1. Introduction:

i. Background:

A ceramic tiles manufacturing industry is a heavy industrial facility that operates multiple large motors, hydraulic presses, kilns, blungers, mixers, polishing lines, conveyors, and inspection/palletizing systems. Continuous operation is mandatory, as stoppages can result in material wastage and significant production losses. The facility requires a robust electrical system to ensure uninterrupted power supply, safety, and efficient operation of all production and auxiliary processes.

ii. Project Objectives:

The primary objectives of this project are:

1. Design a safe and reliable industrial power distribution system.
2. Implement a Double Busbar (DBDB) scheme for all critical production departments to enhance reliability and operational flexibility.
3. Implement Main + Transfer Bus (sectionalizer with single busbar) for non-critical departments such as offices, warehouses, and utility areas.
4. Perform load estimation, apply demand factors, and determine transformer sizing.
5. Perform cable sizing, breaker selection, and busbar dimensioning.
6. Design a full lighting layout using DIALux software to achieve required illuminance levels in all functional areas.

iii. Major Production Areas:

1. **Mill:** Processes raw clay and additives into fine slurry or powder using large grinding mills.

2. **Hydraulic Press:** Forms tiles under high pressure using heavy-duty hydraulic presses.
3. **Kiln**: Main firing area where tiles are baked at high temperatures; requires continuous, reliable power supply.
4. **Polishing & Finishing Section**: Tiles are surface-finished, trimmed, and prepared for inspection.
5. **Inspection & Packing**: High-lux area used for quality checking, defect removal, sorting, and packaging.
6. **Warehouse**: Handles clay, powder, and additives; supplies material to mills.
7. **Control Room**: Houses MCC panels, monitoring systems, and plant automation.
8. **Administrative Areas**: Includes HR offices, staff facilities, and light-duty electrical loads.

iv. Load Nature:

1. Most production loads consist of inductive motor loads, including mills, compressors, pumps, and press motors.
2. Kiln section contains continuous-duty motors for fans, blowers, air supply, and circulation.
3. Administrative areas, HR offices, and the Control Room have light-duty electrical loads, such as lighting, fans, and computers.
4. Lighting load is distributed across all areas to achieve the required illuminance levels, ensuring proper visibility and workplace safety.

v. AutoCAD 2D Demonstration:

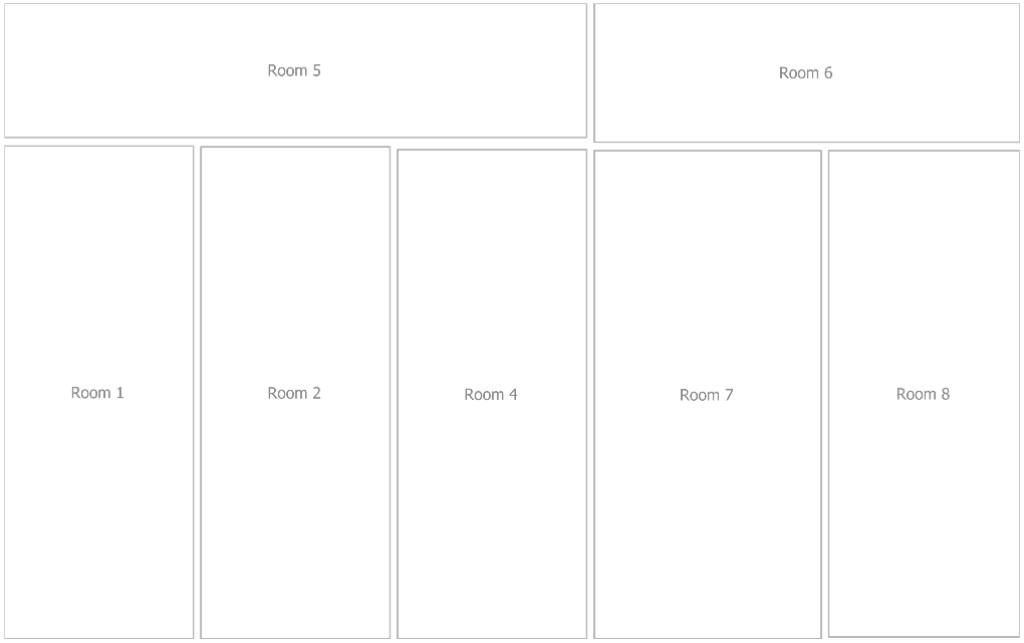


Figure 1: AutoCAD 2D Civil Layout of Ceramic Industry

vi. Lighting Layout:

The lighting design of the ceramic industry has been developed using DIALux software to ensure adequate illumination across all functional areas, including production halls, warehouse, offices, and inspection zones. Both 2D and 3D layouts have been generated to provide a comprehensive view of luminaire placement, lighting zones, and illuminance distribution. The 2D layout illustrates the plan view of fixture locations and lighting coverage, while the 3D view simulates the actual lighting effect within the industrial space, highlighting uniformity, glare control, and compliance with CIE-recommended lux levels (300–500 lux).

