

# **DESCRIPTIVE AND JUSTIFICATIVE MEMORY STANDBY GENERATOR SET**

## **1. PREAMBLE**

The present description and justification refers to the project to assemble an standby generator set that will be established in the area to build the electrical infrastructure in the buildings of the WAREHOUSE CENTRAL DA BEIRA, in the Municipality of Beira, Mozambique.

## **2. GENERAL ASPECTS**

In order to avoid service interruptions during possible interruptions in the supply of electricity in the urban medium voltage network, an emergency generator group (GGE) will be installed with the capacity to supply electrical energy to all electrical loads in the infrastructure to be built.

## **3. LOCATION**

The GGE will be installed at the planned location close to the installation of the automatic transfer switchboard (CIA). The installation will be done on a concrete mass on 400mm high at least in relation to the normal pavement, in the location indicated in the drawings or to be defined in the course of the works. The leveling of the massif must be what allows no water concentration on its surface.

Inside the place to be installed, the GGE will provide an oil discharge ditch, in the area of the diesel engine, from which a drain will be made by means of an evacuation pipe communicating with a drain in the building. For these oil discharges, on the proposal of the contractor, another alternative that guarantees the objective will be accepted.

#### **4. ELETRICAL LOAD**

The GGE will be dimensioned to fully feed the load consisting of: lighting, general purpose outlets, heating, air conditioning, information technology, communications, integrated security systems, driving force whose value corresponds to one hundred percent of the total load of the BEIRA CENTRAL WAREHOUSE.

This infrastructure has an installed electrical load of 520.79KW as the expected installed power that will need electricity in the period of forced interruption of electricity supply that Eletricidade de Moçambique (EDM), against its will, feels unable to supply. This load includes the load that will be installed when the two pavilions are built to serve as warehouses.

**Table 1: Summary table of concentrated load in QEGBT**

Belarmino B Maongane Electrotechnical Engineer				SWITCHBOARD - CIRCUITS QEGBT				CENTRAL BEIRA WAREHOUSE			S.153		1	
Electrical Installation type for Office Use														
INSTALLED POWER (kW)				520,79		Circuits		TYPE: Metallic weatherproof paint						
SIMULTANEITY FACTOR				74%				Nº OF CIRCUITS: 11						
POWER FACTOR				80%		MAIN FEEDER - AP		CABLE SECTION (mm²)				2(4X185)		
SIMULTANEITY POWER (kW)				385,4				TYPE				PVC/PVC/ SWA/PVC		
CURRENT PER PHASE (A)				732,66				CAPACITY (Amp.)				1138		
Nº	CIRC.	PHASE	SECTION	PLACE	LOAD	QUANTY	POWER (Watt)							
							UNITARY	TOTAL	PER PHASE					
1	1	A			ADS1	1	27467	27467						
2	2				ADS2	1	25565	25565						
3	3				QEGUPS	1	18483	18483						
4	4				QECA1	1	11220	11220						
5	5				QECA2	1	11220	11220						
6	6				QEBAPE	1	3733	3733						
7	7				QEBI	1	8560	8560						
8	8				QEBAP	1	4569	4569						
9	9				QEBAA	1	4569	4569						
10	10				QEBFA	1	3876	3876						
11	11				AVAC	1	17233	17233						
12	12					FUTURE WAREHOUSES	1	37100	37100					
13											173595			
1	1	B			ADS1	1	27467	27467						
2	2				ADS2	1	25565	25565						
3	3				QEGUPS	1	18483	18483						
4	4				QECA1	1	11220	11220						
5	5				QECA2	1	11220	11220						
6	6				QEBAPE	1	3733	3733						

7	7				QEBI	1	8560	8560	
8	8				QEBAP	1	4569	4569	
9	9				QEBAA	1	4569	4569	
10	10				QEBFA	1	3876	3876	
11	11				AVAC	1	17233	17233	
12	12				FUTURE WAREHOUSES	1	37100	37100	
13									
1	1	C			ADS1	1	27467	27467	
2	2				ADS2	1	25565	25565	
3	3				QEGUPS	1	18483	18483	
4	4				QECA1	1	11220	11220	
5	5				QECA2	1	11220	11220	
6	6				QEBAPE	1	3733	3733	
7	7				QEBI	1	8560	8560	
8	8				QEBAP	1	4569	4569	
9	9				QEBAA	1	4569	4569	
10	10				QEBFA	1	3876	3876	
11	11				AVAC	1	17233	17233	
12	12				FUTURE WAREHOUSES	1	37100	37100	
13									
14							TOTAL	520785	
2020								1 SHEET	

The installed power in reference will certainly not work fully at the same time, which is why, considering the activities and the peak period of each one, we interpreted the regulation as well as the expected practical dynamics and decided for an application of a facts of simultaneity of 74% in a percentage that we intend to reflect the dynamics of the present and the future of the development of activities in this infrastructure.

From the considered value of 520.79KW, for the power factor of 0.8, and applied the simultaneity factor mentioned above, we will have a simultaneous power of 385.4kW that will provide us with a service current intensity of 733A.

Assuming this capacity, it is necessary to determine by calculation and select the value of the GGE power to be adopted for this infrastructure.

For a power of 385.4kW using a power factor of 0.80, the apparent power will be 481.75kVA and this value is the base reference value for the final power of the standby generator set.

Thus, in addition to seeing the range of powers normally manufactured, we will consider the planned expansion and the need to not have the rotating field of the generator set overloaded. Taking these facts into account, we will assume that the standby generator set should be 500kVA at its nominal power.

This load used as a basis to determine the power of the GGE must be transmitted to each of the loads. To this end, we will resort to the use of the distribution network established within the infrastructure, the details of which are shown in Table 2 below.

**Table 2: Main distribution network data from QEGBT**

CABLE CODE	FROM	TO	CABLE SECTION [mm <sup>2</sup> ]
AS01	QEGBT	ADS1	PVC/PVC/SWA/PVC CABLE 4 CORES 95mm <sup>2</sup> +50mm <sup>2</sup> EARTHWIRE
AS02	QEGBT	ADS2	PVC/PVC/SWA/PVC CABLE 4 CORES 95mm <sup>2</sup> +50mm <sup>2</sup> EARTHWIRE
AS03	QEGBT	QEGUPS	PVC/PVC/SWA/PVC CABLE 4 CORES 50mm <sup>2</sup> +25mm <sup>2</sup> EARTHWIRE
AS04	QEGBT	QECA1	PVC/PVC/SWA/PVC CABLE 4 CORES 25mm <sup>2</sup> +16mm <sup>2</sup> EARTHWIRE
AS05	QEGBT	QECA2	PVC/PVC/SWA/PVC CABLE 4 CORES 25mm <sup>2</sup> +16mm <sup>2</sup> EARTHWIRE
AS06	QEGBT	QEBAPE	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE

AS07	QEGBT	QEBI	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
AS08	QEGBT	QEBAP	PVC/PVC/SWA/PVC CABLE 4 CORES 6mm <sup>2</sup> +6mm <sup>2</sup> EARTHWIRE
AS09	QEGBT	QEBAA	PVC/PVC/SWA/PVC CABLE 4 CORES 4mm <sup>2</sup> +6mm <sup>2</sup> EARTHWIRE
AS10	QEGBT	QEBFA	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
AS11	QEGBT	QEAVAC	PVC/PVC/SWA/PVC CABLE 4 CORES 50mm <sup>2</sup> +25mm <sup>2</sup> EARTHWIRE

As is clearly stated in the title of the table, this is only the main electricity distribution network, as there are secondary distribution networks that ensure that the entire electrical load in buildings receives electrical energy in good conditions of single-phase and three-phase rated voltage.

As we said the electrical charge concentrated in the QEGBT will be distributed among the different secondary cabinets and from these to the various partial electrical panels located in different points of this infrastructure.

For a better illustration we expose the tables of the secondary distribution networks so that when confronting the electricity distribution network in the entire infrastructure, you can see the reach to the load for use according to the needs.

**Table 3: Secondary distribution network data from ADS1**

CABLE CODE	FROM	TO	CABLE SECTION [mm <sup>2</sup> ]
D1ADS1	ADS1	QEAPV	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D2ADS1	ADS1	QE1RC	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D3ADS1	ADS1	QE1AP	PVC/PVC/SWA/PVC CABLE 4 CORES

			16mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D4ADS1	ADS1	QE11A	PVC/PVC/SWA/PVC CABLE 4 CORES 25mm <sup>2</sup> +16mm <sup>2</sup> EARTHWIRE
D5ADS1	ADS1	QE21A	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE

**Table 4: Secondary distribution network data from ADS2**

CABLE CODE	FROM	TO	CABLE SECTION [mm <sup>2</sup> ]
D1ADS2	ADS2	QE2RC	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D2ADS2	ADS2	QEG	PVC/PVC/SWA/PVC CABLE 2 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D3ADS2	ADS2	QERCEF	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D4ADS2	ADS2	QE2AP	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D5ADS2	ADS2	QEGAI	PVC/PVC/SWA/PVC CABLE 4 CORES 25mm <sup>2</sup> +16mm <sup>2</sup> EARTHWIRE

**Table 5: Secondary distribution network data from QEGUPS**

CABLE CODE	FROM	TO	CABLE SECTION [mm <sup>2</sup> ]
D1UPS	QEGUPS	QEEELIT	PVC/PVC/SWA/PVC CABLE 4 CORES 25mm <sup>2</sup> +16mm <sup>2</sup> EARTHWIRE
D2UPS	QEGUPS	QEEELG1A	PVC/PVC/SWA/PVC CABLE 4 CORES 16mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D3UPS	QEGUPS	QEEELRC	PVC/PVC/SWA/PVC CABLE 4 CORES 6mm <sup>2</sup> +6mm <sup>2</sup> EARTHWIRE
D4UPS	QEGUPS	QEEELEF	PVC/PVC/SWA/PVC CABLE 4 CORES 6mm <sup>2</sup> +6mm <sup>2</sup> EARTHWIRE

These are three secondary electricity distribution networks that allow the necessary power to be transported to the equipment installed in various compartments of this infrastructure through the respective electrical panels.

With the infrastructure of the electricity distribution network created, the GGE, when operating, will guarantee electrical energy up to the loads through the secondary distributors having, along with the electrical panels, the electrical distributors that depart from the secondary electrical distribution cabinets.

Due to the existence of several standby generator sets manufacturers, we had to choose one of them to serve as a reference. In this case, we went to the Caterpillar manufacturer catalog that produces the Olympian range. From the range of generator sets normally produced we have seen the power easily calculated will be supported by opting for the generator set of 500kVA as mentioned above.

However, referring to Olympian Caterpillar does not mean that the contractor cannot propose from another manufacturer as long as functionality is guaranteed as well as safeguarding future expansion.

From the calculations and global analysis carried out, we guarantee that at no time will this infrastructure, in the event of a power outage in the EDM electricity network, no load will stop operating due to insufficiency or lack of electricity thus guaranteeing that the services established in the infrastructure will work to the fullest.

## **5. STANDBY GENERATOR SET**

The standby generator set provided consists of a diesel engine directly driving an alternator, both mounted on a single base provided with static supports to prevent the transmission of vibrations.

The diesel engine will be cooled by circulating the air.



The whole set will have a soundproof enclosure, in the form of a cabin, with access for specialized technical personnel for the purpose.

An electrical panel placed on the unit or on the wall, with an outlet to supply the Automatic Inversion Box with the capacity to support 760A, will contain all the equipment of:

- Engine control, starting and monitoring.
- Control, measurement, regulation and protection of the generator.

The standby generator set should start operating automatically as soon as a nominal voltage reduction of -20%  $U_n$  is verified in the QEGBT bus in any of the phases, and the generator can immediately start to supply electricity to the QEGBT bus.

**The characteristics of the “OLYMPIAN” Brand GGE are:**

• Generator Type	• GEP500-3
• Apparent power at 50HZ	• 500 KVA
• Speed at 50Hz	• 1500 rpm
• Current	• 760A
• Voltage at 50HZ	• 400/230V
• Fuel autonomy time at full load and 50 / 60HZ	• 12/10 hours
• Fuel tank capacity	• 530 liters
• Maximum sound pressure at 7m and 75% load and at $f = 50\text{HZ}$	• 69.6/72.5 dB(A)

On the basis of the technical details expressed above it can be seen that the capacity of the GGE will go up to 760A and we know that the simultaneous

load is at 733A. By these values, we can see that, the GGE has a reserve to be able to feed future loads that will result from the construction of more pavilions for storage of medicines.

Thus, although the reserve resulting from the choice of the standby generator set is small, let us not forget that the electric charge that was used to select the generator group already has a reserve foreseen for the construction of new pavilions. Thus, it is guaranteed that the warehouse will not condition the implantation of various and necessary essential equipment to guarantee good storage conditions for medicines.

We have to point out and note that as for the QEGBT in its components, AP main feeder, feeder protection and general cut are at the appropriate range level to respond to the increased load without needing to change any of them.

## **5.1. Feeders**

The connection between the output of the generator set and the automatic inversion box (CIA) will be made through a conduit composed of a pipe and the respective buried PVC/PVC/SWA/PVC cable, the feeder cable provided for in this conduit is called the main feeder 2 (AP2) which guarantees the electrical supply to the electrical installations of use.

The cable to be applied will be VAV2 (3X185mm<sup>2</sup> + 95mm<sup>2</sup> + T95) which is sufficient to support 100% of the load simultaneously present and even for future growth will never harm the rotating field of the GGE. This AP has a capacity of 1138A which means that it has an availability higher than what the GGE may need as well as for expansion.

The connection between the output of the GGE and the automatic transfer service box (CIA) of the generator and from this to the QEGBT will be made through a pipe also in piping whose cable composition will be PVC/PVC/SWA/PVC cable 2(3X185mm<sup>2</sup> + 95mm<sup>2</sup> + T95) designated by AP.

From this AP feeder, when the electricity supply is made through the EDM electrical network or is made from the GGE, electrical energy will always be guaranteed up to the QEGBT, which will distribute it to the various electrical distribution board of the infrastructure as illustrated by the tables.

In both cases, the cables that will guarantee the flow of electrical energy are shown in the designed parts.

In general, from QEGBT to the other load centers from which secondary distributor circuits will be derived, the supply will be made at a three-phase voltage of 380/220 volts, 50Hz.

However, for the earth systems for this network, the measured earth value must have a maximum value of one ohm.

The earth cable connecting the electrodes and the respective connectors must be 70 mm<sup>2</sup> in bare copper.

## **6. ELETRICAL SAFETY**

The entire installation must be assembled in accordance with the "ELETRICAL SAFETY STANDARDS" in force in Mozambique and within the best "rules of art".

Separate earth electrodes should be provided in the appropriate space to obtain a "service earth" which will be connected to the generator neutral and a "protective earth" to which all metallic masses will be connected, not forming part of the current conduction.

A removable connector must be provided for measuring the installation's ground level.

In cases not covered by the present legislation, the relevant Norms of the VDE or the CEI will be followed.

# TECHNICAL DESCRIPTIVE AND JUSTIFICATORY MEMORY OF ELECTRICAL INSTALLATIONS FOR USE

## 1. INTRODUCTION

The present description and justification refers to the design of the electrical installations for use that will be established in the area to build the electrical infrastructures in the Buildings of the WAREHOUSE CENTRAL DA BEIRA, in the Municipality of Beira, Mozambique.

This memory will be used for electrical installations for indoor and outdoor use that will provide electricity for lighting, sockets, heating, air conditioning, driving force and communication.

Respecting the requirements demanded for this type of installations, an appropriate study was developed so that this project meets the technical requirements and conditions necessary for a perfect functioning of the services to be developed. The project ensures that the various compartments are used in the varied possibilities and wishes of future users.

The electrical specialty followed the structure of the infrastructures according to the architectural decisions, since all the specialty's decisions took into account what we perceived in time for this architectural project.

The present memory will be better understood when properly accompanied with the reading of the respective drawings.

On the other hand, the list of quantities was developed in compliance with the basic rules and regulations, so we expect the competitor to be familiar with the rules and regulations.

## 2. POWER SUPPLY

The electricity supply to the building's facilities will be made through the public electricity network of Eletricidade de Moçambique (EDM), the national electricity utility.

Given that the project intends to rehabilitate and expand the current warehouse that is currently powered by the transformation post of Eletricidade de Moçambique (EDM), the National Electricity Concessionaire, located in the warehouse grounds, the eventual increase in installed power will be the subject of negotiation with EDM in order to meet your needs.

Thus, the supply of electricity to this building will be intermediated by the current transformation post which, receiving electricity at 22/6kV, 50Hz will proceed from 22/6kV to 380 / 220V, which will supply the entire load of the buildings built there.

From the low voltage side of the transformer, a PVC/PVC/SWA/PVC cable 4 cores 35mm<sup>2</sup>+16mm<sup>2</sup> earthwire will be designated as main feeder 1 (AP1) to be in parallel with the current feeder that will pass from the three-phase counting chamber (DC) to the automatic inversion box (CIA) or ATS. A PVC/PVC/SWA/PVC double cable 4 cores 185mm<sup>2</sup>+95mm<sup>2</sup> earthwire will come from the CIA to the general low voltage electrical panel (QEGBT), which is called the main power supply (AP). With this procedure, electrical energy reaches buildings exclusively from EDM's medium voltage electrical network.

On the other hand, the main feeder 2 (AP2), whose section is PVC/PVC/SWA/PVC double cable 4 cores 185mm<sup>2</sup>+95mm<sup>2</sup> earthwire, which will start from the new 500kVA standby generator set (GGE) entering the CIA and thus, the emergency generator set, will find the path to transmit electrical energy to the QEGBT using the path indicated by the AP.

Starting from QEGBT, independent power will be provided to the various predefined partial electrical panels. This decision aims to have the respective distributors as short as possible with an electrical autonomy of the respective charges in relation to each other.

AS mentioned on this previous paragraph, to achieve the aforementioned, it was decided to distribute the electrical distribution board independently in such a way as to ensure that the electrical distribution board on the ground floor electrically supply the electrical charge on the ground floor and the electrical panels on the first floor will be exclusively supplying the electrical charges on the first floor.

This decision aims to avoid the concentration of the load at a point, which would imply total dependence on everything at that point. By applying this decision, we will ensure that the command, operation and protection will take place in the best circumstances and favorable to the specific activities that will be developed in the areas covered by each of the electrical panels.

The power system applied here offers a great opportunity for electricity management when working conditions present this potential for this gain that would result, for the institution, in a low electricity consumption bill.

Due to this structure of the low voltage electrical system, we will have a distribution network ensured by distributors (D) making electrical energy reach the partial electrical panels at the locations that are true centers of availability of power for the various equipment that use electricity in the compartments.

### **3. DISTRIBUTION NETWORK**

From the general low voltage electrical panel (QEGBT), eleven secondary feeders (AS) will be established, which will respectively supply eleven electrical panels (QE) in the assumed locations, considering that the twelve secondary feeder is intended for future expansion, so it will not be installed.

