

CUSCO CONSULAR AGENCY LFO

A&E DESIGN SERVICES

SPECIFICATIONS

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1. GENERAL

1.1 General Requirements

The Engineering services include design, analysis, site investigation, engineering calculations, cost estimating and preparation of working drawings and specifications for New Cusco Consular Agency LFO Office. These services are including final construction documents for the solicitation of bids.

The Engineering is providing drawings, specifications, cost estimate and supporting design analysis based on the requirements of the Statement of Work as part of documents for A&E Design Services supplied by U.S. Embassy Lima, Peru.

2. SITE DESCRIPTION

2.1 Site Description

The lease property is located on the second floor of a new three stories building located at Av. El Sol 449 in the city of Cusco, Peru. The first two floors are intended for office space, and upper level for apartments. The access to the building is through El Sol Avenue which is the most important business avenue in Cusco, and located next to Koricancha Temple. The access to second level is a hallway on the right side which leads to the elevator and stairwell in the back. The building includes a common access area from the street, elevator, and stair access to the second floor and a common use garden area in the rear of the building.

2.2 Site Conditions

Cusco city is part “Departamento” and “Provincia” of Cusco located at South-east of Peru 688, miles from Lima City, with the following site conditions:

- Altitude (above sea level) : 10,659 pies <3,249msnm>
- Temperature
 - Maximum : 75.2°F (24°C)
 - Minimum : 24.8°F (-4°C)
 - Average : 53°.0F (12°C)
- Relative Humidity
 - Maximum : 65%
 - Minimum : 46%
 - Average : 55%

- Rainfall
 - Rain : 732 mm (Dec to March)
 - Snow : Not reported

3 CODES AND STANDARDS

All design and details shall conform to the latest revision of the relevant standards, codes and regulations of the organizations listed below. These documents are declared to be a part of the specifications.

Where there is a conflict between these documents, the most stringent shall apply. All recommendations made in these documents shall be considered mandatory.

Applicable Standards:

ICBO	International Building Code. (2012).
ICBO	International Plumbing Code (2012).
ICBO	International Mechanical Code.
ASHRAE	American Society of Heating Refrigeration and Air conditioning Engineers.
SMACNA	Sheet Metal & Air conditioning Contractor's National Association.
NFPA 101	National Fire Protection Associations (2012). Life Safety Code.
NFPA No. 70.	National Electric Code (2014.)
NFPA 72	National Fire Alarm and Signaling Code (2013).
ACI	American Concrete Institute, 381.
USAF	Uniform Federal Accessibility Standards.
ADAAG	Americans with Disability Act Accessibility Guidelines.
ANSI	American National Standards Institute.
ASTM	American Society for Testing and Materials.
AWS	American Welding Society.
NEMA	National Electrical Manufacturer's Association.

Peruvian Local Codes:

CNE	Código Nacional de Electricidad (2011)
RNE	Reglamento Nacional de Edificaciones (2006)
ITINTEC	Instituto de Investigación Tecnológica Industrial y de Normas Técnicas.

4 SCOPE OF SERVICES

4.1 Design Objectives

The design works satisfy the following major objectives:

- (1) Completely functional and operational Cusco Consular Agency LFO within the identified scope.
- (2) Set of complete design and specifications for renovating an existing tenant area on the second floor of a commercial office building. Area includes approximately 154.6 square meters. Renovation includes new Consular Affairs office area.
- (3) Allow the construction contract bidder to submit a complete bid, covering the complete scope of work.

4.2 Design Requirements

According to the requirements of for the remodeling of existing facilities for the new Consular Agency LFO in Cusco, the project includes the development of the following engineering specialties.

- Mechanical (HVAC)
- Electrical
- Fire and Life Safety
- Telecommunications (Telephone / Data)
- Plumbing

4.3 Drawings and Documents

The project is integrated with drawings and technical specifications, which try to present and describe a set of essential parts for complete and satisfactory operation of the systems proposed, and therefore the contractor supply and put all those elements necessary for this purpose, whether or not specifically indicated in the drawings or specifications.

The new Consular Agency LFO in Cusco will occupy a place that is already built and must be refurbished, has been suitable develop as built drawings of the existing installations on the basis of drawings provided by the owner, but which were not updated. Many of these existing installations will be utilized as part of the new remodeling project.

As built drawings:

Drawing Number	Description	Scale
IE-1 of 8	As built Electrical Installation ceiling outlets	1/50
IE-2 of 8	As built Electrical installation wall outlets	1/50

List of Installations drawings:

Drawing Number	Description	Scale
IE-3 of 8	Lighting	1/50
IE-4 of 8	Fire Alarm	1/50
IE-5 of 8	Power Outlets	1/50
IE-6 of 8	Telephone & Data	1/50
IE-7 of 8	Electrical Panels and Legend	1/50
IE-8 of 8	Electrical Ground Floor	1/50
IM-1 of 2	Mechanical Floor Plan (HVAC)	1/75
IM-2 of 2	Mechanical Sections & Details	1/50
IS-1 of 1	Plumbing	1/50

Documents:

-Specifications

4.4 References

Drawings of Existing Facilities in El Sol Avenue 449 building:

Plano Second Level El Sol Av. II.EE (Electrical Installation)

Plano Second Level El Sol Av. II.SS (Plumbing Installation)

OBO International Building Code Supplements a. OBO Supplement to 2012 INTERNATIONAL BUILDING CODE (IBC):

OBO Supplement to 2011 NATIONAL ELECTRICAL CODE (NEC)

OBO Supplement to 2012 INTERNATIONAL PLUMBING CODE (IPC)

Field Testing and Inspection of Electrical Systems.

Security Classification Guide.

US Embassy Lima Inspection Report of existing facilities in El Sol 449 Avenue Building

5 SCOPE OF ENGINEERING DESIGN

5.1 Mechanical

5.1.1 Objective

The objective of the current document is to show all the Engineer standards and parameters that are considering for the mechanical ventilation system with positive pressure for the working area, ventilation for Data/Telephone closet and bathrooms of the Consular Office in Cusco. Also it establishes all practice to follow for performing the installation of the systems.

5.1.2 General

The design of Consular Office Cusco shall consider a mechanic ventilation system to provide positive pressure of general work area to the waiting area. This system will supply filtering fresh air to maintain the work area free of external pollution. Telephone and Data closet will have an axial extraction fan in the wall and a grille in bottom of the door to remove heat from the closet.