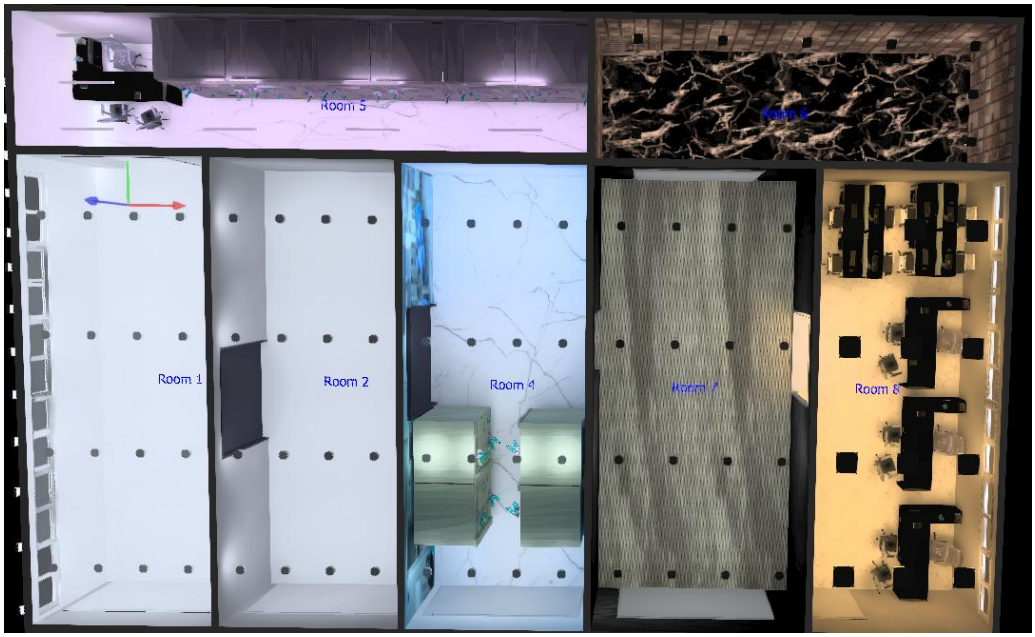


Figure 2: DIALux 3D Lighting Layout – Indoor Area

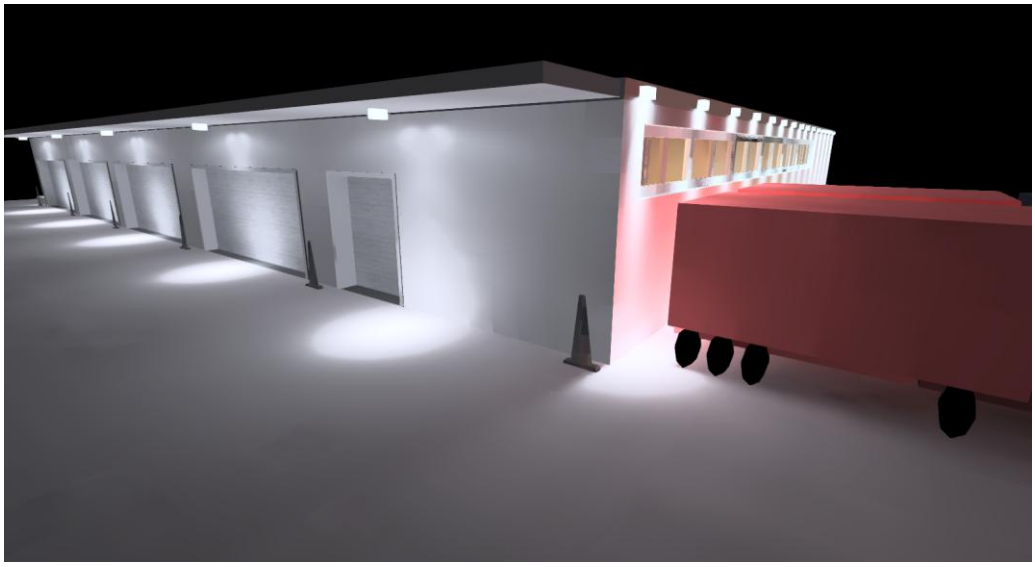


Figure 3: DIALux 3D Lighting Layout – Outdoor Area

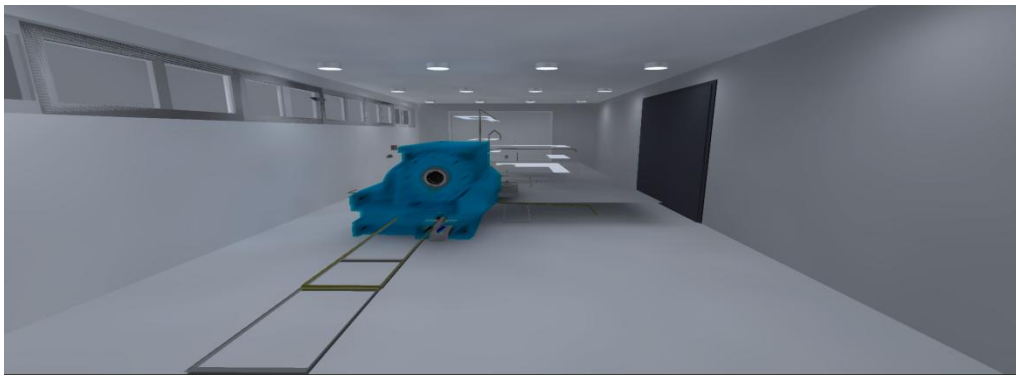


Figure 4: Mill – Production Area

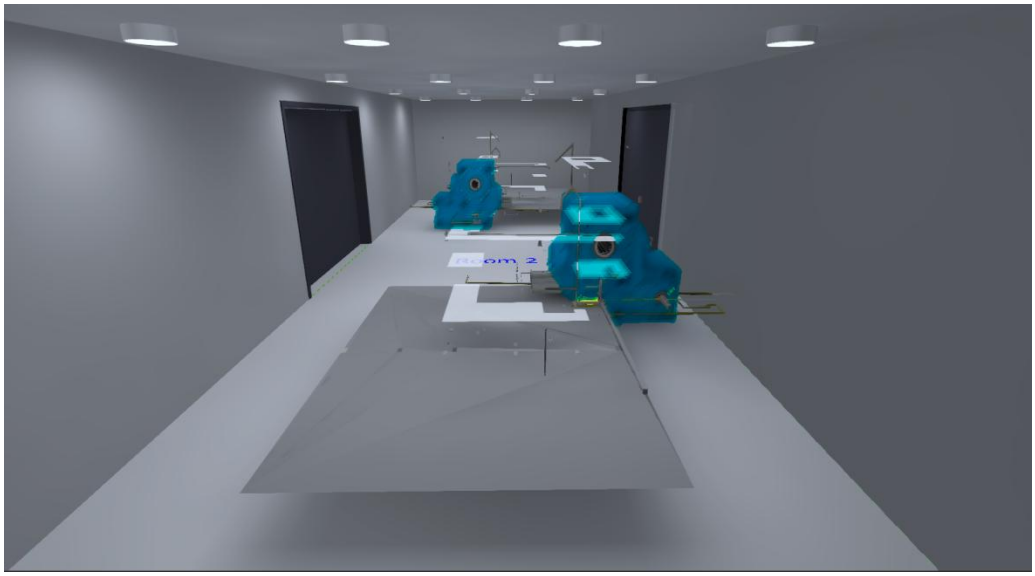


Figure 5: Press – Production Area

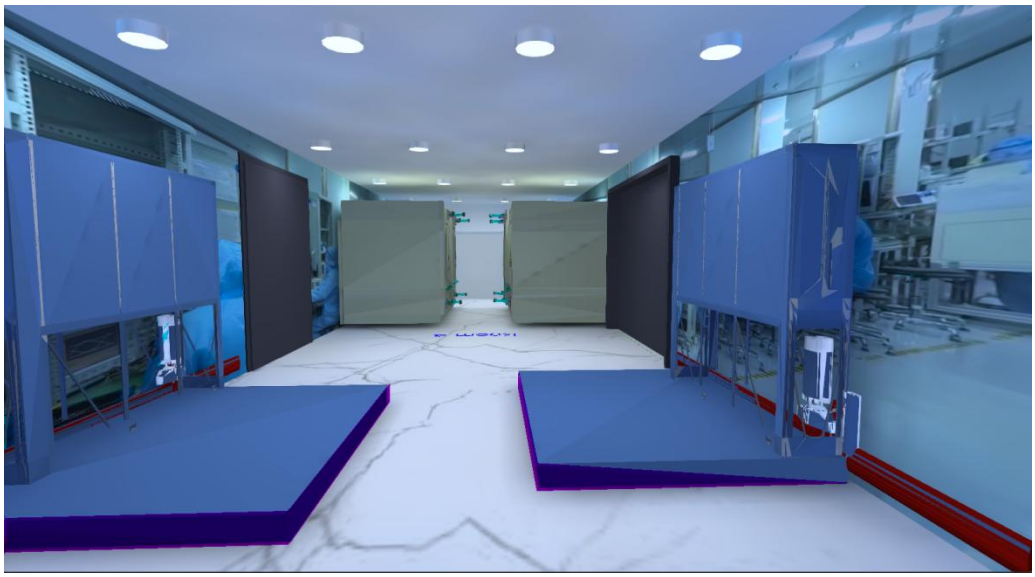


Figure 6: HTF & Packaging – Production Area

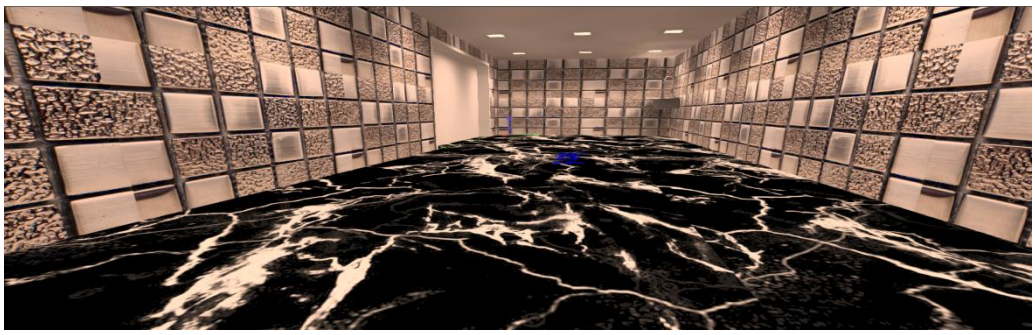


Figure 7: Prayer/kitchen/bathroom – Auxiliary Area

Figure 8: Warehouse – Auxiliary Area

Figure 9: Control Panel & Offices – Auxiliary Area

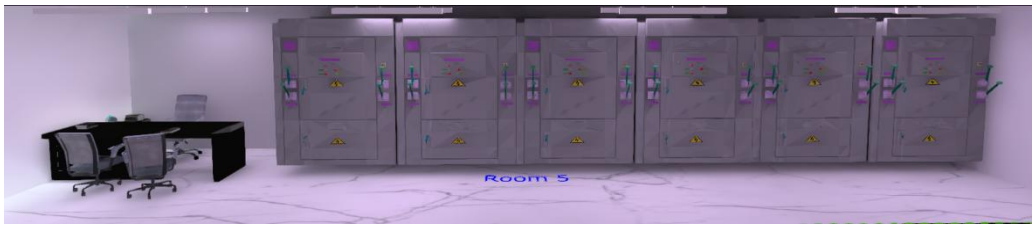


Figure 10: Electrical Distribution – Auxiliary Area

2. Load Estimation and Demand Calculation:

i. Table 1: Load Summary

Section	Installed Load	Future Allowance	Total Load
Mill	Fan: 2(0.5)KW Light: 360W Machines: 37KW Total: 38.360KW	20% =7672W	≈46KW
Press	Fan: 2(0.5)KW Light: 360W Machines: 2(22)KW Total: 45.360KW	20% =9072W	≈54KW
HTF/Packaging	Fan: 4(0.5)KW Light: 360W Machines: 2(20)+2(0.5) Total: 42.360KW	20% =8472W	≈51KW
Warehouse	Fan: 2(0.5)KW Light: 360W Total: 1.360KW	20% =272W	=1632W
Offices	AC: 2(0.8)KW Light: 408W Total: 2.008KW	20% =401.6W	=2409.6W
Electrical Distribution	AC: 0.8KW Light: 833.4W Total: 1.6334KW	20% =326.68 W	≈2KW
Prayer/kitchen/bathroom/Outside	Fan: 2(0.5)KW Light: 315+975W Total: 2290KW	20% =458W	=2748W

-	-	-	=159.79KW

Comment: This table summarizes the installed loads of all sections in the ceramic industry, including future allowances, giving a clear view of total expected load (~159.79 kW). It provides a useful basis for demand calculations and proper electrical system planning.

ii. Table 2: Demand Load Calculation

