Eduneers
Company
Round 3
Gradution Project

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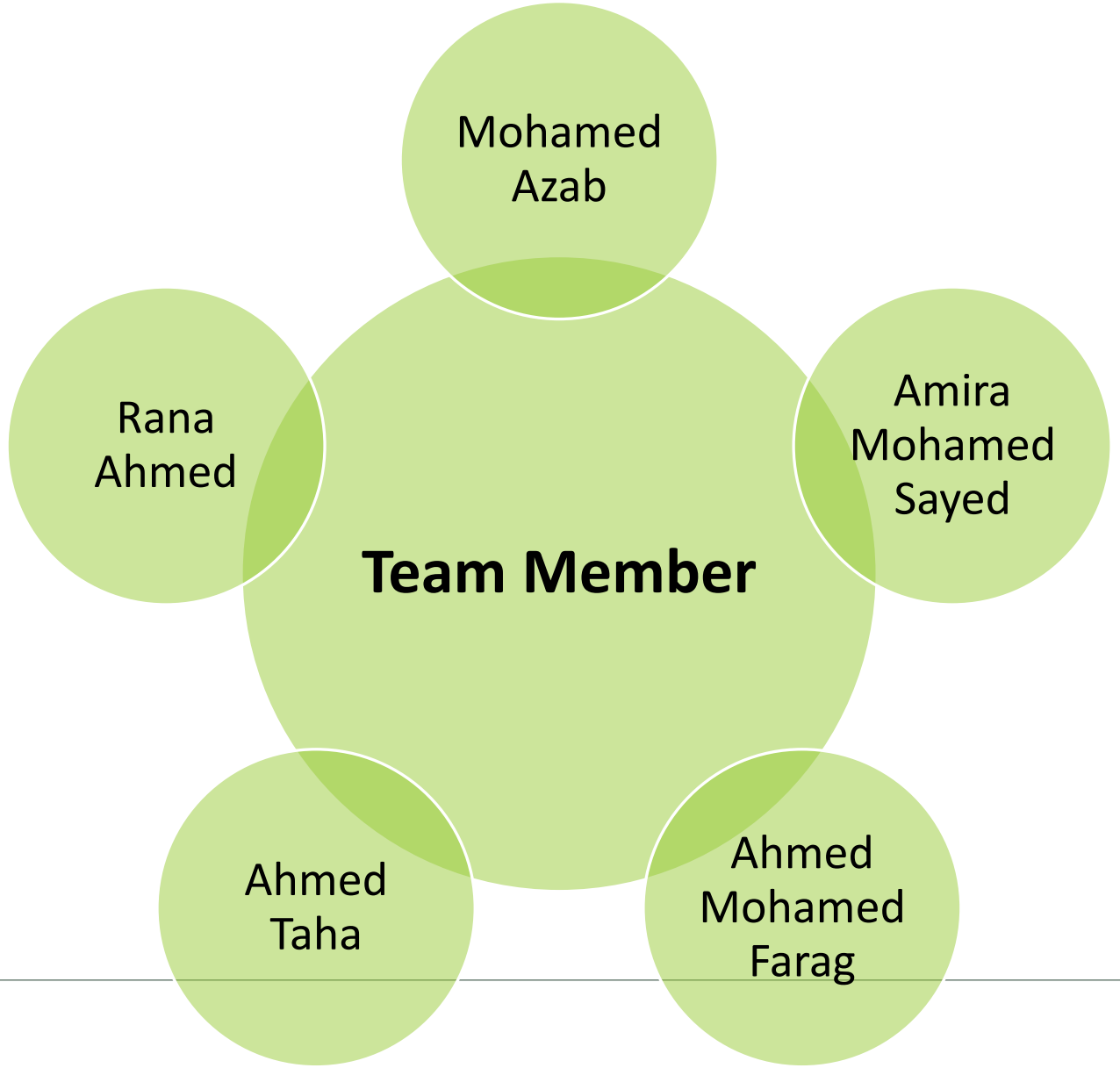
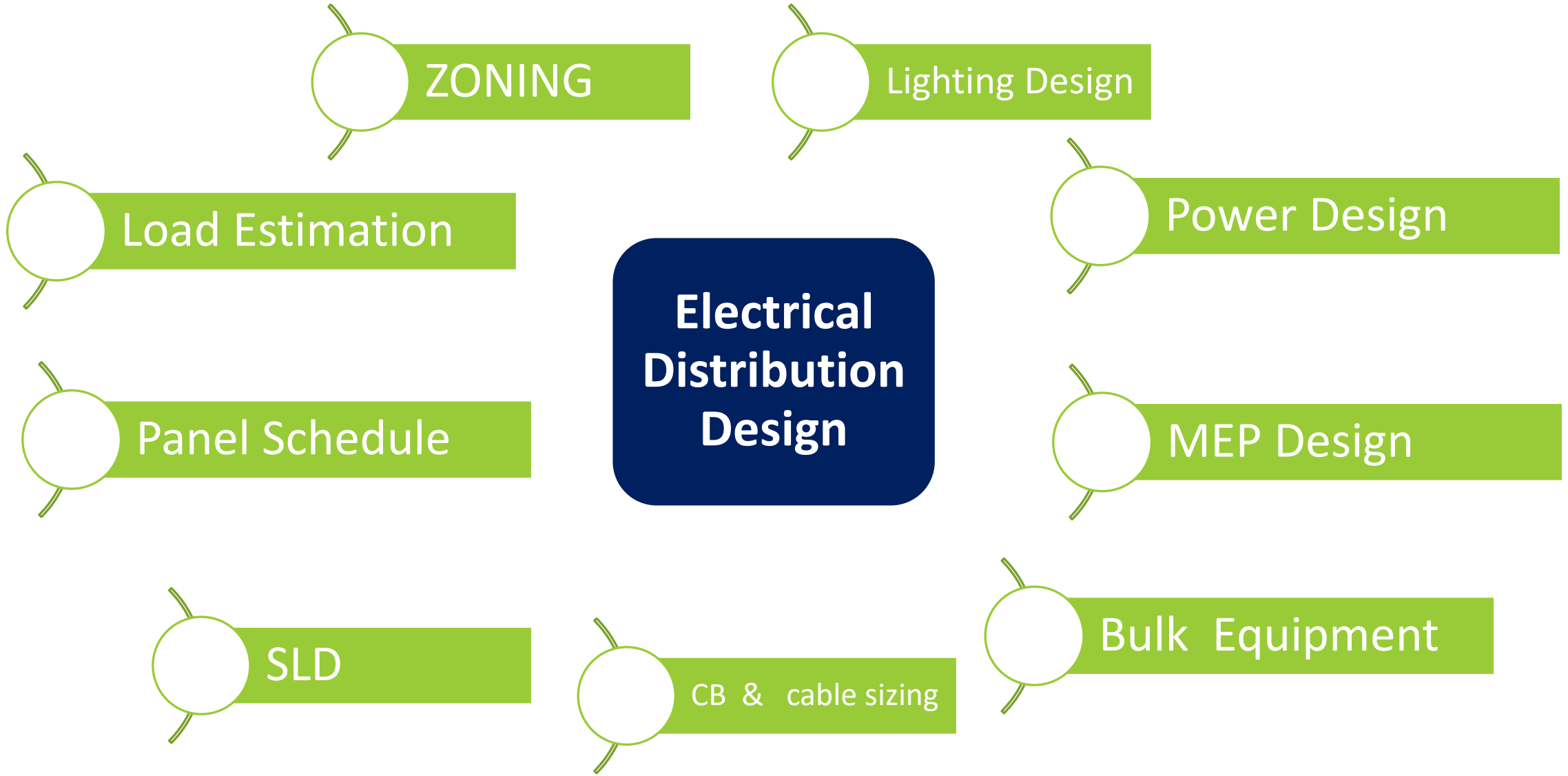
Electrical Distribution Project for Administrative Building 2023


Mohamed Azab
Rana Ahmed
Amira Mohamed Sayed
Team Member
Ahmed Taha
Ahmed Mohamed Farag


ZONING
Lighting Design
Load Estimation
Power Design
Electrical Distribution Design
Panel Schedule
MEP Design
SLD
CB & cable sizing
Bulk Equipment

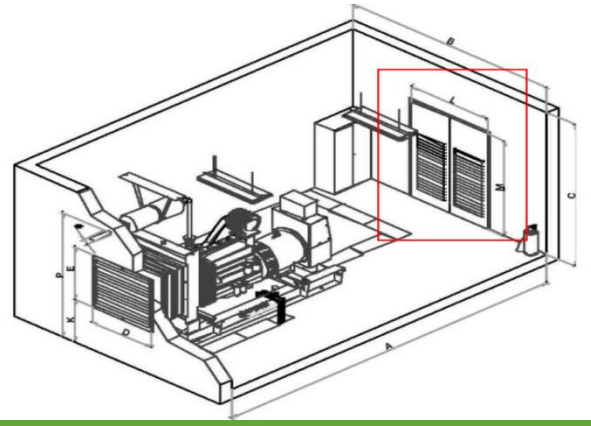
Load Estimation

What is?

Dealing

Why?

How?



Space program

Load Estimation

Codes and standards used

- Egyptian code
- NEC standard
- IEEE standard

Load Estimation

NEC & IEEE standards

The power required :

- For Lighting 39 VA/m2
- For Power 22 VA/m2
- Total kVA = 2000*(39+22)= 122 kVA

Table 220.12 General Lighting Loads by Occupancy

Type of Occupancy	Unit Load: Volt-Amperes per Square Meter	Unit Load: Volt-Amperes per Square Foot
Armories and auditoriums	11	1
Banks	39[b]	3½[b]
Barber shops and beauty parlors	33	3
Churches	11	1
Clubs	22	2
Court rooms	22	2
Dwelling units[a]	33	3
Garages — commercial (storage)	6	½
Hospitals	22	2
Hotels and motels, including apartment houses without provision for cooking by tenants[a]	22	2
Industrial commercial (loft) buildings	22	2
Lodge rooms	17	1½
Office buildings	39[b]	3½[b]
Restaurants	22	2
Schools	33	3
Stores	33	3
Warehouses (storage)	3	¼
In any of the preceding occupancies except one-family dwellings and individual dwelling units of two-family and multifamily dwellings:		
Assembly halls and auditoriums	11	1
Halls, corridors, closets, stairways	6	½
Storage spaces	3	¼

[a]See 220.14(J).
[b]See 220.14(K).

Table 5—Typical Appliance/General-Purpose Receptacle Loads (Excluding Plug-in-Type A/C and Heating Equipment)

Type of Occupancy	Unit Load (VA/ft²) Low	High	Average
Auditoriums	0.1	0.3	0.2
Cafeterias	0.1	0.3	0.2
Churches	0.1	0.3	0.2
Drafting rooms	0.4	1.0	0.7
Gymnasiums	0.1	0.2	0.15
Hospitals	0.5	1.5	1.0
Hospitals, large	0.4	1.0	0.7
Machine shops	0.5	2.5	1.5
Office buildings	0.5	1.5	1.0
Schools, large	0.2	1.0	0.6
Schools, medium	0.25	1.2	0.7
Schools, small	0.3	1.5	0.9
Other Unit Loads:			
Specific appliances — ampere rating of appliance			
Supplying heavy-duty lampholders — 5 A/outlet			

Load Estimation

The power required :

- Total kVA =lighting +power +Air condition

  +elevator +pump = 261 KVA

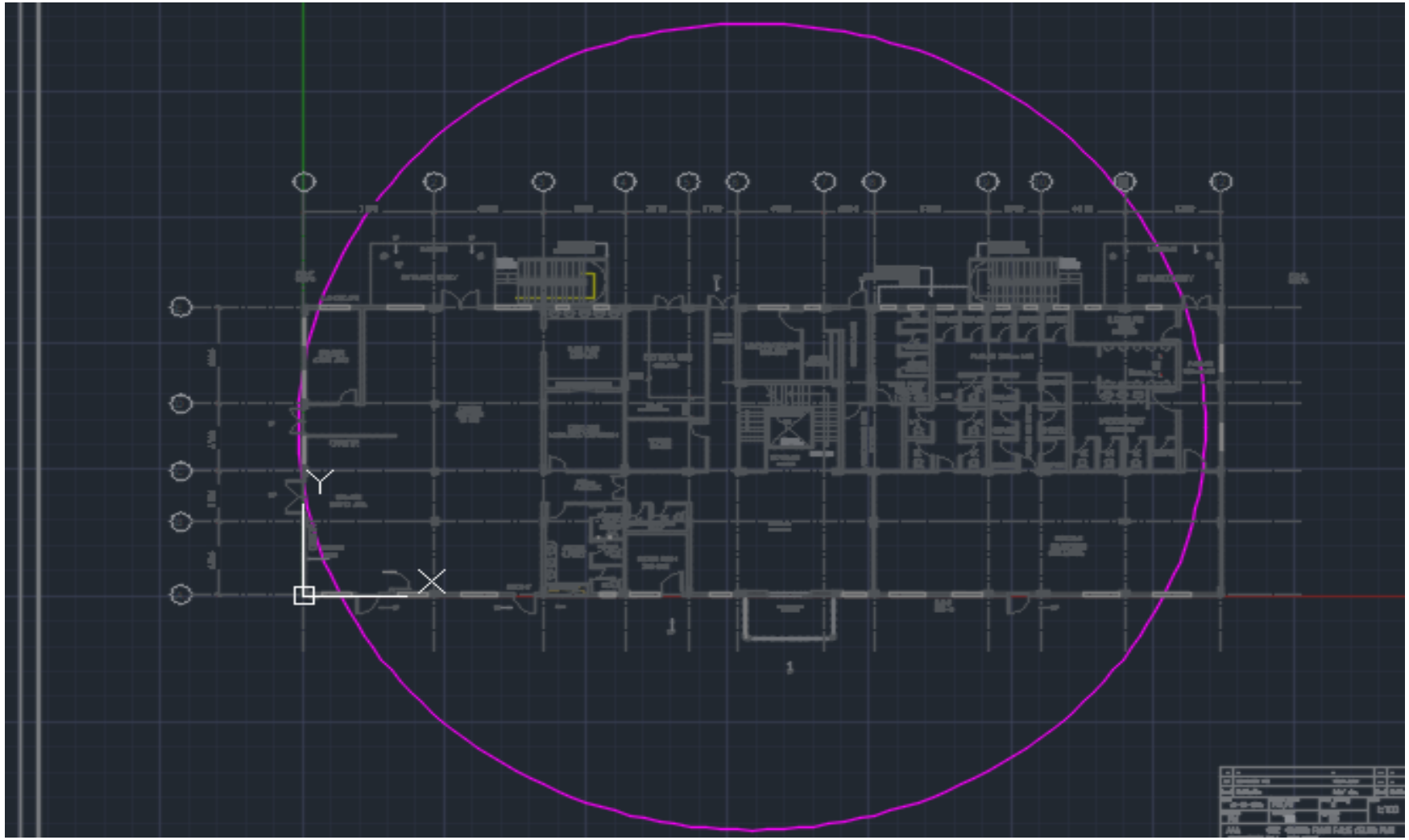
NEC,IEEE							
area (m2)	light/ power	P.PUMP	تكييف	اسانسير	total kVA	EGY. CODE	
2000	122	5	125	9	261	AIR CONDITION	125

Zoning

Rated current of circuit-breakers (in A)	c.s.a. (nominal cross-sectional-area) of conductors (in mm2) 1.5	2.5	4	6	10	16	25	35	50
6	100	167	267	400	667				
10	60	100	160	240	400	640			
16	37	62	100	150	250	400	625	875	
20	30	50	80	120	200	320	500	700	
25	24	40	64	96	160	256	400	560	760
32	18.0	31	50	75	125	200	313	438	594
40	15.0	25	40	60	100	160	250	350	475
50	12.0	20	32	48	80	128	200	280	380
63	9.5	16.0	26	38	64	102	159	222	302
80	7.5	12.5	20	30	50	80	125	175	238
100	6.0	10.0	16.0	24	40	64	100	140	190
125	5.0	8.0	13.0	19.0	32	51	80	112	152

Fig. G49 : Maximum length of copper-conductor circuits in metres protected by C-type circuit-breakers

Zoning



Indoor Lighting Design

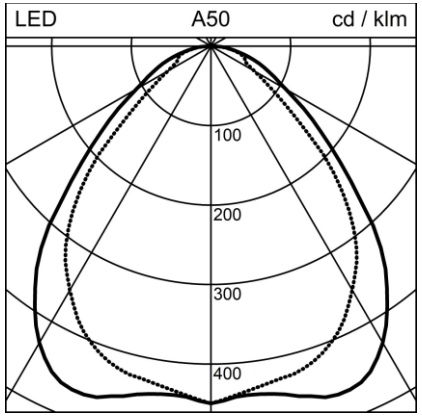
LIGHTING DESIGN

Luminaire Selection

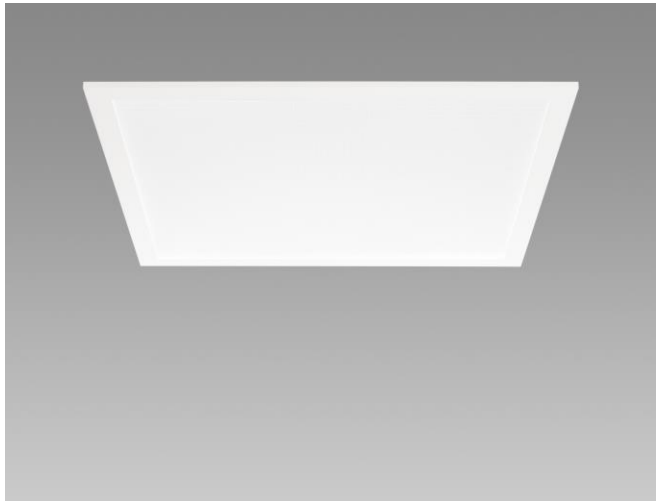
- Determine the type of ceiling.
- Determine the suitable IP
- Determine the suitable IK.
- Determine the suitable color temperature.
- Determine the suitable color rendering index.
- It should be suitable for space use.

The selected luminaires :

System power	33 W
Light control	ON/OFF
Colour temperature	4000 K neutral white
Colour / Finish	white
Luminous flux of luminaire	3800 lm
Weight	3.135 kg
Colour consistency SDCM	SDCM 3
Unified Glare Rating (UGR) C0	19
Colour Rendering Index (CRI)	CRI > 80
Unified Glare Rating (UGR) C90	19
Maintained luminous flux	L80 50'000 h

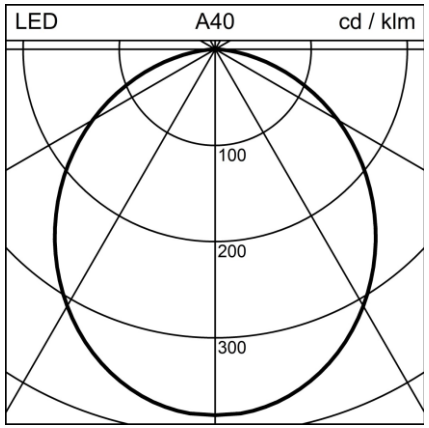


TYPE 1



The selected luminaires :

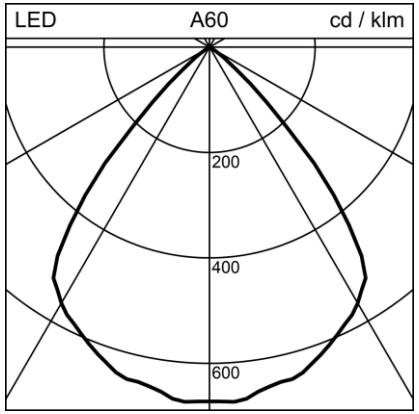
System power	8 W
Light control	ON/OFF
Colour temperature	4000 K neutral white
Colour / Finish	white
Luminous flux of luminaire	1070 lm
Unified Glare Rating (UGR) C0	27
Colour consistency SDCM	SDCM 3
Unified Glare Rating (UGR) C90	27
Colour Rendering Index (CRI)	CRI > 80



TYPE 2

The selected luminaires :

System power	14 W
Maintained luminous flux	L80 50'000 h
ILCOS (ZVEI)	neutral white
Light control	DALI
Colour temperature	4000 K neutral white
Colour / Finish	white
Luminous flux of luminaire	1450 lm
Unified Glare Rating (UGR) C0	21
Colour consistency SDCM	SDCM 3
Unified Glare Rating (UGR) C90	21
Colour Rendering Index (CRI)	CRI > 90



TYPE 3

The selected luminaires :

TYPE 4

Export to File

Currently Selected Luminaire

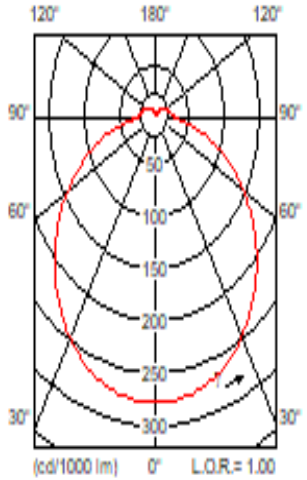
Product

CoreLine Wall-mounted – For every project where light really matters CoreLine Wall-mounted delivers on the CoreLine promise of innovative, easy-to-install and high quality luminaires. It is a circular-shaped surface mounted luminaire for both ceiling and wall installations. It is easy to apply in circulation areas such as hallways and staircases. The modern unobtrusive design, in combination with its homogeneous light distribution, ensures that this luminaire blends into most building architectures. With the push-in connectors, installation is fast and straightforward. This family includes InterAct Ready luminaires with integrated wireless communications, ready for use with InterAct gateways, sensors and software

Reference Name

WL131V PSED 1 xLED12S/840 D350

Technical Specification



Light Source Flux	1200 lm
Light Output Ratio:	1.00
Luminous Flux:	1200 lm
Power:	13.0 W
HxD:	0.10x0.48 m

Driver

NO

Color

840

LUX LEVEL

Codes

300	قراءة	المبانى السكنية
120	غرفة طعام	
120	غرفة نوم	
	مطبخ :	
120	عام	
500	أسطح العمل	
300	حمام	
	حجرة مكتب :	
300	- عام	
500	- سطح المكتب	
120	إستقبال، قاعات إستراحة	المكاتب
300	صالات إجتماعات	
300	حجرة تصوير وطباعة	
500	حجرة الرسم التخطيطى	
1000	حجرة الرسم المعمارى الهندسى	
	أرفف الكتب :	المكتبات
300	المستخدمة	
60	الغير مستخدمة	
	أعمال الفهرسة :	
1000	حجرات الخرائط	
300	حجرات التصوير	
	القراءة :	
300	قراءة مكتبية	
300	شاشات العرض المرئى	
60	قراءة الميكروفيش	

الكود المصري

				changes.
Stairs, escalators, travelators	150	25	40	
Loading ramps/bays	150	25	40	
Canteens	200	22	80	
Rest rooms	100	22	80	
Rooms for physical exercise	300	22	80	
Cloakrooms, washrooms, bathrooms, toilets	200	25	80	
Sick bay	500	19	80	
Rooms for medical attention	500	16	90	T_{cp} at least 4000 K
Plant rooms, switch gear rooms	200	25	60	

ISO 8995:2002(E)
CIE S 008/E-2001

Type of interior, task or activity	$\overline{E_m}$ lux	UGR_L	R_a	Remarks
Post room, switchboard	500	19	80	
Store, stockrooms, cold store	100	25	60	200 lux if continuously occupied
Dispatch packing handling areas	300	25	60	
Control station	150	22	60	200 lux if continuously occupied

CIBSE Code

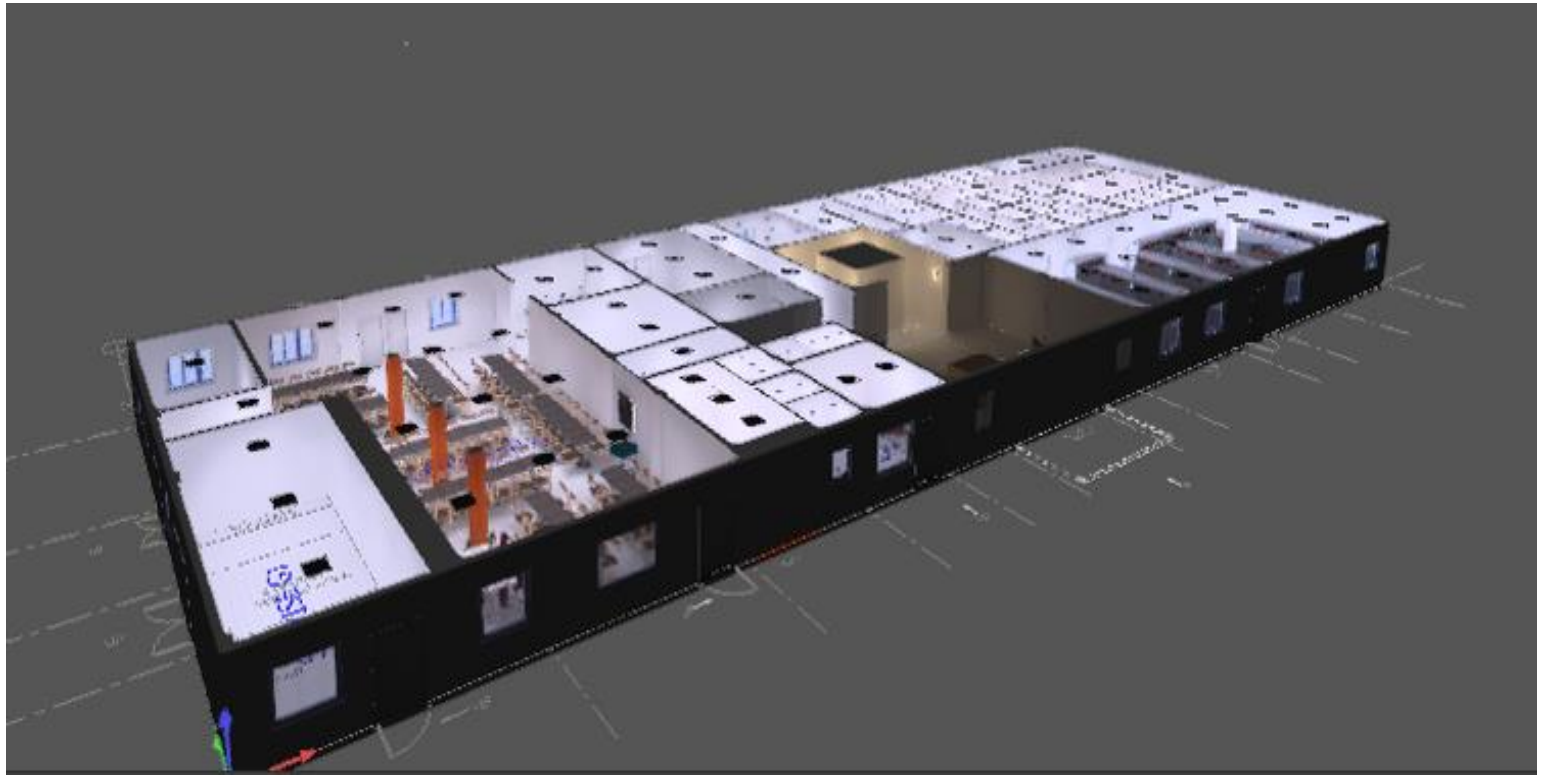
OFFICES		
GENERAL OFFICE WITH MAINLY CLERICAL TASK AND OCCASIONAL TYPING	500	50
DEEP PLAN GENERAL OFFICES	750	75
BUSINESS MACHINE AND TYPING OFFICES	750	75
FILING ROOMS	300	30
CONFERENCE ROOM	750	75
EXECUTIVE OFFICES	500	50
BANKING HALLS - WORKING SPACES	500	50
BANKING HALLS - PUBLIC SPACES	300	30
COMPUTER ROOMS	500	50
DRAWING OFFICES - DRAWING BOARDS	750	75
DRAWING OFFICES - REFERENCE TABLES AND GENERAL	500	50
PRINT ROOMS	300	30

المعايير التصميمية للمباني الادارية

Working plane (IT STORE)		
353 lx	0.59	
LADIED TOILET		
Working plane (LADIED TOILET)		
370 lx	0.38	
MEETING ROOM1		
Working plane (MEETING ROOM1)		
304 lx	0.48	
MEETING ROOM 2		
Working plane (MEETING ROOM 2)		
355 lx	0.54	
MEN TOILET		
Working plane (MEN TOILET)		
304 lx	0.45	
PANTRY		
Working plane (PANTRY)		
208 lx	0.48	
PRAYER ROOM		
Working plane (PRAYER ROOM)		
135 lx	0.60	

Lighting distribution using Dialux Evo program.