The Building is located in Cusco City in Peru at 3,249 above sea level.

5.1.3 Scope of Work

These specifications should be considered as requirements and minimum standards that should be accomplished by the ventilation mechanical contractor, for mounting, installation, ducts manufacturing, materials quality, capacity, equipment types and all general elements necessary for proper installation of the new system.

Mechanical contractor is responsible for proper execution of the Project, the specifications scope only include the main issues details, without include minor elements, the contractor must apply the better techniques for the installation in issues that are not described.

For performing work they should be used qualified workmanship, adequate tools, technical direction from a licensed Mechanical Engineer, as part of specialized Company with experience in management and installation of ventilation systems with same size and characteristics of the Project.

5.1.4 Supply and Installation

All equipment and devices supply that are shown in drawings and/or are required in the technical specifications, with all required devices for proper and normal operation, even if they are not show in the drawings and described in the specifications.

Procurement and Installation of:

- Injector helical-centrifugal Air fan, low noise for working area positive pressure.
- Portable air conditioner for telephone / data room and exhaust fan of mixed-flow, online, to help the equipment to expel the hot air from the condenser.
- 02 axial fans for mechanical ventilation of bathrooms.

Mechanical installation

- Installation of all mentioned equipment with all devices according to the drawings and current specifications.

Electrical connections

- The connections to the equipment will be using bushings and water proof metallic flexible conduit, from the outlets of the electrical network.

5.1.5 Design Conditions

Outdoor conditions

Outdoor temperature dry bulb	: 73.3°F
Temperature humidity bulb	: 51.7°F
Height above sea level	: 10,659 feet (3,249 m)

Indoor conditions: working area

Pressure	: Positive. 0.05" Water column
Temperature and Humidity	: Not controlled

Indoor conditions for Telephone and Data closet

Outdoor temperature dry bulb	: 74°F (+/-2°F)
Relative Humidity	: Not controlled

5.1.6 Ventilation Air Flow with Positive Pressure

According to ASHRAE standard 62-2001, for an office space the minimum flow to use is 17CFM/person. In our estimation it will be $17 \times 9 = 153$ CFM.

According to Peruvian standards (RNE) EM-030 the renovation of air flow for the same office space is 4 to 8 changes by hour. Taking the minimum value we have:

$$4/60 \times (5740 \text{ feet}^3) = 383 \text{ CFM}$$

Applying the correction factor by height of Cusco city to air flow, the correction factor about density of air at 10,659 feet high is 1.49. The air flow will be $383 \text{ CFM} \times 1.49 = 571 \text{ CFM}$.

It will take 750 CFM and complies with the RNE and ASHRAE. With this air flow over to 571 CFM, is being considered the air flows of expulsion of air conditioning condenser and the bathrooms exhaust.

Pressure inside working area will be 0.05" of water column, this value avoid the smoke incoming and is easy for opening the door, (a major pressure can produce a mayor effort for opening the doors).

5.1.7 Telephone and Data Closet Thermal Load

According to electric power consumption of the equipment list that will be located in the closet, the electric power loses by efficiency that will be transformed in heat is: 1,374.5 kW; applying the conversion factor $1W=3.413$ Btu/hr, give us thermal load of 4,691.2 Btu/hr.

We are selecting an air conditioning unit with a nominal total capacity of 13,000 Btu/hr. that equipment working in Cuzco gives a capacity of: $0.9 \times 13,000 = 11,700$ Btu/hr. Considering a factor of sensible heat of 0.6, this equipment enables a capacity of 7,020 Btu/hr. greater than that required of 4,691.2 Btu/hr.

5.1.8 Operation of Ventilation System with Positive Pressure

Working Area

See system working diagram in IM 1 drawing.

The injector will start from start/stop pushbutton. The injector motor will have 2 speeds (high and low). The low speed will be used when the air filter is new. When time pass and air flow decreases by air filter saturation, the equipment high speed will be used, and it will be manually operated from the other stage of the pushbutton starter.

The filtered air will go inside the working area through the diffusers and grilles. Part of air will go out through the consular window openings and the other part for the relief damper. The relief damper will be open when pressure in working area will be over 0.05" of water column in order to avoid over pressure in working area and that it could create difficulties for opening the doors to outdoor.

The air filter will be throw away type and it will be replaced each time it will be saturated and the air flow decreases.

Telephone and Data closet

It will be installed an air conditioning unit of 13,000 Btu/hr. The expulsion of hot condenser air will be with the help of a centrifugal fan, connected online to the expulsion of air from the sleeve and whose discharge of hot air will go to the front of the building through a 6"Ø PVC pipe. The air injector will have an interlock with the operation of the compressor of the equipment and the air injector will start whenever the compressor is running.

Bathrooms

Axial exhaust fans were installed in the place marked in drawings and will be started when the respective lighting switch for each bathroom is activated. When light (bipolar switch) switch is turned off, the fans continue operated 05 minutes, to evacuate the remaining gases. This is achieved by installing of a solid-state electronic timer with delay to shutdown, see outline of principle on drawing IM 1. Axial exhaust fans must have motor with built-in thermal protection or otherwise will be installed an overload relay corresponding to the amperage of the motor.

5.2 Electrical

5.2.1 Objective

The objective of this project is to develop a project of electrical systems quite reliable, safe, easy to maintain for the new Consular Office in Cusco; able to comply with all safety requirements as stipulated in OBO Standards and other international and local standards relating to electrical installations.

5.2.2 Power Supply

Power supply will be provided by concessionaire electrical in this case Electro Sur Este.

The electrical system of low voltage general lighting, outlets and strength will have the following characteristics:

Voltage (V)	220
Number of phases	3
Number of wires	3 phases + ground
Frequency (Hz)	60

Currently, the existing Office has contracted 8 Kw, three phases with the electrical supply company, Electro Sur Este S.A. supply number No 001 -0711073. We have recalculated the maximum demand for facilities of new Consular Office. The Maximum demand is 18.29 kW. It will be necessary increase the Power contracted for normal operation of the new Consular Office.

5.2.3 Scope of the Electrical Project

Includes the design of the electrical installations of interiors for the new Office that includes the following:

- Network of feeders from the existing Panel board and ne the new Subpanel board located in Telephone/Data closet.

- Panel boards one line diagrams
- Lighting circuits.
- Power outlets and receptacles.
- Protection grounding system.

The project has been developed on the basis of the respective architectural drawings.