In general, this distribution network, which constitutes the backbone of this electrical system, from the QEGBT to the load centers from which use circuits will be derived, ending at the loads, the supply will be made at a three-phase voltage of 380/220 volts, 50Hz.

Using the tables, at the exact moment, throughout this memory, data from the referred distribution network will be presented.

The dimensioning of the cables from QEGBT to the electrical panels, was developed according to the installed powers, installed powers corrected and applied the usage and simultaneity factors that, depending on the stage, one or both of them were taken into account, resulting the power of use or simultaneity that was used to obtain the service current intensity that served as a starting point for the protection gauge of the respective cable.

The cables constituting the distribution network will be established inside appropriate tubes in order to guarantee their safety, which means ensuring the reliability and efficiency of the electricity supply.

The table that illustrates the elements that make up the distribution network from the general low-voltage electrical panel of buildings is clearly shown in the table.

The previous description and the one presented in table 1 illustrates that this distribution network uses secondary feeders which constitute the main distribution network. On the other hand, secondary distribution cabinets were foreseen, and, from said cabinets using the distributors (D) that depart from such cabinets, they transport electricity to the respective locations of the partial load centers.

**Table 1: Main distribution network data from QEGBT**

CABLE CODE	FROM	TO	CABLE SECTION [mm <sup>2</sup> ]
AS01	QEGBT	ADS1	PVC/PVC/SWA/PVC CABLE 4 CORES 95mm <sup>2</sup> +50mm <sup>2</sup> EARTHWIRE
AS02	QEGBT	ADS2	PVC/PVC/SWA/PVC CABLE 4 CORES 95mm <sup>2</sup> +50mm <sup>2</sup> EARTHWIRE
AS03	QEGBT	QEGUPS	PVC/PVC/SWA/PVC CABLE 4 CORES 50mm <sup>2</sup> +25mm <sup>2</sup> EARTHWIRE
AS04	QEGBT	QECA1	PVC/PVC/SWA/PVC CABLE 4 CORES 25mm <sup>2</sup> +16mm <sup>2</sup> EARTHWIRE
AS05	QEGBT	QECA2	PVC/PVC/SWA/PVC CABLE 4 CORES 25mm <sup>2</sup> +16mm <sup>2</sup> EARTHWIRE
AS06	QEGBT	QEBAPE	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
AS07	QEGBT	QEBI	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
AS08	QEGBT	QEBAP	PVC/PVC/SWA/PVC CABLE 4 CORES 6mm <sup>2</sup> +6mm <sup>2</sup> EARTHWIRE
AS09	QEGBT	QEBAA	PVC/PVC/SWA/PVC CABLE 4 CORES 4mm <sup>2</sup> +6mm <sup>2</sup> EARTHWIRE
AS10	QEGBT	QEBFA	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
AS11	QEGBT	QEAVAC	PVC/PVC/SWA/PVC CABLE 4 CORES 50mm <sup>2</sup> +25mm <sup>2</sup> EARTHWIRE

We have to draw attention to the fact that the cables are from the same section but with different protections device; that is, it must be understood that it is in line with the way of assembling each cable, that is, for buried cable, the current intensity conduction capacity is greater than when the same cable is mounted outdoors, it conducts less current intensity.



For the ground system for this network, the measured ground value must have a maximum value of one ohm.

The earth cable connecting the electrodes and the respective connectors must be 70 mm<sup>2</sup> in bare copper.

In these conditions of assembly, these distributors have the function of sending electric energy to the electrical panels carefully distributed in the space of each building to guarantee the delivery of power in the equipment for converting electricity into other forms of use.

So it is these distributors that will send electric energy to the different electrical panels located in this infrastructure.

On the other hand, we present table 2 whose values correspond to the base used for the dimensioning of the main feeder (AP) that will feed all the load that, also considering the coordination of the protections, allowed a good reserve margin for possible load increase over the years. It should be noted that the cargo corresponding to two future pavilions to serve as a warehouse is considered. The respective distribution network finds the calculation basis in this load summary table.

**Table 2: Summary table of concentrated load in QEGBT**

Belarmino B Maongane Electrotechnical Engineer				SWITCHBOARD - CIRCUITS QEGBT				CENTRAL BEIRA WAREHOUSE	
								S.153	1
Electrical Installation type for Office Use									
INSTALLED POWER (kW)		520,79		Circuits		TYPE: Metallic weatherproof paint			
SIMULTANEITY FACTOR		74%				Nº OF CIRCUITS: 11			
POWER FACTOR		80%		MAIN FEEDER - AP		CABLE SECTION (mm²)		2(4X185)	
SIMULTANEITY POWER (kW)		385,4				TYPE		PVC/PVC/ SWA/PVC	
CURRENT PER PHASE (A)		732,66				CAPACITY (Amp.)		1138	
Nº	CIRC.	PHASE	SECTION	PLACE	LOAD	QUANTY	POWER (Watt)		
							UNITARY	TOTAL	PER PHASE
1	1	A			ADS1	1	27467	27467	
2	2				ADS2	1	25565	25565	
3	3				QEGUPS	1	18483	18483	
4	4				QECA1	1	11220	11220	
5	5				QECA2	1	11220	11220	
6	6				QEBAPE	1	3733	3733	
7	7				QEBI	1	8560	8560	
8	8				QEBAP	1	4569	4569	
9	9				QEBAA	1	4569	4569	
10	10				QEBFA	1	3876	3876	
11	11				AVAC	1	17233	17233	
12	12				FUTURE WAREHOUSES	1	37100	37100	
13									173595
1	1	B			ADS1	1	27467	27467	
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3	3				QEGUPS	1	18483	18483	
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5	5				QECA2	1	11220	11220	
6	6				QEBAPE	1	3733	3733	
7	7				QEBI	1	8560	8560	

8	8			QEBAP	1	4569	4569	
9	9			QEBAA	1	4569	4569	
10	10			QEBFA	1	3876	3876	
11	11			AVAC	1	17233	17233	
12	12			FUTURE WAREHOUSES	1	37100	37100	
13								173595
1	1	C		ADS1	1	27467	27467	
2	2			ADS2	1	25565	25565	
3	3			QEGUPS	1	18483	18483	
4	4			QECA1	1	11220	11220	
5	5			QECA2	1	11220	11220	
6	6			QEBAPE	1	3733	3733	
7	7			QEBI	1	8560	8560	
8	8			QEBAP	1	4569	4569	
9	9			QEBAA	1	4569	4569	
10	10			QEBFA	1	3876	3876	
11	11			AVAC	1	17233	17233	
12	12			FUTURE WAREHOUSES	1	37100	37100	
13								173595
14							<b>TOTAL</b>	<b>520785</b>
2020							1 SHEET	

The electrical charge concentrated in the QEGBT will be distributed among the different secondary cabinets and from these to the various partial electrical panels located in different points of this infrastructure.

For a better view of the distributors provided for each of the electrical panels, we present the cable tables that make up the secondary distribution network.

**Table 3: Secondary distribution network data from ADS1**

CABLE CODE	FROM	TO	CABLE SECTION [mm <sup>2</sup> ]
D1ADS1	ADS1	QEAPV	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D2ADS1	ADS1	QE1RC	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D3ADS1	ADS1	QE1AP	PVC/PVC/SWA/PVC CABLE 4 CORES 16mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D4ADS1	ADS1	QE11A	PVC/PVC/SWA/PVC CABLE 4 CORES 25mm <sup>2</sup> +16mm <sup>2</sup> EARTHWIRE
D5ADS1	ADS1	QE21A	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE

**Table 4: Secondary distribution network data from ADS2**

CABLE CODE	FROM	TO	CABLE SECTION [mm <sup>2</sup> ]
D1ADS2	ADS2	QE2RC	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D2ADS2	ADS2	QEG	PVC/PVC/SWA/PVC CABLE 2 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D3ADS2	ADS2	QERC EF	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D4ADS2	ADS2	QE2AP	PVC/PVC/SWA/PVC CABLE 4 CORES 10mm <sup>2</sup> +10mm <sup>2</sup> EARTHWIRE
D5ADS2	ADS2	QEGAI	PVC/PVC/SWA/PVC CABLE 4 CORES 25mm <sup>2</sup> +16mm <sup>2</sup> EARTHWIRE

**Table 5: Secondary distribution network data from QEGUPS**

CABLE CODE	FROM	TO	CABLE SECTION		
			[mm <sup>2</sup> ]		
D1UPS	QEGUPS	QEEELIT	PVC/PVC/SWA/PVC CORES EARTHWIRE	CABLE 25mm <sup>2</sup> +16mm <sup>2</sup>	4
D2UPS	QEGUPS	QEEELG1A	PVC/PVC/SWA/PVC CORES EARTHWIRE	CABLE 16mm <sup>2</sup> +10mm <sup>2</sup>	4
D3UPS	QEGUPS	QEEELRC	PVC/PVC/SWA/PVC CORES 6mm <sup>2</sup> +6mm <sup>2</sup> EARTHWIRE	CABLE	4
D4UPS	QEGUPS	QEEELEF	PVC/PVC/SWA/PVC CORES 6mm <sup>2</sup> +6mm <sup>2</sup> EARTHWIRE	CABLE	4

These are three secondary electricity distribution networks that allow the necessary power to be transported to the equipment installed in various compartments of this infrastructure through the respective electrical panels.

#### 4.ELECTRICAL DISTRIBUTION BOARD

In order to guarantee a correct supply of electricity in each of the selected spaces, local electrical panels are needed, which will be the distributor's arrival points and at the same time derivation points of the circuits that will feed each of the loads installed by each of the compartments or spaces

The establishment of the electrical panels obeyed the criterion of space dimension, functionality during the exploration period, type of load involved and the sensitivity of its negative impact in the event that it does not work.

The chosen option takes into account the vitality or not of allowing greater electrical autonomy in the control, maintenance and assistance of each part of the electrical installation in use.

In summary, the electrical panels are the places where the supply or distribution circuits will end and originate the use circuits protected by circuit breakers, in addition to incorporating simple or differential four-pole switches for the connection and interruption of the electricity supply at each one of the areas covered.

By configuring the system, it can be seen that the electrical energy distribution circuits in the different areas will be established from the QEGBT and from this electricity will be delivered to the load centers.

From the drawings of the electrical panels it is possible to obtain all information related to the equipment required for the perfect functioning of all the planned activities and for a good performance.

The required equipment is exactly the circuit breakers and the switches that can be single-phase or three-phase as the case clearly expressed.

To serve as a basis for analysis and understanding in the decisions made, Legrand material was used in which we consider the circuit breakers in the DX<sup>3</sup> series up to 125A and above 125A, the DPX<sup>3</sup> series circuit breakers were used using the D curve invariably to design and predict selectivity. The general disconnect switches required in each electrical panel are from Legrand, also single-phase or three-phase.

The electrical panels must be equipped with a connection to the earth system that will be established in the general low voltage electrical panel as well as in the general electrical panel of the UPS.

The measured ground value must have a maximum value equal to or less than one ohm.

For further measurements, a grounding connector must be provided in the QEGBT foreseen the earth system.

The earth cable connecting the electrodes and the respective connectors must be 70 mm<sup>2</sup> in bare copper.

## **5.LOW VOLTAGE ELETRICAL INSTALLATIONS**

In order to provide a smooth functioning of the services that are expected to be installed in the facilities, use circuits have been designed that satisfy the respective technical requirements; namely the circuits of:

- Lighting

- Sockets

- Air conditioning

- Heating

- Communications

These circuits originate in the partial electrical distribution panels up to the respective loads, having single-phase or three-phase circuit breakers as applied protection devices.

The installation of those circuits will be, on the one hand in embedded or visible pipes made of V conductors or in VV cables protected by VD tubes and on the other hand, in visible pipes in galvanized metallic mats or clamps as well as they can be protected by the technical rail. DLP in the compartments thus selected.

Except for the communications circuits that will be made up of conductors suitable for that purpose but also running on VD piping, DLP technical channel and on the galvanized conveyor in the respective compartment.

The dimensioning of the conductors of the lighting circuits, sockets, air conditioning and heating will be done according to the power of the load installed in them.

The design that gave rise to the layout of the use circuits considered by each installation is then presented in a summarized form.

## **5.1.Lighting**

In order to guarantee lighting in the period when natural lighting is not available, lighting circuits with appropriate armatures were developed to provide adequate lighting according to the type of activity that is expected to be carried out in the specific compartment.

Thus, the weighted lighting levels were considered in accordance with the use of the compartments for the different purposes for which it is intended.

The lighting developed is based on light bulbs with energy saving lamps, which contributes to having a low installed lighting power but guaranteeing a good light level.

With this procedure it is intended to provide a good performance in the work to be carried out in each of the areas and to allow, on the other hand, a perfect and comfortable use of the projected lighting. For this purpose, a minimum luminous level of 500 luxes was considered in the offices of intellectual work.

In addition to lighting for performance purposes at work, adequate lighting in the corridors and nighttime lighting were considered, whose control will be carried out on the basis of the time switch to be adjusted according to the work functionalities to be applied.

All lighting circuits will be established in three conductors (phase, neutral and protective conductor) which constitute the 3x1,5mm<sup>2</sup> VV cable. There is an exception in the storage pavilions that the minimum section will be



VV3x2.5mm<sup>2</sup>. With this type of circuits we intend to guarantee that the metallic parts of each armature must be connected to the earth.

For outdoor lighting, lamps will be established on suitable metal poles whose operation is based on solar technology. In this way, cables will not be needed to put these external reinforcements to light.

## **5.2.Socket for General use**

For a certain area of the installation, for certain spaces and compartments, sockets will be established considering that their use will satisfy the connection of mobile loads represented by a certain cleaning device, for domestic or office use and different.

Each socket circuit will be equipped with three conductors (phase, neutral and protection) which make up the cable used in a specific case and all single-phase sockets will be made of two pins with earth.

Each circuit of sockets that will be derived from the partial electrical panel, will be protected by circuit breakers of at least 16A.

The derivations will be established in VV cable as well as VHV with a minimum of 2.5 mm<sup>2</sup> protected by a VD tube with a minimum diameter of 20 mm.

## **5.3. Heating**

Circuits will be established from the partial electrical switchboards, to supply hand dryers and some mobile load to be used in bathrooms and pantries in the planned compartments of the buildings.

The referred circuits will be single-phase, with protective conductor.

The pipes will be in VD tube protecting VV cables in sections corresponding to the loads to be fed. All circuits will be protected by circuit breakers with calibration that respects the regulated technical principles.

Each cable of the circuit will be equipped with three conductors (phase, neutral and protection) and in case of previous installation of single-phase sockets, they will have two pins with earth.

#### **5.4. Air conditioning**

In certain compartments, it is foreseen that air conditioning devices can be installed to cope with the high temperatures that are registered regularly.

The air conditioning circuits, which must be independent, in their origin, will be protected by properly calibrated circuit breakers.

VV cables of at least 2.5mm<sup>2</sup> will be used, protected by a 20mm diameter VD tube. On the other hand, the number of conductors per cable of the single-phase circuit will be three, namely phase, neutral and protection, or per five conductors, namely three phases, neutral and the protection for three-phase circuits.

Circuits are provided to power the fans that will be installed in pre-selected locations.

#### **5.5. Electric Power Circuits for Computers**

It will be a priority to establish appropriate technical conditions so that certain equipment of high sensitivity receives electricity as stable as possible so that the probable voltage fluctuations do not reach the equipment.

For this purpose, dedicated circuits are provided for such equipment whose energy will come from a general UPS unit to be adopted during the work.

These equipments will receive clean electric energy through single-phase cables whose minimum cross-section will be 2.5mm<sup>2</sup> in a phase conductor, neutral conductor and earth composition. The circuits referred to in this paragraph will end in single-phase sockets with red colored earth and preferably with interlocking to avoid the use of any type of circuit other than clean energy.

The service ground and protection system for the electrical installation in use should be 1 ohm because we want there to be reliability in the use of sensitive equipment.

The aforementioned and thus composed circuits must run in a pipe pipe whose minimum diameter must be 20 mm in VD or in a DLP technical channel in specified places.

## **5.6. Communications**

For communications inside and outside the building it will be ensured by an application of the structured network in the previously selected compartments.

The structured network will be ensured by pre-installing main cables that must be at the height of possible telephone and data network points, thus facilitating the installation of the most diverse types of systems that facilitate communication with each other.

These systems require electrical energy whose circuits are provided for in the electric clean energy electrical panels (QEEEL).

For this network the Cat 6a 4X2X0.5mm UTP cable made of copper material was used, protected by a 16mm diameter VD type plastic tube that terminates at the Cat 6a RJ45 socket.

The operating equipment will be decided by the developer with respective specialists on how to assemble and respective technical details.

## 6. ELETRICAL INSTALATION

The execution of each of the electrical installations will be in VV or VAV cable wrapped or not in VD tube of appropriate diameter, embedded in the construction and suitable for interior and other places but applying cables to be buried in places without any construction. For circuits not applicable burying cables, VV cables will be applied in appropriate tubes properly marked or cables fixed by appropriate clamps.

The control of the various lighting circuits will be carried out by switches placed next to the entrances of the different compartments.

The minimum section to be used in the different circuits will be:

Lighting.....	1,5mm <sup>2</sup>
Socket for general use.....	2,5mm <sup>2</sup>
Heating.....	2,5mm <sup>2</sup>
Air conditioning.....	2,5mm <sup>2</sup>
Motors.....	2,5mm <sup>2</sup>
Telephone.....	2x2x0,5mm

The circuit layout of each installation is illustrated in the drawings that are part of the process of this project.

## 7.SAFETY

All installations must be carefully assembled, in accordance with the provisions of the SAFETY REGULATION FOR INSTALLATIONS FOR THE USE OF ELECTRIC ENERGY AND COLLECTIVE INSTALLATIONS FOR BUILDINGS AND ENTRIES in force in the country, and observe the best rules of art.

All metallic masses, which are not part of the conduction circuits, but can come into contact with them, must be solidly connected to the protective earth of the installation.

In case of omissions in the regulations in force, the rules of the International Electrotechnical Commission (IEC) and the relevant directives of the VDE will be followed.

# UPS MASTERYS *Green Power*

## UPS TECHNICAL SPECIFICATIONS

### A - UPS-40KVA, 20min

96% yield on online double conversion (TUV certification)  
VFI-SS-111 double conversion ON LINE technology UPS (Voltage and frequency independent) Standard CEI 62040-3 standard determines that the output voltage and frequency are completely and independently controlled from the network input characteristics.

UPS must include the following bodies:

- A three-phase charging rectifier:
- A battery protection
- 10-year battery life sized for a 20-minute car
- Bypass circuit including:
- Automatic bypass without interruption (static switch)
- Integrated maintenance bypass

Brand | type SOCOMEC or similar, UPS MASTERYS Green Power 40KVA, 20 minutes at full load.

