VENTILATION PRINCIPLE FOR THE DRIVE BEAM TUNNEL

CERN TS/CV

Wednesday 9th July 2008

Tunnel ventilation functions

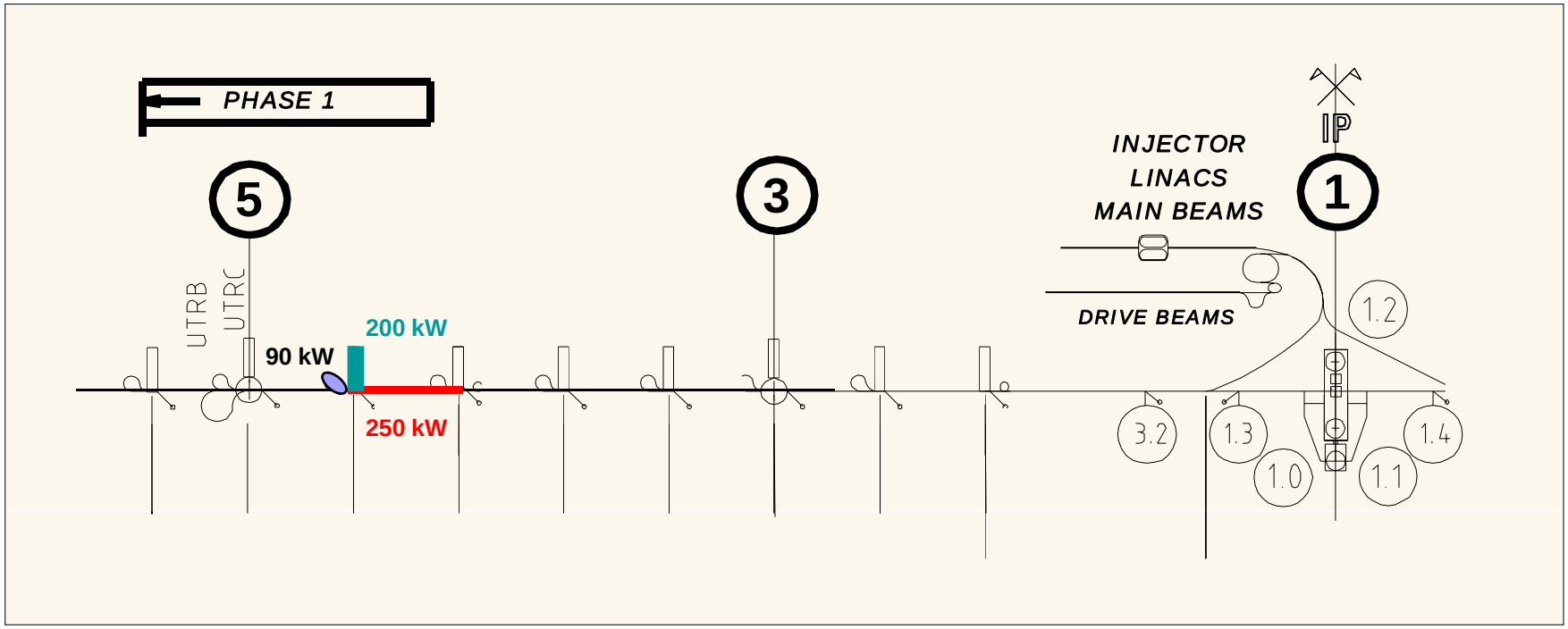
- Fresh air for people and ventilation (obligation).
- Constant ambient conditions (T°C and humidity).
- Remove heat dissipation in air.
- Prevent from any air stratification.
- Prevent from any condensation.
- Purge before access.
- Smoke or gas extraction (obligation).
- Overpressure control linked to radiation (obligation).
- Safety of people, fire brigade access, fire fighting.

HVAC criteria shall be specified for each structure:

- Detailed definition of the structure (fire volumes, partition, and shielding, plug on head of shaft)
- Required ambient conditions: temperature and humidity
- Radiation levels in the various areas
- Description of accessible and non accessible areas
- Detailed heat dissipation level in the air (when water cooling not possible)
- Presence of gas, which gas ?
- Other

Heat dissipation

Tunnel section = 16 m²
DB sector volume =14 000 m²
Inter shaft volume = 70 000 m³



