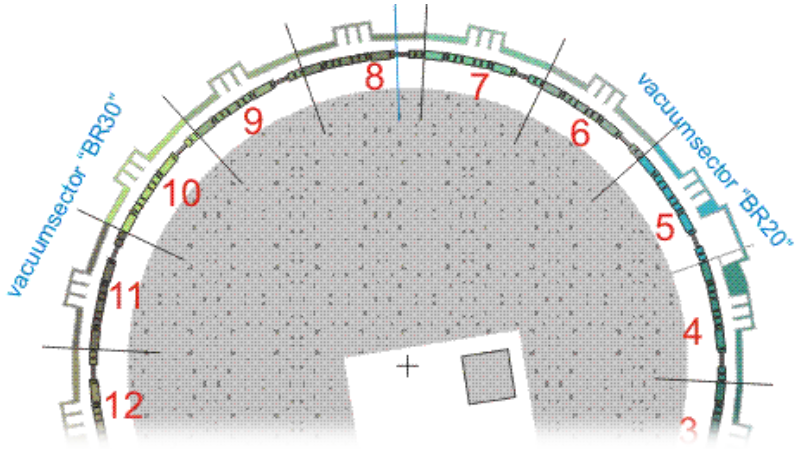
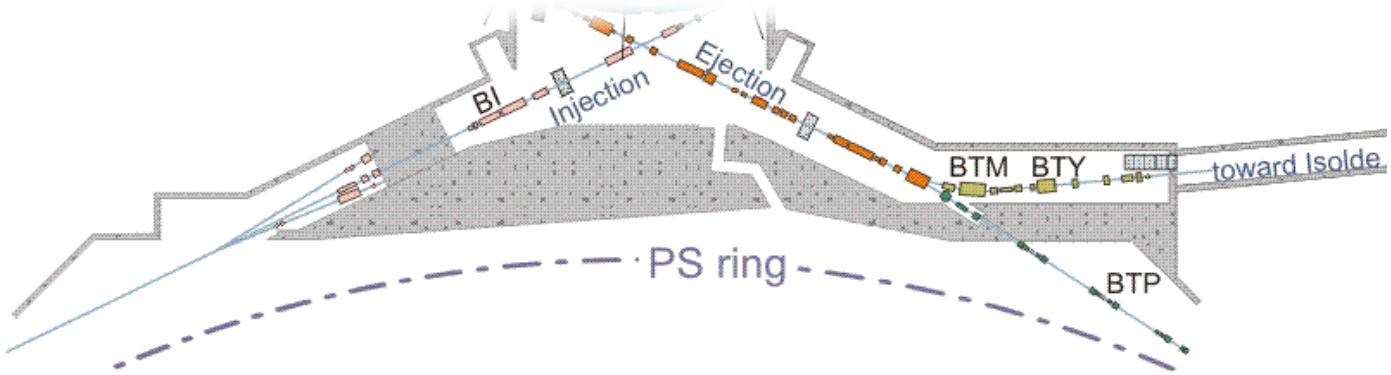


