

CENTRAL REGION MECHANICAL AND ELECTRICAL OVERVIEW

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Sep 27, 2011
ILC Granada, Spain

OUTLINE

- Load Tables/Design Criteria (incl changes)
- Process Water Scheme for Central Region & DR
- Airflow schematic in Central Region & DR
- Electrical System Scope
 - WBS
- Interface to Experimental Facilities
- Electrical Single Line Diagrams

LOAD TABLES - Electrical

Electrical Power in MW DRAFT UPDATED JUL 22 2011

RDR <u>(w adjusted cryo Jan 27 2011)</u>							SB2009 w KlyCluster 5Hz Full Power (w/ 3.2Km DR, 3 ring, 5Hz)							
Area System	RF Power	Conventional Power (operating power)			Emerg Power	Total	RF Power	Conventional Power (operating power)					Emerg Power	Total
		Conv (incl racks)	NC Magnets	Cryo				Conv/Others	Racks	NC Magnets	Cryo			
e-sources	1.05	2.46	0.73	0.59	0.06	4.89	1.05	1.27	1.19	0.73	0.59	0.06	4.89	
e+sources	4.11	8.59	8.9	0.59	0.21	22.4	1.20	1.27	7.32	5.04	0.59	0.21	15.63	
DR	14	2.38	7.92	2.52	0.23	27.05	12.74	0.92	1.46	0	2.07	2.52	0.23	19.94
RTML	7.14	5.12	4.74	0	0.15	17.15	3.57	1.85	1.27	0.55	4.49	0	0.15	11.88
Main Linac	75.72	23.40	0.78	42.9	0.404	143.20	95.344	12.2	2.8	5	0.914	44.2	0.40	160.86
BDS	0	4.62	2.57	0.41	0.2	7.8	0	4.62	0	0	10.43	0.41	0.2	15.66
Dumps	0	3.83	0	0	0.12	3.95	0	3.2	0.63	0	0	0	0.12	3.95
IR	0	0	0	0	0	0	0	0	0	0	0.456	1.324	0	1.78
TOTALS	102.0	50.4	25.6	47.0	1.4	226.4	113.9	25.3	20.2	24.1	49.6	1.4	235	

SB2009 w DRFS Full Power								
Area System	RF Power	Conventional Power (operating power)					Emerg Power	Total
		Conv (incl racks)	Conv/Others	Racks	NC Magnets	Cryo		
e-sources	1.05	1.27	1.19	0.73	0.59	0.06	4.9	
e+sources	1.20	1.27	7.32	5.04	0.59	0.21	15.63	
DR	12.74	0.92	1.46	0	2.07	2.52	0.23	19.94
RTML	3.57	1.85	1.27	0.55	4.49	0	0.15	11.88
Main Linac	128.35	12.2	2.8	6.8	0.914	44.2	0.40	195.67
BDS	0	0.00	0	0	10.43	0.41	0.20	11.04
Dumps	0	3.2	0.63	0	0	0	0.12	3.95
IR	0	0	0	0	0.456	1.324	0	1.78
TOTALS	146.9	20.7	22.0	24.1	49.6	1.4	265	

Items in 'Conv' column will be further updated by CFS (Parsons) !!!
 New numbers given so far (2010)
 placeholder (no info)
 DRFS Info JUL 21 2011

LOAD TABLES - Mechanical

Thermal Load in MW DRAFT JUL 22 2011

RDR 2006 (in MW)					SB2009 w <u>KCS</u> full power 5 HZ				SB2009 w <u>DRFS</u> full power 5 Hz			
	LCW	Air/Chw	Cryo (Water Load)	Total	LCW	Air/Chw	Cryo (Water Load)	Total	LCW	Air/Chw	Cryo (Water Load)	Total
e-sources	2.88	1.42		4.3	2.88	1.42		4.30	2.88	1.42		4.30
e+sources	17.48	5.33		22.8	5.53	0.72	1.18	7.4	5.53	0.72	1.18	7.4
DR	17.68	1.85	Cryo (water) Load was included in Cryo group estimate during the RDR	19.5	13.95	0.87	2.52	17.3	13.95	0.87	2.52	17.3
RTML	9.25	1.34		10.6	6.51 ^A	2.10	included in ML	8.6	6.51 ^A	2.10	included in ML	8.6
Main Linac	56	21.1		77.1	65.43	14.16	44.20	123.8	102.1	11.35	44.20	157.7
BDS	10.29	0.98		11.3	9.20	1.23	0.41	10.8	9.20	1.23	0.41	10.8
Major Dumps ^B	36	0		36	36	0	0	36	36	0	0	36
IR ^D	0	0		0	0.2	0.38	1.324 ^C	1.90	0.2	0.38	1.324 ^C	1.90
TOTAL				182	TOTAL			210	TOTAL			244

A) four 220 KW dump in rtml is not included in this total

B) There are (4) 18 MW major dumps in RDR, but water plant is sized for (2) 18 MW

C) Cryo Load for IR from SiD Jul 13 2010. The rest are from RDR (placeholder)

D) IR load from IRENG table 2007

E) Heat load shown are from 'technical equipment' only. Misc conventional equipment heat loads are NOT YET included!!

Total Excluding Cryo **161**

Total Excluding Cryo **194**

New numbers given so far (2010)

placeholder (no info)

DRFS info JUL 21 2011

Load Table progress – Basis for current Concept design

	starting point	use	current Changes
Main Linac - KCS	Dec 8 2010	Mar 23 2011	none expected
Main Linac - DRFS		email Aug 8 2011	
RTML	Sep 7 2010	Sep 7 2010	Sep 13 2011
Positron Source	Aug 27 2010	Aug 27 2010	Aug 18 2011
Damping Ring	Aug 2 2010	Jun 17 2011	expecting Jan 2012
BDS	Sep 7 2010	Sep 27 2010	None -Sep 21 2011
IR	Jun 30 2010 & Sep 20 2007	Jun 30 2010 & Sep 20 2007	Loads very minor
Electron Source	totals only	totals only	Loads very minor

Other Criteria

ilc
international linear collider

**POSITRON SOURCE
DESIGN CRITERIA FOR
for DARESBUURY WORKS
FEB 10 & 11, 2011**

**DRAFT
UPDATED
FEBRUARY 25 2011**

ilc
international linear collider

**DR (DAMPING RING)
DESIGN CRITERIA FOR CFS**

**DRAFT
MARCH 14, 2011
JUNE 17, 2011**

ilc
international linear collider

**RTML (Ring-To-Main-Linac)
DESIGN CRITERIA FOR CFS**

**DRAFT
MAR 14, 2011**

Page 1

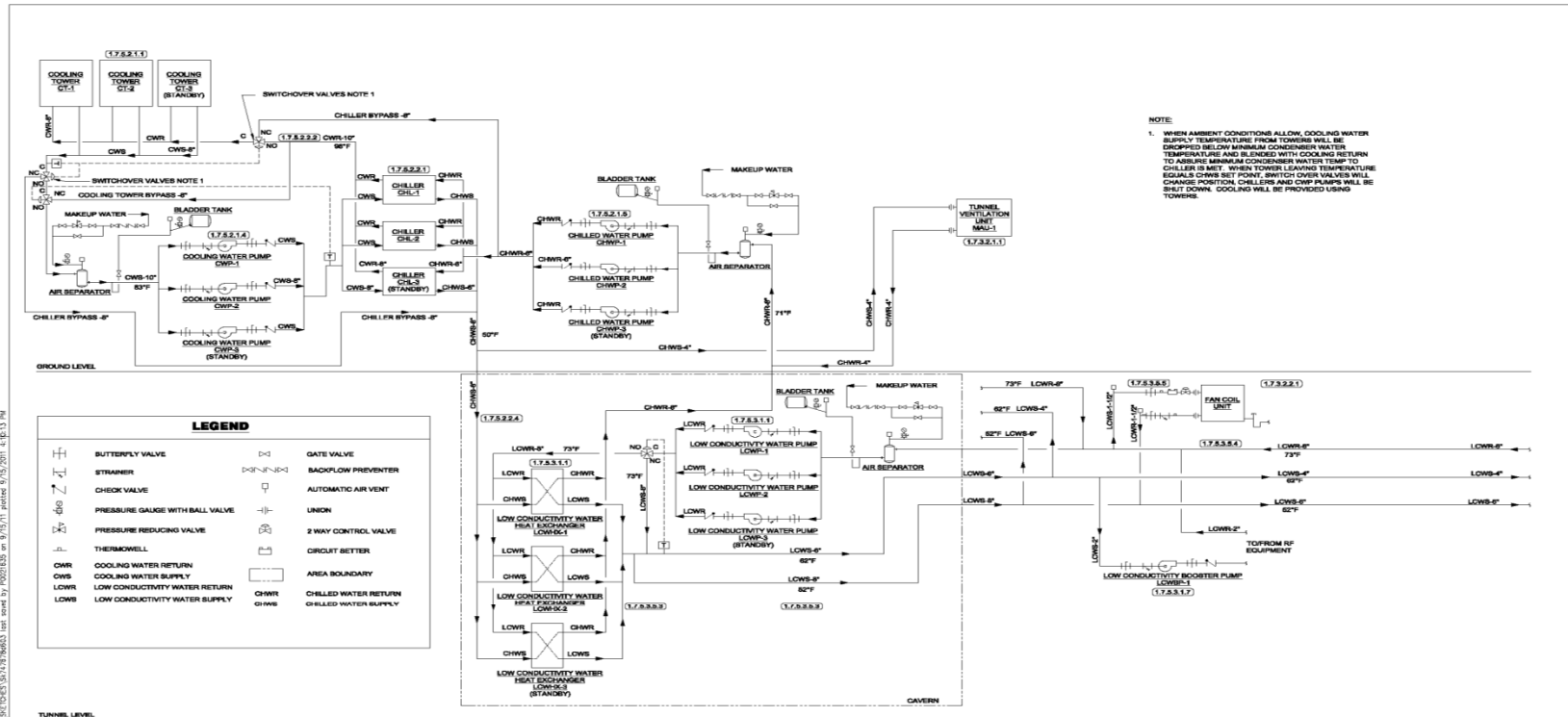
ilc
international linear collider

**BDS (Beam Delivery System)
DESIGN CRITERIA FOR CFS**

**DRAFT
MAR 14, 2011**

Page 1

Cooling Water Flow Diagram Shaft PMB-0



COOLING WATER FLOW DIAGRAM - DAMPING RING SHAFTS PMB-0

NOT FOR CONSTRUCTION

REV.	DATE	DESCRIPTION
A	08-15-11	ISSUED FOR CLIENT REVIEW
		REVISIONS

PARSONS
 10 SOUTH RIVERSIDE PLAZA, SUITE 400
 CHICAGO, ILLINOIS 60606
 OFFICE: 312.930.5100
 FAX: 312.930.0016
 WWW.PARSONS.COM