The project has been developed taking into account the criteria of functionality, safety, maintenance and operation of electrical installations. From the General Board feeders with cables THHN will you leave is distributed to circuits, as it is the lighting, outlets for work stations, Telephone/data closet, kitchenette appliances, ventilations fans, office machines and water heater.

5.2.3.1 Lighting system

For the lighting system lighting system have been considered the following lighting levels:

- Waiting area. : 200 lux.
- Working area : 400 Lux.
- Bathrooms : 30 Lux

Have been installed fixtures with led lamps to limit maximum demand for lighting.

5.2.3.2 Emergency lighting system

It provided for a system of emergency lighting that matches the lighting of evacuation routes indicated on the drawings. That is, hall and passageways. These lights will turn on when the power supply is cut in the building. These luminaires are supplied power from an accumulator. These teams are composed of a battery charger, a battery, transferring equipment electronic and 2 lamps of 1.8W

5.2.3.3 Grounding system

The test of grounding system, according to the provided certificate submitted by the owner, the average metering is 5.6 Ohms which is signed with an electrician engineer. The Department Board is connected to the well of Earth of the building located on the 1st floor (back yard).

5.2.3.4 System of leakage to ground and people protection

System grounding protection and/or protection to people, in the present project, electric is composed of GFCI circuit breakers of 10 milliamps of sensitivity, installed in receptacle circuits after circuit protection switches. They are cutting the circuits when detect leakage currents of a live circuit grounding conductor. In the event that a person accidentally touched a live conductor (with power), automatically it will be protected by the differential switch, cutting the circuit.

5.2.4 Maximum Power Demand

5.2.4.1 Connected Load and Maximum Demand Calculations

The details of the calculations of the maximum demand of the local are indicated in the table Loads Schedule. The calculations have been developed according to the provisions of section 050 of the Peruvian standard National Code of Electricity - Use.

LOADS SCHEDULE ELECTRICAL PANEL TD-LCA			
CIRCUIT	CONNECTED LOAD (kW)	DEMAND FACTOR	MAXIMUM DEMAND (KW)
C1 LIGHTING WAITING AREA	0.93	1.0	0.93
C2 LIGHTING GENERAL WORK AREA	0.87	1.0	0.87
C3 RECEPTACLES CONSULAR WINDOWS	2.40	0.5	1.20
C4 RECEPTACLES WORK STATIONS	2.40	0.5	1.20
C5 RECEPTACLES GENERAL WORK AREA	2.00	0.5	1.00
C6 WATER HEATER BATHROOM OFFICE AREA	1.50	1.0	1.50
C7 LASER PRINTERS	2.65	0.8	2.12
C8 PHOTOCOPIER AND FAX MACHINE	1.98	0.8	1.58
C9 SHEREDER	1.50	0.8	1.20
C10 SUBPANELTEL/DATA	6.94	0.8	5.59
C11 AIR FAN	0.50	1.0	0.50
C12 RECEPTACLES WAITING AREA	1.20	0.5	0.60
MAXIMUM DEMAND= 18.29 KW CONNECTED LOAD = 24.87 KW			

LOADS SCHEDULE SUBPANEL STD-TEL/DATA			
CIRCUIT	CONNECTED LOAD (kW)	DEMAND FACTOR	MAXIMUM DEMAND (KW)
C21 UPS 2200 VA	1.98	0.8	1.58
C22 UPS 1400VA	1.26	0.8	1.01
C23 PBX UPS SYSTEM	1.10	0.8	0.88
C24 KICHENETTE APPLIANCES	2.40	0.8	1.92
C25 AXIAL FAN (600 CFM)	0.20	1.0	0.20
MAXIMUM DEMAND= 18.29 KW CONNECTED LOAD = 24.87 KW			

The maximum power demand determined for the new Consular Office is 18.29 KWs and include installations of lighting, electrical outlets, kitchenette, air fans water heaters, telephone and data equipment, office machines etc.

5.2.5 Tests

In Electrical part the following tests must be performed: continuity, voltage, load balancing, performance of lighting equipment, operation of all facilities at full load, measurement, etc. All these tests and measurements shall be certified by means of a test protocol with the participation of specialists from the case. The results of the measurements shall comply with the minimum requirements indicated in the Peruvian National Electrical Code.

5.2.5.1 About Isolation Tests

The value of the resistance of isolation, according to the Peruvian National Electrical Code - use, rule 300-130, table 24, between two sections of electrical installation located between two protection devices, disconnected all appliances that consume power shall be:

SERVICE NOMINAL VOLTAGE	VOLTAGE TEST (v)	ISOLATION RESISTANCE (MΩ)
Under or equal to 500V	500	≥ 0.5
Over to 500V	1000	≥ 1.0

Testing of insulation to be carried out will be:

- Between each of the active conductors and ground.
- Among all active conductors

5.3 Fire and Life Safety

5.3.1 Scope of Fire Alarm Project

The Fire Alarm Project has included the following:

- Evaluation the building fire alarm/detection system to comply with NFPA 72 requirements.
- Evaluation the fire protection system to assure that the life safety systems remain in compliance with applicable codes and standards.
- The design has included the following devices:
 - a) Addressable Fire Alarm System (existing in reception area Ground floor)
 - b) Smoke detection in the public spaces and open offices
 - c) Synchronized Horn/strobe devices (existing in elevator lobby)
 - d) Pull stations at the exits from each floor/office suite

5.3.2 Existing Addressable Fire Alarm System

Fire Alarm panel is located at the reception desk on the first floor of the building. Fire Alarm panel has the following characteristics: brand: Mircom; model: FA – 1025T and supervises the building corresponding to each of the offices that are located in each of the floors one of them correspond to the office where the new Consular Office will be.



Existing Fire Alarm Panel



Fire Alarm Panel Annunciator



Fire Alarm Panel connections

5.3.3 Fire Alarm Devices located in elevator lobby

The following fire alarm system devices are located in the elevator lobby located at each of the building floors:

- Smoke Detectors,
- Pull Station
- Strobe Bell

All these devices are connected to the Fire Alarm Panel fire through a riser from Fire Alarm Panel located at the reception to the Elevator Lobby on each of the floors.

In the Elevator lobby also is located a fire extinguisher.



