CERN

ENGINEERING DEPARTMENT

HVAC Safety Coordination Meeting HI-ECN3/SHiP

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29.11.2024.

Questions

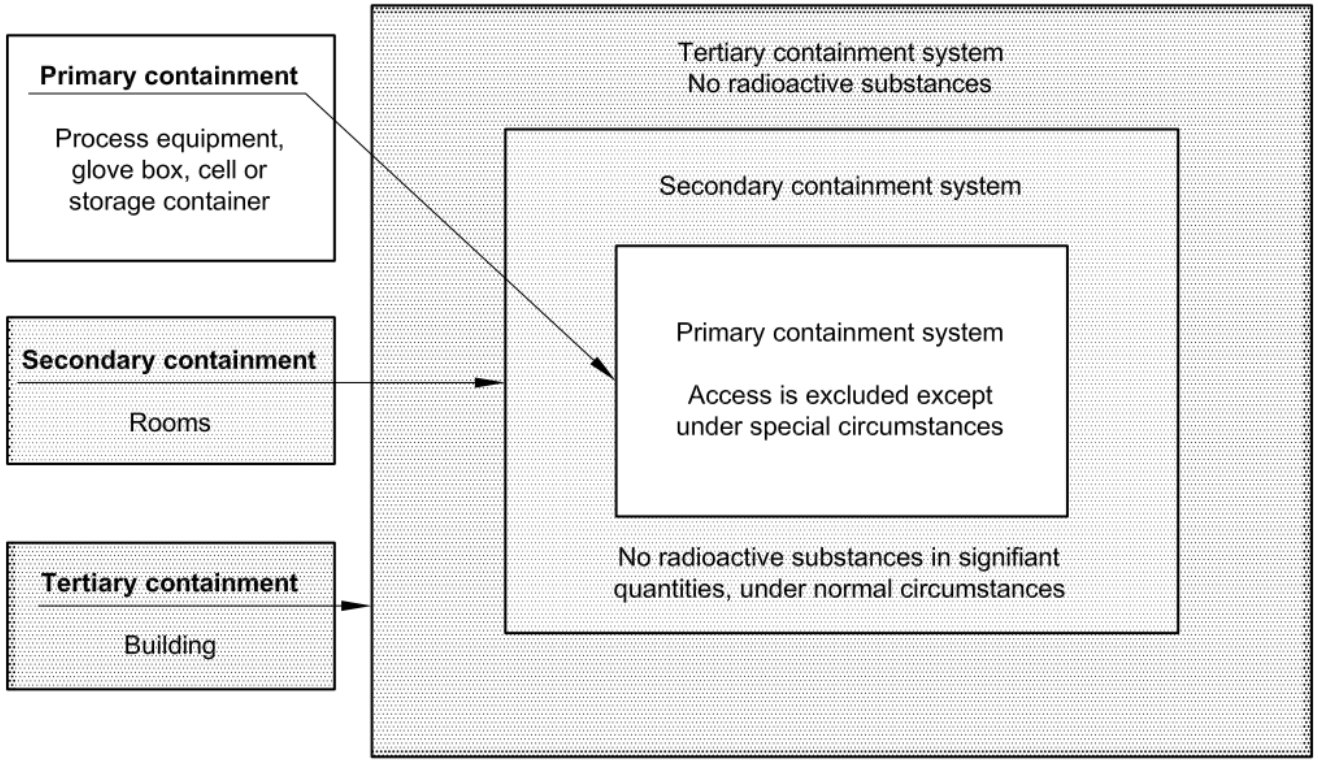
- What is the boundary between the HI-ECN3 and SHiP projects wrt CV ?
- E.g. who is in charge of the ventilation of the control room , meeting rooms, etc in B918?
- Is the values for the underpressure correlated to the class C1, C2, etc? Was there a radiological risk assessment performed to which you based your design?
- Does the WP include the ventilation of ECN3?
- Is there dynamic confinement requirements between TCC8 and ECN3?
- What type of filtration is foreseen?
- From the FIRIA studies to we have an idea if smoke extraction is required underground?
- How many exhaust stacks will there be?

Who is in charge of the ventilation of the control room , meeting rooms, etc in B918?

- EN-CV with the Operation team

Is the values for the underpressure correlated to the class C1, C2, etc? Was there a radiological risk assessment performed to which you based your design?

ISO 17873:2004(E) standard
Guidelines: Attention must be paid to designing protection for personnel in charge of operations that may lead to the spread of radioactive contamination, as well as additional protection for personnel in adjacent areas



Is the values for the underpressure correlated to the class C1, C2, etc? Was there a radiological risk assessment performed to which you based your design?

- Methodology for dimensioning ventilation systems:
  - The areas in which work on radioactive materials takes place shall be classified according to the degree of radioactive hazard they contain. The classification is usually set according to the direct radiation (external exposure), and the potential level of surface contamination and/or airborne contamination (internal exposure).
  - In order to optimize the ventilation system, the installation shall be divided into separate areas with regard to the risk of spread of radioactive contamination.

