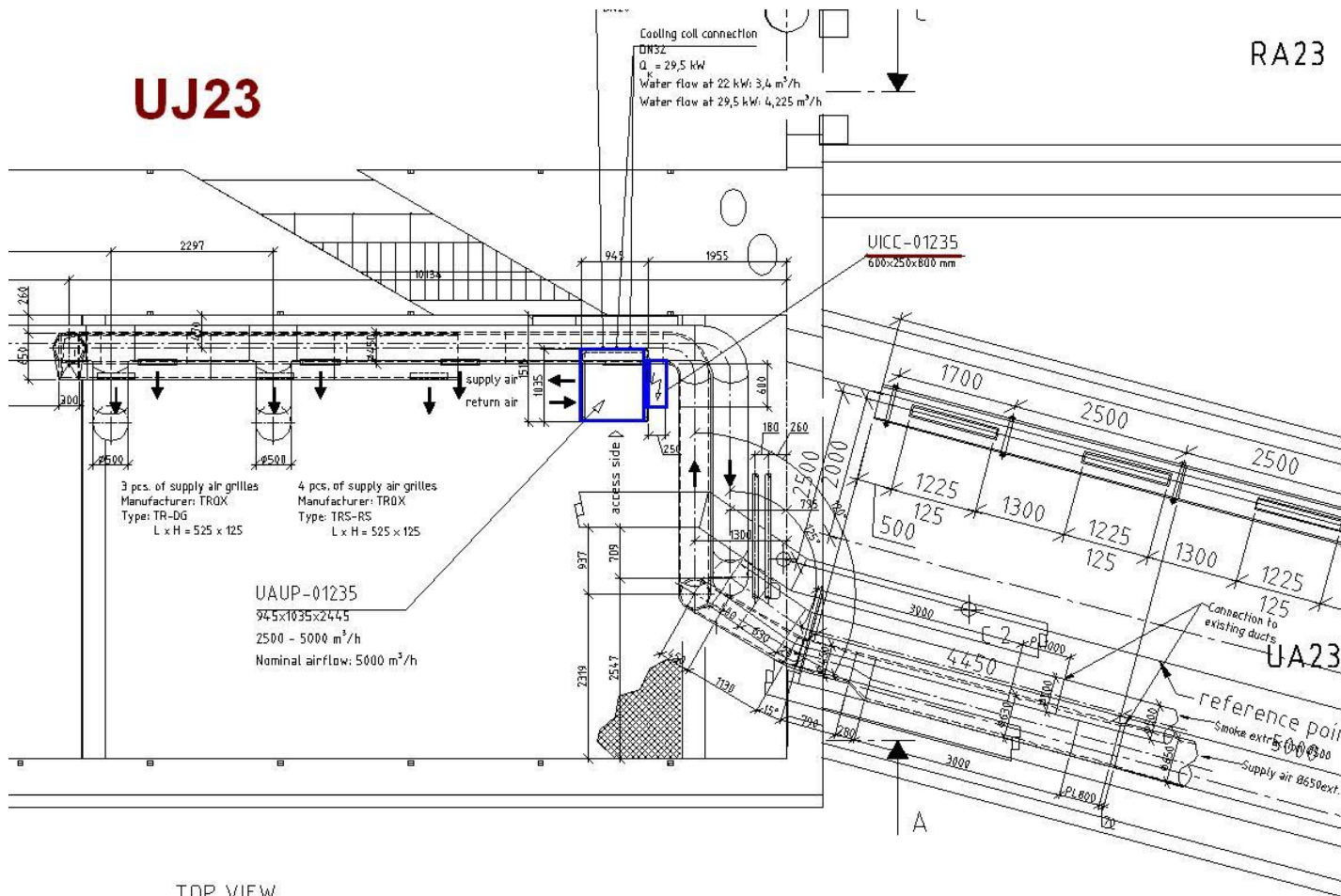
- **UJ76 : Control cubicle UIAO-760**

Local UJ ventilation PLC, RR73 / RR77 ventilation (hard-wired) and Profibus concentrator for ventilation UJ76, TZ76 (S7-200 PLCs)

## Mitigation options

- Relocation to surface (cost: ~20kCHF per rack, time: 2 month)  
(rewiring hard-wired connections and Profibus through shaft !)
- Remote reset possible

# UA/UJ Ventilation S7-200 racks



- Local Control Cubicles PLC S7-200 : UA UJ UL UP ventilation
- Air handling units (sensors, transmitters, servomotors)



