



ILC(International Linear Collider) Asian Region Mechanical Design

2012.3.21

ILC Mechanical & Electrical Review and
CFS Baseline Technical Review



Agenda

- ① Cooling Water System
- ② HVAC System
- ③ Plumbing System

Cooling Water System

Heat Load Summary

Cooling Water Load

(MW)

LCW	AH1	AH2		AH3		AH4		PMC-0	PMB-0	PXB-0	AH5		AH6		AH7		AH8	Total
Source e-											2.88							2.88
Source e+							5.53											5.53
DR								11.8575	2.0925									13.95
RTML		2.9295					0.3255				0.3255					2.9295		6.51
ML		5.591655	5.591655	5.591655	5.591655	5.03385					4.65291	5.591655	5.591655	5.591655	5.591655	5.591655		54.42
BDS							4.6				4.6							9.2
Dumps										39.95								39.95
IR(DH)										0.2								0.2
subTotal	0	8.521155	5.591655	5.591655	5.591655	5.03385	10.4555	11.8575	2.0925	40.15	7.8055	4.65291	5.591655	5.591655	5.591655	8.521155	0	132.64
Cryogenics	0	7.37		7.37		7.96		2.52		1.73	7.96		7.37		7.37		0	49.65
Total	0	21.48281		18.55331		23.44935		14.3775	2.0925	41.88	20.41841		18.55331		21.48281		0	182.3

Air+Chw	AH1	AH2		AH3		AH4		PMC-0	PMB-0	PXB-0	AH5		AH6		AH7		AH8	Total
Source e-											1.42							1.42
Source e+							0.72											0.72
DR								0.7395	0.1305									0.87
RTML		0.945					0.105				0.105					0.945		2.1
ML		1.201148	1.201148	1.201148	1.201148	1.081325						0.999495	1.201148	1.201148	1.201148	1.201148		11.69
BDS							0.615				0.615							1.23
Dumps										0								0
IR(DH)										0.38								0.38
subTotal	0	2.146148	1.201148	1.201148	1.201148	1.081325	1.44	0.7395	0.1305	0.38	2.14	0.999495	1.201148	1.201148	1.201148	2.146148	0	
Total	0	3.347295		2.402295		2.521325		0.7395	0.1305	0.38	3.139495		2.402295		3.347295		0	18.41

Total 200MW 200.73



Cooling Water System

3 Types of Cooling Tower

A Closed-circuit Air-cooled Type

B Closed-circuit Cooling Tower

C Open Type Cooling Tower



Cooling Water System

3 Types of Cooling Tower

Filling water for 200MW cooling

Evaporation $WE=288\text{m}^3/\text{h}$

Carry over $WC=47\text{m}^3/\text{h}$

Blow down $WB=241\text{m}^3/\text{h}$

Total

$$=WE+WC+WB$$

$$=\underline{576\text{m}^3/\text{h}}$$

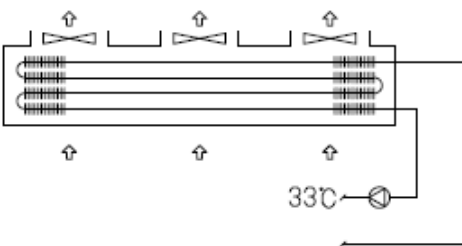
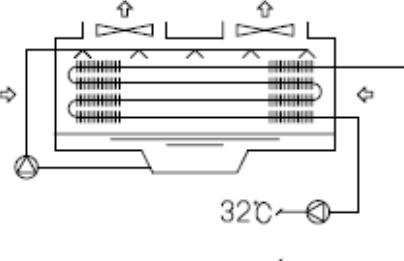
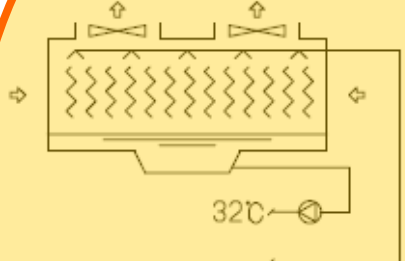
< Ground water