Class	Expected normal and/or occasional contamination
C1	Means a clean area free from normal radioactive contamination, whether surface or airborne. Only in exceptional situations, a low contamination level can be accepted.
C2	Means an area that is substantially clean during normal operation. Only in exceptional circumstances, resulting from an incident or accident situation, is a medium level of surface or airborne contamination acceptable, so appropriate provisions must be made for its control.
C3	Means an area in which some surface contamination could be present but it is normally free from airborne contamination. In some cases, resulting from an incident or accident situation, there will be a potential for surface or airborne contamination at a level higher than in C2 areas, so that suitable provisions must be made for its control.
C4	Means an area in which permanent, as well as occasional, contamination levels are so high that there is normally no access permitted for personnel, except with appropriate protective equipment.

Is the values for the underpressure correlated to the class C1, C2, etc? Was there a radiological risk assessment performed to which you based your design?

- Some examples of classifications are given as follows:
  - Non-contaminated change rooms are classified C1;
  - Mechanical process cells presenting a high level of permanent radioactive contamination are generally classified as C3 or C4;
  - Mechanical process cells presenting a low level of accidental radioactive contamination are generally classified as C2 or C3;
  - Chemical process cells, according to their level of toxicity and whether or not permanent contamination is expected to be present, are generally classified as C2 to C4

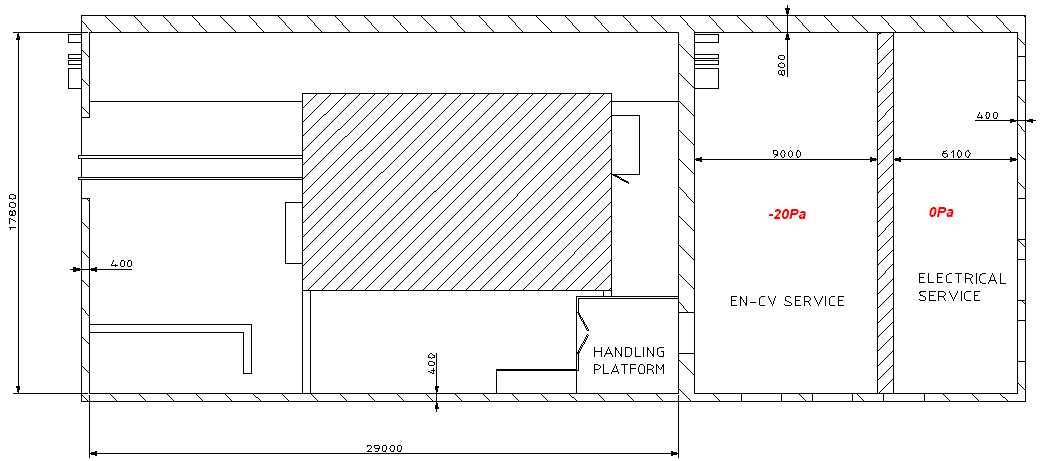
Nature of room or area	Depression value [a]	Containment class
Non-controlled rooms or areas free from contamination	Atmospheric pressure or small overpressure	Unclassified
Supervised areas with low levels of surface or airborne contamination	Less than 60 Pa	C1
C1 should be uncontaminated in normal operations		
Controlled areas with moderate levels of surface or airborne contamination	80 to 100 Pa	C2
Controlled areas with high levels of surface or airborne contamination	120 to 140 Pa	C3
Controlled areas with very high levels of surface or airborne contamination	220 to 300 Pa	C4
Areas which are not accessible except under specific circumstances		

[a] Compared to the reference pressure.

Compartment	Typical air changes per hour	Containment class
Changing rooms, air locks	4 to 5	C1, C2 or C3
Normally clean air corridor	1 to 2	C2
Normally non-active rooms	1 to 2	C2
Controlled areas of medium potential hazard	2	C2
Maintenance areas to primary containment of risk process plants	1 to 5	C3
Controlled area of high potential hazard	5 to 10	C3
Maintenance areas to primary containment of high-risk process plants	10	C3
Primary containment (glove box, containment enclosure or shielded cell)	1 to 30 (depending entirely on process, volume of the containment enclosure and on hazard)	C4

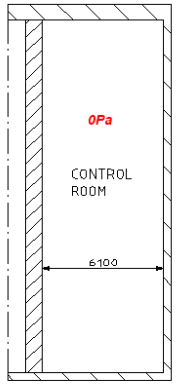
Is the values for the underpressure correlated to the class C1, C2, etc? Was there a radiological risk assessment performed to which you based your design?

