



DESIGN OF ELECTRICAL INSTALLATIONS

Rhys Watts
GOWER COLLEGE SWANSEA



Table of Contents

Table of Contents.....	1
Layouts.....	3
Lighting installation.....	5
Factory	5
Office Block	5
Factory & Office Block.....	5
Diagram Key - Lighting	8
Lighting Tabulated Calculations	10
Single Phase Installations.....	27
Factory & Office Block.....	27
Diagram Key – Single Phase Sockets	31
Single-Phase Tabulated Calculations	33
Three-phase installations.....	41
Factory	41
Diagram Key – Three-Phase Sockets.....	43
Three-Phase Tabulated calculations	45
Emergency Lighting Installations	51
Factory	51
Office Block	51
Diagram Key - Emergency Lighting	54
Emergency Lighting Tabulated Calculations	55
Use of Circuit Protection.....	65
Cable support systems.....	66
Factory	66
Office Block	67
Circuit Diversity Calculations	68
Data Sheets	69
References	96

Introduction

For this assignment, I have been tasked with the design of electrical installations for a factory that is to be constructed. It consists of a workshop and two storey office block.

The factory has been split into sections that include areas such as welding bays, assembly bays, a small tool area and so on.

The design must include the following:

1. Appropriate lighting systems for both the factory and office areas including wiring diagrams.
2. Appropriate power distribution design including wiring diagrams.
3. Cable size calculations. Also, determine the minimum cross sectional area of protective conductor for the Range oven in the canteen.
4. Circuit protection designs.
5. Emergency lighting design.
6. An outline of suitable cable support systems used throughout the installation.

Include any assumptions and relevant manufacturer data.

The power requirements are shown in the tables below.

Factory floor

Reference	Phase	Power	Allow for diversity
CNC1	3	18 kW	Apply diversity where applicable within the installation
CNC2	3	22 kW	
Drill 1	3	3.5kW	
Small tools	1	8 off 13A sockets	
Store room	1	3 kW	
Assembly 1	1	20 off 13A sockets	
Assembly 2	1	20 off 13A sockets	
Assembly 3	1	20 off 13A sockets	
Painting and finishing	1	3 kW compressor + 6 off 13A sockets	
Welding bay 1	3	16 kW	
Welding bay 2	3	16 kW	
Welding bay 3	3	16 kW	
Goods out	1	8 off 13A sockets	
Canteen (see note below)	1	35kW + 5 off 13A sockets	

NOTE: Canteen – 23 kW Range oven, 4 kW water heater, 3 x 2 kW microwave oven, 2 kW Fridge, + 5 power sockets)

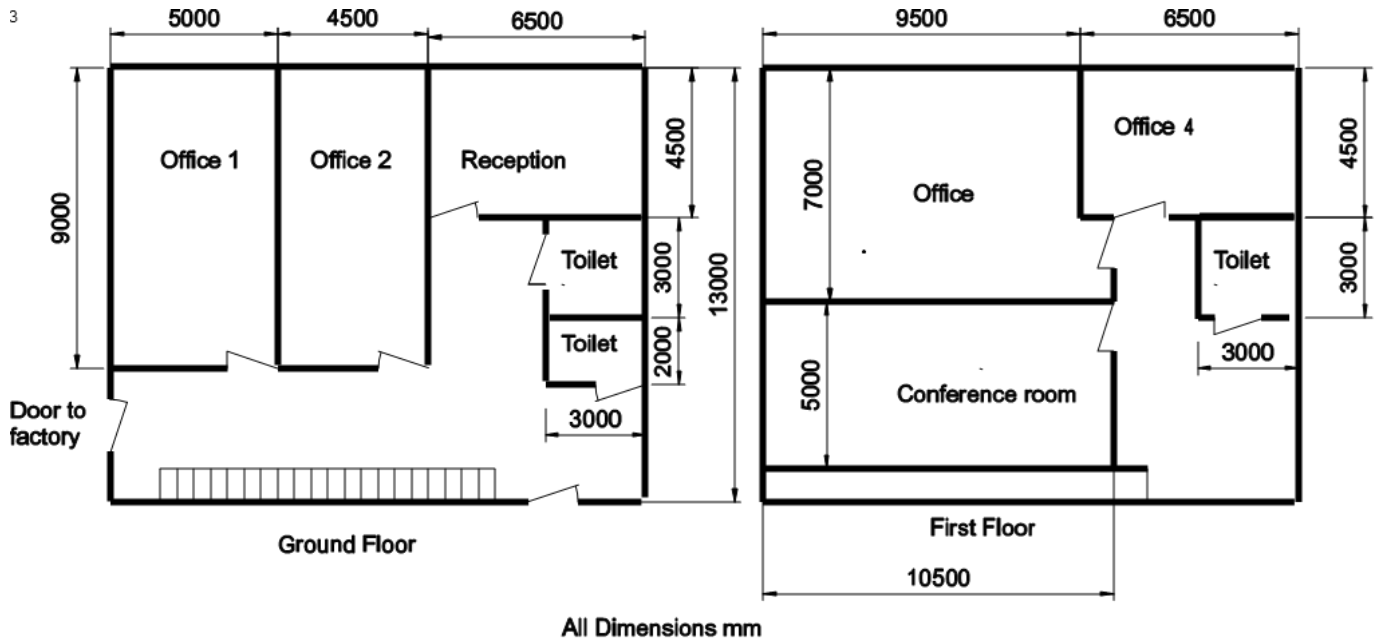
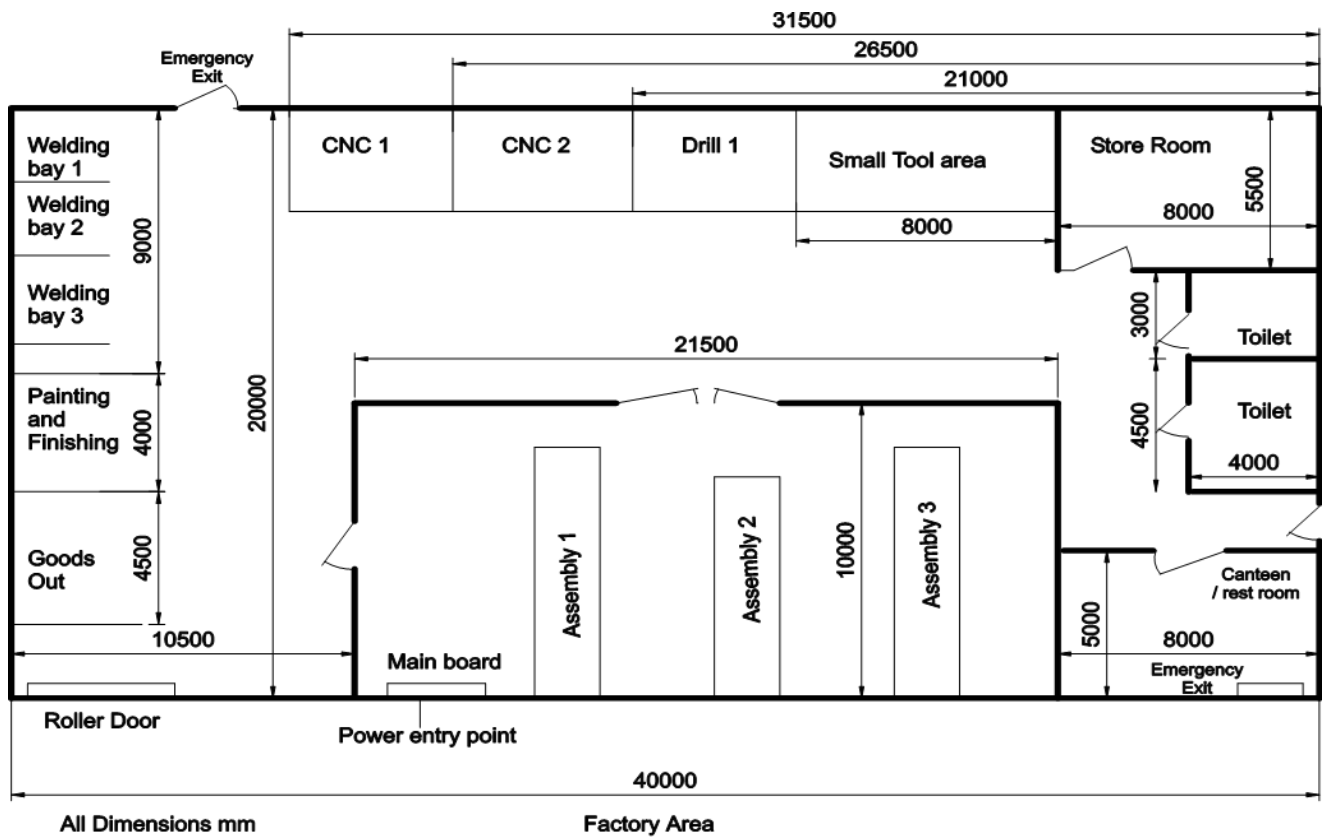
Office power requirements

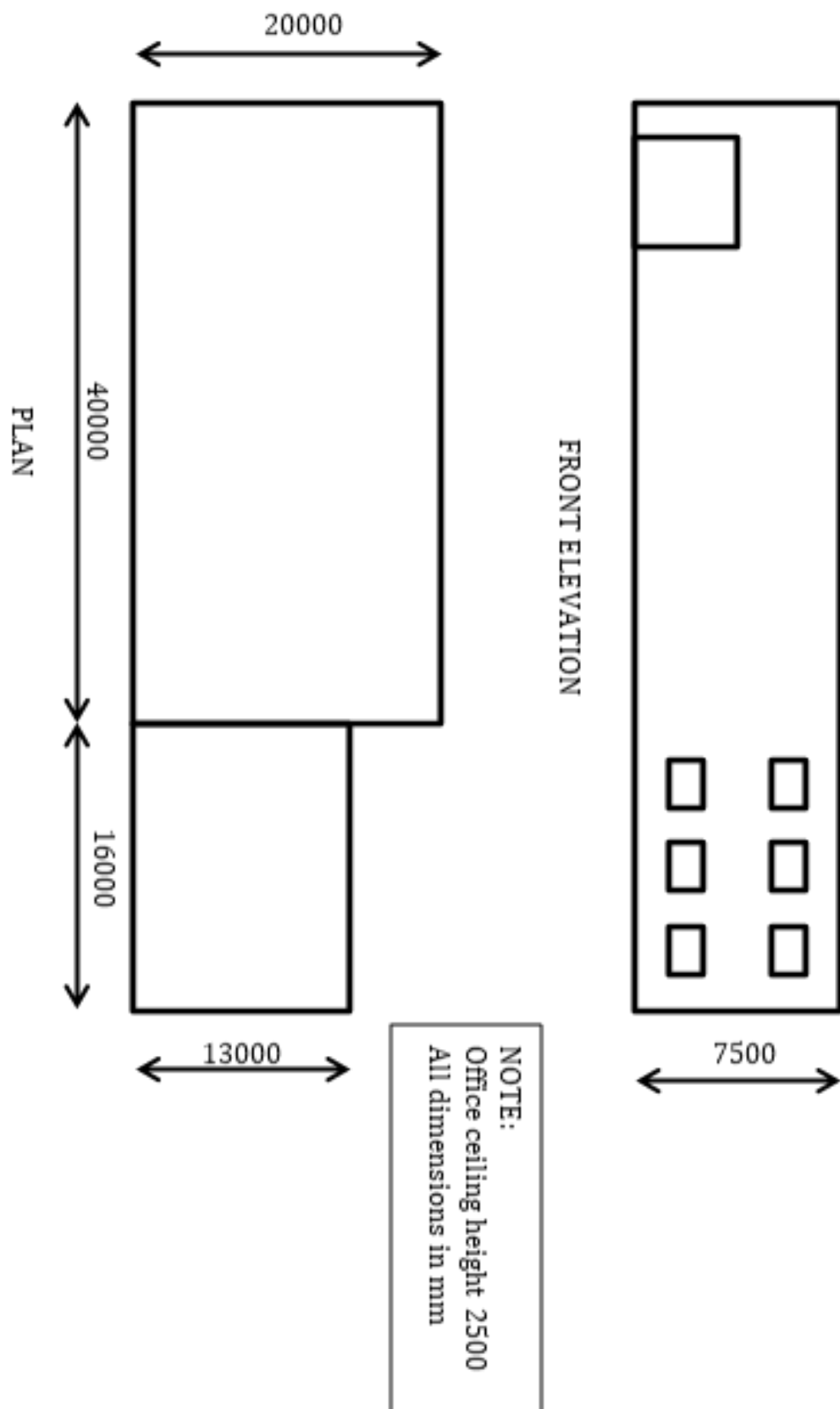
Room	Staff	Power sockets	Allow for diversity
Office 1	4	10 off 13A sockets	Apply diversity where applicable within the installation
Office 2	4	10 off 13A sockets	
Reception	2	8 off 13A sockets	
Office 3	9	12 off 13A sockets	
Office 4	4	6 off 13A sockets	
Conference room		10 off 13A sockets	

Note: Each member of staff has a PC.