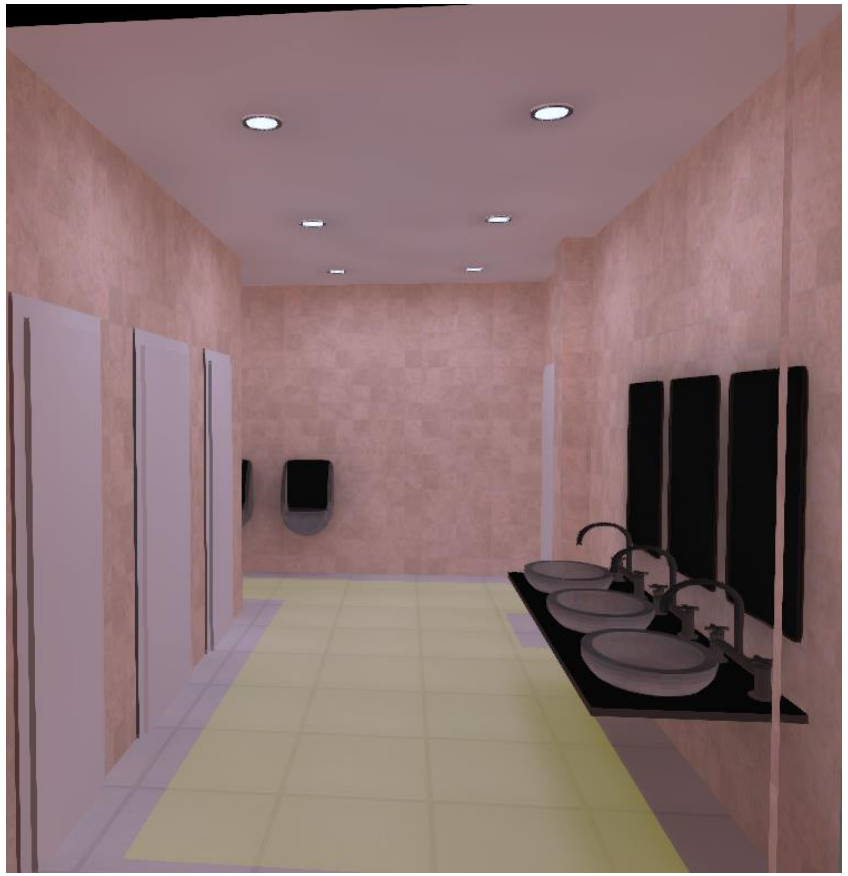
- **For first floor**



Lighting distribution using Dialux Evo program.

- **For ground floor**

Samples of Lighting distribution using Dialux Evo program.



Samples of Lighting distribution using Dialux Evo program.

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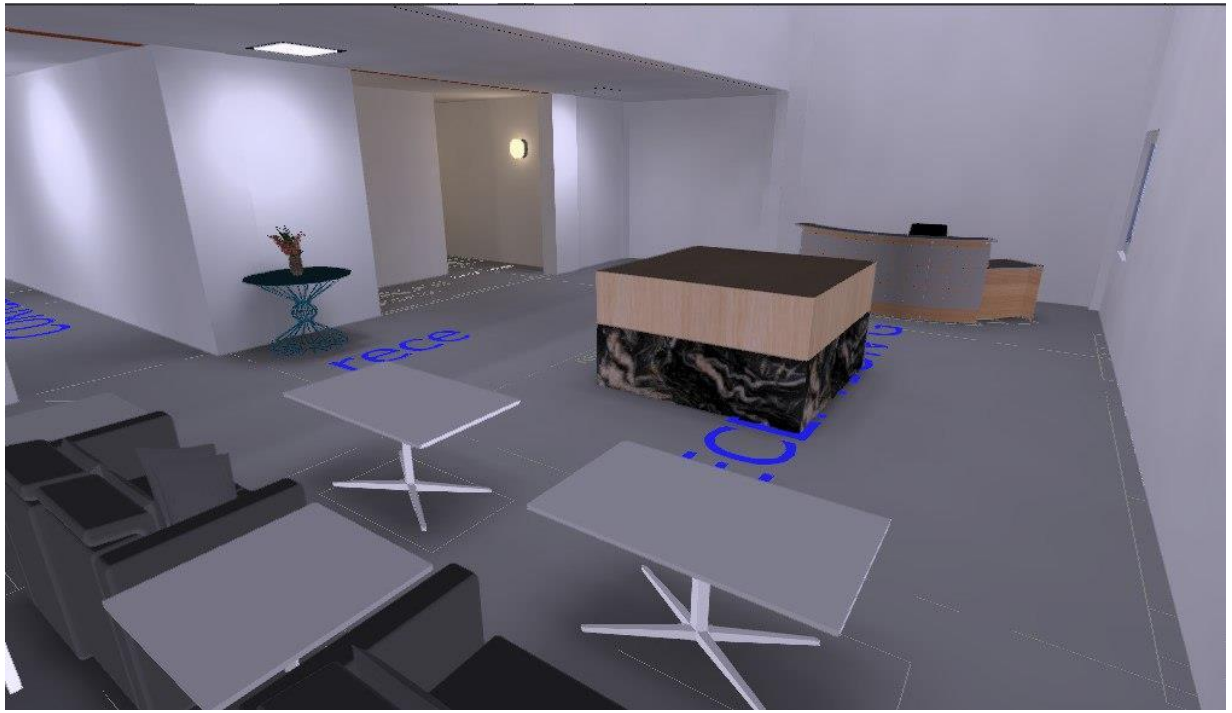
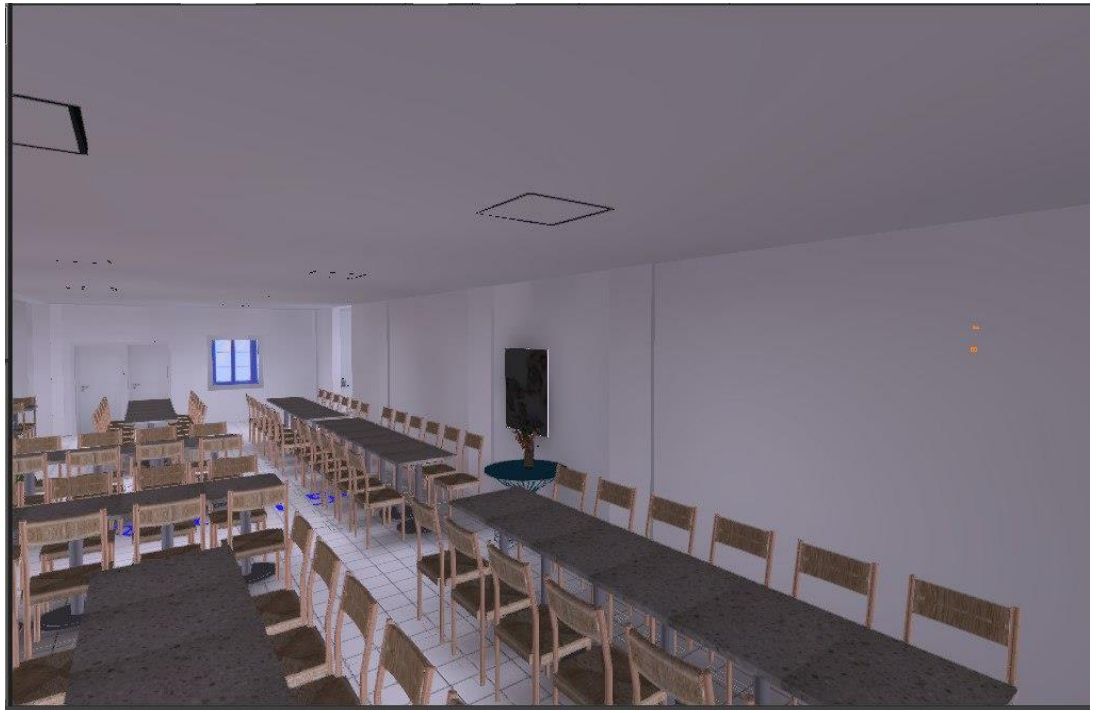
Samples of Lighting distribution using Dialux Evo program.





Lighting Distribution and wiring in AutoCAD

(خ) يراعى تحميل مخارج المآخذ الكهربائية على دوائر فرعية نهائية مستقلة عن الدوائر الفرعية النهائية الخاصة بمخارج الإنارة.

(د) يراعى ألا يزيد عدد مخارج الإنارة أو المآخذ الكهربائية التى تستعمل لأجهزة الإنارة والتى تحمل على دائرة فرعية نهائية واحدة عن عشرة مخارج.

عند تصميم مقطع موصلات الدوائر الفرعية النهائية التى تغذى عددا من مخارج وحدات الإضاءة أو المآخذ الكهربائية المخصصة لأجهزة الإضاءة يراعى أن يحسب الحمل الفعلى لكل مخرج إضاءة أو مخرج مأخذ على أساس ١٠٠ وات لكل مخرج على الأقل مهما كان الحمل الفعلى أقل من ذلك أما إذا زاد الحمل الفعلى للمخرج عن ذلك فيحسب المقطع على أساس الحمل الأقصى الفعلى .

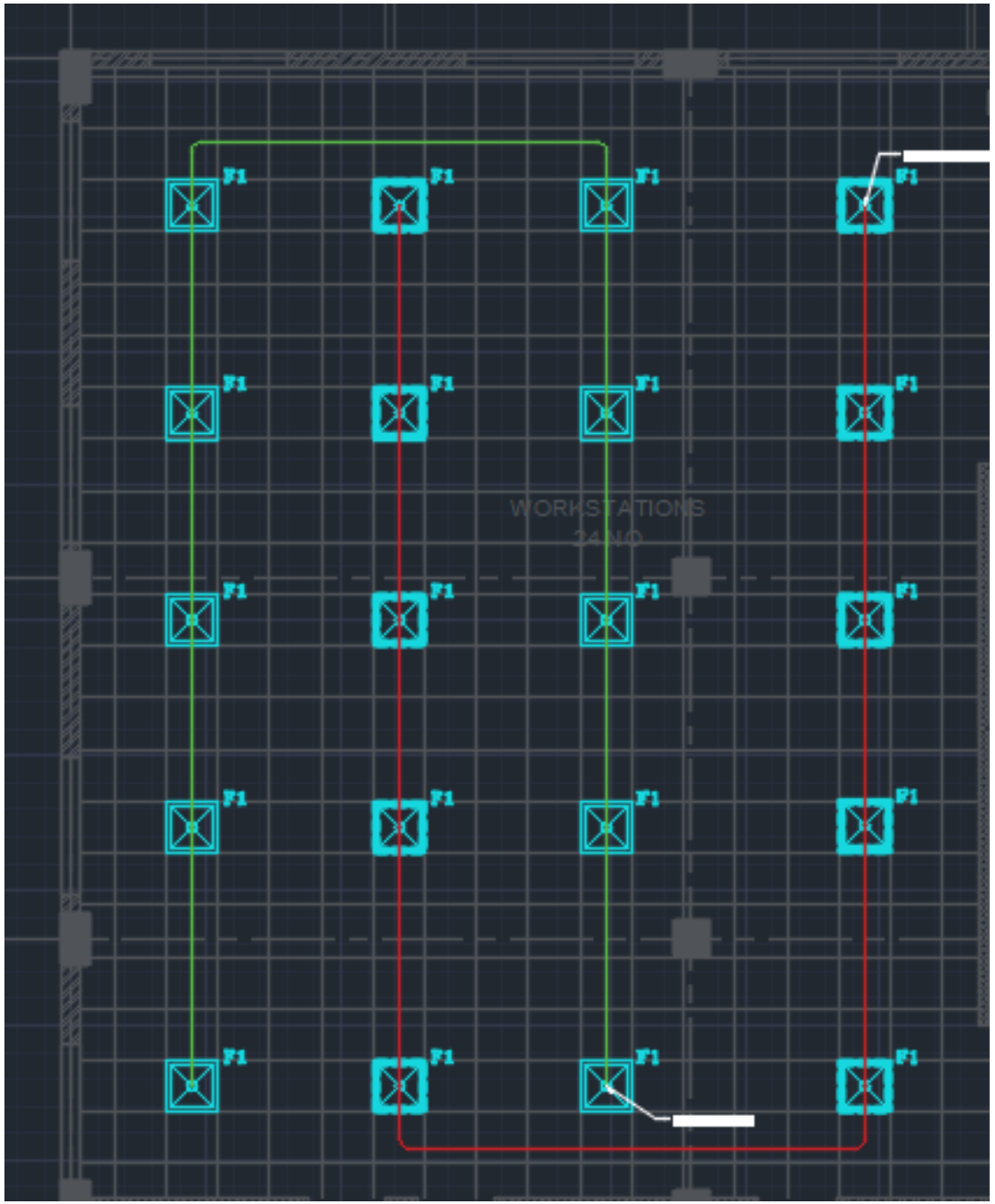
يراعى ألا يزيد عدد مخارج الإنارة أو المآخذ الكهربائية التى تستعمل لأجهزة الإنارة والتى تحمل على دائرة فرعية نهائية واحدة عن عشرة مخارج .

لا يقل مقطع موصلات الدوائر الفرعية النهائية والمخارج للإنارة عن ٢ مم^{٢} والمقابس (البرايز) عن ٣مم٢ مهما كان حملها الفعلى صغيرا .

Lighting Distribution and wiring in AutoCAD

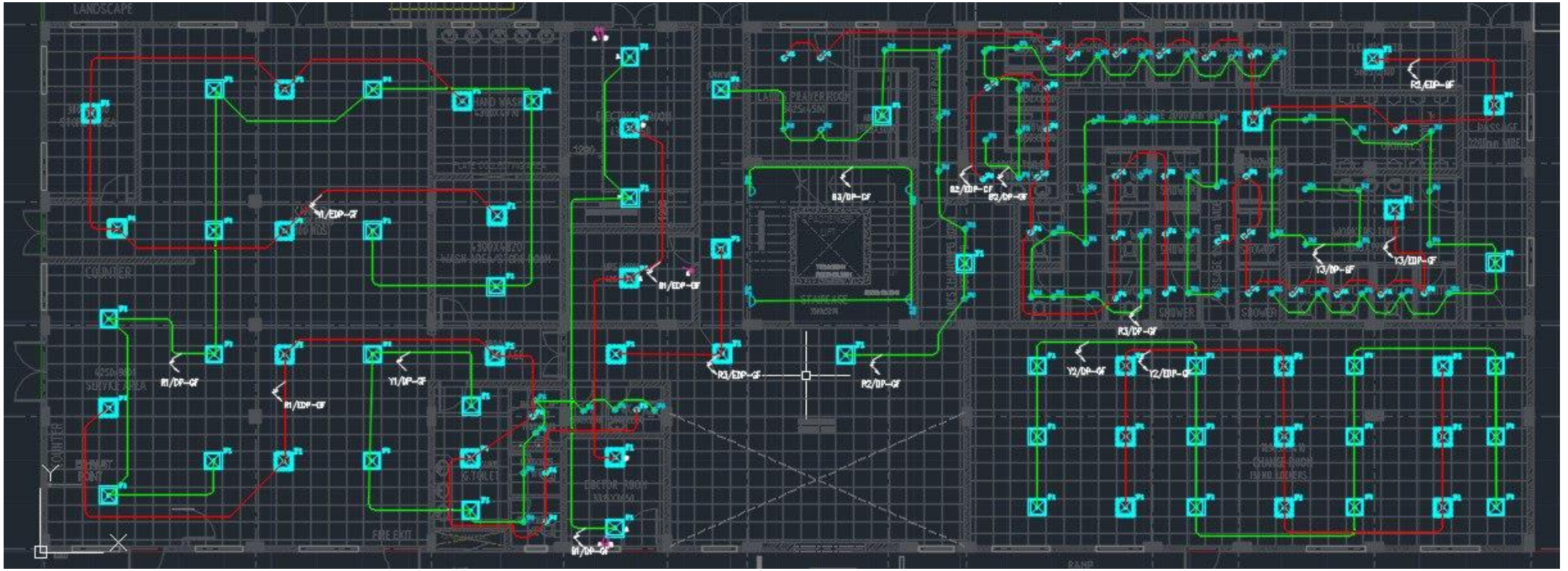
Sample of wiring:

Work stations



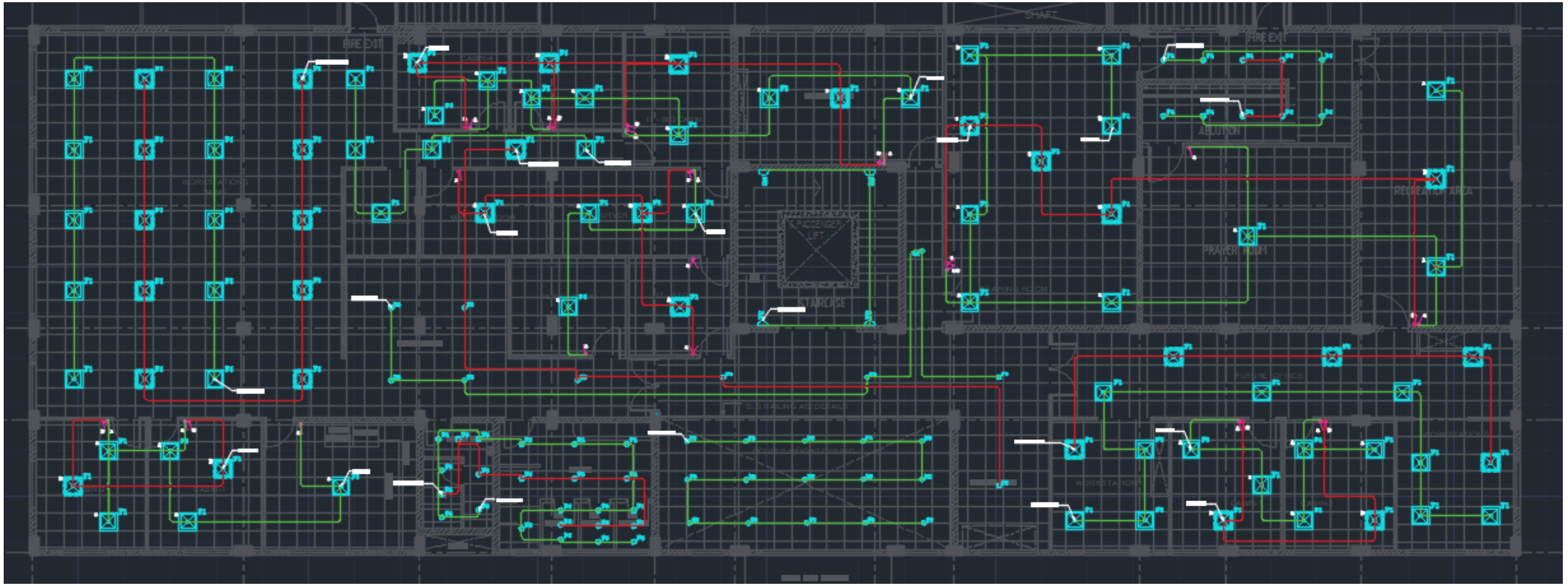
Lighting Distribution and wiring in AutoCAD

- Ground floor:



Lighting Distribution and wiring in AutoCAD

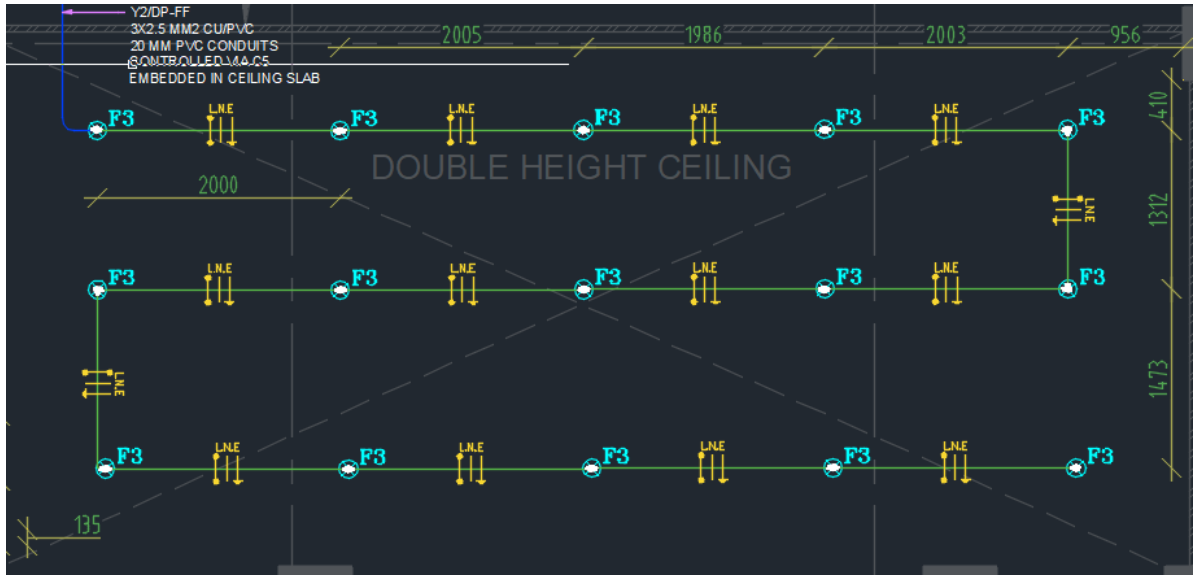
- First floor:



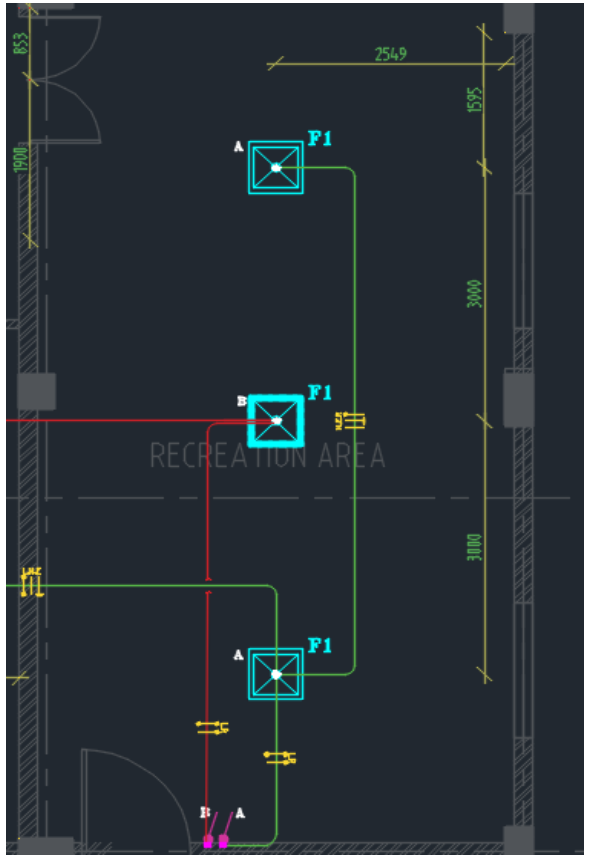
Lighting control methods

- There are many types of lighting control methods such as:
  - Through the light switches.
  - LCP (Light Control Panel).