Elevator Lobby Pull Station and Strobe Bell



Box Fire Alarm Riser

5.3.3 Fire Alarm Devices located in Consular Office

In Consular Office will be located the following Fire Alarm devices:

- Waiting Area : 2 Smoke Detectors
- Working Area : 2 Smoke Detectors + 1 Pull Station
- Telephone and Data closet : 1 Smoke Detector

5.4 Telecommunications

5.4.1 Scope of Telecommunications Project

The telecommunications design consist of a structured horizontal cable plant on one floor of a commercial office building including cabinets, cable tray, horizontal Category 6 cabling to the stations, outlets, faceplates, termination blocks, patch panels, and patch cords

- Each standard work area outlet (WAO) consist of four (4) Category 6 (CAT6) rated RJ-45 jacks on a single gang faceplate. The first RJ-45 jack will be blue color and shall support a blue, plenum-rated CAT6 cable in support of voice connectivity. The second RJ-45 jack shall be orange color and shall support an orange, plenum-rated CAT6 cable in support of data (internet) connectivity. The third RJ-45 shall be green color and shall support a green, plenum-rated CAT6 cable in support of data (internet) connectivity. The fourth RJ-45 jack shall be yellow color and shall support a yellow, plenum-rated CAT6 cable in support of voice or data (internet) connectivity.
- Intercom: Automated access control and remote door opener from office to main street door is provided by Landlord. Contractor shall design the relocation of the equipment on the office side.
- Design of three (3) color-coded patch panels (orange, green, and yellow) in the wiring closet. The cabling will be extended from each WAO to the wiring closet and install in the corresponding color-matched patch panel.
- Design of twelve (12) frame-mounted Bix-style telephone cross-connect blocks in the wiring closet in two groups of six (6) each. Extend the blue cabling from each WAO to the wiring closet and terminate in one group of six (6) Bix blocks to serve as telephone house cabling.

5.4.2 Equipment located in Telephone / Data closet

The following equipment will be located in data closet

- UPS 2200VA
- Server
- UPS 1400 VA
- Floor Cabinet (24U)
With the following equipment inside:
Router /Core Switch

Client Switch
Encryptor
Phone switch (PBX) - IP Office 500V2

- PBX UPS

5.4.3 Installation

For communications circuits, such as telephone and Data the scope of work only will be included boxes, EMT conduit according to size that is indicated in drawings and raceways.

In Tel/ Data closet the wiring will be through snake tray 5" H x 5" W and it must be installed at 15" from the ceiling.

All size of the boxes are indicate in the drawings.

5.5 Plumbing

5.5.1 General

The project includes the modifications in the existing bathrooms of the new Consular Office in Cusco including the following works:

5.5.2 Public toilet (waiting room)

Located in the waiting room, public bath will also use of disabled persons, to which the following modifications must be performed:

- Relocation of the sink and the toilet to allow the rotation of the wheelchair, and demolition of part of the finished floor to relocate the toilet and the sink drain points.
- Relocation of the water outlets, It will be necessary demolishing part of the walls
- Modification of the access door.



Existing sink counter



Existing Toilet Sewage

5.5.3 Office Area Bathroom

This bath will be located in the area of work of the Office and the following renovations must be carried out:

- Change of the existing Water Heater and the connection of water points to the new 150 liters Water heater located in the closet that on the side.
- Demolition of the floor to allow water and drain connections to the new kitchenette to be built on the side of the bathroom door.



Existing Office Bathroom

5.5.4 New Kitchenette

The new kitchenette will be located next to the bathroom of the Office Area and the installation of a new sink with their respective fixtures and connections for water and drain outlets.

6 SPECIFICATIONS

6.1 Mechanical

6.1.1 Pressure System for Office Working Area

6.1.1.1 Air Injector

It will be on line type, low level noise, steel body and support, protected by epoxy polyester paint. Inside fiber glass isolation for noise absorbent, exterior frame sandwich type. Air intake with aerodynamic design for improving the air incoming and lower the noise level. Active disassembly body without contact with raceways, single phase motor 230V-50/60Hz, 2 speeds, with aluminum injection external rotor, condenser and thermal protection included. The maximum noise level permitted will be 48 Dba. The coupling drive - propeller motor will be direct. The Injector will be selected for Cusco city operation, with the following technical characteristics:

- Equipment : Air Injector
- Type : Mixed flow on line (Helical-centrifugal)
- Air Flow : 750 CFM
- Static Pressure Dissipation : 0.53" of water column
- Height above sea level : 3,249 m (10,659feet)
- Voltage : 220V-1Ø-60Hz
- Speed : 02
- Thermal protection : Included
- Noise level : 48 Dba

Brand: Soler & Palau, model: TD-200/315 SILENT, or similar.

6.1.1.2 Hot Air Exhaust Fan for A/C unit condenser:

It will be online, built both the body and the supports in steel sheet protected by epoxy polyester paint. The Equipment inlet for aspiration will have an aerodynamic design to improve air intake and reduce the level of sound. The active body will be disassembly without touching the ducts, single-phase motor 230V-50/60 Hz, 2 speeds, with external aluminum rotor for injection , capacitor and built-in thermal protector. The maximum permitted noise level will be 48 DBA. Transmission engine propeller will be direct. The Fan will draw hot air from the condenser, so it should be selected to work in atmosphere of 140F. The injector will be selected for operation in Cusco, with the following specifications:

- Equipment : Exhaust fan
- Type : Mixed flow on line (Helical-centrifugal)

- Air Flow : 260 CFM
- Static Pressure Dissipation : 0.2" of water column
- Height above sea level : 3,249 m (10,659feet)
- Voltage : 220V-1Ø-60Hz
- Speed : 02
- Thermal protection : Included
- Noise level : 48 Dba

Brand: Soler & Palau, model: TD-500/160, or similar.

6.1.1.3 Air filter

It will be throw away type, polyester made with cartridge frame and holed metal sheet. The report of efficiency minimum value (MERV) will be 7. Since all filters are throw-away the vendor must be supply a 10 units package with the same size. The technical characteristics are:

- Filter type : Throw away
- Dimensions : 20"x20"x20"
- Filtering material : Polyester
- Efficiency : 7
- Pressure drop at 300FBM : 0.04" of water column
- Brands : Air Handler, Aerostar

6.1.1.4 Metal Ducts

They will be made and installed according to size and layout show in the drawings, all metal ducts for ventilation.

The contractor should check all dimensions, verify if there are obstructions and recommend changes in case that will be necessary without additional cost, and they will be submitted to Supervisor Engineer approval.

For duct fabrication it will be used better quality steel galvanized sheets zinc-grip type or similar.