Bulding 245 schedule update

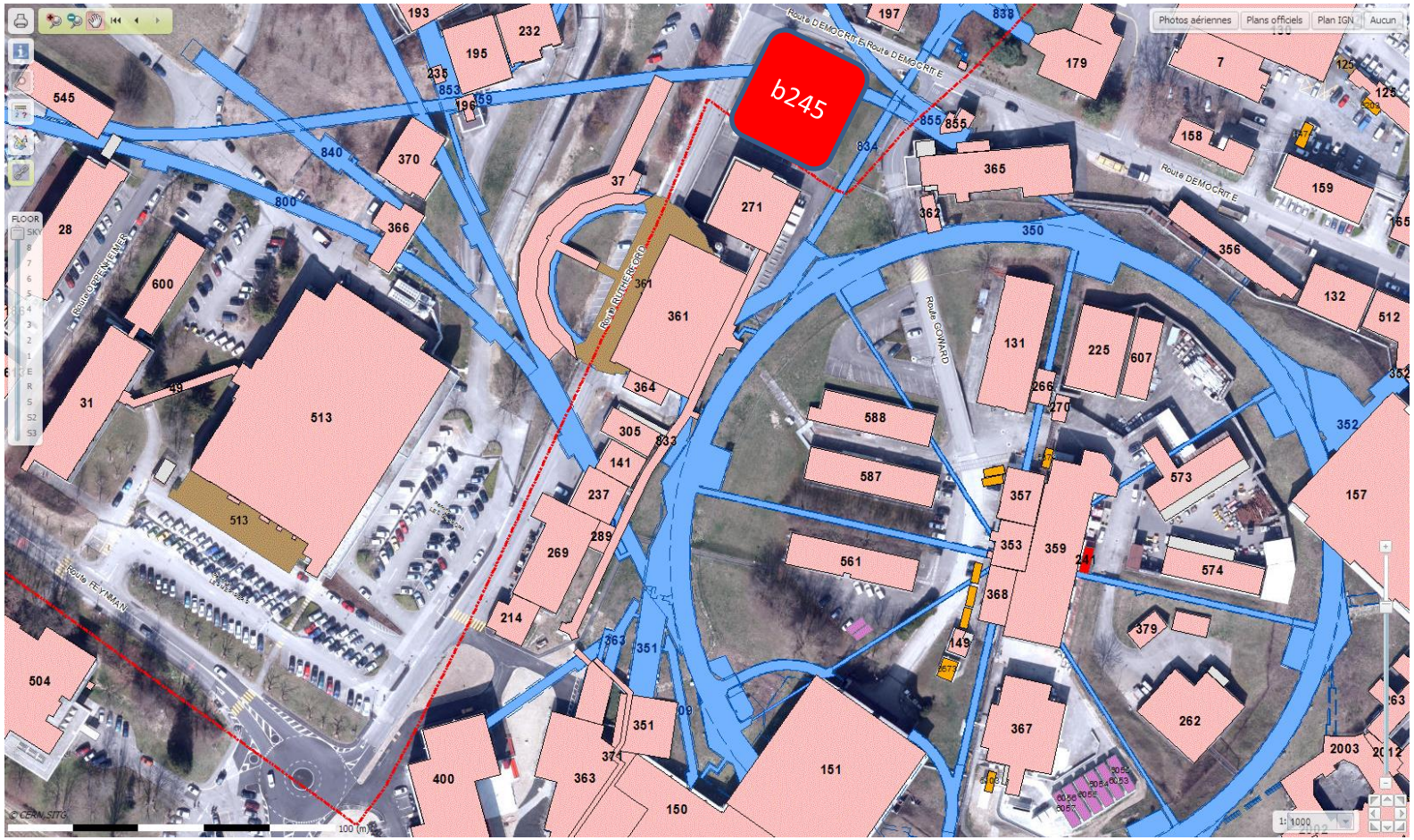


LIU Booster Meeting 27-03-2014

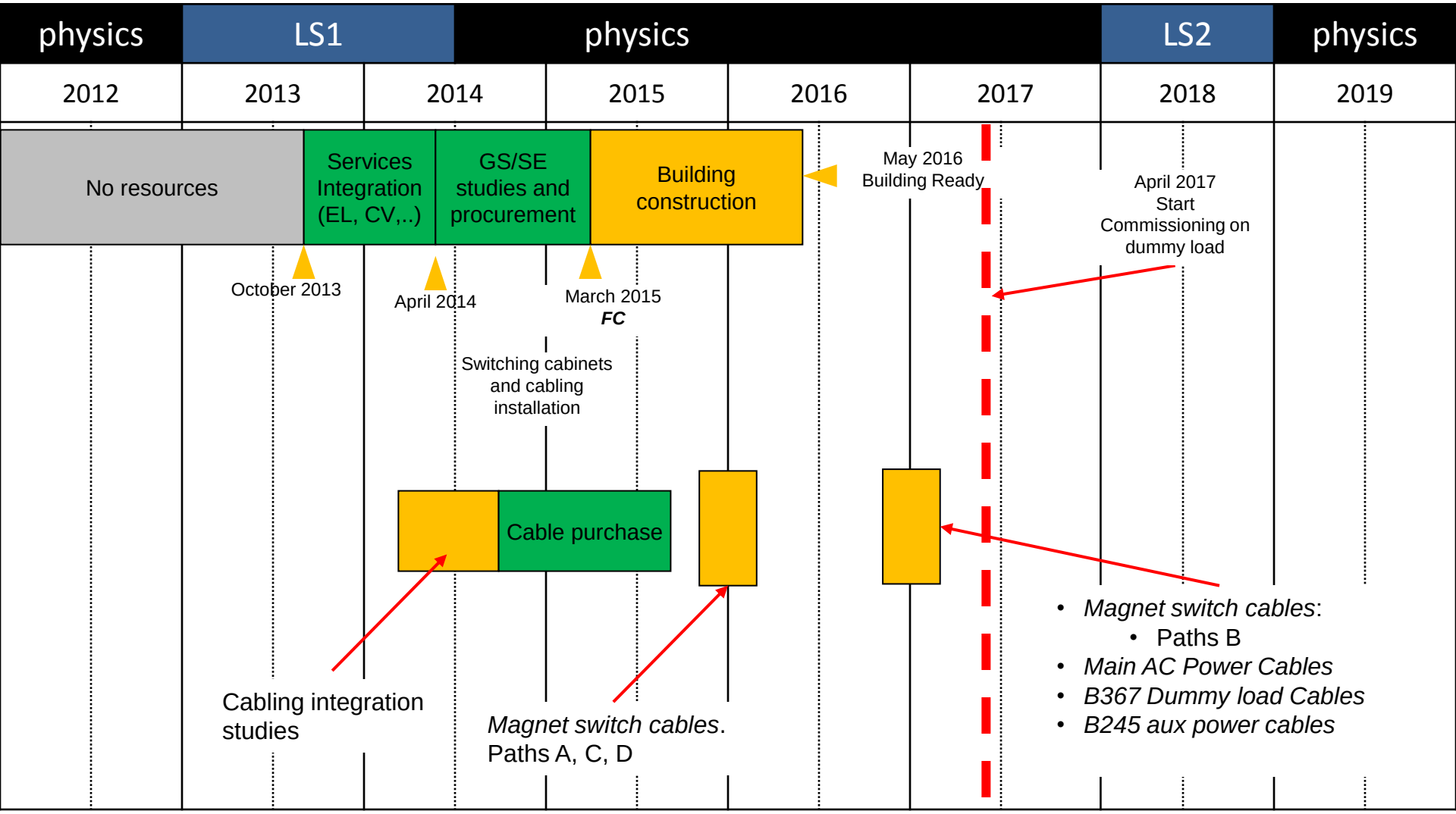
Fulvio Boattini & Michel Obrecht

TE-EPC / EN-CV

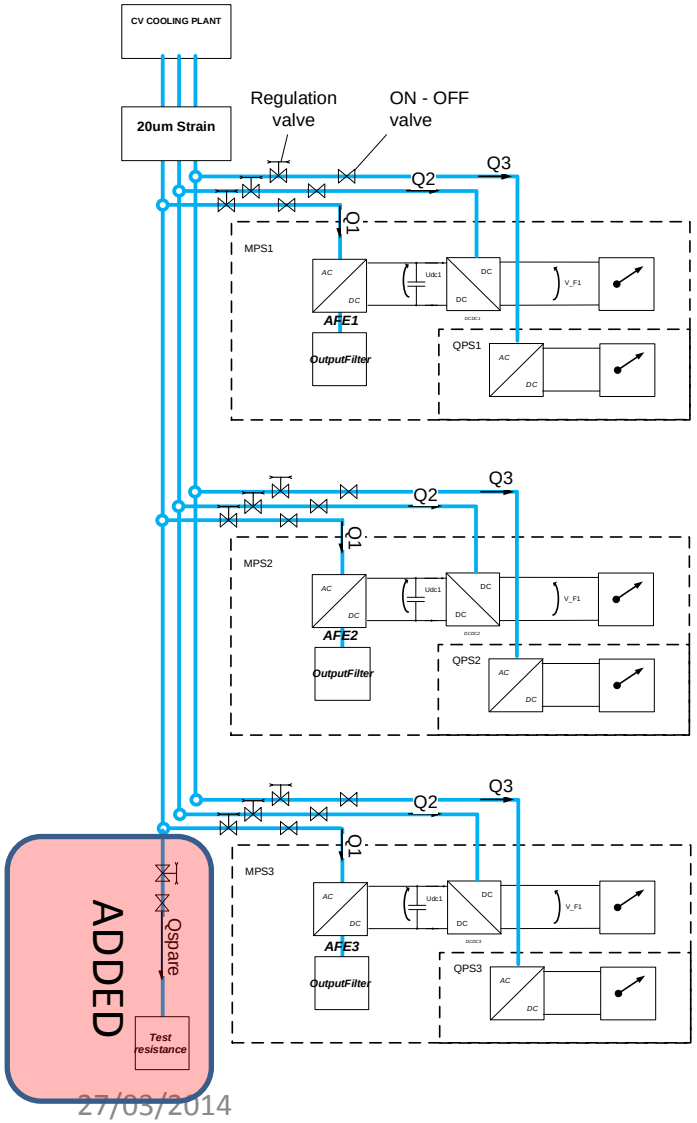
Building 245 position



MPSB Time Schedule



Review of cooling and HVAC requirements for Booster MPS



All circuits are aluminium

A 20um mechanical filter is required before entering the converters

Water flow will be adjusted to its nominal value during commissioning by means of dedicated regulation valves

During operation one of the 3 sets of circuits (and/or the spare circuit) could be disconnected. The flow in the other circuits shall remain the same (regulation and on-off valves separated).

	MPS		QPS	Spare
	AFE + Output Filter	DCDC Converter	Quadrupole Converter	Spare Circuit
Number of Units [Nu]	3	3	3	1
Losses in water per Unit [PlossU]	100kW	77kW	25kW	30kW
Water flow per unit [Q]	Q1: 36 m3/h	Q2: 36 m3/h	Q3: 5 m3/h	Qspare: 5m^3/h
Inlet temperature (Max) [Tin]	30÷35 deg C	30÷35 deg C	30÷35 deg C	30÷35 deg C
Inlet water conductivity [uS/cm] @ Tin	<1.5 uS/cm	<1.5 uS/cm	<1.5 uS/cm	<1.5 uS/cm
Estimated DP @ Q	4.0 bar	4.0 bar	2.5 bar	2 bar
Total Losses in water [PlossH2O] (alu circuit)	500kW			

Review of cooling and HVAC requirements for Booster MPS

	Temperatures [degC]	Losses [kW]	Sun Radiation [W]
Converter Hall	26	160	(*)
Control Room	human range (18deg winter 26 summer)	4	(*)
Capacitor rooms	human range (18deg winter 26 summer)	5 (for each room)	(*)
False Floor	26	15	(*)
EN/EL area	26	10	(*)

Building 245 CV Conceptual Design

Conceptual Design based on :

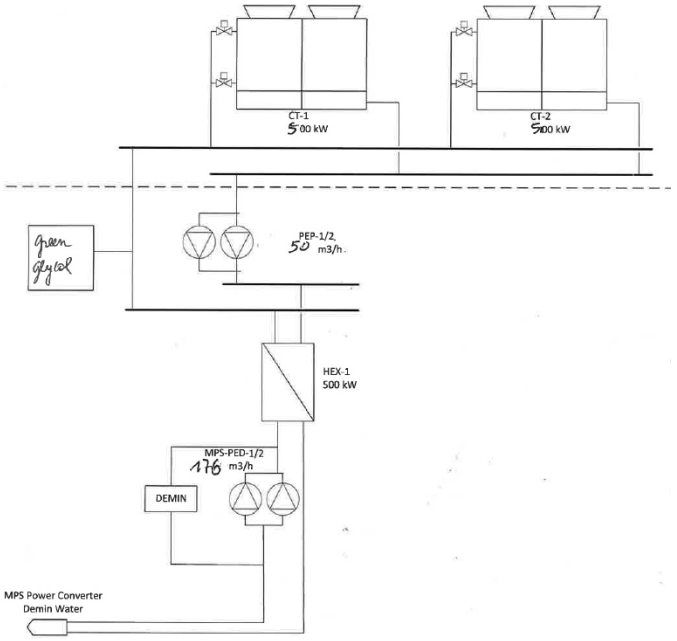
- Independent cooling station :

- Cost optimised Air conditioning system :
  - No chilled water,
  - Units placed on the roof,

URS inputs

- Cooling power on water: confirmed 470 kW = 2 units at 100% + 30% of the third unit Flow rate, delta T of 2.3 °C,
- Conductivity of the water confirmed, maxi 0,8 micro S/cm at 30 °C,
- Need to run independently : **2 fully independent stations for cooling** located in the new building,
- Requirements for internal temperature revised, 26 °C in summer with maxi of 30 °C during limited periods

Building 245 CV Conceptual Design



Débit-Puissance

Débit	CA	**176.35**	[m3/h]
Puissance	470.0	**470.0**	[kW]

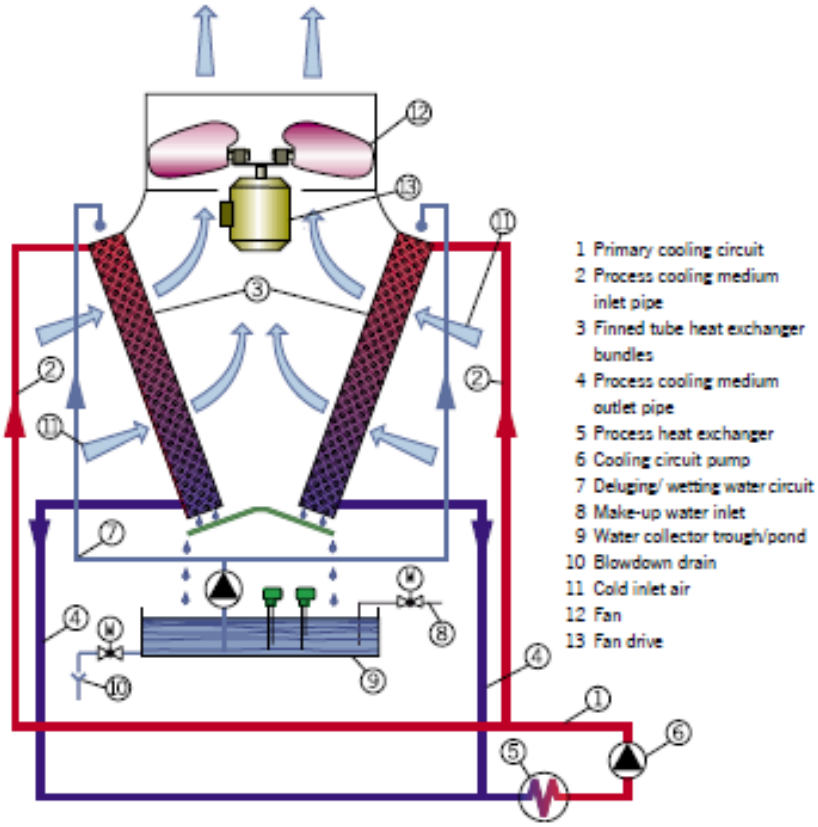
Delta T [K]	Cp [kJ/kg*K]	Densité [kg/m3]	Delta P [bar]	Pompe Rend.	Pompe P [kW]
2.3	4.18	998	4.0	0.5	**39.19**

