ATTACHMENT # 1 SPECIFICATIONS

GENERAL DESCRIPTION OF THE PROJECT

The following are the main characteristics of the work to execute at the Colombian Navy Coast Guard bases located at Bahia Solano and Pizarro, Choco along the Pacific coast.

The works include, but are not limited to, the construction of two (2) 55 m high metallic towers including concrete foundation, and a pre-fabricated HVAC shelter. The works include the necessary activities for the energy supply to the shelter and communications equipment, the obstruction lights of the tower and the grounding and lightning protection systems.

For the structural, the electrical and grounding and lightning protection installations, the Contractor shall supply maintenance and inspection manuals for routine activities with recommendations for the inspection and maintenance.

GENERAL BUILDING REGULATIONS

The Contractor shall make the applicable verifications in order to certify the designs given to them to be adequate for this installation and shall guarantee the correct execution of the works, fulfilling the standards of the applicable codes before the start of the construction process.

The contractor shall give careful attention to the following recommendations.

1. The contractor shall provide all necessary tools, mechanical implements and vertical and horizontal transportation necessary for the proper work execution.
2. Temporary water, electricity and telephone facilities shall be at the contractor expense.
3. Elements and materials to be used on the construction shall be previously approved by the US Government representative by Submittal technical cards, samples or laboratory results, 15 days calendar before the material is required on the work. Also, necessary tests may be ordered by the contractor to ensure that these tests are consistent with specifications.
4. Storage sites, camps and utilities shall be at contractor expense. Other temporary buildings considered necessary for the proper works development shall be also at contractor expense. Their location shall be approved by the US Government representative.
5. As soon as the construction works are finished and prior to contract closed, the contractor shall remove all temporary constructions and excess material. The camps shall be thoroughly cleaned to the former conditions prior to undertaken construction works.
6. These specifications include ICONTEC, ACI Building Regulations, Seism resistant Construction Regulations NSR-10 (Act 100 of 1997, Act 1229 of 2008 and resolution issued by Standing Advisory commission of Seism Resistant Construction regime from National Government) ASIM, CHEC, RAS 2000 Regulation of safe drinking water and basic quality, Technical Regulations of Electrical Installations (RETIE in Spanish) as pit as the manufacturer recommendations for installation and use of their products.
7. The contractor shall assume the protection and preservation of the works until it is definitely delivered or received by the US Government representative. If reparation is needed; it shall be at the contractor expense and in accordance with the US Government representative.
8. The prices shall include the cost of materials, labor, tools, equipment, transportation, quality control testing. Other elements and expenses necessary are also included for suitable execute of the contract as pit as indirect and financial costs.
9. The US Government representative shall be demanding about works finishing and construction. Therefore, the contractor shall use high-quality materials and high-qualified labor. The US Government

representative shall reserve the right of approval or refuse of any work if they consider the work does not comply with the regulations issued on these specifications.

10. Helmet, gloves, glasses, foundations, belts or any other necessary element required by the US Government representative shall be at the contractor expense. During the work, first-aid elements shall be available and fulfill all the labor safe regulations included on Colombian Acts.
11. Trademarks, trade names or manufacturers stated on the drawings or specifications are set out as reference for high-quality of required material. The contractor may propose other product names to the US Government representative in order to be approved, when these are considered equal or better in quality and comply with the regulations set out on these specifications. This shall not entail cost variation.
12. To start any operation, the contractor shall carry out tests clearly indicating the construction process to obtain the Government or representative approval.
13. Guard: facilities, stores, equipment, tools and other elements guard shall be provided by the contractor before and after their installation, until the work is finally received.
14. The Contractor shall guarantee that the project fulfill all the rules of the Ministerio del Medio Ambiente and the Departamento Administrativo de la Aeronáutica Civil.

PARTICULAR WORK CONDITIONS

Laboratory Tests

The contractor shall be responsible for all laboratory expenses. The laboratory shall be previously authorized by the US Government representative. The contractor shall include testing of laboratory samples. The results shall be delivered directly to the US Government representative. Its cost shall be included as part of the contractor proposal.

Construction Procedures

The execution procedures execution on the actual work shall be subject to the contractor initiative in accordance with technical specifications stated on this solicitation for proposal comparison purposes and referred to engineering practice. The contractor shall be ultimately responsible for the application of such procedures which shall aim at obtain the best results in the completion of the work. However, the US Government shall, at any time, have the right of ordering changes to the used procedures for safety purposes and percentage of completion method, its coordination with the works of other contractors related to this one or for requiring the contractor to adjust to the actual contract.

Unauthorized or Defective Work

If the actual work does not fulfill the specifications or the US Government instructions, it shall be considered defective. So in this case corrective actions shall be ordered and it shall not be accepted; completed work shall not be measured or paid before the necessary alignments and levels are met. The same is applied to any unauthorized work by the US Government representative and shall be corrected by the Contractor. The Contractor shall not have right to receive any compensation for not acceptable work.

Damage to the Executed Work and Third Parties

The Contractor shall take full responsibility for all executed work until the project is completed and finally approved. The Contractor shall also take full responsibility for any damage caused to third parties during the execution of construction work. If this is the case, The Contractor shall repair the damage at his expense without additional work or any exception to such responsibilities or to the agreed completion date.

Materials

The contractor shall include new materials and of first quality design for prolong use and heavy duty. The contractor shall assure good materials and excellent finishes. All the colors and finishes shall be submitted to the US Government representative for approval prior to purchase and installation.

In order to guarantee a normal work progress and to avoid any possible lack of materials or un-necessary high-quality elements, the contractor shall provide on a timely manner all the required materials to the construction site and permanently keep the necessary stock of material on site. The US Government representative shall have the right to reject material or used elements if they do not comply with specifications and construction standards. The material rejected shall be removed from the construction site and shall be replaced by an approved material. The defective work shall be corrected satisfactorily without additional cost to the US Government. If verifications to the general material specifications in accordance with the specifications and construction standards are required by The US Government, the contractor is required to carry out all necessary tests at its expense without implying additional cost to the US Government. Once contract is awarded and if the US Government representative considers it necessary, the Contractor shall deliver the supply schedule of the equipment and materials to the project site.

The contractor shall leave on site a stock of materials like bulbs, fuses, terminals or pipes that have been fitted, representing three (3) % of the total quantity, for future maintenance purposes. These items shall be handed over duly packed, identified and listed.

Equipment

The Contractor shall include in his proposal the equipment depreciation and maintenance, as well as all operational, parking, insurance, etc., expenses. The contractor shall also consider having an appropriate amount of equipment in good condition and approved by the US Government representative. This way delays or interruptions due to equipment damage can be avoided. Equipment in Bad conditions, deficiently maintained or damaged shall not be a cause to avoid any contractual obligation. The US Government representative may at any time during the execution of the contract demand the removal from the project site of any equipment or tool that is considered to be defective or not recommended to be used. The Contractor shall replace, as soon as possible, the equipment to be removed by damage or maintenance in order not to delay work.

Signaling

The contractor shall take all necessary cautions to prevent accidents from occurring during the construction process and specially those which can alter the normal vehicular and pedestrian traffic. The contractor shall comply with the necessary construction general standards.

The contractor shall install on site all the necessary warning signaling to prevent accidents during the daily activities and also at night, in accordance with the amount, type, extension, shape, class, color and distances required in accordance with the construction general standards or as recommended by the US Government representative.