	NAME	DATE
DESIGNED	J. BURKE	08-10-2011
DRAWN	M. PARKER	08-10-2011
CHECKED	T. SHEEHAN	08-10-2011
APPROVED	T. SHEEHAN	08-10-2011
SUBMITTED		

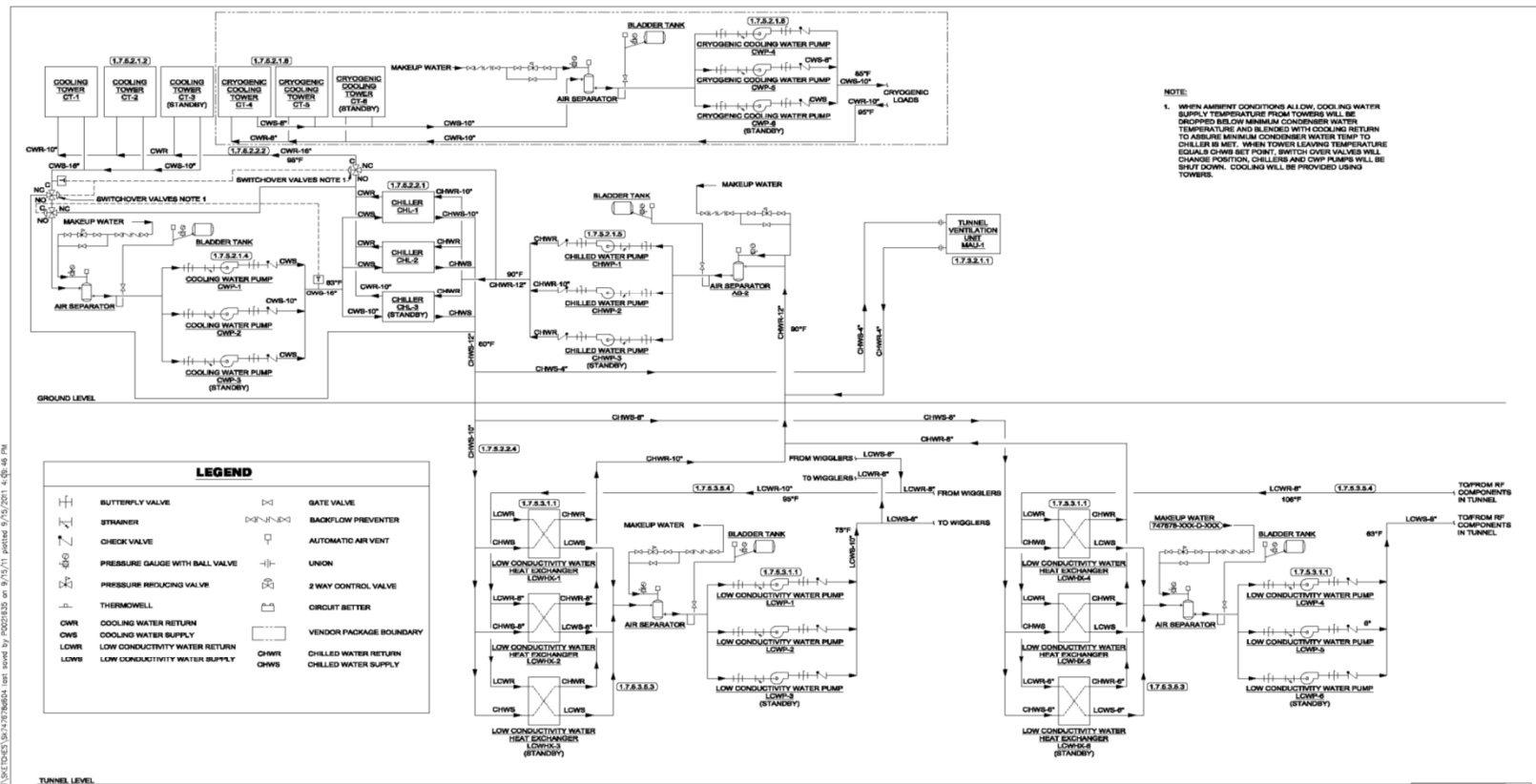
SCALE:

ILC GLOBAL DESIGN EFFORT

FERMILAB LINEAR COLLIDER
 COOLING WATER FLOW DIAGRAM
 DAMPING RING SHAFT PMB-0

DRAWING NO. **X-X-X** **XX** **M-603** REV. **A**

Cooling Water Flow Diagram Shaft PMC-0



COOLING WATER FLOW DIAGRAM - DAMPING RING SHAFTS PMC-0
SCALE: NTS

NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION
A	08-15-11	ISSUED FOR CLIENT REVIEW

PARSONS
10 SOUTH RIVERSIDE PLAZA, SUITE 400
CHICAGO, ILLINOIS 60606
OFFICE: 312.930.8100
FAX: 312.930.0018
WWW.PARSONS.COM

NAME	DATE
DESIGNED J. BURKE	06-15-2011
DRAWN M. PANTER	06-15-2011
CHECKED T. SHEEHAN	06-15-2011
APPROVED T. SHEEHAN	06-15-2011
SUBMITTED	

SCALE:

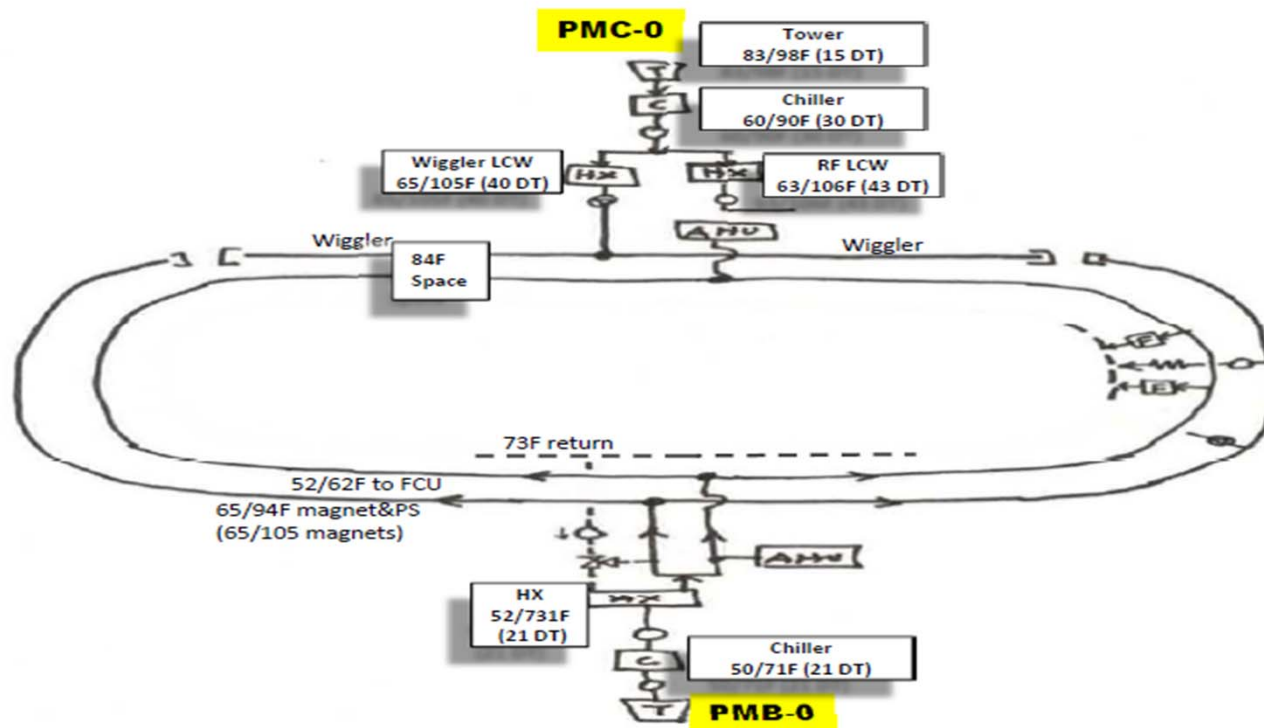
ILC GLOBAL DESIGN EFFORT
CONVENTIONAL FACILITIES AND SITING

FERMILAB LINEAR COLLIDER
COOLING WATER FLOW DIAGRAM
DAMPING RING SHAFT PMC-0

DRAWING NO. **X-X-X XX M-604** REV. **A** **XX** **FRL 2011**

- **Damping Ring Process Water**

Use chilled water at both shafts – dual temp from PMB-0
 Cooler loop for precise temp control maintaining tight stability
 Warmer loop for magnets and power supplies
 Tower system for Cryo at Shaft PMC-0 only
 Cooling Wiggler Issue – highly concentrated heat to air
 Maintain air temp within 1F of the magnet temperature