ACIER INOX

PN10 DN	de [mm]	e [mm]	di [mm]	Vmax [m/s]	V [m/s]	PN16 DN	de [mm]	e [mm]	di [mm]	Vmax [m/s]	V [m/s]
10	17.2	1.6	14.0		**318.21**	**10**	17.2	1.6	14.0		**318.21**
15	21.3	1.6	18.1		**190.38**	**15**	21.3	1.6	18.1		**190.38**
20	26.9	1.6	23.7		**111.04**	**20**	26.9	1.6	23.7		**111.04**
25	33.7	1.6	30.5		**67.05**	**25**	33.7	1.6	30.5		**67.05**
32	42.4	1.6	39.2		**40.59**	**32**	42.4	1.6	39.2		**40.59**
40	48.3	1.6	45.1		**30.66**	**40**	48.3	1.6	45.1		**30.66**
50	60.3	2.0	56.3	1.2	**19.68**	**50**	60.3	2.0	56.3	1.2	**19.68**
65	76.1	2.0	72.1	1.4	**12.00**	**65**	76.1	2.0	72.1	1.4	**12.00**
80	88.9	2.0	84.9	1.5	**8.65**	**80**	88.9	2.0	84.9	1.5	**8.65**
100	114.3	2.0	110.3	1.7	**5.13**	**100**	114.3	2.0	110.3	1.7	**5.13**
125	139.7	2.0	135.7	1.9	**3.39**	**125**	139.7	2.0	135.7	1.9	**3.39**
150	168.3	2.0	164.3	2.0	**2.31**	**150**	168.3	2.3	163.7	2.0	**2.33**
200	219.1	2.3	214.5		**1.36**	**200**	219.1	2.6	213.9		**1.36**
250	273.0	2.6	267.8		**0.87**	**250**	273.0	3.2	266.6		**0.88**
300	323.9	2.9	318.1		**0.62**	**300**	323.9	3.6	316.7		**0.62**

Building 245 CV Conceptual Design

Normal Jäggi Hybridcooler

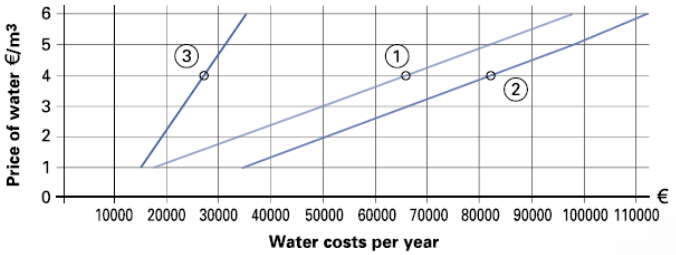


1 Primary cooling circuit
2 Process cooling medium inlet pipe
3 Finned tube heat exchanger bundles
4 Process cooling medium outlet pipe
5 Process heat exchanger
6 Cooling circuit pump
7 Deluging/ wetting water circuit
8 Make-up water inlet
9 Water collector trough/pond
10 Blowdown drain
11 Cold inlet air
12 Fan
13 Fan drive

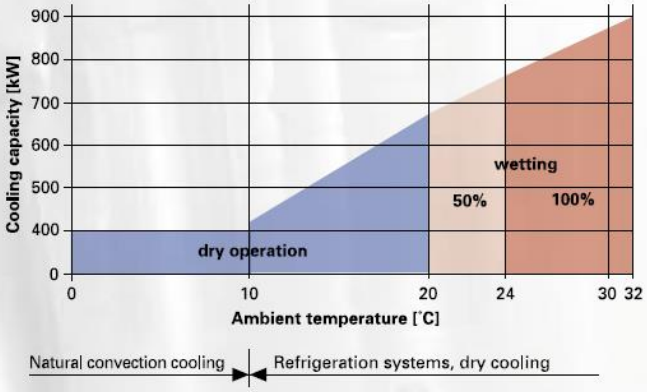
Annual operating costs (water, power and capital costs)

Calculation example at 4 €/m³ water price

	€	System ① Open evaporative cooling tower	System ② Closed loop evaporative cooler	System ③ Jäggi Hybridcooler
Water costs	€/year	63 080	63 080	13 584
Power costs	€/year	1 613	15 927	5 807
Capital costs	€/year	1 646	3 437	6 981
Annual operating costs	€/year	**66 339 (251%)**	**82 444 (312%)**	**26 372 (100%)**



Operating characteristics of a Jäggi Hybridcooler (example)



Natural convection cooling: A considerable saving in power consumption by switching off the fans for a time.

Building 245 CV Conceptual Design

GEA *Adia*-DENCO®

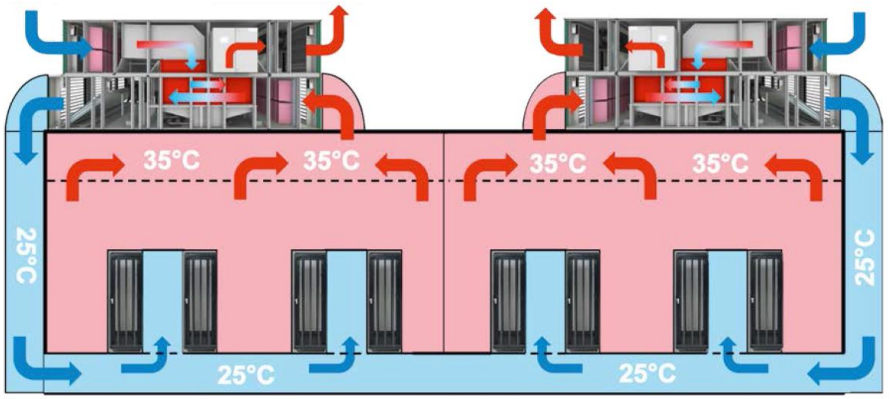
Caractéristiques techniques

DA100#C		nominale DT10 Tɛ: 35°C Ts: 25°C		nominale DT12 Tɛ: 38°C Ts: 26°C	
Puissance & Efficacité [1]					
Puissance frigorifique totale	kW	88,7	108,6	105,8	131,6
Puissance frigorifique utile	kW	84,5	101,7	101,6	124,7
Meilleure efficacité énergétique (EER)		10,3	7,9	12,3	9,6
Ratio de chaleur sensible (SHR)		1,0	1,0	1,0	1,0
Ventilateurs débit d'air extérieur					
Température ambiante	°C	35,0	35,0	35,0	35,0
Humidité ambiante	%	28,0	28,0	28,0	28,0
Débit d'air	m³/h	25.800	32.000	25.800	32.000
Nombre de ventilateurs	Pcs.	3	3	3	3
Puissance absorbée des ventilateurs ext.	kW	3,5	5,9	3,5	5,9
Ventilateurs débit d'air intérieur (Salle IT)					
Débit d'air	m³/h	25.800	32.000	25.800	32.000
Nombre de ventilateurs	Pcs.	3	3	3	3
Puissance absorbée ventilateur int.	kW	4,2	6,9	4,2	6,9
Adiabatique					
Quantité d'eau en circulation	kg/h	664	664	664	664
Quantité en eau évaporée	kg/h	195	195	260	260
Pression nominale	Bar	10,0	10,0	10,0	10,0
Puissance absorbée pompe	kW	0,88	0,88	0,88	0,88
Données acoustiques					
Puissance sonore "caisson"	dB (A)	60	64	60	64
Puissance sonore "entrée d'air"	dB (A)	77	80	77	80
Puissance sonore "sortie d'air"	dB (A)	83	86	83	86
Caractéristiques électriques [2]					
Puissance absorbée totale	kW	8,6	13,7	8,6	13,7
Alimentation électrique	V/Ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50
Eau glacée [3]					
Puissance frigorifique totale	kW	138,6	158,1	138,6	158,1
Puissance frigorifique sensible	kW	124,9	143,7	124,9	143,7
Débit d'eau	m³/h	21,2	24,3	21,2	24,3
Perte de charge échangeur de chaleur	kPa	58,4	74,1	58,4	74,1
Poids & Dimensions [4]					
Hauteur	mm	2.880	2.880	2.880	2.880
Profondeur	mm	2.640	2.640	2.640	2.640
Longueur	mm	6.480	6.480	6.480	6.480
Longueur (avec unité de refroidissement intégrée)	mm	6.920	6.920	6.920	6.920
Poids	kg	4.430	4.430	4.430	4.430
Poids (avec unité de refroidissement intégrée)	kg	4.850	4.851	4.852	4.853

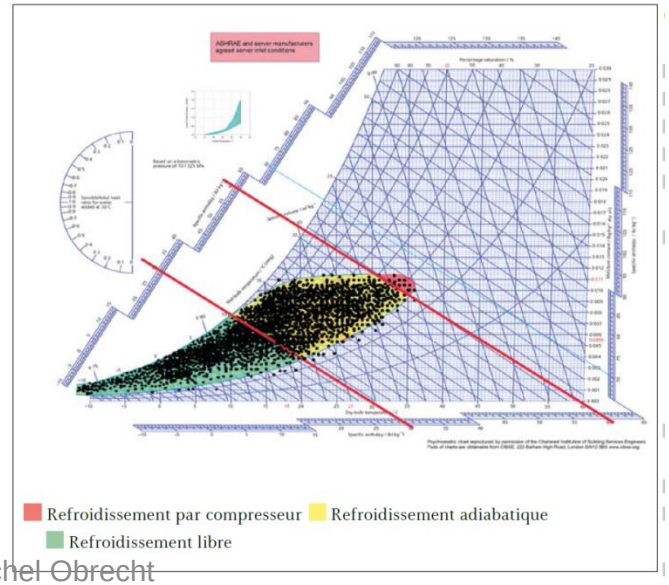
Sous réserve de modifications techniques résultant d'un perfectionnement du produit

[1] Air extrait salle IT 35°C (38°C); Air neuf salle IT 25°C; Environnement: Température bulbe sec 35°C / bulbe humide 21°C