In general it will be necessary comply with recommended SMACNA (Sheet Metal and Air Conditioning contractors National Association, inc) standards.

For manufacturing the ducts work will be following the next instructions:

Gages	Thickness		Ducts
	Inches	mmm	
26	1/54	0.5	up to 12"
24	1/40	0.6	13" to 30"
22	1/27	0.9	31" to 54"
20	1/24	1.0	55" to 84"
18	1/20	1.3	83" and over

All ducts will strongly fix to ceilings and walls with expansion bolts. Supports will be with black steel angle 1 1/2"x1 1/2"x1/8", anticorrosive treatment and with two coats of finishing paint. The union between ducts and equipment will be performed with flexible joints of heavy vinyl canvas and 4" wide neoprene and fixing with clamps and gaskets for hermetic sealed. All transitions will be made with 25% of slope. All short radius bends of current section ducts should have guides according to SMACNA details.

6.1.1.5 Filters- Holder box

It will be of galvanized steel sheet 1/27 gage, according to drawings dimensions, it will have a track to place a filter with nominal dimensions of 20"x20"x2" and a register cover for remove the filter from the side (technician from the second floor window). The filter-holder box will be connected to the extraction duct and will be attached to the wall with the same color of the wall.

6.1.1.6 Diffusers

It will be supplied and installed according to dimensions and locations as show in the drawings. They will make in steel galvanized with "wash-primer" base paint and enamel finish paint, according to the following indications:

- The diffusers with 18" in the bigger side and smaller they were built with a 1/27" steel sheet frame and with 1/54" steel sheet blades.
- The diffusers with bigger side is over 18", they were built with 1/24" steel sheet frame and with 1/40" steel sheet blades.
- They will have damper with opposing blades manually operated for air flow regulation.
- All pieces will paint with "wash-primer" base paint and enamel paint for finish paint with color according to owner recommendations.

6.1.1.7 Grille for air discharge

They will supply and will install according to locations and dimensions shown in the drawings. They will be built in galvanized steel sheet with "wash-primer" base paint and enamel of finish paint, according to the following indications:

- Discharge grilles with double deflection with horizontal and vertical bars.
- All pieces will be made with 1/27" thickness galvanized steel sheets and 1/54" steel sheets for blades.

- They will have damper with opposing blades manually operated for air flow regulation.
- All pieces will be painted with “wash-primer” base paint and enamel paint for finish paint with color according to owner recommendations.

6.1.1.8 Door grille

It will be made during the door made with the dimensions shown in the drawings.

6.1.1.9 Relief Damper

Will be for vertical installation on wall, aluminum made, pivoting over ball bearings to minimize friction. The casement will have counter weights to regulate the opening pressure. The damper will be without frame with nominal dimension of 8”x8”. The opening pressure will be 0.05” of water column. Accepted brand: Greenheck model BR-30 or similar.

6.1.1.10 Pushbutton Start Stop

It will be of two stages for start and stop the air injector, each stage will start each one of the equipment speed.

6.1.2 HVAC System for Telephone and Data Closet and bathrooms

6.1.2.1 Air Conditioning System for Telephone & Data Closet

The Air conditioning will be the portable type for heavy work, working 24 hours a day. The refrigerant will be ecological R410.

The equipment will have a system of self-assessment, with freeze protection thermostat and temperature control thermostat. It will have a drip pan for condensate and condensate overflow protection system. The equipment will have a flexible sleeve. The technical characteristics are as follows:

- Equipment : Air conditioning cold only
- Type : Portable
- Capacity : 13,000 Btu/hr
- Coolant : Ecological R410A
- Working height : 3, 249msnm (10659pies)
- Automatic re-boot : Yes
- Electrical Characteristics : 220V-1-60 Hz.

If the equipment comes in 110V, it will have to include the respective transformer with power recommended by the manufacturer.

Accepted brand: Airrex, Friedrich, Delonghi.

6.1.2.2 Exhaust fan for Bathrooms

It will be axial decorative type, for wall installation. The motor will be single phase with thermal protection incorporated. The technical characteristics are the following:

- Equipment : Air extractor
- Type : Decorative for wall installation
- Air flow : 250 CFM
- Static Pressure Dissip. : Free discharge
- Height (above sea level) : 3249 mm (10659 feet)
- Electrical Characteristics : 220V-1Ø-60Hz
- Thermal protection : Included
- Noise level : 46DbA

Brands: Canarm, Soler & Palau, model: HV or similar

Timer with delay to shutdown

It will be the electronic type of solid state timer, adjustable from 0 to 5 minutes. The contact will be closed 5 minutes after the off switch is open. Input voltage is 220VAC, contacts will withstand 10A resistive current.

Brands: Airotronics, ICM, Mars or similar.

6.1.3 Electrical Installation

It will be performed according to Peruvian Electrical Code and National Electrical (NEC), for power outlets and ground line for all the equipment.

The electrical connections for power and control will be part of the electrical contractor.

6.1.4 Warranty

It will be for one year, against manufacturing defects and other invisible damage.

6.1.5 Test and Balance

All tests and adjustments of ventilation system with positive pressure and ventilation for Telephone and Data closet will be supervised by the in charge of installation Engineer; for all tests and calibrations they will follow the vendor instructions.

Once the owner is informed that the system is balance, they should verify his presence in all tests that is required his checking.

Mechanical contractor hand over the proceedings with the following:

- Descriptive Memory of all works performed
- Equipment list with brands, model and series.

- Maintenance schedule
- Test records
- As built set drawings

6.2 Electrical

6.2.1 Objective

Subject of plans and specifications is finish the work, and leave ready to run all systems of the project. Any work, material and equipment that is not displayed in the specifications, but appearing on the drawings, and vice versa, and that is needed to complete the installation, will be supplied, installed and tested by the contractor free of charge to the owner. Minor details of works and materials not usually shown in the plans and specifications, but necessary for the installation, it should include in the work of the contractors, just as if it had shown in the documents.

6.2.2 About Materials

The characteristics of the materials are specified in the plans. Materials to be used shall be new, of recognized quality, first use and current utilization in the national and international market. Any material that arrives late to work, or that damage during the execution of the works, will be replaced by another equally in good condition. Work inspector will indicate in writing to the contractor the use of a material amount of data does not prevent its use. Materials must be kept in the work properly, especially following the indications given by the manufacturer and the manuals of facilities. If by not be placed properly, occasionally given to person and equipment, the data must be repaired on behalf of the contractor, no cost to the owner.

