




Escola Universitària d'Enginyeria
Tècnica Industrial de Barcelona
Consorci Escola Industrial de Barcelona

UNIVERSITAT POLITÈCNICA DE CATALUNYA

Volum I

General Index-Report-Annexs-Especificacion terms
Measurement state-Budget- Studies with its own entity

Final project grade

A detailed architectural drawing of a large, multi-story building with a central tower and many windows, serving as the background for the title.

"ELECTRICAL INSTALLATION IN A CONCRETE BLOCK FACTORY"

FPG presented to obtain the title of graduate in
mechanical engineering
by **Juan Luis Vera Ambel**

Barcelona, Juny 13, 2012

Director: Jose Luis Rodriguez Espantoso
Department of EG
Politechnical University of Catalonia (UPC)



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I-General index

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VOLUM III

Results of design and calculation of emergency lighting with EMERLIGH, (82 pages)

Results of design and calculation of lighting with DIALUX (206 pages)



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II-Report

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Identification.

Proyec Title.

Electrical installation in a concrete block factory

Instalation situation.

Municipality	Tarragona
Situation	Carrer del plom,35
ZC	43006

Details of the owner

Business Name	MASA.S.A
Full Address	Carrer del plom – Tarragona - 43006
Phone number	93-654-34-21
CIF	44017694-E

Details of the project author

Name	Juan Luis Vera Ambel
Studies	Graduated in mechanical engineering
professional association	CETIB
Number of collegiate	21234
Phone number	646336621

Details of the entity or legal person who has been commissioned to develop the project

Business Name	PROYECTOS VERA.S.A
Full Address	C/Costa Pacheco, 9, 1º 2 – 08035 – Barcelona-
Phone number	93-456-23-46
CIF	B-44567274

Objec.

The object of this document is to describe unambiguously the electrical installation projected, compliance with all norms applicable to it and serve as a document of law to the services and inspection agencies.

Scope of the installation.

Description of the activity.

The activity of the industry is to manufacture concrete blocks by means of a semi-automated process industry, whereby the product to be produced passes through different stages and machines that make the process.

Specific features of the building.

Industrial building of 4830 m², being 2644 m² built and interior and 2168 m² outdoor repeated two zones, one in the back of the industry and the other on the front.

From 2644m² of indoor 2346m² are dedicated to the industry where all the machinery to confer the industrial process for which manufactured concrete blocks, activity of the industry. The rest, 298m², belonging to the office area of two floors, are still located inside, but in a different fire sector.

The size of the areas of each space and are distributed as the 4830m² totals are included in the table below.

Area	Floor	height (m)	Surface (m ²)
Industry	PB	6	2346
Previous outer zone	PB	-	788
Rear outdoor area	PB	-	1398
PB Hall	PB	3	31,87
Distributor PB	PB	3	24,86
Dressing Rooms and Services	PB	3	18,78
Testing Laboratory	PB	3	74
Hall P1	P1	3	22,53
office 1	P2	3	16,4
WC 1	P3	3	6
office	P4	3	82
Meeting Room	P5	3	21,84

Table 1

Sectors	Surface (m ²)
Outside	2186
Inside	2644,28
Offices	298,28
Industry	2346
TOTAL	4830,28

Table 2

Antecedents.

Industrial building built in 2002. For the activity that has been always used is industrial type. was still in its infancy a furniture factory and exposure. The previous company left the building apparently to experience a steady growth until the point of needing to move to a place of greater wingspan.

This building now has been bought by MASA.SA to develop its business there, which is the production of concrete blocks.

Norms and references.

State norms.

- Royal Decree 486/1997 of 14 April by laying down minimum safety and health in the workplace.
- Royal Decree 842/2002 of 2 August, which approves Electrical low-voltage (REBT)
- Complementary Technical Instructions ITC BT 02, 04, 05, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 29, 30, 36, 43, 44, 45, 47 and 48. (*)

Regional norms.

- Decree 363/2004 of 24 August, which regulates the procedure Administrative for application of REBT
- Royal Decree 1627/1997 of 24 October, laying down minimum safety and health in construction.
- Resolution ECF / 4548/2006 of 29 December, approving in Fecsa-Endesa companies the specific technical standards relating to the network installations link

- Royal Decree 208/2005 of 25 February, on electrical and electronic equipment and waste management
- Royal Decree 838/2002 of 2 August, establishing energy efficiency requirements for ballasts for fluorescent lamps
- Decree 363/2004 of 24 August, in Article 6 "checks, inspections and controls"

UNE norms.

- UNE 157001/2002 General criteria for the elaboration of projects
- UNE 12464 about lighting
- UNE 12464.1: European standard for indoor lighting
- UNE mandatory

Others

- Directive 2002/95/EC: Restrictions on the use of certain hazardous substances in electrical and electronic

In case of doubt or ambiguity about the interpretation to go to the facultative direction.

Calculation programs.

- Dialux 4.9: was used to size the installation of light of different areas so we can get the number of luminaires needed in an area to comply the minimum requirements set lighting UNE 12464 and CTE.
- Emerlight: was used to obtain the number, location and type of emergency luminaires required.
- Software of UNEX company for calculate the dimension of trays.

Others referents.

Instalación description.

General aspects

Justification of the need to project.

According to REBT in the ITC-4, point 3 "Installations to need project" the electrical installation covered by this document needs project because its potency is equal to or greater than 20 KW. The power of this installation is 173KW

Destination

The destination of this building is a Industry activity

Classification of installation and justification

The Installations is classified as collected DECREE 363/2004 of 24 August, in article 3 "facility classification" as follows:

- According to the classification section 3.1 is: "a" installations with project
- According to Section 3.2 classification is "group a" generally Industries with Power > 20KW

Need maintenance contract by the authorized installation company.

The installation object of this project must to comply the Decree 363/2004 of 24 August, and as announced in its Article 9 "Maintenance Agreement":

Owners of electrical installations subject to periodic inspections will contract a maintenance with the installation company duly registered with appropriate category, and will need to have a maintenance book containing at least the registry and the results of reviews and inspections. If they prefer they can do it themselves but always complying the minimum requirements of that article.

Need to initial and periodic inspections by an institution of inspection and control.

This installation must comply the Decree 363/2004 of 24 August, and as announced in its Articles 7 " initial inspection " and 8 " periodic inspections " shall be subject to:

- An initial inspection for to be an installation that requires project and have a maximum admissible power greater than 100KW.
- Periodic inspection every five years for all low voltage electrical installations that requiring initial inspections.

The owner of the electrical installation covered by this project is required to obtain, with the periodicities indicated, a favorable certificate of installation.

In the initial inspection, this certification must also refer to administrative technical content of this project.

Also in accordance with the requirements established in Article 14 of Law 21/1992, Industry and Article 7 of Law 13/1987 of July 9, safety of industrial installations, in relation to Article 21 of Royal Decree 842/2002, which approves the Regulation for low Voltage electrical, the Department of Work and Industry has the power to do a inspection and control of the security of low voltage electrical installations.

This authority may be exercised directly by the Department of Work and Industry or by the concession operators assume the execution of the inspections identified in this Decree, subject to all other inspections may be conducted by an approved inspection agency to regulatory action in the area of low voltage in the territory of the Autonomous Community of Catalonia

Installation characteristics

Area classification study.

The classification of areas of the building follows the table:

Area	Floor	height (m)	Surface (m ²)
Industry	PB	6	2346
Previous outer zone	PB	-	788
Rear outdoor area	PB	-	1398
PB Hall	PB	3	31,87
Distributor PB	PB	3	24,86
Dressing Rooms and Services	PB	3	18,78
Testing Laboratory	PB	3	74
Hall P1	P1	3	22,53
office 1	P2	3	16,4
WC 1	P3	3	6
office	P4	3	82
Meeting Room	P5	3	21,84

Table 3

Ventilation.

The need for a ventilation systems and possible solutions to be adopted are determined by the applicable regulations

For the industrial sector of the building regulations applicable there to is the RECIECI. This norm determined that a building of low intrinsic risk no required a smoke extraction in case of fire.

Also the Royal Decree 486/1997 of 14 April by laying down minimum safety and health at work if it determines in its Annex 3 "Environmental conditions in the workplace" that:

- The temperature in rooms where light work shall be between 14 and 25°C
- The relative humidity shall be between 30 and 70%, except in the places where static electricity hazard exist in which the lower limit is 50%

As the location of the installation and the climate of the area, can be concluded that for comply the requirements of Royal Decree 486/1997 of 14 April, do not need any type of machine for summer cooling and winter but is necessary a heating system with energy source, which in this case is a gas boiler, which is not covered in this project for does not need substantial electrical energy to operate. Furthermore for not requiring the norms air changes, if that will do it to maintain quality of air in a decent minimum for the worker or workers present there.

This air is classified in the RITE, for the industry is not mandatory, but is used for to have a guide about how should be the air for not exist other applicable norms. Air type IDA4 corresponds to a renewal of with a flow of air 5dm³ / s minimum. For ensure this minimum flow two fans to be installed, an of extraction and other of drive, on opposite walls that guarantee a circulation and renovation of the inside air to the rhythm minimum of 5dm³ / s

For the office sector according to the RITE in its IT 1.1.4.1.2 "operating temperature and relative humidity" for summer temperatures should be between 23 ° C and 25 ° C with relative humidity between 45% and 60%, and winter temperatures should be between 21 ° C and 23 ° C with relative humidity between 40% and 50%.

According to its IT 1.1.4.2 "Requirements indoor air" the air office is classified as IDA 2 and this should be 12,5 dm³ / s of outside air input per person.

For these two points that affect the office, concluded that to get the temperature and humidity ranges for all possible seasons of the year set by the legislation, the office requires an installation of air conditioning, which imply a machine that its power source be electrical. To comply the requirements of its IT.1.1.4.2, minimum air quality for offices IDA 2 is not going to have to install any additional fan because the air conditioning machine is ready for both functions. Then some air for get the required minimum temperature values will be outside and this for the dimensions of the machine should be much higher than the 12.5 dm³ / s per person minimum established by the RITE.

For all this in the industry sector is not provided any machine with electrical power and in the offices yes, being this 13.5 KW. For obtaining the electrical power of this machine see "Annex calculations"

Lighting

For the design of the lighting installation and calculation has been used the DIALUX software.

The information that this program requires as input values, are the minimum requirements to be satisfied some luminic magnitudes that depend for the local and activity, as reflected in the norms.

- Implementation of section SU4 Technical Code of Buildings (CTE)
- Implementation of section HE3 Technical Code of Buildings (CTE)
- UNE 12464.1: European standard for indoor lighting
- Royal Decree 208/2005 of 25 February, on electrical and electronic equipment and waste management
- Directive 2002/95/EC: Restrictions on the use of certain hazardous substances in electrical and electronic
- Royal Decree 838/2002 of 2 August, establishing energy efficiency requirements for ballasts for fluorescent lamps

To see the types, amount and disposal of each of the luminaries see the planes 6,7 and 8

To view the results of the calculations made by the program DIALUX see the Annex document,

Emergency lighting

According to Royal Decree 486/1997 "business risk prevention" obligatory for the office area and industry and RSCIEI obligatory for industry, need to install emergency lighting in both the office and in the industrial sector because one of the two regulations required minimum or both based on the following extracts from the document named:

Extracts from RSCIEI:

According RSCIEI this building is exempted from emergency lighting system because as quoted:

Shall have an emergency lighting system of escape routes fire sectors of industrial buildings when:

- Stay located on the ground below grade.
- Stay located on any floor above ground, when the occupation, P, is equal to or greater than 10 persons and are of medium or high intrinsic risk.
- In all case, when the occupation, P, is equal to or greater than 25 people.

This building is not captured in any of the above cases, therefore does not require installation according RSCIEI emergency lights, but that does not exempt from complying with other normative that affect them. This is the case of Royal Decree 486/1997 "risk prevention"

Extractos del Real decreto 486/1997 “prevención de riesgos laborales”

Las vías y salidas de evacuación contarán con la instalación de alumbrado de emergencia que garantice una iluminación suficiente para permitir la evacuación en caso de emergencia. A tal efecto, según establece el CTE, deberá proporcionar una iluminación de 1 lux como mínimo, en el nivel del suelo de los recorridos de evacuación, medidos en el eje de pasillos y escaleras, y en todo punto cuando dichos recorridos discurran por espacios distintos de los citados

The emergency lighting system, accordance with CTE must provide an intensity of at minimum of 5 lux on the equipment of the fire protection installations that require manual operation and the lighting distribution panels

In this case about the extinguishers, which are the minimum system load due to for the local intrinsic surface and which obliges the RSCIEI.

The level of lighting and time that should be maintained operational on that system should be sufficient to permit the adoption of all necessary actions to protect the health and safety of workers and others affected. In the REBT and the CTE are fixed requirements of these types of lighting for various establishments.

To comply with all the previous points and for the design of the installation of emergency lighting has been used Emerlight software.

The results of calculations with Emerlight is annex document
The situation and the types of emergency lighting for each area of the building have been obtained through this software and are represented at the planes 9 and 11

In the installation there are 2 different models of emergency lights and every one is destined for a different purpose. The following explains the two types.

Security lighting

Is emergency lighting provided to ensure the safety of people to evacuate an area.

The criteria that must comply this type of emergency lighting is:

The emergency lighting is planned to come on automatically when a fault occurs or general lighting when the voltage drops below 70% of its nominal value.

The installation of the lighting is fixed and is provided with own source of energy.

The luminary model for this purpose is :

- B44 L.V.S / 165 lum1h

Alumbrado de evacuación

It is part of emergency lighting provided to ensure the recognition and use of the evacuation routes when locals are or may be occupied.

The criteria that must comply this type of emergency lighting is:

In the evacuation routes, evacuation lighting must provide at ground level and on the axis of the

main steps a minimum horizontal luminance of 1 lux.

At the points where they are situated the installations equipment protection Fires, which require manual operation and the distribution panel, the minimum luminance is 5 lux.

The relation between the maximum and minimum luminance at the center of principal steps will be less than 40 lux.

Lighting of evacuation be capable of operating, when fault occurrence of the Normal feeding, as a minimum during one hour, providing the luminance provided.

According to the characteristics, the number of blocks shall be sixteen units, located along the main corridors of evacuation, along with the panel and output signaling Dependencies such as toilets, halls and offices. Also will put a block on the outside of the building or for the local area access.

The luminary model for this purpose is:

- G5 / 500 1h Lum

Relation of receptors and charges.

Area	Type	Subtype	Units	Unit Power (W)	Installed power (W)	1/Receivers	1/Costs	Coef. Según ITC-BT-47	Power (W)
Industry	lighting	TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W EQ. MAG. A.F.	75	150	11250	1,00	1,82		20455
	Security lighting	Legrand model G5 500Lum/1h	11	46	506	1,00	1,00		506
	Machine	Prima	1	18400	18400	1,25	1,18		27059
	Machine	Mezcladora MF500	1	22448	22448	1,25	1,18	1,25	41265
	Machine	Esplíadora A	1	8832	8832	1,25	1,18		12988
	Machine	Cinta transportadoras	2	2000	4000	1,25	1,18		5882
	Single phase plugs	-	2	3680	7360	1,00	1,00		7360
	three-phase plugs	-	1	11000	11000	1,00	1,00		11000
Previous outer zone	lighting	TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W EQ. MAG. A.F.	1	1200	1200	1,00	1,82		2182
	Single phase plugs	-	1	3680	3680	1,00	1,00		3680
Rear outdoor area	lighting	TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W EQ. MAG. A.F.	1	1800	1800	1,00	1,82		3273
	Single phase plugs	-	1	3680	3680	1,00	1,00		3680
PB Hall	lighting	TROLL 030354T/84 BATLIGHT (DIR. SIM. L + DIR. SIM. L). 2 x T5 HO 54W 840 EQ. ELECTR.	4	108	432	1,00	1,82		785
Distributor PB	lighting	TROLL 030354T/84 BATLIGHT (DIR. SIM. L + DIR. SIM. L). 2 x T5 HO 54W 840 EQ. ELECTR.	4	108	432	1,00	1,82		785
Dressing Rooms and Services	lighting	TROLL 0105 BASIC +1 x QPAR-CB 50W 25°	8	50	400	1,00	1,00		400
Testing Laboratory	lighting	TROLL 030354T/84 BATLIGHT (DIR. SIM. L + DIR. SIM. L). 2 x T5 HO 54W 840 EQ. ELECTR.	9	108	972	1,00	1,82		1767
Hall P1	lighting	TROLL 030354T/84 BATLIGHT (DIR. SIM.	3	108	324	1,00	1,82		589

		L + DIR. SIM. L). 2 x T5 HO 54W 840 EQ. ELECTR.							
office bus	lighting	TROLL 030354T/84 BATLIGHT (DIR. SIM. L + DIR. SIM. L). 2 x T5 HO 54W 840 EQ. ELECTR.	1	108	108	1,00	1,82		196
WC 1	lighting	230	3	50	150	1,00	1,00		150
office	lighting	TROLL 030354T/84 BATLIGHT (DIR. SIM. L + DIR. SIM. L). 2 x T5 HO 54W 840 EQ. ELECTR.	12	108	1296	1,00	1,82		2356
Meeting Room	lighting	TROLL 030354T/84 BATLIGHT (DIR. SIM. L + DIR. SIM. L). 2 x T5 HO 54W 840 EQ. ELECTR.	3	108	324	1,00	1,82		589
PB Office area	air conditioning and ventilation		1	6750	6750	1,00	1,00		6750
	Single phase plugs	-	2	3680	7360	1,00	1,00		7360
	Security lighting	Legrand model G5 500Lum/1h	14	11	154	1,00	1,00		154
	Security lighting	B44 L.V.S / 165 Lum 1h	4	6	24	1,00	1,00		24
P1 Office area	air conditioning and ventilation		1	6750	6750	1,00	1,00		6750
	Single phase plugs	-	2	3680	7360	1,00	1,00		7360
	Security lighting	Legrand model G5 500Lum/1h	11	15	165	1,00	1,00		165
	Security lighting	B44 L.V.S / 165 Lum 1h	6	4	24	1,00	1,00		24

P1-Total apparent electrical power (kW)	175535
P2-Apparent total electric power industry machines installed (kW):	87194
P3=P1-P2	88341
coincidence factor:	P2+0,75xP3
POWER (kW):	153450

Table 4

Power prevision

Installed power → 137,4KW

Total apparent electrical power (kW) → 176

Power according the ITC-BT-10 → $P = \text{Área Industry} \times 0,125\text{KW/m}^2 = 2346 \times 125 = 293,250$

According to the document the supply company, FECSA-ENDESA "Handbook Guide for installation of low voltage " the IGA that corresponds to individual installations greater than 15KW and with a power calculated of 154 KW is 173kW .

Maximum admissible power (PMA), according installed IGA with a power of 173KW
The power to which must be prepared individually derivation (DI) must be the greater of the two, that is 293kW.

Supply

Company

Business Name	ENDESA
Municipality	Tarragona
ZC	43007
Situation	C/Mallorca, 7
CIF	B-67856691

Characteristics

Supplementary supply

The feeding of the security services does not necessarily have a complementary food service in its place possible to use other systems such as storage batteries.

According to the ITC-BT 28 of REBT in its section 1.

Socorro supplies will have work rooms (offices) with occupancy greater than 300.

To find the number of people in local offices ITC-BT 28 tells us that we must apply the following formula.

$$\text{Occupation} = \text{Area} * (1 \text{ person} / 0.8 \text{ m}^2)$$

where the value of area which enter the formula, is the floor space the local but subtracting the value of the area of corridors, delivery, service, storage.

In this case it will not follow the precedent that sets the rules because which the designer is cognizant of the activity of the office, this is for private use so it will not exist within a number of people greater than 300.

For the industrial zone follows the same criterion, the number of people who will existir inside will never be higher than the 300 minimum that defines the ITC 28 of REBT to take the need for additional supply.

The ITC-28, REBT also says that there is other criterion to take to see the need for complementary feeding system and this is the follows:

In the case of a energy cut compromises the safety of workers.

In this case, if the machines are stopped in the middle of a process there is no risk of damage to the workers who are currently using.

It was concluded that it is not necessary Socorro supplies for any of the two sectors, or the office or industrial.

Description of the electrical installation.

General description

According to the "Guide for link installations Vademecun low voltage" the guideline to follow is

The system have a single electrical connection, underground which feeds directly to a single set of protection and measurement, through a General Protection Box (CGP).

The CGP is installed separately from the set of protection and measurement, the property boundary on the facade of the building, closing the fence within a niche.

Be located inside precincts are intended only for this purpose, in places free and permanent access from the street.

To determine the dimensions of the precincts is taken into account the area occupied by the functional units, leaving a separation between the side walls and the roof with respect to the envelopes, of at least 0.2 m. The ground distances shall be at least 0.5 m, the depth of the precincts shall be at least 0.4 m free space in front of the CPM, once provided access to it, not less than 1.10 m.

This precincts will close with a double door, preferably metal, at least 2 mm of thick, with level of protection IK 10 according to EN 50102, covered externally in accordance with the characteristics of the environment.

Will be protected against corrosion and will have a lock or padlock normalized by ENDESA.

The wall to fixing the set measure and protection may not be exposed to vibrations, so its resistance is not lower than the partition wall.

Not be installed in its proximity gas meters, or water installations. .

in this case also will installed a sectioning box.

Location of protection and measurement set in a wall street with underground electrical connection.

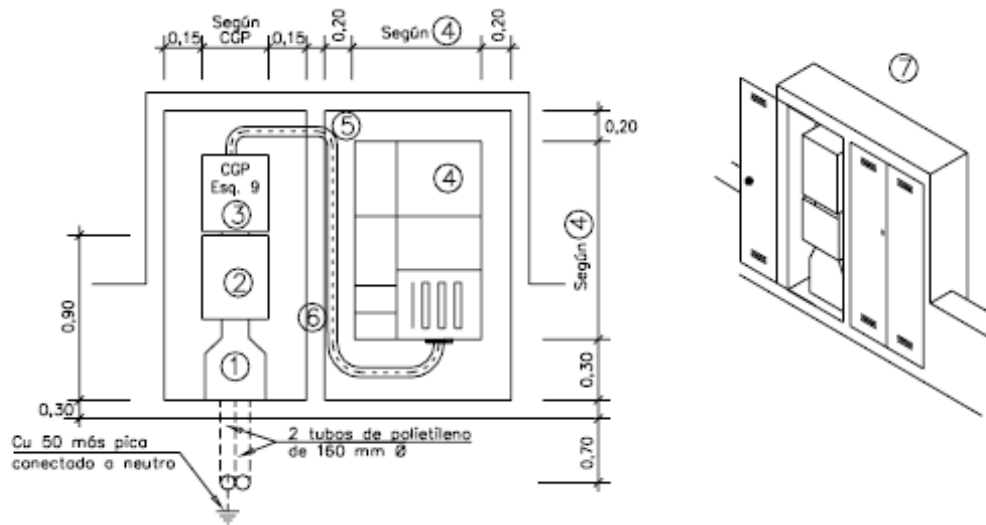


Image 1: Installation protection and measurement set a wall street.

Extract to the Guide for link installations Vademecun low voltage

Box sectioning (CS).

The characteristics of the sectioning box will be determined by the distribution company, in this case FECSA -ENDESA

ICP-M

According to the "Guide Vademecun for link installations of low voltage" the ICP-M which corresponds to this installation for a maximum admissible power of 175KW and type three - phase is:

400V 4P 400/250A

IGA

According to the "Guide Vademecun for link installations of low voltage" the IGA which corresponds to this installation for a maximum admissible power of 175KW and type three - phase is:

400V 4P 250/250A

Verification terminal bloc:

Will comply the following functions:

Jacks appropriate for checking equipment, in order to check the count of the energy consumed and other parameters (current, voltage, etc.).

Open circuit voltage and short circuit current circuits to safely intervene (mount, dismount, etc.).
counters and other control elements of the measuring equipment.

The Verification strip, part of the functional unit testing, module will stay in a double insulated with transparent lid and precintadle as part of the Joint Protection and Measurement for TMF10. The formation of the strip is as follows:

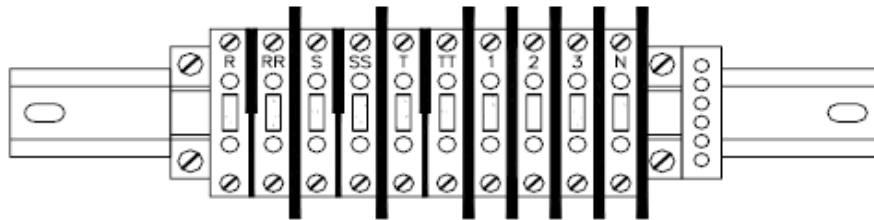


Image 2: Verification terminal bloc.

Extract to the Guide for link installations Vademecun low voltage

The terminals will be divisible, with capacity for connecting Cu conductors to 10 mm² and fixed so as to prevent rotation or displacement during the operation thereof.

When the terminals have bridges for short-circuiting of the secondary circuits of intensity, these shall be designed so as to prevent the bridge connecting the terminals of the counter side .

- The pitch of the terminals is 10 mm.
- The nominal insulation voltage is ≥ 2 kV
- The terminal shall be accompanied by his diagram of composition and usage instructions, clearly indicating the terminal voltage, input and output intensity and phase inscription according to Figure.

The conductors comply with the following requirements:

The union of the secondaries of current transformers with the counters will be made by unipolar copper conductors and semi-flexible (class 5), with a cover of thermoset or thermoplastic, flame

retardant , low smoke emission and halogen free.

The connection will be made using insulated terminals, being deformable cylindrical tip for both the connection of the terminal box on the counter and Verification terminal block.

Isolation voltage of the conductors 450/750 V

The color of the cables is:

- Phase R Black
- Brown S Phase
- Gray T Phase
- Light Blue Neutral
- Yellow-Green Earth
- Red Auxiliary circuits

Clamp the ends of the conductors of union between measuring elements will be indelibly identified with the following nomenclature and coding:

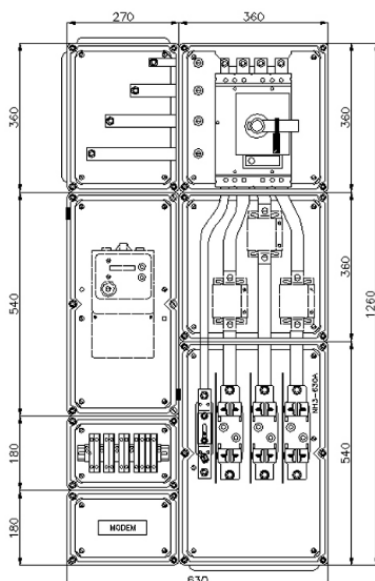
- Current input R, S, T
- Current output RR, SS, TT
- voltages 1, 2, 3, N

The section of the circuit conductors current circuits is 4 mm²

The section of the circuit conductors voltage is 1.5 mm²

The section of the auxiliary circuits shall be 1.5 mm.

TMF10 characteristics



Type	TMF10
Electric meter	Multifunction
Current transformer (A/A)	200/5
ICP (A)	400/250
Breaking (KA)	20
Fuse (A)	As there CGP, fuses are replaced by blades as Vademecun guide



General supply line (LGA)

The general supply line or LGA will be covered conductive section extending from the CGP and TMF10.

Being the TM10 and CGP installed next to the other the length of the LGA be 3m.
Will be a section of insulated conductors inside surface mounting tube being one of the systems listed as possible in the ICT-BT 14 of REBT.

The justification for choosing this system over other possible ones, is due to the proximity between the CGP and TM10 and the easy of installation.

The maximum voltage drop for this section will be 0.5%.

Its maximum admissible intensity is 338 A, is obtained through its maximum permissible power 293 kW according to the ITC-BT-10 (see point power prevision) and after applying the correction factor of 0.8 of the ITC-07 in Section 3.1.3.

The cable section corresponding to an intensity of 338 A according to calculation is 300mm², but the line to be installed will be 2x (3x150 +150mm²) of equivalent section. The diameter of the tube under section calculated according to Table 1 of BT GUIDE 14 is 2x200mm² with a tube for each (3x150mm² +150 mm²).

The union of the rigid pipes staying inside the LGA be threaded or embedded so that its ends can not be separated.

Shall consist of a conductors wire unipolar type asylees RZ1-K (AS) (UNE 21123-4), and its rated voltage 06/1kV.

According to the ITC-BT 21 in section 2.2 fixed mounting surface, fix the pipe with bridles or brace protected against corrosion by installing one every 0.5 m

Individual Derivation (DI)

Individual derivation (DI) is the conductive section comprised that goes from the TMF10 and CGBT.

The course is buried and through the front yard along a perimeter route to enter the industry and connect with CGBT. The tubes will join together by right accessories to its class to ensure continuity of protection.

The maximum voltage drop for this section will be 1.5%.

Its maximum admissible intensity is 338 A, is obtained through its maximum admissible power

293 kW according to the ITC-BT-10 (see point power prevision) and after applying the correction factor of 0.8 of the ITC-07 in Section 3.1.3.

The cable section corresponding to an intensity of 338 A according to calculation is 300mm², but the line to be installed will be 2x (3x150 +150mm² mm²) of equivalent section

The diameter of the tube under section calculated according to Table 1 of BT GUIDE 14 is 2x200mm² with a tube for each (3x150mm² +150 mm²).

Shall consist of a conductors Cable unipolar type asylees RZ1-K (AS) (UNE 21123-4), and its nominal voltage 06/1kV.

According to the ITC-BT 15 in point 2, the tube will have a nominal section section to increase the amount of drivers pre-installed on a 100%

According to ICT-BT 07 of REBT in section 2.1.2, in buried pipelines, it has to install a manhole with lid registrable every 40 m of straight section and one on each curve or abrupt turn tracing to see the amount of installed manholes and location of each view plane13.

According to the ITC-BT 21 of REBT in Section 1.2.4, is installed to a minimum depth of 0.6 m, will also have a minimum cover less than 0.03 m and a higher minimum of 0.06 m. the outer diameter of the tube according to Table 9

According to the REBT ITC-BT15, referral should include a single thread of control red and section 1.5 mm²..

Description of pipelines used

For the industrial building (Trays blind)

The trays do not protective function then the conductors that pass through them should be 06/1kV nominal voltage.

The route will follow will be vertical and horizontal lines of the building to consulting the route see planes 14

trays shall be type blindly, this system was chosen over others, because due to the nature of the activity of the industrial building there is a risk that amounts of dust from industry reaching the trays, if its are blinddon't have holes to dust can be deposited with the cables that could cause problems .

The trays will be class II

The size of the trays will be varied, is set according to the size and number of conductors that flow through it, the size for each section is obtained through an application of the manufacturer of trays UNEX (see map 14 and calculation in annex)

To derivation individual (DI)

2 pipes underground under the conditions specified in point "Derivation individual (DI)" with a section of 200mm² each.

For the general supply line or (LGA)

2 pipe surface mounted under the conditions specified in point "General Line of Power" with a

section of 200mm² each.

For offices:

in the interior of tubes embedded with minimum diameter according to number of conductors accommodated in the tube according Table 2 to the ITC-BT 21.

Area of unipolar conductors (mm ²)	external diameter of the tubes (mm)				
	Number of conductors				
	1	2	3	4	5
1,5	12	12	16	16	16
2,5	12	12	16	16	20
4	12	16	20	20	20
6	12	16	20	20	25
10	16	20	25	32	32
16	16	25	32	32	32
25	20	32	32	40	40
35	25	32	40	40	50
50	25	40	50	50	50
70	32	40	50	63	63
95	32	50	63	63	75
120	40	50	63	63	75
150	40	63	75	75	
185	50	63	75	-	-
240	50	75	-	-	-

Table 5: Extract from ITC-BT 14 of the REBT

Description of the cables.

The type of cable to use in the installation will vary depending on the section, this table is collected in summary what type to use for each of the different sections or parts of the installation:

Have been taken into account in making the following table the instructions in point 3.3 of RSCIEI.

Only cables located in the interior of false ceilings or raised floors shall be non-propagating fire and smoke emission and opacity reduced. All other cables shall comply what for them is established in the specific norms that apply to them.

In this case, the cables which distribute electrical energy throughout the industry are through unperforated trays which implies that do not roll either by false ceiling or raised floors.

To retard fire propagation along cabling shall apply coatings (resins or intumescent paint), which are given directly on the cables.

Segment	Cable designation	Cable characteristics
General Supply Line	cable RZ1-K (AS) (norm UNE 21123-4)	Cable does not propagate the fire rated voltage 0.6 / 1 kV, with copper conductor class 5 (-K), polyethylene insulation (R) and covered with composite thermoplastic polyolefin base with low emission of smoke and gases corrosive (Z1)
Individual Derivation	cable RZ1-K (AS) (norm UNE 21123-4)	Cable does not propagate the fire rated voltage 0.6 / 1 kV, with copper conductor class 5 (-K), polyethylene insulation (R) and covered with composite thermoplastic polyolefin base with low emission of smoke and gases corrosive (Z1)
Installing outdoor lighting	RZ (Cu)	-
Insulated conductors laid directly on the walls	H07V-K	Isolated unipolar Conductor rated voltage 450/750 V, with copper conductor class 5 (-K) and isolation of polyvinyl chloride (V)
Insulated conductors in support tray or trays	Cable RV-K (norm UNE 21123-2)	Cable nominal voltage 0.6 / 1 kV, with copper conductor class 5 (-K), polyethylene insulation (R) and covered with polyvinyl chloride (V)

Drivers for humid areas	cable H07Z1-K (AS) (norm UNE 211002)	Conductor does not propagate the fire, isolated unipolar rated voltage 450/750 V with copper conductor class 5 (-K) and isolation of compound based thermoplastic polyolefin with low smoke and corrosive gases (Z1)
Sector offices, except for dressing rooms	H07V-K	Isolated unipolar Conductor rated voltage 450/750 V, with copper conductor class 5 (-K) and isolation of polyvinyl chloride (V)
Earth conductor the net that connects the electrodes.	-	Naked, copper, 35 mm ² minimum, will the pipes outside of the power cables. Shall be of the Conductor consists of several rigid wires wired together
Net conductor Earth Ground	Cable H07V-R (norm UNE 21031-3)	Isolated unipolar Conductor nominal voltage 450/750 V with copper conductor 2 (-K) and isolation of policlorudo chloride (V)
Office interior electrical panel	ES05Z1-K(AS)	Conductor does not propagate the fire, isolated unipolar rated voltage 300/500 V with copper conductor class 5 (-K) and isolation of compound based thermoplastic polyolefin with low smoke and corrosive gases (Z1)

Maximum voltage drop

The voltage drop limits permitted are collected in the REBT in its ITC-BT 14, 15 and 19 for the installation referred to in this project are:

Part of the installation	Voltage drop maximum percentage of the supply (%)	drop in three-phase circuits (V)	drop in single-phase circuits (V)
General line of supply	0,5	1,15	2
Individual derivation	1,5	6	3,45
Lighting circuits	3	12	6,9
Power circuits	5	20	11,5

description of the electrical apparatus

To determine the type, quantity, sizing and layout of each of the different protections have been taken into account the following criteria

- A fault should be easy to identifiable location, affecting a small portion of this installation can electrically isolate for repair and not compromising the proper functioning of other facility during the entire process.
- The charges corresponding to a type, such as the lighting of an area has been divided into a number of multiples of 3 circuits, with the minimum number of divisions of 3, to divide that power between 3 phases and to guarantee the balance of the circuit. To achieve this it has had to have a larger number of lines and protections.
- There is need for magneto thermal protection to protect the installation.
- The design of the magnet thermal protection of each line was performed considering the intensity that must pass for the proper functioning of the charge and what value should open the circuit to protect heating lines and machines that deteriorate or spoil.
- There is a need for differential protections to protect people from potential direct and indirect contacts.
- The disposition of the differential distribution obeys a type hierarchy of selectivity or horizontal. Differentials exist only in an installation level and this upstream of PIAS protecting lines and downstream of the main switches of each frame.
- The number of differential adopted due to at least one per five lines downstream, may be more, including one for each line as in the case of panel machines where it is recommended for convenience, for easy location

of the ground fault and power is a big difference between the lines.

- The design of the general protections of each panel is determined taking into account the amount of intensity that has been stipulated (see calculation) to be run on the line to be protected.
- To determine the breaking of each of the wards, has been applied IccEs method, which determines the ability to have the thermal magnet to open the circuit and comply its function of protecting the line against a sudden and inordinate amount intensity caused by a short circuit. This method has been applied to the main switches of each panel and the value obtained was extrapolated to other protections of the same panel.
- To determine the sensitivity of the circuit breakers have addressed the type of activity, and for an industrial activity is recommended sensitivity 300mA, higher sensitivity, 30 mA, may cause continuous interruptions.
- The current value of the differential is the guarantee that in the case of a maximum consumption of each of the downstream circuits, the sum of the all intensities should be less than the differential, because this value is that the manufacturer provided as a high intensity that can pass continuously through of the apparatus without this to became damage.
- The value of Icm differentials must be equal to or greater than the breaking magneto thermal switch accommodated in the same panel, since this value corresponds to the maximum intensity that can flow instantaneously through the apparatus without damage. The maximum intensity value is determined by the cuts powers protections downstream.
- The type of trip curve of thermal magneto is the "C" for most circuits as is the curve that best fits the line installations, conventional charges. In the case of power lines of the machines has been established curve "D" as the best option as it ensures the closed circuit during starting of these motors is when they have a higher than nominal consumption.
- The curve of the differential switches is because for such applications and to a limited number of electronic apparatus, computers, is the best fit.
- All types of protections are bipolar or tetra polar, settling first in the case of single-phase lines and the latter in the case of three phase..

Index of protection devices

It will generally consider that to external devices such as CGP, CS and TMF10 and closets or exterior places , unless elsewhere in this document set a different protection for a specific

application will have the following values of protection : IP43 K08

It will generally consider that the internals as CGBT and subpanels and any other device, unless elsewhere in this document set a different protection for a particular application, shall have the following values of protection: IP30 K08

Adaptation of the category of sites and equipment according to the classification of risk of explosion areas

All equipment of the installation will be Class II

Installation of ground connections.

Shall consist of a cable section 35 mm², naked, buried, running out of any pipeline and around the perimeter of the building (see plane 15). Because the terrain characteristics and the size of ring does not require installation of earth spikes (see annex calculations)

Protections

There are 3 general types of protection at the installation.

The protections are:

Thermal Magnetic: Protect the installation of any potentially damaging increases in consumption for it, whether caused by a short circuit or an increase of intensity.

Its operation is based on the following physical principles: When to circulate a current through the electromagnet, it creates a force that, through a mechanical device, open the circuit tends to separate the contacts, but can open only if the current flowing through the charge exceeds that intervention limit fixed. This level of intervention is usually between 3 and 20 times the nominal current (the current design of the circuit breaker) and its action is approximately 25 milliseconds, making it very safe for your reaction. This is the part used for protection against short circuits, which produces a very rapid increase and high current.

The other part is constituted by a bimetallic film when circulating current through it, this is heated by Joule effect and is deformed as a result of an increase in temperature. This deformation curve because it is composed of two materials with different coefficients of deformation. If the current flowing through the large enough and kept a certain time warp that will suffer the bimetal opens the circuit .. This part is responsible for protecting currents, although its higher than those permitted by the installation, do not reach the level of intervention of the magnetic device.

The other part is constituted by a bimetallic film when circulating current through it, this is heated by Joule effect and is deformed as a result of an increase in temperature. This deformation curve because it is composed of two materials with different coefficients of deformation. If the current flowing through the large enough and kept a certain time warp that will suffer the bimetal opens the circuit .. This part is responsible for protecting currents, although its higher than those permitted by the installation, do not reach the level of intervention of the magnetic device.

To know how many, type, location (See plan 5)

To find the selection criteria see the point (electric aparatage description)

Differential Switches: The mission of these mechanisms is to protect people from possible electrical contacts, direct and indirect derivations due to lack of insulation between conductors and earth or mass of the devices.

In essence, the differential switch consists of two coils, arranged in series with the current supply conductors and produce opposing magnetic fields and an armature core or by a adequate mechanical device can actuate a contact.

If the current through the conductor input is different from that flowing through the outlet, the magnetic generated in the coils is no longer magnetically which counteract the magnetic causes the remaining (not offset) induces a current in a toroidal and this comes to a coil open circuit.

To know how many, type, location (See plan 5)
To find the selection criteria see the point (electric aparatage description)

Overvoltage protection: These elements protect equipment or machines that want to connect to the electricity net, especially electronics. An increase in permanent tension, tension greater than 10% of nominal voltage, and indefinite duration may generate:

- Overheating of equipment.
- Reduced life.
- Fire.
- Destruction of equipment.
- Service interruption.

To know how many, type, location (See plan 5)
To find the selection criteria see the point (electric aparatage description)

Overcurrents..

Indirect contacts

Protection Automatic power cut.

Is designed to prevent a contact voltage of sufficient value, is maintained for a time such that can result in a risk.

The masses of electrical equipment protected for the same protective device must be interconnected and linked for protective conductors to the same ground.

See section "Calculation of protection against indirect contact and contact voltage (Vc)"

direct contacts

The protection against direct contact be made by:

- Insulation of live parts.
- Protection by enclosures IP-30 IK-08 Indoor IP-45 IK-10 Outdoor
- supplementary differential switches protection

Overvoltages

The Overvoltages are the voltage increases higher than normalized values (230V / 400V) that occur on the net and can shorten the life of equipment that are connected to our net or damage them, especially sensitive electronics.

Can be given two different types of overvoltage:

- Transient overvoltages: Normally atmospheric effects are produced by lightning than to fall, direct or indirect contact with stretches of outdoor installation, may cause a power surge in one of these sections and this will spread to our indoor installation. These increases are transient, last a few decimes of a second, but enough to cause destruction and having to protect our installation from them. In this type of overvoltages, usually by a protective device to earth derive.
- overvoltages permanent: voltage increases are produced by an imbalance in the system, usually the neutral conductor is broken somewhere, and this results in less charge phase voltage imbalance increase if compared to the other..

In this type of overvoltages, protection They act by opening the circuit and disconnecting our net, where our devices are connected, in the moment when detected an excessive input voltage.

For installation of this project are needed both types of protections, and the manufacturer CIPROTEC which is one of the two systems provides unified protection in one device, making installation and maintenance easier.

The selected model is the V-CHECK 4RPT of CIPROTEC, is a three-phase model, protection is combined, is a model specially designed for industrial use, its maximum intensity (I_{max}) is 40kA, amply exceeding
Its installation will be carried out inside the CGBT and location will be between the ICP and the IGA.

Reactive power compensation

Following the implementation and entry into service of the installation, the installation will need a adequate study on the value of reactive power consumption.

From this value defines the type of capacitor to compensate the reactive power to ensure a value of minimum power Factor of 0.9..

Other documents related to the dossier.

These are as follows, and are enclosed in Volume 2 of this project:

- Model Printed: ELEC 1
- Certificate of final electrical installation (Model: ELEC 4)
- List of equipment i auxiliary installations subject to specific industrial safety regulations (Model: ELEC 5)
- Electrical Installation Certificate.

Name	Juan Luis Vera Ambel
Studies	Graduated in mechanical engineering
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Sign manual:	



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UNIVERSITAT POLITÈCNICA DE CATALUNYA

III-Annex

"ELECTRICAL INSTALLATION IN A CONCRETE BLOCK FACTORY"

FPG presented to obtain the title of graduate in
mechanical engineering
by **Juan Luis Vera Ambel**

Barcelona, Juny 13, 2012

Director: Jose Luis Rodriguez Espantoso
Department of EG
Politecnical University of Catalonia (UPC)

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ELECTRICAL INSTALLATION

Calculation and justifications.

Starting hypothesis.

HYPOTHESIS OF BEGINNING	
single-phase voltage	230V
Three-phase voltage	400V
Length for lighting circuits	0,75 x Length to the faster point.
Length for the rest of the circuits	0,75 x Length to the faster point.
voltage drop in lighting circuits from CGBT to the farthest lamp	3%
voltage drop in rest of the circuits from CGBT to the farthest point.	5%
K	44
Performance of this engine is low	0,85
Cos (α) taken for discharge lamps	0,55
Cos (α) taken for engines	0,8
Resistivity of copper, 20°C	0,01785 $\Omega\text{mm}^2/\text{m}$
maximum ambient temperature	40
Reduction factor for grouping of various circuits or conductors	0,75-0,8-1
correction factor for different ambient temperatures of 40 ° C	1
Type of protection for conductor	XLPE

Coefficients prescribed (according to BT ITC 44 and 47)

According to the ITC-BT 47 of REBT in section 3.1 "single engine" and 3.2 "multiple engines" the power for which has been calculated the lines that feed a single engine must be 125% electric power from the engine and that feed several motors is the sum of the electric power of all engines and 125% of the largest of these.

According to the ITC-BT 44 of REBT, receptors that are discharge lamps must be applied a factor of 1.8 power in Watt of the lamp.

Maximum admissible power.

The maximum admissible power is 173 KW

Simultaneity coefficient applied.

There is provided a simultaneity coefficient of 1 for total power of all charges intervening directly in the production process.

There is provided a simultaneity coefficient of 0.75 for the sum of the other charges, including lighting and others.

Nominal voltage.

Single-phase voltage 230V/50Hz

Three-phase voltage 400V/50Hz

Admissible voltage drop.

The maximum voltage drop that may exist between the CGP and CGBT is to say Individual derivation (DI) is 1,5%.

The maximum voltage drop that may exist between the charge which is more distant from each line and CGBT is 3% for lighting circuits and 5% for all other circuits.

Calculations of intensity.

For sigle-phase lines

$$I_b = \frac{P}{V_l * \text{Cos}(\varphi)}$$

For three-phase lines

$$I_b = \frac{P}{\sqrt{3} * V_f * \text{Cos}(\varphi)}$$

I_b → Current (A)

P → Power (W)

V_l → Line voltage (V), usually 230V

V_f → Phase voltage (V) usually 400V

$\text{Cos}(\varphi)$ → Power factor.

Voltage drop calculations.

The maximum voltage drop calculations are a percentage of the nominal voltage of the section to which this calculation is applied.

These percentages vary depending on the length and type of installation.

The maximum voltage drop limits permitted are listed in REBT in its ITC-BT 14, 15 and 19 for the installation of this project are:

Part of the installation	Voltage drop maximum percentage of the supply (%)	drop in three-phase circuits (V)	drop in single-phase circuits (V)
General line of supply	0,5	1,15	2
Individual derivation	1,5	6	3,45
Lighting circuits	3	12	6,9
Power circuits	5	20	11,5

Calculation of the dimension of conductors.

:

The regulatory determination of a driver section is to calculate the minimum section that simultaneously satisfies the following conditions:

Criterion of permissible current :

When a conductor is crossed by an intensity that is heated by Joule effect. Your heating will be higher or lower depending on its section. The higher section less heating and lower section more heating.

In this case the section that will get smaller to allow for circulation of a given amount of electric current conductor does not exceed 90 ° C.

The procedure is as follows:

Calculate the current which is flowing through the conductor (see point calculations of intensity).

Through the 52-C20 table of UNE 20-460-94/5-523, extract the appropriate section in the table by entering data:

Conductive material: In this case Copper

Type of installation of wiring: For this case E

Insulation of the conductors is: In this case XLPE

And given before, that the maximum intensity that holds the selected section according to the table, you must apply two factors lowering of the norm UNE 20-460-94/5-523. This is the maximum current that can flow through the cable corrected.

The first is called reduction factor for grouping of various circuits or several multiconductor cables (Table 52-E1)

The second is called correction factor for different ambient temperatures of 40 ° C (Table 52-D1)

This final calculated intensity flowing through a conductor obeys the following formula:

$$I_z = I' * F1 * F2$$

I' → maximum current that can flow through a conductor without any degradation that, according to table 52-C20, before applying the factors F1 and F2

I_z → Maximum current that can flow through a conductor without any degradation that, according to table 52-C20, corrected by the factors F1 and F2

F1 → reduction factor for clustering. This factor is obtained from Table 52-E1 of the UNE 20-460-94/5-523

F2 → Correction factor for ambient temperatures than 40 ° C. This factor is obtained from Table 52-D1 of the UNE 20-460-94/5-523

After the selection criterion of section according to the table is the one corresponding to the maximum that can circulate through the cable just corrected immediately superior to the intensity that will circulate in the cable, the calculated.

The section obtained through this procedure will call S1.

Criterion of the voltage drop:

The normative specify a maximum voltage drop for each of the conductors of the installation (see section Calculation of voltage drops). This voltage drop is greater when greater is the length of the conductor and the lower is its section. The length of the conductor is something we can not change, because we do not decide the position of the charges in reference to CGBT but the section, yes, and this is the object of this calculation. The voltage drop may cause that some receiver to function deficiently in the case of incandescent bulbs, or non-functional or risk of damage, for example in the case of machines.

The procedure is as follows:

Depending on the type of conductor (see section Calculation of voltage drop) we choose the

percentage imposed by the norms of voltage drop across the conductor.
For calculating the minimum section which guarantees the maximum voltage drop imposed apply two formulas, one for three-phase lines and one for single-phase:

Por single-phase

$$S = \frac{2 * P * L}{K * v * V_l^2}$$

Por three-phase

$$S = \frac{P * L}{K * v * V_f^2}$$

S→ Sección en (mm²)

P→ Potencia en (W)

L→ Longitud de la línea en (m)

K→ Conductividad del cobre a 70°C en (m/mm²Ω), para este caso 48

v→ Caída de tensión para la línea en (tanto por 1)

V_l→ Voltage de línea en (V) para este caso 230V

V_f→ Voltage de fase en (V) para este caso 400V

After applying these formulas we obtain the minimum section to comply the criterion of this point, but the calculated section is not standardized and not exist in the market. when we choose the standard section immediately superior to calculated.

The section obtained through this procedure will call S₂.

Criterion of the section for protection associated:

Circuit breakers are the protections that are put at each of the lines to protect itself from a higher intensities than expected on whether caused by currents or short circuits and which can damage the conductor.

These protections have the mission to open the circuit to prevent that the electrical current continues flowing through the line once this dangerous increase current occurs. On the other way this protection must be dimensioned for that under normal electric current flow did not act by opening the circuit and leaving the receiver without electrical energie.

For this reason, this protection must act to a value intensity of more than normal operating (I_b)

and lower than the conductor can resist before damage occurs in it (I_z).

The (I_B) is imposed and has been calculated yet (see Calculation of intensity point) but the (I_Z) is determined for the section of the driver until now not established, this being the object of finding this criterion. This intensity is obtained by following the procedure in "Criterion of maximum allowable intensity "

Then the intensity of the protection (I_p) must to comply with the following criterion.

$$I_b < I_p < I_z$$

Sometimes there are no standard magneto thermal protection to comply with this criterion, especially when (I_b) and (I_z) are proximate and the range of possible currents or that lies between these two values is small.

As (I_z) depends of the section of conductor ,this, will vary it across the table 52-C20 of the UNE 20-460-94/5-523 until that across the table C20 of the UNE entering the section and other requirements are comply that (I_z) become sufficiently large for that to exist normalized protection conforms to the criterion.

$$I_b < I_p < I_z$$

The section obtained through this procedure will call S3.

Finally, to determine the minimum section that satisfies the three criterion and selected to the correct section line we must to follow the next procedure.

S1 to S2 and choose the larger of the two.

The selected section is replaced for S3 in the case of to be this superior.

Determination of breaking capacity of the protections.

For this calculation has followed the procedure of the document "Calculation alternative short-circuit currents, IccES method."

This method is to find short-circuit currents previously "Icc" and then find the powers of court "PDC"

Is a valid method, extended and recognized by the engineering college as an alternative to the traditional method that establishes the REBT and this is more simple, why not require external variables and difficult to obtain for its development.

The procedure is as follows:

It determines the maximum value of the expected short-circuit current in the net low voltage:

It compares the expected maximum value of short-circuit current net low voltage, which is 10 kA, with value indicated by the power cut ICP or IGA. The two values is chosen as large, and called I_{cc} network.

Using the data of the previous section, the impedance is calculated equivalent "upstream" using the following expression:

$$Z_{cc\ x} = \frac{V_f}{I_{cc\ x}}$$

$Z_{cc\ x}$ → Short circuit impedance of the power network (Ω)

V_f → Phase voltage (V)

$I_{cc\ x}$ → expected short-circuit current (A)

All the impedance reactance is considered, so ZCC net will be Xcc net

Calculating the equivalent resistance of electrical conductors:

This calculation depends of each section of the conductor, with different section and / or length.

$$R = \frac{\rho * L}{S}$$

R → Conductor resistance conductor (Ω)

ρ → Coefficient of resistivity at 20°C ($\Omega\ \text{mm}^2 / \text{m}$)

L → length of conductor (m)

S → Conductor area (mm^2)

For its low influence on the final result, and the purpose of simplify the calculation, do not take into account the reactance of the cables.

This is also the side of safety, as it considers smaller total impedance.

Calculating the total impedance:

First calculating the total resistance as the sum of the resistances the various sections of conductor:

$$R_{cct} = R1 + R2 + \dots + Rn$$

Then it calculates the total shunt impedance:

$$Z_{cct} = \sqrt{R_{cct}^2 + X_{cct}^2}$$

Calculation of short-circuit current:

Three-phase Short-circuit

$$I_{cc3p} = \frac{Vf}{Z_{cct}}$$

Single-phase Short-circuit

$$I_{cc1p} = \frac{I_{cc3p}}{2}$$

Calculation of protection against indirect contact and contact voltage (Vc)

The REBT in its ITC-BT-24, requires that the fault voltage is lower than the limit voltage conventional contact:

$$R_A * I_a < V_c$$

RA → The sum of the resistance of the grounding conductors and protection of the masses.

I_a → Current that ensures operation of protection

According to point 9 of the ITC-BT 18, this local so is type conductor to be of a driver, its V_c, 24V will be

It is an industry and its protections differential sensitivity is 300mA.

Then Ra is:

$$80\Omega = \frac{24V}{0,3A}$$

The grounding resistance based on the differential will be :

$$R_A = 80\Omega$$

However the maximum resistance that we will use will be 37Ω. This is because in anticipation of future local activity changed, the net installation of ground to be something that can not be changed easily, take it as resistance which corresponds to the case of more restrictive activity.

All protective devices are defined in the plane (line diagram)

Calculation of the resistance of the grounding according the picks installed.

The purpose of the grounding of the masses of the receivers is to ensure the safety of persons to indirect contact.

The maximum voltage that can appear on the masses of recipients (default voltage), when there has been a ground fault, is the product of the maximum fault current without acting the differential resistance of ground.

In point of location of the CGP (the LGA should take protective conductor which constitutes the main ground line).

The REBT in ITC-BT-18 requires a device to measure ground resistance, which may be in the main ground terminal, and should be removable by a tool.

The grounding terminal of the CGP may also be used as ground maintenance and repair of the distribution system

The calculation procedure to find the number of picks would be:

We found the ring Resistance

$$R_{t_{\text{anillo}}} = 2 * \rho / L_1$$

The resistance of the ring is connected in parallel with the picks, so to unify all in one strength we use the sum formula for parallel resistance

$$R_A = \frac{1}{\frac{1}{R_{t_{\text{ring}}}} + \frac{1}{R_{t_{\text{picks}}}}}$$

From this formula to obtain $R_{t_{\text{picks}}}$ with the following formula and having fixed length of the spikes obtain the necessary number of pickes which we must to add for guarantee a resistance ring of all equal to the maximum permitted is 37Ω .

$$N = \frac{\rho}{R_{t_{\text{pikes}}} * L}$$

Start the calculation.

$$R_{t_{\text{ring}}} = 2 * \rho / L_1$$

$$R_{t_{\text{pikes}}} = 2 * 500 / 312$$

$$R_{\text{ring}} = 3,2\Omega$$

As the ground resistance is less than 37Ω is considered correct.

Calculation of the dimension of machine of air conditioning for the offices.

As a data unknown to us because it is not still projected that installation, the reference require will be a electric power of $50W$ for m^2

$$50 \frac{W}{m^2} * 270 m^2 = 13.500W$$

As there are 2 floors, this power divide it by two to divide it between two floors, it is assumed that there will be a machine on each floor

$$\frac{13.500W}{2} = 6750W$$

According to the calculation estimates that the power for which must be dimensioned the two lines fed air conditioning machines are of 6750W for each one.

Calculation of the dimension trays of the industry

To calculate this have used a commercial program that offers the UNEX website "www.unex.biz / online"

Only must be defined number and section of conductors that going to watch on each section and the program gives you the dimensions that have to have trays that stretch.

The results of these calculations and all are collected in the following section "Results of the calculations"

Results of the calculations..

Line	Phase	Power (W)	Voltage (V)	length (m)	length to calculate (m)	v (%)	K	Calculation of S1		Calculation of S2				Calculation of S3		Calculation PDC with method IccEs						Protection (A)				
								Area 1 (mm2)	Commercial Area "S1" (mm2)	Current "I" (A)	F1	F2	Maximum current corrected by F1 and F2 for the cable according to "S2" (A)	Maximum current for the cable according to "S2" (A)	Area "S2" (mm2)	MAX(S1 y S2)	Maximum current correcter by F1 and F2 for the cable according to "S3" (A)	Maximum current for the cable according to "S3" (A)	Area "S3" (mm2)	Resistivity of copper	Impedance		Rtt	Zcc	Icc3p /Icc1p	PDC
3.1	T	18151,80	400,00	25,00	25,00	0,00	44,00	51,57	70,0	26,20	1,00	1,00	29,00	29,00	2,5	70,0	224,00	224,00	70,0	0,02	0,01	0,01	0,01	8006,26	10	63
3.2	T	18100,60	400,00	25,00	25,00	0,00	44,00	51,42	70,0	26,13	1,00	1,00	29,00	29,00	2,5	70,0	224,00	224,00	70,0	0,02	0,01	0,01	0,01	8006,26	10	63
3.3	T	20756,00	400,00	3,00	3,00	0,00	44,00	7,08	10,0	29,96	1,00	1,00	38,00	38,00	4,0	10,0	68,00	68,00	10,0	0,02	0,01	0,01	0,01	8347,35	10	50
3.4	T	18374,00	400,00	4,00	4,00	0,00	44,00	8,35	10,0	26,52	1,00	1,00	29,00	29,00	2,5	10,0	68,00	68,00	10,0	0,02	0,01	0,01	0,01	7752,06	10	40
3.5	T	86714,55	400,00	5,00	5,00	0,00	44,00	49,27	50,0	125,16	1,00	1,00	144,00	144,00	35,0	50,0	175,00	175,00	50,0	0,02	0,00	0,00	0,01	9440,82	10	160/160
3.6	T	5760,00	400,00	6,00	6,00	0,00	44,00	3,93	4,0	8,31	1,00	1,00	21,00	21,00	1,5	4,0	38,00	38,00	4,0	0,02	0,03	0,03	0,03	3685,57	10	25
3.7	T	6840	400	70	70	0,00125	44	54,40909091	70,0	9,8726896	1	1	21,00	21	1,5	70,0	224,00	224	70,0	0,01785	0,01785	0,02008125	0,02314102	4969,53125	6	25

General Line, Level 4

Line	Phase	Power (W)	Voltage (V)	length (m)	length to calculate (m)	v (%)	K	Calculation of S1		Calculation of S2				Calculation of S3		Calculation PDC with method IccEs						Protection (A)				
								Area 1 (mm2)	Commercial Area "S1" (mm2)	Current "I" (A)	F1	F2	Maximum current corrected by F1 and F2 for the cable according to "S2" (A)	Maximum current for the cable according to "S2" (A)	Area "S2" (mm2)	MAX(S1 y S2)	Maximum current correcter by F1 and F2 for the cable according to "S3" (A)	Maximum current for the cable according to "S3" (A)	Area "S3" (mm2)	Resistivity of copper	Impedance		Rtt	Zcc	Icc3p /Icc1p	PDC
4.1	T	152701,35	400	30	30	0,0025	44	260,286392	300	220,405414	1	1	565,00	565	70	300	565,00	565	300	0,01785	0,001785	0,001785	0,001785	9881,67168	20	250

Charges distribution In phase for the equilibrium

POWER PHASE	
1	64025,7783 34%
2	58635,7783 32%
3	63454,7808 34%
TOTAL	186116,338

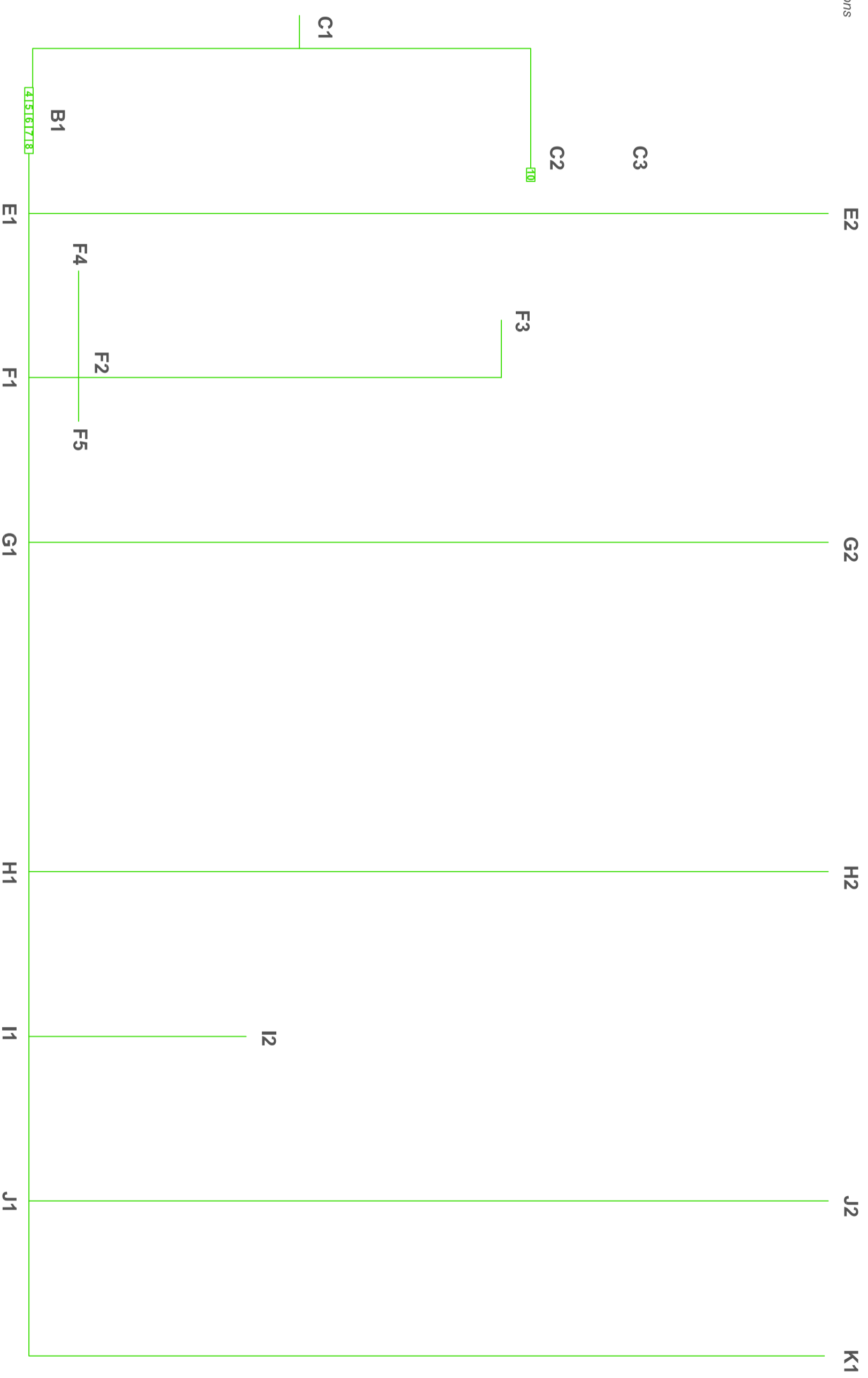
Number and type of lines in each section of tray

Section of tray		Circuit for each section of tray																		
A1	B1	4.1																		
B1	C1	1.35	1.36	1.37	1.38	3.1	3.2	1.28												
C1	C2	3.1	3.2																	
C2	C3	3.2																		
B1	E1	3.7	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.25	1.26	1.27	1.29	1.30	1.31	1.32	1.33
E1	E2	1.16	1.17	1.25	1.27															
E1	F1	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.29	1.30	1.31	1.32	1.33	3.7						
F1	F2	1.30	1.31	1.33																
F2	F3	1.30																		
F2	F4	1.31																		
F2	F5	1.33																		
F1	G1	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.29	1.33	3.7							
G1	G2	1.18	1.19	1.20	1.21	1.22	1.23	1.24	1.29	1.33	3.7									
G1	H1	1.16	1.17	1.20	1.21	1.22	1.23	1.24	1.29											
H1	H2	1.20	1.21	1.22	1.23	1.24	1.29	1.33	3.7											
H1	I1	1.16	1.17	1.22	1.23	1.24	1.29	1.33	3.7											
I1	I2	1.32																		
I1	J1	1.22	1.23	1.24	1.29	3.7														
J1	J2	1.22	1.23	1.24	1.29															
J1	K1	1.29	3.7																	

Dimensions of each section of tray according to calculation program UNEX

NOTE: The documentation of the process of calculating the dimensions of the trays from the UNEX program is to continue.

Segment	dimension
B1-C1	60 X 150
C1-C2	60 X 150
C2-C3	50 X 100
B1-E1	60 X 150
E1-E2	60 X 75
E1-F1	60 X 100
F1-F2	60 X 75
F2-F4	60 X 75
F2-F4	60 X 75
F2-F5	60 X 75
F1-G1	60 X 150
G1-G2	60 X 75
G1-H1	60 X 150
H1-J1	60 X 100
I1-I2	60 X 75
I1-J1	60 X 100
J1-J2	60 X 75
J1-K1	60 X 100



B1-C1**List of cables in each compartment****Compartment**

Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 3x 1.5	3	9,20	0,11	1,4	118,50	355,49
With Cover 06/1 kV (RV-K) 4x 2.5	1	11,00	0,18	1,4	169,40	169,40
With Cover 06/1 kV (RV-K) 3x 4	1	11,10	0,20	1,4	172,49	172,49
With Cover 06/1 kV (RV-K) 4x 70	2	35,80	3,26	1,4	1794,30	3588,59 4285,97

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	4285,97	30	5571,77

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x150 Base	7025,00	66150

C1-C2**List of cables in each compartment****Compartment**

Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 70	2	35,80	3,26	1,4	1794,30	3588,59 3588,59

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	3588,59	30	4665,17

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x150 Base	7025,00	66150

C2-C3

List of cables in each compartment

Compartment

Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 70	1	35,80	3,26	1,4	1794,30	1794,30 1794,30

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	1794,30	30	2332,58

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x100 Base	4349,00	66100

B1-E1

List of cables in each compartment

Compartment

Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 3x 1.5	1	9,20	0,11	1,4	118,50	118,50
With Cover 06/1 kV (RV-K) 4x 2.5	3	11,00	0,18	1,4	169,40	508,20
With Cover 06/1 kV (RV-K) 5x 4	6	13,20	0,30	1,4	243,94	1463,62
With Cover 06/1 kV (RZ1-K) 1x 4	1	6,80	0,07	1,4	64,74	64,74
With Cover 06/1 kV (RV-K) 3x 6	2	12,30	0,27	1,4	211,81	423,61
With Cover 06/1 kV (RV-K) 4x 10	1	16,20	0,52	1,4	367,42	367,42
With Cover 06/1 kV (RV-K) 4x 16	1	19,90	0,79	1,4	554,41	554,41
With Cover 06/1 kV (RV-K) 4x 70	1	35,80	3,26	1,4	1794,30	1794,30 5294,79

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	5294,79	30	6883,22

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x150 Base	7025,00	66150

E1-E2

List of cables in each compartment

Compartment Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 3x 2.5	1	10,10	0,15	1,4	142,81	142,81
With Cover 06/1 kV (RV-K) 3x 4	2	11,10	0,20	1,4	172,49	344,99
With Cover 06/1 kV (RV-K) 3x 6	1	12,30	0,27	1,4	211,81	211,81 699,61

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	699,61	30	909,49

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x75 Base	2770,00	66090

E1-F1

List of cables in each compartment

Compartment Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 2.5	2	11,00	0,18	1,4	169,40	338,80
With Cover 06/1 kV (RV-K) 4x 10	1	16,20	0,52	1,4	367,42	367,42
With Cover 06/1 kV (RV-K) 4x 4	1	12,10	0,24	1,4	204,97	204,97
With Cover 06/1 kV (RV-K) 4x 16	1	19,90	0,79	1,4	554,41	554,41
With Cover 06/1 kV (RV-K) 4x 70	1	35,80	3,26	1,4	1794,30	1794,30 3259,90

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	3259,90	30	4237,87

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x100 Base	4349,00	66100

F1-F2

List of cables in each compartment

Compartment

Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 2.5	1	11,00	0,18	1,4	169,40	169,40
With Cover 06/1 kV (RV-K) 4x 10	1	16,20	0,52	1,4	367,42	367,42
With Cover 06/1 kV (RV-K) 4x 16	1	19,90	0,79	1,4	554,41	554,41
						1091,23

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	1091,23	30	1418,60

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x75 Base	2770,00	66090

F2-F3

List of cables in each compartment**Compartment**

Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 16	1	19,90	0,79	1,4	554,41	554,41
						554,41

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	554,41	30	720,74

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x75 Base	2770,00	66090

F2-F4

List of cables in each compartment**Compartment**

Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 10	1	16,20	0,52	1,4	367,42	367,42
						367,42

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	367,42	30	477,64

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x75 Base	2770,00	66090

F2-F5

List of cables in each compartment**Compartment**

Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 2.5	1	11,00	0,18	1,4	169,40	169,40
						169,40

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	169,40	30	220,22

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x75 Base	2770,00	66090

F1-G1

List of cables in each compartment**Compartment**

Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 2.5	2	11,00	0,18	1,4	169,40	338,80
With Cover 06/1 kV (RV-K) 3x 4	9	11,10	0,20	1,4	172,49	1552,45
With Cover 06/1 kV (RV-K) 4x 70	1	35,80	3,26	1,4	1794,30	1794,30
						3685,54

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	3685,54	30	4791,20

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x150 Base	7025,00	66150

G1-G2

List of cables in each compartment

Compartment Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 3x 4	2	11,10	0,20	1,4	172,49	344,99
						344,99

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	344,99	30	448,48

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x75 Base	2770,00	66090

G1-H1

List of cables in each compartment

Compartment Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 2.5	2	11,00	0,18	1,4	169,40	338,80
With Cover 06/1 kV (RV-K) 3x 6	7	12,30	0,27	1,4	211,81	1482,64
With Cover 06/1 kV (RV-K) 4x 70	1	35,80	3,26	1,4	1794,30	1794,30
						3615,74

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	3615,74	30	4700,46

Selected tray:

AxB mm	Comp.1 mm2	Reference
60x150 Base	7025,00	66150

H1-I1

List of cables in each compartment

Compartment Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 2.5	2	11,00	0,18	1,4	169,40	338,80
With Cover 06/1 kV (RV-K) 3x 4	5	11,10	0,20	1,4	172,49	862,47

With Cover 06/1 kV (RV-K) 4x 70	1	35,80	3,26	1,4	1794,30	1794,30
						2995,57

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	2995,57	30	3894,24

Selected tray:

AxB	Comp.1	
mm	mm2	Reference
60x100 Base	4349,00	66100

I1-I2

List of cables in each compartment

Compartment						
Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 4	1	12,10	0,24	1,4	204,97	204,97
						204,97

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	204,97	30	266,47

Selected tray:

AxB	Comp.1	
mm	mm2	Reference
60x75 Base	2770,00	66090

I1-J1

List of cables in each compartment

Compartment						
Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 2.5	1	11,00	0,18	1,4	169,40	169,40
With Cover 06/1 kV (RV-K) 3x 4	3	11,10	0,20	1,4	172,49	517,48
With Cover 06/1 kV (RV-K) 4x 70	1	35,80	3,26	1,4	1794,30	1794,30
						2481,18

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	2481,18	30	3225,53

Selected tray:

AxB	Comp.1	
mm	mm2	Reference
60x100 Base	4349,00	66100

J1-J2

List of cables in each compartment

Compartment Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 3x 4	3	11,10	0,20	1,4	172,49	517,48 517,48

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	517,48	30	672,73

Selected tray:

AxB	Comp.1	
mm	mm2	Reference
60x75 Base	2770,00	66090

J1-K1

List of cables in each compartment

Compartment Identification	N° cables	diameter	weight kg/m.	Coef. corr.	Secc. unit.	Secc. total
With Cover 06/1 kV (RV-K) 4x 2.5	1	11,00	0,18	1,4	169,40	169,40
With Cover 06/1 kV (RV-K) 4x 70	1	35,80	3,26	1,4	1794,30	1794,30 1963,70

Overview of sections

compartments	Required length mm	Coef. magnification %	total section mm2
Compartment	1963,70	30	2552,80

Selected tray:

AxB	Comp.1	
mm	mm2	Reference
60x100 Base	4349,00	66100

FIRE INSTALLATION

Introduction

The electrical installation of this project is conditioned largely by the measures taken in the prevention or fire safety.

Is conditional because many measures require electricity, such as pumping groups for installation of fire hoses (BIES) or sprinklers. There may also be the possibility of having to define multiple sectors of fire, forcing to take protective measures against fire on the border of each sector also affect the electrical system and many other possible measures that will affect the design of the electrical installation, which is taken into account during the same.

To establish the minimum fire safety for the industry, the norms to apply is FIRE SAFETY REGULATIONS ON INDUSTRIAL ESTABLISHMENTS (RESCIEI).

The method which proposed this norm is include the building inside a typology , calculate the fire load, and know the local surface. From this information the RESCIEI also establishes the fire measures be taking in the industry.

According to Article 3. "Regulatory compatibility" of RESCIEI to establish the minimum fire safety in the office, like the surface of this is greater 250m², the norm to be used is, Technical Building Code (CTE). Only applying RSCIEI to the part industrial.

According also cites Article 3. "Regulatory compatibility" of RESCIEI, the areas to which they apply the surface requirements of the aforementioned regulations shall constitute a separate fire area. the office and industrial sectors of fire are independent

Norms applied:

- Royal Decree 2267/2004 of 3 December, which approves the Regulations on fire safety in industrial establishments. (RSCIEI)
- Document DB SI: Safety in a case of Fire of Royal Decree 314/2006 of 17 March, approving the Technical Building Code. (CTE)

Rationale for the need of the project..

The RESCIEI includes this building among which need fire project (PCI).

This document "Fire Instalación" has been developed with the purpose of clarify which aspects of the fire installation would affect to low voltage proyect. this document is no comparable or substitute of the fire project developed by a competent technician.

Type of establishment.

There are many different settings and locations that may have industrial establishments classified in the RESCIEI the 5 different types are: A, B, C, D, E.

The building of this project belongs to the type C

TYPE C: The industrial establishment full occupies a building, or more, if there are more, is at a distance of three meters from the nearest building. This distance must be free of fuel or intermediate goods that could spread the fire

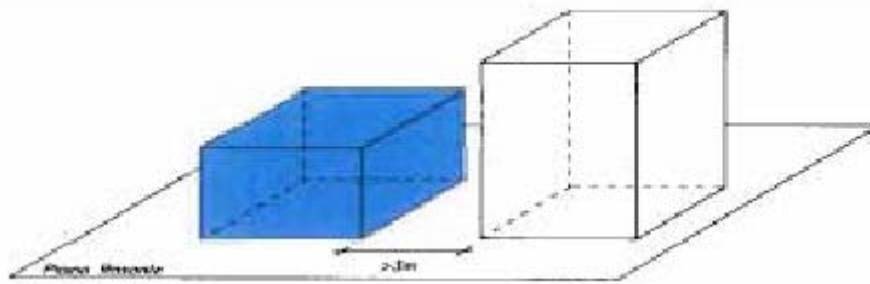


Image extracted from RSCIEI

Calculation of intrinsic risk.

The RSCIEI establishes one form of calculation for production areas and another for storage areas.

For the production area there is this formula:

$$Q_s = \frac{\sum_i q_{si} S_i C_i}{A} R_a \text{ (MJ / m}^2\text{) o (Mcal / m}^2\text{)}$$

For the storage area there is this formula:

$$Q_s = \frac{\sum_i q_{vi} C_i h_i s_i}{A} R_a \text{ (MJ / m}^2\text{) o (Mcal / m}^2\text{)}$$

As in this case the two activities coexist has decided to simplify all calculation using the following formula:

$$Q_s = \frac{\sum_i q_{si} S_i C_i + \sum_j q_{vj} C_j h_j S_j}{A} R_a$$

Being this a fusion of two existing ones.

Where:

Q_s = fire load density, weighted and corrected, of the sector or area of fire in MJ/m².

C_i = dimensional weighted factor to the level of danger (of the combustibility) of each of the fuels that exist in the sector of fire.

R_a = coefficient that corrects the level of danger (by activation) inherent to industrial activity that develops in the fire sector, production, installation, alteration, repair, storage, etc..

A = built area of the sector of fire or occupied area of the fire area in m².

Q_{Si} = fire load density of each zone with different process for different processes in the sector of fire (i) in MJ/m²

S_i = area of each zone with different process and fire load density, Q_{Si} different in m².

Q_{Vi} = fire load contributed by each m³ of each area with different types of storage in the sector of fire, in MJ/m³

h_i = height of the storage of each of the fuel, (i), in meters.

The values are:

For C_i , in this case be taken by the value of $C_i = 1.00$ (Low). This is because in the activity of the industry can exist materials like a cement, concrete and metals

They belong to solid start their ignition temperatures superior to 200 ° C, which in Table 1.1 of RSCIEI we can found the value of C_i .

For R_a , Table 1.2 can be used. From the activity of the industry, articles of Concrete, can be obtain $R = 1$

For A , the area occupied by the fire sector of the industry: 2346m²

For q_{si} , Table 1.2 can be used. From the activity of the industry, articles of Concrete, can be obtain $q_{si} = 100$ MJ/m²

For S_i , 577 which is the drying surface in m²

For q_{vi} , depends on the material

For h_i , depends on the height of the material storage

As the development of the formula is tedious for the number of typologies of materials in it storage area has been done using an Excel table:

Ra	1
A	2346

Production

	q	S	C	Qs
Concrete	100	577	1	57700

Storage

	qvi	Ci	hi	Si	Qs
Cement	40	1	3	105	12600
Concrete	100	1	3,6	525	189000
Pallets	1300	1	2	50	130000

$\sum Qs$	331600
-----------	--------

Qs storage + Qs production = 57700+331600= 389.300MJ/m2

$$Q_s = \frac{57700 + 331600}{2346} * 1 = 165,94 \text{ MJ/m}^2$$

After to obtain the weighted load value corrected using the following table we can find the level of inherent risk has the industry

Level of inherent risk	Fire load density weighted and corrected	
	Mcal/m ²	MJ/m ²
LOW	1 $Q_s \leq 100$	$Q_s \leq 425$
	2 $100 < Q_s \leq 200$	$425 < Q_s \leq 850$
MEDIUM	3 $200 < Q_s \leq 300$	$850 < Q_s \leq 1275$
	4 $300 < Q_s \leq 400$	$1275 < Q_s \leq 1700$
	5 $400 < Q_s \leq 800$	$1700 < Q_s \leq 3400$
HIGH	6 $800 < Q_s \leq 1600$	$3400 < Q_s \leq 6800$
	7 $1600 < Q_s \leq 3200$	$6800 < Q_s \leq 13600$
	8 $3200 < Q_s$	$13600 < Q_s$

Table 1.3 of RSCIEI

$$Q_s = 165.94 \text{ MJ/m}^2$$

$$Q_s < 425 \text{ MJ/m}^2$$

The inherent risk level is LOW 1

Construction requirements of industrial establishments for your set, location and level of inherent risk

Has been proven to comply with the numerous building requirements define in the RSCIEI for its intrinsic configuration and location, retail should be at its corresponding PCI.