Layouts

Below are the factory and office block floor plans, with descriptions for each area/ room, along with the front elevation plans:





Lighting installation

Within the brief, the first task asks us to design appropriate lighting systems for both the factory and office areas including wiring diagrams.

Factory

For the main factory area, I have opted for the TamLite Expo 60W LED High Output Wide Beam Low / High Bay 4000K – due to its suitability “within sports halls, industrial and warehousing areas up to 20 metres mounting height” as this matches the ceiling height of the factory.

Another crucial element is the unit's ability to be Suspended or mounted on a surface “via end brackets and wired via 3 pin plug and socket”.

Here are the unit's technical specifications, noting important information such as its lamp life of 60000h, power rating of 60W and sufficient lumen output of 9600lm.

This means that service intervals will be less frequent and power consumption in relation to its illumination capabilities are efficient. (City Electrical Factors Ltd, 2024) **See data sheet – 01**

For the toilets, store room and canteen area, I have made an assumption that suspended ceilings have been installed. For this, I have chosen the Xcite 12W LED colour selectable Bulkhead White.

This lighting has been chosen as it's suitable for store rooms, bathrooms and rest areas. The lamp life is 30000h, which is half of that in the factory. However, due to the assumed suspended ceilings, this increases the serviceability of the lighting and is a good trade off for its energy saving properties along with an efficiency rating of 92. (City Electrical Factors Ltd, 2024) **See data sheet – 02**

Office Block

For the office block, the brief states that the ceilings are suspended 600mm x 600mm grids with removable tiles, 2500mm above from the floor. In alignment with this, I have selected the Xcite 30W 600mm x 600mm LED backlit panel 4000k. The features list the panel as being “suitable for offices and schools” and has an optional “extra emergency pack available in case of an outage.” Another important specification is the operating temperature range of 0-25°C which matches the maximum ambient temperature in the building.

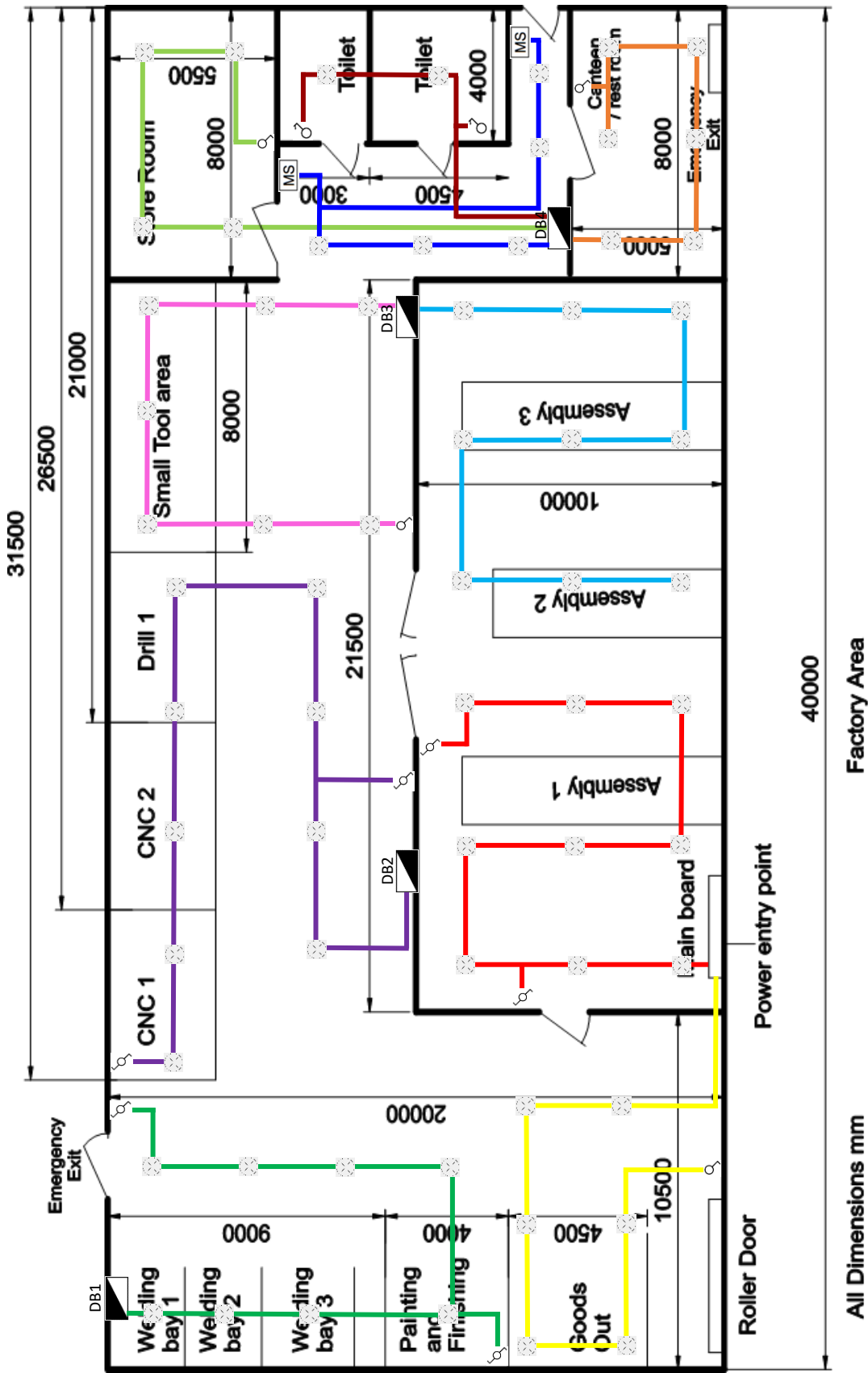
The panel has a lamp life of 30000h which is adequate due to the cleaner environment and suspended ceilings. (City Electrical Factors Ltd, 2024) **See data sheet – 03**

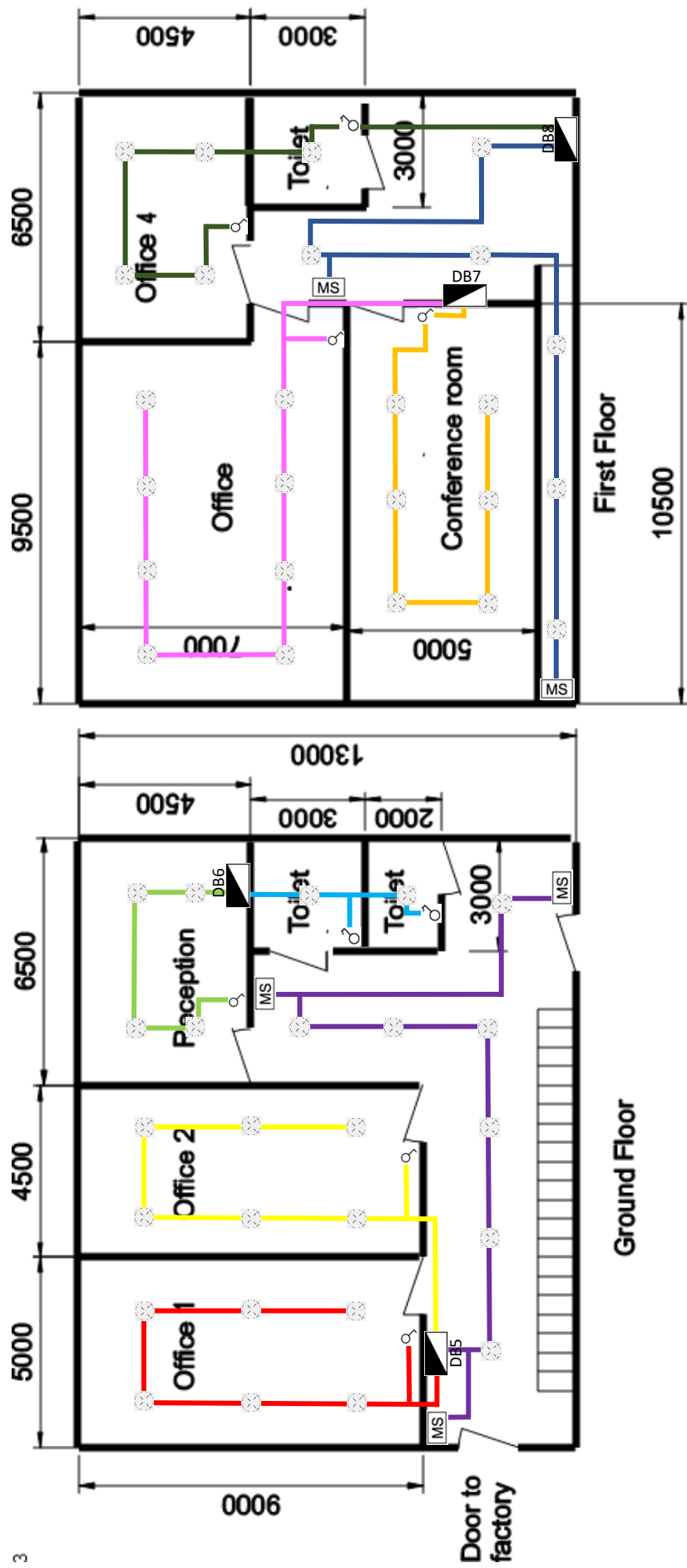
Factory & Office Block

Pull cords have been added to all 5 toilets to comply with safety regulations (MK Logic Plus 6A SP 2 Way Ceiling Switch with Mounting Block White, **See data sheet - 04**). The single pole switches selected are the Legrand 10A 1 Gang 1 Way Light Switch White (**See data sheet – 05**). No circuit is grouped with more than 3 other circuits in alignment with the brief. I have also opted for motion sensors in the corridor area between the storeroom, toilets and canteen, along with the corridors and stairway in the office block to be more energy efficient (**See data sheet – 06**).

Distribution boards: DB1-4, have been fitted in the factory and boards DB5-8 in the office block. I have chosen the BRITISH GENERAL FORTRESS 12-MODULE 10-WAY PART-POPULATED MAIN SWITCH CONSUMER UNIT. Being part populated, the 4 blanks will allow me to add other value RCBO's in where necessary (**See data sheet – 07**).

Below are the lighting wiring diagrams for the factory floor and both offices:





All Dimensions mm

Diagram Key - Lighting

	Lighting Fixture
	Single Pole Switch
	Double Pole Switch
	Pull Cord Switch
	Motion Sensor
	Distribution Board

The cable colours on the diagram above have been matched within the cable calculation tables below:

****Reference abbreviations FFL() for factory, OGL() for office ground floor and OFL() for office first floor****

All calculations including the correct circuit breakers have been calculated below. Here is a full calculation for circuit ref **FFL1 (factory floor)**, the rest have been tabulated:

Single Phase:

$$I_b = \frac{P}{V} = \frac{(8 \times 100W)}{230V} = 3.48A$$

$$I_n = 6A$$

$$I_z = \frac{6}{0.94 \times 0.77 \times 1 \times 1 \times 1} = 8.29A$$

Table 4D2A – Reference method E-8 (1mm² conductor)

$$I_t = 17A$$

$$V_d = \frac{44 \times 3.48 \times 35}{1000} = 5.35V$$

$$R_1 + R_2 = \frac{36.2 \times 1.2 \times 35}{1000} = 1.52\Omega$$

$$Z_s = 0.08 + 1.52 = 1.6\Omega$$

$$I_f = \frac{230}{1.6} = 143.8A$$

MCB Disconnection time = 0.1s

$$S = \frac{\sqrt{(143.8^2) \times 0.1}}{115} = 0.4mm^2$$

Actual CPC size = 1mm²

Lighting Tabulated Calculations

Circuit:	FFL2			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	600	
	Design Current	Ib	2.61	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	26	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.29	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.99	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.13	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.21	
	Maximum Earth Loop Impedance	Zs(max)	7.28	BS7671: Table 41.3

Circuit:	FFL3			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	900	
	Design Current	Ib	3.91	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	34	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.29	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	5.85	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.48	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.56	
	Maximum Earth Loop Impedance	Zs(max)	7.28	BS7671: Table 41.3

Circuit:	FFL4&5			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	900	
	Design Current	Ib	3.91	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	31	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.29	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	5.33	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.35	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.43	
	Maximum Earth Loop Impedance	Zs(max)	7.28	BS7671: Table 41.3

Circuit:	FFL6			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	700	
	Design Current	Ib	3.04	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	22	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.29	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.94	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.96	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.04	
	Maximum Earth Loop Impedance	Zs(max)	7.28	BS7671: Table 41.3