6.2.3 Cables

6.2.3.1 Cables THHN

These cables will be copper electrolytic, hard drawn, 99.9% of conductivity THHN isolation type for general purpose building wire for services, feeders and branch circuits. For THHN applications, the conductor is appropriate for use in dry locations not to exceed 90°C.

Cable Specifications:

Operating voltage: 600 volts.

Operating temperature: 70 °C

Insulation:

- Color-coded premium-grade flame-retardant, heat- and moisture-resistant Polyvinyl Chloride (PVC)

Jacket:

- Tough Polyamide (Nylon)

Manufacturing standard:

- ASTM B3 and B8
- UL Standard 83 – THHN/THWN-2
- ICEA S-95-658/NEMA WC70
- NEC® Article 310
- c(UL) – T90 Nylon

The minimum size to be used will be 4 mm 2 (12 AWG).

CHARACTERISTICS CABLE TYPE THHN						
SIZE (AWG)	SIZE (mm ²)	N° OF WIRES	ISOLATION / NYLON THICKNESS (mm)	NOMINAL CABLE O.D. (mm)	WEIGHT (Kg/Km)	AMPACITY (A)
12	3.31	1	0.38/0.10	3.05	34	25
10	5.26	1	0.51/0.10	3.78	55	35
8	8.367	19	0.76/0.13	5.7	94	50
6	13.3	19	0.76/0.13	6.7	141	65
4	21.15	19	1.02/0.15	8.5	228	85
2	33.62	19	1.02/0.15	10.1	348	115
1/0	53.48	19	1.27/0.18	12.7	554	150
2/0	67.43	19	1.27/0.18	13.9	687	175
3/0	85.1	19	1.27/0.18	15.2	851	200

Temp.

environment.= 30°C Temp. of conductor operation = 75°C

6.2.3.4 Cables Installation

All cables will be continuous from box to box, and run the joints so that they aren't on the inside of the duct. Joints of the conductors of power among board's boxed lines will be welded or with staples or copper terminals protected and properly insulated with gutta-percha and vulcanizing tape and mechanically and electrically tied. Before wiring, they will be cleaned and they dry up the pipes and boxes, to facilitate the passage of wires will be used powders or stearine, and not use greases or oils.

6.2.4 Distribution Panels

Design new electrical feeders for the existing panel and a new electrical subpanel within the Telephone and Data closet. Panel board shall have main circuit breakers, protection switches, copper phase, and ground bus.

They are formed from two parts:

- Cabinet: consists of box, frame and cover with sheet metal, vertical bars for normal switches, ground bar, door, circuit's directory and other accessories.
- Protection switches, SPDs (former TVSS), bolt-on type circuit breakers.

6.2.4.1 Box

It will be recessed in the wall, built of iron galvanized sheet of 1.58 mm thickness, as a minimum, must bring hollow blind on its four sides, of varied diameter: 20, 25, 35, 40 mm, etc. according to the feeders.

6.2.4.2 Frame and Cover

They will be made of the same material of the box, must be bolted to it.

The framework will be a plate that covers the switches.

The cover must be painted dark grey and they shall show the name of the Board on the front. The panel board should be hinged door, door-in-door construction and it should be also include the lock, as well as a directory of the circuits controlling each switch.

6.2.4.3 Bars and accessories

The bars must be placed isolated to the Cabinet to exactly meet the specifications of "DEAD FRONT PANELS". The bars will be copper electrolyte with a minimum capacity of double circuit breakers amperage.

Bars will have to connect the different grounds for all circuits; this will be done by screws.

6.2.4.4 Circuit Breakers

Circuits Breakers will be Thermo-magnetic type, must be made to work in hard climatic conditions and service, allowing a safe protection and a good use of the section of the line. The body shall be constructed of a highly heat-resistant insulating material. The contacts will be in silver alloy hardened which ensure a good electrical contact. The ability to short circuit current interruption will have the following values:

- From 15 to 90A ----- 10 KA
- From 100 to 600A ----- 20 KA



Existing Electrical Panel

6.2.4.5 Ground Fault Protection GFCI Circuit Breakers

Standard Ground Fault Circuit Interrupter (GFCI) receptacles don't work properly with Peruvian electrical system (single phase 220V Line to Line, without neutral).

GFCI receptacles shall not be used. Outlets designated for GFCI protection shall be fed from a GFCI circuit breaker. One GFCI breaker, rated for 10 mA ground fault trip, 60 Hz, 220V (line to line) shall be installed in the branch circuit before to the first receptacle. This breaker will provide ground fault protection for all receptacles in the circuit.

GFCI circuit breakers have the main function to protect human life through disconnection of an electrical circuit when there is a direct or indirect contact of the person to a part of the circuit where there are failures of isolation.

These switches will be esthetically and dimensionally compatible with the circuit breakers, and they will be installed on horizontal rails in the system BT-DIN as we can see in the existing electrical panel.

6.2.4.6 Transient Voltage Surge Suppression (TVSS)

The purpose of TVSS is to eliminate or reduce damage to critical equipment by limiting transient voltages and currents on electrical circuits. High-energy surges can be harmful to many loads, causing component degradation, temporary or

definite shut down.

Brand: Emerson model: NFT 305 09, Square D model: Surgelagic or similar

6.2.5 Conduits

The existing conduits embedded in concrete are heavy duty PVC nonmetallic conduits for the existing lighting circuits and outlets and other feeders indicated in the as built drawings. The minimum used diameter will be 20 mm. All new conduits in reflecting ceilings, drywalls and telephone and data wires distribution will be EMT metallic conduit the minimum diameter will be 20mm.

The new conduits shall be free from contact with pipes of other facilities. More than 3 bends between box and box will not be allowed.

Bending and setting of conduits must be done with special bending apparatus manufactured for the purpose and which are obtainable from the manufacturers of the conduit systems.

Damage to conduits resulting from the use of incorrect bending apparatus or methods applied must on indication by the Engineer, be completely removed and rectified and any wiring already drawn into such damaged conduits must be completely renewed at the contractor's expense.

Conduits may not be installed closer than 150 mm to pipes containing gas, steam, hot water or other materials, which may damage the conduits or conductors. Conduits may not touch pipes of other service installations in order to prevent electrolytic corrosion.

Conduits shall be terminated by means of a brass female bush and two locknuts in pressed steel switchboards and distribution boxes, cable ducts, power skirting, etc. The conduit end shall only project far enough through the entry hole to accommodate the bush and locknut.