Section	Total Load (kW)	Diversity Factor	Demand Factor	Demand Load (kW)
Mill	46	0.85	0.80	46 × 0.85 × 0.80 = 31.28
Press	54	0.85	0.80	54 × 0.85 × 0.80 = 36.72
HTF / Packaging	51	0.85	0.80	51 × 0.85 × 0.80 = 34.68
Warehouse	1.632	0.85	0.80	1.632 × 0.85 × 0.80 ≈ 1.11
Offices	2.41	0.85	0.80	2.41 × 0.85 × 0.80 ≈ 1.64
Electrical Distribution	2	0.85	0.80	2 × 0.85 × 0.80 = 1.36
Prayer / Kitchen / Bathroom / Outside	2.748	0.85	0.80	2.748 × 0.85 × 0.80 ≈ 1.87
Total	159.79	-	-	**≈108.66 kW**

Comment: For industrial load estimation, a diversity factor of 0.85 has been adopted, which lies within the standard engineering practice range (0.80–0.90) as recommended by IEC 60364 for mixed motor and lighting loads. This accounts for the fact that not all motors, lighting circuits, and auxiliary equipment operate simultaneously at full load.

iii. Table 3: Phase-wise Assignment

Section	Demand Load (kW)	R (kW)	Y (kW)	B (kW)
Mill	31.28	10.43	10.43	10.42
Press	36.72	12.24	12.24	12.24
HTF / Packaging	34.68	11.56	11.56	11.56
Warehouse (Auxiliary)	1.11	0.37	0.37	0.37

Offices (Auxiliary)	1.64	1.64	-	-
Electrical Distribution (Auxiliary)	1.36	-	1.36	-
Prayer/Kitchen/Bathroom/Outside (Auxiliary)	1.87	-	-	1.87
Total Phase Load (kW)	108.66	36.24	35.96	36.46

Comment: This table clearly shows the phase-wise distribution of demand loads for the ceramic industry, balancing large machinery across R, Y, B phases while assigning auxiliary sections to single phases. It helps visualize load allocation, ensuring minimal unbalance and safer operation of the electrical system.

iv. Table 4: Phase Current Calculation

$$I = \frac{P \times 1000}{\sqrt{3} \times V \times pf}$$

As we know; V = 420V, pf = 0.9

Phase	Load (kW)	Current (A)