Circuit:	FFL7			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	400	
	Design Current	Ib	1.74	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	20	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.14	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	1.53	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.87	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.95	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	FFL8			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	600	
	Design Current	Ib	2.61	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	15	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.29	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	1.72	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.65	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.73	
	Maximum Earth Loop Impedance	Zs(max)	7.28	BS7671: Table 41.3

Circuit:	FFL9			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	200	
	Design Current	Ib	0.86	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	15	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.14	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	0.57	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.65	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.73	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	FFL10			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	500	
	Design Current	Ib	2.17	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	22	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.29	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.1	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.95	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.03	
	Maximum Earth Loop Impedance	Zs(max)	7.28	BS7671: Table 41.3

Circuit:	OGL1			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	600	
	Design Current	Ib	2.61	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	18	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.96	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.1	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.78	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.86	
	Maximum Earth Loop Impedance	Zs(max)	7.28	BS7671: Table 41.3

Circuit:	OGL2			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	600	
	Design Current	Ib	2.61	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	22	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.96	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.53	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.95	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.03	
	Maximum Earth Loop Impedance	Zs(max)	7.28	BS7671: Table 41.3

Circuit:	OGL3			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	400	
	Design Current	Ib	1.73	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	13	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.5	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	0.99	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.56	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.64	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	OGL4			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	200	
	Design Current	Ib	0.87	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	6	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.5	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	0.22	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.27	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.35	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	OGL5			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	700	
	Design Current	Ib	3.04	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	26	
	Insulation		None	
	Ambient Temperature	°C	25	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.96	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	3.5	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.13	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.21	
	Maximum Earth Loop Impedance	Zs(max)	7.29	BS7671: Table 41.3

Circuit:	OFL1			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	600	
	Design Current	Ib	2.61	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	31	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.96	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	3.6	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.35	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.43	
	Maximum Earth Loop Impedance	Zs(max)	7.29	BS7671: Table 41.3

Circuit:	OFL2			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	500	
	Design Current	Ib	2.17	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	30	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.96	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.9	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.3	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.38	
	Maximum Earth Loop Impedance	Zs(max)	7.29	BS7671: Table 41.3

Circuit:	OFL3			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	6	
	Design Current	Ib	2.61	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	26	
	Insulation		None	
	Ambient Temperature	°C	25	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.96	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.99	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.12	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.2	
	Maximum Earth Loop Impedance	Zs(max)	7.29	BS7671: Table 41.3

Circuit:	OFL4			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	6	
	Design Current	Ib	2.61	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	30	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.96	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	3.45	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.3	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.38	
	Maximum Earth Loop Impedance	Zs(max)	7.29	BS7671: Table 41.3

Within the Lighting circuits, BS EN 60898 - 3A & 6A RCBO's have been implemented. In the case of the design current being close to 3A, I have used a 6A breaker as that would allow for an additional light to be added. I deemed this adequate as the fault currents are still high enough to allow for a 0.1 disconnection time from the RCBO.

The lights, despite the different types, are LED's. I opted for these as they are much more energy efficient and consume less power than a typical 100W bulb. However, the calculations have been completed with each bulb being 100W if the lighting was subject to change.

The cable that has been chosen is 70°C Thermoplastic with Protective Conductor. It is easily obtainable and cheap. Finally, it is more than able to withstand the temperatures required.

Within the cable length measurements, I have calculated the length from the Distribution boards vertically as well as the horizontal runs. All cables in the main factory area will be routed via cable trays due to the ceiling heights and their design flexibility capabilities.

Cables within the toilet, storeroom and rest area will be bunched in air due to the assumption made of suspended ceilings. This also applies to both floors of the office block.

Single Phase Installations

This section covers all single-phase socket circuits for both the factory and office areas including wiring diagrams.

Factory & Office Block

For all standard socket outlets, I chose the KnightsBridge MR9000 13 Amp 2 Gang Switched Metalclad Socket. Being metal clad, It's more durable - enabling it to withstand an industrial working environment, whereas your typical thermoset socket may struggle.

Being that the office block is attached to the factory, I continued the use of the socket into the offices.

Included with the socket, comes a 25 year guarantee from TLC-Direct <https://www.tlc-direct.co.uk/>. This aids in keeping service intervals low and enables manufacturing efficiency to remain the same.

It also comes "Complete with surface box" and is "Ideal for use with conduit." (TLC-Direct, 2024)

See data sheet – 08

For the Compressor and storeroom, I chose the 240v 16 Amp 3 Pin MK Commando Socket - Blue - IP44 as it's suitable for the current draw required. It also offers a "unified seal and cable protector forms a convex dome that prevents the plug from fastening on objects or collecting debris when dragged." (TLC-Direct, 2024)

See data sheet – 09

Within the canteen, the water heater has been wired up using an LAP 20A 1-GANG DP WATER HEATER SWITCH WHITE WITH NEON.

See data sheet – 10

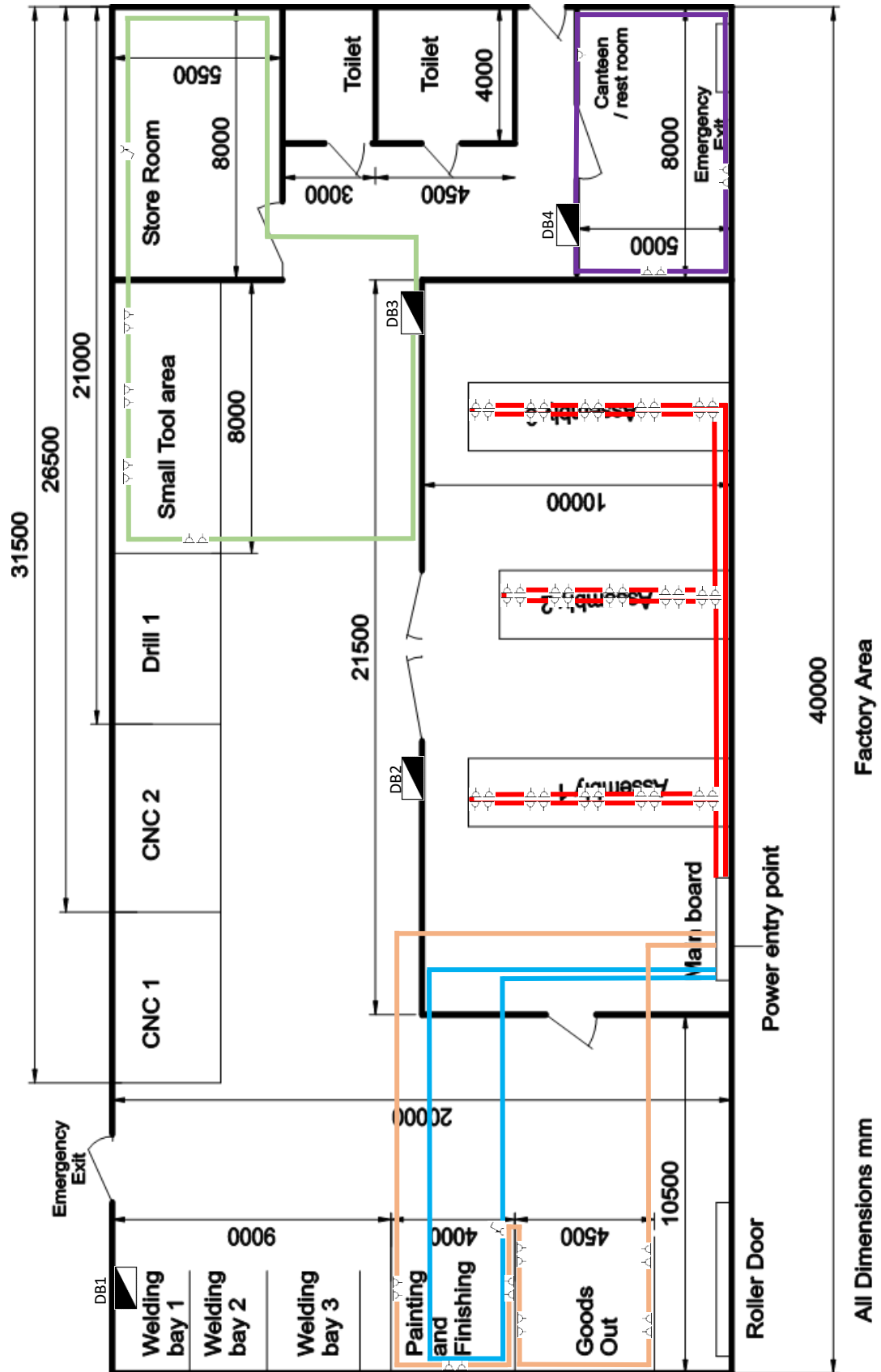
The Fridge is also on the same circuit, however to avoid any overcurrent, a Timeguard 13 Amp 1 Gang Single RCD Switched Socket - Metal – Active has been wired in.

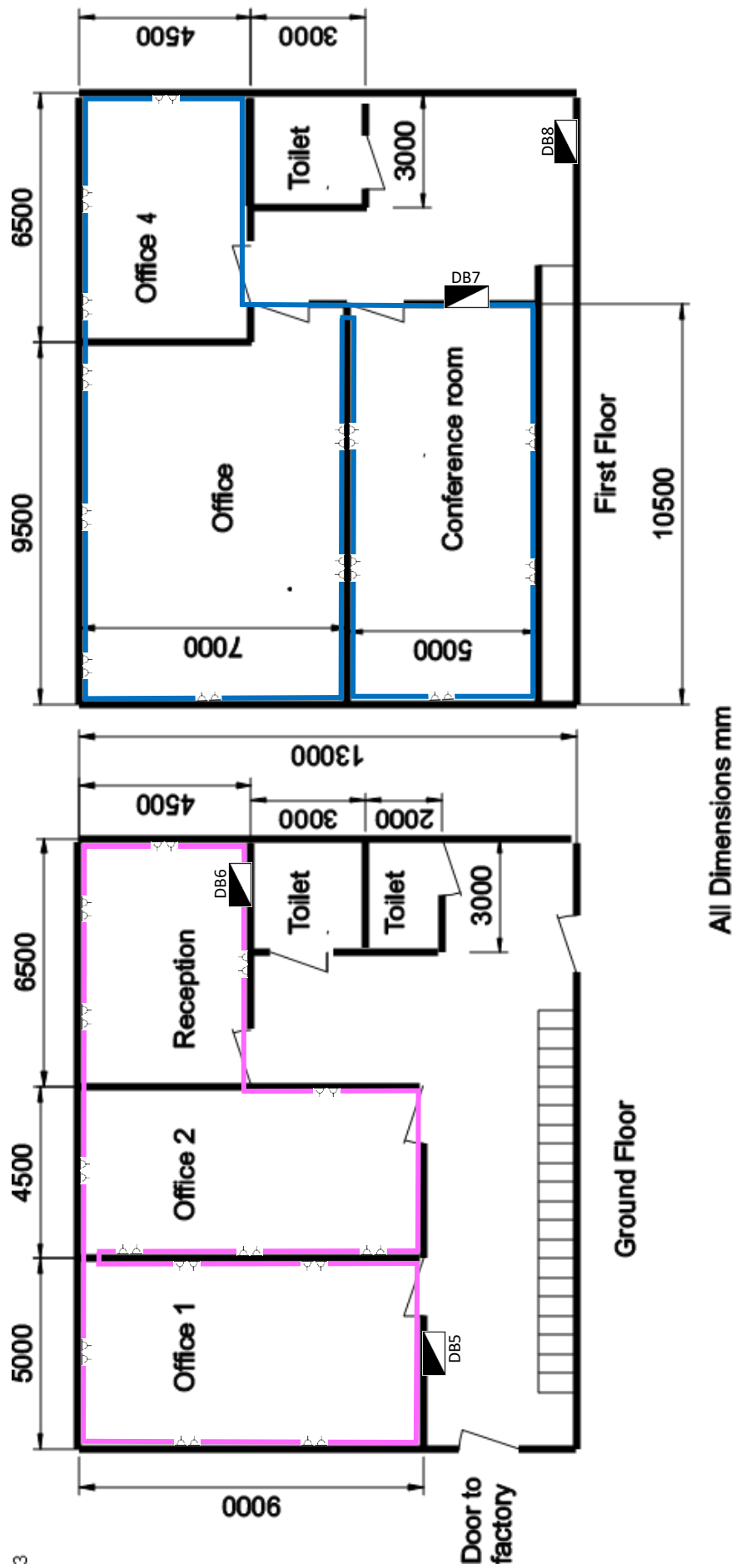
The same applies to all 3 microwave ovens, they are all on the same circuit, each connected via the RCD Switched socket

The distribution boards are as per the previous section.