### B - DETAIL OF UPS TECHNICAL AND FUNCTIONAL FEATURES

It should offer:

1. Maximum energy savings
2. 96% energy efficiency
3. Extremely compact UPS and battery

# **UPS MASTERYS** *Green Power*

4. Input power factor greater than 0.99 and harmonic distortion of input current less than 2.5%.
5. The system up to being used with the latest generation servers.
6. Advanced battery monitoring and management for optimal battery reliability.
7. Internal Automatic Cross Synchronization (ACS).
8. Multilingual user-friendly interface with graphic display.
9. Internal maintenance bypass.
10. Return protection: detection circuit.
11. EBS (Expert Battery System) for battery management.
12. External maintenance bypass.
13. High longevity batteries.
14. Battery temperature sensor.
15. Galvanic isolation transformer
16. Multilingual graphic display.
17. Interface MODBUS / JBUS.
18. Interface Modem / SMS.
19. Interface LAN integrado.

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20. slots for communication options.

## 21. Technical Data

Sn [kVA]	40				
Pn [kW]	36				
Entrance/ exit:3/3	3/3				
Parallel configuration	None				

## C – INPUT

Rectifier rated voltage	400 V 3phases + N
Input frequency	50 Hz $\pm$ 10 %
Power factor/THDI	0,99 / < 2.5 %

## D - OUTPUT

Output Voltage	3 phases + N 400 $\pm$ 1 % (380 / 415 V configurable)
Voltage tolerance	static charge $\pm$ 1 % dynamic load according to VFI-SS-111
Output frequency	50 Hz $\pm$ 2 % (configurable with generator, from 1 % a 8 %)
Automatic bypass	rated output voltage $\pm$ 15 % (configurable with generator, from



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	10 % to 20 %)
Overload with p.f. 0,8	125 % during 10', 150 % during 60"
SOVerload with p.f. 0,9	125 % during 5', 150 % during 30"
Crest Factor	3:1 (in accordance with the standard EN 62040-3)

## E – EFFICIENCY (verified by TÜV SÜD)

Online mode at 50% load	up to 96%
Online Mode at 75 % load	Up to 96 %
Online Mode at 100 % load	Up to 95,5 %
Efficiency in <b>ECO-MODE</b>	Up to 98 %

## F – ENVIRONMENT

Service environment temperature	0 °C a + 40 °C (15 °C a 25 °C for maximum battery longevity)	
Storage temperature range	-5 a + 45 °C (15 °C a 25 °C for maximum battery longevity)	
Relative humidity	0 % - 95 % without condensation	
Maximum altitude	1000 m without discharge (maximum 3000 m)	
Sound level (ISO 3746)	< 52 dB	< 55 dB

## G - UPS CABINET

Dimensions L x P x A (with standard batteries) (mm)	444x795x800		444x795x1000		444x795x1400
Weight	190	195	195	315	320

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(with standard batteries) (kg)					
Protection index	IP 20 (in accordance the standard IEC 60529), IP 21 optional				
Colors	RAL 7012, plastic front panels: dark gray				

## H - STANDARDS

Safety	EN 62040-1 (certified by TÜV SÜD), EN 60950-1
Efficiency and Topology	EN 62040-3 [VFI-SS-111]
Standard CEM	EN 62040-2 (2 <sup>a</sup> edition)
Product certification	CE

# 1 TECHNICAL SPECIFICATIONS FOR ELECTRICAL MATERIALS

2

## F.00 Electrical Power Supply

### F.000 Standby Generator Set (GGE)

F.010 Diesel generator set of the "OLYMPIAN" brand developing 500 KVA, at 0.80 power factor and three-phase. With voltage 415/231 volt, 50 Hz with 1500 r.p.m equipped with a "Perkins" model GEP500-1-50 Hz diesel engine, directly coupled to a branded alternator. The group must have all the necessary elements to work as an autonomous unit, including its control panel. It should also be self-excited and self-regulating. The group must be prepared for automatic start with immediate connection to the general electrical panel of the low voltage load (QEGBT) as soon as there is a decrease in the voltage value in any of the phases (greater than 20%) or interruption in the supply.

- Fixed metallic base (chassis) with damping and anti-vibration supports.
- Tropicalized radiator with fan ventilation.
- Electric starter system with dry batteries and battery recharging system.
- High capacity air, fuel and oil filters
- Fuel tank with capacity for 8 hours of service.
- Equipped with a cutting system when there is a low level of diesel and properly signaled on the control panel.
- Quiet escape suitable for residential areas with connections for assembly.
- Automatic protective equipment for stopping the engine with pilot lamps to indicate low oil pressure and high water temperature.
- Instrument panel containing the following:
  - voltmeter with phase selector, ammeter with phase selector, frequency meter, box with circuit breaker, ignition key for starting and stopping the engine, water temperature thermometer, oil pressure gauge, battery charge ammeter and hour meter

- Automatic start board with contactors for transferring the load
- Own container for installation of the generator set with protection against bad weather, equipped with access door for operation and maintenance and with sound reduction of approximately 97 DBA at 1 meter distance.
- Sound signaling against low fuel level
- Automatic protection device against excess or reduced voltage
- Instruction manual and electrical circuit diagrams

F.011 500kVA Standby Generator Set (GGE) with soundproof box type LEHF3132-08

F.012 ATS for 500kVA Standby Generator Set (GGE)

F.020 UPS three-phase input and 40kVA three-phase output, autonomy of at least 20 minutes.  
(Similar type MASTERYS EL Green Power from 10 to 80 kVA / kW).  
See details of the characteristics in the catalog attached to these technical specifications -The competitor must respect the manufacturing standards and main parameters of operation and efficiency if he does not buy the brand detailed in the attached catalog.

F.021 40kVA Green Power three-phase / three-phase UPS

## **A.000 Distribution Cabinets**

A.010 Electrical panel in a metal construction cabinet with strong and complete anti-corrosive and anti-saline moisture treatment, for vertical support, mounting on a concrete cement base whose screws, with washers and fixing nut, will be anchored to the said base, composed of one to four compartments, the structure of which must be reinforced with angles in the corners and compartmentalization places; provided with electrolytic copper busbars for the three phases, neutral and earth, whose amperage

must be suitable for the load and short-circuit level of the EDM public network area, which busbar is properly fixed in insulators of adequate height, containing ladder and rail for fixing the control and protection apparatus for the distribution circuits; with suitable points for earthing in the frame, in the mirror and in the respective door, with space for displaying the circuit identification map, provided in the respective door and the appropriate arrangement mirror to allocate the identification of the cabinet, provided with a mirror and doors with lock and painted according to the construction specifications of frames and panels and in the color to be defined. In the event of being mounted outdoors, the upper part must have a wrapping with sufficient fall so that the pools and rains slide easily avoiding the entrance of the waters inside. In the door and in other places that require it, a constructive form must be applied that offers watertightness to dust and water.

A.011 General low voltage switchboard in cabinet, QEGBT

## **B.000 Electrical Boards**

B.010 Electric construction boards in hardened polycarbonate material, for mounting embedded in the construction or projecting over the construction, with one or two compartments, with electrolytic copper busbars for the three phases, neutral and earth, with ladder and rail for fixing the control device and protection of the distribution circuits, with suitable points for earthing in the frame, mirror and respective door, with space for displaying the circuit identification map, provided in the respective door and appropriate arrangement mirror to allocate the identification of the electrical panel , fitted with a mirror and lockable doors and painted according to the construction specifications of frames and panels and in the color to be defined.

B.011 Secondary switch cabinet 1, ADS1

B.012 Secondary switch cabinet 2, ADS2

B.013 Small Volume Warehouse Electrical Board, QEAPV

B.014	Ground Floor Electrical Board 1, QE1RC
B.015	Main Warehouse Electrical Board 1, QE1AP
B.016	First Floor Electrical Board 1, QE11A
B.017	First Floor Electrical Board 2, QE21A
B.018	Ground Floor Electric Board 2, QE2RC
B.019	Electric Board of the Guardhouse, QEG
B.110	Electric Ground Floor Board Front Entrance, QERCEF
B.111	Main Warehouse Electrical Board 2, QE2AP
B.112	General Electrical Board of the Flammable Warehouse, QEGAI

## **C.000 Pipes and Fittings**

C.010	<p>VD tubes for electrical plumbing, in rigid PVC according to NP-1071/1 standards, for interior installation and on the false ceiling, including all necessary accessories for connection and entry in the junction boxes or equipment.</p> <p>(Similar type, ref. 32501 to 32507, manufactured by LEGRAND, CORSINO SIPE, Portugal).</p>
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C.011	VD16 Tube
C.012	VD20 Tube
C.013	VD25 Tube
C.014	VD32 Tube
C.015	VD40 Tube
C.016	VD50 Tube
C.017	VD63 Tube
C.018	VD75 Tube
C.019	VD90 Tube
C.110	VD110 Tube

C.020	<p>PVC pipes for electrical plumbing, in rigid PVC according to NP-1071/1 standards, for interior installation and on the false ceiling, including all the necessary accessories for connection and entry in the junction boxes or equipment.</p> <p>(Similar type, ref. 32501 to 32507, manufactured by LEGRAND,</p>
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CORSINO SIPE, Portugal).

- C.021 PVC 40 Tube
- C.022 PVC 50 Tube
- C.023 PVC 75 Tube
- C.024 PVC 110 Tube

- C.030 PVC junction boxes, to be embedded or mounted under the false ceiling, with a cream-colored lid, prepared for eight applications of cables or tubes by means of cable glands and placed inside a terminal block or junction bars.

(Similar type, reference 89183, manufactured by LEGRAND; CORSINO SIPE, Portugal)

- C.031 Standard junction boxes, for embedded mounting, in cream color
- C.032 Complete PVC simple boxes.
- C.033 Wall small simple flush boxes
- C.034 Passage boxes
- C.035 Complete PVC double flush box

- C.040 Watertight cream-colored PVC junction boxes, prepared for six applications of cables or tubes by means of cable glands and placement inside terminal blocks or junction bars.

- C.041 Watertight junction boxes, cream colored

- C.050 Connections VD16 to VD110, manufactured in accordance with the EEC26 standard.

(Similar type, ref 32541 to 32545, manufactured by LEGRAND, CORSINO SIPE, Portugal).

- C.051 VD16 Joint
- C.052 VD20 Joint
- C.053 VD25 Joint
- C.054 VD32 Joint
- C.055 VD40 Joint

C.056	VD50 Joint
C.057	VD63 Joint
C.058	VD75 Joint
C.059	VD90 Joint
C.510	VD110 Joint
C.060	Curves VD16 to VD110, manufactured in accordance with the EEC26 standard. (Similar type, ref. 32521 to 32535, manufactured by LEGRAND, CORSINO SIPE, Portugal).
C.061	VD16 Curve
C.062	VD20 Curve
C.063	VD25 Curve
C.064	VD32 Curve
C.065	VD40 Curve
C.066	VD50 Curve
C.067	VD63 Curve
C.068	VD75 Curve
C.069	VD90 Curve
C.610	VD110 Curve
C.070	Connector plates, molded polyester base, connectors for mechanical tightening for connecting conductors up to 6mm <sup>2</sup> , nominal voltage 380V, fixing by screws 28mm. (Similar type, ref 34080 to 34090, manufactured by LEGRAND, CORSINO SIPE, Portugal)
C.071	Connector plates up to 6mm <sup>2</sup>
C.080	Cable glands in fiberglass, PVC or metallic with silk
C.090	PVC or metallic stops of different diameters depending on the application



- C.100 DLP technical rail divisible into two to three compartments 150x50mm with: cover, separators, tops, curves, angles, connectors and other accessories required according to the mounting location that allow an appropriate assembly.  
(Similar Legrand type, made by LEGRAND, France)
- C.101 Calha DLP com dois compartimentos 150x50mm
- C.120 Galvanized metallic mat in perforated plate or grid in the following dimensions 150x65mm, 150x65mm of adequate size for the quantity of cables to be received and must include all accessories for correction and operation. This mat must be equipped with potential.  
(Similar Legrand type, made by LEGRAND, South Africa)
- C.121 Perforated galvanized metallic mat 150x65mm for electric power cables
- C.122 Perforated galvanized metallic mat 200x65mm for electric power cables
- C.123 Perforated galvanized metallic mat 300x65mm for electric power cables
- C.124 Galvanized metallic mat in grid 150x65mm for communications cables
- C.125 Galvanized metallic mat in grid 200x65mm for communications cables
- C.126 Galvanized metallic mat in grid 300x65mm for communications cables

## **D.000 Conductors and Cables**

- D.010 Single-stranded copper conductors type H07V-U or general purpose house wiring (GPHW), manufactured according to NP2356 / 3 (Cenelec HD 2 S2 part 3), for the voltage of 450/750 V, these conductors consisting of rigid conductor core of soft copper according to NP2363, class 1, isolated and protected by PVC sheath, type TI1. They are manufactured in sections between 1.5 mm<sup>2</sup> and 10 mm<sup>2</sup>, conductors suitable for use inside buildings in embedded installations, with the HAR marking.  
(Similar type H07V-U, manufactured by CABELTE/ Portugal).
- D.011 V1,5mm<sup>2</sup> copper GPHW
- D.012 V2,5mm<sup>2</sup> copper GPHW
- D.013 V4mm<sup>2</sup> copper GPHW
- D.014 V6mm<sup>2</sup> copper GPHW
- D.015 V10mm<sup>2</sup> copper GPHW
- D.016 V16mm<sup>2</sup> copper GPHW
- D.017 V25mm<sup>2</sup> copper GPHW
- D.018 V35mm<sup>2</sup> copper GPHW
- D.019 V50mm<sup>2</sup> copper GPHW
- D.110 V70mm<sup>2</sup> copper GPHW
- D.020 Type VV (PVC/PVC/PVC) cables for 0.6 / 1 kV voltage, manufactured according to standard NP 2365 (CEI 502), these cables consist of rigid soft copper conductors, insulated with PVC, type A. On the insulation of single-conductor cables or on the cabled set of multi-conductor cables has an optional hitch and an inner PVC sheath over which the reinforcement that can consist of steel tape (VV) is applied.  
A PVC sheath is applied externally. In single-conductor conductors intended for alternating current installations, the armature consists of non-magnetic material. Class 1 single-line cables up to 6mm<sup>2</sup>, with four conductors or multi-line with a section equal to or greater than 16mm<sup>2</sup> class 2, according

to NP 2363 (CEI 228), one of the conductors will normally have a reduced section.

They are manufactured in sections between 1.5mm<sup>2</sup> and 500mm<sup>2</sup>.

(Similar type VV, manufactured by CABELTE / Portugal).

D.021	PVC/PVC/PVC	Cable	2	cores	copper	1.5mm <sup>2</sup> +1.5mm <sup>2</sup>	earthwire
D.022	PVC/PVC/PVC	Cable	2	cores	copper	2.5mm <sup>2</sup> +2.5mm <sup>2</sup>	earthwire
D.023	PVC/PVC/PVC	Cable	2	cores	copper	4mm <sup>2</sup> +4mm <sup>2</sup>	earthwire
D.024	PVC/PVC/PVC	Cable	3	cores	copper	4mm <sup>2</sup> +4mm <sup>2</sup>	earthwire
D.025	PVC/PVC/PVC	Cable	4	cores	copper	4mm <sup>2</sup> +4mm <sup>2</sup>	earthwire
D.026	PVC/PVC/PVC	Cable	4	cores	copper	6mm <sup>2</sup> +6mm <sup>2</sup>	earthwire
D.027	PVC/PVC/PVC	Cable	4	cores	copper	10mm <sup>2</sup> +10mm <sup>2</sup>	earthwire
D.028	PVC/PVC/PVC	Cable	4	cores	copper	16mm <sup>2</sup> +10mm <sup>2</sup>	earthwire
D.029	PVC/PVC/PVC	Cable	4	cores	copper	25mm <sup>2</sup> +16mm <sup>2</sup>	earthwire
D. 210	PVC/PVC/PVC	Cable	4	cores	copper	35mm <sup>2</sup> +16mm <sup>2</sup>	earthwire
D.211	PVC/PVC/PVC	Cable	4	cores	copper	50mm <sup>2</sup> +25mm <sup>2</sup>	earthwire
D. 212	PVC/PVC/PVC	Cable	4	cores	copper	70mm <sup>2</sup> +35mm <sup>2</sup>	

earthwire

- D.030 PVC/PVC/SWA/PVC type cables for 0.6 / 1 kV voltage, copper conductors, manufactured according to standard NP 2365 (CEI 502), cables consisting of rigid soft copper conductors, insulated with PVC, type A. On the insulation of single-conductor cables or on the cabled set of multiconductor cables has an optional hollow and an inner PVC sheath on which the reinforcement is applied, which may consist of two steel strands (VAV) round wires (VRV) or galvanized steel bars (VMV).  
A PVC sheath is applied externally. In single-conductor conductors intended for alternating current installations, the armature consists of non-magnetic material. Class 1 single-line cables up to 6mm<sup>2</sup>, with four conductors or multi-line with a section equal to or greater than 16mm<sup>2</sup> class 2, according to NP 2363 (CEI 228), one of the conductors will normally have a reduced section.  
They are manufactured in sections between 1.5mm<sup>2</sup> and 500mm<sup>2</sup>.  
(Similar type PVC/PVC/SWA/PVC copper conductors, made by CABELTE / Portugal).
- D.031 PVC/PVC/SWA/PVC cable 2 cores copper 2.5mm<sup>2</sup> + 2.5mm<sup>2</sup> earthwire
- D.032 PVC/PVC/SWA/PVC cable 2 cores copper 4mm<sup>2</sup> + 4mm<sup>2</sup> earthwire
- D.033 PVC/PVC/SWA/PVC cable 3 cores copper 4mm<sup>2</sup> + 4mm<sup>2</sup> earthwire
- D.034 PVC/PVC/SWA/PVC cable 4 cores copper 4mm<sup>2</sup> + 4mm<sup>2</sup> earthwire

- D.035 PVC/PVC/SWA/PVC cable 4 cores copper 6mm<sup>2</sup> + 6mm<sup>2</sup> earthwire
- D.036 PVC/PVC/SWA/PVC cable 4 cores copper 10mm<sup>2</sup> + 10mm<sup>2</sup> earthwire
- D.037 PVC/PVC/SWA/PVC cable 4 cores copper 16mm<sup>2</sup> + 10mm<sup>2</sup> earthwire
- D.038 PVC/PVC/SWA/PVC cable 4 cores copper 25mm<sup>2</sup> + 16mm<sup>2</sup> earthwire
- D.039 PVC/PVC/SWA/PVC cable 4 cores copper 35mm<sup>2</sup> + 16mm<sup>2</sup> earthwire
- D.310 PVC/PVC/SWA/PVC cable 4 cores copper 50mm<sup>2</sup> + 25mm<sup>2</sup> earthwire
- D.311 PVC/PVC/SWA/PVC cable 4 cores copper 70mm<sup>2</sup> + 35mm<sup>2</sup> earthwire
- D.312 PVC/PVC/SWA/PVC cable 4 cores copper 95mm<sup>2</sup> + 50mm<sup>2</sup> earthwire
- D.313 PVC/PVC/SWA/PVC cable 4 cores copper 120mm<sup>2</sup> + 70mm<sup>2</sup> earthwire
- D.314 PVC/PVC/SWA/PVC cable 4 cores copper 150mm<sup>2</sup> + 70mm<sup>2</sup> earthwire
- D.315 PVC/PVC/SWA/PVC cable 4 cores copper 185mm<sup>2</sup> + 95mm<sup>2</sup> earthwire
- D.316 PVC/PVC/SWA/PVC cable 4 cores copper 240mm<sup>2</sup> + 120mm<sup>2</sup> earthwire

D.040 Category 6a UTP cable; suitable for telephone, computer data, image; cables consisting of tinned copper conductors, normally 0.5 mm in diameter, insulated with PVC and grouped in pairs or suits. These pairs or suits are wired in concentric layers and the layers are separated by an open polyester ribbon guipure

They are normally manufactured in the following compositions:  
1, 2, 3, 6, 10, 15, 20, 25, 30, 40, 50, 60 and 100 pairs or suits

D.041 UTP cable Cat 6a, 2x2x0,5mm

D.042 UTP cable Cat 6a, 4x2x0,5mm

D.043 UTP cable Cat 6a, 10x2x0,5mm

D.044 UTP cable Cat 6a, 20x2x0,5mm

D.045 UTP cable Cat 6a, 30x2x0,5mm

## **E.000 Control and connection equipment**

E.010 Lighting control device for recessed mounting, to operate on alternating current, 10A, 250V, 50Hz, including frames, mirrors and other accessories.