$$=1\text{m}^3/\text{km}/\text{min} * 30\text{km} * 60\text{min}/\text{h}$$

$$=\underline{1800\text{m}^3/\text{h}}$$

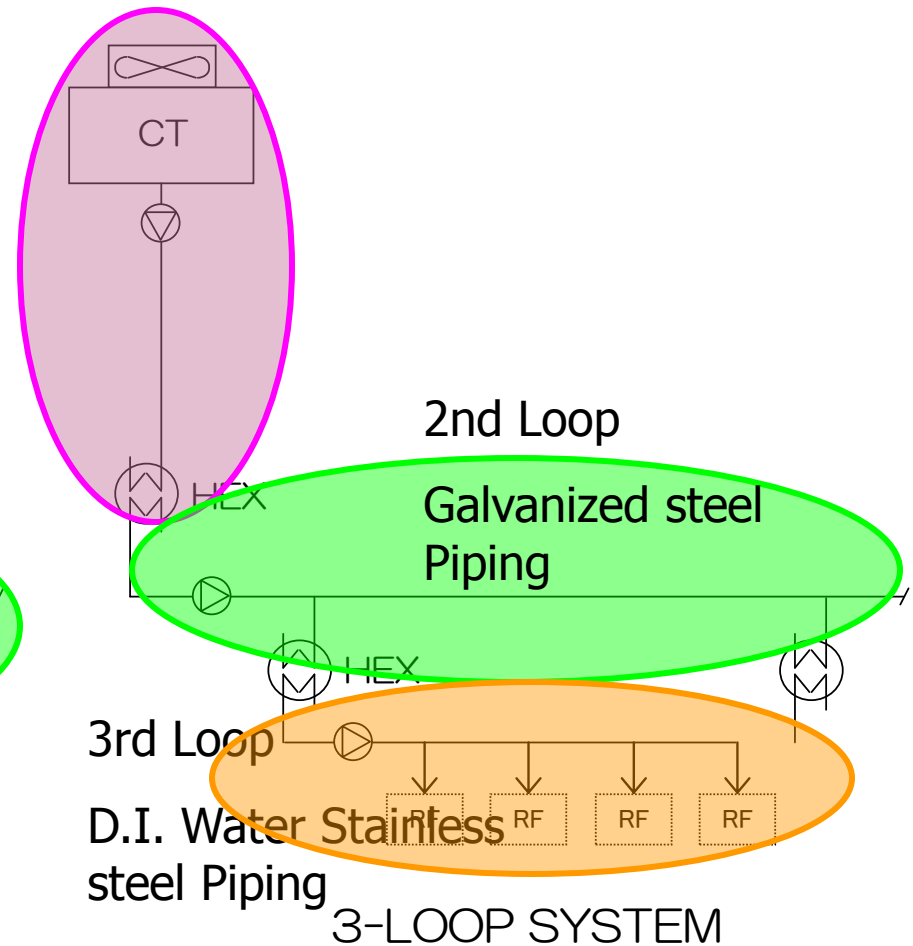
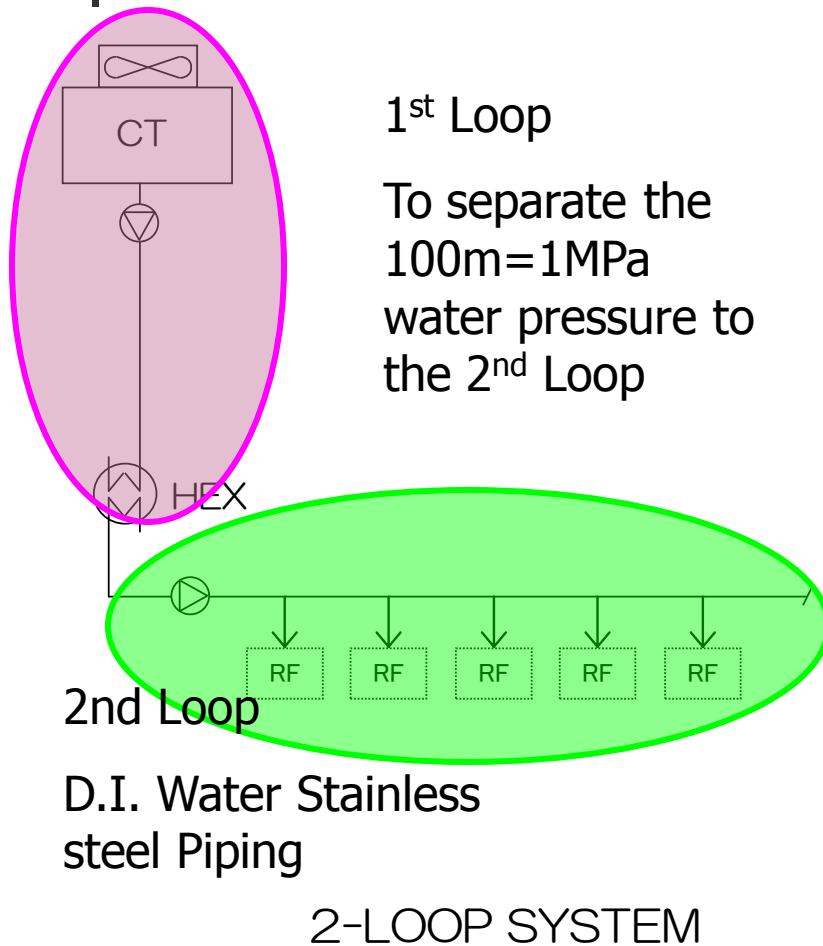
Cooling Water System

Comparison of Cooling Tower Type

	A	B	C
TYPE	Closed-circuit Air-cooled Type	Closed-circuit Cooling Tower	Open Type Cooling Tower
			
UNIT SIZE (6MW UNIT)	59m × 10m	22m × 4m	12m × 4m
SPACE (for 200MW)	14,160m ²	5,870m ²	3,200m ²
NOISE (6MW UNIT)	95dB(A)	80dB(A)	75dB(A)
UNIT COST (for 200MW)	9,330M¥	1,810M¥	370M¥