Has been found that the surfaces of each sector are within the maximum marking the RSCIEI according to the table Table 1.2 of RSCIEI: Maximum permissible area built each sector of fire

Fume evacuation:

According to point 7.1 "They must have smoke evacuation system," the RSCIEI not require any type of pump or fan due to inherent risk level (low), which at this point according to the RSCIEI is free from encumbrances installing fire to the design of the electrical installation

This does not mean that other norms also apply if required ventilation and so put fans.

See point "Ventilation. (if it is necessary, system justification)" of document "Report"

Requirements of fire protection systems of industrial establishments.

As explained earlier in this document, FIRE INSTALLATION, now have be collect all the fire protection installations required by RSCIEI based on the value of intrinsic risk, and local type and area.:

According to RSCIEI for a industry with this dates:

- Level of inherent risk: LOW 1
- Type of establishment: C
- Built area: 2346m²

Requires the following installations:

- Emergency lighting
- 9 extinguishers effectively 21.A

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IV- Especification terms

"ELECTRICAL INSTALLATION IN A CONCRETE BLOCK FACTORY"

FPG presented to obtain the title of graduate in
mechanical engineering
by **Juan Luis Vera Ambel**

Barcelona, Juny 13, 2012

Director: Jose Luis Rodriguez Espantoso
Department of EG
Politecnical University of Catalonia (UPC)

SPECIFICATION TERMS

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Technical conditions

Legislation and Norms

State norms.

- Royal Decree 486/1997 of 14 April by laying down minimum safety and health in the workplace.
- Royal Decree 842/2002 of 2 August, which approves Electrical low-voltage (REBT)
- Complementary Technical Instructions ITC BT 02, 04, 05, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 29, 30, 36, 43, 44, 45, 47 and 48. (*)

Regional norms.

- Decree 363/2004 of 24 August, which regulates the procedure Administrative for application of REBT
- Royal Decree 1627/1997 of 24 October, laying down minimum safety and health in construction.
- Resolution ECF / 4548/2006 of 29 December, approving in Fecsa-Endesa companies the specific technical standards relating to the network installations link
- Royal Decree 208/2005 of 25 February, on electrical and electronic equipment and waste management
- Royal Decree 838/2002 of 2 August, establishing energy efficiency requirements for ballasts for fluorescent lamps
- Decree 363/2004 of 24 August, in Article 6 "checks, inspections and controls"

UNE norms.

- UNE 157001/2002 General criteria for the elaboration of projects
- UNE 12464 about lighting
- UNE 12464.1: European standard for indoor lighting
- UNE mandatory

Others

- Directive 2002/95/EC: Restrictions on the use of certain hazardous substances in electrical and electronic

In case of doubt or ambiguity about the interpretation to go to the facultative direction.

Minimum quantities of materials

- The electrical panel will have enough free space, to enable expand in the future installation if desired. The space is 10% in each panel that is a module for every 10 installed.
- All materials comply with EU directives that apply to them mandatory (construction products, electromagnetic compatibility) and all marked with "CE" which certifies this.
- All bases single phase will be. 2 P + T. 16 A. and the three-phases will be 3 P + T. 16 A

Execution Rules of the Installations.

Here are the rules for the implementation or how to execute some parts of the installation.

- The conductors inside panel will be of type flame retardant and low fume emission, using cuttings when the section is greater than 6mm^2 for its connection.
- The electrical conductors are exposed to mechanical stress in the works. then, we must focus our attention on their conservation status.
In case of damage should not be repaired with electrical tape, because the product degrades with time and weather conditions, no ensuring therefore tightness.
- For wiring the switching panels will be considered as a general rule, the entries shall be in the top terminals of the switchgear and the bottom terminals outputs
- The cable tray shall be conducted in accordance with the manufacturer recommendations, as to the number of supports, connections, etc .
- All panels and trays shall be of Class 2.
- The maximum current (Inc) of the differential of each panel must be equal or superior to the breaking capacity of protective devices lodged in the panels
- offices, the trays of ground must be raised 30cm to prevent possible electrical risk during flooding
- if you make future extensions in which the installations cross sections of fire , should be done with additional materials to ensure the sectoring after that.
Any electrically conductive things capable of be subject to voluntary or involuntary tension must be connected to ground, as representative as indicated below.
 - The envelopes of the sets of metal cabinets, transformers, motors and machines.
 - The metal doors.
 - The metal fences.
 - The work stands that have metal wiring
 - columns, brackets, frames,
 - The metallic pipes and ducts
 - All electrical machine that works at voltages above 24 V

Checks and regulatory testing.

According to Decree 363/2004 of 24 August, in Article 6 "checks, inspections and controls"

After completing the work prior to the operation of the installation is to be verified by the installation company following the methodology that includes UNE 20460-6-61.

This procedure as follows:

Visual

- Protection against contact.
- Barriers firewall (Distance of combustible parts).
- Use of cables for the maximum admissible intensities and admissible voltage drop.
- Existence and calibration of protective devices.
- Control devices and disconnecting right.
- Protective measures to external influences.
- Identification of conductors.
- Existing diagrams and local information.
- Identification of protection and circuits.
- Check the connections.

Trials

- Continuity of protective conductors.
- Must be made with right equipment.
- Insulation resistance.

NOMINA VOLTAGE	TEST VOLTAGE	INSULATION RESISTANCE
MBTS MBTP	250	³ 0.25
EQUAL O INFERIOR A 500V	500	³ 0.5
SUPERIOR A 500V	1000	³ 1.0

- Electrical separation
- Testing of polarity.
- Dielectric test.
- Functional tests.

Checking of correct operation of the installation, motors, mechanisms, etc..

Should also be make the following check is not contained in that UNE.

- The maximum resistance of the ground shall be less than 37 ohms, which should be ensured through appropriate measures by a qualified technician. This value is defined in the ITC-BT-18.

Documentation necessary to legalize the installation

This is:

- This document, project of the installation by a qualified technician.
- Printed ELEC model 1
- Certificate of final electrical installation (Model 4)
- Electrical Installation Certificate
- Maintenance contract
- Certification of qualifications positive initial inspection
- Copy existing facility registration.

Installation Guarantees

The guarantee period is different depending on the case:

Materials: 2 years from the provisional acceptance of work.

Labor: During the first year the installer covers any travel and repair has to be done the installation executed. From first to second year covers labor only for repairs but no movement.

Legal requirements

The property has the obligation to keep the installation in the best possible conditions, quoted verbatim in his in Article 20 of Royal Decree 842/2002 of 2 August, which approves the Regulation for Low Voltage Electrical. "The owners of the installation must keep in good state its installations, using it according to its characteristics and not taking action to modify the same. If modifications are necessary, they should be made by an authorized undertaking ". Also the property in conformity with Article 9 "Maintenance Agreement" of Decree 363/2004 of 24 August.

Should contract a installation company with maintenance of the appropriate category and duly registered. Also need to have a maintenance stating at least the registry and the results of reviews and inspections.

For this case the company should be hired to perform such maintenance must have the basic category (IBTB) under Item 3 "CLASSIFICATION OF AUTHORIZED INSTALLERS IN LOW VOLTAGE" of REBT.

The owner may not make changes to the system without the intervention of an authorized installer and / or technician.

The facultative direction is required to implement the document provisional reception of work in order to define the date from which begins the period of guarantee.

Economic conditions.

Measurement and payment of work executed

Certification of work or economic periodic compensation to be received by the installer according to the periods established is effected as follows:

The property at the beginning of the work pact with installer the number of days each month where payments are made on the progress made during the previous month by the installer in the conception of the work.

The installer will pass an account of work done during that month and the facultative direction must compare the quantity of work done by the installer with which should have done during that month on the plan of work. The installer every month should receive an equal quantity of money, and is proportionally linked to the fraction of work that was done this month with respect total money agreed upon for such execution, retaining 5% of the money estimated to cover possible incidents by the installer.

For example, if the plan of work stipulates that the work will take a total of 24 months and this has a cost of 240,000 €, if the facultative direction approves the work done by the installer last month as 1/24 of the total, then this will receive 1/24 of the total quantity of 240,000 € being these 10,000 € less a 5% retention leaving a final quantity of 9500 €. Retention is like a guarantee for the property can solve any damage or malfunction of the installation by the installer installer did not want to responsible of that.

So if the property wants to benefit from this should make use of the installation and consequently start business in this period and as soon as possible to complete the work and be delivered by the installer.

Responsibility of collecting of materials.

Materials for installation in the first instance will be carried to work and stored in a space that the property has previously predetermined. This space must have minimum requirements listed below:

- Safe against possible vandalism or theft
- Free from humidities
- At ambient temperature
- Clean
- Space is not shared with the storage of other materials foreign to the work or any other activity. Exclusive use for this storage.
- With a size sufficient to store all materials in an orderly way, not piling materials that not can be piled and leaving space for a minimum of 2 people can reach any part to remove material.

Once stored economically responsible for responding in case of loss, theft, damage, etc.. of this material lies with the installer.

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V- Measurement state

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MEASUREMENT STATE

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Measurement state

REFERENCE	DESCRIPTION	UNIT	NUMER UNIT
BG319320	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 1.5 mm ² cable with PVC cover	m	240
BG319330	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 2.5 mm ² cable with PVC cover	m	80
BG319350	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 6 mm ² cable with PVC cover	m	400
BG319340	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 4 mm ² cable with PVC cover	m	2895
BG319530	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 2.5 mm ² cable with PVC cover	m	476
BG319570	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 16 mm ² cable with PVC cover	m	30
BG319560	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 10 mm ² cable with PVC cover	m	84
BG319540	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 4 mm ² cable with PVC cover	m	116
BG319360	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 10 mm ² cable with PVC cover	m	8
BG319520	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 1.5 mm ² cable with PVC cover	m	12
BG319550	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 6 mm ² cable with PVC cover	m	4

BG3191A0	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 1 x 50 mm ² cable with PVC cover	m	14
BG3191B0	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 1 x 70 mm ² cable with PVC cover	m	180
BG3124H0	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RZ1-K(AS), tetrapolar, section 3 x 300/150 mm ² cable with PVC cover	m	90
66150	Unex blind tray, gray RAL7035 60x150 U23X	m	90
66152	RAL7035 gray cover 150 U23X	m	90
66168	RAL7035 gray T branch 60x150 U23X	m	4
66155	RAL7035 gray vertical support 150 U23X	u	51
66166	RAL7035 gray blind corner 60x150 U23X	u	2
66165	RAL7035 gray corner cover 150 U23X	u	2
66090	Unex blind tray, gray 60x75 U23X RA No. L7035	m	191
66072	RAL7035 gray cover 75 U23X	m	191
66098	RAL7035 gray 60x75 T branch U23X	u	2
66106	Support steel L gray RAL7035 epoxy 100	u	128
66100	Unex blind tray, gray RAL7035 60x100 U23X	m	65
66102	RAL7035 gray cover 100 U23X	m	65
66118	RAL7035 gray T branch 60x100 U23X	u	3
66106	Support steel L gray RAL7035 epoxy 100	u	45
66116	RAL7035 gray blind corner 60x100 U23X	u	2
BG61CEC8	Mechanism box for centralization of functions in the workplace, 4 columns, up to 8 modular mechanisms for embedding	u	8
BG631A51	plug universal type bipolar displaced grounding (2P + T), 16 A 250 V, with cover, low price, to fit	u	48
BG671111	Framework for universal mechanism of 1 element, low price	u	17

BG6211D1	Switch, universal type, bipolar (2P), 10 AX/250 V, with key, affordable price, to fit	u	5
BG621J91	Crosspoint switch, universal type, unipolar (1P), 10 AX/250 V, with key, affordable price, to fit	u	8
BG621J91	Crosspoint switch, universal type, unipolar (1P), 10 AX/250 V, with key, affordable price, to fit	u	2
BG64D17T	Pushbutton, surface, 10 A 250 V, 1 NO contact, with button and pilot lamp and waterproof case, high price, with degree of protection IP-55,	u	2
BG611030	mechanism box for an item, average price	u	17
BG731223	Circuit simulator presence of universal type, with normal operating mode, random memory and memorized maximum number of connections 124, for resistive charges up to 400 W and 230 V power supply voltage, light sensor 10 lux, price high, to fit in universal box	u	1
BG6P1142	Industrial socket 2P + T mural type, 16 A and 200-250 V nominal voltage according to UNE-EN 60309-1, protection degree IP-44	u	9
BG6P1262	Industrial socket 3P + T type mural of 16 A and 380-415 V nominal voltage according to UNE-EN 60309-1, protection degree IP-44	u	3
BG415D59	Magnetothermic nominal current 10 A, type C curve , bipolar (1P + N), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 2 moduls, 18 mm DIN modules wide, DIN rail mount	u	24
BG415D5B	Magnetothermic nominal current 16A, type C curve , bipolar (1P + N), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 2 moduls, 18 mm DIN modules wide, DIN rail mount	u	9
BG415D5F	Magnetothermic nominal current 32A, type C curve , bipolar (1P + N), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 2 moduls, 18 mm DIN modules wide, DIN rail mount	u	2
BG415DJ9	Magnetothermic nominal current 10A, type C curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	2

BG415DJB	Magnetothermic nominal current 16A, type C curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	2
BG414DJF	Magnetothermic nominal current 32A, type C curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	
BG418LCH	Magnetothermic nominal current 63A, type C curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	6
BG418RDL	Magnetothermic nominal current 63A, type MA curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4,5 moduls, 18 mm DIN modules wide, DIN rail mount	u	0
BG415FJJ	Magnetothermic nominal current 50A, type C curve , tetrapolar (4P), 10000A power cut UNE-EN 60898 and 15 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	2
BG415DJ9	Magnetothermic nominal current 16A, type MA curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4,5 moduls, 18 mm DIN modules wide, DIN rail mount	u	1
BG41HBSP	magnetothermal molded case, 160 A maximum intensity and calibrated to 160 A, with 4 poles and 3 partial protection relays and relay block neutral standard magnetothermal, 36 kA breaking capacity according to UNE-EN 60947 - 2, DIN rail mount	u	1
BG4243JD	Differential switch AC class, tertiary range of 25 A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount	u	7
BG42429H	Differential switch AC class, tertiary range of 40 A nominal current, bipolar (2P), 0.03 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 2 modules of 18 mm	u	1

	wide, DIN rail mount		
BG4243JD	Differential switch AC class, tertiary range of 32 A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount	u	2
BG4243JH	Differential switch AC class, tertiary range of 40 A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount	u	1
BG4243JL	Differential switch AC class, tertiary range of 63A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount	u	2
BG4243JD	Differential switch AC class, tertiary range of 25A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount	u	7
BG1PUA40	Joint protection and measurement type three phase supply TMF10 for more than 15 kW for indirect measurement, power between 139 and 277 kW (200 A and 400 A), voltage of 400 V, consisting of modular set of double insulated boxes polyester reinforced with fiberglass total 630x1260x171 mm tall with based fuse (not including the fuses) without counter equipment, without IGA differential unprotected	u	1
BG41JBSR	magnetothermal molded case, 250 A maximum intensity and calibrated to 250 A, with 4 poles and 3 partial protection relays and relay block neutral standard magnetothermal, 36 kA breaking capacity according to	u	1

	UNE-EN 60947 - 2, for mounting surface		
BG41LHTT	magnetothermal molded case, 400 A peak current 250A calibrated with 4 poles and 3 or 4 relays or 3 relays with neutral partial protection relays and electronic control block for switches up to 630 A, 45 kA of breaking UNE-EN 60947-2, surface mount	u	1
BG46C5C0	Fuse sectioning Box 400 A, at most, three-pole and neutral, for cylindrical fuses 22x58 mm size	u	1
BG1127B0	General protection box reinforced polyester fiberglass with bimetallic terminals 400-A, as Unesa scheme number 8	u	1
BG22H710	Corrugated plastic flexible tube halogen-free, 20 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	200
BG22H810	Corrugated plastic flexible tube halogen-free, 25 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	200
BG22H910	Corrugated plastic flexible tube halogen-free, 32 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	300
BG22HA10	Corrugated plastic flexible tube halogen-free, 40 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	200
BG22HB10	Corrugated plastic flexible tube halogen-free, 50 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	100

BG21RP10	Rigid PVC pipe, 200 mm in nominal diameter, insulated and non-flame retardant, an impact resistance of 15 J compressive strength of 250 N, 2.2 mm thick	m	90
BH619SGB	Emergency Light not permanent watertight, protection grade IP4X, circular diffuser and polycarbonate body with fluorescent lamp 16 W, flow rate of 470 to 500 lumens, 1 h of autonomy, high price	m	60
BH619K6A	Emergency light, not permanent watertight, protection grade IP4X, rectangular body with polycarbonate diffuser, fluorescent lamp of 8 W, flow rate of 140 to 170 lumens, 1 h of autonomy, average price	u	9
BHA21HVO	Industrial luminaire with symmetrical extensive and metal halide lamp of 150 W, anodized aluminum plate with embedded electrical equipment, closed	u	95
BHA21HVO	Surface mounted luminaire for twin tube with anodized aluminum chassis and metal louver for 2 pipes (twin tube) fluorescence T16/G5 of 54 W, (2x54W) with electronic ballast	u	32
BHUA1100	Halogen PAR 20 designation, 64 mm in diameter, with E27, 50 W peak power and 230 V supply voltage, with a color temperature of 2900 K and a degree of color rendering of Ra = 100	u	9

Name	Juan Luis Vera Ambel
Studies	Graduated in mechanical engineering
Number of collegiate	21234
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UNIVERSITAT POLITÈCNICA DE CATALUNYA

VI - Budget

"ELECTRICAL INSTALLATION IN A CONCRETE BLOCK FACTORY"

FPG presented to obtain the title of graduate in
mechanical engineering
by **Juan Luis Vera Ambel**

Barcelona, Juny 13, 2012

Director: Jose Luis Rodriguez Espantoso
Department of EG
Politecnical University of Catalonia (UPC)

BUDGET

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Budget item of material

REFERENCE	DESCRIPTION	UNIT	NUMER UNIT	COST / UNIT	TOTAL COST
BG319320	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 1.5 mm ² cable with PVC cover	m	240	0,89 €	213,60 €
BG319330	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 2.5 mm ² cable with PVC cover	m	80	1,30 €	104,00 €
BG319350	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 6 mm ² cable with PVC cover	m	400	2,70 €	1.080,00 €
BG319340	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 4 mm ² cable with PVC cover	m	2895	1,90 €	5.500,50 €
BG319530	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 2.5 mm ² cable with PVC cover	m	476	1,67 €	794,92 €
BG319570	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 16 mm ² cable with PVC cover	m	30	8,21 €	246,30 €
BG319560	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 10 mm ² cable with PVC cover	m	84	5,34 €	448,56 €
BG319540	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 4 mm ² cable with PVC cover	m	116	2,44 €	283,04 €
BG319360	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 3 x 10 mm ² cable with PVC cover	m	8	4,24 €	33,92 €
BG319520	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 1.5 mm ² cable with PVC cover	m	12	1,11 €	13,32 €

BG319550	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 4 x 6 mm ² cable with PVC cover	m	4	3,50 €	14,00 €
BG3191A0	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 1 x 50 mm ² cable with PVC cover	m	14	6,54 €	91,56 €
BG3191B0	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RV-K, tripolar, section 1 x 70 mm ² cable with PVC cover	m	180	9,58 €	1.724,40 €
BG3124H0	Cable with copper conductor 0.6 / 1 kV nominal voltage, with designation RZ1-K(AS), tetrapolar, section 3 x 300/150 mm ² cable with PVC cover	m	90	54,76 €	4.928,40 €
66150	Unex blind tray, gray RAL7035 60x150 U23X	m	90	11,45 €	1.030,50 €
66152	RAL7035 gray cover 150 U23X	m	90	7,17 €	645,30 €
66168	RAL7035 gray T branch 60x150 U23X	m	4	19,45 €	77,80 €
66155	RAL7035 gray vertical support 150 U23X	u	51	7,30 €	372,30 €
66166	RAL7035 gray blind corner 60x150 U23X	u	2	34,07 €	68,14 €
66165	RAL7035 gray corner cover 150 U23X	u	2	15,34 €	30,68 €
66090	Unex blind tray, gray 60x75 U23X RA No. L7035	m	191	7,85 €	1.499,35 €
66072	RAL7035 gray cover 75 U23X	m	191	3,79 €	723,89 €
66098	RAL7035 gray 60x75 T branch U23X	u	2	17,06 €	34,12 €
66106	Support steel L gray RAL7035 epoxy 100	u	128	5,40 €	691,20 €
66100	Unex blind tray, gray RAL7035 60x100 U23X	m	65	8,99 €	584,35 €
66102	RAL7035 gray cover 100 U23X	m	65	5,13 €	333,45 €
66118	RAL7035 gray T branch 60x100 U23X	u	3	18,87 €	56,61 €
66106	Support steel L gray RAL7035 epoxy 100	u	45	5,40 €	243,00 €
66116	RAL7035 gray blind corner 60x100 U23X	u	2	27,52 €	55,04 €
BG61CEC8	Mechanism box for centralization of functions in the workplace, 4 columns, up to 8 modular mechanisms for embedding	u	8	15,70 €	125,60 €
BG631A51	plug universal type bipolar displaced grounding (2P + T), 16 A 250 V, with cover, low price, to fit	u	48	2,42 €	116,16 €

BG671111	Framework for universal mechanism of 1 element, low price	u	17	1,74 €	29,58 €
BG6211D1	Switch, universal type, bipolar (2P), 10 AX/250 V, with key, affordable price, to fit	u	5	4,82 €	24,10 €
BG621J91	Crosspoint switch, universal type, unipolar (1P), 10 AX/250 V, with key, affordable price, to fit	u	8	5,09 €	40,72 €
BG621J91	Crosspoint switch, universal type, unipolar (1P), 10 AX/250 V, with key, affordable price, to fit	u	2	5,09 €	10,18 €
BG64D17T	Pushbutton, surface, 10 A 250 V, 1 NO contact, with button and pilot lamp and waterproof case, high price, with degree of protection IP-55,	u	2	6,02 €	12,04 €
BG611030	mechanism box for an item, average price	u	17	0,68 €	11,56 €
BG731223	Circuit simulator presence of universal type, with normal operating mode, random memory and memorized maximum number of connections 124, for resistive charges up to 400 W and 230 V power supply voltage, light sensor 10 lux, price high, to fit in universal box	u	1	39,75 €	39,75 €
BG6P1142	Industrial socket 2P + T mural type, 16 A and 200-250 V nominal voltage according to UNE-EN 60309-1, protection degree IP-44	u	9	4,91 €	44,19 €
BG6P1262	Industrial socket 3P + T type mural of 16 A and 380-415 V nominal voltage according to UNE-EN 60309-1, protection degree IP-44	u	3	5,02 €	15,06 €
BG415D59	Magnetothermic nominal current 10 A, type C curve , bipolar (1P + N), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 2 moduls, 18 mm DIN modules wide, DIN rail mount	u	24	18,69 €	448,56 €
BG415D5B	Magnetothermic nominal current 16A, type C curve , bipolar (1P + N), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 2 moduls, 18 mm DIN modules wide, DIN rail mount	u	9	19,03 €	171,27 €

BG415D5F	Magnetothermic nominal current 32A, type C curve , bipolar (1P + N), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 2 moduls, 18 mm DIN modules wide, DIN rail mount	u	2	21,18 €	42,36 €
BG415DJ9	Magnetothermic nominal current 10A, type C curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	2	44,18 €	88,36 €
BG415DJB	Magnetothermic nominal current 16A, type C curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	2	44,97 €	89,94 €
BG414DJF	Magnetothermic nominal current 32A, type C curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	1	56,62 €	56,62 €
BG418LCH	Magnetothermic nominal current 63A, type C curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	6	111,13 €	666,78 €
BG418RDL	Magnetothermic nominal current 63A, type MA curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4,5 moduls, 18 mm DIN modules wide, DIN rail mount	u	1	129,54 €	129,54 €
BG415FJJ	Magnetothermic nominal current 50A, type C curve , tetrapolar (4P), 10000A power cut UNE-EN 60898 and 15 kA breaking capacity according to UNE-EN 60947-2, 4 moduls, 18 mm DIN modules wide, DIN rail mount	u	2	98,55 €	197,10 €
BG415DJ9	Magnetothermic nominal current 16A, type MA curve , tetrapolar (3P), 6000 A power cut UNE-EN 60898 and 10 kA breaking capacity according to UNE-EN 60947-2, 4,5 moduls, 18 mm DIN modules wide, DIN rail mount	u	1	62,13 €	62,13 €

BG41HBSP	magnetothermal molded case, 160 A maximum intensity and calibrated to 160 A, with 4 poles and 3 partial protection relays and relay block neutral standard magnetothermal, 36 kA breaking capacity according to UNE-EN 60947 - 2, DIN rail mount	u	1	569,37 €	569,37 €
BG4243JD	Differential switch AC class, tertiary range of 25 A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount	u	7	99,13 €	693,91 €
BG42429H	Differential switch AC class, tertiary range of 40 A nominal current, bipolar (2P), 0.03 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 2 modules of 18 mm wide, DIN rail mount	u	1	64,25 €	64,25 €
BG4243JD	Differential switch AC class, tertiary range of 32 A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount	u	2	99,13 €	198,26 €
BG4243JH	Differential switch AC class, tertiary range of 40 A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount	u	1	102,19 €	102,19 €
BG4243JL	Differential switch AC class, tertiary range of 63A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the	u	2	173,24 €	346,48 €

	standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount				
BG4243JD	Differential switch AC class, tertiary range of 25A nominal current, tetrapolar (4P), 0.3 A sensitivity, instantaneous fixed off with test button and mechanical indicator built in default, built to specifications of the standard UNE-EN 61008-1, DIN 4 modules of 18 mm wide, DIN rail mount	u	7	99,13 €	693,91 €
BG1PUA40	Joint protection and measurement type three phase supply TMF10 for more than 15 kW for indirect measurement, power between 139 and 277 kW (200 A and 400 A), voltage of 400 V, consisting of modular set of double insulated boxes polyester reinforced with fiberglass total 630x1260x171 mm tall with based fuse (not including the fuses) without counter equipment, without IGA differential unprotected	u	1	582,00 €	582,00 €
BG41JBSR	magnetothermal molded case, 250 A maximum intensity and calibrated to 250 A, with 4 poles and 3 partial protection relays and relay block neutral standard magnetothermal, 36 kA breaking capacity according to UNE-EN 60947 - 2, for mounting surface	u	1	923,14 €	923,14 €
BG41LHTT	magnetothermal molded case, 400 A peak current 250A calibrated with 4 poles and 3 or 4 relays or 3 relays with neutral partial protection relays and electronic control block for switches up to 630 A, 45 kA of breaking UNE-EN 60947-2, surface mount	u	1	1.339,83 €	1.339,83 €
BG46C5C0	Fuse sectioning Box 400 A, at most, three-pole and neutral, for cylindrical fuses 22x58 mm size	u	1	123,00 €	123,00 €
BG1127B0	General protection box reinforced polyester fiberglass with bimetallic terminals 400-A, as Unesa scheme number 8	u	1	267,42 €	267,42 €

BG22H710	Corrugated plastic flexible tube halogen-free, 20 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	200	0,68 €	136,00 €
BG22H810	Corrugated plastic flexible tube halogen-free, 25 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	200	0,90 €	180,00 €
BG22H910	Corrugated plastic flexible tube halogen-free, 32 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	300	1,35 €	405,00 €
BG22HA10	Corrugated plastic flexible tube halogen-free, 40 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	200	1,80 €	360,00 €
BG22HB10	Corrugated plastic flexible tube halogen-free, 50 mm nominal diameter, insulation and flame retardant, low smoke emission and no emission of toxic gases or corrosive, impact resistance of 2 J, compressive strength of 320 N and a dielectric strength of 2000 V	m	100	2,85 €	285,00 €
BG21RP10	Rigid PVC pipe, 200 mm in nominal diameter, insulated and non-flame retardant, an impact resistance of 15 J compressive strength of 250 N, 2.2 mm thick	m	90	5,70 €	513,00 €

BH619SGB	Emergency Lightnot permanentwatertight, protection grade IP4X, circular diffuser and polycarbonate body with fluorescent lamp 16 W, flow rate of 470 to 500 lumens, 1 h of autonomy, high price	m	60	116,14 €	6.968,40 €
BH619K6A	Emergency light, not permanent watertight, protection grade IP4X, rectangular body with polycarbonate diffuser, fluorescent lamp of 8 W, flow rate of 140 to 170 lumens, 1 h of autonomy, average price	u	9	50,00 €	450,00 €
BHA21HVO	Industrial luminaire with symmetrical extensive and metal halide lamp of 150 W, anodized aluminum plate with embedded electrical equipment, closed	u	95	116,65 €	11.081,75 €
BHA21HVO	Surface mounted luminaire for twin tube with anodized aluminum chassis and metal louver for 2 pipes (twin tube) fluorescence T16/G5 of 54 W, (2x54W) with electronic ballast	u	32	113,90 €	3.644,80 €
BHUA1100	Halogen PAR 20 designation, 64 mm in diameter, with E27, 50 W peak power and 230 V supply voltage, with a color temperature of 2900 K and a degree of color rendering of Ra = 100	u	9	13,32 €	119,88 €
MATERIAL TOTAL COST					54.205,28 €

Budget item of labor

REFERENCE	DESCRIPTION	UNIT	NUMER UNIT	COST / UNIT	TOTAL COST
A012H000	Official the 1st electrician	h	2x800	19,05	30480
A013H000	electrician helper	h	1x800	17,14	13712
-	Responsible in work	h	1 x800	22,07	17656
LABOR TOTAL COST					61.848,00 €

Budget item of engineering

REFERENCE	DESCRIPTION	UNIT	NUMER UNIT	COST / UNIT	TOTAL COST
-	Project engineer	h	200	30,4	6080
-	Facultative direction	h	50	30,4	1520
-	Legalization	h	2	30,4	60,8
ENGINEERING AND PROJECT TOTAL COST					7.660,80 €

Total Budget

MATERIAL TOTAL COST	54.205,28 €
LABOR TOTAL COST	61.848,00 €
ENGINEERING AND PROJECT TOTAL COST	7.660,80 €
TOTAL BUDGET	123.714,08 €

Twenty-three thousand seven hundred and fourteen hundred Euros and 8 cents.

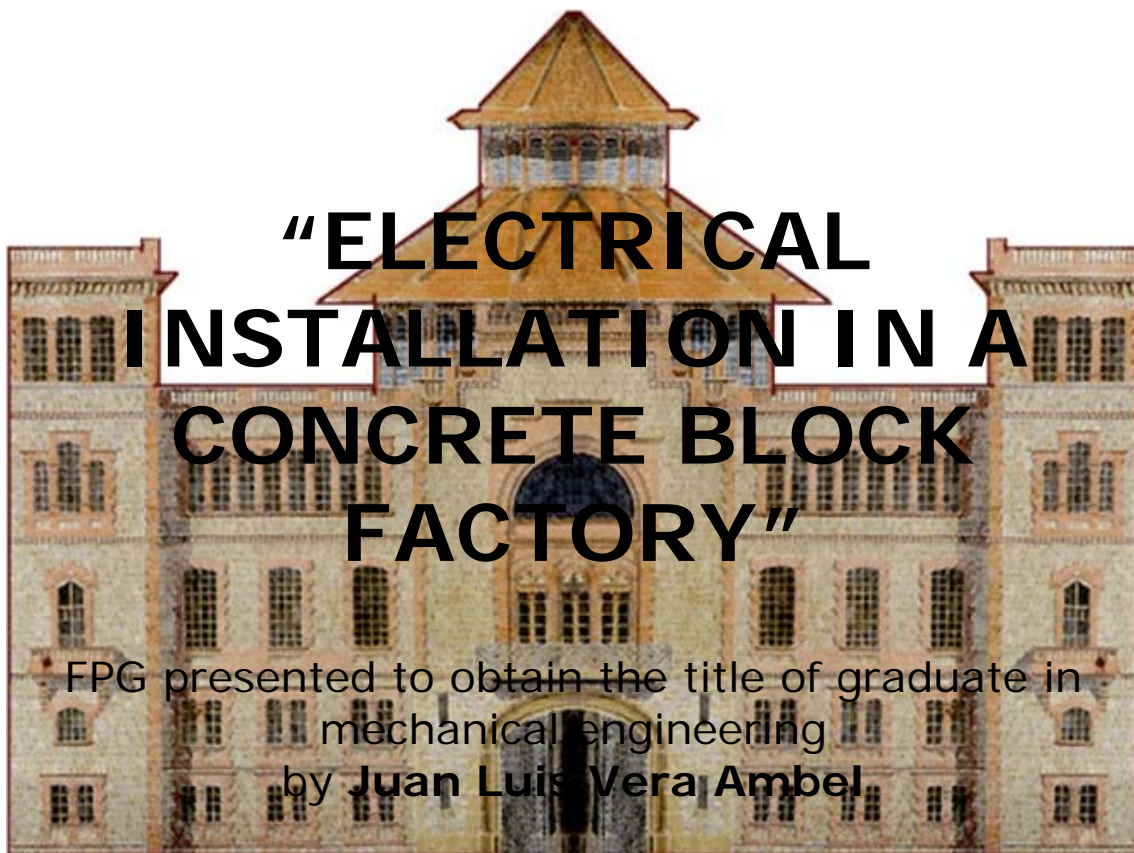
Name	Juan Luis Vera Ambel
Studies	Graduated in mechanical engineering
Number of collegiate	21234
Sign manual:	



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UNIVERSITAT POLITÈCNICA DE CATALUNYA

VII - Studies with its own entity



Barcelona, Juny 13, 2012

Director: Jose Luis Rodriguez Espantoso
Department of EG
Politechnical University of Catalonia (UPC)

ENTITY OWN STUDIES

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Health and safety study

According to Article 4 of Royal Decree 1627/1997 of 24 October, laying down minimum safety and health in construction. BOE No 256 25.10.1997:

The promoter is obliged in the phase of this project, develop a safety and health study because according to Article 4 of Royal Decree, this project complies at least one of the following points:

- a) That the budget execution by contract included in the project equals or exceeds 75 million pesetas or currently € 450,759.078
- b) The estimated duration exceeds 30 days, being used at one time more than 20 workers simultaneously.
- c) The volume of estimated labor, defined as the sum of the working days of total workers in the work, exceeds 500.
- d) works of tunnels, galleries, underground pipelines and dams

According to Article 5 of Royal Decree:

The health and safety study be developed by the competent technician designated by the promoter.

This will be developed by the coordinator on safety and health during the development of project work and will be the responsibility of the individual that appears in the document.

The technician which is assigned the task of the health and safety study is as follows.

Name	
Studies	
professional association	
Number of collegiate	
Phone number	

Note: If the table contains no information about it is because the end date of this document has not yet been assigned the technician, but this table can be filled in by hand on this same document once the technician has been determinate

Name	Juan Luis Vera Ambel
Studies	Graduated in mechanical engineering
Number of collegiate	21234
Sign manual:	



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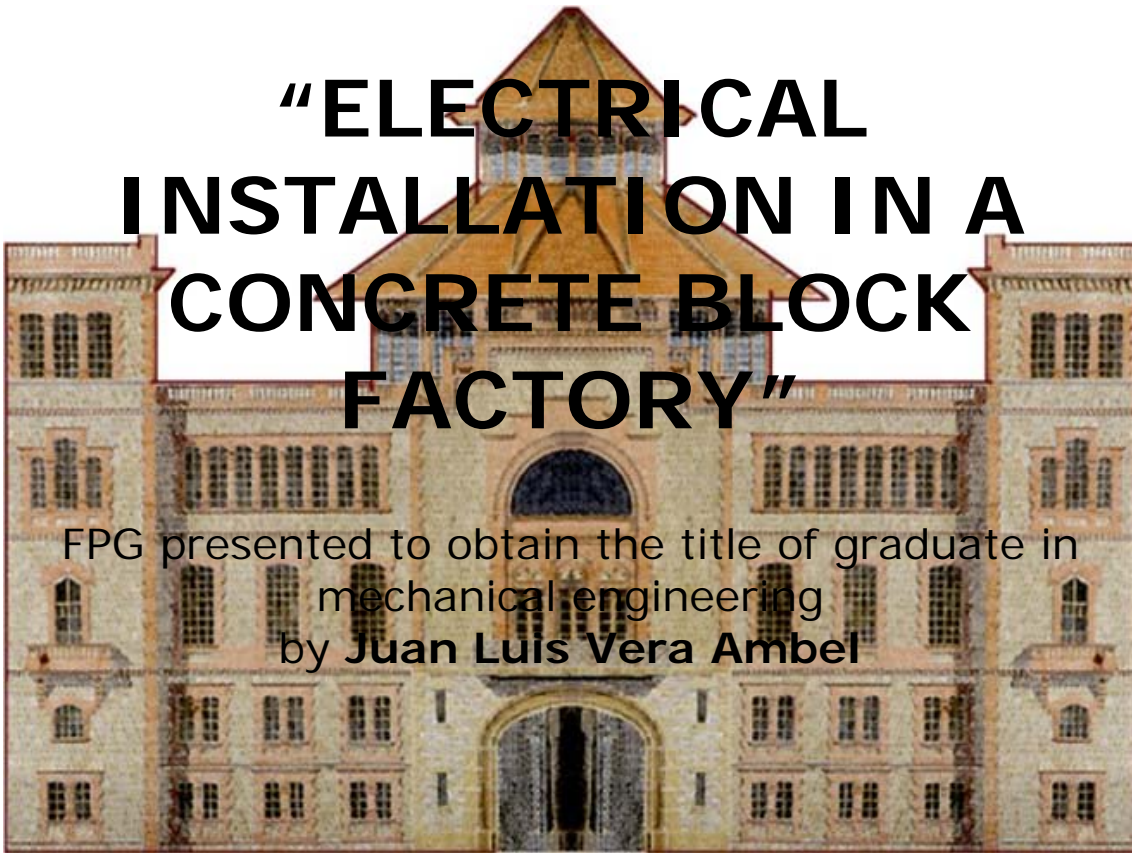
Volum II

Plans- Other documents related for the dossier

Final project grade

"ELECTRICAL INSTALLATION IN A CONCRETE BLOCK FACTORY"

FPG presented to obtain the title of graduate in
mechanical engineering
by **Juan Luis Vera Ambel**



Barcelona, Juny 13, 2012

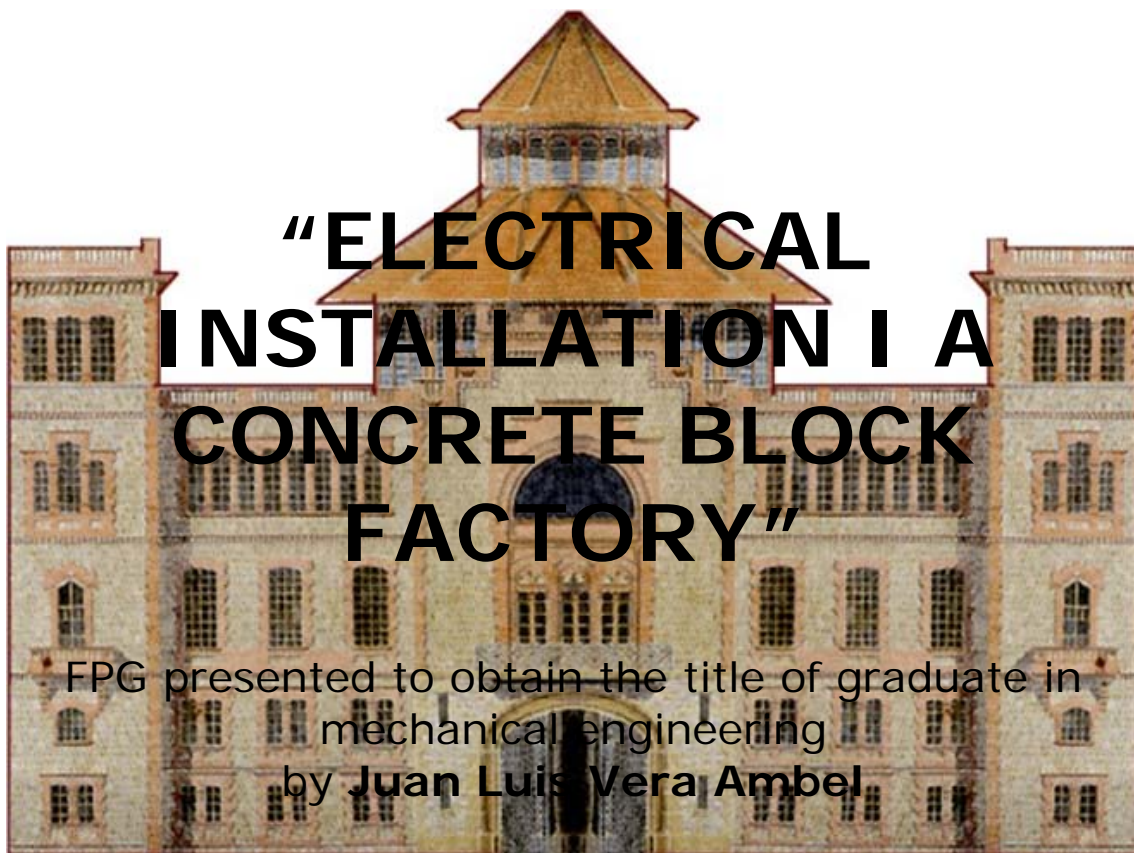
Director: Jose Luis Rodriguez Espantoso
Department of EG
Politecnica University of Catalonia (UPC)



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VIII- Other documents related to the dossier



Barcelona, Juny 13, 2012

Director: Jose Luis Rodriguez Espantoso
Department of EG
Politechnical University of Catalonia (UPC)

Segell i data d'entrada

BAIXA TENSIO

TITULAR

Nom MASA.S.A
DNI o NIF 44017694-E Tel. 93-654-34-21
Adreça Carrer del Plom
Població Tarragona
CP 43006 Província Barcelona

La persona que subscriu MANIFESTA que són certes les dades de la instal·lació elèctrica descrita, la qual desitja posar en funcionament previs els tràmits corresponents.

(Signatura de la persona titular)

REPRESENTANT I ADREÇA PER A NOTIFICACIONS

Nom David Zaragoza Garcia
Adreça Avinguda Roma,47, 1º 2ª
Població Tarragona
CP 43008 Província Barcelona
Telèfon 93-654-66-27

EMPLAÇAMENT DE LA INSTAL·LACIÓ

Adreça Carrer del Plom
Població Tarragona
CP 43006 Província Barcelona

CARACTERÍSTIQUES DE LA INSTAL·LACIÓ

ÚS A QUÈ ES DESTINA	Industria	SUPERFÍCIE m ²	2645
---------------------	-----------	---------------------------	------

AMB PROJECTE	<input checked="" type="checkbox"/>	AMB MEMÒRIA TÈCNICA DE DISSENY	
--------------	-------------------------------------	--------------------------------	--

INSTAL·LACIÓ			
NOVA	X	AMPLIACIÓ	REFORMA

INTERRUPTORS DIFERENCIALS	CIRCUIT	NOMBRE	In	SENSIBILITAT
	Segons projecte		A	mA
			A	mA
			A	mA

TENSIO	230/400 V	SECCIÓ DE LA DERIVACIÓ INDIVIDUAL	2x(3x150+N x150) mm ²
INTENSITAT INTERRUPTOR GENERAL AUTOMÀTIC	400/250 A	RESISTÈNCIA DE TERRA DE PROTECCIÓ PREVISTA	37 Ω

POTÈNCIA/ POTENCIA	MÀXIMA ADMISSIBLE	176 kW
	A INSTAL·LAR	137,4 kW

Empresa distribuïdora d'energia

EMPRESA INSTAL·LADORA

Nom INSTALACIONES SANTANDER.S.L
Núm. de Registre 3080167336
Categoria: Bàsica Especialista
Adreça C/ Teodora Lamadrid.20 tda 1
Població celona Telèfon 93-211-52-43

MANTENIMENT (Conservador inicial)

Nom
Núm. de Registre
Categoria: BÀSICA ESPECIALISTA

Núm. expedient

BT /

Núm. Registre Industrial

REIC

TIPUS DE TRÀMIT

- Nova instal·lació Ampliació
 Modificació o reforma Canvi de nom

PROJECTE

Autor Jua Luis Vera Ambel
Adreça C/ Costa Pacheco, 9 ,1º 2ª
Població Barcelona Tel. 646336621
Col·legi oficial CETIB

CERTIFICAT DE DIRECCIÓ I ACABAMENT D'OBRA

Autor Juan Luis Vera Ambel
Adreça C/ Costa Pacheco, 9 ,1º 2ª
Població Barcelona Tel. 646336621
Col·legi oficial CETIB

REBUT núm.	IMPORT EUROS	
	TAXA	
	TARIFA	

CONTROLS	INSPECTOR	CONFORME
Documentació tècnica		
Instal·lació		

DOCUMENTS PRESENTATS

PER TOT TIPUS DE TRÀMIT

- Impresos model ELEC 1
 Impresos model ELEC 5
 Certificat d'instal·lació elèctrica de baixa tensió
 Fotocòpia DNI o NIF Titular

.....

EN EL CAS D'INSTAL·LACIONS AMB PROJECTE, AFEGIR-HI

- Projecte
 Certificat de direcció i acabament d'obra
 Contracte de manteniment quan s'escaigui
 Certificat d'inspecció inicial quan s'escaigui, amb qualificació favorable

EN EL CAS D'INSTAL·LACIONS AMB MEMÒRIA TÈCNICA DE DISSENY , AFEGIR-HI

- Esquema i memòria models ELEC 2 i ELEC 3
 Croquis de l'emplaçament
 Croquis del traçat de la instal·lació

EN EL CAS D'AMPLIACIÓ O REFORMA, AFEGIR-HI

- Fotocòpia inscripció instal·lació existent

Nom

responsable de l'oficina receptora de ENTITAT D'INSPECCIÓ I CONTROL

CERTIFICA que en la data del Registre d'Entrada de l'encapçalament s'ha rebut la documentació indicada al requadre de DOCUMENTS PRESENTATS corresponent a la instal·lació descrita.

(Segell i signatura de la persona receptora)

CONFORME

ELEC 4. Certificat de direcció i acabament d'obra d'instal·lació elèctrica privada d'alta tensió**1. Dades del tècnic/a titular**

Nom i cognoms		Núm. de col·legiat/ada	
Juan Luis Vera Ambel		21234	
Titulació			
Graduado en ingeniería mecánica			
Adreça			
C/ Costa Pacheco, 9 , 1º 2ª			
Codi postal	Població	Província	Telèfon
08035	Brcelona	Barcelona	646336621

2. Característiques principals de la instal·lació (segons el model ELEC 6)

Tipus

 Estació transformadora Línia Central elèctrica Estació receptora Estació receptora, de mesura i protecció**Emplaçament de la instal·lació**

Adreça

Carrer del plom

Codi postal	Població	Província
43006	Tarragona	Barcelona

Nom i cognoms de la persona titular

David Zaragoza Garcia

Codi postal	Població	Província
43008	Tarragona	Barcelona

Autor/a del projecte específic

Juan Luis Vera Ambel

Nom de l'empresa instal·ladora	Núm. d'inscripció d'AT
	080167336

3. Proves que s'han dut a terme amb un resultat favorable¹

Resistència de terra	Tensió màxima de pas ²	
	Interior	Exterior
37	≤	≤

Tensió màxima de contacte

24

Altres proves

-

4. Modificacions del projecte i justificació

-

Nom i cognoms del director/a tècnic de la instal·lació

Juan Luis Vera Ambel

CERTIFICO:

- Que la instal·lació està acabada i que, d'acord amb els resultats de les mesures i proves que s'han dut a terme, compleix tots els requisits que exigeixen el Reglament sobre condicions tècniques i garanties de seguretat en centrals elèctriques, subestacions i centres de transformació, el Reglament tècnic de línies elèctriques aèries d'alta tensió i altra reglamentació que hi és d'aplicació. La instal·lació s'ha executat d'acord amb el projecte exposat, i al qual s'ajusta, llevat de les modificacions que s'indiquen a l'apartat 4.

- Que durant l'execució de la instal·lació s'han observat els condicionaments que ha/h imposat -

Signatura del tècnic

L'Oficina receptora FA CONSTAR:

Que, en data d'avui, s'ha rebut la documentació completa que s'ha de presentar a l'Administració, d'acord amb el Decret 351/1987, de 23 de novembre de 1987, per la qual cosa la instal·lació descrita pot entrar en servei, sense perjudici de les comprovacions que s'hi puguin fer.

Signatura i segell de l'oficina receptora de la documentació

Lloc i data Barcelona, 13-Juny-2012

Lloc i data Barcelona, 13-Juny-2012

1. Esmenteu els resultats de les proves d'acord amb el reglament aplicats.
2. Els valors mesurats de tensió de pas no poden superar els valors acceptables calculats (MIE-RAT 13).



CERTIFICADO DE INSTALACIÓN ELÉCTRICA DE BAJA TENSIÓN

Expediente Núm:

Nombre de la empresa instaladora de baja tensión

INSTALACIONES SANTANDER.S.L

Número Inscripción 080167336

EIBTB EIBTE

Nombre y Apellidos del instalador autorizado:

JOSE LUIS GARCIA FERNANDEZ

Teléfono 646336645

DNI 44017652-J

NIF B-62580220

DATOS DE LA INSTALACIÓN Nueva Ampliación Modificación o reforma

SITUACIÓN:

Calle o paraje Carrer del Plom

Localidad Tarragona

Uso a que se destina: Industrial

Término Municipal Tarragona

Superficie: 2645 m²

núm. 35

CP 42006

TITULAR MASA.S.A

Domicilio Carrer del Plom

Teléfono 93-654-34-21

NIF: 44017694-E

Localidad: Tarragona

CP 42006

DOCUMENTACIÓN TÉCNICA:

Projecto (Grupo): a b c d e f g h i j k l m n o Memoria técnica de diseño

Autor Juan Luis Vera Ambel

Objeto -

CARACTERÍSTICAS TÉCNICAS DE LA INSTALACIÓN:

Interruptor general automático de corte omnipolar 400/250 A

Potencia máxima admisible 173 kW Potencia instalada 137,4 kW Tensión 230/400 V Sección derivación individual 2x(3x150+Nx150) mm2 Resistencia de tierra de protección 37 Ω Resistencia de aislamiento - Ω

Table with 3 columns: Número, In, Sensibilidad. Rows for Segun proyecto, A, mA.

OBSERVACIONES:

CERTIFICACIÓN de inspección inicial con resultado FAVORABLE (cuando proceda)

Entidad de Inspección y Control que lo ha emitido Fecha de la inspección

Don / ña, con carnet individual identificativo de instalador autorizado número, y DNI, que pertenece a la empresa instaladora con número de inscripción, de acuerdo con las verificaciones realizadas siguiendo la metodología de la norma UNE 20.460-6-61, CERTIFICA que la instalación descrita ha sido realizada de acuerdo con las prescripciones del Reglamento Electrotécnico para baja tensión y sus ITC-BT, aprobado por RD 842/2002 de 2 de agosto, así como con la documentación técnica antes mencionada.

Fecha

Firma y sello del instalador y de la empresa instaladora

ANEXO: Información al usuario para el correcto uso y mantenimiento de la instalación.

Table with 2 columns: EIC contratada por la empresa instaladora, ICICT, S.A., ECA, S.A.

NOTA: Este certificado tiene una validez de 6 meses, a efectos de inscripción de la instalación.

Vertical text on the left side: Ejemplar para el titular de la instalación, Ejemplar per al Departament de Economia y Finanzas, Ejemplar para la empresa distribuidora de energía eléctrica, Ejemplar para la empresa instaladora autorizada (marcar el que corresponda)

INSTRUCCIONES PARA RELLENAR EL CERTIFICADO DE INSTALACIÓN ELÉCTRICA DE BAJA TENSIÓN POR PARTE DE LA EMPRESA INSTALADORA.

1. El apartado Expediente núm.....ha de ser rellenado por el organismo que recepciona la documentación.
2. En el recuadro del apartado de empresa instaladora de baja tensión, además de su número de inscripción en el Registro correspondiente, se ha de indicar con una X la categoría de la empresa: categoría básica (EIBTB) o categoría especialista (EIBTE).
3. La potencia máxima admisible es la máxima que puede soportar el conjunto de la instalación. Coincide con la utilizada en los cálculos y con la prevista en la ITC-BT-10.
4. Cuando se trate de instalaciones de enlace y servicios comunes, en el apartado de "características técnicas de la instalación", se especificarán las que correspondan a los servicios comunes.

En el apartado de observaciones se hará constar, como mínimo, la potencia máxima admisible de las instalaciones de enlace, prevista en la ITC-BT10, la sección de la línea general de alimentación y la intensidad del interruptor general de maniobra.

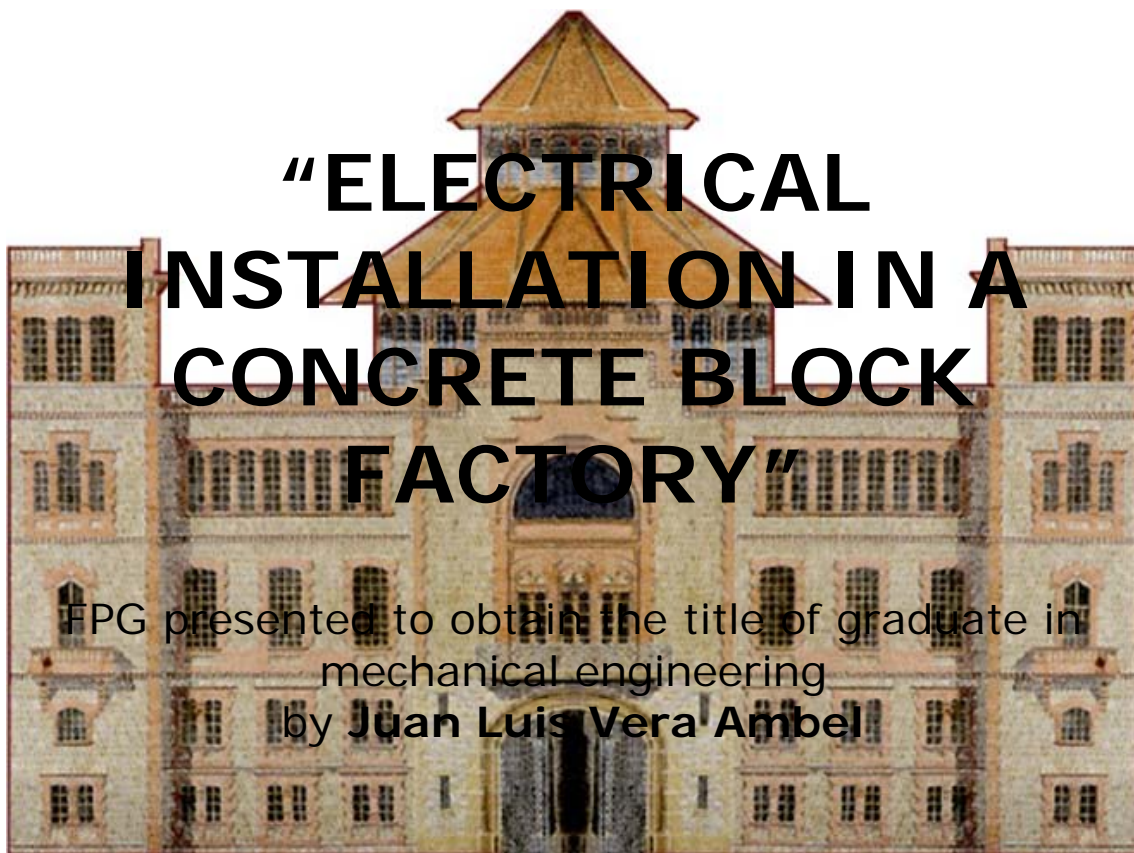
5. Para las instalaciones que son objeto de inspección inicial por parte de una EIC, el certificado de instalación eléctrica de baja tensión que ha de estender la empresa instaladora será emitido una vez se haya obtenido el certificado de inspección inicial con la calificación de resultado favorable.
6. Como anexo al certificado de instalación que se entrega al titular de cualquier instalación eléctrica, la empresa instaladora habrá de confeccionar unas instrucciones para el correcto uso y mantenimiento de la misma. Estas instrucciones, como mínimo, incluirán un esquema unifilar de la instalación con las características técnicas fundamentales de los equipos y materiales eléctricos instalados, así como un croquis de su trazado.



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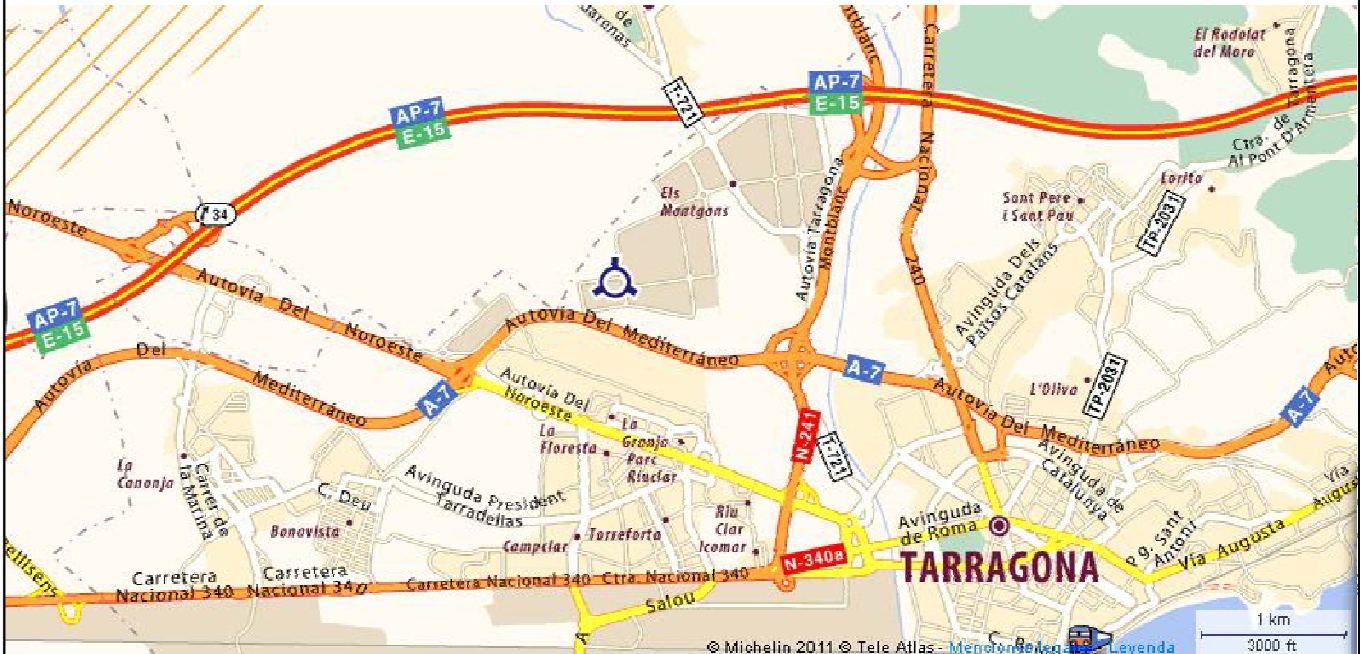
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IX- Planes




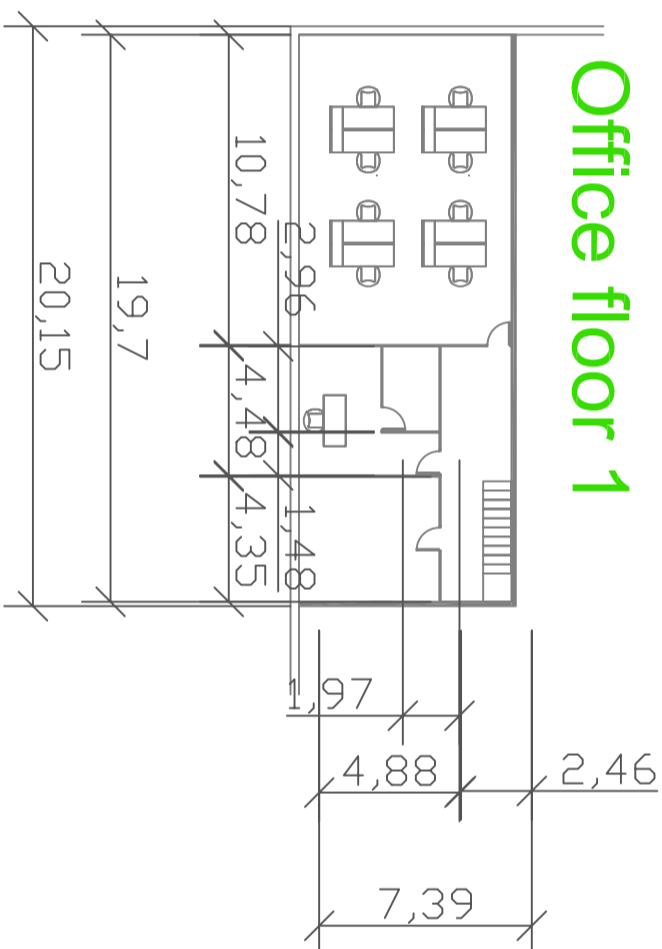
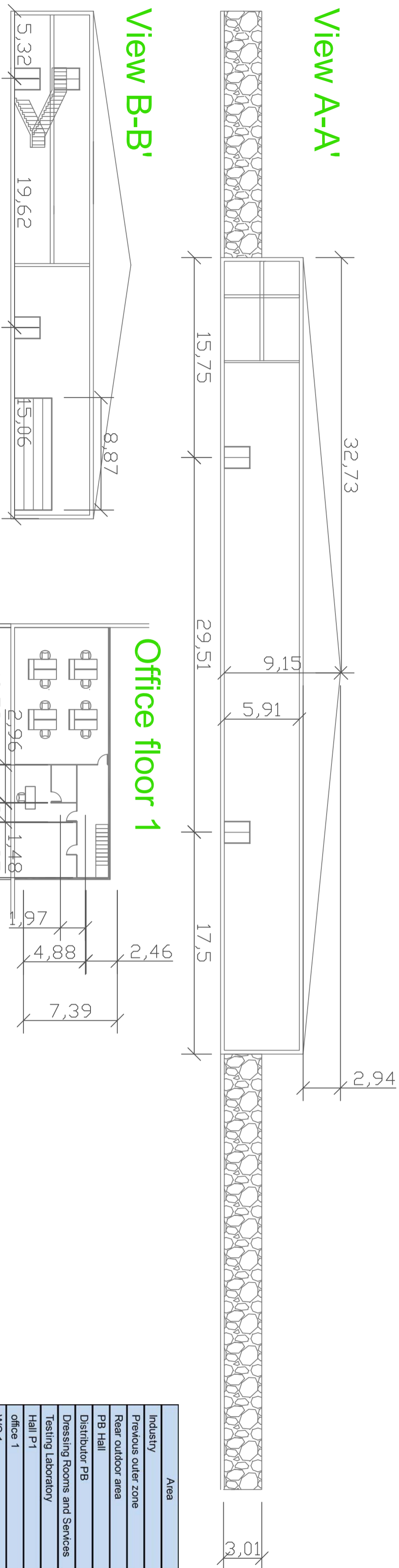
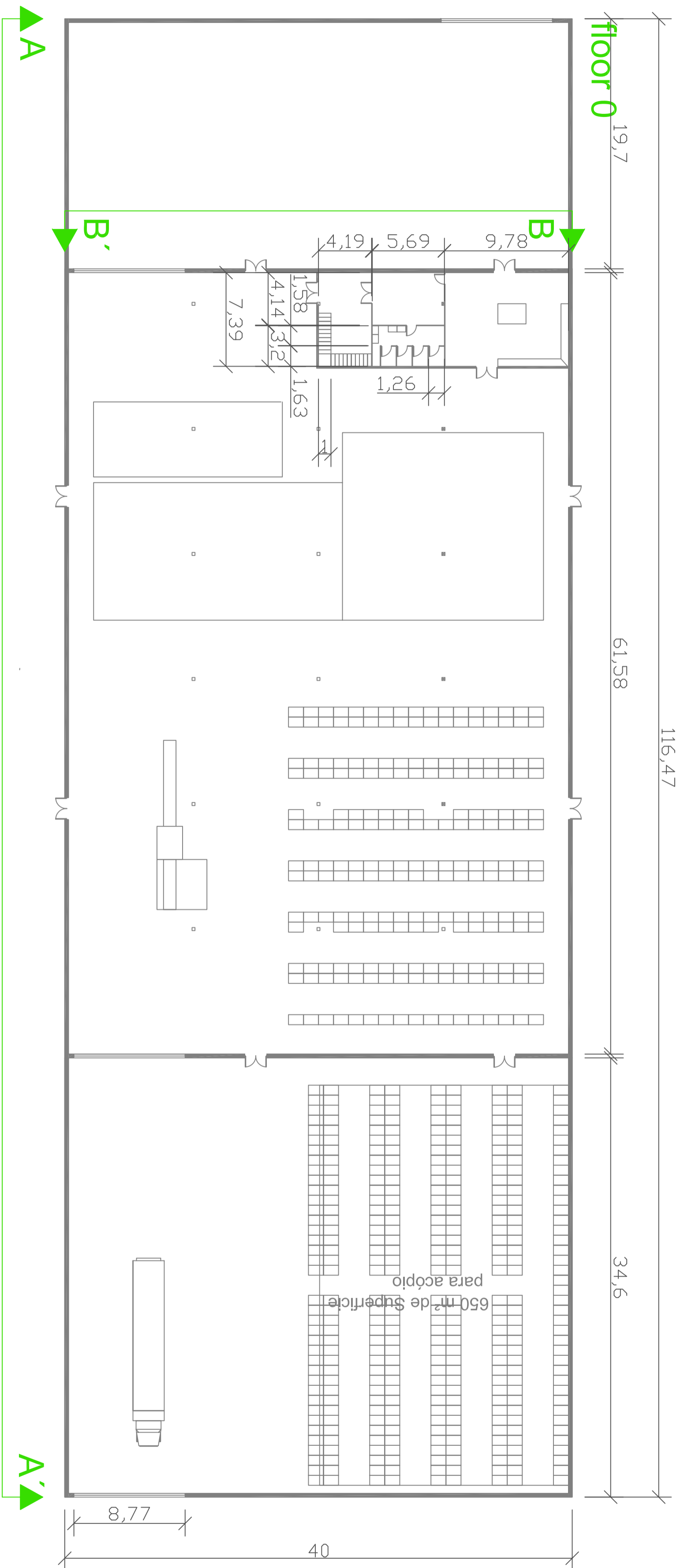
Barcelona, Juny 13, 2012

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Politecnica University of Catalonia (UPC)



Electrical installation in a concrete block factory

	Scale:	1/200000	Drawn by	Date	Tested by	Date
	N. of plane:	1	Juan Luis Vera Ambel	13/06/2012	Jose Luis Rodriguez Espantoso	13/06/2012
	Location Map					

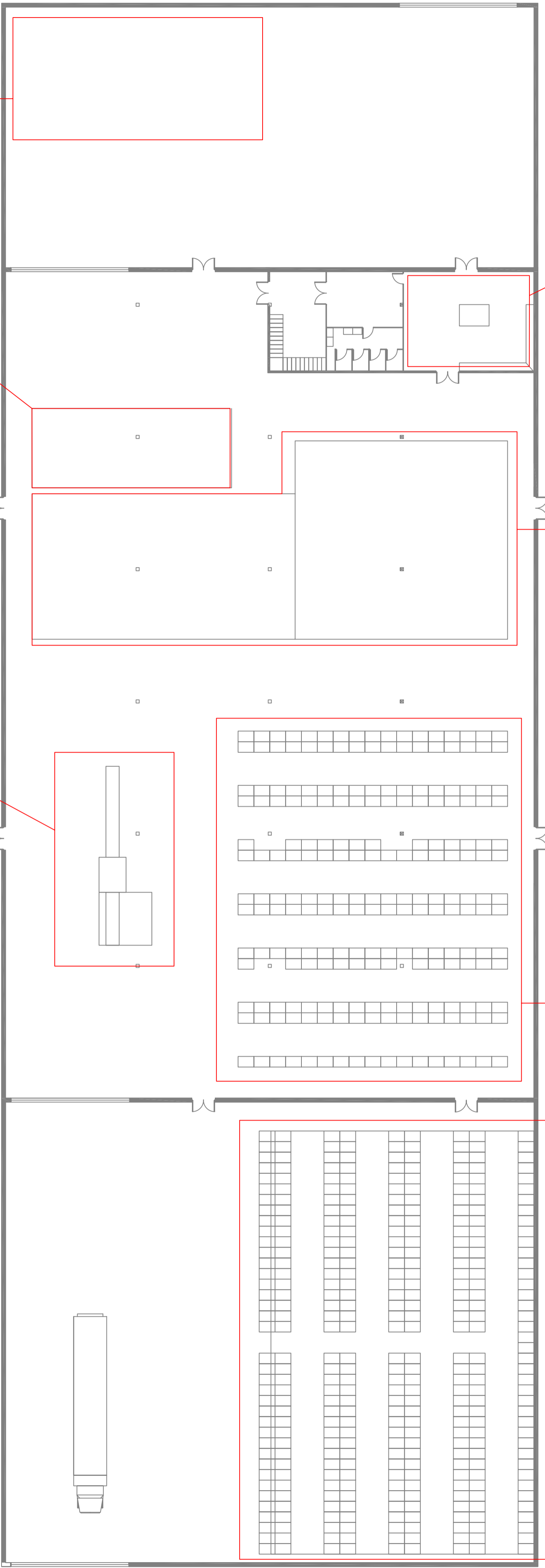


Area	Floor	Surface (m²)
Industry	PB	2346
Previous outer zone	PB	788
Rear outdoor area	PB	1398
PB Hall	PB	31,87
Distributor PB	PB	24,86
Dressing Rooms and Services	PB	18,78
Testing Laboratory	PB	74
Hall P1	P1	22,53
office 1	P2	16,4
WC 1	P3	6
office	P4	82
Meeting Room	P5	21,84

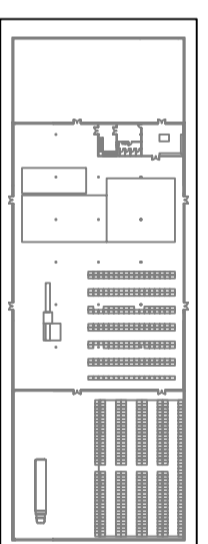
Electrical installation in a concrete block factory

Scale:	1/300	Drawn by	Juan Luis Vera Amabel	Date	13/06/2012	Tested by	Jose Luis Rodriguez Espantoso	Date	13/06/2012
N. of plane:	3	Plan dimensions and surfaces							
Observations:									

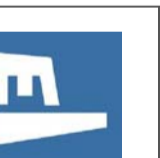




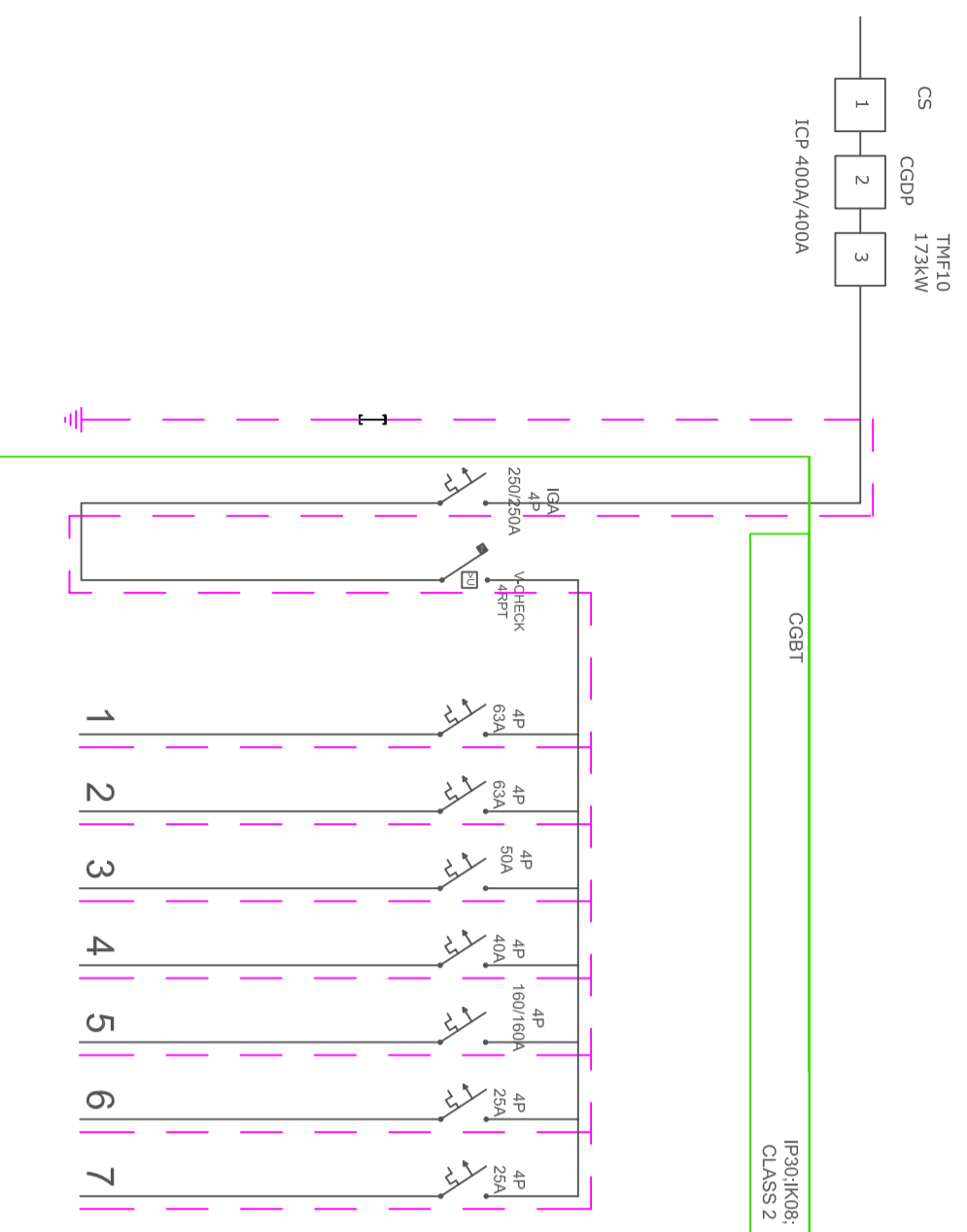
P2-Scale:1/2000



Electrical installation in a concrete block factory

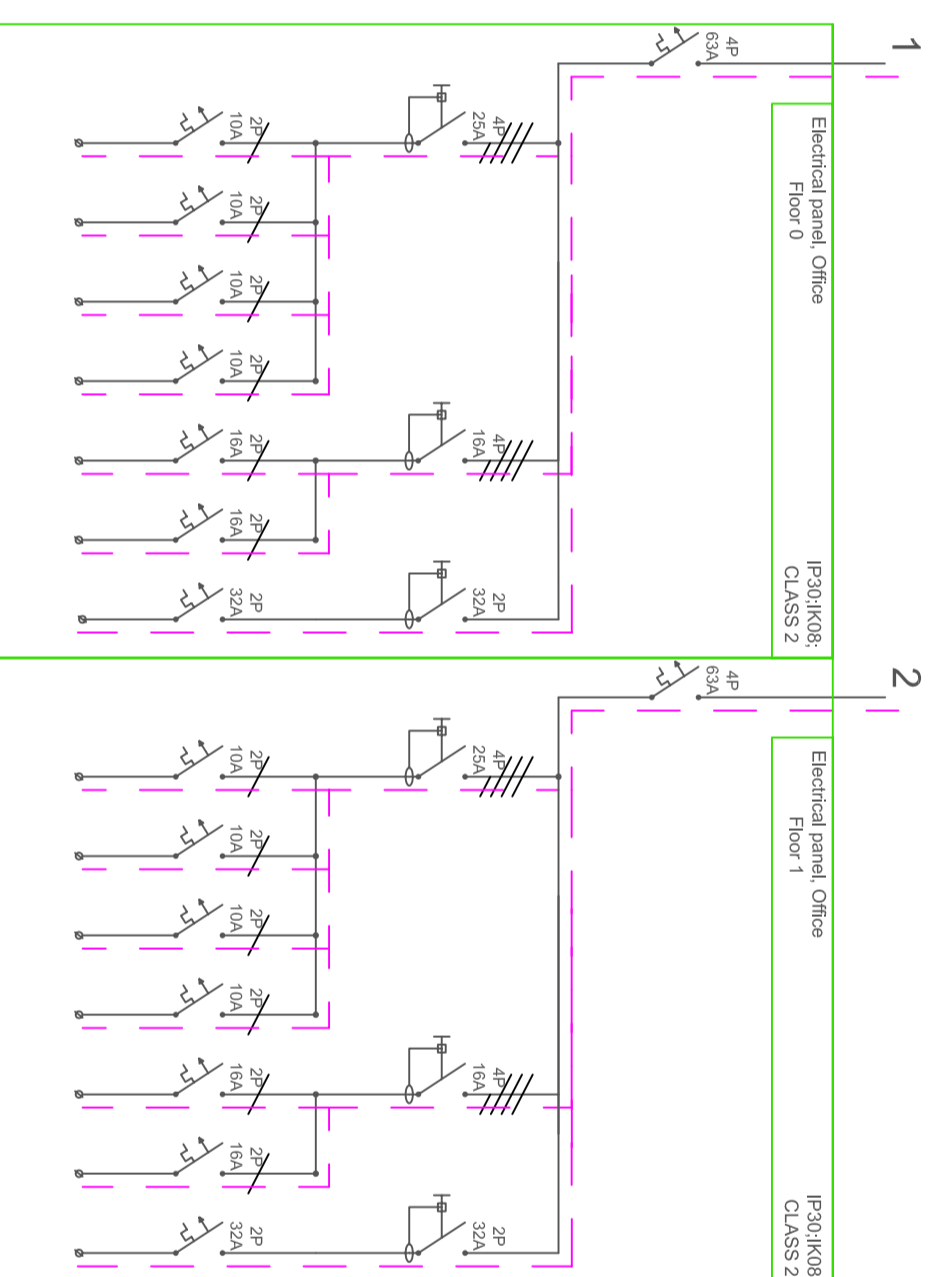


Scale: 1/250		Drawn by		Date		Tested by		Date	
N. of plane: 4		Juan Luis Vera Ambel		13/06/2012		Jose Luis Rodriguez Espantoso		13/06/2012	
Distribution					Observations:				