## Details UA/UJ Ventilation S7-200 PLCs

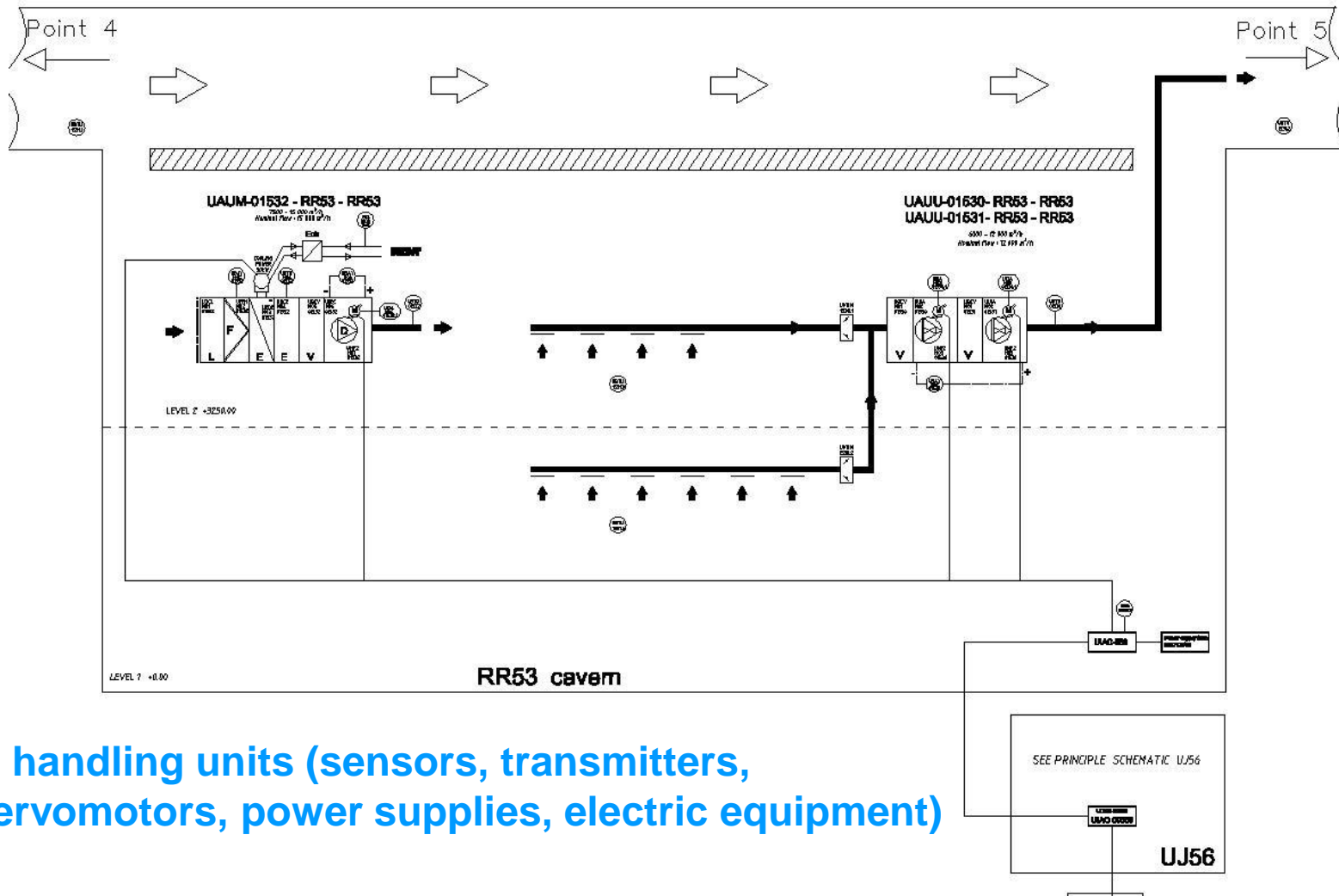
- 2 air handling units and S7-200 racks in UJ14 / UJ16
- 28 air handling units and S7-200 racks in UA23 / UJ23 / UJ 24 / UJ26 / UA27 / UA27
- 34 air handling units and S7-200 racks in UA43/UJ43/UJ 44/UL44/UJ46/UL46/UA47/UA47
- 26 air handling units and S7-200 racks in UA63 / UA67 / UJ63 / UJ67 / UP63 / UP68
- 28 air handling units and S7-200 racks in UA83 / UA87 / UJ83 / UJ87
- Air handling units with electronic equipment (sensors/transmitters/servomotors)
- (affected racks/units to be seen/discussed in detail as there are more than 100)

## Mitigation options

- Relocation/ rewiring to safe area (cost: ~5kCHF per rack ? )
- Running units in fixed mode (no regulation/measurements)
- Shielding
- Remote reset possible



# Ventilation Units (hard-wired)



**Air handling units (sensors, transmitters, servomotors, power supplies, electric equipment)**



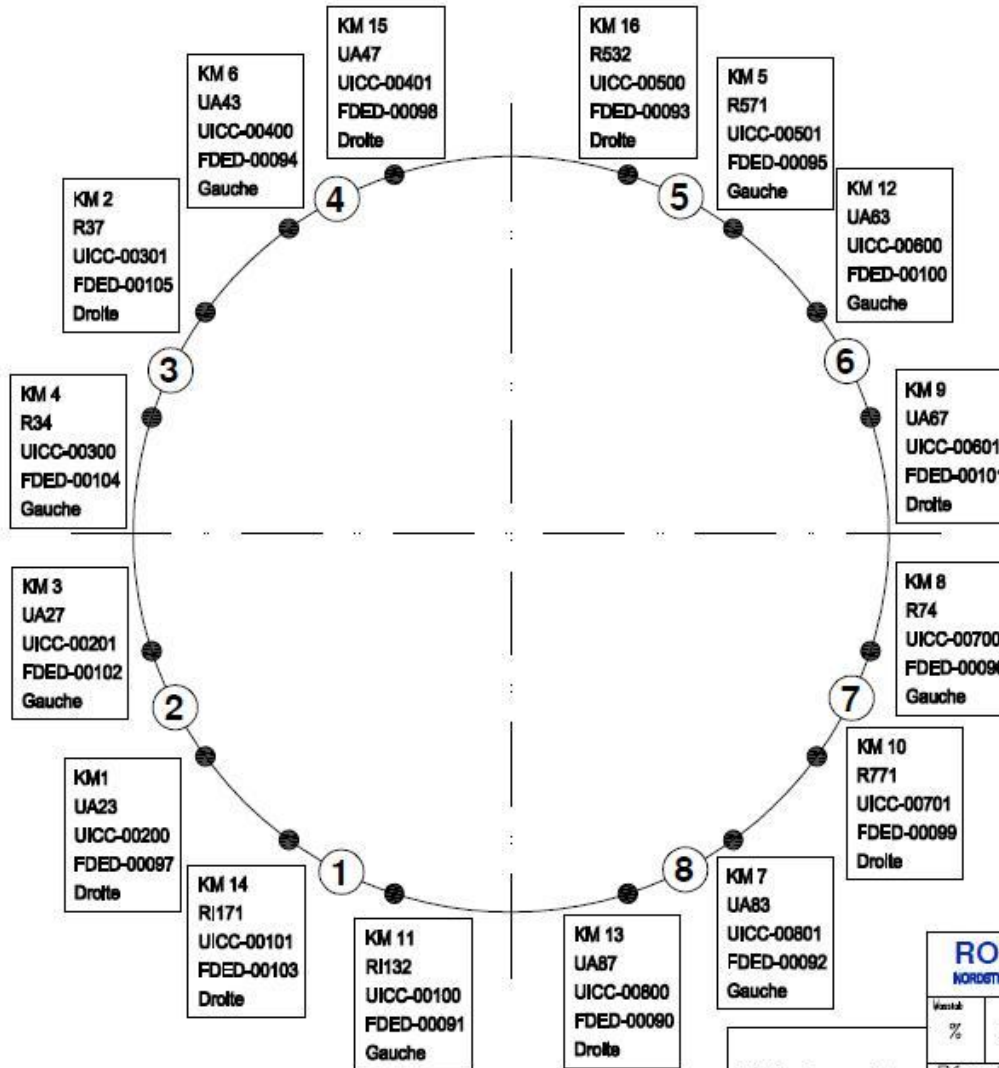
## Details Ventilation Units RR/UJ/US (hardwired to Concentrator)