Any accident caused by the lack of such warning signals shall be the responsibility of the contractor. The US Government representative shall, at any time, order the partial or total work suspension if systemic breach by the contractor occurs to carry out the signaling requirement or instruction given in this respect.

If work shall be performed without enough natural light, the contractor shall supply proper illumination according to the type of work to be executed. If the illumination is not appropriate to the type of work, the US

Government representative shall order the suspension of work until the contractor provide the adequate safety conditions. Dragged cord extensions, dangerously hanging or cables poorly connected or insulated shall not be allowed in the project site. Fluorescent warnings and required flickering lights shall be placed to a proper distance from the work site.
The contractor shall be responsible for any expenses generated by the supply and installation of signaling as well as for the implementation of all necessary caution measures in order to prevent accidents.

Distinctive Insignias and safety of Personnel

The contractor personnel shall be equipped with an overall of the same design and color, or long pants and T-shirt with sleeves of the same type and color, boots, hardhats, gloves and any security elements required for their particular activity, such as face masks or shields, gloves, boots, ear plugs, etc. Use of these items at the work site is mandatory. Likewise, each employee shall wear a laminated recent photo identity card indicating his/her name and identification card number, position, and contractor name.

Prior to initiation of the work, a list of personnel to be employed at the site shall be submitted for review to be able to obtain access to work area, including full names, identification card numbers, place and date of birth, home address and, in some cases, a government valid certificate of good conduct and photographs. The US Government and the Navy Base shall reserve the right to admit or withdraw personnel from the work site for reasons of security and/or due to the quality of the work.

The Contractor shall supply, to the US Government representative the complete and correct information regarding the affiliations to general health system and pension funds. The contractor shall also be responsible for the vigilance and execution of the occupational health program in accordance with the stated on current regulations. The Contractor shall take the responsibility for any risks shall be present in the working environment and adopt the necessary cautions to reduce such risks (Decree 1295/94).

Prevention of Accidents and Safety Measures

The contractor shall, at any time during the execution of the project, provide the necessary resources to ensure hygiene, quality and safety facilities to all employees, workers, and subcontractors. The contractor shall as well provide training to its employees, workers, subcontractors, providers and to all persons related to the contract execution, on the compliment of all conditions related to hygiene, safety, quality, and prevention of accidents and the actual safety measures, as stated on the proposed safety plan.

During the contract execution, the contractor shall fulfill all the regulations under its jurisdiction to be executed on the contract. The regulations are related to safety, accidents prevention, occupational disease, hygiene and quality and general regulations.

Prior to initiating the contract, the contractor shall prepare a complete safety plan with all the necessary measures to be taken during the works execution, which shall be submitted for approval to the US Government representative.

If the contractor does not satisfactorily comply with hygiene or safety requirements or with the US Government recommendations, the Contractor may be subject to a partial or total suspension of work by the US Government representative. In this regards the contractor shall not have the right to demand a time extension and shall be subject to penalties for this concept.

In case that the US Government representative detects imminent danger to personnel, work or goods, the US Government representative may omit the written notification and shall demand that corrective measures be taken immediately. In these cases, the contractor shall not have the right to any monetary recognition or compensation.

Cleaning and Debris Removal

The contractor shall keep personnel cleaning the construction site and nearby zones daily. The unit prices for all items, without exception, include the costs of cleaning up, loading and removal of all materials resulting from the building work. The contractor shall take these materials to an authorized dump, where the interests of the base, third parties and the environment shall not be affected (the contractor shall follow the parameters established in Resolution 541/94 and the subsequent that modify it). Material from excavations shall be deposited in such a way as to avoid blocking the entrance to the site at all times or occupying public roads while the material is being loaded into trucks for removal.

Site Description

The contractor before beginning preliminary works shall complete a site description with photographs and an account of the actual conditions of roads, sidewalks, surrounding buildings, etc., this report shall be signed by the commander and contractor. This report is for the purpose documenting the actual status of the area before the work is performed. This report will be used to compare the site after the work is finished. Three identical copies must be furnished: one for the user (Colombian Navy), one for the contractor, and the other one for the US Government. If the Contractor caused any damage to the work site or other private or public property he/she shall do all the repairs prior to the contract closeout; these repairs are without cost to the US Government. At the end of the projects a closing review and memorandum should be done with the participants, a signed copy shall be furnished in the final report.

GENERAL BUILDING REGULATIONS

The work shall be executed in accordance with the general building specifications stated on the Colombian Seism resistant building regulation NSR-10 (400 act of 1997, act 1229 of 2008 and resolution published by permanent commission of seism resistant construction by the National Government) and the particular specifications. The general specifications are part of the documents present on this contract. The particular specifications take precedence over the general ones. Where specific regulations are not stated, the materials, the equipment, the testes and supplied work by the contractor shall comply with the requirements of applicable regulations mentioned below:

- NSR-10 The Colombian Seism Resistant building regulation.
- INCONTEC (the Colombian technical standards institute)
- ICPC (the Colombian institute of cement producers)
- ASTM American Society for Testing and Materials
- AISC American Institute of Steel Construction
- ACI American Concrete Institute
- RAS 2000 Local Health and Safety standards for drinking water.
- RETILAP Technical Regulations for public lighting.
- NEC National Electrical Code.
- ANSI American National Standards Institute.

The requirements here stated shall be seen as a basic guide, not a limitation for the work scope.

PARTICULAR SPECIFICATIONS –BASE CONTRACT

1) RADAR TOWER BAHIA SOLANO AND PIZARRO

1.01) General Requirements

1.01.01) Provisional installations

The Contractor shall submit a drawing with location of the camp, fencing of the construction site and temporary services (water, energy, telephone, etc.), before starting its installation, for the approval of the US Government representative. All the installations shall be removed by the Contractor with the approval of the US Government representative when the works are finished. The site shall be left as it was found before the start of the constructions, with grass, sidewalks, etc. This removal, along with the installation shall be quoted at a global price and shall be included in the total cost of the project.

Provisional services: the eventual supply of any service by the final user to the Contractor shall not be a conditioned help and its eventual suspension shall not give place to any claim by the Contractor. The Contractor shall provide alternative services for these situations.

1.01.02) Security of the construction site

The Contractor shall supply the services of security of the construction site and the camps. The US Government and the final user shall not be responsible for the payment of the security services nor for the elements left at the construction site.

1.01.03) Temporary Facilities

The Contractor shall construct a temporary camp using materials such as wood or galvanized sheet and cement-fiber tile, which conforms the material storage places, personnel dressing rooms, office and bathrooms.

The location of this campsite shall be in a place coordinated by the contractor, the commander of the Navy base and US government representative. After the work has been completed, the Contractor shall leave the as it was found before the start of the constructions, with grass, sidewalks, etc.

1.01.04) Provisional fencing

The work site shall be completely isolated from zones or roads surrounding the same. Similarly, if a materials storage area is built, this shall be fenced off in the same manner. A fence shall be built for this purpose, consisting of synthetic canvas with wooden posts every two meters, kept taut by means of wires at the top, middle and bottom. Props shall be fitted either side of the access door or whenever there is a change of direction. This fence shall have one access point only, a double door through which machinery, vehicles and personnel shall enter. While the works are in progress, the contractor shall ensure that the fence is maintained and repaired, so that it is always in suitable condition.

1.01.05) Location and layout

This item refers to the use of precision topographical instruments and pursuant to the architectural distribution, the draw up of the ground plan for each of the elements to be constructed. The area to be constructed is that indicated in the plans, plus the extra widths and the utilities connections. The Contractor shall use a qualified professional to perform this activity, who shall determine the levels in addition to the ground plan. Everything shall be bench-marked on securely anchored wooden bridges.