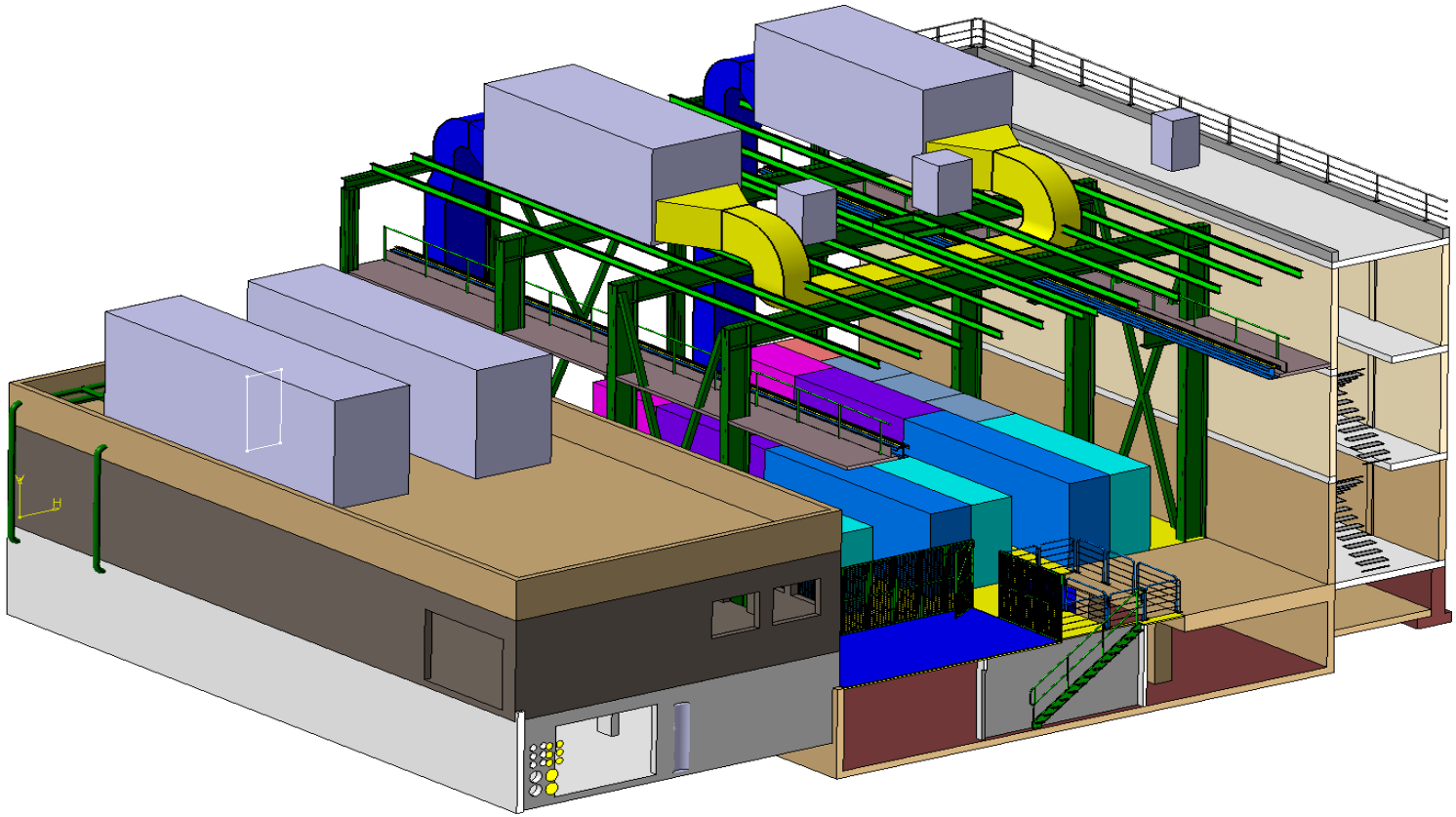
[2] Filtres propres / sans raccord gaine [3] Eau 10 / 16°C / 0% glycol [4] Sans annexe (toiture / armoire de régulation)