(Similar type MOSAIC, Legrand, South Africa).

E.011 Simple switch, 10 A

E.012 Double switch, 10 A

E.013 Simple stair switch, 10 A

E.020 360° infrared detector with a maximum range of 8 meters in diameter for lighting control in bathrooms for mounting embedded in the false ceiling, to operate in alternating current, 6A, 250V, 50Hz, connection with the use of three wires with neutral, including built-in claws and other accessories. For large spaces, mount two detectors six meters apart.  
(Similar type MOSAIC, from Legrand, South Africa).

- E.021 Detector switch activated by motion detection reference 0 488 04
- E.030 Waterproof lighting control device for surface mounting, to operate on alternating current, 10A, 250V, 50Hz, including switchboards and other accessories (similar type PLEXO 55, from Legrand, South Africa).
- E.031 Simple switch, 10A.
- E.032 Double switch, 10A
- E.040 Connecting device for removable mounting equipment embedded in the building wall, white in color, equipped with a protective conductor connection point, operating in alternating current, 16A, 250V, 50Hz, including frames, mirrors and other accessories.  
(Similar type MOSAIC, Legrand, South Africa).
- E.041 2P + T sockets type schuko 16A / 250V, white, mounted on cement wall
- E.050 Device for connecting removable mounting equipment embedded in the DLP 150x50mm technical track, white, equipped with a protective conductor connection point, operating on alternating current, 16A, 250V, 50Hz, including frames, mirrors and other accessories.  
(Similar type MOSAIC, Legrand, South Africa).
- E.051 2P + T sockets type schuko 16A / 250V, white, mounted on DLP 150x50mm technical track
- E.060 Device for connecting removable mounting equipment embedded in the building wall, in red color, equipped with a protective conductor connection point, operating in alternating

current, 16A, 250V, 50Hz, including frames, mirrors and other accessories.

(Similar type MOSAIC, Legrand, South Africa).

E.061 2P + T sockets type schuko 16A / 250V, red, mounting embedded in the cement wall

E.070 Device for connecting removable mounting equipment embedded in the DLP 150x50mm technical rail, in red color, equipped with a protective conductor connection point, operating on alternating current, 16A, 250V, 50Hz, including frames, mirrors and other accessories.

(Similar type MOSAIC, Legrand, South Africa).

E.071 2P + T sockets type schuko 16A / 250V, red, assembly soaked in DLP 150x50mm technical channel

E.080 Device for connection of printer and photocopier of mounting embedded in the building wall, white, equipped with a connection point of the protective conductor, operating in alternating current, 16A, 250V, 50Hz, including the frames, mirrors and other accessories.

(Similar type MOSAIC, Legrand, South Africa).

E.081 2P + T sockets type schuko 16A / 250V, white, mounting embedded in the cement wall.

E.090 Device for connecting removable surface and watertight equipment, equipped with a protective conductor, operating in alternating current, 16A, 250V, 50Hz, including switchboards and other accessories.

(Similar type PLEXO 55, from Legrand, South Africa)

E.091 2P + T sockets schuko type 16A / 250V



- E.100 Sockets of the industrial type for indoor or outdoor use, watertight and resistant to mechanical impacts and indoor or outdoor temperature, IP44, 230V, 50Hz, mobile or fixed on the wall (IP66 / IP67).
- E.101 Industrial sockets 2P + T type 32A / 250V
- E.110 Sockets of the industrial type for indoor or outdoor use, watertight and resistant to mechanical impacts and indoor or outdoor temperature, IP44, 380V, 50Hz, mobile or fixed on the wall (IP66 / IP67).
- E.112 Industrial sockets 3P + N + T type 32A / 250V
- E.120 Connection device, embedded assembly, manufactured according to technical specification 226.19.003 of CTT / TLPB, with opening contact, operating mechanically when inserting the plug, insulating material, contact resistance at connection points less than 30, with protection against the penetration of foreign solid bodies and K4 dust, resistance to mechanical actions class M3 specific to CAT 6a.  
(Similar type MOSAIC, Legrand, made in France).
- E.121 Telephone sockets, computer data network type RJ45 Category 6a mounting embedded in the cement wall.
- E.122 Telephone sockets, computer data network type RJ45 Category 6a mounting embedded in the DLP 150x50mm technical rail.
- K.000 Circuit Protection and Command Equipment**
- K.001 Command and protection apparatus consisting of single-phase or three-phase circuit breakers and bipolar or tetrapolar switches as well as single-phase or three-phase contactors

with nominal capacity between 6 A to 1600 A whose short-circuit capacity is at least 4 kA, service voltage of 230V and of 290V insulation with a 6 kV impulse, thermal and magnetic protection. The actual capacity of each protection device or general cut is expressed in the single-line diagram for each electrical panel to see in drawings.

(Devices similar product type from Legrand)

## **G.0000 Lighting Material**

**Introduction** The lighting material comprises lighting fittings that must contain: box, electronic ballast, capacitor, starter when required, correct wiring, power factor control equipment, lamp (s) being metal box must have a grounding point; these data are applicable to projectors and other types of lighting equipment.

G.010 Complete fluorescent tubular lighting, simple ruler type, with reflective body in mild steel sheet of 0.6 mm thick, treated and electrically painted with epoxy resin, thermoset in white for lighting common environments with normal atmosphere, 230V / 50Hz, Class I , IP20, QC31.

(Lighting similar to KA from Radiant Lighting, Republic of South Africa)

G.011 T5 tubular fluorescent lighting, white, 1x18W type KA12

G.012 T5 tubular fluorescent lighting, white, 2x18W type KA22

G.013 T5 tubular fluorescent lighting, white, 1x36W type KA14

G.014 T5 tubular fluorescent lighting, white, 2x36W type KA24

G.013 T5 tubular fluorescent lighting, white, 1x58W type KA15

G.014 T5 tubular fluorescent lighting, white, 2x58W type KA25

G.020 Watertight tubular fluorescent fittings, class IP 65, surface-mounted rectangular equipped with a prismatic methacrylate diffuser, self-extinguishing polyester body, reinforced with fiberglass, with white

lacquered reflector. Very robust construction and easy installation or maintenance, available in versions of one and two lamps, in different powers. Equipped with equipment for normal starting and power factor compensation, 220V / 50Hz, IP65, QC24, Class I, with electronic ballast. (Similar to the KB type produced by Radiant Lighting (pages G11 and G12), Republic of South Africa)

G.021 Waterproof tubular fluorescent lighting, 2x36W type KB50

G.030 Armatures, interior use for surface mounting on the wall, with 2x14W compact fluorescent lamps, wall type armatures, cast aluminum body with internal reflector and frosted glass diffuser, armature to operate at 230V / 50Hz, Class I, IP54 , QC22.  
(Similar to fused body armor, 2x14W compact lamps, WT44, manufactured by Radiant Lighting, catalog 2014, page M54, South Africa)

G.031 Compact fluorescent lighting 2X14W, WT44

G.040 Armatures, external use for surface mounting on wall or ceiling, with 2x9W compact fluorescent lamps, these wall panels are applied on the ceiling to be applied over the real concrete wall or ceiling, waterproof plastic body with opaque glass diffuser. Equipped with equipment for normal starting and power factor compensation, 220V / 50Hz, IP65, QC24, Class I.  
(Similar to 2X9W plastic armor, WT23, manufactured by Radiant Lighting, 2008 catalog, page M40, South Africa)

G.041 Compact fluorescent lighting 2X9W, WT23

G.050 Lighting fixtures suitable for suspension in the ceiling with 0.5 meters, with body composed of metallic compartment containing electrical components, type E27 nozzle for metal halide lamp or metal halide, acrylic prismatic diffuser and reflector, class I, IP20,

QC32. (Similar type JC28 / 22 / GEAR and JC28 / 01 by Radiant Lighting South Africa)

- G.051 Metal halide lamp fittings 70W, JC28/22
- G.052 Metal halide lamp fittings 150W, JC28/22
- G.053 Metal halide lamp fittings 250W, JC28/22
- G.060 Armatures, interior use of mounting embedded in the ceiling, with 2x13W compact fluorescent lamps, downlights armatures, metal body with internal aluminum reflector and without diffuser. Equipped with equipment for normal start and power factor compensation. Possessing a circular ring to be applied close to the false ceiling externally, armature to operate at 240V / 50Hz, IP20, QC31, Class I. (Similar to 2x13W aluminum armor, BA62, manufactured by Radiant Lighting, 2008 catalog, page B22, South Africa)
- G.061 Compact fluorescent lighting 2X13W, BA62
- G.070 Armatures, interior use for mounting embedded in the ceiling, with 2x26W compact fluorescent lamps, downlights armatures, metal body with internal aluminum reflector and without diffuser. Equipped with equipment for normal start and power factor compensation. Possessing a circular ring to be applied close to the false ceiling externally, armature to operate at 240V / 50Hz, IP20, QC31, Class I. (Similar to 2x26W aluminum armor, BA66, manufactured by Radiant Lighting, 2008 catalog, page B22, South Africa)
- G.071 Compact fluorescent lighting 2X26W, BA66
- G.080 Lighting and emergency armatures in the same unit, interior use for surface mounting on the wall, with 1x11W non-replaceable tubular high-luminance fluorescent lamp, body made of self-fire-resistant material, elegant that offers an aesthetic assembly and good visibility in plastic incorporating non-opaque diffuser. It also

incorporates sealed Ni-Cd rechargeable batteries that withstand high temperatures, rechargeable in 24 hours and with two indicators of voltage presence and battery recharge. Operating at 230V +/- 10%; 50Hz, IP42, Class II, with 515lm for 1 hour. (Similar to 11W G5 plastic reinforcements, references 617 44, manufactured by Legrand, South Africa)

- G.081 11W emergency fluorescent armatures lasting 1 hour, type G5, attached to it pictogram 661811 with “SAIDA” flag.
- G.090 Lighting and emergency armatures in the same unit, interior use for surface mounting on the wall, with 1x11W non-replaceable tubular high-luminance fluorescent lamp, body made of self-fire-resistant material, elegant that offers an aesthetic assembly and good visibility in plastic incorporating non-opaque diffuser. It also incorporates sealed Ni-Cd rechargeable batteries that withstand high temperatures, rechargeable in 24 hours and with two indicators of voltage presence and battery recharge. Operating at 230V +/- 10%; 50Hz, IP42, Class II, with 515lm for 1 hour. (Similar to 11W G5 plastic armor, references 617 44, made by Legrand, South Africa)
- G.091 11W emergency fluorescent armatures lasting 1 hour, type G5, attached to them 660865 or 660866 pictograms on one side.
- G.100 Lighting and emergency armatures in the same unit, interior use for surface mounting or suspension in a real ceiling, with a fluorescent lamp of 1x11W non-replaceable tubular brightness, elegant body that offers an aesthetic assembly and good visibility in plastic incorporating with non-diffuser opaque. It also incorporates sealed rechargeable Ni-Cd batteries that withstand high temperatures, rechargeable in 24 hours and with a green indicator that indicates that it is in the process of charging. Operating at 230V +/- 10%; 50Hz, IP42, Class II, with 515lm for 1 hour. (Similar to 11W G5

plastic armor, references 617 44, made by Legrand, South Africa)

G.101 1W fluorescent armatures of emergency duration of 1 hour of type G5, attached to them 660869 pictograms on one side.

G.102 11W fluorescent armatures of emergency duration of 1 hour of type G5, coupled in them pictograms 660869 on both sides.

G.103 Emergency fluorescent armatures of 11W with duration of 1 hour of type G5, coupled in them pictograms 660867 and 660869 on both sides.

## **H.000 Heating**

H.010 Stainless steel hand dryers with side panels, complete, automatic operation by electric photocell by approaching objects on the sensor, suitable for use in public places with frequent humid environments, for wall mounting, 50Hz, 220V, IP21. (Similar to Xpelair type, manufactured by INDUSTRIAL SERIES, Portugal).

H.011 Hand dryer, Industrial Series.

# **TECHNICAL SPECIFICATIONS FOR CONSTRUCTION AND ASSEMBLY OF MATERIALS**

## **LOW VOLTAGE ELECTRICAL INSTALLATION CIRCUITS**

### **A-EMBEDDED MOUNTING SPECIFICATIONS**

#### **1. INTRODUCTION**

In this type of installation, the various elements are embedded in the masonry or concrete slabs, in the technical track, leaving only the access covers and the maneuvering controls

This is the type of installation allowed for indoor environments without special risks or temporarily wet

#### **2. CHANNELS**

They will be of the fixed, embedded type, constituted by insulated rigid conductors protected by tubes or technical rail, having interspersed boxes for the assembly of the connection and control or regulation devices

##### **2.1. GENERAL**

2.1.1.The conductor enclosures and the mechanical protection of the pipes, must have mechanical and also electrical continuity when metallic along their entire length and according to the conditions of the place

2.1.2.Connections of conductors to pipes can only be made using suitable connection devices

2.1.3. A conduit may only contain conductors belonging to the same circuit, with the exception of the technical channel, which may comprise conductors belonging to different circuits.

2.1.4. Pipelines cannot be established less than 30cm from non-electrical pipelines, where greater distances should be used whenever possible

## **2.2. PIPING AND TECHNICAL TRACK**

2.2.1. The piping to be applied must comply with the rules or regulations of the legislation that is assumed and that is in force

2.2.2. The tubes should be connected to each other using appropriate and properly sealed joints in order to achieve a perfect connection between the tubes

2.2.3. The tubes and technical gutter to be used will be of the types indicated below, obeying the electrical characteristics to the regulation in force, being:

- Plastic

VD ou PVC TYPE

2.2.4. The pipes to be used on floors and concrete must be made of medium density polyethylene, type ERFE (ISOGRIS)

2.2.5. The tubes must have, regularly along their length, clearly visible marks that allow to identify the manufacturer, the type and the nominal diameter

2.2.6. The tubes must have an inner surface without sharp edges, roughness or crack

2.2.7. Before proceeding to the opening of the sections, a trace must be made on the walls of the path to follow



2.2.8. When tracing the tubes on the walls, oblique sections should be avoided, establishing horizontal and vertical sections from the interleaved devices.

2.2.9. When tracing the technical gutter on the walls, oblique sections should be avoided, establishing horizontal and vertical sections from the appropriate points and, if possible, applied to the corners of the walls and not passing through the walls.

2.2.10. The plastic or metallic tubes to be embedded in the concrete or placed in grooves, must not suffer deterioration or denting, either in the installation or in the covering. Those soaked in the mix to be poured must be whole from box to box

2.2.11. The connections between the tubes and each other to the boxes must be made with accessories, suitable and properly glued, in order to guarantee the continuity of the piping.

2.2.12. The pipes installed in the same section must be spaced apart from each other so that the mortar penetrates well between them and the respective covering can only be carried out after being authorized by the construction supervision

2.2.13. The covering of the ditches should be made by mortar with a high dose of cement (500kg / m) especially in places with high moisture content or corrosive environment

2.2.14. The possibility of accumulation of condensation water inside the tubes should be avoided by assembling them with an inclination in the direction of the boxes and not allowing curves with a concave facing upwards

2.2.15. The curves of the tubes must have radii appropriate to the respective diameters and be made hot, with an appropriate helix spring or bending machine, depending on whether they are plastic or metallic, when those from the factory are not suitable at the point of application.

2.2.16.To allow easy and quick threading of the conductors, passage boxes should be mounted, arranged at convenient distances, being mandatory to place them on straight paths greater than nine meters, or when there are two curves in opposite directions

2.2.17.To allow easy threading of the conductors and separation of circuits, separators must be applied to the technical trough, being mandatory the placement of the cover and tops at the ends of the technical trough, thus allowing the accumulation of dust inside the trough.

2.2.18.The diameter of the tubes to be used will be as indicated in the regulations in force for the sections and numbers of conductors to be inserted into them, not being in any case less than 16mm in diameter for lighting circuits and 20mm for other circuits

2.2.19.The type of technical gutter to be used will be indicated in the technical specifications made by the designer

2.2.20.In the partitions of walls made of non-cement the tubes must be applied vertically and affixed to the aluminum parts of the structure of the partitions by sheet metal clamps

2.2.21. In partitions made of non-cement walls, the gutters must be fixed to the plates with riveting in the structure of the partitions, and it is necessary to coordinate with the civil construction in order to reinforce the structure of the partitions in places that may constitute a weak point during the operation of the electrical installation.

2.2.22.The tubing to be applied to the partition wall plates must be fixed in an adequate way to resist the mechanical actions that will be exerted during threading.

2.2.23. At the ends of the piping and gutter, inside the junction boxes, switchgear boxes, on the gutters the circuit should be written on them to be inserted using a permanent ink pen.