Lighting control methods



CONTROLLED VIA LCP



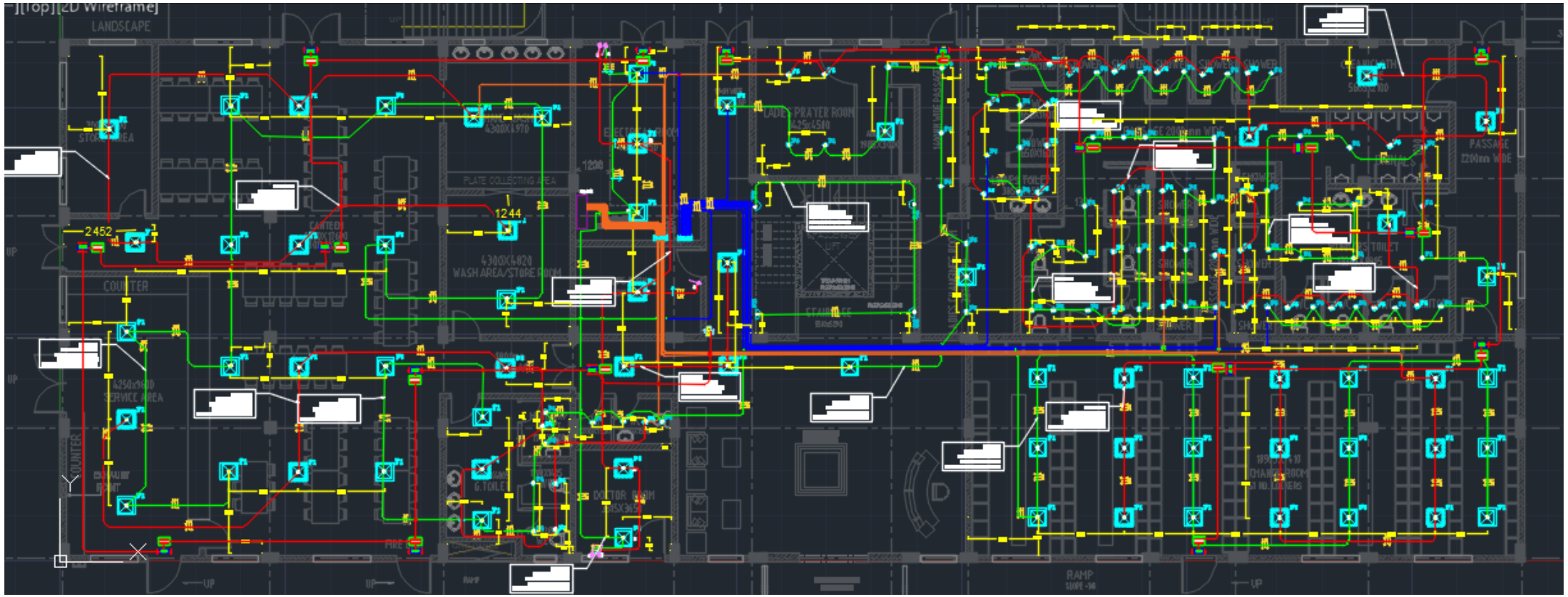
CONTROLLED BY SWITCHES

Lighting Shop Drawing

LIGHTING SHD

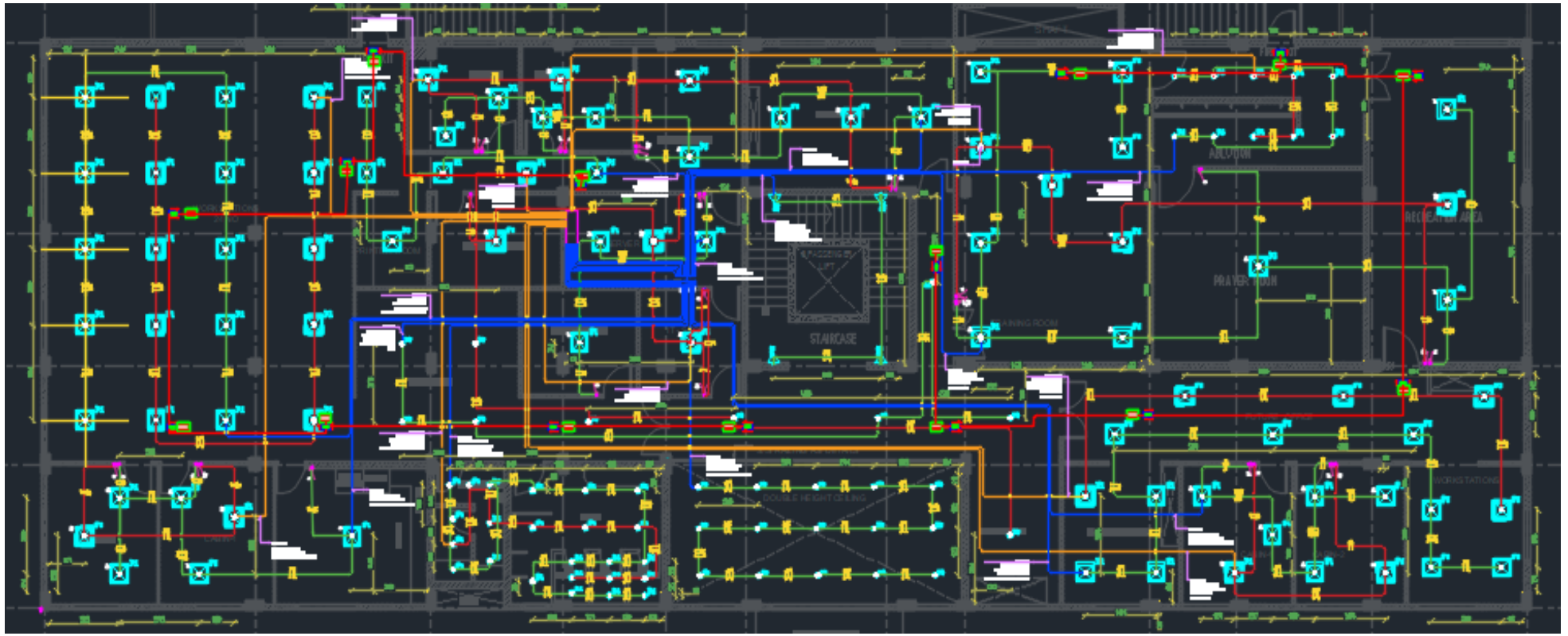
Lighting shop drawing in AutoCAD

- Ground floor:



Lighting shop drawing in AutoCAD

- First floor:



Power Design

Sockets Classification

Physical Types

1. Simplex or General Socket (Italian)
2. SCHUKO type
3. Industrial type
4. Switched Socket
5. Floor Box and Grommet Box
6. Column Socket
7. Socket With USB
8. Trunking Socket
9. BHU
10. Socket With GFCI
11. Hospital Grade Socket

Environmental Conditions

1. Weather Proof
2. Anti- Bacterial
3. Explosion Proof

Installation method

1. Flush
2. Surface
3. Desk
4. Floor
5. Ceiling

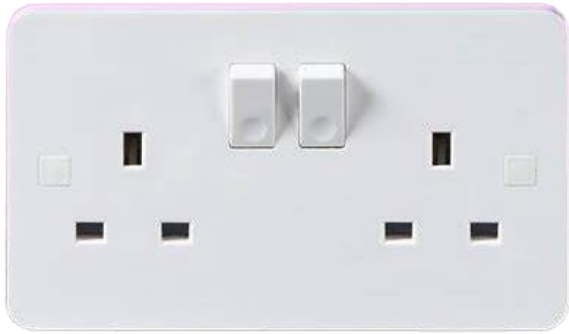
Load Type

1. Normal
2. Emergency
3. UPS

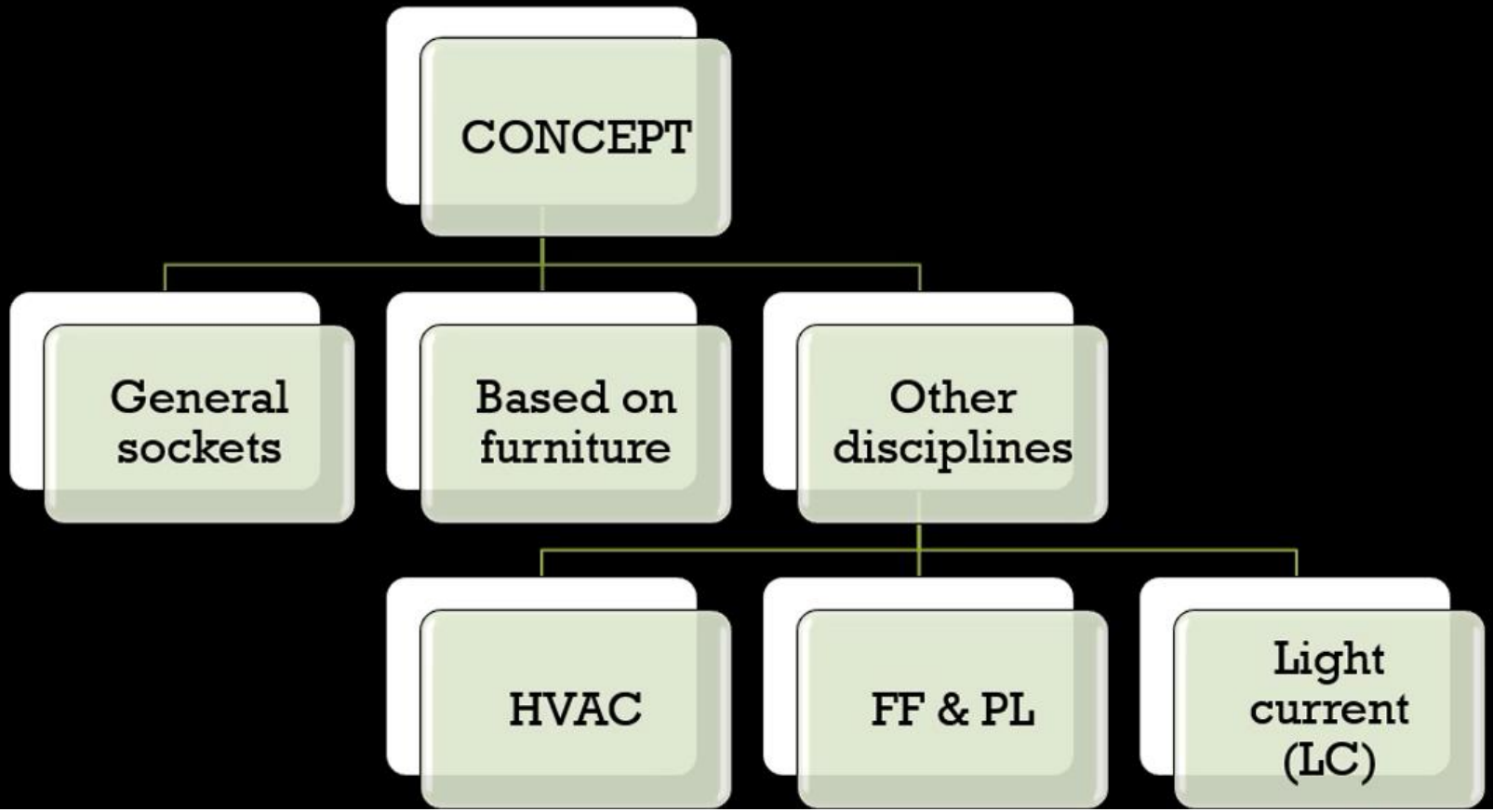
Power Design

Legend

SYMBOLS	DESCRIPTION
SOCKETS:	
	16A SOCKET OUTLET AT 0.3mt HEIGHT
	16A DUPLEX SOCKET OUTLET AT 0.3mt HEIGHT
	16A SOCKET OUTLET AT 1.2mt HEIGHT
W.P.	16A SOCKET OUTLET AT 1.2mt HEIGHT (WATER PROOF)
W.P.	16A DUPLEX SOCKET OUTLET AT 1.2mt HEIGHT (WATER PROOF)
	16A WALL OR CEILING MOUNTED DUPLEX SOCKET OUTLET FOR SCREEN
	POWER OUTLET
	WATER HEATER SWITCH FUSE AT 2.5mt HEIGHT (WEATHER PROOF)
	DISCONNECTING SWITCH 3P, 16 A, CEILING MOUNTED FOR IN 92 x 64 x 83 mm
	GROMMET BOX WITH 1NO. 16A/220V DUPLEX SOCKET OUTLET, 1NO. 16A/220V DUPLEX SOCKET OUTLET FED FROM UPS, 1NO. 16A/220V DUPLEX SOCKET OUTLET FED FROM NORMAL, COMPLETE WITH FLEXIABLE CONDUIT FOR INTERFACING BETWEEN GROMMET AND FURNITURE CABLE MANGEMENT
W.P.	16A POWER SOCKET OUTLET AT 1.5mt HEIGHT (WATER PROOF)
	16A POWER SOCKET OUTLET AT 0.3mt HEIGHT
	16A DUPLEX SOCKET OUTLET AT 0.3mt HEIGHT FED FROM UPS
W.P.	16A POWER SOCKET OUTLET AT ABOVE FALSE CEILING (WATER PROOF)



Small power system distribution



Based on the Code if there is no a furniture plan

المسافة بين كل بريزة والتي تليها على نفس الجدار لا تزيد عن 3.65 م (وفقا للكود المصري).

المسافة بين أى بريزة والحائط لا تزيد عن 1.8 م (وفقا للكود المصري)

منسوب تركيب البرايز 40سم عدا المطابخ
والحمامات من 120 سم إلى 135 سم (وفقا للكود المصري)

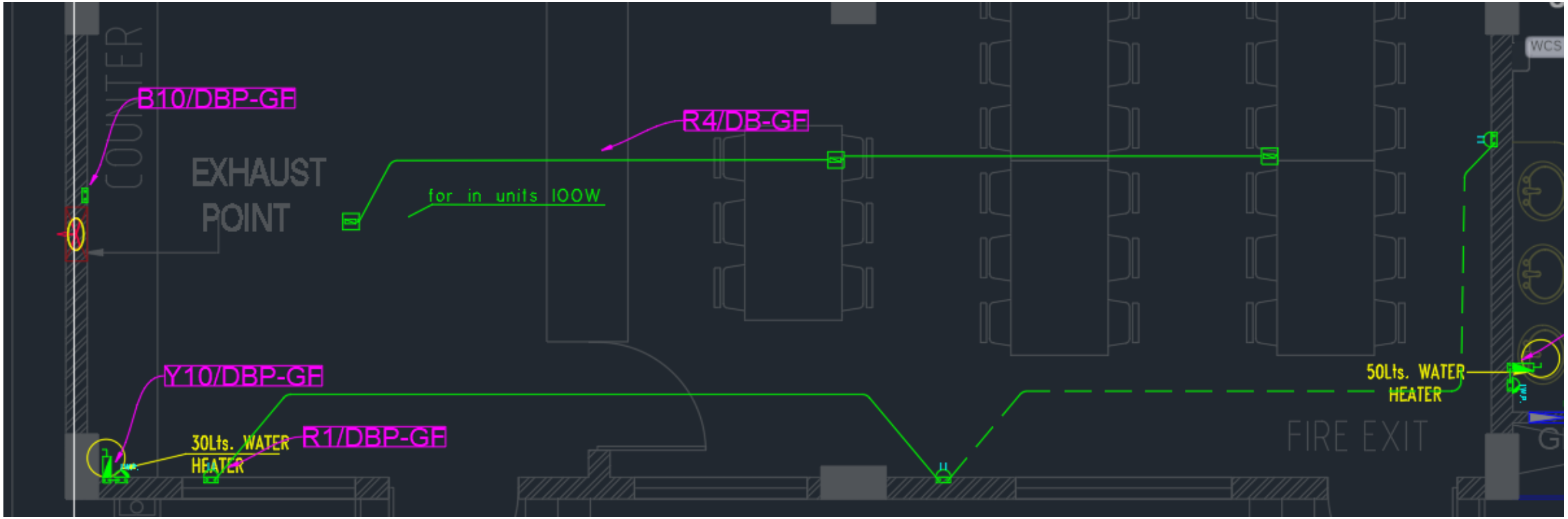
Based on the furniture plans:

1. By the interior designer (residential buildings and similar applications)

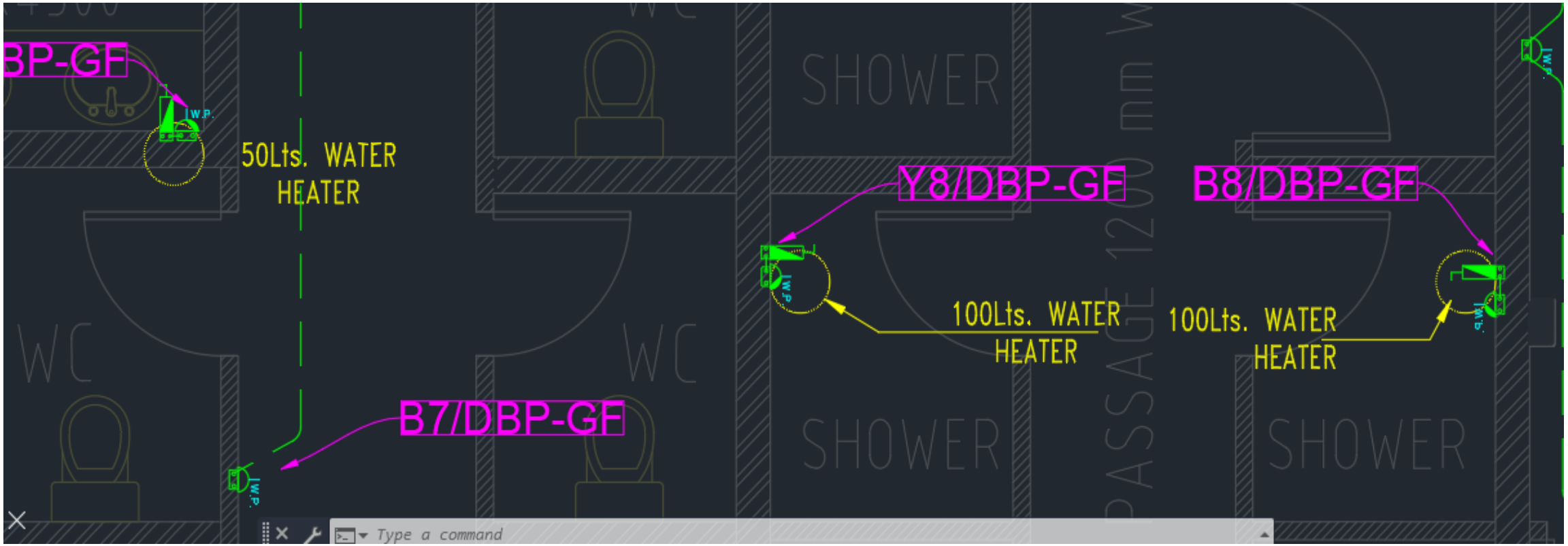
2. By medical consultant (health care applications)

3. By Kitchen Equipment Supplier

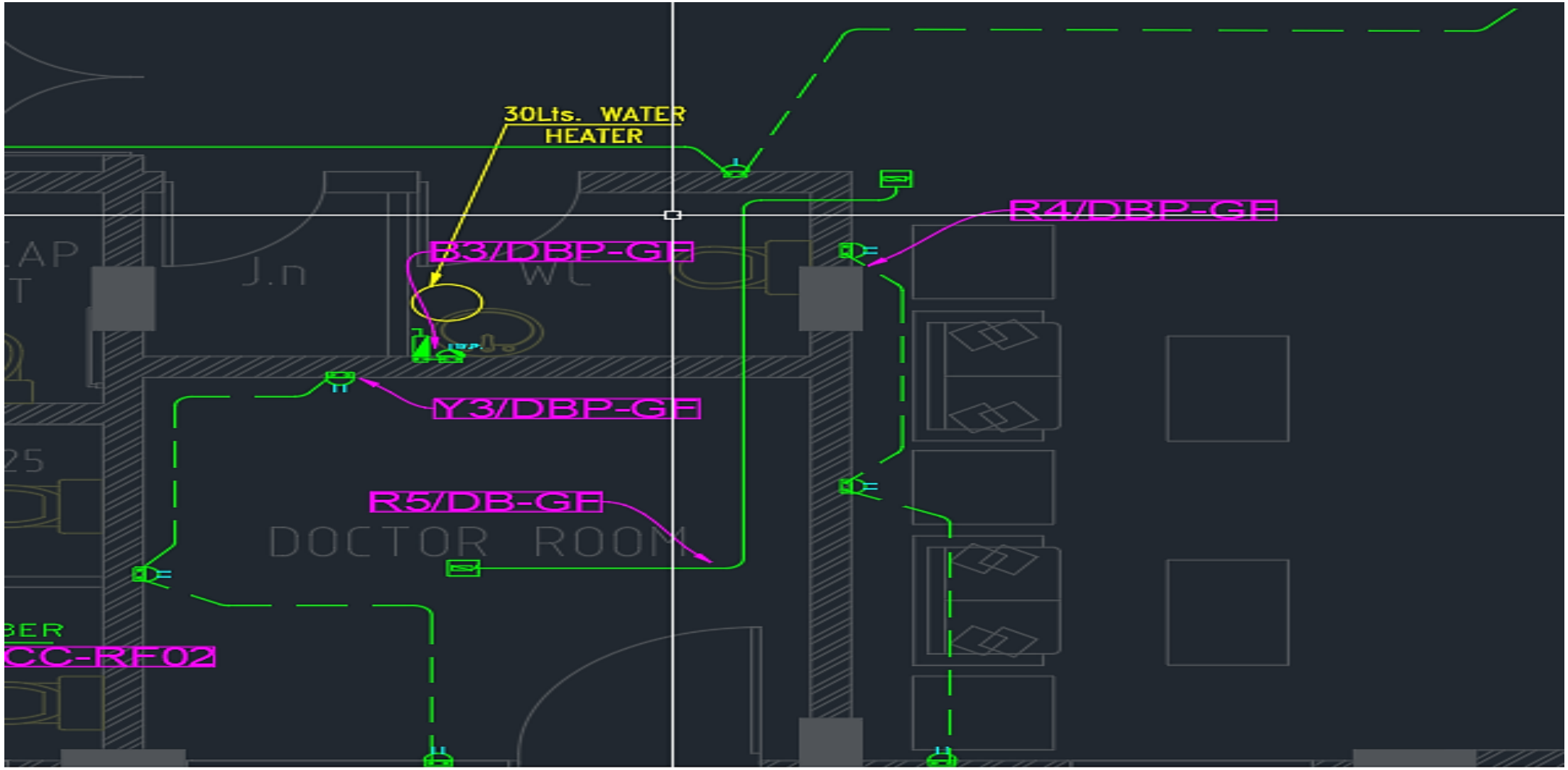
4. By the electrical engineer (in the rest of projects and in the above projects if not if sockets not distributed by medical consultant or interior designer)



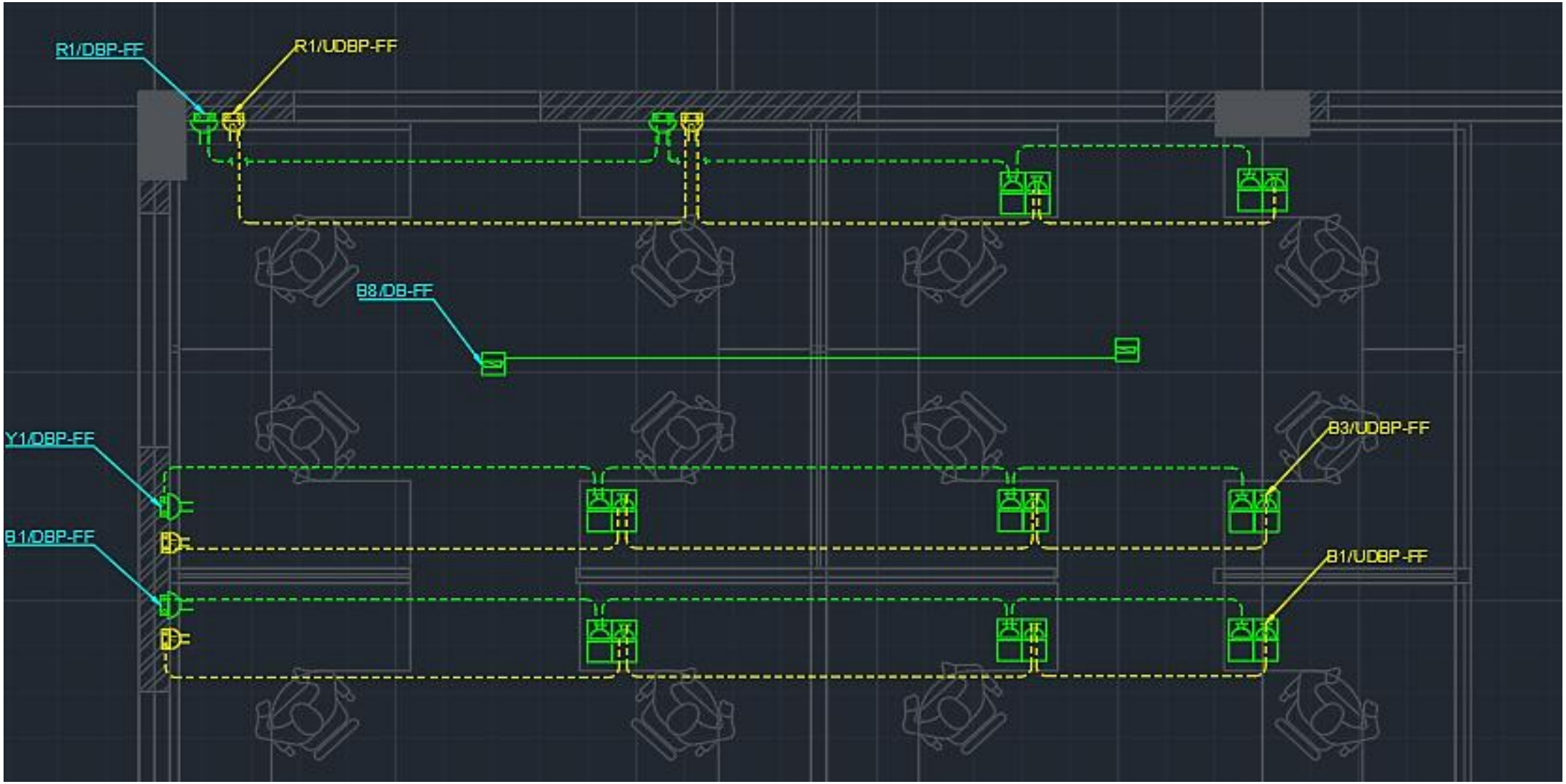
Ground Floor


BP-GF
W.P.
50Lts. WATER
HEATER
B7/DBP-GF
W.P.
WC
WC
SHOWER
SHOWER
SHOWER
PASSAGE 1200 mm W
Y8/DBP-GF
W.P.
100Lts. WATER
HEATER
B8/DBP-GF
100Lts. WATER
HEATER
W.P.
W.P.
Type a command