The contractor shall supply all materials required to establish the planimetric and altimetric benchmarks, such as stakes and field books, etc. The US Government representative shall review the location of the axes, but this does not exonerate the contractor from his responsibility for errors in locating or leveling any portion of the

work. Prior to locating and laying out the work, the necessary datum or tie points, both horizontal and vertical, as well as the boundaries of the terrain to be occupied shall be defined and approved.

The temporary BM and reference axes shall be placed at sites where they do not interfere with the execution of the work and that does not need to be moved, in order to allow their subsequent control at any point during the course of the work. No marks made with paint of any type, scratches, nails, centering, etc. shall be permitted on any current building or structure. Once the layout is complete, the contractor shall submit a scheme for approval, including the location of existing structures and vegetation.

1.01.06) Removal of surface layer

This includes the area shown in the drawings as the areas to be built plus an additional area of one (1) meter wide in the perimeter. This operation shall be made by manual means taking care not to move the points of reference previously established on site. This way, the removal of the surface layer shall be made in a thickness that can vary from 0 to 0.50 m, until completely eliminate the vegetation layer, the organic material and other unwanted materials deposited in the soil.

This operation shall not be limited to the removal of the surface layer. It shall include the removal of roots and other objects that according to the COR´s judgement are not convenient for the development of the works. In this activity square pieces of grass shall be removed in good shape in order to use them again. These pieces of grass shall be kept during the construction process. The leftovers shall be removed by the Contractor according to the general cleaning specifications.

1.01.07) Excavation

This item consists in the excavation and removal of remnant material until the adequate depth for the location of the foundation elements for the tower according with the project drawings.

The contractor shall perform the excavations needed to execute the works and shall be prepared to excavate in any type of material, using the appropriate methods, equipment and tools. Prior to start with the excavation, the contractor shall perform a survey of all aerial, surface or underground interference, in order not to damage pipes, boxes, wiring, posts, hoses, wells or other elements or structures existing in the work area or adjacent to it. Should the excavation interfere with sewers or pipes, the contractor shall build adequate support or protection for these installations.

The depth of the excavations and fills shall vary according to the works to be executed and the studies done by the Contractor. The excavated material shall not be stored in the top of the excavation. It shall be lifted immediately to the trucks and transported to an authorized dump located outside the base if it is required.

The contractor shall post signs (warning signals) and provisional fencing at all excavation sites. The fencing shall consist of three yellow plastic tape eight (8) centimeters wide and supported by temporary sleepers fastened securely to the ground, placed in order to avoid accidents. To prevent their obstruction or damage, the contractor shall keep clear all drains, caps and catch pits in public utility networks near excavation sites.

The contractor shall be responsible of any over excavation caused by a cave-in, deficiency of the material existing in the zone or other reasons, who shall fill at his cost the over excavation with granular material previously approved, until the excavation has the required section.

The material removed from the excavation shall be removed as indicated in the general cleaning items. The contractors shall be responsible of the conduction of surface water and the evacuation of underground water and

any other type of water, as well as the supply and maintenance of drainage or pumping systems required to stabilize the slopes and avoid water getting into the excavations.

1.01.08) Compacting of the foundation level

This item consists in the compacting of the bottom level of the foundation for the construction of the foundation elements of the tower.

In all the areas to build, the soil in the bottom of the excavations shall be compacted before initiating the filling activities, using mechanical and/or manual equipment. The selection of the compacting equipment shall be approved by the US Government representative and shall adjust to the plasticity characteristics of the material to be compacted.

If during the compaction process the bearing layers show faults or bland zones, these shall be replaced on time with excavations and fillings by the Contractor at its own cost.

1.01.09) Filling in compacted granular material

This item consists in the supply, installation and compaction of the base in selected granular material that shall be the support for the foundation elements for the tower according with the drawings of the project.

This item includes the supply of all the labor, materials, equipment and the execution of all the necessary works for the installation of the compacted filling material required by the project. The thickness of the fill shall vary according with the area of the foundation, for each of the works. Before initiating the filling works, the base material shall be totally clean of any vegetation, organic material and residual material from the construction and the surfaces shall not have any inundation or zones with stagnant water.

The filling materials shall be obtained from sources authorized by current applicable environmental standards and by the Law, selected by the Contractor and approved by the US Government Representative. At least 7 days before initiating the filling materials works, the contractor shall submit to the US Government the information on the sources of materials and shall submit all the working permits, the representative samples and the results of laboratory tests. The supply of the samples and the laboratory tests shall not represent additional cost.

The filling material shall be constituted by sandy granular material without organic lime, vegetal material, residues, waste or debris. The maximum size of the material shall not exceed five (5) centimeters. The fines content (percentage passing sieve No. 200) shall be inferior to 20% and the plasticity index of the material passing sieve # 40 shall be lower than 6%. The filling material shall be compacted in symmetric layers of ten (10) centimeters and 95% of the density shall be obtained with the compaction test of the Modified Proctor. The methods and equipment of compaction shall have the approval of the US Government Representative. The thickness of the compacted filling shall be at least 20 cm.

1.02) Concrete Structures

1.02.01) Concrete foundation

The part of the construction specified here includes the supply of the manual labor, materials and equipment, and the execution of all the works necessary for the construction of the foundation for the tower which consists in concrete reinforced footing, concrete pedestals, concrete tie beams and sub-floor concrete slab. Before initiating the construction of the foundation, the construction site shall be free from vegetation and construction materials and the surfaces shall not have inundated zones or zones with stagnant water. The bases shall be leveled before pouring the concrete.

The foundation structures shall be built in accordance with the NSR-10 and the recommendations of the soils study. The concretes shall have a strength f'c of minimum 3000 psi (210 kg/cm2), which shall be certified by the Contractor using test cylinders that he shall take following the applicable standards. The re-bar for the foundation shall be grade 60. The contractor shall follow the parameters of the design supplied by the US Government.

This activity includes the supply, formwork, transportation and installation of the concrete for the footing and pedestal as well as for the concrete tie beams and sub-floor slab including the reinforcement steel specified on the structural design.

Contractor shall include the execution of the corresponding laboratory tests as required. The Contractor shall take 6 sample cylinders for concrete resistance tests per pouring or per each 5 m3, in order to test 2 cylinders at 7 days, 2 cylinders at 28 days and leave 2 cylinders as proof samples. The results of the laboratory tests shall be given at the right time to the Embassy Representative.

High quality grouting shall be taken into account for filling and leveling of the anchorages between the upper part of the concrete pedestals and the base of the tower. The concrete surface shall be adequate for the placing of the grouting.

1.03) Steel Structure

This chapter consists in the construction of the complete structure of the tower, in accordance with the drawings and terms of reference, including all the elements and accessories necessary for its fabrication, assembly and installation. Before the construction of the steel structure, the Contractor shall verify the design supplied by the US Government, the shop and construction drawings, and the description of all the fabrication and assembly system, characteristics of bolts and welding, steel qualities, painting, etc. If it is found that in the design some changes shall be done in order to fulfill the standards, this changes shall be taken into account in the proposal. This way when executing the project, this shall be done in total accordance with the current standards.