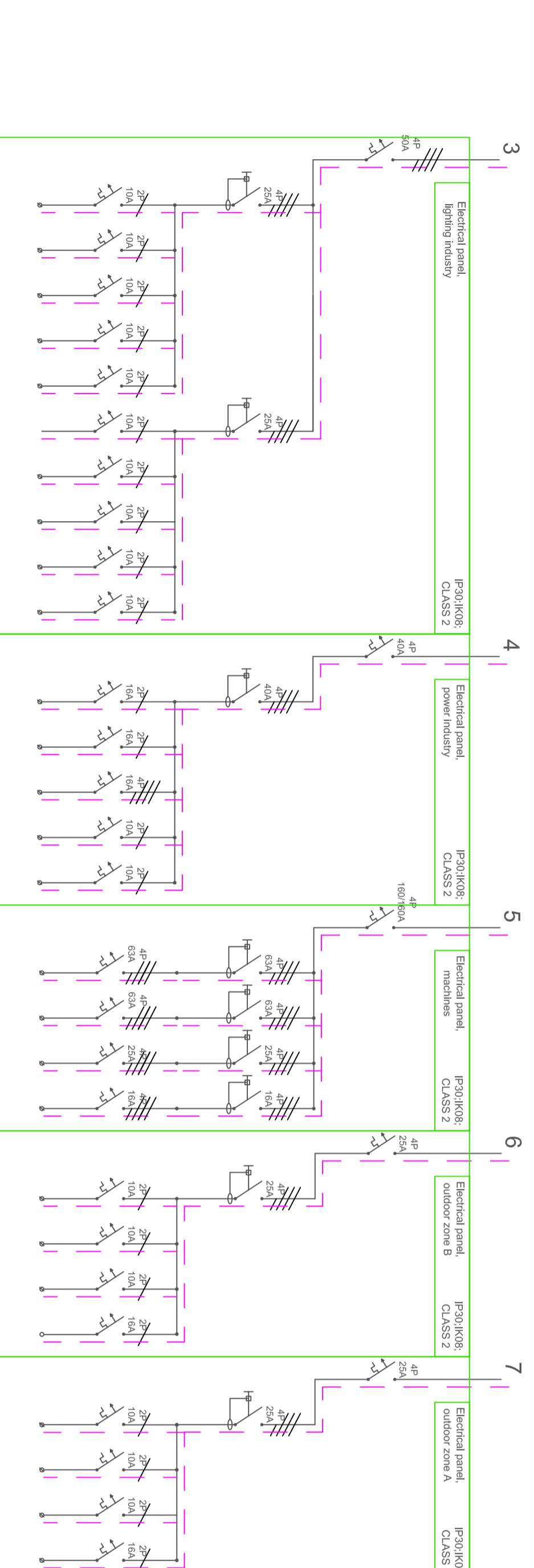
Note: The information, of the general sections can be found in the document Report

Circuit code	Line to the electrical panel, office floor 0	Line to the electrical panel, office floor 1	Line to the Electrical panel, lighting industry	Line to the Electrical panel, power industry	Line to the Electrical panel, machines	Line to the Electrical panel, outdoor zone B	Line to the Electrical panel, outdoor zone A
Phase	3.1	3.2	3.3	3.4	3.5	3.6	3.7
Power (W)	18052	18101	20756	18374	88715	5760	6940
Current (A)	26.20	26.13	29.96	28.52	125.16	8.31	9.87
Cut power (kA)	10	10	10	10	10	4.5	4.5
Breaker curve	C	C	C	C	D	C	C
Differential type							
Length (m)	25	25	3	4	5	6	70
Conductor (mm²)	50	50	10	10	50	4	70
Conductor type	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE
voltage	400	230	400	230	400	400	400



Line power supply office floor 0	3.1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11	1.12	1.13	1.14
emergency lighting offices, floor 0	1	2	1	3	3	3	2	2	3	2	2	3	3	3	3
Line 1, light offices floor 0	18052	177	1341	1341	1341	3680	3680	6750	18101	187	1321	1321	3680	3680	6750
Line 2, light offices floor 0	26.20	0.77	5.83	5.83	5.83	15.65	15.65	29.34	26.13	0.71	5.74	5.74	15.65	15.65	29.34
Line 3, light offices floor 0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Line 1, single-phase power office, floor 0	C	C	C	C	C	C	C	SI	C	C	C	C	C	C	D
Line 2, single-phase power office, floor 0	C	C	C	C	C	C	C	AC	C	C	C	C	C	C	AC
AA Machine floor 0	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC
Line power supply office floor 1	3.2	1	2	2	2	2	2	3	3.2	1.8	1.9	1.10	1.11	1.12	1.13
emergency lighting offices, floor 1	1	2	1	3	3	3	2	2	3	2	2	3	3	3	3
Line 1, light offices floor 1	18052	177	1341	1341	1341	3680	3680	6750	18101	187	1321	1321	3680	3680	6750
Line 2, light offices floor 1	26.20	0.77	5.83	5.83	5.83	15.65	15.65	29.34	26.13	0.71	5.74	5.74	15.65	15.65	29.34
Line 3, light offices floor 1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Line 1, single-phase power office, floor 1	C	C	C	C	C	C	C	SI	C	C	C	C	C	C	D
Line 2, single-phase power office, floor 1	C	C	C	C	C	C	C	SI	C	C	C	C	C	C	AC
AA Machine floor 1	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC
Conductor (mm²)	50	1.5	1.5	1.5	1.5	2.5	2.5	6	50	1.5	1.5	1.5	2.5	2.5	6
Conductor type	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE
voltage	400	230	230	230	230	230	230	400	230	230	230	230	230	230	400

1	CAJA SECCIONADORA
2	CAJA GENERAL DE PROTECCION
3	TMF 10
	IGA/PIA/Magnetothermal
	Overvoltage protector
	Differential switch
	Disconnecter blade
	Conductor
	Grounding conductor
	Envelopment, electrical panel



Circuit	Line power supply light industry panel	emergency lighting industry	Line 1 light industry	Line 2 light industry	Line 3 light industry	Line 4 light industry	Line 5 light industry	Line 6 light industry	Line 7 light industry	Line 8 light industry	Line 9 light industry	Line power supply power industry panel	Line 1, single-phase power for industry	Line 2, single-phase power for industry	Line 1, three-phase power for industry	drive ventilation for industry	extraction ventilation for industry	Line power supply machine panel	MF 500	PRIMA	ESPLITADORA	Conveyer belt	Line power supply zone B panel	Line 1, outdoor lighting B	Line 2, outdoor lighting B	Line 3, outdoor lighting B	Single phase-power outside zone B	Line power supply zone A panel	Line 1, outdoor lighting A	Line 2, outdoor lighting A	Line 3, outdoor lighting A	Single phase-power outside zone A		
Circuit code	3.3	1.15	1.16	1.17	1.18	1.19	1.20	1.21	1.22	1.23	1.24	3.4	1.25	1.26	1.27	1.28	1.29	3.5	1.30	1.31	1.32	1.33	3.6	1.34	1.35	1.36	1.37	3.7	1.38	1.39	1.40	1.41		
Phase	T	3	1	1	1	2	2	2	3	3	3	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T		
Power (W)	20756	506	2250	2250	2250	2250	2250	2250	2250	2250	2250	18374	3680	3680	11000	87	87	88715	41038	33637	16146	7312	5760	720	720	313	313	313	313	3680	6940	1080	1080	3680
Current (A)	29.96	2.2	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78	9.78	18374	3680	3680	15.65	15.65	15.65	1565	4855	23.3	10.55	8.31	3.13	3.13	3.13	3.13	15.65	9.87	4.70	4.70	15.65			
Power der curve (kA)	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Breaker curve	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	
Differential type																																		
Length (m)	3	95	95	95	95	95	95	95	95	95	95	4	95	95	95	10	95	5	15	35	50	30	6	60	60	60	70	70	50	50	50	50		
Conductor (mm²)	10	1.5	6	6	6	6	6	6	6	6	6	10	6	6	2.5	2.5	2.5	5	10	6	2.5	30	4	1.5	1.5	1.5	2.5	2.5	1.5	1.5	1.5	2.5		
Conductor type	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	XLPE	
voltage	400	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	400	400	400	400	400	400	230	230	230	230	400	230	230	230	230		

Electrical installation in a concrete block factory

Scale: S/E

N. of planes: 5

Drawn by: Juan Luis Vera Amiel

Date: 13/06/2012

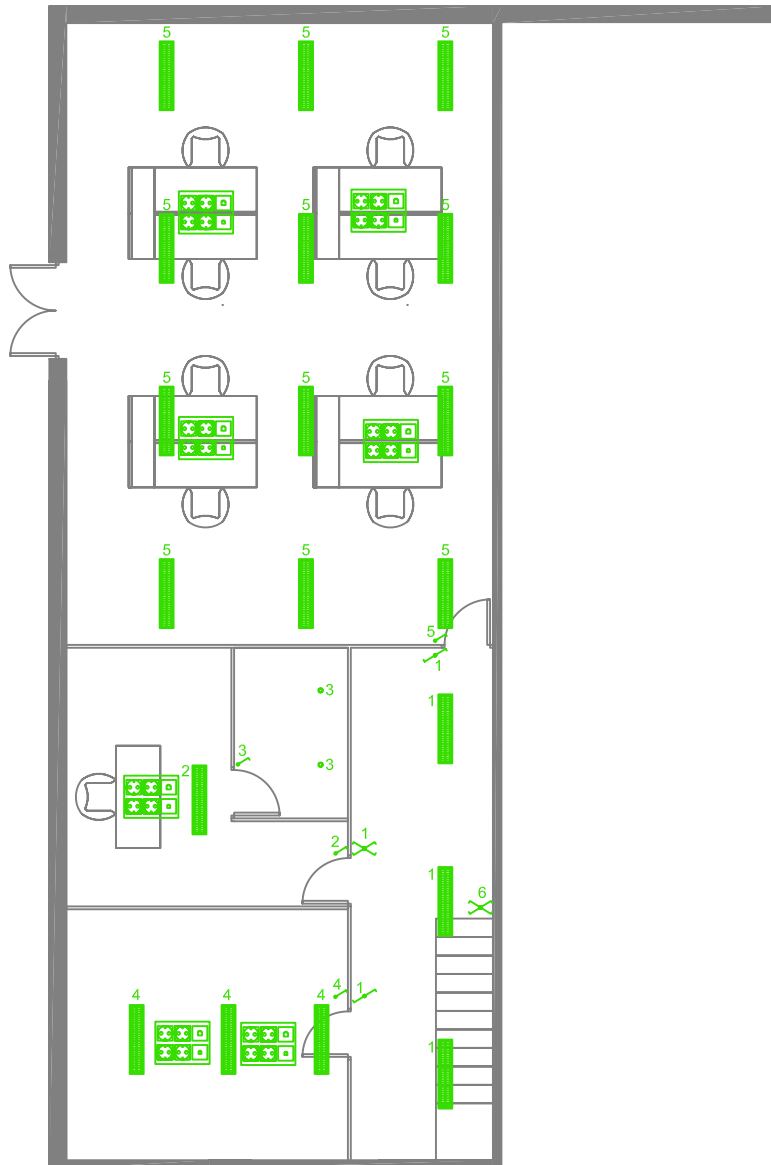
Tested by: Jose Luis Rodríguez Espantoso

Date: 13/06/2012

Observations:

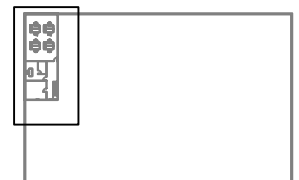
Single-line diagram





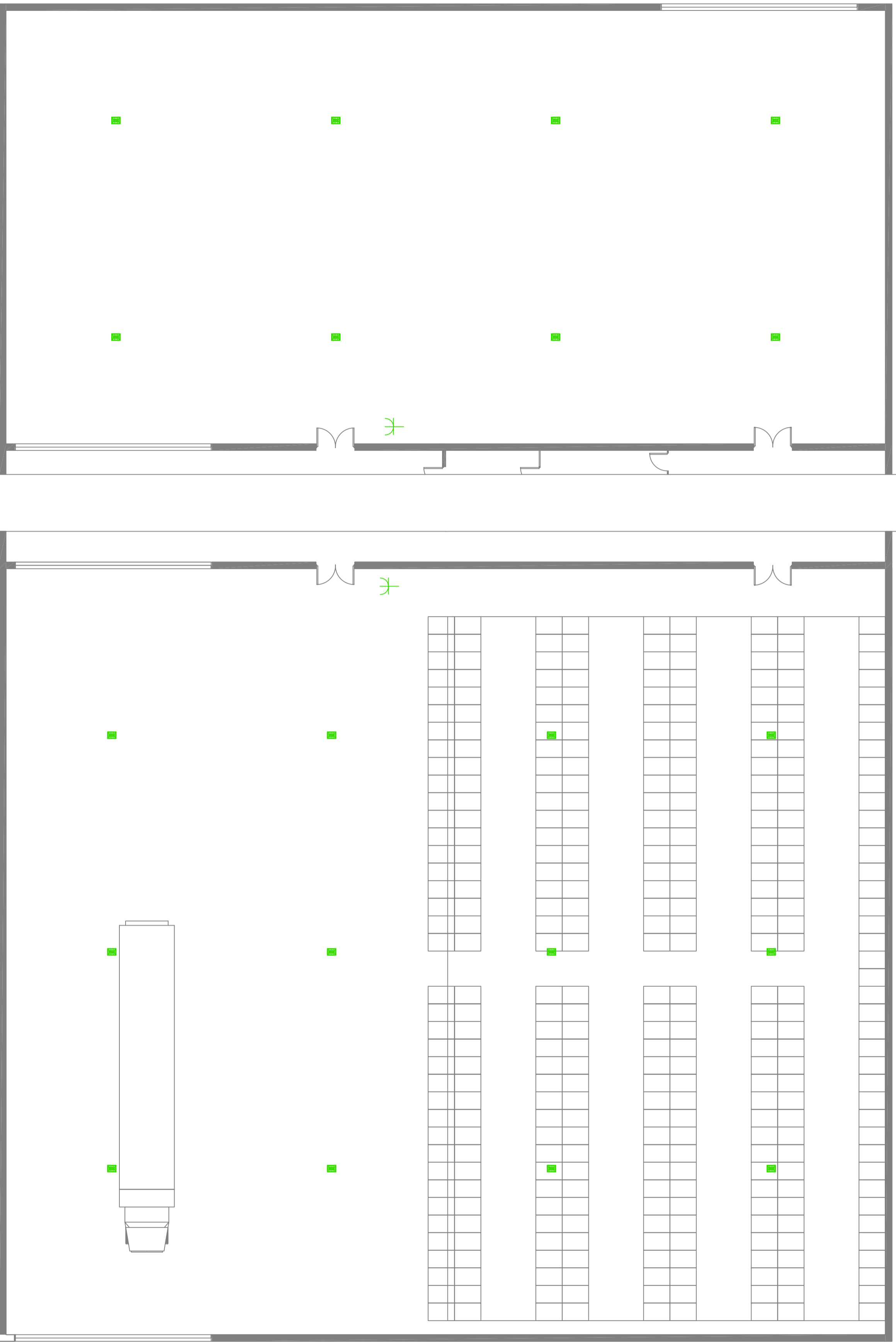
LEYEND	
	LIGHTMOTIV +1 X HIT -DE-CRI 150W HF MAG. GEAR
	BASIC +1 x QPAR-CB 50W 25°
	BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR
	workstation
	Three-fase plug 3P+1N+1T 16A
	Single-fase plug 1P+1N+1T 16A
	simple switch 10A
	commutator switch 10A

P2-Scale:1/2000



Electrical installation in a concrete block factory

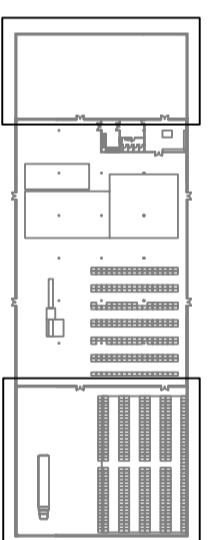
	Scale: 1/150	Drawn by	Date	Tested by	Date
	N. of plane: 6	Juan Luis Vera Ambel	13/06/2012	Jose Luis Rodriguez Espantoso	13/06/2012
	Office floor 2, lighting			Observations:	



LEYEND

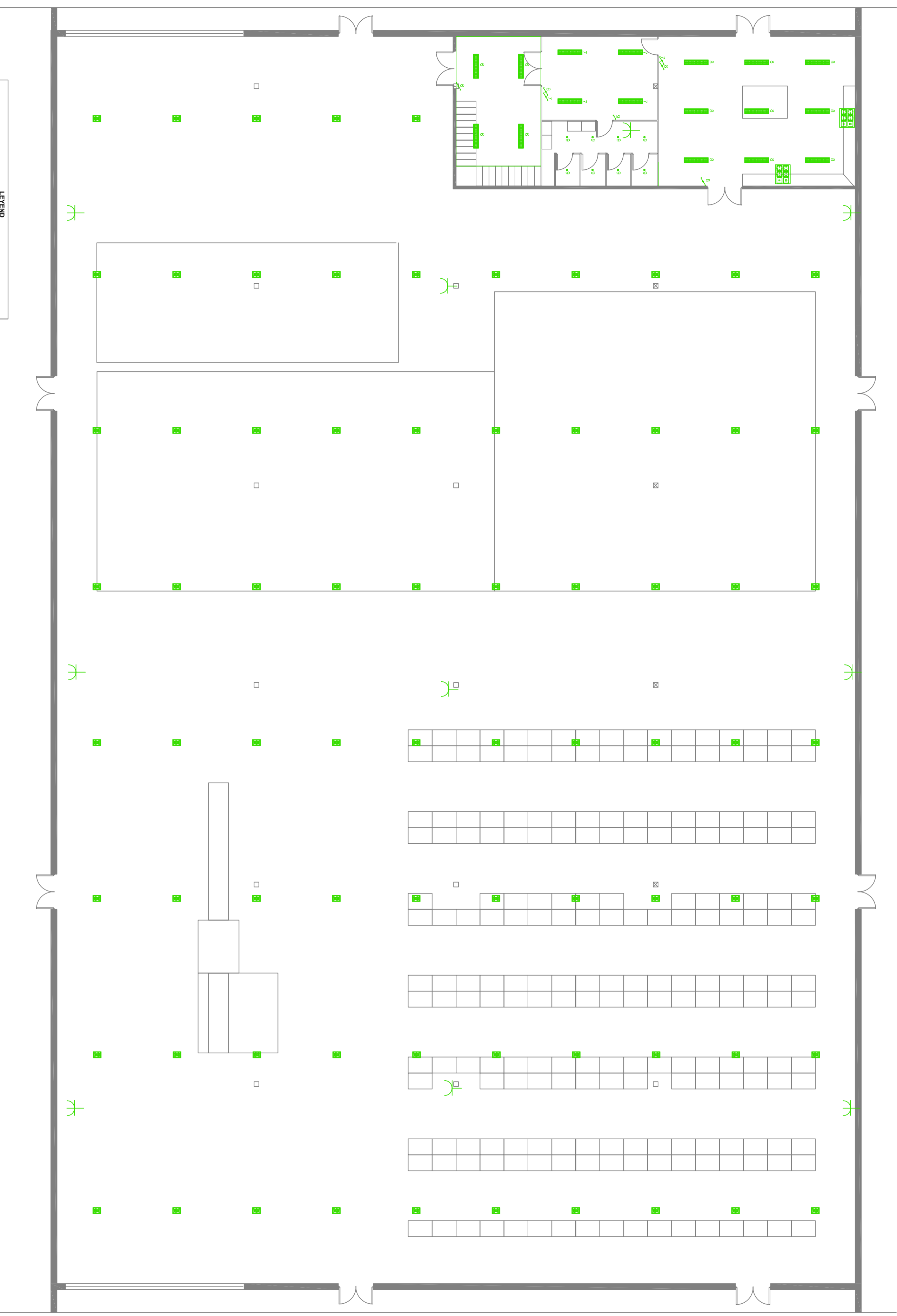
	LIGHTING/ 1 x HT -DE-CRI 15W HF MAG. GEAR
	BASIF 1 x GRACIAS SW 2P
	BATLIGHT (DR. SWM. L + DR. SWM. L) 2 x TS HO SW 840 ELECTR. GEAR
	workstation
	Three-phase plug 3P+1N+1T 16A
	Single-phase plug 1P+1N+1T 16A
	single switch 10A
	commander switch 10A

P2-Scale:1/2000



Electrical installation in a concrete block factory			
Scale:	1/150	Drawn by	Juan Luis Vera Ambel
N. of plane:	7	Date	13/06/2012
Outsides Floor 0, lighting		Tested by	Jose Luis Rodriguez Espantoso
		Date	13/06/2012
Observations:			

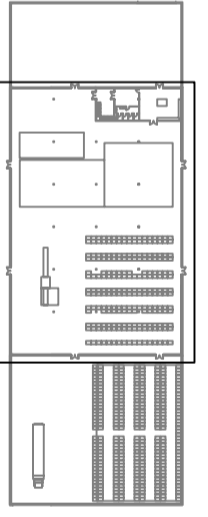




LEGENDO

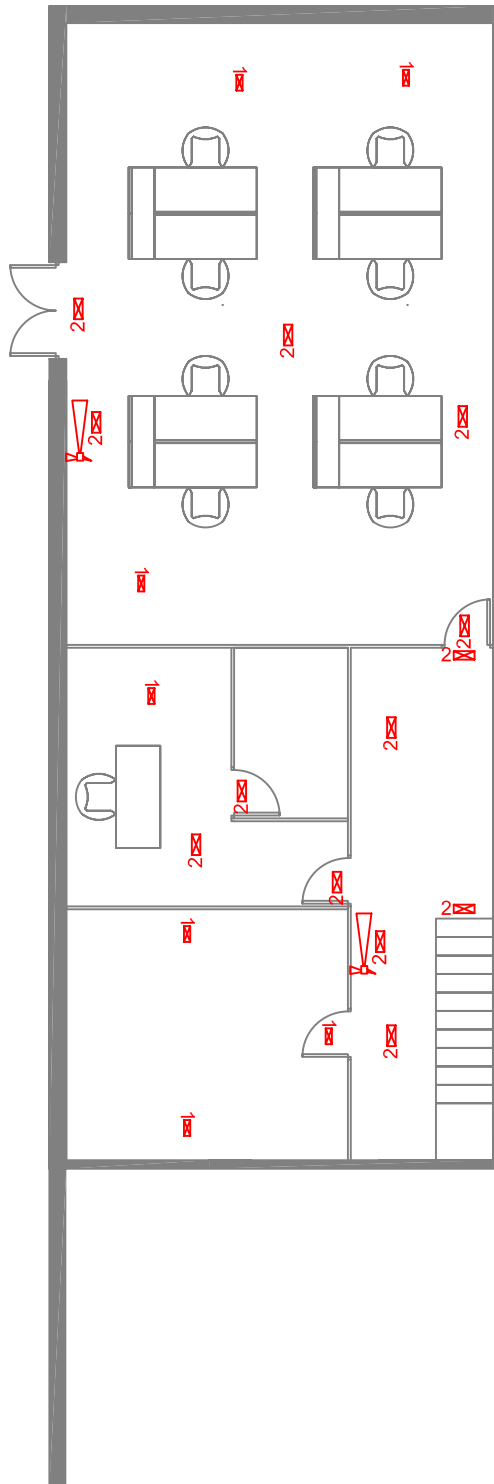
	LIGHTING: 4 x 1 FT - 2E-CR1 150W HF MAG. GEAR
	BASIC: 1 x 20A-CR1 150W HF MAG. GEAR
	BATT LIGHT: 2CR. 3VWL. L. * 2CR. 3VWL. L. 2 x 15 HO 5AW 840 ELECTR. GEAR
	workstation
	Three-phase plug 3P-1N-1T 16A
	Single switch 10A
	communicator switch 10A

P2-Scale: 1/2000



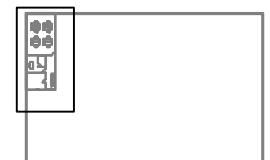
Electrical installation in a concrete block factory			
Scale:	1/150	Drawn by	Juan Luis Vera Ambel
N. of plane:	8	Date	13/06/2012
Industry and office	Floor 0, lighting	Tested by	Jose Luis Rodriguez Espanoso
		Date	13/06/2012
Observations:			





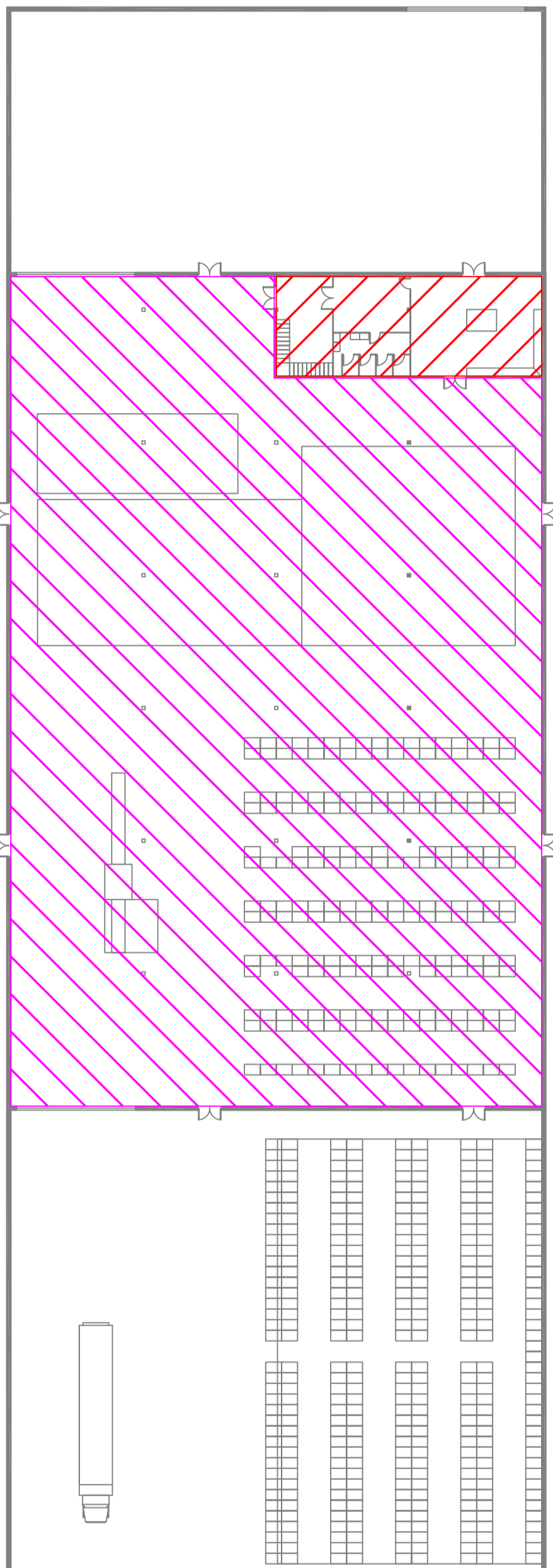
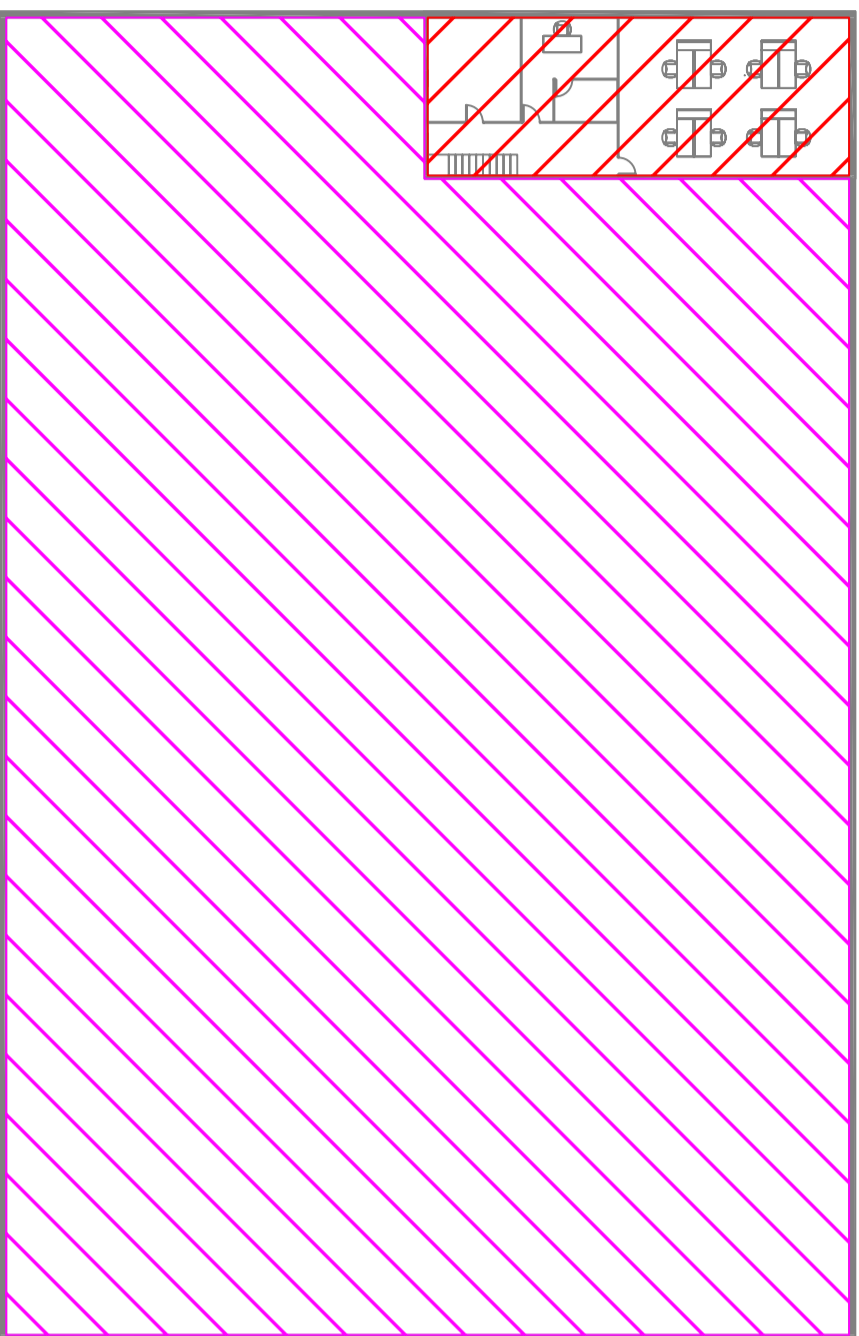
LEYEND	
1	Evacuación light G5 / 500 Lum 1h
2	Emergency light B44 L.V.S / 165 lum1h
	Sector offices fire
	Sector Industry fire
	fire extinguisher
	RF Door
	Rockwool high-density for hole in fire sector

P2-Scale:1/500



Electrical installation in a concrete block factory

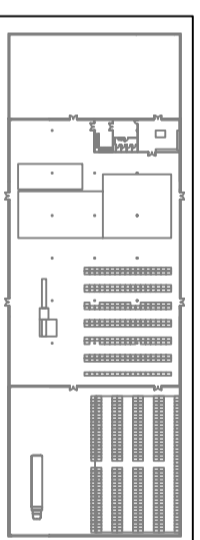
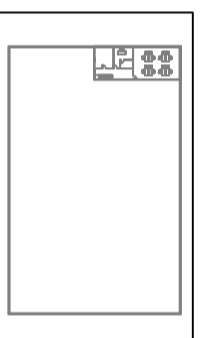
	Scale: 1/150	Drawn by	Date	Tested by	Date
	N. of plane: 9	Juan Luis Vera Ambel	13/06/2012	Jose Luis Rodriguez Espantoso	13/06/2012
	Office floor 2, Fire installation			Observations:	



LEYEND	
	Evacuation light G5 / 500 Lum 1h
	Emergency light B44 L.V.S / 165 lum/h
	Sector offices fire
	Sector industry fire
	fire extinguisher
	RF Door
	Rockwool high-density for hole in fire sector

P2-Scale:1/2000

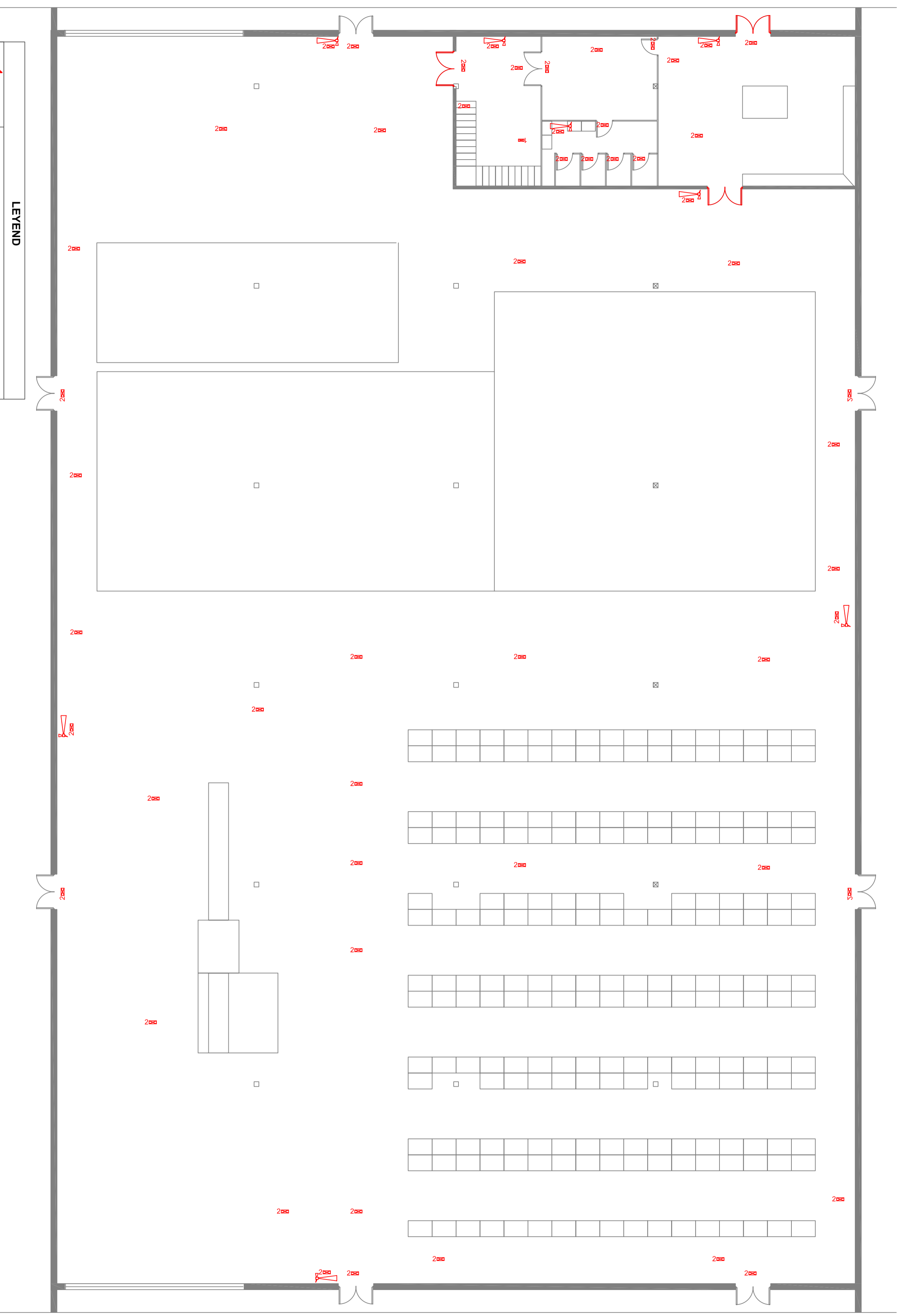
P2-Scale:1/2000



Electrical installation in a concrete block factory



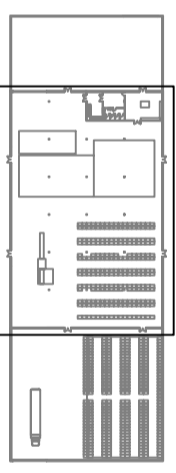
Scale:	1/500	Drawn by	Juan Luis Vera Ambel	Date	13/06/2012	Tested by	Jose Luis Rodriguez Espantoso	Date	13/06/2012	
N. of plans:	10	Fire sectors							Observations:	



LEYEND

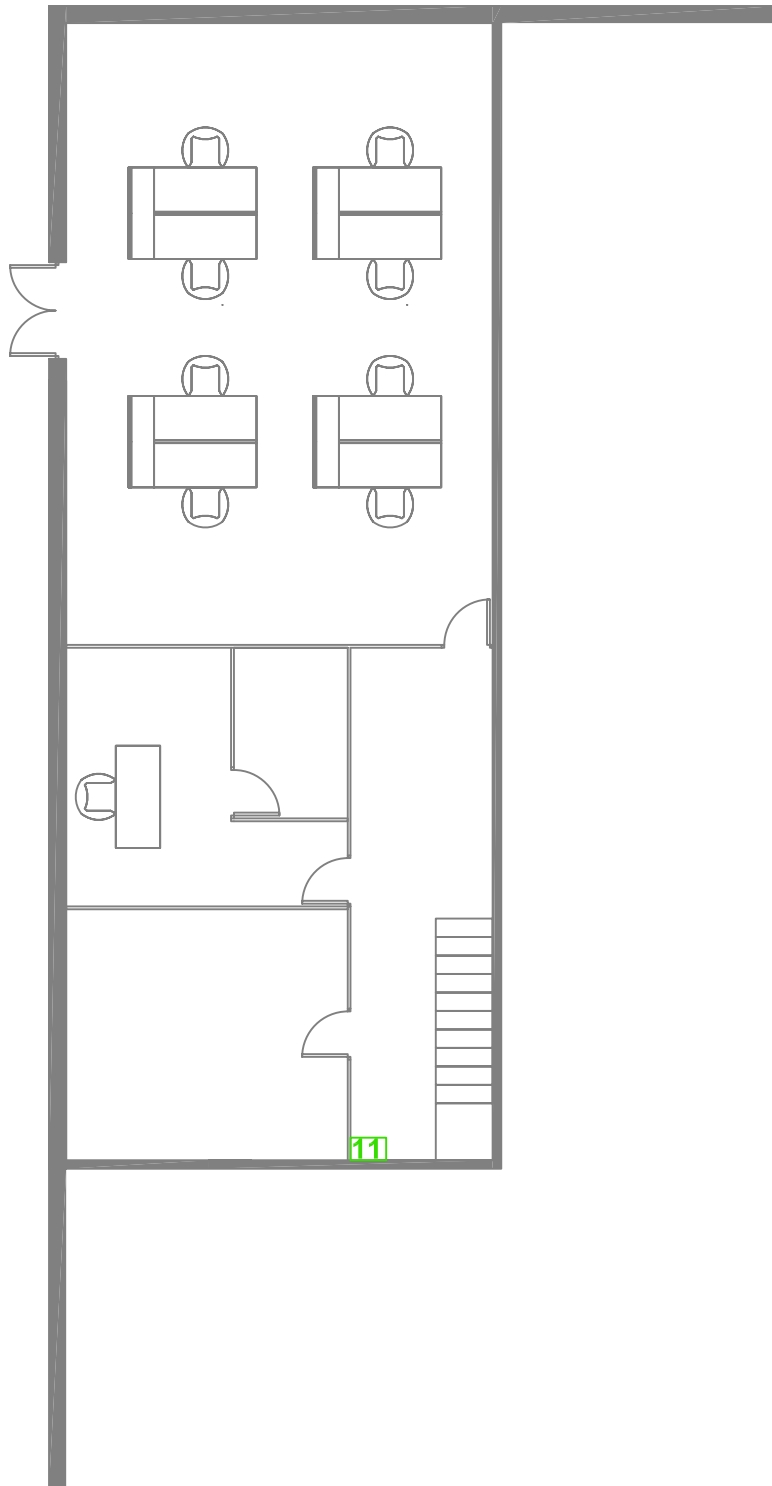
	Evacuation light GS / 500 Lum 1h
	Emergency light B44 L.V.S / 165 lum1h
	Sector offices fire
	Sector Industry fire
	fire extinguisher
	RF Door
	Rockwool high-density for hole in fire sector

P2-Scale:1/2000

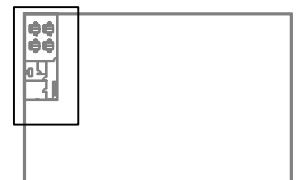


Electrical installation in a concrete block factory			
Scale:	1/150	Drawn by	Juan Luis Vera Ambel
N. of plane:	11	Date	13/06/2012
Industry and office Floor 0, Instalation fire		Tested by	Jose Luis Rodriguez Espantoso
		Date	13/06/2012
Observations:			




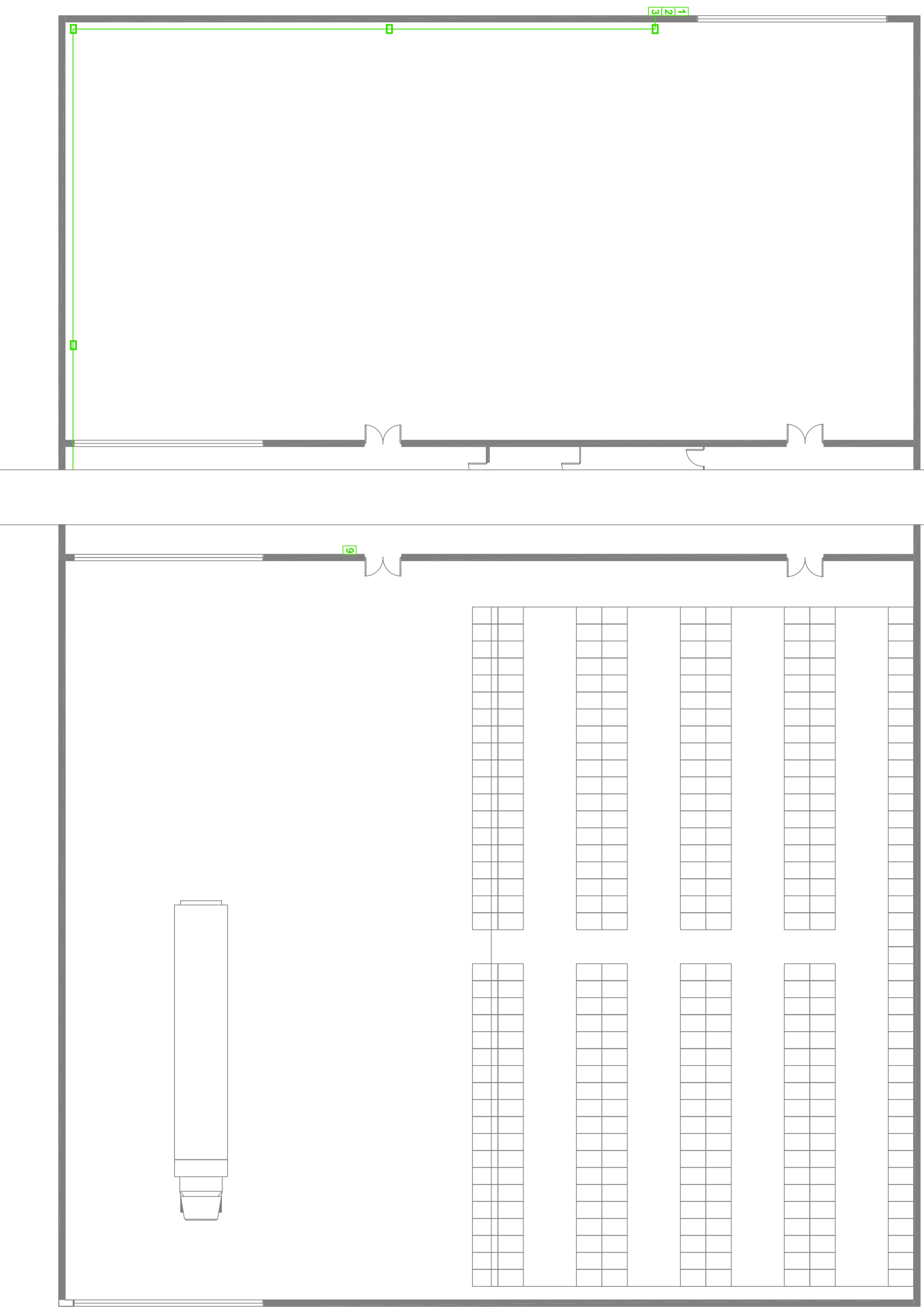


P2-Scale:1/2000



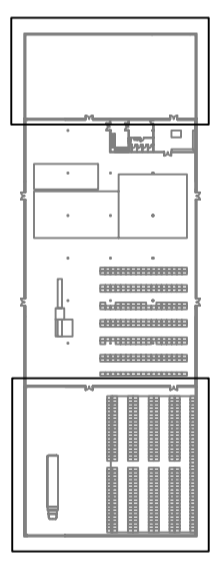
Electrical installation in a concrete block factory

	Scale: 1/150	Drawn by	Date	Tested by	Date
	N. of plane: 12	Juan Luis Vera Ambel	13/06/2012	Jose Luis Rodriguez Espantoso	13/06/2012
	Office floor 2, electrical instalation			Observations:	



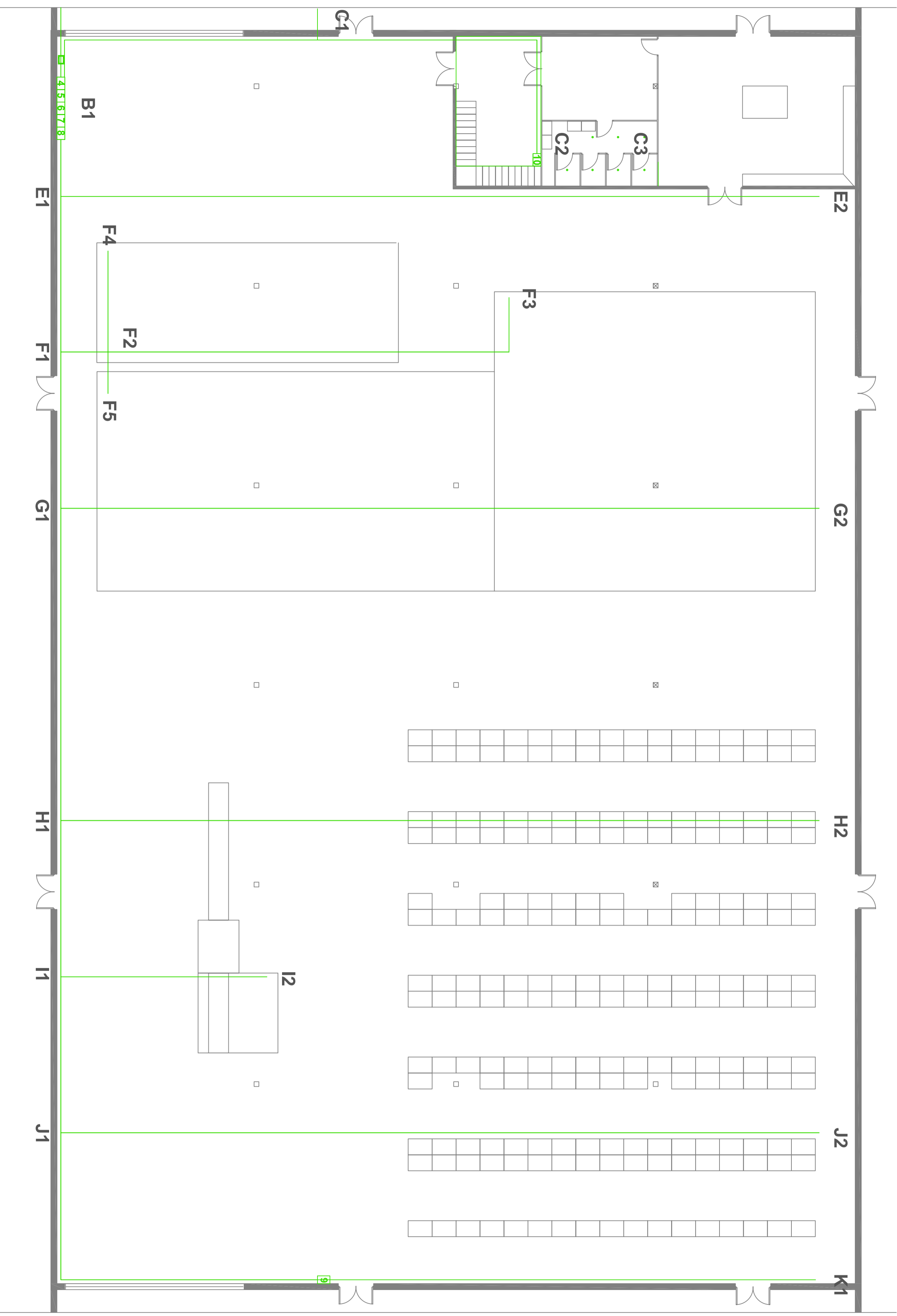
LEGEND	
	CS
	CDDP
	TMF10
	GRLV
	lighting and power panel outdoor A
	Machines panel Industry
	Power Industry
	lighting panel Industry
	lighting and power panel outdoor B
	lighting and power panel office plant 0
	lighting and power panel office plant 1
	Derivation Individual
	manhole
	tray

P2-Scale:1/2000



Electrical installation in a concrete block factory			
Scale:	1/150	Drawn by	
N. of planes:	13	Juan Luis Vera Ambel	
Date	13/06/2012	Tested by	Jose Luis Rodriguez Espantoso
Date	13/06/2012	Observations:	

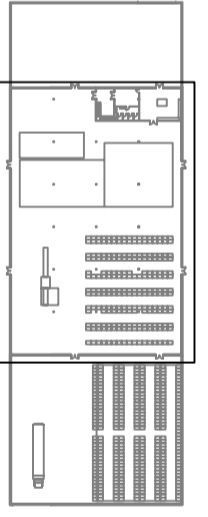




LEGENDA	
	CS
	CGP
	TRF 0
	GP.V
	Lighting and power panel outside A
	Machines panel industry
	Power industry
	Lighting panel industry
	Lighting and power panel outside B
	Lighting and power panel office plant 0
	Lighting and power panel office plant 1
	Derivation individual
	manhole
	tray

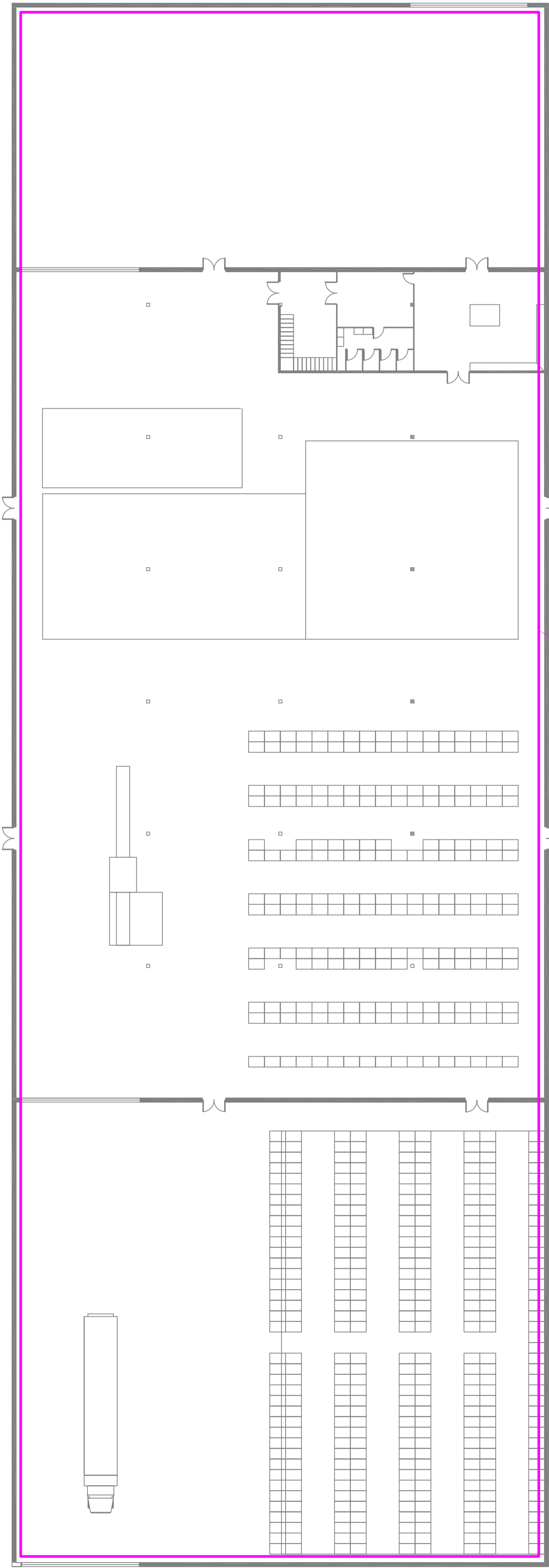
Segment	dimension
B1-C1	60 X 150
C1-C2	60 X 150
C2-C3	50 X 100
B1-E1	60 X 150
E1-E2	60 X 75
E1-F1	60 X 100
F1-F2	60 X 75
F2-F4	60 X 75
F2-F4	60 X 75
F2-F5	60 X 75
F1-G1	60 X150
G1-G2	60 X 75
G1-H1	60 X 150
H1-J1	60 X 100
I1-I2	60 X75
I1-J1	60 X 100
J1-I2	60 X 75
J1-K1	60 X 100

P2-Scale:1/2000



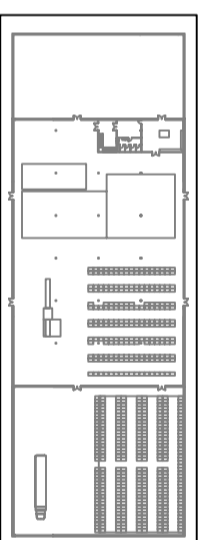
Electrical installation in a concrete block factory			
Scale:	1/150	Drawn by	
N. of plane:	14	Juan Luis Vera Ambel	
Date	13/06/2012	Tested by	Jose Luis Rodriguez Espantoso
Date	13/06/2012	Observations:	



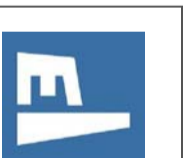


Ring

P2-Scale:1/2000



Electrical installation in a concrete block factory



Scale:	Drawn by	Date	Tested by	Date
1/250	Juan Luis Vera Ambel	13/06/2012	Jose Luis Rodriguez Espantoso	13/06/2012
N. of plane: 15		Ground Installation		
Observations:				



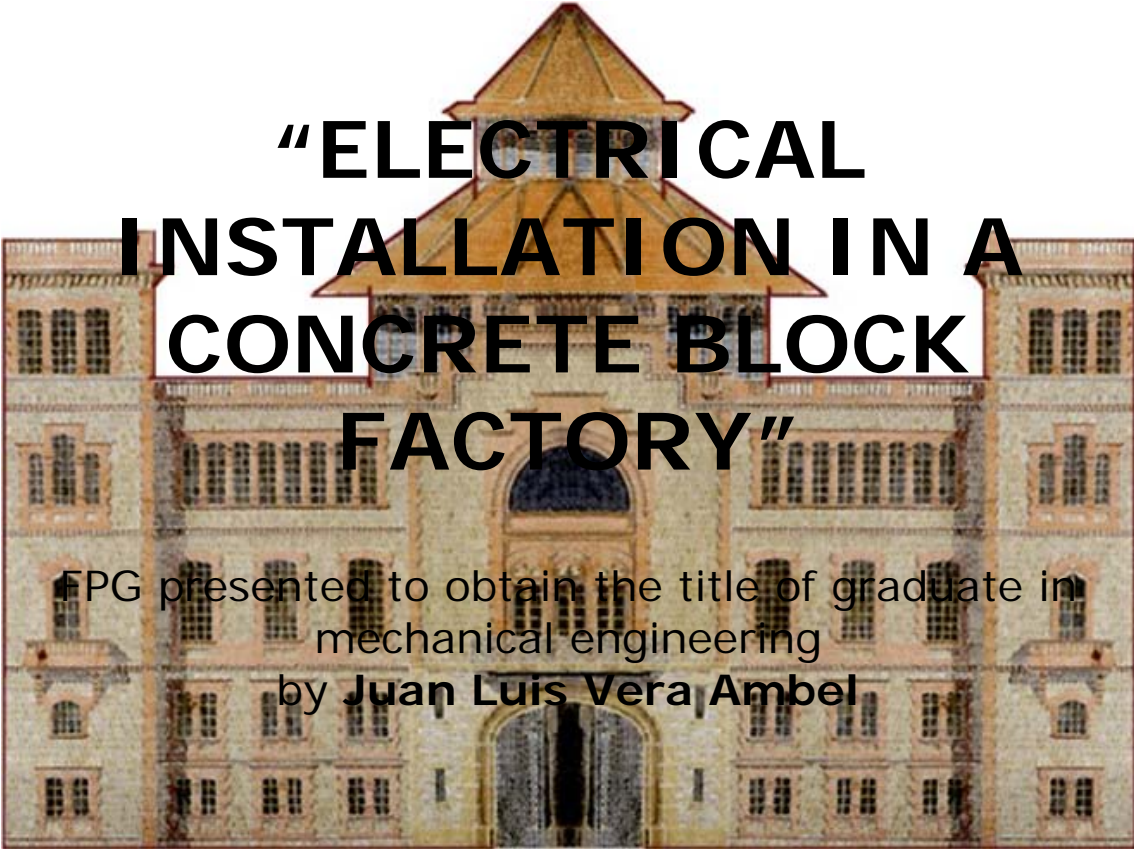
Escola Universitària d'Enginyeria
Tècnica Industrial de Barcelona
Consorci Escola Industrial de Barcelona

UNIVERSITAT POLITÈCNICA DE CATALUNYA

Volum III

Results of calculations of illumination with Dialux and
emergency lighting with Emerlithg

Final project grade

A photograph of a large, multi-story building facade with a central arched entrance and a prominent tower-like structure at the top. The building has a classical architectural style with many windows.

"ELECTRICAL INSTALLATION IN A CONCRETE BLOCK FACTORY"

FPG presented to obtain the title of graduate in
mechanical engineering
by **Juan Luis Vera Ambel**

Barcelona, Juny 13, 2012

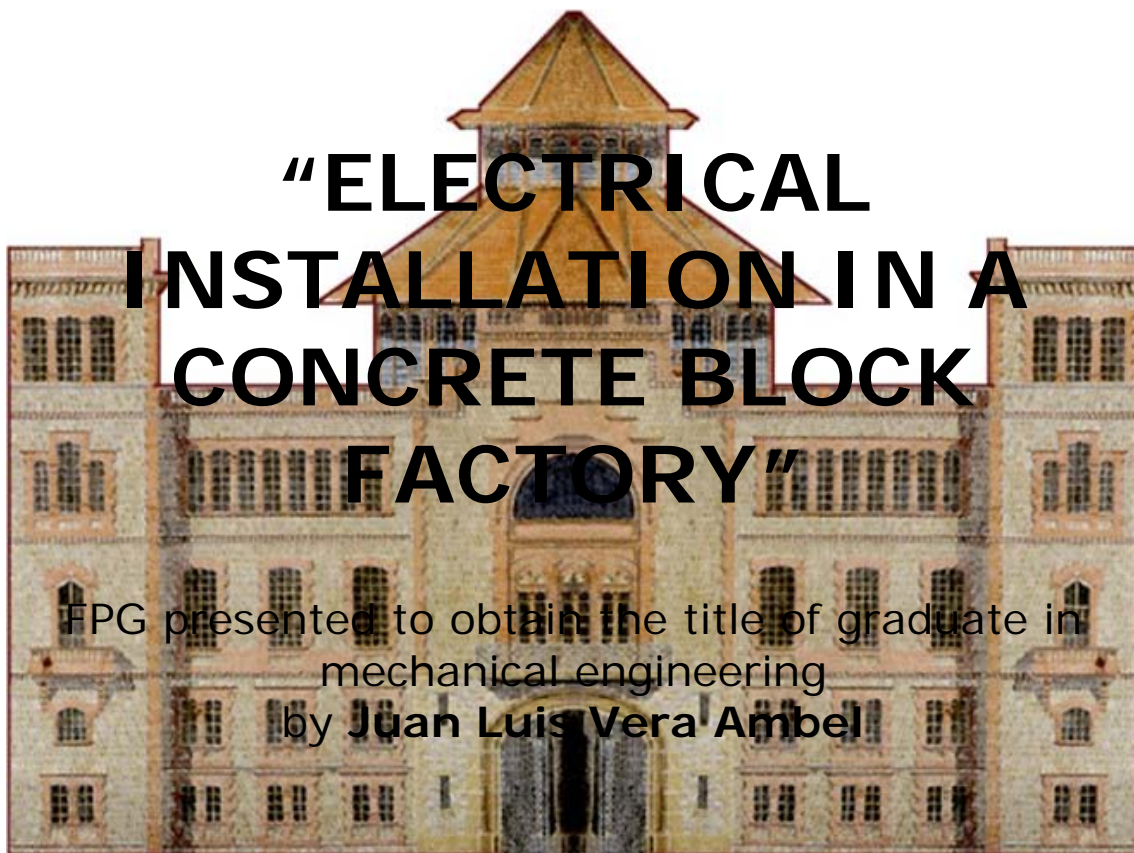
Director: Jose Luis Rodriguez Espantoso
Department of EG
Politechnical University of Catalonia (UPC)



Escola Universit ria d'Enginyeria
T cnica Industrial de Barcelona
Consorci Escola Industrial de Barcelona

UNIVERSITAT POLIT CNICA DE CATALUNYA

XI - Results of calculations of emergency lighting with Emerlithg



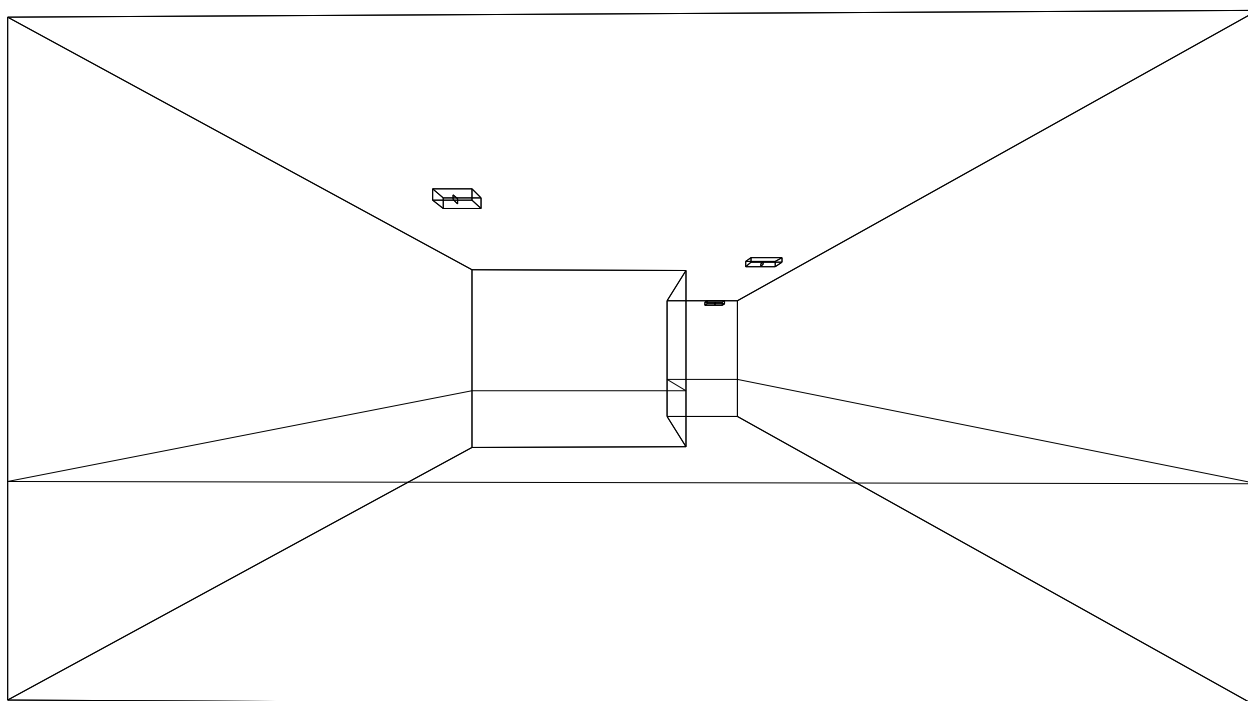
Barcelona, Juny 13, 2012

Director: Jose Luis Rodriguez Espantoso
Department of EG
Politechnical University of Catalonia (UPC)

Block factory

Installation Notes: Electrical instalación
Customer: ENDESA
Project Code: 985
Date: 13-06-2012

Notes:



DESIGNER NAME: LEGRAND GROUP ESPAÑA S.L.
Address: C/Hierro 56 - 28850 Torrejón de Ardoz (Madrid)
Tel.-Fax: Tel.+34/91/6561812 Fax +34/91/6566788

Remarks:

1.1 General Notes

Surface	Dimensions [m]	Angle°	Color	Coefficient Reflectance	Average Illum. [lux]	Ave.Luminance [cd/m²]
Floor	4.92x4.55	Plane	RGB=205,153,95	40%	20.3	2.58
Wall 6	2.50x1.51	-180°	RGB=255,249,128	65%	81.4	16.84
Wall 5	2.50x4.92	90°	RGB=255,249,128	65%	26.6	5.51
Wall 4	2.50x4.53	-0°	RGB=255,249,128	65%	8.3	1.71
Wall 3	2.50x2.84	-90°	RGB=255,249,128	65%	5.9	1.23
Wall 2	2.50x3.02	-180°	RGB=255,249,128	65%	6.2	1.27
Wall 1	2.50x2.04	-90°	RGB=255,249,128	65%	23.1	4.77
Ceiling	4.55x4.92	Plane	RGB=255,255,255	80%	1.6	0.40

Dimensions of Room Bounding Box [m]: 4.55x4.92x2.50
 Calculation Points Grid of Bounding Box [m]: direction X 0.51 - Y 0.49 - Z 0.50

1.2 Energy Calculation (Working Plane)

Area	16.03 m2
Average Illuminance	28.60 lx
Specific Power	1.75 W/m2
Lighting Engineering Specific Power	6.11 W/(m2 * 100lx)
Energy Efficiency	16.37 (m2*lx)/W
Total Power Used	28.00 W

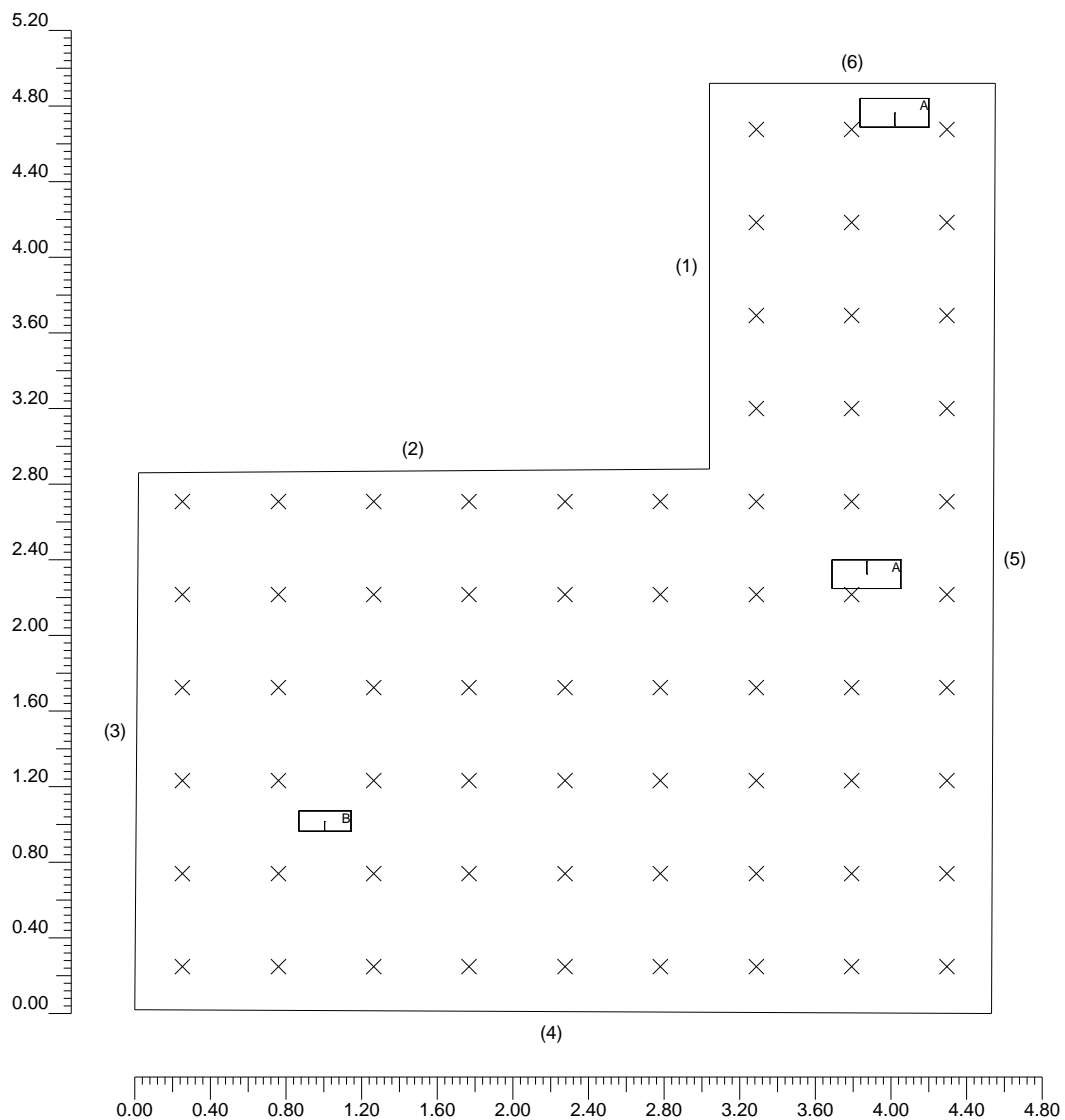
1.3 Uniformity Installation Parameters

Surface	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
Working Plane (h=0.80 m)	Horizontal Illuminance (E)	28.6 lux	4.6 lux	72.9 lux	0.16	0.06	0.39
					1:6.19	1:15.77	1:2.55
Floor	Horizontal Illuminance (E)	20.3 lux	5.4 lux	39.7 lux	0.26	0.13	0.51
					1:3.79	1:7.43	1:1.96

Calculation Type: Only Dir. + Furniture + Shadows

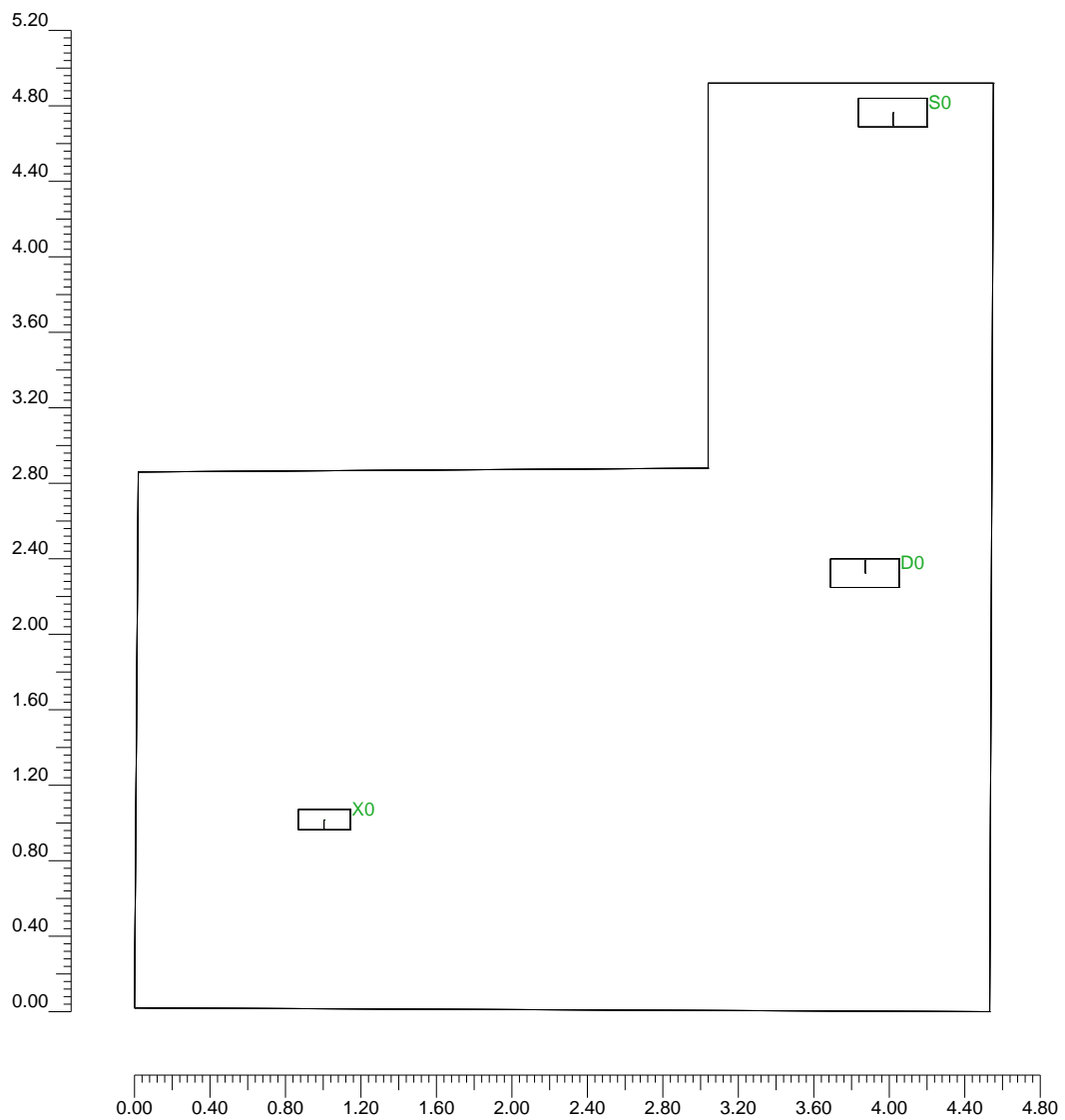
2.1 Working Plane 2D View and Calculation Grid

Scale 1/40



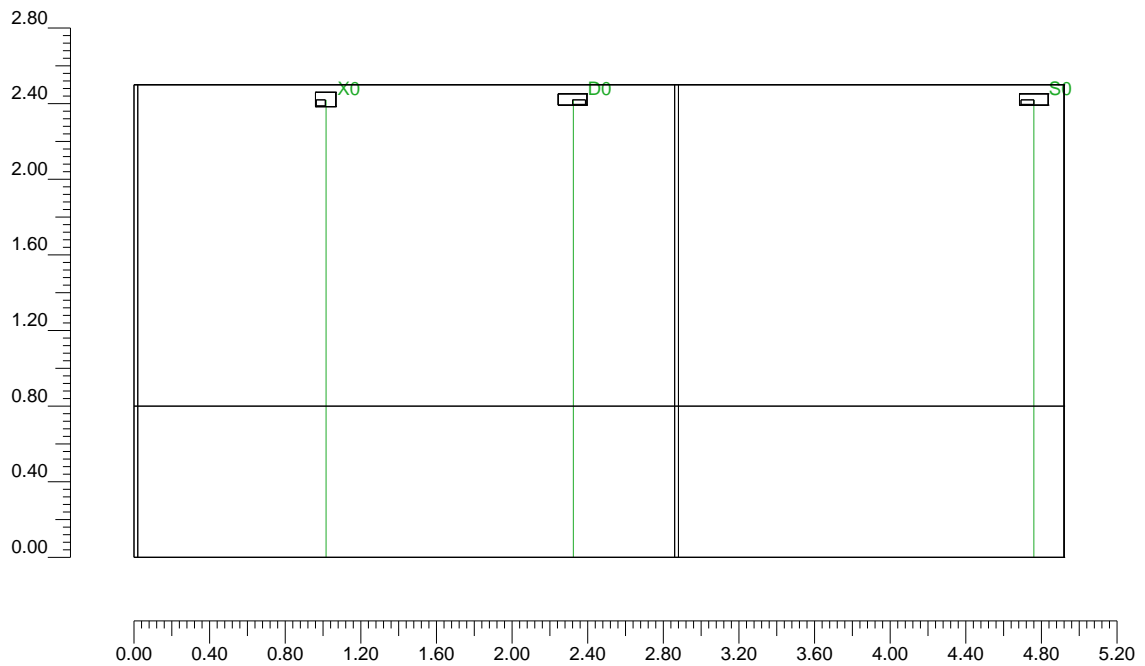
2.2 2D Plane View

Scale 1/40



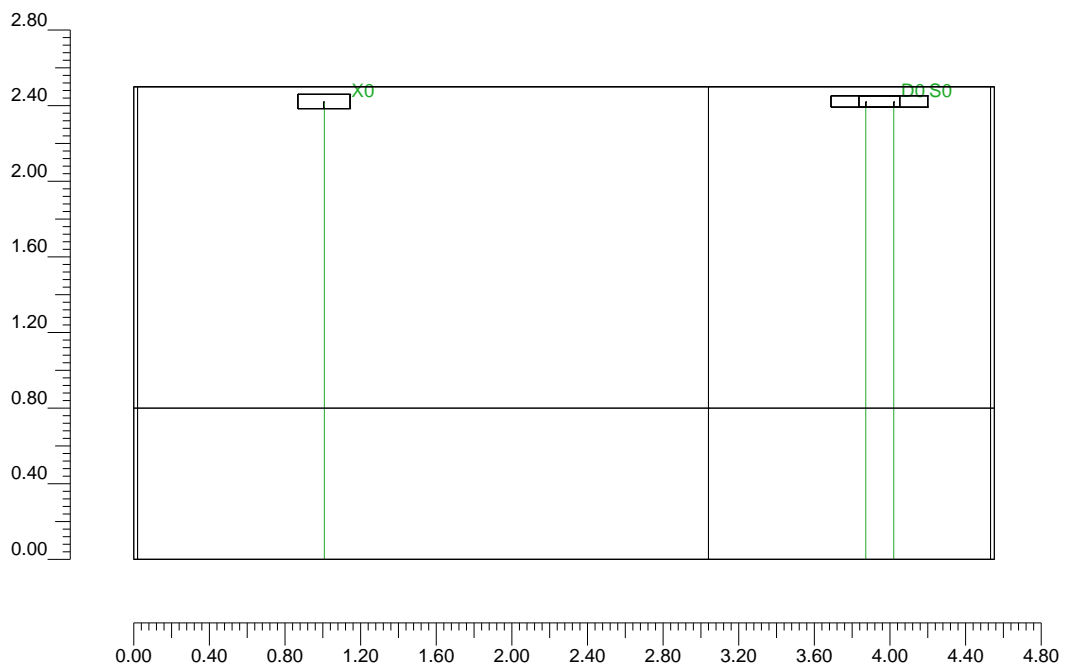
2.3 Lateral View

Scale 1/40



2.4 Front View

Scale 1/40



3.1 Luminaire/Measurements Info

Refer.	Line	Luminaire Name (Measurement Name)	Luminaire Code (Measurement Code)	Luminaires N.	Ref.Lamps	Lamps N.
A	G5	G5 / 500 Lum 1h (LEGR 61833+1SYLV PL-11W/840 (8))	61734 (61734LG)	2	LMP-A	1
B	B44 L.V.S.	B44 L.V.S./ 165 Lum 1h (LEGR 61541+1SYLV F6W/CW (3.6 V))	61552 (61541LG)	1	LMP-B	1

