

**Request for Expressions of Interest (REOI)
(Consulting Services-Firms Selection)**

Date: 19th November 2018

Last Date for submission of EoI: 19th December 2018

Country: India

Name of Project: National Cyclone Risk Mitigation Project (NCRMP) II

Assignment Title: Selection of Consultancy firm for Third Party Quality Auditor (TPQA) in the State of Maharashtra

Reference No. IN-RRD-MAH-271-CS-QCBS

The Government of India has received financing from the World Bank towards the cost of the National Cyclone Risk Mitigation Project (NCRMP-II) and intends to apply part of the proceeds for consulting services.

The consulting services (“the Services”) include providing THIRD PARTY QUALITY AUDITOR FOR NCRMP-II providing Third Party Quality Audit services for construction of Cyclone Shelters with Approach Roads, Under Ground Cabling and Saline Embankments under NCRPM-II over a period of 18 months. The objectives of the assignment are:-

- a) to assist the State Project Implementation Unit (SPIU) in maintaining the quality standards of the works by independent assessment/audit of quality of works at various stages of construction of Multipurpose Cyclone Shelters with approach road, Saline Embankment, , and Underground Cabling Works
- b) Conducting Orientation Workshops for the SPIU and Line Agency staff in improving their Engineering/ Technical/ Managerial skills.
- c) Assess and report on the compliance with the requirements of environmental and social safeguards in the form of Environmental Management Plans and Resettlement Action Plan.

The Project Director, SPIU, NCRMP-II, Government of Maharashtra now invites eligible consulting firms (Consultants) to indicate their interest in providing the Services. Interested Consultant should provide information demonstrating that they have the required qualifications and relevant experience to perform the Services.

The shortlisting criteria are:-

- d) The firm should have at least 2 similar experiences as TPQA consultant (costing not less than INR 5 crores in same or different contracts) in assignments related to Civil engineering projects such as buildings with approach road, saline embankments, bridges and Underground Cabling Works and experience in rehabilitation or restoration projects will have advantage over general experiences.
- e) The firm should demonstrate that they have enough capacity (including personnel) in handling Civil engineering projects such as building with approach road and saline Embankments and Underground Cabling.
- f) The firms should have an average annual turnover of at least INR 7 cores in the last 3 years (2015-16, 2016-17 and 2017-18); and
- g) Experience in handling externally aided projects such as the World Bank and ADB will be an advantage.
- h) Prior work experience in similar geographical conditions would be an advantage

Expressions of interest (EOI) must include:

- a) Introductory letter on letter head (with complete contact details – name of contact person, mailing address, telephone, fax, email etc.) explaining how the firm is best to deliver the task.

- b) Organization profile:
- c) Two years annual report (Year 2016-17 and Year 2017-18) and 3 years Financial statement;
- d) Short note on the similar projects implemented by the firm pertaining to the shortlisting criteria along with the contact details of past clients;
- e) Number of States in the Country in which the Firm has branches/offices, giving full address of the branches/offices.
- f) The EOI should contain sufficient supporting document to substantiate the claim of the Consultant towards their qualification as per the shortlisting criteria

The attention of interested consultants is drawn to paragraph 1.9 of the World Bank's Guidelines: Selection and Employment of Consultants (under IBRD Loans and IDA Credits and Grants) by World Bank Borrowers January 2011 updated July 2014 ("Consultant Guidelines") setting forth the World Bank's policy on conflict of interest. Consultants may associate with other firms in the form of a joint venture or a sub-consultancy to enhance their qualifications. Such association must be clearly stated in the EOI. A Consultant will be selected in accordance with the Quality & Cost Based Selection (QCBS) method set out in the Consultant Guidelines.

**STATE PROJECT IMPLEMENTATION UNIT NATIONAL
CYCLONE RISK MITIGATION PROJECT PHASE- II
RELIEF & REHABILITATION DEPARTMENT
GOVERNMENT OF MAHARASHTRA**

**Terms of Reference
Third Party Quality Auditor**

Address :-:

State Project Implementation Unit (SPIU),
NCRMP II, Relief and Rehabilitation Department
1st floor, Main Building, Mantralaya,
Madam Cama Road, Mumbai-400032, Tel No.: 022-22026712
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1.0 Project Background

The Government of India has initiated the National Cyclone Risk Mitigation Project (NCRMP) with a view to address cyclone risks in the country. It is a World Bank funded project for which National Disaster Management Authority (NDMA) is the nodal implementation agency at national level.