- **Central (BDS/e+)**

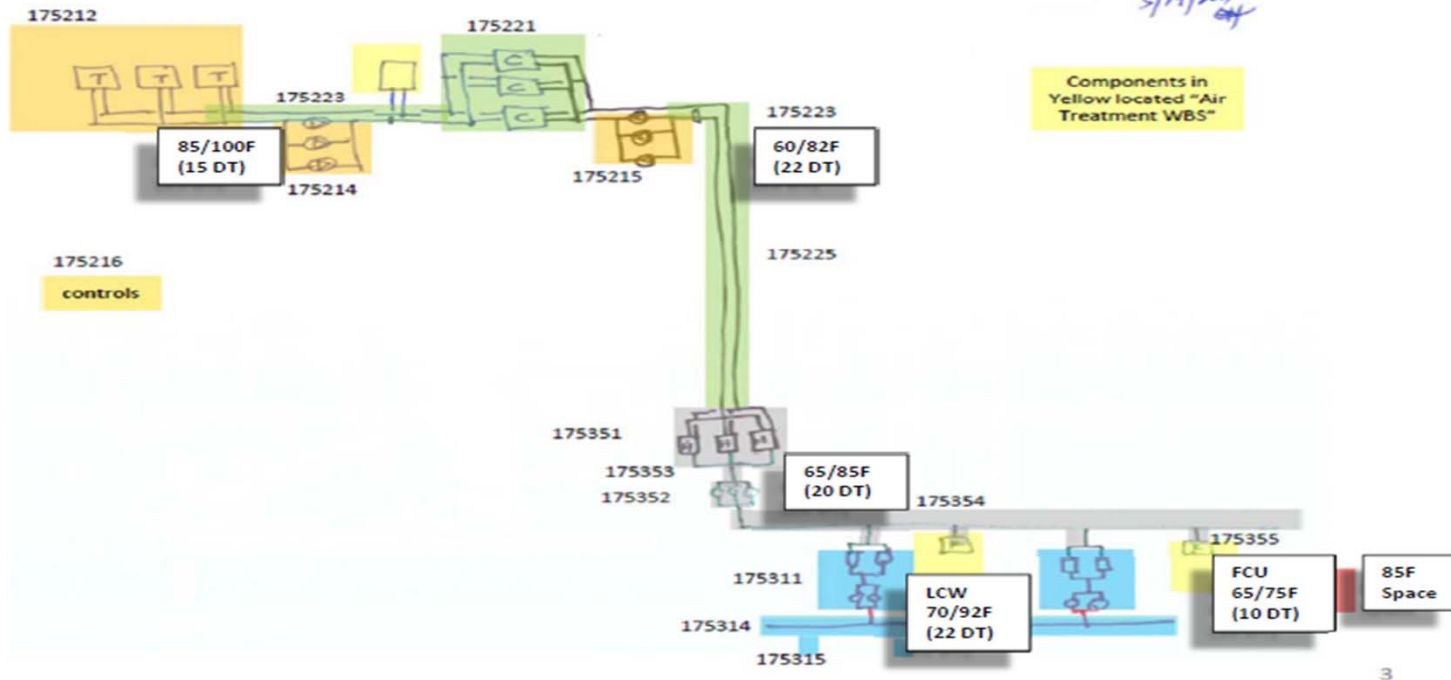
Temperature @ 84-85F

RTML load in the CR is about 2% of the total area on each
the PLTR/ELTR

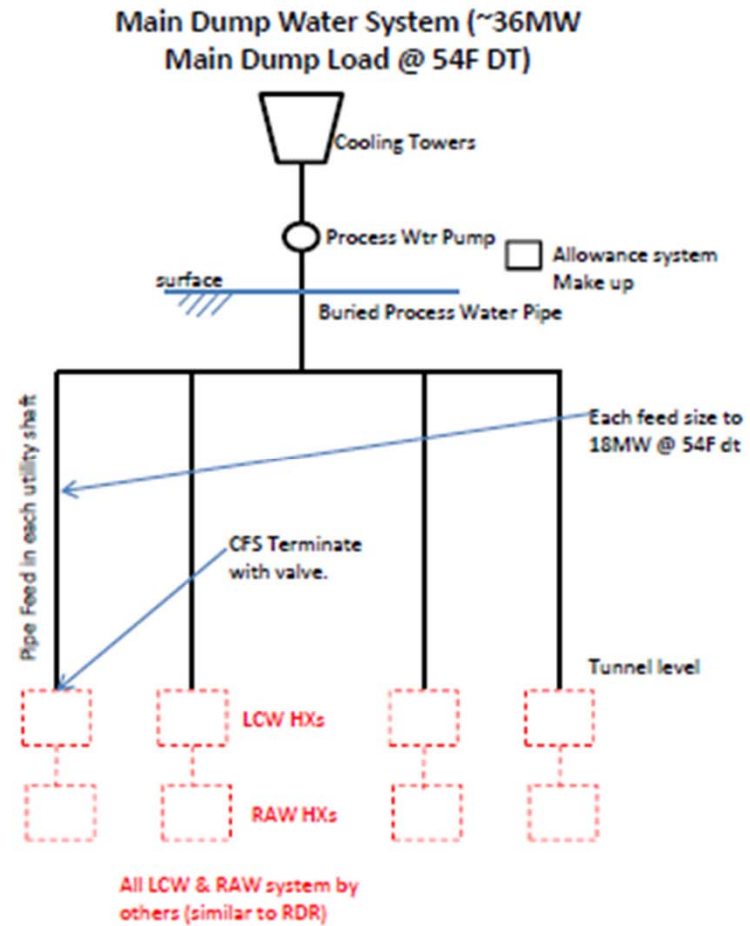
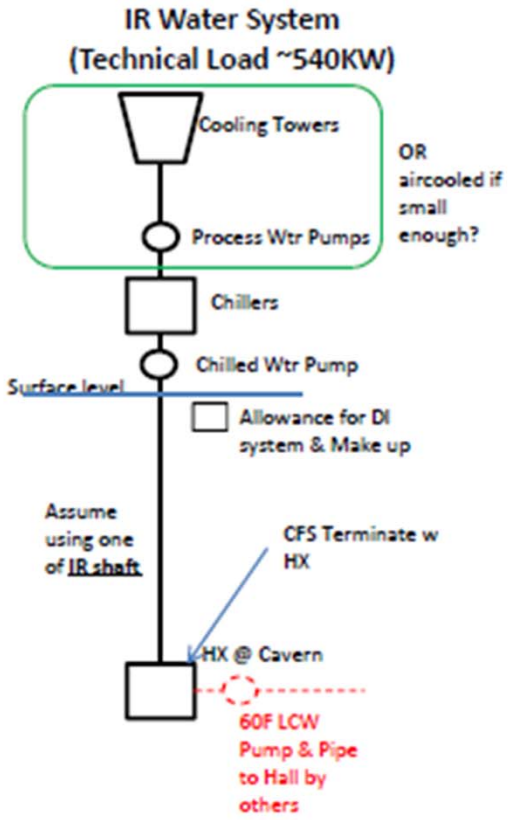
Maintain tunnel stability