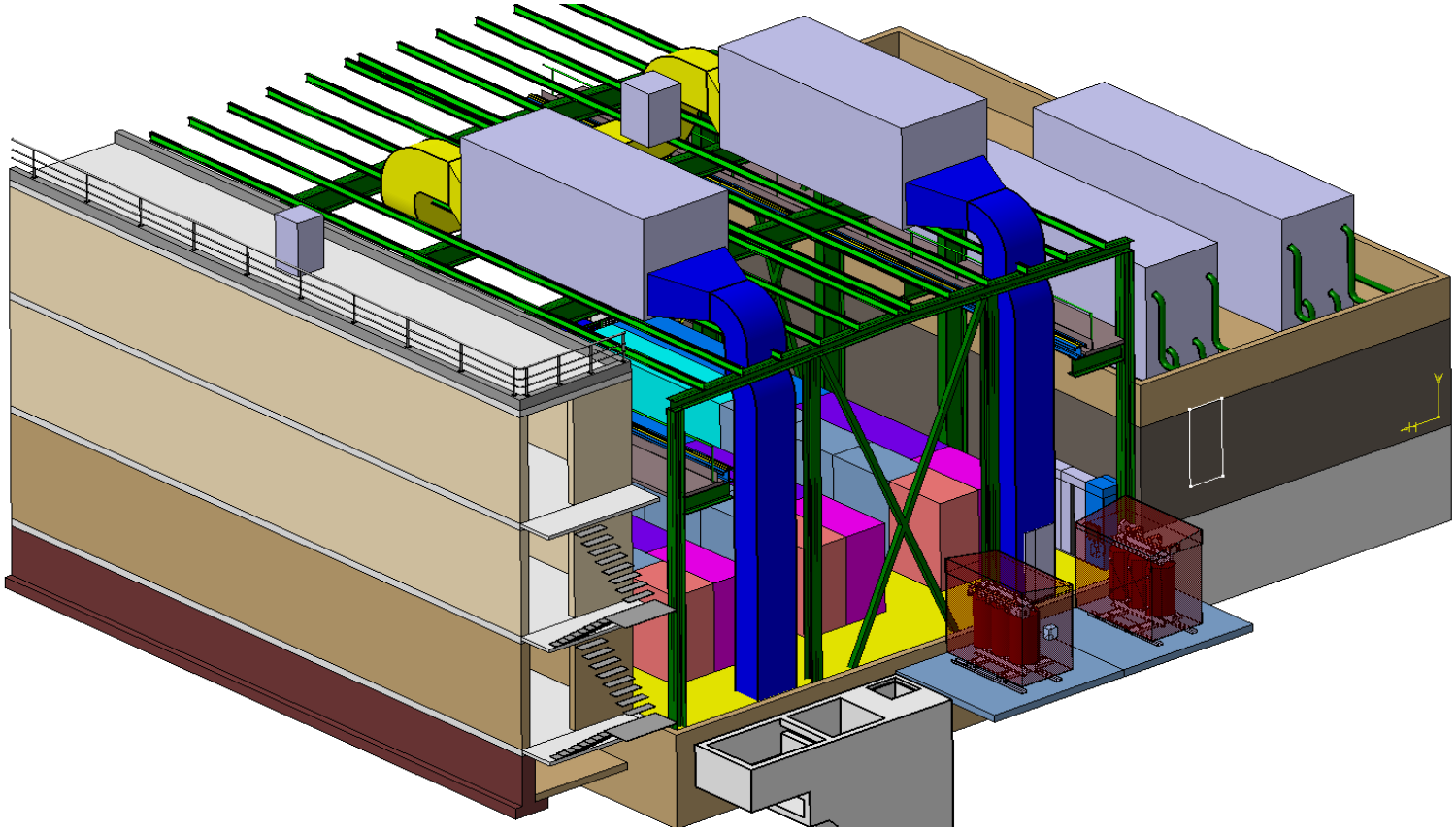
Concept du système *Adia*-DENCO®



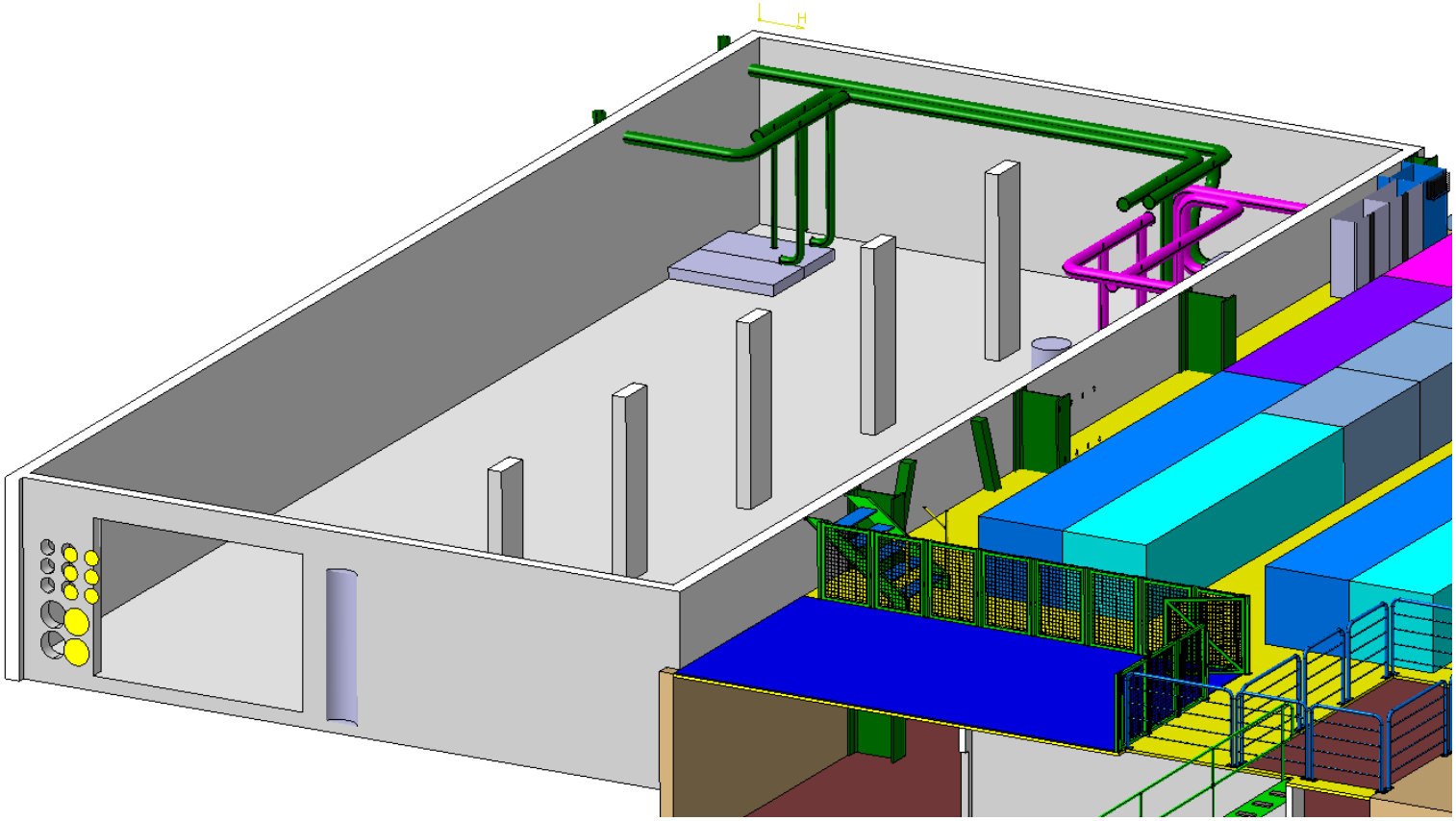
CV Integration



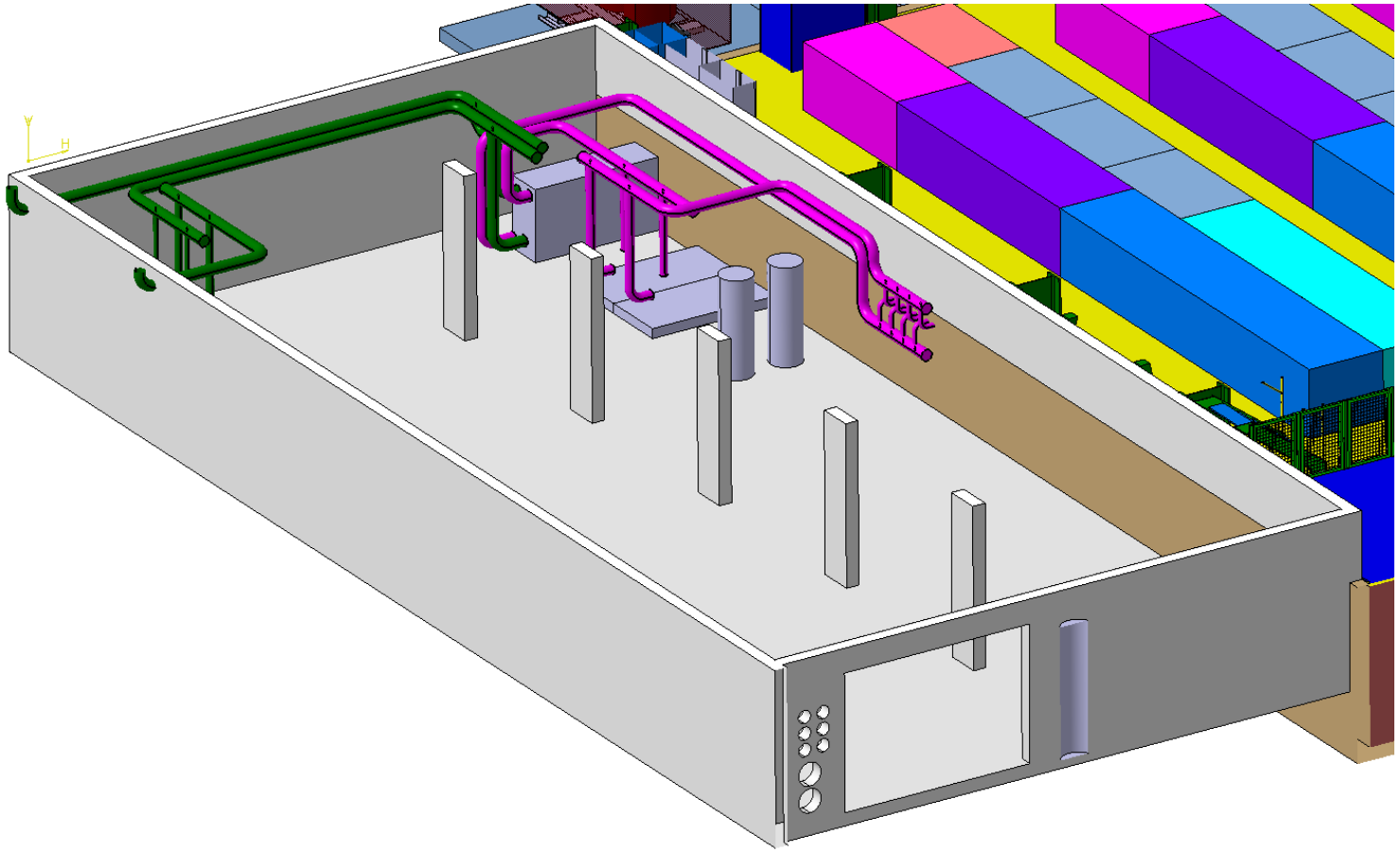
CV Integration



CV Integration



CV Integration



B245 Integration Milestones

- Update of the Electrical Power Consumption: 17th March 2014
- Final Decision on Dummy Load by TE/EPC: 17th March 2014
- Decision on number of galleries between b271 and b245: 24th March 2014
- Update of the Electrical Network schematic: 28th March 2014
- Integration of major CV 3D components in the b245 model: 28th March 2014
- Update of integration of EN/EL cabinets: 28th March 2014
- Final Modification of b245 structure: 11th April 2014
- Integration of pipes, cables ladders and others: 25th April 2014

B245 Integration Milestones

- Update of the Electrical Power Consumption: 17th March 2014

USER	POWER [kW]	COMMENT	REFERECENCE
EN/CV	135	Water cooling and towers b.245	M.Obrecht 08/03/2013
TE/EPC	392	Auxiliaries	F.Boattini 22/11/2013 QTR power converters + all Converters and capacitor rooms aux
TE/EPC	6750	N.3 transformer 2.7 MVA (2@100%, 1@50%)	F.Boattini 22/11/2013
EN/EL	70	Lights, sockets, OH crane - b.245	F.Boattini 22/11/2013
EN/CV	153	HVAC b.245	M.Obrecht 08/03/2013
TE/EPC	15	Auxiliaries which need UPS	F.Boattini 22/11/2013
EN/CV	8	Smoke extraction	M.Obrecht 08/03/2013
EN/EL	25	Emergency light, fire detection	F.Boattini 22/11/2013

P. Converters power: 6750kW
Auxiliaries EPC: 392kW+15kW UPS
Auxiliaries CV: 288kW
B245:103kW

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B245 Integration Milestones

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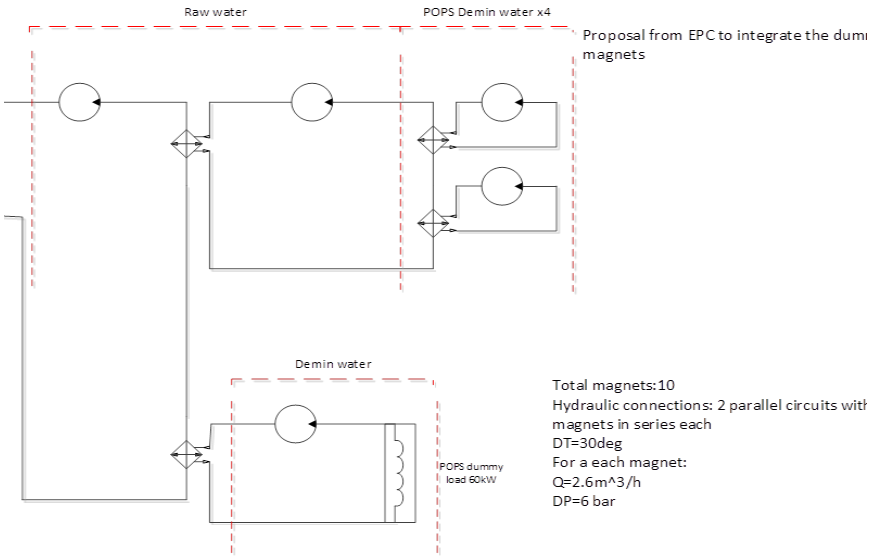
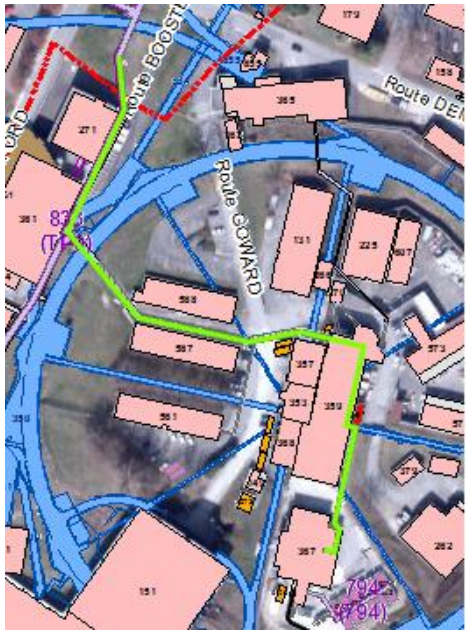
Approved by Serge Deleval





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B245 Integration Milestones

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  1366598_V1_Booster_2GeV_cabling **docx** (2 Mb) **pdf** (923 Kb)

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B245 Integration Milestones

DGS-SEE would like to have an UPS for smoke extraction.
EN-EL replies it is not justified and not “CERN standard”.