R	36.24	36.24 × 1000 / 654.3 ≈ 55.4 A
Y	35.96	35.96 × 1000 / 654.3 ≈ 55.0 A
B	36.46	36.46 × 1000 / 654.3 ≈ 55.7 A

Observation:

1. All phases nearly balanced**,** unbalance ~0.7 % (negligible).
2. Auxiliary single-phase load (Offices, Electrical Distribution, Prayer/Kitchen, Warehouse) totals ~6 kW, 15.9 A at 420 V.
3. Large machinery (Mill, Press, HTF/Packaging) remain 3-phase to avoid overloads and short circuits.

Recommendation: Assign auxiliary loads to different phases (as above) and protect each with MCBs.

3. Transformer Sizing:

i. Assumption:

- Total Demand Load = **108.66 kW**
- System: **3-phase, 420 V (LV)**, **50 Hz**
- Assumed power factor (pf) = **0.90**
- Utility / HV side assumed = **11 kV** (change if your primary is different)
- Diversity & demand already applied in demand load
- Practical margin included to accommodate motor starting and expansion

ii. Basic kVA Requirement:

Formula:

$$KVA = \frac{kW}{pf}$$

$$KVA = \frac{108.66}{0.9}$$

$$KVA = 120.73KVA$$

iii. Line Current (3 phase) at 430:

For 125kVA:

$$I = \frac{KVA \times 1000}{\sqrt{3} \times V}$$

$$I = \frac{125 \times 1000}{\sqrt{3} \times 420}$$

$$\boxed{I = 171.83A}$$

For 150kVA:

$$I = \frac{KVA \times 1000}{\sqrt{3} \times V}$$

$$I = \frac{150 \times 1000}{\sqrt{3} \times 420}$$

$$\boxed{I = 206.19A}$$

iv. Recommendation:

Based on the calculated three-phase line currents at 420 V (125 kVA = 171.83 A, 150 kVA = 206.19 A) and considering motor starting currents, short-term overloads, and future modest expansion, it is recommended to select a 150 kVA, 11 kV / 420 V, 3-phase transformer. This rating provides sufficient operational margin and ensures reliable power supply to all production and utility loads.