Cooling Water System

2-Loop vs 3-Loop System





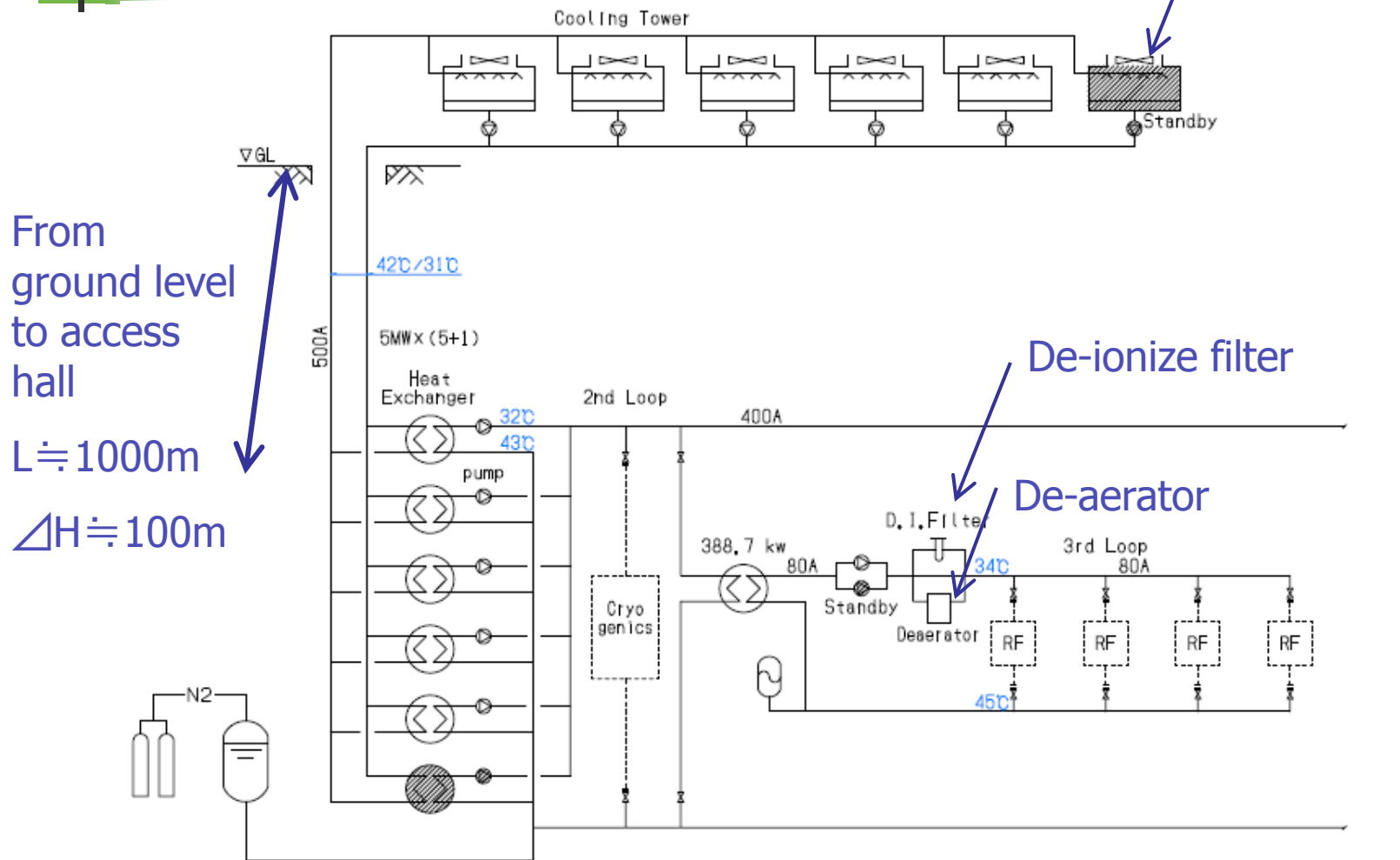
Cooling Water System

Comparison of 2-Loop and 3-Loop

	2-Loop System	3-Loop System
Cost (AH-3)	3,423M¥	2,943M¥
Water leakage	If there would be some trouble at the thin pipe around accelerator, 5km (total 650m ³) of ionized cooling water would be run over.	
Evaluation	△	○

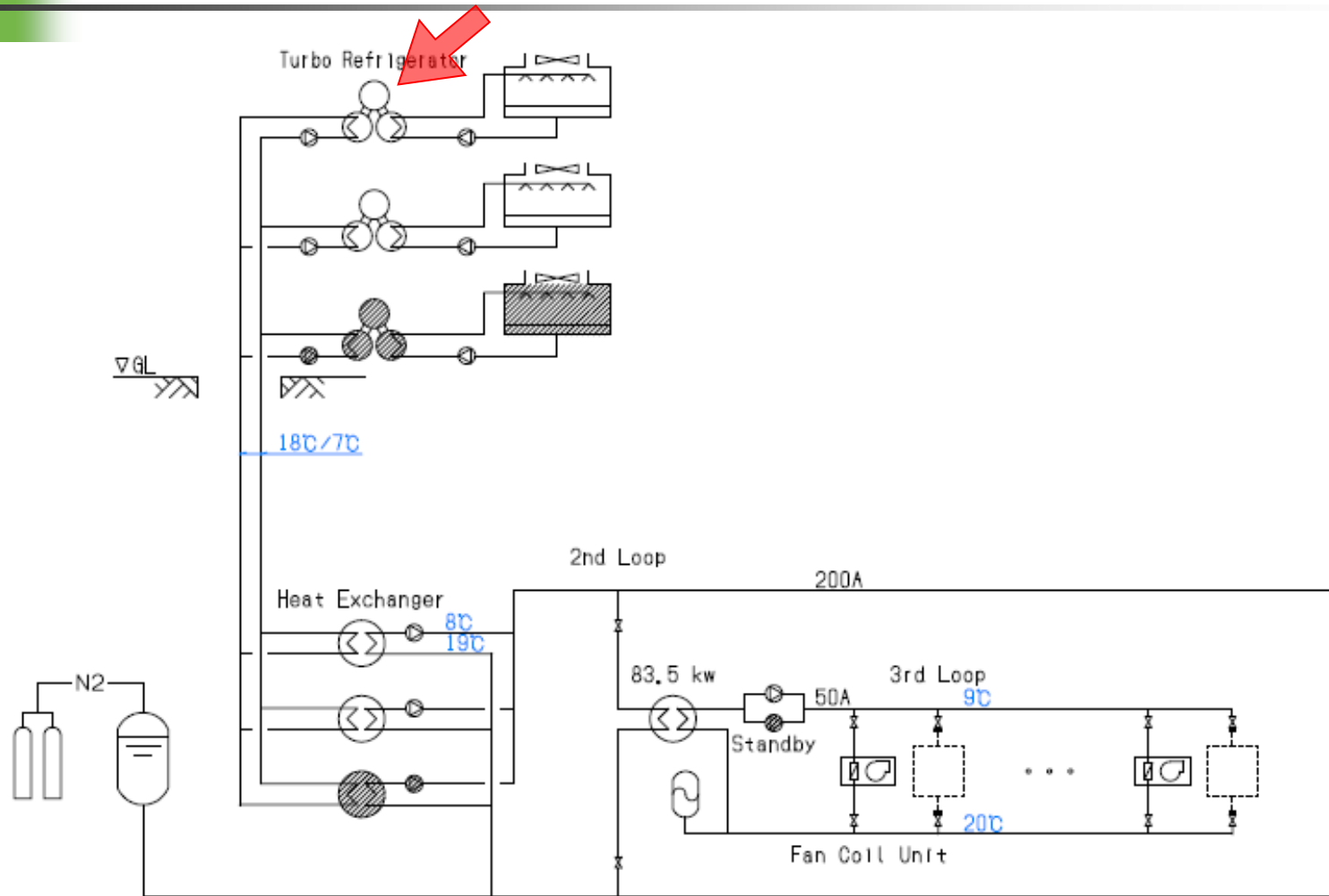
Cooling Water System

3-Loop LCW System (AH-3)