See data sheet – 11

Below are the single-phase standard socket wiring diagrams for the factory floor and both offices along with the storeroom and paint & finishing compressor:





Below are the single-phase wiring diagrams for the factory floor canteen appliances:

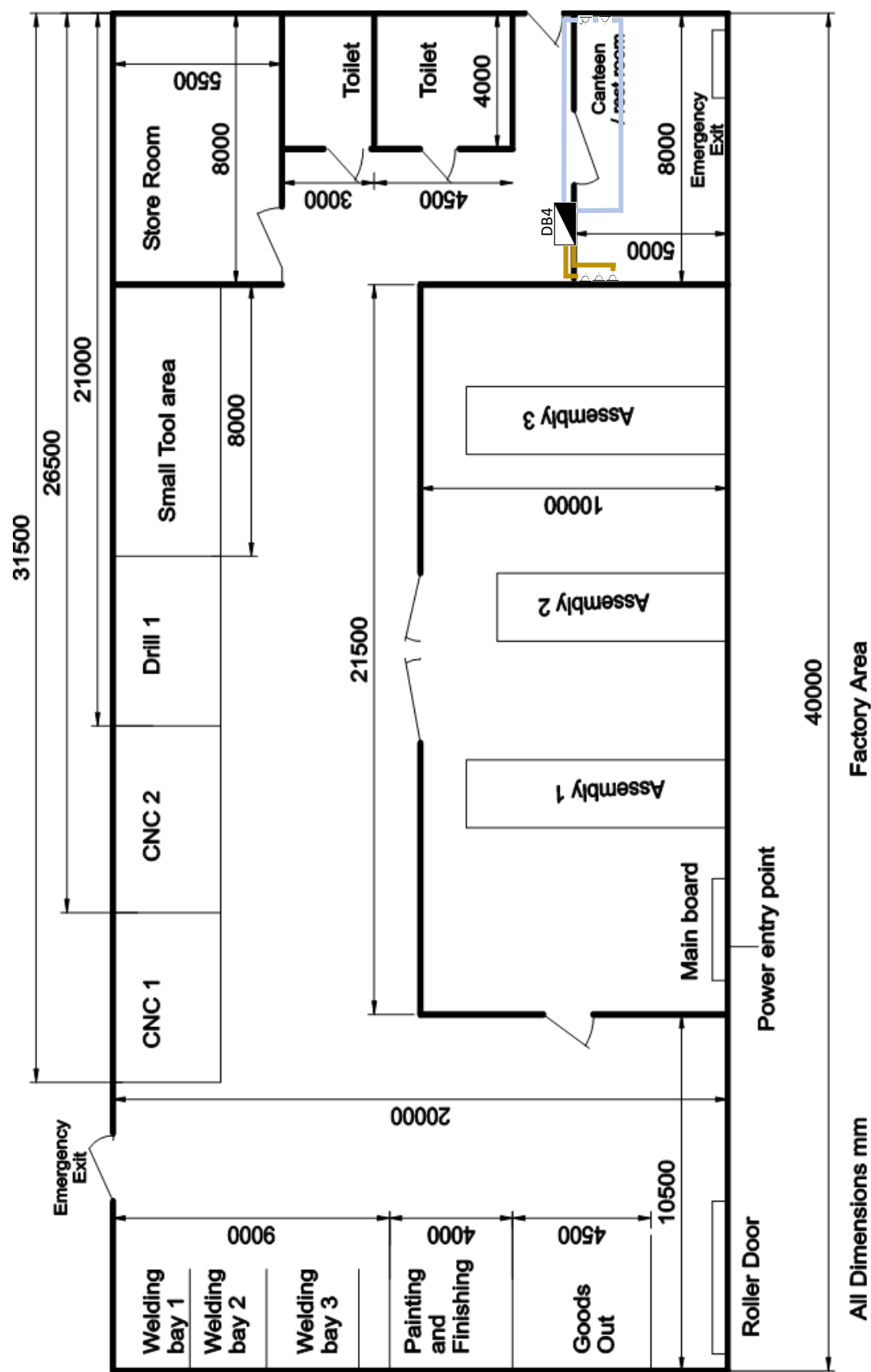
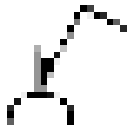
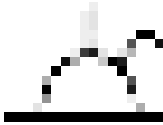


Diagram Key – Single Phase Sockets

	Twin Socket
	Single Single Socket
	Commando Socket
	Water Heater Switch
	Distribution Board

The cable colours on the diagrams above have been matched within the cable calculation tables below:

All calculations including the correct circuit breakers have been calculated below. Here is a full calculation for circuit ref **RM1 (factory floor)**, the rest have been tabulated:

Single Phase:

$$I_b = 20A$$

As per BS7671: Reg 433.1.204

$$I_n = 20A$$

$$I_z = \frac{20}{0.94 \times 0.8 \times 1 \times 1 \times 1} = 26.5A$$

Table 4D2A – Reference method B-4 (4mm² conductor)

$$I_t = 30A$$

$$V_d = \frac{11 \times 20 \times 112}{4000} = 6.16V$$

$$R_1 + R_2 = \frac{16.71 \times 1.2 \times 112}{4000} = 0.56\Omega$$

$$Z_s = 0.08 + 0.56 = 0.64\Omega$$

$$I_f = \frac{230}{0.64} = 359.4A$$

MCB Disconnection time = 0.1s

$$S = \frac{\sqrt{(359.4^2) \times 0.1}}{115} = 0.99mm^2$$

Actual CPC size = 1.5mm²

Single-Phase Tabulated Calculations

Circuit:	RM2			
	Nominal Voltage	V	230	
	Number of sockets		5	
	Design Current	Ib	20	BS7671: Reg 433.1.204
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	20	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		In Conduit	
	Reference Method		B	BS7671: Table 4D2A
	Cable Run Length (m)	L	61.5	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.8	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	26.5	
	Tabulated Value of Cable Current carrying capacity	It	30	BS7671: Table 4D2A
	Selected Cable Size	mm ²	4	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	11	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	3.4	
	Resistance of Line Conductor % CPC	r1+r2	16.71	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.31	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.39	
	Maximum Earth Loop Impedance	Zs(max)	2.19	BS7671: Table 41.3

Circuit:	RM3			
	Nominal Voltage	V	230	
	Number of sockets		5	
	Design Current	Ib	20	BS7671: Reg 433.1.204
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	20	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		In Conduit	
	Reference Method		B	BS7671: Table 4D2A
	Cable Run Length (m)	L	26	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.8	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	26.5	
	Tabulated Value of Cable Current carrying capacity	It	30	BS7671: Table 4D2A
	Selected Cable Size	mm ²	4	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	11	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	1.43	
	Resistance of Line Conductor % CPC	r1+r2	16.71	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.13	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.21	
	Maximum Earth Loop Impedance	Zs(max)	2.19	BS7671: Table 41.3

Circuit:	RM4			
	Nominal Voltage	V	230	
	Number of sockets		14	
	Design Current	Ib	20	BS7671: Reg 433.1.204
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	20	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		In Conduit	
	Reference Method		B	BS7671: Table 4D2A
	Cable Run Length (m)	L	68.5	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.8	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	26.5	
	Tabulated Value of Cable Current carrying capacity	It	30	BS7671: Table 4D2A
	Selected Cable Size	mm ²	4	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	11	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	3.8	
	Resistance of Line Conductor % CPC	r1+r2	16.71	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.35	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.43	
	Maximum Earth Loop Impedance	Zs(max)	2.19	BS7671: Table 41.3

Circuit:	RM5			
	Nominal Voltage	V	230	
	Equipment Power Consumption	W	3k	
	Design Current	Ib	13.1	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	16	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		In Conduit	
	Reference Method		B	BS7671: Table 4D2A
	Cable Run Length (m)	L	58	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.8	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	21.3	
	Tabulated Value of Cable Current carrying capacity	It	30	BS7671: Table 4D2A
	Selected Cable Size	mm ²	4	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	11	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.6	
	Resistance of Line Conductor % CPC	r1+r2	16.71	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.3	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.38	
	Maximum Earth Loop Impedance	Zs(max)	2.19	BS7671: Table 41.3

Circuit:	RM6			
	Nominal Voltage	V	230	
	Number of Sockets		14	
	Design Current	Ib	20	BS7671: Reg 433.1.204
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	20	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		In Conduit	
	Reference Method		B	BS7671: Table 4D2A
	Cable Run Length (m)	L	74.5	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.8	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	26.5	
	Tabulated Value of Cable Current carrying capacity	It	30	BS7671: Table 4D2A
	Selected Cable Size	mm ²	4	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	11	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	4.1	
	Resistance of Line Conductor % CPC	r1+r2	16.71	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.37	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.45	
	Maximum Earth Loop Impedance	Zs(max)	2.19	BS7671: Table 41.3

Circuit:	RM7			
	Nominal Voltage	V	230	
	Number of Sockets		14	
	Design Current	Ib	20	BS7671: Reg 433.1.204
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	20	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		In Conduit	
	Reference Method		B	BS7671: Table 4D2A
	Cable Run Length (m)	L	73.5	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.8	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	26.5	
	Tabulated Value of Cable Current carrying capacity	It	30	BS7671: Table 4D2A
	Selected Cable Size	mm ²	4	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	11	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	4.04	
	Resistance of Line Conductor % CPC	r1+r2	16.71	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.37	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.45	
	Maximum Earth Loop Impedance	Zs(max)	2.19	BS7671: Table 41.3

Circuit:	RM8			
	Nominal Voltage	V	230	
	Equipment Power Consumption	W	6k	
	Design Current	Ib	26.1	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	32A	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		In Conduit	
	Reference Method		B	BS7671: Table 4D2A
	Cable Run Length (m)	L	16	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	1	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	34.04	
	Tabulated Value of Cable Current carrying capacity	It	38	BS7671: Table 4D2A
	Selected Cable Size	mm ²	6	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	7.3	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	0.93	
	Resistance of Line Conductor % CPC	r1+r2	10.49	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.05	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.13	
	Maximum Earth Loop Impedance	Zs(max)	1.37	BS7671: Table 41.3

Circuit:	RM9			
	Nominal Voltage	V	230	
	Equipment Power Consumption	W	6k	
	Design Current	Ib	26.1	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	32A	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		In Conduit	
	Reference Method		B	BS7671: Table 4D2A
	Cable Run Length (m)	L	6	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	1	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	34.04	
	Tabulated Value of Cable Current carrying capacity	It	38	BS7671: Table 4D2A
	Selected Cable Size	mm ²	6	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	7.3	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	0.93	
	Resistance of Line Conductor % CPC	r1+r2	10.49	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.02	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.1	
	Maximum Earth Loop Impedance	Zs(max)	1.37	BS7671: Table 41.3

The locations and spacings of the sockets have been taken into consideration, bearing in mind the staff counts of each room and accessibility of each area.

Three-phase installations

The next element I completed was all of the 3 phase equipment, for the factory areas including wiring diagrams.

Factory

For all manufacturing equipment I have used the Lewden 32A 415V Surface Interlocked Socket 3P+N+E 6H IP44 mainly because “Interlocked sockets are equipped with an integral switch ensuring safe electrical disconnection and isolation.”

Other reasons for choosing this socket include – The ability to “padlock the isolation switch in both the on and off positions.” Which is suitable for efficiently ensuring the machine is disconnected during servicing, its impact resistance is greater than IK08 standard and in the event of a fault current, it is guaranteed to have “10,000 switching cycles at full load” Finally, it is suitable for all of my chosen cable sizes –

- min: 1mm²
- max:10mm²

(TLC-Direct, 2024)

See data sheet - 12

For the range oven, I decided on the BRITISH GENERAL 900 SERIES 45A 1-GANG DP COOKER SWITCH WHITE along with a 1-GANG SURFACE PATTERESS BACK BOX 47MM.

The cooker switch comes with clear “on” and “off” indicators and has room to add a “range oven” sticker if desired. The switches’ internals are also capable of receiving 10mm² cable which is suitable for the required installation method.