- Update of the Electrical Network schematic: 28th March 2014

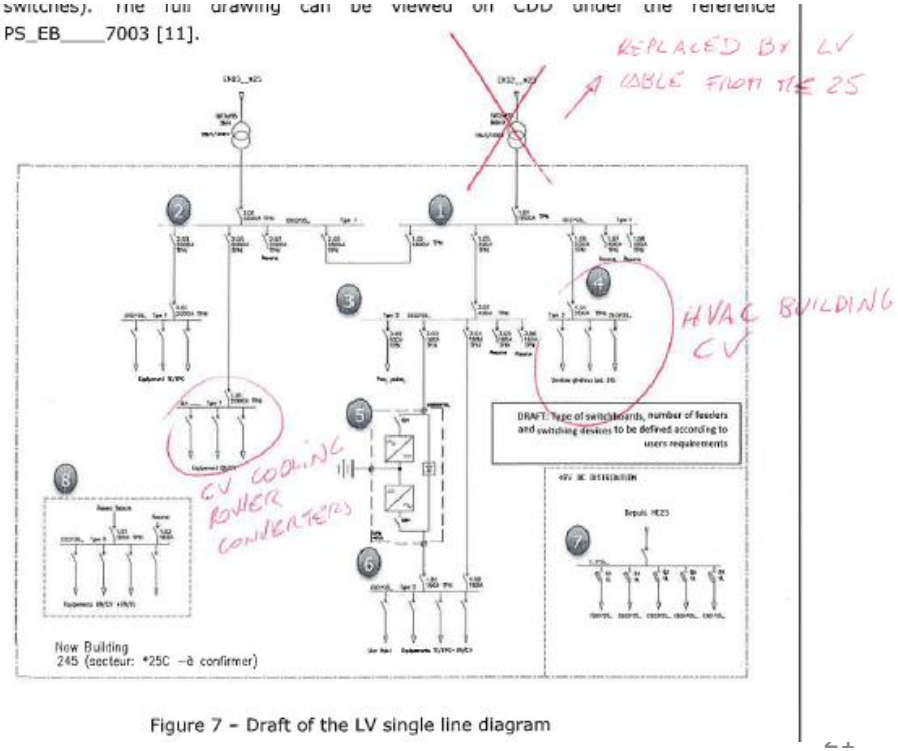

Figure 7 – Draft of the LV single line diagram

B245 Integration Milestones

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WU baselines

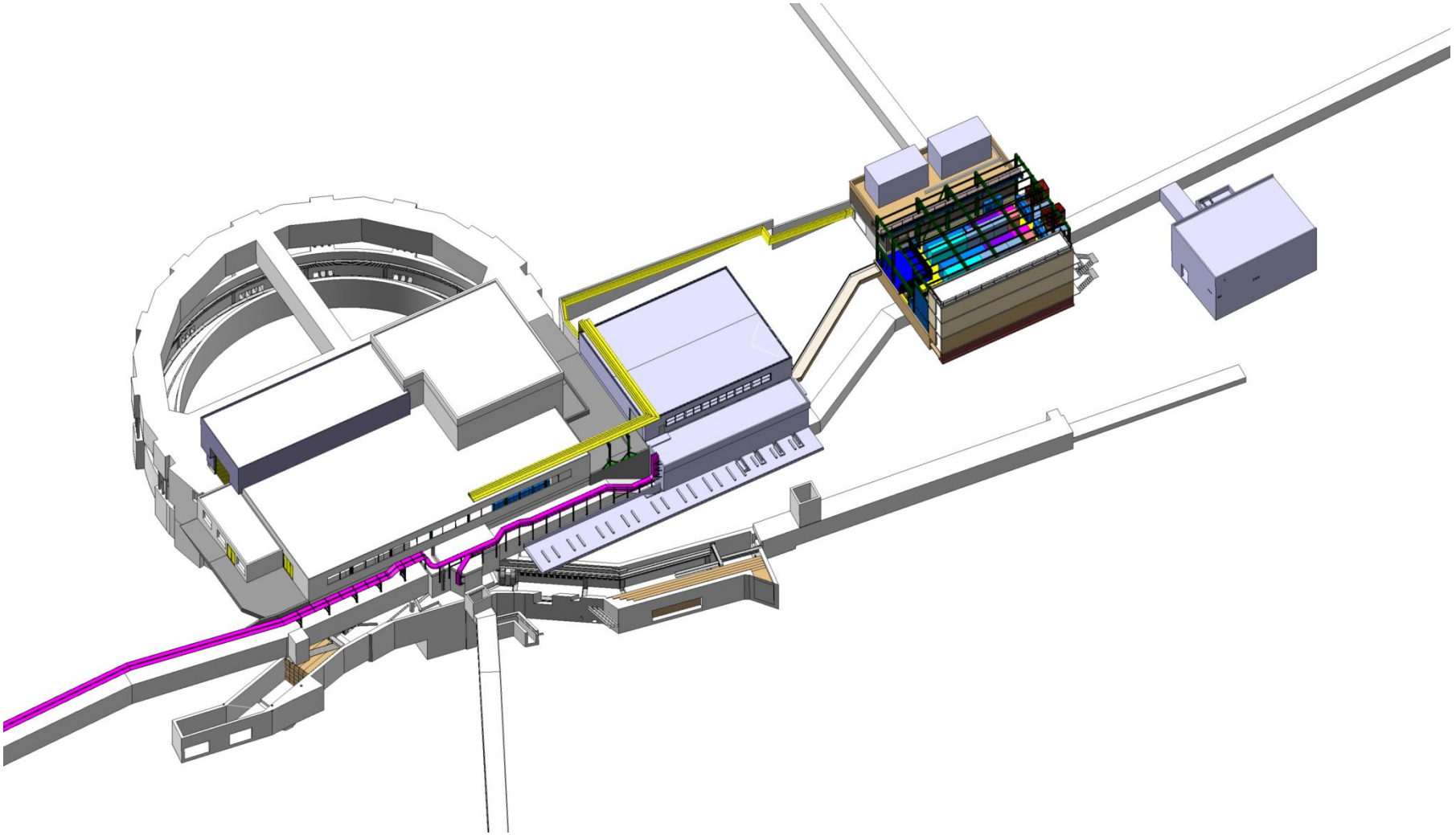
Excel file

Bulding 245 schedule update

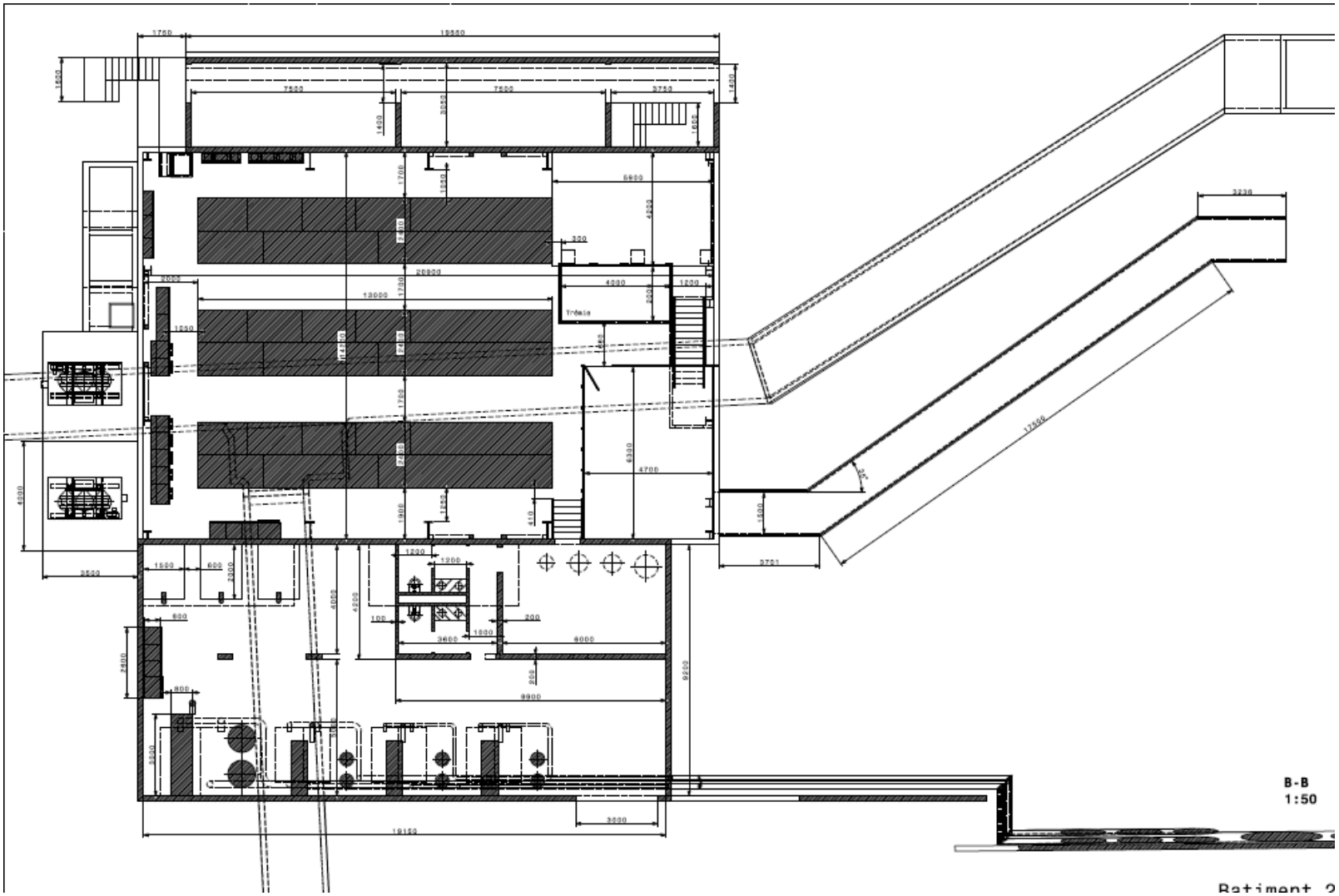
THANKS FOR THE ATTENTION

QUESTIONS?