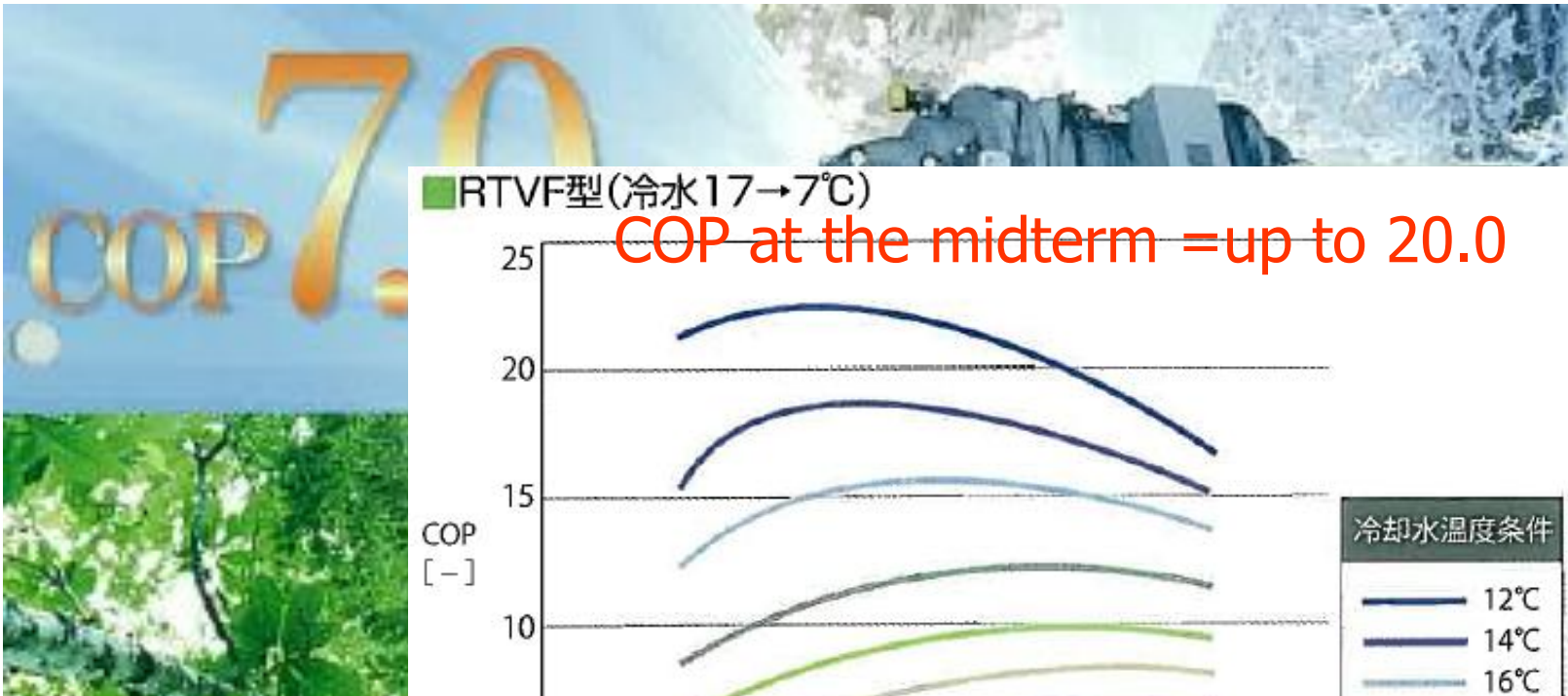
Cooling Water System

3-Loop Chw System (AH-3)