(Screwfix, 2024)

See data sheet – 13 & 14

Below are the three-phase wiring diagrams for the factory floor equipment:

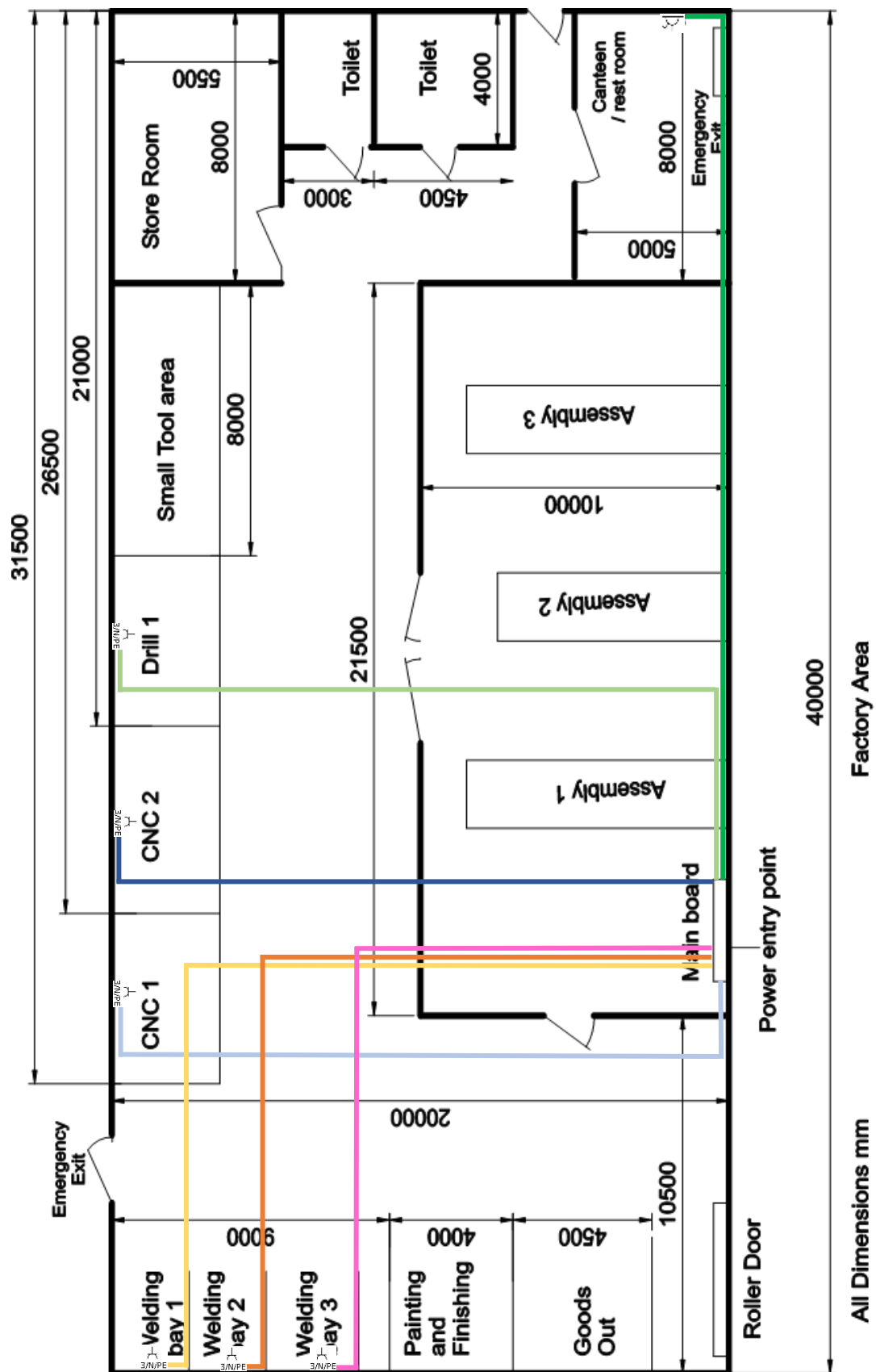


Diagram Key – Three-Phase Sockets

 3/N/PE	3P+N+E interlocked Socket
	Range Oven Switch

The cable colours on the diagrams above have been matched within the cable calculation tables below:

All calculations including the correct circuit breakers have been calculated below. Here is a full calculation for the **Canteen Range Oven**, the rest have been tabulated:

Single Phase:

$$I_b = \frac{P}{(\sqrt{3}) \times V} = \frac{(23kW)}{(\sqrt{3}) \times 400V} = 33.2A$$

$$I_n = 40A$$

$$I_z = \frac{40}{0.94 \times 0.77 \times 1 \times 1 \times 1} = 55.3A$$

Table 4D4A – Reference method E-5 (10mm² conductor)

$$I_t = 62A$$

$$V_d = \frac{3.8 \times 33.2 \times 45}{1000} = 5.7V$$

$$R_1 + R_2 = \frac{3.66 \times 1.2 \times 45}{1000} = 0.2\Omega$$

$$Z_s = 0.08 + 0.2 = 0.28\Omega$$

$$I_f = \frac{400}{0.28} = 1.429kA$$

MCB Disconnection time = 0.1s

$$S = \frac{\sqrt{(1429^2) \times 0.1}}{115} = 3.93mm^2$$

Actual CPC size = 10mm²

Three-Phase Tabulated calculations

Circuit:	CNC1			
	Nominal Voltage	V	400	
	Equipment Power Consumption	W	18k	
	Design Current	Ib	26	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	32	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D4A
	Cable Run Length (m)	L	45	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	44.2	
	Tabulated Value of Cable Current carrying capacity	It	45	BS7671: Table 4D4A
	Selected Cable Size	mm ²	6	BS7671: Table 4D4A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	6.4	BS7671: Table 4D4B
	Actual Voltage Drop	Vd	7.5	
	Resistance of Line Conductor % CPC	r1+r2	6.16	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.33	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.41	
	Maximum Earth Loop Impedance	Zs(max)	1.37	BS7671: Table 41.3

Circuit:	CNC2			
	Nominal Voltage	V	400	
	Equipment Power Consumption	W	22k	
	Design Current	Ib	31.75	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	32	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D4A
	Cable Run Length (m)	L	40	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	44.2	
	Tabulated Value of Cable Current carrying capacity	It	45	BS7671: Table 4D4A
	Selected Cable Size	mm ²	6	BS7671: Table 4D4A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	6.4	BS7671: Table 4D4B
	Actual Voltage Drop	Vd	8.1	
	Resistance of Line Conductor % CPC	r1+r2	6.16	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.3	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.38	
	Maximum Earth Loop Impedance	Zs(max)	1.37	BS7671: Table 41.3

Circuit:	Drill 1			
	Nominal Voltage	V	400	
	Equipment Power Consumption	W	3.5k	
	Design Current	Ib	5.1	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D4A
	Cable Run Length (m)	L	48	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.3	
	Tabulated Value of Cable Current carrying capacity	It	19	BS7671: Table 4D4A
	Selected Cable Size	mm ²	1.5	BS7671: Table 4D4A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	25	BS7671: Table 4D4B
	Actual Voltage Drop	Vd	6.12	
	Resistance of Line Conductor % CPC	r1+r2	24.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.4	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.48	
	Maximum Earth Loop Impedance	Zs(max)	7.28	BS7671: Table 41.3

Circuit:	Welding Bay 1			
	Nominal Voltage	V	400	
	Equipment Power Consumption	W	16k	
	Design Current	Ib	23.1	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	25	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D4A
	Cable Run Length (m)	L	52	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	34.5	
	Tabulated Value of Cable Current carrying capacity	It	35	BS7671: Table 4D4A
	Selected Cable Size	mm ²	4	BS7671: Table 4D4A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	9.5	BS7671: Table 4D4B
	Actual Voltage Drop	Vd	11.4	
	Resistance of Line Conductor % CPC	r1+r2	9.22	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.58	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.66	
	Maximum Earth Loop Impedance	Zs(max)	1.75	BS7671: Table 41.3

Circuit:	Welding Bay 2			
	Nominal Voltage	V	400	
	Equipment Power Consumption	W	16k	
	Design Current	Ib	23.1	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	25	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D4A
	Cable Run Length (m)	L	48	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	34.5	
	Tabulated Value of Cable Current carrying capacity	It	35	BS7671: Table 4D4A
	Selected Cable Size	mm ²	4	BS7671: Table 4D4A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	9.5	BS7671: Table 4D4B
	Actual Voltage Drop	Vd	10.5	
	Resistance of Line Conductor % CPC	r1+r2	9.22	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.53	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.61	
	Maximum Earth Loop Impedance	Zs(max)	1.75	BS7671: Table 41.3

Circuit:	Welding Bay 3			
	Nominal Voltage	V	400	
	Equipment Power Consumption	W	16k	
	Design Current	Ib	23.1	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	25	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D4A
	Cable Run Length (m)	L	43	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	34.5	
	Tabulated Value of Cable Current carrying capacity	It	35	BS7671: Table 4D4A
	Selected Cable Size	mm ²	4	BS7671: Table 4D4A
	Maximum Voltage Drop	Vd(max)	11.5	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	9.5	BS7671: Table 4D4B
	Actual Voltage Drop	Vd	9.44	
	Resistance of Line Conductor % CPC	r1+r2	9.22	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.48	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.56	
	Maximum Earth Loop Impedance	Zs(max)	1.75	BS7671: Table 41.3

The cable chosen for all 3 phase circuits is 70°C Armoured Multicore cable as it is able to withstand harsh working conditions.

Emergency Lighting Installations

BS EN 1838 specifies escape and standby lighting requirements for businesses in the event of a power failure.

Factory

According to Surrey Fire UK, “Emergency lighting illuminates areas that lead occupants to the nearest fire exit. In an outage, the lights should remain on for between one and three hours.”

After doing research, I have decided that the factory falls under “High-risk task area lighting”

This category is for workspaces that “play host to extremely high-risk tasks (such as working with tools or operating machinery).” (Surrey Fire, 2024)

This being the case, the lights chosen are the Integral LED Emergency Twin Spot Non Maintained 5W 550lm Self Test IP65.

See data sheet – 15

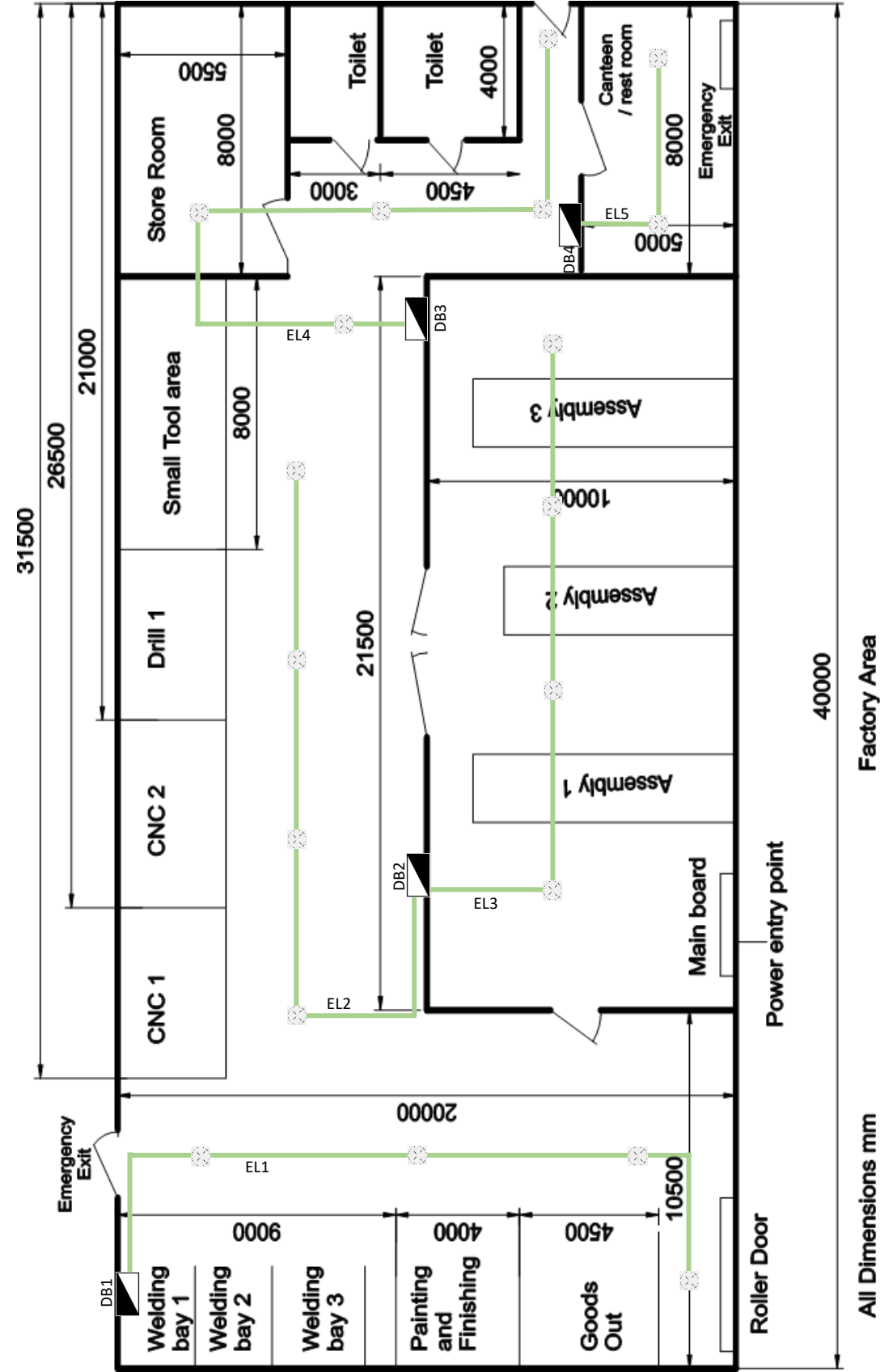
Office Block

Within the Office block, I have opted for the 36W 600x600mm LED Emergency Light Panel Recessed UGR>19 For Office Suspended Ceiling White.