The main design standards are the EIA-222F, the code AISC and the standard NSR-10. The design shall also fulfill the following minimum specifications for the structural elements:

-The struts, diagonals and steps which are high resistance steel shall comply with the ASTM A572 Grade 50, with a leverage point of 50,000 psi or 350 Mpa.
-The brackets and union metal plates which are normal resistance steel shall comply with ASTM A36 with a leverage point of 36,000 psi or 250 Mpa.
-The nuts and bolts shall comply with the ASTM A394 and ASTM A A563.
-The anchor bolts shall be SAE 1020 normalize.
-The structural elements shall be galvanized in heat by immersion according to the standard ASTM-A123.

Before beginning with the fabrication of the structural elements, the contractor shall deliver the quality certificates of the elements in order to guarantee compliance of the specifications; otherwise the contractor shall perform mechanical and chemical tests as described on the ASTM A370 and the A-6 designation of the ASTM.

The fabrication of the steel structure shall be done following the design supplied by the US Government, the shop and construction drawings as well as the actual edition of the AISC and the NSR-10.

The welding works and materials shall comply with the AWS D1.0 as described on the design supplied by the US Government. The contractor shall follow the welding requirements described on the shop and construction drawings.

The US Government representative shall inspect the fabrication and welding at the workshop, before approving the material to be transported to the project site. Any defect or correction to the steel structure or the welding works detected during the inspection shall be corrected by the contractor with no additional cost to the US Government.

A complete section of the tower shall be assembled on the workshop as a sample of the structure. This section shall be chosen randomly and the adjustment of the parts shall be verified by the US Government representative along with the contractor representative. Any defect or correction to the steel structure detected during the inspection shall be corrected by the contractor with no additional cost to the US Government.

The application of the protection coating, epoxy base and paint for the elements of the structure shall be done following the procedures described on the design supplied by the US Government. The metallic coating for protection shall be alloy between galvanize and aluminum in a 95% - 5% proportion or as suggested by the contractor based on quality standards. The tower structure shall be painted using base primmer epoxy "poliamida-poliamina" type with high solid content with a minimum dry paint thickness of 4.0 mils. And the finishing paint shall be aliphatic polyurethane type resistant to ultraviolet rays with orange and white colors approved by the Aeronáutica Civil with a minimum thickness of 3.0 mils. These paintings shall be applied with compressor, for aggressive atmospheric conditions.

The tower shall have enough resistance to support the radar and telecommunications equipment required by the Colombian Navy Coast Guard. The assembly shall be done following the procedures described on the design supplied by the US Government and shall include the tower erection, the aligning for the correct verticality and the bolts connection according to the diameter and grade of the bolts. All safety measures shall be considered for the installation.

After the structure is assembled, the surface shall be cleaned with tow cloth, in order to eliminate residues of grease, dust or humidity.

1.04) Tower Shelter and Enclosure

The Contractor shall build a shelter in prefabricated material RBS or similar including walls, roof and divisions in the same material, with a free interior area of 5 m long and 4 m wide and shall be installed on top of the tower concrete slab as shown on structural drawings. The free height of the shelter is 2.83 m average. This shelter is required for the radar equipment and the operators. The structural design shall be reviewed by the Contractor, in order to verify that it is done according with the NSR-10 or shall do the adjustments required. The construction of the RBS pre-fabricated shelter includes the following items:

1.04.01) Pre-Fabricated Wall

The contractor shall construct the shelter using a prefabricated PVC e-100 mm or equivalent building that is easy to assembly and dismantle and which has been designed to have heavy duty materials; transportation and relocation, accessories shall be firmly fixed in place so they cannot be removed easily, especially those on the outside of the building. The construction shall be completely hermetic, and the materials should be capable of withstanding a tropical rainy climate.

The building shall comply with Fire Standards and shall be designed in line with the current version of the Colombian Seismic Resistance Code (NSR Standard, 2010).

The contractor shall provide construction equipment and personnel for assembling the building on site as quickly as possible. The contractor shall be responsible for board and lodging for the construction team on the work site (away from the base), or as arranged with COLNAV Base personnel.

The contractor shall be responsible to receive the material on the COLNAV Base, and shall be responsible for unloading the material and transporting it to the actual work site.

The contractor shall use the same prefabricated panel in PVC or equivalent for exterior and interior walls; and shall adapt the design to the construction.

1.04.02) Wall Structure

The contractor shall supply and install the corresponding structure according to NSR 10. The prefabricated wall cells shall be filled with reinforced concrete. Vertical and horizontal reinforcement shall be minimum ½".Walls shall be anchored to concrete slab. Wall shall be perfectly leveled, verifying that between wall and floor slab there is a 90 degree angle. Electrical and air conditioning units' drainage systems shall be embedded into walls. Windows and door frames shall be embedded into walls.

1.04.03) PVC Roof Panels

Roof shall be made of prefabricated PVC or equivalent panels, with the edge made of PVC; colors shall be selected by the US Government representative.

2) GENERAL ELECTRIC INSTALLATIONS

2.01) Electrical Scope

The electrical work consists of the following activities:

- Installation of two generator sets to provide electricity to the radar tower.
- Supply and installation of the electrical power system - Low Voltage (LV) networks
- Supply and installation of the internal network distribution of the communication house (named also as "Shelter").
- Supply and installation of the Air Conditioning system
- Supply and installation of the grounding and lightning protection systems.

2.01.01) Electrical Standards

The proposed work paper includes all the electrical designs, technical specifications, supply of materials and parts, which are required for the electrical work and its execution on site. The Contractor shall comply and strictly observer the last upgrade of the following electrical standards: NTC 2050, NEC 250, NTC 3475/ UL 67, EIA/TIA 568-569, EIA/TIA 607, IEEE C62.41-C62.45, NFPA 780, NTC 4552, IEEE-80, RETIE and CIDET. The awarded Contractor shall have an electrical/electronics engineer, who shall oversee the execution of the work. The proposed electrical/electronics engineer shall also sign the installation conformity and material conformity acts requested on RETIE. The proposed engineer shall have experience of five years or more on similar projects, in fact his/her curriculum vitae shall be annexed in the proposal.

2.01.02) Material, Equipment and Parts

The Contractor shall use well known market brand materials, equipment and parts certified and approved by RETIE. All products to be used during the project execution shall be new, manufactured in a period not longer than six months when the contract is awarded. The products, equipment and parts to be supplied and installed shall comply with international standards and US Federal Regulations. The Contractor shall submit the custom clearance documentation (nationalization acts) for those assets which were directly imported, this is required to accredit afterwards the assets' ownership and to perform the process of donation in a suitable manner for the Colombian Government.

Important notes: The contractor shall submit in his proposal catalogs and technical sheets for all the electrical materials to be used during the project (detailing specifically the items to be used on the contract). Lack of information and omission of such data shall consider the proposal as invalid and shall not be taken into the awarding process. The required civil work for the underground raceway system shall include the costs for repairing the affected areas during the project execution (Sidewalks, pavements, green areas and concretes among others). The awarded Contractor shall comply with civil and electrical Colombian Constructions standards even if the affected areas do not.

The Contractor shall not supply and install products, materials, equipment or accessories during the contract execution, which have not been previously approved by the US Government representative. In that case the Contractor shall be responsible to assume costs (overruns) and time that might be necessary to comply with the US Government representative and contract requirements.

Testing: The Contractor shall include in his offer a list of equipment and devices required to achieve a testing process over the systems to be installed. The equipment to be used during testing processes shall be calibrated by a certified company. The equipment to be used shall count with a valid calibration certificate issued no longer than 12 months.