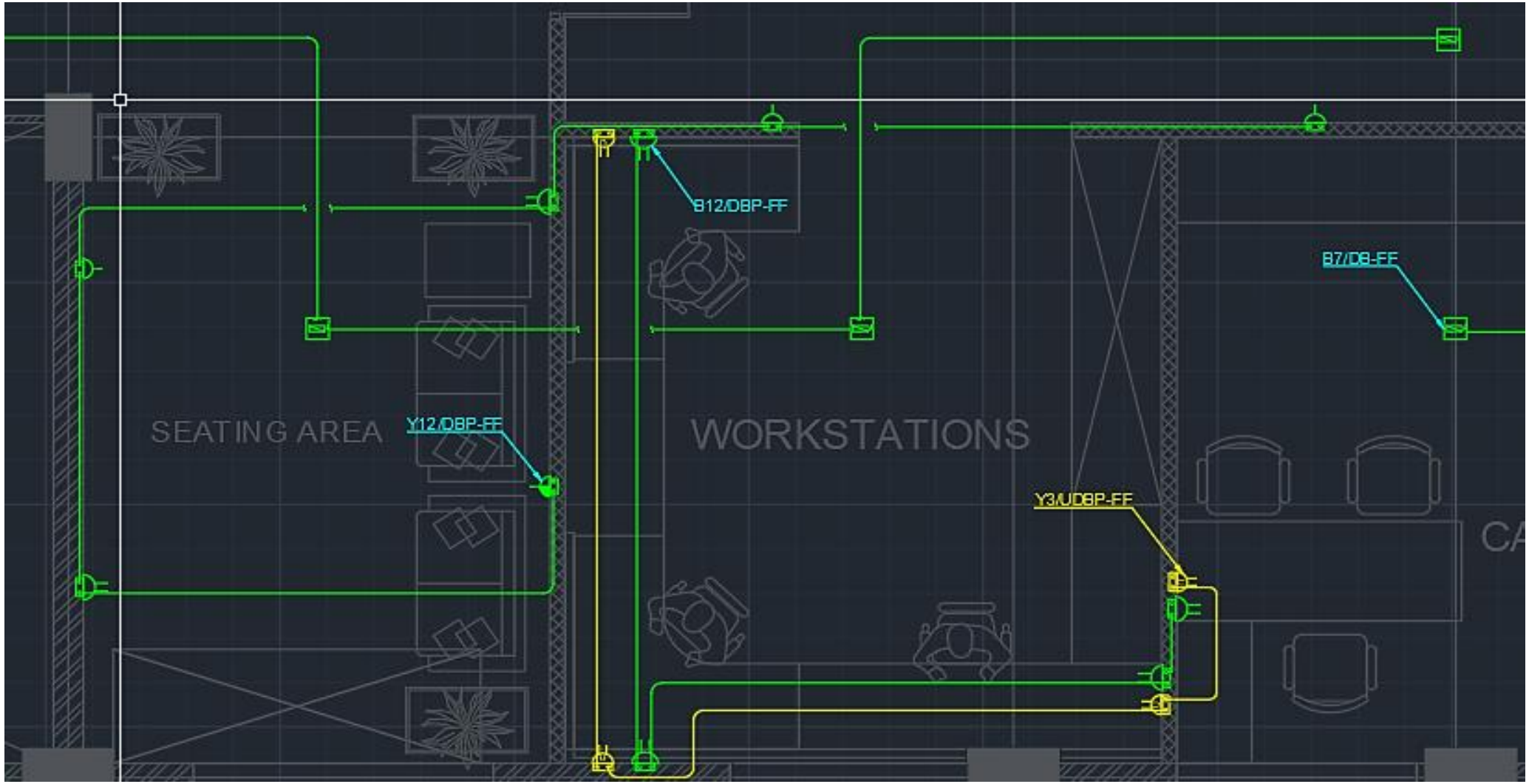
CONT. GF


30Lts. WATER
HEATER
B3/DBP-GF
R4/DBP-GF
Y3/DBP-GF
R5/DB-GF
DOCTOR ROOM
J.n
WC
CC-RF02

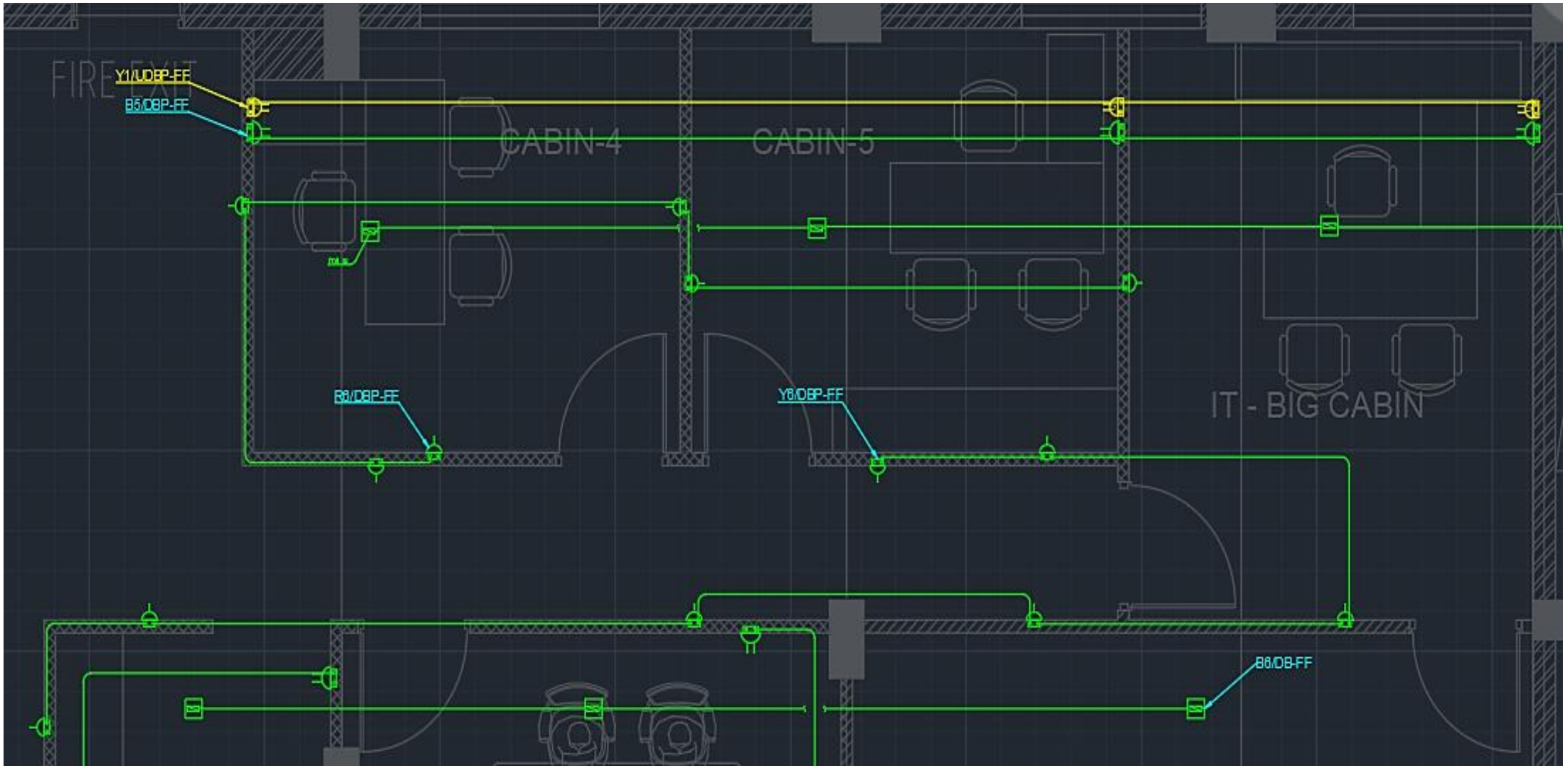
CONT. GF


R1/DBP-FF
R1/UDBP-FF
B8/DB-FF
Y1/DBP-FF
B1/DBP-FF
B3/UDBP-FF
B1/UDBP-FF

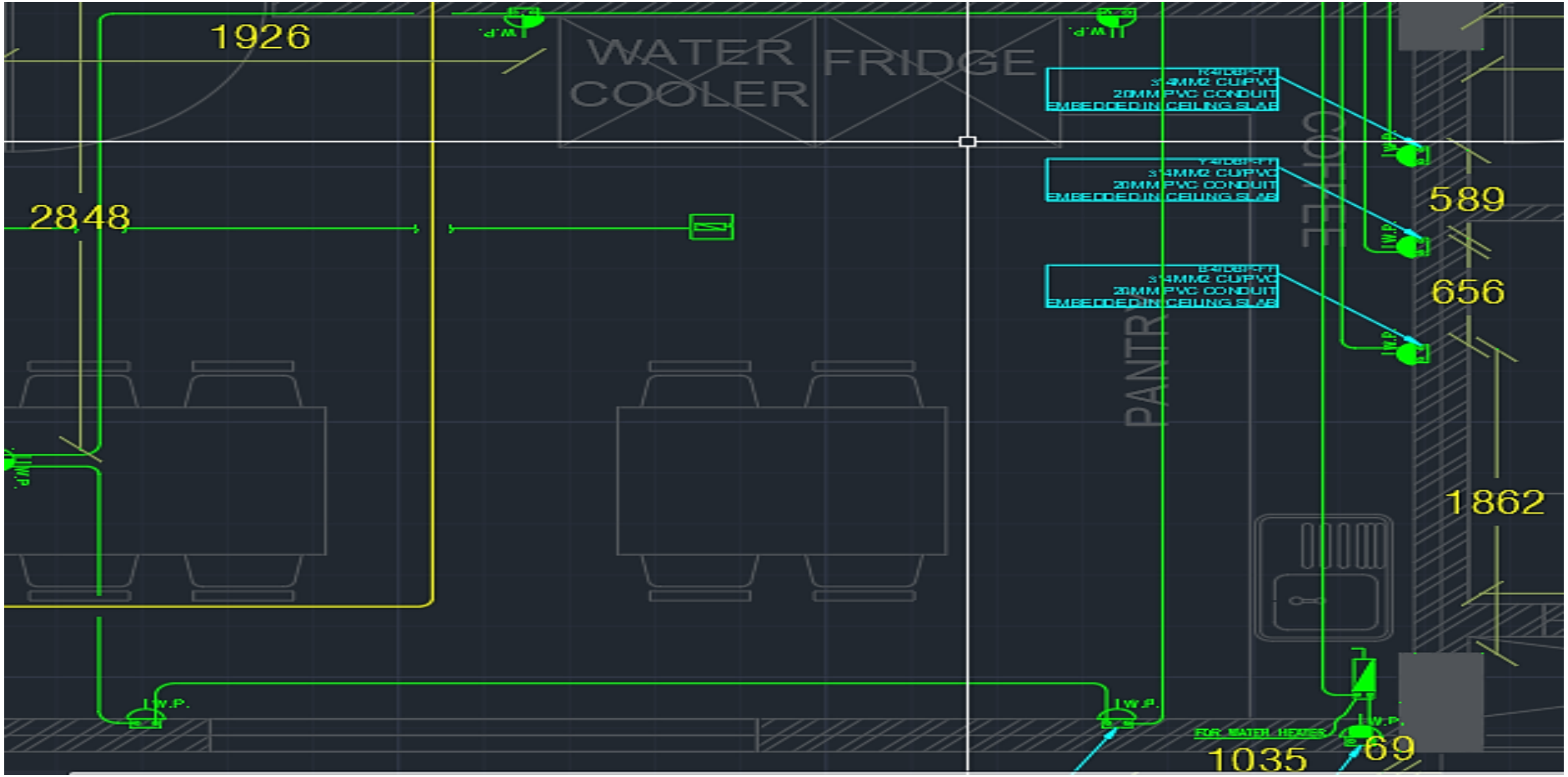
First Floor


B12/DBP-FF
B7/DB-FF
SEATING AREA
Y12/DBP-FF
WORKSTATIONS
Y3/UDBP-FF

CONT. FF


FIRE EXIT
Y1/UDBP-FF
B5/DBP-FF
CABIN-4
CABIN-5
B6/DBP-FF
Y8/DBP-FF
IT - BIG CABIN
B8/DB-FF

CONT. FF


1926
WATER COOLER
FRIDGE
2848
589
656
1862
1035
69
FOR WATER HEATER

CONT. FF

HVAC System

HVAC refers to the different systems used for moving air between indoor and outdoor areas

To keep it simple the system is the respiratory system of any building.

Its main purpose is to provide conditioned air, which is clean and odorless to breathe in a safe and comfortable environment .

VRF System

Outdoor unit that uses inverter technology in saving energy.

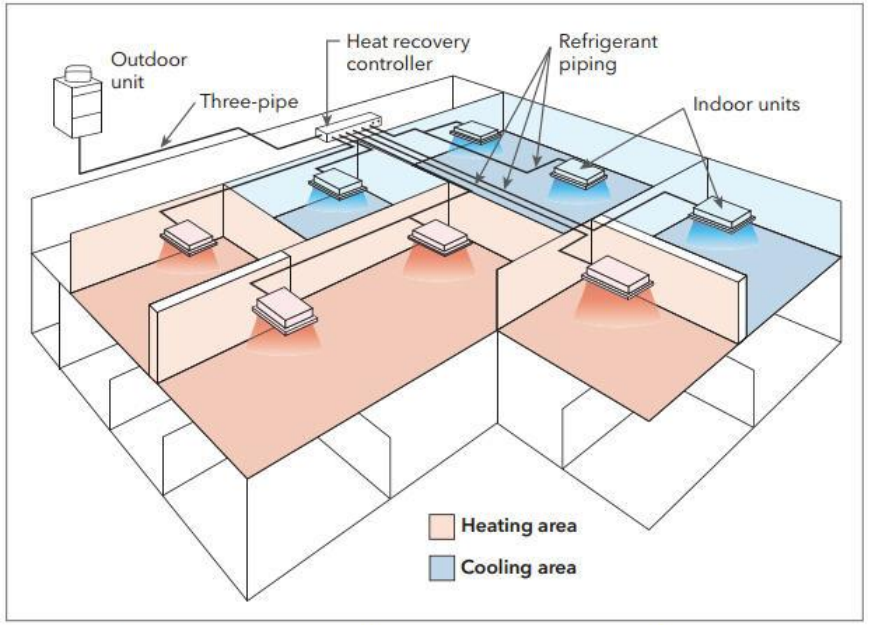
The ability to save up to 50% of power consumption

The flexibility provided by the diversity of the indoor units that can basically be any shape or form.

HVAC System

- **VRF System**

  - Outdoor unit
  - Three Pipes
  - AHU
  - Pipes
  - Indoor Units



Variable refrigerant flow systems can deliver cooling to some zones and heating to others, with no reheat needed (an air-source system is shown here).

Panel Schedule &Panel Board Design

Panel Schedule

- Distribution Panels

- DB-GF

PROJECT: EDUNEERS-2023 — LOAD DISTRIBUTION SCHEDULE

DB NO: DB-GF — VOLTAGE & FREQ.: 3PH, 380V & 50Hz — XXA — MCCB — XX kA

FED FROM: XX — PANEL ENCLOSURE: IP 31 — FORM: 1 — (4x10)+10E — CU/XLPE/PVC

S/N	Circuit	CB Rating (A)	CB Type	Wire (Cable) Size mm2	Load Type	No. of points			Point Load (w)			Load Per Phase (kw) R	Y	B	Sensor	LCP	Push Button	Remarks
1	R1	16	MCB	3x3	Lighting	10			33			0.33						
2	Y1	16	MCB	3x3	Lighting	4	7		33	8			0.19					
3	B1	16	MCB	3x3	Lighting	3			33					0.10				
4	R2	16	MCB	3x3	Lighting	4	8		33	8		0.20						
5	Y2	16	MCB	3x3	Lighting	12			33				0.40					
6	B2	16	MCB	3x3	Lighting	11			33					0.36				
7	R3	16	MCB	3x3	Lighting	17			8			0.14						
8	Y3	16	MCB	3x3	Lighting	1	16		33	8			0.16					
9	B3	16	MCB	3x3	Lighting	4			13					0.05				
10	R4	16	MCB	3x3	IU	3			100			0.30						
11	Y4	16	MCB	3x3	IU	3			100				0.30					
12	B4	16	MCB	3x3	IU	3			100					0.30				
13	R5	16	MCB	3x3	IU	1	1		100	200		0.30						
14	Y5	16	MCB	3x3	IU	2			100				0.20					
15	B5	16	MCB	3x3	IU	2			100					0.20				
16	R6	16	MCB	3x3	SPARE							0.00						
17	Y6	16	MCB	3x3	SPARE								0.00					
18	B6	16	MCB	3x3	IU	3			100	10				0.30				
					TOTAL CONNECTED LOAD							1.26	1.25	1.31				
												3.82				Blalnce check :		5%

Load Type	Lighting	Sockets	P.S	Heaters			H.D			HVAC	Others	TOTAL
Connected Load (KW)	1.92	0.00	0.00	0.00			0.00			1.90	0.00	3.82
Demand Factor	0.90	0.50	1.00	0.70			1.00			0.70	1.00	0.80
Demand Load (KW)	1.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	0.00	3.06

Connected Load (KVA)	4.7763
Demand Load (KVA):	3.8236

P.S : Power Socket - D/S : Disconnect Switch - H.D : Hand dryer -A/C : Air Conditioning -EXF:EXHAUST FAN

Panel Schedule

- Power Distribution Panel
- DBP-GF

31	R11	16	MCB	3x4	EXF	1	300	0.30								
32	Y11	16	MCB	3x3	SPARE				0.00							
33	B11	16	MCB	3x3	SPARE					0.00						
34	R12	16	MCB	3x3	S.D	1	200	0.20								
35	Y12	16	MCB	3x3	S.D	1	150		0.15							
36	B12	16	MCB	3x3	S.D	1	150			0.15						
37	R13	16	MCB	3x3	SPARE			0.00								
38	Y13	16	MCB	3x3	SPARE				0.00							
39	B13	16	MCB	3x3	SPARE					0.00						
40	R14	16	MCB	3x3	SPARE			0.00								
41	Y14	16	MCB	3x3	SPACE				0.00							
42	B14	16	MCB	3x3	SPARE					0.00						
43	R15	16	MCB		SPACE			0.00								
44	Y15	16	MCB		SPACE				0.00							
45	B15	16	MCB		SPACE					0.00						
46	R16	16	MCB		SPACE			0.00								
47	Y16	16	MCB		SPACE				0.00							
48	B16	16	MCB		SPACE					0.00						
					TOTAL CONNECTED LOAD			11.60	10.95	11.25						
								33.80						Blalnce check :		6%

Load Type	Lighting	Sockets	P.S	Heaters	EXF	S.D	H.D			HVAC	Others	TOTAL
Connected Load (KW)		11.00	2.40	19.30	0.60	0.50						33.80
Demand Factor		0.80	0.80	0.80	0.90	0.90						0.80
Demand Load (KW)		8.80	1.92	15.44	0.54	0.45						27.15

Connected Load (KVA):	42.25
Demand Load (KVA):	33.938

P.S : Power Socket - D/S : Disconnect Switch - H.D : Hand dryer -A/C : Air Conditioning -EXF:EXHAUST FAN S.D: SLIDING DOOR

Panel Schedule

EMERGENCY Distribution Panel

-EDB-GF

FED FROM:	XX			PANEL ENCLOSURE:		IP 31			FORM:		1	(4x10)+10E	CU/XLPE/PVC		
S/N	Circuit	CB Rating (A)	CB Type	Wire (Cable) Size mm2	Load Type	No. of points			Point Load (w)			Load Per Phase (kw) R	Y	B	Sensor	LCP	Push Button	Remarks
1	R1	16	MCB	3x3	Lighting	5	4		33	8		0.20						
2	Y1	16	MCB	3x3	Lighting	6			33				0.20					
3	B1	16	MCB	3x3	Lighting	3			33					0.10				
4	R2	16	MCB	3x3	SPARE							0.00						
5	Y2	16	MCB	3x3	Lighting	9			33				0.30					
6	B2	16	MCB	3x3	Lighting	12			8					0.10				
7	R3	16	MCB	3x3	SPARE							0.00						
8	Y3	16	MCB	3x3	Lighting	1	8		33	8			0.10					
9	B3	16	MCB	3x3	Lighting	3			33					0.10				
10	R4	16	MCB	3x3	Lighting	10			33			0.33						
11	Y4	16	MCB	3x3	Lighting	1	4		33	14			0.09					
12	B4	16	MCB	3x3	Lighting	9			8					0.07				
13	R5	16	MCB	3x3	Lighting	5			33			0.17						
14	Y5	16	MCB	3x3	Lighting	4			8				0.03					
15	B5	16	MCB	3x3	Lighting	2			33					0.07				
16	R6	16	MCB	3x3	Lighting	3			33			0.10						
17	Y6	16	MCB	3x3	Lighting	4			33				0.13					
18	B6	16	MCB	3x3	Lighting	2			33					0.07				
19	R7	16	MCB	3x3	SPACE							0.00						
20	Y7	16	MCB	3x3	SPACE								0.00					
21	B7	16	MCB	3x3	Lighting	4			33					0.13				
22	R8	16	MCB	3x3	SPACE							0.00						
23	Y8	16	MCB	3x3	SPACE								0.00					
24	B8	16	MCB	3x3	Lighting	3	9		33	8				0.10				
					TOTAL CONNECTED LOAD							0.79	0.85	0.73				
												2.37				Blalnce check :		8%

DB-GF | DB-FF | DBP-GF | DBP-FF | EDB-GF | UDBP-FF

Panel Schedule

- UPS Distribution Panel

-UDBP-GF

DB NO:	DBP-FF			VOLTAGE & FREQ.:		3PH, 380V & 50Hz				XXA	MCCB	XX kA		
FED FROM:	XX			PANEL ENCLOSURE:		IP 31		FORM:	1	(4x10)+10E	CU/XLPE/PVC			
S/N	Circuit	CB Rating (A)	CB Type	Wire (Cable) Size mm2	Load Type	No. of points	Point Load (w)	Load Per Phase (kw)			Sensor	LCP	Push Button	Remarks
								R	Y	B				
1	R1	20	MCB	3x4	SOCKET	4	400	1.60						
2	Y1	20	MCB	3x4	SOCKET	3	400		1.20					
3	B1	20	MCB	3x4	SOCKET	4	400			1.60				
4	R2	16	MCB	3x3	SOCKET	2	400	0.80						
5	Y2	20	MCB	3x4	SOCKET	4	400		1.60					
6	B2	20	MCB	3x4	SOCKET	4	400			1.60				
7	R3	16	MCB	3x3	SOCKET	2	400	0.80						
8	Y3	20	MCB	3x4	SOCKET	4	400		1.60					
9	B3	16	MCB	3x3	SOCKET	4	400			1.60				
10	R4	16	MCB	3x3	SOCKET	3	400	1.20						
11	Y4	16	MCB	3x3	SPARE				0.00					
12	B4	16	MCB	3x3	SOCKET	3	400			1.20				
13	R5	20	MCB	3x4	P.SOCKET	1	1600	1.60						
14	Y5	20	MCB	3x4	P.SOCKET	1	1600		1.60					
					TOTAL CONNECTED LOAD			6.00	6.00	6.00				
								18.00				Blalnce check :		0%

Load Type	Lighting	Sockets	P.S	Heaters			H.D			HVAC	Others	TOTAL
Connected Load (KW)	12.40	0.00	0.00	0.00			0.00			5.60	0.00	18.00
Demand Factor	0.90	0.50	1.00	0.70			1.00			0.70	1.00	0.84
Demand Load (KW)	11.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.92	0.00	15.08

Connected Load (KVA):	20
Demand Load (KVA):	16.756

P.S : Power Socket – D/S : Disconnect Switch – H.D : Hand dryer –A/C : Air Conditioning –EXF:EXHAUST FAN

DB-GF | DB-FF | DBP-GF | DBP-FF | EDB-GF | UDBP-FF

CABLE SIZING

- According to C.B current and taking account of derating factors which effect on cable (temperature, grouping factor, depth, soil thermal resistivity)
- Icable = C. B ÷ Derating factors
- Find suitable cable from ELSEWEDY CABLES catalogue.

Air temprature derating factors

Table 3

Air temperature	15	20	25	30	35	40	45	50	55
PVC cables rated 70°C	1.21	1.15	1.07	1	0.92	0.84	0.75	0.66	0.55
XLPE cables rated 90°C	1.15	1.1	1.05	1	0.95	0.9	0.84	0.78	0.72

Reduction factors for groups of more than one multi-core cable in air to be applied to the current-carrying capacity for one multi-core cable in free air

Table 10

Number of trays	Number of cables						Method of installation
	1	2	3	4	6	9	
1	1.00	0.88	0.82	0.79	0.76	0.73	Cables on perforated trays — Touching
2	1.00	0.87	0.80	0.77	0.73	0.68	
3	1.00	0.86	0.79	0.76	0.71	0.66	
1	1.00	1.00	0.98	0.95	0.91	-	Spaced
2	1.00	0.99	0.96	0.92	0.87	-	
3	1.00	0.98	0.95	0.91	0.85	-	

CABLE SIZING

-Main Distribution Panel

- MDB

1	Panel name :	MCC-RF02			VD upstream %		0.50%	Short circuit level :		8			DF :	0.80	TCL (KVA) :	281.7	TDL (KVA):	22		
2	Fed from :	TRANS						Temp.→	40											
3								CB			Cable										
4	S/N	From	To	FEEDER REF	LOAD KVA	LOAD TYPE 1PH OR 3PH	Ib	IN	AT	CB TYPE	Installation Method	De-rating correction factors					Calculated Iz	Cable size (mm2)	Iz	No Of Cables	Cable Length (m)	MV
5												Ambient Temprature	Grouping factor	Ground temperature	Burried Depth	Soil resistivity						
6	1	MCC-RF02	MCC-RF01		61.6	Three_Phase	93.63	117.0	125	MCCB	Free Air	0.85	0.85	1	1	1	129.59	3x50+25 mm² XLPE/PVC/CU	143.06	1	16	0.
7	2	MCC-RF02	MCC-RF02		16.0	Three_Phase	24.32	30.4	32	MCCB	Free Air	0.85	0.85	1	1	1	33.66	4x10 mm² XLPE/PVC/CU	54.19	1	30	3.
8	3	MCC-RF02	EMDB		39.7	Three_Phase	60.36	75.5	80	MCCB	Free Air	0.85	0.85	1	1	1	83.55	50+25 mm² XLPE/STA/PVC/	143.06	1	8	0.
9	4	MCC-RF02	CHLLLER-01		41.0	Three_Phase	62.32	77.9	80	MCCB	Free Air	0.85	0.85	1	1	1	86.26	3x25+16 mm² XLPE/PVC/CU	93.20	1	16	1.
10	5	MCC-RF02	CHLLLER-02		28.5	Three_Phase	43.32	54.2	63	MCCB	Free Air	0.85	0.85	1	1	1	59.96	4x16 mm² XLPE/PVC/CU	70.81	1	45	1.
11	6	MCC-RF02	DBP-GF		33.938	Three_Phase	51.59	64.5	80	MCCB	Free Air	0.85	0.85	1	1	1	71.40	3x25+16 mm² XLPE/PVC/CU	93.20	1	15	1.
12	7	MCC-RF02	DB-GF		3.8	Three_Phase	5.78	7.2	16	MCCB	Free Air	0.85	0.85	1	1	1	7.99	4x4 mm² XLPE/PVC/CU	32.51	1	15	7.
13	8	MCC-RF02	DBP-FF		40.3	Three_Phase	61.18	76.5	80	MCCB	Free Air	0.85	0.85	1	1	1	84.68	35+16 mm² PVC/STA/PVC/	91.76	1	15	0.
14	9	MCC-RF02	DB-FF		16.9	Three_Phase	25.69	32.1	40	MCCB	Free Air	0.85	0.85	1	1	1	35.55	4x10 mm² XLPE/PVC/CU	54.19	1	15	3.
15	10	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
16	11	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
17	12	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
18	13	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
19	14	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
20	15	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
21	16	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
22	17	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
23	18	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
24	19	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
25	20	MCC-RF02					0.00	0.0	16		Free Air	0.85	0.85	1	1	1	0.00			1		
26	Total Demand load				225.36		342.55	428.2	500													
27																						

CABLE SIZING

-MCC Distribution Panel - MCC-RF02

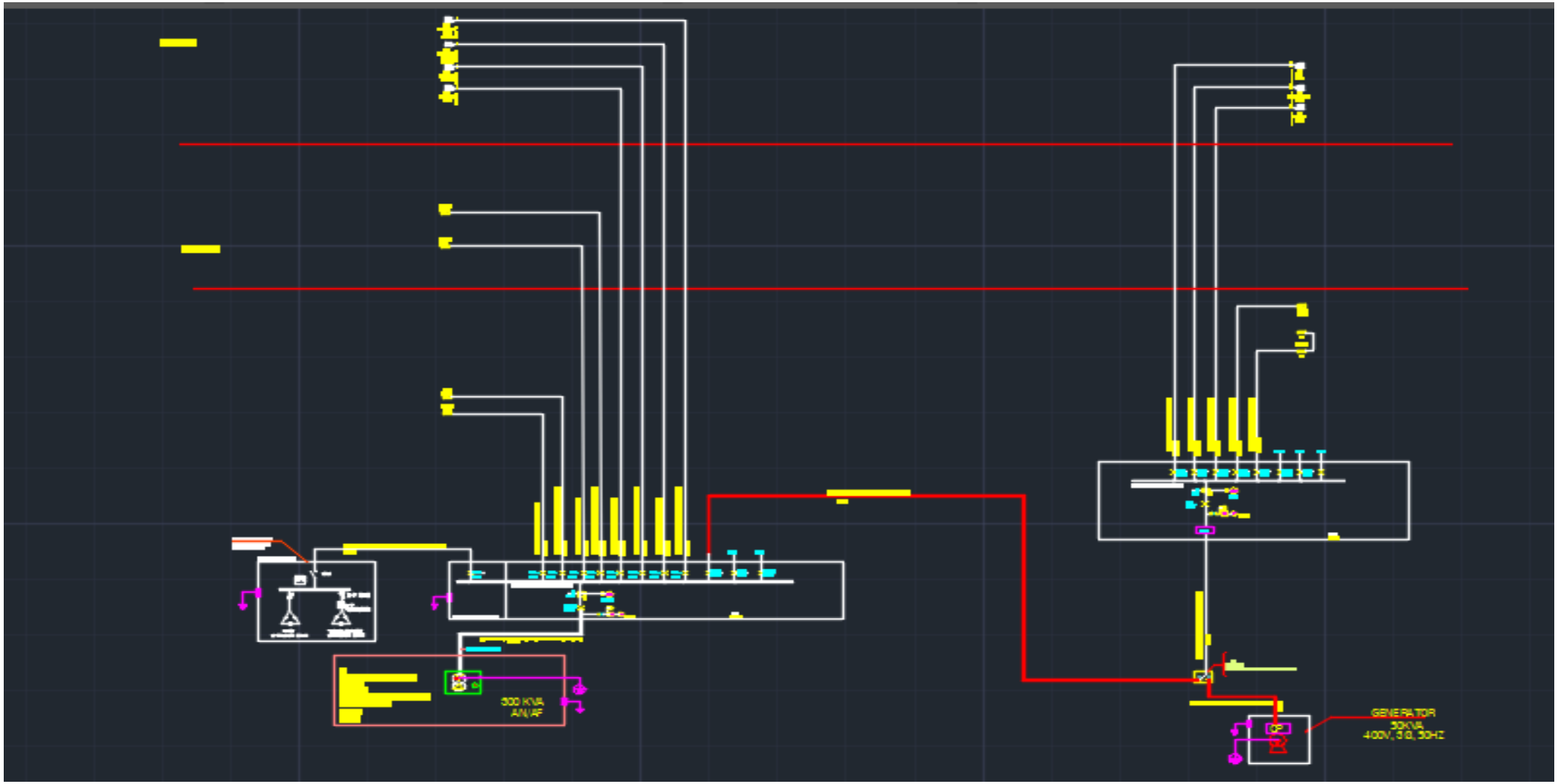
1	MCC-RF02			VD upstream %		0.72%		Short circuit level :		8			DF :	0.80	TCL (KVA) :	77.0	TDL (KVA):	61.60			
2	MDB							Temp.→	40												
3	To	FEEDER REF	LOAD KVA	LOAD TYPE 1PH OR 3PH	Ib	CB			Cable										VD Check		
4									Installation Method	De-rating correction factors					Calculated Iz	Cable size (mm2)	Iz	No Of Cables	Cable Length (m)	MV/A/M	V.D %	Total voltage drop
5						IN	AT	CB TYPE		Ambient Temprature	Grouping factor	Ground temperature	Burried Depth	Soil resistivity							
6	VRVU-01		8.5	Three_Phase	12.92	16.2	20	MCCB	Free Air	0.85	0.85	1	1	1	17.88	4x4 mm² XLPE/PVC/CU	32.51	1	8	7.731	0.21%	0.93%
7	VRVU-02		8.5	Three_Phase	12.92	16.2	20	MCCB	Free Air	0.85	0.85	1	1	1	17.88	4x4 mm² XLPE/PVC/CU	32.51	1	9.5	7.731	0.25%	0.97%
8	VRVU-03		8.5	Three_Phase	12.92	16.2	20	MCCB	Free Air	0.85	0.85	1	1	1	17.88	4x4 mm² XLPE/PVC/CU	32.51	1	11	7.731	0.29%	1.01%
9	VRVU-04		18.0	Three_Phase	27.36	34.2	40	MCCB	Free Air	0.85	0.85	1	1	1	37.87	4x10 mm² XLPE/PVC/CU	54.19	1	12.5	3.094	0.28%	1.00%
10	VRVU-05		8.5	Three_Phase	12.92	16.2	20	MCCB	Free Air	0.85	0.85	1	1	1	17.88	4x4 mm² XLPE/PVC/CU	32.51	1	14	7.731	0.37%	1.09%
11	VRVU-06		18.0	Three_Phase	27.36	34.2	40	MCCB	Free Air	0.85	0.85	1	1	1	37.87	4x10 mm² XLPE/PVC/CU	54.19	1	16.5	3.094	0.37%	1.09%
12	VRVU-07		7.0	Three_Phase	10.64	13.3	16	MCCB	Free Air	0.85	0.85	1	1	1	14.73	4x4 mm² XLPE/PVC/CU	32.51	1	18	7.731	0.39%	1.11%
26	Demand load		61.6		93.63	117.0	125														

