(CLIENT’S NAME)(FONT SIZE 18)

(PLACE)(FONT SIZE 18)

<NAME OF THE ASSIGNMENT> (FONT SIZE 16)

**TENDER SPECIFICATIONS** (FONT SIZE 18)  **FOR (FONT SIZE 14)   
NON-DESTRUCTIVE TESTING (FONT SIZE 14)   
(PACKAGE No. 1).(FONT** SIZE 14)

  
**STEEL AUTHORITY OF INDIA LIMITED** (FONT SIZE 14) **CENTRE FOR ENGINEERING & TECHNOLOGY** (FONT SIZE 12) **RANCHI – 834002** (FONT SIZE 12)  
**JANUARY, 2017** (FONT SIZE 12) **CET/0\_/\_\_/\_\_\_\_/TS/CE/\_\_/R=0(TS NO.)** (FONT SIZE 12)

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| **PACKAGE LEADER(PL)** | **TASK FORCE LEADER(TFL)** | **HOD (PL)** |
| <Name with designation> | <Name with designation> | <Name with designation > |

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Blue with yellow background: Instructions for the respective write-up.

**“Successful bidder”** shall not be used at any place in the TS and only “**bidder”** shall be used.

Red with grey background: To be modified or deleted as per specific requirement.

## INTRODUCTION

* 1. **GENERAL**
     1. (Only specific information related to project should be given like :

1. Brief about concerned plant
2. Brief about the unit to be modified/ upgraded/ new installation)
   1. **OVERVIEW OF THE PROJECT**
      1. As the existing structures are suspected to have undergone loss of strength due to weathering and decay over long period of time and the possibility to study the re-usability of the existing structure is to be done which are essentially required for planning the new facilities, it is required to carry out Non-Destructive Testing (NDT).
      2. Before implementation, it is required to ascertain the condition and suitability of the structure and foundations for change in loading. It is proposed to conduct Non-Destructive Testing (NDT) to investigate the same.
      3. The data generated from this package shall be used as basis for planning and designing of various units / facilities under all other packages as required.
   2. **IMPLEMENTATION**
      1. The complete job of Non-destructive testing is envisaged to be executed through a single package.
      2. This tender specification pertains to non-destructive testing to be executed on **Item Rate basis** which includes investigation of structural health of structure, foundations etc. & Non-destructive testing, to be used as basis of planning & design for the proposed facilities.
   3. **INTENT OF THE SPECIFICATION**
      1. The intent of this tender specification is to furnish required details for enabling the bidder to submit their best bids (technical & commercial) as per the scope of work mentioned at chapter 2.0, technical specifications at chapter 3.0 & Schedule of Quantities.
      2. This tender specification shall be read in conjunction with other documents enclosed with the NIT.
   4. **SITE VISIT AND OTHER REQUIREMENTS**
      1. The bidder shall visit the site, study drawings/ documents and discuss with the employer/ consultant, if required, regarding any technical clarification and get satisfied with respect to the nature and extent of work involved. The bidder shall also obtain first-hand information regarding location, work terrain, climate condition, railways, roads, airports and communication etc. before offering the bid for the job.
      2. Any local factors, if felt by the bidder, must be factored in before quoting for the work. No separate payment shall be made towards this. The quoted rates shall be considered as inclusive of cost towards these factors.
      3. All materials/ equipment/ machinery/ fabricated items used in the subject package shall be according to the specification given herein.
      4. Bidder has to accept all terms and conditions without any exclusions and deviations.
   5. **SCHEDULES TO BE DULY FILLED AND SUBMITTED WITH THE BID**

|  |  |
| --- | --- |
| 1.6-1 | Declaration of site visit |
| 1.6-2 | Details of contact persons for furnishing clarifications during tender evaluation |