3.2 Lamp Information

Ref.Lamps	Type	Code	Flux lm	Power W	Color K	N.
LMP-A	FDH	11W 61734	515	11	1	2
LMP-B	FDH	6W 61541	165	6	1	1

3.3 Luminaire Table

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	1	X	15.33;126.62;2.42	0.0;0.0;-90.0	61734	1.00	11W 61734	1*515
	2	X	15.18;124.18;2.42	0.0;0.0;90.0		1.00		
B	1	X	12.32;122.88;2.42	0.0;0.0;-90.0	61552	1.00	6W 61541	1*165

3.4 Aiming Summary Table

Mast	Row	Column	Refer. 2D	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Aiming X[m] Y[m] Z[m]	R.Axis °	Coeff. Mant.	Refer.
			S0	X	15.33;126.62;2.42	0.0;0.0;-90.0	15.33;126.62;0.00	-90	1.00	A
			D0	X	15.18;124.18;2.42	0.0;0.0;90.0	15.18;124.18;0.00	90	1.00	A
			X0	X	12.32;122.88;2.42	0.0;0.0;-90.0	12.32;122.88;0.00	-90	1.00	B

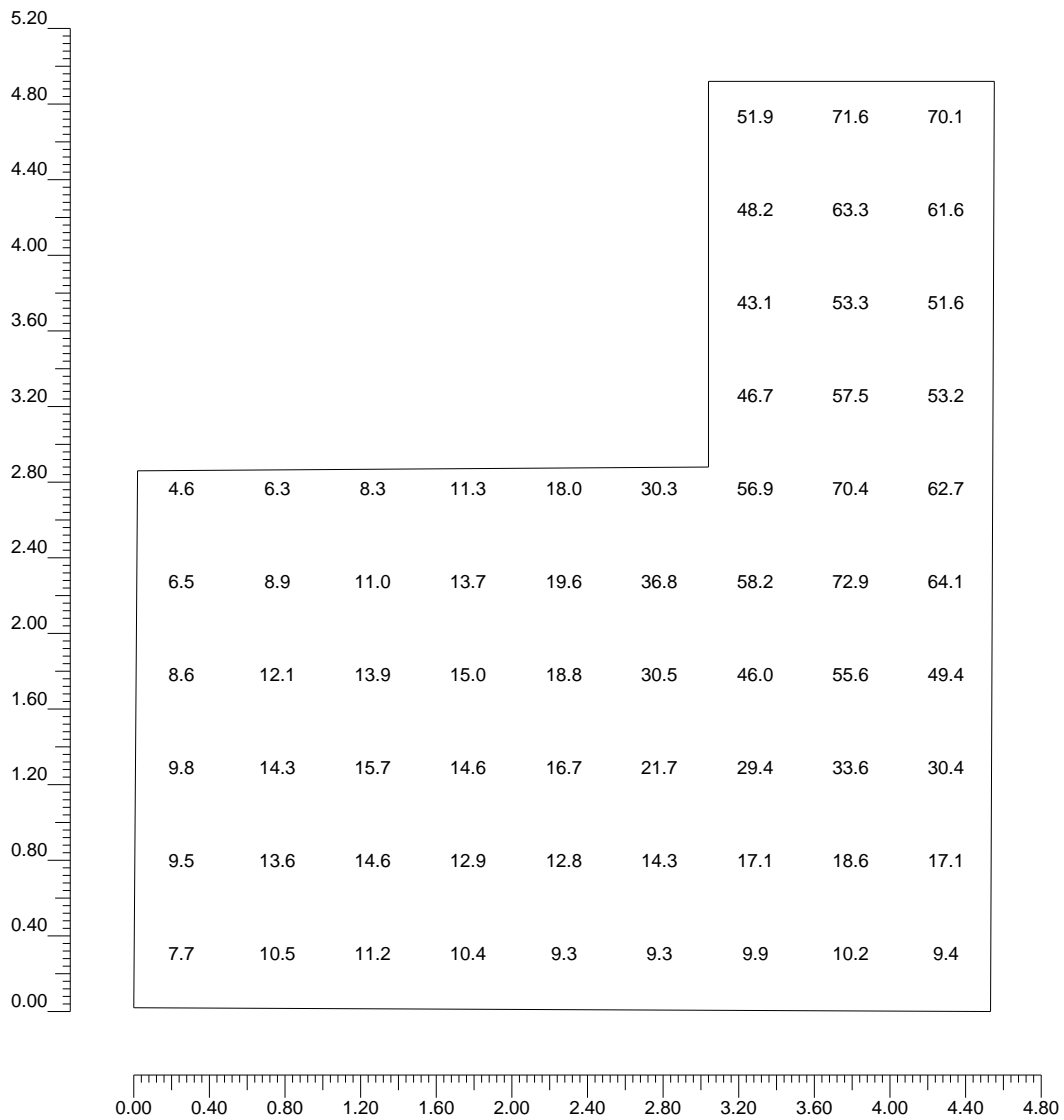
4.1 Horizontal Illuminance Values on the Working Plane

O (x:11.31 y:126.78 z:0.80)	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
DX:0.49 DY:0.51	Horizontal Illuminance (E)	28.6 lux	4.6 lux	72.9 lux	0.16	0.06	0.39
					1:6.19	1:15.77	1:2.55

Calculation Type

Only Dir. + Furniture + Shadows

Scale 1/40



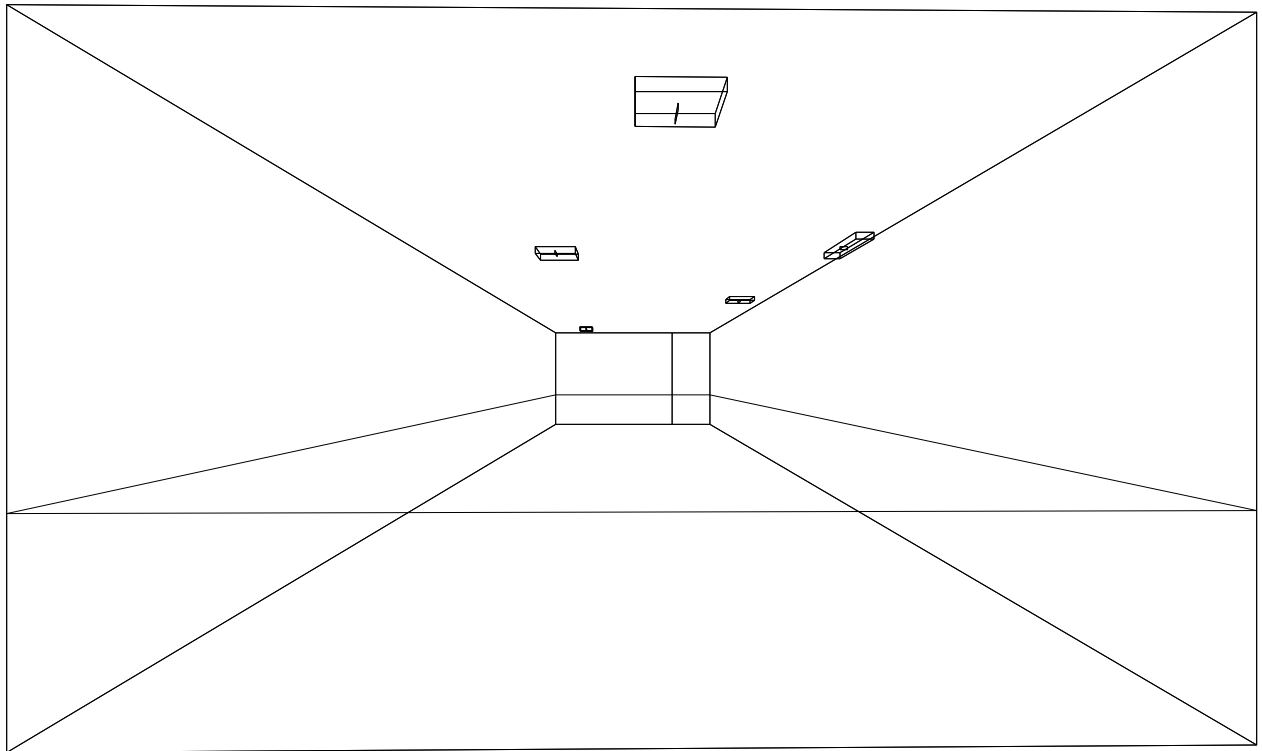
General Information	1
1. Project Data	
1.1 General Notes	2
1.2 Energy Calculation	2
1.3 Uniformity Installation Parameters	2
2. Project Views	
2.1 Working Plane 2D View and Calculation Grid	3
2.2 2D Plane View	4
2.3 Lateral View	5
2.4 Front View	6
3. Luminaire Data	
3.1 Luminaire/Measurements Info	7
3.2 Lamp Information	7
3.3 Luminaire Table	7
3.4 Aiming Summary Table	7
4. Results Table	
4.1 Horizontal Illuminance Values on the Working Plane	8

Block factory

Installation Notes:

Customer: ENDESA
Project Code:
Date: 26/04/2012

Notes:



DESIGNER NAME: LEGRAND GROUP ESPAÑA S.L.
Address: C/Hierro 56 - 28850 Torrejón de Ardoz (Madrid)
Tel.-Fax: Tel.+34/91/6561812 Fax +34/91/6566788

Remarks:

1.1 General Notes

Surface	Dimensions [m]	Angle°	Color	Coefficient Reflectance	Average Illum. [lux]	Ave.Luminance [cd/m²]
Floor	4.22x6.52	Plane	RGB=205,153,95	40%	34.9	4.44
Wall 5	2.50x3.18	-180°	RGB=255,249,128	65%	9.0	1.86
Wall 4	2.50x1.01	179°	RGB=255,249,128	65%	5.4	1.12
Wall 3	2.50x6.48	90°	RGB=255,249,128	65%	37.3	7.71
Wall 2	2.50x4.22	0°	RGB=255,249,128	65%	47.9	9.90
Wall 1	2.50x6.50	-90°	RGB=255,249,128	65%	14.0	2.90
Ceiling	4.22x6.52	Plane	RGB=255,255,255	80%	0.9	0.24

Dimensions of Room Bounding Box [m]:

4.22x6.52x2.50

Calculation Points Grid of Bounding Box [m]:

direction X 0.53 - Y 0.50 - Z 0.50

1.2 Energy Calculation (Working Plane)

Area	27.33 m2
Average Illuminance	44.37 lx
Specific Power	1.83 W/m2
Lighting Engineering Specific Power	4.12 W/(m2 * 100lx)
Energy Efficiency	24.25 (m2*lx)/W
Total Power Used	50.00 W

1.3 Uniformity Installation Parameters

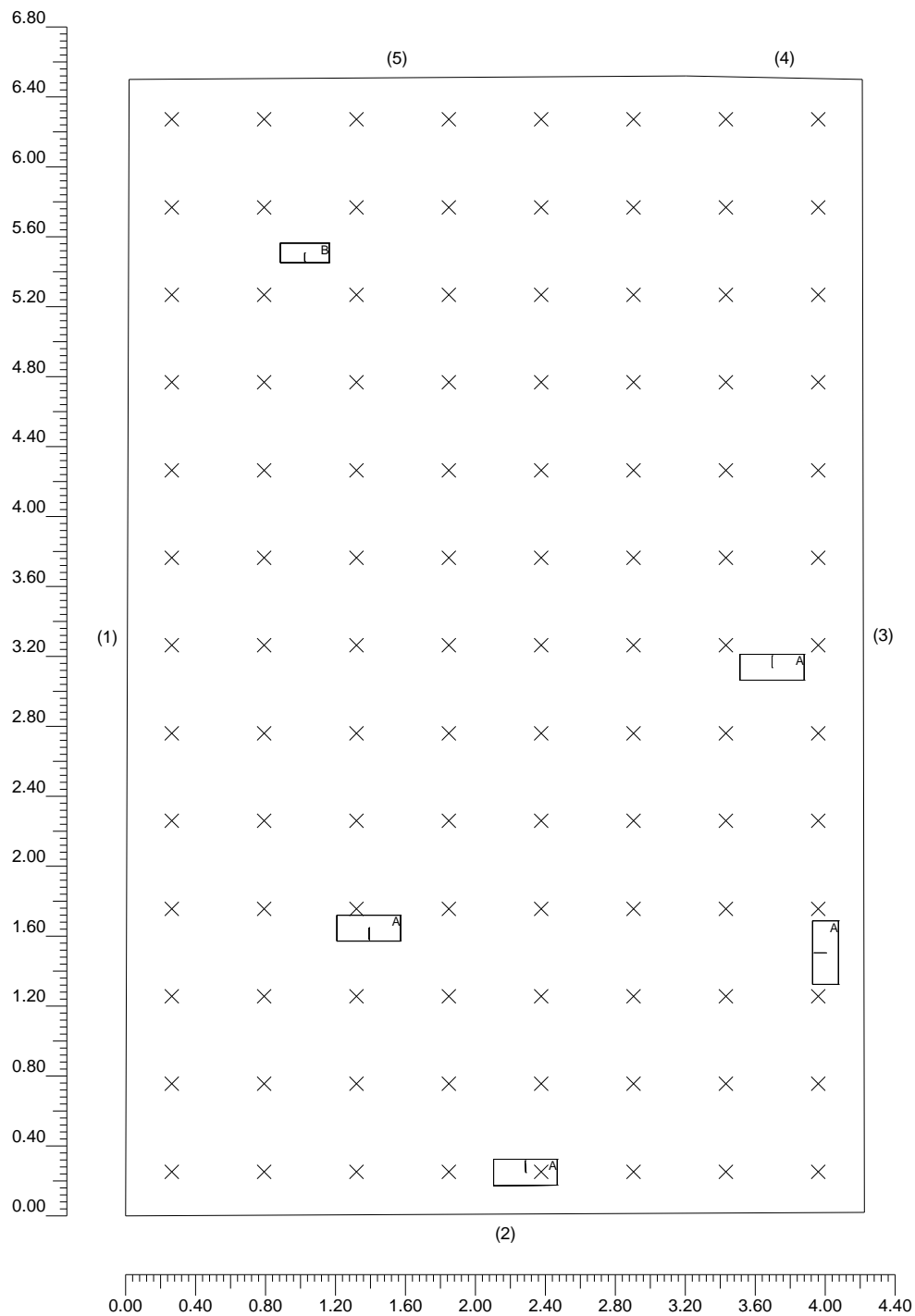
Surface	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
Working Plane (h=0.80 m)	Horizontal Illuminance (E)	44.4 lux	4.1 lux	98.3 lux	0.09	0.04	0.45
					1:10.72	1:23.77	1:2.22
Floor	Horizontal Illuminance (E)	34.9 lux	7.0 lux	65.9 lux	0.20	0.11	0.53
					1:5.02	1:9.48	1:1.89

Calculation Type

Only Dir. + Furniture + Shadows

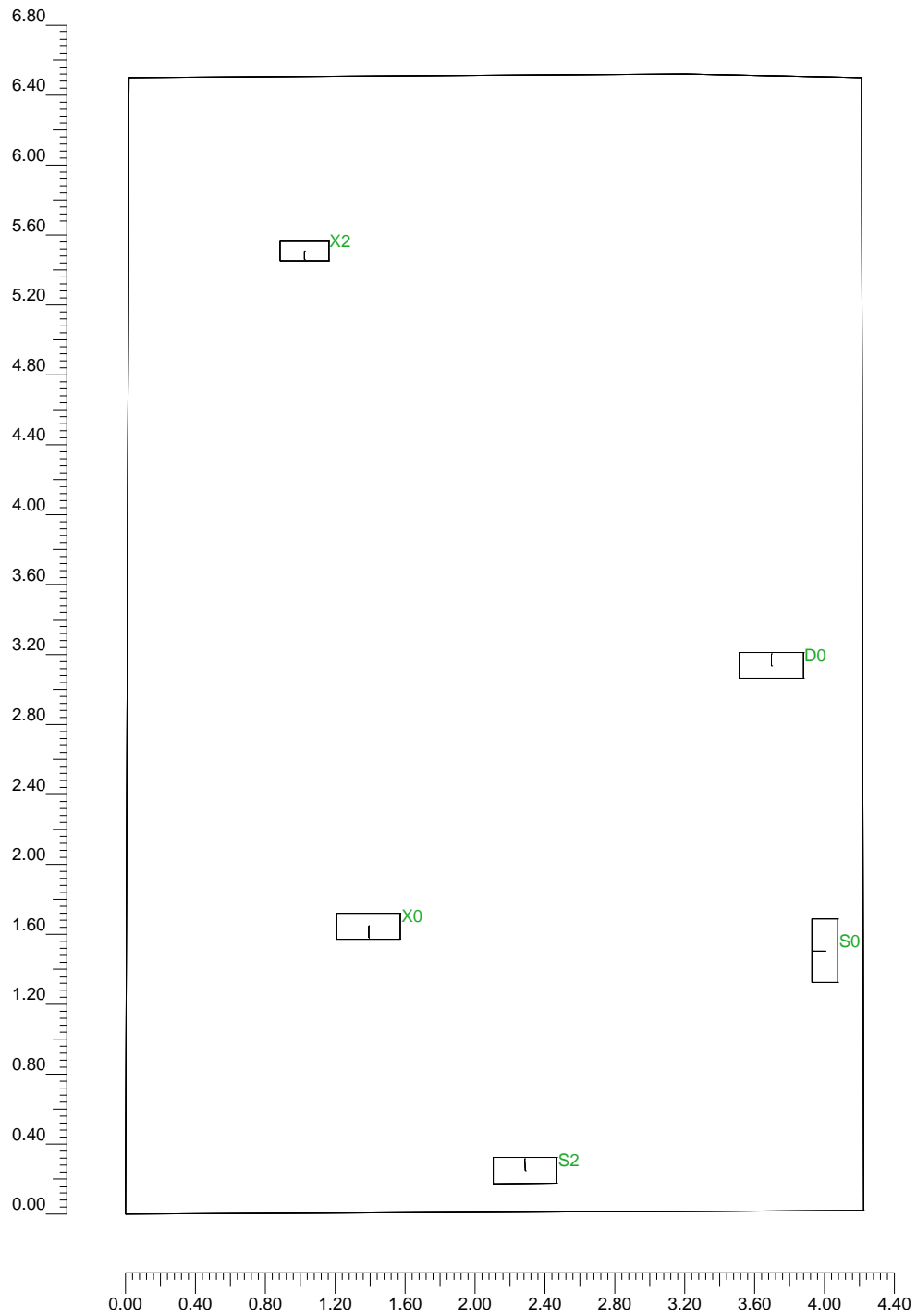
2.1 Working Plane 2D View and Calculation Grid

Scale 1/40



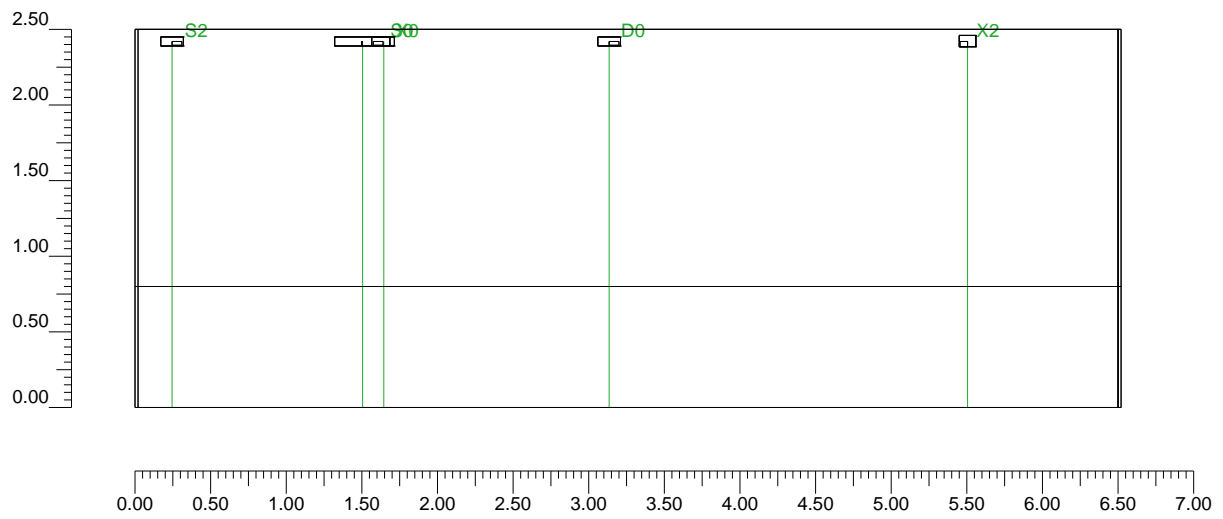
2.2 2D Plane View

Scale 1/40



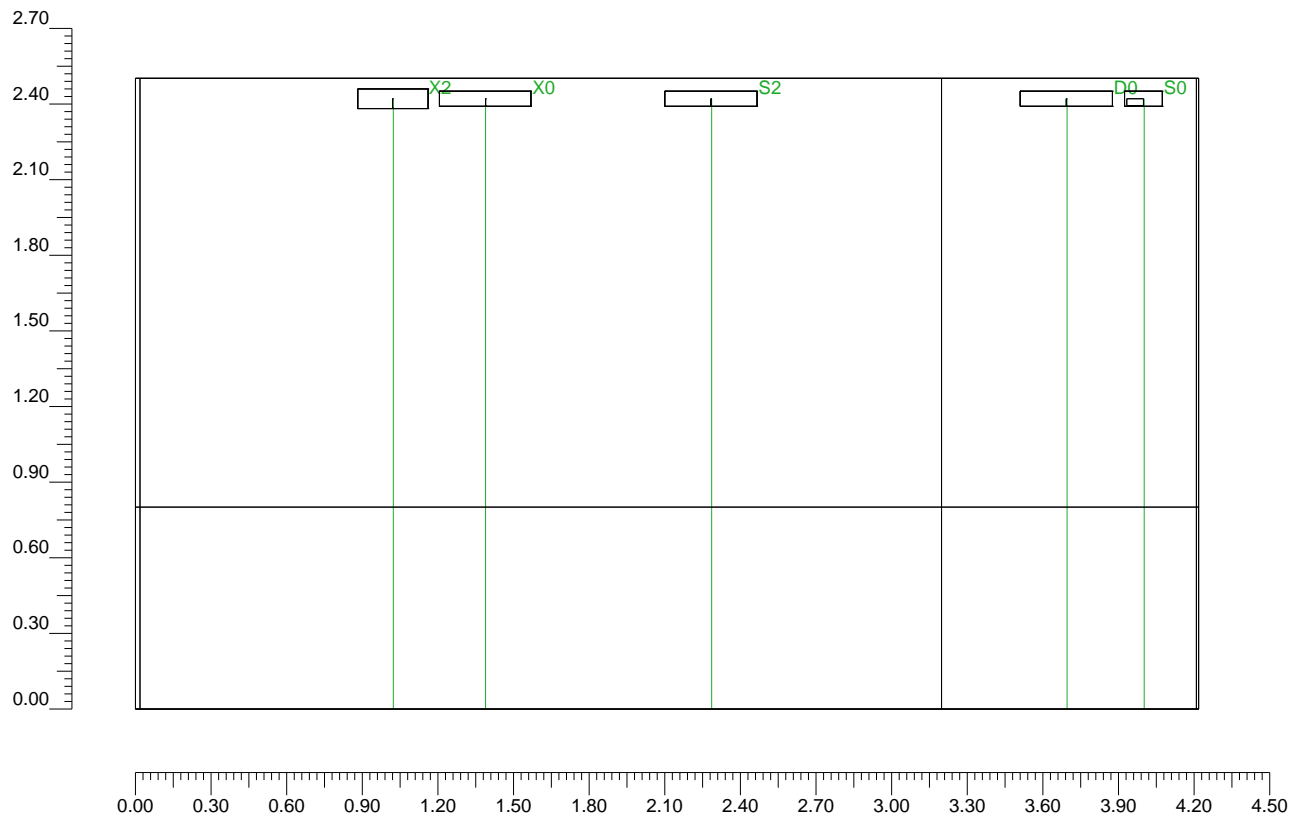
2.3 Lateral View

Scale 1/50



2.4 Front View

Scale 1/30



3.1 Luminaire/Measurements Info

Refer.	Line	Luminaire Name (Measurement Name)	Luminaire Code (Measurement Code)	Luminaires N.	Ref.Lamps	Lamps N.
A	G5	G5 / 500 Lum 1h (LEGR 61833+1SYLV PL-11W/840 (8))	61734 (61734LG)	4	LMP-A	1
B	B44 L.V.S.	B44 L.V.S./ 165 Lum 1h (LEGR 61541+1SYLV F6W/CW (3.6 V))	61552 (61541LG)	1	LMP-B	1

3.2 Lamp Information

Ref.Lamps	Type	Code	Flux lm	Power W	Color K	N.
LMP-A	FDH	11W 61734	515	11	1	4
LMP-B	FDH	6W 61541	165	6	1	1

3.3 Luminaire Table

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	1	X	17.45;21.94;2.42	0.0;0.0;-90.0	61734	1.00	11W 61734	1*515
	2	X	20.06;21.80;2.42	0.0;0.0;-179.9		1.00		
	3	X	18.34;20.55;2.42	0.0;0.0;90.3		1.00		
	4	X	19.75;23.44;2.42	0.0;0.0;90.0		1.00		
B	1	X	17.08;25.81;2.42	0.0;0.0;-90.0	61552	1.00	6W 61541	1*165

3.4 Aiming Summary Table

Mast	Row	Column	Refer. 2D	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Aiming X[m] Y[m] Z[m]	R.Axis °	Coeff. Mant.	Refer.
			X0	X	17.45;21.94;2.42	0.0;0.0;-90.0	17.45;21.94;0.00	-90	1.00	A
			S0	X	20.06;21.80;2.42	0.0;0.0;-179.9	20.06;21.80;0.00	-180	1.00	A
			S2	X	18.34;20.55;2.42	0.0;0.0;90.3	18.34;20.55;0.00	90	1.00	A
			D0	X	19.75;23.44;2.42	0.0;0.0;90.0	19.75;23.44;0.00	90	1.00	A
			X2	X	17.08;25.81;2.42	0.0;0.0;-90.0	17.08;25.81;0.00	-90	1.00	B

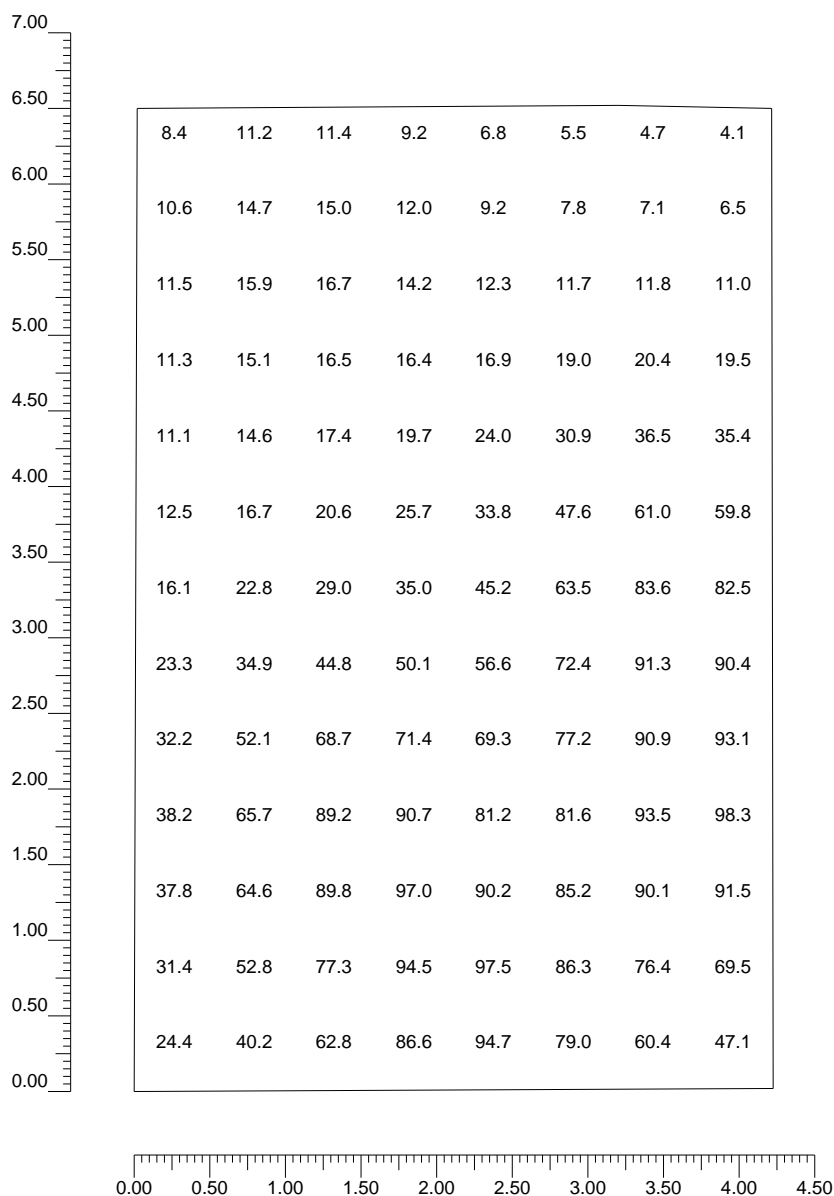
4.1 Horizontal Illuminance Values on the Working Plane

O (x:16.06 y:20.30 z:0.80)	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
DX:0.53 DY:0.50	Horizontal Illuminance (E)	44.4 lux	4.1 lux	98.3 lux	0.09 1:10.72	0.04 1:23.77	0.45 1:2.22

Calculation Type

Only Dir. + Furniture + Shadows

Scale 1/50



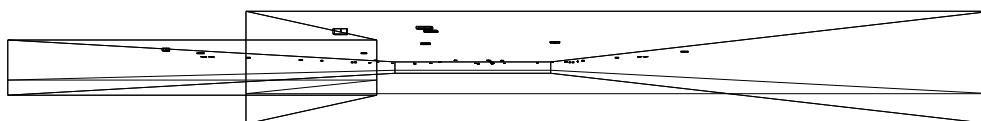
General Information	1
1. Project Data	
1.1 General Notes	2
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block factory

Installation Notes:

Customer: ENDESA
Project Code:
Date: 26/04/2012

Notes:



DESIGNER NAME: LEGRAND GROUP ESPAÑA S.L.
Address: C/Hierro 56 - 28850 Torrejón de Ardoz (Madrid)
Tel.-Fax: Tel.+34/91/6561812 Fax +34/91/6566788

Remarks:

1.1 General Notes

Surface	Dimensions [m]	Angle°	Color	Coefficient Reflectance	Average Illum. [lux]	Ave.Luminance [cd/m²]
Floor	40.00x62.49	Plane	RGB=205,153,95	40%	6.4	0.82
Wall 6	3.00x39.99	180°	RGB=255,249,128	65%	7.5	1.55
Wall 5	3.00x62.46	90°	RGB=255,249,128	65%	6.6	1.36
Wall 4	3.00x19.83	0°	RGB=255,249,128	65%	6.0	1.24
Wall 3	3.00x7.64	-90°	RGB=255,249,128	65%	5.6	1.15
Wall 2	3.00x20.19	0°	RGB=255,249,128	65%	1.4	0.29
Wall 1	3.00x54.85	-90°	RGB=255,249,128	65%	8.5	1.75
Ceiling	40.00x62.49	Plane	RGB=255,255,255	80%	0.5	0.13

Dimensions of Room Bounding Box [m]: 40.00x62.49x3.00
 Calculation Points Grid of Bounding Box [m]: direction X 0.50 - Y 0.50 - Z 0.50

1.2 Energy Calculation (Working Plane)

Area	2344.10 m2
Average Illuminance	6.71 lx
Specific Power	0.22 W/m2
Lighting Engineering Specific Power	3.22 W/(m2 * 100lx)
Energy Efficiency	31.08 (m2*lx)/W
Total Power Used	506.00 W

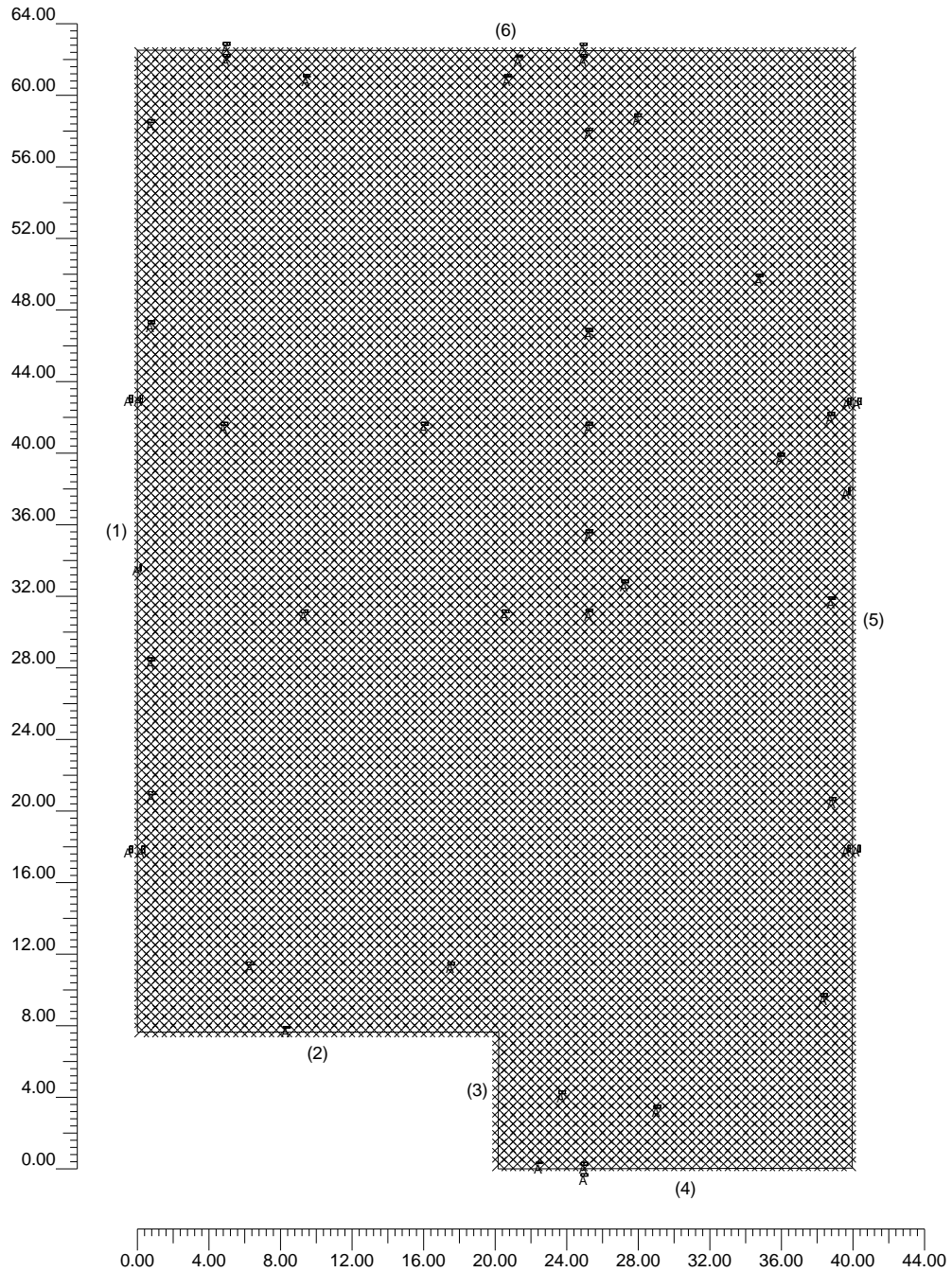
1.3 Uniformity Installation Parameters

Surface	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
Working Plane (h=0.80 m)	Horizontal Illuminance (E)	6.7 lux	0.1 lux	96.4 lux	0.01	0.00	0.07
					1:125.18	1:1797.85	1:14.36
Floor	Horizontal Illuminance (E)	6.4 lux	0.1 lux	53.0 lux	0.02	0.00	0.12
					1:55.05	1:455.62	1:8.28

Calculation Type Only Dir. + Furniture + Shadows

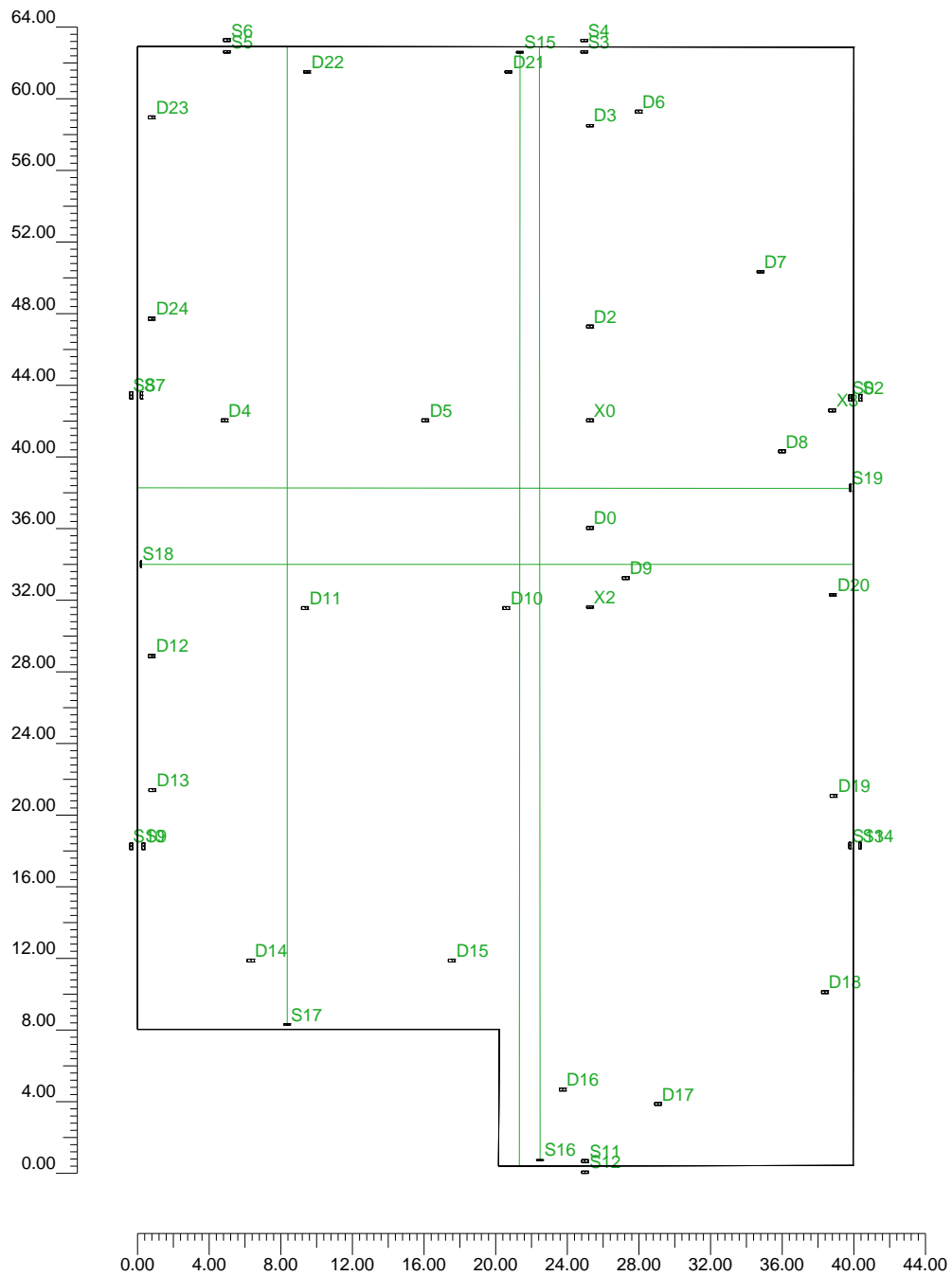
2.1 Working Plane 2D View and Calculation Grid

Scale 1/400



2.2 2D Plane View

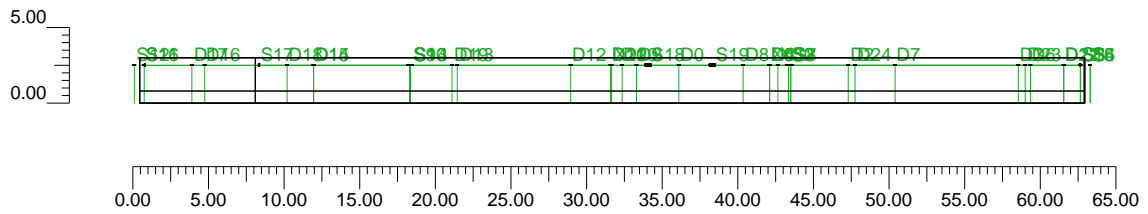
Scale 1/400



2.3 Lateral View

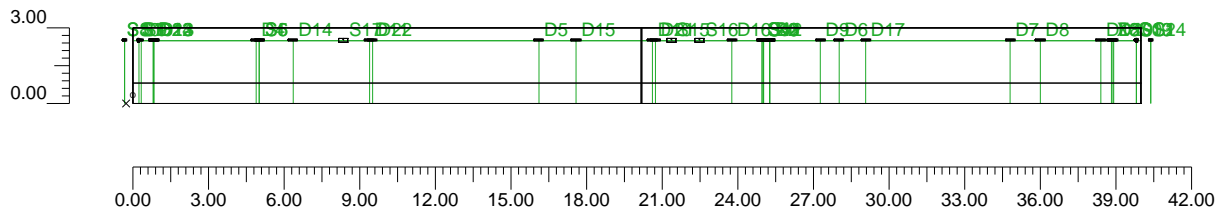
Scale 1/500

x°



2.4 Front View

Scale 1/300



3.1 Luminaire/Measurements Info

Refer.	Line	Luminaire Name (Measurement Name)	Luminaire Code (Measurement Code)	Luminaires N.	Ref.Lamps	Lamps N.
A	G5	G5 / 500 Lum 1h (LEGR 61833+1SYLV PL-11W/840 (8))	61734 (61734LG)	46	LMP-A	1

3.2 Lamp Information

Ref.Lamps	Type	Code	Flux lm	Power W	Color K	N.
LMP-A	FDH	11W 61734	515	11	1	46

3.3 Luminaire Table

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	1	X	25.54;61.93;2.50	0.0;0.0;-90.0	61734	1.00	11W 61734	1*515
	2	X	25.54;51.52;2.50	0.0;0.0;-90.0		1.00		
	3	X	39.10;62.50;2.50	0.0;0.0;-90.0		1.00		
	4	X	40.09;63.18;2.50	0.0;0.0;180.0		1.00		
	5	X	40.65;63.18;2.50	0.0;0.0;-0.0		1.00		
	6	X	25.23;82.52;2.50	0.0;0.0;-90.0		1.00		
	7	X	25.23;83.16;2.50	0.0;0.0;90.0		1.00		
	8	X	5.29;82.52;2.50	0.0;0.0;-90.0		1.00		
	9	X	5.29;83.17;2.50	0.0;0.0;90.0		1.00		
	10	X	0.52;63.34;2.50	0.0;0.0;-0.0		1.00		
	11	X	-0.07;63.34;2.50	0.0;0.0;180.0		1.00		
	12	X	0.61;38.16;2.50	0.0;0.0;-0.0		1.00		
	13	X	-0.07;38.16;2.50	0.0;0.0;180.0		1.00		
	14	X	25.28;20.58;2.50	0.0;0.0;90.0		1.00		
	15	X	25.28;19.96;2.50	0.0;0.0;-90.0		1.00		
	16	X	40.08;38.20;2.50	0.0;0.0;180.0		1.00		
	17	X	40.64;38.20;2.50	0.0;0.0;-0.0		1.00		
	18	X	21.64;82.49;2.50	-90.0;-90.0;0.0		1.00		
	19	X	22.76;20.63;2.50	90.0;-90.0;0.0		1.00		
	20	X	8.64;28.21;2.50	90.0;-90.0;0.0		1.00		
	21	X	0.48;53.93;2.50	-0.0;-90.0;0.0		1.00		
	22	X	40.10;58.18;2.50	180.0;-90.0;0.0		1.00		
	23	X	25.54;55.94;2.50	0.0;0.0;90.0		1.00		
	24	X	25.54;67.17;2.50	0.0;0.0;90.0		1.00		
	25	X	25.54;78.40;2.50	0.0;0.0;90.0		1.00		
	26	X	5.15;61.93;2.50	0.0;0.0;90.0		1.00		
	27	X	16.38;61.93;2.50	0.0;0.0;90.0		1.00		
	28	X	28.28;79.18;2.50	0.0;0.0;90.0		1.00		
	29	X	35.08;70.24;2.50	0.0;0.0;90.0		1.00		
	30	X	36.27;60.21;2.50	0.0;0.0;90.0		1.00		
	31	X	27.55;53.14;2.50	0.0;0.0;90.0		1.00		
	32	X	20.88;51.45;2.50	0.0;0.0;90.0		1.00		
	33	X	9.65;51.45;2.50	0.0;0.0;90.0		1.00		
	34	X	1.09;48.79;2.50	0.0;0.0;90.0		1.00		
	35	X	1.12;41.30;2.50	0.0;0.0;90.0		1.00		
	36	X	6.62;31.78;2.50	0.0;0.0;90.0		1.00		
	37	X	17.85;31.78;2.50	0.0;0.0;90.0		1.00		
	38	X	24.03;24.59;2.50	0.0;0.0;90.0		1.00		
	39	X	29.35;23.77;2.50	0.0;0.0;90.0		1.00		
	40	X	38.67;30.03;2.50	0.0;0.0;90.0		1.00		
	41	X	39.18;40.97;2.50	0.0;0.0;90.0		1.00		
	42	X	39.14;52.20;2.50	0.0;0.0;90.0		1.00		
	43	X	21.00;81.40;2.50	0.0;0.0;90.0		1.00		
	44	X	9.77;81.40;2.50	0.0;0.0;90.0		1.00		

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	45	X	1.09;78.85;2.50	0.0;0.0;90.0	61734	1.00	11W 61734	1*515
	46	X	1.09;67.62;2.50	0.0;0.0;90.0		1.00		

3.4 Aiming Summary Table

Mast	Row	Column	Refer. 2D	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Aiming X[m] Y[m] Z[m]	R.Axis °	Coeff. Mant.	Refer.
			X0	X	25.54;61.93;2.50	0.0;0.0;-90.0	25.54;61.93;0.00	-90	1.00	A
			X2	X	25.54;51.52;2.50	0.0;0.0;-90.0	25.54;51.52;0.00	-90	1.00	A
			X3	X	39.10;62.50;2.50	0.0;0.0;-90.0	39.10;62.50;0.00	-90	1.00	A
			S0	X	40.09;63.18;2.50	0.0;0.0;180.0	40.09;63.18;0.00	180	1.00	A
			S2	X	40.65;63.18;2.50	0.0;0.0;-0.0	40.65;63.18;0.00	90	1.00	A
			S3	X	25.23;82.52;2.50	0.0;0.0;-90.0	25.23;82.52;0.00	-90	1.00	A
			S4	X	25.23;83.16;2.50	0.0;0.0;90.0	25.23;83.16;0.00	-90	1.00	A
			S5	X	5.29;82.52;2.50	0.0;0.0;-90.0	5.29;82.52;0.00	-90	1.00	A
			S6	X	5.29;83.17;2.50	0.0;0.0;90.0	5.29;83.17;0.00	-176	1.00	A
			S7	X	0.52;63.34;2.50	0.0;0.0;-0.0	0.52;63.34;0.00	-0	1.00	A
			S8	X	-0.07;63.34;2.50	0.0;0.0;180.0	-0.07;63.34;0.00	-90	1.00	A
			S9	X	0.61;38.16;2.50	0.0;0.0;-0.0	0.61;38.16;0.00	-0	1.00	A
			S10	X	-0.07;38.16;2.50	0.0;0.0;180.0	-0.07;38.16;0.00	180	1.00	A
			S11	X	25.28;20.58;2.50	0.0;0.0;90.0	25.28;20.58;0.00	90	1.00	A
			S12	X	25.28;19.96;2.50	0.0;0.0;-90.0	25.28;19.96;0.00	90	1.00	A
			S13	X	40.08;38.20;2.50	0.0;0.0;180.0	40.08;38.20;0.00	180	1.00	A
			S14	X	40.64;38.20;2.50	0.0;0.0;-0.0	40.64;38.20;0.00	-0	1.00	A
			S15	X	21.64;82.49;2.50	-90.0;-90.0;0.0	21.61;20.32;2.50	0	1.00	A
			S16	X	22.76;20.63;2.50	90.0;-90.0;0.0	22.73;82.80;2.50	-0	1.00	A
			S17	X	8.64;28.21;2.50	90.0;-90.0;0.0	8.64;82.81;2.50	-0	1.00	A
			S18	X	0.48;53.93;2.50	-0.0;-90.0;0.0	40.28;53.92;2.50	0	1.00	A
			S19	X	40.10;58.18;2.50	180.0;-90.0;0.0	0.30;58.19;2.50	-0	1.00	A
			D0	X	25.54;55.94;2.50	0.0;0.0;90.0	25.54;55.94;0.00	90	1.00	A
			D2	X	25.54;67.17;2.50	0.0;0.0;90.0	25.54;67.17;0.00	90	1.00	A
			D3	X	25.54;78.40;2.50	0.0;0.0;90.0	25.54;78.40;0.00	90	1.00	A
			D4	X	5.15;61.93;2.50	0.0;0.0;90.0	5.15;61.93;0.00	90	1.00	A
			D5	X	16.38;61.93;2.50	0.0;0.0;90.0	16.38;61.93;0.00	90	1.00	A
			D6	X	28.28;79.18;2.50	0.0;0.0;90.0	28.28;79.18;0.00	90	1.00	A
			D7	X	35.08;70.24;2.50	0.0;0.0;90.0	35.08;70.24;0.00	90	1.00	A
			D8	X	36.27;60.21;2.50	0.0;0.0;90.0	36.27;60.21;0.00	90	1.00	A
			D9	X	27.55;53.14;2.50	0.0;0.0;90.0	27.55;53.14;0.00	90	1.00	A
			D10	X	20.88;51.45;2.50	0.0;0.0;90.0	20.88;51.45;0.00	90	1.00	A
			D11	X	9.65;51.45;2.50	0.0;0.0;90.0	9.65;51.45;0.00	90	1.00	A
			D12	X	1.09;48.79;2.50	0.0;0.0;90.0	1.09;48.79;0.00	90	1.00	A
			D13	X	1.12;41.30;2.50	0.0;0.0;90.0	1.12;41.30;0.00	90	1.00	A
			D14	X	6.62;31.78;2.50	0.0;0.0;90.0	6.62;31.78;0.00	90	1.00	A
			D15	X	17.85;31.78;2.50	0.0;0.0;90.0	17.85;31.78;0.00	90	1.00	A
			D16	X	24.03;24.59;2.50	0.0;0.0;90.0	24.03;24.59;0.00	90	1.00	A
			D17	X	29.35;23.77;2.50	0.0;0.0;90.0	29.35;23.77;0.00	90	1.00	A
			D18	X	38.67;30.03;2.50	0.0;0.0;90.0	38.67;30.03;0.00	90	1.00	A
			D19	X	39.18;40.97;2.50	0.0;0.0;90.0	39.18;40.97;0.00	90	1.00	A
			D20	X	39.14;52.20;2.50	0.0;0.0;90.0	39.14;52.20;0.00	90	1.00	A
			D21	X	21.00;81.40;2.50	0.0;0.0;90.0	21.00;81.40;0.00	90	1.00	A
			D22	X	9.77;81.40;2.50	0.0;0.0;90.0	9.77;81.40;0.00	90	1.00	A
			D23	X	1.09;78.85;2.50	0.0;0.0;90.0	1.09;78.85;0.00	90	1.00	A
			D24	X	1.09;67.62;2.50	0.0;0.0;90.0	1.09;67.62;0.00	90	1.00	A

4.1 Horizontal Illuminance Values on the Working Plane

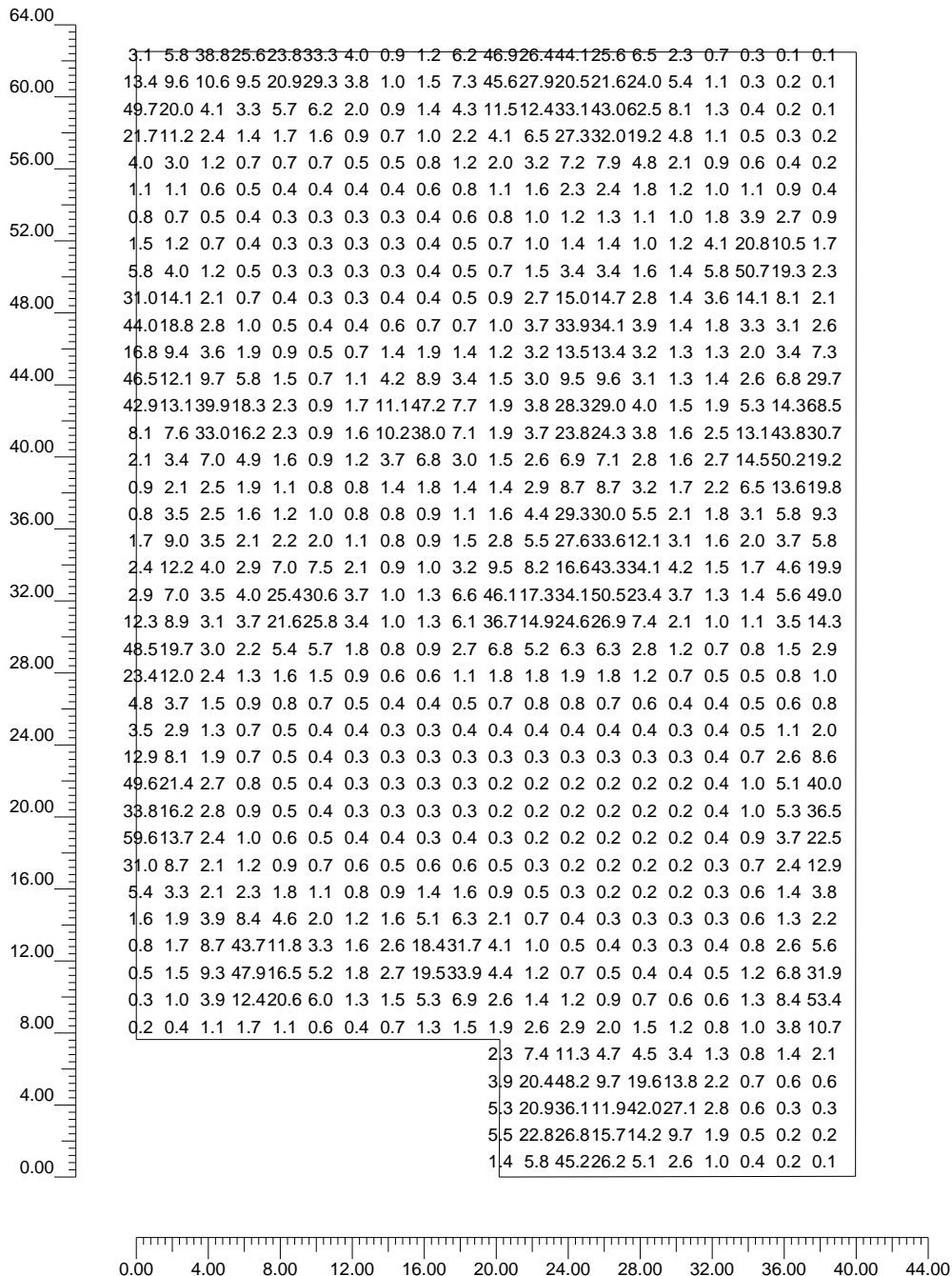
O (x:0.29 y:20.32 z:0.80)	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
DX:0.50 DY:0.50	Horizontal Illuminance (E)	6.7 lux	0.1 lux	96.4 lux	0.01 1:125.18	0.00 1:1797.85	0.07 1:14.36

Calculation Type

Only Dir. + Furniture + Shadows

Scale 1/400

Not all the calculated points are visible



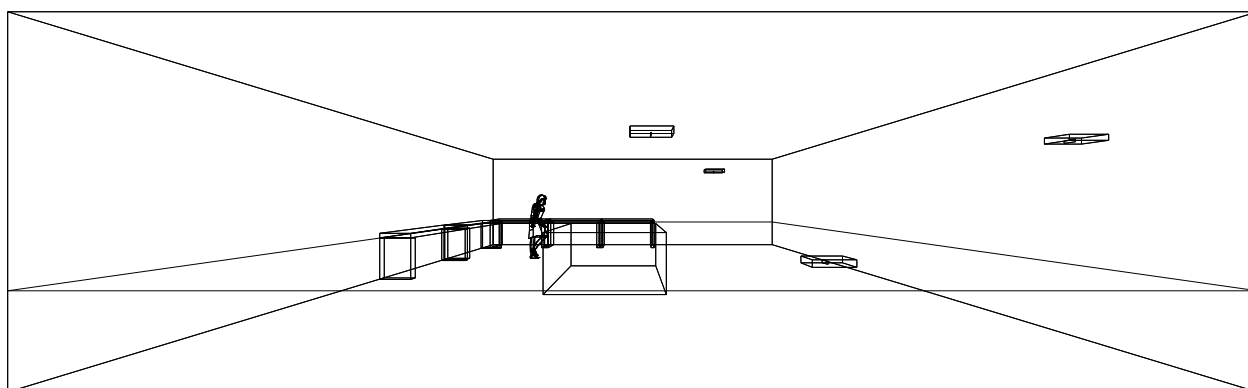
General Information	1
1. Project Data	
1.1 General Notes	2
1.2 Energy Calculation	2
1.3 Uniformity Installation Parameters	2
2. Project Views	
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block factory

Installation Notes:

Customer: ENDESA
Project Code:
Date: 23/04/2012

Notes:
f



DESIGNER NAME: LEGRAND GROUP ESPAÑA S.L.
Address: C/Hierro 56 - 28850 Torrejón de Ardoz (Madrid)
Tel.-Fax: Tel.+34/91/6561812 Fax +34/91/6566788

Remarks:
f

1.1 General Notes

Surface	Dimensions [m]	Angle°	Color	Coefficient Reflectance	Average Illum. [lux]	Ave.Luminance [cd/m²]
Floor	-	Plane	RGB=205,153,95	40%	-	-
Wall 4	-	180°	RGB=255,249,128	65%	-	-
Wall 3	-	90°	RGB=255,249,128	65%	-	-
Wall 2	-	0°	RGB=255,249,128	65%	-	-
Wall 1	-	-90°	RGB=255,249,128	65%	-	-
Ceiling	-	Plane	RGB=255,255,255	80%	-	-

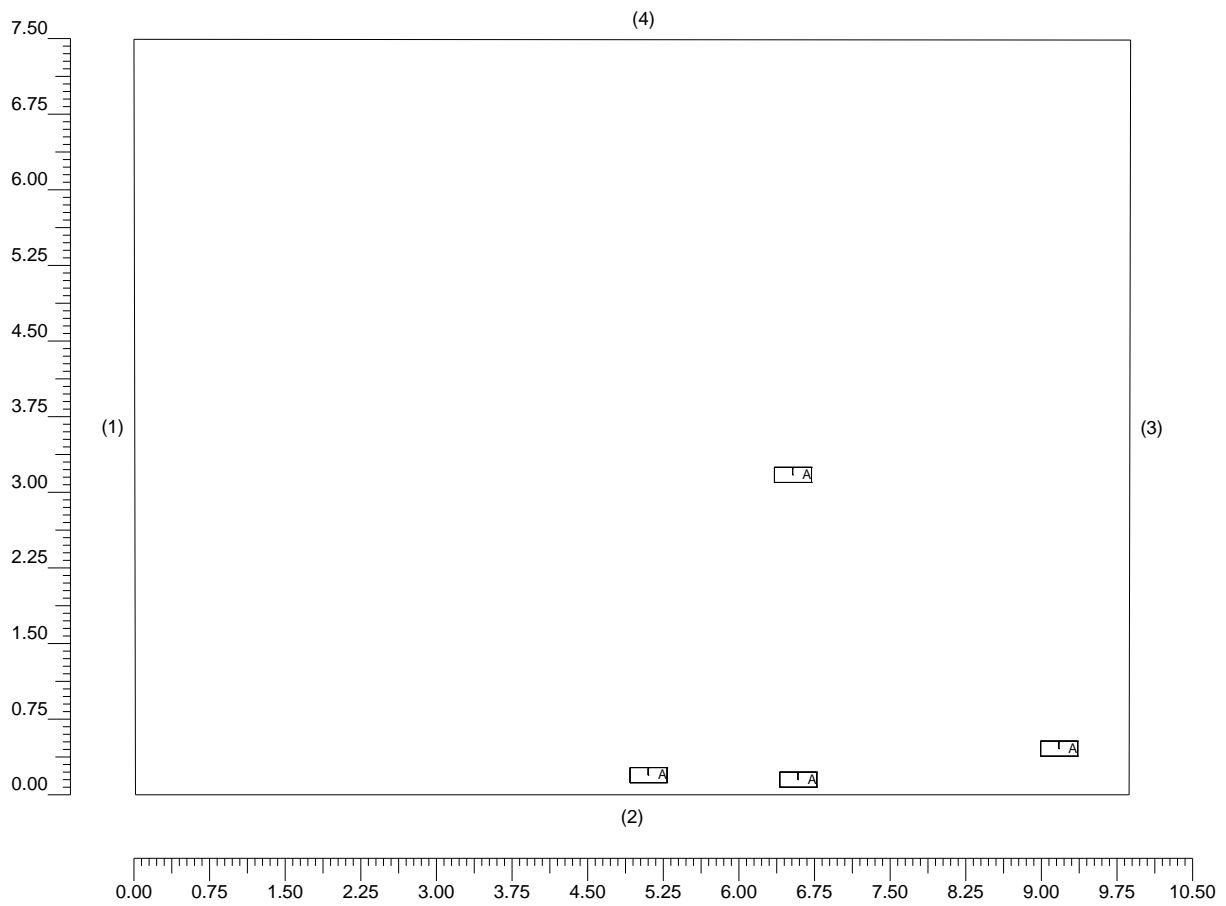
Dimensions of Room Bounding Box [m]: 9.88x7.49x3.00

1.2 Energy Calculation (Working Plane)

Area	73.88 m2
Average Illuminance	0.00 lx
Specific Power	0.60 W/m2
Lighting Engineering Specific Power	- W/(m2 * 100lx)
Energy Efficiency	0.00 (m2*lx)/W
Total Power Used	44.00 W

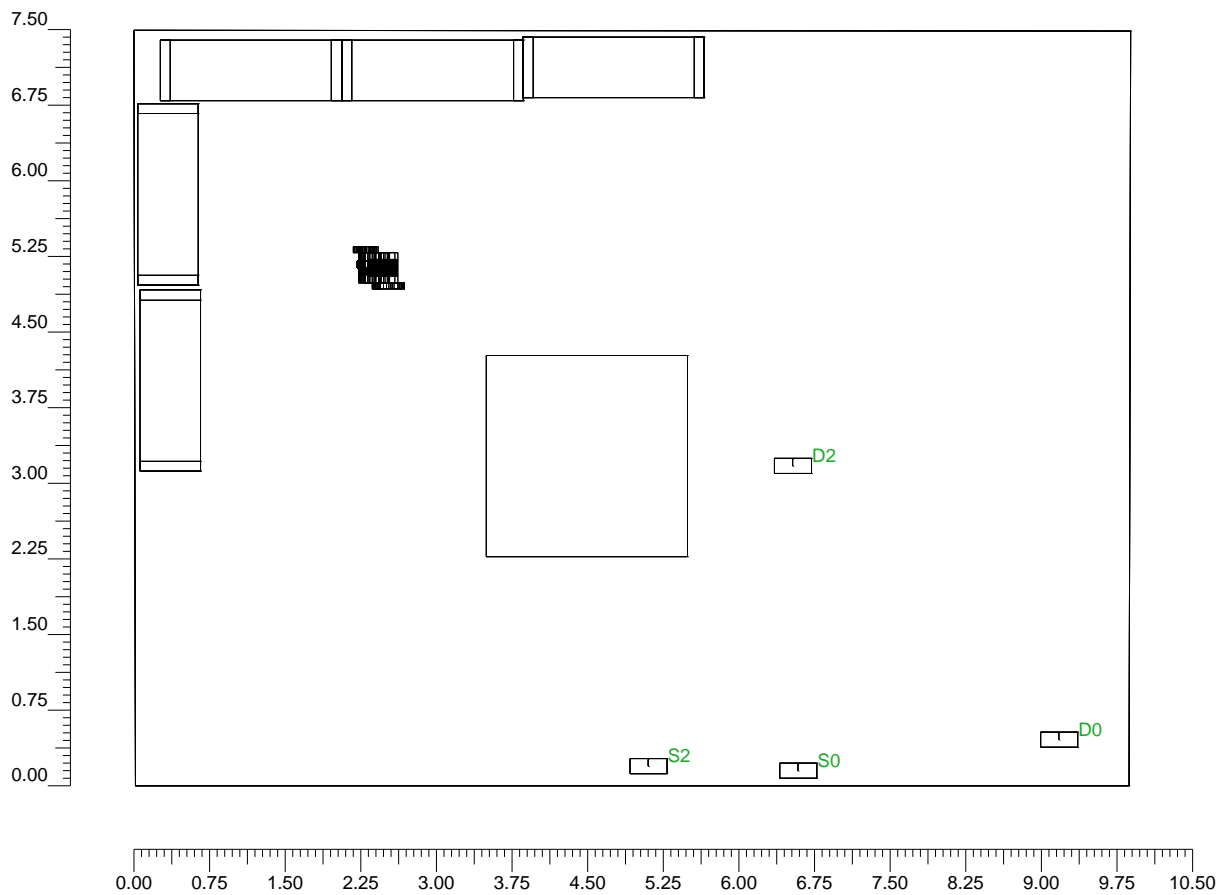
2.1 Working Plane 2D View and Calculation Grid

Scale 1/75



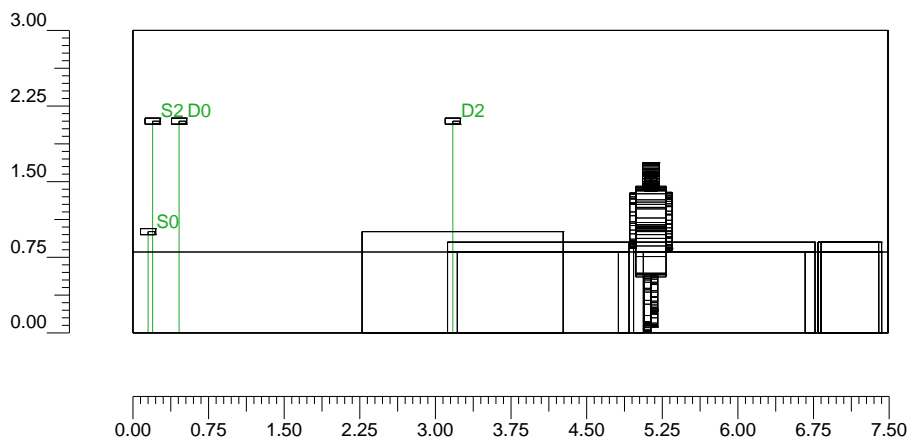
2.2 2D Plane View

Scale 1/75



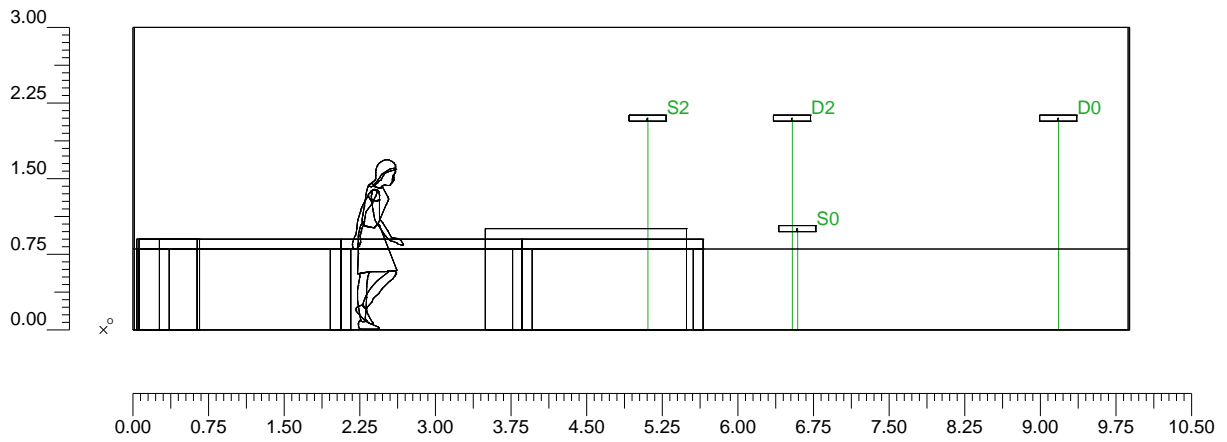
2.3 Lateral View

Scale 1/75



2.4 Front View

Scale 1/75



3.1 Luminaire/Measurements Info

Refer.	Line	Luminaire Name (Measurement Name)	Luminaire Code (Measurement Code)	Luminaires N.	Ref.Lamps	Lamps N.
A	G5	G5 / 500 Lum 1h (LEGR 61833+1SYLV PL-11W/840 (8))	61734 (61734LG)	4	LMP-A	1

3.2 Lamp Information

Ref.Lamps	Type	Code	Flux lm	Power W	Color K	N.
LMP-A	FDH	11W 61734	515	11	1	4

3.3 Luminaire Table

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	1	X	6.88;20.46;1.00	0.0;0.0;90.0	61734	1.00	11W 61734	1*515
	2	X	5.40;20.50;2.10	0.0;0.0;90.0		1.00		
	3	X	9.47;20.76;2.10	0.0;0.0;90.0		1.00		
	4	X	6.83;23.48;2.10	0.0;0.0;90.0		1.00		

3.4 Aiming Summary Table

Mast	Row	Column	Refer. 2D	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Aiming X[m] Y[m] Z[m]	R.Axis °	Coeff. Mant.	Refer.
			S0	X	6.88;20.46;1.00	0.0;0.0;90.0	6.88;20.46;0.00	90	1.00	A
			S2	X	5.40;20.50;2.10	0.0;0.0;90.0	5.40;20.50;0.00	90	1.00	A
			D0	X	9.47;20.76;2.10	0.0;0.0;90.0	9.47;20.76;0.00	90	1.00	A
			D2	X	6.83;23.48;2.10	0.0;0.0;90.0	6.83;23.48;0.00	90	1.00	A

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block factory

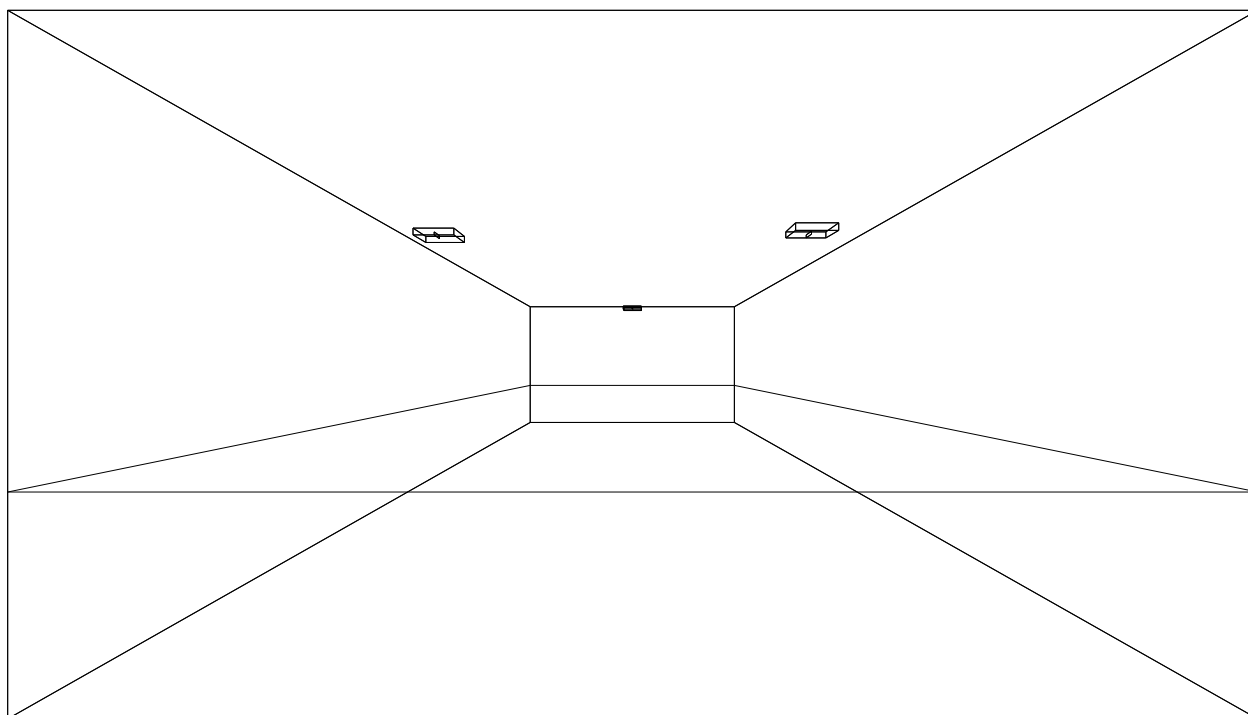
Installation Notes:

Customer: ENDESA

Project Code:

Date: 26/04/2012

Notes:



DESIGNER NAME: LEGRAND GROUP ESPAÑA S.L.
Address: C/Hierro 56 - 28850 Torrejón de Ardoz (Madrid)
Tel.-Fax: Tel.+34/91/6561812 Fax +34/91/6566788

Remarks:

1.1 General Notes

Surface	Dimensions [m]	Angle°	Color	Coefficient Reflectance	Average Illum. [lux]	Ave.Luminance [cd/m²]
Floor	4.90x4.41	Plane	RGB=205,153,95	40%	28.7	3.65
Wall 4	2.50x4.39	-180°	RGB=255,249,128	65%	34.6	7.15
Wall 3	2.50x4.90	90°	RGB=255,249,128	65%	19.8	4.09
Wall 2	2.50x4.41	0°	RGB=255,249,128	65%	15.2	3.14
Wall 1	2.50x4.90	-90°	RGB=255,249,128	65%	23.0	4.76
Ceiling	4.41x4.90	Plane	RGB=255,255,255	80%	0.0	0.01

Dimensions of Room Bounding Box [m]: 4.41x4.90x2.50
 Calculation Points Grid of Bounding Box [m]: direction X 0.49 - Y 0.49 - Z 0.50

1.2 Energy Calculation (Working Plane)

Area	21.56 m2
Average Illuminance	37.27 lx
Specific Power	1.53 W/m2
Lighting Engineering Specific Power	4.11 W/(m2 * 100lx)
Energy Efficiency	24.35 (m2*lx)/W
Total Power Used	33.00 W

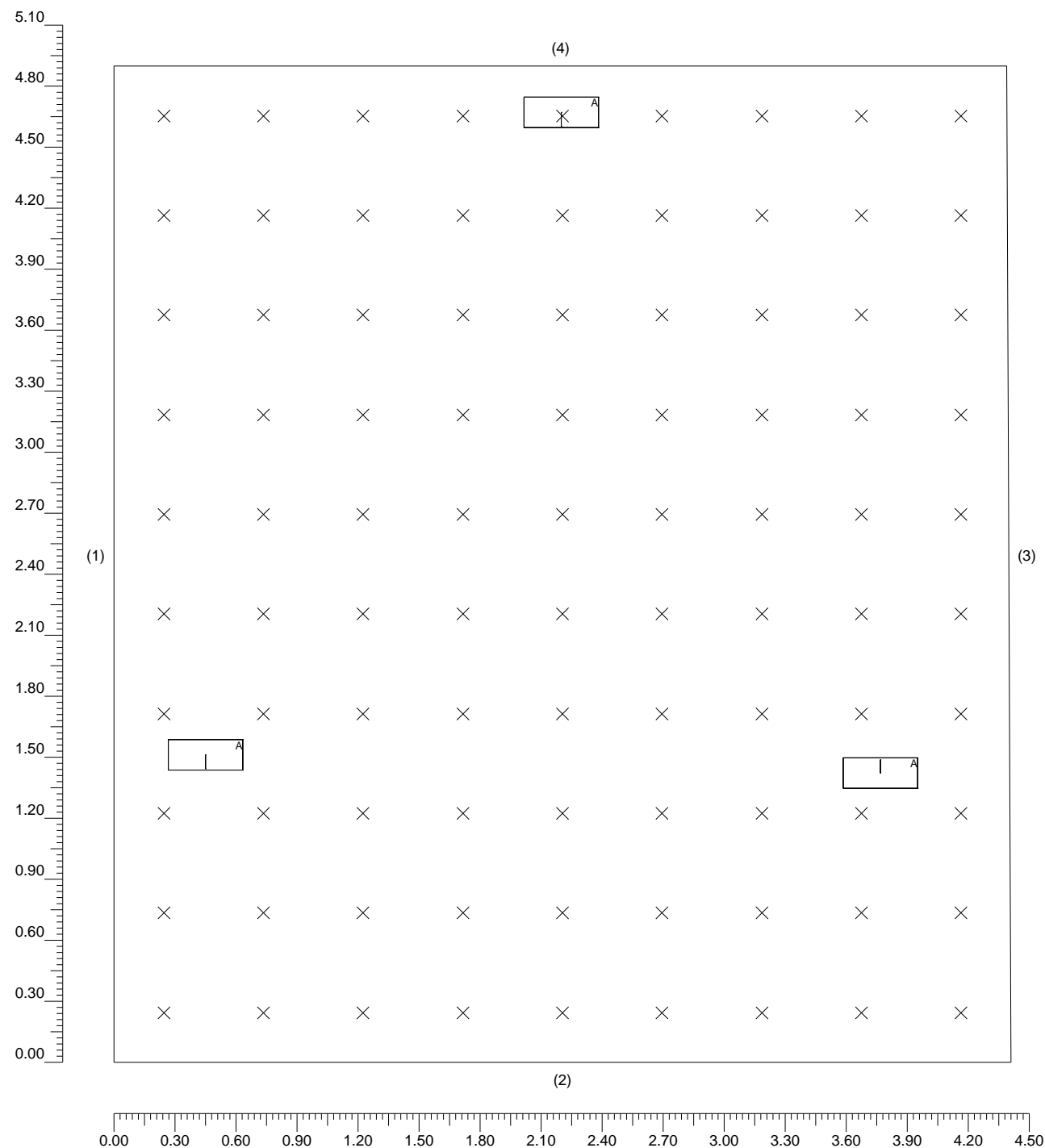
1.3 Uniformity Installation Parameters

Surface	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
Working Plane (h=0.80 m)	Horizontal Illuminance (E)	37.3 lux	12.9 lux	71.7 lux	0.35	0.18	0.52
Floor	Horizontal Illuminance (E)	28.7 lux	15.2 lux	37.2 lux	1:2.89	1:5.56	1:1.92
					1:1.88	1:2.45	1:1.30