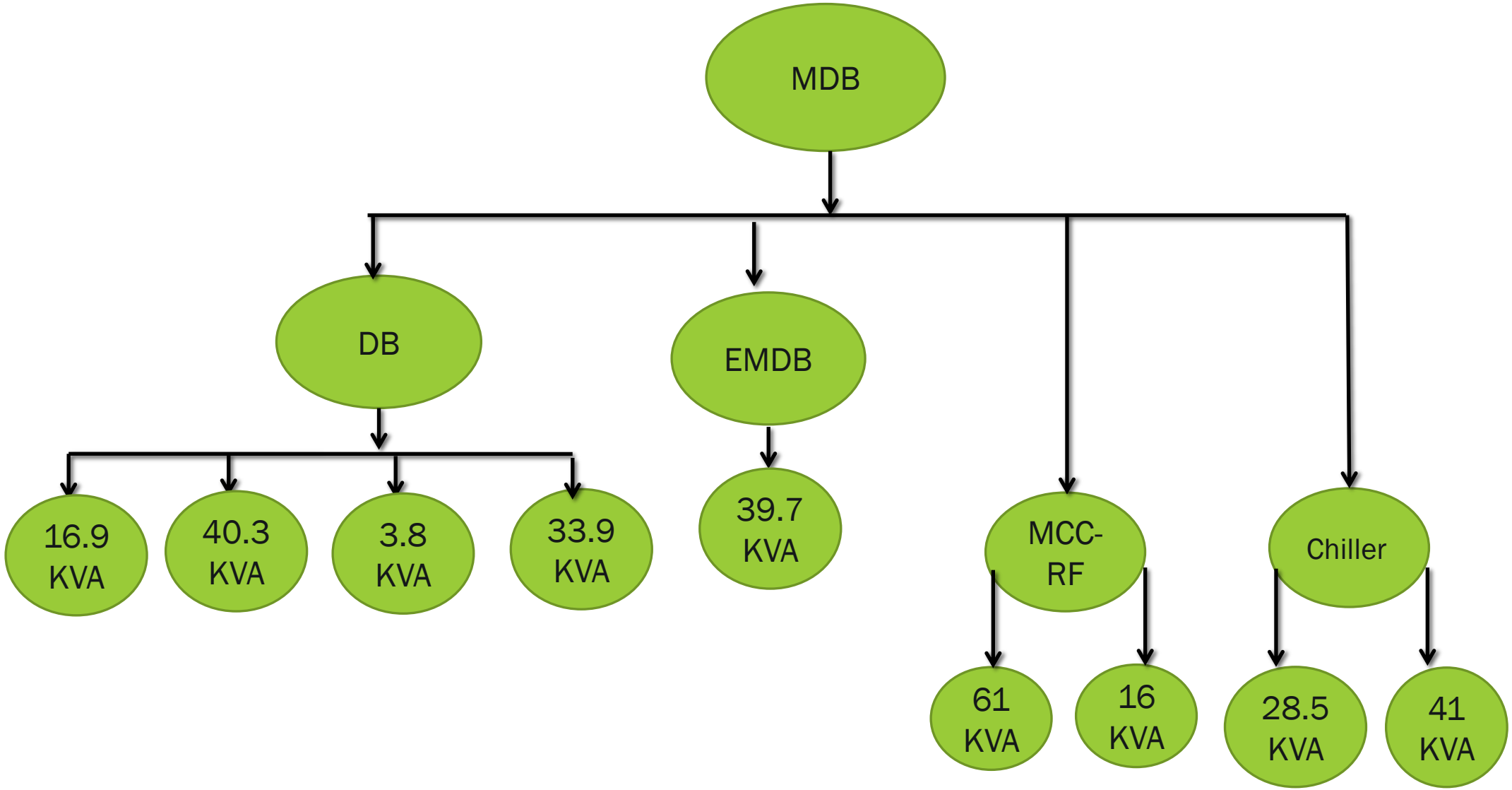
CABLE SIZING

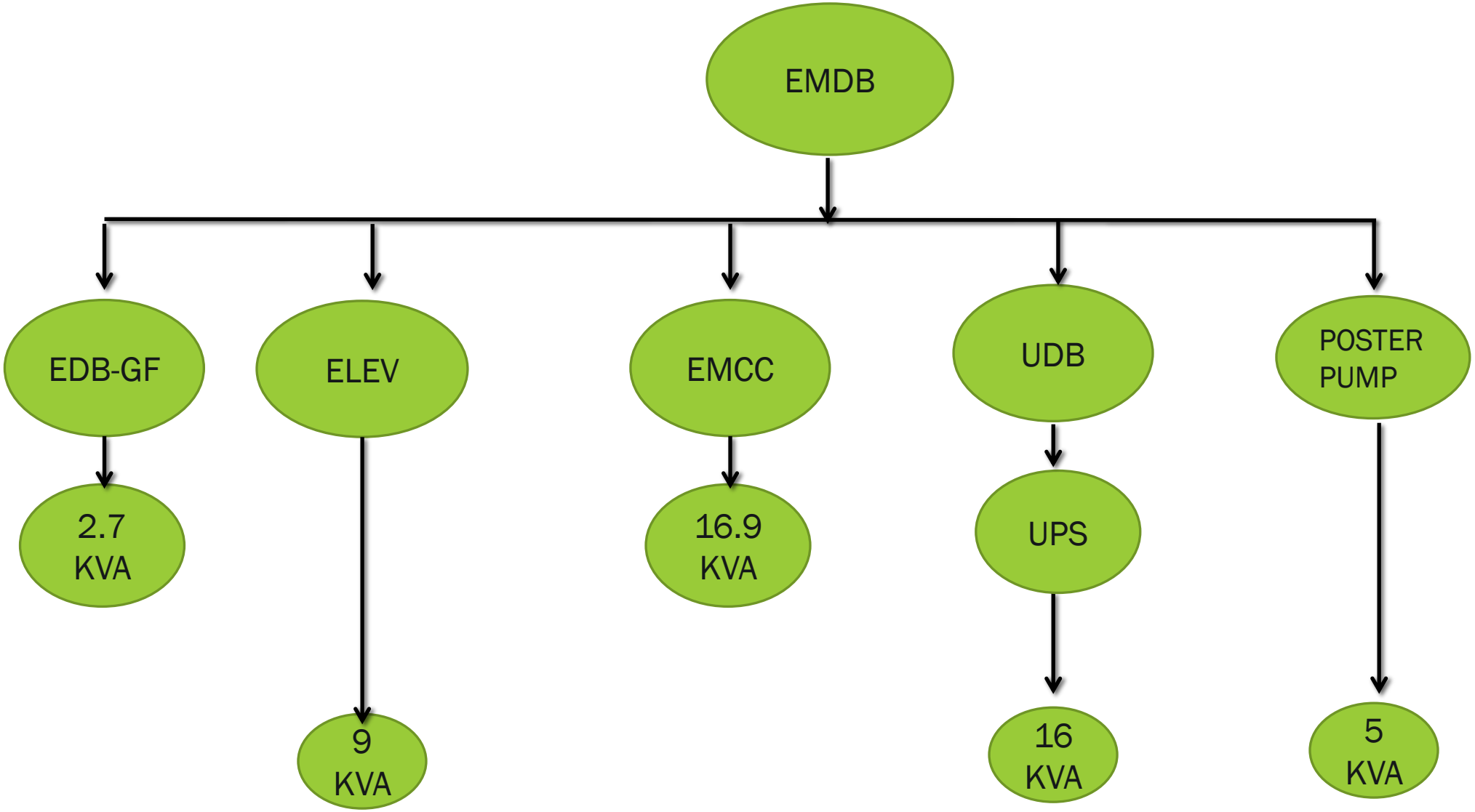
-Emergency Distribution Panel - EMDB

1	Panel name :	EMDB			VD upstream %		0.57%	Short circuit level :		8			DF :	0.80	TCL (KVA) :	49.6	TDL (KVA):	39		
2	Fed from :	MDB AND GEN							Temp.→	40										
3								CB				Cable								
4	S/N	From	To	FEEDER REF	LOAD KVA	LOAD TYPE 1PH OR 3PH	Ib				Installation Method	De-rating correction factors					Calculated Iz	Cable size (mm2)	Iz	No Of Cables	Cable Length (m)
5								IN	AT	CB TYPE		Ambient Temprature	Grouping factor	Ground temperature	Burried Depth	Soil resistivity					
6	1	EMDB	POSTER PUMP		5.0	Three_Phase	7.60	9.5	16	MCCB	Free Air	0.85	0.88	1	1	1	10.16	4x4 mm² XLPE/PVC/CU	33.66	1	22
7	2	EMDB	ELEVATOR		9.0	Three_Phase	13.68	17.1	20	MCCB	Free Air	0.85	0.88	1	1	1	18.29	4x4 mm² XLPE/PVC/CU	33.66	1	22
8	3	EMDB	EMCC		16.9	Three_Phase	25.75	32.2	40	MCCB	Free Air	0.85	0.88	1	1	1	34.42	4x6 mm² XLPE/PVC/CU	41.14	1	22
9	4	EMDB	EDB-GF		2.7	Three_Phase	4.10	5.1	16	MCCB	Free Air	0.85	0.88	1	1	1	5.49	4x4 mm² XLPE/PVC/CU	33.66	1	15
10	5	EMDB	UDB		16.0	Three_Phase	24.32	30.4	32	MCCB	Free Air	0.85	0.88	1	1	1	32.51	4x6 mm² XLPE/PVC/CU	41.14	1	15
26	Total Demand load				39.712		60.36	75.5	80												

Bulk Equipment (SLD)




MDB
DB
EMDB
MCC-RF
Chiller
16.9 KVA
40.3 KVA
3.8 KVA
33.9 KVA
39.7 KVA
61 KVA
16 KVA
28.5 KVA
41 KVA


EMDB
EDB-GF
ELEV
EMCC
UDB
POSTER PUMP
2.7 KVA
9 KVA
16.9 KVA
UPS
16 KVA
5 KVA

Bulk Equipment

Fed from :		TRANS		
S/N	From	To	LOAD KVA	LOAD TYPE 1PH OR 3PH
1	MDB	MCC-RF01	61.6	Three_Phase
2	MDB	MCC-RF02	16.0	Three_Phase
3	MDB	EMDB	39.7	Three_Phase
4	MDB	CHLLLER-01	41.0	Three_Phase
5	MDB	CHLLLER-02	28.5	Three_Phase
6	MDB	DBP-GF	33.938	Three_Phase
7	MDB	DB-GF	3.8	Three_Phase
8	MDB	DBP-FF	40.3	Three_Phase
9	MDB	DB-FF	16.9	Three_Phase
Total Demand load			225.36	

Transformer=300KVA

S/N	From	To	FEEDER REF	LOAD KVA	LOAD TYPE 1PH OR 3PH
1	EMDB	POSTER PUMP		5.0	Three_Phase
2	EMDB	ELEVATOR		9.0	Three_Phase
3	EMDB	EMCC		16.9	Three_Phase
4	EMDB	EDB-GF		2.7	Three_Phase
5	EMDB	UDB		16.0	Three_Phase
Total Demand load				39.712	

Generator

CUMMINS Recommended GEN

Recommended Generator Report - C110D5

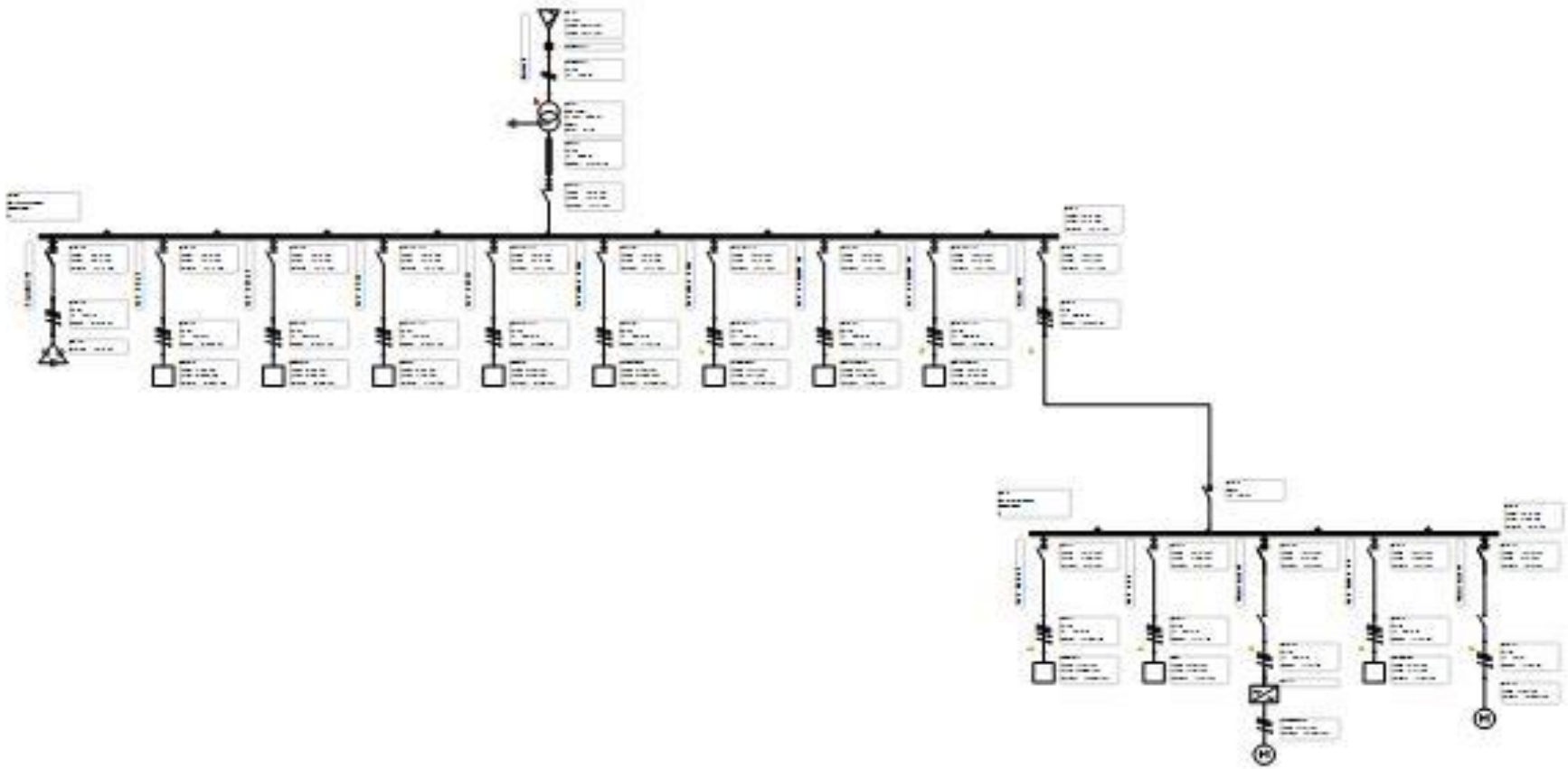
Project - E33 EDU GRADUTION

Comments -

Project Requirements			
Frequency, Hz	: 50.0	**Generators Running in Parallel**	: 1
Duty	: Standby	**Site Altitude, ft(m)**	: 361(110)
Voltage	: 230/400, Series Wye	**Site Temperature, °C**	: 40
Phase	: 3	**Max. Altr Temp Rise, °C**	: 125
Fuel	: Diesel	**Project Voltage Distortion Limit, %**	:
Emissions	: No Preference		

Calculated Individual Generator Set Load Running and Peak Requirements					
Running kW	: 40.2	**Max. Step kW**	: 55.4 In Step 3	**Cumulative Step kW**	: 83.4
Running kVA	: 49.2	**Max. Step kVA**	: 97.8 In Step 3	**Cumulative Step kVA**	: 132.8
Running PF	: 0.82	**Peak kW**	: None	**Cumulative Peak kW**	: None
Running NLL kVA	: 0.0	**Peak kVA**	: None	**Cumulative Peak kVA**	: None
Alternator kW	: 40.25			**Pct Rated Capacity**	: 45.8

Ecodial calculation



Light Current Systems

Data & Telephone

cctv

Light Current Systems

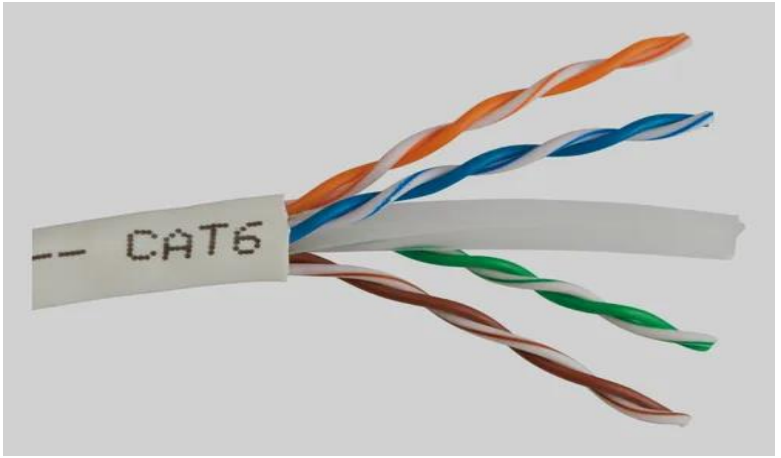
Fire Alarm

Access Control

Data System

Components:

- **Passive Components**:
  - **Data Socket**
  - **Patch Panel**
  - **Cables**
  - **Cable Organizer**
  - **Power Distribution Unit**
  - **Rack**



A metallic box to put the device inside and its height in units (1U=4.44cm), availed in

16-18-22-26-32-36-48 U.

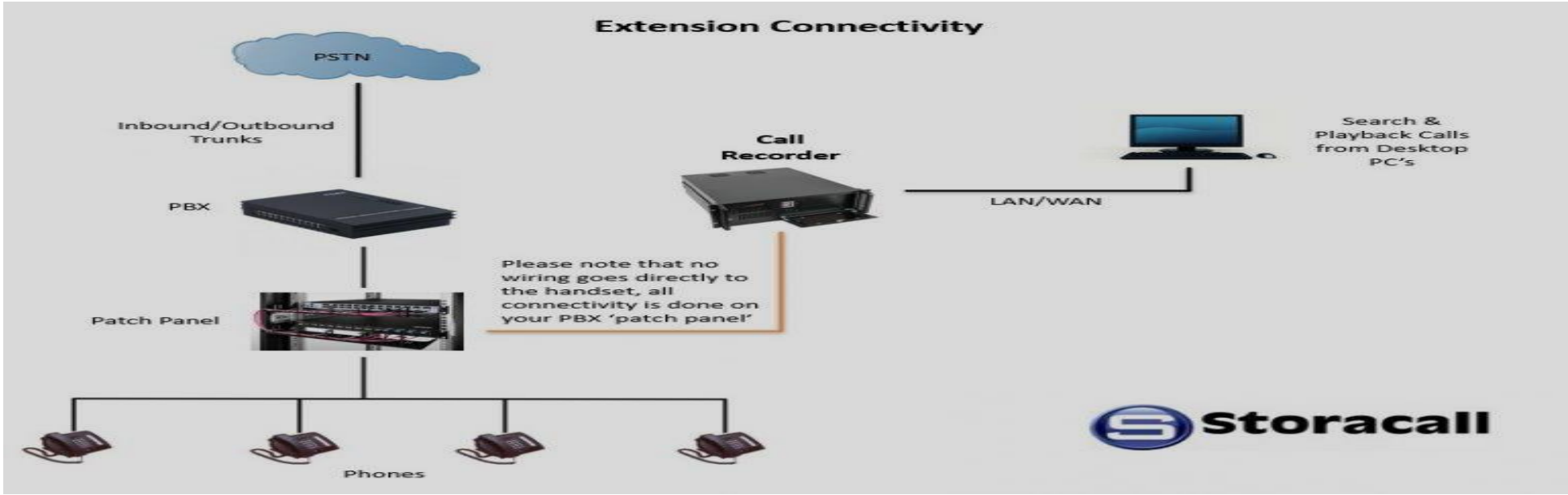
Data System

Components:

- **Active Components**:
  - **Switch**
  - **Core Switch**
  - **Router**
  - **Server**
  - **Fire wall**

Telephone System

- Internal telephone network aims to connect the company telephones together to call each other easily.



Telephone System

Components:

- **Passive Components**:
  - **IP Telephone**
  - **Telephone Outlet**
  - **Patch Panel**
  - **Cables**

Telephone System

Components:

- **Active Components**:
  - **IP-PBX**
  - **Switch**
  - **Router**

Data & Telephone System

Design:

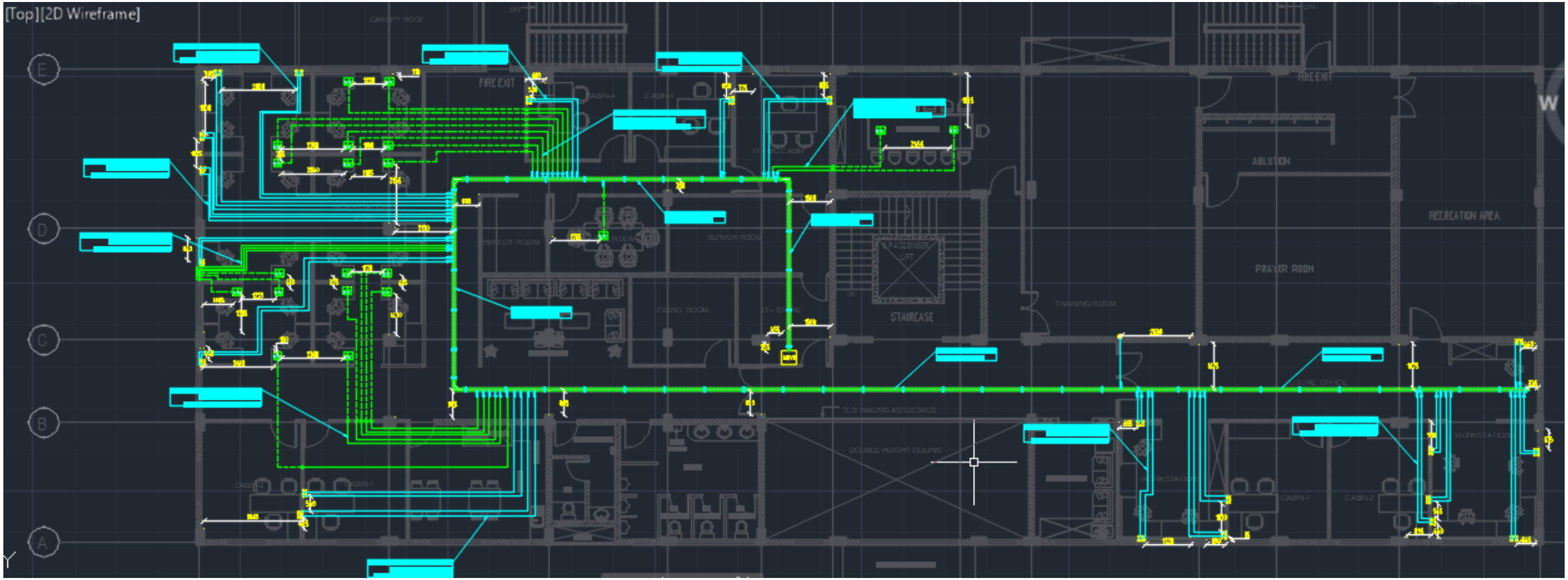
DATA & TEL & MATV	
	TELEPHONE SOCKET (RJ45) – CAT.6 , AT 0.3 METER HEIGHT
	DATA SOCKET (RJ45) – CAT.6 , AT 0.3 METER HEIGHT
	TELEPHONE SOCKET (RJ45) – CAT.6 , AT 1.2 METER HEIGHT
	TV SOCKET (RJ45) – CAT.6
	GROMMET BOX WITH 1NO. 16A/220V DUPLEX SOCKET OUTLET, 1NO. SINGLE TELEPHONE OUTLET AND 1NO. DATA OUTLET. COMPLETE WITH FLEXIABLE CONDUIT FOR INTERFACING BETWEEN GROMMET AND FURNITURE CABLE MANGEMENT IT BOX USED 25 MM2 CONDUIT FLOOR OR WALL MOUNTED
MDVR	Main Data Rack

Data & Telephone System

Design:

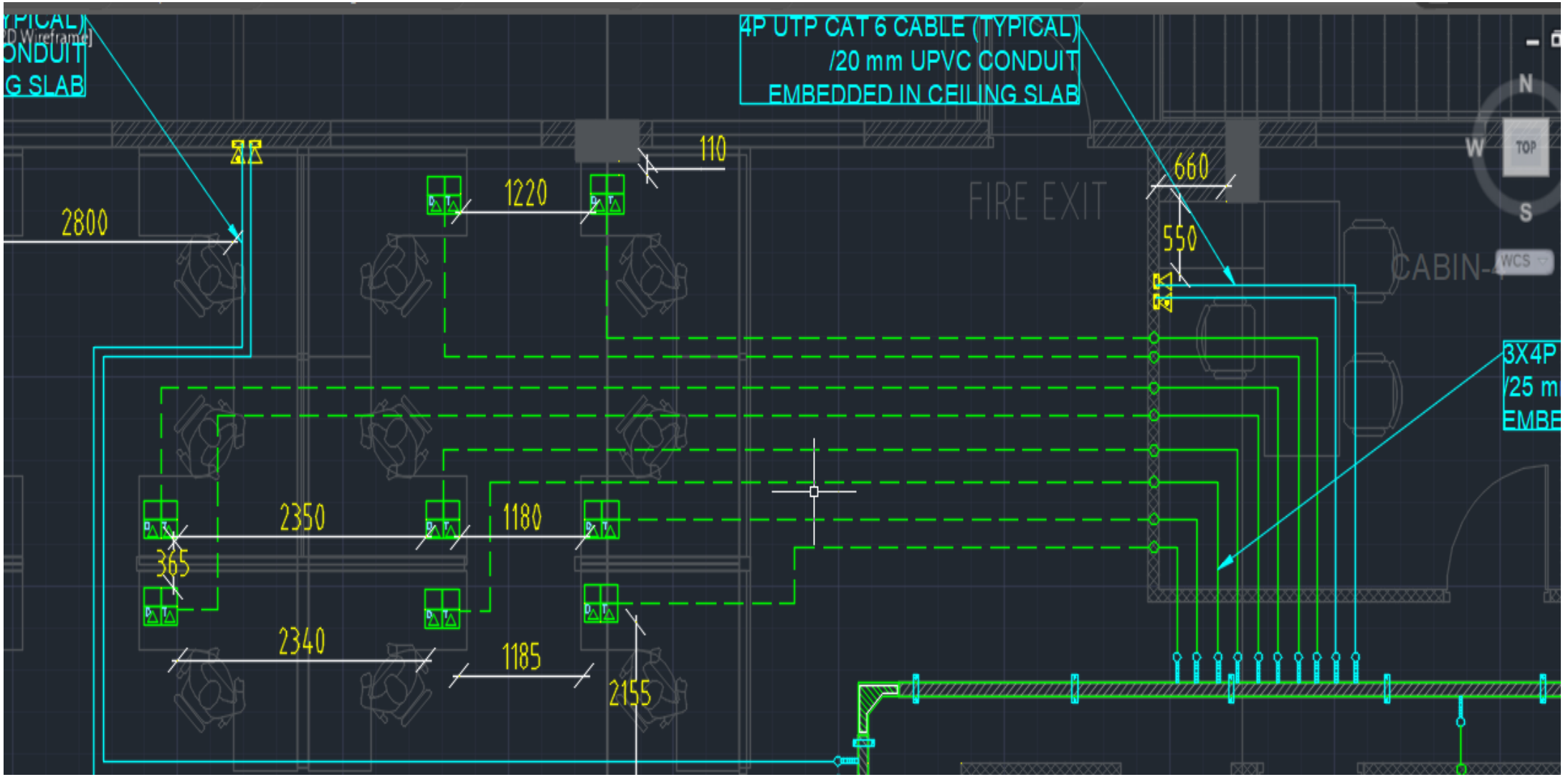
Data & Telephone System

Design (Shop Drawing):



Data & Telephone System

Design:



CCTV System

- **Why CCTV system :**
  - CCTV system is mainly used to ensure safety and security by monitoring entrance, lobbies and corridors to record every visitor and worker passing through entrance.
  - Avoid any undesired situation.