These lights are suitable for the office block as they are panel fittings.

See data sheet – 16

Below are the emergency lighting wiring diagrams for both the factory floor and office block:



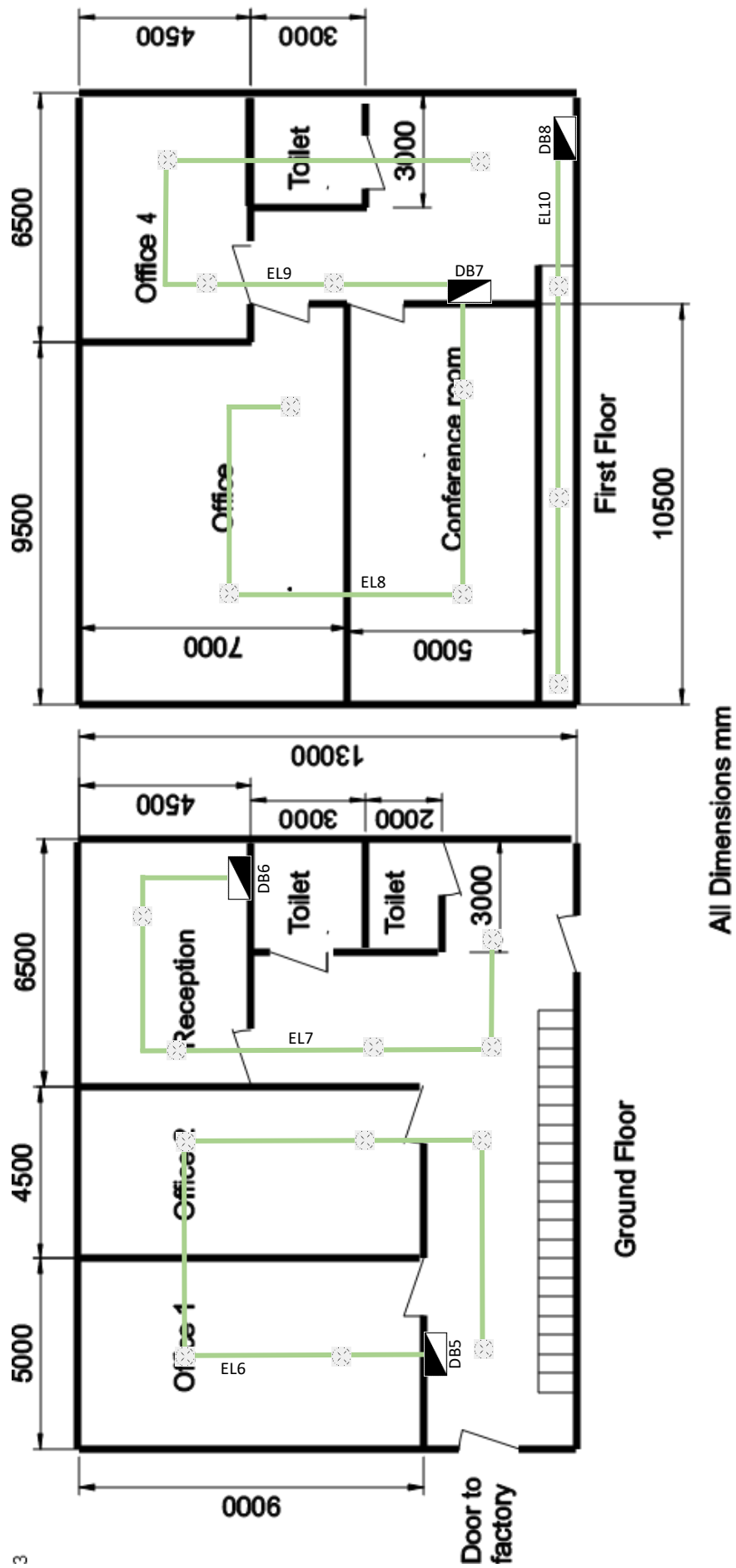


Diagram Key - Emergency Lighting

	Lighting Fixture
	Distribution Board

The cable calculations below have been referenced in accordance with the diagrams above (EL1-10)

Emergency Lighting Tabulated Calculations

Circuit:	EL1			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	400	
	Design Current	Ib	1.74	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	40	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.14	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	3.06	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.74	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.82	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	EL2			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	400	
	Design Current	Ib	1.74	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	31.5	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.14	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.41	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.37	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.45	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	EL3			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	400	
	Design Current	Ib	1.74	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	27	
	Insulation		None	
	Ambient Temperature	°C	35	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.14	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.06	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.17	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.25	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	EL4			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	500	
	Design Current	Ib	2.17	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	37.5	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.14	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	3.6	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.63	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.71	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	EL5			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	200	
	Design Current	Ib	0.87	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Cable Tray	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	11	
	Insulation		None	
	Ambient Temperature	°C	35	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	0.94	BS7671: Table 4B1
	Grouping	Cg	0.77	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.14	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	0.42	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.48	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.56	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	EL6			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	600	
	Design Current	Ib	2.61	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	6	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	30	
	Insulation		None	
Correctional Factors	Ambient Temperature	°C	25	
	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	8.96	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	3.44	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.3	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.38	
	Maximum Earth Loop Impedance	Zs(max)	7.29	BS7671: Table 41.3

Circuit:	EL7			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	500	
	Design Current	Ib	2.17	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	28	
	Insulation		None	
	Ambient Temperature	°C	25	
	Maximum number of circuit grouped		4	
Correctional Factors	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.5	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.7	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.22	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.3	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	EL8			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	400	
	Design Current	Ib	1.74	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	26	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.5	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	1.99	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.13	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.21	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	EL9			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	400	
	Design Current	Ib	1.74	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	27	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.5	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	2.07	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	1.17	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	1.25	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

Circuit:	EL10			
	Nominal Voltage	V	230	
	Power (Combined) - n lamps x 100	W	300	
	Design Current	Ib	1.3	
	Protective Device		Type B RCBO	
	Protective Device Rating (A)	In	3	BS7671: Table 41.3
	Cable Type		70°C Thermoplastic with Protective Conductor	
	Installation Method		Bunched in Air	
	Reference Method		E	BS7671: Table 4D2A
	Cable Run Length (m)	L	18	
	Insulation		None	
	Ambient Temperature	°C	25	
Correctional Factors	Maximum number of circuit grouped		4	
	Ambient Temperature	Ca	1.03	BS7671: Table 4B1
	Grouping	Cg	0.65	BS7671: Table 4C1
	Thermal Insulation	Ci	1	BS7671: Table 52.2
	Fuses	Cf	1	BS7671: Reg 433.1.202
	Buried In The Ground	Cc	1	BS7671: Reg 433.1.203
	Cable Current Carrying Capacity (A)	Iz	4.5	
	Tabulated Value of Cable Current carrying capacity	It	17	BS7671: Table 4D2A
	Selected Cable Size	mm ²	1	BS7671: Table 4D2A
	Maximum Voltage Drop	Vd(max)	6.9	BS7671: Table 4Ab
	Voltage Drop Per Meter	mV/A/m	44	BS7671: Table 4D2B
	Actual Voltage Drop	Vd	1.03	
	Resistance of Line Conductor % CPC	r1+r2	36.2	Table L1 OSG
	Multiplier		1.2	Table L3 OSG
	Actual Circuit Resistance (Ω)	R1+R2	0.8	
	External Earth Loop Impedance (Ω)	Ze	0.08	
	Earth Fault Loop Impedance (Ω)	Zs	0.88	
	Maximum Earth Loop Impedance	Zs(max)	14.57	BS7671: Table 41.3

As these calculations are also with lights, each light has been given a wattage of 100W.

Use of Circuit Protection

The distribution boards chosen, come supplied with 6 RCBO's with ranging cut-off currents.

Where additional RCBO's need to be installed, individual devices are available to purchase, see below:

18th Edition
2nd Amendment







BRITISH GENERAL FORTRESS 6A 30MA SP & N TYPE B COMPACT RCBO (374VF)

★★★★★ 5.0 (1) [Write a review](#) [Ask a question](#)

18th Edition Amendment 2. Suitable for use on AC and pulsed DC circuits within BG Fortress range of consumer units and enclosures. Integrated blue neutral lead. Manual test button.

- DIN Rail Mounted Fitting
- 6kA Breaking Capacity
- Type A RCD
- Type B Curve
- Positive Contact Status Indication

[More Info](#)

View all: [British General RCBOs](#)

£19.99
INC VAT

QTY

Add to basket for...

 **Delivery**

 **Click & Collect**

[Check stock in your local store](#)

Add to saved list...

Save

Cable support systems

Factory

Within the factory area, cable trays have been used. This is because the flexibility options are greater than the likes of using steel conduit, which is important in an area where new equipment may be added or moved around.

Another advantage to this installation method is the cost compared to others:



100MM PREMIER MEDIUM DUTY CABLE TRAY X 3 METRE

★★★★★ 0 reviews | Write a review

Product Code: CPM100

£7.50 inc VAT
(£6.25 exc VAT)

Qty	Price
25+	£7.35 inc VAT (£6.13 exc VAT)
50+	£7.20 inc VAT (£6.00 exc VAT)
BEST PRICE 100+	£7.13 inc VAT (£5.94 exc VAT)

— 1 +

ADD TO CART



Click to Zoom

Tamlex 25 mm Metal Pre Galvanised Steel Conduit (3m Length)

Part Code: SPC25-3 Stock Code: 0672-3151

★★★★★ 6 reviews

£14.10 For 3m

£16.92 Inc VAT

Compare

BULK SAVINGS OF 7.4% 24+ £13.05 for 3m Ex VAT

— 3 +

Add to Basket for Delivery

Delivery

15165 In Stock

Free delivery on orders over £50
£5.95 Delivery on orders under £50

Reserve & Collect

Delivery Only

Office Block

Within the offices, a combination of Bunched in air (above the suspended ceiling) and PVC conduit has been chosen.

The suspended ceiling allows the cables to be routed without any specific cable management, the conduit is then used vertically along the walls for sockets.



Q Click to Zoom



Centauro 20mm PVC Round Conduit Heavy Gauge White (3m Length)

Part Code: HG 20W Stock Code: 0009-1240

★★★★★ 10 reviews



£2.22 For 3m
£2.66 Inc VAT

[Compare](#)

BULK SAVINGS OF 8.1% 30+ £2.04 for 3m Ex VAT

3

Add to Basket for Delivery

Delivery

12333 In Stock

Free delivery on orders over £50
£5.95 Delivery on orders under £50

Reserve & Collect

Select Collection Store

Circuit Diversity Calculations

Circuit Ref:	Total Circuit Current (A)	Diversity Percentage	After Applied Diversity (A)
FFL1	3.48	90%	3.132
FFL2	2.61	90%	2.349
FFL3	3.91	90%	3.519
FFL4	3.91	90%	3.519
FFL5	3.91	90%	3.519
FFL6	3.04	90%	2.736
FFL7	1.74	90%	1.566
FFL8	2.61	90%	2.349
FFL9	0.86	90%	0.774
FFL10	2.17	90%	1.953
OFL1	2.61	90%	2.349
OFL2	2.17	90%	1.953
OFL3	2.61	90%	2.349
OFL4	2.61	90%	2.349
OG11	2.61	90%	2.349
OG12	2.61	90%	2.349
OG13	1.73	90%	1.557
OG14	0.87	90%	0.783
OG15	3.04	90%	2.736
EL1	1.74	90%	1.566
EL2	1.74	90%	1.566
EL3	1.74	90%	1.566
EL4	2.17	90%	1.953
EL5	0.87	90%	0.783
EL6	2.61	90%	2.349
EL7	2.17	90%	1.953
EL8	1.74	90%	1.566
EL9	1.74	90%	1.566
EL10	1.3	90%	1.17
RM1	20	75%	15
RM2	20	75%	15
RM3	20	75%	15
RM4	20	75%	15
RM5	13.1	75%	9.825
RM6	20	75%	15
RM7	20	75%	15
RM8	26.1	75%	19.575
RM9	26.1	75%	19.575
CNC1	26	75%	19.5
CNC2	31.75	75%	23.8125
DRILL 1	5.1	75%	3.825
WELDING BAY 1	23.1	75%	17.325
WELDING BAY 2	23.1	75%	17.325
WELDING BAY 3	23.1	75%	17.325
RANGE OVEN	33.2	60%	19.92