Calculation Type Only Dir. + Furniture + Shadows

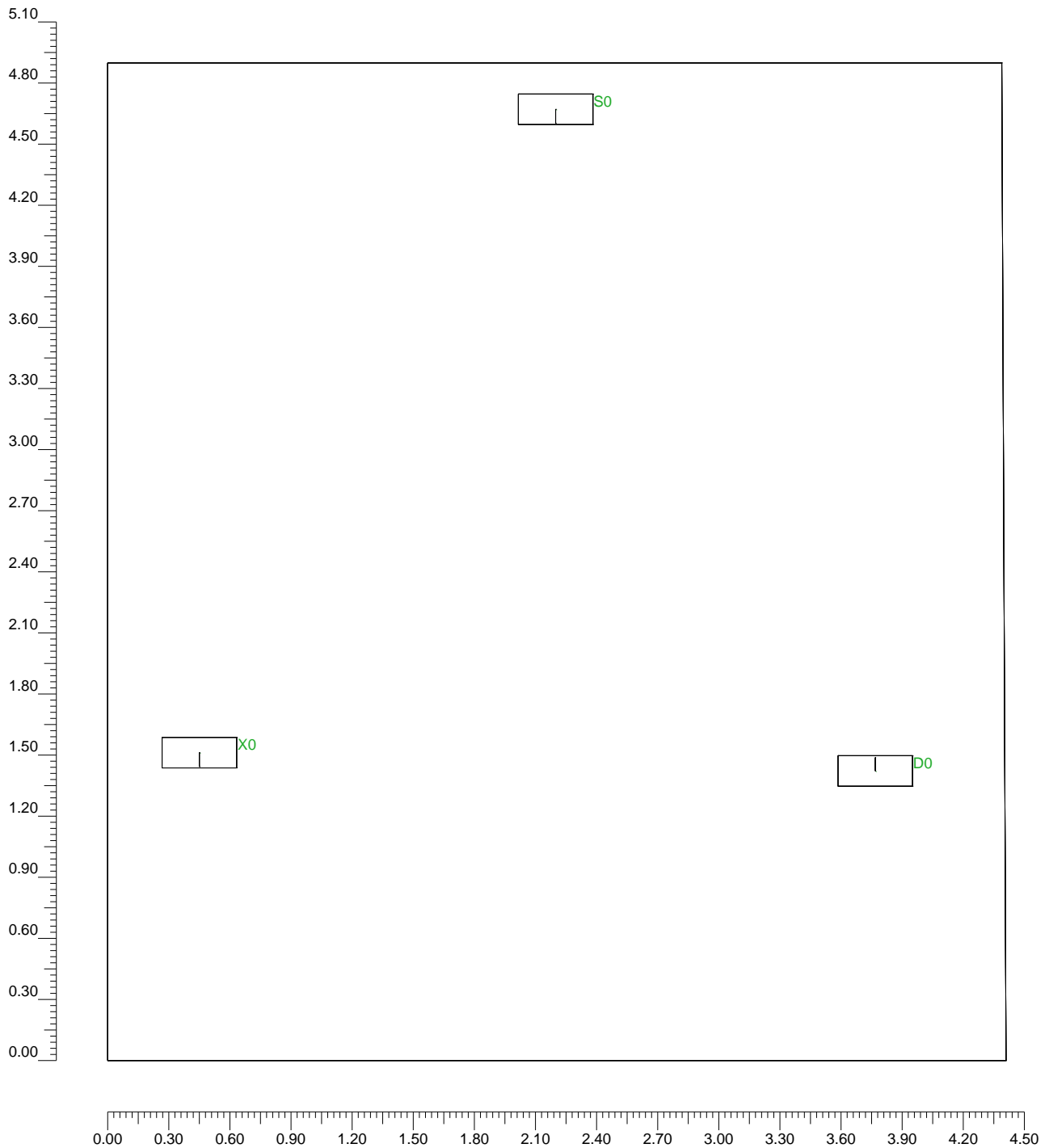
2.1 Working Plane 2D View and Calculation Grid

Scale 1/30



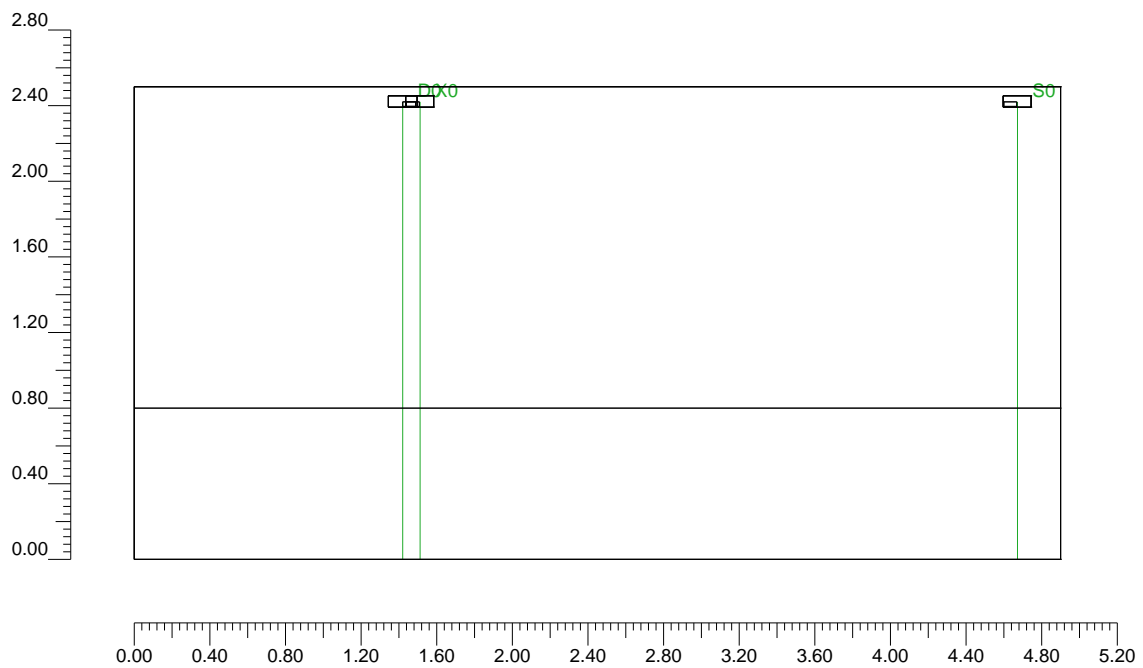
2.2 2D Plane View

Scale 1/30



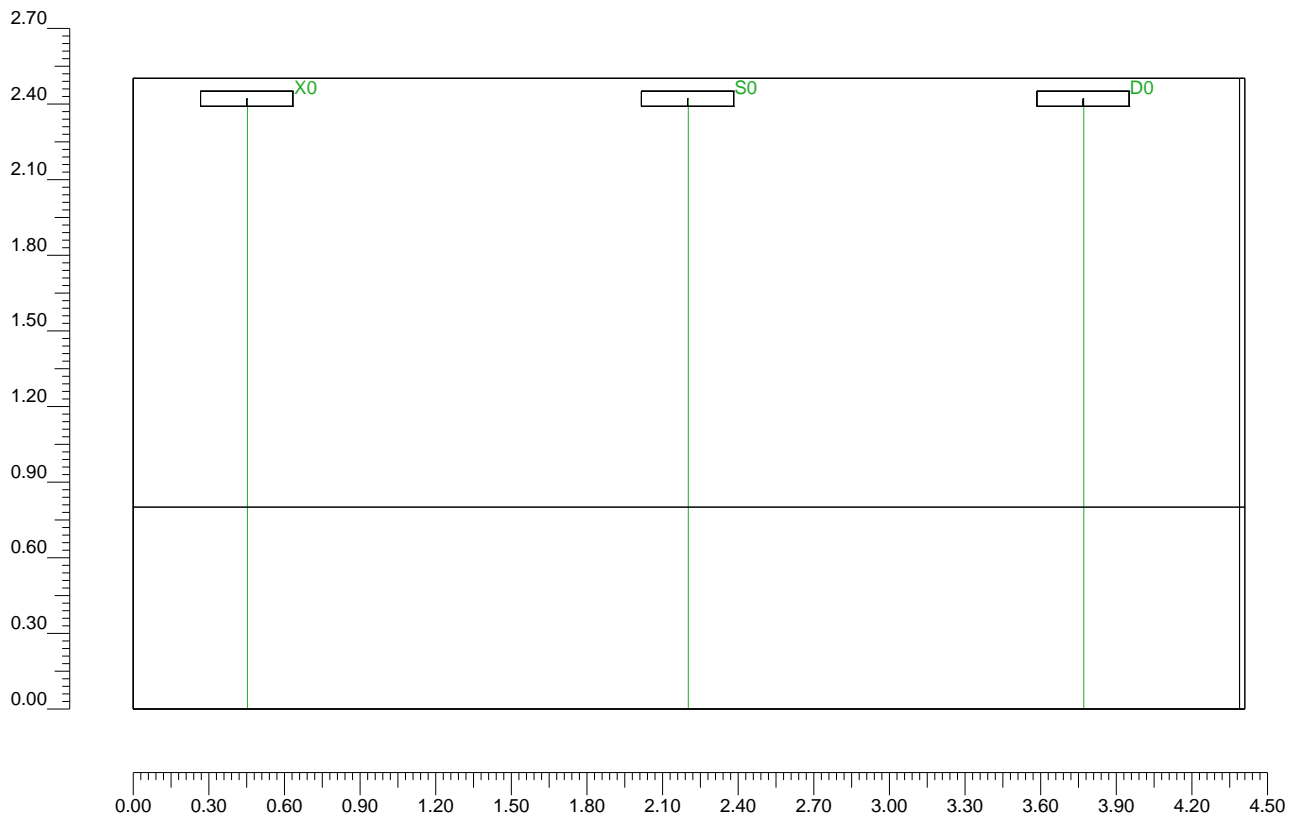
2.3 Lateral View

Scale 1/40



2.4 Front View

Scale 1/30



3.1 Luminaire/Measurements Info

Refer.	Line	Luminaire Name (Measurement Name)	Luminaire Code (Measurement Code)	Luminaires N.	Ref.Lamps	Lamps N.
A	G5	G5 / 500 Lum 1h (LEGR 61833+1SYLV PL-11W/840 (8))	61734 (61734LG)	3	LMP-A	1

3.2 Lamp Information

Ref.Lamps	Type	Code	Flux lm	Power W	Color K	N.
LMP-A	FDH	11W 61734	515	11	1	3

3.3 Luminaire Table

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	1	X	16.34;123.35;2.42	0.0;0.0;-90.0	61734	1.00	11W 61734	1*515
	2	X	18.09;126.51;2.42	0.0;0.0;-90.0		1.00		
	3	X	19.66;123.26;2.42	0.0;0.0;90.0		1.00		

3.4 Aiming Summary Table

Mast	Row	Column	Refer. 2D	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Aiming X[m] Y[m] Z[m]	R.Axis °	Coeff. Mant.	Refer.
			X0	X	16.34;123.35;2.42	0.0;0.0;-90.0	16.34;123.35;0.00	-90	1.00	A
			S0	X	18.09;126.51;2.42	0.0;0.0;-90.0	18.09;126.51;0.00	-90	1.00	A
			D0	X	19.66;123.26;2.42	0.0;0.0;90.0	19.66;123.26;0.00	90	1.00	A

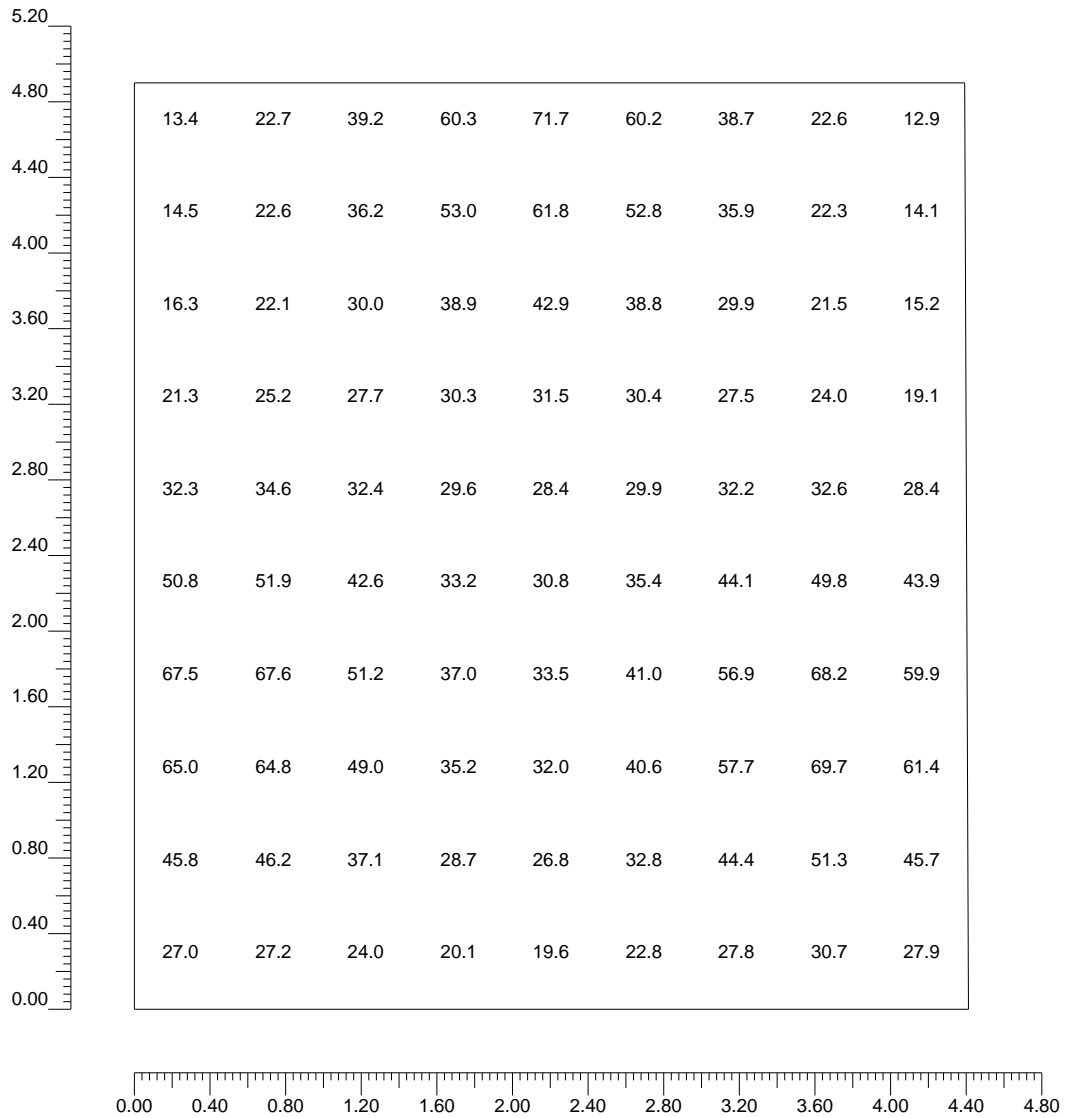
4.1 Horizontal Illuminance Values on the Working Plane

O (x:15.89 y:126.74 z:0.80)	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
DX:0.49 DY:0.49	Horizontal Illuminance (E)	37.3 lux	12.9 lux	71.7 lux	0.35 1:2.89	0.18 1:5.56	0.52 1:1.92

Calculation Type

Only Dir. + Furniture + Shadows

Scale 1/40



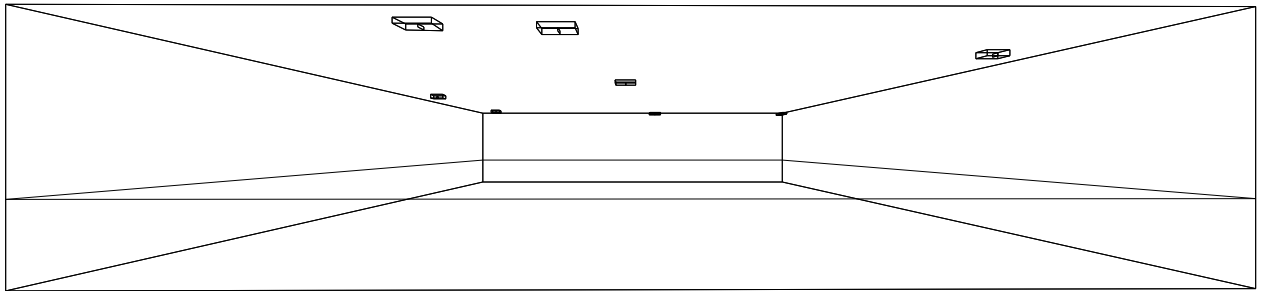
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block factory

Installation Notes:

Customer: ENDESA
Project Code:
Date: 26/04/2012

Notes:



DESIGNER NAME: LEGRAND GROUP ESPAÑA S.L.
Address: C/Hierro 56 - 28850 Torrejón de Ardoz (Madrid)
Tel.-Fax: Tel.+34/91/6561812 Fax +34/91/6566788

Remarks:

1.1 General Notes

Surface	Dimensions [m]	Angle°	Color	Coefficient Reflectance	Average Illum. [lux]	Ave.Luminance [cd/m²]
Floor	10.99x7.53	Plane	RGB=205,153,95	40%	18.8	2.39
Wall 4	2.50x10.88	180°	RGB=255,249,128	65%	18.6	3.86
Wall 3	2.50x7.46	90°	RGB=255,249,128	65%	17.3	3.57
Wall 2	2.50x10.99	0°	RGB=255,249,128	65%	27.6	5.70
Wall 1	2.50x7.53	-91°	RGB=255,249,128	65%	6.8	1.40
Ceiling	10.99x7.53	Plane	RGB=255,255,255	80%	1.0	0.25

Dimensions of Room Bounding Box [m]: 10.99x7.53x2.50
 Calculation Points Grid of Bounding Box [m]: direction X 0.50 - Y 0.50 - Z 0.50

1.2 Energy Calculation (Working Plane)

Area	81.96 m2
Average Illuminance	21.36 lx
Specific Power	0.89 W/m2
Lighting Engineering Specific Power	4.17 W/(m2 * 100lx)
Energy Efficiency	23.98 (m2*lx)/W
Total Power Used	73.00 W

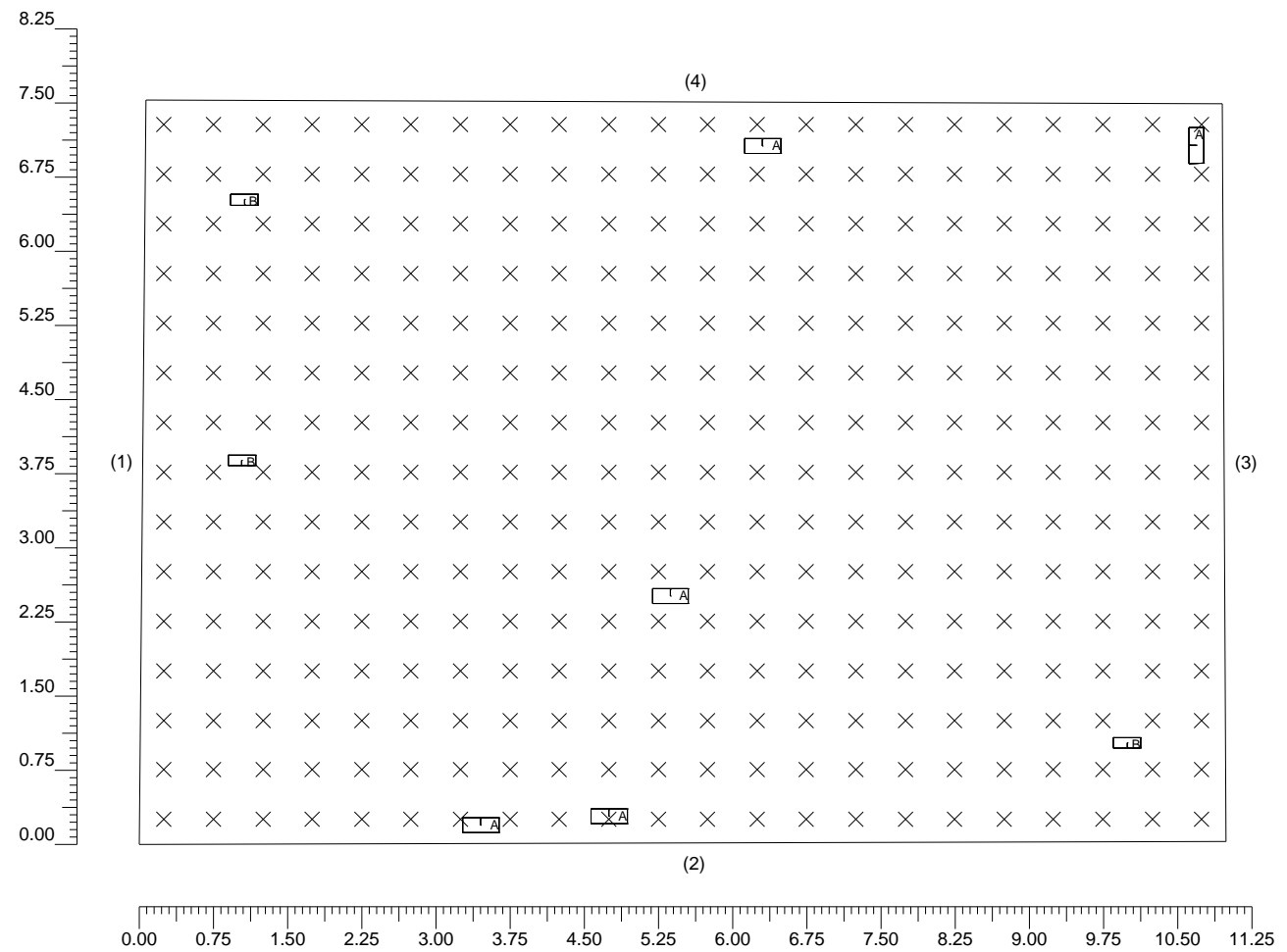
1.3 Uniformity Installation Parameters

Surface	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
Working Plane (h=0.80 m)	Horizontal Illuminance (E)	21.4 lux	3.9 lux	106.0 lux	0.18	0.04	0.20
Floor	Horizontal Illuminance (E)	18.8 lux	5.8 lux	60.6 lux	1:5.53	1:27.46	1:4.96
					1:3.22	1:10.40	1:3.23

Calculation Type Only Dir. + Furniture + Shadows

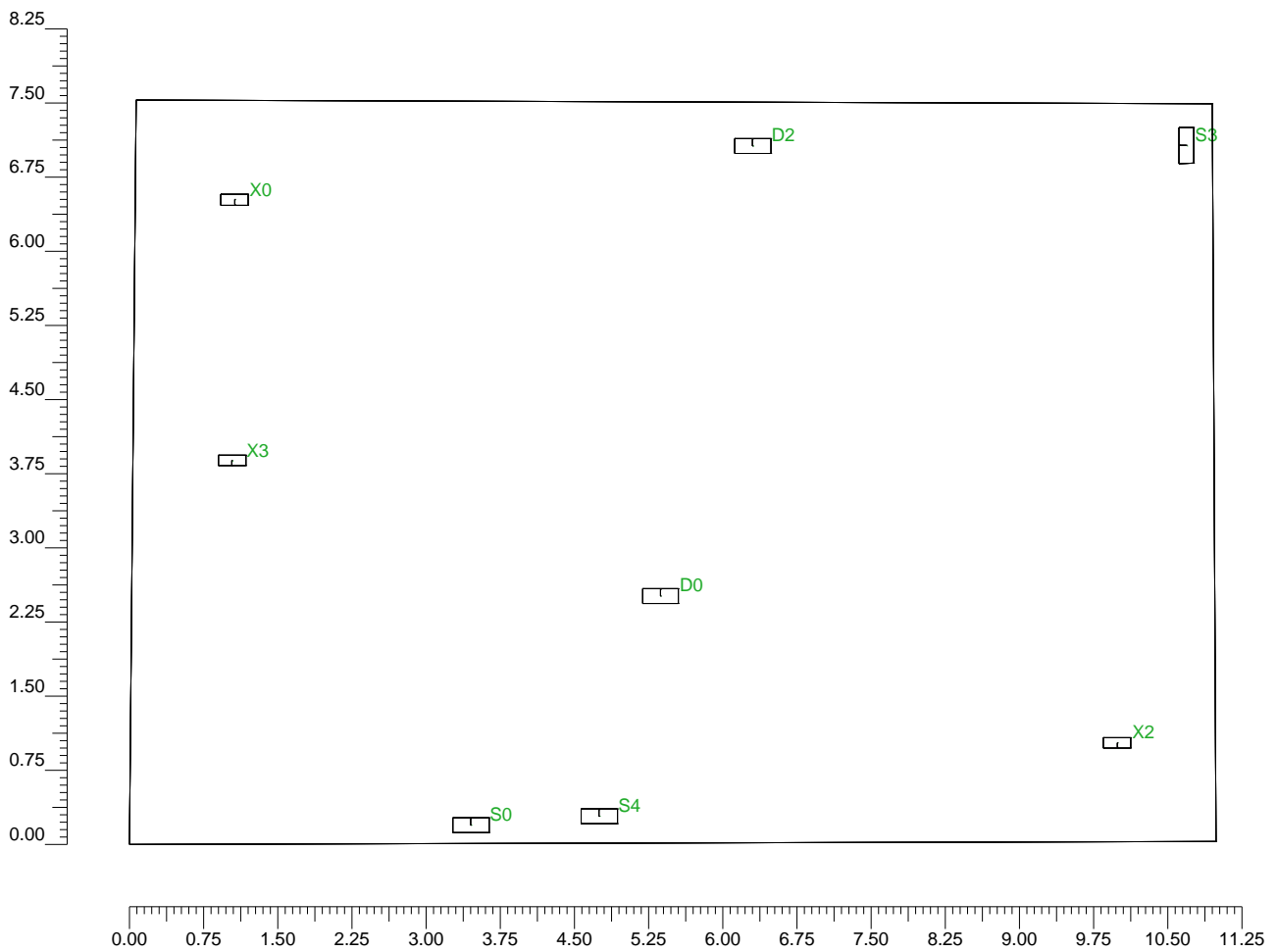
2.1 Working Plane 2D View and Calculation Grid

Scale 1/75



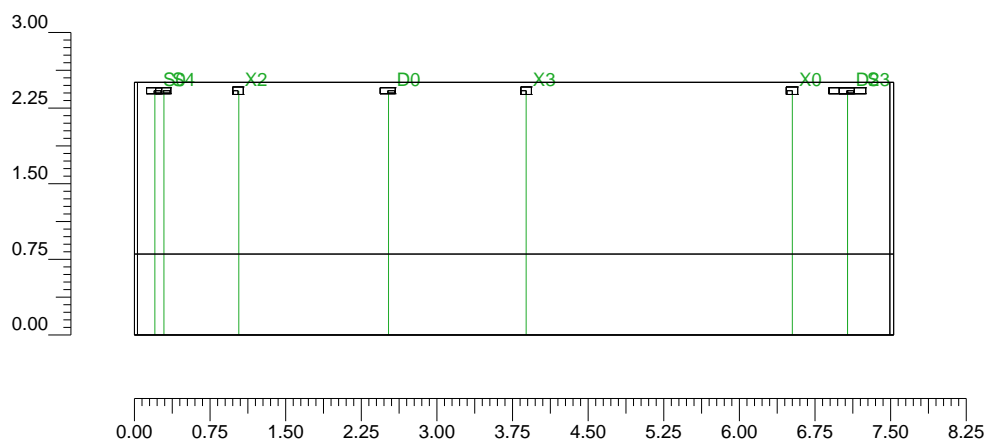
2.2 2D Plane View

Scale 1/75



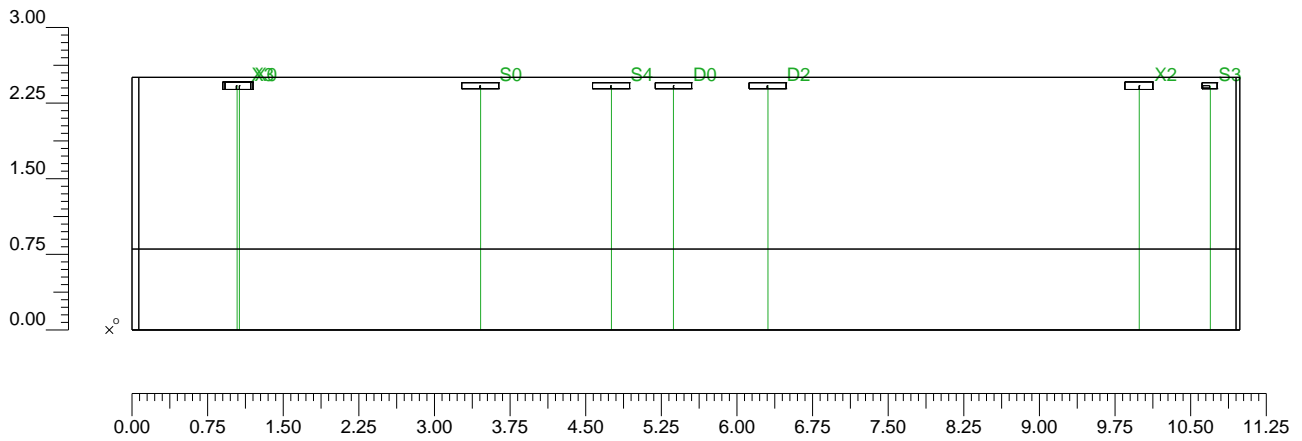
2.3 Lateral View

Scale 1/75



2.4 Front View

Scale 1/75



3.1 Luminaire/Measurements Info

Refer.	Line	Luminaire Name (Measurement Name)	Luminaire Code (Measurement Code)	Luminaires N.	Ref.Lamps	Lamps N.
A	G5	G5 / 500 Lum 1h (LEGR 61833+1SYLV PL-11W/840 (8))	61734 (61734LG)	5	LMP-A	1
B	B44 L.V.S.	B44 L.V.S./ 165 Lum 1h (LEGR 61541+1SYLV F6W/CW (3.6 V))	61552 (61541LG)	3	LMP-B	1

3.2 Lamp Information

Ref.Lamps	Type	Code	Flux lm	Power W	Color K	N.
LMP-A	FDH	11W 61734	515	11	1	5
LMP-B	FDH	6W 61541	165	6	1	3

3.3 Luminaire Table

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	1	X	3.68;122.01;2.42	0.0;0.0;90.2	61734	1.00	11W 61734	1*515
	2	X	10.92;128.89;2.42	0.0;0.0;-179.7		1.00		
	3	X	4.98;122.11;2.42	0.0;0.0;90.2		1.00		
	4	X	5.60;124.33;2.42	0.0;0.0;90.0		1.00		
	5	X	6.53;128.89;2.42	0.0;0.0;90.0		1.00		
B	1	X	1.29;128.34;2.42	0.0;0.0;-90.0	61552	1.00	6W 61541	1*165
	2	X	10.22;122.85;2.42	0.0;0.0;-90.0		1.00		
	3	X	1.27;125.70;2.42	0.0;0.0;-90.0		1.00		

3.4 Aiming Summary Table

Mast	Row	Column	Refer. 2D	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Aiming X[m] Y[m] Z[m]	R.Axis °	Coeff. Mant.	Refer.
			S0	X	3.68;122.01;2.42	0.0;0.0;90.2	3.68;122.01;0.00	90	1.00	A
			S3	X	10.92;128.89;2.42	0.0;0.0;-179.7	10.92;128.89;0.00	-180	1.00	A
			S4	X	4.98;122.11;2.42	0.0;0.0;90.2	4.98;122.11;0.00	90	1.00	A
			D0	X	5.60;124.33;2.42	0.0;0.0;90.0	5.60;124.33;0.00	90	1.00	A
			D2	X	6.53;128.89;2.42	0.0;0.0;90.0	6.53;128.89;0.00	90	1.00	A
			X0	X	1.29;128.34;2.42	0.0;0.0;-90.0	1.29;128.34;0.00	-90	1.00	B
			X2	X	10.22;122.85;2.42	0.0;0.0;-90.0	10.22;122.85;0.00	-90	1.00	B
			X3	X	1.27;125.70;2.42	0.0;0.0;-90.0	1.27;125.70;0.00	-90	1.00	B

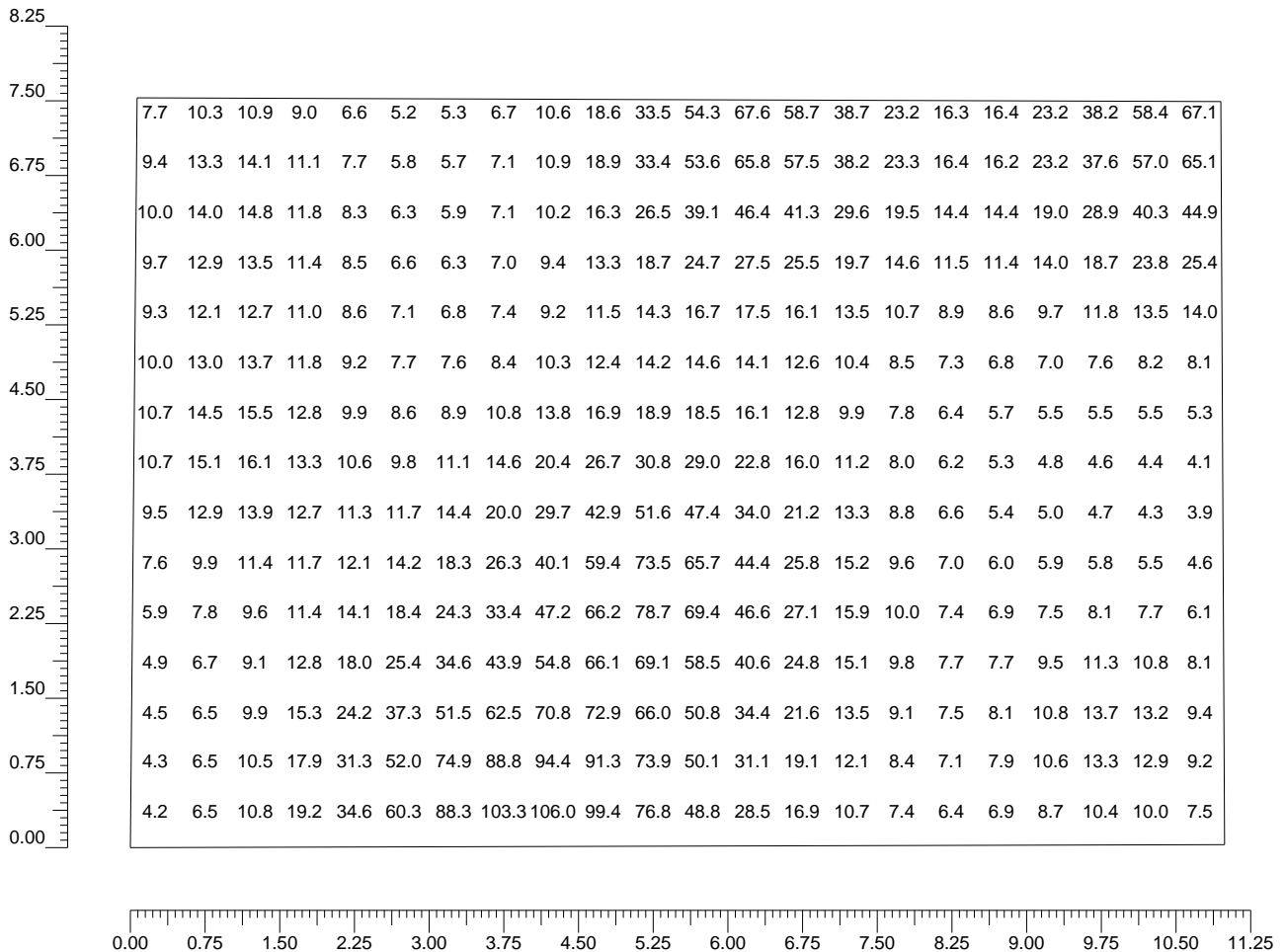
4.1 Horizontal Illuminance Values on the Working Plane

O (x:0.23 y:121.82 z:0.80)	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
DX:0.50 DY:0.50	Horizontal Illuminance (E)	21.4 lux	3.9 lux	106.0 lux	0.18 1:5.53	0.04 1:27.46	0.20 1:4.96

Calculation Type

Only Dir. + Furniture + Shadows

Scale 1/75

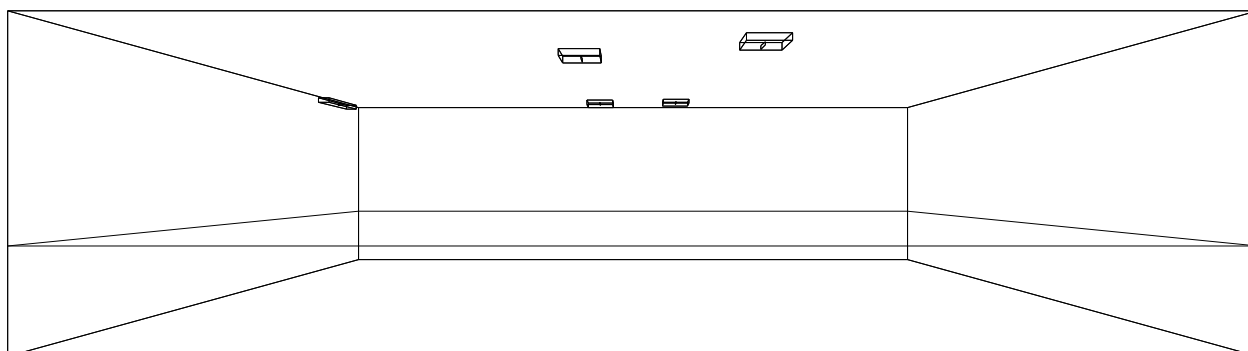


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Block Factory

Installation Notes: Electrical instalation
Customer: Endesa
Project Code:
Date: 26/04/2012

Notes:



DESIGNER NAME: LEGRAND GROUP ESPAÑA S.L.
Address: C/Hierro 56 - 28850 Torrejón de Ardoz (Madrid)
Tel.-Fax: Tel.+34/91/6561812 Fax +34/91/6566788

Remarks:

1.1 General Notes

Surface	Dimensions [m]	Angle°	Color	Coefficient Reflectance	Average Illum. [lux]	Ave.Luminance [cd/m²]
Floor	9.04x2.50	Plane	RGB=205,153,95	40%	43.0	5.48
Wall 4	2.50x9.00	180°	RGB=255,249,128	65%	32.7	6.76
Wall 3	2.50x2.49	90°	RGB=255,249,128	65%	6.3	1.30
Wall 2	2.50x9.04	0°	RGB=255,249,128	65%	30.7	6.35
Wall 1	2.50x2.50	-90°	RGB=255,249,128	65%	50.9	10.52
Ceiling	9.04x2.50	Plane	RGB=255,255,255	80%	0.0	0.01

Dimensions of Room Bounding Box [m]: 9.04x2.50x2.50
 Calculation Points Grid of Bounding Box [m]: direction X 0.50 - Y 0.50 - Z 0.50

1.2 Energy Calculation (Working Plane)

Area	22.50 m2
Average Illuminance	56.03 lx
Specific Power	2.44 W/m2
Lighting Engineering Specific Power	4.36 W/(m2 * 100lx)
Energy Efficiency	22.92 (m2*lx)/W
Total Power Used	55.00 W

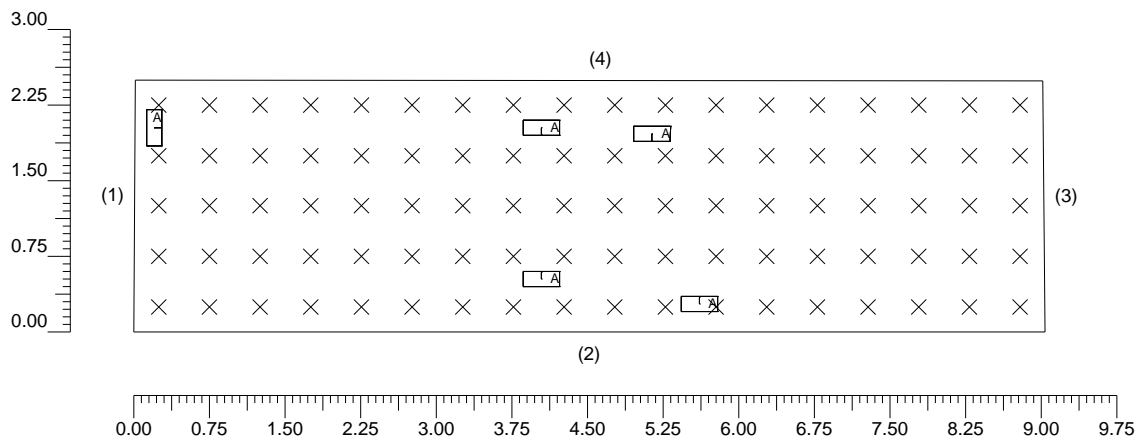
1.3 Uniformity Installation Parameters

Surface	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
Working Plane (h=0.80 m)	Horizontal Illuminance (E)	56.0 lux	4.0 lux	140.0 lux	0.07	0.03	0.40
Floor	Horizontal Illuminance (E)	43.0 lux	6.9 lux	87.6 lux	1:14.15	1:35.35	1:2.50
					0.16	0.08	0.49
					1:6.19	1:12.60	1:2.04

Calculation Type Only Dir. + Furniture + Shadows

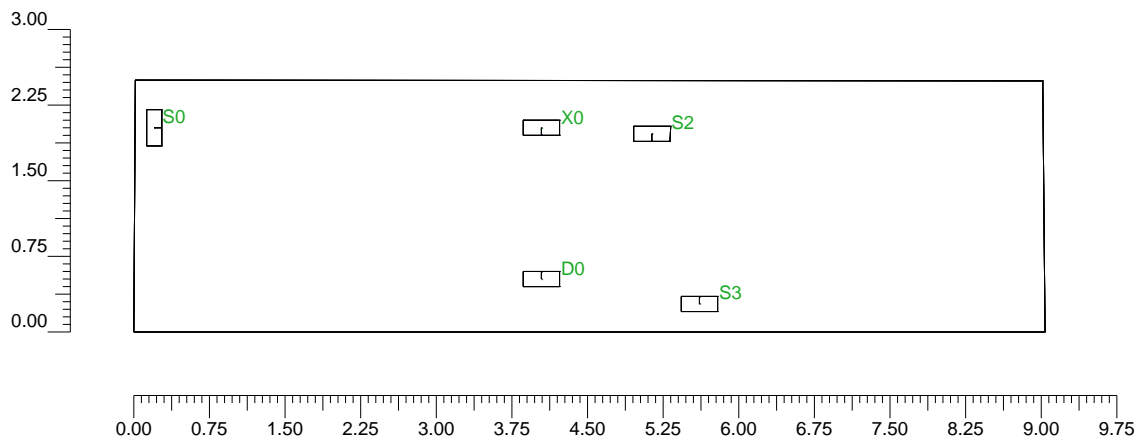
2.1 Working Plane 2D View and Calculation Grid

Scale 1/75



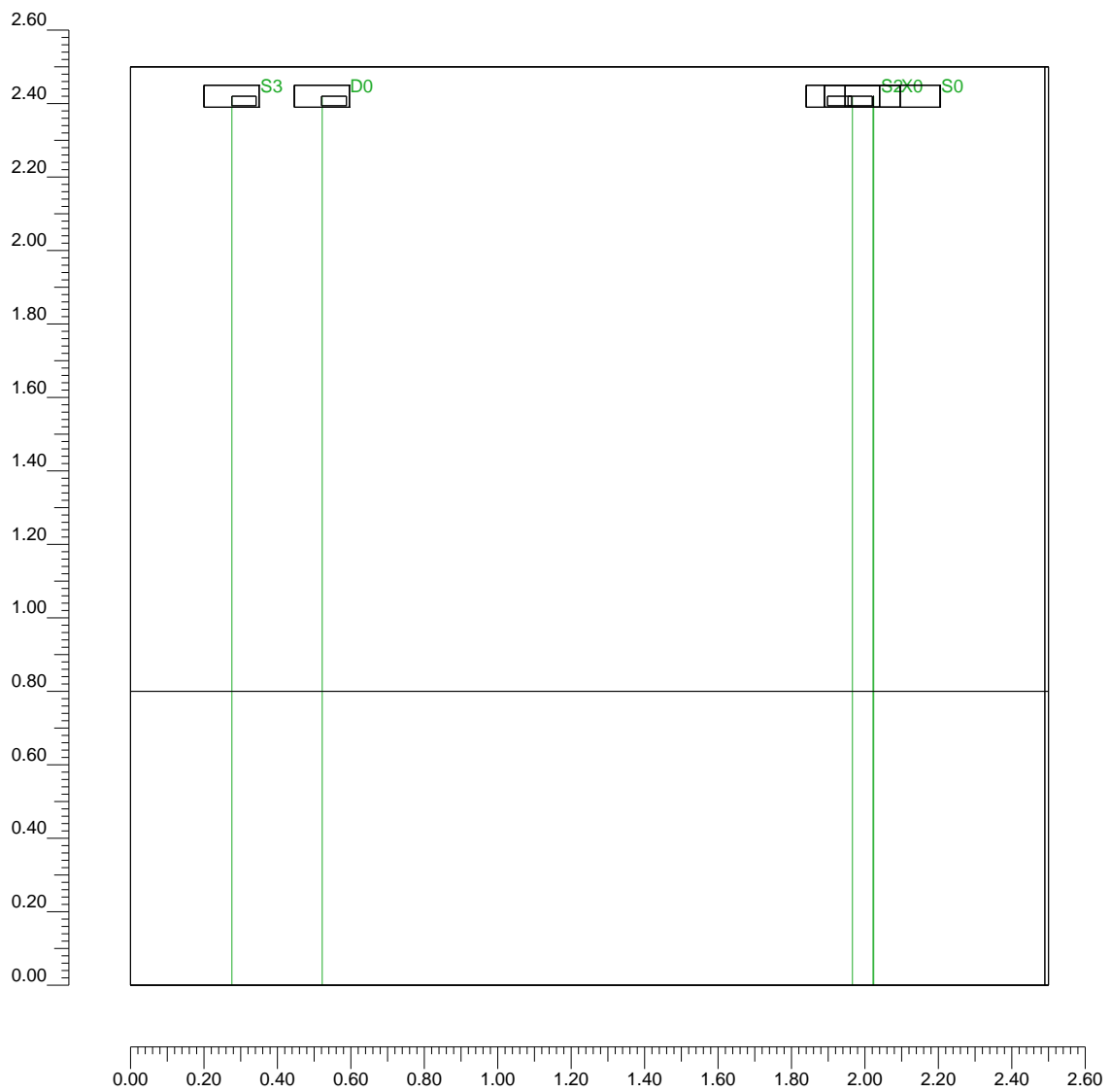
2.2 2D Plane View

Scale 1/75



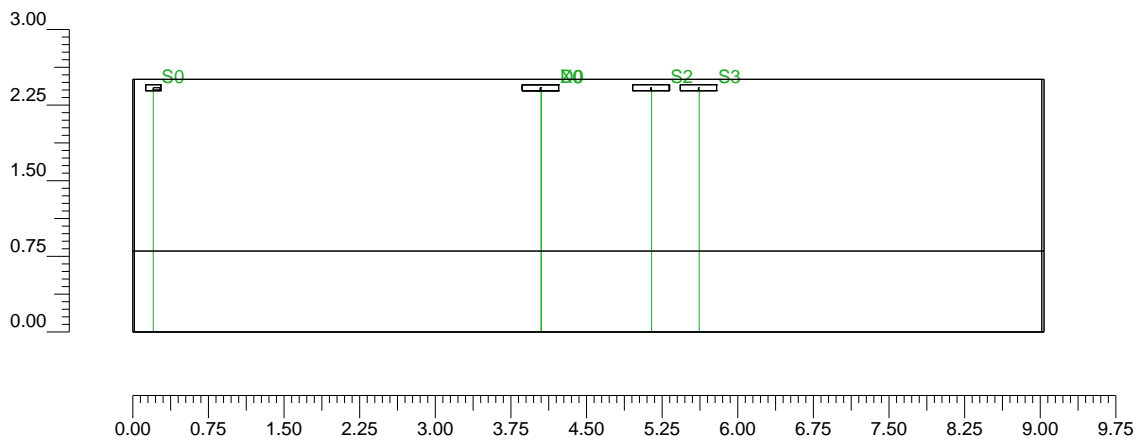
2.3 Lateral View

Scale 1/20



2.4 Front View

Scale 1/75



3.1 Luminaire/Measurements Info

Refer.	Line	Luminaire Name (Measurement Name)	Luminaire Code (Measurement Code)	Luminaires N.	Ref.Lamps	Lamps N.
A	G5	G5 / 500 Lum 1h (LEGR 61833+1SYLV PL-11W/840 (8))	61734 (61734LG)	5	LMP-A	1

3.2 Lamp Information

Ref.Lamps	Type	Code	Flux lm	Power W	Color K	N.
LMP-A	FDH	11W 61734	515	11	1	5

3.3 Luminaire Table

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	1	X	15.30;128.85;2.42	0.0;0.0;-90.0	61734	1.00	11W 61734	1*515
	2	X	11.46;128.85;2.42	0.0;0.0;-0.5		1.00		
	3	X	16.40;128.80;2.42	0.0;0.0;-90.1		1.00		
	4	X	16.87;127.11;2.42	0.0;0.0;90.0		1.00		
	5	X	15.30;127.35;2.42	0.0;0.0;90.0		1.00		

3.4 Aiming Summary Table

Mast	Row	Column	Refer. 2D	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Aiming X[m] Y[m] Z[m]	R.Axis °	Coeff. Mant.	Refer.
			X0	X	15.30;128.85;2.42	0.0;0.0;-90.0	15.30;128.85;0.00	-90	1.00	A
			S0	X	11.46;128.85;2.42	0.0;0.0;-0.5	11.46;128.85;0.00	-0	1.00	A
			S2	X	16.40;128.80;2.42	0.0;0.0;-90.1	16.40;128.80;0.00	-90	1.00	A
			S3	X	16.87;127.11;2.42	0.0;0.0;90.0	16.87;127.11;0.00	90	1.00	A
			D0	X	15.30;127.35;2.42	0.0;0.0;90.0	15.30;127.35;0.00	90	1.00	A

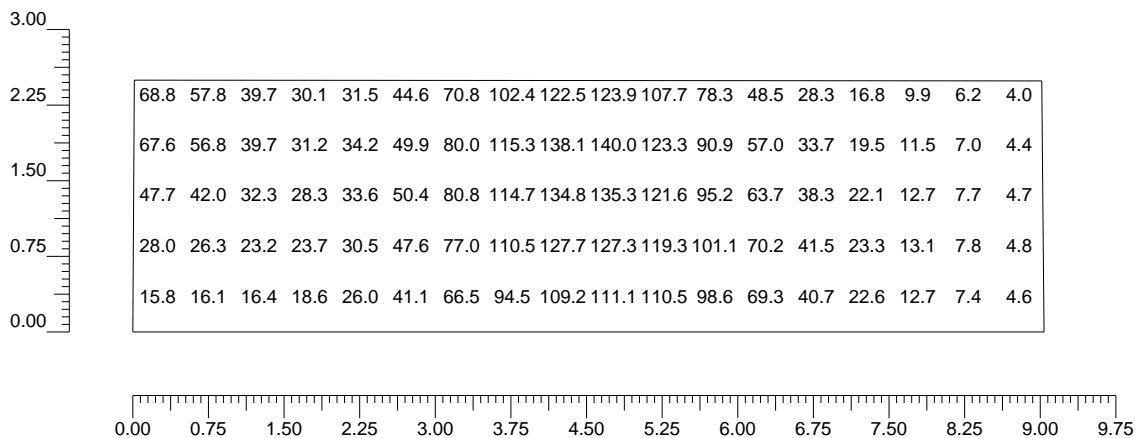
4.1 Horizontal Illuminance Values on the Working Plane

O (x:11.26 y:126.83 z:0.80)	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
DX:0.50 DY:0.50	Horizontal Illuminance (E)	56.0 lux	4.0 lux	140.0 lux	0.07 1:14.15	0.03 1:35.35	0.40 1:2.50

Calculation Type

Only Dir. + Furniture + Shadows

Scale 1/75



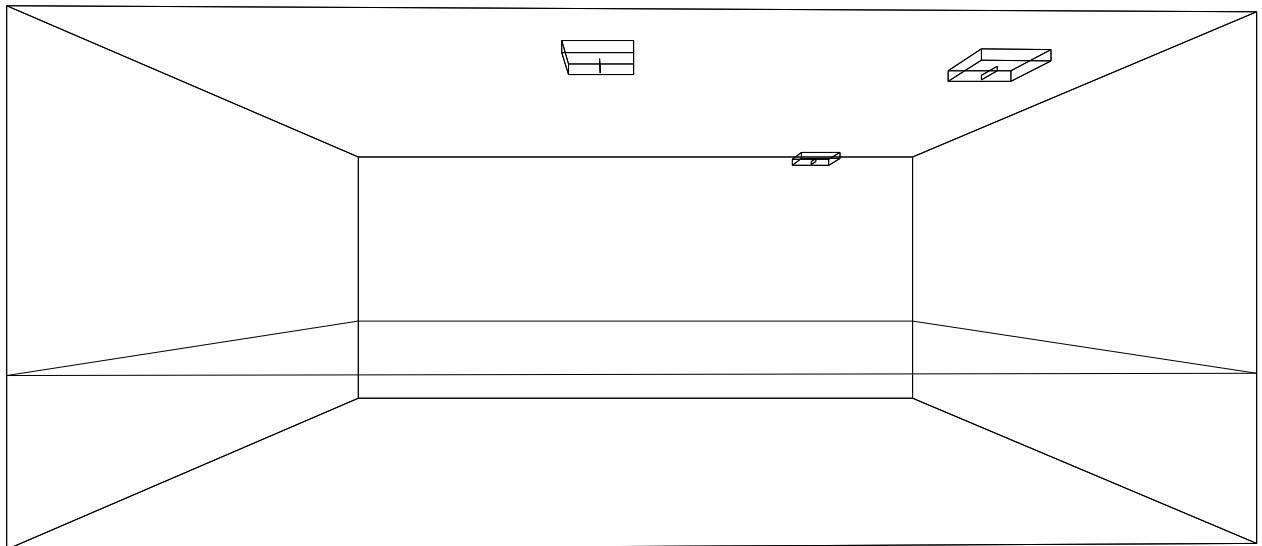
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block factory

Installation Notes:

Customer: ENDESA
Project Code:
Date: 26/04/2012

Notes:



DESIGNER NAME: LEGRAND GROUP ESPAÑA S.L.
Address: C/Hierro 56 - 28850 Torrejón de Ardoz (Madrid)
Tel.-Fax: Tel.+34/91/6561812 Fax +34/91/6566788

Remarks:

1.1 General Notes

Surface	Dimensions [m]	Angle°	Color	Coefficient Reflectance	Average Illum. [lux]	Ave.Luminance [cd/m²]
Floor	5.81x1.57	Plane	RGB=205,153,95	40%	39.9	5.09
Wall 4	2.50x5.74	-180°	RGB=255,249,128	65%	35.7	7.38
Wall 3	2.50x1.54	91°	RGB=255,249,128	65%	41.6	8.61
Wall 2	2.50x5.81	0°	RGB=255,249,128	65%	53.0	10.96
Wall 1	2.50x1.57	-91°	RGB=255,249,128	65%	7.0	1.44
Ceiling	5.81x1.57	Plane	RGB=255,255,255	80%	0.0	0.01

Dimensions of Room Bounding Box [m]: 5.81x1.57x2.50
 Calculation Points Grid of Bounding Box [m]: direction X 0.48 - Y 0.52 - Z 0.50

1.2 Energy Calculation (Working Plane)

Area	8.98 m2
Average Illuminance	58.63 lx
Specific Power	3.67 W/m2
Lighting Engineering Specific Power	6.27 W/(m2 * 100lx)
Energy Efficiency	15.96 (m2*lx)/W
Total Power Used	33.00 W

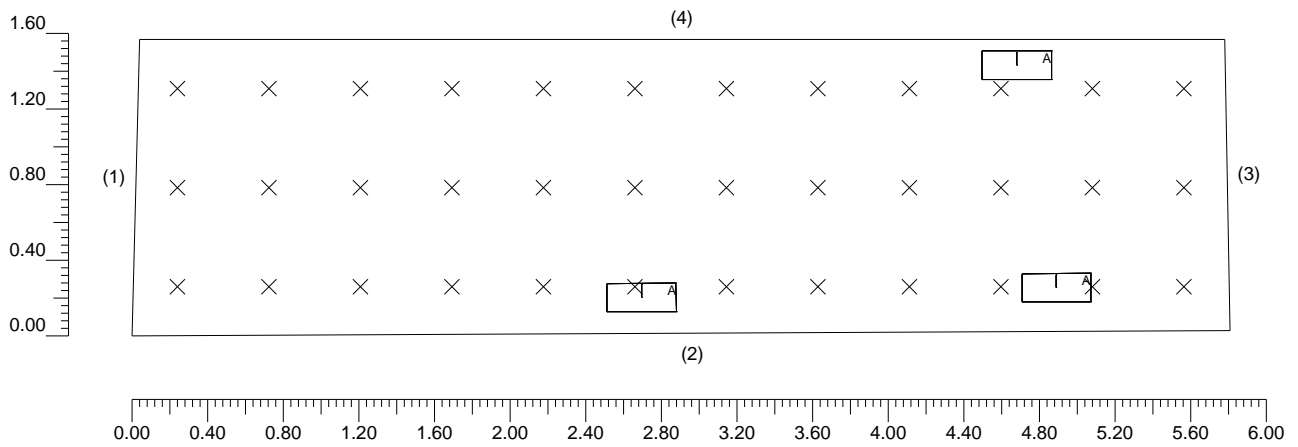
1.3 Uniformity Installation Parameters

Surface	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
Working Plane (h=0.80 m)	Horizontal Illuminance (E)	58.6 lux	5.6 lux	112.3 lux	0.10	0.05	0.52
Floor	Horizontal Illuminance (E)	39.9 lux	8.3 lux	64.4 lux	1:10.48	1:20.07	1:1.92
					1:4.84	1:7.80	1:1.61

Calculation Type Only Dir. + Furniture + Shadows

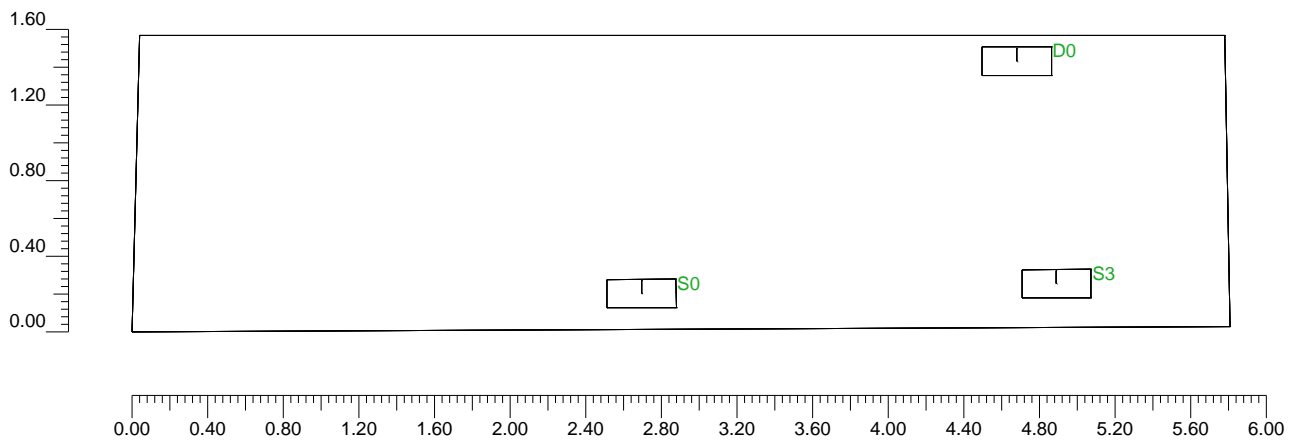
2.1 Working Plane 2D View and Calculation Grid

Scale 1/40



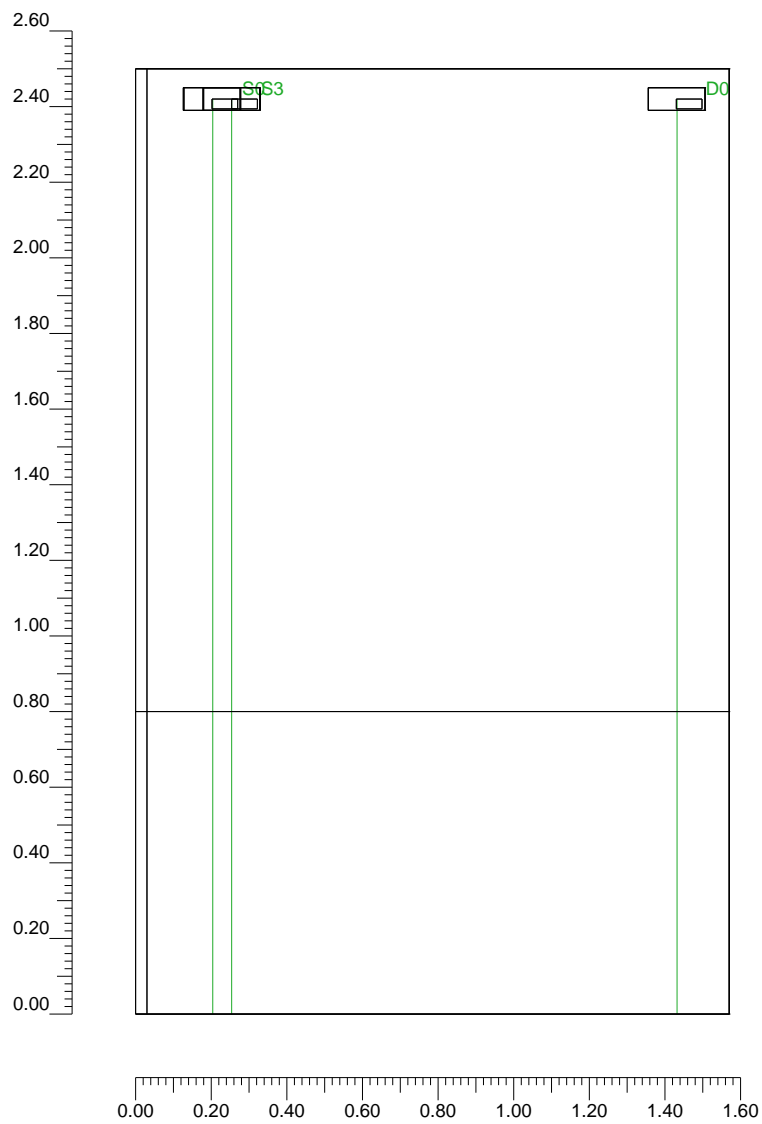
2.2 2D Plane View

Scale 1/40



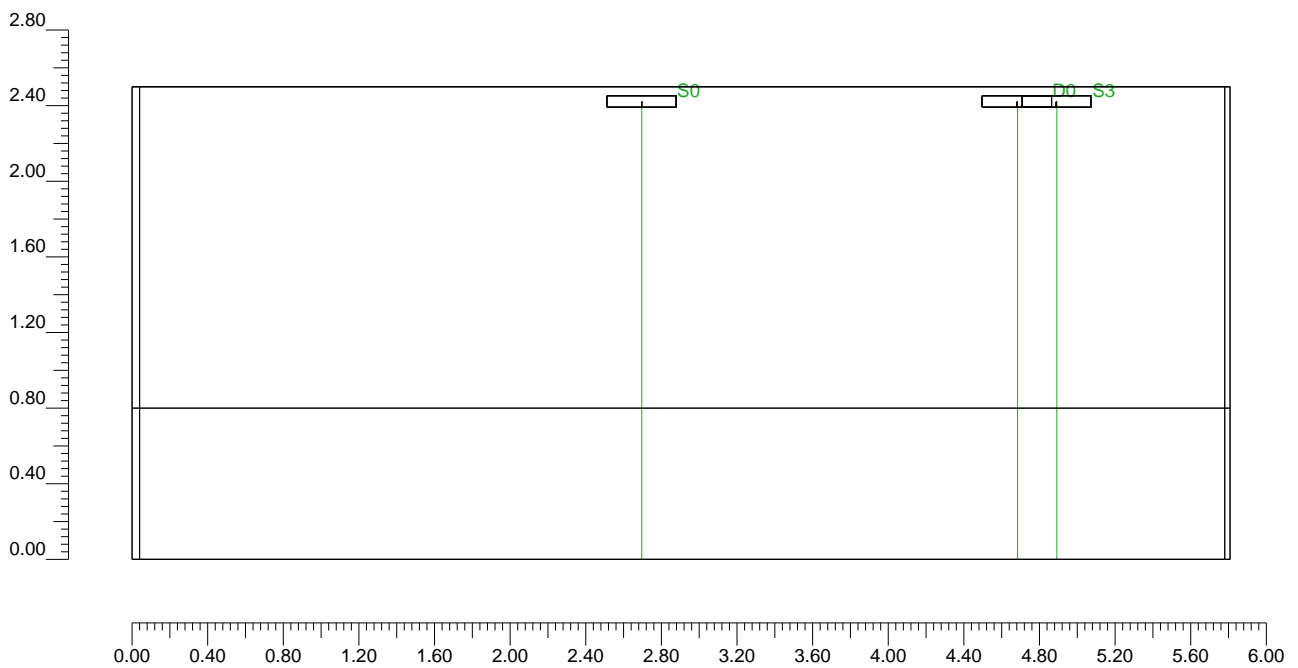
2.3 Lateral View

Scale 1/20



2.4 Front View

Scale 1/40



3.1 Luminaire/Measurements Info

Refer.	Line	Luminaire Name (Measurement Name)	Luminaire Code (Measurement Code)	Luminaires N.	Ref.Lamps	Lamps N.
A	G5	G5 / 500 Lum 1h (LEGR 61833+1SYLV PL-11W/840 (8))	61734 (61734LG)	3	LMP-A	1

3.2 Lamp Information

Ref.Lamps	Type	Code	Flux lm	Power W	Color K	N.
LMP-A	FDH	11W 61734	515	11	1	3

3.3 Luminaire Table

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	1	X	12.88;24.77;2.42	0.0;0.0;90.3	61734	1.00	11W 61734	1*515
	2	X	15.07;24.82;2.42	0.0;0.0;90.3		1.00		
	3	X	14.86;26.00;2.42	0.0;0.0;90.0		1.00		

3.4 Aiming Summary Table

Mast	Row	Column	Refer. 2D	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Aiming X[m] Y[m] Z[m]	R.Axis °	Coeff. Mant.	Refer.
			S0	X	12.88;24.77;2.42	0.0;0.0;90.3	12.88;24.77;0.00	90	1.00	A
			S3	X	15.07;24.82;2.42	0.0;0.0;90.3	15.07;24.82;0.00	90	1.00	A
			D0	X	14.86;26.00;2.42	0.0;0.0;90.0	14.86;26.00;0.00	90	1.00	A

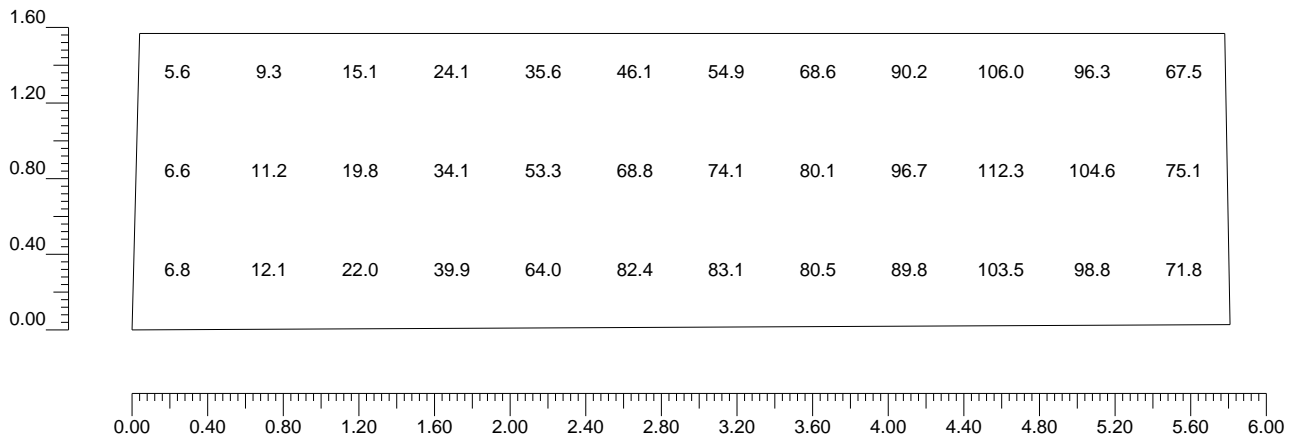
4.1 Horizontal Illuminance Values on the Working Plane

O (x:10.18 y:24.57 z:0.80)	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
DX:0.48 DY:0.52	Horizontal Illuminance (E)	58.6 lux	5.6 lux	112.3 lux	0.10 1:10.48	0.05 1:20.07	0.52 1:1.92

Calculation Type

Only Dir. + Furniture + Shadows

Scale 1/40



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block factory

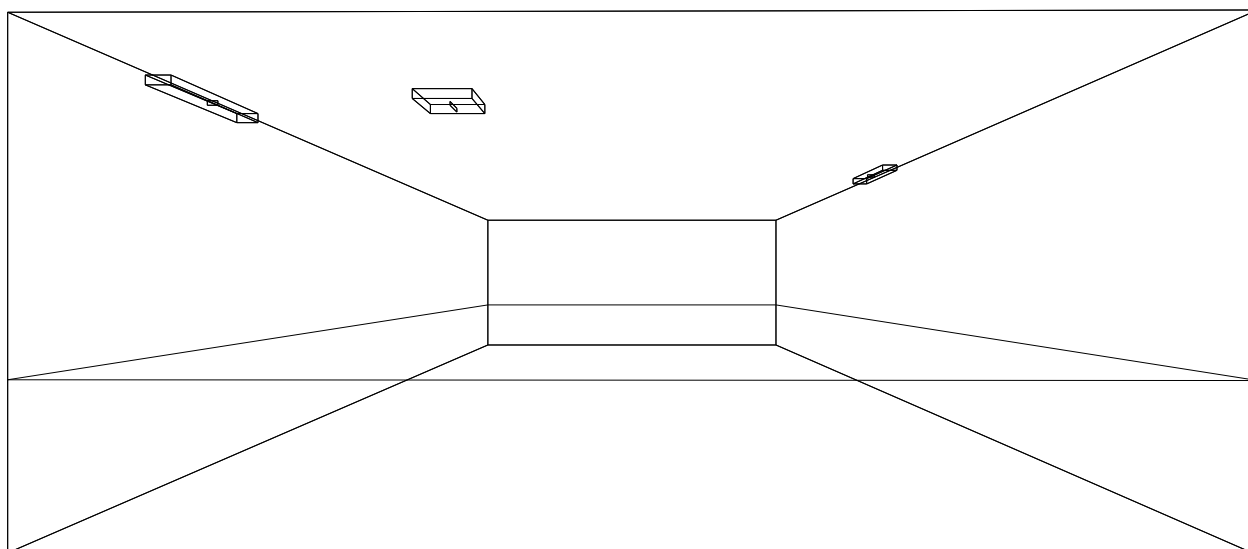
Installation Notes:

Customer: ENDESA

Project Code:

Date: 26/04/2012

Notes:



DESIGNER NAME:

Address:

Tel.-Fax:

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C/Hierro 56 - 28850 Torrejón de Ardoz (Madrid)

Tel.+34/91/6561812 Fax +34/91/6566788

Remarks:

1.1 General Notes

Surface	Dimensions [m]	Angle°	Color	Coefficient Reflectance	Average Illum. [lux]	Ave.Luminance [cd/m²]
Floor	5.75x4.20	Plane	RGB=205,153,95	40%	23.0	2.92
Wall 4	2.50x5.75	-180°	RGB=255,249,128	65%	5.2	1.07
Wall 3	2.50x4.20	90°	RGB=255,249,128	65%	30.9	6.40
Wall 2	2.50x5.75	-0°	RGB=255,249,128	65%	28.1	5.82
Wall 1	2.50x4.18	-90°	RGB=255,249,128	65%	33.7	6.96
Ceiling	5.75x4.20	Plane	RGB=255,255,255	80%	0.0	0.00

Dimensions of Room Bounding Box [m]: 5.75x4.20x2.50
 Calculation Points Grid of Bounding Box [m]: direction X 0.48 - Y 0.53 - Z 0.50

1.2 Energy Calculation (Working Plane)

Area	24.09 m2
Average Illuminance	29.05 lx
Specific Power	1.37 W/m2
Lighting Engineering Specific Power	4.72 W/(m2 * 100lx)
Energy Efficiency	21.21 (m2*lx)/W
Total Power Used	33.00 W

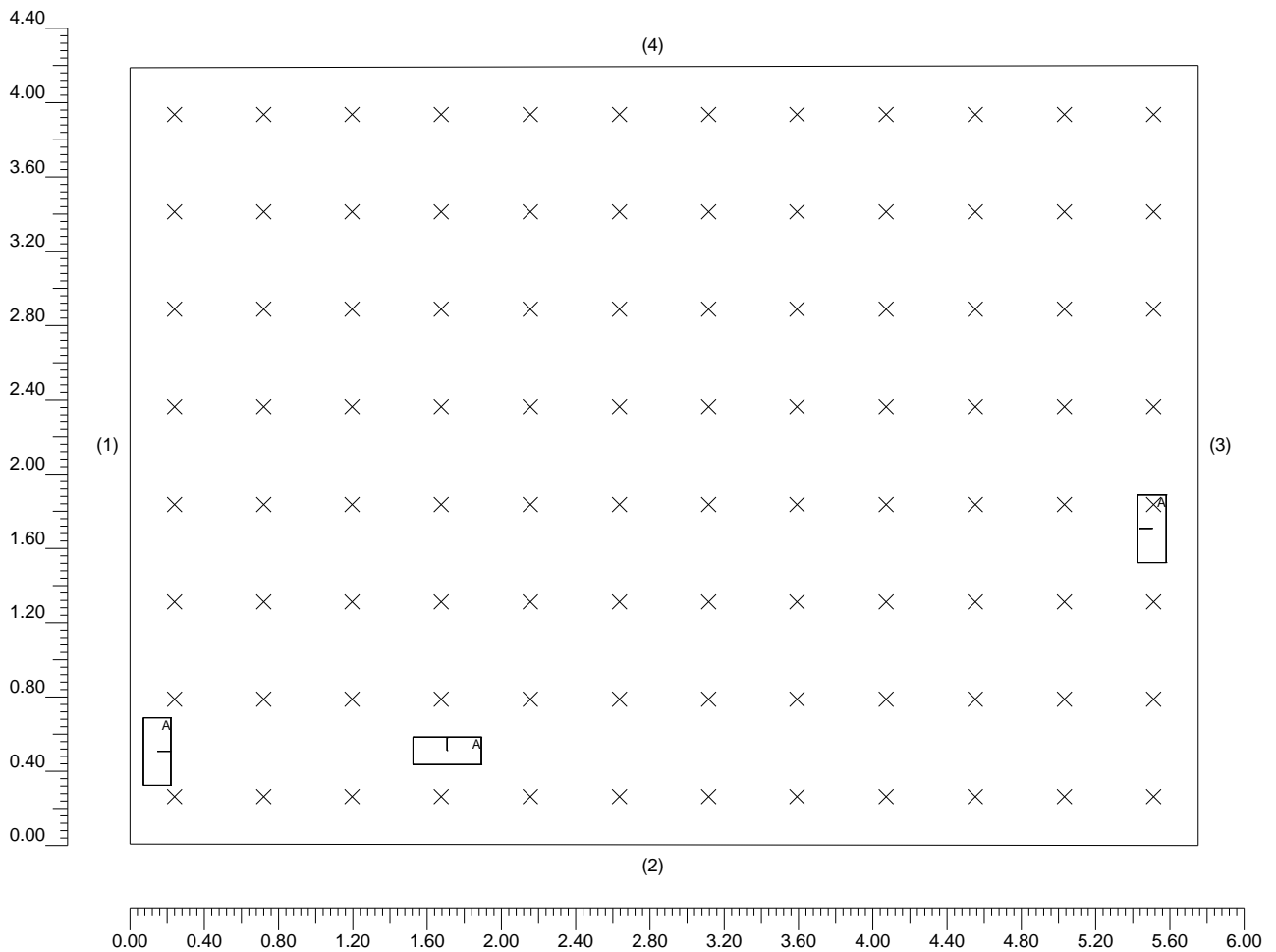
1.3 Uniformity Installation Parameters

Surface	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
Working Plane (h=0.80 m)	Horizontal Illuminance (E)	29.0 lux	3.5 lux	86.9 lux	0.12	0.04	0.33
Floor	Horizontal Illuminance (E)	23.0 lux	6.0 lux	50.3 lux	1:8.20	1:24.53	1:2.99
					0.26	0.12	0.46
					1:3.83	1:8.39	1:2.19