The overall objective of the Project is to undertake suitable structural and non-structural measures to mitigate the effects of cyclones and other hydro meteorological hazards in the coastal States/UTs of India.

The key objectives of the Project are as follows:

- Reduction in cyclone vulnerability of coastal states, through creation of appropriate infrastructure which can help mitigate the adverse impacts of cyclones
- Strengthening of cyclone warning systems enabling quick dissemination of warnings and advisories from source/district/sub-district level to the community and vice versa for their timely reception and adequate response.

The Project has identified 13 cyclone prone States and Union Territories (UTs) with varying levels of vulnerability. These States/UTs have further been classified into two categories, based on the frequency of occurrence of cyclones, size of population and the existing institutional mechanism for disaster management. These categories are

Category I Higher Vulnerability States i.e. Andhra Pradesh, Gujarat, Orissa, Tamil Nadu and West Bengal

Category II Lower Vulnerability states i.e. Maharashtra, Goa, Karnataka, Kerala, Daman & Diu, Puducherry, Lakshadweep and Andaman & Nicobar Islands

1.1 Project Components

- a. Based on the above stated objectives project has been divided in to The project has the following four components:

Component A: Early Warning Dissemination Systems (EWDS)

The installation of an EWDS based on Satellite, Radio, Internet and Global System for Mobile Communication (GSMC) based technologies, including strengthening State Emergency Operation Centers (SEOCs) to send the warning through different communication channels directly to the village level. Providing satellite phones/alternative technology to key officials to fail proof the EWDS and also expand a new radio based wireless communication technology in selected blocks in each state;

Component B: Cyclone Risk Mitigation Infrastructure

This component is to increase the preparedness and reduce the vulnerability of coastal communities through strategic infrastructure investments, i.e., improving their capacity/access to emergency shelter. The portfolio of risk mitigation infrastructure under this component includes a broad range of investment such as Multipurpose Cyclone Shelters, Underground Electric cabling, strengthening of saline embankments in the state.

Component C: Technical Assistance for Multi-Hazard Risk Management

This component will improve the quality of available information on multi-hazard risks for decision making, and strengthen multi-hazard risk management at a national level. The PMU-NDMA will be the nodal agency for this

component. The components will be included the activities such as Coastal Multi-hazard Risk Modeling and Assessment, Strengthening Emergency Recovery Capacity, Enhancing the Capacity for Disaster Risk Management and response in non-coastal states, Hydro-meteorological Resilience Action Plans, Design of a National Seismic Risk M Hydro-meteorological Resilience Action Plans.

Component D: Project Management and Implementation Support

This component will support the incremental operating costs of the Project Management Unit (PMU) and the State PIUs

b. Project Implementation Arrangements

- a) A central State Project Implementing Unit (“SPIU”) has been set up at the State. This SPIU is responsible for coordinating and monitoring the implementation of the Project by the respective implementation agencies. The line departments are the implementation agencies on ground, and are responsible to ensure timely completion of the works at desired quality levels.
- b) The Third Party Quality Auditor (“TPQA”) will be appointed by the SPIU who shall report to it on its findings.
- c) Details of Implementation of NCRMP II Maharashtra

Nodal Agency	Relief and Rehabilitation Department (Disaster Management Unit)
Executing Agency	<ol style="list-style-type: none"> 1. Telecommunication Consultants India Ltd (TCIL) - Government of India Undertaking – Consultant for EWDS; Implementation by the agency selected through due bid process 2. Maharashtra State Electricity Distribution Company Ltd. (Govt. of Maharashtra Undertaking) – For UGC Works 3. Public Works Department - For MPCS Construction Works 4. Khar Land Development Circle (Water Resources Department) – For Saline Embankment Works

- c. In the state of Maharashtra, the Project envisages implementation of following component

