

US EMBASSY, NEW DELHI
STATEMENT OF WORKS FOR
STUDY OF TOTAL HARMONICS DISTORTION AND MITIGATION AT ENCLAVE COMPOUND,
NEW DELHI

BRIEF DESCRIPTION OF WORKS:

The US Embassy, New Delhi requires services for studying the total Harmonic distortion and design the mitigation array for the same with expected saving potential and execution cost for the entire area in Enclave compound consisting two office buildings, one residential building having three apartments blocks and other associated small buildings within the compound i.e. ACSA, Health Unit etc..

1.0 GENERAL GUIDELINES

- a. Contractor is advised to go thru the detailed statement of works and specifications. Contractor shall furnish all the materials, labor, and tools to execute the project as per scope of works mentioned in the detailed SOW, specifications and to the satisfaction of the COR.
- b. Contractor shall provide a detailed time schedule of activities involved in the project within a week of the award of contract.
- c. Contractor shall deploy a full time engineer/supervisor and a safety inspector at site during the installation.
- d. The total duration of the project will be 30 days including the delivery of materials/ instruments/tools at site and completion of work.
- e. Provide and implement all safety measures in the working area, taking into consideration of the needs/functions of the offices in the vicinity of the work area (see Annexure-I).
- f. Contractor shall be responsible for barricading by caution tape and putting caution sign in the area wherever he is working in the compound during the entire project.
- g. Damage of any nature to the Embassy facility, caused due to the negligence of contractor's workers while performing the job, shall be restored by the contractor at his cost.

- h. Contractor shall hand over all the design details, as built drawings, test certificates and operational procedures to the Embassy representative after the completion of the project.
- i. All other logistical requirements pertaining to the transportation and movement of materials shall be under contractor's scope.
- j. Embassy will provide assistance for temporary power requirements for the use of equipments and instruments & power tools used by the contractor during the execution of the work.
- k. Contractor shall follow the prevailing local Electrical Rules during all the activities involved in the project.
- l. All workers employed by the contractor at the site require security clearance from the Embassy RSO. Contractor must provide in writing the names of all the workers and supervisors who will be engaged in the project at least 15 days in advance enabling the Embassy representative to arrange the necessary security clearance for the workers.
- m. The Contractor shall collect security forms for daily worker badges or cleared badges for his workers from FMS office after award of the contract. Contractor shall submit the duly filled forms with required documents specified in the forms within 3 days of the receipt of the forms.
- n. The contractor shall not take any task orders or instructions from any persons other than the Contracting Officer or his representative.
- o. The contractor is responsible for Personal Protective Equipment (PPE) for employees. Workers shall wear sturdy shoes or boots (flip-flops are not approved). PPE shall include hardhats, hearing, breathing, and eye protection as required.

2.0 DETAILED STATEMENT OF WORKS:

- 2.1 The work will include, but not limited to, study the Total Harmonic distortion in the entire electrical system and analysis of the results and solution with respect to guide lines laid down in IEEE 519
- 2.2 The contractor shall conduct a study of the entire Enclave compound area and diagnose to identify those areas which have harmonic distortion level in the electrical network of the Enclave compound beyond the permissible limits of IEEE 519 standards.
- 2.3 After the study is completed the contractor will provide the detail study report with workable solution to minimize the impact of harmonic distortion subject to the maximum limits per IEEE 519. The contractor shall estimate the expected saving potential & detailed implementation plan along with cost implication for Enclave compound area consisting of office buildings, residential building having three apartments blocks and other associated small buildings within the compound i.e.

ACSA, Health Unit etc. The submission should include drawings and detailed specification of equipment and necessary drawing, supporting calculations, bill of quantities and cost estimate etc.

2.4 The contractor shall carry out the work in such a manner so as to create minimum inconvenience to the operation of the facility and the workers.