Calculation Type Only Dir. + Furniture + Shadows

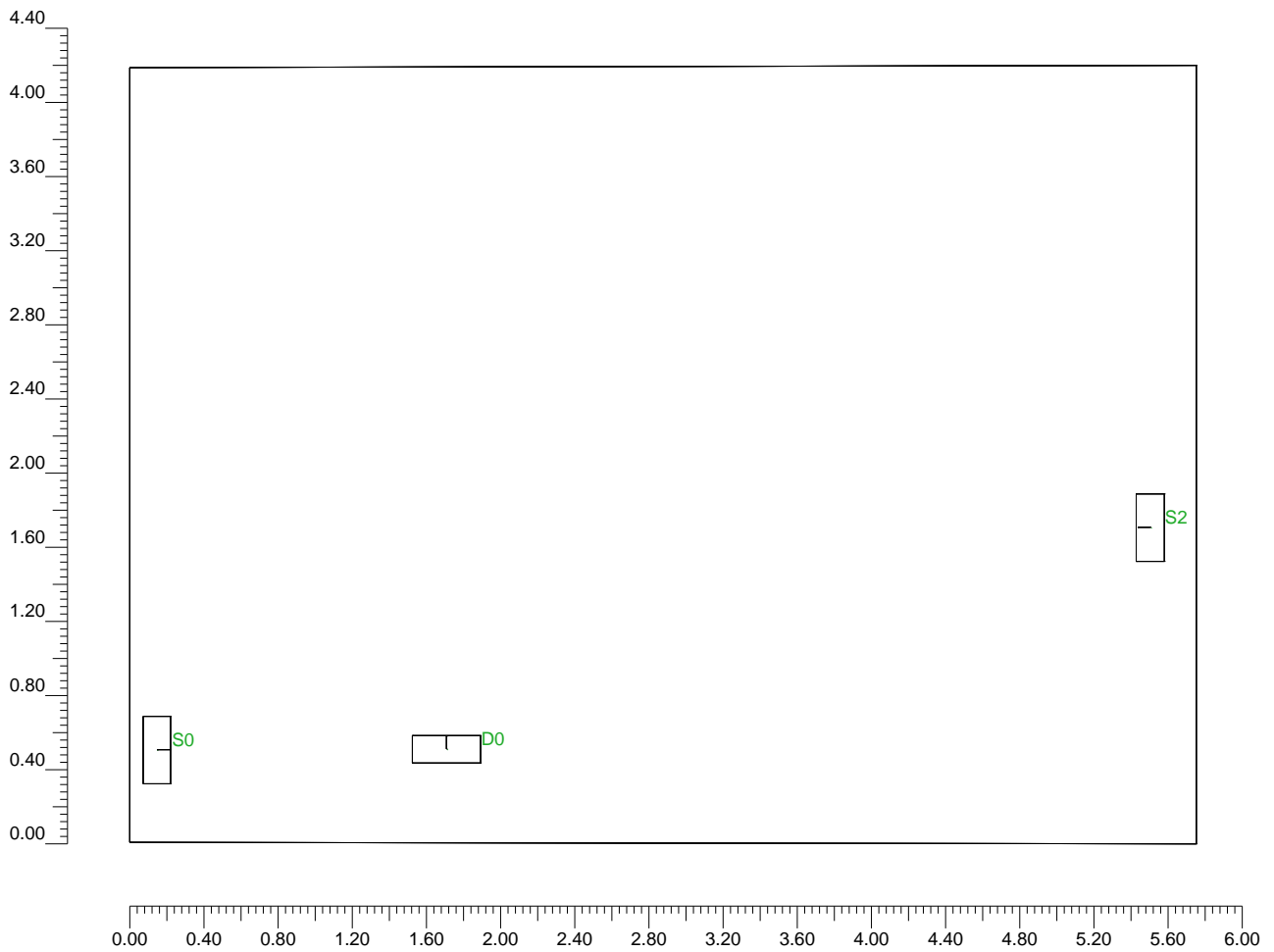
2.1 Working Plane 2D View and Calculation Grid

Scale 1/40



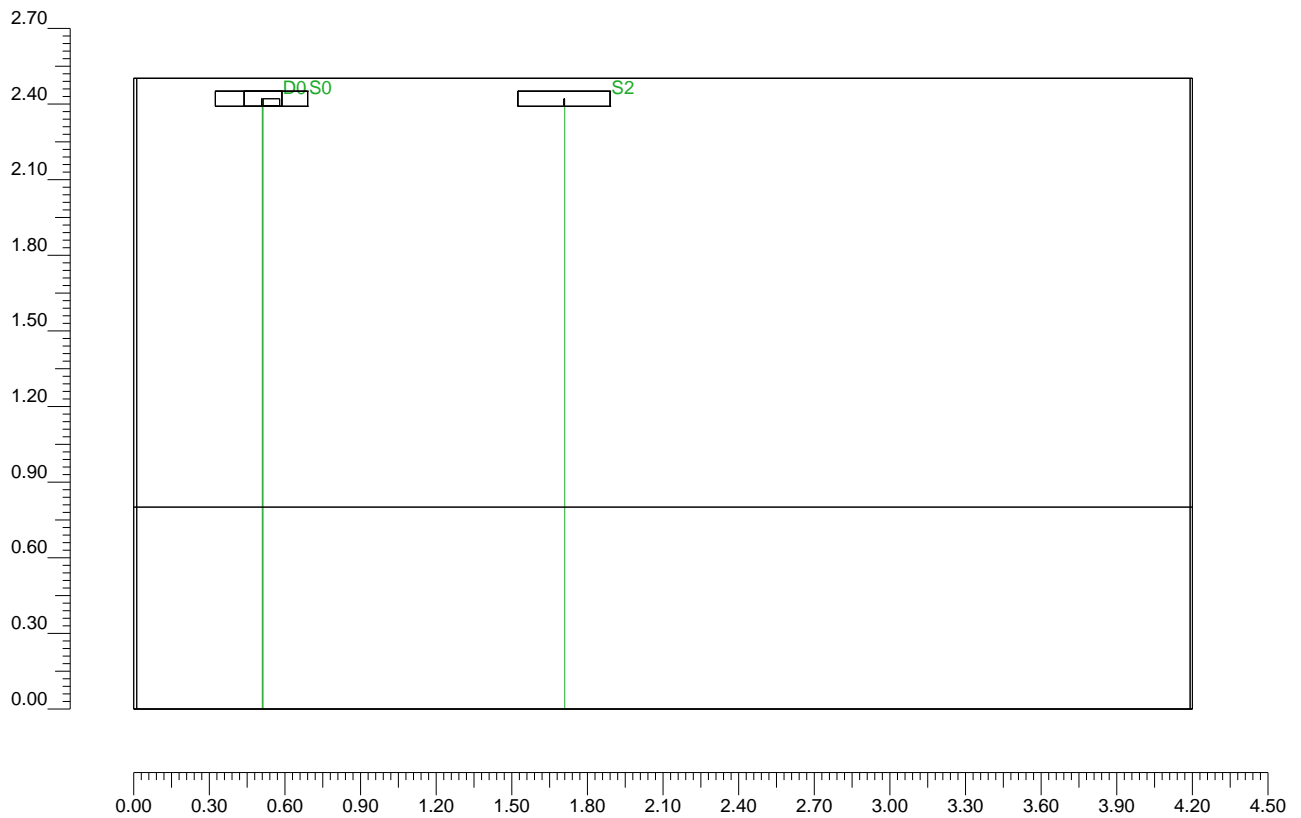
2.2 2D Plane View

Scale 1/40



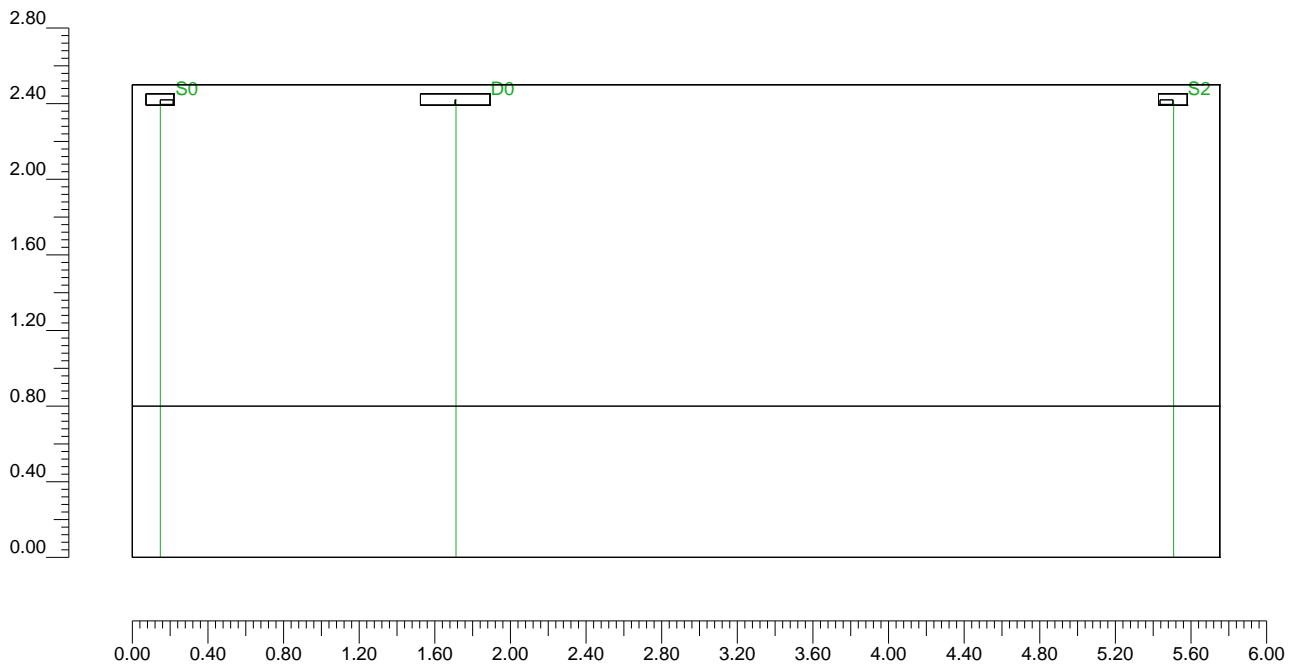
2.3 Lateral View

Scale 1/30



2.4 Front View

Scale 1/40



3.1 Luminaire/Measurements Info

Refer.	Line	Luminaire Name (Measurement Name)	Luminaire Code (Measurement Code)	Luminaires N.	Ref.Lamps	Lamps N.
A	G5	G5 / 500 Lum 1h (LEGR 61833+1SYLV PL-11W/840 (8))	61734 (61734LG)	3	LMP-A	1

3.2 Lamp Information

Ref.Lamps	Type	Code	Flux lm	Power W	Color K	N.
LMP-A	FDH	11W 61734	515	11	1	3

3.3 Luminaire Table

Refer.	Lum.	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Luminaire Code	Coeff. Mant.	Lamp Code	Flux lm
A	1	X	10.38;20.82;2.42	0.0;0.0;0.0	61734	1.00	11W 61734	1*515
	2	X	15.73;22.02;2.42	0.0;0.0;180.0		1.00		
	3	X	11.94;20.82;2.42	0.0;0.0;90.0		1.00		

3.4 Aiming Summary Table

Mast	Row	Column	Refer. 2D	On	Luminaire Position X[m] Y[m] Z[m]	Luminaire Rotation X° Y° Z°	Aiming X[m] Y[m] Z[m]	R.Axis °	Coeff. Mant.	Refer.
			S0	X	10.38;20.82;2.42	0.0;0.0;0.0	10.38;20.82;0.00	0	1.00	A
			S2	X	15.73;22.02;2.42	0.0;0.0;180.0	15.73;22.02;0.00	180	1.00	A
			D0	X	11.94;20.82;2.42	0.0;0.0;90.0	11.94;20.82;0.00	90	1.00	A

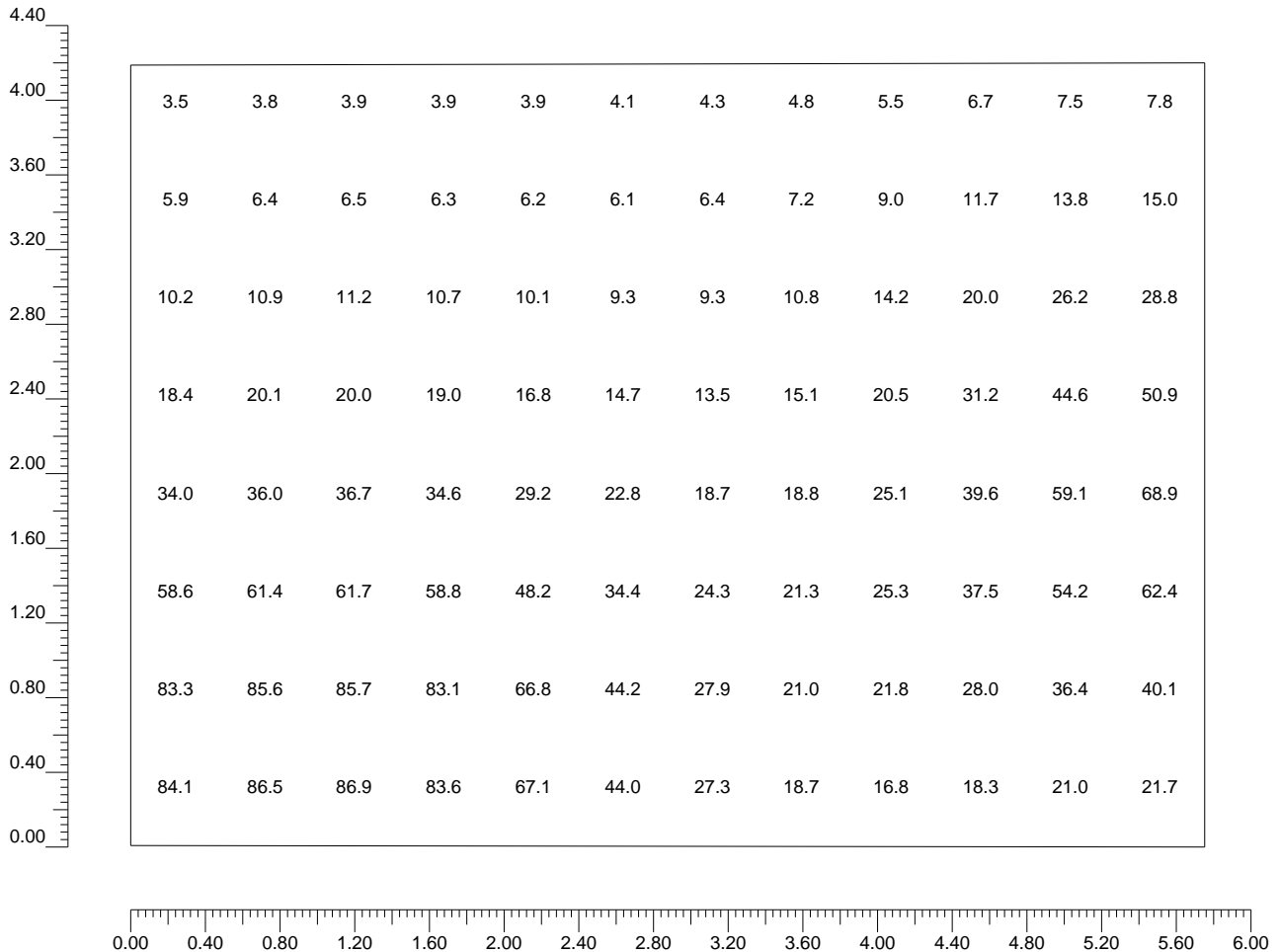
4.1 Horizontal Illuminance Values on the Working Plane

O (x:10.23 y:20.31 z:0.80)	Results	Average	Minimum	Maximum	Min/Ave	Min/Max	Ave/Max
DX:0.48 DY:0.53	Horizontal Illuminance (E)	29.0 lux	3.5 lux	86.9 lux	0.12 1:8.20	0.04 1:24.53	0.33 1:2.99

Calculation Type

Only Dir. + Furniture + Shadows

Scale 1/40



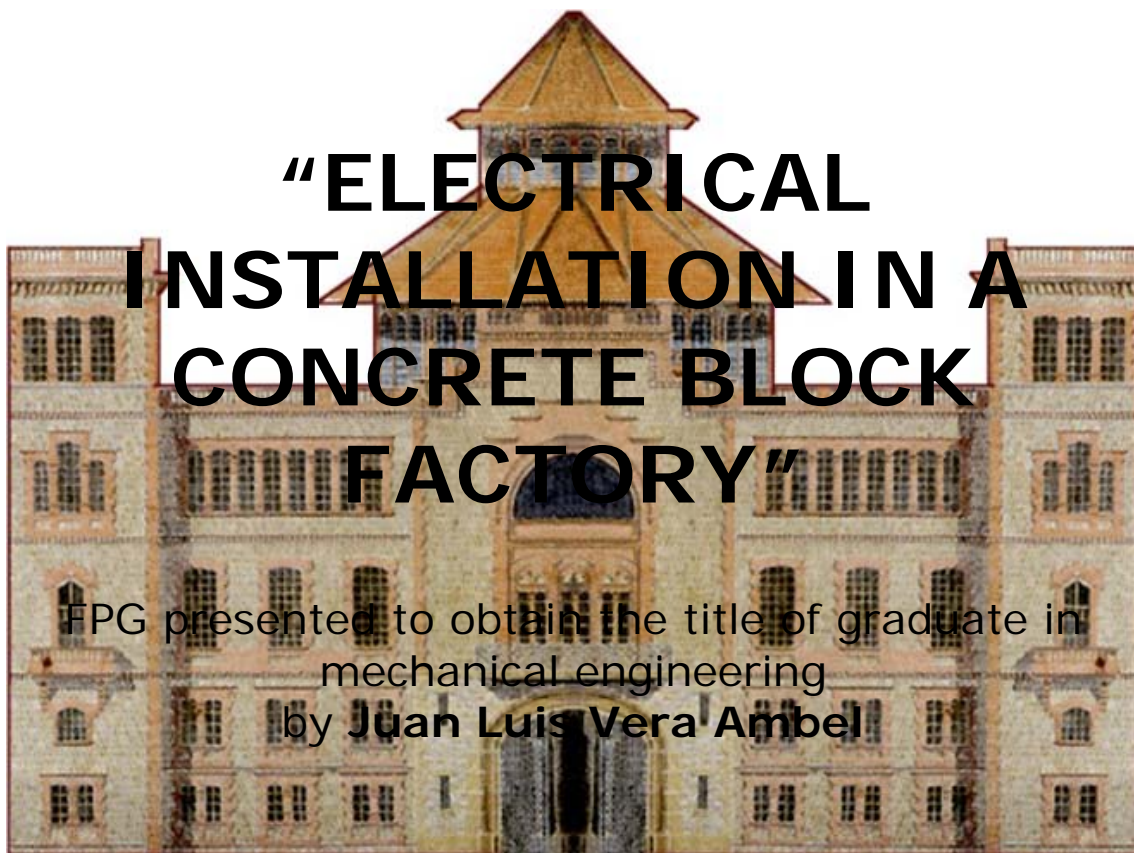
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Escola Universitària d'Enginyeria
Tècnica Industrial de Barcelona
Consorci Escola Industrial de Barcelona

UNIVERSITAT POLITÈCNICA DE CATALUNYA

XI - Results of calculations of illumination with Dialux



Barcelona, Juny 13, 2012

Director: Jose Luis Rodriguez Espantoso
Department of EG
Politechnical University of Catalonia (UPC)

Electrical installation in a block factory

08.06.2012

Instalaciones.V

Operator Juan Luis Vera Ambel
Telephone 646336621

C/Jose Sangenis, 15-19, 1º 2ª

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Electrical installation in a block factory



08.06.20

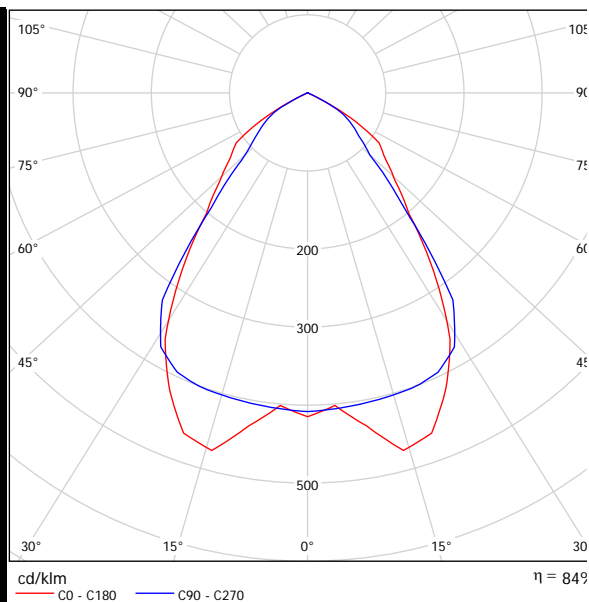
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**TROLL 6402/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR
 Luminaire Data Sheet**

Luminous emittance 1:



Luminaire classification according to CIE: 100
 CIE flux code: 70 97 100 100 84

Luminous emittance 1:

TROLL 6402/150 LIGHTMOTIV. OUTDOOR SPOTLIGHTS IP65.
 Surface-mounted. Double axis optics. 1 x HIT-DE 150 W . H.F. Magnetic gear. Colours: Troll Black (/04), Metallic Light Grey (/221), White RAL 9010 (/33), Sand Colour (/69)

Glare Evaluation According to UGR											
ρ Ceiling	70	70	50	50	30	70	70	50	50	30	
ρ Walls	50	30	50	30	30	50	30	50	30	30	
ρ Floor	20	20	20	20	20	20	20	20	20	20	
Room Size X Y	Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	25.6	26.6	25.9	26.8	27.0	25.1	26.1	25.4	26.3	26.6
	3H	25.5	26.4	25.8	26.6	26.9	25.0	25.9	25.3	26.1	26.6
	4H	25.4	26.2	25.7	26.5	26.8	24.9	25.8	25.3	26.0	26.6
	6H	25.3	26.1	25.7	26.4	26.7	24.9	25.6	25.2	25.9	26.6
	8H	25.3	26.0	25.6	26.3	26.6	24.8	25.6	25.2	25.9	26.6
12H	25.3	25.9	25.6	26.3	26.6	24.8	25.5	25.2	25.8	26.6	
4H	2H	25.9	26.8	26.3	27.0	27.3	25.6	26.4	25.9	26.7	26.6
	3H	25.8	26.5	26.2	26.8	27.1	25.5	26.2	25.8	26.5	26.6
	4H	25.7	26.3	26.1	26.7	27.0	25.4	26.0	25.8	26.4	26.6
	6H	25.7	26.2	26.1	26.5	26.9	25.3	25.9	25.8	26.2	26.6
	8H	25.6	26.1	26.0	26.5	26.9	25.3	25.8	25.7	26.2	26.6
12H	25.6	26.0	26.0	26.4	26.8	25.3	25.7	25.7	26.1	26.6	
8H	4H	25.6	26.1	26.0	26.5	26.9	25.3	25.8	25.7	26.2	26.6
	6H	25.5	25.9	26.0	26.3	26.8	25.2	25.6	25.7	26.0	26.6
	8H	25.5	25.8	26.0	26.3	26.7	25.2	25.5	25.7	26.0	26.6
	12H	25.4	25.7	25.9	26.2	26.7	25.1	25.4	25.6	25.9	26.6
	12H	4H	25.6	26.0	26.0	26.4	26.8	25.3	25.7	25.7	26.1
6H	25.5	25.8	26.0	26.3	26.7	25.2	25.5	25.7	26.0	26.6	
8H	25.4	25.7	25.9	26.2	26.7	25.1	25.4	25.6	25.9	26.6	
Variation of the observer position for the luminaire distances S											
S = 1.0H	+1.8 / -1.1					+2.1 / -2.1					
S = 1.5H	+1.4 / -6.0					+2.1 / -4.0					
S = 2.0H	+2.5 / -21.4					+3.6 / -15.1					
Standard table	BK01					BK01					
Correction Summand	7.2					6.8					
Corrected Glare Indices referring to 13500lm Total Luminous Flux											

ADDITIONAL PHOTOMETRIC DESCRIPTION

LAMP

+1 x HIT-DE-CRI 150W

EQUIPMENT

HF MAG. GEAR

Electrical installation in a block factory



08.06.20

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TROLL 6402/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR / UGR Tabl

Luminaire: TROLL 6402/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR
 Lamps: 1 x HIT-DE

Glare Evaluation According to UGR												
ρ Ceiling		70	70	50	50	30	ρ Walls		50	30	50	30
ρ Floor		20	20	20	20	20	ρ Floor		20	20	20	20
Room Size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	25.6	26.6	25.9	26.8	27.0	25.1	26.1	25.4	26.3	26.5	
	3H	25.5	26.4	25.8	26.6	26.9	25.0	25.9	25.3	26.1	26.4	
	4H	25.4	26.2	25.7	26.5	26.8	24.9	25.8	25.3	26.0	26.3	
	6H	25.3	26.1	25.7	26.4	26.7	24.9	25.6	25.2	25.9	26.2	
	8H	25.3	26.0	25.6	26.3	26.6	24.8	25.6	25.2	25.9	26.2	
	12H	25.3	25.9	25.6	26.3	26.6	24.8	25.5	25.2	25.8	26.1	
4H	2H	25.9	26.8	26.3	27.0	27.3	25.6	26.4	25.9	26.7	26.9	
	3H	25.8	26.5	26.2	26.8	27.1	25.5	26.2	25.8	26.5	26.8	
	4H	25.7	26.3	26.1	26.7	27.0	25.4	26.0	25.8	26.4	26.7	
	6H	25.7	26.2	26.1	26.5	26.9	25.3	25.9	25.8	26.2	26.6	
	8H	25.6	26.1	26.0	26.5	26.9	25.3	25.8	25.7	26.2	26.6	
	12H	25.6	26.0	26.0	26.4	26.8	25.3	25.7	25.7	26.1	26.5	
8H	4H	25.6	26.1	26.0	26.5	26.9	25.3	25.8	25.7	26.2	26.6	
	6H	25.5	25.9	26.0	26.3	26.8	25.2	25.6	25.7	26.0	26.5	
	8H	25.5	25.8	26.0	26.3	26.7	25.2	25.5	25.7	26.0	26.4	
	12H	25.4	25.7	25.9	26.2	26.7	25.1	25.4	25.6	25.9	26.4	
12H	4H	25.6	26.0	26.0	26.4	26.8	25.3	25.7	25.7	26.1	26.5	
	6H	25.5	25.8	26.0	26.3	26.7	25.2	25.5	25.7	26.0	26.4	
	8H	25.4	25.7	25.9	26.2	26.7	25.1	25.4	25.6	25.9	26.4	
Variation of the observer position for the luminaire distances S												
S = 1.0H		+1.8 / -1.1					+2.1 / -2.1					
S = 1.5H		+1.4 / -6.0					+2.1 / -4.0					
S = 2.0H		+2.5 / -21.4					+3.6 / -15.1					
Standard table		BK01					BK01					
Correction Summand		7.2					6.8					
Corrected Glare Indices referring to 13500lm Total Luminous Flux												

The UGR values have been calculated according to CIE Publ. 117 Spacing-to-Height-Ratio = 0.25.

Electrical installation in a block factory



08.06.2012

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TROLL 6402/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR / Luminous intensity table

Luminaire: TROLL 6402/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR

Lamps: 1 x HIT-DE

Gamma	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
0.0°	415	402	395	396	404	410	408
5.0°	402	391	384	387	394	403	406
10.0°	433	420	401	391	391	397	404
15.0°	474	458	435	415	395	391	403
20.0°	464	459	447	426	401	390	401
25.0°	418	420	430	421	392	374	395
30.0°	365	359	391	409	396	359	376
35.0°	283	298	357	404	395	331	324
40.0°	201	218	283	370	347	234	191
45.0°	158	164	207	297	251	140	112
50.0°	129	129	149	186	156	98	85
55.0°	111	111	115	117	99	77	68
60.0°	63	76	98	91	78	60	49
65.0°	2.77	3.38	16	81	50	16	9.34
70.0°	1.34	1.47	1.50	2.89	2.08	1.55	1.37
75.0°	0.71	0.74	0.71	0.64	0.81	0.58	0.52
80.0°	0.34	0.34	0.39	0.43	0.42	0.37	0.37
85.0°	0.14	0.16	0.21	0.26	0.28	0.29	0.30
90.0°	0.03	0.07	0.13	0.18	0.22	0.24	0.24

Values in cd/klm

Electrical installation in a block factory



08.06.2012

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TROLL 6402/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR / Glare Data Sheet

Luminaire: TROLL 6402/150
LIGHTMOTIV +1 x HIT-DE-CRI
150W HF MAG. GEAR

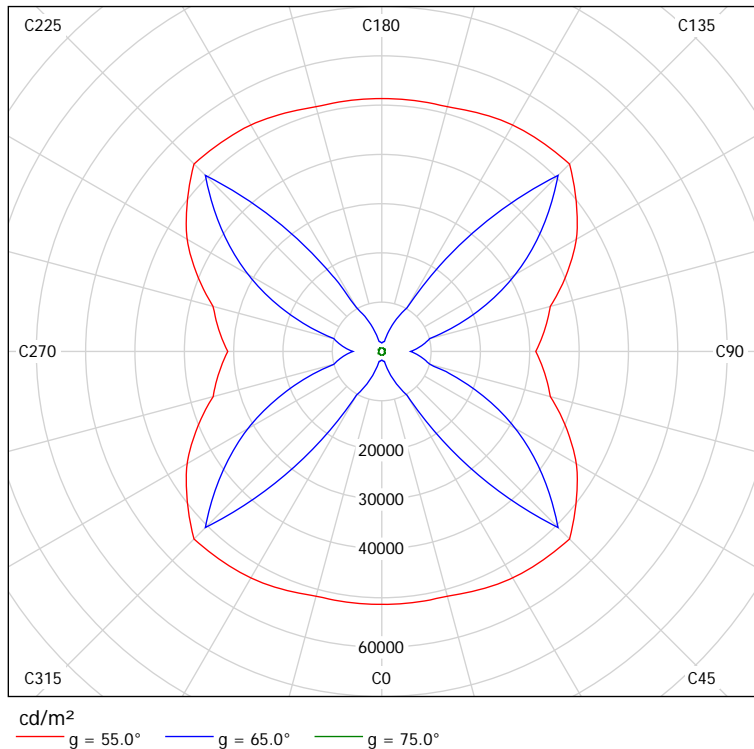
Lamps: 1 x HIT-DE

Glare Evaluation According to UGR													
ρ Ceiling		70	70	50	50	30	ρ Walls		70	70	50	50	30
ρ Floor		50	30	50	30	30	ρ Floor		50	30	50	30	30
		20	20	20	20	20			20	20	20	20	20
Room Size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis						
2H	2H	25.6	26.6	25.9	26.8	27.0	25.1	26.1	25.4	26.3	26.5		
	3H	25.5	26.4	25.8	26.6	26.9	25.0	25.9	25.3	26.1	26.4		
	4H	25.4	26.2	25.7	26.5	26.8	24.9	25.8	25.3	26.0	26.3		
	6H	25.3	26.1	25.7	26.4	26.7	24.9	25.6	25.2	25.9	26.2		
	8H	25.3	26.0	25.6	26.3	26.6	24.8	25.6	25.2	25.9	26.2		
4H	12H	25.3	25.9	25.6	26.3	26.6	24.8	25.5	25.2	25.8	26.1		
	2H	25.9	26.8	26.3	27.0	27.3	25.6	26.4	25.9	26.7	26.9		
	3H	25.8	26.5	26.2	26.8	27.1	25.5	26.2	25.8	26.5	26.8		
	4H	25.7	26.3	26.1	26.7	27.0	25.4	26.0	25.8	26.4	26.7		
	6H	25.7	26.2	26.1	26.5	26.9	25.3	25.9	25.8	26.2	26.6		
8H	8H	25.6	26.1	26.0	26.5	26.9	25.3	25.8	25.7	26.2	26.6		
	12H	25.6	26.0	26.0	26.4	26.8	25.3	25.7	25.7	26.1	26.5		
	4H	25.6	26.1	26.0	26.5	26.9	25.3	25.8	25.7	26.2	26.6		
	6H	25.5	25.9	26.0	26.3	26.8	25.2	25.6	25.7	26.0	26.5		
	8H	25.5	25.8	26.0	26.3	26.7	25.2	25.5	25.7	26.0	26.4		
12H	12H	25.4	25.7	25.9	26.2	26.7	25.1	25.4	25.6	25.9	26.4		
	4H	25.6	26.0	26.0	26.4	26.8	25.3	25.7	25.7	26.1	26.5		
	6H	25.5	25.8	26.0	26.3	26.7	25.2	25.5	25.7	26.0	26.4		
	8H	25.4	25.7	25.9	26.2	26.7	25.1	25.4	25.6	25.9	26.4		

Variation of the observer position for the luminaire distances S		
S = 1.0H	+1.8 / -1.1	+2.1 / -2.1
S = 1.5H	+1.4 / -6.0	+2.1 / -4.0
S = 2.0H	+2.5 / -21.4	+3.6 / -15.1
Standard table Correction Summand	BK01 7.2	BK01 6.8

Corrected Glare Indices referring to 13500lm Total Luminous Flux

The UGR values have been calculated according to CIE Publ. 117 Spacing-to-Height-Ratio = 0.25.



Electrical installation in a block factory



08.06.20

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

Operator Juan Luis Vera Ambel

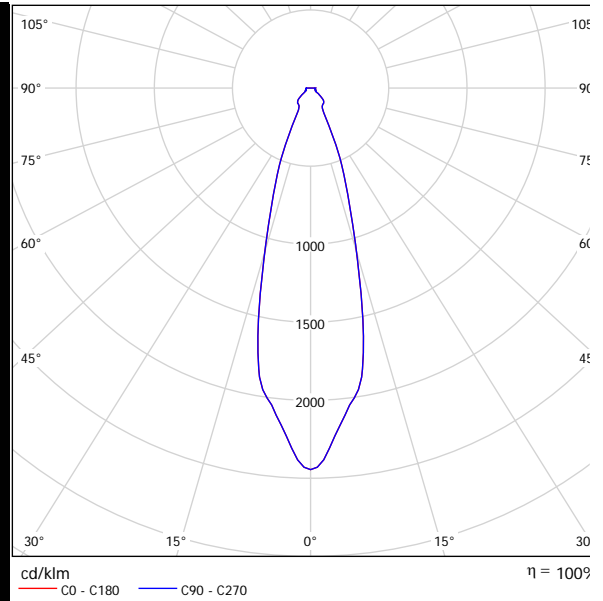
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TROLL 0105 BASIC +1 x QPAR-CB 50W 25° / Luminaire Data Sheet

Luminous emittance 1:



Luminaire classification according to CIE: 100
CIE flux code: 78 90 95 100 101

TROLL 0105 BASIC. INDOOR DOWNLIGHTS IP20. Recessed. 1 x QPAR-CB 50 W . Colours: White RAL 9010 (/33)

ADDITIONAL PHOTOMETRIC DESCRIPTION

LAMP

+1 x QPAR-CB 50W 25°

Luminous emittance 1:

Glare Evaluation According to UGR											
ρ Ceiling	70	70	50	50	30	70	70	50	50	30	
ρ Walls	50	30	50	30	30	50	30	50	30	30	
ρ Floor	20	20	20	20	20	20	20	20	20	20	
Room Size	Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
X	Y										
2H	2H	17.1	18.0	17.3	18.2	18.4	17.1	18.0	17.3	18.2	18.4
	3H	18.5	19.4	18.8	19.6	19.9	18.5	19.4	18.8	19.6	19.9
	4H	19.6	20.4	19.9	20.7	20.9	19.6	20.4	19.9	20.7	20.9
	6H	21.1	21.8	21.4	22.1	22.4	21.1	21.8	21.4	22.1	22.4
	8H	22.0	22.7	22.4	23.0	23.4	22.0	22.7	22.4	23.0	23.4
	12H	23.1	23.8	23.5	24.1	24.4	23.1	23.8	23.5	24.1	24.4
4H	2H	17.6	18.4	17.9	18.6	18.9	17.6	18.4	17.9	18.6	18.9
	3H	19.4	20.1	19.7	20.4	20.7	19.4	20.1	19.7	20.4	20.7
	4H	20.7	21.3	21.1	21.6	22.0	20.7	21.3	21.1	21.6	22.0
	6H	22.5	23.0	22.9	23.4	23.8	22.5	23.0	22.9	23.4	23.8
	8H	23.6	24.1	24.0	24.5	24.9	23.6	24.1	24.0	24.5	24.9
	12H	24.8	25.3	25.3	25.7	26.1	24.8	25.3	25.3	25.7	26.1
8H	4H	21.3	21.8	21.8	22.2	22.6	21.3	21.8	21.8	22.2	22.6
	6H	23.5	23.9	23.9	24.3	24.7	23.5	23.9	23.9	24.3	24.7
	8H	24.8	25.1	25.2	25.6	26.0	24.8	25.1	25.2	25.6	26.0
	12H	26.2	26.5	26.7	27.0	27.5	26.2	26.5	26.7	27.0	27.5
12H	4H	21.5	22.0	22.0	22.4	22.8	21.5	22.0	22.0	22.4	22.8
	6H	23.8	24.1	24.3	24.6	25.1	23.8	24.1	24.3	24.6	25.1
	8H	25.2	25.5	25.7	26.0	26.4	25.2	25.5	25.7	26.0	26.4
Variation of the observer position for the luminaire distances S											
S = 1.0H	+0.2 / -0.1					+0.2 / -0.1					
S = 1.5H	+0.2 / -0.4					+0.2 / -0.4					
S = 2.0H	+0.3 / -0.6					+0.3 / -0.6					
Standard table	---					---					
Correction Summand	---					---					
Corrected Glare Indices referring to 485lm Total Luminous Flux											

Electrical installation in a block factory



08.06.20

Instalaciones.V

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TROLL 0105 BASIC +1 x QPAR-CB 50W 25° / UGR-Tabl

Luminaire: TROLL 0105 BASIC +1 x QPAR-CB 50W 25°

Lamps: 1 x QPAR-CB

Glare Evaluation According to UGR											
ρ Ceiling		70	70	50	50	30	70	70	50	50	30
ρ Walls		50	30	50	30	30	50	30	50	30	30
ρ Floor		20	20	20	20	20	20	20	20	20	20
Room Size		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis				
X	Y										
2H	2H	17.1	18.0	17.3	18.2	18.4	17.1	18.0	17.3	18.2	18.4
	3H	18.5	19.4	18.8	19.6	19.9	18.5	19.4	18.8	19.6	19.9
	4H	19.6	20.4	19.9	20.7	20.9	19.6	20.4	19.9	20.7	20.9
	6H	21.1	21.8	21.4	22.1	22.4	21.1	21.8	21.4	22.1	22.4
	8H	22.0	22.7	22.4	23.0	23.4	22.0	22.7	22.4	23.0	23.4
	12H	23.1	23.8	23.5	24.1	24.4	23.1	23.8	23.5	24.1	24.4
4H	2H	17.6	18.4	17.9	18.6	18.9	17.6	18.4	17.9	18.6	18.9
	3H	19.4	20.1	19.7	20.4	20.7	19.4	20.1	19.7	20.4	20.7
	4H	20.7	21.3	21.1	21.6	22.0	20.7	21.3	21.1	21.6	22.0
	6H	22.5	23.0	22.9	23.4	23.8	22.5	23.0	22.9	23.4	23.8
	8H	23.6	24.1	24.0	24.5	24.9	23.6	24.1	24.0	24.5	24.9
	12H	24.8	25.3	25.3	25.7	26.1	24.8	25.3	25.3	25.7	26.1
8H	4H	21.3	21.8	21.8	22.2	22.6	21.3	21.8	21.8	22.2	22.6
	6H	23.5	23.9	23.9	24.3	24.7	23.5	23.9	23.9	24.3	24.7
	8H	24.8	25.1	25.2	25.6	26.0	24.8	25.1	25.2	25.6	26.0
	12H	26.2	26.5	26.7	27.0	27.5	26.2	26.5	26.7	27.0	27.5
12H	4H	21.5	22.0	22.0	22.4	22.8	21.5	22.0	22.0	22.4	22.8
	6H	23.8	24.1	24.3	24.6	25.1	23.8	24.1	24.3	24.6	25.1
	8H	25.2	25.5	25.7	26.0	26.4	25.2	25.5	25.7	26.0	26.4
Variation of the observer position for the luminaire distances S											
S = 1.0H		+0.2 / -0.1					+0.2 / -0.1				
S = 1.5H		+0.2 / -0.4					+0.2 / -0.4				
S = 2.0H		+0.3 / -0.6					+0.3 / -0.6				
Standard table		---					---				
Correction Summand		---					---				
Corrected Glare Indices referring to 485lm Total Luminous Flux											

The UGR values have been calculated according to CIE Publ. 117 Spacing-to-Height-Ratio = 0.25.

Electrical installation in a block factory

08.06.2012

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TROLL 0105 BASIC +1 x QPAR-CB 50W 25° / Luminous intensity table

Luminaire: TROLL 0105 BASIC +1 x QPAR-CB 50W 25°

Lamps: 1 x QPAR-CB

Gamma C 0°

0.0° 2445

5.0° 2166

10.0° 1880

15.0° 1174

20.0° 665

25.0° 325

30.0° 151

35.0° 133

40.0° 128

45.0° 116

50.0° 86

55.0° 50

60.0° 39

65.0° 37

70.0° 32

75.0° 31

80.0° 32

85.0° 30

90.0° 30

Values in cd/klm

Electrical installation in a block factory



08.06.2012

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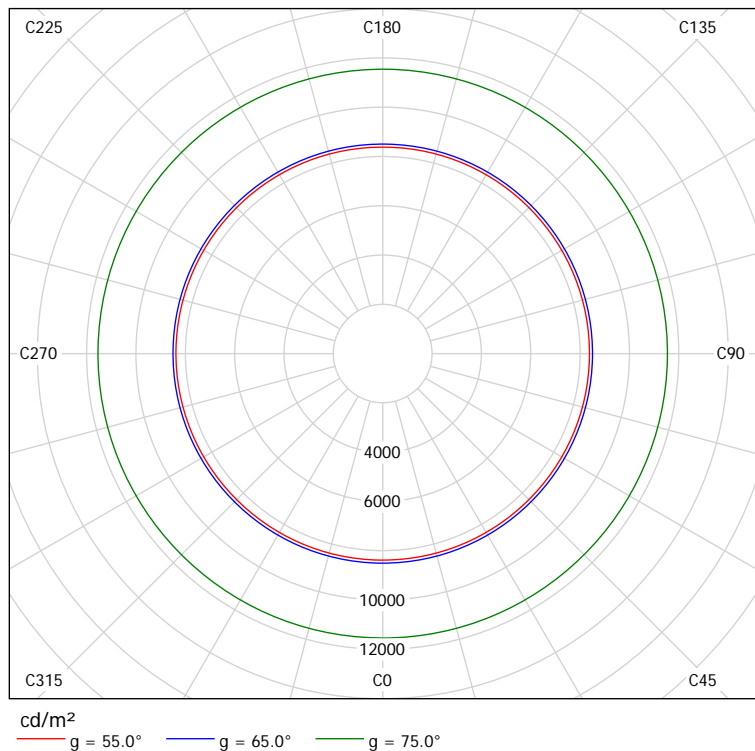
TROLL 0105 BASIC +1 x QPAR-CB 50W 25° / Glare Data Sheet

Luminaire: TROLL 0105 BASIC
 +1 x QPAR-CB 50W 25°

Lamps: 1 x QPAR-CB

Glare Evaluation According to UGR													
ρ Ceiling		70	70	50	50	30	ρ Walls		70	70	50	50	30
ρ Walls		50	30	50	30	30	ρ Floor		50	30	50	30	30
ρ Floor		20	20	20	20	20			20	20	20	20	20
Room Size X	Y	Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis						
2H	2H	17.1	18.0	17.3	18.2	18.4	17.1	18.0	17.3	18.2	18.4		
	3H	18.5	19.4	18.8	19.6	19.9	18.5	19.4	18.8	19.6	19.9		
	4H	19.6	20.4	19.9	20.7	20.9	19.6	20.4	19.9	20.7	20.9		
	6H	21.1	21.8	21.4	22.1	22.4	21.1	21.8	21.4	22.1	22.4		
	8H	22.0	22.7	22.4	23.0	23.4	22.0	22.7	22.4	23.0	23.4		
4H	12H	23.1	23.8	23.5	24.1	24.4	23.1	23.8	23.5	24.1	24.4		
	2H	17.6	18.4	17.9	18.6	18.9	17.6	18.4	17.9	18.6	18.9		
	3H	19.4	20.1	19.7	20.4	20.7	19.4	20.1	19.7	20.4	20.7		
	4H	20.7	21.3	21.1	21.6	22.0	20.7	21.3	21.1	21.6	22.0		
	6H	22.5	23.0	22.9	23.4	23.8	22.5	23.0	22.9	23.4	23.8		
8H	8H	23.6	24.1	24.0	24.5	24.9	23.6	24.1	24.0	24.5	24.9		
	12H	24.8	25.3	25.3	25.7	26.1	24.8	25.3	25.3	25.7	26.1		
	4H	21.3	21.8	21.8	22.2	22.6	21.3	21.8	21.8	22.2	22.6		
	6H	23.5	23.9	23.9	24.3	24.7	23.5	23.9	23.9	24.3	24.7		
	8H	24.8	25.1	25.2	25.6	26.0	24.8	25.1	25.2	25.6	26.0		
12H	12H	26.2	26.5	26.7	27.0	27.5	26.2	26.5	26.7	27.0	27.5		
	4H	21.5	22.0	22.0	22.4	22.8	21.5	22.0	22.0	22.4	22.8		
	6H	23.8	24.1	24.3	24.6	25.1	23.8	24.1	24.3	24.6	25.1		
	8H	25.2	25.5	25.7	26.0	26.4	25.2	25.5	25.7	26.0	26.4		
Variation of the observer position for the luminaire distances S													
S = 1.0H		+0.2 / -0.1					+0.2 / -0.1						
S = 1.5H		+0.2 / -0.4					+0.2 / -0.4						
S = 2.0H		+0.3 / -0.6					+0.3 / -0.6						
Standard table Correction		---					---						
Summand		---					---						
Corrected Glare Indices referring to 485lm Total Luminous Flux													

The UGR values have been calculated according to CIE Publ. 117 Spacing-to-Height-Ratio = 0.25.



Electrical installation in a block factory



08.06.20

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

Operator Juan Luis Vera Ambel

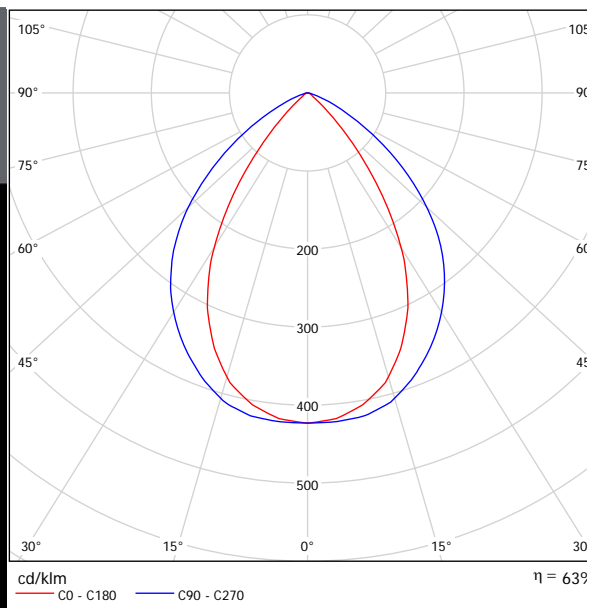
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**TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 84
ELECTR. GEAR / Luminaire Data Sheet**

Luminous emittance 1:



Luminaire classification according to CIE: 100
CIE flux code: 76 97 100 100 63

Luminous emittance 1:

TROLL 030354T/84 BATLIGHT, INDOOR FLUORESCENT LUMINAIRES IP20. 2-circuit surface track. Direct double symmetric optics with aluminium low luminance louvers. 2 x T5 HO 54 W 840 Lamps included. Electronic ballast with preheating. Colours: Metallic light grey RAL 9006 (/21)

Glare Evaluation According to UGR											
ρ Ceiling	70	70	50	50	30	70	70	50	50	30	
ρ Walls	50	30	50	30	30	50	30	50	30	30	
ρ Floor	20	20	20	20	20	20	20	20	20	20	
Room Size X Y	Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	12.1	13.0	12.4	13.2	13.4	18.3	19.2	18.6	19.4	19.9
	3H	12.0	12.9	12.3	13.1	13.3	18.4	19.2	18.7	19.5	19.9
	4H	12.0	12.7	12.3	13.0	13.3	18.4	19.2	18.7	19.4	19.9
	6H	11.9	12.6	12.2	12.9	13.2	18.3	19.0	18.7	19.3	19.9
	8H	11.9	12.5	12.2	12.8	13.1	18.3	19.0	18.7	19.3	19.9
4H	12H	11.8	12.5	12.2	12.8	13.1	18.3	18.9	18.6	19.2	19.9
	2H	12.3	13.1	12.6	13.3	13.6	18.1	18.9	18.4	19.1	19.9
	3H	12.3	12.9	12.6	13.2	13.5	18.2	18.9	18.6	19.2	19.9
	4H	12.2	12.8	12.6	13.1	13.4	18.2	18.8	18.6	19.1	19.9
	6H	12.1	12.6	12.5	13.0	13.4	18.2	18.6	18.6	19.0	19.9
8H	12H	12.1	12.5	12.5	12.9	13.3	18.1	18.6	18.6	19.0	19.9
	12H	12.1	12.4	12.5	12.8	13.3	18.1	18.5	18.6	18.9	19.9
	4H	12.1	12.5	12.5	12.9	13.3	18.1	18.5	18.5	18.9	19.9
	6H	12.0	12.4	12.5	12.8	13.3	18.1	18.4	18.5	18.8	19.9
	8H	12.0	12.3	12.5	12.7	13.2	18.0	18.3	18.5	18.8	19.9
12H	12H	12.0	12.2	12.4	12.7	13.2	18.0	18.2	18.5	18.7	19.9
	4H	12.1	12.5	12.5	12.9	13.3	18.1	18.5	18.5	18.9	19.9
	6H	12.0	12.3	12.5	12.7	13.2	18.0	18.3	18.5	18.8	19.9
8H	12.0	12.2	12.4	12.7	13.2	18.0	18.2	18.5	18.7	19.9	
Variation of the observer position for the luminaire distances S											
S = 1.0H	+3.0 / -7.3					+0.4 / -0.9					
S = 1.5H	+4.4 / -9.5					+2.2 / -4.2					
S = 2.0H	+6.0 / -10.6					+4.1 / -8.1					
Standard table	BK01					BK00					
Correction Summand	-7.3					-1.7					
Corrected Glare Indices referring to 8900lm Total Luminous Flux											

ADDITIONAL PHOTOMETRIC DESCRIPTION

LAMP

2 x T5 HO 54W 840

EQUIPMENT

ELECTR. GEAR

OPTIC

(DIR. SYM. L + DIR. SYM. L).

Electrical installation in a block factory



08.06.20

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

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TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 84 ELECTR. GEAR / UGR-Tabl

Luminaire: TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840
 ELECTR. GEAR
 Lamps: 2 x T5 HO

Glare Evaluation According to UGR											
ρ Ceiling		70	70	50	50	30	70	70	50	50	30
ρ Walls		50	30	50	30	30	50	30	50	30	30
ρ Floor		20	20	20	20	20	20	20	20	20	20
Room Size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis				
2H	2H	12.1	13.0	12.4	13.2	13.4	18.3	19.2	18.6	19.4	19.6
	3H	12.0	12.9	12.3	13.1	13.3	18.4	19.2	18.7	19.5	19.7
	4H	12.0	12.7	12.3	13.0	13.3	18.4	19.2	18.7	19.4	19.7
	6H	11.9	12.6	12.2	12.9	13.2	18.3	19.0	18.7	19.3	19.6
	8H	11.9	12.5	12.2	12.8	13.1	18.3	19.0	18.7	19.3	19.6
	12H	11.8	12.5	12.2	12.8	13.1	18.3	18.9	18.6	19.2	19.5
4H	2H	12.3	13.1	12.6	13.3	13.6	18.1	18.9	18.4	19.1	19.4
	3H	12.3	12.9	12.6	13.2	13.5	18.2	18.9	18.6	19.2	19.5
	4H	12.2	12.8	12.6	13.1	13.4	18.2	18.8	18.6	19.1	19.5
	6H	12.1	12.6	12.5	13.0	13.4	18.2	18.6	18.6	19.0	19.4
	8H	12.1	12.5	12.5	12.9	13.3	18.1	18.6	18.6	19.0	19.4
	12H	12.1	12.4	12.5	12.8	13.3	18.1	18.5	18.6	18.9	19.3
8H	4H	12.1	12.5	12.5	12.9	13.3	18.1	18.5	18.5	18.9	19.3
	6H	12.0	12.4	12.5	12.8	13.3	18.1	18.4	18.5	18.8	19.3
	8H	12.0	12.3	12.5	12.7	13.2	18.0	18.3	18.5	18.8	19.2
	12H	12.0	12.2	12.4	12.7	13.2	18.0	18.2	18.5	18.7	19.2
12H	4H	12.1	12.5	12.5	12.9	13.3	18.1	18.5	18.5	18.9	19.3
	6H	12.0	12.3	12.5	12.7	13.2	18.0	18.3	18.5	18.8	19.2
	8H	12.0	12.2	12.4	12.7	13.2	18.0	18.2	18.5	18.7	19.2
Variation of the observer position for the luminaire distances S											
S = 1.0H		+3.0 / -7.3					+0.4 / -0.9				
S = 1.5H		+4.4 / -9.5					+2.2 / -4.2				
S = 2.0H		+6.0 / -10.6					+4.1 / -8.1				
Standard table		BK01					BK00				
Correction Summand		-7.3					-1.7				
Corrected Glare Indices referring to 8900lm Total Luminous Flux											

The UGR values have been calculated according to CIE Publ. 117 Spacing-to-Height-Ratio = 0.25.

Electrical installation in a block factory



08.06.2012

Instalaciones.V

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TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR / Luminous intensity table

Luminaire: TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840
 ELECTR. GEAR
 Lamps: 2 x T5 HO

Gamma	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
0.0°	423	423	423	423	423	423	423
5.0°	419	419	420	421	422	423	423
10.0°	406	407	409	413	417	420	420
15.0°	384	387	394	400	403	409	410
20.0°	349	354	366	377	383	388	390
25.0°	304	311	327	341	354	360	366
30.0°	247	258	279	297	316	331	338
35.0°	177	192	217	245	276	293	306
40.0°	106	121	149	188	226	252	268
45.0°	50	62	86	128	175	209	223
50.0°	19	26	40	73	124	161	172
55.0°	7.93	12	17	33	76	112	120
60.0°	5.97	8.55	9.27	13	37	65	75
65.0°	4.53	6.44	6.89	6.37	13	29	41
70.0°	2.53	3.60	4.15	4.05	4.36	13	19
75.0°	0.80	1.08	1.56	1.93	2.31	4.49	5.59
80.0°	0.35	0.32	0.42	0.51	1.02	1.66	3.77
85.0°	0.31	0.34	0.33	0.19	0.26	0.51	1.95
90.0°	0.06	0.04	0.03	0.01	0.01	0.01	0.00

Values in cd/klm

Electrical installation in a block factory



08.06.2012

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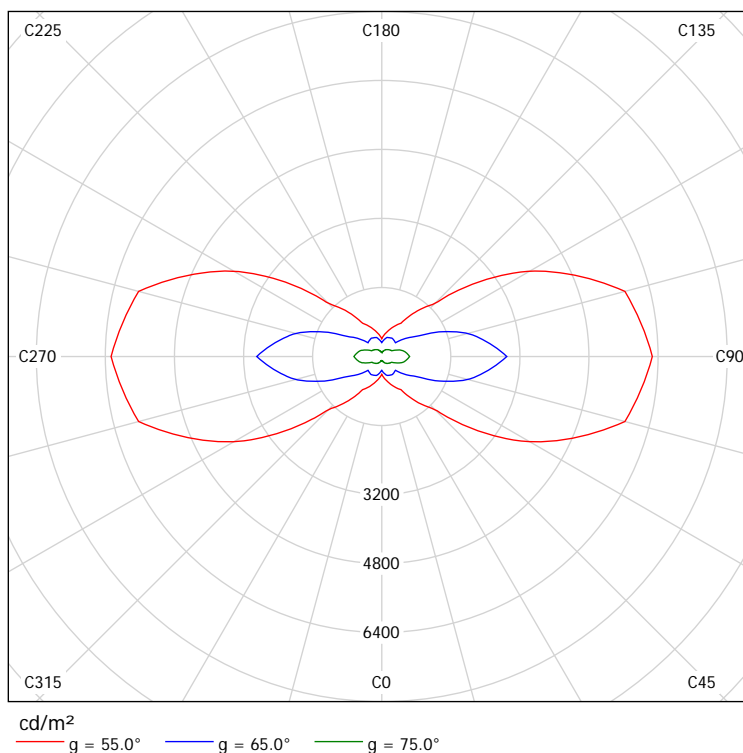
**TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W
840 ELECTR. GEAR / Glare Data Sheet**

Luminaire: TROLL 030354T/84
BATLIGHT (DIR. SYM. L + DIR.
SYM. L). 2 x T5 HO 54W 840
ELECTR. GEAR

Lamps: 2 x T5 HO

Glare Evaluation According to UGR											
ρ Ceiling	70	70	50	50	30	70	70	50	50	30	
ρ Walls	50	30	50	30	30	50	30	50	30	30	
ρ Floor	20	20	20	20	20	20	20	20	20	20	
Room Size X Y	Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	12.1	13.0	12.4	13.2	13.4	18.3	19.2	18.6	19.4	19.6
	3H	12.0	12.9	12.3	13.1	13.3	18.4	19.2	18.7	19.5	19.7
	4H	12.0	12.7	12.3	13.0	13.3	18.4	19.2	18.7	19.4	19.7
	6H	11.9	12.6	12.2	12.9	13.2	18.3	19.0	18.7	19.3	19.6
	8H	11.9	12.5	12.2	12.8	13.1	18.3	19.0	18.7	19.3	19.6
4H	12H	11.8	12.5	12.2	12.8	13.1	18.3	18.9	18.6	19.2	19.5
	2H	12.3	13.1	12.6	13.3	13.6	18.1	18.9	18.4	19.1	19.4
	3H	12.3	12.9	12.6	13.2	13.5	18.2	18.9	18.6	19.2	19.5
	4H	12.2	12.8	12.6	13.1	13.4	18.2	18.8	18.6	19.1	19.5
	6H	12.1	12.6	12.5	13.0	13.4	18.2	18.6	18.6	19.0	19.4
8H	8H	12.1	12.5	12.5	12.9	13.3	18.1	18.6	18.6	19.0	19.4
	12H	12.1	12.4	12.5	12.8	13.3	18.1	18.5	18.6	18.9	19.3
	4H	12.1	12.5	12.5	12.9	13.3	18.1	18.5	18.5	18.9	19.3
12H	6H	12.0	12.4	12.5	12.8	13.3	18.1	18.4	18.5	18.8	19.3
	8H	12.0	12.3	12.5	12.7	13.2	18.0	18.3	18.5	18.8	19.2
	12H	12.0	12.2	12.4	12.7	13.2	18.0	18.2	18.5	18.7	19.2
	4H	12.1	12.5	12.5	12.9	13.3	18.1	18.5	18.5	18.9	19.3
6H	6H	12.0	12.3	12.5	12.7	13.2	18.0	18.3	18.5	18.8	19.2
	8H	12.0	12.2	12.4	12.7	13.2	18.0	18.2	18.5	18.7	19.2
Variation of the observer position for the luminaire distances S											
S = 1.0H	+3.0 / -7.3					+0.4 / -0.9					
S = 1.5H	+4.4 / -9.5					+2.2 / -4.2					
S = 2.0H	+6.0 / -10.6					+4.1 / -8.1					
Standard table	BK01					BK00					
Correction Summand	-7.3					-1.7					
Corrected Glare Indices referring to 8900lm Total Luminous Flux											

The UGR values have been calculated according to CIE Publ. 117 Spacing-to-Height-Ratio = 0.25.



Electrical installation in a block factory



08.06.20

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

Operator Juan Luis Vera Ambel

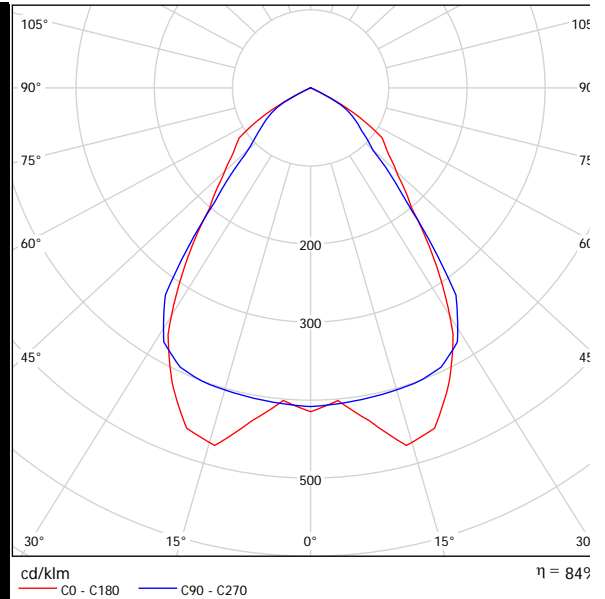
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**TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR
Luminaire Data Sheet**

Luminous emittance 1:



Luminaire classification according to CIE: 100
CIE flux code: 70 97 100 100 84

Luminous emittance 1:

TROLL 0642/150 LIGHTMOTIV. OUTDOOR RECESSED LUMINAIRES
IP65 / IK7. Ceiling / wall(accessories needed) recessed. Double axis
optics. 1 x HIT-DE 150 W . H.F. Magnetic gear. Colours: White RAL
9010 (/33)

Glare Evaluation According to UGR

ρ Ceiling	70	70	50	50	30	70	70	50	50	30	
ρ Walls	50	30	50	30	30	50	30	50	30	30	
ρ Floor	20	20	20	20	20	20	20	20	20	20	
Room Size X Y	Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis					
2H	2H	22.6	23.6	22.9	23.8	24.0	22.1	23.1	22.4	23.3	23.3
	3H	22.4	23.3	22.7	23.6	23.8	22.0	22.9	22.3	23.1	23.3
	4H	22.4	23.2	22.7	23.5	23.7	21.9	22.7	22.2	23.0	23.3
	6H	22.3	23.1	22.6	23.3	23.6	21.8	22.6	22.2	22.9	23.3
	8H	22.3	23.0	22.6	23.3	23.6	21.8	22.5	22.1	22.8	23.3
12H	22.2	22.9	22.6	23.2	23.5	21.8	22.4	22.1	22.8	23.3	
4H	2H	22.9	23.7	23.2	24.0	24.3	22.5	23.4	22.9	23.6	23.3
	3H	22.8	23.4	23.1	23.8	24.1	22.4	23.1	22.8	23.4	23.3
	4H	22.7	23.3	23.1	23.6	24.0	22.4	23.0	22.8	23.3	23.3
	6H	22.6	23.1	23.0	23.5	23.9	22.3	22.8	22.7	23.2	23.3
	8H	22.6	23.0	23.0	23.4	23.8	22.3	22.7	22.7	23.1	23.3
12H	22.5	23.0	23.0	23.4	23.8	22.2	22.6	22.7	23.0	23.3	
8H	4H	22.6	23.0	23.0	23.4	23.8	22.3	22.7	22.7	23.1	23.3
	6H	22.5	22.9	23.0	23.3	23.7	22.2	22.6	22.6	23.0	23.3
	8H	22.5	22.8	22.9	23.2	23.7	22.1	22.5	22.6	22.9	23.3
	12H	22.4	22.7	22.9	23.2	23.6	22.1	22.4	22.6	22.8	23.3
	12H	4H	22.5	23.0	23.0	23.4	23.8	22.2	22.6	22.7	23.0
6H		22.5	22.8	22.9	23.2	23.7	22.1	22.5	22.6	22.9	23.3
8H		22.4	22.7	22.9	23.2	23.6	22.1	22.4	22.6	22.8	23.3
12H		22.4	22.7	22.9	23.2	23.6	22.1	22.4	22.6	22.8	23.3
Variation of the observer position for the luminaire distances S											
S = 1.0H	+1.8 / -1.1					+2.1 / -2.1					
S = 1.5H	+1.4 / -6.0					+2.1 / -4.0					
S = 2.0H	+2.5 / -21.4					+3.6 / -15.1					
Standard table	BK01					BK01					
Correction Summand	4.2					3.8					
Corrected Glare Indices referring to 13500lm Total Luminous Flux											

ADDITIONAL PHOTOMETRIC DESCRIPTION

LAMP

+1 x HIT-DE-CRI 150W

EQUIPMENT

HF MAG. GEAR

Electrical installation in a block factory



08.06.20

Instalaciones.V

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TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR / UGF Tabl

Luminaire: TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR
 Lamps: 1 x HIT-DE

Glare Evaluation According to UGR											
ρ Ceiling		70	70	50	50	30	70	70	50	50	30
ρ Walls		50	30	50	30	30	50	30	50	30	30
ρ Floor		20	20	20	20	20	20	20	20	20	20
Room Size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis				
2H	2H	22.6	23.6	22.9	23.8	24.0	22.1	23.1	22.4	23.3	23.5
	3H	22.4	23.3	22.7	23.6	23.8	22.0	22.9	22.3	23.1	23.4
	4H	22.4	23.2	22.7	23.5	23.7	21.9	22.7	22.2	23.0	23.3
	6H	22.3	23.1	22.6	23.3	23.6	21.8	22.6	22.2	22.9	23.2
	8H	22.3	23.0	22.6	23.3	23.6	21.8	22.5	22.1	22.8	23.1
	12H	22.2	22.9	22.6	23.2	23.5	21.8	22.4	22.1	22.8	23.1
4H	2H	22.9	23.7	23.2	24.0	24.3	22.5	23.4	22.9	23.6	23.9
	3H	22.8	23.4	23.1	23.8	24.1	22.4	23.1	22.8	23.4	23.8
	4H	22.7	23.3	23.1	23.6	24.0	22.4	23.0	22.8	23.3	23.7
	6H	22.6	23.1	23.0	23.5	23.9	22.3	22.8	22.7	23.2	23.6
	8H	22.6	23.0	23.0	23.4	23.8	22.3	22.7	22.7	23.1	23.5
	12H	22.5	23.0	23.0	23.4	23.8	22.2	22.6	22.7	23.0	23.5
8H	4H	22.6	23.0	23.0	23.4	23.8	22.3	22.7	22.7	23.1	23.5
	6H	22.5	22.9	23.0	23.3	23.7	22.2	22.6	22.6	23.0	23.4
	8H	22.5	22.8	22.9	23.2	23.7	22.1	22.5	22.6	22.9	23.4
	12H	22.4	22.7	22.9	23.2	23.6	22.1	22.4	22.6	22.8	23.3
12H	4H	22.5	23.0	23.0	23.4	23.8	22.2	22.6	22.7	23.0	23.5
	6H	22.5	22.8	22.9	23.2	23.7	22.1	22.5	22.6	22.9	23.4
	8H	22.4	22.7	22.9	23.2	23.6	22.1	22.4	22.6	22.8	23.3
Variation of the observer position for the luminaire distances S											
S = 1.0H		+1.8 / -1.1					+2.1 / -2.1				
S = 1.5H		+1.4 / -6.0					+2.1 / -4.0				
S = 2.0H		+2.5 / -21.4					+3.6 / -15.1				
Standard table		BK01					BK01				
Correction Summand		4.2					3.8				
Corrected Glare Indices referring to 13500lm Total Luminous Flux											

The UGR values have been calculated according to CIE Publ. 117 Spacing-to-Height-Ratio = 0.25.

Electrical installation in a block factory



08.06.2012

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TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR / Luminous intensity table

Luminaire: TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR

Lamps: 1 x HIT-DE

Gamma	C 0°	C 15°	C 30°	C 45°	C 60°	C 75°	C 90°
0.0°	415	402	395	396	404	410	408
5.0°	402	391	384	387	394	403	406
10.0°	433	420	401	391	391	397	404
15.0°	474	458	435	415	395	391	403
20.0°	464	459	447	426	401	390	401
25.0°	418	420	430	421	392	374	395
30.0°	365	359	391	409	396	359	376
35.0°	283	298	357	404	395	331	324
40.0°	201	218	283	370	347	234	191
45.0°	158	164	207	297	251	140	112
50.0°	129	129	149	186	156	98	85
55.0°	111	111	115	117	99	77	68
60.0°	63	76	98	91	78	60	49
65.0°	2.77	3.38	16	81	50	16	9.34
70.0°	1.34	1.47	1.50	2.89	2.08	1.55	1.37
75.0°	0.71	0.74	0.71	0.64	0.81	0.58	0.52
80.0°	0.34	0.34	0.39	0.43	0.42	0.37	0.37
85.0°	0.14	0.16	0.21	0.26	0.28	0.29	0.30
90.0°	0.03	0.07	0.13	0.18	0.22	0.24	0.24

Values in cd/klm

Electrical installation in a block factory



08.06.2012

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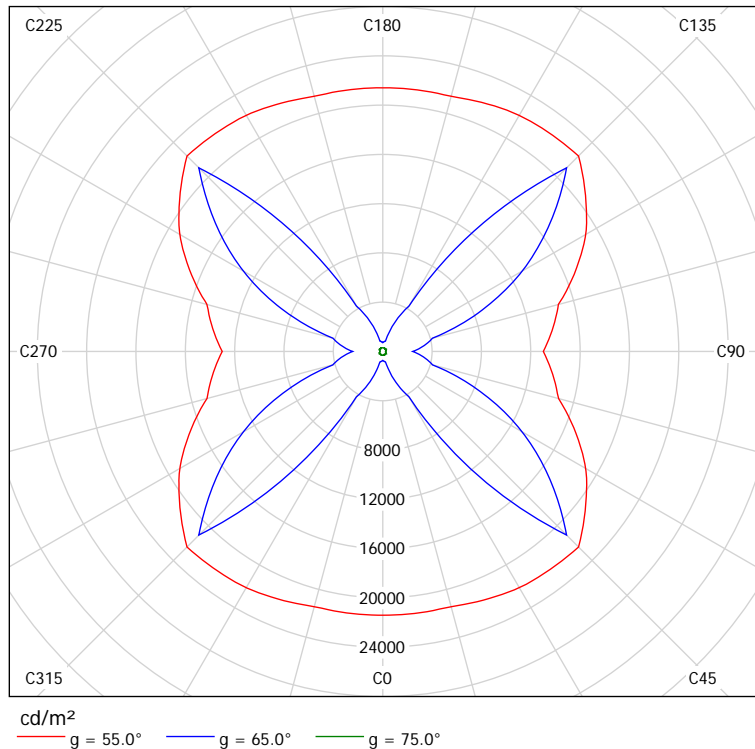
TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR / Glare Data Sheet

Luminaire: TROLL 0642/150
LIGHTMOTIV +1 x HIT-DE-CRI
150W HF MAG. GEAR

Lamps: 1 x HIT-DE

Glare Evaluation According to UGR													
p Ceiling		70	70	50	50	30	p Walls		50	30	50	30	30
p Floor		20	20	20	20	20	p Floor		20	20	20	20	20
Room Size X Y		Viewing direction at right angles to lamp axis					Viewing direction parallel to lamp axis						
2H	2H	22.6	23.6	22.9	23.8	24.0	22.1	23.1	22.4	23.3	23.5		
	3H	22.4	23.3	22.7	23.6	23.8	22.0	22.9	22.3	23.1	23.4		
	4H	22.4	23.2	22.7	23.5	23.7	21.9	22.7	22.2	23.0	23.3		
	6H	22.3	23.1	22.6	23.3	23.6	21.8	22.6	22.2	22.9	23.2		
	8H	22.3	23.0	22.6	23.3	23.6	21.8	22.5	22.1	22.8	23.1		
4H	12H	22.2	22.9	22.6	23.2	23.5	21.8	22.4	22.1	22.8	23.1		
	2H	22.9	23.7	23.2	24.0	24.3	22.5	23.4	22.9	23.6	23.9		
	3H	22.8	23.4	23.1	23.8	24.1	22.4	23.1	22.8	23.4	23.8		
	4H	22.7	23.3	23.1	23.6	24.0	22.4	23.0	22.8	23.3	23.7		
	6H	22.6	23.1	23.0	23.5	23.9	22.3	22.8	22.7	23.2	23.6		
8H	8H	22.6	23.0	23.0	23.4	23.8	22.3	22.7	22.7	23.1	23.5		
	12H	22.5	23.0	23.0	23.4	23.8	22.2	22.6	22.7	23.0	23.5		
	4H	22.6	23.0	23.0	23.4	23.8	22.3	22.7	22.7	23.1	23.5		
	6H	22.5	22.9	23.0	23.3	23.7	22.2	22.6	22.6	23.0	23.4		
	8H	22.5	22.8	22.9	23.2	23.7	22.1	22.5	22.6	22.9	23.4		
12H	12H	22.4	22.7	22.9	23.2	23.6	22.1	22.4	22.6	22.8	23.3		
	4H	22.5	23.0	23.0	23.4	23.8	22.2	22.6	22.7	23.0	23.5		
	6H	22.5	22.8	22.9	23.2	23.7	22.1	22.5	22.6	22.9	23.4		
8H	22.4	22.7	22.9	23.2	23.6	22.1	22.4	22.6	22.8	23.3			
Variation of the observer position for the luminaire distances S													
S = 1.0H		+1.8 / -1.1					+2.1 / -2.1						
S = 1.5H		+1.4 / -6.0					+2.1 / -4.0						
S = 2.0H		+2.5 / -21.4					+3.6 / -15.1						
Standard table Correction Summand		BK01 4.2					BK01 3.8						
Corrected Glare Indices referring to 13500lm Total Luminous Flux													

The UGR values have been calculated according to CIE Publ. 117 Spacing-to-Height-Ratio = 0.25.



Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

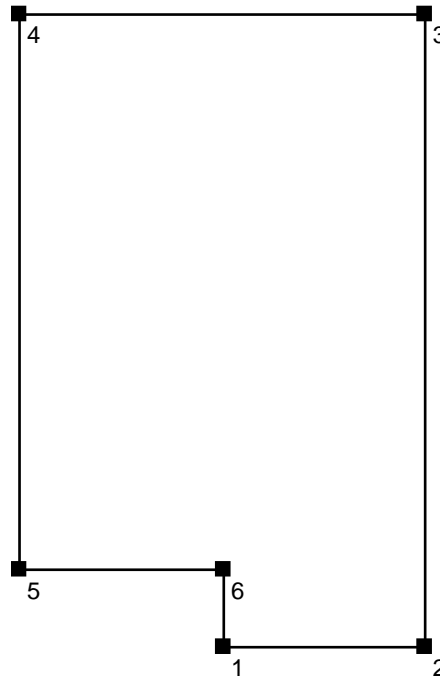
Operator Juan Luis Vera Ambel
 Telephone 646336621
 Fax -
 e-Mail Instalaciones.V@gmail.com

PB Industry / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 6.000 m
 Ground area: 2345.85 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	54	/	/	/
Techo	70	/	/	/
Pared 1	34	(20.450 20.300)	(40.300 20.300)	19.850
Pared 2	34	(40.300 20.300)	(40.300 82.800)	62.500
Pared 3	34	(40.300 82.800)	(0.300 82.800)	40.000
Pared 4	34	(0.300 82.800)	(0.300 27.950)	54.850
Pared 5	34	(0.300 27.950)	(20.450 27.950)	20.150
Pared 6	34	(20.450 27.950)	(20.450 20.300)	7.650

Electrical installation in a block factory

08.06.2012

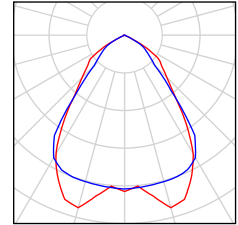
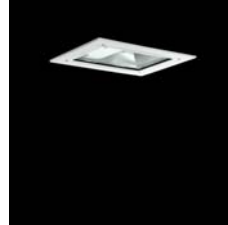
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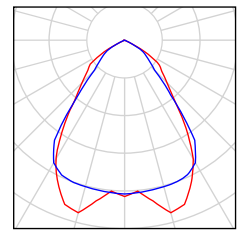
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PB Industry / Luminaire parts list

2 Pieces TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR
 Article No.: 0642/150
 Luminaire Luminous Flux: 13500 lm
 Luminaire Wattage: 171.0 W
 Luminaire classification according to CIE: 100
 CIE flux code: 70 97 100 100 84
 Fitting: 1 x HIT-DE (Correction Factor 1.000).



75 Pieces TROLL 6402/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR
 Article No.: 6402/150
 Luminaire Luminous Flux: 13500 lm
 Luminaire Wattage: 171.0 W
 Luminaire classification according to CIE: 100
 CIE flux code: 70 97 100 100 84
 Fitting: 1 x HIT-DE (Correction Factor 1.000).