- 4 air handling units in RR13 and RR17 ( power rack, wired to UIAO-150 )
- 4 air handling units in RR53 and RR57 ( power rack, wired to UIAO-560 )
- 4 air handling units in RR73 and RR77 ( power rack, wired to UIAO-760 )
  
- 8 air handling units in US15 ( directly wired to Concentrator UIAO-150 )
- 2 air handling units in US25 ( directly wired to Concentrator UIAO-250 )
- 2 air handling units in US85 ( directly wired to Concentrator UIAO-850 )
  
- 10 air handling units in UJ56 ( directly wired to Concentrator UIAO-560 )
- 4 air handling units in UJ76 ( directly wired to Concentrator UIAO-760 )
  
- Air handling units with electric or electronic equipment, (power racks with power supplies), sensors/transmitters/servomotors
- Dysfunction: Increasing temperatures (trouble for electronic equipment)

## Mitigation options

- Running units in fixed mode (no regulation/measurements)
- Shielding
- Remote reset possible

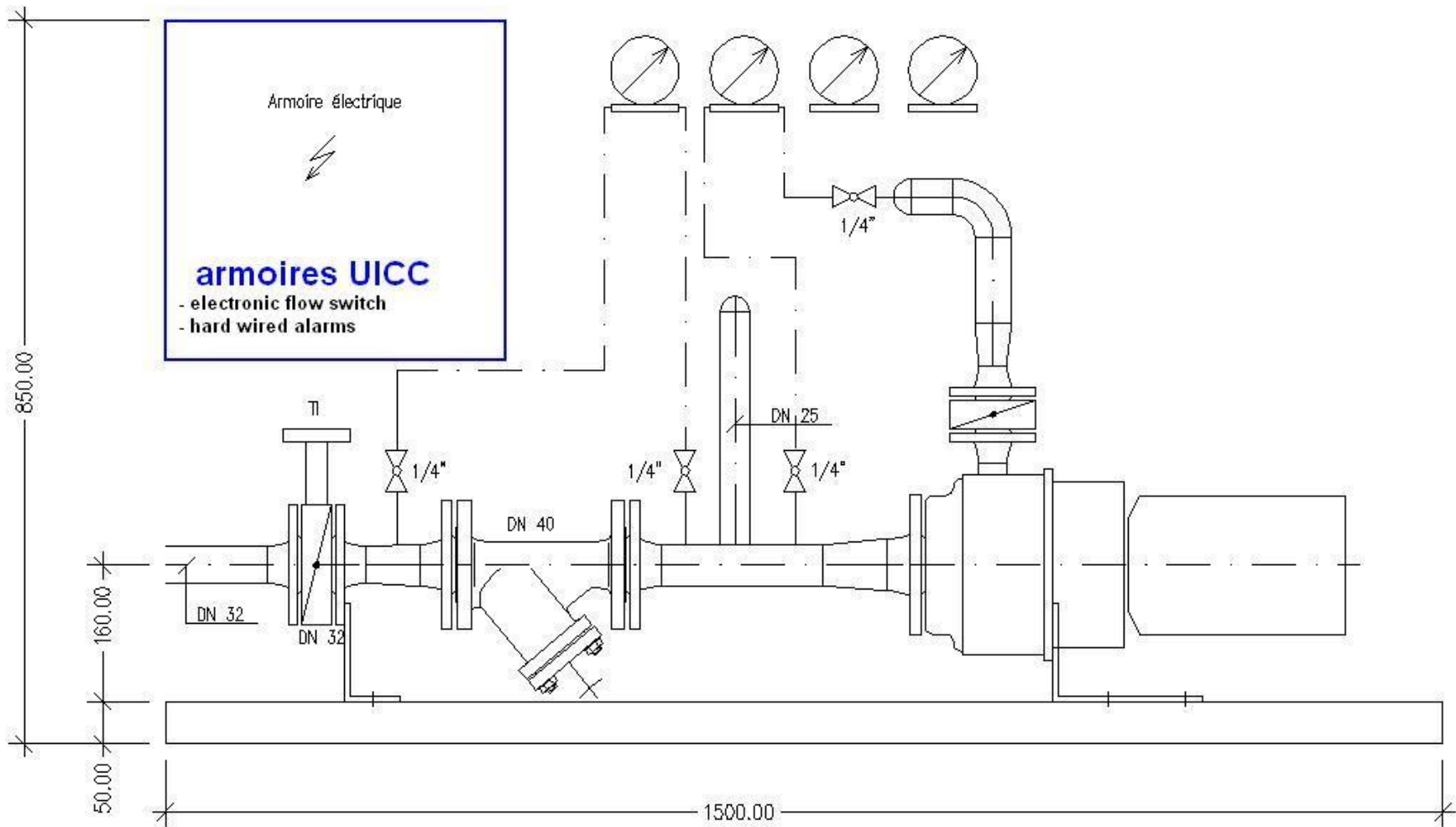
# DQR cooling stations LHC tunnel



- Cooling stations (flow switch sensor, valves, electric equipment)

<b>ROESE</b> Haustechnik GmbH NORDSTRASSE 14, 98587 BREITLINGEN; TEL. 0369/4086-0		Date:	04.05.2007	Version:	1
		Del.:	04.05.2007	Uf.:	Uf.:
		Dep.:	04.05.2007	Tr.:	Tr.:
%		CERN - IT 3188		Zich. Nr.:	ROE_UHF_..._KL_05_REV
CERN's Reserved Area		Répartition des modules de refroidissement DQWCS dans le LHC.		Project No.:	2003 245





## Details Cooling stations DQR

- **16 cooling stations along the LHC:**

R132 R171 UA23 UA27 R34 R37 UA43 UA47

R532 R571 UA63 UA67 R74 R771 UA83 UA87

- Few electrics : pressure switch, circuit breakers, LEDs
- Electronics : flow switch
- Dysfunction : DQR with increasing temperatures

## Mitigation options

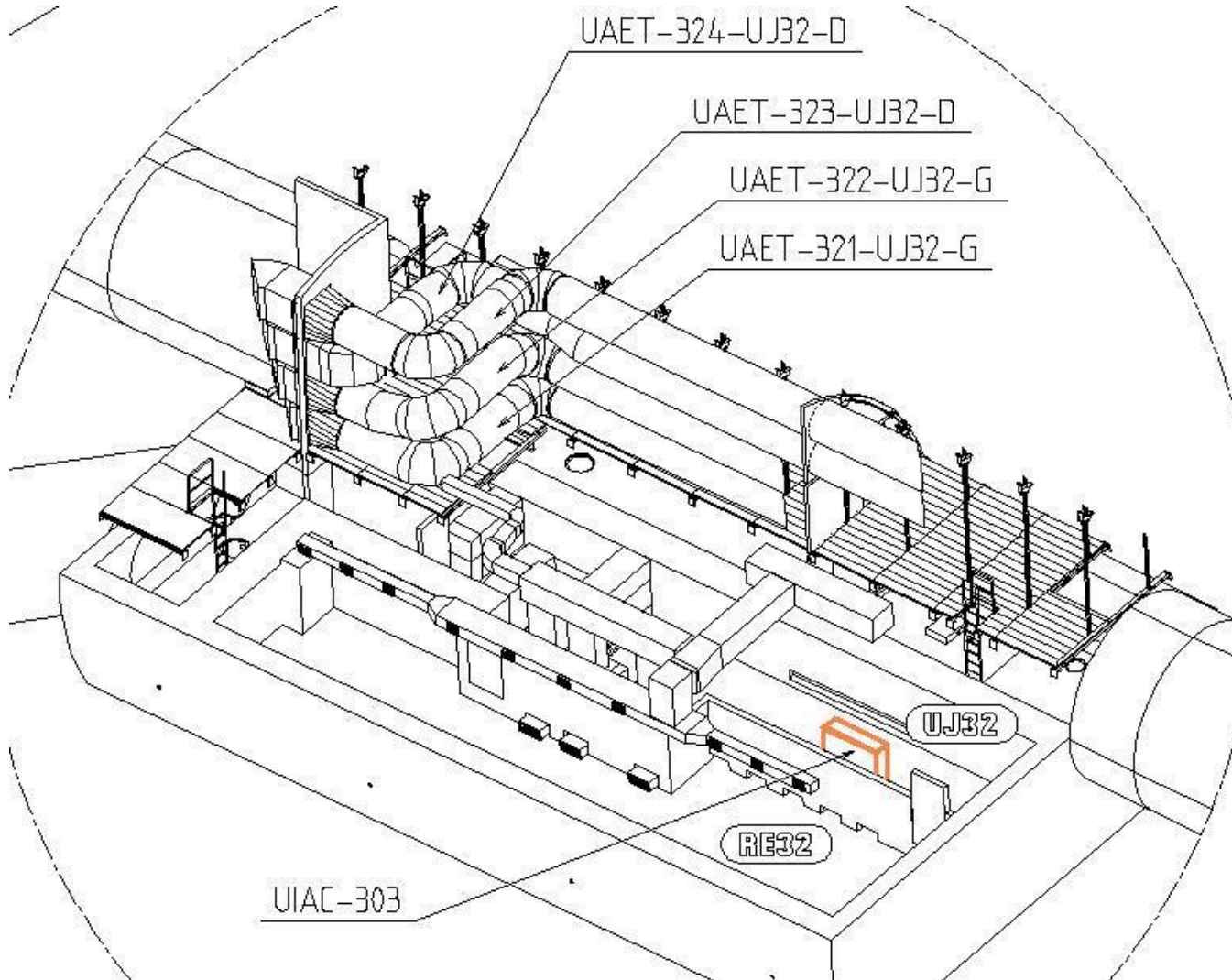
- Shielding (necessary ?)