2.01.03) Main Electrical Circuits

The new electrical circuit branches shall support a 15KVA power system. The new circuit branches shall by three-phase and neutral system plus grounding line, THHN/THWN-2, 4X#8 + 1X#8 AWG. The installed feeder lines shall be brand Centelsa, Procables or equivalent RETIE certified.

2.01.03.01) Main circuit branches – Low Voltage (LV)

The Contractor shall supply and install a new main circuit branch, 208VAC/60Hz, running from each one of the two generator sets (Generator A and Generator B) to the Automatic transfer system (ATS). The approximately distance of each branch is 4 meters; however the Contractor shall verify the distance.

The Contractor shall supply and install a new main circuit branch, 208VAC/60Hz, running from the automatic transfer system to the general panel board (TP) located adjacent to the ATS. The approximately distance between both panel boards is 1 meter; however the Contractor shall verify the distance.

The Contractor shall supply and install a new main circuit branch, 208VAC/60Hz, running from the general panel board (TP), to the panel board located at the shelter (TAC). The approximately distance between both panel boards is 6 meters; however the Contractor shall verify the distance.

2.01.03.02) Concrete pad for generators room

The Contractor shall include the construction of a concrete pad, which shall be placed as a solid base for the electrical equipment (two 15KVA generator sets and the metallic enclosure for LV). The concrete pad shall have an area of 3.8m X 4.7m and 3000 PSI resistance. The Contractor shall supply and install a chain link metallic fence (2.5m high), with two doors and lock, according to the Drawing E3. Along the chain link fence the contractor shall supply and install a black canvas in order to cover the generator room.

The Contractor shall supply and install roof tiles of thermo-acoustic type with trapezoidal shape. The roof tiles item refers to the covering of the generators room. The roof tile shall be in galvanized steel sheets covered on both sides with treated asphalt and modified with polymers to avoid crystallizations, and shall have a final finish with a covering of aluminum foil with zero porosity and covered with a coat of monopigmented paint protected by anti-stain lacquer. The Contractor shall install the roof tiles over the metallic fence. The Contractor shall fix the roof tiles in the lower part of the structure with galvanized screws with hexagonal head, conic metallic washer and a neoprene sealant washer. The Contractor shall consider roof tiles Ajover brand or equivalent. The Contractor shall take special care not to damage the roof tiles during the transportation and installation processes, and repairs or replacement shall be foreseen. Once the roof is installed, it must be submitted to the necessary test to insure that there are not leaks.

2.01.03.03) Raceway for LV system

The Contractor shall supply and install an underground raceway. The segment has a length of 8 meters approximately, which runs from the generators room to the new panel board (TAC). First, in the concrete base designed for the generator sets, the Contractor shall include the construction of a concrete ditch (width 30cm x depth 10cm) to canalize electrical cables between the generator sets and the panel boards (ATS and TP), according to the Drawing E1. The concrete ditch shall include an angled frame of 1" x 3/16" and shall be covered by a metallic surface (alfajor) sectioned every meter.

The Contractor shall supply and install two (2) pipes underground from the end of the concrete ditch to the shelter, two (2) inches gauge, PVC DB type for electrical purposes. Each extreme of the concrete ditches shall include a terminal type “chamber”.

The raceway continues by means of an EMT pipe, two (2) inches gauge, COLMENA or RETIE certified equivalent which shall be overlaid along the shelter wall to the new panel board TAC. The graphic description of the requested raceway is shown in Drawing E1. All the electrical pipes shall be sealed to avoid the entrance of animals, insects or water.

2.01.04) Electrical Panel Boards

2.01.04.01) Metallic enclosure - TP

The Contractor shall install a board with the automatic transfer system supplied by the US Military Group. This ATS board shall be embedded in a wall built by the Contractor, inside the Generators room.

In addition, the Contractor shall supply and install a metallic enclosure (TP) for outdoor operation, 80cmX80cmX30cm (H,W,D), which shall allocate the industrial breaker, the control system, the power meter and the TVVS. This new LV enclosure shall be placed beside of the ATS. The construction parameters such as painting, CR sheet gauge, door, ventilation among other definitions, shall follow the Colombian standard ET 914.

Control system: The Contractor shall supply and install a control system to alternate the working of two generator sets. The control shall be programmable between 6 and 24 hours with a timer Legrand D21 or similar. The control system shall commutate the primary and secondary network services in the event that either of the two generators fail or have problems of over-voltage or under-voltage. The control shall permit to adjust delay times when a fail of voltage occurs in the primary network as well as the repositioning time once service is reestablished.

Power quality analyzer: For the new general panel board TP the contractor shall include the supply and installation of a power meter PM210 or equivalent (at least same number and function types), which shall be supplied and installed by the awarded Contractor; the proposed device shall be RETIE certified.

TVSS: The new general panel board shall also have a TVSS unit class B, Leviton or similar, which shall comply with US standard ANSI/IEEE C62.41-C62.45, interruption capacity up to 100KA, protection modes L-L-L-N, L-G, reject filtering rated > -30dB, led indicator of status, operational voltage 208VAC/120VAC, three pole system. The unit shall be installed internally or externally. The Contractor shall annex in his proposal the NEMA LS-1 format, specifying the equipment's technical sheet to be supplied.

2.01.04.02) General panel board - TAC

The Contractor shall supply and install a new electrical panel board (TAC), which allows the electrical distribution for the proposed services on the new facilities. The new panel board shall have space for the main breaker (3X40A), copper barrages for phases, neutral and ground. The phases' barrages shall be protected by a RETIE certified mechanism, in order to avoid direct manipulation (Dead front). The power capacity list for the new breakers is available in the Drawing E6 "Electrical calculations". The new unit shall have a single diagram, load sheet and markings for all circuits. The new panel board shall be installed/ overlaid at the shelter wall.

The Contractor shall supply and install two (2) industrial three-pole main breakers, 3X40 Amp. each one (with thermal adjustment of the 70% of the nominal current, Legrand DPX125 or similar), placing one unit in the general panel board (TP) and the other one in the TAC panel board. The new industrial breakers to be supplied and installed shall be a well-known brand such as Siemens, ABB, Schneider, Legrand or equivalent RETIE certified.

Electrical board characteristics: The new panel board units to be supplied and installed shall be new, Luminex or similar, made of metal and shall comply with Colombian standard NTC 3475 or US standard UL67. All the new electrical boards shall have frontal door, lock and external signaling according to RETIE. The phases' barrages shall be protected by a RETIE-certified mechanism, in order to avoid direct manipulation (Dead front). The new panel board units shall have a current capacity up to 200A (See capacity accordingly in NTC 3475, table 11.2), voltage isolation rate 600VAC and interruptive current capacity up to 10KA. The new panel boards shall be made in CR BWG No 16-18 and shall be painted using a special treatment in order to support current conditions such as oxidation, water and salinity, which are currently present in the area. The internal spaces shall comply with the US standard IEEE-142. The Colombian standard NTC 2050 and RETIE shall be observed during installation and hardware deployment. The Contractor shall guarantee that the circuit board is grounded to a grounding master bus.

Circuit breakers: Each breaker shall have these characteristics: 6,000 cycles of operation, 10 KA capacity interrupting, 600VAC insulation voltage and compliance UL 489. The power capacity list for the new breakers is available in the annex "Electrical calculations.pdf". The circuit breakers to be used during the project shall be brand new, RETIE-certified and of a well-known brand such as ABB, Legrand or Merlin Gerin.