## 2.3. CONDUCTORS

2.3.1. Type GPHW, PVC/PVC/PVC, PVC/SWA/PVC or PVC/PVC/SWA/PVC cable will be used, following the electrical and mechanical characteristics of the regulations in force and having the following colors:

• Electrical distribution	- PHASES	Black / Black / Brown
	or	Brown / Brown / Black
	- NEUTRAL	Light blue
	- PROTECTION	Green / Yellow

2.3.2. The minimum sections to be used are:

• Lighting circuits	1,5mm <sup>2</sup>
• General purpose socket circuits	2,5mm <sup>2</sup>
• HVAC and heating circuits	2,5mm <sup>2</sup>
• Circuitos da força motriz	2,5 mm <sup>2</sup>
• Driving force circuits	2,5mm

2.3.3. Conductors should be inserted into the piping with great care in order to avoid deformation or insulation injury, this operation being carried out only after the covering mass of the strips has made pre

2.3.4. No splices or connections are allowed inside the tubes

2.3.5. At the ends of the cables or conductors, labels must be affixed with, or written on, the words related to the circuit to which they will belong

## 2.4.BOXES

2.4.1.The connection of the tubes to the junction boxes, passage and equipment, will always be made by means of brass stops or bushings and hexagon nut, according to whether plastic or metallic tubing is used.

2.4.2.The connection of the tubes to the junction boxes, passage and equipment, will always be made by means of brass stops or bushings and hexagon nut, according to whether plastic or metallic tubing is used.

2.4.3.The connections of the conductors inside the boxes must be made with connectors fixed to the bottom of the boxes and appropriate to the section and number of conductors to be connected

2.4.4.The layout must be established in such a way as to avoid as much as possible the existence of boxes inside the compartments, therefore locating them in the corridors, well centered with the doorways and windows, in the space between the lintels of these elements and the ceiling, respecting the distances to the cover plate, normally 0.3 meters

2.4.5.The location of the equipment boxes will respect the opening direction of the doors and windows, as well as the indication on the construction site. In general, the following mounting heights are adopted in relation to the floor:

• Switches, two way switches, call buttons	1,20m
• General purpose sockets	0,35m
• Outer boxes	1,20m

2.4.6.The switch boxes for bathrooms and toilets will always be mounted outside the respective compartment

2.4.7.In the partitions of walls made of non-cement, the switchgear boxes as well as the sockets must be fixed on the plates with riveting in one of the parts of the structure of the partitions being necessary to coordinate with the civil construction so that these parts are added in places where they there is

coincidence. The structure of the partitions should also be reinforced in the area where there are alignment of switchgear boxes for sockets, as they become a weak point during the operation of the electrical installation.

2.4.8. The switchgear boxes to be applied to the partition wall plates must be fixed in an appropriate way to resist the mechanical actions that will be exercised during the application of switches and sockets.

### **3. APPARATUS**

3.1. All connecting, cutting and command equipment must be placed in proper boxes, embedded in the masonry and fixed to it by screws

3.2. The connectors must ensure good conductivity by mechanical tightening without a voltage drop or overheating.

3.3. Each connector must not tighten more than four conductors with a section equal to or less than 4mm<sup>2</sup>, or two conductors with equal or contiguous sections for sections greater than 4mm<sup>2</sup>.

3.4. The equipment works in conjunction with the piping and boxes so the installation embedded in concrete, in the construction of walls, pillars or beams, must be prepared during the formwork phase, before concreting.

3.5. The installer must position all the piping, junction boxes, equipment boxes and other necessary negatives, fixing them to the reinforcement or the partition wall in preparation.

3.6. The piping, boxes and equipment to be applied in the areas to be concreted must be adequate to resist the mechanical actions that will be exerted during the concreting

3.7. The application of switches, power outlets or communications must be made in the equipment boxes properly fixed to the plates of the partition walls

in an adequate way to resist the mechanical actions that will be exercised during the use of the electrical installation.

## **4.SWITCHBOARD**

4.1.The frame box, for mounting soaked, should be placed after the construction of the masonry, its bottom part being 1.5 meters away from the floor

4.2.The entrance of the frames, must be made according to the piping used:

- Plastic tubing
- Adequate stop

4.3.Only after the plastering has been completed and the conductors have been threaded will the placement of the removable structure on which the appliance is placed be allowed

4.4.Within the frame, all cables must be perfectly identified, namely at their ends, with the corresponding circuit and phase number, using labels of the type “LEGRAND” or similar

4.5.All commands will be provided with labels, clearly indicating the circuit to which they belong

4.6.An identification map of circuits must be affixed to the internal part of the electrical panel door, as well as to the external part of the same door and the identification plate of the electrical panel must be affixed to the mirror.

## **B- SURFACE MOUNTING ELECTRICAL INSTALLATION**

### **1. INTRODUCTION**

For the execution of the present electrical installation of use, the surface mounting installation will be applied. In this type of installation, the various elements are affixed to the masonry or concrete slabs, and the passage or branch boxes and the maneuver controls are also visible.

This is the type of the electrical installation allowed for indoor environments without special risks or temporarily wet.

### **2.ELETRICAL CABLES CHANNELS**

The electrical cables channels will be of the surface fixed type, of sight assembly, constituted by protected insulated rigid cables, having interspersed boxes for assembly of the connection devices or interspersed by command or regulation apparatus.

#### **2.1. GENERAL**

2.1.1.The cable coverings and the mechanical protection of the pipes, must have mechanical and also electrical continuity when metallic along their entire length and according to the conditions of the place.

2.1.2.Cable connections to the pipes can only be made using suitable connecting devices.

2.1.3.A conduit can only contain conductors or cables belonging to the same circuit,

2.1.4.Pipelines cannot be established less than 30mm from non-electrical pipelines, and greater distances should be used whenever possible.

## **2.2. PIPE**

2.2.1. The tubes to be used will be of the types indicated below, obeying the electrical characteristics to the regulation in force, being:

- In plastic                      VD or PVC TYPE

2.2.2. When laying tubes or cables on the walls, oblique sections should be avoided by establishing horizontal and vertical sections from the interleaved devices.

2.2.3. The piping, in its layout, will follow the foot wheel or the angles of the walls as a way to present good aesthetics and good presentation to the whole view.

2.2.3. The plastic or metallic tubes to be attached to the concrete or masonry, must not suffer deterioration or denting during the installation.

2.2.4. The possibility of accumulation of condensation water inside the tubes should be avoided by mounting them with an inclination in the direction of the boxes and not allowing curves with a concave facing upwards.

2.2.5. The curves of the tubes must have radii appropriate to the respective diameters and be made hot, with an appropriate helix spring or bending machine, depending on whether they are plastic or metallic.

2.2.6. The diameter of the tubes to be used will be as indicated in the regulations in force for cables, for the sections and numbers of conductors to be inserted into them.

## **2.3. CONDUCTORS**

2.3.1. Type GPHW or PVC/PVC/PVC, PVC/SWA/PVC or PVC/PVC/SWA/PVC cables will be used, in compliance with the electrical



and mechanical characteristics of the regulations in force and having the following colors:

• Electrical distribution - PHASES	Black / Black / Brown
or	Brown / Brown / Black
- NEUTRAL	Light blue
- PROTECTION	Green / Yellow

2.3.2.The minimum sections to be used are:

• Lighting circuits	1,5mm <sup>2</sup>
• General purpose socket circuits	2,5mm <sup>2</sup>
• Circuitos de climatização e aquecimento	2,5mm <sup>2</sup>
• HVAC and heating circuits	2,5mm <sup>2</sup>
• Driving force circuits	2,5mm <sup>2</sup>

2.3.3.Conductors or cables should be inserted into the piping with great care in order to avoid insulation deformations.

2.3.4. The clamps for fixing the tubes or cables on the masonry should be correctly applied without causing injury to the body.

2.3.4.No splices or connections are allowed inside or outside the tubes.

## 2.4.BOXES

2.4.1.They will be made of bakelite or metal, depending on the type of tubing used and of round, square or rectangular shape.

2.4.2.The assembly of the boxes on the construction will be done using plastic or metallic dowels and screws depending on the convenience of the location and the efforts expected during the exploration.

2.4.3. The connection of the tubes to the junction boxes, passage and equipment, will always be made by means of brass stops or bushings and hexagon nut, according to whether plastic or metallic tubing is used.

2.4.4. The connections of the conductors inside the boxes, must be made with connectors fixed to the bottom of the boxes and appropriate to the section and number of conductors to be connected.

2.4.5. The connections of the conductors inside the boxes, must be made with connectors fixed to the bottom of the boxes and appropriate to the section and number of conductors to be connected.

2.4.6. The layout must be established in such a way as to avoid as much as possible the existence of boxes inside the compartments, therefore locating them in the corridors, well centered with the doorways and windows, in the space between the lintels of these elements and the ceiling, respecting the distances to the cover plate (usually 0.3 meters).

2.4.5. The location of the equipment boxes will respect the opening direction of the doors and windows, as well as the indication on the construction site. In general, the following minimum mounting heights are adopted in relation to the floor:

- |  |       |
|--|-------|
| • Switches, two way switches, call buttons | 1,20m |
| • General purpose sockets                  | 0,30m |
| • Outer boxes                              | 1,20m |

2.4.6. The location of the switches regarding the bathrooms and toilets, will always be mounted outside the respective compartment.

### **3.APPARATUS**

3.1.All the connection, cutting and control equipment must be suitable for a surface-mounted installation, however attached to the masonry by plugs and screws.

3.2.The connectors must ensure good conductivity by mechanical tightening without a voltage drop or overheating.

3.3. Each connector must not tighten more than four conductors with a section equal to or less than 4mm<sup>2</sup>, or two conductors with equal or contiguous sections for sections greater than 4mm<sup>2</sup>

### **4.SWITCHBOARD**

4.1.The frame box, for surface mounting, must be placed after the construction of the masonry and at least the first hand of the painting is done, the lower part of which is 1.5 meters away from the floor.

4.2.The entry into the electrical panels, must be made according to the piping used:

- Plastic tubing
- Adequate stop
- Suitable cable glands

4.3. The entry of the circuits must be made at the top of the electrical board, and the perforations at the bottom of the board are not accepted.

4.4.All commands will be provided with labels, clearly indicating the circuit to which they belong.

## C-ELETRICAL DISTRIBUTION BOARDS AND PANEL CONSTRUCTION SPECIFICATIONS

### 1. Aim

1.01-The present specification has the aim of presenting the main constructive features of low voltage distribution boards, kiosks and panels, for interior and exterior mounting in places without special risks and for the following local conditions:

Altitude..... sea level  
Average temperature.....35°C  
Relative Humidity.....90%

1.02-It is intended, with these conditions, to systematize their construction as much as possible, always having into account total safety for the operator and space saving, keeping conditions good for future maintenance works.

### 2. GENERAL

2.01-The distribution boards or kiosks should be prepared for interior and exterior mounting in environments without special risks, allowing connection with other units, totally independent, that may be grouped to form a bigger unit.

2.02-They should have independent internal removable grates, of easy installment, designated to attach the several electrical components.

2.03-Access may be had through front and/or back door, blocked by Delta lockers or as required, with identification labels inside and outside the panel.

2.04-Electrical equipment should be installed in them in a rational way, allowing easy access for connection and maintenance.

### 3. CONSTRUCTION

3.01-They must be of robust construction and capable of withstanding the normal service efforts of the equipment installed in them, as well as those resulting from shipping, transportation and handling during transit, without showing deformation or misalignment.

3.02-The structure must be built in steel sheet profiles and/or laminated profiles, being welded in all points that are necessary for the formation of a rigid set

3.03-The panels and doors must be made of mild steel plate and their rigidity is obtained by edging or cold bending

3.04-Inferior access to distribution boards or kiosks should be done by removable sectional plates, so that openings may be made, designated for fixing glands for enclosing the cables.

3.05-The doors should be provided with Delta or Yale type lockers, according to option, opening only in one direction and allowing a maximum angle of 150 degrees. When there is need of watching certain organs while at service, they should have transparent visors.

3.06-The distribution boards or kiosks should be constructively prepared for easy fixing in place, provided with U profiled rim, independent from the panels' structure, provided with appropriate fixing bolts, supplied with the whole.

3.07-All distribution boards or kiosks should have labels with indication of the appliance and numbering of the various circuits.

3.08-On the bottom of the lateral walls there should be a screw threaded bolt, with a minimum diameter of 10mm, welded to the plate of the structure, projecting at least 15mm both to the interior as well as to the exterior, designated to connect the earth wire and provided with galvanized washers and nuts. The earth bar that should be set along the whole distribution board or kiosks, will be connected to this bolt, at 150mm from the panels bottom.

3.09-For fixing the equipments and facilitating maintenance, supports, gutters and other elements that permit their rational mounting, forming internal grates, should be foreseen.

3.10-For extractable equipments there should be appropriate gutters for easy displacement, and connection sockets of their electrical control elements should be foreseen.

3.11-All metallic parts of the construction must be protected against corrosion by adequate treatment and properly coated with paint, as it follows;

a)Protection against corrosion can be carried out by any method, which is duly indicated, requiring at least, however:

- Oil free, achieved by chemical cleaning,
- Washing by under pressure running water,
- Stripping by disinhibiting chemical,
- Phosphate and passive treatment by chemical product.

b) Painting should be done by any appropriate process, as long as it is properly specified, demanding however, at least the following:

- two coats of base paint (primer),
- two coats of finishing paint, being it the one giving color and final finishing.

## **4. BUSBARS**

4.01-It should be calculated in such a way as to support thermal and mechanic efforts as a result of short circuit currents, characteristic to the system.

4.02-The elevation of temperature should not exceed 40 degrees Celsius above environment temperature expected to be 30 degrees Celsius, when at service.

4.03-They must be made of electrolytic copper bars or rods with smooth faces and uniform section, supported by support insulators in epoxy resin

4.04-All junctions or derivations should be properly prepared and firmly connected to guarantee maximum conductivity.

## **5 - WIRING**

5.01- All wiring must be carried out with PVC insulated copper conductors, 500 volts, with a minimum cross-section of 2.5 mm<sup>2</sup> for voltage circuits and 4 mm<sup>2</sup> for secondary circuits of current transformers

5.02-For the application and organization of the wiring, a suitable technical channel must be provided for the interior of the electrical panels, which will allow the cable path to be followed at any time or the inclusion of new ones according to the necessary circuits.

5.03-All wires should be conducted to the mechanical bar connectors, to facilitate interconnection with equipments supplied by third parties. These connectors should be supplied with a reserve of 20% in relation to the connectors used.

5.04-Mechanic connectors should be calculated for a current of 16Amps/500volts, and there cannot be put more than two wires in each insulator.

5.05-The mechanic connectors should be clearly identified with characters and numbers, at each end, according to layouts.

## **6. EARTH CONNECTION**

6.01-In the interior, at the back/bottom side of the distribution board or kiosks, a main earth bar should be mounted along its entire length, solidly connected to the metallic structure, executed in copper with a minimum section of 125mm<sup>2</sup>, starting from the 6mm earth bolt welded to the structure, allowing a connection inside and outside, and disposing of means of tightening the protection wires and cables reinforcement, at distances not superior than 15mm.

6.02-A copper bar should be mounted on the grates, solidly connected to its metallic part that will connect the main earth bar of the distribution board or kiosks by flexible wire.

6.03-All metal parts excluded from the electrical circuits for conducting current intensity, must be connected to the general earth bar.

## **7. MISCELLANEOUS**

7.01-After the routine testing by the manufacturer, the equipment should be delivered at the factory door, complete and ready for service conditions.

7.02-A discriminative list of the various circuits should be put at back of the distribution board door, with indications of protection calibers, the phase to which it is connected and space for writing their uses.

7.03-Simultaneously with the delivery of the equipment, the manufacturer should present:

- List of features of the distribution board or kiosks and installed materials,
- Single-line scheme of power circuits,
- Layout of control and measuring connections, with complete description of the mechanical connectors block,
- Equipment assembly instructions
- Identification of inlet and outlet cables.





REPÚBLICA DE MOÇAMBIQUE

## **MINISTÉRIO DA SAÚDE**

### **MEDICINES AND MEDICAL SUPPLIES CENTER**

### **TERMS OF REFERENCE FOR CONTRACTING SECURITY SERVICES INTEGRATED IN THE CENTRAL WAREHOUSES OF MEDICINES OF BEIRA SOFALA**

#### **1-OBJECT**

The purpose of this Term of Reference (TOR) is to define the objectives, scope of work and supply of equipment and contracting of integrated security services at the Central Warehouses for Medicines and Medical Articles of BEIRA (ACMAMB).

#### **2- JUSTIFICATION**

ACMAMB is a State institution under the supervision of the Ministry of Health (MISAU) with the duties of administering, coordinating and executing the functions related to the planning, acquisition, storage, conservation and distribution of medicines and related health products in the National Health Service (SNS).

As part of the implementation of the PELF, the Strategic Plan for Pharmaceutical Logistics (2014 - 2023), approved in 2013, whose strategic pillars include the expansion and rehabilitation of infrastructures for the storage and conservation of medicines and related products, the rehabilitation and expansion of the infrastructures of the BEIRA Central Medicines Warehouse, with delivery scheduled for November this year and

the beginning of rehabilitation and expansion of the Beira Central Medicines Warehouse (Pioneiros), starting in the initial months of 2021.

Thus, considering the high volume and value of the patrimonial goods that will be stored and handled in the Central Warehouses of Medicines of Beira, ACMAMB intends to implement a robust security solution, in order to mitigate the risk of theft and theft to which the facilities will be exposed.

### **3- OBJECTIVES**

#### **3.1-GENERAL**

- Implement an integrated security solution in the Central Warehouses for Medicines and Medical Articles, mitigating the various risks to which the facilities are exposed, including theft and theft.

#### **3.2- SPECIFIC:**

- Design an integrated security solution, consisting of the integration of Video Surveillance Systems (CCTV), Automatic Fire Detection, Integrated Access Control and Intrusion Alarm;
- Provide and install the necessary equipment for the implementation of the integrated security solution, including maintenance, preventive and corrective services, for the referred equipment;
- Quantify and budget all the equipment and materials needed to implement the proposed solution;
- Operate the Monitoring Center (24 hours / day) for Video Surveillance Cameras and Alarm Reception.

### **4-TECHNICAL SPECIFICATIONS OF THE SECURITY SOLUTION**

The security solution should, as far as possible, comply with the following minimum technical specifications below, without prejudice to minor adjustments.

#### 4.1-VIDEO SURVEILLANCE SYSTEM (CCTV)

For the purpose of implementing the System in question, the need to install fixed and mobile video cameras connected on TCP / IP platforms in the most sensitive areas is expressed, that is, strategic, namely in the perimeter, the building access areas, areas work areas, intermediate corridors, in order to ensure a very detailed monitoring of the entire operation, circulation of goods, people and vehicles.