CCTV System

Components:

- Camera
- POE Switch
- NVR
- Storage
- Monitor

CCTV System

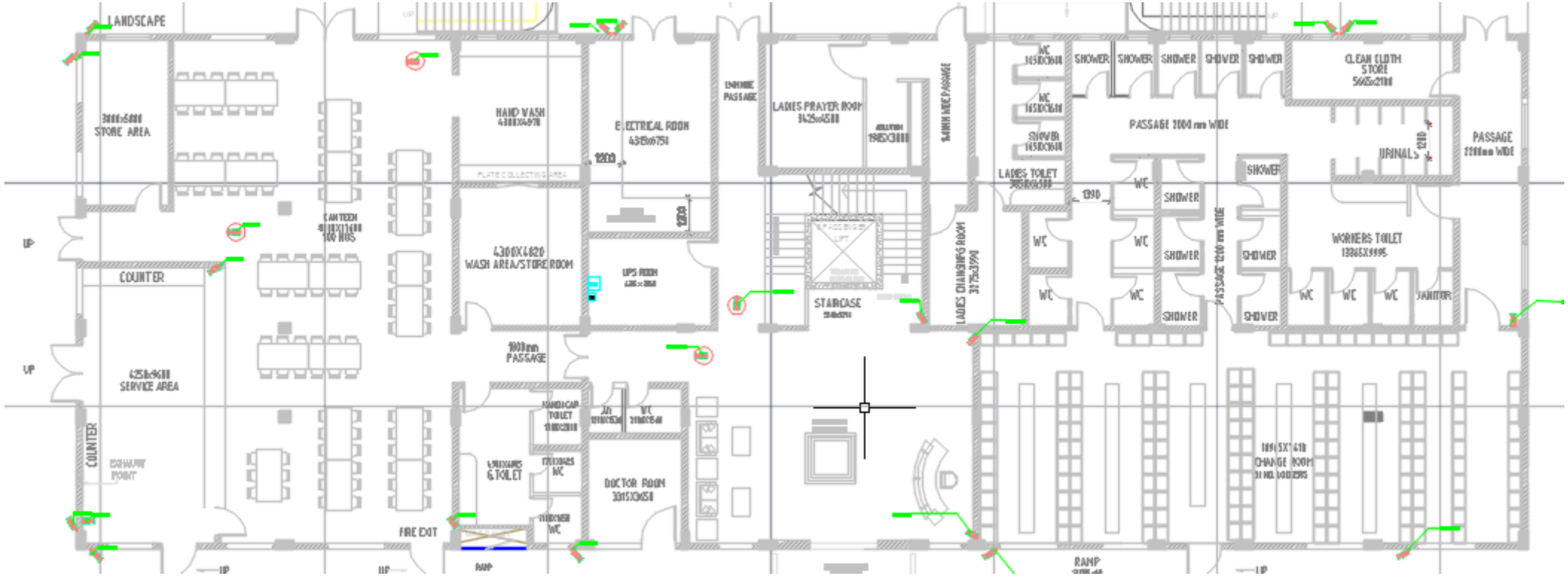
Design:

Legend:

CCTV SYSTEM		
TYPE	SYMBOLS	DESCRIPTION
1	CCTV	CCTV CONSOLE & MONITOR EQUIPMENT
2	NVR	NETWORK VIDEO RECORDER,POE
3	SWITCH	POE SWITCH
4		INDOOR DOME CAMERA CEILING MOUNTED, 2MP VARIIFOCAL LENGTH LENS AND INFERA RED RAYS.
5		OUTDOOR BULLET CAMERA WALL MOUNTED, 5MP IP67, VARIIFOCAL LENGTH LENS AND INFERA RED RAYS.

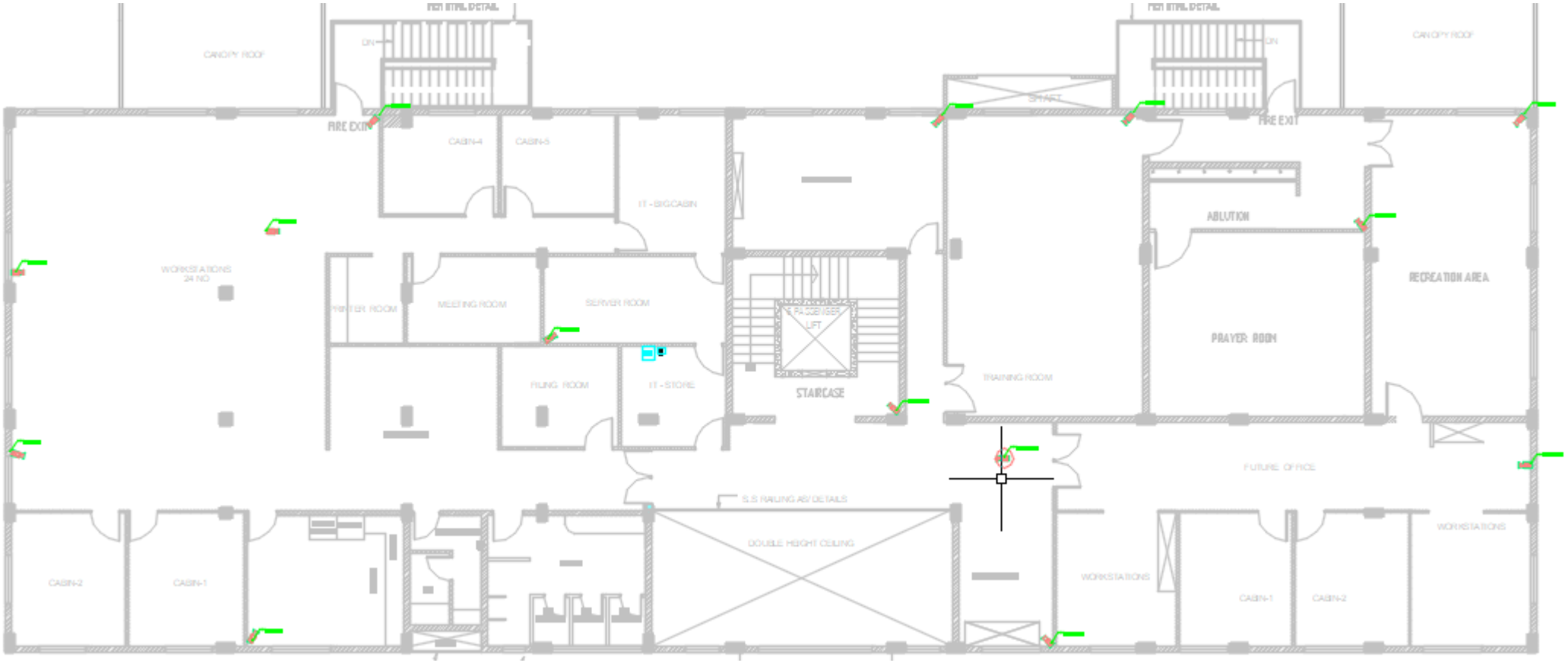
CCTV System

Design:



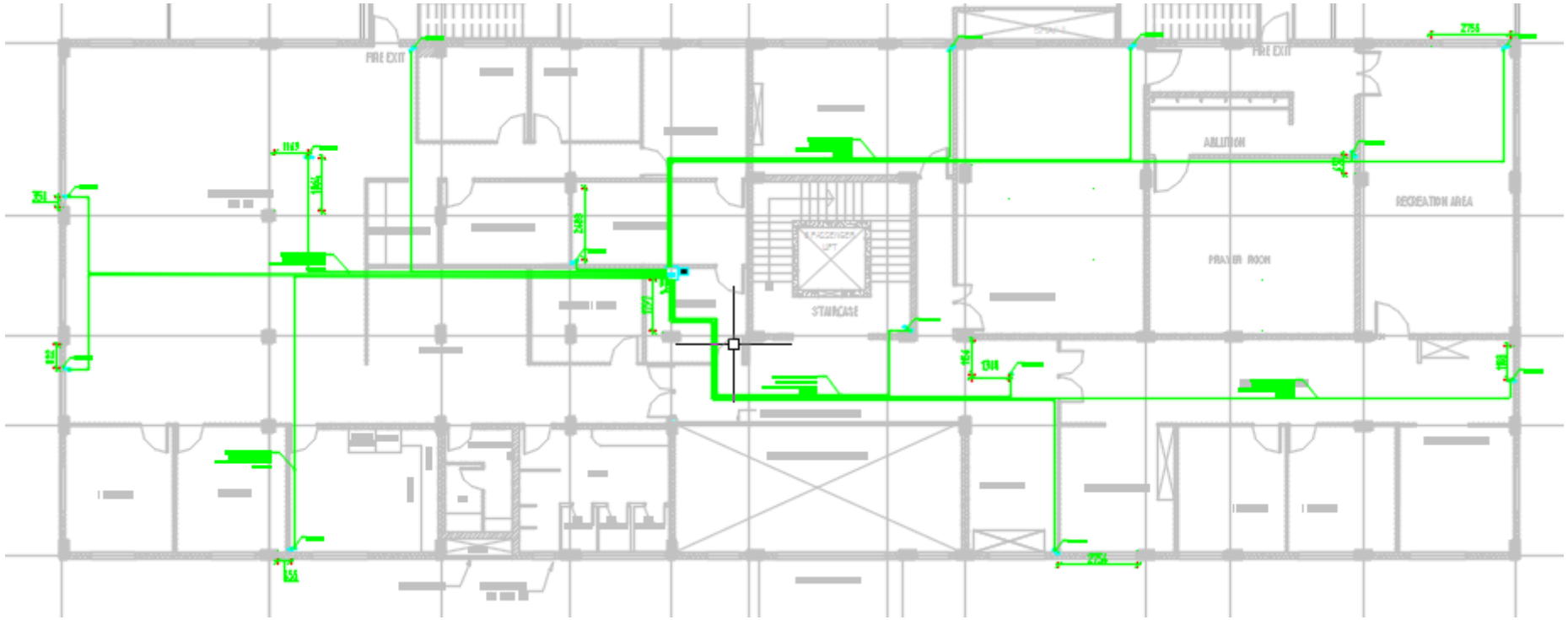
CCTV System

Design:



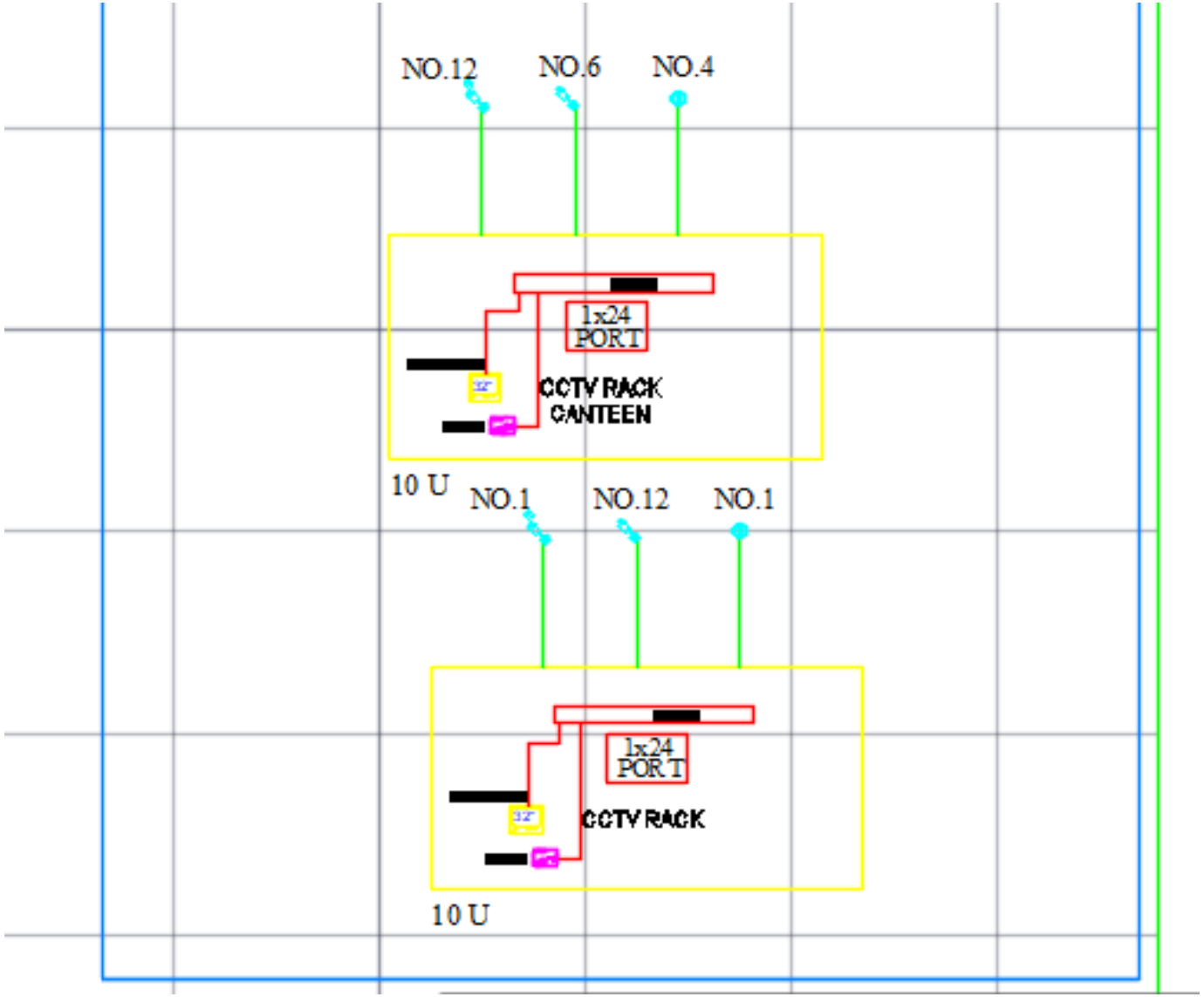
CCTV System

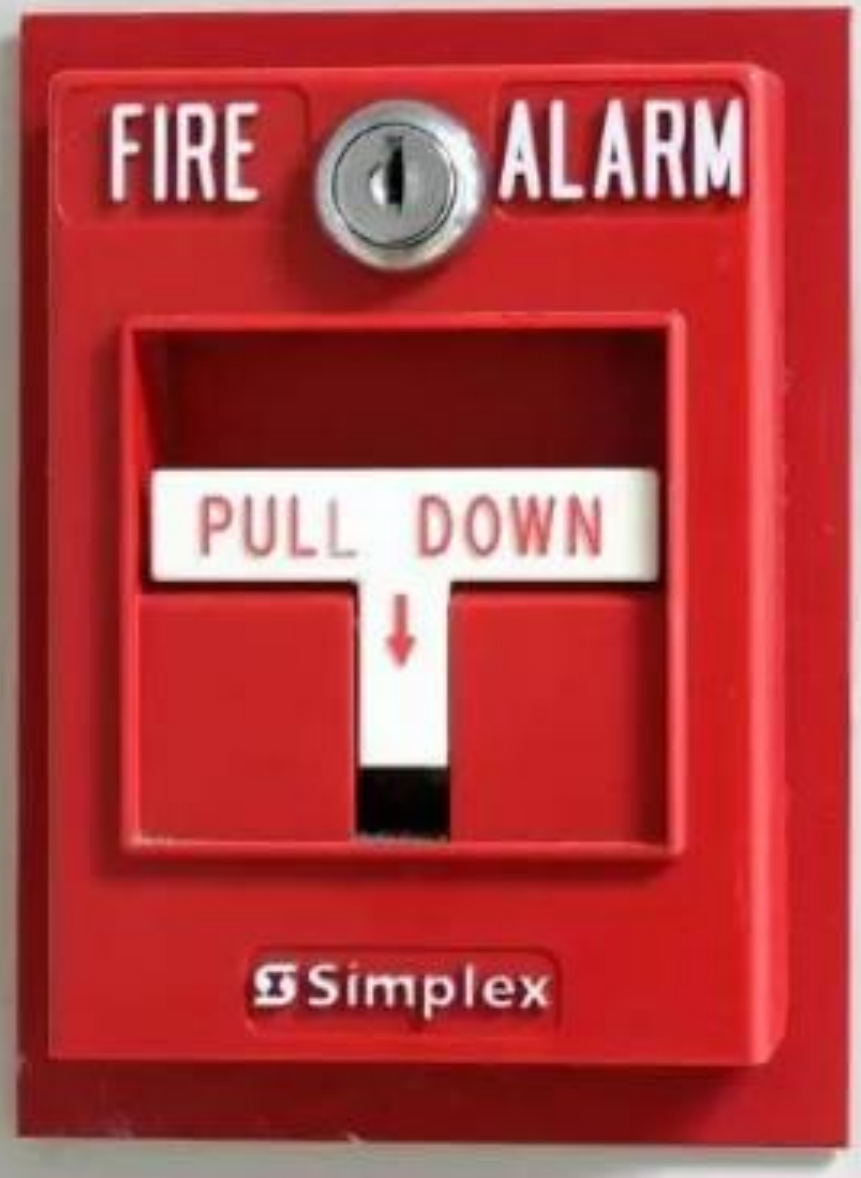
Design(shop drawing):



CCTV System

Design (SLD):





Fire Alarm System

Fire Alarm System

Why have a Fire Alarm System?

- A fire alarm system is intended to enable a fire to be detected at a sufficiently early stage so that people who are at risk can be made safe either by escaping from the fire, or by the fire being extinguished (also to prevent extensive property damage).

Fire Alarm System

Design:

Standards:

- NFPA72 : National Fire Protection Association

- BS 5839 : British Standards

- Egyptian Fire Protection Association

Fire Alarm System

Components:

Inputs :

1) Smoke Detector.
2) Heat Detector.
3) Multi-Detector.
4) Gas Detector.
5) Manual Station.

Fire Alarm System

Components:
Outputs :

1) Strobe Light.
2) Horn.
3) Control Module.
4) Monitor Module.

Fire Alarm System

Design:

Legend:

FIRE ALARM	
	ADDRESSABLE MULTI DETECTOR
	ADDRESSABLE SMOKE DETECTOR
	ADDRESSABLE HEAT DETECTOR
	ADDRESSABLE ELECTRONIC SOUNDER WITH STROBE – WP 2.5M HIGHT
	ADDRESSABLE MANUAL CALL POINT 1.5M HIGHT
FACP	ADDRESSABLE FIRE ALARM CONTROL PANEL
	Control Module
	Monitor Module
----------	2X2.5mm2 DC LINE FIRE RETARDANT CABLE(105s)
————	2X1.5mm2 LOOP LINE FIRE RETARDANT CABLE(105s)

Fire Alarm System

Design:

Making the Drawings CAD:

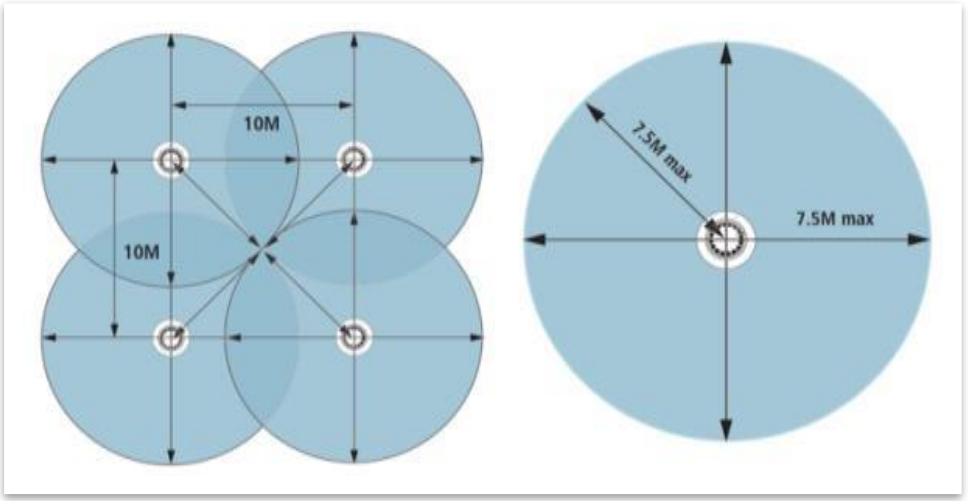
Smoke Detectors

EGY Code

٣-١-٥-٩ تركيب كواشف الدخان الموضعية تحت الأسقف الأفقية المستوية:

(أ) بالنسبة للأسقف الأفقية للأماكن غير المعرضة للتيارات الهوائية يجب ألا تزيد المسافة البينية عن ٩متر، ولا تزيد المسافة الأفقية بين أى نقطة فى المساحة المحمية وبين أقرب كاشف عن ٧,٥٠ متر ، وفى جميع الأحوال يجب الرجوع إلى تعليمات الجهة الصانعة.

(ب) بالنسبة لتركيب الكواشف فى الممرات التى يقل عرضها عن ٥ متر ، فيسمح بزيادة المسافة الأفقية المشار إليها فى الفقرة السابقة بمقدار نصف الفرق بين ٥ متر وبين عرض الممر. وعلى سبيل المثال إذا كان عرض الممر ٣ متر فيمكن زيادة المسافة المشار إليها بمقدار متر واحد ، أما الممرات التى يزيد عرضها عن ٥ متر فلا ينطبق عليها هذا السماح.



Fire Alarm System

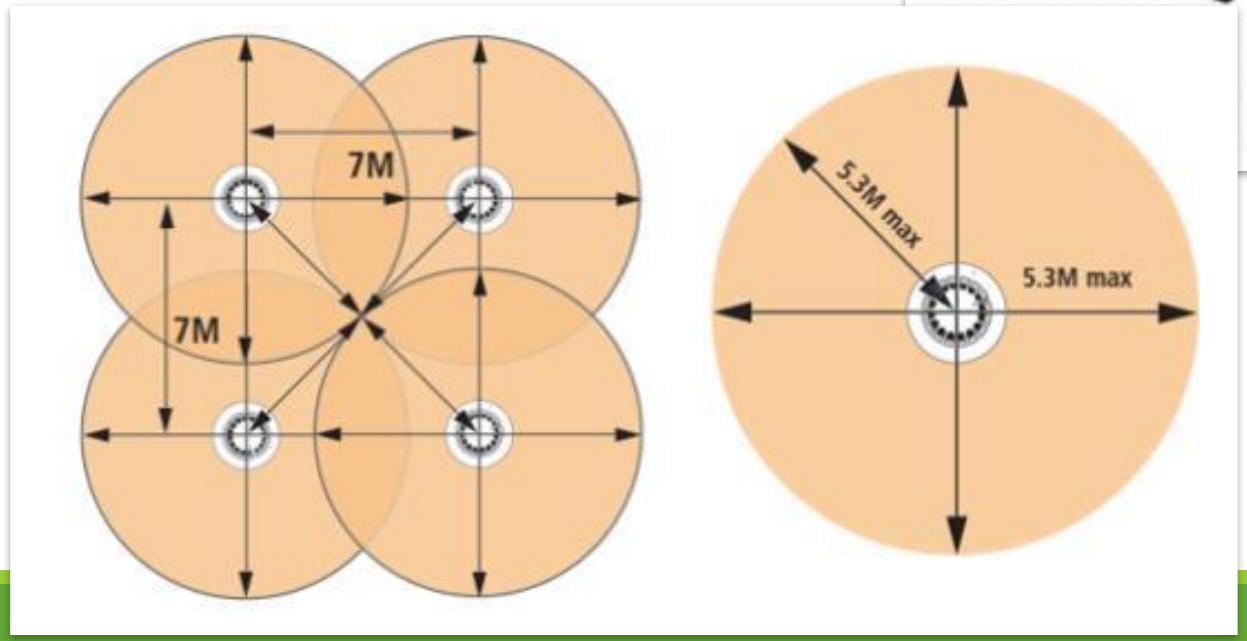
Design:

Making the Drawings CAD:

Heat Detectors

EGY Code

(أ) يجب ألا تزيد المسافة البينية لكواشف الحرارة الموضعية عن ٧ متر ، ولا تزيد المسافة الأفقية بين أى نقطة فى المساحة المحمية وبين أقرب كاشف عن ٥,٣ متر، وفى جميع الأحوال يجب الرجوع إلى تعليمات الجهة الصانعة.



Fire Alarm System

Design:

EGY Code

٣-٣-٥-٣ إذا تم تركيب اللوحة الرئيسية فى منطقة ليس بـــها أفـــراد للمراقبـــة فيجب تركيب لوحة تكرارية متصلة باللوحة الرئيسية ومجهزة بوسيلة مسموعة ومرئية للإنذار عن الحريق وعن الأعطال ، وذلك فى مكـــان آخر يمكن مراقبتها فيه بصفة دائمة.

EGY Code

٣-٢-٢-٣ يجب أن تركب الأزرار فى مسالك الـــهروب بالمســـارات الموصلـــة للمخارج والردهات المؤدية للسلالم عند كل طابق وكذلـــك فـــى منـــافذ صرف المخارج.