6.2.6 Flexible Conduit

In installations where the equipment has to be moved frequently to enable adjustment during normal operation, for the connection of motors or any other vibrating equipment, for the connection of thermostats and sensors on equipment, and where otherwise required, flexible conduit shall be used for the final connection to the equipment.

Flexible conduit shall preferably be connected to the remainder of the installation by means of a draw-box. The flexible conduit may be connected directly to the end of a conduit if an existing draw box is available within 2 m of the junction and if the flexible conduit can easily be rewired.

Flexible conduits shall consist of metal-reinforced plastic conduits or PVC-covered metal conduits with an internal diameter of at least 15mm, unless approved to the contrary. In reflecting ceiling, flexible conduits of galvanized steel construction may be used. Connectors for coupling to the flexible conduit shall be of the gland or screw-in type, manufactured of either brass or mild steel plated with either zinc or cadmium.

6.2.7. Receptacles

Outlets in general will be bipolar double, with ground line, of high security type, with plate of Bakelite, 15A, 250V. The receptacles pins configuration will be according to NEMA 5 – 15 R. As an alternative NEMA 6 – 20R can be used, but the pins configuration is not according to the Peruvian plugs pins configuration and will be necessary use adaptors.

6.2.8. Luminaires fixed to ceilings

- In all cases where luminaires are fixed to false ceilings, the Contractor shall ensure that the ceiling is capable of carrying the weight of the luminaires before commencing installation.
- In cases where the weight of the luminaire is not carried by the ceiling but by a support or other suspension method, provision shall be made to prevent relative movement between the ceiling and luminaire, ceiling rose or connection point.
- In the case of tiled ceilings with exposed or concealed T-section supports, surface mounted luminaires shall be fixed only to the tiles by means of butterfly screws or bolts with nuts and washers. The tiles shall be suitably reinforced.
- Luminaires may alternatively be fixed to metal cross-pieces resting in the ceiling tees.
- Drilling of holes in ceiling tees to support luminaires will not be allowed.
- Luminaires shall be fixed in neat relation to the ceiling lay-out.

6.2.9 Recessed Luminaires

Where recessed luminaires are specified, the Contractor shall maintain close liaison with the ceiling Contractor. In the case of tiled ceilings, the luminaires shall preferably be installed while the metal supports are being installed and before the tiles are placed in position. The Electrical Contractor shall be responsible for the co-ordination of the cutting of ceiling tiles with the other contractors concerned. All mounting rings and other accessories shall fit closely into cut-outs to ensure a proper finish.

6.2.10 Lighting switches

The switches will be type recessed luminaire with plate of bakelite, color ivory, with cubes of bakelite, 15 A, 250V. They will be single or double poles according to drawings.

6.2.11 Motion sensor

Motion sensor for lighting controls will be used in public areas, The Legrand brand CS Series sensor is a 24VDC Passive Infrared (PIR) occupancy sensor which controls lighting systems based on occupancy in a given area. The system should work with the lighting switch to override the Motion Sensor. See wiring diagram in drawing IE 3.

6.2.12 Field Installation

Any changes performed by the General contractor of the work involving changes in the original project should be consulted to the owner Engineer presenting for his approval, an original drawing with the proposed amendment, this drawing, signed by the Engineer, it must be presented by the contractor to the inspection of the work for conformity and final approval of the owner. Once approved the modification, the contractor run drawings for updating, in original copies provided by the owner.

The contractor for the execution of the corresponding to the part of installation work, carefully check this project with the relevant projects listed in this specification.

All work will be carried out in accordance with the requirements of sections applied to the codes or regulations listed in paragraph 1.4

All material and installation method are or not specifically mentioned here or in the drawings should meet the requirements of the code and regulations mentioned in paragraph 1.4.

Prior to placement of lighting fixtures for use, shall be performed tests for each circuit, on feeders and finally the whole installation. The tests will be ground insulation and insulation between conductors, must be performed for each circuit and each feeder. After fixtures installation, shall be carried out a second test.

6.3 Fire and Life Safety

6.2.7. Fire Alarm Devices located in Consular Office

In Consular Office will be located the following Fire Alarm devices:

Waiting Area	: 2 Smoke Detector
Working Area	: 2 Smoke Detectors + 1 Pull Station
Telephone and Data close	: 1 Smoke Detector

The characteristics of the existing Fire Alarm Panel located in ground floor of the building are the following:

Brand: Mircom

Model: AE-1025T

6.2.7.1 Smoke Detectors

The addressable ionization detector shall be a plug-in, twist/lock unit, which shall be capable of removal from or installation into its base with one hand.

The detector shall contain two ionization chambers and solid-state indicator lamp.

The reference chamber shall compensate against sensitivity changes due to changes in environmental temperature, humidity, and barometric pressure.

The sensing chamber shall be open to the outside elements through a protective cover, which will permit product of combustion to enter while preventing foreign matter from entering and causing unwanted alarms.

Smoke detectors to be installed shall be compatible with the existing Fire Alarm Panel of alarm. The lists of devices compatible with Mircom Fire alarm Panel are attached in the catalogs of reference package.

6.2.7.1 Pull Stations

The addressable manual pull station shall operate on any addressable detection circuit. The addressable manual pull station shall be individually annunciated on the control panel. The unit shall be double-action initiated, having latching relays.

Pull Stations to be installed shall be compatible with the existing Fire Alarm Panel.

The lists of devices compatible with Mircom Fire alarm Panel are attached in the catalogs of reference package.

6.2.7.1 Fire Alarm Cables

Fire alarm cables will be Copper Conductors, Polypropylene Insulation, and Polyvinyl-Chloride Jacket.

Standard Jacket Color: Red 1, Conductor gage 18 AWG.

6.4 Telecommunications

6.4.1 CAT 6 cable

The CAT 6 4 pairs cable will be Low smoke, zero halogen (LSOH) and PVC version with the following installation characteristics:

- Maximum pulling tension : (N) 90
- Minimum bend radius during installation (mm) : 55
- Minimum installed bend radius (mm) : 27
- Nominal weight : 40 kg/km
- Temperature rating (°C)
 - Installation : 0 to +50
 - Operation : -20 to +60
- Conductor resistance at 20° C (max.) : 98,6 Ω/km
- Dielectric strength at 50 Hz : 1 kV/1min
- Insulation resistance (min.) : 5000 MΩ/km
- Velocity (nom.) : 66%
- Characteristic impedance : 100 +/-15 Ω (1 to 100 MHz)
- Mutual capacitance (nom) : <55 pF/m.
- Propagation delay skew : <20 ns/100m

Colors: orange, yellow, green and blue

6.4.2 RJ45 Jack

It will comply with the following standards ISO/IEC 11801 and ANSI/TIA/EIA-568B.2-1, mounting, which will include a comprehensive range of connections to patch panels, sockets and faceplates, Cat 6 patch cords and cables connections.