Basically, the system must permanently ensure the monitoring, command and archiving of all images from the security room and must consist of the following equipment:

- a. **The video recorder** must perform uninterrupted recording by motion detection to save storage space and must be equipped with 16 Terabytes to allow the storage of high resolution images. It must have 64 channels, covering future needs to expand the number of chambers, with the identification of new areas susceptible to protection, namely outside or resulting from the expansion of the building. This equipment must be connected to a “nobreak”.
- b. The entire system must be managed with the network recorder with the 21 ”monitor, or at the Vigilante station through a Workstation with the Visualization Software, preferably in Portuguese, equipped with 3 22” Monitors and 1 50 ”Monitor “. From the outside and via the Internet (optimal bandwidth), this recorder will have the possibility of being accessible by whoever is duly authorized for the purpose (“**username and password**”), with regard to both live and to images recorded on disc, just for that there is internet in the place.

- c. The software should have exception reports where all manual interventions in the System will be reported (System manually turned off, power failure, images deleted manually, user access with date and time and from which point it was accessed, camera disconnected).
- d. The 3G / 4G smartphone software should be made available that will allow remote access to images.
- e. To finish, the system must allow the real-time display of all cameras simultaneously on a 50 "screen, as well as allowing the viewing of only a few of them determined by the user.
- f. The images must be of high quality such that it allows identification of the target / person / intruder without a doubt with the possibility of viewing particular and localized characteristics, allowing zoom, recovery in the backup devices, regardless of the lighting conditions at the time of capture.
- g. The system must be free of discontinuity of images in sensitive areas (interior of the warehouse, perimeter and areas of greater concentration and / or movement of personnel).
- h. **Fixed cameras must be high resolution with 3.0 megapixel**, to offer a very detailed and defined image. They must be equipped with infrared projectors that allow viewing in total darkness at 30 meters, suitable for outdoor use with an IP66 degree of protection.
- i. **The mini-dome cameras must be 3.0 megapixel** and equipped with infrared capable of reaching 30 meters in total darkness, to be used in the interior access areas.
- j. **The Indoor Speed-Dome mobile video cameras** for video surveillance of doors, access circulation corridors.

- k. **The Outdoor Speed-Dome mobile video cameras** for video surveillance of doors, circulation areas and park access circulation corridors.
- l. **The Indoor PTZ IP cameras** in areas of higher concentration or places where the light is dark or off and requires high definition quality;
- m. **The distribution and positioning of the chambers through the most sensitive points of the installation** must, in order to ensure the monitoring of the perimeter areas of the Intrusion Detection System. This fact is important to allow associating a camera to each intrusion zone, so that it is possible to carry out an instant video verification efficiently, without the operator having to know the installation in question.
- n. **The operator, in case of need, must have access to the remaining cameras**, always assisted with an interactive map of the installation with all the equipment represented.

#### 4.1.1-NVR VIDEOGRAVATION SYSTEM

##### **Mandatory features:**

- Viewing mode: Multi-window 1, 4, 8, 9 and 16
- Recording resolution: 5 Mp, 3 Mp, HD1080P or HD720P and 640 x 360.
- Number of users: 10 users
- Minimum file capacity in each NVR: 5 of 6Tb discs totaling 30Tb (The competitor must justify its proposed capacity).
- Network interfaces:8 (Camera IP, PoE(802.3at) + 1 LAN + 1 WAN)
- Serial Ports:1xRS232, 1xRS485
- USB port: 3 ports
- Power PoE: 72W
- Integrated HUB: 8 independent PoE ports

- Chassis: 19 "Rack Mount.
- Power supply: 240 V/50Hz

#### **4.1.2- BULLET CAMERAS FOR INTERIOR**

##### **Mandatory Features:**

- Sensitivity: 0 Lux with active IV projector
- Optical zoom: 4.3x
- Digital zoom: 2 – 10x
- Frame: 1ips – 25 ips
- Compression: H.264, MJPEG (100 adjustable quality levels)
- Resolution: 1920 x 1080(Full HD), 1280 x 1024(SXGA), 1024x768(XGA), 1280 x 720(720p), 640 x 480(VGA), 640 x 360(HVGAW)
- 704 x 480/576(4CIF), 352 x 240/288(CIF)
- Security: password protection
- Video motion detection: programmable up to 4 ROI and 30 adjustment level
- Alarm notification: E-mail (Snapshot), FTP transfer(Snapshot)
- Infrared projector: 36 LEDs (minimum) automatic
- e-Shutter manual: 1/4 - 1/2000
- e-Shutter automatic: 1/25(30) – 1/5000
- Day/night filter: automatic
- WDR: Digital
- BLC: integrated
- Access Web Browser: Internet Explorer 9.0 or posterior, Firefox, Chrome. Smart Phone (iOS, Android)
- White balance: ATW / MANUAL(PRESET)
- Power: PoE (802.3af) class 2, 112 mA@PoE, 5.4 W
- Environment operating temperature: -10° - 50°C
- Humidity: < 90% without condensation
- Protection: IP65

#### **4.1.3- FIXED IP “BULLET” CAMERAS FOR OUTDOORS**

- Sensibility: 0.1 Lux(to color), 0.005Lux to P/B and 0 lux with active infrared projector.
- Power: PoE
- Day/night filter: switchable
- Directional detection function: input or output
- Day/night switching: automatic
- Network interface: 10/100 Base T/Line – in/out
- Private masks: 4 areas
- WDR: True WDR
- Video motion detection: 3 areas
- Image definition functions: including ROI, BLC,/3D DNR/Defog/EIS.
- Directional detection function: input or output
- Environment operating temperature: -30°C a 50°C @ humidity 95%
- Integrated infrared projector: With a range of 30 meters
- Protection: IP68, IK10

#### **4.1.4- INTERIOR IP FIXED MINI-DOME CAMERAS**

IP Video cameras, fixed “Mini-dome” type of high sensitivity at night, for indoor installation, for monitoring doors, circulation aisles, accesses must have a minimum resolution of 5 Megapixel, sensor 1 / 1.8 ”Progressive Scan CMOS, 3.6-10mm motorized vari-focal lens with autofocus, pendant side wall fixing base, H.265 / H.264 and MJPEG video compression.

##### **Mandatory Features:**

- Sensibility: 0.1 Lux (at color) and 0.05 (a P/B)
- Power supply: PoE/12V CC
- Day/night switching: automatic
- Network interfaces: 10/100 Base T/Line – in/out
- Private masks: 4 areas
- WDR: True WDR

- Video motion detection: 3 areas
- Image definition functions: including ROI, BLC,/3D DNR/Defog/EIS.
- Directional detection function: input or output
- Environment operating temperature: -40°C a 50°C @ humidity 95%
- Integrated infrared projector: With a range of 30 meters
- Protection: IP66, IK10 e NEMAX4
- Integrated infrared projector: Automatic variation with a minimum range of 30 meters

#### **4.1.5-MOBILE SPEED-DOME IP CAMERAS OUTDOOR**

IP video cameras, mobile Speed-dome with high sensitivity at night, for Outdoor installation, for video surveillance of doors, circulation areas and parking of vehicles, support for video surveillance systems of the fence and other interior perimeter, accesses must have a minimum resolution 3 Megapixel sensor, 1 / 2.8 "CMOS sensor, 4.3-129mm optical zoom 30x lens, 16x digital zoom, pendant side wall mounting bracket, H.264 / MJPEG video compression.

#### **Mandatory Features:**

- Sensibility: 0.01 Lux (to colors) and 0.001 Lux (to P/B) and 0 Lux with active infrared
- Resolution to 25ips: 2048 x 1536
- IR day / night filter: Included
- Intelligent infrared projector: Range up to 120m.
- DNR: including DNR 3D.
- WDR: Digital WDR.
- Network Interface: RJ-45 10 / 100 Base-T
- Angle and speed PAN: 360° continuous, 0.01° - 180°/seg
- Angle and speed to TILP: -10° ~ 90°, 0.01° - 90°/seg
- Programmable Repositioning: 400
- Tour: 12 patrols



- Auto-Scan: 12 patrols
- Alarm inputs: 7
- Alarm Outputs: 2
- Power supply 24V CA
- Protection: IP66
- Environment operating temperature: -40°C a +65°C @ humidity 90%.
- Integrated infrared projector: Adjustable light intensity depending on zoom ratio.

#### **4.1.6- MOBILE SPEED-DOME IP INTERIOR CAMERAS**

IP video cameras, mobile Speed-dome of high sensitivity at night, for indoor installation, for video surveillance of doors, circulation aisles, accesses must have a minimum resolution of 3 Megapixel, 1 / 2.8 "CMOS sensor, 4.7-56.4 mm lens , 12x optical zoom, 16x digital zoom, pendant side wall mounting bracket, H.264 / MJPEG video compression.

##### **Mandatory Features:**

- Sensibility: 0.01 Lux (to colors) and 0.001 Lux (to P/B) and 0 Lux with active infrared
- Resolution to 25ips: 2048 x 1536
- IR day / night filter: included
- Intelligent infrared projector: Range up to 120m.
- DNR: including DNR 3D.
- WDR: Digital WDR.
- Network Interface: RJ-45 10 / 100 Base-T
- Angle and speed PAN: 360° continuous, 0.01° - 180°/seg
- Angle and speed to TILP: -10° ~ 90°, 0.01° - 90°/seg
- Programmable Repositioning: 300
- Tour: 12 patrols
- Auto-Scan: 12 patrols
- Alarm inputs: 7
- Alarm outputs: 2
- Power supply: 12V CC/PoE+

- Protection: IP66
- Operating room temperature: -40°C to + 65°C @ humidity 90%.
- Integrated infrared projector: Adjustable light intensity depending on the zoom ratio.

#### **4.1.7-50 "LED MONITORS - VIDEOWALL**

For monitoring in Videowall 2 x 4, 50" LED Backlit TFT LCD monitors must be installed, with Full HD 1920 x 1080 resolution, uniform brightness, wide field of view 178° H / 178°V, equipped with controller for joining several video signals (multi-scenarios).

##### **Mandatory Features:**

- Colors: 16.7 M
- High definition
- Cashier:. Ultra-slim metal
- Continuous operation: 24 hours (low maintenance cost)
- Power: 240V 50Hz
- Dimensions: 1022.08 mm x 576.67 mm x 120.2 mm
- Adjustable wall mounting bracket: included

#### **4.1.8-21" LED MONITORS**

The 21" monitors, to support operators (2 monitors / operator) to be installed in the command and control room and in the main entrance of the installations, must be LED Backlit TFT LCD, with Full HD resolution 1920 x 1080, wide field of view 170° H / 160°V.

##### **They must have the following mandatory characteristics:**

- Pixel Pitch (H x V): 0.248mm x 0.248mm.
- BNC input: 1 input and 1 output

- Maximum consumption: 0.5 W (Standby)
- Plastic box
- Power: 240V 50Hz
- Adjustable wall mounting bracket: included

#### **4.1.9- MULTIFUNCTION KEYBOARD (OPERATORS - SECURITY ROOM)**

The multifunction CCTV command and control keypads, to be installed in the command and control room and entrance by each operator, must be console type with an alphanumeric LCD display of 2 lines of text, with a joystick operating in 3 axes, for command of mobile video cameras, allowing to control up to 255 cameras, RS232 / RS485 communication, with USB function.

##### **Mandatory features:**

- Communications port: RS-485 / RS-422 up to 1.2 km away
- Joystick: 3 axes with included PAN & TILT speed variation
- Alphanumeric LCD display: 2 lines x 16 characters;
- Programming of mobile cameras, respectively, automatic visualization, pre-positioning, patrols and patterns;
- Power: 12V DC
- Operating temperature: 0° - 45°C
- Humidity: 10% to 70% without condensation

#### **4.1.10-REMOTE ACCESS**

The System must be accessible from other points of the installation as long as there is a network point.

##### **Mandatory features:**

- Real-time video (licensed) software for mobile devices;
- Handling of cameras in real time;
- Viewing up to 4 channels simultaneously;
- Remote configuration, administration of multiple devices;

- Real time video streaming;
- Transmission pot TCP / IP;
- Compatible with recorders, IP cameras and video servers.

#### **4.1.11- REMOTE CONNECTION OF THE SYSTEMS PERMANENTLY WITH THE SECURITY OPERATIONAL CENTER OF THE SUPPLIER COMPANY.**

It is a service that guarantees the monitoring of the alarm until the cause is fully investigated and the appropriate means are activated for the situation. The supplier's Operations Center, when receiving an alarm from an Instructional Detection System, immediately connects to the installation. At this stage, the call has two objectives:

- Confirmation of the alarm and determination of the cause of the alarm;
- Absence of response that can mean intrusion giving way to activate the means of intervention;
- Monitoring of technical alarms that are sometimes associated with temperature and humidity in the Datacenter;

#### **4.2- AUTOMATIC FIRE DETECTION SYSTEM (SADI)**

With the automatic fire detection and alarm system to be provided for the protection and safety of these installations, the intention is to guarantee the alarm and alert detection of a possible fire outbreak, as early as possible, by installing an intelligent fire detection system. addressable analog fires.

Basically, the system should ensure permanent monitoring of all areas of this complex, with unequivocal signaling of the element in alarm in the Security Room, and the respective commands acted automatically and / or manually controlled by the operator.

The interconnection of all devices, namely automatic detectors, alarm buttons, sirens and command interfaces, must be carried out via two conductors in a closed circuit (loop - ring), so that communication is done in two directions (redundant communication) from the central (CDI).

Each ring must have a minimum capacity to manage up to 199 addresses per loop.

It must support all the elements previously described, where each one will have its address that will be unique.

The maximum length of each loop should depend on the cable to be applied recommended by the manufacturer of the system proposed by each competitor, having to be self-extinguishing.

The order of addresses should be imposed by the exchange and not based on their physical distribution. However, whenever you want to add new devices to each loop, the system must be flexible enough so that you do not need to perform a new reprogramming, thus maintaining the entire structure previously defined.

It must also guarantee power to all devices (analog detectors, alarm buttons, sirens, command interfaces), without the need for any additional power.

For the protection of peripheral buildings, conventional automatic fire detection systems will be installed, which are described below.

#### **4.2.1- FIRE DETECTION CENTER (MASTER)**

For command and control management of the automatic fire detection system, a main addressable analog fire detection center (CDI) must be installed (MASTER), which should monitor all the devices on the communication lines, as well as the respective wiring. A change in the conditions of any sensor and / or conventional fire detection systems, must be signaled according to the analog values such as failure, pre-alarm, alarm or maintenance (cleaning). In case of small changes in sensitivity or environmental conditions, they should be automatically compensated within certain limits.

The control panel (CDI) must be equipped with 4 loops with a capacity for a maximum of 199 addressable elements per loop, expandable to 8 loops and allow monitoring up to 99 zones. It must signal optically and acoustically in case of alarm and pre-alarm (general and by zone) and these must always be given priority in relation to the fault indications.

Associated with the luminous acoustic indication, the CDI must have an alphanumeric liquid crystal display (LCD display) with 4 lines of 40 characters, where the following data is indicated:

- Alarm type
- Device that triggered it (loop and address)
- Device type (sensor type or interface)
- Zone
- Text with location indication **required in Portuguese**

The fault information occurs in a manner similar to that previously described in the alarm situation, but with a differentiated acoustic light indication.

The CDI must also have manual actuation buttons, in order to accept the alarm (with the silence of local acoustics), replacement and evacuation.

It must be fully programmable, so that the exploration is adaptable to each case, allowing the parameterization of the following conditions:

- Day - all siren commands and actions must be timed (except those originating from manual alarm buttons)
- Night - all siren commands and actions will be immediate
- Timings for alarm acceptance
- Replacement timings
- Timings for transmitting alarms remotely to firefighters
- Siren and command timing

It must have its own power and is supported by 2 batteries of 12V / 18Ah, so that the system remains in operation, even if the mains power supply fails, thus continuing to guarantee operation up to 72 hours at rest plus 5 minutes in alarm.

It should allow isolation from the CDI, of any element connected to the CDI through the communication lines ("loops"), without affecting the remaining elements of the loops.

It must be equipped with a printer for recording on paper all occurrences which must be physically incorporated in the panel of the exchange.

You must have an internal memory for recording history, for at least 4095 events in memory by date, time and place.

#### **Other mandatory features:**

- Operating voltage: 220 - 240 VA.C.Bit Internal bitonal siren: fault / alarm.
- Signals: Fire, Pre-alarm, new alarm, CPU failure, battery failure, power failure, fire / zone failure.
- Manual controls: turn on / off sirens, silence beetle and reset.
- **Must have EN 54-2 and EN 54-4 certification and CE mark.** (The competitor must present a copy of the certificate, under penalty of exclusion)
- Access to the control panel protected by numeric code
- Should incorporate IP module for TCP / IP networking

The exchange must be equipped with all modules, panels, equipment and accessories necessary for its correct operation.

#### **4.2.2- FIRE DETECTION CENTERS (SLAVES)**

For command and control monitoring of the automatic fire detection system in buildings, 2 central units / 2 local conventional SADI systems (CDICL)

should be installed, with the possibility of installing intermediate central units in the distance, which should monitor all existing devices and the respective wiring.

At the exchanges, the alert and alarm detection devices for buildings, the guardhouse and the flammable warehouse must be connected and include the possibilities of technical installations for drinking water and other relevant places. In these centers, all malfunction, pre-alarm and alarm situations must be signaled.

These two plants must be connected to the “Master” fire detection plant, in which all events of the referred peripheral buildings will be reported.

Each control panel (CDICL) must be equipped with 8 zones with a maximum capacity of 32 elements per zone and 2 12V / 7Ah batteries. It must signal optically and acoustically in case of alarm and pre-alarm (general), which must always be given priority in relation to the fault indications.

**They must have the following mandatory characteristics:**

- Siren outputs: 2 monitored outputs with 0 to 10 minute timings
- Alarm outputs: 1 output per NO / NC dry contact
- Fault outputs: 1 output per NO / NC dry contact
- Auxiliary outputs: 2 auxiliary controlled outputs 30V DC
- Housing: Metallic
- Protocols: RS485 MODBUS;
- **Must have EN 54 part 2 and EN 54 part 4 certification and CE mark.** (The competitor must present a copy of the certificate, under penalty of exclusion)
- Power supply: 230V AC
- Output voltage: 21 V DC
- Maximum consumption: 70VA @ 230V AC
- Integrated power supply: 2.2 A
- Consumption by zone at rest: 2 mA



- Operating temperature: -10° to + 50°C

### **4.2.3- ADDRESSABLE PERIPHERALS**

#### **4.2.3.1 OPTICAL SMOKE DETECTOR**

For the detection and alarm of a fire by the release of fumes, analogue and addressable optical sensors must be installed, operating according to the principle of light scattering in a darkroom (Tyndall effect).