B–B – FIRST FLOOR

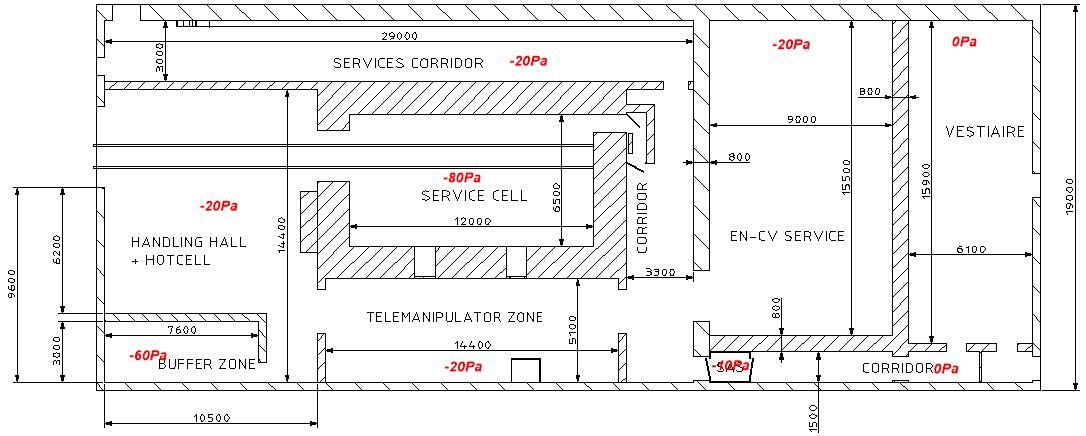


New service building – pressure cascade system

C–C – SECOND FLOOR



A–A – GROUND FLOOR



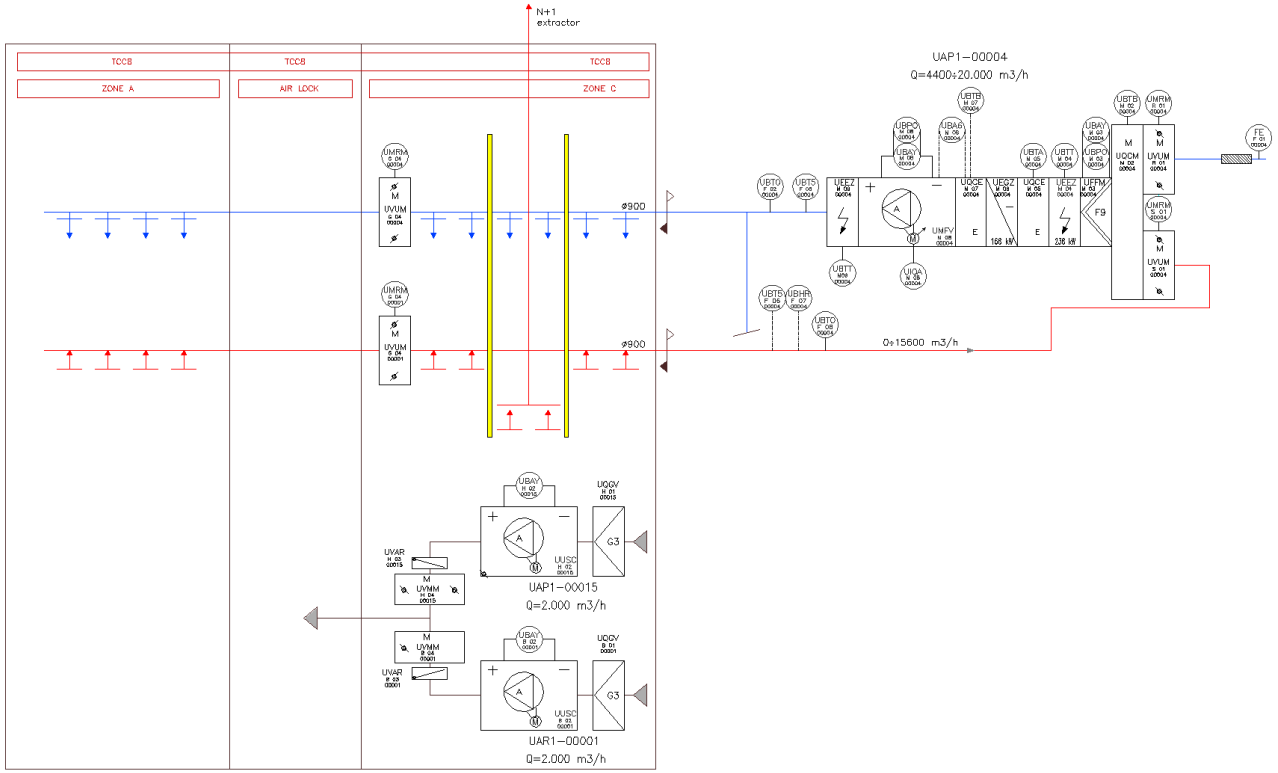
Is the values for the underpressure correlated to the class C1, C2, etc? Was there a radiological risk assessment performed to which you based your design?

- Based on our knowledge, there was no radiological risk assessment

Does the WP include the ventilation of ECN3?
Is there dynamic confinement requirements between TCC8 and ECN3?