2.01.05) Receptacles

2.01.05.01) Duplex receptacle 120VAC/15A with grounding pin

The Contractor shall supply and install twelve (12) single-phase receptacles duplex type, insolated grounding pin, hospital grade, 120VAC/15A, white color, Leviton or similar, which shall be distributed according to drawing E2. The new receptacles to be provided and installed shall be placed 40 cm over the finished floor level. The new receptacles to be supplied and installed shall have metallic box (Rawelt or similar) and metallic face plate. In addition, the two receptacles located inside the generators rooms shall have weatherproof covers for outdoor installation. The new receptacle shall be marked accord to US Government representative instructions. The AC receptacles shall be marked by using plastic labels, low relief; color font in white and background in black. A text sample is shown as follows (intentionally left in Spanish): **# TABLERO - # CIRCUITO, EJEMPLO: TAC-C1.**

2.01.05.02) Duplex receptacle 120VAC/15A, outdoor installation

The Contractor shall supply and install one (1) single-phase receptacle duplex type, insolated grounding pin, hospital grade, 120VAC/15A, beige color, which shall be located in the metallic tower to be supplied and installed. The new electrical receptacle shall count with piping installation galvanized, ¾ inches, placed along the new metallic tray to be supplied and installed also. The location is in the middle of the height of the tower (27.5 meter approximately). The new receptacle shall count with metallic box (Rawelt or similar) and weatherproof cover for outdoor installation. The new receptacles to be supplied and installed shall be marked as indicated by the US Government representative.

2.01.05.03) Air Extractors

The Contractor shall supply and install two (2) air extractors units with capacity up to 350m3/h. The new units to be supplied and installed shall have power “contactor” for turning on. The new extractor shall have metallic grid protector, installation frame and indoor and outdoor protector. The units shall be 10 inches diameter, operational voltage 120VAC/60Hz. One of the air extractor units shall be placed 180 cm from finished floor level and the other shall be placed 20cm from finished floor level. The units shall be located a shown in drawing E2. This item includes the 120V single receptacle and the switch. The switch shall be placed 120cm above the floor.

2.01.05.04) AC receptacles for battery rectifiers

The Contractor shall supply and install two (2) receptacles, duplex, 120VAC/15A, isolated grounding pin, hospital grade, which shall be placed as shown in drawing E2.

2.01.05.05) AC Circuit raceway

The Contractor shall supply and install ¾ - inch ducts PVC DB for all electrical system (embedded) and ¾- inch duct EMT (suspended), except for those places indicated on this technical paper. Pining shall be embedded or suspended and material may change such as indications in drawing E2. The new raceway shall run up to each duplex receptacle, socket, light switch, air extractor, among other electrical devices specified in this paper.

2.01.05.06) AC circuit cabling

The Contractor shall supply and install the new cabling system for each of the new AC circuits; the expected wiring shall be type THHN/THWN-2 AWG 3XNo.12, except where indicated. The information regarding wire’s caliber is attached in Drawing E6 “Electrical calculations”. Each conductor shall observe the color code

requested on this technical paper. Each phase shall be colored in red, yellow and blue accordingly and phase's color shall not repeat each other. Neutral shall be colored in white and ground in green. Cabling installation shall be removed if awarded Contractor does not observe the requested color coding. All conductors shall be marked by means of plastic rings. All cabling to be used for the AC system shall have the letters "AC" and the circuit number, example: AC-CTO-1.

2.01.06) Air Conditioner System

The contractor shall supply and install two (2) air conditioning (AC) units, mini-split type, with cooling capacity of 9000 BTU each one. The units shall contain their respective supports and anchor elements. The air conditioning units shall be fitted at a height of 2.00 m above floor level (measured to the top edge of the air conditioning unit). The units to be supplied and install shall be well-known brand with representation in Colombia, such as York, Samsung, LG SJ092CD or equivalent.

2.01.06.01) Interior evaporation unit

The units shall be two-phase system (230VAC), wall mounting and mini-split type. It will operate silently with ventilators and directional flow regulator. A remote control shall be delivered and installed with each unit for its operation.

The awarded Contractor shall place the new units such as shown in the Drawing E4. This item shall include the price for all fixing and retention elements, accessories, anchors and drains in order to guarantee operational condition required by the product´s vendor.

2.01.06.02) Condensing unit

The air-cooled condensing units shall be provided and installed by the Contractor. The condensing units shall operate with R-410A coolant; they shall work silently with a rotary type compressor. The condensing units shall come with an air-condensing coil, horizontal air outflow from back outlet. The units shall be specifically designed for outdoors installation. The AC condenser units shall be overlapped over circular rubber appliance, 2 ½ inches external diameter, with internal hole ½" and 2 inches thickness, this way shall warranty that condenser AC unit shall not contact the concrete on site, the unit is placed over a concrete pad. The expected location is showed in Drawing E4.

2.01.06.03) Electrical connection

The Contractor shall install the electrical receptacle according to Air Conditioning units' consumption and manufacturer conditions for the proposed equipment. The electrical installations shall comply with RETIE, NTC-2050 standards and Air Conditioning manufacturer requirements. The receptacles shall be distributed according to drawing E4.

2.01.06.04) Drainage

The Contractor shall connect the Air Conditioning drainage system for each Air Conditioning unit. The water drain system shall be designed in order to evacuate the water to a place away from the tower area.

2.01.06.05) Insulated copper pipes

The Contractor shall consider the supply and installation of type L copper pipes, dehydrated and sealed, free of contaminants. Welding shall be silver weld equal or similar to HARRIS-5 (5% Ag) for copper to copper joints and HARRIS-15 (15% Ag) for copper to bronze joints.

The Contractor shall install the PVC piping installed to confirm that it is in accordance with the capacity of the system, distance and coolant to be used, taking into account the best practices for minimizing pressure drop-off, guarantee oil return and make it possible to absorb vibrations.

Welding procedure: Once the material has been laid out and cut, the Contractor shall induce a flow of nitrogen through the pipes at a pressure of 2 psig to prevent internal rusting and slag during welding due to the oxyacetylene or oxypropane equipment.

Leakage test: When the welding activities are finished, the Contractor shall flush the system using nitrogen and guarantee that the system is completely closed in order to test for leaks up to 300 psig by means of a mixture of nitrogen and coolant. At that time, the Contractor shall inspect the system with an electronic leak detector that is sensitive to coolant, with water-soap or other reliable methods. Once this process is finished and the leaks found have been repaired, the test shall be repeated and the Contractor shall leave the system at a pressure of 150 psig for a minimum of 12 hours. The pipes shall be left pressurized up to the point in which they are emptied and the system is loaded.

Evacuation and dehydration of the system: The Contractor shall reduce the pressure in the pipes up to 1 psig and they shall be emptied with a high vacuum pump until it reaches a pressure of 1,500 microns. The vacuum shall be broken up to 1 psig of coolant and the evacuation shall be repeated at 1,500 microns. The Contractor shall load the pipe with coolant again with pressure up to 1 psig of coolant and a deep vacuum shall be done until an absolute pressure of 500 microns is reached. Once this is achieved, it is broken with coolant to a pressure of 2 psig.

Coolant load: The Contractor shall calculate the weight of the coolant needed for the system to work correctly and an electronic scale shall be used for introducing the amount of coolant with the system on. Once the loading is complete, the Contractor shall take measures in order to superheat the TXV and sub cool the condensing unit so that, by these means, the optimum functioning of the system is verified.