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1. **SCOPE OF WORK**
   1. **GENERAL**
      1. The bidder shall be responsible for execution of the jobs envisaged for non-destructive testing of concrete structure on Item Rate basis.
      2. The scope of works includes mobilization of testing equipment at site & laboratory for all tests as below, including hire charges, procurement / purchase cost, transportation charges, taxes/duties, setting up of the equipment, withdrawing samples from cores / samples from structures, preservation, handling etc. The scope covers procurement and supply of all consumables, transportation of sample to laboratory, testing, analysis of the data and presenting the test results and findings in a report.
      3. The scope of work shall cover all works and by-works as mentioned in the schedule of quantities (**Schedule 2.1.3-1** of this document) and supported and supplemented by the specifications mentioned in the document.
      4. All work shall be completed in all respects and final report submitted for approval within **2 months** from the date of issue of Award Letter / LOI. The observations/comments on the final report from the employer/consultant, if any, shall be incorporated and submitted within 15 days.
      5. Quantities indicated in the schedule of quantities are to be considered for submission of the bids. Actual amount payable shall be based on actual site measurement approved by the employer or their authorised representative. The unit rate quoted by the bidder shall be firm for the total amount irrespective of the quantity variation.
      6. Utmost care shall be taken by the bidder to ensure that no damage is caused to existing underground service lines during boring, excavation etc. The bidder shall make test trenches to ascertain their presence and take appropriate steps to safe guard them. In case any damage is caused to the services, the same will be made good by the bidder without any additional financial implication.
      7. Any existing underground cables, pipes encountered during course of execution shall be suitably taken care of by bidder in consultation with the employer/ consultant.
   2. **SCOPE OF WORK**
      1. **Non-destructive testing**
         1. The scope of work comprises of the following tests:
            1. Arranging tools, tackles, handling equipment, scaffolding, temporary platforms, erection fixtures etc.,
            2. Visual inspection of RCC structures.
            3. Vertical & horizontal drilling in RCC for taking out core samples.
            4. Conducting compressive test on core samples.
            5. Conducting Ultrasonic Pulse Velocity Test on RCC.
            6. Determination of carbonation of concrete.
            7. Residual Life Assessment (RLA) based on NDT.
            8. Determination of location of reinforcement and concrete cover.
            9. Testing of soil sample collected from the vicinity of foundation.
         2. The above tests (Sl. Nos. 1 to 6 above) shall be done on the beams, columns and foundation raft of \_\_\_\_\_ structure. Bidder to note that at present the equipment is in operation and the equipment is installed on top of the RCC structure. Bidder has to conduct the tests enumerated above with the equipment in place.
         3. Soil samples (Sl. No. i) of para 2.2.4.1 (i), shall be tested for presence of any chemical content in the soil, which may adversely affect the health and life of foundation raft.
         4. Core holes shall be filled with approved ready mix high strength grout of at least 30 MPa strength.
      2. **Drawings and technical documents:**

The following shall broadly constitute the scope of work:

* + - * 1. Submission of report for NDT
        2. Editable format soft copies on CD/DVD of all drawings and documents shall be supplied by the bidder.
  1. **HANDING OVER SITE**
     1. On completion of work, all rubbish, debris, temporary supports, enabling structures etc. shall be removed from the site and the site (including the storage site) shall be handed over to employer in a tidy manner. All scrap, muck, etc. shall be dumped suitably at specified places within a lead distance of 2 km, as directed by the employer. If the bidder fails to clean up the site within a reasonable period of completion of erection, the employer may do so at the expense of the bidder.
     2. Throughout the execution of the work, the bidder shall perform cleaning on a day-to-day basis.

1. **TECHNICAL SPECIFICATIONS**
   1. **GENERAL**
      1. **General information on site:**

Durgapur Steel Plant (DSP) is located in West Bengal at about 170 km from Kolkata.

* + 1. **Climatic Condition**

Local climatic conditions are as follows:

|  |  |  |
| --- | --- | --- |
| 1. | Elevation above MSL | 222 m |
| 2. | Maximum temperature | 50oC |
| 3. | Minimum temperature | 8oC |
| 4. | Relative Humidity | 100% (max.) and 22% (min) |

However, maximum temperature and maximum relative humidity shall not occur at the same time.

* + 1. **Connectivity**

The nearest Railway station is Durgapur. The plant site is about 12 km from the Railway station. It is adjacent to the National Highway (NH-2). The nearest domestic and international airport is at Kolkata.

* + 1. **Communication Facilities**

Postal, telegraph, telephone, fax & internet facilities are available at Durgapur.

* 1. **PROCESS AND TECHNOLOGY**
     1. Standards

Unless specifically mentioned otherwise, all applicable codes and standards (latest revisions) published by the Bureau of Indian Standards and all other such documents as may be published by them up to the commencement of work, shall govern design, workmanship, quality and properties of material and method of field and laboratory testing. Some of the relevant codes are:

IS: 2131-1981 - Method of Standard penetration test for soils.

IS: 2132-1986 - Code of practice for thin walled tube sampling of soils.

IS: 2720-(latest) -Method of tests for soils (All parts).

IS: 2809-1972 - Glossary of terms & symbols relating to Soil Engineering.

* + 1. **Language And Unit**

The soil investigation report shall be in English language. Dimensions in the drawings, technical data and weights furnished shall be in SI units. The glossary of terms & symbols shall conform to IS: 2809-1972.

* 1. **NON-DESTRUCTIVE TESTING**
     1. **Visual Inspection of RCC Structure**

RCC structures generally visible over the floor and ground level shall be inspected and their conditions shall be noted down in log form indicating their colour, softness, spalling, cracks and pattern, observation of sound quality by applying mild blows of hammer etc. Also the condition of reinforcement exposed, if any, shall be noted.