Placeholder for ventilation in target from Minos

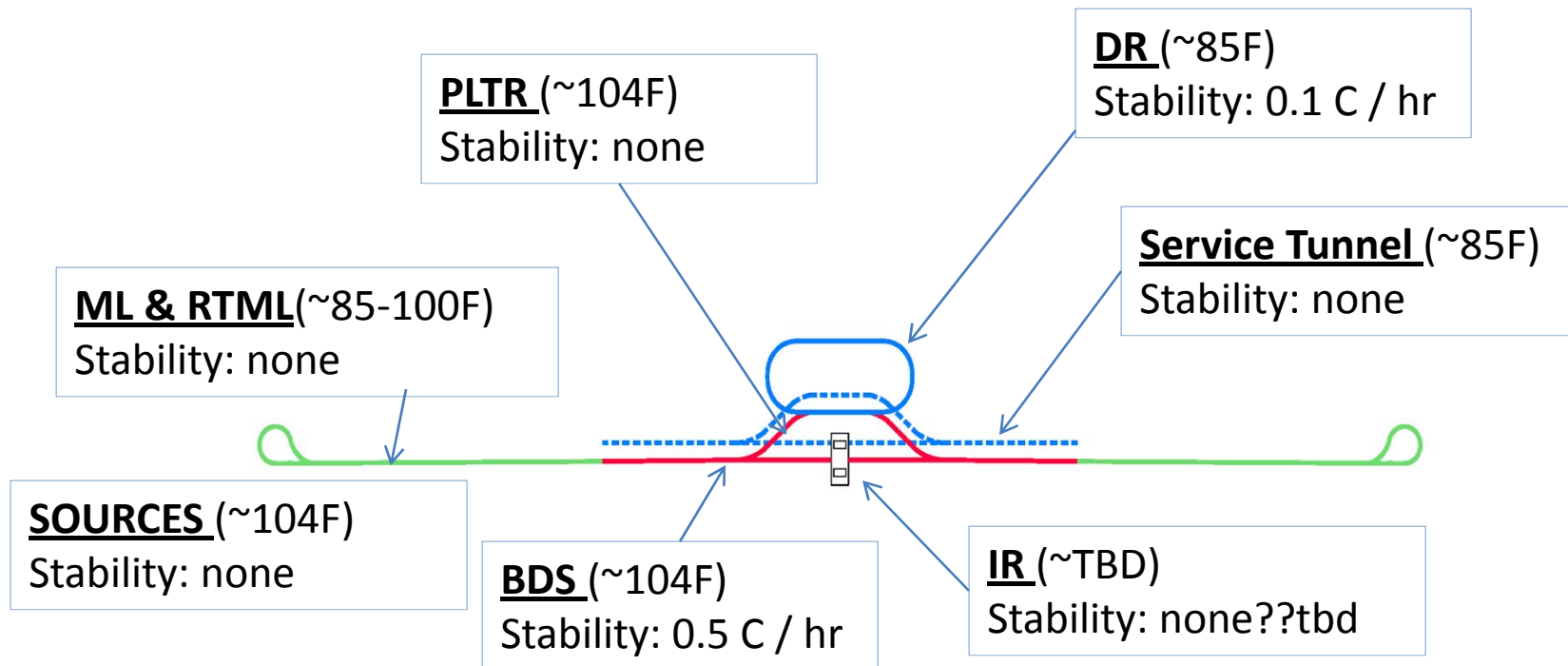
Similar system for each side



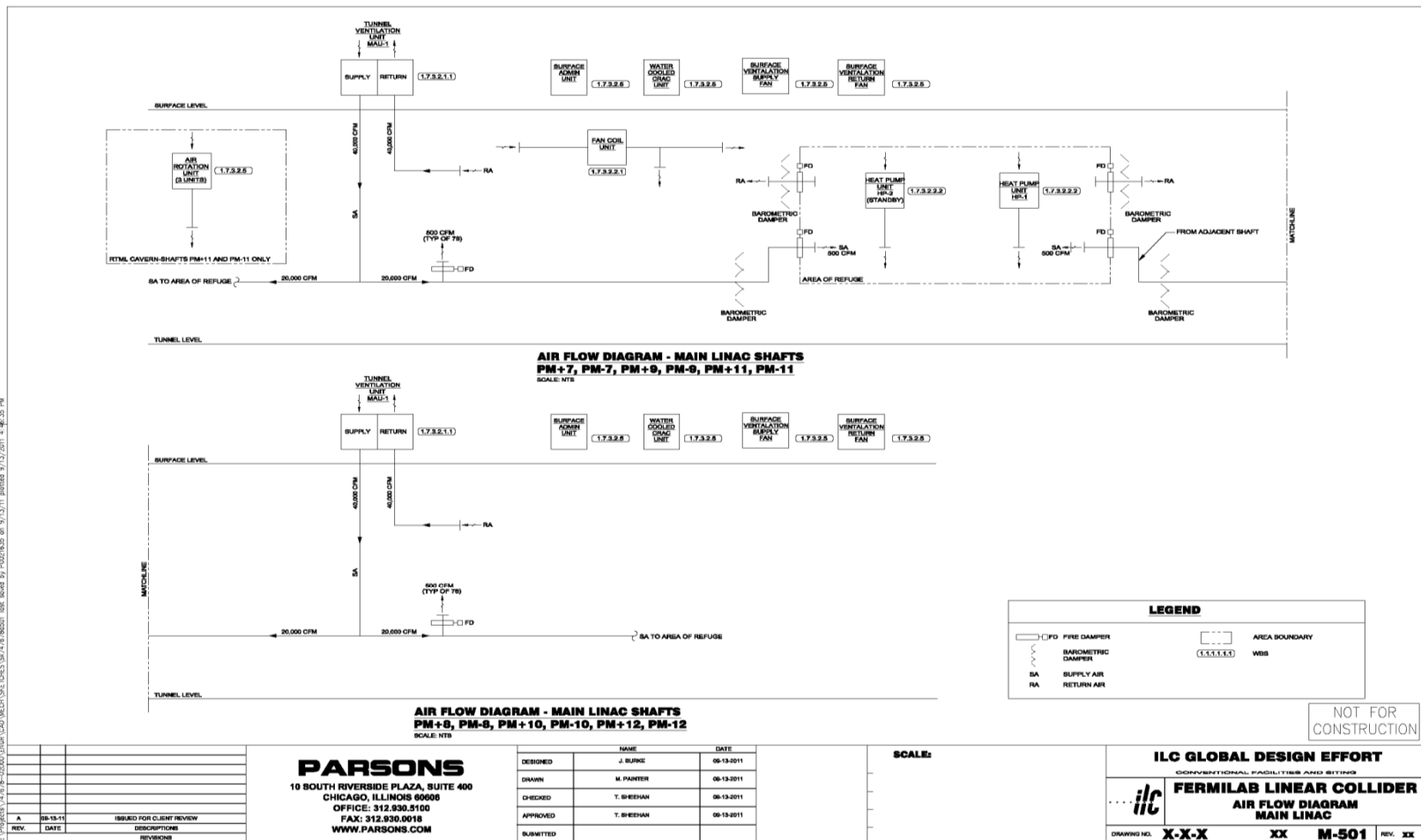
IR & Main Dump CFS water System



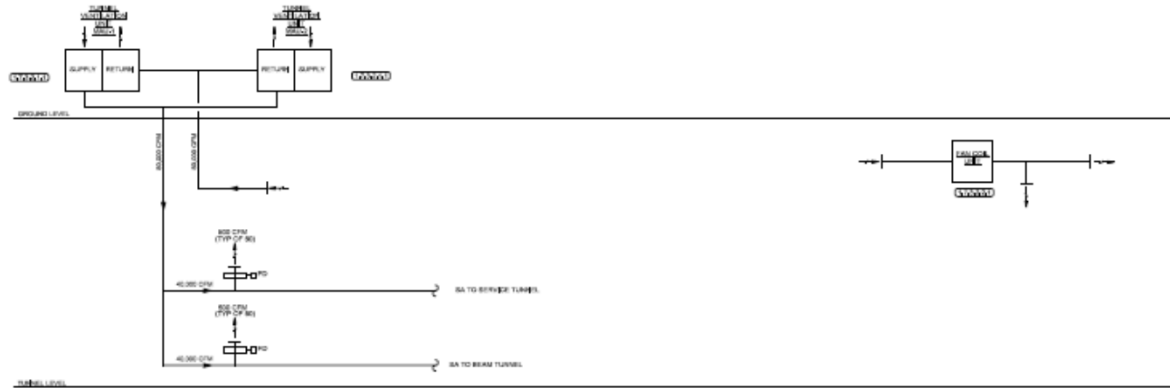
SPACE TEMPERATURE and STABILITY REQUIREMENT



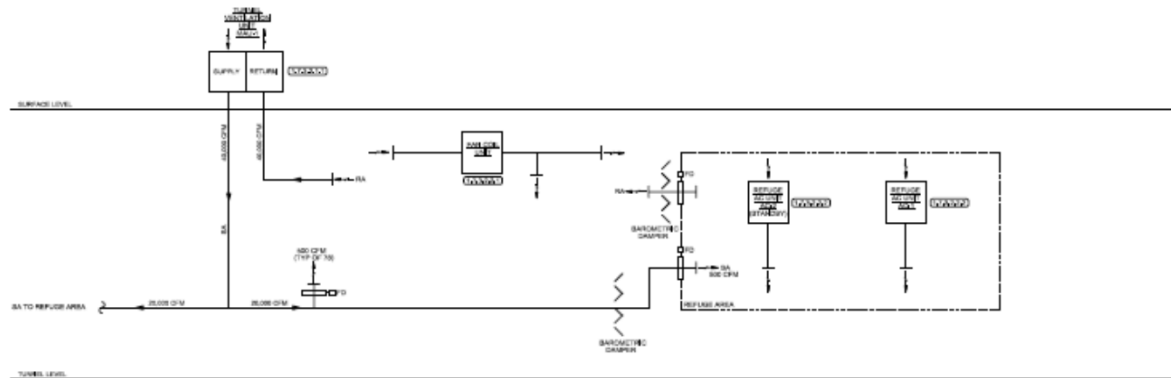
Typical Shaft Airflow Diagram



CR/DR Shaft Airflow Diagram

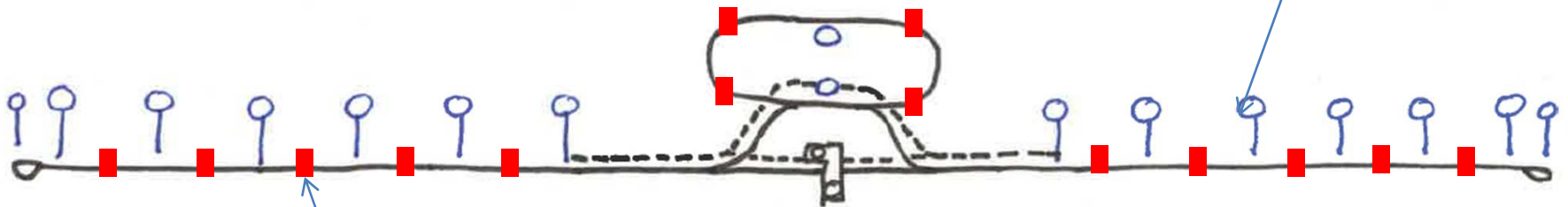
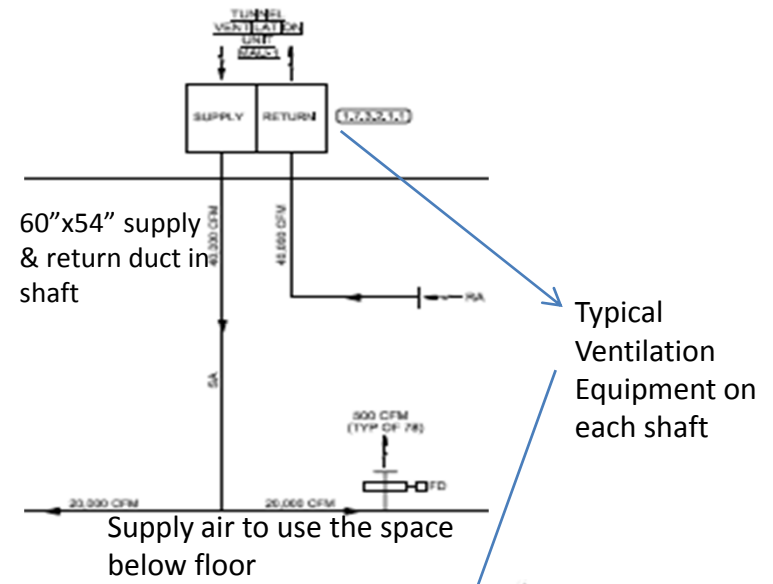
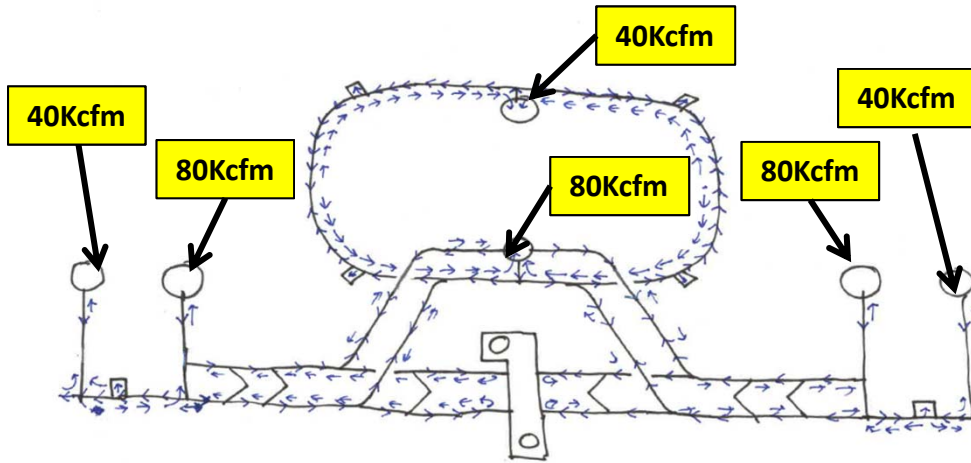