Implementing Agency	Component	Total No. of Units	Implementation Status
To be shortlisted	Component –A Early Warning Dissemination Systems (EWDS)	1	Pre-tendering Stage
PWD	Component-B - Construction of Multi-Purpose Cyclone Shelter Structures	13	Pre-tendering Stage
KLDC	Component-B -Saline Embankment	8	Pre-tendering Stage
MSEDCL	Component-B - Under-Ground Cabling Works	3	Pre-tendering Stage

2.0 Objectives of the Third Party Quality Audit (TPQA)

- a) Assist the SPIU in maintaining the quality standards of the civil, electrical and associated scope of works by independent and concurrent assessment/audit of the quality of works at various stages of construction of Cyclone Risk Mitigation Infrastructure (Multi- purpose Cyclone Shelters with approach road, Under Ground Cabling Works, Saline Embankment,) being implemented by Implementing Agency (IA) and contractor.
- b) Assist SPIU in maintaining the quality standards of the EWDS system in all aspects
- c) Certify the quality, and provide the necessary guidance and support to address any necessary compliances for proper completion.
- d) Assess and report on the compliance with the requirements of Environmental and Social Frame work (ESMF), including the management measures provided in the Environmental & Social Management Plans/ Framework.

3.0 Outline of tasks to be carried out

The scope of services for the TPQA assignment includes:

i. Project Inception (Preparatory/ Pre-Construction Stage)

1. At this stage the TPQA shall conduct a preliminary review of standard contract documents, drawings, specifications, materials reports and status of the work for the current contracts to obtain understanding of the scope and complexities of the assignment. This exercise will also include familiarization with the Environment and Social Framework (ESMF) and Environment Management Plans (EMP).
2. The TPQA will also have discussions with the key stakeholders at SPIU to understand implementation status, basis for site selection, the various manuals and guidelines prepared for the project, specific concerns of PMU (if any) and the nature and frequency of various field tests to be performed on civil works and reporting arrangements.
3. After the initial study and discussions, the TPQA will prepare and submit a Project Inception Report, within 30 days of issue of work order. The Inception report would include items like –
 - a. Detailed methodology for execution of the audit, including the various tests that will be conducted and outlining quality audit procedures.
 - b. Detailed methodology for checking compliance to Environment and Social Management Framework (ESMF) including the EMPs and applicable laws pertaining to environment protection and labour welfare.
 - c. Audit plan for the first year clearly identifying the audit stage for each type of work.
 - d. Overall team deployment schedule.
 - e. Reporting formats including schedule of reporting and verification of compliance to observations.
 - f. Reporting and escalation protocols including methodology for integrating the audit results in payment certification system and
 - g. Evaluation of the project MIS and suggesting updating requirements for capturing the audit reports, compliance and linking with payment certification system.

ii. Audit Planning

4. During the inception for first year and subsequently at the beginning of next year an audit plan will be prepared in consultation with SPIU. The audit plan would be updated quarterly and may be revised on the basis of findings of the audits conducted in the preceding quarter. The plan will list the sites to be audited along with specific timelines. The frequency and timing of audits of various sites would be agreed in discussion with the PIU, however each site has to be audited at least once during each stage of work and for certification of compliance of reported non compliances.

iii. Stages of Audit

5. Each site shall be audited during each stage of work in concurrent manner as shown below. Wherever one or more stages of work for a particular work are executed simultaneously, audit deliverables shall include/ reflect all such works being carried out.

S.No.	Infrastructure	STAGE OF AUDIT	Deliverables
	MPCS		
1.		Footing	1. Material Testing Reports 2. Material and Consumption Report. 3. Checking & Inspection Reports 4. Item Rate Quantity Measurements 5. Random Site Visit Reports 6. Non-Compliance Reports (NCR) 7. Overall Activity Status (Barchart) 8. Environment and Social Management Compliance
2		Plinth	9. Material Testing Reports 10. Material Consumption Report. 11. Checking & Inspection Reports 12. Item Rate Quantity Measurements 13. Random Site Visit Reports 14. Non-Compliance Reports (NCR) 15. Overall Activity Status (Barchart) 16. Environment and Social Management Compliance
3		Ground Floor Slab	17. Material Testing Reports 18. Material Consumption Report. 19. Checking & Inspection Reports 20. Item Rate Quantity Measurements 21. Random Site Visit Reports 22. Non-Compliance Reports (NCR) 23. Overall Activity Status (Barchart) 24. Environment and Social Management Compliance
4		First Floor Slab	25. Material Testing Reports 26. Material Consumption Report. 27. Checking & Inspection Reports 28. Item Rate Quantity Measurements 29. Random Site Visit Reports 30. Non-Compliance Reports (NCR) 31. Overall Activity Status (Barchart) 32. Environment and Social Management Compliance