Cooling Water System

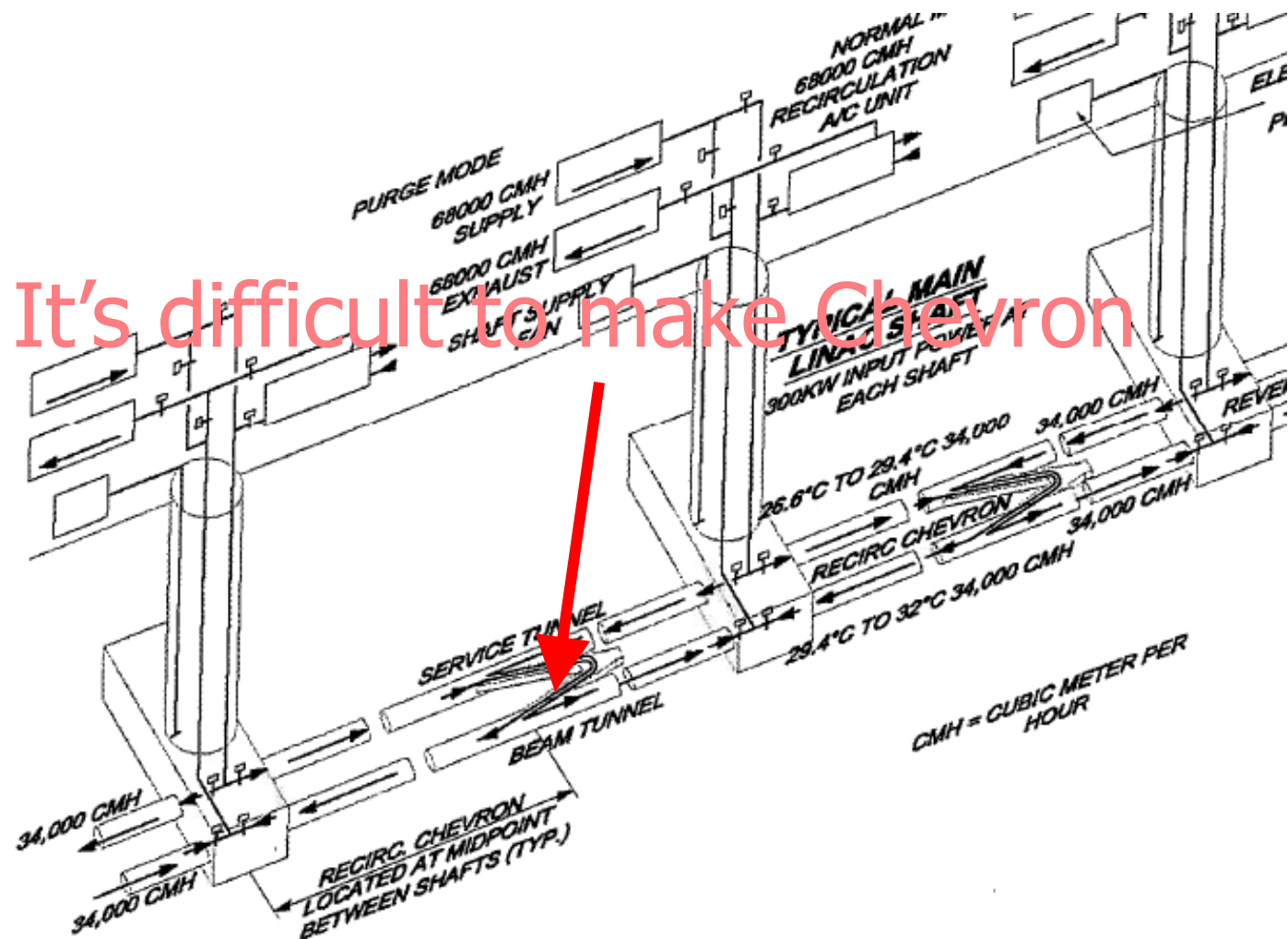
Inverter turbo refrigerator



COP(Coefficient of performance)
the rating p

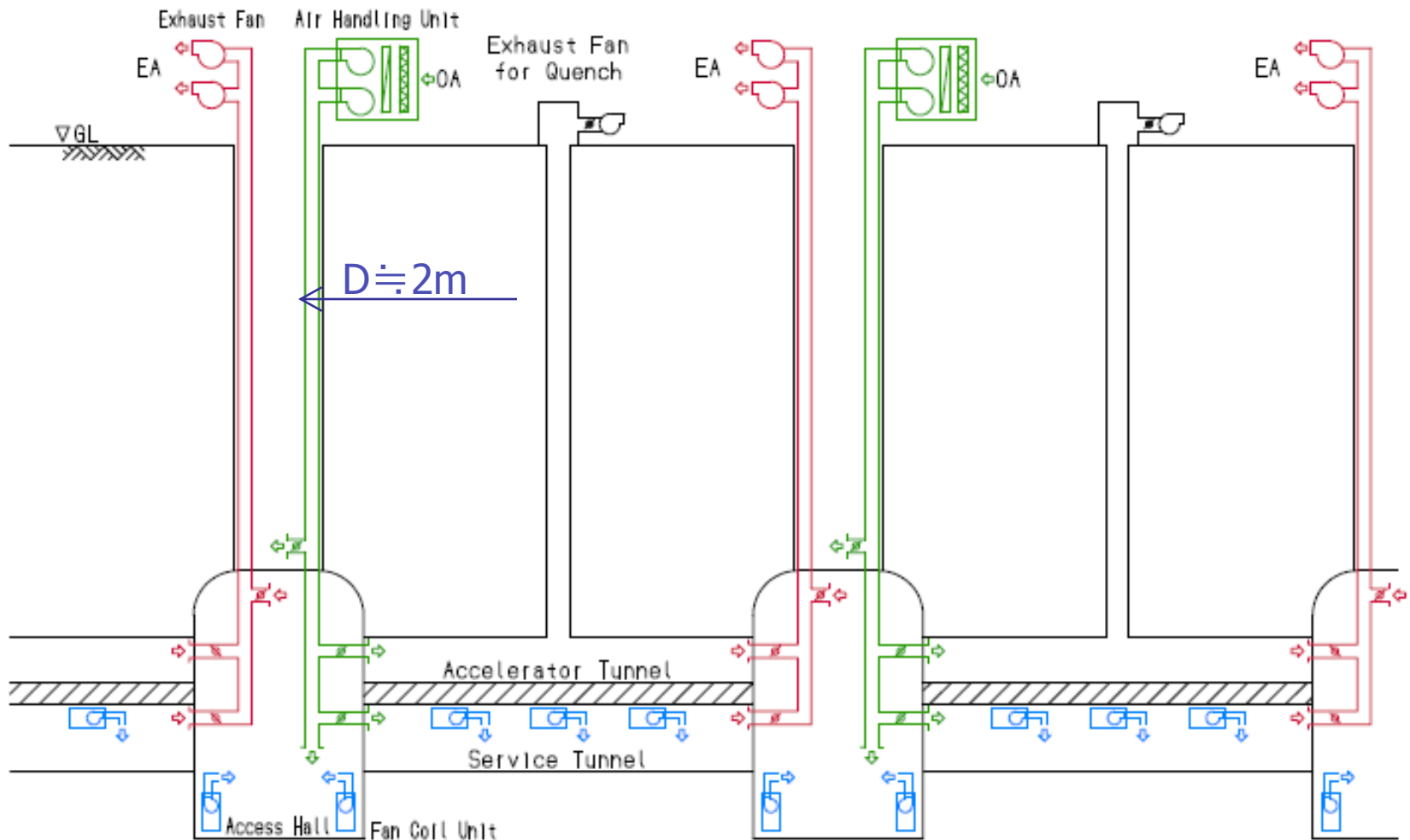
HVAC System

Tunnel Ventilation System in RDR