4. Busbar Scheme:

For the ceramic industry, a dual-level busbar arrangement is proposed to ensure operational flexibility, ease of maintenance, and effective fault management:

- **Production Area:** Double Busbar (DBDB) configuration is adopted to allow critical production loads (mills, presses, HTF, packaging) to remain operational during maintenance or faults on one busbar. Bus couplers with circuit breakers are included for selective isolation and redundancy.
- **Non-Critical Areas:** Single busbar with sectionalizers is used for offices, warehouse, HR, kitchen, and utility loads to optimize cost while maintaining safety and reliability.
- **Environmental & Sustainability Considerations:** Busbar design minimizes energy losses, supports efficient load distribution, and allows future expansion without major infrastructure changes. Proper earthing, insulated supports, and low-loss copper/aluminium busbars are recommended.

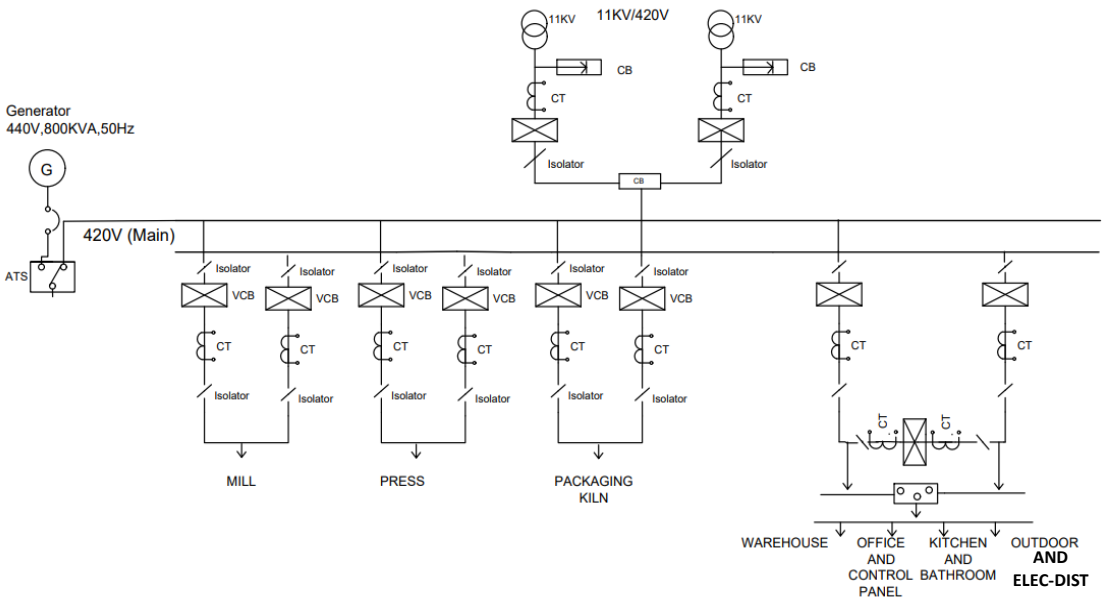


Figure 11: Single Line Diagram

a. Single-Line Diagram (SLD) Description:

The single-line diagram (Figure 11) illustrates the electrical distribution of the ceramic industry, including production, utility, and administrative areas:

i. **Power Sources:**

- Two 11 kV incoming feeders supply the main transformer bank.
- A backup generator (440 V, 800 kVA, 50 Hz) is connected through an Automatic Transfer Switch (ATS) to provide emergency power in case of utility failure.

ii. **Transformer Arrangement:**

- Main transformer: 150 kVA, 11 kV / 420 V, 3-phase supplies all plant loads.
- A second identical transformer is kept as a cold spare in a dedicated shelter for quick replacement during maintenance or fault.

iii. **Busbar Configuration:**

- **Production Areas (MILL, PRESS, PACKAGING/KILN):** Double Copper Busbar (DBDB) configuration ensures high reliability and allows maintenance on one busbar without interrupting critical production loads.
- **Non-Critical Areas (Warehouse, Offices, Kitchen, Outdoor, Control Panel):** Single Copper Busbar with sectionalizers is sufficient for light loads, optimizing cost while maintaining safety.

iv. **Switchgear and Protection:**

- VCBs (Vacuum Circuit Breakers) and isolators are installed at each feeder for selective protection and isolation.
- Current transformers (CTs) are provided for monitoring and protection relays.
- ATS ensures seamless transfer between utility and generator supply during outages.

v. **Design Considerations:**

- Copper busbars are selected for all main feeders to minimize energy losses and provide long-term reliability.
- Sufficient spare capacity in busbar and cable ducts is provided **for** future load expansion.
- Proper earthing and insulation are implemented according to IEC 60364 standards.

5. Main and Sub-Distribution:

- **Main Distribution Panel (MDB):** Sized to carry the total calculated load of 108.66 kW, considering future allowance and transformer rating (150 kVA, 420 V). Rated current and short-circuit capacity are selected to accommodate all production and auxiliary loads with a safe margin.

- **Sub-Distribution Panels (SDBs):** Located strategically across production, warehouse, and administrative areas. Panels are rated according to the branch loads and demand factors for each section.
- **Design Considerations:** Main and sub-distribution panels include provisions for MCCBs/fuse protection, metering, monitoring, and easy maintenance. Cable feeders are sized based on line currents, voltage drop limits, and diverting factors. The arrangement ensures selective coordination, protection, and operational reliability.