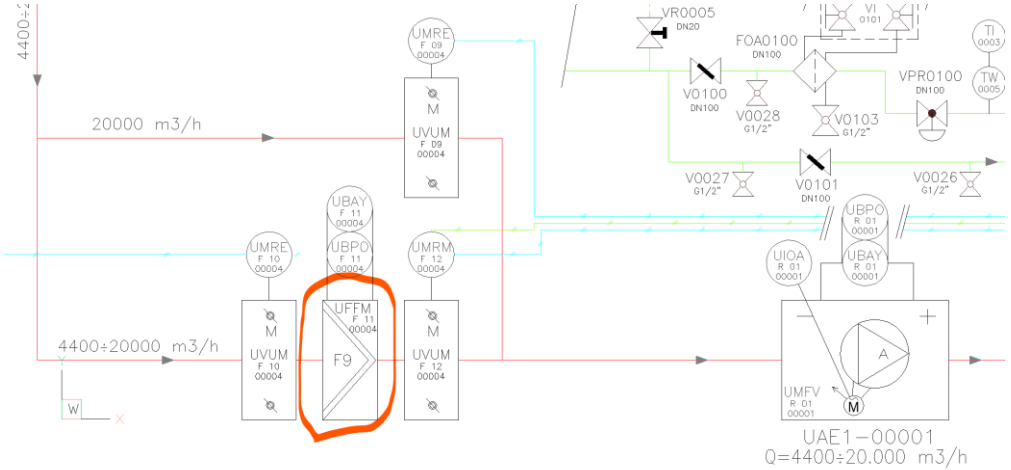
- At the moment, we are not planning to do any modification to ECN3, apart from the extraction where will be Target

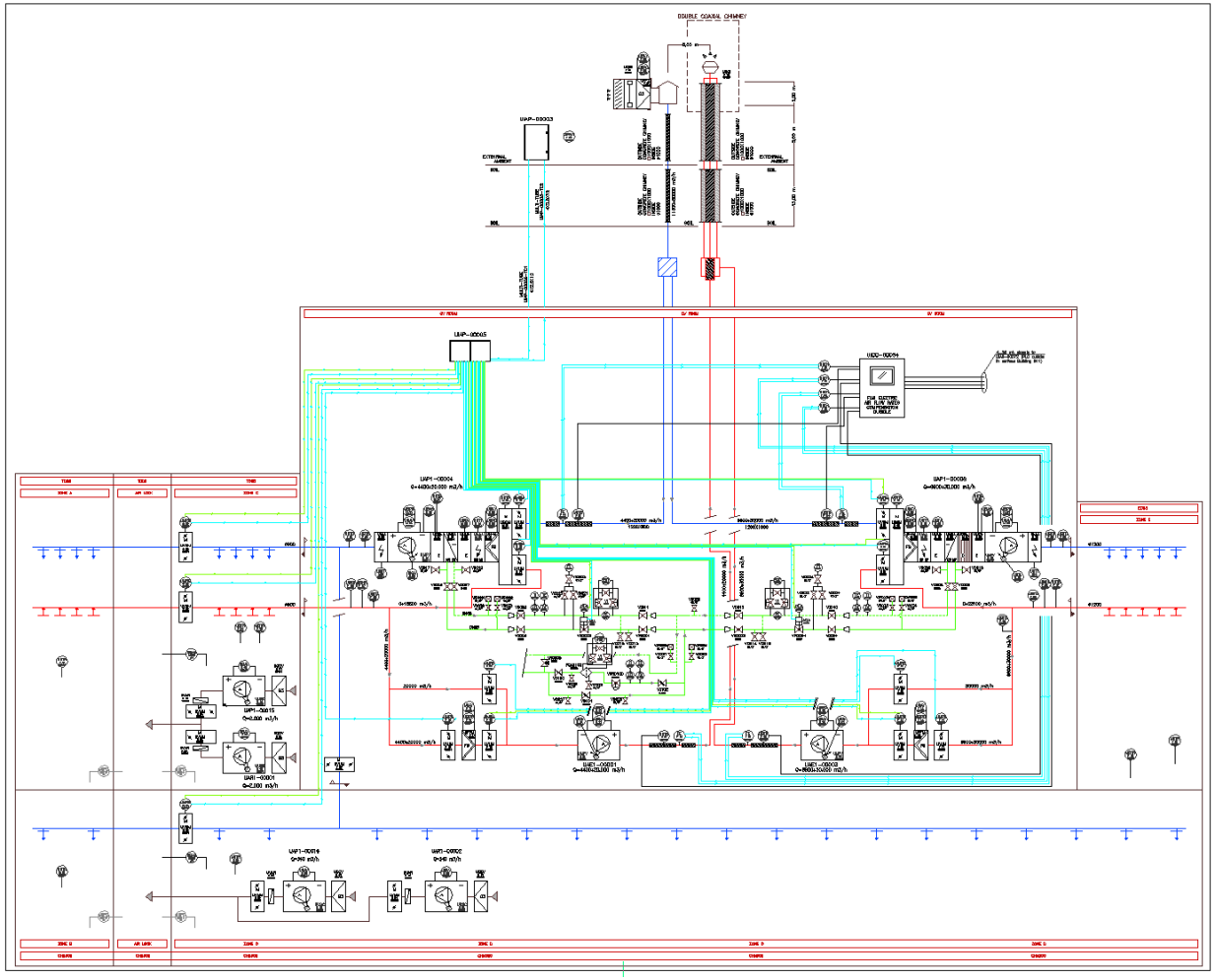
- Not question for CV, we can modify if necessary, but at this moment, we don't plane to have any modifications



What type of filtration is foreseen?