08.06.2012

Electrical installation in a block factory

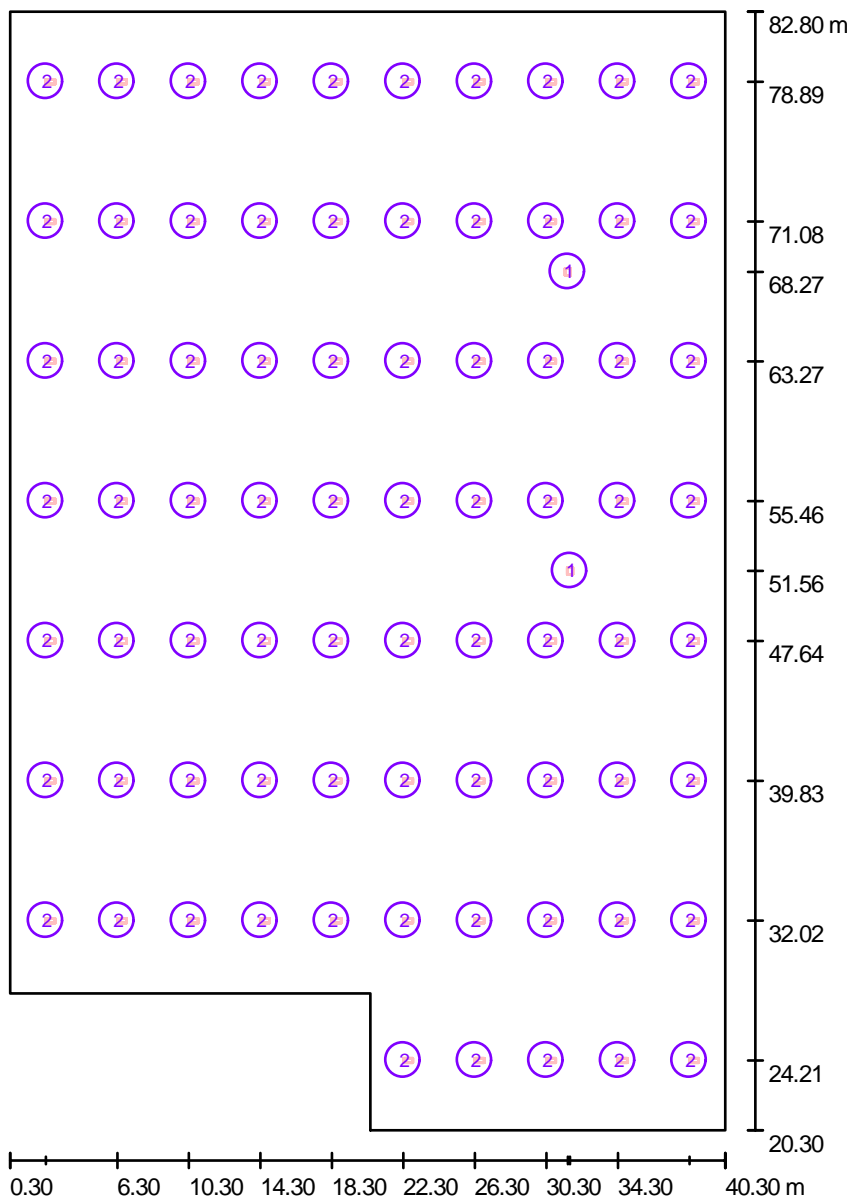


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PB Industry / Luminaires (layout plan)



Scale 1 : 423

Luminaire Parts List

No.	Pieces	Designation
1	2	TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR
2	75	TROLL 6402/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

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PB Industry / Photometric Results

Total Luminous Flux: 1039500 lm
 Total Load: 13167.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m²]
	direct	indirect	total		
Plano útil	291	98	390	/	/
Suelo	245	85	331	54	57
Techo	0.00	157	157	70	35
Pared 1	4.11	99	103	34	11
Pared 2	31	129	160	34	17
Pared 3	7.09	135	142	34	15
Pared 4	16	121	138	34	15
Pared 5	6.04	108	114	34	12
Pared 6	18	98	116	34	13

Uniformity on the working plane
 u0: 0.155 (1:6)
 E_{\min} / E_{\max} : 0.048 (1:21)

Specific connected load: $5.61 \text{ W/m}^2 = 1.44 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 2345.85 m^2)

Electrical installation in a block factory



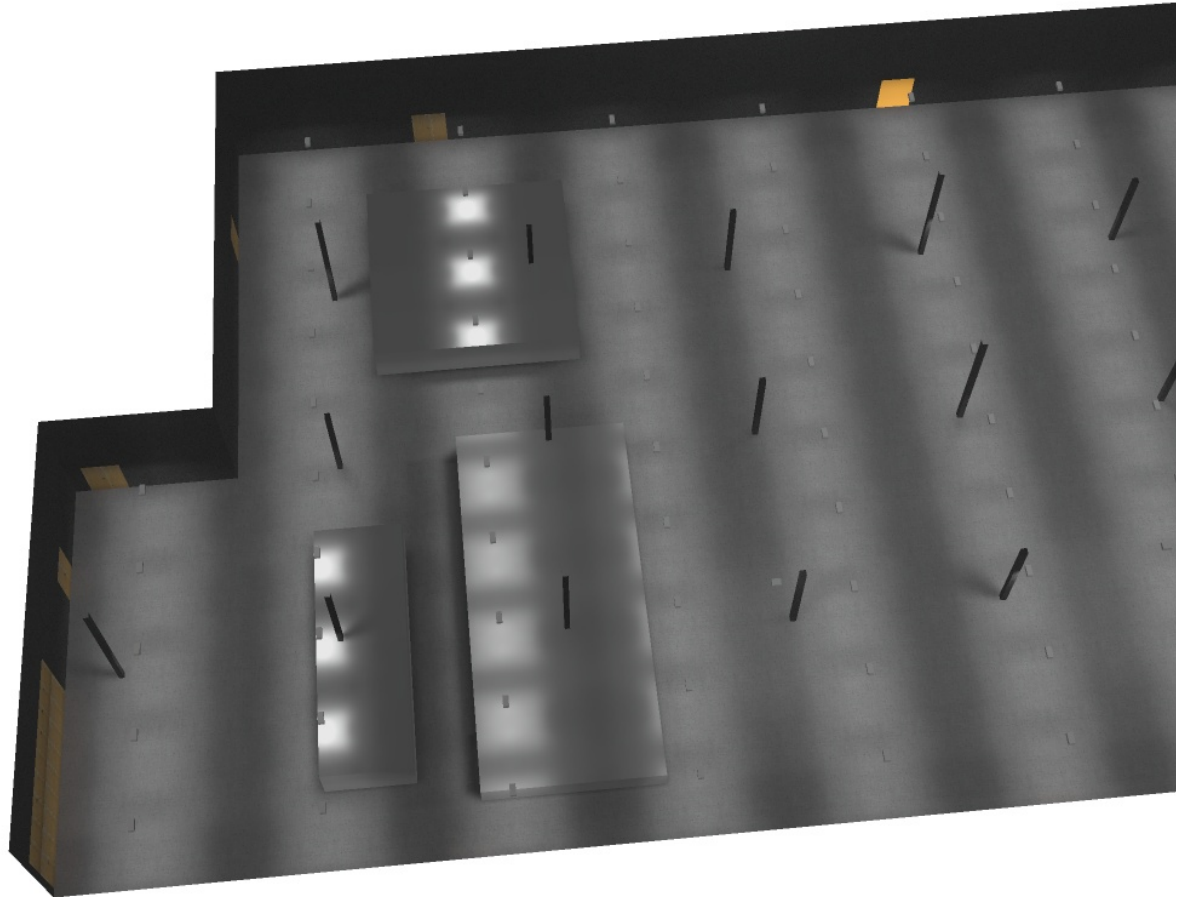
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PB Industry / 3D Rendering





08.06.2012

Electrical installation in a block factory

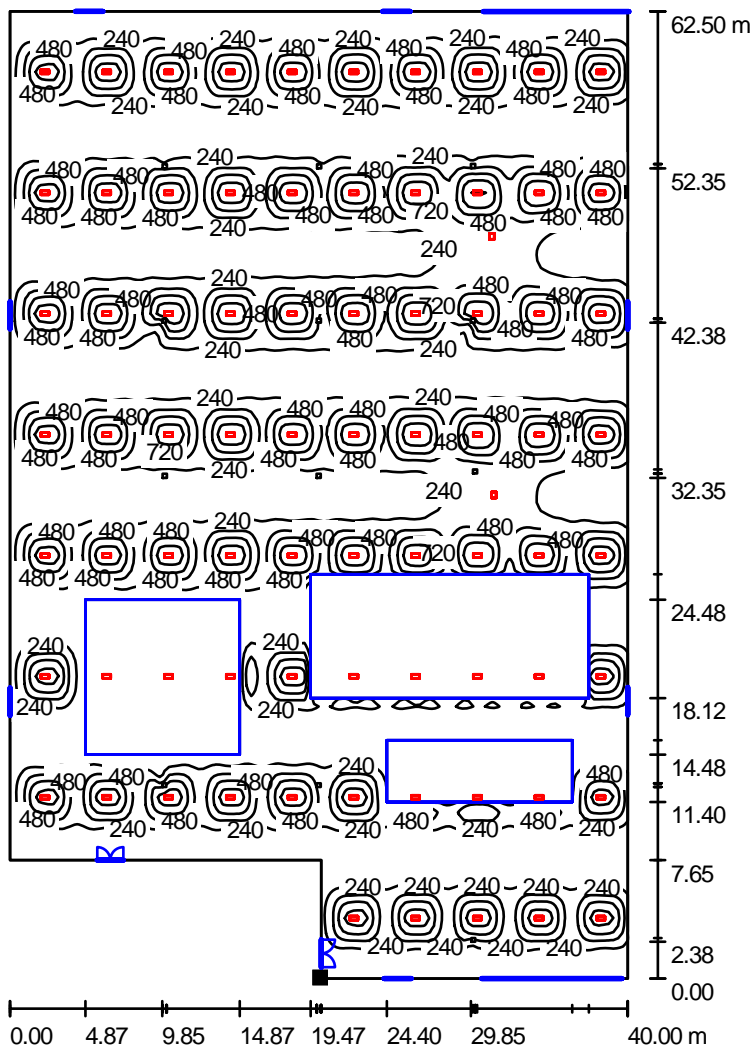


Instalaciones.V

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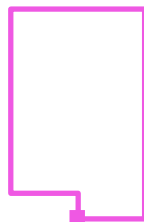
C/Jose Sangenis, 15-19, 1º 2ª

PB Industry / Plano útil / Isolines (E)



Values in Lux, Scale 1 : 489

Position of surface in room:
 Marked point:
 (20.450 m, 20.300 m, 0.850 m)



Grid: 128 x 128 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
390	60	1253	0.155	0.048

Electrical installation in a block factory



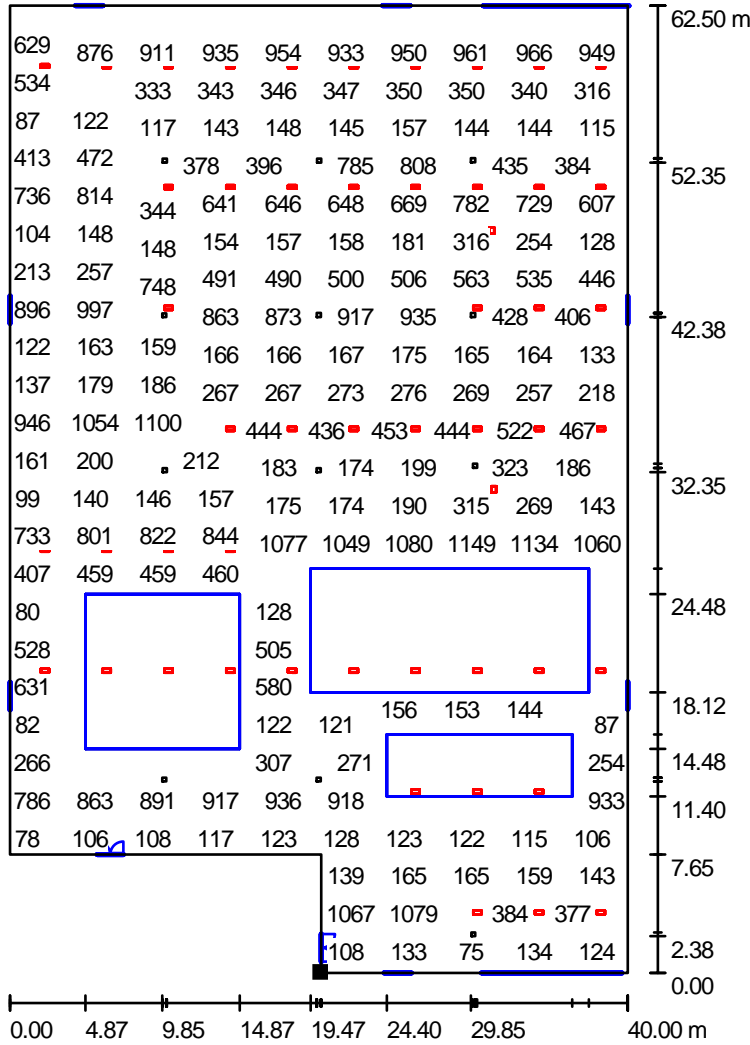
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PB Industry / Plano útil / Value Chart (E)



Values in Lux, Scale 1 : 489

Not all calculated values could be displayed.

Position of surface in room:
 Marked point:
 (20.450 m, 20.300 m, 0.850 m)



Grid: 128 x 128 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
390	60	1253	0.155	0.048



Electrical installation in a block factory



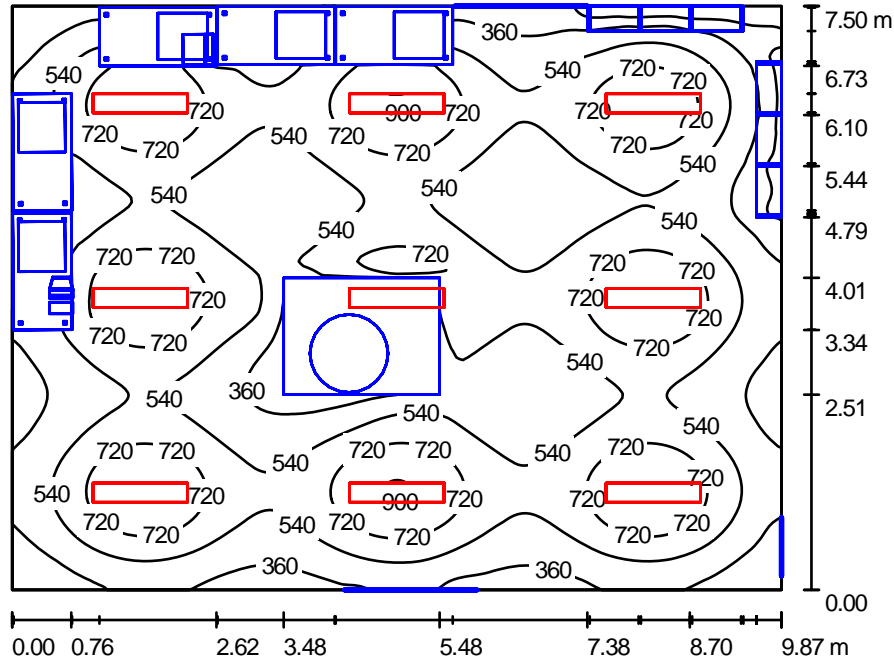
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PB Testing laboratory / Summary



Height of Room: 2.800 m, Mounting Height: 2.800 m, Light loss factor: 0.80

Values in Lux, Scale 1:97

Surface	ρ [%]	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u_0
Plano útil	/	564	29	921	0.052
Suelo	30	448	10	629	0.023
Techo	70	108	60	134	0.556
Walls (4)	61	143	22	332	/

Plano útil:

Height: 0.850 m
 Grid: 128 x 128 Points
 Boundary Zone: 0.000 m

Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ [lm]	P [W]
1	9	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR (1.000)	8900	118.0
Total:			80100	1062.0

Specific connected load: $14.34 \text{ W/m}^2 = 2.54 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 74.04 m^2)

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

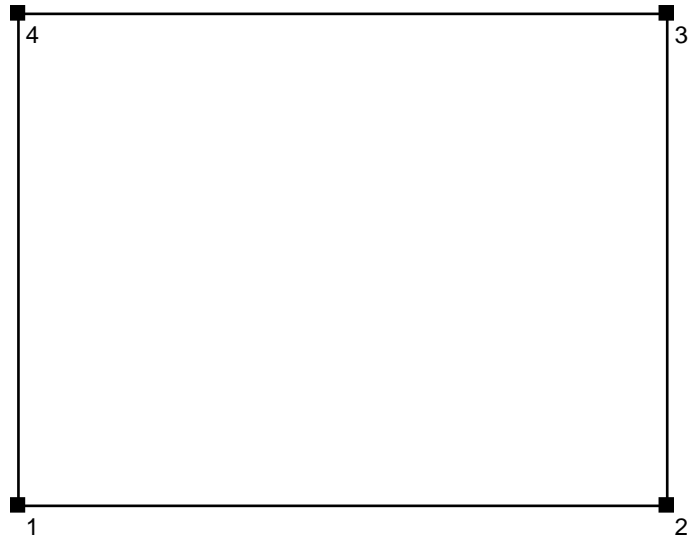
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 Fax -
 e-Mail Instalaciones.V@gmail.com

PB Testing laboratory / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 2.800 m
 Ground area: 74.04 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	30	/	/	/
Techo	70	/	/	/
Pared 1	61	(0.300 20.300)	(10.172 20.300)	9.872
Pared 2	61	(10.172 20.300)	(10.172 27.800)	7.500
Pared 3	61	(10.172 27.800)	(0.300 27.800)	9.872
Pared 4	61	(0.300 27.800)	(0.300 20.300)	7.500

Electrical installation in a block factory

08.06.2012

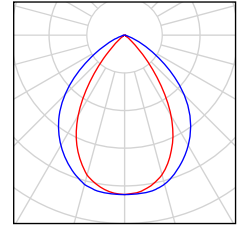
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PB Testing laboratory / Luminaire parts list

9 Pieces TROLL 030354T/84 BATLIGHT (DIR. SYM.
L + DIR. SYM. L). 2 x T5 HO 54W 840
ELECTR. GEAR
Article No.: 030354T/84
Luminaire Luminous Flux: 8900 lm
Luminaire Wattage: 118.0 W
Luminaire classification according to CIE:
100
CIE flux code: 76 97 100 100 63
Fitting: 2 x T5 HO (Correction Factor 1.000).



Electrical installation in a block factory



08.06.20

Instalaciones.V

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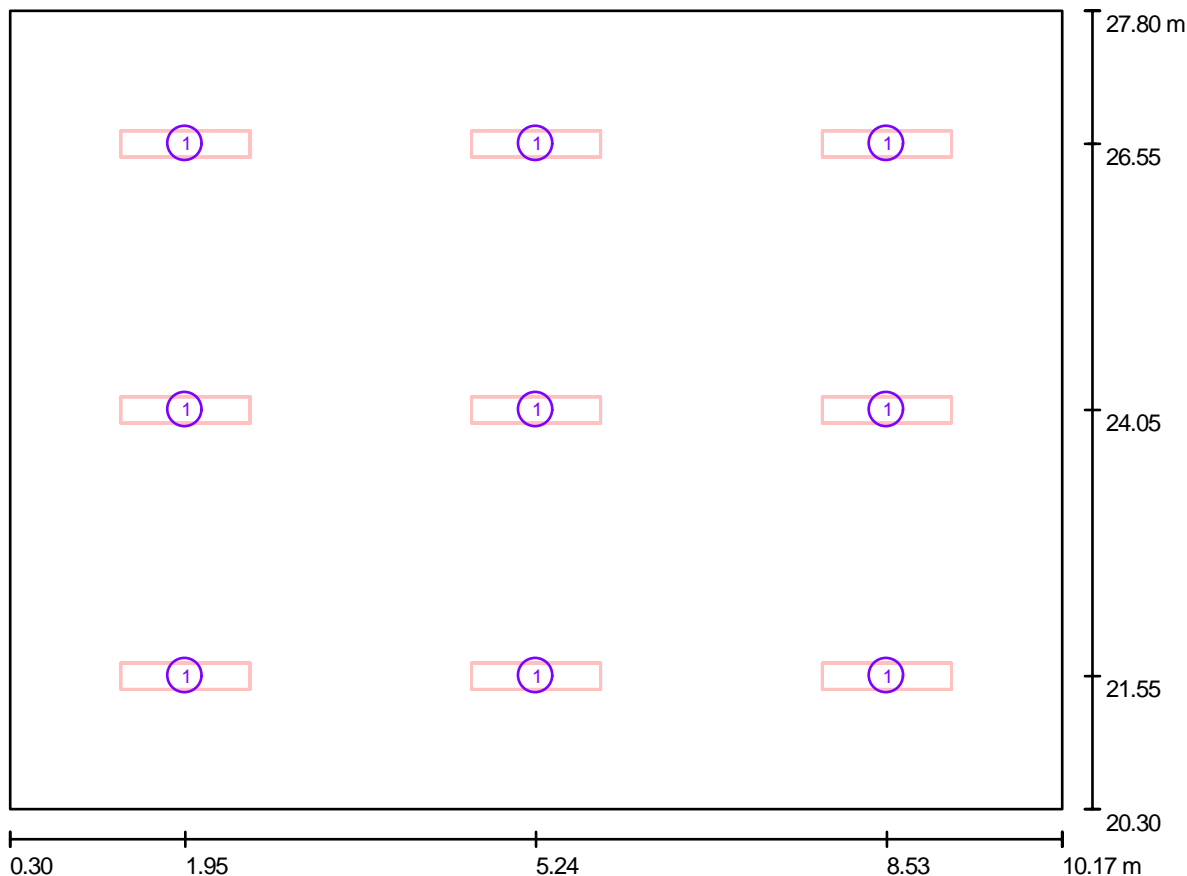
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PB Testing laboratory / Luminaires (layout plan)



Scale 1 : 1

Luminaire Parts List

No.	Pieces	Designation
1	9	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR

Electrical installation in a block factory



08.06.2012

Instalaciones.V

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PB Testing laboratory / Photometric Results

Total Luminous Flux: 80100 lm
 Total Load: 1062.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m ²]
	direct	indirect	total		
Plano útil	487	77	564	/	/
Superficie de cálculo 1	487	77	564	/	/
Suelo	375	74	448	30	43
Techo	0.00	108	108	70	24
Pared 1	64	102	166	61	32
Pared 2	74	78	152	61	29
Pared 3	26	66	92	61	18
Pared 4	83	89	172	61	33

Uniformity on the working plane
 u₀: 0.052 (1:19)
 E_{min} / E_{max}: 0.032 (1:32)

Specific connected load: 14.34 W/m² = 2.54 W/m²/100 lx (Ground area: 74.04 m²)

Electrical installation in a block factory



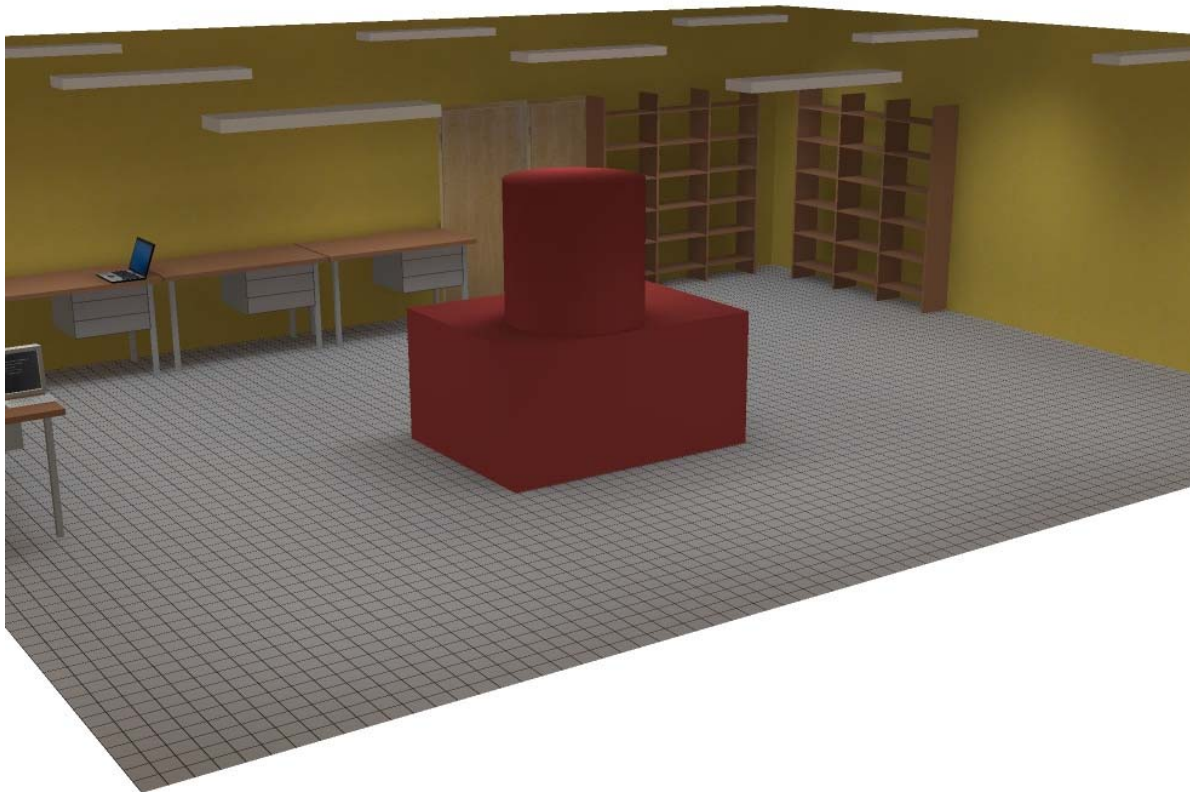
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PB Testing laboratory / 3D Rendering



Electrical installation in a block factory



08.06.20

Instalaciones.V

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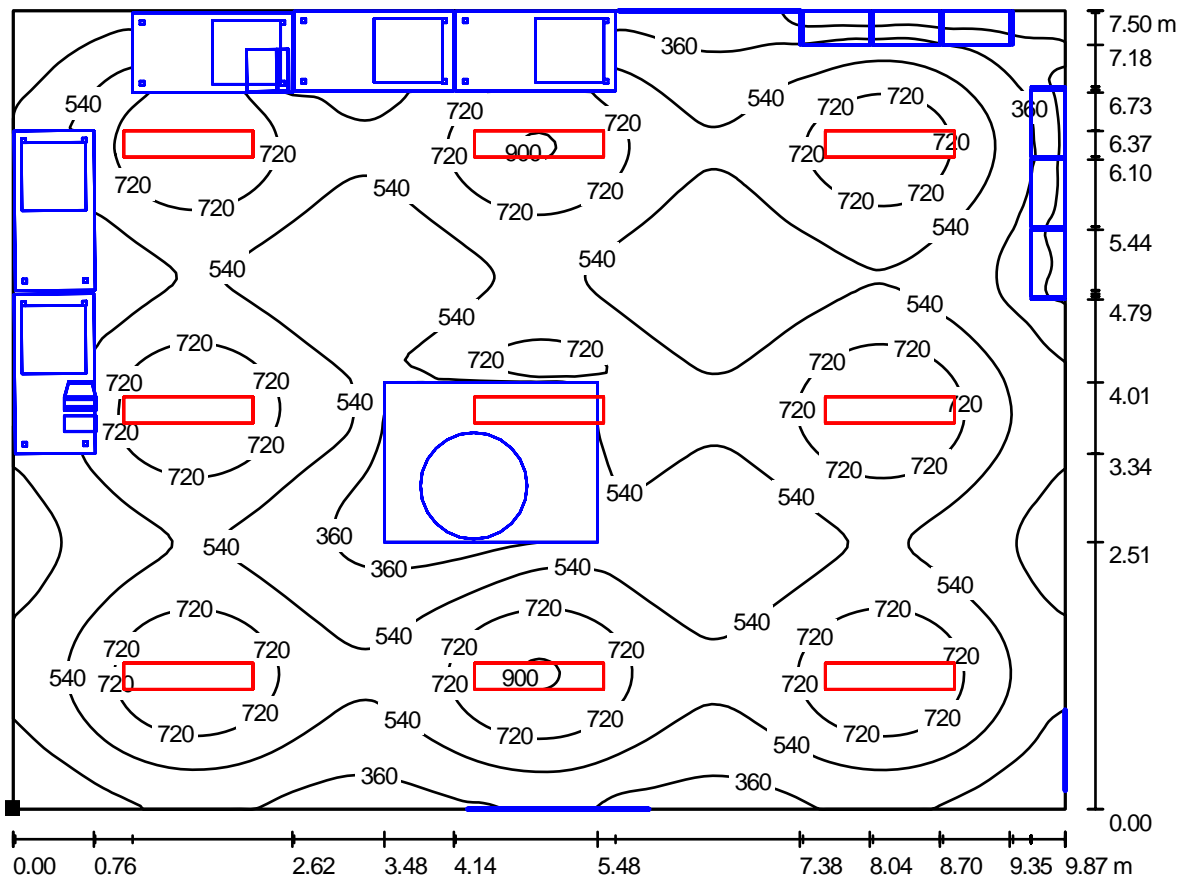
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PB Testing laboratory / Plano útil / Isolines (lx)



Values in Lux, Scale 1 : 1

Position of surface in room:
Marked point:
(0.300 m, 20.300 m, 0.850 m)



Grid: 128 x 128 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{r}
564	29	921	0.052	0.0:

Electrical installation in a block factory



08.06.20

Instalaciones.V

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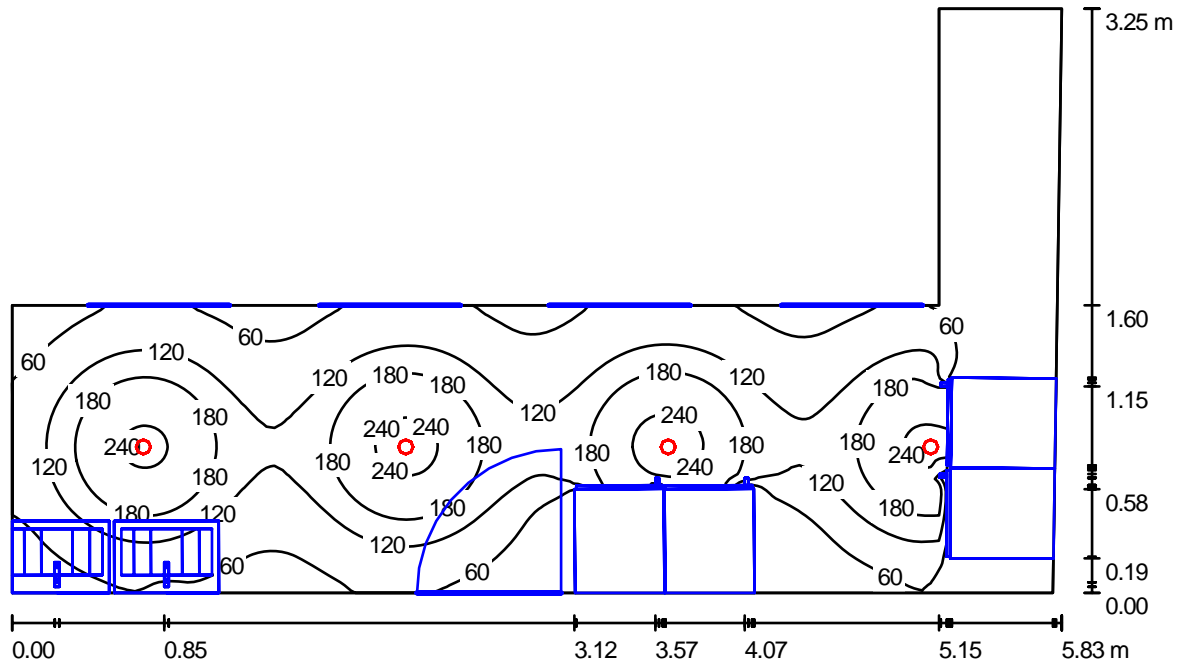
Operator Juan Luis Vera Ambel

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PB Dressing Rooms and Services / Summary



Height of Room: 2.800 m, Mounting Height: 2.943 m, Light loss factor: 0.80

Values in Lux, Scale 1:4

Surface	ρ [%]	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u
Plano útil	/	106	1.50	271	0.01
Suelo	30	77	1.51	151	0.02
Techo	70	17	2.05	32	0.11
Walls (6)	30	21	0.59	69	

Plano útil:

Height: 0.850 m
 Grid: 128 x 128 Points
 Boundary Zone: 0.000 m

Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ [lm]	P [W]
1	4	TROLL 0105 BASIC +1 x QPAR-CB 50W 25º (1.000)	485	50.
			Total:	1940 200.

Specific connected load: $19.29 \text{ W/m}^2 = 18.11 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 10.37 m^2)

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

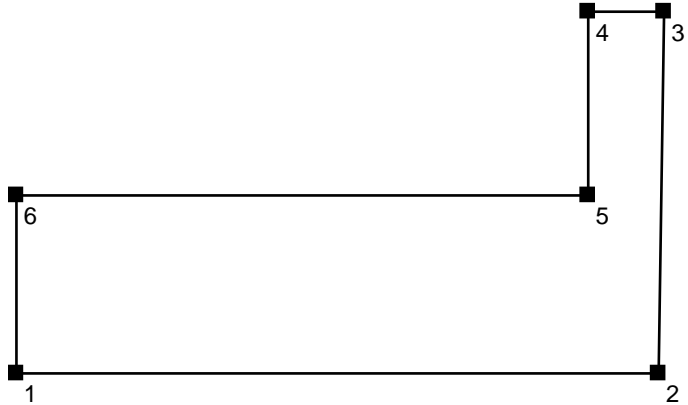
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PB Dressing Rooms and Services / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 2.800 m
 Ground area: 10.37 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	30	/	/	/
Techo	70	/	/	/
Pared 1	30	(10.222 24.550)	(16.000 24.550)	5.778
Pared 2	30	(16.000 24.550)	(16.050 27.800)	3.250
Pared 3	30	(16.050 27.800)	(15.368 27.800)	0.682
Pared 4	30	(15.368 27.800)	(15.368 26.150)	1.650
Pared 5	30	(15.368 26.150)	(10.222 26.150)	5.145
Pared 6	30	(10.222 26.150)	(10.222 24.550)	1.600

Electrical installation in a block factory

08.06.2012

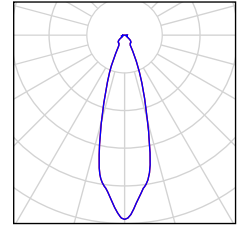
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C/Jose Sangenis, 15-19, 1º 2ª

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PB Dressing Rooms and Services / Luminaire parts list

4 Pieces TROLL 0105 BASIC +1 x QPAR-CB 50W
25°
Article No.: 0105
Luminaire Luminous Flux: 485 lm
Luminaire Wattage: 50.0 W
Luminaire classification according to CIE:
100
CIE flux code: 78 90 95 100 101
Fitting: 1 x QPAR-CB (Correction Factor
1.000).



Electrical installation in a block factory



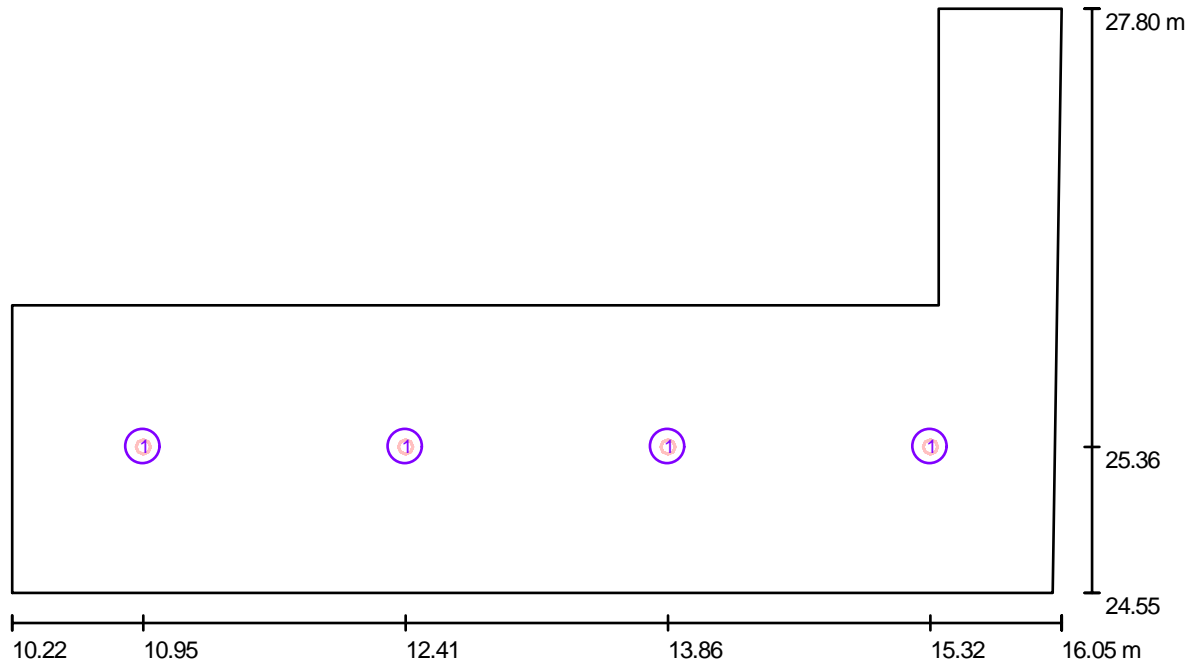
08.06.20

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PB Dressing Rooms and Services / Luminaires (layout plan)



Scale 1 : 4

Luminaire Parts List

No.	Pieces	Designation
1	4	TROLL 0105 BASIC +1 x QPAR-CB 50W 25°

Electrical installation in a block factory



08.06.2012

Instalaciones.V

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PB Dressing Rooms and Services / Photometric Results

Total Luminous Flux: 1940 lm
 Total Load: 200.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m ²]
	direct	indirect	total		
Plano útil	96	11	106	/	/
Superficie de cálculo 1	104	11	114	/	/
Suelo	67	10	77	30	7.38
Techo	0.00	17	17	70	3.86
Pared 1	11	12	23	30	2.24
Pared 2	3.99	4.82	8.81	30	0.84
Pared 3	1.72	1.72	3.45	30	0.33
Pared 4	0.00	2.12	2.12	30	0.20
Pared 5	17	16	33	30	3.12
Pared 6	16	15	31	30	2.95

Uniformity on the working plane

u₀: 0.014 (1:71)E_{min} / E_{max}: 0.006 (1:181)Specific connected load: 19.29 W/m² = 18.11 W/m²/100 lx (Ground area: 10.37 m²)

Electrical installation in a block factory



08.06.20

Instalaciones.V

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PB Dressing Rooms and Services / 3D Renderin



Electrical installation in a block factory



08.06.20

Instalaciones.V

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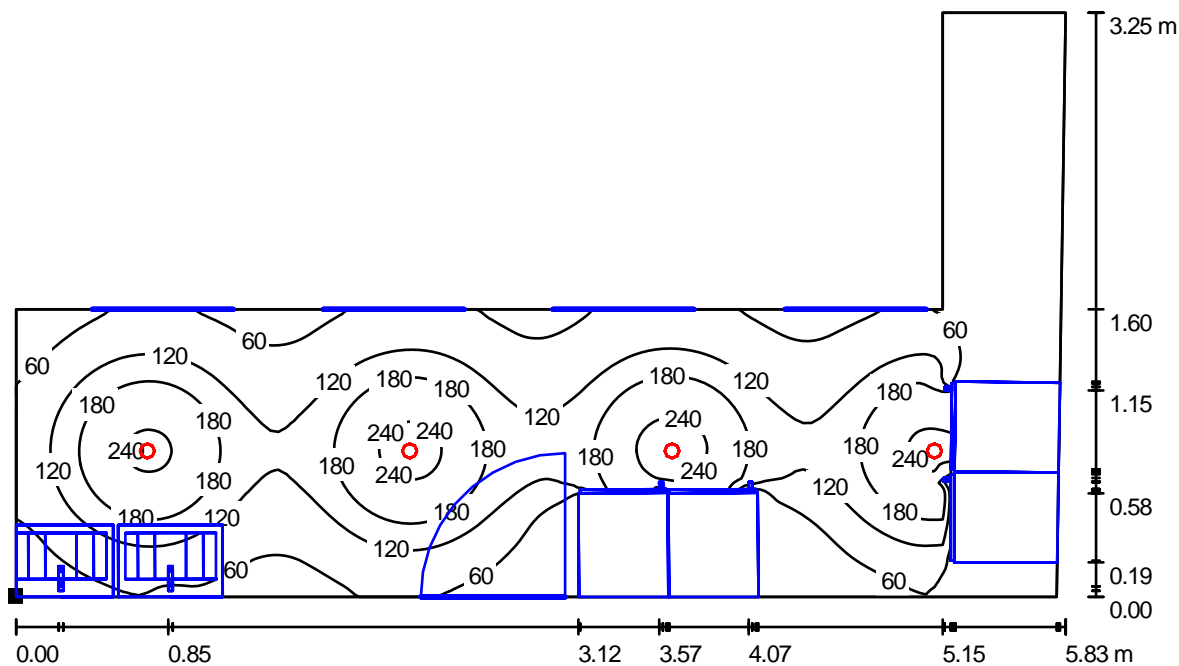
Operator Juan Luis Vera Ambel

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PB Dressing Rooms and Services / Plano útil / Isolines (E



Values in Lux, Scale 1 : 4

Position of surface in room:
Marked point:
(10.222 m, 24.550 m, 0.850 m)



Grid: 128 x 128 Points

E_{av} [lx]
106

E_{min} [lx]
1.50

E_{max} [lx]
271

u_0
0.014

E_{min} / E_{mi}
0.00

Electrical installation in a block factory



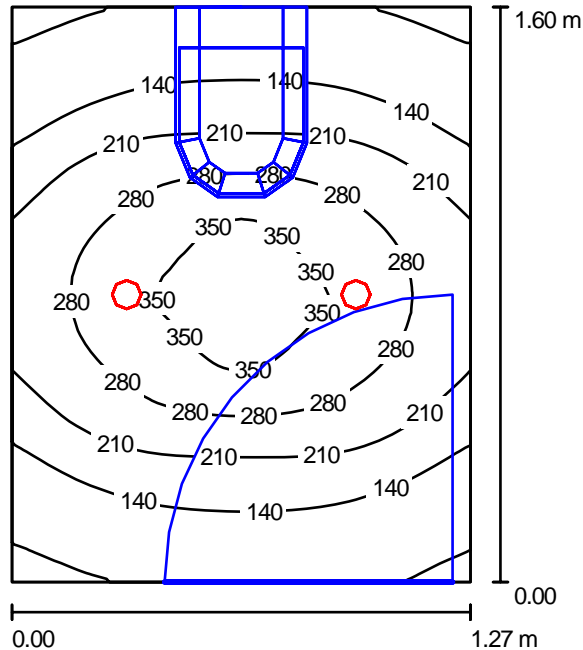
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PB WC 1 / Summary



Height of Room: 2.800 m, Mounting Height: 2.908 m, Light loss factor: 0.80

Values in Lux, Scale 1:21

Surface	ρ [%]	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u_0
Plano útil	/	206	57	397	0.277
Suelo	30	144	13	221	0.092
Techo	30	19	15	34	0.784
Walls (4)	30	49	5.64	184	/

Plano útil:

Height: 0.850 m
 Grid: 32 x 32 Points
 Boundary Zone: 0.000 m

Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ [lm]	P [W]
1	2	TROLL 0105 BASIC +1 x QPAR-CB 50W 25° (1.000)	485	50.0
Total:			970	100.0

Specific connected load: $49.06 \text{ W/m}^2 = 23.79 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 2.04 m^2)

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

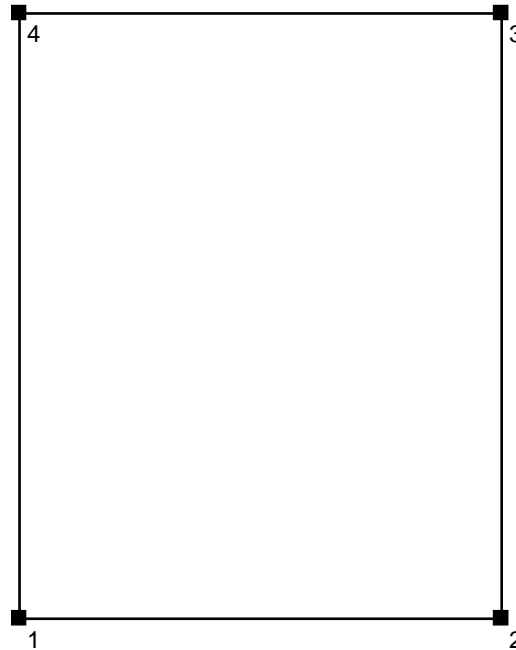
Operator Juan Luis Vera Ambel
 Telephone 646336621
 Fax -
 e-Mail Instalaciones.V@gmail.com

PB WC 1 / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 2.800 m
 Ground area: 2.04 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	30	/	/	/
Techo	30	/	/	/
Pared 1	30	(10.222 26.200)	(11.496 26.200)	1.274
Pared 2	30	(11.496 26.200)	(11.496 27.800)	1.600
Pared 3	30	(11.496 27.800)	(10.222 27.800)	1.274
Pared 4	30	(10.222 27.800)	(10.222 26.200)	1.600

Electrical installation in a block factory

08.06.2012

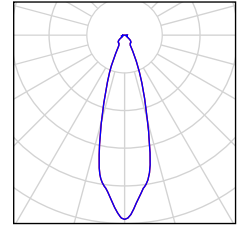
Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

Operator Juan Luis Vera Ambel
Telephone 646336621
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PB WC 1 / Luminaire parts list

2 Pieces TROLL 0105 BASIC +1 x QPAR-CB 50W
25°
Article No.: 0105
Luminaire Luminous Flux: 485 lm
Luminaire Wattage: 50.0 W
Luminaire classification according to CIE:
100
CIE flux code: 78 90 95 100 101
Fitting: 1 x QPAR-CB (Correction Factor
1.000).



Electrical installation in a block factory



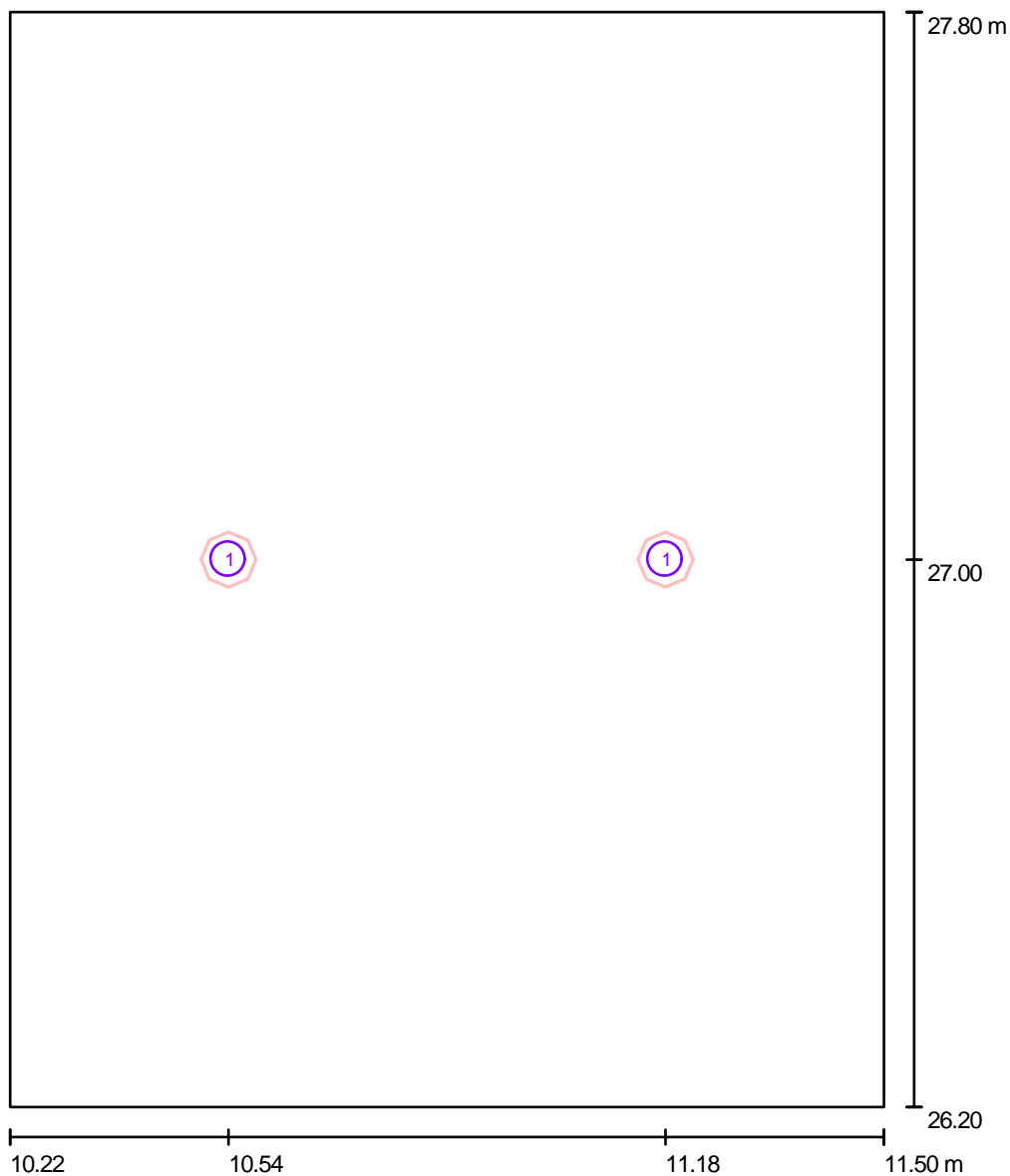
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C/Jose Sangenis, 15-19, 1º 2ª

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PB WC 1 / Luminaires (layout plan)



Scale 1 : 11

Luminaire Parts List

No.	Pieces	Designation
1	2	TROLL 0105 BASIC +1 x QPAR-CB 50W 25°

Electrical installation in a block factory



08.06.2012

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C/Jose Sangenis, 15-19, 1º 2ª

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PB WC 1 / Photometric Results

Total Luminous Flux: 970 lm
 Total Load: 100.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m²]
	direct	indirect	total		
Plano útil	191	15	206	/	/
Suelo	128	16	144	30	14
Techo	0.06	19	19	30	1.82
Pared 1	23	16	39	30	3.77
Pared 2	36	19	56	30	5.33
Pared 3	22	19	41	30	3.93
Pared 4	36	19	55	30	5.28

Uniformity on the working plane

u0: 0.277 (1:4)

E_{\min} / E_{\max} : 0.144 (1:7)

Specific connected load: $49.06 \text{ W/m}^2 = 23.79 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 2.04 m^2)

Electrical installation in a block factory



08.06.20

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

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PB WC 1 / 3D Renderin



Electrical installation in a block factory



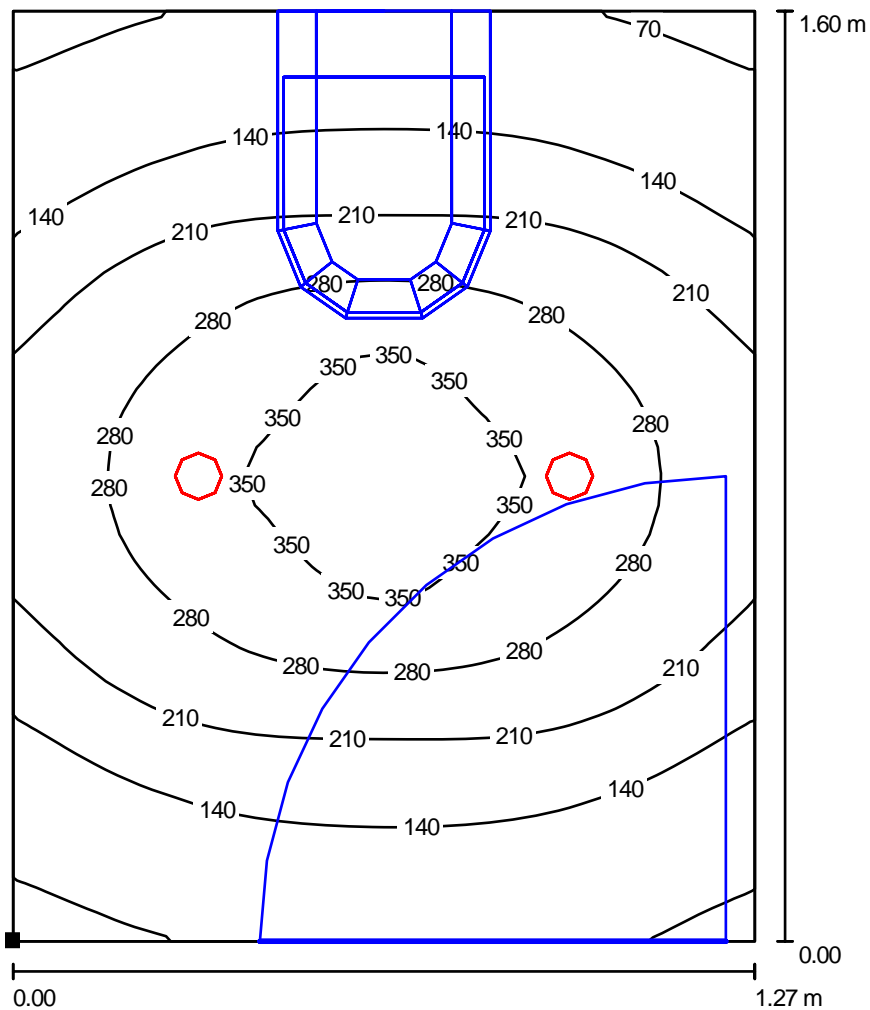
08.06.2012

Instalaciones.V

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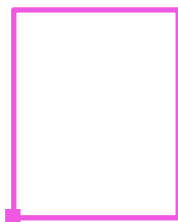
Operator Juan Luis Vera Ambel
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 e-Mail Instalaciones.V@gmail.com

PB WC 1 / Plano útil / Isolines (E)



Values in Lux, Scale 1 : 13

Position of surface in room:
 Marked point:
 (10.222 m, 26.200 m, 0.850 m)



Grid: 32 x 32 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
206	57	397	0.277	0.144



08.06.2012

Electrical installation in a block factory



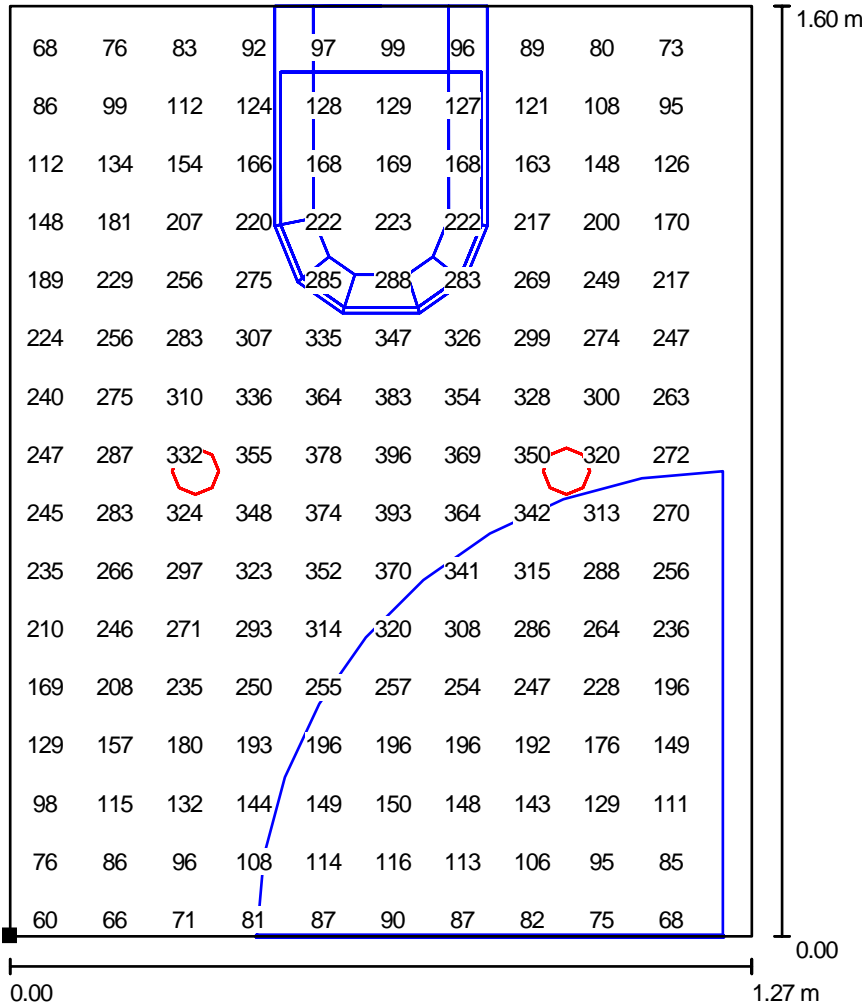
Instalaciones.V

Operator Juan Luis Vera Ambel
Telephone 646336621

C/Jose Sangenis, 15-19, 1º 2ª

Fax -
e-Mail Instalaciones.V@gmail.com

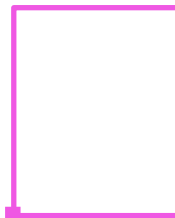
PB WC 1 / Plano útil / Value Chart (E)



Values in Lux, Scale 1 : 13

Not all calculated values could be displayed.

Position of surface in room:
Marked point:
(10.222 m, 26.200 m, 0.850 m)



Grid: 32 x 32 Points

E_{av} [lx]
206

E_{min} [lx]
57

E_{max} [lx]
397

u_0
0.277

E_{min} / E_{max}
0.144

Electrical installation in a block factory



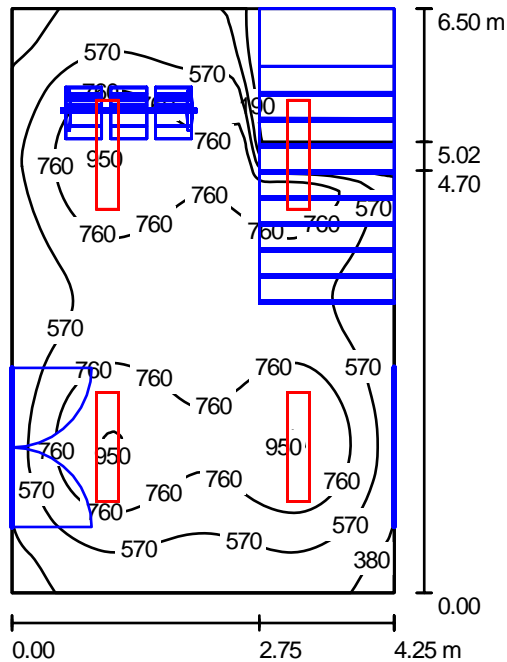
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PB Hall / Summary



Height of Room: 2.800 m, Mounting Height: 2.800 m, Light loss factor: 0.80

Values in Lux, Scale 1:84

Surface	ρ [%]	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u_0
Plano útil	/	602	24	965	0.039
Suelo	32	461	15	723	0.032
Techo	70	160	117	202	0.731
Walls (4)	61	212	38	387	/

Plano útil:

Height: 0.850 m
 Grid: 64 x 64 Points
 Boundary Zone: 0.000 m

Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ [lm]	P [W]
1	4	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR (1.000)	8900	118.0
Total:			35600	472.0

Specific connected load: $17.09 \text{ W/m}^2 = 2.84 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 27.62 m^2)

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

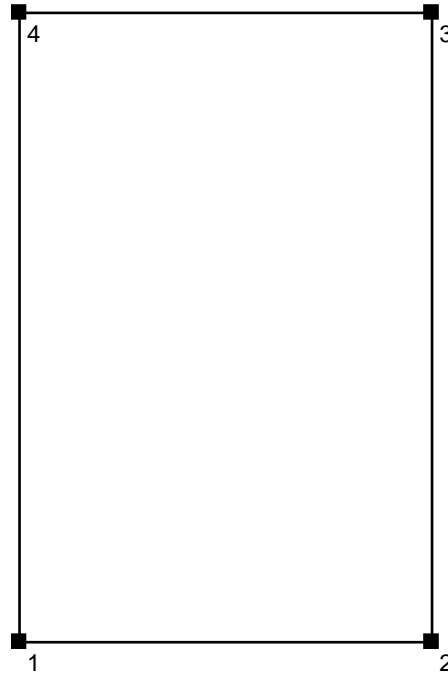
Operator Juan Luis Vera Ambel
 Telephone 646336621
 Fax -
 e-Mail Instalaciones.V@gmail.com

PB Hall / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 2.800 m
 Ground area: 27.62 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	32	/	/	/
Techo	70	/	/	/
Pared 1	61	(16.050 20.300)	(20.300 20.300)	4.250
Pared 2	61	(20.300 20.300)	(20.300 26.800)	6.500
Pared 3	61	(20.300 26.800)	(16.050 26.800)	4.250
Pared 4	61	(16.050 26.800)	(16.050 20.300)	6.500

Electrical installation in a block factory

08.06.2012

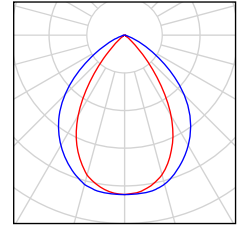
Instalaciones.V

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e-Mail Instalaciones.V@gmail.com

PB Hall / Luminaire parts list

4 Pieces TROLL 030354T/84 BATLIGHT (DIR. SYM.
L + DIR. SYM. L). 2 x T5 HO 54W 840
ELECTR. GEAR
Article No.: 030354T/84
Luminaire Luminous Flux: 8900 lm
Luminaire Wattage: 118.0 W
Luminaire classification according to CIE:
100
CIE flux code: 76 97 100 100 63
Fitting: 2 x T5 HO (Correction Factor 1.000).



Electrical installation in a block factory



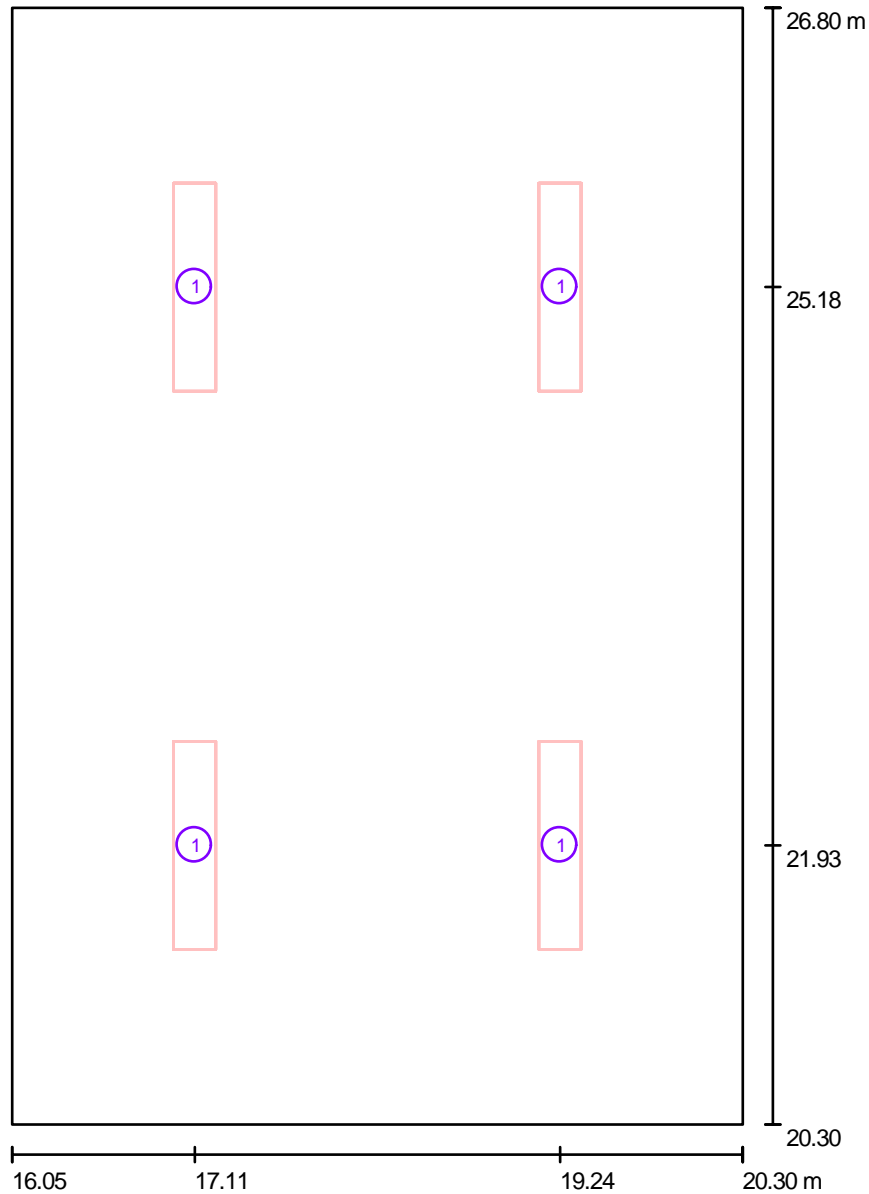
08.06.2012

Instalaciones.V

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PB Hall / Luminaires (layout plan)



Scale 1 : 44

Luminaire Parts List

No.	Pieces	Designation
1	4	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR

Electrical installation in a block factory



08.06.2012

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PB Hall / Photometric Results

Total Luminous Flux: 35600 lm
 Total Load: 472.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m ²]
	direct	indirect	total		
Plano útil	483	119	602	/	/
Superficie de cálculo 1	483	119	602	/	/
Suelo	340	122	461	32	47
Techo	0.00	160	160	70	36
Pared 1	116	150	265	61	51
Pared 2	47	131	178	61	35
Pared 3	81	116	197	61	38
Pared 4	74	145	220	61	43

Uniformity on the working plane
 u₀: 0.039 (1:26)
 E_{min} / E_{max}: 0.024 (1:41)

Specific connected load: 17.09 W/m² = 2.84 W/m²/100 lx (Ground area: 27.62 m²)

Electrical installation in a block factory



08.06.20

Instalaciones.V

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PB Hall / 3D Rendering



Electrical installation in a block factory



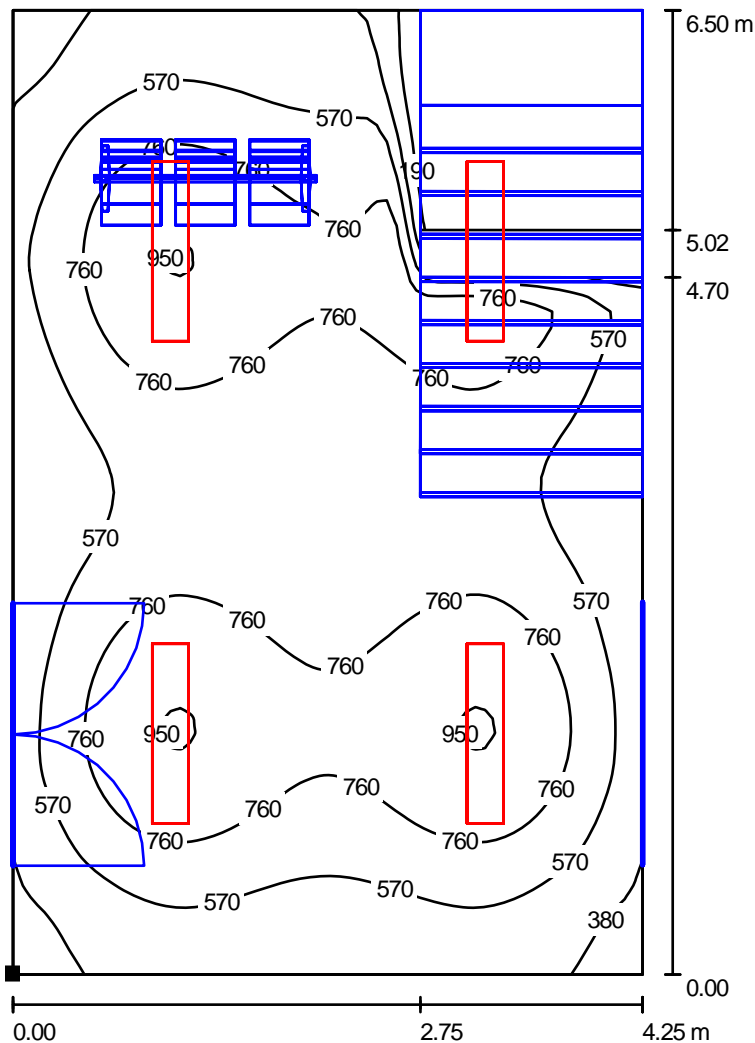
08.06.2012

Instalaciones.V

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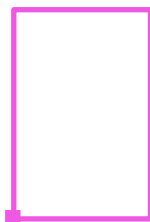
Operator Juan Luis Vera Ambel
 Telephone 646336621
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PB Hall / Plano útil / Isolines (E)



Values in Lux, Scale 1 : 51

Position of surface in room:
 Marked point:
 (16.050 m, 20.300 m, 0.850 m)



Grid: 64 x 64 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u_0	E_{min} / E_{max}
602	24	965	0.039	0.024

Electrical installation in a block factory



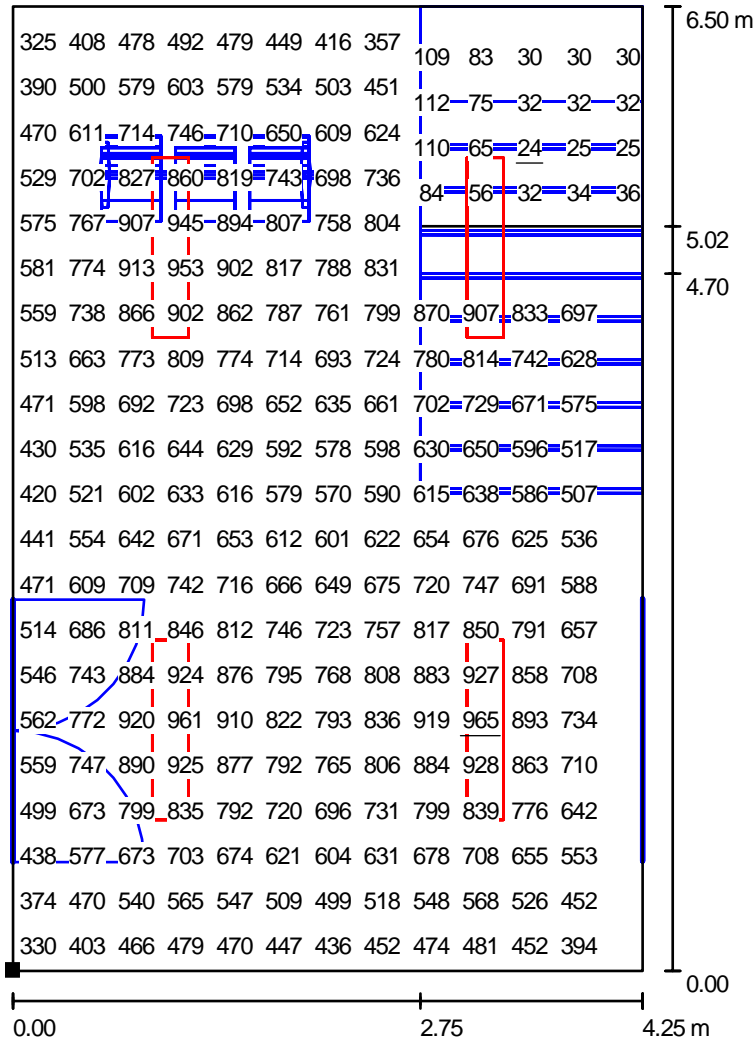
08.06.2012

Instalaciones.V

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 Telephone 646336621
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 e-Mail Instalaciones.V@gmail.com

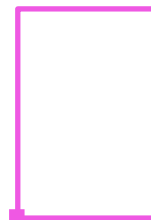
PB Hall / Plano útil / Value Chart (E)



Values in Lux, Scale 1 : 51

Not all calculated values could be displayed.

Position of surface in room:
 Marked point:
 (16.050 m, 20.300 m, 0.850 m)



Grid: 64 x 64 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
602	24	965	0.039	0.024



Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

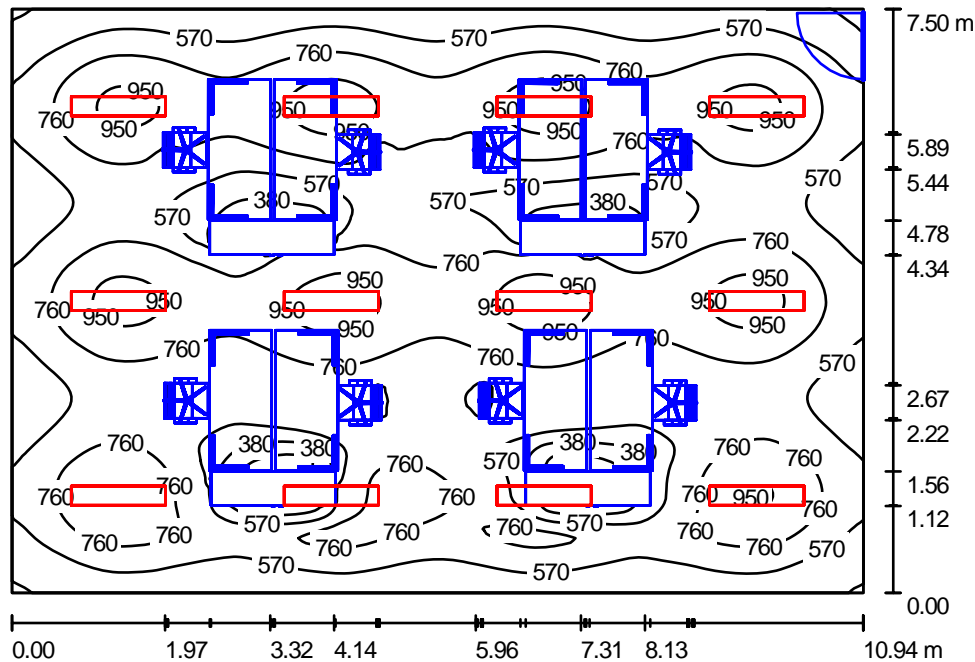
Operator Juan Luis Vera Ambel

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P1 Office / Summary



Height of Room: 2.800 m, Mounting Height: 2.800 m, Light loss factor: 0.80

Values in Lux, Scale 1:97

Surface	ρ [%]	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u_0
Plano útil	/	695	104	1047	0.150
Suelo	70	483	26	747	0.053
Techo	70	220	170	279	0.772
Walls (4)	61	307	145	555	/

Plano útil:

Height: 0.850 m
 Grid: 128 x 128 Points
 Boundary Zone: 0.000 m

Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ [lm]	P [W]
1	12	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR (1.000)	8900	118.0
Total:			106800	1416.0

Specific connected load: $17.26 \text{ W/m}^2 = 2.49 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 82.03 m^2)

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

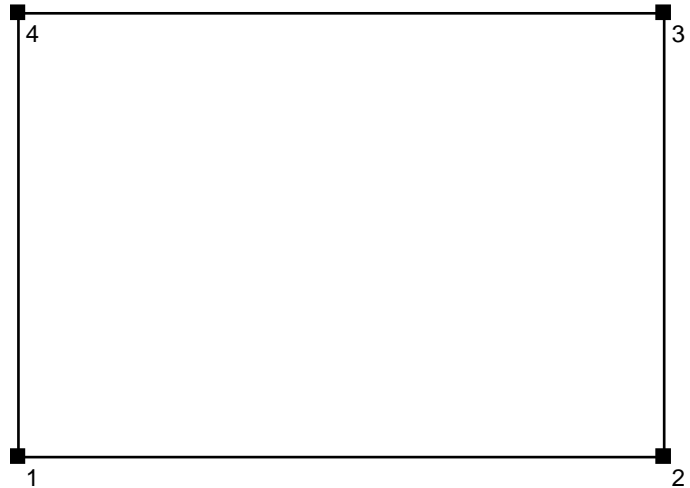
Operator Juan Luis Vera Ambel
 Telephone 646336621
 Fax -
 e-Mail Instalaciones.V@gmail.com

P1 Office / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 2.800 m
 Ground area: 82.03 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	70	/	/	/
Techo	70	/	/	/
Pared 1	61	(0.300 121.831)	(11.237 121.831)	10.937
Pared 2	61	(11.237 121.831)	(11.237 129.331)	7.500
Pared 3	61	(11.237 129.331)	(0.300 129.331)	10.937
Pared 4	61	(0.300 129.331)	(0.300 121.831)	7.500

Electrical installation in a block factory

08.06.2012

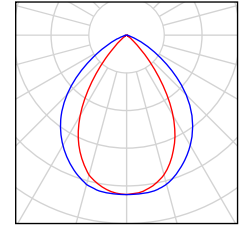
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P1 Office / Luminaire parts list

12 Pieces TROLL 030354T/84 BATLIGHT (DIR. SYM.
L + DIR. SYM. L). 2 x T5 HO 54W 840
ELECTR. GEAR
Article No.: 030354T/84
Luminaire Luminous Flux: 8900 lm
Luminaire Wattage: 118.0 W
Luminaire classification according to CIE:
100
CIE flux code: 76 97 100 100 63
Fitting: 2 x T5 HO (Correction Factor 1.000).