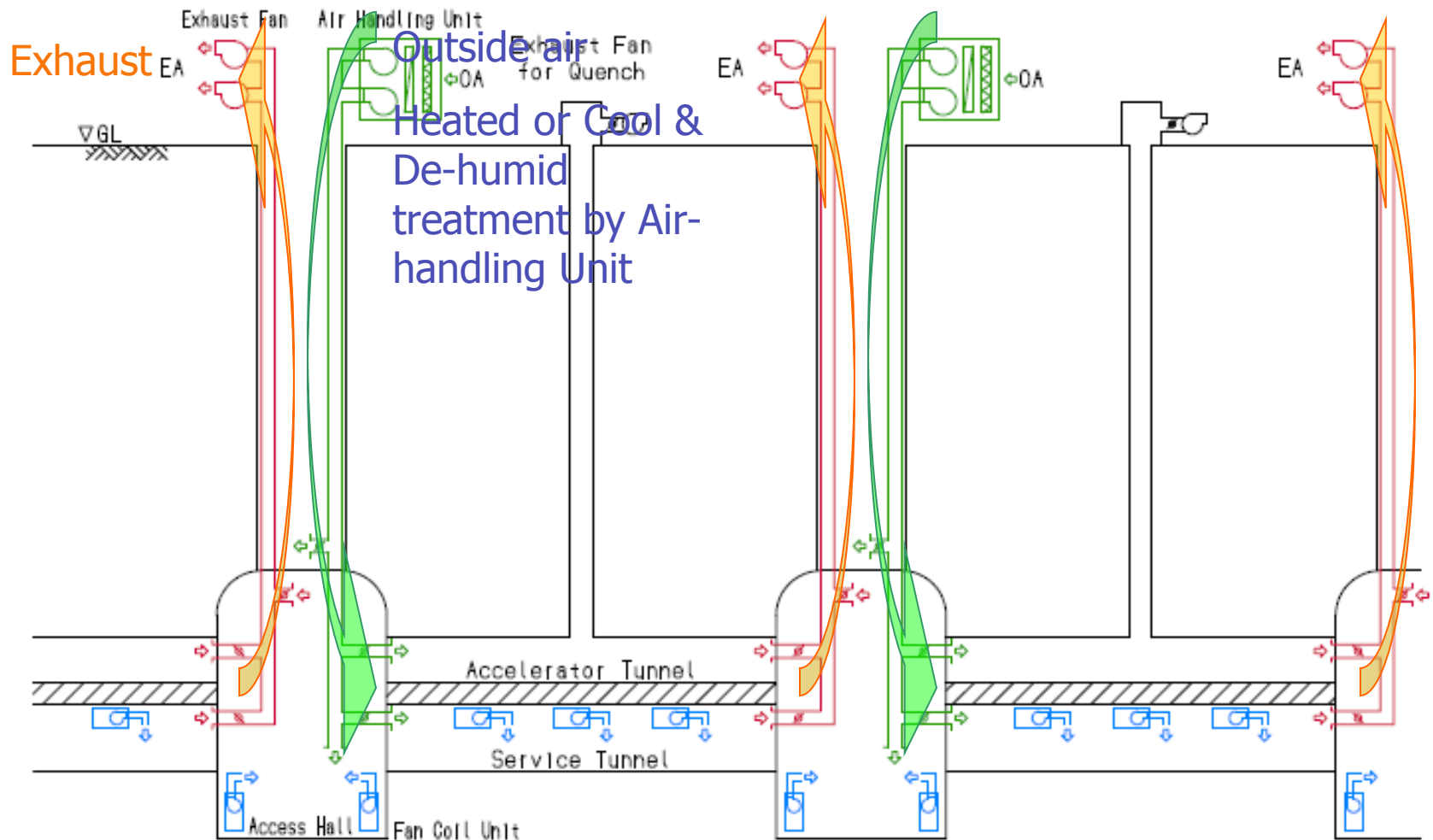
HVAC System

Tunnel Ventilation System



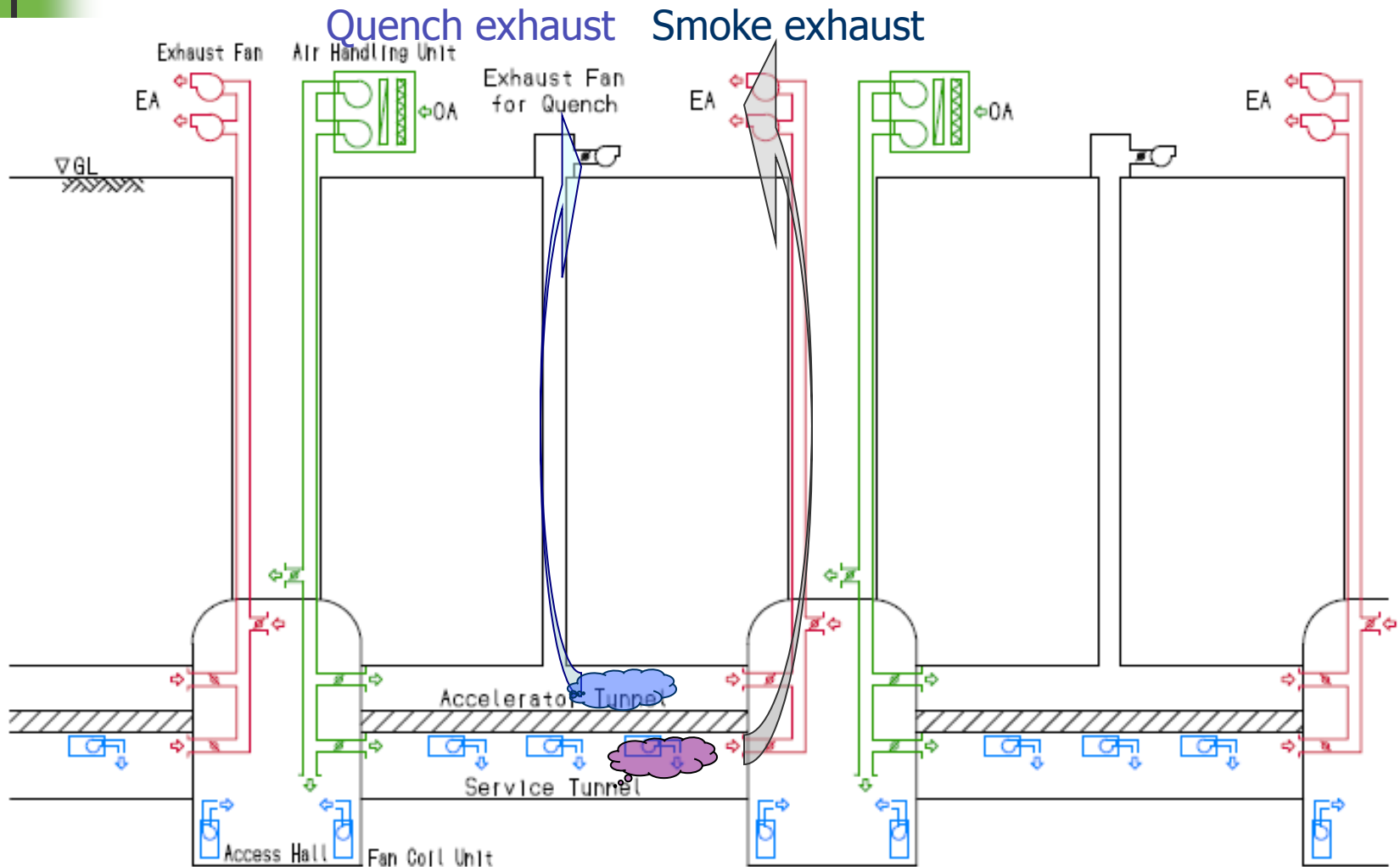
HVAC System

Tunnel Ventilation System



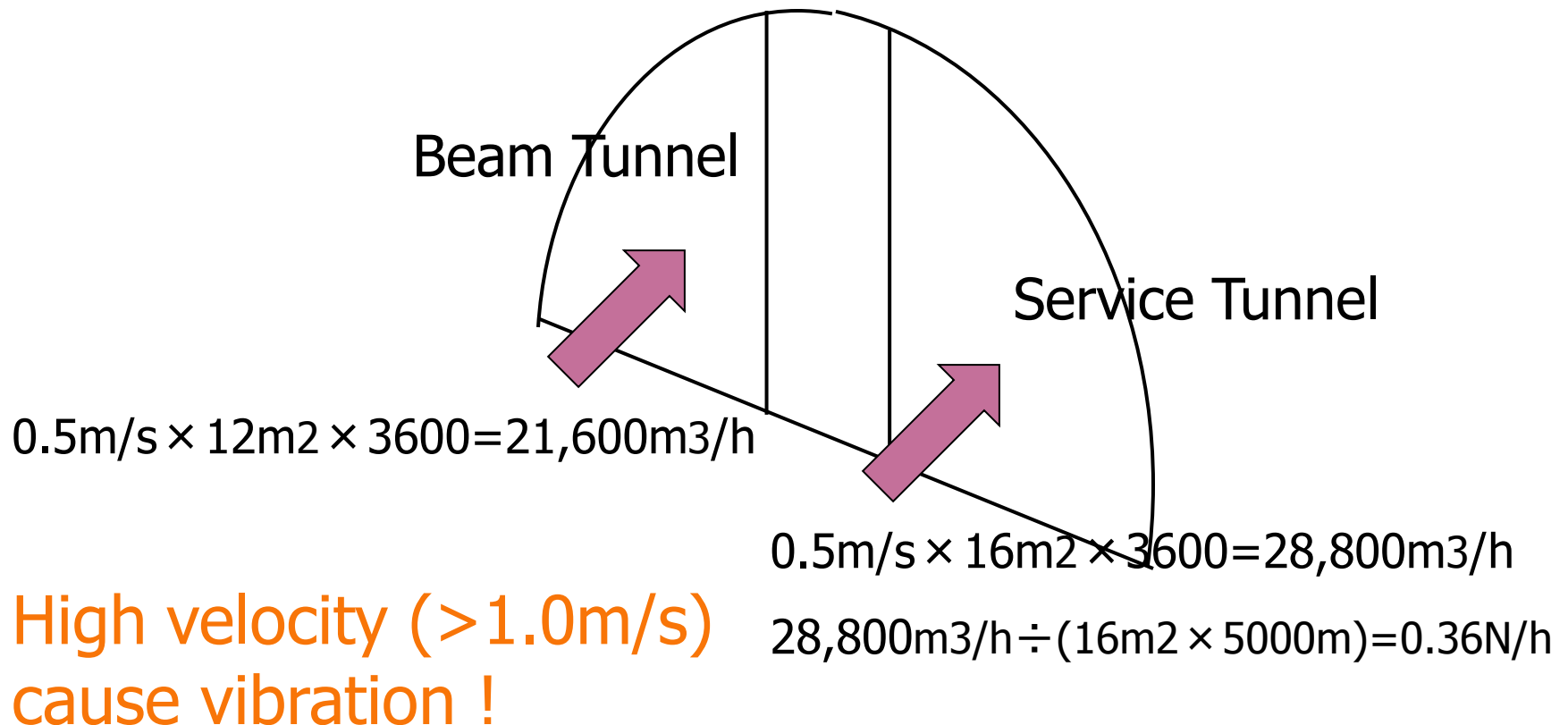
HVAC System

Tunnel Ventilation System