S.No.	Infrastructure	STAGE OF AUDIT	Deliverables
5		Second Floor Slab	33. Material Testing Reports 34. Material Consumption Report. 35. Checking & Inspection Reports 36. Itam Rate Quantity Measurements 37. Random Site Visit Reports 38. Non-Compliance Reports (NCR) 39. Overall Activity Status (Barchart) 40. Environment and Social Management Compliance
6		Completion of walls	41. Material Testing Reports 42. Material Consumption Report. 43. Checking & Inspection Reports 44. Itam Rate Quantity Measurements 45. Random Site Visit Reports 46. Non-Compliance Reports (NCR) 47. Overall Activity Status (Barchart) 48. Environment and Social Management Compliance
7		Completion of flooring & finishing of other items	49. Material Testing Reports 50. Material Consumption Report. 51. Checking & Inspection Reports 52. Itam Rate Quantity Measurements 53. Random Site Visit Reports 54. Non-Compliance Reports (NCR) 55. Overall Activity Status (Barchart) 56. Environment and Social Management Compliance
8		Water Supply & Sanitation	57. Material Testing Reports 58. Material Consumption Report. 59. Checking & Inspection Reports 60. Itam Rate Quantity Measurements 61. Random Site Visit Reports 62. Non-Compliance Reports (NCR) 63. Overall Activity Status (Barchart) 64. Environment and Social Management Compliance
9		Electrification & its allied works	65. Material Testing Reports 66. Material Consumption Report. 67. Checking & Inspection Reports 68. Itam Rate Quantity Measurements 69. Random Site Visit Reports 70. Non-Compliance Reports (NCR) 71. Overall Activity Status (Barchart) 72. Environment and Social Management Compliance
10		Final Completion	73. Material Testing Reports 74. Material Consumption Report. 75. Checking & Inspection Reports 76. Itam Rate Quantity Measurements 77. Random Site Visit Reports 78. Non-Compliance Reports (NCR) 79. Overall Activity Status (Barchart) 80. Environment and Social Management Compliance

S.No.	Infrastructure	STAGE OF AUDIT	Deliverables
	Embankments		
1	The deliverables are applicable for stages of entire or any part of the embankment under construction as per implementation Plan.	Fixing of alignment	<ol style="list-style-type: none"> 1. Material Testing Reports 2. Material and Consumption Report. 3. Checking & Inspection Reports 4. Itam Rate Quantity Measurements 5. Random Site Visit Reports 6. Non-Compliance Reports (NCR) 7. Overall Activity Status (Barchart) 8. Environment and Social Management Compliance
2		Finalization of materials	<ol style="list-style-type: none"> 9. Material Testing Reports 10. Material Consumption Report. 11. Checking & Inspection Reports 12. Itam Rate Quantity Measurements 13. Random Site Visit Reports 14. Non-Compliance Reports (NCR) 15. Overall Activity Status (Barchart) 16. Environment and Social Management Compliance
3		Foundation	<ol style="list-style-type: none"> 17. Material Testing Reports 18. Material Consumption Report. 19. Checking & Inspection Reports 20. Itam Rate Quantity Measurements 21. Random Site Visit Reports 22. Non-Compliance Reports (NCR) 23. Overall Activity Status (Barchart) 24. Environment and Social Management Compliance
4		Superstructure Stage I	<ol style="list-style-type: none"> 25. Material Testing Reports 26. Material Consumption Report. 27. Checking & Inspection Reports 28. Itam Rate Quantity Measurements 29. Random Site Visit Reports 30. Non-Compliance Reports (NCR) 31. Overall Activity Status (Barchart) 32. Environment and Social Management Compliance
5		Superstructure Stage II	<ol style="list-style-type: none"> 33. Material Testing Reports 34. Material Consumption Report. 35. Checking & Inspection Reports 36. Itam Rate Quantity Measurements 37. Random Site Visit Reports 38. Non-Compliance Reports (NCR) 39. Overall Activity Status (Barchart) 40. Environment and Social Management Compliance
6		Completion	<ol style="list-style-type: none"> 41. Material Testing Reports 42. Material Consumption Report. 43. Checking & Inspection Reports 44. Itam Rate Quantity Measurements 45. Random Site Visit Reports 46. Non-Compliance Reports (NCR) 47. Overall Activity Status (Barchart)