**They must have the following mandatory characteristics:**

- Low profile, maximum height including 53.4mm base.
- Material: Fire retardant ABS.
- Base type: Universal and interchangeable.
- Easy installation: No danger of reversing polarity.
- Signaling of the state of conservation: Signaling at the CDI of its contamination status.
- Operating area: 80 - 100 m<sup>2</sup>
- Installation height: <11 m.
- Protection index: IP 40
- Operating voltage: 24-35 Vdc.
- Consumption at rest: 1 mA.
- Alarm consumption: 5 mA.
- Optical signaling in alarm: 2 red LEDs diametrically opposite, allowing its visibility in 360°.
- Status indicator: 1 pulsating red LED.
- Operating temperature: - 10 to + 50°C.
- Humidity: 20 - 95% RH
- Standards: according to EN54 part 7 and CE mark.

#### **4.2.3.2 THERMAL DETECTOR**

In order to detect alarms and warn of a possible outbreak of fires due to a rise in temperature, analogue and addressable thermal sensors should be

installed, according to the principle of variation of the electrical characteristics of the NTC thermistor element, depending on the temperature change of the location > 55°C, acting at from that level.

It must have the following mandatory characteristics:

- Low profile, maximum height including the 45 mm base.
- Material: Fire retardant ABS.
- Base type: Universal and interchangeable.
- Easy installation: No danger of reversing polarity.
- Signaling of the state of conservation: Signaling at the CDI of its contamination status.
- Operating area: 40 - 50 m<sup>2</sup>
- Installation height: <12 m.
- Protection index: IP 20
- Operating voltage: 24 - 35 Vdc.
- Consumption at rest: 1 mA.
- Alarm consumption: 5 mA.
- Optical signaling in alarm: 2 red LEDs diametrically opposite, allowing its visibility in 360°.
- Status indicator: 1 pulsating red LED.
- Operating temperature: - 10 to + 50°C.
- Humidity: 20 - 95% RH
- Standards: according to EN54 part 5 and CE mark.

#### **4.2.3.3 SMOKE DETECTOR BY INFRARED BEAMS**

To detect alarm and alert of a possible fire outbreak in the main warehouse, smoke detectors by infrared beams “Beam Detectors” should be installed on 2 levels, respectively, for monitoring the environment below the false ceiling and the environment in the empty ceiling ( between the real roof and the false roof). These detectors will consist of a transmitting receiver module and a reflecting mirror. They will be of the analog addressable type interconnected in the loops.

It must have the following mandatory characteristics:

- Emitter / receiver head: Motorized with ground level controller
- Coverage area: 1400 m<sup>2</sup> (range 100m x 14m)
- Material: Fire retardant ABS.
- Range of alarm sensitivity levels: 25% (1.25dB) to 50% (3dB) in 1% increments (0.05dB).
- Programmable alarm timings: 2 to 30 sec, in increments of 1 sec.
- Signaling of the state of conservation: Signaling at the CDI of its contamination status.
- Operating area: 1120 - 1400 m<sup>2</sup>
- Installation height: > 11 m and <25 m.
- Protection index: IP 65
- Operating voltage: 10.2 - 40 Vdc.
- Consumption at rest: 3 mA.
- Alarm consumption: 3 mA.
- Optical wavelength: 870nm.
- Operating temperature: - 10 to + 55°C.
- Humidity: 10 - 95% RH
- Type of reflector: Prismatic reflecting mirrors.

#### **4.2.3.4 ADDRESSABLE MANUAL ALARM PANEL**

To act by human action, by breaking the glass after confirmation of the eventual fire, analogue addressable manual alarm panels must be installed, with a built-in red LED optical signal.

The communication protocol between this detector and the control panel is a priority to the alarm triggered by any automatic detector / sensor.

They should be installed on escape routes, such as stair skates, exits from fire zones, emergency exits, exits to the outside, etc. and assembled a 1,5m do solo.

It must have the following mandatory characteristics:

- Equipped with built-in short circuit isolator
- Replacement: Easy via yellow switch on the front face
- Breaking glass protection: With hinged transparent cover
- Operating voltage: 24 - 35 Vdc.
- Consumption at rest: 1 mA.
- Operating consumption: 5 mA.
- Operating temperature: - 10°C to + 50°C.
- Relative humidity: 95%.
- Color: Red.
- Standards: according to EN54 part 11 and CE mark.

#### **4.2.3.5 ACTION INDICATORS**

For remote optical signaling of actuated detectors installed in compartmentalized areas, high luminous output action indicators should be installed. Its installation must be carried out on the doors of the closed compartments, on the false ceiling for signaling point detectors and infrared beams installed on the false ceiling deviations.

They must be fully compatible for operation with conventional and addressable analog detectors.

They must have a white body and red lens so that they can transmit an alarm signal according to a 180° field of view.

In terms of connections, they must be insensitive to the supply polarity.

The luminous power of this indicator must be ensured by 2 high-efficiency LEDs, with pulsating light in an alarm situation.

#### **It should have the following main characteristics:**

- Maximum distance between flag and detector: 100 m.
- Analog system supply voltage: 5 to 15 V DC.
- Conventional Supply voltage conventional system: 3 to 5 V DC.

- Resting current: <300A.
- Alarm current: 15 mA
- Operating temperature: 0 °C to +40 °C.
- Humidity: 85% RH without condensation
- Color of product: white
- Color of display: red

#### **4.2.3.6 ADDRESSABLE INTERIOR SIRENE**

For optical acoustic signaling of a possible fire outbreak, electronic acoustic optical alarm sirens, addressable with built-in short-circuit isolator, with two different tones and volume control and pulsating flash should be installed. It must incorporate a connection base for indoor use.

It should have the following main characteristics:

- Power supply: 24 to 35 V DC.
- Consumption at rest: 1mA.
- Alarm consumption: 5 - 50 mA
- Material: ABS body with high fire resistance
- Adjustable noise flow: 95 to 105 dB at 1 m.
- Flash intensity: W2, 4-2, 37, 5
- Working temperature: - 10 to + Color: red with red flash lens
- Protection: IP 65
- Standards: According to EN54 part 3

#### **4.2.3.7 EXTERNAL ALARM SIREN (UNIVERSAL)**

For signaling the external acoustic optical fire alarm, for addressable and conventional analog systems, electronic sirens with strobe, self-powered, with LEDs at rest, and with double tamper protection (wall and cover) must be installed.

They should be in A.B.S. red, with red optical lenses, with electronic circuit totally encapsulated in Epoxy Resin, to guarantee a high protection against humidity.

**It should have the following main characteristics:**

- Operating voltage: 12 or 24 VDC
- Consumption: 400 mA
- Number of piezo: 2 piezo of 110 dB
- Tones: 2 tones
- Noise flow: 115 dB
- IP grade: IP 65 and UV protection
- Operating temperature: -10° C to + 55° C
- Certification: EN 54-3: 2001, EN 54-3: 2001 / A1: 2002, EN 54-3: 2001 / A2: 2006

#### **4.2.3.8 CONVENTIONAL PERIPHERALS**

##### **4.2.3.8.1 CONVENTIONAL OPTICAL SMOKE DETECTOR**

For alert detection and alarm of a smoke release fire, conventional optical smoke detectors operating according to the principle of light scattering in the darkroom (Tyndall effect) must be installed.

They must have the following mandatory characteristics:

- Low profile, maximum height including the 45 mm base.
- Material: Fire retardant ABS.
- Base type: Universal and interchangeable.
- Easy installation: No danger of reversing polarity.
- Signaling of the state of conservation: Signaling at the CDI of its contamination status.
- Operating area: 80 - 100 m<sup>2</sup>
- Installation height: <11 m.
- Protection index: IP 40
- Operating voltage: 12-30 Vdc.

- Consumption at rest: 60 A.
- Alarm consumption: 40 mA.
- Optical signaling in alarm: 2 red LEDs diametrically opposite, allowing its visibility in 360°.
- Status indicator: 2 pulsating red LEDs.
- Operating temperature: - 10 to + 50°C.
- Humidity: 20 - 95% RH
- Standards: according to EN54 part 7 and CE mark.

#### **4.3.3.8.2 CONVENTIONAL THERMOVELOCIMETRIC DETECTOR**

In order to detect alarms and warn of a possible outbreak of fires due to a rise in temperature, conventional thermovelocimetric detectors should be installed, with a double thermal sensor, operating according to the principle of temperature comparison, activating from 55°C.

##### **It must have the following mandatory characteristics:**

- Low profile, maximum height including the 45 mm base.
- Material: Fire retardant ABS.
- Base type: Universal and interchangeable.
- Easy installation: No danger of reversing polarity.
- Operating area: 40 - 50 m<sup>2</sup>
- Installation height: <12 m.
- Protection index: IP 20
- Operating voltage: 12 - 30 Vdc.
- Consumption at rest: 40 A.
- Alarm consumption: 40 mA.
- Optical signaling in alarm: 2 red LEDs diametrically opposite, allowing its visibility in 360°.
- Operating temperature: - 10 to + 50°C.
- Humidity: 20 - 95% RH
- Standards: according to EN54 part 5 and CE mark.

#### **4.3.3.8.3 CONVENTIONAL MANUAL ALARM PANEL**

To act by human action, by breaking the glass after confirmation of the eventual fire, conventional manual alarm panels must be installed, with a built-in red LED optical signal.

The communication protocol between this detector and the control panel is a priority to the alarm triggered by any automatic detector / sensor.

They must be installed on escape routes, such as stair skates, exits from fire zones, emergency exits, exits to the outside, etc. and mounted 1.5m from the ground.

**It must have the following mandatory characteristics:**

- Replacement: Easy via yellow switch on the front face
- Breaking glass protection: With hinged transparent cover
- Operating voltage: 24 - 35 Vdc.
- Consumption at rest: 0 mA.
- Operating consumption: 35 mA.
- Operating temperature: - 10°C to + 50°C.
- Relative humidity: 95%.
- Color: Red.
- Standards: according to EN54 part 11 and CE mark.

#### **4.3.3.8.4 ACTION INDICATORS**

For remote optical signaling of actuated detectors installed in compartmentalized areas, high luminous output action indicators should be installed. Its installation must be carried out on the doors of the closed compartments, on the ceiling for signaling point detectors and infrared beams installed in the ceiling gaps.

They must be fully compatible for operation with conventional and addressable analog detectors.



They must have a white body and red lens so that they can transmit an alarm signal according to a 180° field of view.

In terms of connections, they must be insensitive to the supply polarity.

The luminous power of this indicator must be ensured by 2 high-efficiency LEDs, with pulsating light in an alarm situation.

**It should have the following main characteristics:**

- Maximum distance between flag and detector: 100 m.
- Analog system supply voltage: 5 to 15 V DC.
- Supply voltage conventional system: 3 to 5 V DC.
- Resting current: <300A.
- Alarm current: 15 mA
- Operating temperature: 0 °C to +40 °C.
- Humidity: 85% RH without condensation
- Color of product: white
- Display color: red

#### **4.3.3.8.5 CONVENTIONAL INTERIOR SIRENE**

For optical acoustic signaling of a possible fire outbreak, electronic acoustic optical alarm sirens, conventional multi-tones and pulsating flash must be installed.

It must incorporate a connection base for indoor use.

**It should have the following main characteristics:**

- Power supply: 20 to 30 V DC.
- Alarm consumption: 10 mA
- Material: ABS body with high fire resistance
- Noise flow: 97 dB at 1 m.
- Flash intensity: W2, 4-2, 37, 5
- Working temperature: - 10 to + 55° C.

- Humidity: 95% RH without condensation
- Color: red with red flash lens
- Protection: IP 21C

#### **4.4- INTEGRATED SYSTEM OF ACCESS CONTROL (BAG) AND INTRUSION DETECTION (SADIR)**

With the integrated access control system (SACA) and intrusion detection and alarm (SADIR) to be implemented, it should operate on a single platform, with the objective of controlling and conditioning access by external people and CMAM employees and monitoring against intrusion and theft from the Command and Control Room and Main Entrance, the various areas of the installations object of implementation of this system, as well as proceed to the respective registration of all events through biometric readers, proximity readers, keyboards, sensors and security modules. intrusion.

The type of protection abroad should be based on the use of long-range infrared beams, to constitute a type of protection that detects with a high level of security all threats coming from outside.

Access points must be managed by the controllers that make the System more reliable and secure even in the event of a cut in communications or power.

All accesses must be registered and it is possible to extract access reports based on various criteria, schedules, users, access groups, etc.

**In general terms, the system should be composed of:**

- i. Central server, with pre-installed command and control management software, for LAN network management of access control system doors, intrusion zones, remote controls allowing interconnection to the CCTV video surveillance system for event search with video image associated;

- ii. ii. Remote operation and registration station in the Main Ordinance, connected to the LAN / WLAN network, equipped with PC, Monitor, Keyboard, mouse and visitor registration reader;
- iii. iii. Operation stations supervising and monitoring events in the Security Room, interconnected on the LAN / WLAN network, each equipped with a PC, Monitor, Keyboard, mouse and protocol printer;
- iv. iv. Mixed readers with biometric reading and proximity "Mifare", for interconnection in LAN and WLAN networks;
- v. v. Door opening button, must be of the industrial type, "No - Touch" operation, sensor with a range of up to 10 cm, "dual color" red / green flag, single stainless steel front panel, weather resistant and anti-vandal.
- vi. saw. Green emergency entrance panel, for quick activation of the door opening in case of emergency, must be of the "plug and play" type, for surface mounting, with activation glass and easy reset, with anti-tamper protection cover, with ease operative testing by key, with highly reliable microswitch;
- vii. vii. Electromagnetic door closing, must be of the electromagnetic lock type, surface / surface mounting, with a holding force of 600Kgs, with position sensor for signaling open door;
- viii. viii. Recovery springs for doors, must be of the industrial type in aluminum from DORMA, Grade 1 hydraulic, with a minimum guarantee of 25 years, body of the watertight hydraulic mechanism, for surface mounting, with articulated double adjustment arm 180°-10° and 10°- 0°, must comply with UL10C and UBC 7.2 (1997) for positive pressure and comply with ANSI / BHMA A156.4 Grade 1 certifications;
- ix. Double magnetic contact, industrial type, for monitoring the status of the ADIL warehouse gate on level 0 of the central warehouse;
- x. Intrusion detection and alarm central and access control (SACA + SADIR), to be installed in the command and control room, with capacity for monitoring up to 520 zones and 64 doors, internal memory with capacity for 1,000 intrusion events and 1,000 users of access control properly equipped with TCP / IP networking module and batteries for emergency power;

- xi. Multifunction keypads, to be installed in the main Ordinance, administrative area of the central warehouse, command and control room and loading and unloading area (medication dispensing), with programming, activation / deactivation and command and control functions for the SADIR system, 32-character alphanumeric retro-lit LCD display, 16 backlit tactile buttons, with side opening protection cover, with “tamper” alarm, for wall mounting on the surface, with interconnection to the SADIR control panel;
- xii. Zone expanders, for interconnecting remote peripherals (sensors, buttons, magnetic contacts, sirens, etc.) with 8 inputs and 4 outputs fully programmable, in plastic box (ABS) with “tamper” protection, status LED and an internal beetle , interconnection to the SADIR plant;
- xiii. Zone expanders with power supply, for interconnection of remote peripherals (sensors, buttons, magnetic contacts, sirens, etc.) with 8 inputs and 2 fully programmable outputs, in a box with “tamper” protection, with a power supply that will ensure powering the local safety devices connected to the system;
- xiv. Door control expanders with power supply, for interconnecting and feeding access control readers, emergency opening and opening buttons, and electromagnetic locks of the access control system, interconnected with the SADIR control panel;
- xv. Panic buttons, for action by human action in the event of an attempted intrusion or theft in critical areas, namely the trimming area (loading and unloading of medicines) and reception of access to the administrative area;
- xvi. Dual technology indoor detectors, PIR and Microwave technology, immune to small animals for installation inside the central warehouse reception;
- xvii. Outdoor motion detectors, PIR technology for complementary and reinforced protection against intrusion through the balcony;
- xviii. Magnetic gate contacts, for monitoring open / closed status of truck access gates to the loading / unloading area (aviation);

- xix. External optical and acoustic sirens, for installation along the fence for optical-acoustic alarm in the event of any intrusions through the installations fence wall;
- xx. Network of power cables and equipment interconnection, including all associated accessories and construction services;

#### **4.4.1 MINIMUM TECHNICAL SPECIFICATIONS**

In supplying this SACA system, the competitor must comply with the minimum requirements that are described below.

##### **4.4.1.1 CENTRAL SERVER**

The central server must have the necessary technical characteristics to run the applications of the proposed competing system, and must have the following minimum characteristics below:

- Mounting: 1U chassis for 19 "rack mounting
- Processor: Intel Xeon E5-2640v2 8C / 16T 2.00GHz 20MB
- Memory RAM: 8GB (1x8GB) 1Rx4 L DDR3-1600 R ECC
- Data export support: DVD-RW supermulti slimline SATA
- HD: 2 x HDD SATA 6G 500GB 7.2K HOT PL 3.5 "BC

The central server must be installed in the cabinet rack inside the command and control room.

##### **4.4.1.2 MANAGEMENT SOFTWARE**

The integration of the systems in a single platform (SACA + SADIR) should occur in such a way that events / alarms in one of the (correlated) systems appear to the operator as if they were a single system, which is the central objective of the management software.