6. Cable Sizing:

Cable sizing is a critical aspect of electrical system design to ensure safe and reliable operation. The purpose of cable sizing is to select a conductor that can carry the expected current without excessive voltage drop or overheating, while also withstanding short-circuit conditions.

i. Table 5: Cable Size

Section	Demand Load (kW)	Phase Current (A)	Recommended Cable (Underground, XLPE/PVC)	Justification
Mill	31.28	55	3-core, 70 mm² Cu + SWA	Heavy machinery; oversized for future load, low voltage drop, mechanical protection
Press	36.72	55	3-core, 70 mm² Cu + SWA	Large motors; future-proof, underground hazard-safe
HTF / Packaging	34.68	55	3-core, 70 mm² Cu + SWA	Motors and auxiliary equipment; accommodates future expansion
Warehouse (Auxiliary)	1.11	1	3-core, 10 mm² Cu	Lighting and fans; slightly oversized for future loads

Offices (Auxiliary)	1.64	2	3-core, 10 mm² Cu	AC and lighting; margin for additional devices
Electrical Distribution (Auxiliary)	1.36	2	3-core, 10 mm² Cu	Auxiliary lighting/panels; underground protection
Prayer / Kitchen / Bathroom / Outside	1.87	2	3-core, 10 mm² Cu	Fans and lighting; future-proof and underground safe

Notes:

- All main cables (Mill, Press, Packaging) are SWA (armoured) for mechanical protection.
- Voltage drop kept well below 5%, even with future load growth.
- Underground installation, PVC/XLPE insulated, suitable for soil conditions and ambient temperature.

ii. Table 6: Earthing and Grounding Cable

Section / Equipment	Earthing Cable	Justification
Main Plant (Mill, Press, Packaging)	35–50 mm² Cu	Safely carries fault currents; oversized for future expansion
Auxiliary / Lighting / Offices	16–25 mm² Cu	Sufficient for small loads; future-proof for added equipment
Transformers / Distribution Panels	50 mm² Cu	Handles maximum short-circuit current; ensures low earth resistance
Earth Rods / Ground Grid	25–35 mm² Cu	Connects steel rods/plates; maintains <1 Ω resistance

Future-Safe Design Principles:

- Oversize main and earthing cables for load growth and hazard protection**.**
- Use armoured cables for underground mechanical protection.
- Multiple earth points and low-resistance connections for safety and reliability.

7. Breaker Sizing:

i. Table 7: Introduction of Breakers

Breaker Type	Definition
MCCB (Molded Case Circuit Breaker)	Protects cables and equipment from overload and short-circuit. Used for medium to large currents (up to ~1000 A). Adjustable trip settings. Ideal for motors, feeders, panels.
MCB (Miniature Circuit Breaker)	Small, compact breaker for low-current circuits (lighting, small AC, auxiliary loads). Protects from overload and short-circuit, typically <100 A.
CB (Circuit Breaker)	General term for breakers; can be AC or DC, low or high voltage. Protects circuits from overload/short-circuit.
VCB (Vacuum Circuit Breaker)	High-voltage breaker using vacuum arc quenching. Used for 11 kV – 33 kV switchgear in industrial plants.
VCCB (Vacuum Current Circuit Breaker / VCB variant)	High-voltage breaker with current-limiting features; used in HV distribution for fault protection and switching.

ii. Breaker Sizing Criteria:

- **Breaker Rating > Full Load Current (FLC)**
    - Select nominal rating slightly higher than running phase current.
- **Short-Circuit Rating (kA)**
    - Must withstand prospective fault current at installation point.
- **Trip Characteristics**
    - Motors: use type D or inverse time trip.
    - Lighting / Aux: use type B MCB.
- **Coordination with Cable**
    - Breaker rating must not exceed cable thermal limit.
- **Future Proofing**
    - Allow 10–20% extra margin for future load growth.

iii. Table 8: Department wise Breaker Sizing

Section / Dept	Demand Load (kW)	Phase Current (A)	Recommended Breaker Type	Rated Current (A)
Mill	31.28	55	MCCB	63 A, 3-pole
Press	36.72	55	MCCB	63 A, 3-pole
HTF / Packaging	34.68	55	MCCB	63 A, 3-pole
Warehouse (Auxiliary)	1.11	1	MCB	10 A, 1-pole
Offices (Auxiliary)	1.64	2	MCB	16 A, 1-pole
Electrical Distribution (Auxiliary)	1.36	2	MCB	
Prayer/Kitchen/Bathroom/Outside	1.87	2	MCB	16 A, 1-pole
Main 11 kV Feed / Incoming	108.66 (total)	~160 A (11 kV)	VCB	According to HV design
Transformer Feeder	According to transformer rating	According to load	VCCB	According to HV design

Notes

1. **MCCB**: Use for all medium current industrial motors and feeders. Adjustable trip settings improve motor start-up reliability.
2. **MCB**: Use **for** lighting, AC, and auxiliary circuits; compact and cost-effective.
3. **VCB / VCCB**: Use at high-voltage incoming lines and transformer feeders. Provides safe switching and fault isolation.
4. **Coordination**: Breakers must coordinate with cable size to prevent nuisance tripping and cable damage.
5. **Future-Proofing**: Allow 10–20% extra capacity in breaker rating to accommodate plant expansion and unforeseen loads.