Heat dissipation in the tunnel:
250 kW / DB sector
1250 kW between two shafts

Corresponding air flow:
Delta T°C = 28-18 = 10 °C
370 000 m3/h -> 5 vol/h

To be
Optimised …

Air flow rate considerations

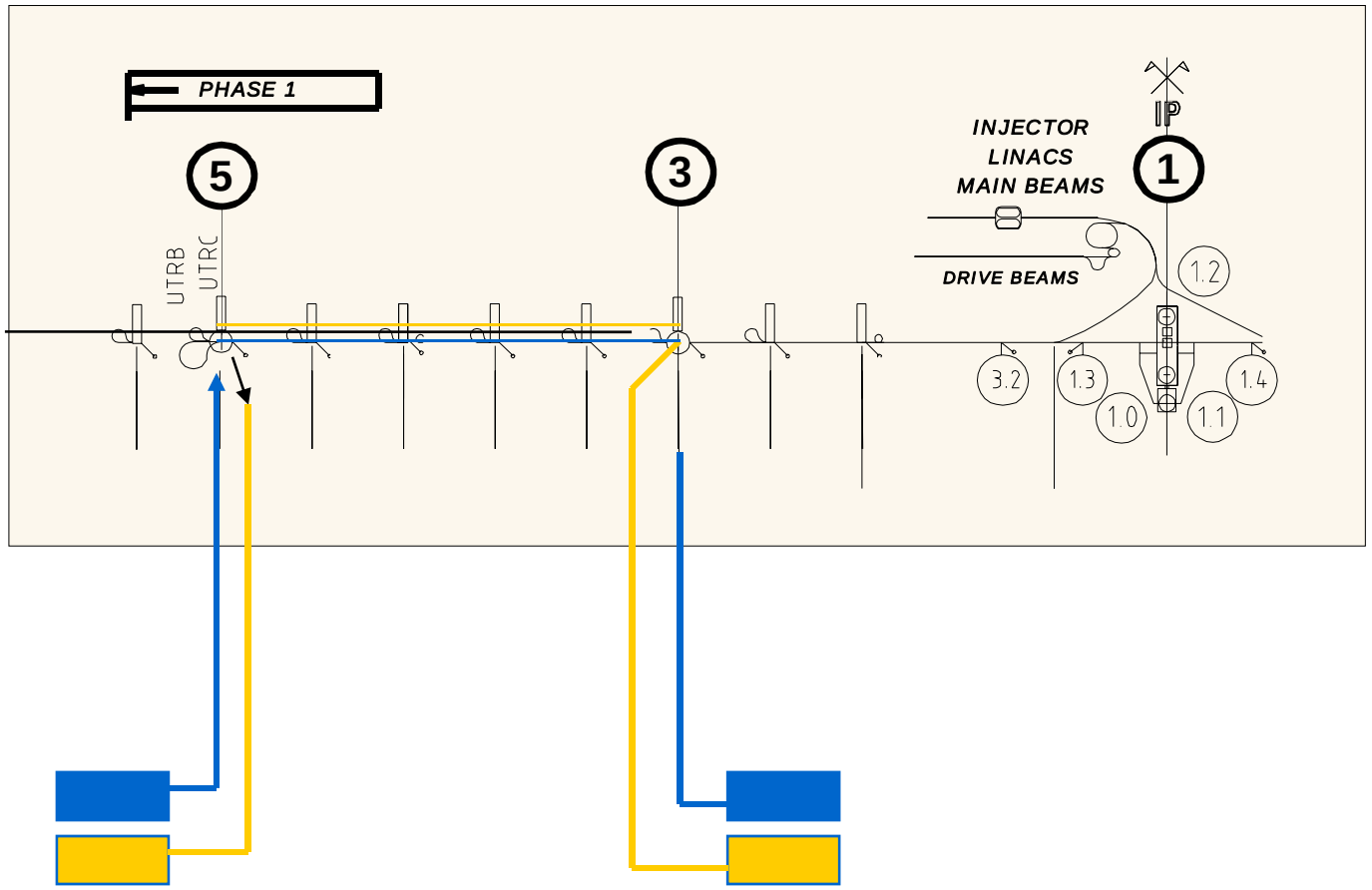
Tunnel section = 16 m^2
DB sector volume =14 000 m^2
Inter shaft volume = 70 000 m^3