# **Unique installations**

**(Unique installations, special  
equipment, special conditions, etc.)**



# UJ32 Tunnel Extraction Rack





Control Rack  
UIAC-303

## **Details UJ32 Tunnel extraction sector 2-3 & 3-4**

- Control cubicle with PLC S7-300 (UOWC-310)
- Control of 4 LHC tunnel extraction units, type UAET
- Dysfunction : wrong pressure conditions in LHC tunnel

## **Mitigation options**

- Shielding of control cubicle
- Relocation/ rewiring to surface area (cost: ~5-8kCHF ? )
- Remote reset not possible  
(immediate pressure drop in LHC tunnel)

# TZ76 Local ventilation



Air handling unit  
UAUK type



UIAC-770 control rack

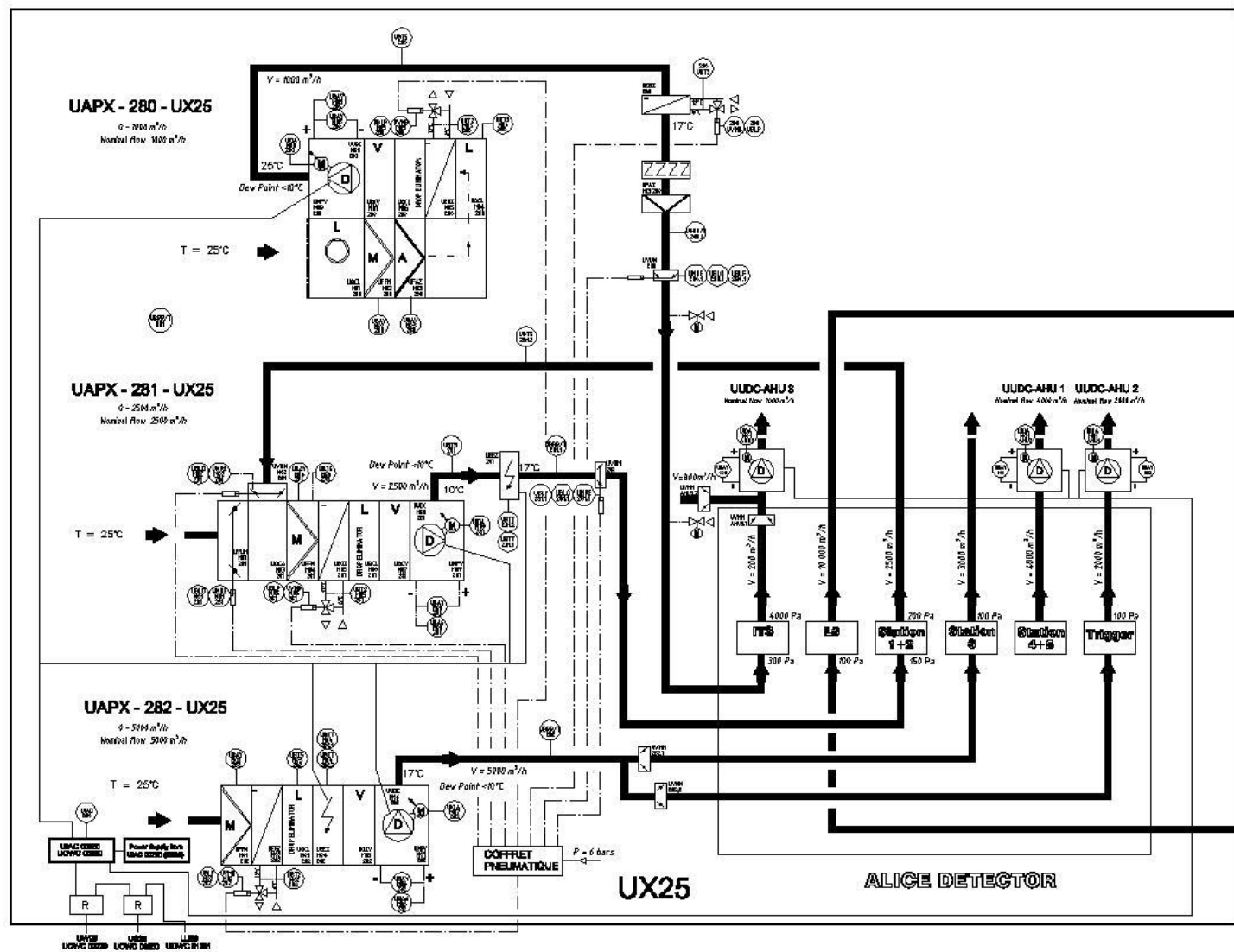
## Details TZ76 local ventilation

- 2 new control cubicles with 2 PLC S7-300 (UIAC-770, UIAC-771)
- Control of 10 local ventilation units, type UAUK
- Dysfunction would increase temperatures in TZ76 (causing problems to electronic racks)

## Mitigation options

- Shielding (necessary ?)
- Relocation/ rewiring to surface area (cost: ~5-8kCHF ? )
- Remote reset possible

# UX25 detector ventilation





UJDC M06 00281  
UMFV M07 00281

UJDC M06 00281  
UMFV M07 00281

UJDC M06 00281  
UMFV M07 00281

UJDC M06 00281  
UMFV M07 00281

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UJDC M06 00281  
UMFV M07 00281