Thermal insulation: The Contractor shall insulate the suction line with a closed cell flexible hose equal, or a similar approved one, to RUBATEX that has a minimum thick of ½-inch and shall be installed in accordance with the manufacturer's recommendations. Insulation with 35 Kg/m3 polyurethane wrap lined with aluminum foil as a vapor barrier and covered with a 0.7 mm aluminum sheet as a mechanical protection jacket. In this case, neither screws nor rivets shall be used but rather aluminum bands.

2.01.06.06) Warranty

The Contractor shall supply the knowledge, experience and labor needed for the correct operation and for all of the corrective maintenance necessary on all of the equipment and controls supplied in this contract, not including mal usage of the A/C units by the end user as described on the manufacturer manual. This obligation shall be valid for one (1) year starting from the date the A/C units are finally turned over and fully operational.

The Contractor shall make four visits to inspect all of the equipment and take notes of the results on an inspection sheet specified later. Entrances permits shall be requested to the Colombian Navy Base officer in charge. These preventive services shall include cleaning, adjustments, replacing of consumables and technical support. These services shall be provided by qualified technicians with at least two years of experience in maintenance and competences on the A/C brand to be used in the project.

The Contractor shall accept calls made to him with respect to any problem that appears in the operations of the equipment supplied under this contract and shall take the necessary measures within the next 3 days to correct any deficiency that exists.

Inspection sheet: The Contractor shall provide an inspection sheet and place a copy of it in the main machine room. This sheet shall have a list of all of the air conditioning equipment provided under this contract. The inspection sheet shall have space for the next 12 months to be able to indicate that the inspections had been done.

The person that has performed the inspections shall certify on this inspection sheet that he guarantees he has examined each part of the equipment and that, in his opinion, it is operating as recommended by the manufacturer, that it has been lubricated correctly and that all of the corrective and preventive maintenance operations have been done in accordance with the recommendations of the manufacturer and normal accepted practices.

2.01.07) Illumination Plan

2.01.07.01) Fluorescent Lamps

The contractor shall install an illumination system for the shelter as shown in drawing E3. The contractor shall verify the level of 500 luxes at work surface according to the RETILAP standards.

The Contractor shall supply and install six (6) lamps 2 x 32W fluorescent type, each lamp shall fulfill these characteristics: IP 65 waterproof fluorescent lamp, 120 V electronic ballast with harmonic distortion < 10%, power factor >= 98%, two T8 32W fluorescent tubes white 8000 hours of life, Casing polycarbonate, Clips closure, 2-years warranty, Sylvania or similar. These lamps shall be fitted to the roof. The item includes the lamps themselves, single receptacles 120V, wiring with jack and rubber conduit for low smoke emission, switches and fluorescent tubes (See drawing). The switches shall be placed 120 cm above the floor.

The Contractor shall supply and install ¾-inches ducts PVC DB (embedded) and ¾-inches duct EMT (suspended). The price shall also include accessories such as unions, connectors, and miscellaneous elements which are required for the canalization work.

2.01.07.02) Obstruction lights

The Contractor shall supply and install two obstruction light and signaling systems, which shall be located as follows: one at the top of the tower and the other at the middle of the tower height. Each system shall have one omni-directional, red, energy-saving LED double light, cable protected with galvanized pipe, supports. The system shall have a Photocell for automatic activation at night and a controller for flashing mode. The installation shall include all necessary materials, which shall comply with Colombian electrical standards (NTC2050) and REITE, as well as Colombian Aerial Agency "Aeronáutica Civil". The circuit for each light system shall run from the Communications Room (AC panel board) to be constructed by the awarded Contractor. The contractor shall include in his proposal the AC/DC power supply unit in order to feed the light system as well as the required galvanized piping system ¾-inches, which shall connect both beacon lights at 27.5 meters and 55 meters accordingly. The new independent circuit shall be installed using metallic junction boxes with dimension of 10 cm X 10 cm, enclosures are for outdoor installation, being placed on the change of directions and for the electrical split points between the beacons' boxes.

2.01.08) Ladder Cable Tray

The Contractor shall supply and install a ladder cable tray (plenum ventilation), metallic, galvanized, for outdoor installation, antistatic treatment, which shall be used to carry in communication cables from the rack located at the shelter up to top of the metallic tower (60 meters approximately).

The ladder cable tray of 0,3 m wide, shall run from the shelter, the ladder cable tray shall be placed 220 cm from finished floor level, this level is hold up to the metallic tower. Beside each side of the tray, the awarded Contractor shall install two ¾-inch galvanized pipes, which shall be used to canalized the obstruction lights as well as to place an outdoor receptacle 120VAC/15A and for further applications.

Both piping and ladder cable tray shall be grounded and tied to the grounding system. A grounding line shall be placed along the structure THHN/THWN-2 AWG No. 8; such line shall be screwed every meter. Junction boxes and change of directions shall be grounded as well by using grounding kits.

Civil work and any other task required to install the piping and tray system such as painting, arrangements and waterproofing treatments shall be included as part of the scope of the contract.

The Poke-thru to be done for the tray installation shall have a system that prevents for water going inside and/or insects into the shelter. Finally, the ladder cable structure shall support total weight of all the elements like cables, pipes and trays itself, for that reason accessories and anchors shall be install providing rigidity and avoiding any kind of deformation. Details and locations are shown in drawing E4.

2.01.09) Lightning Protection System

The installation of the LPS to be supplied and installed by the Contractor shall comply with NFPA 780 and NTC 4550 standards. The Contractor shall annex the virtual test using a rolling sphere software and showing the solution in a 3D graphic. If the Contractor considers a different design that the indicated in this SOW, the Contractor shall indicate his/her Lightning proposal with the test using the rolling sphere method.

The Contractor shall supply and install a Lightning Protection System (LPS), which shall be composed of one aerial terminal Franklin blunt type Ref P8, shown on Drawing E5. The air terminal shall be coupled with a copper pole 300 cm length with screw-socket. The air terminal and the copper pole shall be placed over the top roof ridge, which shall be connected by two line downs (THHN/THWN cooper feeder caliber AWG No. 1/0),

such as shown on drawing E5. A ring in cooper conductor AWG No. 2 shall be placed on the top of the tower, line downs, ring and electrodes shall be connected and their unions shall be welded.

Holders and isolators shall be supplied by the Contractor. Grounding line shall be separated 10 cm from the surface's structure. The line-down shall be canalized by means of a duct ¾ inch, which shall be placed along the structure, with a pipe's length of three (3) meters from soil level. The line down shall end in a grounding system, which shall be connected with the tower's grounding system. The line downs shall be tied to the grounding electrodes by using exothermic weld soldering for connections purposes. Each line down shall be undergrounded 50 cm at least. The line-down's pipe shall be grounded as well. The installation details are depicted in drawing E5.

2.01.10) Grounding System

The Contractor shall supply and install a grounding system, such as requested on this item. The system is expected to have less than 2 ohms impedance value. The Contractor shall execute a testing of the site, and design a system that fulfills the requirement. In case that soil conditions were not proper to get the expected impedance value, the contractor shall include in his proposal the soil study, in order to recommend a soil treatment, which shall be required to improve the soil conditions. The Contractor shall submit the proposed design for approval before to execute the installation.