Data Sheets

01

Brand	Tamlite
Beam Angle	90°
Class Type	Class 1
Colour	White
Colour Rendering Index(Cri)	80
Colour Temperature	4000 K
Compliance	UKCA, CE
Dimensions	(L)560 mm x (H)85 mm x (W)380 mm
Efficacy Rating	160
Energy Saving	Yes
Finish	White [RAL 9016]
Guarantee	7 Years
Height	85mm
IP Rating	IP20
Ik Rating	IK10
Lamp Life	60000h
Lamp Type	Integrated LED
Length	560mm
Lumens Output	9600lm
Material	Steel Body
Maximum Mounting Height	20m
Mounting	Surface / Suspended
Operating Temperature Range	-20 - +25°C
Packaging Types	Box
Power Rating	60W
Previously Known As	EXP950WNW
Product Range	Expo
Type	Low Bay
Unspsc V18	39111546
Voltage Rating	230V
Weight	4.632kg
Width	380mm

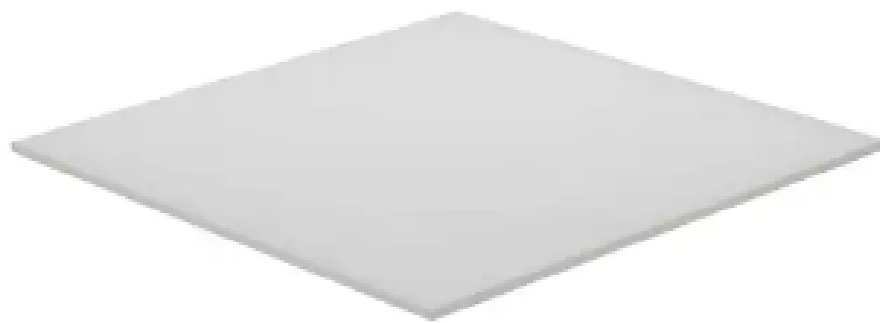


02

Class Type	Class 2
Colour	White
Colour Rendering Index(Cri)	80
Colour Temperature	Selectable - 3000/4000/6000 K
Compliance	UKCA, CE
Depth	110mm
Diameter	330mm
Dimensions	(Dia)330 mm x (D)110 mm
Dimmable	No
Efficacy Rating	92
Emergency	No
Energy Saving	Yes
Finish	White
Guarantee	5 Years
IP Rating	IP65
Ik Rating	IK08
Lamp Life	30000h
Lamp Type	Integrated LED
Lens Colour	Opal
Lumens Output	1000lm 1050lm 1100lm
Material	Polycarbonate Body / Diffuser
Mounting	Surface
Packaging Types	Each
Power Rating	12W
Product Range	xcite Bulkhead
Sensor	No
Shape	Circular
Type	LED Bulkhead
Unspsc V18	39111544
Voltage Rating	230V
Weight	1.26kg



Class Type	Class 2
Colour	White
Colour Rendering Index(Cri)	80
Colour Temperature	4000 K
Compliance	UKCA, CE
Depth	35mm
Dimensions	(L)595 mm x (W)595 mm x (D)35 mm
Efficacy Rating	100
Energy Saving	Yes
Guarantee	5 Years
IP Rating	IP20
Ik Rating	IK03
Lamp Life	30000h
Lamp Type	Integrated LED
Length	595mm
Lumens Output	3000lm
Material	Extruded aluminium
Mounting	Recessed
Operating Temperature Range	0 - +25°C
Packaging Types	Each
Power Rating	30W
Product Range	xcite PANEL
Suitable For	Retro-fit of existing T8 or T5 fixtures
Unspsc V18	39111505
Voltage Rating	230V
Weight	3.5kg
Width	595mm



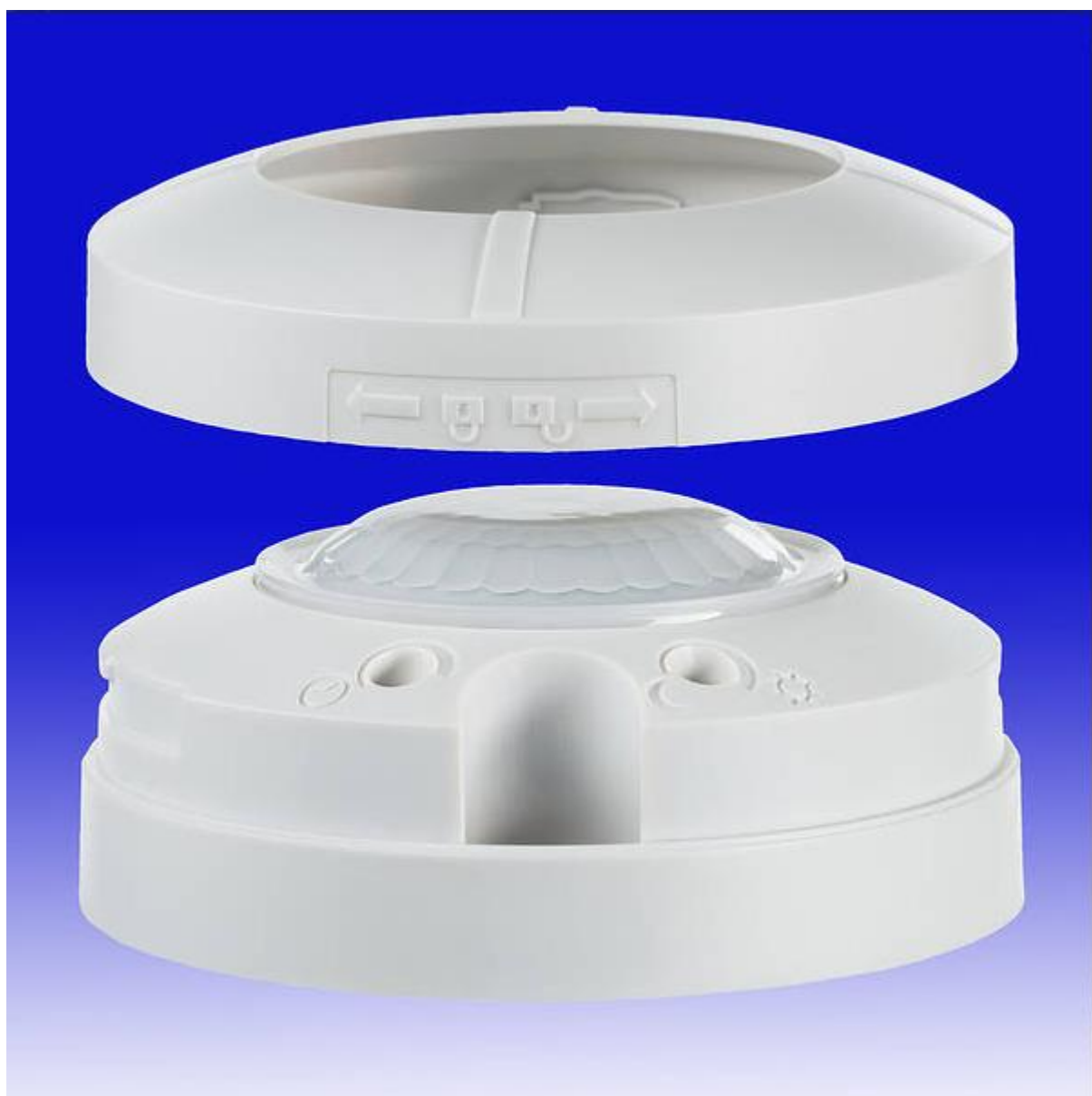
Colour	White
Current Rating	6A
Depth	45mm
Dimensions	(L)1.5 m x (W)77 mm x (D)45 mm
Fixing Centres	50.8mm
Frequency	50/60 Hz
Guarantee	30 Years
Length	1.5m
Mounting	Ceiling
Number of Poles	Single Pole
Packaging Types	Each
Previously Known As	3192WHI
Standards	BS 3676, BS EN 60669
Unspsc V18	39122239
Voltage Rating	230V
Weight	0.055kg
Width	77mm



Brand	Legrand
Colour	White
Current Rating	10A
Dimensions	(H)86 mm x (W)86 mm
Fixing Centres	60.3mm
Frequency	50/60 Hz
Guarantee	1 Year
Height	86mm
Material	Moulded
Mounting	Wall
Mounting Depth	16mm
Number of Gangs	1
Number of Poles	Single Pole
Number of Ways	1
Packaging Types	Each
Product Range	Synergy
Standards	BS EN 60669
Unspsc V18	39122226
Voltage Rating	230V
Weight	0.069kg
Width	86mm



- 360° ceiling surface mount PIR sensor
- Operating Voltage - 230V AC
- 8 metre diameter detection range (at 3m height)
- No creep zone – maximum coverage
- Light ON time adjustable 3 secs - 18 mins
- Manual ON/OFF override
- IP44 weatherproof rating
- Not suitable for discharge lighting
- Adjustable Light Level Control - Yes (1 to 1000Lux)
- Conforms to Directives - 73/23/EEC, 89/336/EEC
- Total PIR switching
 - 2000W incandescent or halogen,
 - 500W fluorescent (low loss ballast),,
 - 200W fluorescent (electronic ballast),
 - 75W Fan
 - LED lamps 0W 500W
 - Not suitable for discharge lighting
- Maximum Fusing - 10A
- Angle of Detection - 360°
- Light On Time After last detection (Adjustable) - 3 Seconds (Min), 18 Minutes (Max)
- Permanent ON Facility - (Electronic)



SPECIFICATION

Brand	British General
Busbar Type	Floating Busbar
CSU Populated/Unpopulated	Part-Populated
Cable Entry Points	Top, Bottom, Left, Right & Rear
Construction Material (Electrical)	Steel
Consumer Unit Type	Main Switch
Current Rating	100A Max Load A
DIN Rail Supplied	DIN Rail Supplied
Fixings Supplied	Fixings Not Supplied
IP Rating	IP2XC
Integrity	Non High Integrity
MCBs Supplied	No MCBs Supplied
Mains Switch Rating	100A Mains Switch
Manufacturer Guarantee	10 Year Manufacturer's Guarantee (T&Cs Apply)
Model Name	Fortress
Model No	CFUSWP610A
No. of Available Ways	10
No. of MCBs Supplied	0 x MCBs
No. of RCBOs Supplied	6 x Type B RCBOs (2 x 6A, 1 x 16A, 2 x 32A & 1 x 40A)
No. of RCDs Supplied	0 x RCDs
No. of SPDs Supplied	0 x SPDs
Pack Size	1
Pieces in Pack/Case	1
Power Voltage Supply	230 V
Product Depth	115.5 mm
Product Height	231 mm
Product Type	Consumer Unit
Product Width	388 mm
RCBOs Supplied	RCBO
RCD Type	No RCD
RCDs Supplied	No RCDs Supplied
SPDs Supplied	No SPDs Supplied
Total No. Module Spaces When Empty	12
Total Product Weight	3.6 kg
Way	10 Way

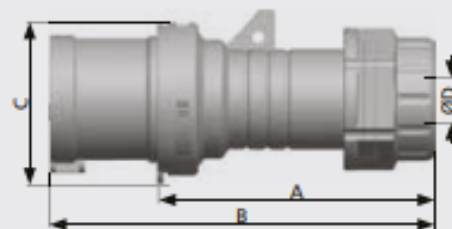


MLA PART CODE	MR9000
DESCRIPTION	Metal Clad 13A 2G DP Switched Socket
NET WEIGHT (KG)	0.344
DIMENSIONS (MM)	Height - 82 Width - 142 Projection - 45
CONSTRUCTION	Construction - Premium grade steel
CLASS	I
IP RATING	IP20
INPUT VOLTAGE	230V 50Hz
SWITCH TYPE	Double Pole
EARTH TERMINAL	Yes
NEON INDICATOR	No
LOAD/MAX. LOAD	13A
TERMINAL TYPE	Screw
TERMINAL CAPACITY	3 x 2.5mm ² or 2 x 4.0mm ²
WARRANTY	15year(s)
MANUFACTURED IN ACCORDANCE WITH	BS 1363-2
ORIGIN OF MANUFACTURE	China
DECLARATION OF CONFORMITY (HELD ON FILE)	Yes
EAN	5055832957065



Plugs 16 and 32 Amp

IP44 SPLASHPROOF



AMPS	PIN. CONFIGURATION	100-130V 50-60HZ	200-250V 50-60HZ	380-415V 50-60HZ	CABLE DIAMETER D MM		TERMINAL CAPACITY* MM ²	DIMENSIONS IN MM		
		LIST NO.	LIST NO.	LIST NO.	MIN	MAX		A	B	C
16A	2P+E	K9000YEL	K9001BLU 6		8.2	13	1-2.5	132.3	95.5	55.5
16A	3P+E		K9006BLU 6	K9007RED 6	8.9	15.5	1-2.5	132.3	95.5	61.5
16A	3P+N+E		K9014BLU 9	K9015RED 6	10.1	17	1-2.5	132.3	95.5	67.5
32A	2P+E	K9032YEL 4	K9033BLU 6		11.7	18	2.5-6	135.8	90	72.5
32A	3P+E		K9036BLU	K9037RED 6	11.7	22	2.5-6	135.8	90	72.5
32A	3P+N+E		K9044BLU 9	K9045RED 6	14.2	22	2.5-6	141.8	95.8	79.7