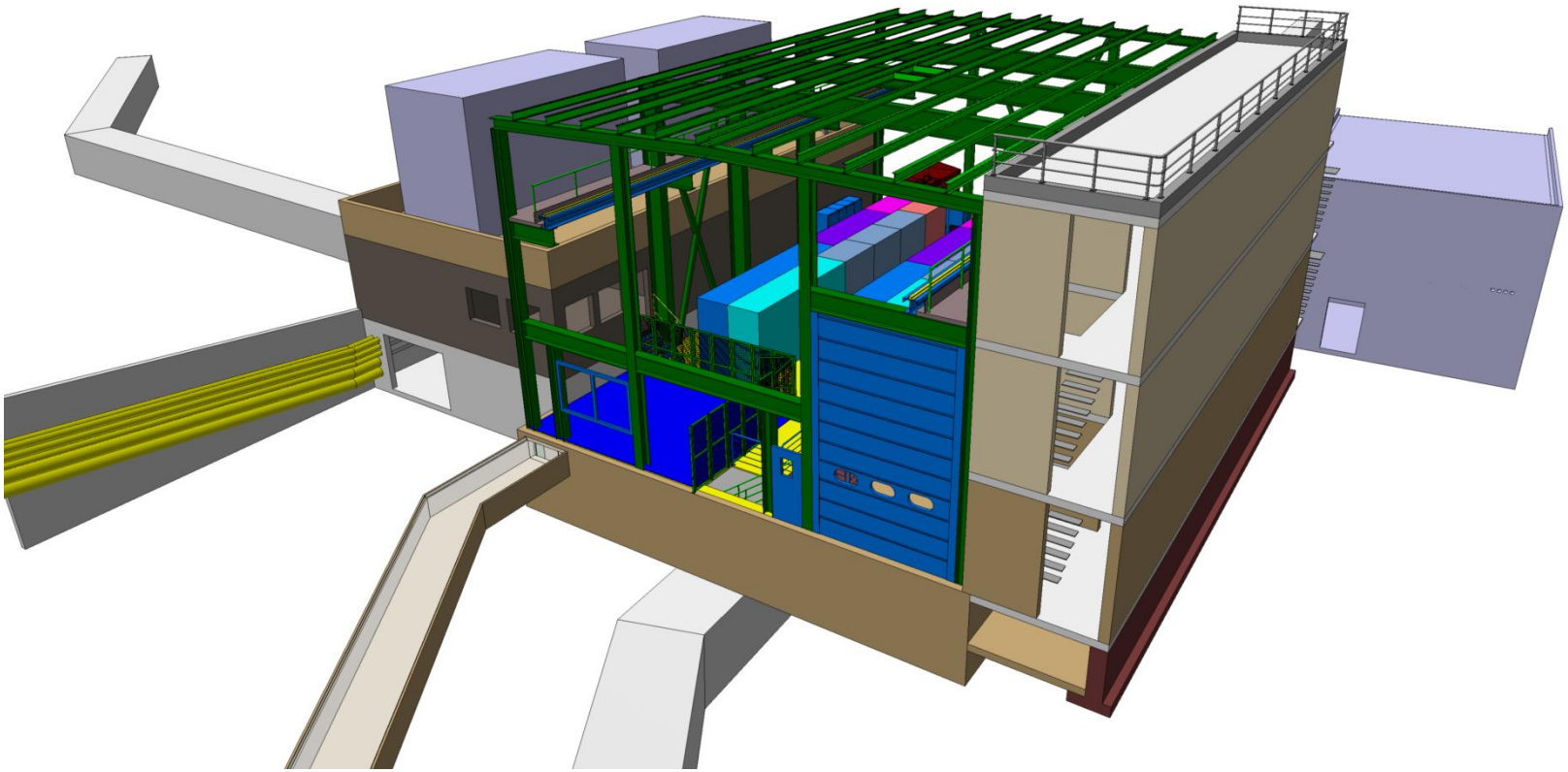
Building 245 layout



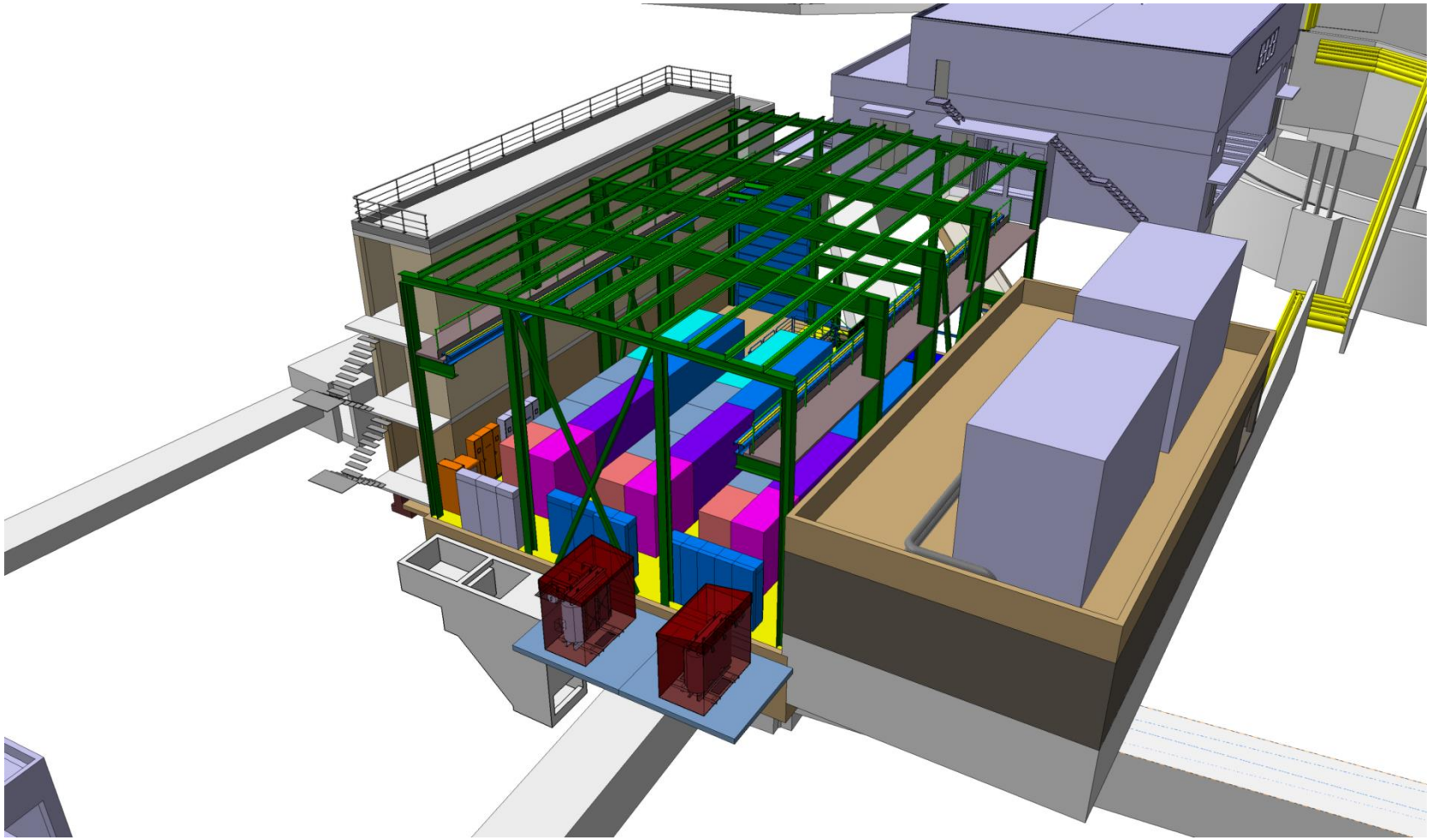
Building 245 layout



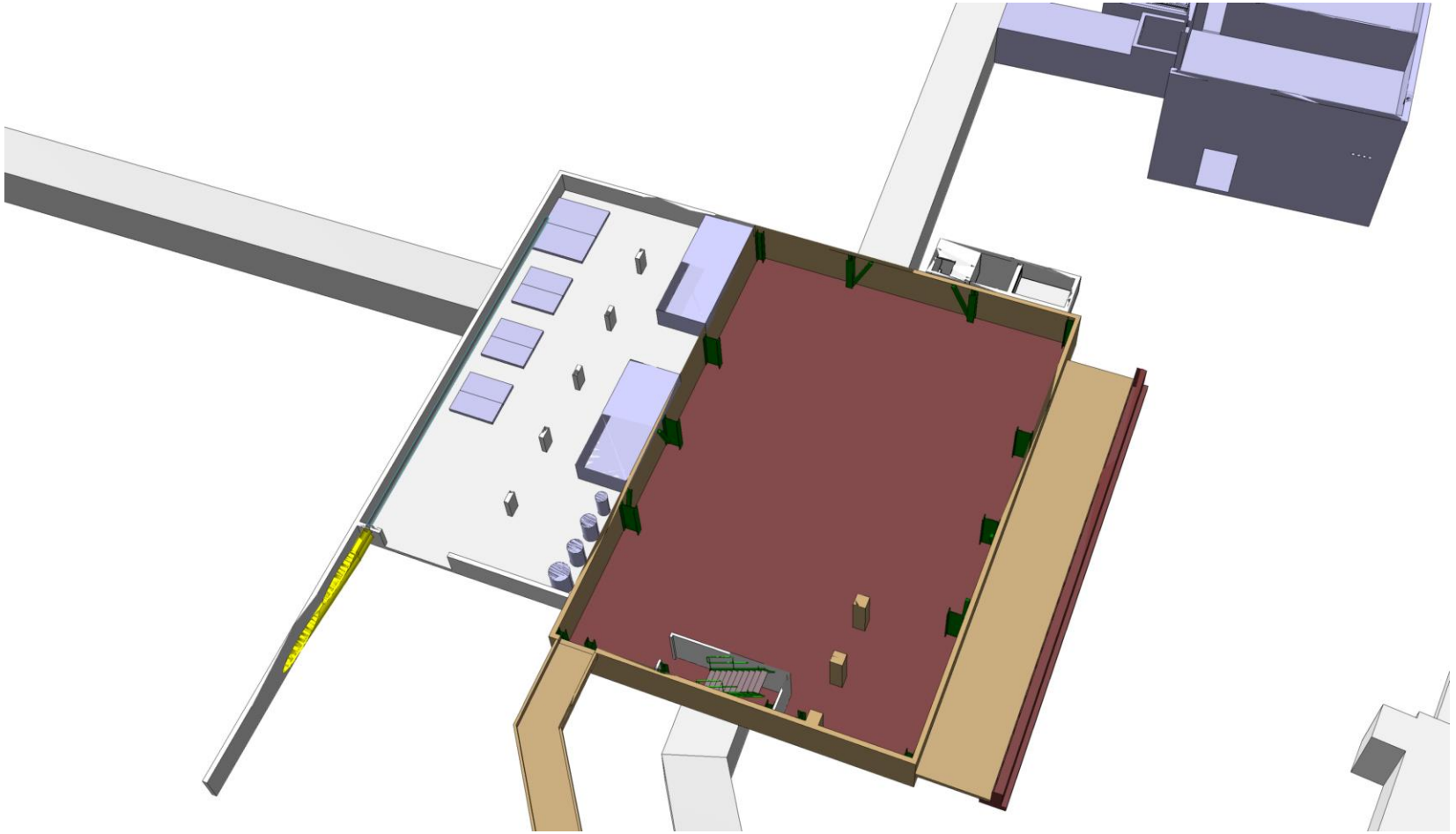
Building 245 layout (b271 side)