Electrical installation in a block factory



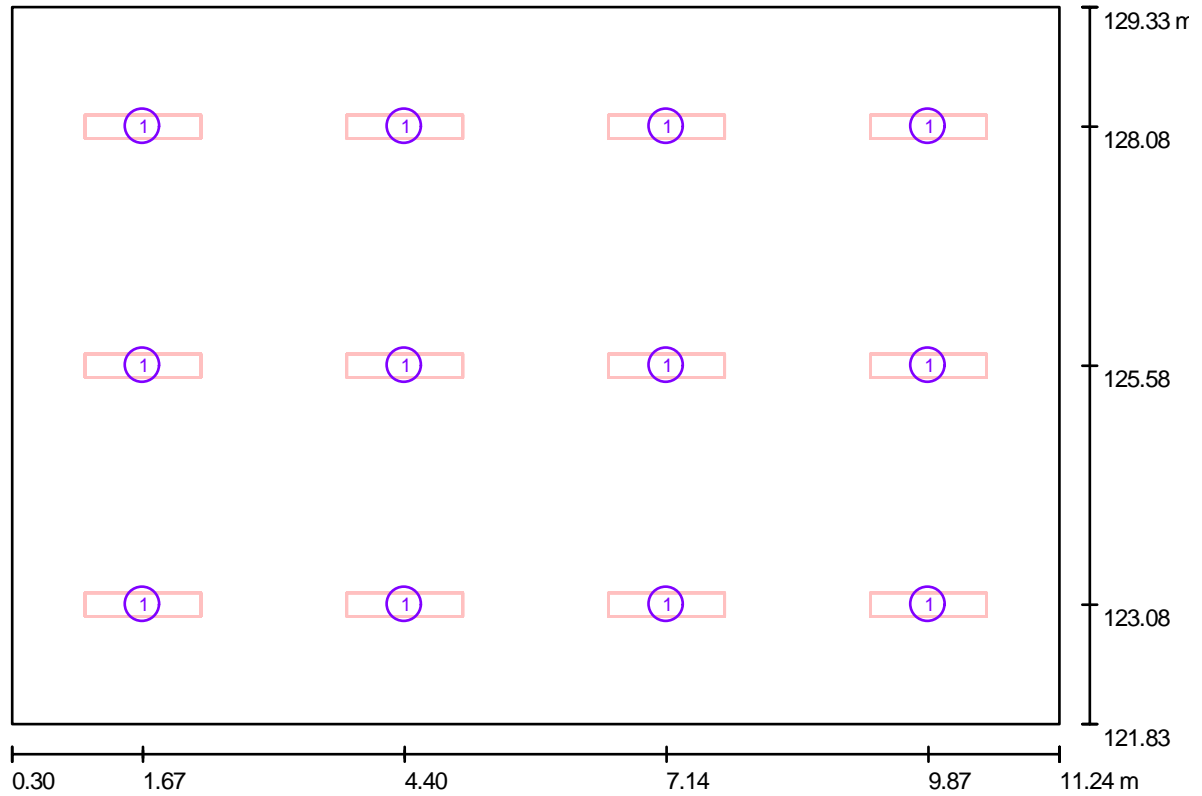
08.06.20

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

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P1 Office / Luminaires (layout plan)



Scale 1 : 7

Luminaire Parts List

No.	Pieces	Designation
1	12	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

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P1 Office / Photometric Results

Total Luminous Flux: 106800 lm
 Total Load: 1416.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m ²]
	direct	indirect	total		
Plano útil	544	150	695	/	/
Superficie de cálculo 1	544	150	695	/	/
Suelo	353	129	483	70	108
Techo	0.00	220	220	70	49
Pared 1	82	191	274	61	53
Pared 2	135	220	355	61	69
Pared 3	83	197	281	61	54
Pared 4	134	210	344	61	67

Uniformity on the working plane
 u₀: 0.150 (1:7)
 E_{min} / E_{max}: 0.099 (1:10)

Specific connected load: 17.26 W/m² = 2.49 W/m²/100 lx (Ground area: 82.03 m²)

Electrical installation in a block factory



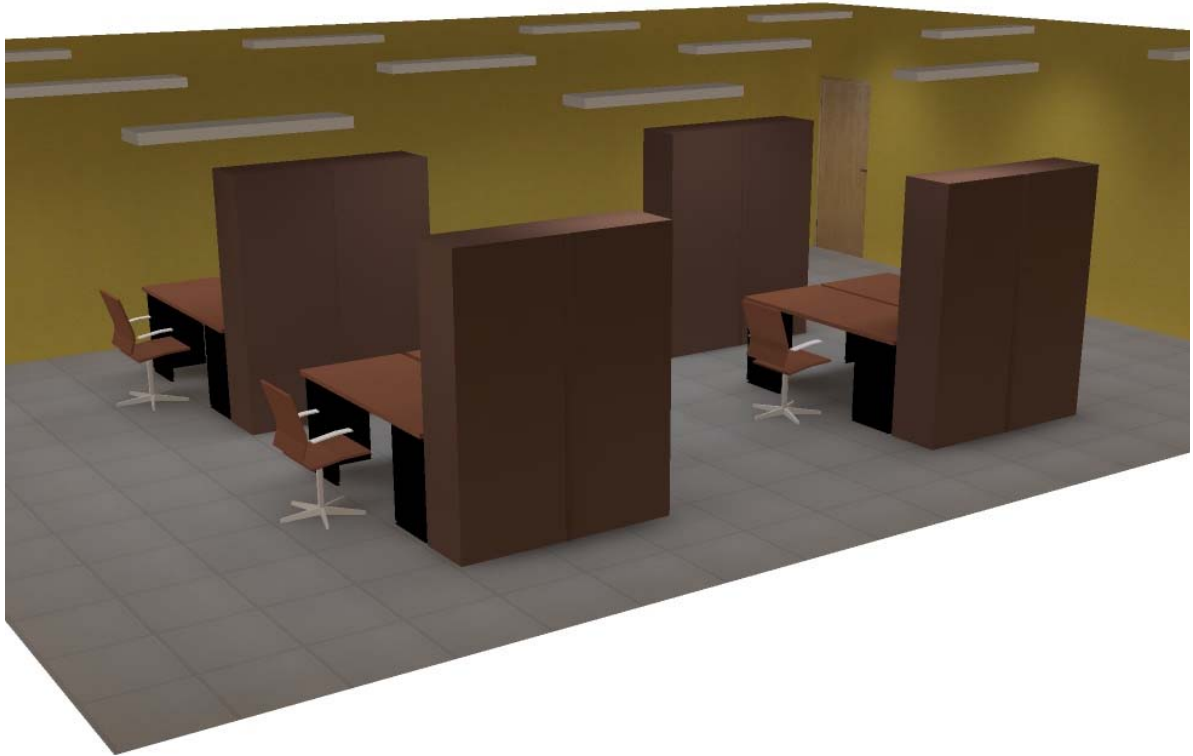
08.06.20

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P1 Office / 3D Renderin



Electrical installation in a block factory



08.06.20

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

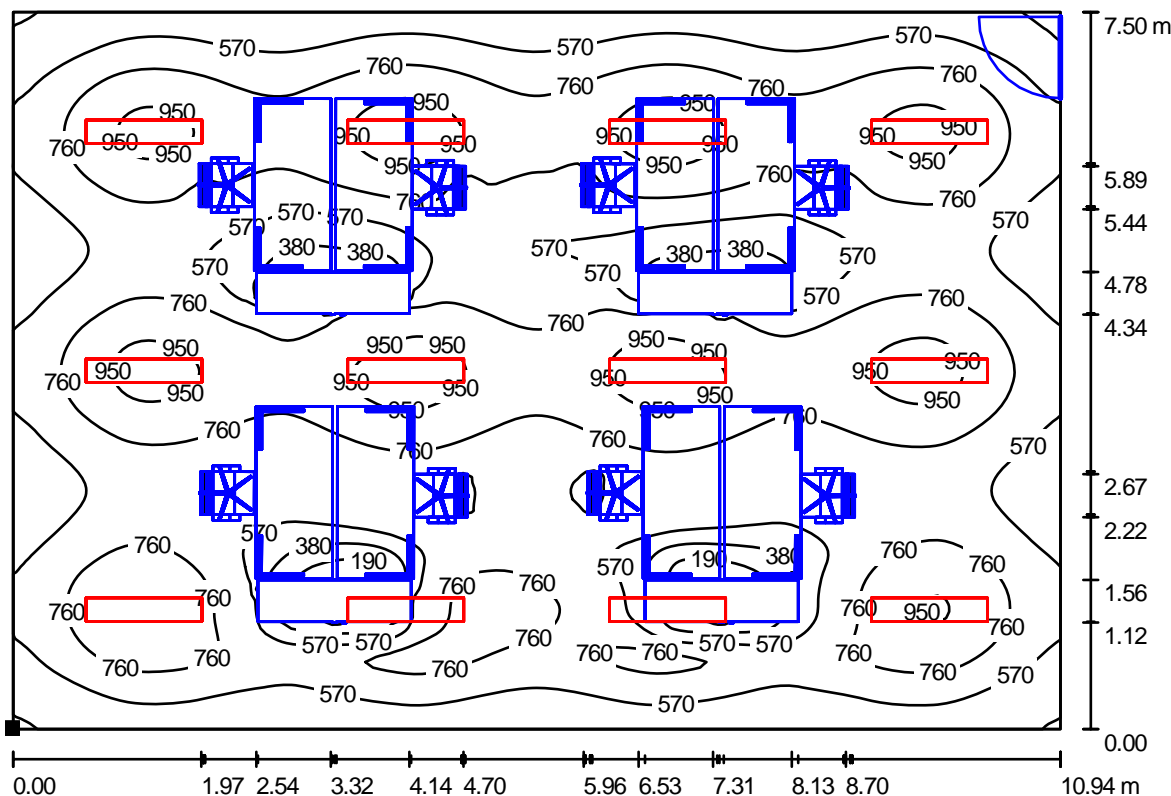
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P1 Office / Plano útil / Isolines (E)



Values in Lux, Scale 1 : 7

Position of surface in room:
Marked point:
(0.300 m, 121.831 m, 0.850 m)



Grid: 128 x 128 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
695	104	1047	0.150	0.09

Electrical installation in a block factory



08.06.20

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

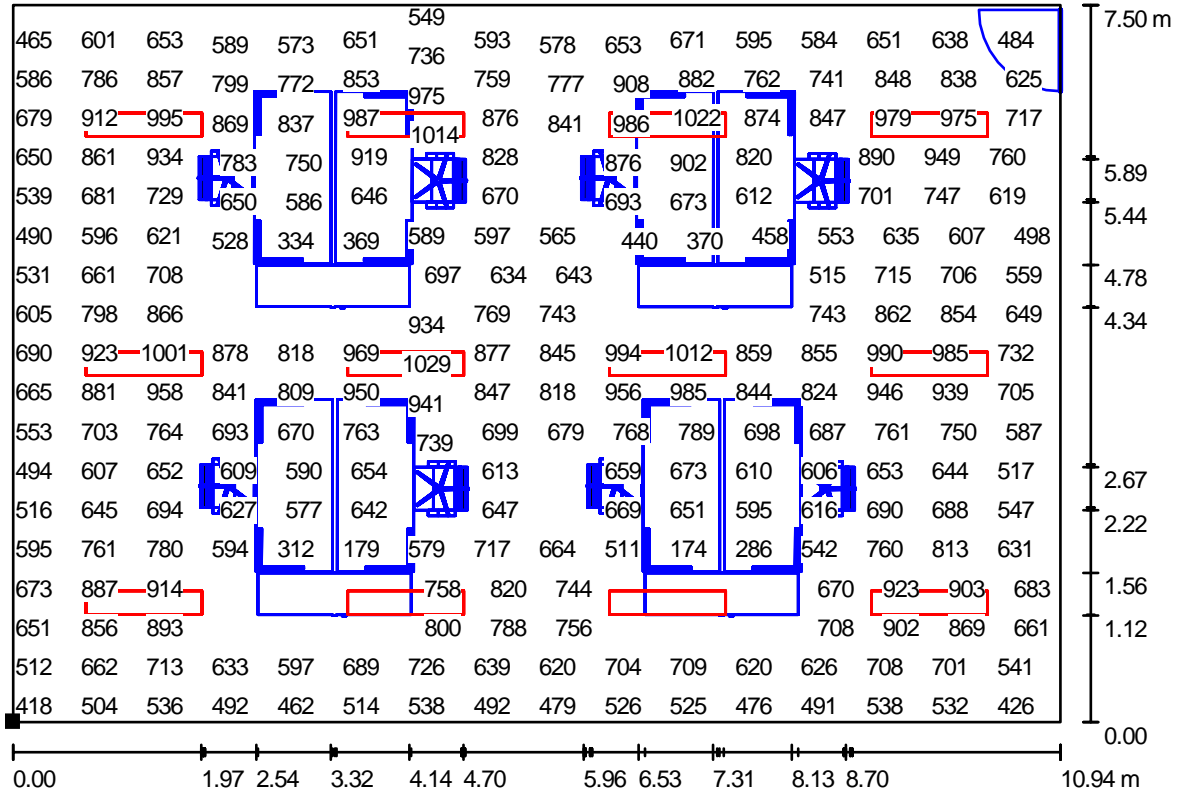
Operator Juan Luis Vera Ambel

Telephone 646336621

Fax -

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P1 Office / Plano útil / Value Chart (E)



Values in Lux, Scale 1 : 7

Not all calculated values could be displayed.

Position of surface in room:

Marked point:

(0.300 m, 121.831 m, 0.850 m)



Grid: 128 x 128 Points

E_{av} [lx]
695

E_{min} [lx]
104

E_{max} [lx]
1047

$u0$
0.150

E_{min} / E_{max}
0.09

Electrical installation in a block factory



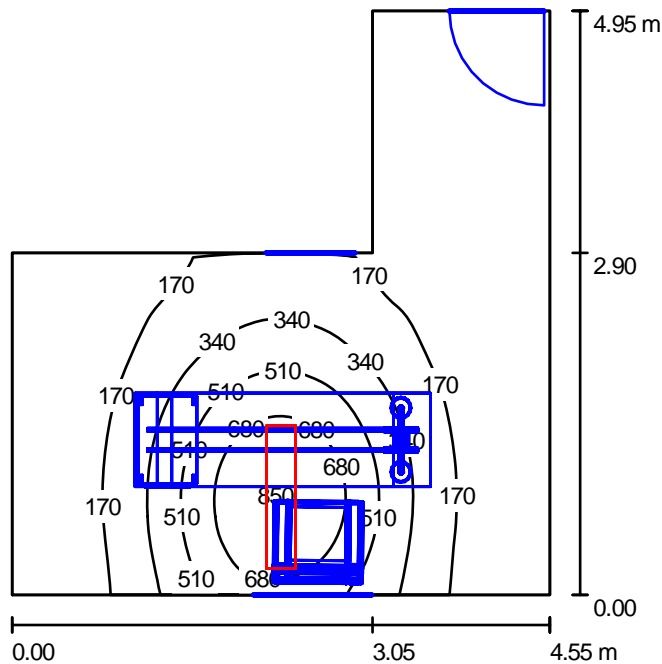
08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

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 e-Mail Instalaciones.V@gmail.com

P1 owner room / Summary



Height of Room: 2.800 m, Mounting Height: 2.800 m, Light loss factor: 0.80

Values in Lux, Scale 1:64

Surface	ρ [%]	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u_0
Plano útil	/	241	16	858	0.067
Suelo	32	125	16	433	0.131
Techo	70	54	17	102	0.307
Walls (6)	61	71	14	1203	/

Plano útil:

Height: 0.850 m
 Grid: 64 x 64 Points
 Boundary Zone: 0.000 m

Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ [lm]	P [W]
1	1	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR (1.000)	8900	118.0
Total:			8900	118.0

Specific connected load: $7.25 \text{ W/m}^2 = 3.01 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 16.27 m^2)

Electrical installation in a block factory



08.06.2012

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C/Jose Sangenis, 15-19, 1º 2ª

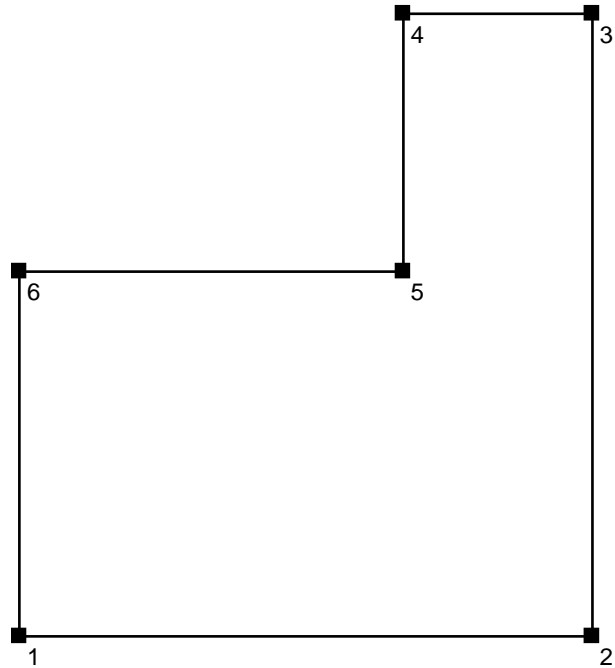
Operator Juan Luis Vera Ambel
 Telephone 646336621
 Fax -
 e-Mail Instalaciones.V@gmail.com

P1 owner room / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 2.800 m
 Ground area: 16.27 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	32	/	/	/
Techo	70	/	/	/
Pared 1	61	(11.287 121.831)	(15.837 121.831)	4.550
Pared 2	61	(15.837 121.831)	(15.837 126.781)	4.950
Pared 3	61	(15.837 126.781)	(14.337 126.781)	1.500
Pared 4	61	(14.337 126.781)	(14.337 124.731)	2.050
Pared 5	61	(14.337 124.731)	(11.287 124.731)	3.050
Pared 6	61	(11.287 124.731)	(11.287 121.831)	2.900

Electrical installation in a block factory

08.06.2012

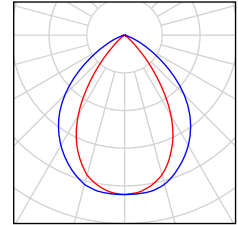
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C/Jose Sangenis, 15-19, 1º 2ª

Operator Juan Luis Vera Ambel
Telephone 646336621
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P1 owner room / Luminaire parts list

1 Pieces TROLL 030354T/84 BATLIGHT (DIR. SYM.
L + DIR. SYM. L). 2 x T5 HO 54W 840
ELECTR. GEAR
Article No.: 030354T/84
Luminaire Luminous Flux: 8900 lm
Luminaire Wattage: 118.0 W
Luminaire classification according to CIE:
100
CIE flux code: 76 97 100 100 63
Fitting: 2 x T5 HO (Correction Factor 1.000).



Electrical installation in a block factory



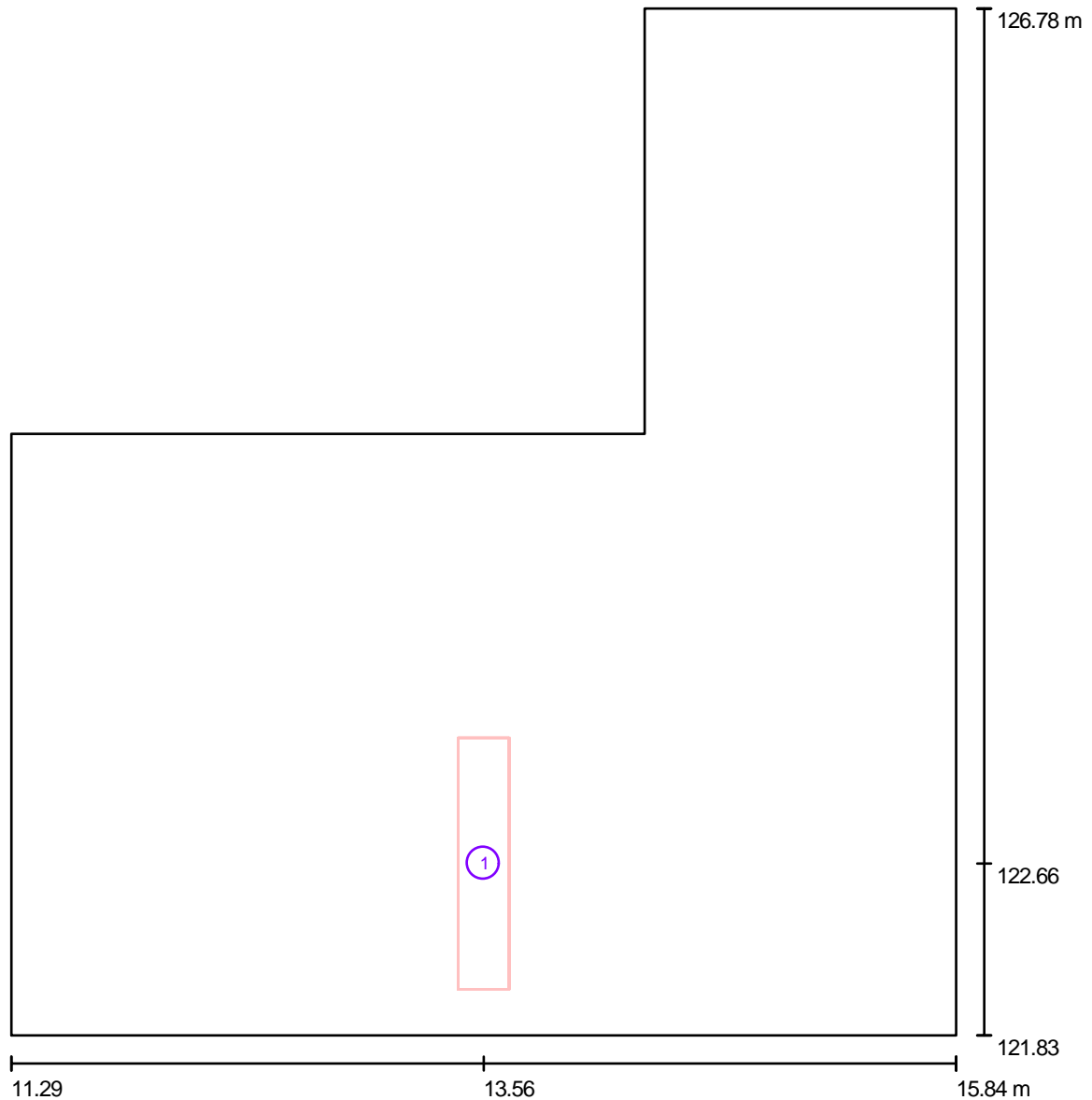
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P1 owner room / Luminaires (layout plan)



Scale 1 : 34

Luminaire Parts List

No.	Pieces	Designation
1	1	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR

Electrical installation in a block factory



08.06.2012

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P1 owner room / Photometric Results

Total Luminous Flux: 8900 lm
 Total Load: 118.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m ²]
	direct	indirect	total		
Plano útil	196	44	241	/	/
Superficie de cálculo 2	239	50	289	/	/
Suelo	86	39	125	32	13
Techo	0.00	54	54	70	12
Pared 1	83	49	132	61	26
Pared 2	6.67	37	43	61	8.41
Pared 3	0.59	21	22	61	4.18
Pared 4	0.00	20	20	61	3.81
Pared 5	37	56	93	61	18
Pared 6	9.54	53	63	61	12

Uniformity on the working plane
 u₀: 0.067 (1:15)
 E_{min} / E_{max}: 0.019 (1:53)

Specific connected load: 7.25 W/m² = 3.01 W/m²/100 lx (Ground area: 16.27 m²)

Electrical installation in a block factory



08.06.20

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P1 owner room / 3D Renderin



Electrical installation in a block factory



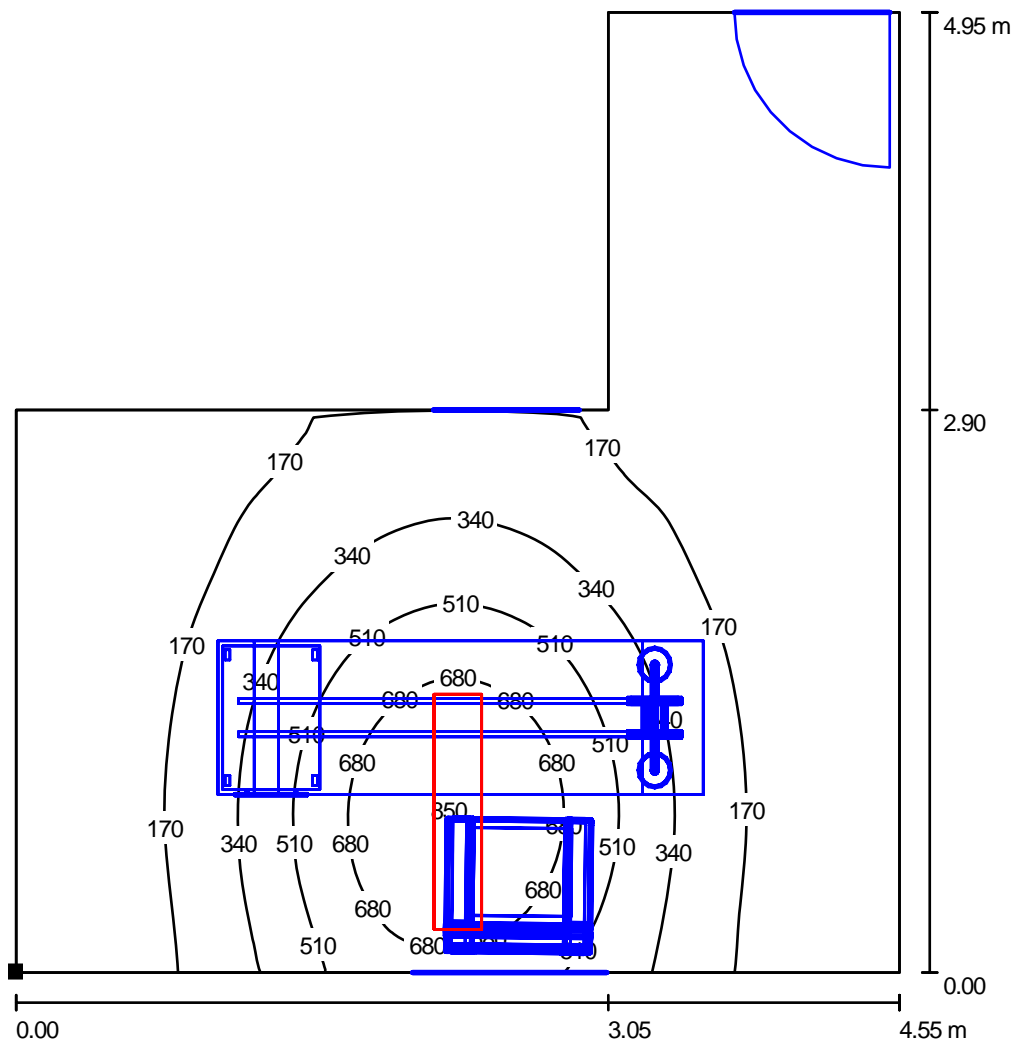
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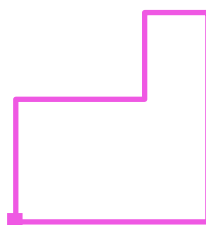
Operator Juan Luis Vera Ambel
 Telephone 646336621
 Fax -
 e-Mail Instalaciones.V@gmail.com

P1 owner room / Plano útil / Isolines (E)



Values in Lux, Scale 1 : 39

Position of surface in room:
 Marked point:
 (11.287 m, 121.831 m, 0.850 m)



Grid: 64 x 64 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
241	16	858	0.067	0.019



08.06.2012

Electrical installation in a block factory

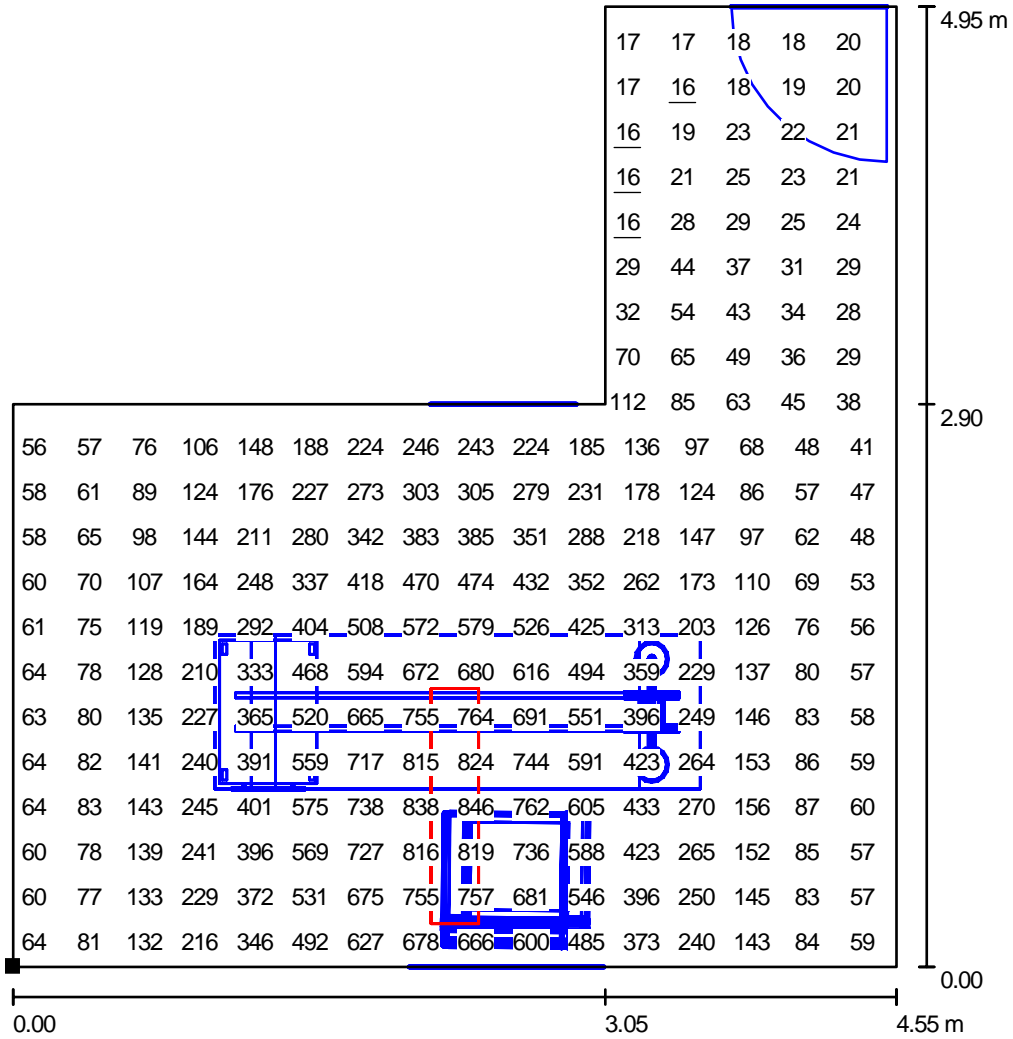


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Operator Juan Luis Vera Ambel
 Telephone 646336621
 Fax -
 e-Mail Instalaciones.V@gmail.com

P1 owner room / Plano útil / Value Chart (E)



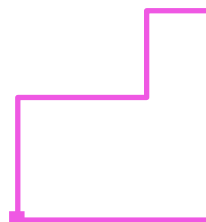
Values in Lux, Scale 1 : 39

Not all calculated values could be displayed.

Position of surface in room:

Marked point:

(11.287 m, 121.831 m, 0.850 m)



Grid: 64 x 64 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
241	16	858	0.067	0.019



Electrical installation in a block factory



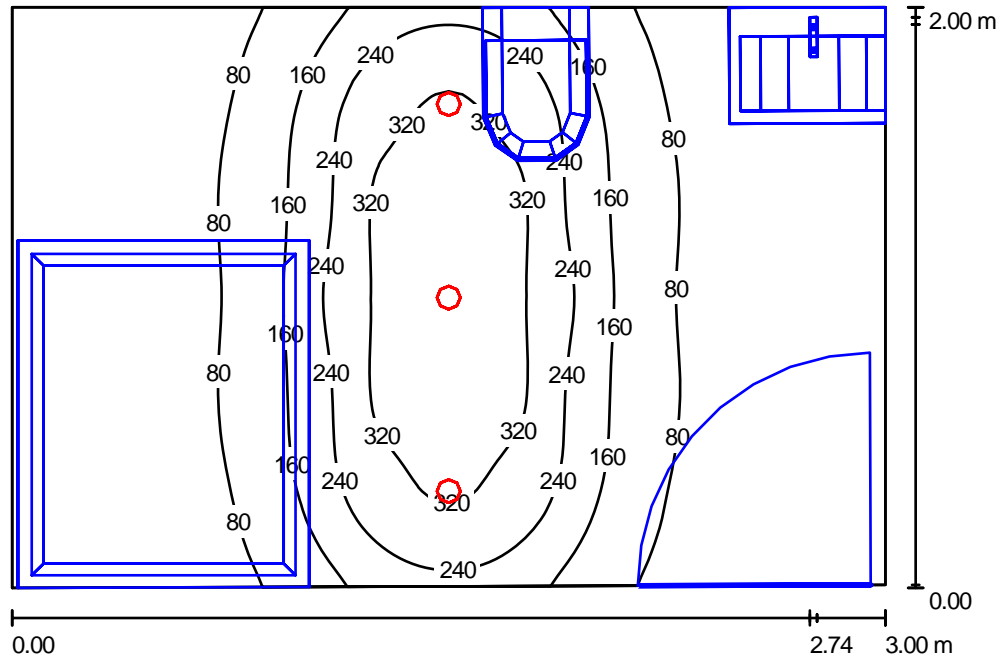
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P1 WC owner room / Summary



Height of Room: 2.800 m, Mounting Height: 2.908 m, Light loss factor: 0.80

Values in Lux, Scale 1:26

Surface	ρ [%]	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u_0
Plano útil	/	133	18	400	0.134
Suelo	30	94	0.46	261	0.005
Techo	30	17	12	31	0.738
Walls (4)	30	35	4.46	177	/

Plano útil:

Height: 0.850 m
 Grid: 64 x 64 Points
 Boundary Zone: 0.000 m

Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ [lm]	P [W]
1	3	TROLL 0105 BASIC +1 x QPAR-CB 50W 25º (1.000)	485	50.0
Total:			1455	150.0

Specific connected load: $25.06 \text{ W/m}^2 = 18.81 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 5.98 m^2)

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

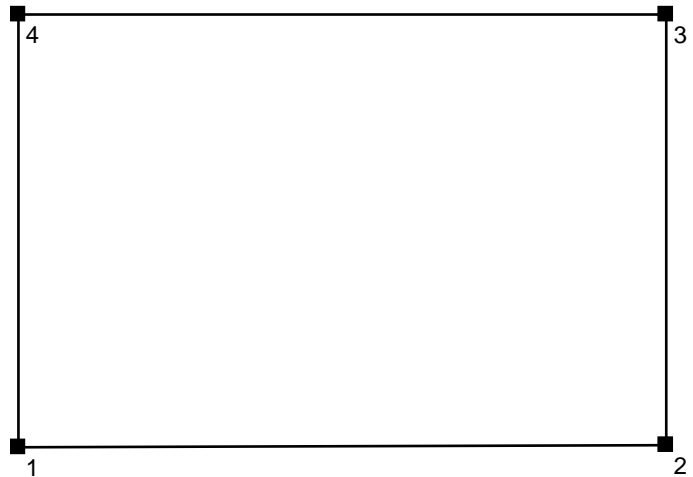
Operator Juan Luis Vera Ambel
 Telephone 646336621
 Fax -
 e-Mail Instalaciones.V@gmail.com

P1 WC owner room / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 2.800 m
 Ground area: 5.98 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	30	/	/	/
Techo	30	/	/	/
Pared 1	30	(11.287 124.781)	(14.287 124.791)	3.000
Pared 2	30	(14.287 124.791)	(14.287 126.781)	1.990
Pared 3	30	(14.287 126.781)	(11.287 126.781)	3.000
Pared 4	30	(11.287 126.781)	(11.287 124.781)	2.000

Electrical installation in a block factory

08.06.2012

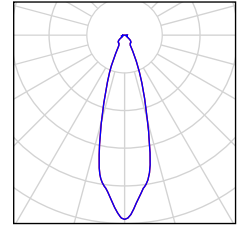
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Operator Juan Luis Vera Ambel
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e-Mail Instalaciones.V@gmail.com

P1 WC owner room / Luminaire parts list

3 Pieces TROLL 0105 BASIC +1 x QPAR-CB 50W
25°
Article No.: 0105
Luminaire Luminous Flux: 485 lm
Luminaire Wattage: 50.0 W
Luminaire classification according to CIE:
100
CIE flux code: 78 90 95 100 101
Fitting: 1 x QPAR-CB (Correction Factor
1.000).



Electrical installation in a block factory



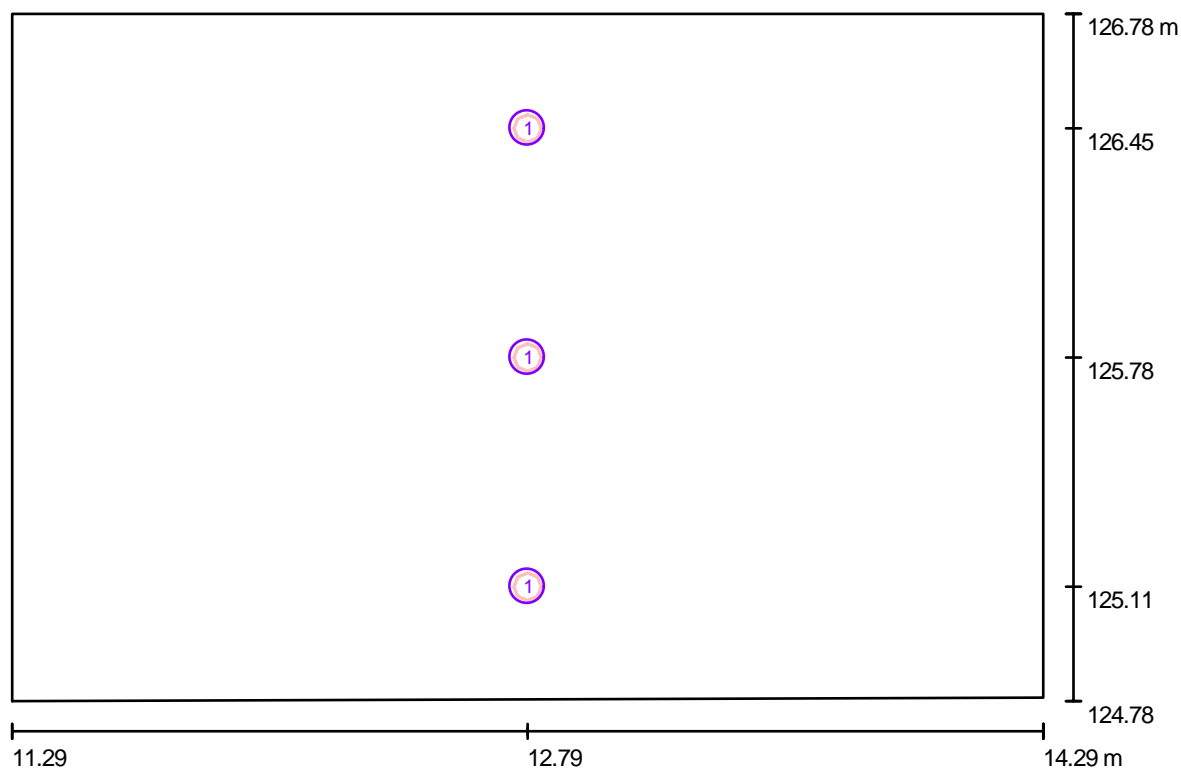
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P1 WC owner room / Luminaires (layout plan)



Scale 1 : 22

Luminaire Parts List

No.	Pieces	Designation
1	3	TROLL 0105 BASIC +1 x QPAR-CB 50W 25°

Electrical installation in a block factory



08.06.2012

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P1 WC owner room / Photometric Results

Total Luminous Flux: 1455 lm
 Total Load: 150.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m ²]
	direct	indirect	total		
Plano útil	123	9.78	133	/	/
Superficie de cálculo 1	123	9.65	133	/	/
Suelo	85	8.89	94	30	8.98
Techo	0.09	17	17	30	1.59
Pared 1	27	16	43	30	4.14
Pared 2	11	14	25	30	2.42
Pared 3	24	15	39	30	3.74
Pared 4	11	15	26	30	2.50

Uniformity on the working plane
 u₀: 0.134 (1:7)
 E_{min} / E_{max}: 0.045 (1:22)

Specific connected load: 25.06 W/m² = 18.81 W/m²/100 lx (Ground area: 5.98 m²)

Electrical installation in a block factory



08.06.20

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

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P1 WC owner room / 3D Rendering



Electrical installation in a block factory



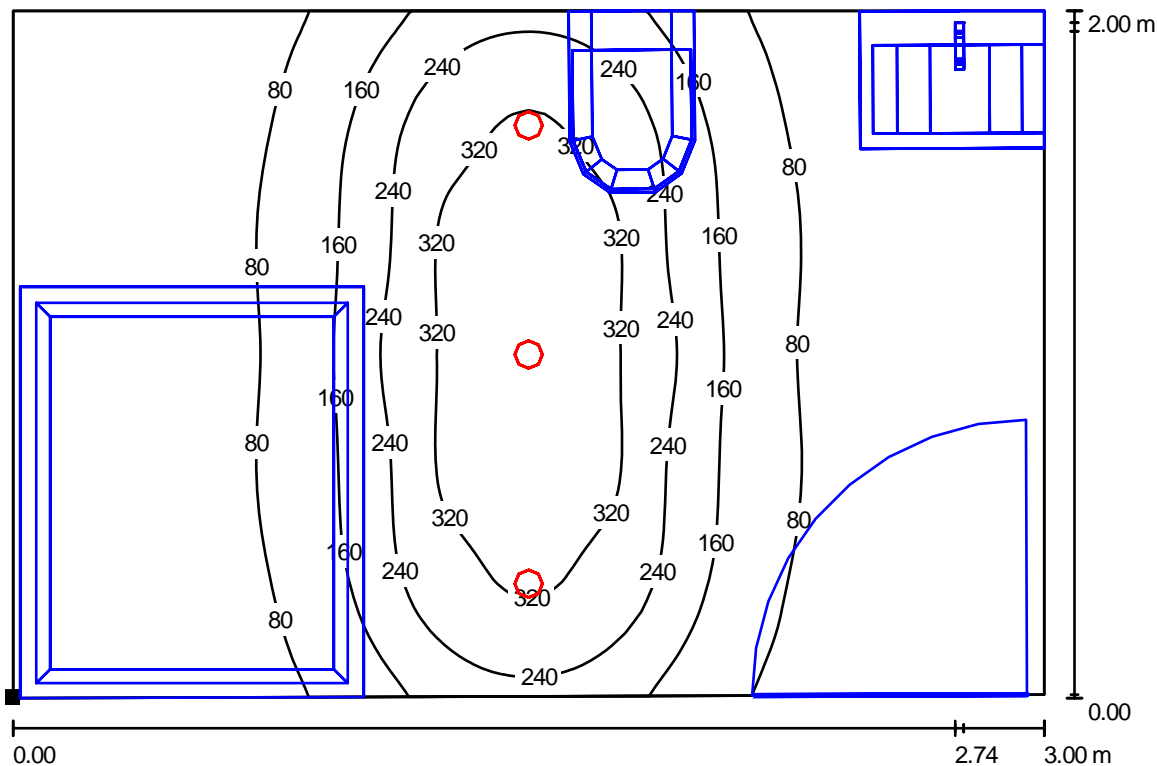
08.06.2012

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P1 WC owner room / Plano útil / Isolines (E)



Values in Lux, Scale 1 : 22

Position of surface in room:

Marked point:

(11.287 m, 124.781 m, 0.850 m)



Grid: 64 x 64 Points

E_{av} [lx]
133

E_{min} [lx]
18

E_{max} [lx]
400

u_0
0.134

E_{min} / E_{max}
0.045

Electrical installation in a block factory



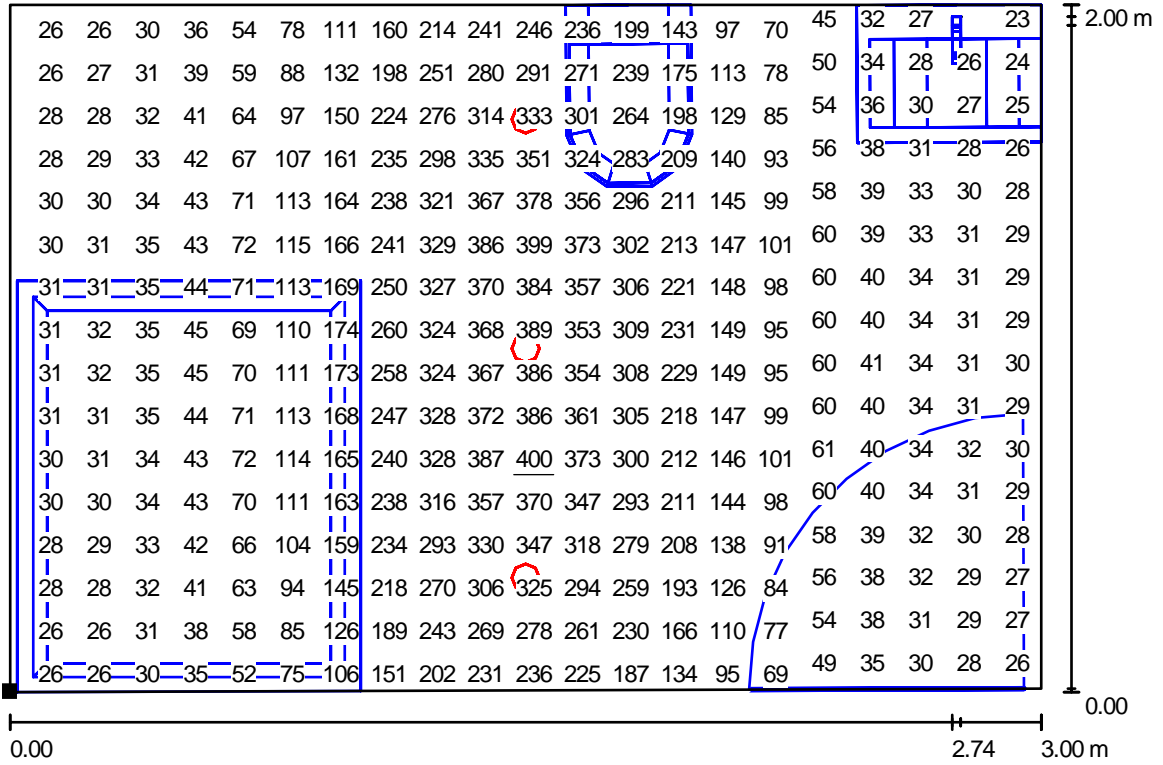
08.06.2012

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Operator Juan Luis Vera Ambel
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P1 WC owner room / Plano útil / Value Chart (E)



Values in Lux, Scale 1 : 22

Not all calculated values could be displayed.

Position of surface in room:

Marked point:

(11.287 m, 124.781 m, 0.850 m)



Grid: 64 x 64 Points

E_{av} [lx]
133

E_{min} [lx]
18

E_{max} [lx]
400

u_0
0.134

E_{min} / E_{max}
0.045



08.06.20

Electrical installation in a block factory



Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

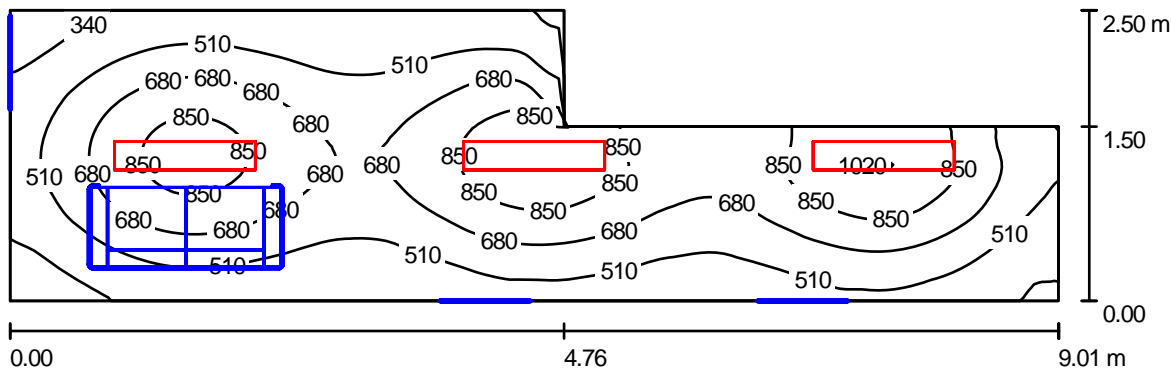
Operator Juan Luis Vera Ambel

Telephone 646336621

Fax -

e-Mail Instalaciones.V@gmail.com

p2 Hall / Summary



Height of Room: 2.800 m, Mounting Height: 2.800 m, Light loss factor: 0.80

Values in Lux, Scale 1:6

Surface	ρ [%]	E _{av} [lx]	E _{min} [lx]	E _{max} [lx]	u
Plano útil	/	623	239	1042	0.38
Suelo	32	468	41	660	0.08
Techo	70	138	81	228	0.58
Walls (6)	61	248	85	1805	

Plano útil:

Height: 0.850 m
 Grid: 128 x 32 Points
 Boundary Zone: 0.000 m

Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ [lm]	P [W]
1	3	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR (1.000)	8900	118.
Total:			26700	354.

Specific connected load: 19.36 W/m² = 3.11 W/m²/100 lx (Ground area: 18.28 m²)

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

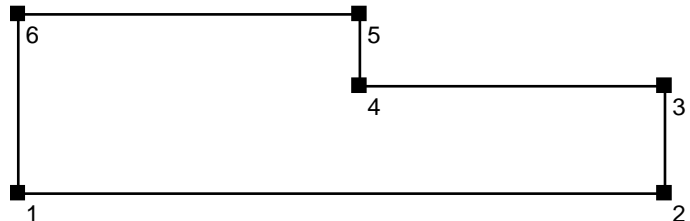
Operator Juan Luis Vera Ambel
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p2 Hall / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 2.800 m
 Ground area: 18.28 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	32	/	/	/
Techo	70	/	/	/
Pared 1	61	(11.287 126.831)	(20.300 126.831)	9.013
Pared 2	61	(20.300 126.831)	(20.300 128.331)	1.500
Pared 3	61	(20.300 128.331)	(16.050 128.331)	4.250
Pared 4	61	(16.050 128.331)	(16.050 129.331)	1.000
Pared 5	61	(16.050 129.331)	(11.287 129.331)	4.763
Pared 6	61	(11.287 129.331)	(11.287 126.831)	2.500

Electrical installation in a block factory

08.06.2012

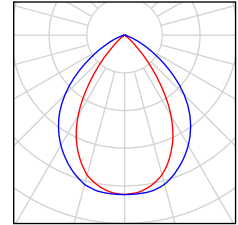
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p2 Hall / Luminaire parts list

3 Pieces TROLL 030354T/84 BATLIGHT (DIR. SYM.
L + DIR. SYM. L). 2 x T5 HO 54W 840
ELECTR. GEAR
Article No.: 030354T/84
Luminaire Luminous Flux: 8900 lm
Luminaire Wattage: 118.0 W
Luminaire classification according to CIE:
100
CIE flux code: 76 97 100 100 63
Fitting: 2 x T5 HO (Correction Factor 1.000).



Electrical installation in a block factory



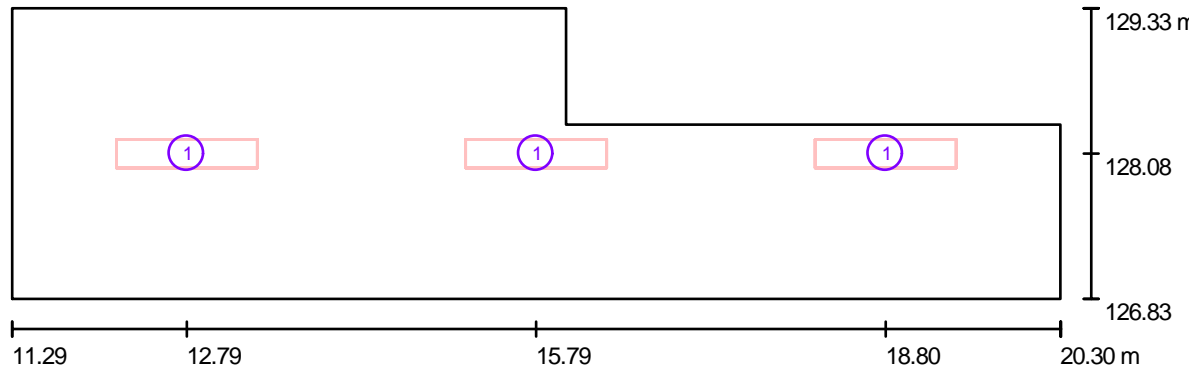
08.06.20

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p2 Hall / Luminaires (layout plan)



Scale 1 : 6

Luminaire Parts List

No.	Pieces	Designation
1	3	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR

Electrical installation in a block factory



08.06.2012

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C/Jose Sangenis, 15-19, 1º 2ª

Operator Juan Luis Vera Ambel
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p2 Hall / Photometric Results

Total Luminous Flux: 26700 lm
 Total Load: 354.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m ²]
	direct	indirect	total		
Plano útil	489	133	623	/	/
Superficie de cálculo 1	397	109	506	/	/
Suelo	332	136	468	32	48
Techo	0.00	138	138	70	31
Pared 1	69	154	223	61	43
Pared 2	116	178	294	61	57
Pared 3	205	169	374	61	73
Pared 4	101	128	229	61	45
Pared 5	69	123	192	61	37
Pared 6	102	105	208	61	40

Uniformity on the working plane
 u₀: 0.384 (1:3)
 E_{min} / E_{max}: 0.230 (1:4)

Specific connected load: 19.36 W/m² = 3.11 W/m²/100 lx (Ground area: 18.28 m²)

Electrical installation in a block factory



08.06.20

Instalaciones.V

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p2 Hall / 3D Renderin



Electrical installation in a block factory



08.06.20

Instalaciones.V

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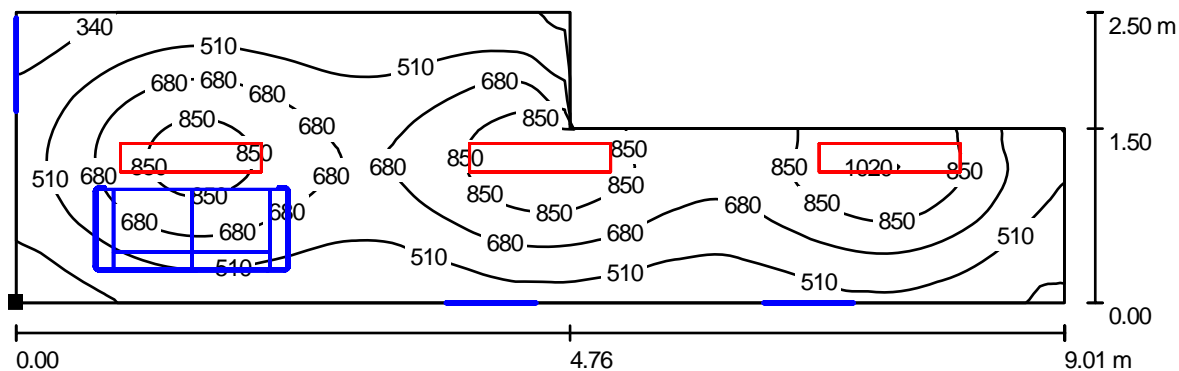
Operator Juan Luis Vera Ambel

Telephone 646336621

Fax -

e-Mail Instalaciones.V@gmail.com

p2 Hall / Plano útil / Isolines (E)

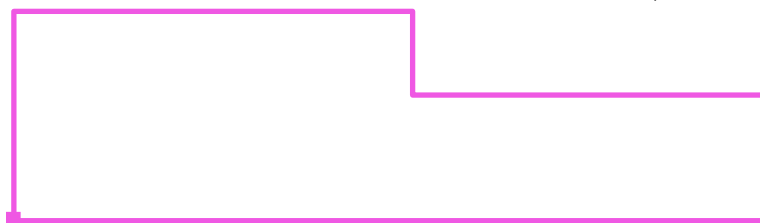


Values in Lux, Scale 1 : 6

Position of surface in room:

Marked point:

(11.287 m, 126.831 m, 0.850 m)



Grid: 128 x 32 Points

E_{av} [lx]
623

E_{min} [lx]
239

E_{max} [lx]
1042

$u0$
0.384

E_{min} / E_{max}
0.23

Electrical installation in a block factory



08.06.20

Instalaciones.V

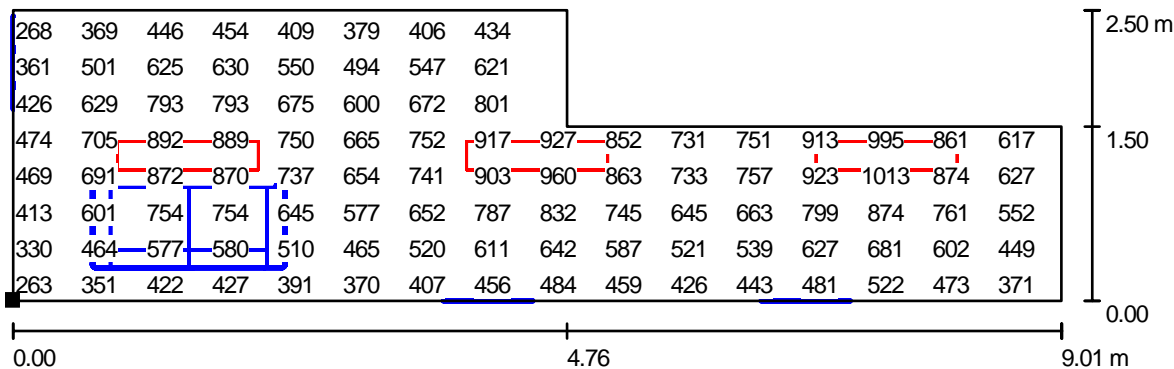
C/Jose Sangenis, 15-19, 1º 2ª

Operator Juan Luis Vera Ambel
Telephone 646336621

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p2 Hall / Plano útil / Value Chart (E



Values in Lux, Scale 1 : 6

Not all calculated values could be displayed.

Position of surface in room:

Marked point:

(11.287 m, 126.831 m, 0.850 m)



Grid: 128 x 32 Points

E_{av} [lx]
623

E_{min} [lx]
239

E_{max} [lx]
1042

u_0
0.384

E_{min} / E_{max}
0.23

Electrical installation in a block factory



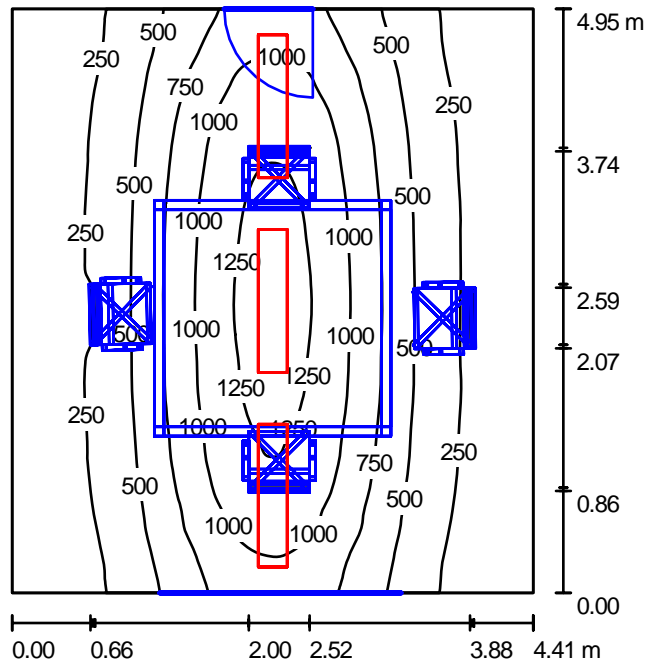
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P2 meting's room / Summary



Height of Room: 2.800 m, Mounting Height: 2.800 m, Light loss factor: 0.80

Values in Lux, Scale 1:64

Surface	ρ [%]	E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u_0
Plano útil	/	590	105	1352	0.178
Suelo	32	296	35	687	0.117
Techo	70	102	78	144	0.762
Walls (4)	61	158	75	1257	/

Plano útil:

Height: 0.850 m
 Grid: 128 x 128 Points
 Boundary Zone: 0.000 m

Luminaire Parts List

No.	Pieces	Designation (Correction Factor)	Φ [lm]	P [W]
1	3	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR (1.000)	8900	118.0
Total:			26700	354.0

Specific connected load: $16.21 \text{ W/m}^2 = 2.75 \text{ W/m}^2/100 \text{ lx}$ (Ground area: 21.84 m^2)

Electrical installation in a block factory



08.06.2012

Instalaciones.V

C/Jose Sangenis, 15-19, 1º 2ª

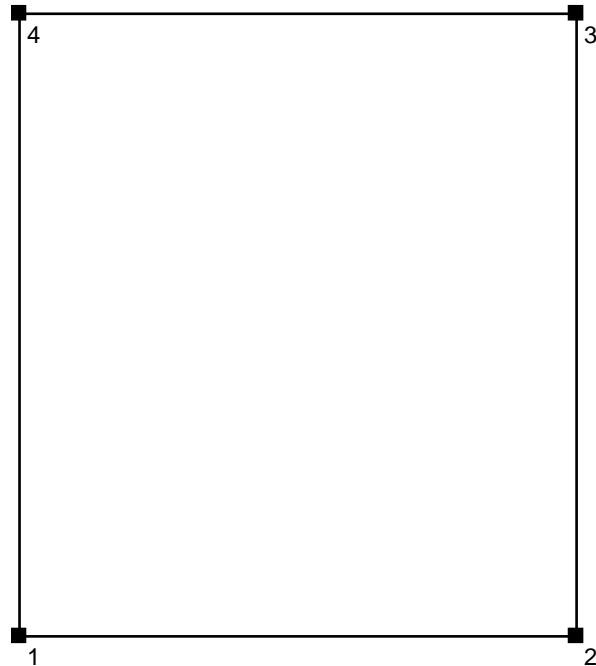
Operator Juan Luis Vera Ambel
 Telephone 646336621
 Fax -
 e-Mail Instalaciones.V@gmail.com

P2 meting's room / Input Protocol

Height of working plane: 0.850 m
 Boundary Zone: 0.000 m

Light loss factor: 0.80

Height of Room: 2.800 m
 Ground area: 21.84 m²



Surface	Rho [%]	from ([m] [m])	towards ([m] [m])	Length [m]
Suelo	32	/	/	/
Techo	70	/	/	/
Pared 1	61	(15.887 121.831)	(20.300 121.831)	4.413
Pared 2	61	(20.300 121.831)	(20.300 126.781)	4.950
Pared 3	61	(20.300 126.781)	(15.887 126.781)	4.413
Pared 4	61	(15.887 126.781)	(15.887 121.831)	4.950

Electrical installation in a block factory

08.06.2012

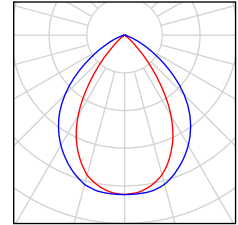
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Operator Juan Luis Vera Ambel
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P2 meting's room / Luminaire parts list

3 Pieces TROLL 030354T/84 BATLIGHT (DIR. SYM.
L + DIR. SYM. L). 2 x T5 HO 54W 840
ELECTR. GEAR
Article No.: 030354T/84
Luminaire Luminous Flux: 8900 lm
Luminaire Wattage: 118.0 W
Luminaire classification according to CIE:
100
CIE flux code: 76 97 100 100 63
Fitting: 2 x T5 HO (Correction Factor 1.000).



Electrical installation in a block factory



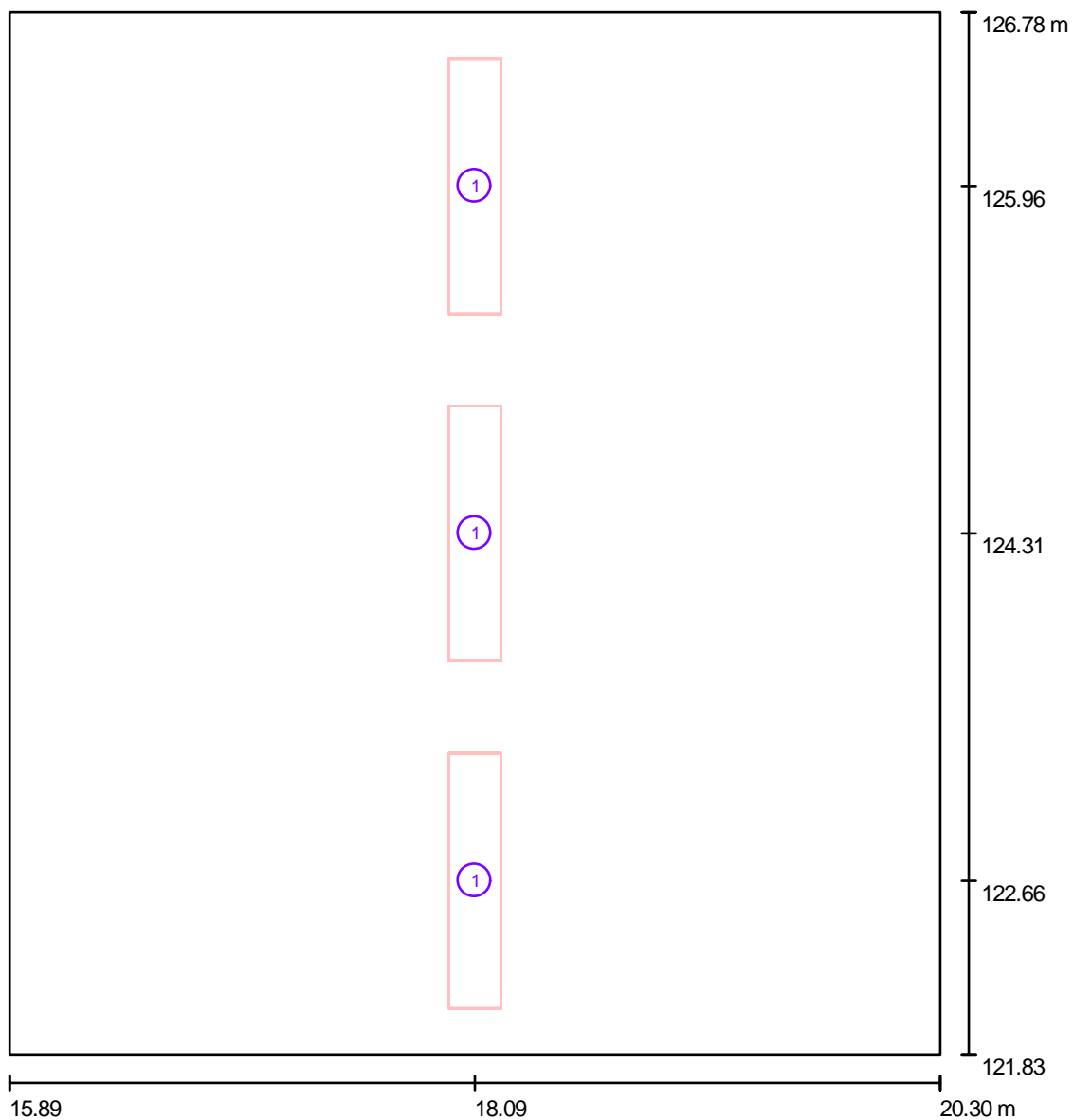
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P2 meting's room / Luminaires (layout plan)



Scale 1 : 34

Luminaire Parts List

No.	Pieces	Designation
1	3	TROLL 030354T/84 BATLIGHT (DIR. SYM. L + DIR. SYM. L). 2 x T5 HO 54W 840 ELECTR. GEAR

Electrical installation in a block factory



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P2 meting's room / Photometric Results

Total Luminous Flux: 26700 lm
 Total Load: 354.0 W
 Light loss factor: 0.80
 Boundary Zone: 0.000 m

Surface	Average illuminances [lx]			Reflection factor [%]	Average luminance [cd/m ²]
	direct	indirect	total		
Plano útil	495	96	590	/	/
Superficie de cálculo 1	495	96	590	/	/
Suelo	211	86	296	32	30
Techo	0.00	102	102	70	23
Pared 1	97	88	185	61	36
Pared 2	23	98	121	61	24
Pared 3	118	95	213	61	41
Pared 4	24	99	123	61	24

Uniformity on the working plane
 u₀: 0.178 (1:6)
 E_{min} / E_{max}: 0.078 (1:13)

Specific connected load: 16.21 W/m² = 2.75 W/m²/100 lx (Ground area: 21.84 m²)

Electrical installation in a block factory



08.06.20

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P2 meeting's room / 3D Renderin



Electrical installation in a block factory



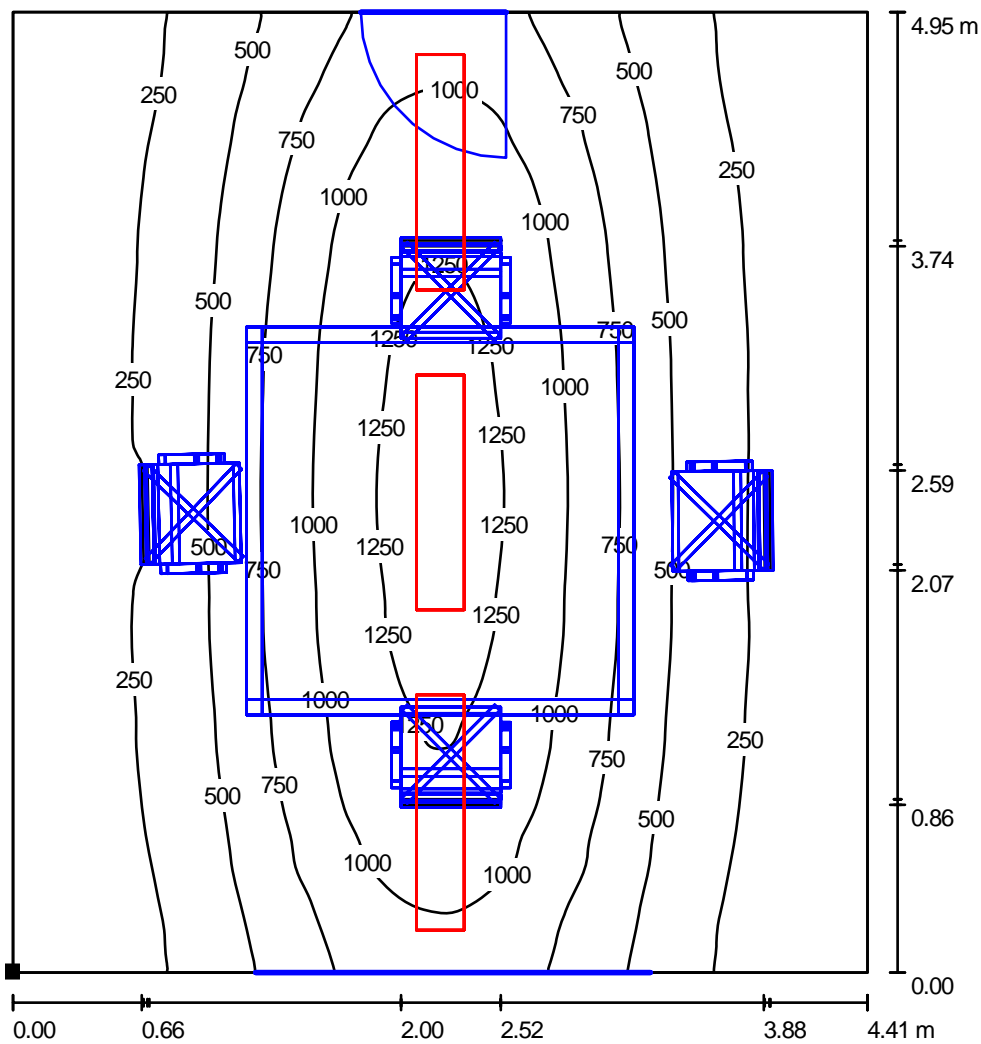
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P2 meting's room / Plano útil / Isolines (E)



Values in Lux, Scale 1 : 39

Position of surface in room:
 Marked point:
 (15.887 m, 121.831 m, 0.850 m)



Grid: 128 x 128 Points

E_{av} [lx]	E_{min} [lx]	E_{max} [lx]	u0	E_{min} / E_{max}
590	105	1352	0.178	0.078



08.06.2012

Electrical installation in a block factory



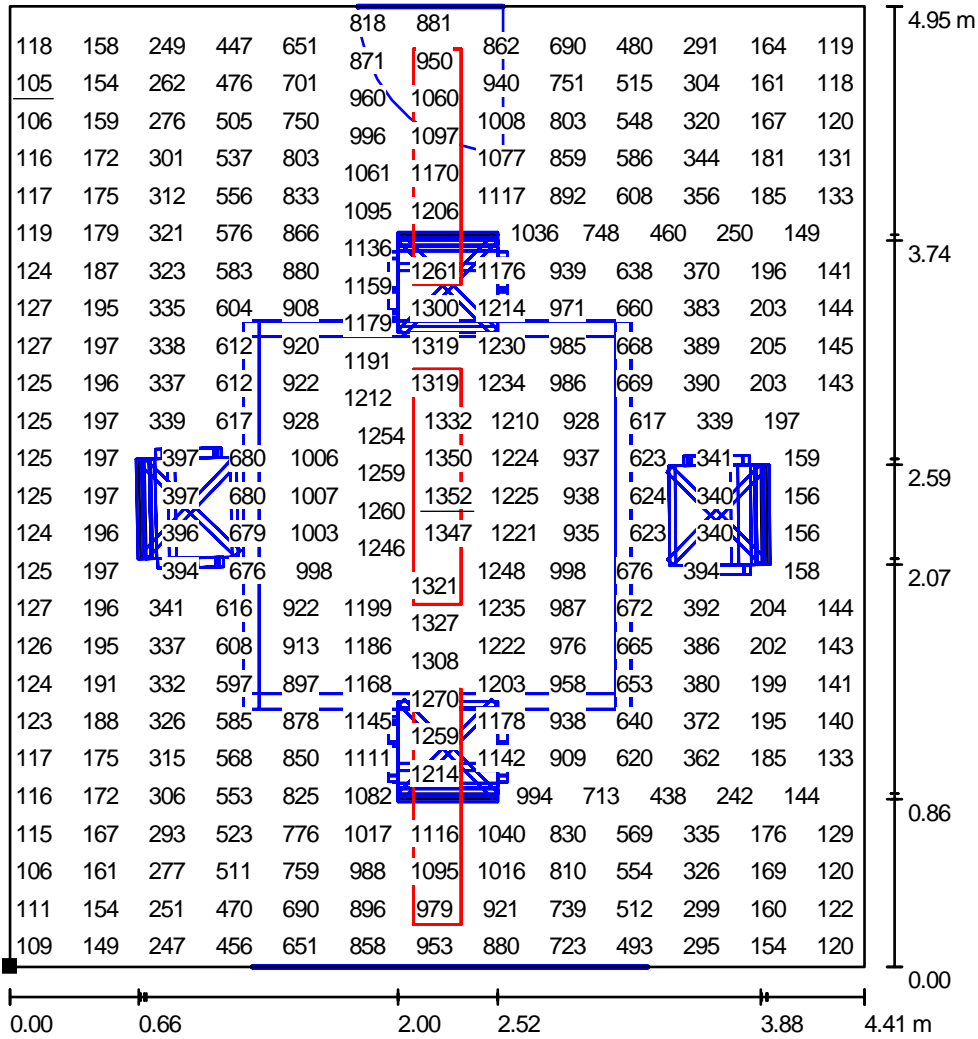
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P2 meting's room / Plano útil / Value Chart (E)



Values in Lux, Scale 1 : 39

Not all calculated values could be displayed.

Position of surface in room:
Marked point:
(15.887 m, 121.831 m, 0.850 m)



Grid: 128 x 128 Points

E_{av} [lx] 590 E_{min} [lx] 105 E_{max} [lx] 1352 u_0 0.178 E_{min} / E_{max} 0.078



Electrical installation in a block factory



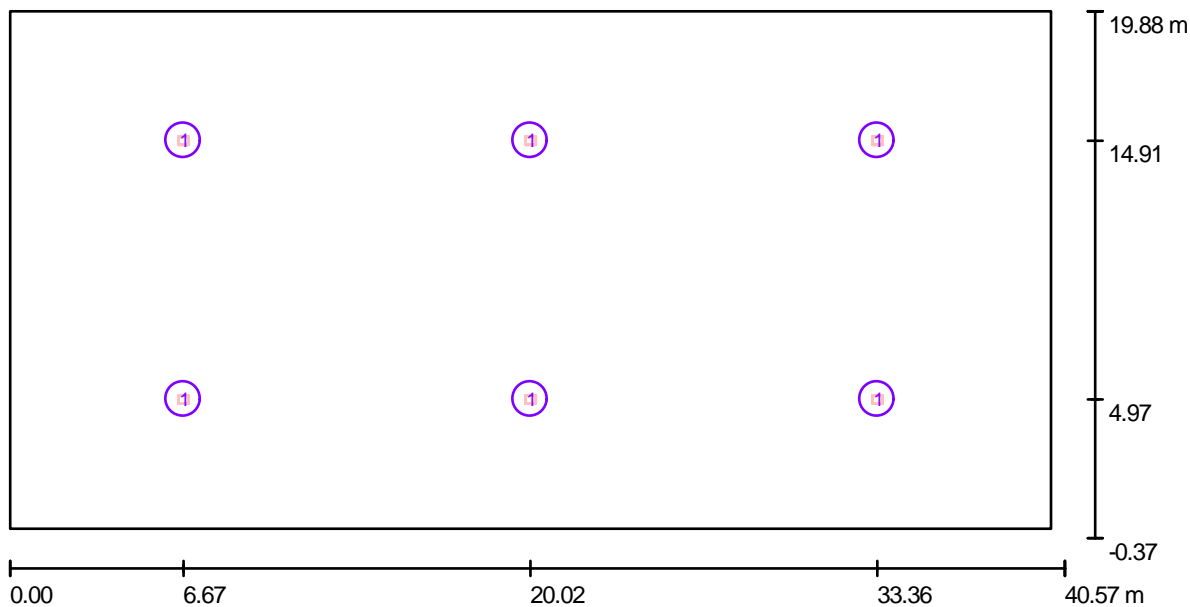
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Previous outer zone / Luminaires (layout plan)



Scale 1 : 2!

Luminaire Parts List

No.	Pieces	Designation
1	6	TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR

Electrical installation in a block factory



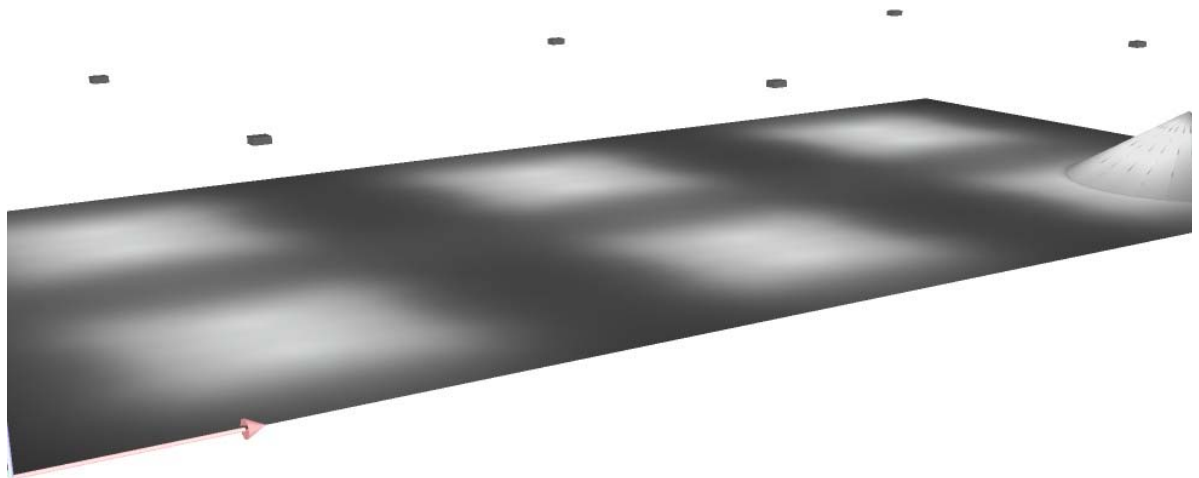
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Previous outer zone / 3D Rendering



Electrical installation in a block factory



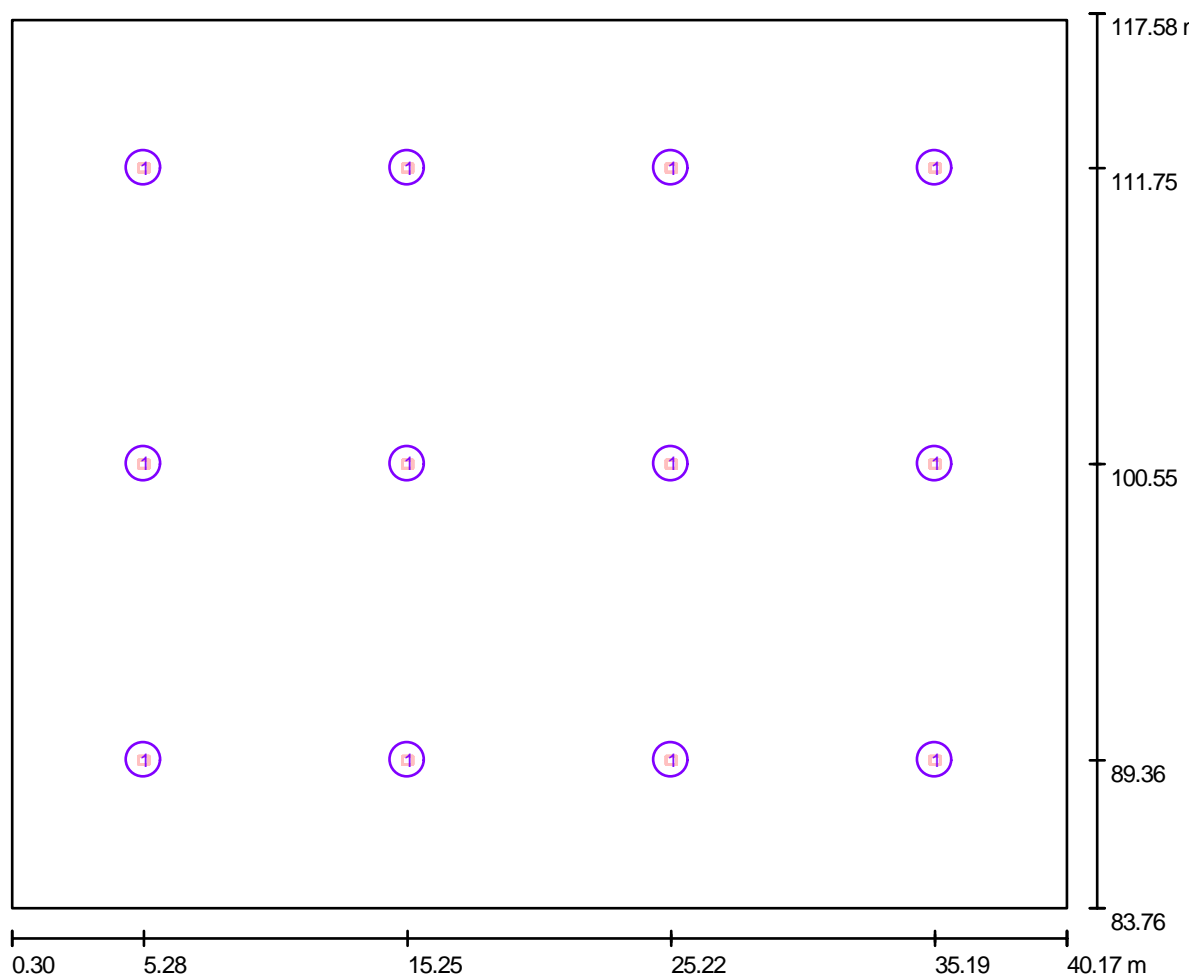
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Back outer zone / Luminaires (layout plan)



Scale 1 : 20

Luminaire Parts List

No.	Pieces	Designation
1	12	TROLL 0642/150 LIGHTMOTIV +1 x HIT-DE-CRI 150W HF MAG. GEAR

Electrical installation in a block factory



08.06.20

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Back outer zone / 3D Rendering