* + 1. **Core Test**

Cores shall be taken from the RCC elements as per provision of IS: 1199-1959. The diameter of cores shall be 54 mm and the height to diameter ratio shall be kept between 1.0 to 1.2 the cores shall be taken out from such location from the surface of concrete so as it truly represents the strength characteristic of concrete. The compression test shall be carried out as per provision of IS: 516-1959. Correction factor shall be applied subsequently to convert the compressive strength into equivalent cube strength.

Both vertical & horizontal cores shall be taken depending upon the type of structures. In columns the core shall be 300mm either above or below the construction lift.

* + 1. **Endoscopy**

Endoscopy is to be performed at the location where cores were taken out. Photographs shall be taken in the interior of the cores and the photographs shall be investigated for locating the discontinuity, voids etc. in the concrete.

* + 1. **Ultra Sonic Pulse Velocity Test**

This test shall be conducted as per provision of IS: 13311 (part 1)-1992. The pulse velocity found in km/sec across 2 points in the structures shall be tabulated and the corresponding concrete quality shall be obtained in terms of excellent, good, medium and doubtful.

* + 1. **Carbonation Test**

The measurement of depth of carbonation of concrete shall be carried out by spraying a freshly fractured in-situ concrete surface with 0.2 % solution of Phenolphthalein in Ethanol. Phenolphthalein in Ethanol being a pH indicator the magenta area (pink colour) represent uncarbonated concrete and the remaining (colourless portion) the carbonated areas. The change in colour occurs at about pH 10 of concrete.

* + 1. **Position and Cover to Reinforcement**

Before taking out cores, the position and cover to the reinforcement shall be determined using concrete cover meter or any other suitable method and results shall be represented in the form of drawings. Cores shall be taken from carefully chosen locations so as not to affect existing reinforcement.

* + 1. **Chemical Analysis of Soil & Sub-Soil Water**

The following chemical characteristics shall be determined for the sub-soil.

pH value IS: 2720(Part 26)-1987

Total soluble sulphates IS: 2720(Part.27)-1977

Chloride Content

In addition, bidder may decide to conduct testing for presence and content thereof any other chemicals, which might cause adverse impact on the condition, health and life of the structures/foundations.

* 1. **NDT REPORT**
     1. The report on NDT testing must contain the following:
        + 1. Site photographs, taken during physical inspection, sample collection, conducting tests etc.
          2. Short description of test methodology & equipment used along with calibration date of equipment and the reference international/ BIS code number.
          3. Report of visual inspection.
          4. Range of equipment reading, interpretation of equipment reading range and actual readings for tests at site & laboratory along with correlation of such reading with the present health.
          5. Residual Life Assessment (RLA) based on NDT in regards to the usability with or without restoration, up to the designed life. Alternatively, the measures & precautions to be taken for keeping the facility in operation for next 20 to 25 years after carrying out the recommended restorations/ repairs based on report.
          6. Recommendations for restorations & repairs in consultation with the manufacturers of construction chemical & fibre (Carbon/ FRP- laminates & bars) health restoration/ strengthening system (any one out of Sika, Fosroc, MYK Arment and BASF). Recommendations should include the typical and specific sketches for the restoration and strengthening methodology being proposed.

(Report from manufacturer must be appended with the final NDT report. Moreover, for compatibility of restoration system, only one manufacturer shall be selected for getting the expert report)

* + - * 1. Bill of material/ Schedule of quantities for entire repair & restoration work along with specifications.

**DECLARATION FOR SITE VISIT**

(To be filled up by the Bidder)

I, hereby, declare that I have visited the site to understand the site conditions, and acquainted myself with atmosphere prevalent therein. I have also understood the extent of total works involved for this package.

|  |  |
| --- | --- |
|  | Signature of the Bidder: |
| Seal of company | Name: |
|  | Designation: |

**DETAILS OF AUTHORISED PERSON DURING TENDER EVALUATION STAGE**

1. Name of Project :
2. Tender No. :
3. Name & Address of Bidder :
4. Name of authorised person (TECHNICAL) :
5. Email address :
6. Mobile No. :
7. Name of alternate authorised person (TECH) :
8. Email address :
9. Mobile No. :
10. Name of authorized person (COMMERCIAL) :
11. Email address :
12. Mobile No. :
13. Name of alternate authorised person (COMM) :
14. Email address :
15. Mobile No. :