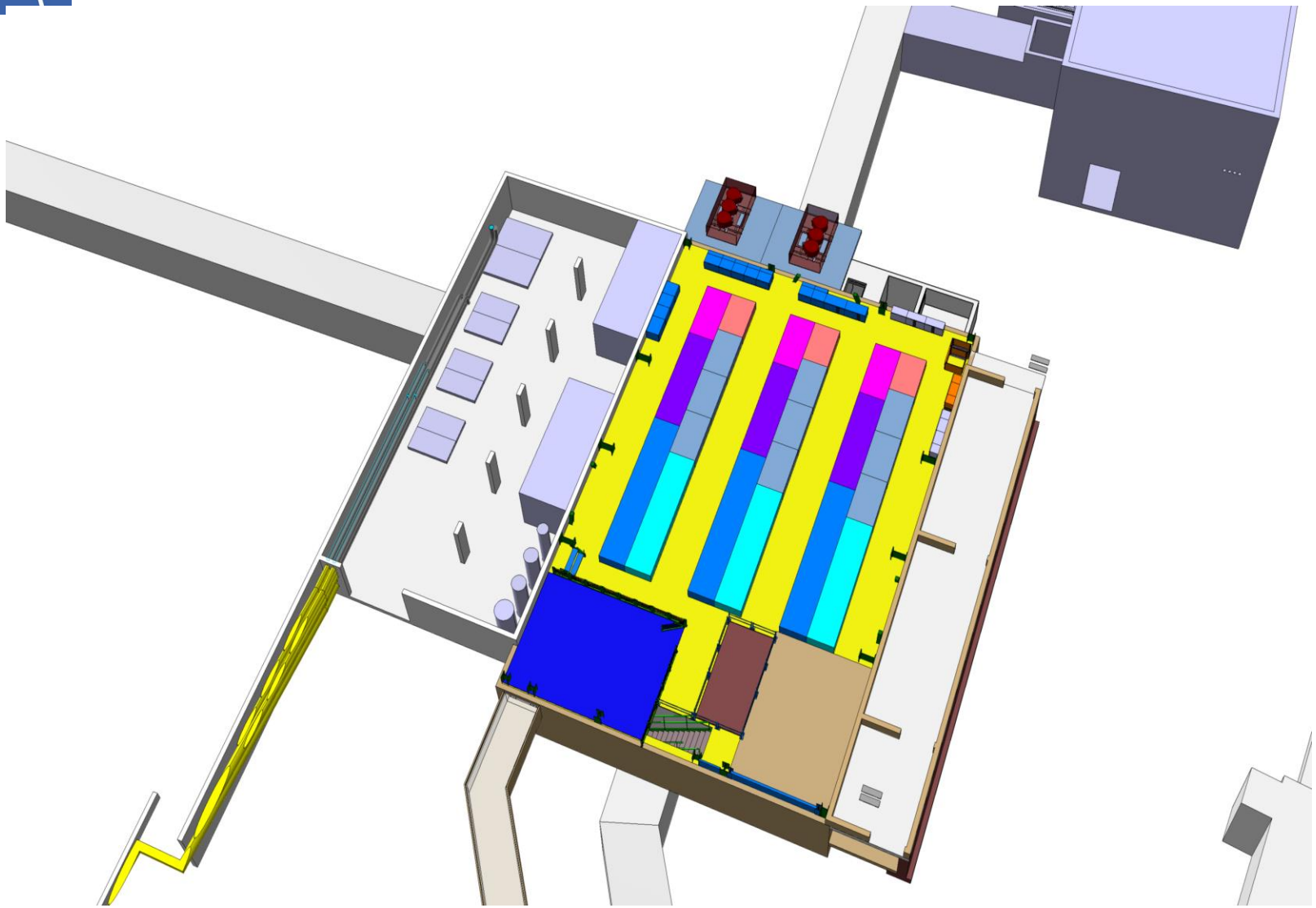
Building 245 layout (Isolde side)



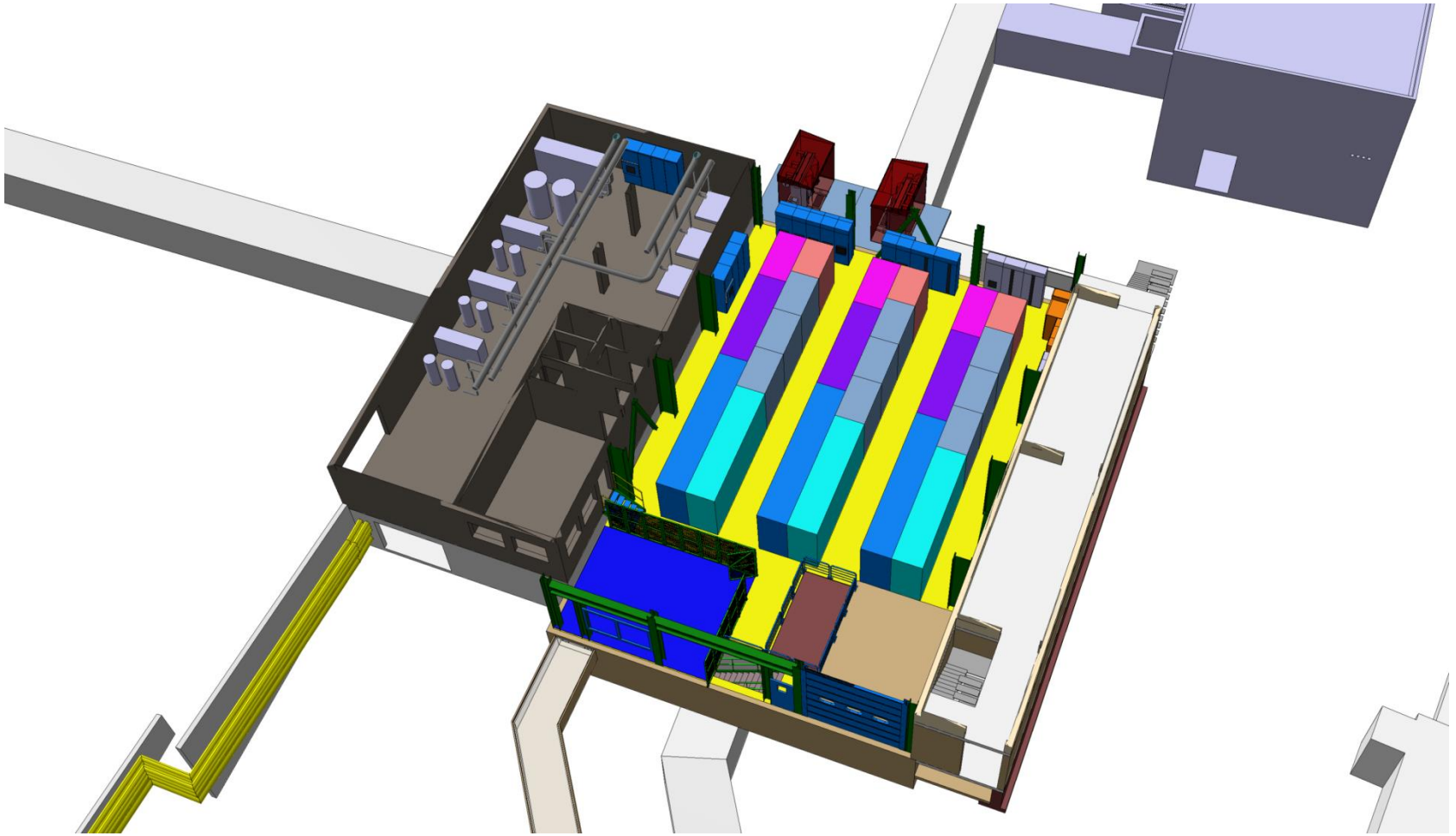
Building 245 layout



Building 245 layout



Building 245 layout



Building 245 layout