**It should include the following:**

- Software and licenses for systems and sensors (indicate which and reference);
- The software must be able to work and be used on one or more workstations simultaneously with the connection to be made via LAN;
- The software must run on / be compatible with the Windows Server 2012, Windows 7 and Windows 8 operating system;
- The software must allow the configuration of hardware devices;
- Allow the programming and data entry of people and access control cards;
- Allow the issuance of event reports and system data;
- Be able to handle at least 999 users;

#### **4.4.1.3 OPERATING STATIONS**

The operating stations must be of the modular type for 19 "rack mounting and must have the following minimum characteristics:

- Mounting: 1U chassis for 19"rack mounting
- Processor: Core i3-3220
- Memory: 4GB DDR3-1600
- DVD-RW supermulti slimline SATA
- HD: 2 x SATA III HDD 500GB 7.2k
- Ethernet Adapter: Intel 2x1Gb Ethernet Adapter I350-T2
- Graphics card: NVIDIA GEFORCE GTX 780
- OS: Windows 8.1 Pro
- 2 Monitors: PHILIPS 21.5"LED; DVI-D; VGA; VESA; SA PLUG
- Mouse and keyboard: Wireless

#### **4.4.1.4 BIOMETRY AND PROXIMITY MIXED READER**

The access control reader for interconnection in LAN and WLAN networks, must have a minimum degree of protection IP65, highly resistant to dust and humidity, with built-in 400MHz DSP microprocessor, 16MB RAM plus

8MB flash memory, Wiegand interface, with 128 x 64 monochrome alphanumeric LCD display, multicolored optical beacons, multi-tone acoustic beacon, with associated technical command module, and with the following minimum characteristics:

- Minimum biometric reading 5,000 users and 10,000 templates
- Identification speed: 2,000 / sec
- Log capacity: 50,000 events
- Mifare Proximity Reading @ 13.56 MHz
- Optical sensor resolution: 500 dpi
- Ports: 1 RS-485 and 1 TCP / IP
- Entries: 2
- Operating temperature range: -20° to 50°C
- Built-in tamper protection
- Power supply: 12V DC

#### **4.4.1.5 OPENING BUTTON**

The exit opening button, must be of the industrial type, for wall mounting, weather resistant and anti-vandal, “No – Touch” operation, with a single stainless steel front plate, it must incorporate an infrared sensor with a range up to 10 cm , and must have the following minimum technical characteristics:

- Input: 25mA at rest and 70mA activated @ 12V DC or 24V DC
- Output: DPDT 3 Dry contact
- Activation: 5 seconds
- Dual optical signaling: Red at rest) and green activated
- Dimensions: 114 x 70 x 25 (mm)

#### **4.4.1.6 GREEN OPENING PANEL IN CASE OF EMERGENCY**

The entrance panel in case of emergency, must be of the industrial type, for wall mounting on the surface, with activation and reset glass, green

color, with anti-tamper protection cover, and must have the following minimum technical characteristics:

- Dimensions: 93x89x59.5mm
- IP24D protection index
- Operating temperature: -10°C to + 55°C
- Cables: 0.5 - 2.5 mm<sup>2</sup>
- Contacts: 2nd @ 30V DC
- Material: PC ABS

#### **4.4.1.7 ELECTROMAGNETIC LOCK**

Should be of the type "fail safe" electromagnetic lock, surface / surface mounting, with a holding force of 600Kgs, with back plate, with position sensor for open door signaling, stainless steel body, with L fixing bracket and / or Z, and must have the following minimum technical characteristics:

- Dimensions: 266x73x40mm
- Power supply: 12/24 V DC
- Consumption: 450 mA (+/- 2.5% @ 13.5 V)
- Signaling: Double color Red / Green

#### **4.4.1.8 RECOVERY SPRINGS**

It must be of the industrial type in aluminum, body of the watertight hydraulic mechanism, for surface mounting, with double adjustment arm 180°-10° and 10°-0°, must comply with UL10C and UBC 7.2 (1997) for positive pressure and comply with the certifications ANSI / BHMA A156.4 Grade 1; and must have the following minimum technical characteristics:

- Door capacity: Minimum 65 kg

#### **4.4.1.10 INTRUSION AND THEFT ALARM DETECTION CENTER (CDIR)**



The CDIR exchange must have the mandatory capacity for a minimum of 520 wired zones and 120 non-wired zones, 2 exits to the X-BUS high-speed bus (expansion bus), be equipped with a TCP / IP network interconnection module, and it must unambiguously allow the individual status signaling of each of the peripherals and have the following mandatory technical characteristics:

- Housing: Metallic for wall mounting with “tamper” protection switch
  - Power supply: Integrated
  - Batteries: Equipped with 2 batteries of 12V 7Ah;
  - Minimum capacity: 520 zones, with a minimum of 8 zones in the exchange;
  - Areas: 60 fully programmable;
  - Door control capability: Max. 64 input only or 32 input / output
  - Capacity to interconnect door controller modules: minimum 32
  - User capacity: 512 users with different access levels;
  - Weekly programs: minimum 64 programs
  - Calendars: 64 (53-week calendar);
  - TCP / IP interconnection module: must be included;
  - Event memory: 10,000 intrusion events and 10,000 access events;
  - Central board outputs: 5 400mA outputs and 1 output with monopolar transition 30 VDC / max. 1A;
  - Number of interconnected keyboards: minimum 32 multifunction keyboards;
- 
- Mandatory interfaces: 4 BUS RS485, 1 RS232, Fast Programmer, Ethernet, and USB;
  - Remote access via LAN / WLAN: facility included
  - Command and control management software: Mandatorily included for installation in the Operation Desk supervising and monitoring intrusion events in the Security Room, running on Windows on PC Desktop and on mobile devices Smartphones and Tablets;
  - Communications ports: mandatory PSTN or GSM / GPRS;
  - Channels for audio verification: Minimum 16 channels;

- Operating temperature: -10 °C to +50 °C;

#### **4.4.1.11 MULTIFUNCTION KEYBOARD (CDIR)**

Multifunction keypads must be equipped with a 2-line, 16-character, backlit alphanumeric LCD display, 16 backlit tactile buttons, left side opening protection cover, optical status indicator, and must allow their connection to the CDIR via X-BUS and possess the following mandatory technical characteristics:

- Protection: Mandatory by contact “Tamper”;
- Programming and access: via PIN;
- Maximum consumption at rest: 70 mA
- Maximum operating consumption: 95 mA;
- Environmental class: Class II;
- Body: ABS with high impact resistance;
- Dimensions: 150 x 90 x 30 mm;
- Color: White;
- Certificate: CE

#### **4.4.1.12 ZONE EXPANDERS**

The zone expanders must be installed in a plastic box (ABS) with “Tamper” protection, and intended for the connection and individual addressing of different alarm devices, having the following mandatory technical characteristics:

- Entry Zones: 8 freely programmable mandatory entries;
- Output Zones: 4 freely programmable mandatory outputs
- Connection to the SADIR control panel: Via BUS RS485
- Power supply: 12 V DC via BUS;
- Current consumption: maximum 80 mA;
- RS485 BUS ports: Included
- LEDs and Indication beetle: included;

#### **4.4.1.13 ZONE EXPANDERS WITH POWER SUPPLY**

The zone expanders must be installed in a metallic box with “Tamper” protection, with the respective power supply and 12V 17Ah battery with the capacity to supply at least 2 X-BUS devices, and must have the following mandatory technical characteristics:

- Entry Zones: 8 freely programmable mandatory entries;
- Output Zones: 4 freely programmable mandatory outputs
- Connection to the SADIR control panel: Via BUS RS485
- Power supply: 230 V AC, + 10% / -15%, 50 Hz;
- Output voltage: 11 - 14 V DC
- Current consumption: maximum 117 mA @ 12 V DC;
- Auxiliary voltage (nominal): maximum 1500 mA at 12 V DC (750 mA per output)
- X-BUS Ports: Included

#### **4.4.1.14 DOOR EXPANDERS WITH POWER SUPPLY**

The door expanders must be installed in a metallic box with “Tamper” protection, with the respective power supply and 12V 17Ah battery and intended for the connection and individual addressing of devices intended for access control (card readers, opening and closing buttons). emergency opening and electromagnetic closures), and must have the following mandatory technical characteristics:

- Number of readers: 2
- Number of inputs: 4 freely programmable;
- Number of Outputs: 4 freely programmable
- Connection to the SADIR exchange: via RS485 BUS
- Power supply: 230 V AC, + 10% / -15%, 50 Hz;
- Output voltage: 11 - 14 V DC
- Current consumption: maximum 124 mA @ 12 V DC;

- Auxiliary voltage (nominal): maximum 1500 mA at 12 V DC (750 mA per output)
- Battery capacity: maximum 17 Ah / 12 V
- X-BUS interfaces: Included

#### **4.4.1.15 PANIC BUTTONS**

Panic buttons must be installed to act by human action in the event of an intrusion / theft / sabotage emergency, they must be installed in the main entrance, They must be of the push button type, robust construction, with gold-plated contacts for reliable operation at long term, with “tamper” protection against removal, with optical status indicator, silent relays, and have the following mandatory technical characteristics:

- Power supply: 30V DC / 100 mA;
- No. of tamper contacts: 1 35V DC / 50 mA contact;
- Body: ABS;
- Color white;
- Lifetime:> 10,000 activations at 40mA
- IP protection: IP35;
- Dimensions: 60 x 50 x 35mm;

#### **4.4.1.16 DOUBLE TECHNOLOGY DETECTORS (INTERIOR)**

For monitoring and intrusion detection outside the premises, dual technology intrusion detectors, PIR and Microwave, immune to small animals up to 45Kgs (reduction of false alarms), with “Anti-Mask” protection system should be installed. ”“ Tamper ”against removal and opening, as a complementary means of motion detection. They must be of robust construction, easy installation “plug and play”, and have the following mandatory technical characteristics:

- Power supply: 9V to 15V DC;
- Range: Minimum 16m x 22m;

- Microwave frequencies: 10,525 GHz
- RF Immunity: 20V / m 10-1000 MHz, 15V / m, 1000-2700 MHz
- Immunity to white light PIR: 6,500 lux;
- Filter against fluorescent light: 50Hz / 60Hz;
- Certifications: EN50131-2-2 Grade 2 Class II;

#### **4.4.1.17 MOTION DETECTORS DOUBLE PIR + MO TECHNOLOGY (OUTSIDE)**

They must be of robust construction, easy to install and have the following mandatory technical characteristics:

- Power supply: 9.6V to 16V DC;
- Range: Minimum 12m x 22m;
- Microwave frequencies: 24,125 GHz;
- RF immunity: 10 V / m + 80% AM from 80 MHz to 2GHz;
- IP protection index: IP65
- Dimensions: 200 x 86 x 80 mm

#### **4.4.1.18 MAGNETIC CONTACTS**

For monitoring the open / closed status of the truck access gates to the loading and unloading (aviation) zone, industrial-type magnetic contacts must be installed and must have the following mandatory technical characteristics:

- Industrial contact - adonisada box
- High security balanced
- High security balanced industrial contact
- GAP: min 1.9 / max 6.3 cm
- NF / C / NA - 2m wire cable

#### **4.4.1.19 EXTERNAL OPTICAL-ACOUSTIC SIRENES**

The external optical / acoustic alarm sirens, to be installed on the facade of the central warehouse and on posts strategically located next to the fence, must be electronic with strobe, body in A.B.S. in BLUE color with electronic circuit totally encapsulated in Epoxy Resin to guarantee its watertightness and high protection against humidity. Its action command must be ensured by CDIR.

**They must have the following main characteristics:**

- Operating voltage: 12 or 24 V DC
- Consumption: 68 mA
- Number of rings: 1
- Noise flow: 101 dB at 1 meter
- IP grade: IP 65
- Operating temperature: -10° C to + 55° C

#### **4.5- COMPLEMENTARY ELECTRICAL INFRASTRUCTURES**

The project includes supply, works and services that are implicitly considered to be necessary complements for the full functioning of the electronic security systems described above. This chapter is a complement to the previous chapters and is intended to draw attention to the need to include electrical supplies for all equipment, namely:

- NVRs
- Motorized chambers (PTZs)
- UPS's
- Switches
- Monitors
- Operation stations
- Central server
- Intrusion detection and alarm central
- Zone expanders
- Door expanders

The network of electrical power cables for the equipment must be dimensioned according to the characteristics of the solution proposed by the competitor, in view of the use of what is available in the pure electricity project. For this purpose, competitors must present the cable network layout diagrams to be used, as well as the respective technical characteristics of all materials to be applied.

The electrical infrastructures must consist of:

- Power feeders and main circuits;
- UPS's;
- Electrical panels with identification of the interior wiring, terminal strips also identified and trafficking labels for the identification of circuits, with respective single-line schemes;
- Infrastructures, cable trays, DLP rails and floor / walkway boxes as needed;
- The cable trays must include all the mounting accessories, namely joints, supports, suspensions, fixings, support profiles on the floor so that the cable track does not touch the slab, supports at intersections, etc;
- The pipes must be of the VD type or metallic;
- The DLP rails must be made of PVC with lids and a central separator to individualize the strong currents of the weak ones with dimension 150x50;
- PVC equipment boxes with dimensions suitable for the type of equipment they house;
- Watertight PVC derivation boxes, minimum dimensions of boxes 80x80x42mm - for VD16 and VD20 tubes up to a maximum of 5 inlets and 103x103x42mm - for VD25 tubes up to a maximum of 5 inlets, properly labeled;
- The junction boxes must include isolated terminals with direct connection, lids with nickel-plated or cadmium-plated screws and all assembly and installation accessories (nozzles, rigid PVC stops, glands, etc.);
- Cables type XV / XAV or XZ1, including accessories and complements necessary for a good assembly (clamps, terminals, markers, etc.);
- The cables and conductors of the interior electrifications (control, signaling devices, etc.) must circulate in plastic rails.

The electrical plumbing will be established according to the best rules of the art, adopting the routes that aim at an easy maintenance in the future, without neglecting the aesthetic aspect of the installation.

All international and Mozambican regulations and standards that are mandatory for this type of installation must be observed.

#### **4.6- STRUCTURED WIRING NETWORK: OTHER SERVICES AND CONVERGENCE (DATA, VOICE AND VIDEO)**

**Standardization:** structured cabling must be supported by standards so that current and future needs have a good degree of quality, capacity and equivalence.

**Oversizing:** Need for logical convergence with the use of multiple services over structured cabling / TCP network, all over IP including the **DATA, VOICE and IMAGE / VIDEO signal, including wireless network access points (Wi-Fi).**

With the structured cabling network, we intend to implement a network interconnecting all network devices of the CCTV, Access Control and Intrusion systems, in order to allow the installation of the most diverse types of devices that need to communicate with each other. This cabling network should serve as physical support for a set of applications, designed to satisfy the foreseeable needs, and eventual, of data transmission and image over IP.

The structured network will be implemented with UTP and fiber optic cable. The installation of racks should be considered, whose interconnection between them will be made through fiber optic cables, through different racks according to the needs.



The racks must be prepared for the placement of active and passive equipment.

The technical cabinets to be installed in the outdoor area must be watertight.

The structured network should be composed of:

- Wiring
- Backstage cabinets
- Active equipment
- Passive equipment

In supplying these, the supplier must comply with the minimum requirements that are described below.

#### **4.6.1- WIRING**

Set of specific cables for communications obeying the following distribution subsystems:

##### **4.6.1.1- HORIZONTAL DISTRIBUTION**

For the physical connection between the rack cabinets and the terminal sockets that make up the various network devices. Copper cable of the type UTP Cat. 6a of 4 twisted pairs should be considered in this wiring. This wiring will extend from the cabinet / rack to the socket at the workstation, to the cameras or any IP device.

The maximum length of each stitch must be observed up to the frame, which should not exceed 90m.

##### **4.6.1.2- VERTICAL DISTRIBUTION**

Intended for interconnection of the backstage. This distribution should be made in OM3 multimode glass fiber optic cables. Connections must be provided by connectors of the LC type or equivalent. The fiber optic cables

to be installed must comply with the standards recommended by ITU-T G651 for multimode cables.

#### **4.6.2- STORAGE CABINET**

The rack cabinets must be of the standard modular type (19 "rack) of 48 U main and 9 U the rest, built in treated and painted steel plate, provided with movable columns, equipment support guides and various accessories.

Backstage cabinets should be able to receive at least 2 PDU (Power Distribution Units) in order to cope with significant increases in consumption or the need for double supplies.

The main cabinet should be installed in the data center room. Other cabinets should be strategically distributed both outside and inside to cover all points where IP equipment will be installed.

All backstage cabinets must include:

- Cooling system;
- Open door signaling tamper connected to the intrusion system.

#### **4.6.3-ACTIVE EQUIPMENT**

The provision of network switches should be considered for the active equipment in terms of access to be installed in the rack's. The competitor must specify and quantify the switches indicating the distribution of the doors by the different points of use, and in what physical space they will occupy in the cabinets. State-of-the-art switches with "up-links" to the layer above 10 Gbit / s redundant in OM3 fiber and with PoE support for powering the cameras of the CCTV system. The supply of this equipment also includes the installation, parameterization and configuration necessary for the correct operation, including all the necessary calculations of the power to be supplied in PoE. A reserve on open doors should be considered for at least 20% of the points in each rack.

#### **4.6.4- PASSIVE EQUIPMENT**

Passive equipment is considered to be all components for distribution, termination and organization of cables located in the racks, namely:

- Patch panels;
- Interconnection cords (patch-cords);
- Management and routing panels for interconnection cords;
- Panels for organization of optical fibers, distribution and fixation of the cable terminations in vertical distribution, with LC / LC type adapters;
- RJ45 sockets for terminating the horizontal distribution cable to allow quick and effective connection of terminal equipment to the communications network (cases of operating stations);
- Equipment cords, for connecting the RJ45 terminal sockets to the terminal equipment of the workstation.

The installation of passive equipment must be in accordance with internationally applicable standards.

#### **4.7- LOCATION OF SECURITY SOLUTIONS**

**It is intended that the supplier performs** Assembly, Installation and Maintenance of Electronic Security Equipment in the strategically defined places, respectively in the main entrance, in the perimeter, entrances and exits including emergency doors, interior of the warehouse, in the loading and unloading docks, in the administrative services, server room and recording centers, warehouses for toxic and flammable products, PT and generators.

##### **4.7.1-LOCATION OF THE ACCESS CONTROL SYSTEM AND INTRUSION ALARM**

- A) Installation of common components
- B) Main Ordinance;
- C) Entrances to the Central Warehouse and Emergency Doors;

- D) Administrative services, server room and recording center;
- E) Warehouses of Toxic and Flammable products.

#### **4.7.2-LOCATION OF THE AUTOMATIC FIRE DETECTION SYSTEM**

- A) Installation of common components
- B) Main Ordinance;
- C) Emergency Generator Group;
- D) Truck Loading and Unloading Docks;
- E) Central Warehouse;
- F) Administrative Services;
- G) Warehouses of Toxic and Flammable products;

#### **4.7.3-VIDEOVIGILANCE SYSTEM-CCTV**

- A) Installation of common components
- B) Main Ordinance;
- C) Perimeter of the Central Warehouse;
- D) Emergency Generator Group;
- E) Central Warehouse (intermediate zones, dispensing, dispatch, laboratory);
- F) Entrance and Exit Pier;
- G) Administrative services, server room and recording center;
- H) Warehouses of Toxic and Flammable products

#### **4.8-SUPPLIES AND MISCELLANEOUS WORKS**

The following supplies and works are part of the Contractor:

- Presentation of descriptive memory, studies and drawings for carrying out the work;
- Drawings of services / work actually performed;
- Installation instructions and technical manuals;
- Tests, verifications and tests;
- Maintenance plan for installed equipment;

- **Guarantee of facilities and reserve materials. The mandatory warranty period must be at least 1 year;**
- Preventive maintenance plan that establishes the planned maintenance tasks, taking into account the rules of good practice, manufacturers' instructions and existing regulations;
- Training and monitoring during the exploration period. The trainees will be appointed by CMAM with the following profiles: central operators (2 trainees) and technicians (4 trainees). The duration of the training must be included in the competitor's proposal, and the monitoring during the initial exploration period must be at least 1 month.

#### **4.9-SEVERAL**

**The contractor / competitor is responsible for the following:**

Visit the site of the work in order to be aware of any constraints and assembly of the various equipment, operationalize the solution and make explicit in your proposal the restrictions or additional needs, taking into account the warehouse expansion project in progress, as well as sustainability of the solution to implement.

**Maputo, 02 November 2020**