S.No.	Infrastructure	STAGE OF AUDIT	Deliverables
			48. Environment and Social Management Compliance
	<p>Under Ground Cabling</p> <p>The deliverables are applicable for stages of entire or any part of the embankment under construction as per implementation Plan.</p>		
1		Design and Preliminary Services	1. Validation and certification of all designs, drawings, Bill of Materials and approval by Project Manager
2		Supply of Material	<ol style="list-style-type: none"> 1. Material Testing Reports 2. Material and Consumption Report. 3. Checking & Inspection Reports 4. Item Rate Quantity Measurements 5. Random Site Visit Reports 6. Non-Compliance Reports (NCR) 7. Overall Activity Status (Barchart) 8. Environment and Social Management Compliance
3		Installation Work and Associated Civil Work	<ol style="list-style-type: none"> 1. Activity wise Testing Reports 2. Material and Consumption Report. 3. Checking & Inspection Reports 4. Item Rate Quantity Measurements 5. Random Site Visit Reports 6. Non-Compliance Reports (NCR) 7. Test charge and commissioning report (Activitiwise) 8. Overall Activity Status (Barchart) 9. Environment and Social Management Compliance
4		Restoration, Dismantling and other Misc work.	<ol style="list-style-type: none"> 1. Non-Compliance Reports (NCR) 2. Overall Activity Status (Barchart) 3. Item Rate Quantity Measurement 4. Environment and Social Management Compliance
	Early Warning Dissemination Systems (EWDS)		
		District wise division of work packages in to following Milestones for Tracking and monitoring purpose	<ol style="list-style-type: none"> 1. Implementation of last mile connectivity with: <ol style="list-style-type: none"> a. Use of Existing MPLS Network b. Use of existing Mobile (GSM/2G/3G/4G) network c. Use of Internet Connectivity d. Setting up new Digital Mobile Radio (DMR) Network

S.No.	Infrastructure	STAGE OF AUDIT	Deliverables
			<ul style="list-style-type: none"> e. Network Management System f. Satellite Based Communication Network g. Power Backup Systems 2. Implementation of Alert Siren System 3. Civil Work related to: <ul style="list-style-type: none"> a. Design & construction of foundations for Poles/Towers b. Fabrication and erection of poles/towers c. Flooring, painting, air-conditioning, painting of SEOC, DEOCs & TEOCs etc.

iv. Testing Frequency

6. The frequency of tests to be carried out shall be as specified in the relevant specifications. A testing plan giving the testing frequency, standards and acceptance criteria must be prepared and incorporated in the Inception Report.

v. Execution of Audit

7. The execution of audits will be in accordance with the approach and methodology agreed in the Inception Report and in accordance with the audit plan. In general, the purpose of quality audit exercise is to ensure that

- a. the work is executed according to the designs, drawings and specifications as specified in the bidding documents / applicable standards, and that good engineering practices are followed in construction.
- b. True to desired lines, levels and finishing.
- c. The work is executed following the EMP provisions those are included in the bidding documents and in general follow the agreed provisions in the ESMF.
- d. The work is executed following the relevant laws / statutes and practices / guidelines related to workers welfare, safety at worksite, insurances, etc.
- e. The quality audit at construction sites shall include (but not be limited to) the following –
 - i. Assess independently the quality of construction vis-à-vis the standards specified in the bidding documents and good engineering practices including disaster resistant construction standards.
- f. Review the degree of quality control exercised during the construction by the contractor maintaining adequate arrangements / practices (tests, numbers, frequency, approach and timing etc.) / documentation (QC registers, test reports, Measurement Book (MB) records & bills, observations of supervisory staff, compliances etc) and the degree of monitoring done by the line department identify non-compliances and suggests necessary improvements and compliance methodologies.