2.5 Consultant has to analyze the entire electrical system in Enclave Compound for the following parameters:

- I. Measurement of all Electrical parameters like Voltage, Current, kW, Power Factor, neutral current, THD Voltage, THD Current Harmonic and Individual harmonics levels (up to 50th) at switchgears' input and output side.
- II. Analysis of the harmonic readings as per IEEE 519 standard.
- III. Measurement and Analysis of current variation, current unbalance, voltage variations, frequency variations, voltage unbalance, interruptions, Swells, dips, transients (short term), neutral to earth voltage as per the EN 61000-4-30 standard analyzer at main LT incomer for 24 hours duration.
- IV. Analysis of power quality for necessary parameters which affect the consumption of electricity in the network.
- V. Assessment of existing capacitor banks.
- VI. Provide recommendation to improve the power quality, power factor improvement, reduction in harmonic levels, if any, to comply with IEEE 519, 1992 standards.
- VII. Scanning of electrical installations and capturing thermal Images using thermal imaging camera. (At main LT breakers, 30 nodes/images).
- VIII. Analysis of the captured Image using appropriate software.
- IX. Diagnosis of the captured image and pointing out hot spots, abnormal conditions i.e. identified will be projected in report.
- X. Final report submission indicating Observations, Recommendations and images for the present THD and mitigation of THD.
- XI. Deliverables: Harmonic analysis, voltage variations, frequency variations, reactive power compensation. Transformer loading, current and voltage unbalance analysis report in laminated folder with mitigation study, estimated cost for the procurement of mitigation equipment, estimated saving with implementation of that study.
- XII. All the instruments for measurement must be calibrated by certified labs.
- XIII. Contractor shall provide all the supportive calculations and detailed drawings for review by the COR and for execution of the work later by the contractor.
- XIV. Contractor shall provide scope of work for implementation of the solutions, bill of quantities, cost estimate and other related documents to hire a separate agency for execution / implementation of the design prepared by him.

- XV. Contractor shall answer the questions as received from other agency hired for implementation of solutions to mitigate the harmonics in the future before bidding and during the implementation/ execution phase related to design at no extra cost to USG.
- XVI. In case there is any deviation in the design during implementation phase, after completion of the study, due to some over-site during study & designing phase, that shall be corrected and new / alternate design shall be provided by the consultant at no extra cost to USG.
- XVII. Contractor shall be provided with all available necessary information regarding existing electrical distribution system. Any additional information required shall be measure / calculated /explored by the contractor on his own.

3.0 **WORK STANDARDS:**

The contractor shall be responsible for providing the workers proper tools and test equipments to accomplish each segment of this work statement. The entire work shall be carried out by professionally qualified and certified persons. The craftsmanship shall be professional and maintain the Indian standards or embassy standards with necessary fire and life safety precautions wherever required. The following are the routine practices which are required to be completed at his end:

- 1) **CLEANING OF THE WORK SITE:** The contractor shall be responsible for cleaning of the work-site every day during the execution of work. The contractor shall be responsible to dispose of the trash and debris, if any.
- 2) **SITE RESTORATION:** The contractor shall ensure that all facilities receiving this work shall be left in a condition acceptable to COR and the site supervisor upon completion.
- 3) **SAFETY:** Safety is the highest priority. The contractor shall direct all of those under his charge to work safely. The safety concerns shall be brought to the attention of the COR. The contractor shall take all necessary measures and precautions to avoid interruptions of Government operations and delays. Contractor must provide and maintain work environment and procedures, which will safeguard the public and Government personnel, property, materials and equipment exposed to his operations and activities. The contractor's staff will take all safety precautions and comply with the standards issued by OSHA, local authorities, Embassy over occupational health and safety issues. All work should be carried in accordance with applicable safety regulations and as per the Annexure – I.
- 4) **SECURITY REQUIREMENTS:** The Embassy shall arrange for security clearances of the contractors' workers to be deployed at the Embassy. The contractor is required to provide the full names and completed security forms of personnel's those who are assigned to this

specific task within ten working days after the award of the contract.

- 5) ALLOWANCES FOR MISCELLANEOUS TIME REQUIREMENTS: No additional funds will be provided to compensate for additional time requirements or delays that could have been reasonably anticipated.

4.0 **WARRANTY:**

The entire work shall be warranted for any incorrectness, misleading information liability for a period of minimum two years from the date of acceptance by the COR.

5.0 **SUBMITTALS:**

- a. Contractor shall submit three set of submittal (hard copies) including but not limited to different Reports, calculations, recommendations for mitigation of THD, material specification, AutoCAD drawings, bill of quantities, etc with one soft copy (CD) for the complete submittal.
- b. All submittals must be of a quality to achieve this result. The Contractor shall perform its services in accordance with professional standards of skill, care, and diligence adhered to by reputable, first class firms performing services of the same or similar nature for facilities of similar complexity. The contractor's design shall conform to generally accepted engineering practices and the approved design criteria.

6.0 **DELIVERY SCHEDULE FOR SUBMITTAL:**

Site survey report and proposed options for mitigation of total harmonic distortion, as per the IEEE 519, 1992 standards with estimated saving potential and implementation cost - Within 10 calendar days after completion of work.

7.0 **SECURITY:**

- a. All documents received or generated under the contract are the property of the U.S. Government.
- b. All documents are to be controlled and disseminated on a need-to-know basis. Reproduction and distribution is prohibited without express approval of the U.S. Government. The contractor shall mark all design and construction documents as follows:

WARNING: This document is the property of the United States Government. Further reproduction and/or distribution are prohibited without the express written approval of: The Contracting Officer, American Embassy, New Delhi.