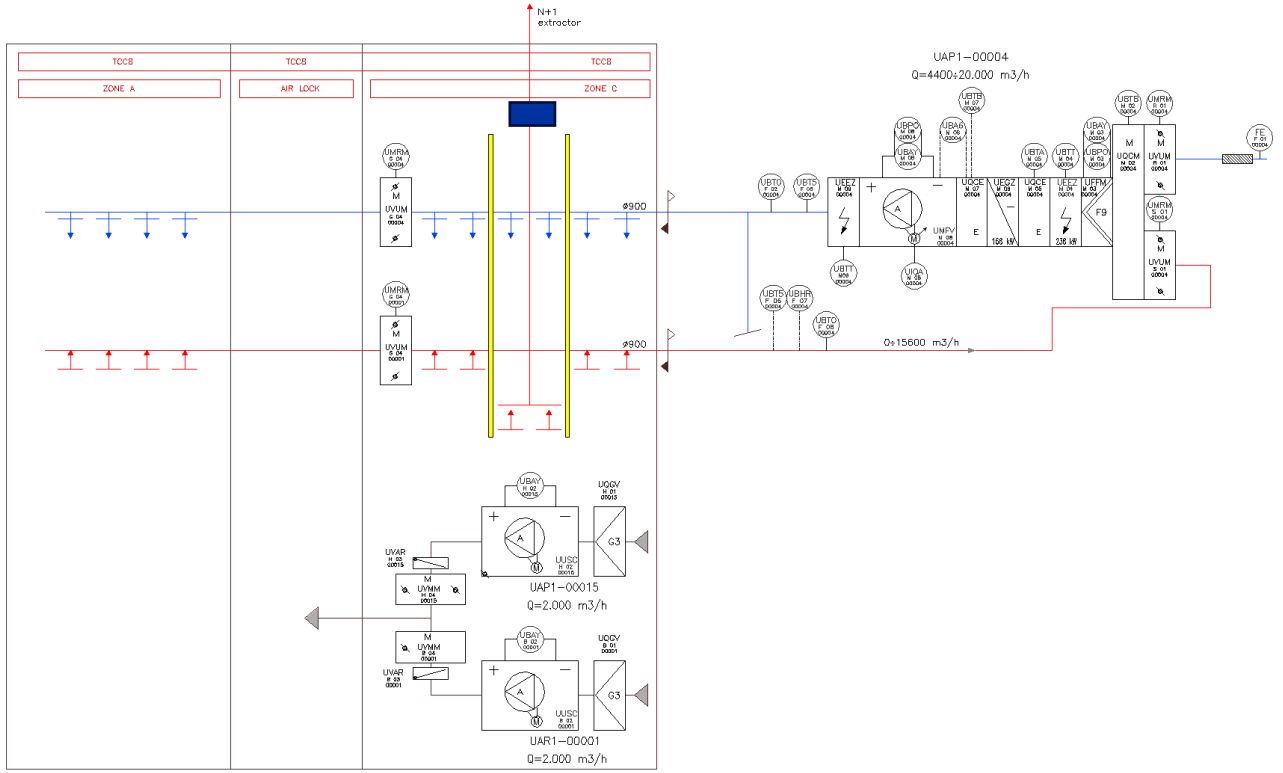
- TCC8 & ECN3: current filtration F9





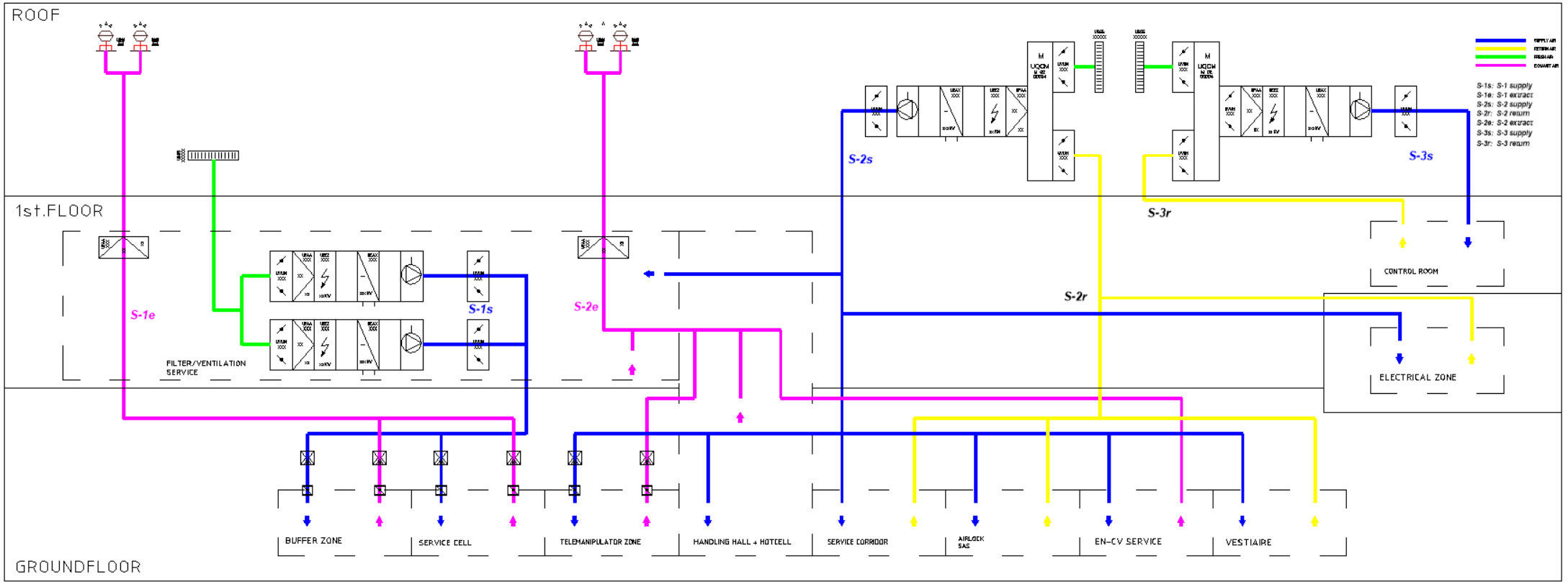
What type of filtration is foreseen?