Earth Hour Position

*Flexible conductors



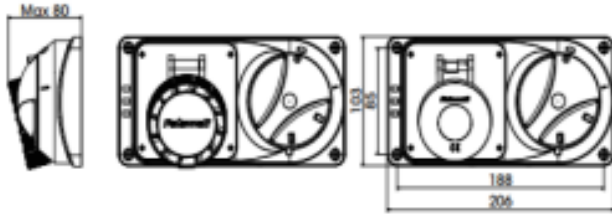
SPECIFICATION		
Amp Rating		20 A
Appliance Switch Type		Water Heater
Brand		LAP
Fixings Supplied		Fixings Supplied
Indicator Type		Neon Power Indicator
Insert Colour		Without Inserts
Manufacturer Guarantee		1 Year Guarantee
Min. Back Box Depth Required		35 mm
No. of Earth Terminals		2
Number of Gangs		1 Gang
Number of Poles		Double Pole
Pack Size		1
Parent Colour		White
Pieces in Pack/Case		1
Power Voltage Supply		250 V
Product Type		20 Amp Switch
Screwed/ Screwless		Screwed
Switch Operation		Rocker
Switch Operation Colour		Colour-Matched
Switch Product Type		Appliance
Switches & Sockets Finish		Plastic
Switches & Sockets Product Type		Appliance Switch
Switches & Sockets Profile Type		Raised Slim
Terminal Capacity		Terminals accept 2 x 2.5mm ² or 1 x 6mm ² cables
With Flex Outlet		Without Flex Outlet
With USB Ports		Without USB



11

- Protects appliances from possible fire hazard.
- Manual reset.
- Extra fast action – trips out within 40 milliseconds (BS7288).
- Automatically disconnects both Live and Neutral connections leaving Earth connection intact.
- Trips out when the power supply is temporarily lost. A safety must for machine tool applications.
- Test button for safety checks.
- Still protects with lost neutral.
- Still protects with pulsating DC earth fault currents.
- Complies with BS7288 and BS1363.
- Supplied with a 40mm BS metal surface wall box.
- Type - Non-Latching
- Operating Voltage - 230V AC
- Current Rating - Fully Complies With BS1363
- Rated Trip Current - 30mA
- Trip Speed - BS 7288 – 40ms
- Contact Break - Double Pole
- Continues to Protect With Lost Neutral & Pulsating DC Earth Fault
- Cable Capacity - $3 \times 2.5\text{mm}^2$
- Conforms To BS1363, BS7288
- Surface Mount Wall Box Supplied
- Metal RCD Sockets supplied with a 40mm BS metal surface wall box.





Design Characteristics

- Constructed from high quality thermo-plastic material.
- Ingress protection IP44
- 32A 400V 50Hz 3P+N+E interlocked socket outlet in compliance to IEC 60309-1, IEC 60309-2, IEC 60529, IEC 60947-3.
- Impact resistance >IK 08
- Connecting sections of wires
min:1mm² max:10mm².

AC3 / AC23A utilization categories at fully rated current ensure that isolation switches are designed for use with highly inductive load equipment, e.g. motor applications.

- Dimensions (as seen in the diagram);

Max 80mm / 103mm - 85mm / 188mm - 206mm

Features and Benefits

Safety:

Interlocked sockets are equipped with an integrated isolator switch AC3-AC23A which guarantee;

- Load break disconnect on nominal rated current
- Safe Isolation in the OFF position
- 10,000 switching cycles at full load

All interlocked sockets can be locked both at position 0 and 1

Interlocked sockets are equipped with an integral switch ensuring safe electrical disconnection and isolation.

In order to prevent disconnection of the plug and socket coupling under load, it is not possible to turn the integral isolator switch to the 'on' position until a mating plug has been fully inserted. The plug cannot then be withdrawn until the isolator has been selected to the 'off' position.

It is possible to padlock the isolation switch in both the on and off positions.



SPECIFICATION

Amp Rating	45 A
Appliance Switch Type	Cooker
Brand	British General
Cooker Switch Socket	Without Socket
Fixings Supplied	Fixings Supplied
Indicator Type	Without Indicator
Insert Colour	Without Inserts
Manufacturer Guarantee	25 Year Manufacturer's Guarantee (T&Cs Apply)
Min. Back Box Depth Required	47 mm
Model Name	900 Series
Model No	975
No. of Earth Terminals	2
Number of Gangs	1 Gang
Number of Poles	Double Pole
Pack Size	1
Parent Colour	White
Pieces in Pack/Case	1
Power Voltage Supply	240 V
Product Type	Cooker Switch
Screwed/Screwless	Screwed
Switch Operation	Rocker
Switch Operation Colour	Red
Switch Product Type	Appliance
Switches & Sockets Finish	Plastic
Switches & Sockets Product Type	Cooker Switch
Switches & Sockets Profile Type	Raised Square
Terminal Capacity	Terminals accept up to 10mm ² cable
With Flex Outlet	Without Flex Outlet
With USB Ports	Without USB



SPECIFICATION

Back Box Type	Surface Pattrass
Box Depth Internal	47 mm
Brand	Essentials
Construction Material (Electrical)	Plastic
Fixings Supplied	Fixings Not Supplied
Knockout Position	Side & Base Knockouts
Knockout Size	15 mm
Lug Description	Fixed Lugs
Manufacturer Guarantee	1 Year Guarantee
No. of Earth Terminals	1
No. of Knockouts	4
Number of Gangs	1 Gang
Pack Size	1
Parent Colour	White
Pieces in Pack/Case	1
Product Type	Back Box
Switches & Sockets Product Type	Appliance Switch

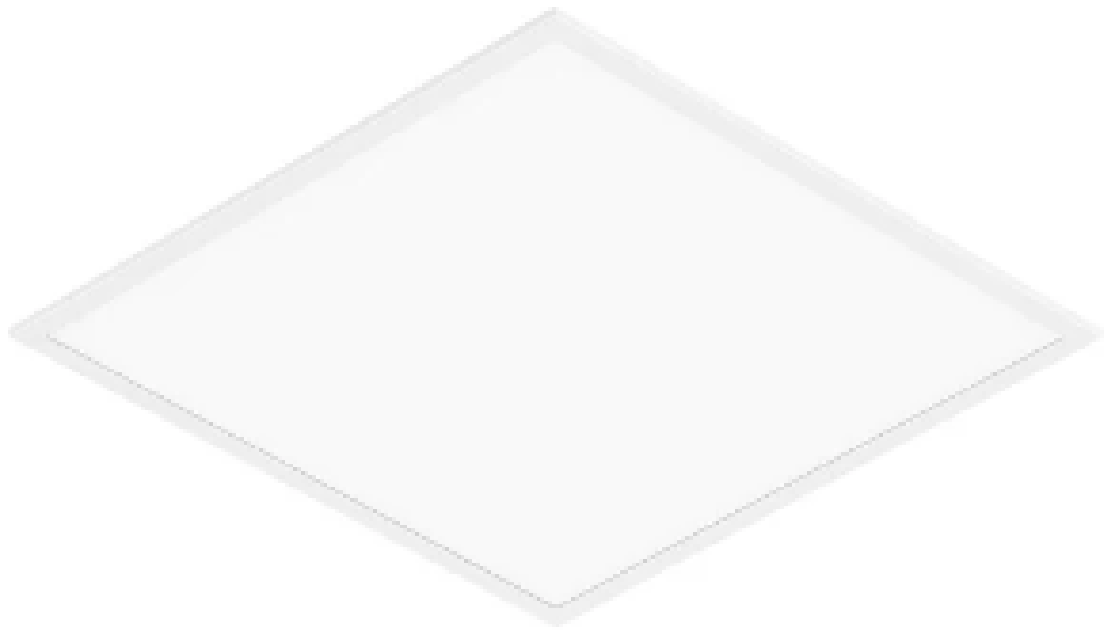


Brand	Integral LED
Manufacturer ID	ILEMTS035
Wattage	5
Lumens	550
Colour Temperature (K)	6000k
Light Bulb Colour	Cool White
IP Rating	IP65



Average Life	30,000 hrs
Beam Angle	110°
Body Colour	White
Body Material	Pressed Steel
Box Contents	Fitting, Emergency Pack & Fixings
Cable Entry	External Driver
Cap Type	Integrated LEDs
Colour Rendering Index (CRI)	>=80
Colour Temperature Description	Neutral White
Colour Temperature Value	4000K
Dimmable	Non-Dimmable
Domestic/Commercial Use	Commercial & Semi-Commercial
Earth Protection	Class II
Emergency (Yes/No)	Yes
Emergency Battery Life	>3 Hours
Emergency Lighting Maintained	Maintained only
Fire Rating	TP(b) Rated
Fitting Installation	Ceiling
Fixings Supplied	Yes
Indoor/Outdoor Usage	Indoor
Installation Options	offices, garages, waiting rooms, hospitals, schools, restaurants, and other commercial & semi commercial buildings
IP Rating	IP20
kWh Per 1000hr Life	38
Diffuser Colour	Frosted

Diffuser Material	Polystyrene
Light Technology	LED SMD 2835
Light Bulb(s) Supplied	Integrated LEDs
Luminous Flux	3700 lm
Lumens per watt	102.78lm/w
Manufacturer Guarantee	5 Years
Model No	PAN36CW-EM
Operating Temp (°C)	-10°C to 40°C
Pack Size	1 Unit
Power Input	Mains (Hardwired)
Power Factor Value	0.9
Product Dimenions (H x W x D)	596mm (h) x 596mm (w) x 33mm (d)
Product Type	Emergency LED Panel
Product Weight	2 kg
Shape	Square
Smart Compatibility	No
Transformer	External Driver
UKCA & CE Compliant	Yes (Conformity Certificate Available)
UK & EU Regulations	BS2782.0:2011 Method 508A, BS EN 12464-1 L
Unified Glare Rating (UGR)	>19 Low Glare
Voltage	220-240
Voltage Supply	AC 50/60Hz
Wattage	36.0W



References

City Electrical Factors Ltd, 2024. *12W LED Colour Selectable Bulkhead White*. [Online]
Available at: <https://www.cef.co.uk/catalogue/products/4923754-12w-led-colour-selectable-bulkhead-white>
[Accessed 16 April 2024].

City Electrical Factors Ltd, 2024. *30W 600mm x 600mm LED Panel 4000K*. [Online]
Available at: <https://www.cef.co.uk/catalogue/products/4574495-30w-600mm-x-600mm-led-flat-panel-4000k>
[Accessed 16 April 2024].

City Electrical Factors Ltd, 2024. *Expo 60W LED High Output Wide Beam Low / High Bay 4000K*. [Online]
Available at: <https://www.cef.co.uk/catalogue/products/5028047-60w-led-high-output-wide-beam-low-high-bay-4000k>
[Accessed 16 April 2024].

Screwfix, 2024. *BRITISH GENERAL 900 SERIES 45A 1-GANG DP COOKER SWITCH WHITE*. [Online]
Available at: https://www.screwfix.com/p/british-general-900-series-45a-1-gang-dp-cooker-switch-white/45659#product_additional_details_container
[Accessed 16 April 2024].

Surrey Fire, 2024. *Emergency Lighting Regulations for 2024*. [Online]
Available at: <https://surreyfire.co.uk/emergency-lighting-regulations/>
[Accessed 16 April 2024].

TLC-Direct, 2024. *240v 16 Amp 3 Pin MK Commando Socket - Blue - IP44*. [Online]
Available at: <https://www.tlc-direct.co.uk/Products/MKK9201BLU.html>
[Accessed 16 April 2024].

TLC-Direct, 2024. *13 Amp 2 Gang Switched Socket - Metalclad*. [Online]
Available at: <https://www.tlc-direct.co.uk/Products/AA3356.html>
[Accessed 16 April 2024].

TLC-Direct, 2024. *32A 415V Surface Interlocked Socket 3P+N+E 6H IP44*. [Online]
Available at: https://www.tlc-direct.co.uk/Products/LDR32%2f5SS.html?source=adwords&ad_position=&ad_id=&placement=&kw=&network=x&matchtype=&ad_type=pla&product_id=LDR32%2f5SS&product_partition_id=&campaign=shopping_switches_sockets&version=finalurl_v3&gad_source=1&gc
[Accessed 16 April 2024].