AIR FLOW DIAGRAM - CENTRAL REGION SHAFTS PM-7
SCALE: 1/8"

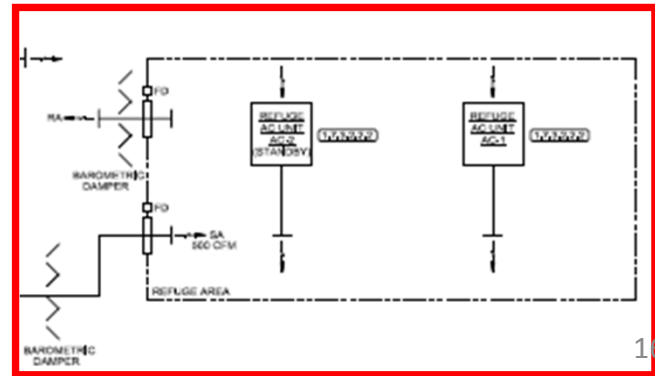


AIR FLOW DIAGRAM - DAMPING RING SHAFTS PMB-0, PIMC-0
SCALE: 1/8"

- Central Region Air System



Ducted supply air to each "Refuge Area Alcove"



1.7.2.1. *Engineering, Study work & Documentation*

1.7.2.2 High Voltage Equipment & Power Distribution

1.7.2.2.1	Main Substation
1.7.2.2.1.1	Transmission to 345 KV Substation
1.7.2.2.1.2	345 KV Substation
1.7.2.2.1.3	Transformers
1.7.2.2.1.4	Transmission Lines
1.7.2.2.1.5	35 KV/ 69KV switchgear
1.7.2.2.2	Distribution Substation
1.7.2.2.2.1	Transmission from source to 35/69 KV Substation
1.7.2.2.2.2	69 KV Substation
1.7.2.2.2.3	Transformers
1.7.2.2.2.4	Transmission Lines
1.7.2.2.2.5	35 KV switchgear
1.7.2.2.3	Medium Voltage Distribution & Transforming
1.7.2.2.3.1	Distribution from source
1.7.2.2.3.2	Not used
1.7.2.2.3.3	Transformers 35KV to 480V
1.7.2.2.3.4	not used

1.7.2.3 Low Voltage Equipment & Power Distribution

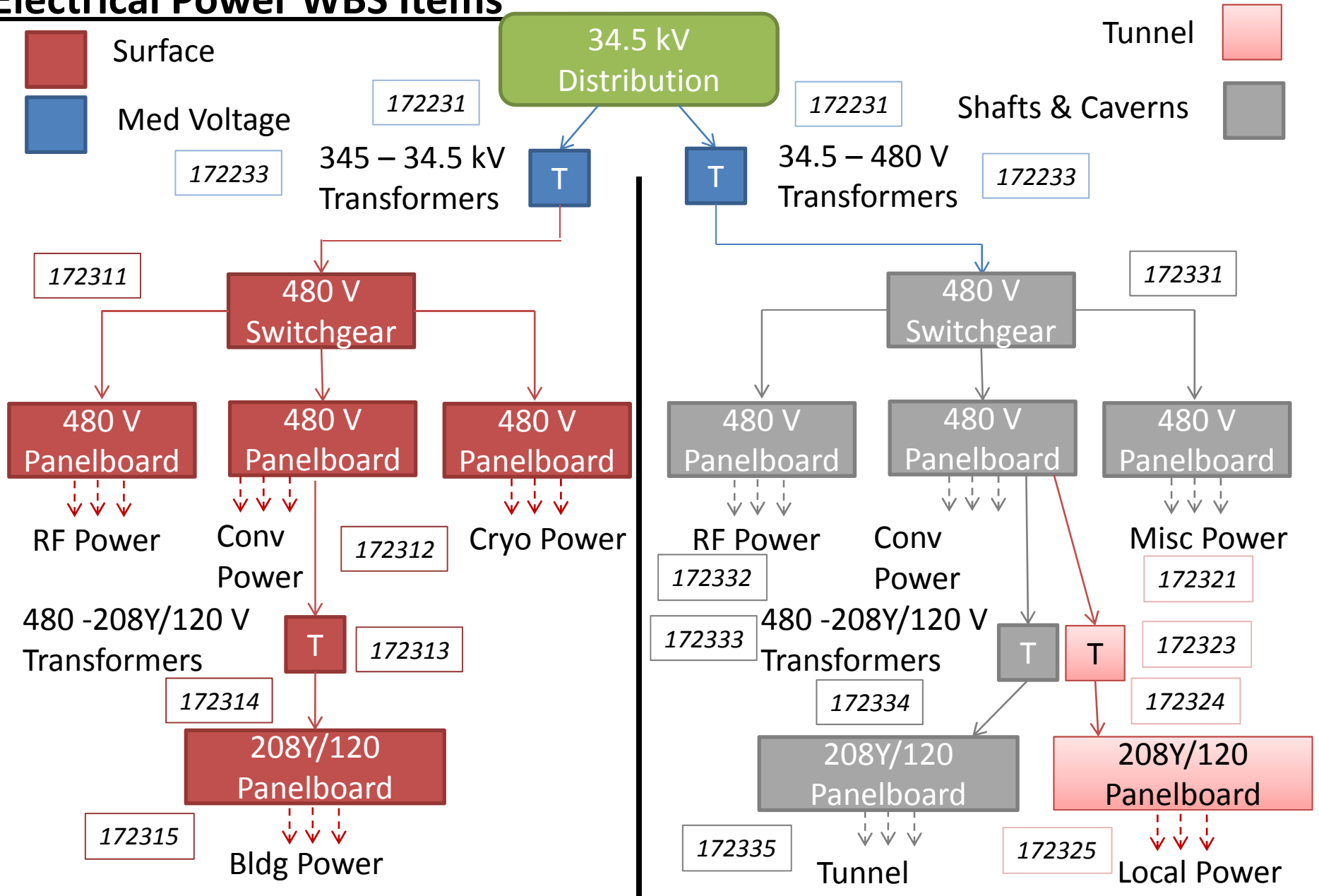
1.7.2.3.1	Surface Buildings (major equipment)
1.7.2.3.1.1	480V service distribution to panels
1.7.2.3.1.2	480V service distribution to equipment
1.7.2.3.1.3	Transformer 480v to 120/208V
1.7.2.3.1.4	120/208V dsitribution to panels
1.7.2.3.1.5	120/208V dsitribution to equipment
1.7.2.3.2	Shaft & Base Caverns
1.7.2.3.2.1	480V service distribution to panels
1.7.2.3.2.2	480V service distribution to equipment
1.7.2.3.2.3	Transformer 480v to 120/208V
1.7.2.3.2.4	120/208V dsitribution to panels
1.7.2.3.2.5	120/208V dsitribution to equipment
1.7.2.3.3	Tunnels
1.7.2.3.3.1	480V service distribution to panels
1.7.2.3.3.2	480V service distribution to equipment
1.7.2.3.3.3	Transformer 480v to 120/208V
1.7.2.3.3.4	120/208V dsitribution to panels
1.7.2.3.3.5	120/208V dsitribution to equipment