- TCC8 new zone: filter type to be seen, could be F9 or any other level



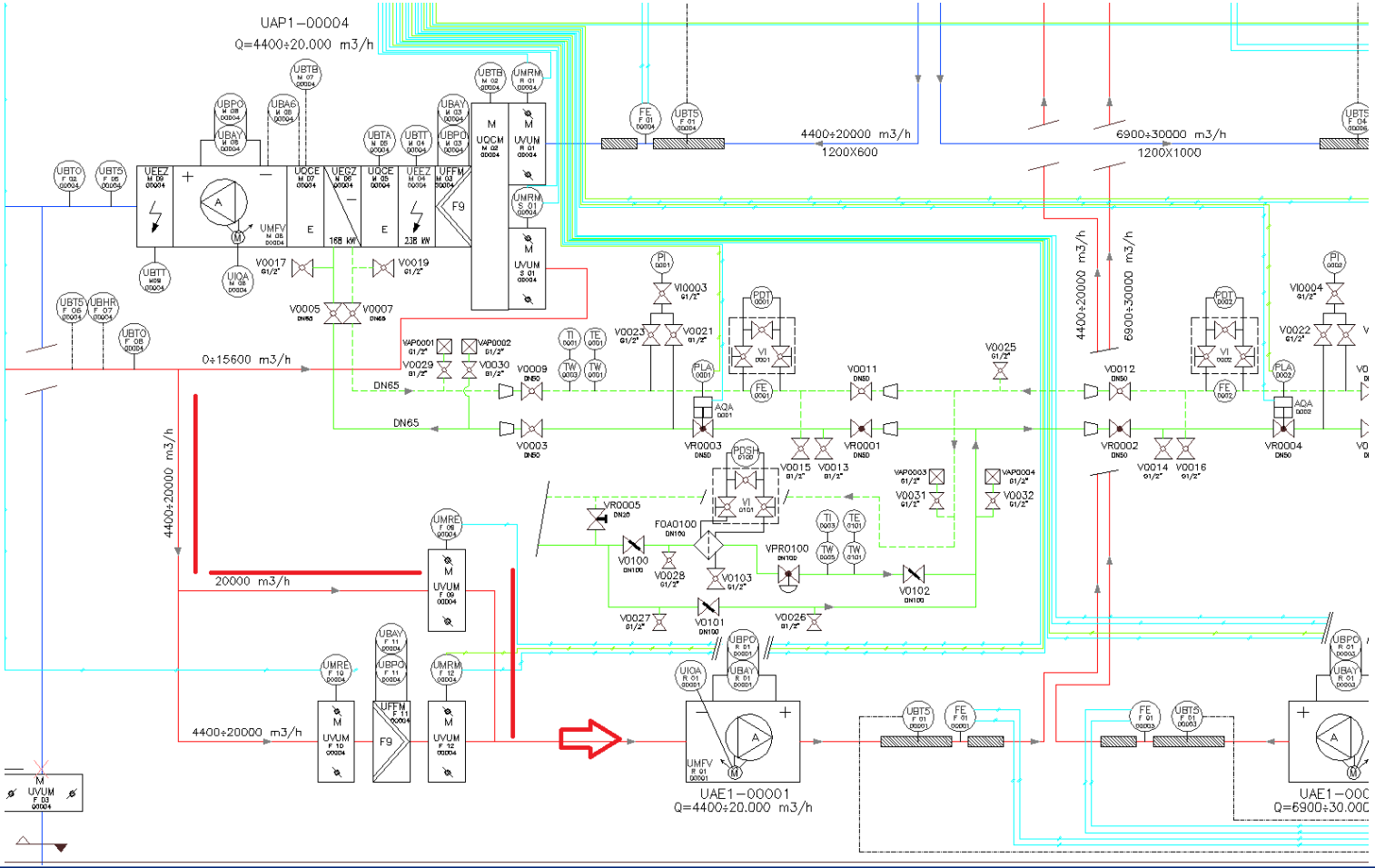
What type of filtration is foreseen?