8. Illumination Design:

a. Table 9: Types of Luminaires

Project

DIALux

Luminaire list

Φ_{total}	P_{total}	Luminous efficacy
499618 lm	4751.4 W	105.2 lm/W

pcs.	Manufacturer	Article No.	Article name	P	Φ	Luminous efficacy
12	3F Filippi S.p.A.	22790 +A01485	3FLP6060UGR-830 (850mA) + ON-OFF	34.0 W	3830 lm	112.6 lm/W
15	3F Filippi S.p.A.	36576	Lucequadro LED 2000 EP VS	21.0 W	2291 lm	109.1 lm/W
64	ASTZ	-	DBO85-24-241 Tablette EM1 840	22.5 W	2701 lm	120.2 lm/W
45	ASTZ	-	DO15-40-301 Kosmos SP 850	39.0 W	4917 lm	126.1 lm/W
9	LIGMAN	NYB-80636 -O-40	NYBRO 6 Surface ceiling luminaires	92.6 W	2801 lm	30.3 lm/W

Comment: The lighting design prepared for the ceramic industry facility provides an efficient, uniform, and task-appropriate illumination level across all major operational zones. The selected luminaires deliver a combined luminous flux of 49,961.8 lm with a total connected load of 4.75 kW, resulting in an overall system efficacy of 105.2 lm/W, which aligns well with industrial-grade energy-efficiency standards.

High-efficacy fixtures from 3F Filippi, ASTZ, and LIGMAN have been strategically deployed to ensure proper visibility for ceramic processing, material handling, and machine operation areas. Most installed fixtures operate above 100 lm/W, making the design suitable for continuous industrial operations where reliability, glare control, and low maintenance

are essential. One low-efficacy fixture (30.3 lm/W) is likely used for specific accent or localized lighting requirements.

The quantity and placement of luminaires demonstrate proper illumination zoning according to the functional needs of ball mills, HTF machines, packing area, and storage sections. Overall, the lighting design enhances worker safety, reduces fatigue, and ensures clear visual performance required in ceramic production environments.

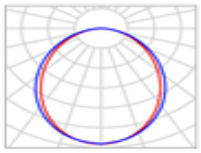
b. Table 10: Mounting Height

Project

DIALux

Building 1 · Storey 1 · Room 5

Luminaire layout plan



Manufacturer	LIGMAN	P	92.6 W
Article No.	NYB-80636-O-40	$\Phi_{Luminaire}$	2801 lm
Article name	NYBRO 6 Surface ceiling luminaires		
Fitting	1x NYB-80636-O-R, 1x NYB-80636-O-G, 1x NYB-80636-O-B, 1x NYB-80636-O-W40		

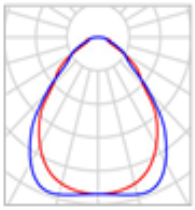
9 x LIGMAN NYBRO 6 Surface ceiling luminaires

Type	Field Arrangement
1st luminaire (X/Y/Z)	1.920 m / 0.470 m / 2.799 m
X-direction	4 pcs., Centre - centre, 3.850 m
Y-direction	3 pcs., Centre - centre, 1.240 m
Arrangement	A1

X	Y	Mounting height	Luminaire
1.892 m	2.951 m	2.799 m	1
1.906 m	1.710 m	2.799 m	2
5.755 m	1.753 m	2.799 m	3
9.605 m	1.796 m	2.799 m	4
13.455 m	1.839 m	2.799 m	5
1.920 m	0.470 m	2.799 m	6
5.769 m	0.513 m	2.799 m	7
9.619 m	0.556 m	2.799 m	8
13.468 m	0.599 m	2.799 m	9

Building 1 · Storey 1 · Room 8

Luminaire layout plan



Manufacturer	3F Filippi S.p.A.	P	34.0 W
Article No.	22790+A01485	$\Phi_{Luminaire}$	3830 lm
Article name	3FLP6060UGR-830 (850mA) + ON-OFF		
Fitting	1x LED L - LED Panel - 2 - 830		

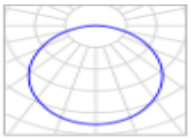
12 x 3F Filippi S.p.A. 3FLP6060UGR-830 (850mA) + ON-OFF

Type	Field Arrangement
1st luminaire (X/Y/Z)	0.842 m / 1.606 m / 2.807 m
X-direction	3 pcs., Centre - centre, 1.683 m
Y-direction	4 pcs., Centre - centre, 3.213 m
Arrangement	A1

X	Y	Mounting height	Luminaire
0.842 m	11.244 m	2.807 m	1
2.525 m	11.244 m	2.807 m	2
4.208 m	11.244 m	2.807 m	3
0.842 m	8.031 m	2.807 m	4
2.525 m	8.031 m	2.807 m	5
4.208 m	8.031 m	2.807 m	6
0.842 m	4.819 m	2.807 m	7
2.525 m	4.819 m	2.807 m	8
4.208 m	4.819 m	2.807 m	9
0.842 m	1.606 m	2.807 m	10
2.525 m	1.606 m	2.807 m	11
4.208 m	1.606 m	2.807 m	12

Building 1 · Storey 1 · Room 1

Luminaire layout plan



Manufacturer	ASTZ
Article No.	-
Article name	DBO85-24-241 Tablette EM1 840
Fitting	1x LED

P	22.5 W
$\Phi_{Luminaire}$	2701 lm

16 x ASTZ DBO85-24-241 Tablette EM1 840

Type	Field Arrangement
1st luminaire (X/Y/Z)	0.625 m / 1.627 m / 2.800 m
X-direction	4 pcs., Centre - centre, 1.250 m
Y-direction	4 pcs., Centre - centre, 3.255 m
Arrangement	A1

X	Y	Mounting height	Luminaire
0.625 m	11.392 m	2.800 m	1
1.876 m	11.392 m	2.800 m	2
3.126 m	11.392 m	2.800 m	3
4.376 m	11.392 m	2.800 m	4
0.625 m	8.137 m	2.800 m	5
1.876 m	8.137 m	2.800 m	6
3.126 m	8.137 m	2.800 m	7
4.376 m	8.137 m	2.800 m	8
0.625 m	4.882 m	2.800 m	9
1.876 m	4.882 m	2.800 m	10
3.126 m	4.882 m	2.800 m	11
4.376 m	4.882 m	2.800 m	12
0.625 m	1.627 m	2.800 m	13