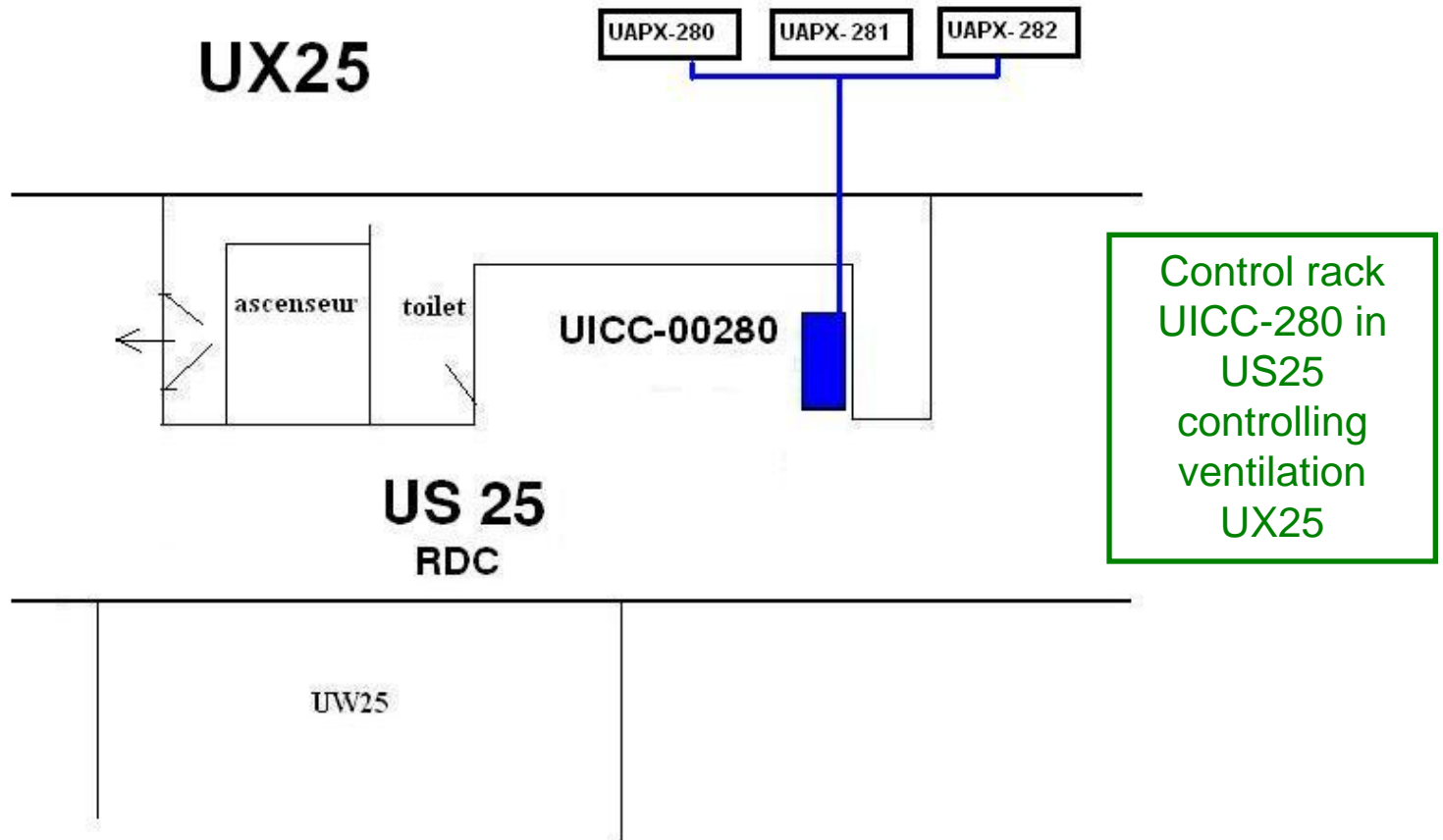
UJDC M06 00281  
UMFV M07 00281

**DANGER!**  
Before the doors can be  
opened, the fan must be  
stopped. The doors should  
not be opened until the  
warning horn has stopped.