1.7.2.4 Emergency Power Sources

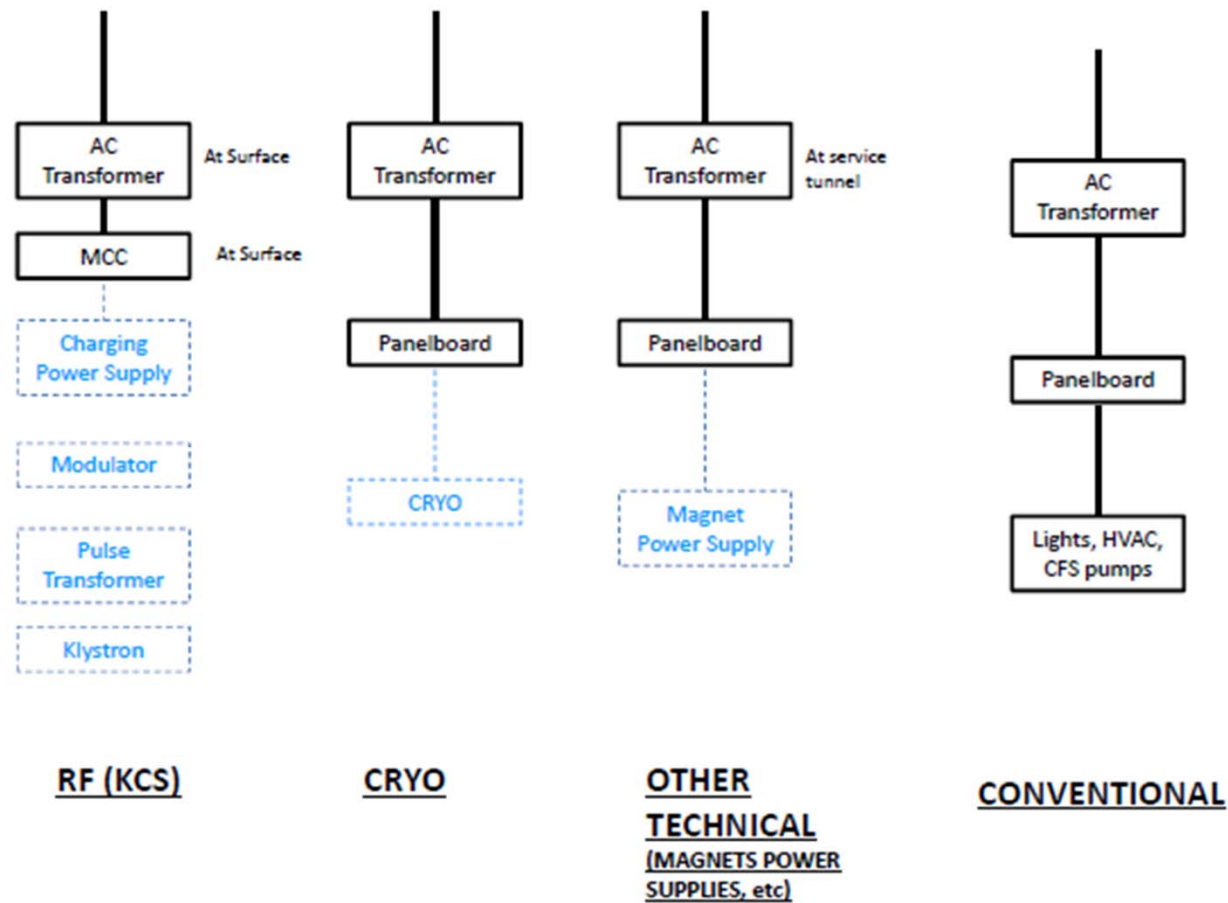
1.7.2.5 Power Network Monitoring

1.7.5.6 Communication Equipment

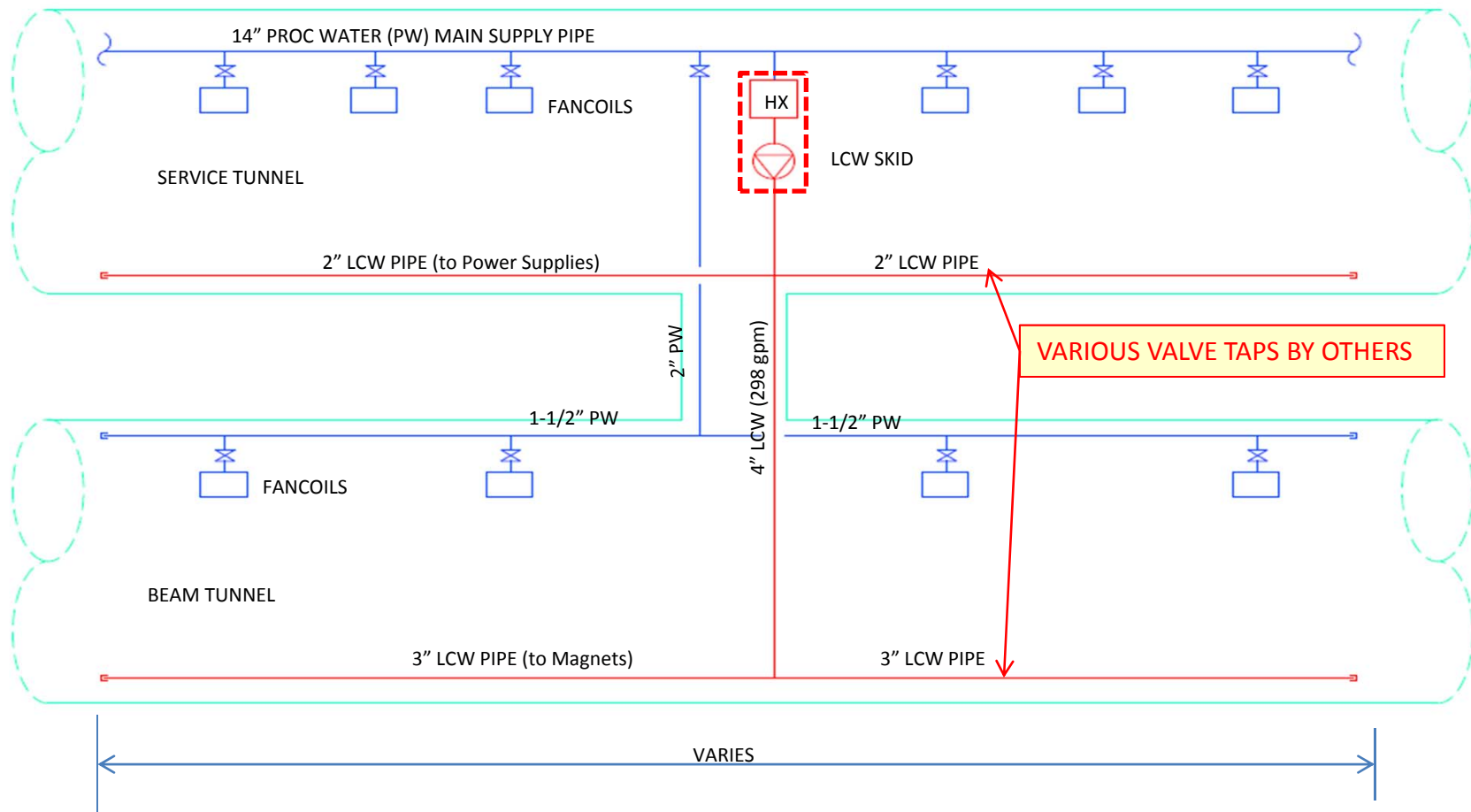
Electrical Power WBS Items



INTERFACE – Electrical



INTERFACE (Central Region) (ONLY THE SUPPLY PIPE ARE SHOWN FOR CLARITY)



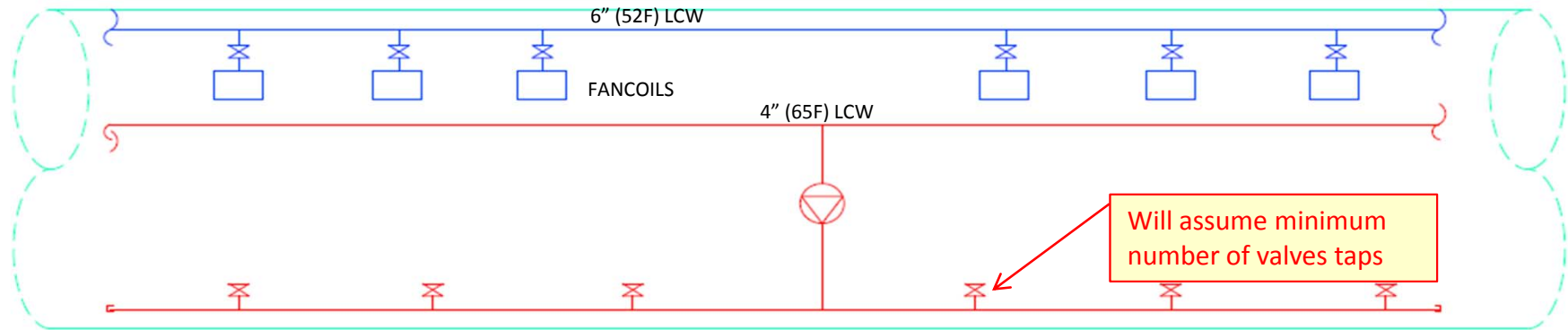
SEP 23 2011

9/27/2011

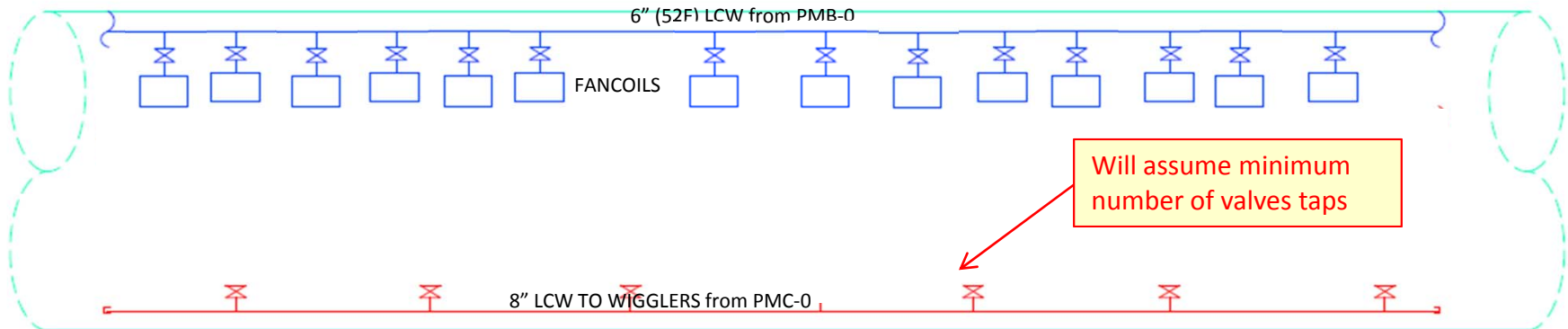
Mechanical & Electrical Overview in CR & DR