RELEASE OF INFORMATION:

- a. All data furnished to the Contractor and data developed in connection with the project shall be considered privileged. The contractor shall not make public announcements, including news and press releases; these are the prerogative of the Contracting Officer.

Annexure- I

SAFETY STANDARDS TO BE FOLLOWED AT CONSTRUCTION AND RENOVATION SITES

General

1. All contractor employees engaged in maintenance/construction activities must wear proper shoes appropriate for their trade. No open toed sandals, flip-flops, or bare feet are permitted at work site.
2. All workers shall be fully clothed. No half pants and other non-appropriate clothing (Dhoti) will be accepted.
3. Malba / trash accumulated on the site shall be removed at a regular intervals (if possible on a daily basis) to prevent trip hazards.
4. Employees exposed to occupational hazards shall wear personal protective equipment (hard-hats, eye protection, ear protection, etc.). Appropriate protective equipment for any operation varies with the size, nature and location of work to be performed.
5. Drinking water must be made available to all contractor employees.
6. It is the responsibility of the contractor to provide all personal protective equipment (PPE) per the requirements at the work site and as directed by the COR. Any mishap due to negligence on the part of the contractor shall be entirely the contractor's responsibility.

Hot Work/ Metal Work

1. All contractor's employees who are arc welding at the work site shall use a full face shield with #10 or darker lenses. No contractor employee will be permitted to arc weld with sun glasses, no matter how dark the lenses.
2. All the contractor's employees grinding and sanding shall have approved face masks and goggles for face and eye protection.
3. Contractor's employees handling heavy metallic material shall have appropriate gloves and steel toed safety shoes.
4. Lifting and shifting of the heavy material shall be done with the help of appropriate number of employees or machines.
5. Compressed gas cylinders shall be properly marked and should always be kept in standing positions secured from falling.
6. Hoses connected to the cylinder should be in good condition.
7. The contractor shall provide ventilation during interior arc welding operations.
8. Contractor shall use sight shields during welding to protect against any potential vision hazard.
9. Always keep an approved fire extinguisher near the site of welding.
10. Workers working with metal sheets must wear appropriate gloves to avoid any cuts on the hands.

Ladders Safety

1. Contractor shall use aluminum or fiber glass ladders for most purposes. Wooden or bamboo ladders are not allowed on the site.
2. Proper ladder for the specific job shall be used (for example fiber glass ladders for electrical work etc.).
3. Damaged ladders or ladders with missing supports, shoes, etc. shall not be used at the work site.
4. Height of the ladder shall be at least two feet above the required height for the work.

Electrical

1. All the equipment / machines to be used for the execution of the job shall be properly grounded.
2. All the extension boards to be used at the site shall have proper grounding.
3. All connections to any of the outlets shall be through three pin plugs. Direct connection of wires into receptacles is not permitted.
4. Machines/Tools with damaged wiring/ cabling shall not be used at site. The extension cord or wire with the machines shall be solid core with no breaks.
5. Electricians working on the site shall wear non-conductive shoes with rubber soles and shall use rubber gloves during execution of the work.
6. Any heavy equipment requiring voltage higher than 220VAC shall be connected under supervision of an embassy electrician.
7. No taped joint or undersize wiring is allowed at the site for the work.

Carpentry

1. Carpenters shall have dust masks to protect from the potential hazards from saw dust. Sanding machines used at the site shall have proper guards and operator shall wear suitable PPE, for example safety goggles, safety shoes, gloves etc.
2. All lumber used at the site shall be stored and must not pose a trip hazard.
3. Entire site shall be kept clean from the saw dust at the end of each work day.
4. Carpenter shall use machine guards on all machines used at the site.
5. All power carpentry equipment used at the site shall be properly grounded and wired.
6. Contractor shall use proper tools and tackles for the execution of the work at site.
7. Nails and other sharp material posing a laceration risk shall not be scattered about the site.

Fire

1. Contractor shall provide and place fire extinguishers at the work site.
2. No flammable material shall be stored inside the premises and must be removed at the end of the work day.

Lock Out / Tag Out

1. Lock out/tag out devices should be used during the testing of the electrical points and wiring in **Confined Spaces**.
2. If contractor's employees must work in a confined space the contractor shall contact the COR before proceeding with the work. Contractor shall arrange all the equipment as instructed by the COR to accomplish the job in a safe manner.

Hearing Protection

1. Contractor's employees working in excessively noisy environments shall wear proper hearing protection.

Height Protection

1. Contractor's employees working at elevations greater than 8 feet for prolonged periods (greater than 1 hour) shall use sturdy metal pipe scaffolding. Alternatives to scaffolding shall require approval of the COR.