Building 1 · Storey 1 · Room 1

Luminaire layout plan

X	Y	Mounting height	Luminaire
1.876 m	1.627 m	2.800 m	14
3.126 m	1.627 m	2.800 m	15
4.376 m	1.627 m	2.800 m	16

Comment: The rest of the rooms are same as the room 1. The luminaire layout for the ceramic production room shows the placement of 16 ASTZ DBO85-24-241 Tablette EM1 840 LED fixtures, each providing 2701 lm at 22.5 W. The luminaires are mounted at a height of 2.8 m, ensuring uniform light distribution across the workspace. The grid arrangement (A1) with equal spacing in both X and Y directions provides consistent illumination levels suitable for industrial tasks, material inspection, and machine operation.

The spacing (approx. 1.25 m centre-to-centre along X-direction and 3.255 m along Y-direction) is designed to avoid dark zones and to maintain visual comfort for workers, especially in areas where ceramic material handling and equipment operation require clear visibility. The symmetrical layout enhances safety by minimizing shadows around machinery and reduces worker fatigue during long production hours.

Overall, this luminaire arrangement supports a well-balanced industrial lighting environment that aligns with recommended lux levels for ceramic processing facilities.

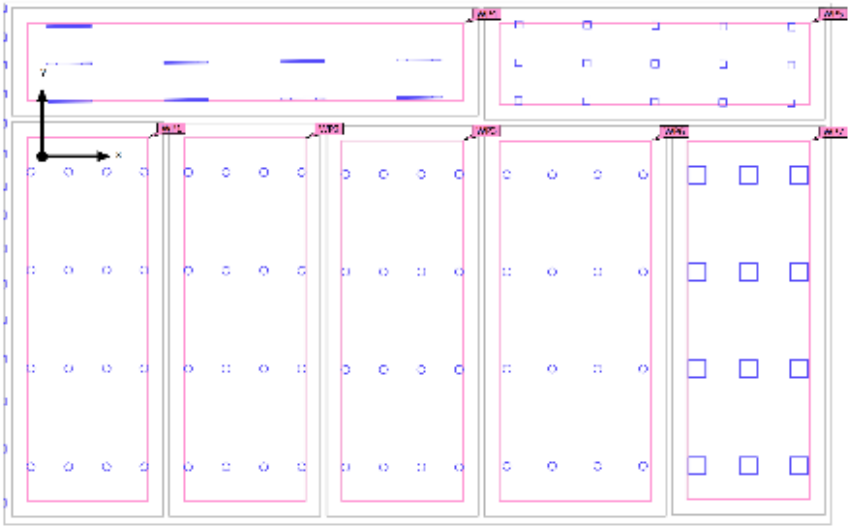
c. Calculation

Project

DIALux

Building 1 · Storey 1 (Light scene 1)

Calculation objects



Building 1 - Storey 1 (Light scene 1)

Calculation objects

Working planes

Properties	Ē (Target)	E_{min}	E_{max}	U_o (g_1) (Target)	g_2	Index
Working plane (Room 1) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.500 m	854 lx (≥ 500 lx) ✓	628 lx	1039 lx	0.74 (≥ 0.60) ✓	0.60	WP1
Working plane (Room 2) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.500 m	546 lx (≥ 500 lx) ✓	363 lx	673 lx	0.66 (≥ 0.60) ✓	0.54	WP2
Working plane (Room 4) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.500 m	428 lx (≥ 500 lx) ✗	0.00 lx	744 lx	0.00 (≥ 0.60) ✗	0.00	WP3
Working plane (Room 5) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.500 m	411 lx (≥ 500 lx) ✗	1.20 lx	908 lx	0.003 (≥ 0.60) ✗	0.001	WP4
Working plane (Room 6) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.500 m	597 lx (≥ 500 lx) ✓	357 lx	772 lx	0.60 (≥ 0.60) ✓	0.46	WP5
Working plane (Room 7) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.500 m	365 lx (≥ 500 lx) ✗	217 lx	505 lx	0.59 (≥ 0.60) ✗	0.43	WP6
Working plane (Room 8) Perpendicular illuminance (adaptive) Height: 0.800 m, Wall zone: 0.500 m	581 lx (≥ 500 lx) ✓	198 lx	815 lx	0.34 (≥ 0.60) ✗	0.24	WP7

9. Summary:

The electrical power distribution system of the ceramic industry is designed for high reliability, safety, and future expansion. Two 11 kV utility feeders supply power through a pair of 150 kVA transformers, where one transformer operates as the main source while the second remains as a dedicated spare for emergency replacement. A 440 V, 800 kVA generator provides backup power through an Automatic Transfer Switch (ATS), ensuring uninterrupted operation during utility failures.

A copper busbar system is used throughout the plant to enhance conductivity, reduce losses, and improve long-term durability. Critical production sections such as the Mill, Press, and Kiln are connected through a robust double busbar arrangement to allow maintenance without interrupting operations. Non-critical areas, including the warehouse, offices, kitchen, and outdoor loads, are supplied through a single busbar system for optimized cost and efficiency. Each feeder is equipped with vacuum circuit breakers (VCBs), isolators, and current transformers (CTs) to ensure selective protection and operational safety.

Overall, the SLD layout ensures reliable power distribution, efficient fault management, proper segregation of critical and non-critical loads, and readiness for future expansion of the facility.

10.Refferences:

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