- New service building: filtration level not decided yet



From the FIRIA studies to we have an idea if smoke extraction is required underground?

- Bypass for the smoke extraction is present in the underground, maximum temperature of air up to 400°C, for 120 min



From the FIRIA studies to we have an idea if smoke extraction is required underground?

Technical data of the fan: RER 17-0630-400 — fulfills the ErP-directive 2015

Description	Value	Dimension
Installation acc. DIN 24163 Part 1	D	
Reference density (Rho1)	1.15	kg/m³
Medium temperature (t)	20	C
Air flow rate (V)	20000	m³/h
Total pressure rise (dp_f)	1374	Pa
Dynamic pressure at discharge (pd_2)	174	Pa
Static pressure rise (dp_{fs})	1200	Pa
Pressure drop (p_r) installed/attached	-	Pa
Fan speed (n_v) 1)	1792	min⁻¹
Power on fan shaft (P_w)	10.4	kW
Absorbed power of the system (P_1) with V-belt / flat belt drive	11.8 / 11.5	kW
Total efficiency (ETA_f)	73	%
Static efficiency (ETA_w)	64	%
System efficiency (ETA_{fsS}) (over all efficiency of fan (static), motor, and V-belt / flat belt drive)	57 / 58	%
Specific Fan Power (SFP-factor) with V-belt / flat belt drive	2116 / 2078	W/(m³/s)
Nozzle calibration factor (K_{10})	365	m³s/h
Differential pressure on nozzle (dp_D)	1508	Pa
Velocity at discharge area (c)	17.4	m/s
Fan weight	188	kg

1) Speed deviations within ±4% may be possible with the final selection of the belt drive which may slightly modify technical data

A-weighted sound power level discharge/intake LwA_{47}	94/94	dB
Unweighted octave sound power level	Octave mid frequencies 2)	
	63/125/250/500/1k/2k/4k/8k	Hz
	97/92/90/91/89/85/80/71	dB discharge $LwOkt_4$
	84/87/86/93/89/86/81/73	dB intake $LwOkt_7$

2) The octave sound power levels can be higher at octave bands at or close to blade passing frequency.

To motor: Siemens-Fire<=1000 1LE1003-1DB43-4AB4/IE3

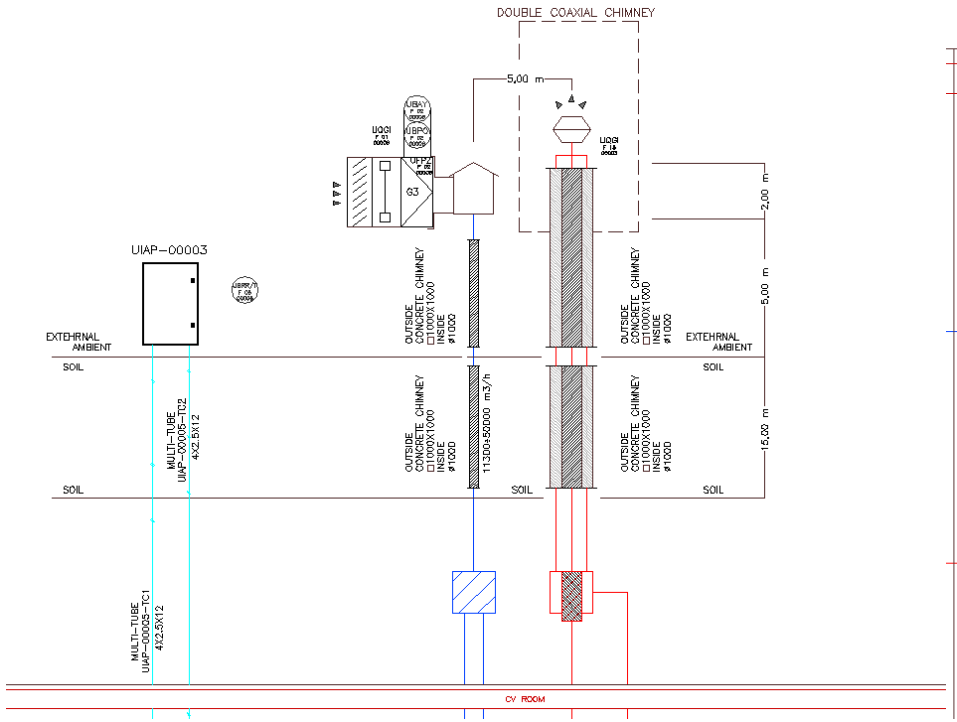
Phase-Voltage-Frequency	3~400/690-50	V-Hz
Frame size-poles:	160-4	
Rated power (P_N)	15.00	kW
Rated speed (n_N)	1475	min⁻¹