The grounding electrodes shall count with inspection enclosures, which shall be built in concrete, diameter of 40 cms, and concrete or metallic "alfajor" covers. The free space between cover and viewable ending of the grounding electrode shall be at least 60 cms. The drawing E1 shows a layout of the enclosure construction. The awarded Contractor shall certify the system by the following sheet:

Impedance value according to IEE 142-4.1.2
Electrodes material NEC 250-52-c (2)
Electrodes size and diameter NEC 250-52-c (3)
Electrodes separation NEC 250-56
Connection quality NEC 250-70
Conductor's gauge network NEC 250-50 (d)
Conductor's gauge for grounding NEC 250-66C
Conductor qualities NEC 250-50
Low power interconnection NEC 250-68
Electrodes accessibility NEC 250-68
Grounding barrage EI/TIA 607-5.4
Flowing current IEEE 1100 table 4.3

The electrodes shall be caliber 5/8-inch, 2.44 length and copper 99%. The grounding line shall be made in copper conductor caliber AWG #1/0. The electrodes' inspection enclosures shall contain a soil treatment such as "Favigel" or "Hidrosolta", in order to improve soil conductivity and homogeneity features. As an example, Figure No.1 shows a typical inspection box required for previous projects.

Figure No.1

2.01.10.01) Metallic tower shelter

The system shall be composed of seven (7) grounding electrodes, which shall be placed such as shown in drawing E5.

The Contractor shall supply and install a new master grounding bar shall be made in copper electro-tinned with 15mm of thickness, 25 cm length and 8 cm width., which shall be placed 30 cm from finished floor level. The grounding bar shall be mounted over power isolators, which shall be fixed to wall. The grounding lines shall be marked by means of plastic marking color in red for background and yellow for fonts.

The shelter's grounding system shall be connected with the metallic tower's grounding system by using a choke coil and grounding lines AWG 1/0, such as depicted in drawing E5.

2.01.11) Marking

The Contractor shall supply and install plastic plates with black bas-relief and printed white letters of no less than one centimeter in height, on all the main equipment for distribution such as measuring center, panels and telephonic or voice and data distributors. These plates shall indicate the use for each device or element according to the diagrams.

- All electrical panels shall have the single line diagram and power distribution chart; each circuit shall be identified.
- The main distribution panel shall be identified with 10 cm x5 cm labels, with white letters and black background. Secondary panels shall have similar 5 cm x3 cm labels.
- Each breaker in the main electric panel shall have a 5 cm x 3 cm label.
- Solid plastic safety signs (electric risk) shall be installed in every electric panel, in the electric room, emergency generator and electrical sub-station.
- 5 cm x 3 cm solid plastic labels shall be installed in the grounding lines coming out of the main distribution panel, with red letters and yellow background.
- 3 cm x 4 cm metallic labels shall be installed for the inspection boxes.
- 10 cm x5 cm plastic labels with white letters and black background shall be installed or each end of the main circuit.
- 10 cm x5 cm plastic labels with white letters and black background shall be installed for secondary circuits; the cables shall have plastic ties every 1.5 meters.
- Electric outlets shall indicate the respective panel and secondary circuit, as well as the corresponding voltage.
- Switches shall indicate the respective panel and secondary circuit.
- Each faceplate shall indicate the number of the corresponding port in the patch panel.

3.01) Transportation and Logistic

3.01.01) Transportation Bogota - Buenaventura

The contractor shall include the transportation of the complete metallic tower, shelter and electrical, lighting protection and grounding elements from the production site in Bogota's urban perimeter to the Buenaventura port where these elements shall be shipped to Bahia Solano and Pizarro. The work includes loading and unloading the metallic tower, shelter and electrical, lighting protection and grounding elements, obtaining and renting a crane or forklift, and localization of these elements in the warehouse or indicated site according to the instructions of the Colombian Navy Base representative and US Government representative at the Buenaventura port. If the metallic tower, shelter and electrical, lighting protection and grounding elements or nearby structures suffer any damage during transportation and/or movement to the site indicated, the contractor shall bear with all associated costs and expenses which might be incurred in carrying out repairs, all at no cost whatsoever to the US Government.

3.01.02) Logistic On Site

The contractor shall include lodging, transportation and associated expenses of his personnel at the project area in Bahia Solano and Pizarro which are involved in the supply and installation process of the tower and elements included in the actual SOW. The contractor shall include as well the equipment, materials and elements require for the complete transportation and installation of the metallic tower, shelter and electrical, lighting protection and grounding elements to the project area. If the nearby areas are affected by these lodging, transportation and associated expenses of the contractor personnel at the site indicated, the contractor shall bear with all associated costs and expenses which might be incurred in carrying out repairs, all at no cost whatsoever to the US Government.

Specifically for the Pizarro tower the contractor shall include the transportation of the complete metallic tower, shelter and electrical, lighting protection and grounding elements from the Pizarro port to the project site where these elements shall be constructed and installed. The work includes loading and unloading the metallic tower, shelter and electrical, lighting protection and grounding elements, obtaining and renting a crane or forklift, and localization of these elements in the Temporary facilities or warehouse according to the instructions and approvals of the Colombian Navy Base representative and US Government representative. If the metallic tower, shelter and electrical, lighting protection and grounding elements or nearby structures suffer any damage during transportation and/or movement to the site indicated, the contractor shall bear with all associated costs and expenses which might be incurred in carrying out repairs, all at no cost whatsoever to the US Government.

<u>BID OPTION #1</u>

Transportation Bahia Solano Port – Project Site (Cerro Mutis)

The contractor shall include the transportation using Helicopter of the complete metallic tower, shelter and electrical, lighting protection and grounding elements from the Bahia Solano port to the project site at Cerro Mutis where these elements shall be constructed and installed. The work includes loading and unloading the metallic tower, shelter and electrical, lighting protection and grounding elements, obtaining and renting a crane or forklift, and localization of these elements in the Temporary facilities or warehouse according to the instructions and approvals of the Colombian Navy Base representative and US Government representative. If the metallic tower, shelter and electrical, lighting protection and grounding elements or nearby structures suffer any damage during transportation and/or movement to the site indicated, the contractor shall bear with all associated costs and expenses which might be incurred in carrying out repairs, all at no cost whatsoever to the US Government.

BID OPTION #2

Transportation Buenaventura – Bahia Solano

The contractor shall include the transportation of the complete metallic tower, shelter and electrical, lighting protection and grounding elements from the Buenaventura port to the Bahia Solano port where these elements shall be transported to the project site at Bahia Solano (Cerro Mutis). The work includes loading and unloading the metallic tower, shelter and electrical, lighting protection and grounding elements, obtaining and renting a crane or forklift, and localization of these elements in the warehouse or indicated site according to the instructions of the Colombian Navy Base representative and US Government representative at the Bahia Solano port. If the metallic tower, shelter and electrical, lighting protection and grounding elements or nearby structures suffer any damage during transportation and/or movement to the site indicated, the contractor shall bear with all associated costs and expenses which might be incurred in carrying out repairs, all at no cost whatsoever to the US Government.

BID OPTION #3

Transportation Buenaventura – Pizarro

The contractor shall include the transportation of the complete metallic tower, shelter and electrical, lighting protection and grounding elements from the Buenaventura port to the Pizarro port where these elements shall be transported to the project site at the Pizarro area. The work includes loading and unloading the metallic tower, shelter and electrical, lighting protection and grounding elements, obtaining and renting a crane or forklift, and localization of these elements in the warehouse or indicated site according to the instructions of the Colombian Navy Base representative and US Government representative at the Pizarro port. If the metallic tower, shelter and electrical, lighting protection and grounding elements or nearby structures suffer any damage during transportation and/or movement to the site indicated, the contractor shall bear with all associated costs and expenses which might be incurred in carrying out repairs, all at no cost whatsoever to the US Government.