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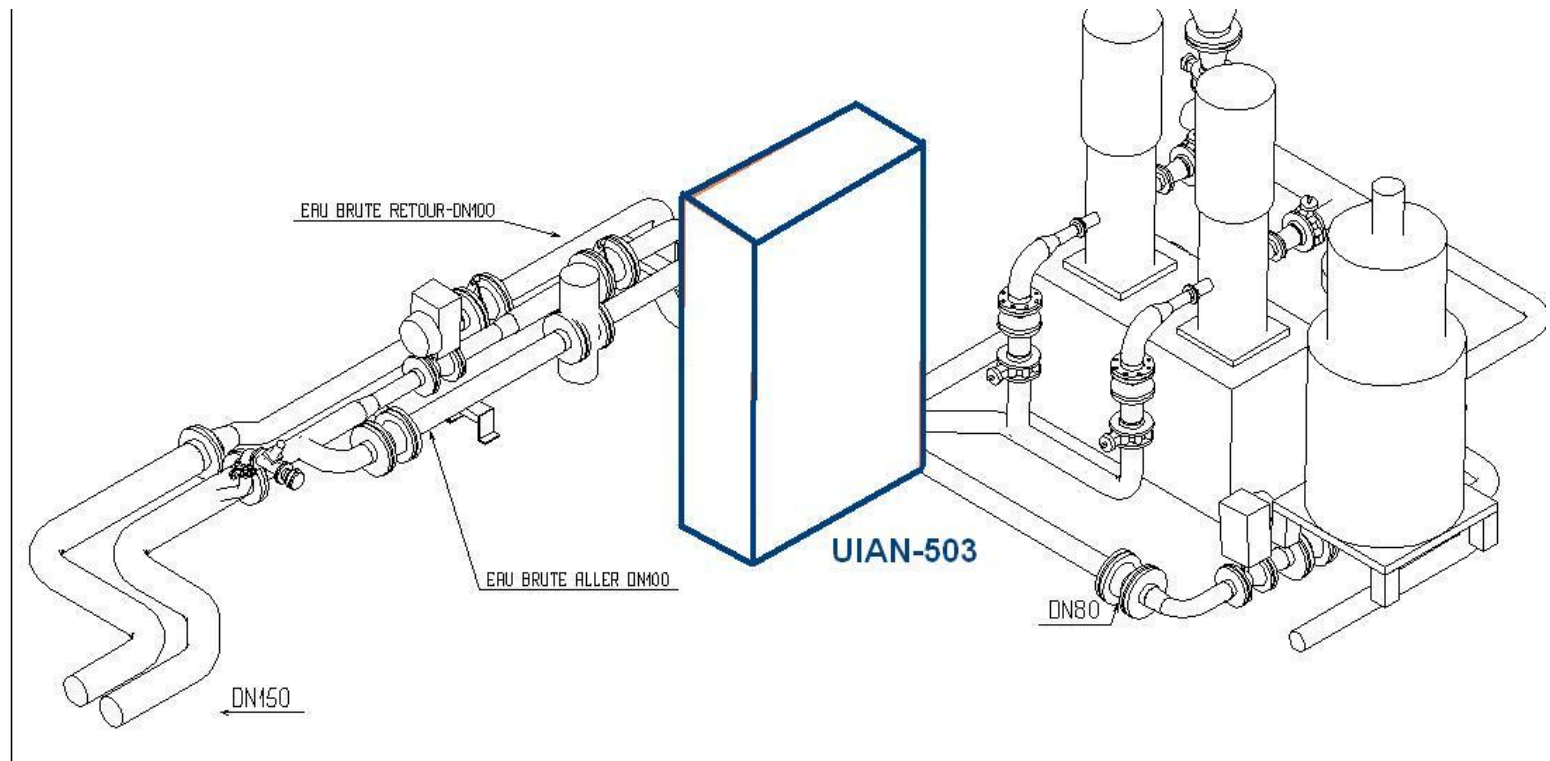
## Details UX25 ALICE detector ventilation

- 3 x Air handling units in the experimental cavern UX25 (UAPX-280, UAPX-281, UAPX-282) with electric or electronic equipment, sensors, transmitters, servomotors
- Control cubicle UICC-280 in US25 with S7-300 PLC
- Dysfunction would stop ALICE detector

## Mitigation options

- Shielding of control cubicle
- Relocation/ rewiring to UW or surface area (cost: ~3-8kCHF ? , time 1 month)
- Remote reset probably not possible (to see with ALICE exp.)
- Running units in a fixed mode (no regulation, measuring)

# UJ56 Raw Water Pumps





## Details UJ56 Raw Water Pumps

- Control Cubicle UIAN-503 (NO plc), with operator touch panel linked to surface (SF5) via Profibus connection, circuit breakers, LEDs, power supply, few electronic equipment (flow switches and thermal relays)
- Control of Raw Water Pumps (eau incendie), filling up water for SUX5 chilled water, SF5 primary water
- Dysfunction stops chilled water, primary water point5

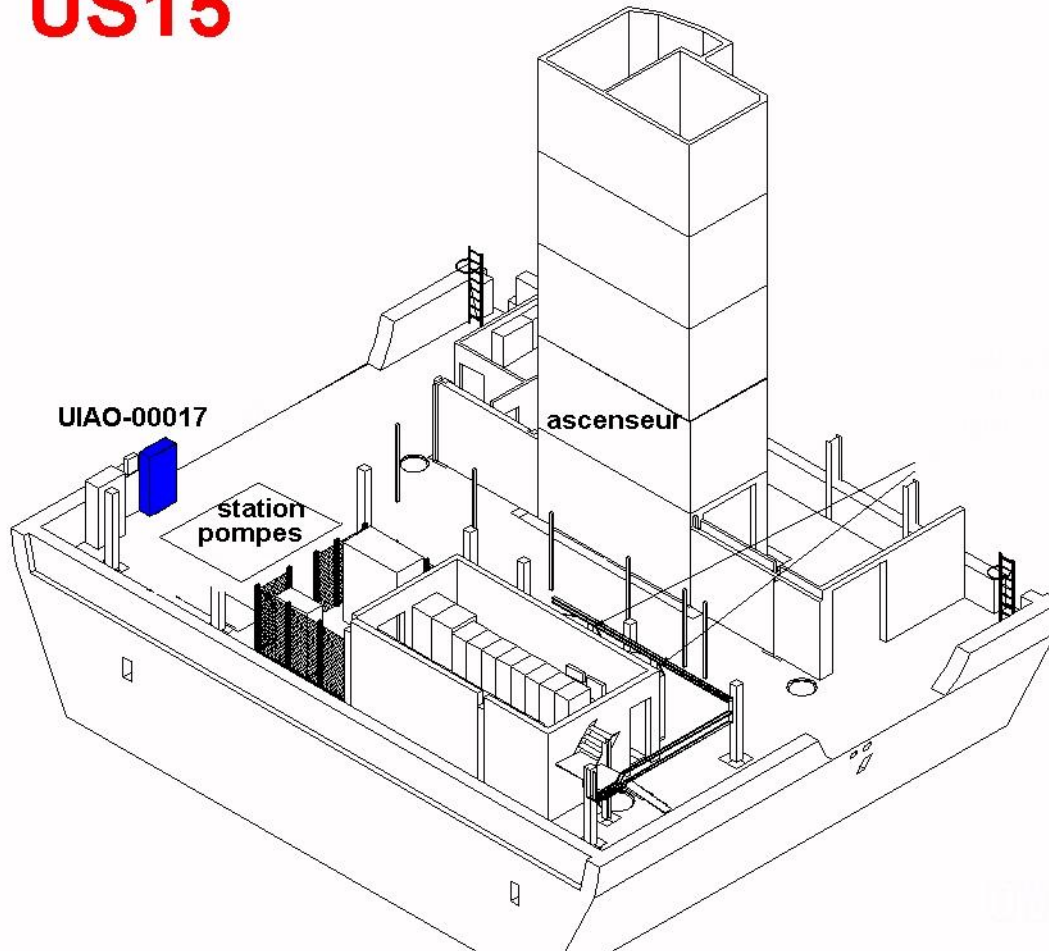
## Mitigation options

- Shielding of control cubicle (necessary ?)
- Relocation/ rewiring to surface area (cost: ~5-8kCHF ?)