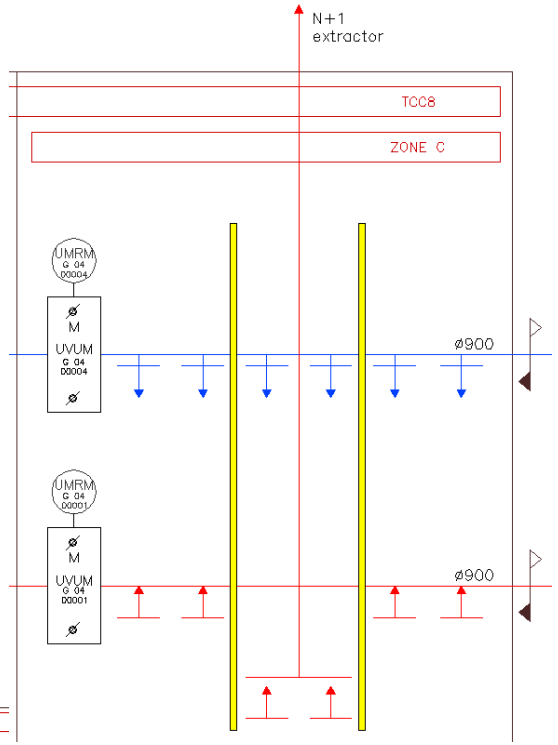
NICOTRA Gebhardt

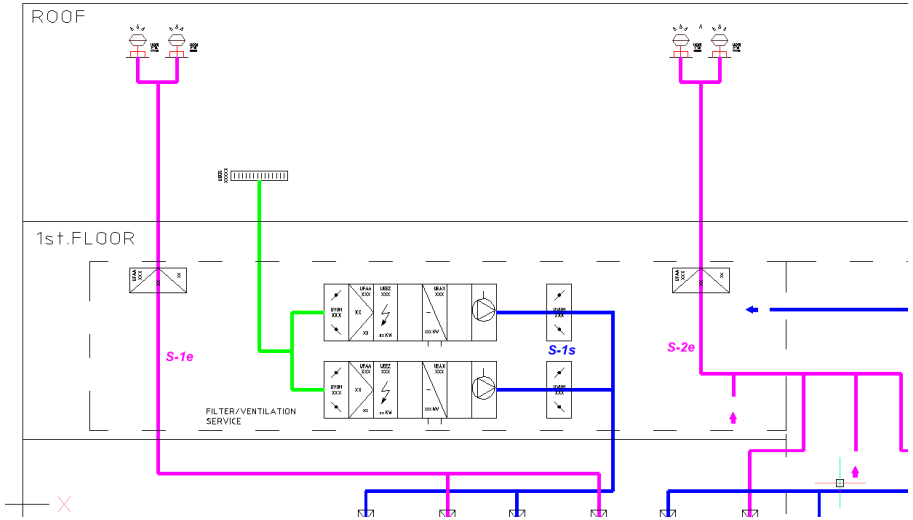
Rated current (I_N)	28,5/16,5	A
Speed up time at direct start (t_A)	2	s
operational limits		
Max. fan speed (n_{vmax})	1990	min⁻¹
Max. power on shaft (P_{wmax})	16.40	kW
Temperature range for conveying medium (t_{min} ...t_{max})	-20...80	C
Max. temperature t_{max}, admitted for 120 min only	400	C
ErP - Data at optimum efficiency and density 1.15 kg/m^3		
measurement- / efficiency category	B / total	
design status of VSD	without VSD	
overall efficiency with V-belt / flat belt drive (ETA_{opt})	73.0 / 74.3	%
achieved efficiency grade with V-belt / flat belt drive (N_{act})	72.6 / 74.0	
required efficiency grade in 2013 / 2015 (N)	55 / 61	
Air flow rate (V_{opt})	16402	m³/h
pressure rise (dp_{opt})	2402	Pa
Fan speed (n_{vopt})	1984	min⁻¹
motor power input with V-belt / flat belt drive (P_{1opt})	14.99 / 14.73	kW
specific ratio (d_{dpopt})	1.024	

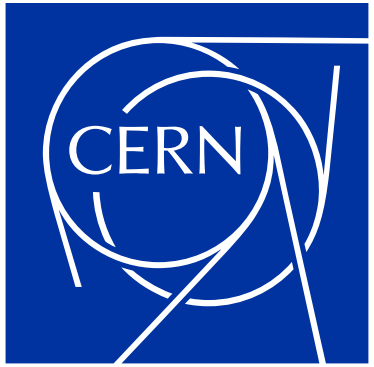
How many exhaust stacks will there be?

TCC8 & ECN3: 1 existing common exhaust stack
TCC8 new zone: +1 new exhaust stack (to be discussed)
New service building: +2 new exhaust stacks









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