21

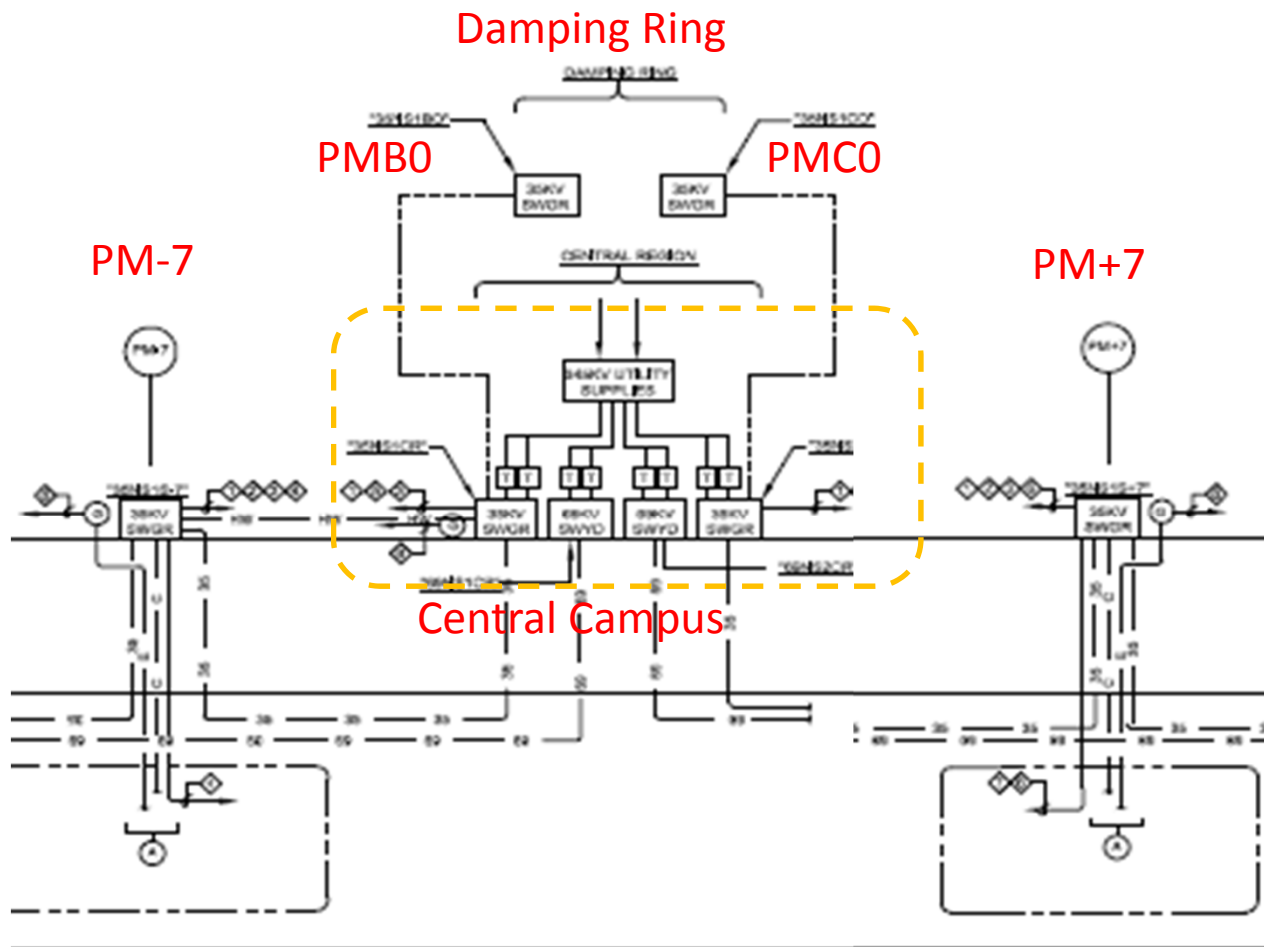
INTERFACE (Damping Ring) (ONLY THE SUPPLY PIPE ARE SHOWN FOR CLARITY)



Feed from PMB-0 to beam tunnel (approx 1.3 Km)



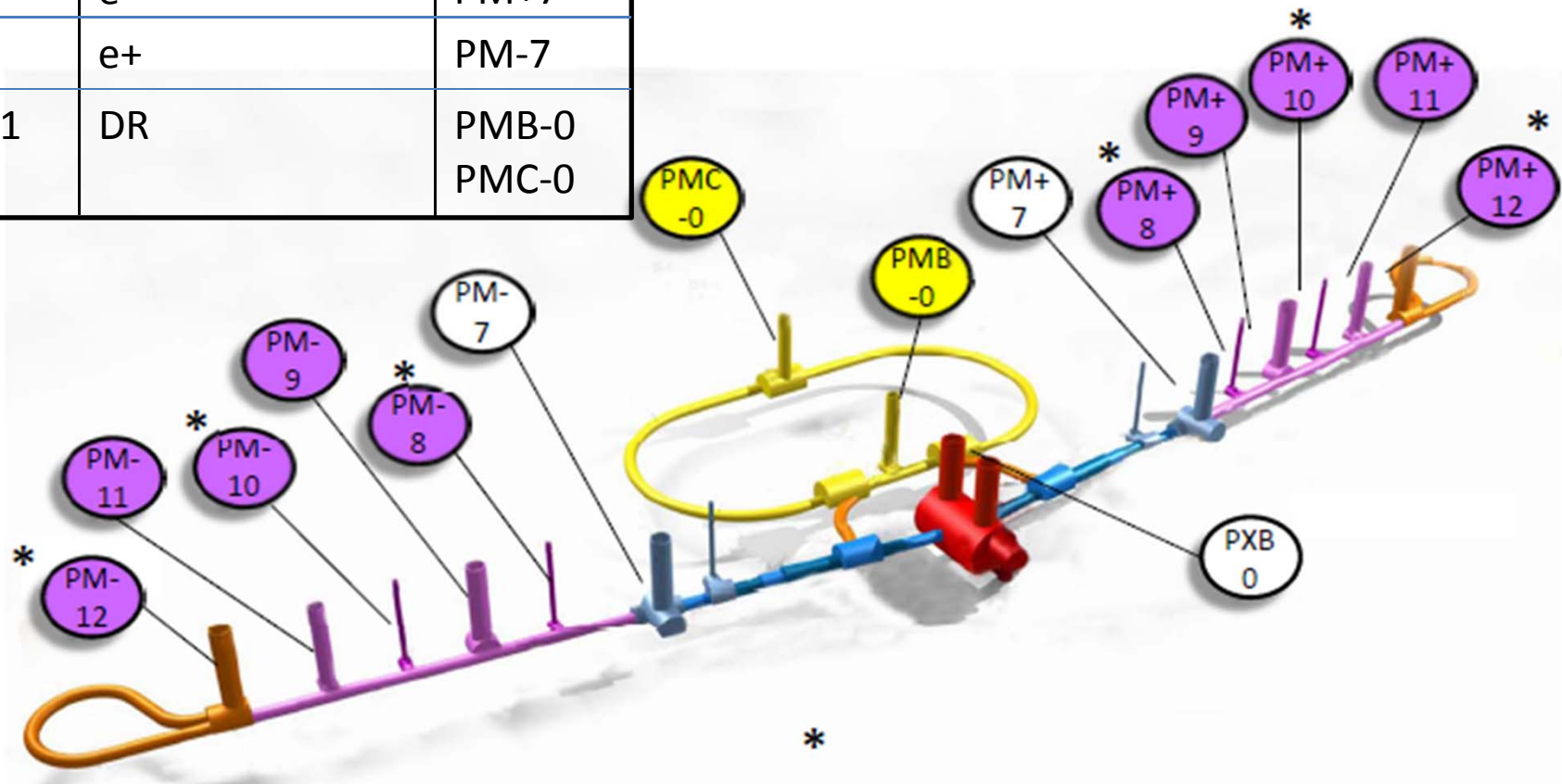
Feed from PMC-0 to wiggler area (approx 204m x 2)