Authorised Signatory

| **Item No.** | **Description** | **Unit** | **Qty.** | **Rate** | **Amount** |
| --- | --- | --- | --- | --- | --- |
| ND-1 | **Mobilization of in-situ test equipment etc.** & personnel and arrangements for testing and de-mobilization on completion and removal from site of work | Lump sum |  |  |  |
| ND-2 | **Providing and fixing double scaffolding system (cup lock type)** on the exterior side, up to seven story height made with 40 mm dia M.S. tube 1.5m centre to centre, horizontal & vertical tubes joining with cup & lock system with M.S. tubes, M.S. tube challies, M.S. clamps and M.S. staircase system in the scaffolding for working platform etc. and maintaining it in a serviceable condition for the required duration as approved and removing it thereafter. The scaffolding system shall be stiffened with bracings, runners, connection with the building etc. wherever required for inspection of work at required locations with essential safety features for the workmen etc. complete as per directions and approval of Engineer-in-charge. The elevational area of the scaffolding shall be measured for payment purpose. The payment will be made once irrespective of duration of scaffolding. | Sqm |  |  |  |
| ND-3 | **Visual Survey**:-Visual inspection for surface damages, cracks, flaking, coloration, local weaknesses, etc. and their damage classification. Simple tools and instruments like camera with flashlight, magnifying glass, binoculars, gauge for crack width measurement, chisel and hammer, etc. shall be used. The visual inspection shall largely cover areas of high distress, cracks and their location, moisture, leakage, abnormal variations in structure, algae and fungus growth, efflorescence, etc. Visual inspection would be documented in the form of worksheets, photographic records, distress over drawings etc. | Lump sum |  |  |  |
| ND-4 | **Rebound Hammer Test:** for determining the estimated compressive strength of concrete and uniformity of concrete in terms of surface hardness test as per IS13311(Part-2)-1992, ASTMC805-02, BS 6089:1981 and BS 1881: Part 202, BSEN:13791. | Nos. |  |  |  |
| ND-5 | **Ultrasonic Pulse Velocity Test**: for ascertaining the quality of concrete, soundness and density of concrete, uniformity of concrete in terms of density, crack depth and width, cause analysis of crack propagation as per IS13311(Part-1)-1992, ASTM:C597-83, BS6089:1981 and BS1881:Part203 and BSEN:13791. | Nos. |  |  |  |
| ND-6 | **Core Compressive strength Test:** concrete extraction for exact in-situ compressive strength evaluation of concrete, grade and fck value of concrete as per IS516:1959, IS456:2000, IS1199-1959: Part 4, ASTM C 42-77, ACI 318. | Nos. |  |  |  |
| ND-7 | **Carbonation Test:** Measurement of carbonation depth by phenolphthalein spray test at selected locations on RCC members of the structures covered under the study to see the depth of carbonation as per BS EN 14630:2006, BS EN 13295:2004. | Nos. |  |  |  |
| ND-8 | **Cover Meter Test:** Conducting cover meter test at selected locations on RCC members of the structures covered under the study to see the adequacy of concrete cover to rebars and creation of contour mapping of cover depth in RCC Structure (working on magnetic field generation concept) as per IS:456:2000 and relevant code of particular structure. | Nos. |  |  |  |
| ND-9 | **Resistivity Meter Test:-** It is used in determination of Estimation of the likelihood of corrosion, Indication of corrosion rate, Correlation to chloride permeability, Determination of zonal requirements for cathodic protection systems, identification of areas within a structure most susceptible to chloride penetration as per BS EN 12696:2000, RILEM TC-154, AASHTO T277 RCP, AASHTO T259, ASTM C 1202 97. | Nos. |  |  |  |
| ND-10 | **Chemical analysis of concrete** **powder** collected from the structure's concrete core sample/ by drilling to understand the chemical deterioration / degradation of concrete and its effect on reinforcement corrosion in the laboratory to determine the following parameters: |  |  |  |  |
| a) **pH Value** (to check alkanity of concrete) as per relevant B.S. 5328, ACI 201.2R-92 and ACI-318-99, IS 456:2000, BS 8110. | Nos. |  |  |  |
| b) **Water Soluble Chloride Content %** (by of mass of concrete) to check the risk of corrosion due to present chloride % as per IS: 14959 (Part 2) – 2001, B.S. 5328 Part 1, ACI 201.2R-92, BS 1881 Part 124:1988, BS 8110, IS 456:2000. | Nos. |  |  |  |
| c) **Linear Polarisation Test (LPR, Galva Pulse):** for analysis of rate of diameter loss in steel bar due to corrosion in reinforcement as per BRE DIGEST 434. | Nos. |  |  |  |
| ND-11 | **Water Permeability Test:** To check the water permeability indices of concrete/waterproofing product (depth of water penetration and water absorption percentage) as per DIN 1048 part 5 and BIS 1881 part 122, IS 456:2000. | Nos. |  |  |  |
| ND-12 | **Crack Pattern Analysis**: Crack depth and crack width be will be measured by Ultrasonic Pulse Velocity system, mapping of crack pattern, classification of cracks and cause analysis of crack propagation as per ACI 318, 201, IS 456. | Nos. |  |  |  |
| ND-13 | **Report, Interpretation and Recommendation:** Preparing and submitting comprehensive report consisting of findings from visual inspection, test data, interpretation of results, conclusions and final recommendations. | Lump sum |  |  |  |