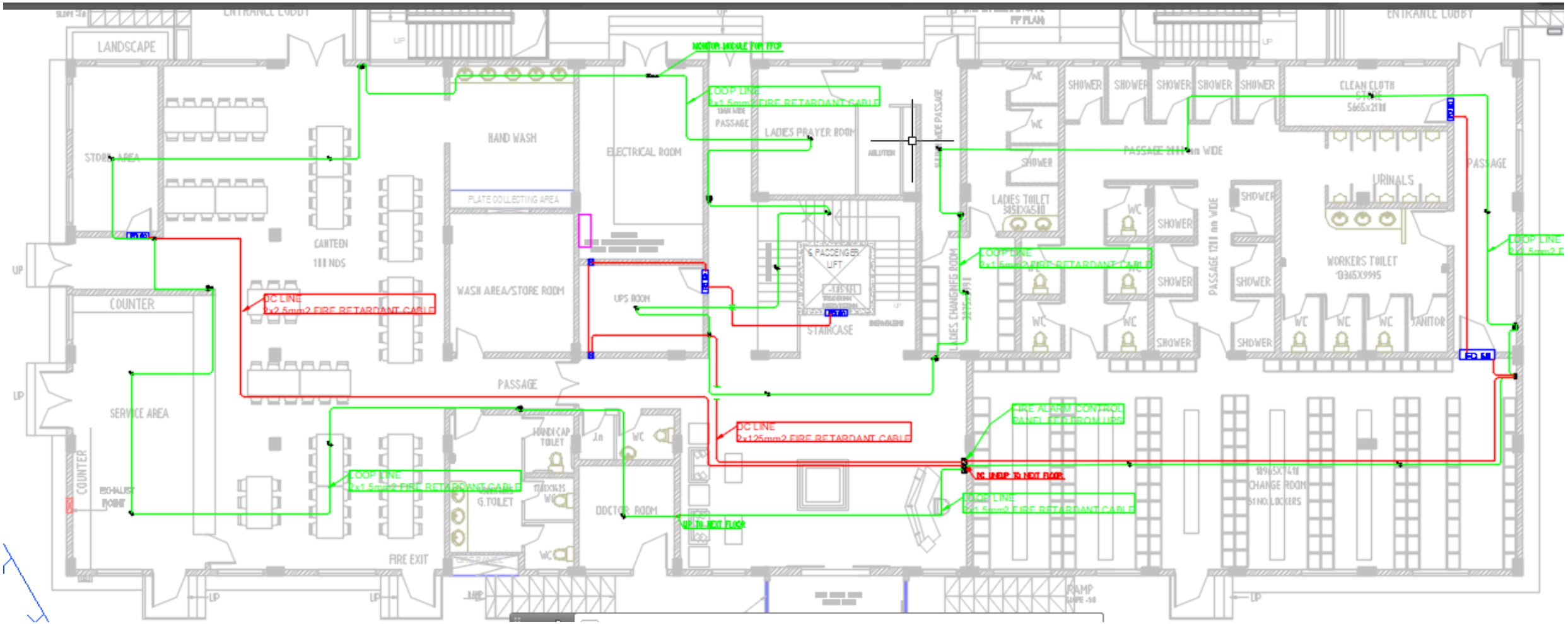
٣-٢-٢-٤ تحدد مسافة الارتحال لأقرب زرار إنذار يدوى طبقاً لظروف الموقـــع وحالة شاغليه وبشرط ألا تزيد عن ٣٠ متر.

٣-٢-٢-٥ يجب أن تكون أزرار الإنذار مركبة على ارتفاع لا يقل عن ١,١٠ متر ولا يزيد عن ١,٤٠ متر من الأرضية فى مكان يسهل الوصـــول إليـــه وتتوافر فيه الإضاءة الكافية وتكون مميزة عن لون الحـــائط المركبـــة عليه.

يجب ألا يقل ارتفاع جهاز الإنذار الصوتـــى عـــن ٢,٣٠ مـــتر مـــن الأرضية.

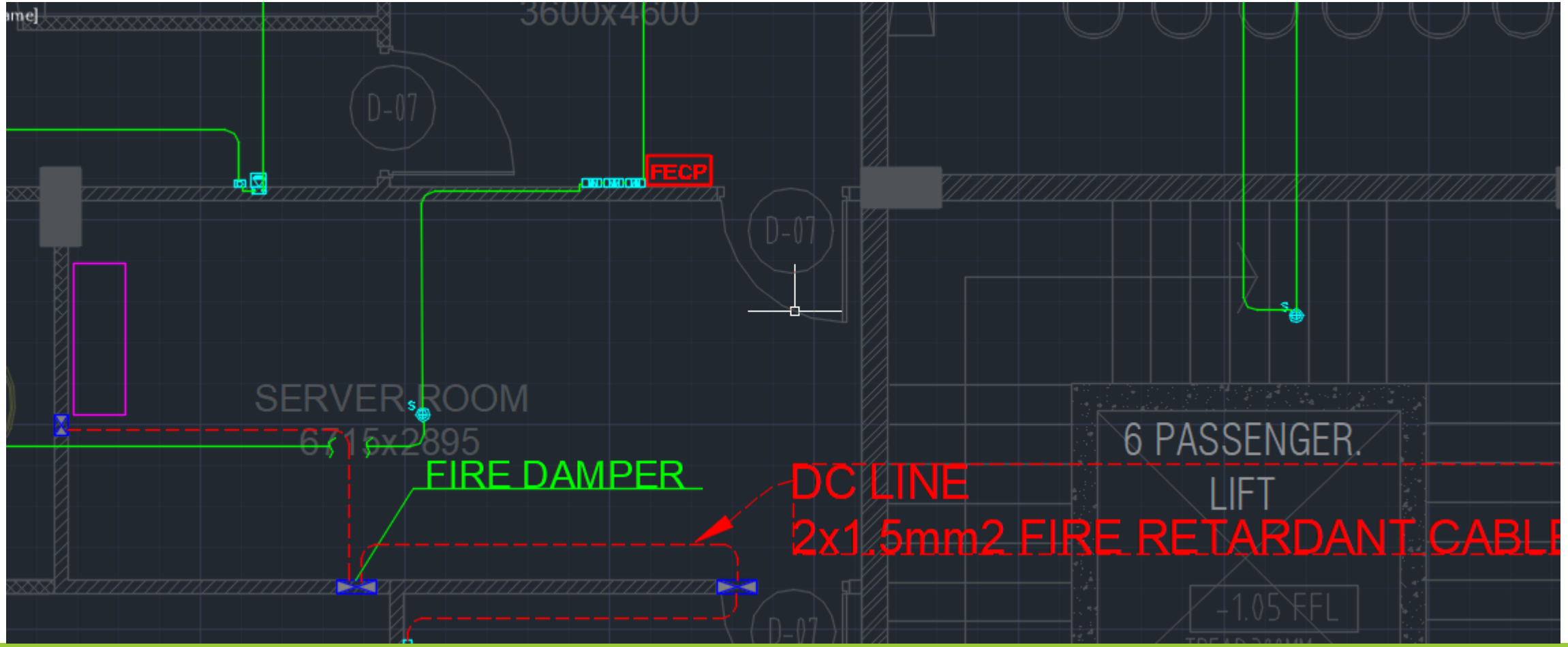
Fire Alarm System

Design:



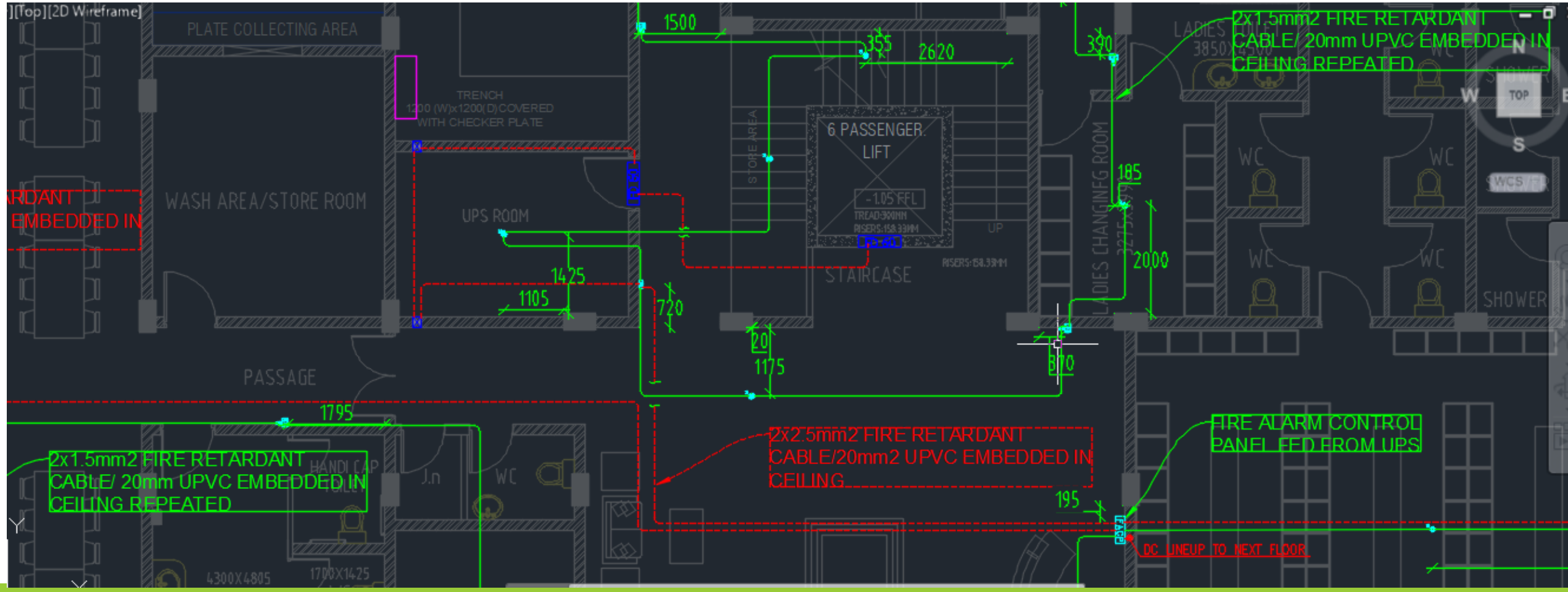
Fire Alarm System

Design:



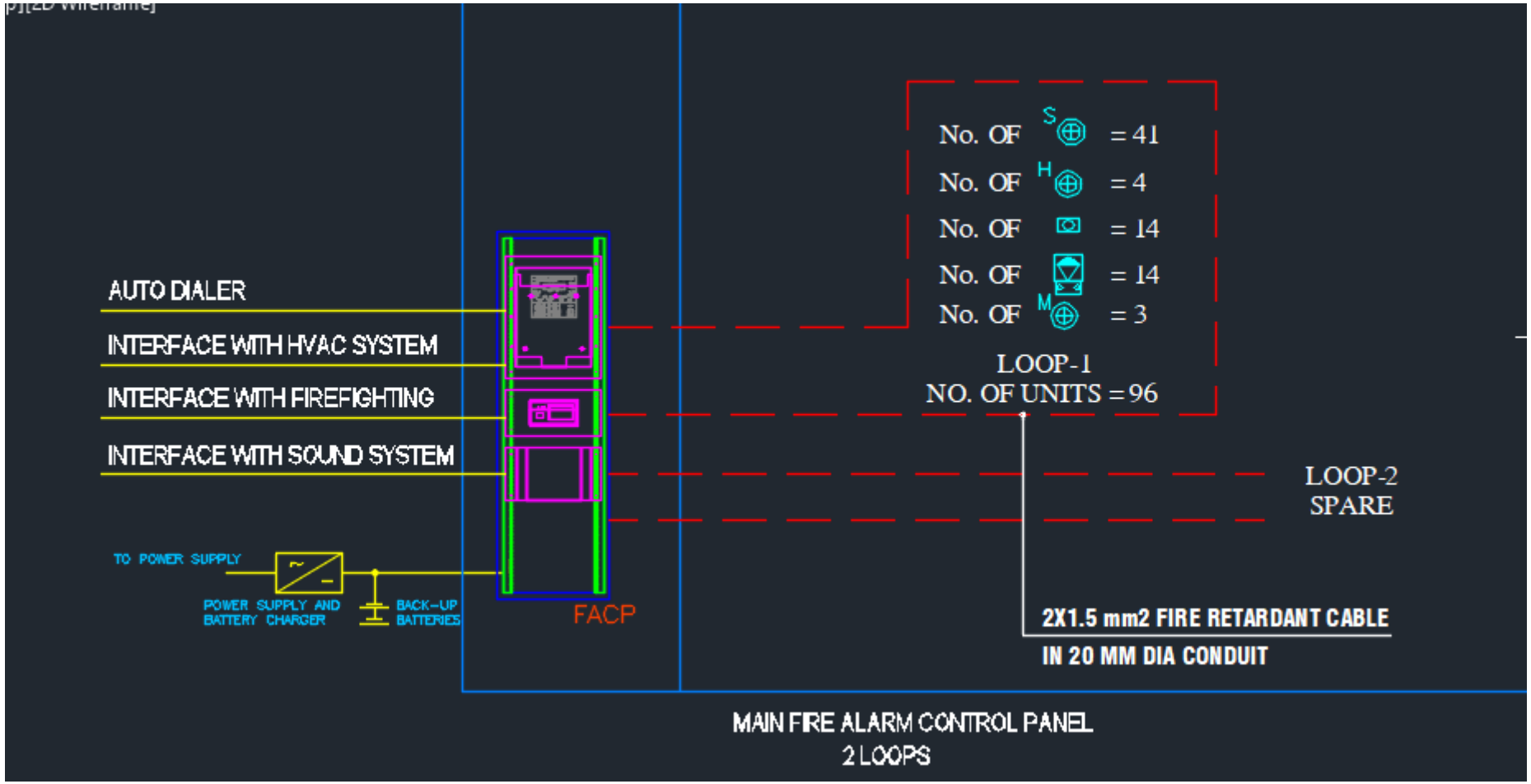
Fire Alarm System

Design(Shop Drawing):



Fire Alarm System

Design(SLD):



Fire Alarm System

Design:

Fire Alarm Cables

EGY Code

٣-٦-٢-٢ يجب أن تكون الأسلاك نحاسية ومن الأنواع المناسبة للغرض ، كما يجب توفير الحماية لها بإدخالها داخل مجارى أو مواسير إذا كانت معرضة لعوامل التلف الميكانيكى كالصدمات أو الاحتكاك أو إذا كانت من الأنواع غير المغلفة (أى إذا كانت أسلاك وليست كابلات) أو إذا كان ارتفاعها عن الأرضية يقل عن ٢,٤ متر أو إذا كانت ممتدة بأماكن غير ظاهرة.

٣-٦-٢-٣ إذا كانت التوصيلات ممتدة داخل مواسير خارج الحائط فيجب أن تكون المواسير مثبتة جيداً بالحائط.

٣-٦-٢-٤ يجب اختيار قطاعات الأسلاك بحيث لا تسبب انخفاضاً فى الجهد يؤثر على كفاءة عمل الأجهزة.

٣-٦-٢-٥ لا يجوز إدخال الأسلاك التى تقل مساحة مقطعها عن ١مم٢ داخل مواسير.

Fire Alarm System

Supplier Catalogue

Design:

Fire Alarm Cables

For Loop (2*2.5 mm2 – Fire Resistant Cable)
For Zone (2*1.5 mm2 – Fire Resistant Cable)

Fire Alarm Stranded

Stranded Fire Alarm Cables 500 V
Multi-Core cables to BS EN 50288-7

Cable Description

Conductor	Plain annealed stranded copper
Core Insulation	PVC (Polyvinyl chloride) 105°C
Color coding	Two Cores : Red, Black Three Cores : Red, Yellow, Blue Four Cores : Red, Yellow, Blue, Black
Assembly	Cores twisted together to form round cable.
Outer Sheath	PVC (Polyvinyl chloride)
Cable Marking	= EL SEWEDY CABLES = , Size , Cable short description , Voltage , manufacturing year , meter marking

Application

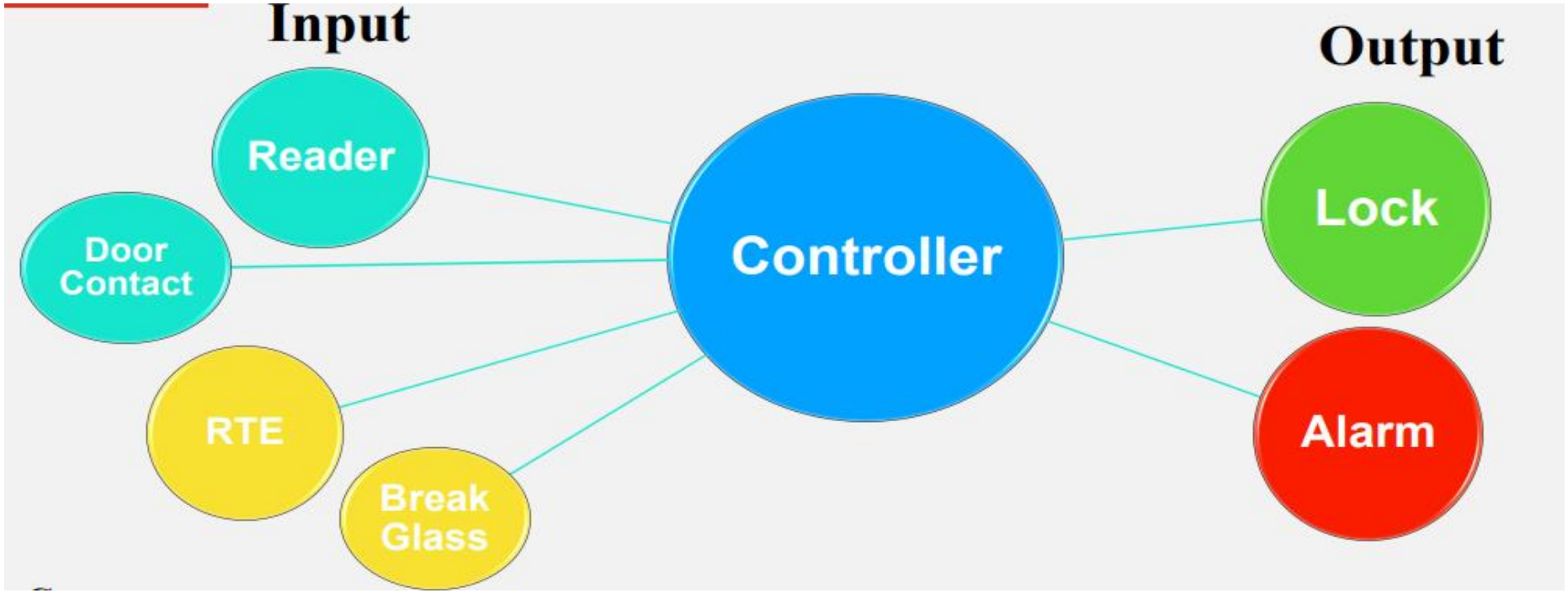
These cables are used for communication and signaling in fire alarm systems.

Product Code	No. of cores	Nominal Cross sectional area (mm²)	Nominal Thickness of Insulation (mm)	Approx. Overall Diameter (mm)	Approx. Net Weight (kg/km)
FA009001	2	1.00	0.44	6.61	56.58
FA009002	3			6.99	72.6
FA009003	4			7.6	89.7
FA009004	2	1.50	0.44	7.15	69.31
FA009005	3			7.57	90.63
FA009006	4			8.46	117.3

Access Control System

Access Control System

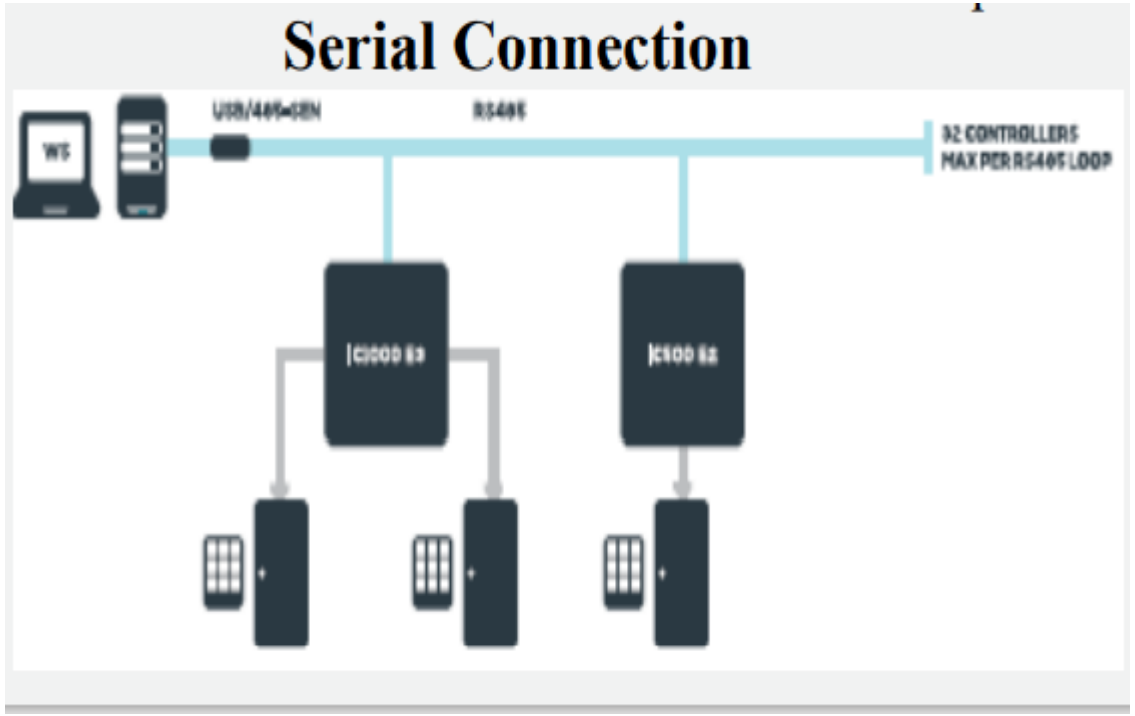
Components

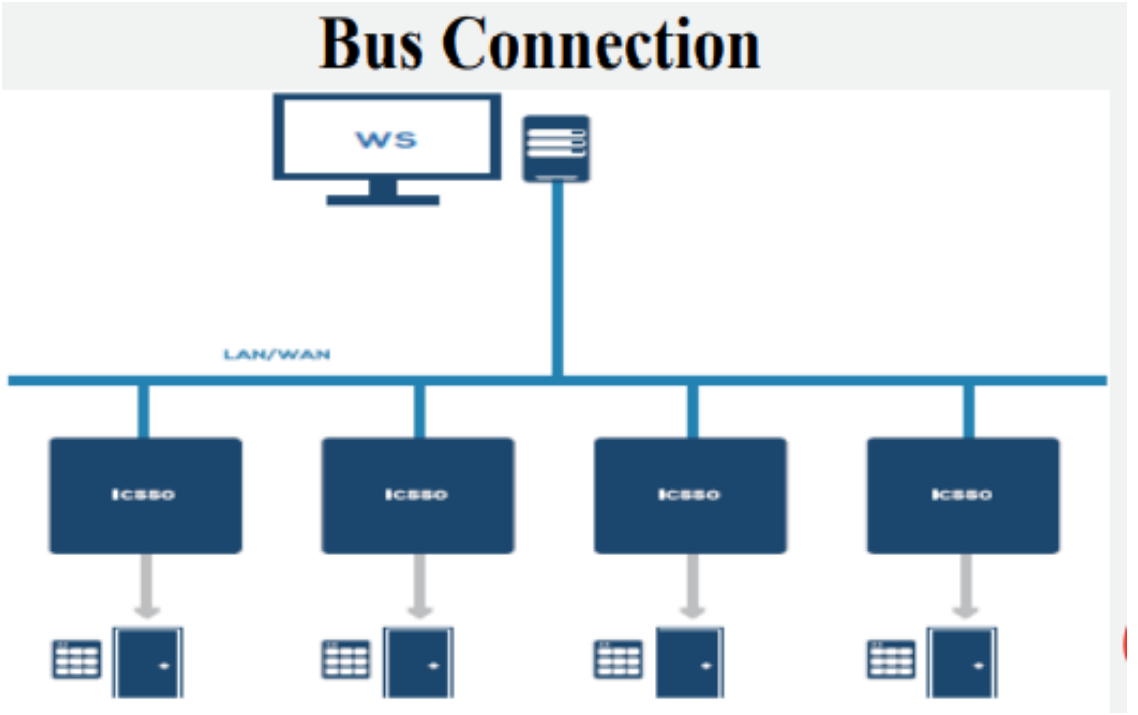


Access Control System

Design:

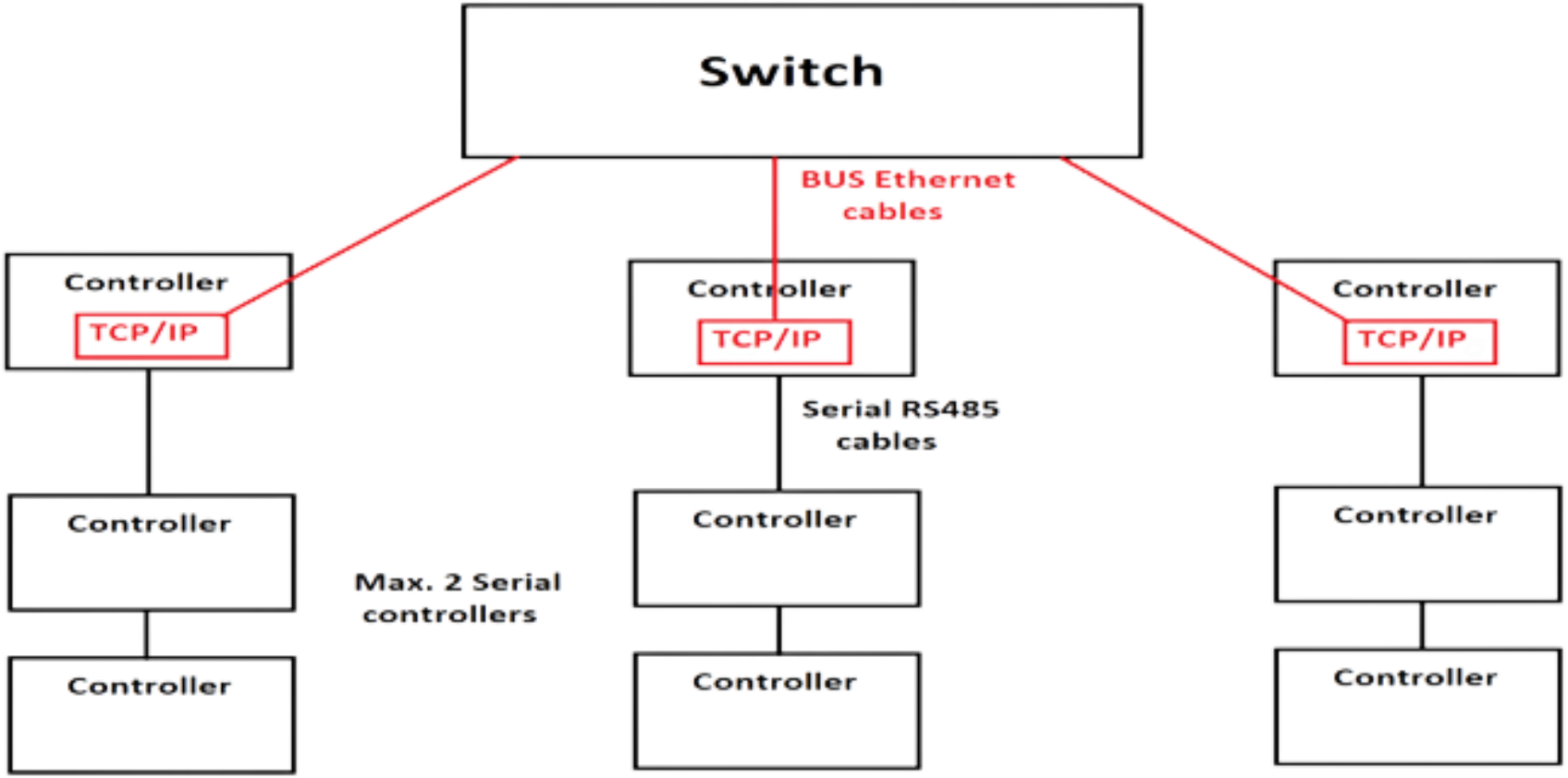
Connection:





Access Control System

Design:



Access Control System

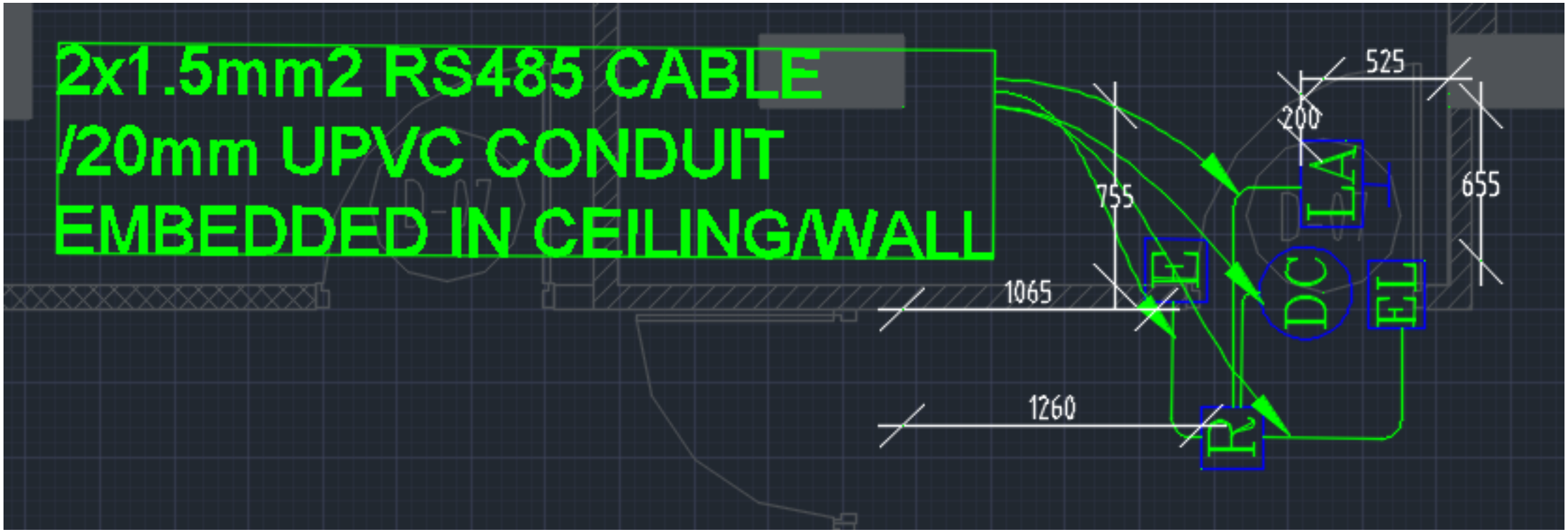
Design:

Legend:

SN	SYMBOL	DESCRIPTION
RIN		STANDALONE PROXIMITY CARD READER
ROU		PUSH TO EXIT BUTTON
LA		LOCAL ALARM UNIT
DC		MAGNETIC DOOR CONTACT
EL		ELECTROMAGNETIC LOCK

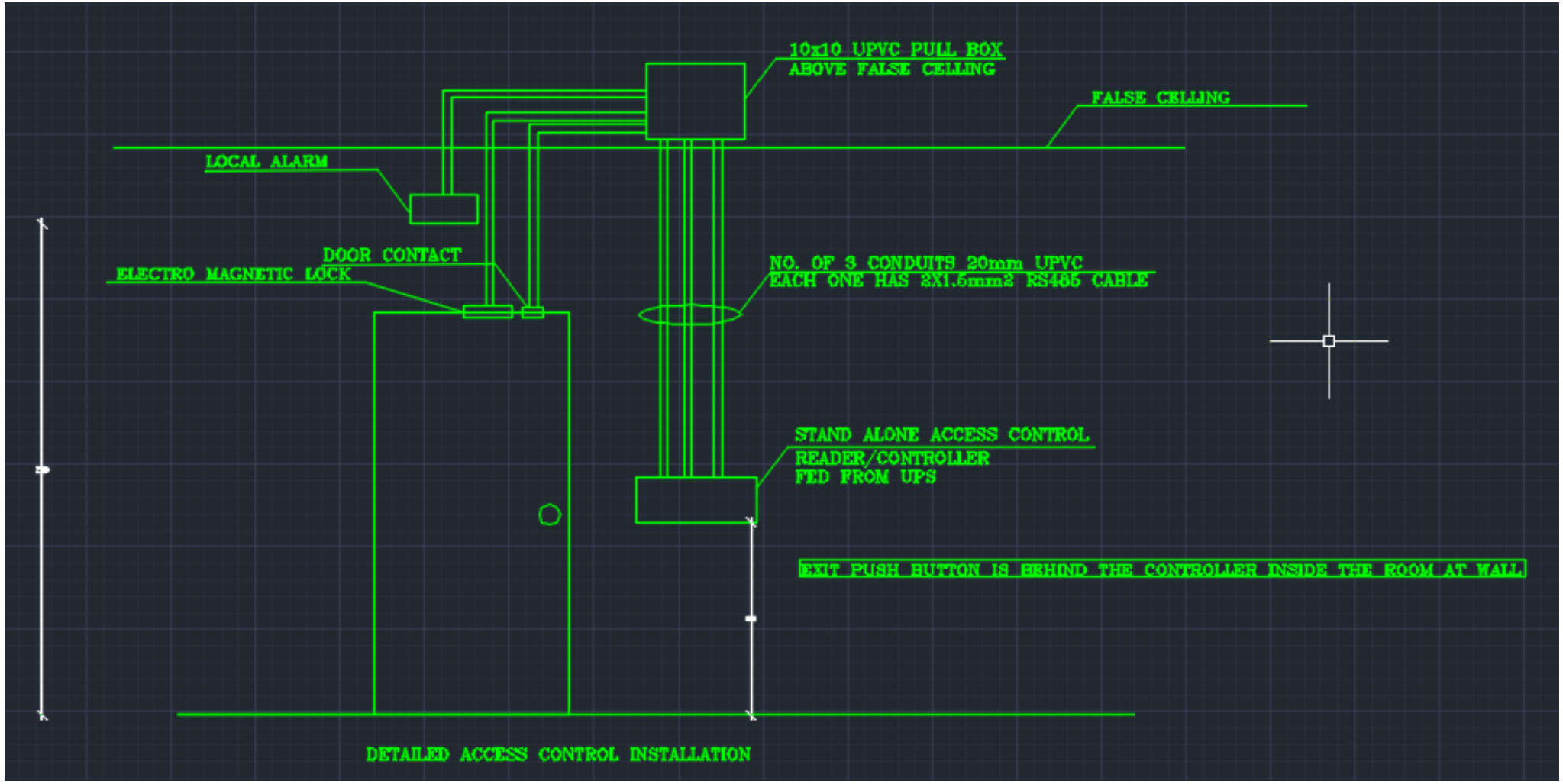
Access Control System

Design(Shop Drawing):



Access Control System

Design:



Earthing System

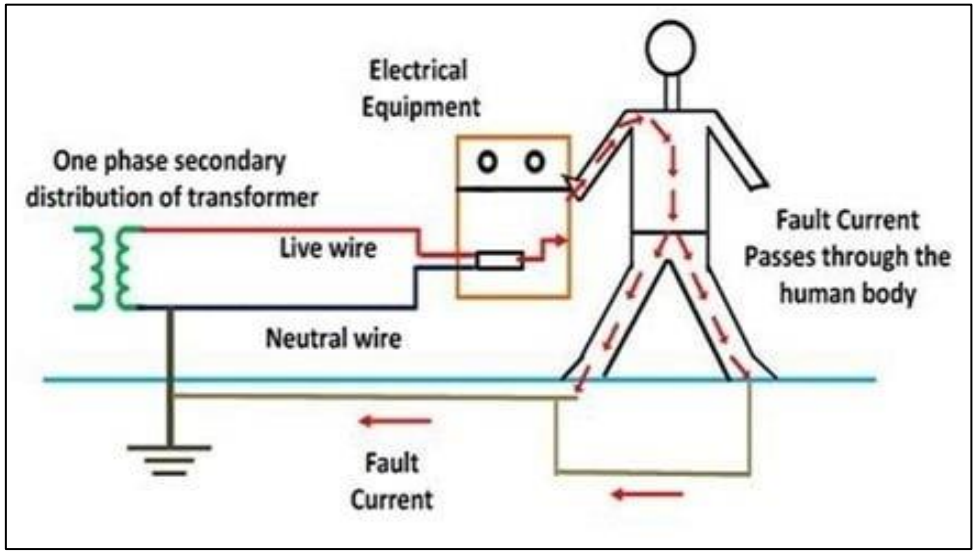
Earthing System

- **Earthing**

It is connecting the electricity network or conductive non-carrying current parts of equipment in the building to earth.

- **Important of Earthing**

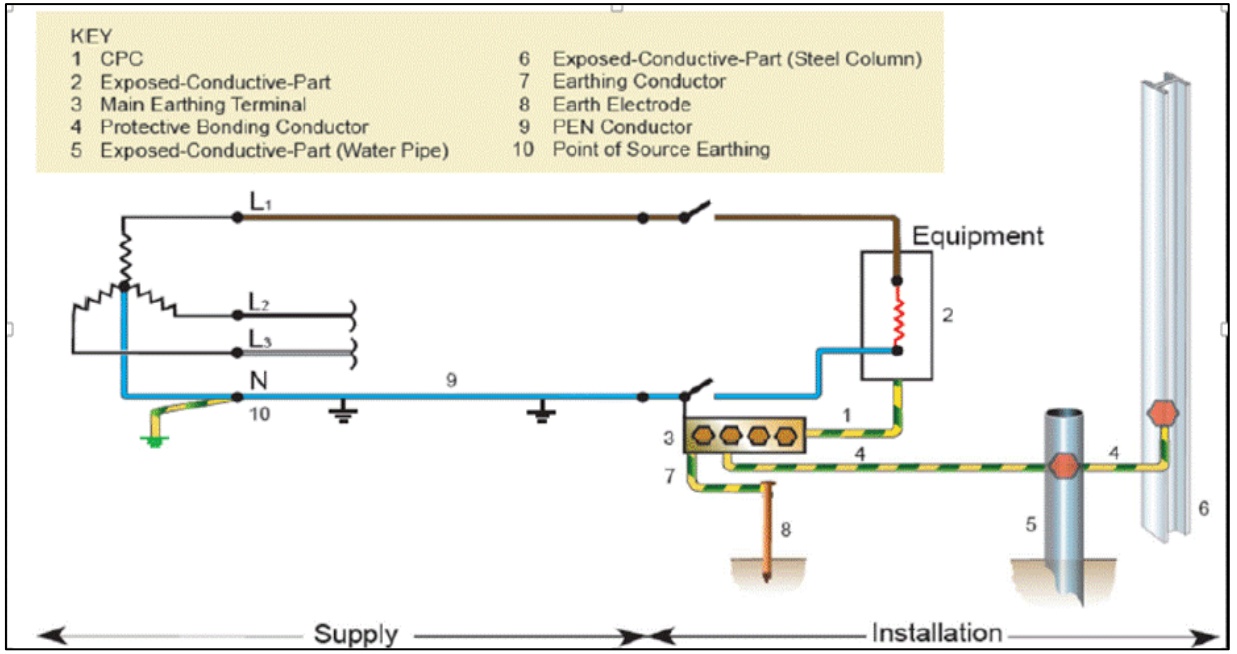
  - Provide safety to personnel.
  - Prevent damage to equipment.
  - Provide zero path for star connection



Earthing System

- **Component**

  - Soil.
  - Earth Electrode.
  - Earthing Conductor.



Earthing System

Design:

وعليه، كلما كانت التركيبات بقيمة منخفضة لتيار الخطأ الأرضي، فأنها لا تحتاج إلى قيم منخفضة لمقاومة التأريض. وعليه فإن مقاومات التأريض من (١–٥) أوم تكون مناسبة لنظم

Figure 21 LV system

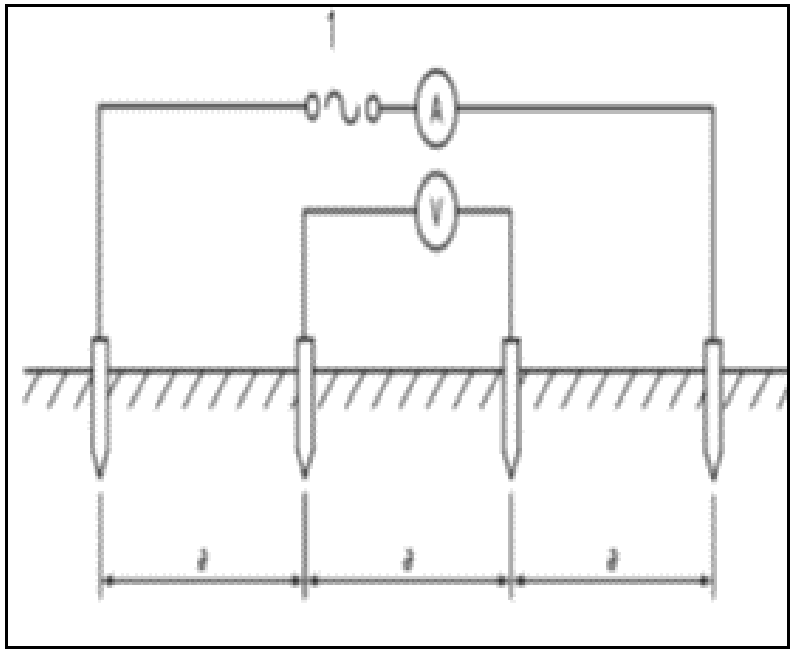
أما في حالة تأريض نظم التيار الخفيف في المبنى، فيتم استخدام نظام تأريض ذات مقاومة لا تزيد عن ٠.٥ أوم ، بينما يجب في المستشفيات تأريض المعدات الطبية بنظام تأريض منفصل وبمقاومة أرضي أقل من ٠.٥ أوم.

SYSTEM	Recommended Earthing system Resistance (Ω)
Low Current	0.5-1
Low Voltage	1-5
Medium Voltage	2.5

Earthing System

Design:

- **Soil resistivity (4_point method) Wenner method**



BS 7430:2011 BRITISH STANDARD

Table 1 Examples of soil resistivity in Ωm

Type of soil	Climatic condition			
	Normal and high rainfall, i.e. > 500 mm/year		Low rainfall and desert conditions, i.e.< 250 mm/ year	Underground waters (saline)
	Probable value	Range of values encountered	Range of values encountered	Range of values encountered
1	2	3	3	5
Alluvium and lighter clays	5	A)	A)	1–5
Clays (except alluvium)	10	5–20	10–100	1–5
Marls (e.g. Keuper marl)	20	10–30	50–300	—
Porous limestone (e.g. chalk)	50	30–100	—	—
Porous sandstone (e.g. Keuper sandstone and clay shales)	100	30–300	—	—
Quartzite, compact and crystalline limestone (e.g. carboniferous sediments, marble, etc.)	300	100–1 000	—	—
Clay slates and slatey shales	1 000	300–3 000	1 000 upward	30–100
Granite	1 000	—	—	—
Fissiles shales, schists, gneiss and igneous rocks	2 000	1 000 upward	—	—

A) Depends on water level of locality.

Earthing System

Design:

- **Earth Conductor**

1- CALCULATION OF MAIN EARTHING CONDUCTOR

1.1 According to BS 7430

A	=	95.34	10 % corrosion tolerance	104.87	(mm2)

A	cross section area of the main earthing conductor (mm2)	
I	fault current (ampere)	50645
t	duration of fault current (seconds)	1.00
K	material coefficient of the main earth conductor (A.sqrt(sec.)/mm2)	
K =	k * SQRT { LOGe ((T2+β) / (T1+β)) }	531.22
	(for copper)	
where :-		
T2	maximum permitted final temperature of the conductor (c)	250
T1	ambient temperature of the conductor (c)	40

SELECTED CROSS SECTION AREA FOR THE MAIN COPPER CONDUCTOR (mm2)	=	120.00	(mm2)

NOTE:

Metal	k	β
Copper	226	254

ثلاث قوانين فقط لحساب تيار القصر
عند أى نقطة فى شبكات الجهد المتوسط والمنخفض

$$I_{SC} = \frac{MVA_{SC}}{\sqrt{3} * V_L}$$

القانون الاول:
حساب تيار القصر فى شبكة الجهد المتوسط

$$I_{SC} = \frac{S_{Tr}}{\sqrt{3} * V_S * Z\%}$$

القانون الثانى:
حساب تيار القصر عند أطراف الجهد المنخفض لمحول التوزيع

$$I_{SC} = \frac{V_S}{\sqrt{3} * Z_{Total}}$$

القانون الثالث:
حساب تيار القصر عند أى نقطة فى شبكة الجهد المنخفض

Earthing System

Design:

- **Resistance of one Rod & combined rods**

1 – CALCULATION OF SINGLE EARTHING ROD RESISTANCE

According to BS 7430:2011 + A1:2015 Equation 9.5.3

$$R = \frac{\rho}{2\pi L}\left(ln\frac{8L}{d} - 1\right)$$

16.56 ohm

where :-

ρ Rho	Specific Resistivity of the Soil (ohm.m)	50.00	
L	length of the earth rod (m)	3.00	
d	diameter of the earth rod (m)	0.017	3/4inch

2 – CALCULATION OF EARTH RESISTANCE MULTIPLE RC LINE

According to BS 7430:2011 + A1:2015 Equation 9.5.8.5

$$Rt = Rr\left(\frac{1 + \lambda\alpha}{n}\right)$$

$$\alpha = \frac{\rho}{2\pi RS}$$

R_{TOT} = 4.57 ohm

where :-

α = 0.048

ρ	Specific Resistivity of the Soil (ohm. m)	50.00
R_r	Resistance of Single Rod	16.56
N	Number of Rods around the square	4
S	Space of Rods in Metres (m)	10
λ	Appropriate factor fram Table 2	2.15
n	Number of Rods side of the square	0

Earthing Conductor | EarthResistance LV | EarthResistance MV

Table 2 — Factors for parallel electrodes arranged in line

Number of electrodes *(n)*	Factor λ
2	1.00
3	1.66
4	2.15
5	2.54
6	2.87
7	3.15
8	3.39
9	3.61
10	3.81

For electrodes equally spaced around a hollow square, e.g. around the perimeter of a building, the equations given above are used with a value of λ taken from Table 3.

For three rods placed in an equilateral triangle, or in an L formation, a value of $\lambda = 1.66$ may be assumed.

Earthing System

Design:

- Resistance of round conductor
- The total resistance of LV system

3- CALCULATION OF EARTH RESISTANCE FOR STRIP OR ROUND CONDUCTOR

According to BS 7430:2011 +A1:2015 Equation 9.5.5

R_{to} = $R_{to} = \frac{\rho}{2\pi L}\log_e\left(\frac{L^2}{xhd}\right)$ R_{to} = 3.43 ohm

where :-

ρ Rho	specific resistivity of the soil (ohm. m)		50.00
L	the total length of conductor (m)		25
h	the depth of burial in metres (m)		0.50
d	Diameter of the round conductor or cross sectional area of the strip (m)	120	0.01421
k	has the value of 1.36 for strip or 1.83 for round conductor.		

4- THE COMBINED EARTH RESISTANCE OF THE RODS & CONDUCTOR (LOOP) AS FOLLOWS

$1/R = 1/R_{TOT} + 1/Rta$

R = Combined system earth resistance (ohm)

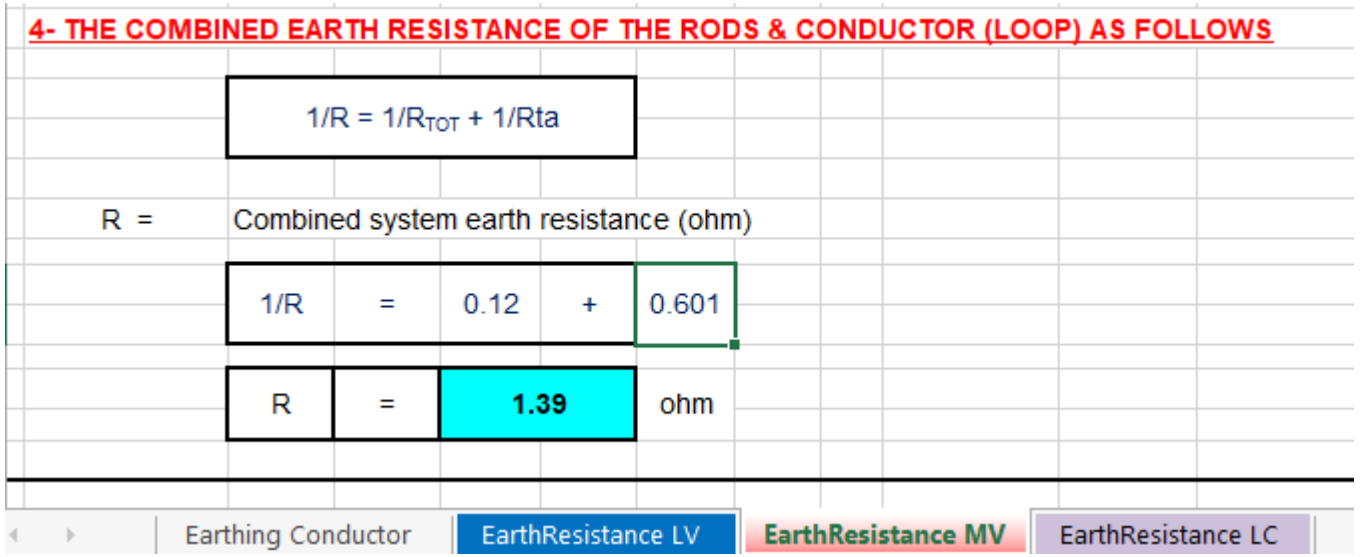
1/R	=	0.219	+	0.291
R	=	1.96	ohm	

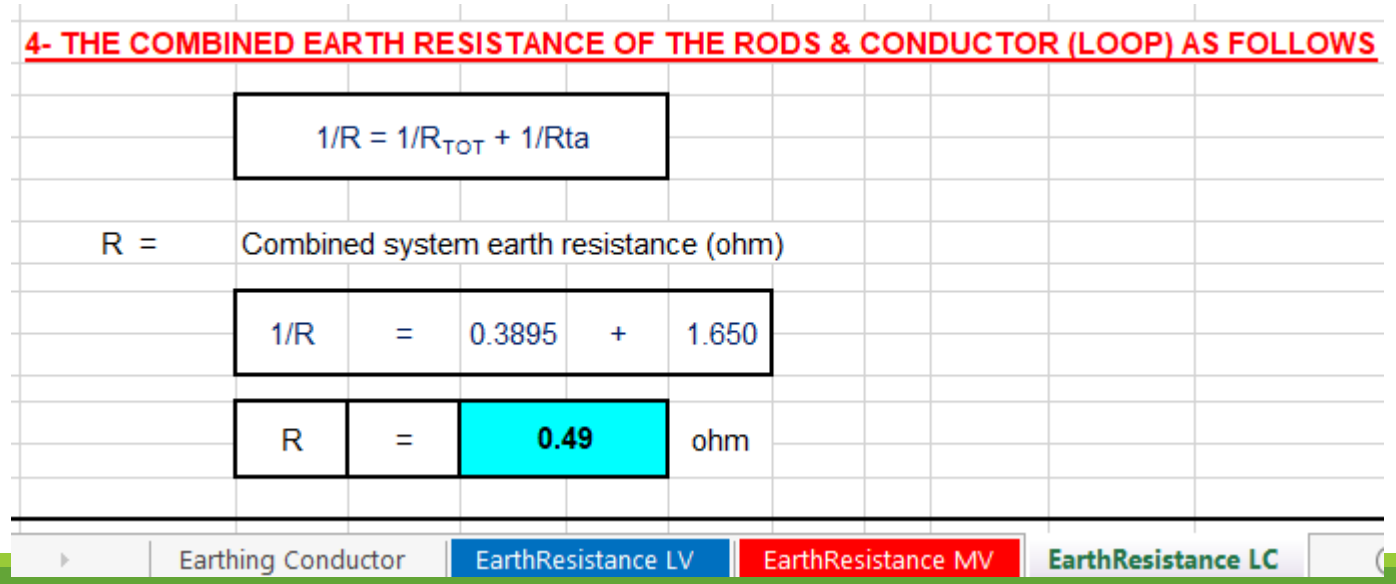
Earthing System

Design:

- The total resistance of MV system

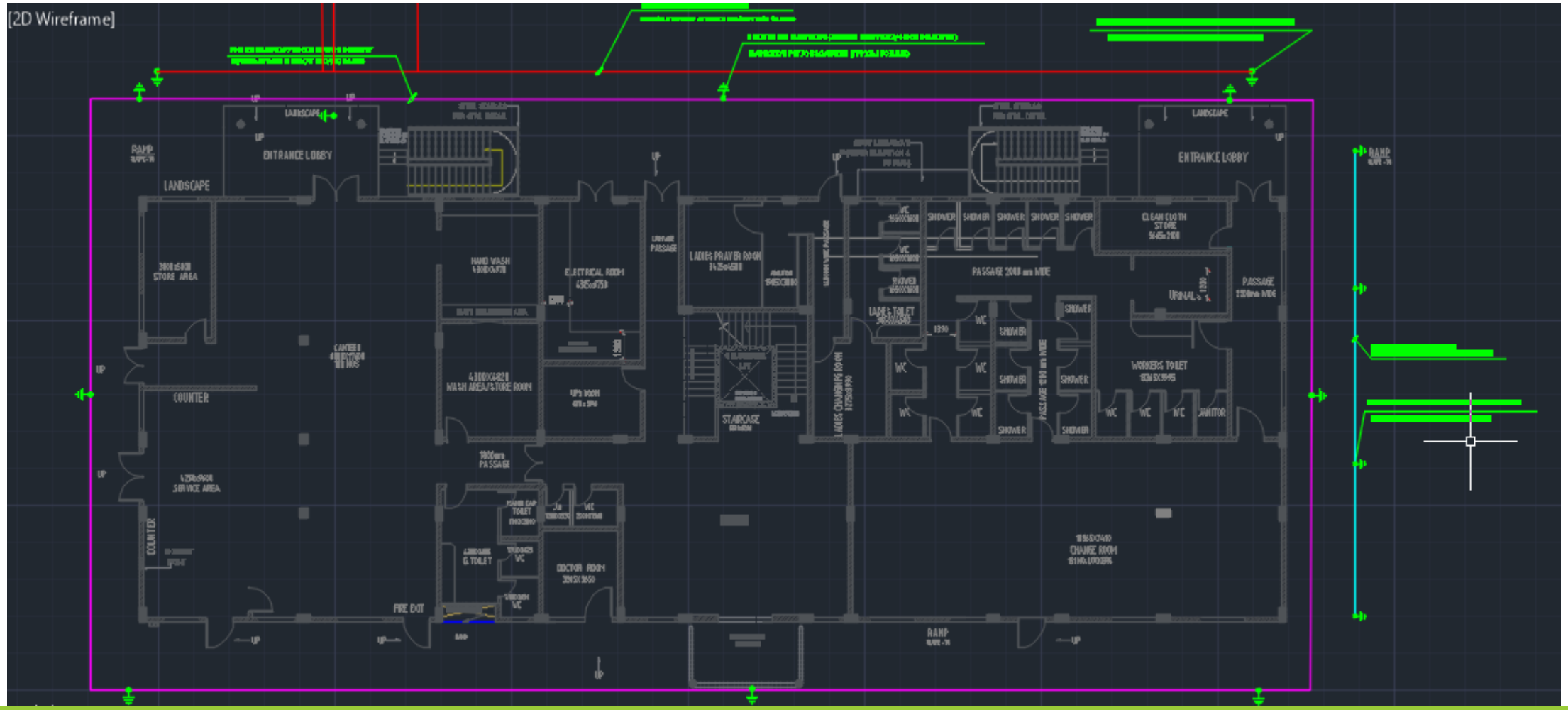
- The total resistance of LC system





Earthing System

Design:



Thank You