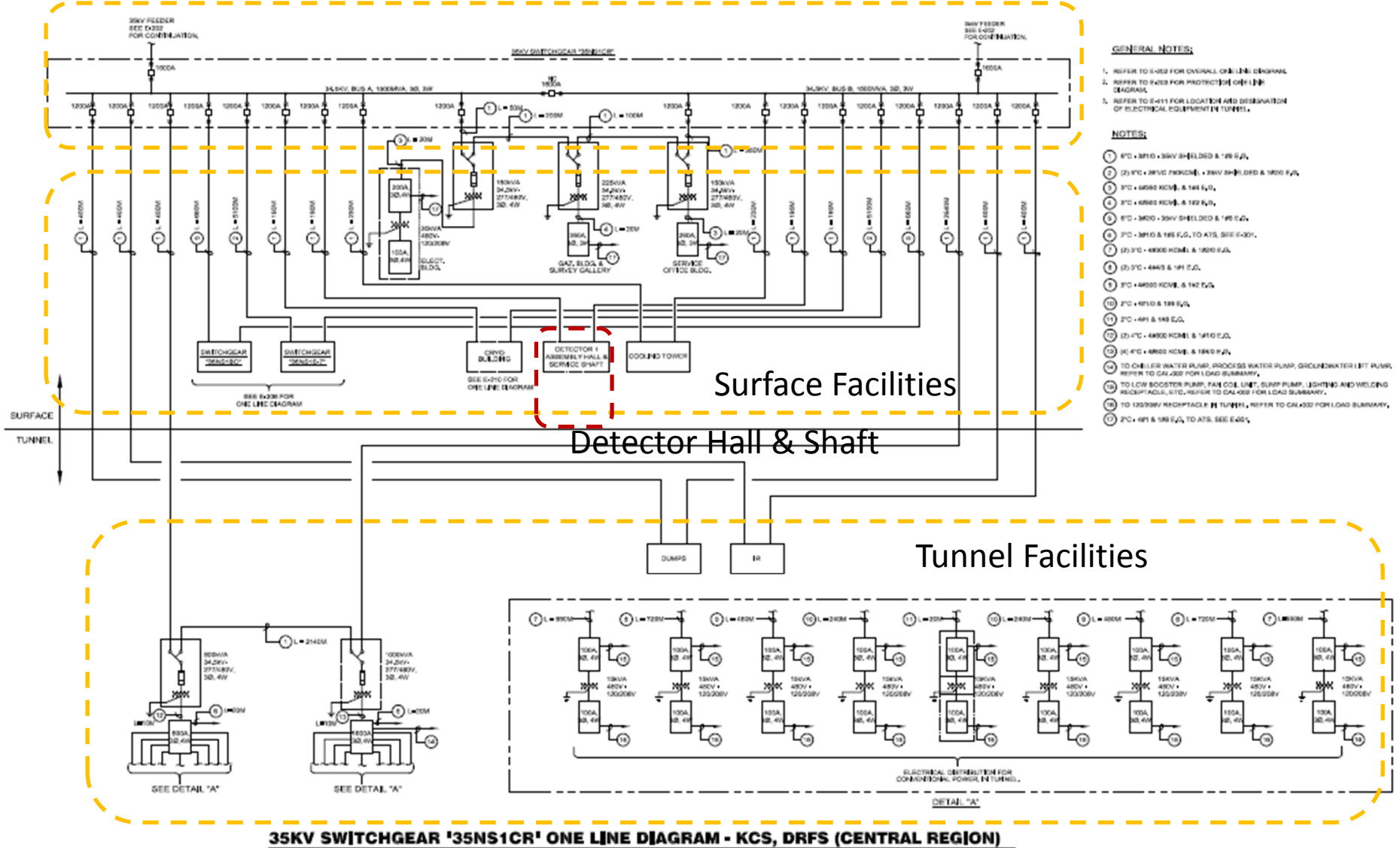
Electrical Power Single Line Diagram
Central Region

<u>MW</u>	<u>AREA</u>	<u>SHAFT</u>
15.0	IR ,BDS,DMP	PXA PXB
8.61	RTML	PM+/-12 PMB-0
4.0	e-	PM+7
6.25	e+	PM-7
14.81	DR	PMB-0 PMC-0

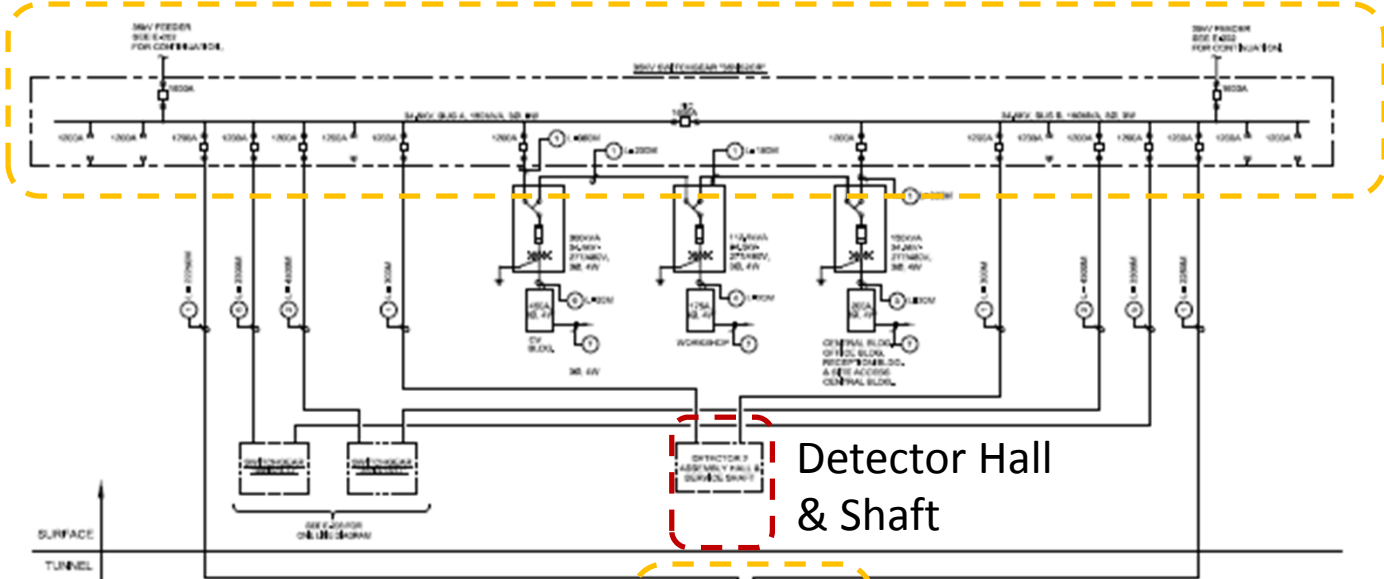
Electrical Power Distribution Central Region Tunnel



34.5 kV Power Distribution



34.5 kV Power Distribution



GENERAL NOTES

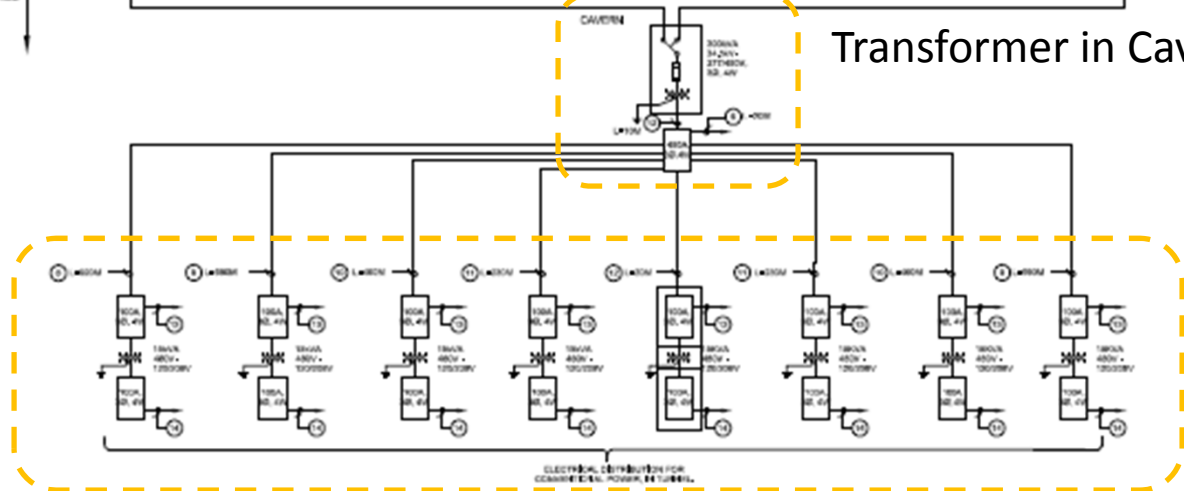
- 1. REFER TO PAGES FOR OVERALL ONE LINE DIAGRAM.
- 2. REFER TO PAGES FOR PROTECTIVE ONE LINE DIAGRAM.
- 3. REFER TO DATA FOR LOCATION AND DESIGNATION OF ELECTRICAL EQUIPMENT IN TUNNEL.

NOTES

- ① 8FC - 8FC - 300V 2-POLE & 1P/1L S/L
- ② 20FC - 2000 KWH - 200V 2-POLE & 1P/1L S/L
- ③ 8FC - 8FC & 1P/1L S/L
- ④ 2FC - 800 & 1P/1L S/L
- ⑤ 8FC - 8000 KWH - 200V 2-POLE & 1P/1L S/L
- ⑥ 2FC - 8000 KWH - 200V 2-POLE & 1P/1L S/L
- ⑦ TO ATS FOR EMERGENCY POWER, SEE 8-401
- ⑧ 20 FC - 8000 KWH - 200V 2-POLE & 1P/1L S/L
- ⑨ 20 FC - 8000 KWH - 200V 2-POLE & 1P/1L S/L
- ⑩ 2FC - 800 & 1P/1L S/L
- ⑪ 2FC - 8000 KWH - 200V 2-POLE & 1P/1L S/L
- ⑫ 2FC - 800 & 1P/1L S/L
- ⑬ 2FC - 800 & 1P/1L S/L
- ⑭ TO LOW RECEPTION PUMP, FAN COOL. UNIT, SLURP PUMP, LEDS (SEE 8-401) & 1P/1L RECEPTACLE, ETC., REFER TO CAL-462 FOR LOAD SCHEDULE.
- ⑮ TO 12000V RECEPTACLE IN TUNNEL, REFER TO CAL-462 FOR LOAD SCHEDULE.

Detector Hall & Shaft

Transformer in Cavern



480 V Power Distribution In Tunnel

35KV SWITCHGEAR '35NS2CR' ONE LINE DIAGRAM - KCS, DRFS (CENTRAL REGION)