Delta T°C = 28 – 18 = 10°C

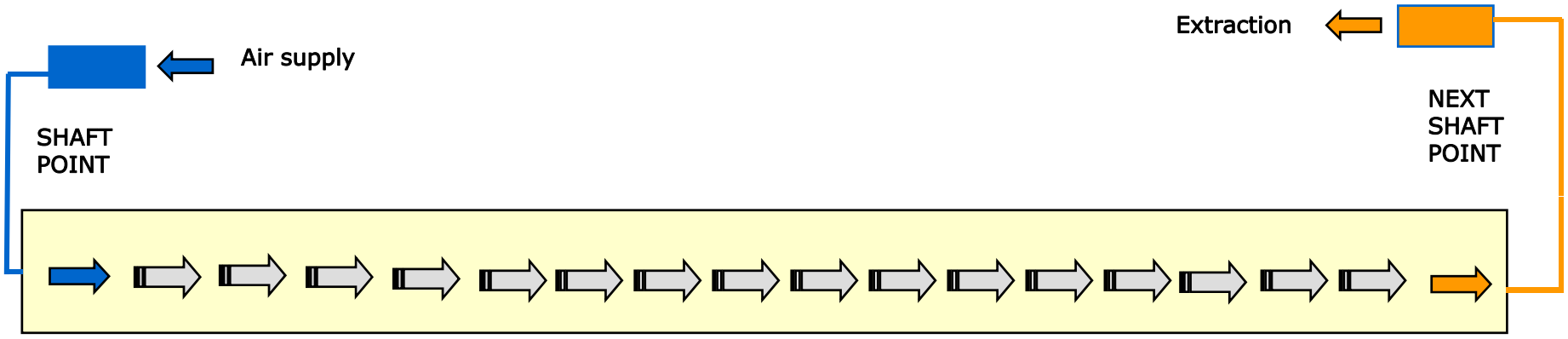
	Heat dissipation in the tunnel	Air flow rate	Air duct section	Air duct Diameter
DB sector	250 kW	75 000 m^3/h	1.73 m^2	1.48 m
Intershafts	1250 kW	370 000 m^3/h	8.56 m^2	3.3 m
Intershafts*	470 kW	140 000 m^3/h	3.25 m^2	2.03 m