With the following characteristics:

Lead-through resistance	: 17 mΩ < to <20 mΩ
Insulation resistance	: > 10 mΩ
Frequency	: 100 MHz 200 MHz 250 MHz
Attenuation	: < 0.2 dB < 0.2 dB < 0.3 dB
Return Loss	: 24 dB 18.5 dB 16 dB
NEXT pair to pair	: 58 dB 50 dB 47.5 dB
Conductor diameter	0.50 mm to 0.65 mm solid copper, 7 x 0.15 to 0.20 mm
Stranded cable.	
Sheath diameter	1.6 mm max.

6.4.3 Faceplate Outlets

The faceplate allows the Cat. 6 jacks to be used with wall adapters and work with surface mount applications. This faceplate color will be white in 4 port

configurations. The faceplate will use labels, label windows and port icons for port identification, the label color will be orange yellow green and blue.

6.5 Plumbing

6.5.1 Pipe and Fittings for Cold Water Installations

6.5.1.1 Piping and Fittings

Pipes for cold water networks will be PVC heavy standard schedule 40 (150 pound/sqinch) threaded pipes and pug-in accessories, they will be bounded with special adhesive for PVC of recognized brand, the manufacturer's instructions will be followed and they shall meet Peruvian INDECOPI's standards (Class 10), and the exposed area will be painted green.

6.5.1.2 Cold Water Outlets

A cold water outlet is the installation of piping and fittings from the derivation of the distribution network or the limit set by the bathroom walls, out to each of the outlet points to the sanitary fixtures, they will be P.V.C. with elbow or simple terminal union made of galvanized iron.

6.5.1.3 Valves

A ball type valve will be used; brass chrome-plated with threaded joint and intended for 150 pound/sqinch pressure, they will be of similar in quality to the CIM and without universal union in standpipe.

6.5.1.4 Universal Unions

They will be of galvanized iron with a bronze conical seat and two unions every valve installed.

6.5.1.5 Reductions

General for PVC pipes, reductions bell-shaped will be used for changes in diameter; Bushings will only be accepted for connections to sanitary fixtures.

6.5.1.6 Hydraulic Tests

Before covering the pipes, prior testing will be done, which consist of the following:

Filling the pipes with water and submitting them to a pressure test for cold water, and hot water pipes with a hand pump were they need to withstand a 150 lbs/pulg² pressure without any leaks at least for half an hour.

6.5.1.7 Cleaning and Disinfection

After they tested and protected water lines, they will be washed with clean water and they will be drain completely; the system will be disinfected using a mixture of calcium hypochlorite solution, as follows: The pipes will be filled slowly with water while the active chlorine is added at 50 ppm (parts per million).

After 4 hours of filling the pipe ends of the network will be tested to determine the residual chlorine. If the residual chlorine is less than 3 p.p.m evacuate the pipes and repeat the disinfection operation.

When residual chlorine tests shows at least a proportion of 3 p.p.m. the piping must be cleaned with clean water until there are no remains of chemical.

Apply anticorrosive paint and enamel green on the exposed pipes.

6.5.2 Piping and Fittings for Sewage and Ventilation Installation

6.5.2.1 Piping and Fittings

The pipes shall be polyvinyl chloride not plastic (PVC) will be of type Lightweight American Standard (SAL), with needle or bell joints whichever the case, joined with special glue, all according to the Peruvian standards INDECOPI.

6.5.2.2 Sewage Outlet

Sewage outlet is the combination of all pipes and accessories you need to meet the output of every sanitary fixture, drains and registers, to connect with the backbone or tank as the case.

6.4.2.3 Ventilation Outlet

A ventilation outlet is the installation of piping and accessories contained from the exit of sanitary fixtures to connect with the rise pipe or output to the final end of the ventilation backbone which ends in a CAP to 0.30 m on the level of the finished floor of the roof.

All pipes of ventilation that move horizontally will go to 1.00 m above the finished floor level and shall have a minimum upward slope of 1%.

Vents will rise recessed in walls up to the roof and end at hat of ventilation to 0.30 on N.P.T.

6.5.2.4 Sumps

Where required bronze sumps, the following will be used:

- Simple bronze body with removable grille, connected to the trap "P", which will be installed in external areas.

- Brass chrome-plated grille insert for showers.

6.5.2.4 Threaded Registers

Registers will be bronze, with screw cap tightly and slot to be removed with a screwdriver, heavy type to be placed in the headwaters of the pipes or connections with screw cap and will be installed to the finished floors, at locations shown on the drawings.

6.5.2.5 Temporary Caps

All drain outlets, must be clogged immediately after finished and remain so until placement of fixtures to prevent introduction of impurities to the pipes and destroy them and them to jam. All drain plugs will be P.V.C.

7. FIELD TESTING AND INSPECTION

7.1 General Tests and Inspections

7.1.1 Testing Preparation

Prepare systems, equipment, and components for tests and inspections, and perform preliminary tests to ensure that systems, equipment, and components are ready for testing. Include the following minimum preparations as appropriate:

- a) Perform insulation-resistance tests.
- b) Perform continuity tests.
- c) Perform rotation test (for motors to be tested).
- d) Provide a stable source of electrical power for test instrumentation at each test location.

7.1.2 Field Test and Inspection Reporting:

Ensure that each test and inspection report includes the following:

- a) Manufacturer's written testing and inspecting instructions.
- b) Calibration and adjustment settings of adjustable and interchangeable devices involved in tests.
- c) Tabulation of expected measurement results made before measurements.
- d) Tabulation of "as-found" and "as-left" measurement and observation results

7.1.3 Safety during Testing

In advance of testing and commissioning, review project-specific safety recommendations from reports prepared in accordance with OBO Standard Specifications Division 26 Section "Overcurrent Protective Device Coordination Study" and safety accessories provided in Division 26 Section "Common Work Results for Electrical, Communications, and Electronic Safety."

8. REFERENCE CATALOGS