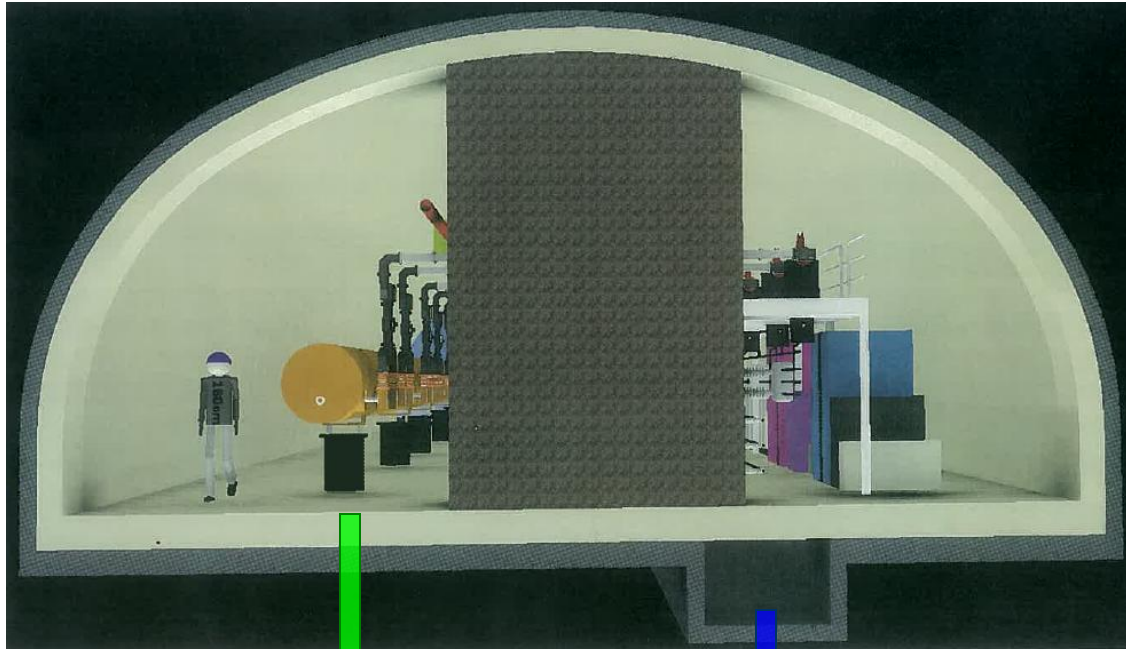
HVAC System

Tunnel Ventilation Rate



Plumbing System

Drainage System



Cooling water leakage :
Need RI monitoring

Ground water :
Flow down drainage ditch
to the Access Hall