** Correct ratio compared to the treated volume*

Air handling principle

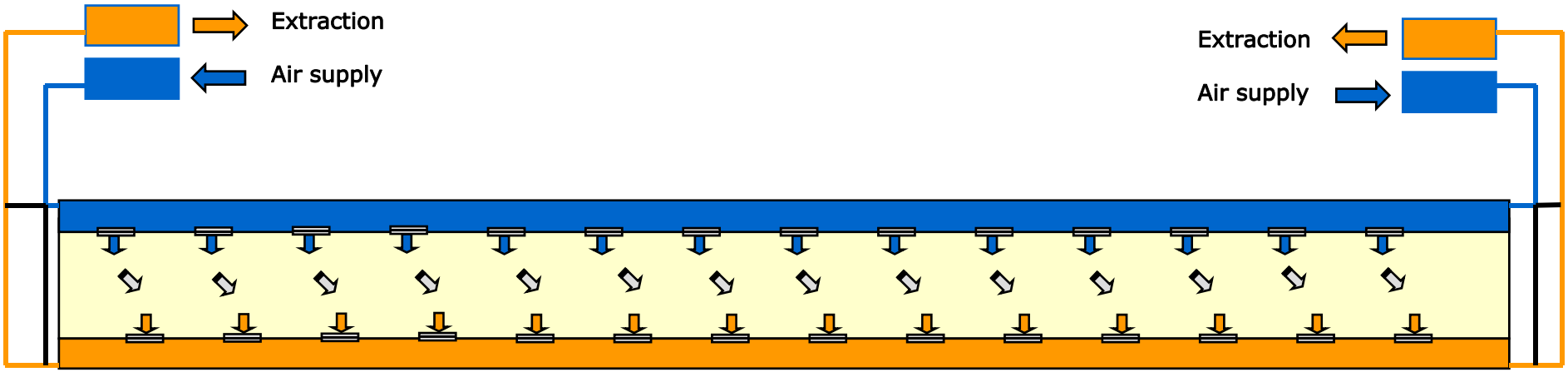


Longitudinal principle



Big air flow rate
High speed
Temperature gradient

Semi transversal principle

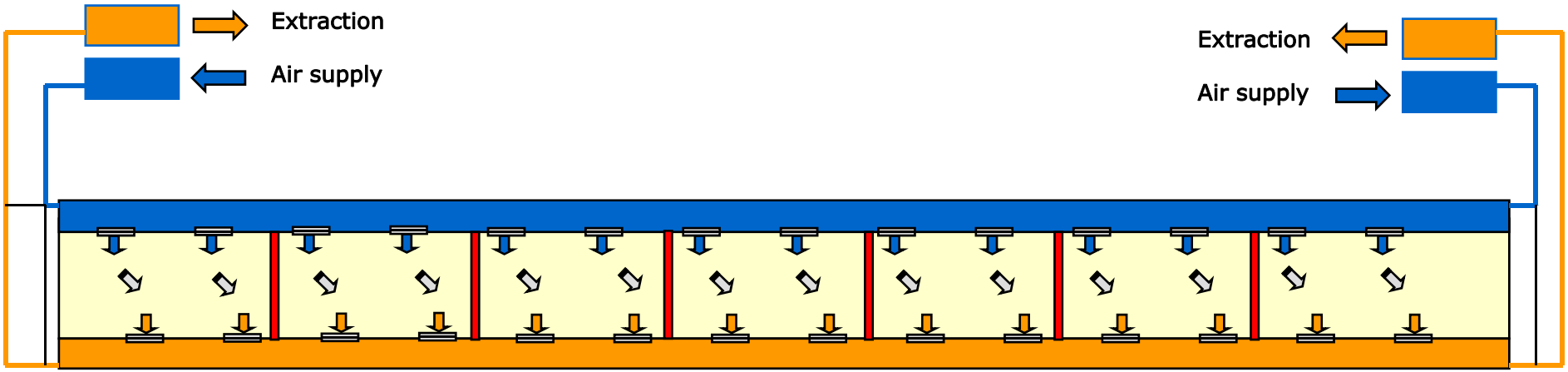


SHAFT
POINT

Small air flow rate
Low speed
No gradient temperature

NEXT
SHAFT
POINT

Semi transversal principle

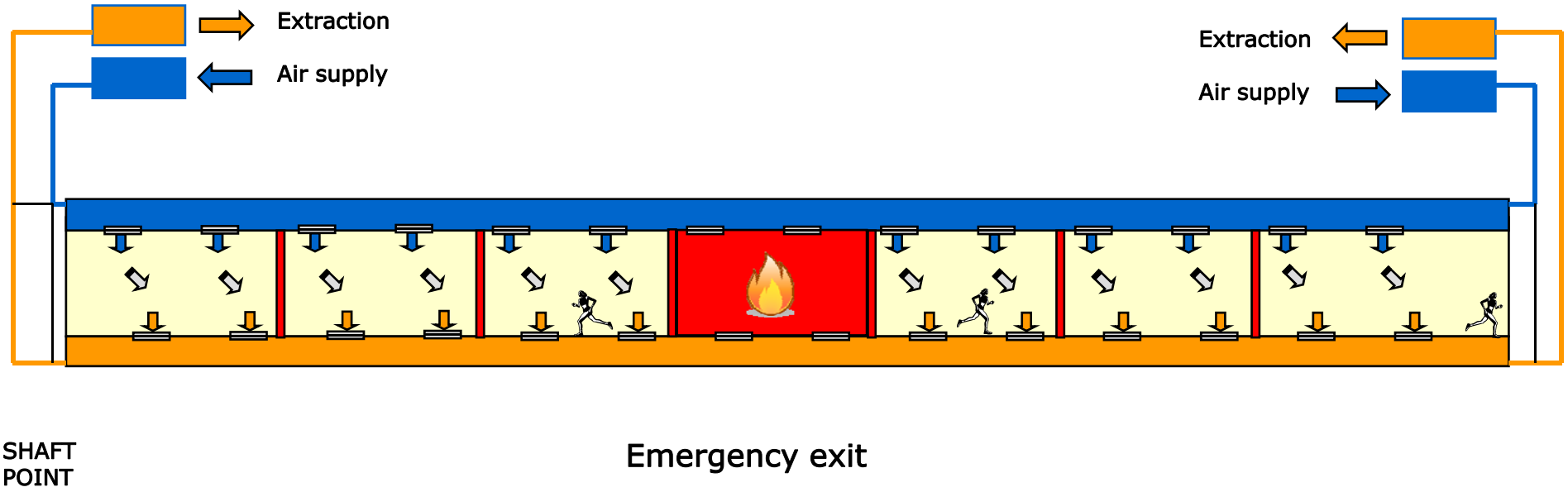


SHAFT
POINT

Small air flow rate
Low speed
No gradient temperature

NEXT
SHAFT
POINT

Semi transversal principle



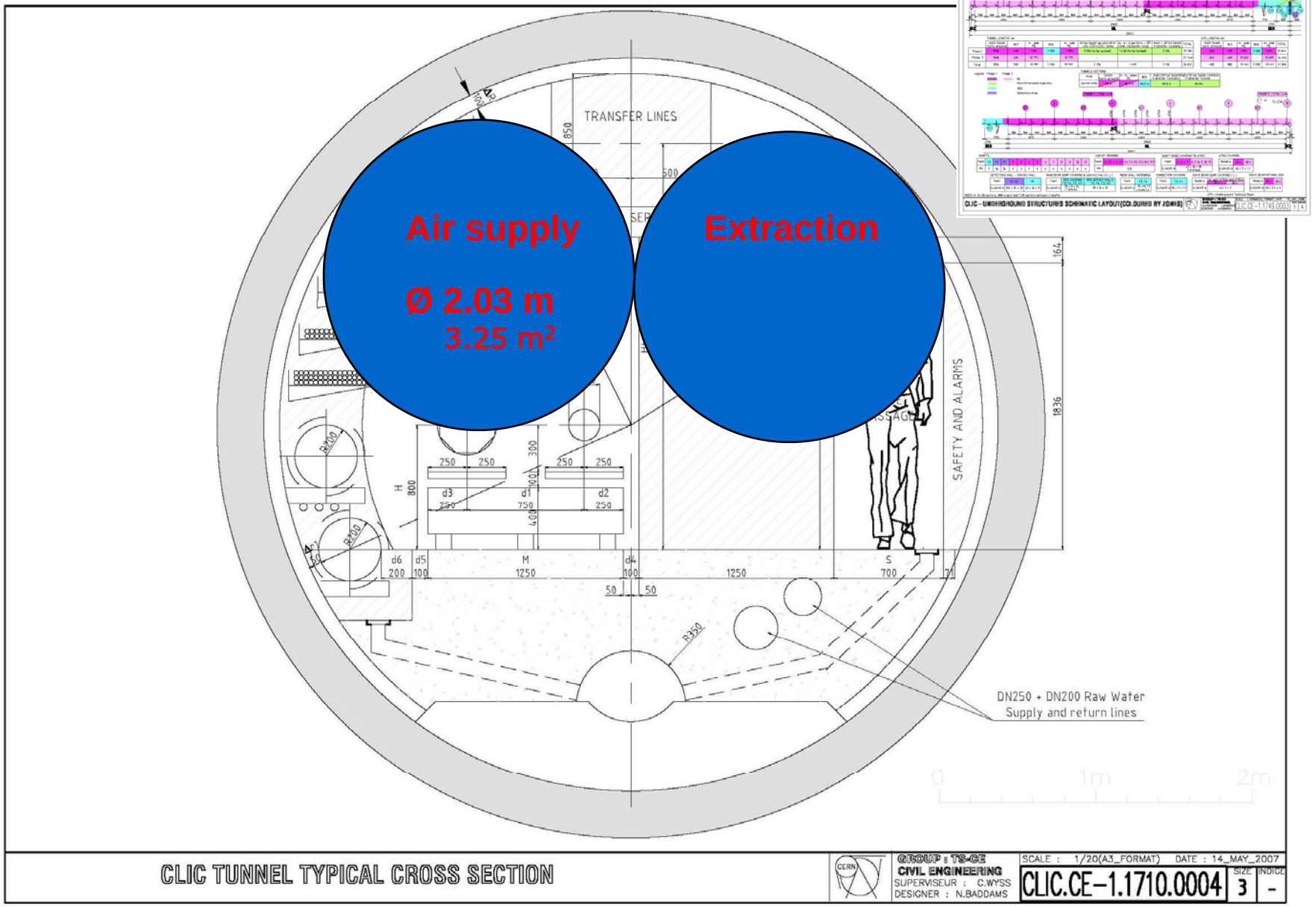
Advantages of this semi-transversal ventilation

- Energy recovering point to point
- Safety sections possible, smoke extraction
- No gradient temperature
- Low air speed

AIR SPEED CALCULATION
Base tunnel section : 12 m^2

	Long.	Transv. (300 m sectors, 10 grilles/sector)
75 000 m^3/h	1.74 m/s	0.01 m/s
140 000 m^3/h	3.24 m/s	0.019 m/s
370 000 m^3/h	30.8 m/s	0.05 m/s

CLIC


Air supply
Ø 2.03 m
3.25 m²
Extraction
TRANSFER LINES
SAFETY AND ALARMS
DN250 + DN200 Raw Water
Supply and return lines
CLIC TUNNEL TYPICAL CROSS SECTION
CERN
GROUP : TS-CE
CIVIL ENGINEERING
SUPERVISEUR : C.WYSS
DESIGNER : N.BADDAMS
SCALE : 1/20(A3_FORMAT)
DATE : 14_MAY_2007
CLIC.CE-1.1710.0004
SIZE 3
INDICE -

Tunnel section principles