# US15 Pumping Station

OVERVIEW ( GROUND FLOOR )

**US15**



000000



Control Rack  
UIAO-017





## Details US15 Mixed Water Pumps

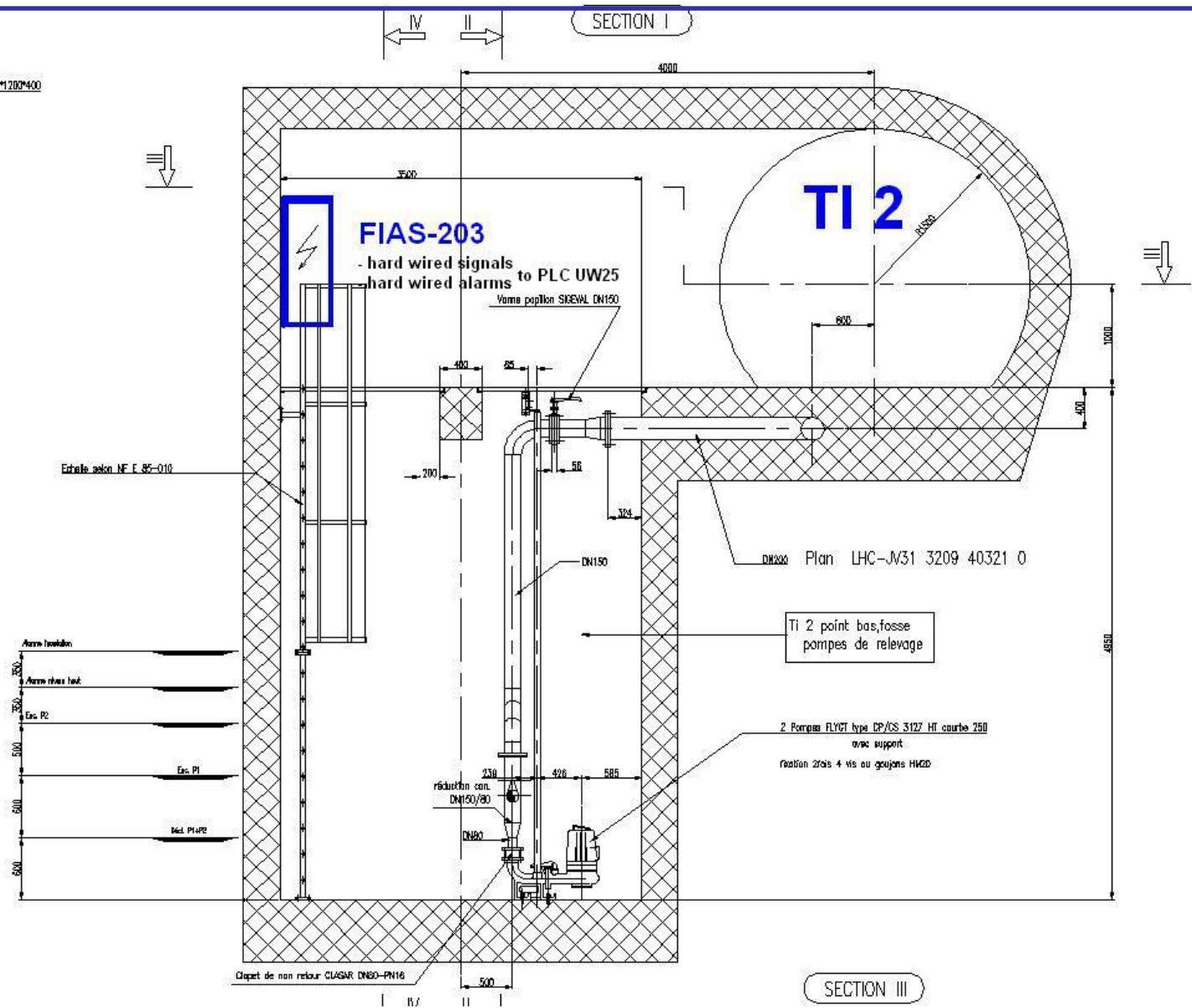
- Control Cubicle with PLC Schneider Twido power supplies, circuit breakers, etc.
- Control of Mixed Water Pumps (Cooling circuit for ATLAS electronic racks)  
Sensors, transmitters, control valves
- Dysfunction interlocked with ATLAS racks

## Mitigation options

- Shielding of control cubicle
- Relocation/ rewiring to surface area (cost: ~5-8kCHF ? )
- Remote reset probably possible (to see with ATLAS)

# TI 2 – Rising Pumps

Electricité 1002\*1202\*400





## Details TI 2 - lowest point rising pumps

- Power Cubicle FIAS-203  
Few electric equipment : circuit breakers, LEDs, relays
- Control of clear water 2x raising pumps  
Level sensors, floaters (hard wired to UW25 control rack)
- Dysfunction risks flooding of TI2

## Mitigation options

- Shielding (?)
- Relocation/ rewiring to safe area (cost: ~5-8kCHF ? )