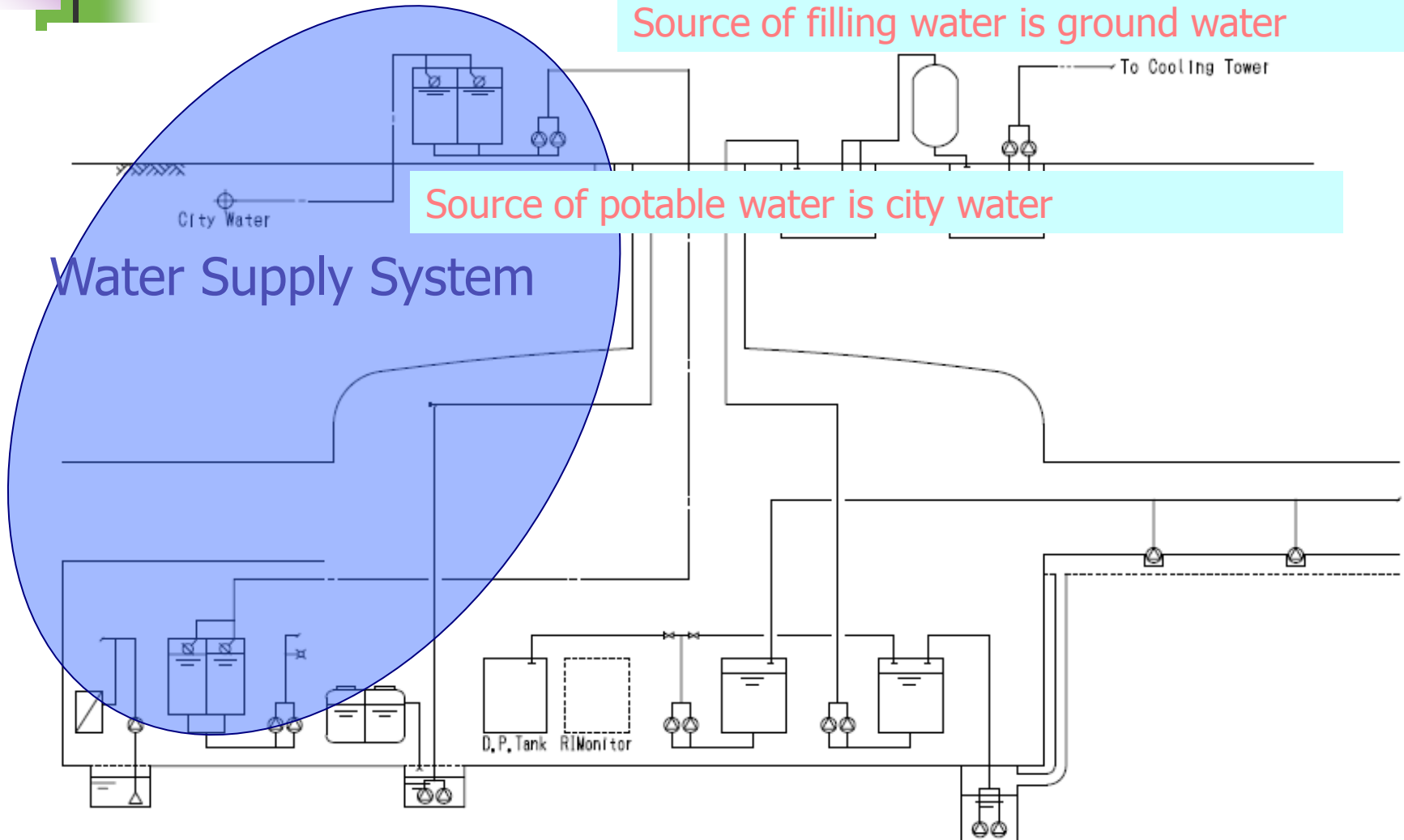
Plumbing System

Water Supply and Drainage System

Source of filling water is ground water

Source of potable water is city water

Water Supply System



Plumbing System

Water Supply and Drainage System