8. Through the agreed Audit Strategy and series of test procedures

- g. Review that the materials have been procured stored and used in accordance with the quality standard requirements set forth in the contract agreement.
 - h. Assess if the progress of work is as per scheduled in the contract and remedial measures there to.
 - i. Review that the test reports of the materials / workmanship that were tested by the contractor as required in the individual contract document are satisfactory.
9. Carry out required field-testing or additional testing (Where ever necessary or reasonably demanded by Consultants/ SPIU/ PMC with justification) of quality of materials and works at any stage of construction wherever necessary at site or in the approved laboratories.
 10. Identify and report major construction issues and corrective/remedial measures including assessing compliance to the corrective measures proposed in the previous audits. Report on noncompliance of earlier audits remarks shall be brought to the notice of the concerned heads of Departments and follow up action taken to get the defects rectified.
 11. Review the action taken on the earlier reported non-compliances and recertify including following up with the heads of implementing agencies for action on earlier reported non-compliances.
 12. Assist the SPIU/ line departments in resolving the issues related to non-compliances. The TPQA's responsibility does not end by merely pointing the defects rather they should facilitate the follow up action required to rectify the defects.
 13. The Field Engineer of TPQA should remain present during all critical stages of execution.
 14. Create photo documentations (before, during & after) of quality related issues including its compliances with date and geo-tags.
 15. Check and report on compliance to –
 - a. Environment Management Plans (EMP) defined in the contract document.
 - b. Environment laws / regulations of Govt. of India, NDMA, World Bank and rules formulated by the concerned State Government.
 - c. Labour laws/ regulations applicable to construction sites.
 - d. Safety management at the construction sites as per the relevant IS codes such as (but not limited to) IS 3764: Code of safety for excavation work (first revision), IS 5916: Safety code for construction involving use of hot bituminous materials etc.
 - e. Specifications of agencies like Indian Road Congress, Ministry of Shipping and Road Transport, Central Public Health Engineering Organization, Bureau of Indian Standards, Ministry of Rural Development (MORD), Ministry of Road Transport and Highways (MORTH), Ministry of Environment, Forest & Climate Change (MoEF & CC) etc. as applicable.
 16. The TPQA shall also –
 - a. Inspect, review and report the adequacy and competence of contractor's staff, labour and machinery.
 - b. Review the works progress in accordance with agreed milestones and work schedules and provide regular updates for including need for increasing resources and / or change in work plan for timely execution.

- c. Certify the compliances to the observations made during the earlier visits; and provide overall opinion on the quality of works based on audit done
17. All the apparatus and equipment for the field testing shall be procured by the TPQA at its own cost.
18. The TPQA shall be free to take back these apparatus and equipment on completion of the contract.
19. The tests shall include all common tests as specified. The tests shall include all common tests as specified by technical specification and as prescribed by BIS6. Where use of back office laboratory is necessary, TPQA will take the samples and get it tested in accredited/approved laboratories, which will be first inspected and recommended for accrediting by TPQA under the project, by SPMU. The identification and certification of the testing agency will be specific to the tests that can be carried out in a particular laboratory. The minor testing equipment include as but not limited to: sieves and weights, moisture meter, soil density meter, temperature recorder, surface finish recording instruments such as straight edges, measuring tapes, calipers, etc. for 'on spot field testing' of material and workmanship. Besides this a compressive testing machine (mobile) should also be included for field testing of concrete cubes.
20. In case any specific quality testing is required by the SPIU for any work within the site, it shall be carried out and report shall be furnished with a reasonable time.
21. Field testing and sampling shall be done in the presence of Engineer/Contractor's representative.
22. The material samples for testing will be collected in the presence of the representative of the contractor and Engineer from the Implementing Agency and should be photo documented with date and geo tagging.
23. The TPQA will use approved laboratory in the region which will be first inspected and recommended for accrediting by Consultant under the project by SPIU. The identification and certification of the testing agency will be specific to the tests that can be carried out in a particular laboratory.
24. The TPQA may propose alternative independent testing laboratories for undertaking the works of the contractor. Full details and information on the testing laboratories are to be provided. On approval the alternative laboratories may be used.
25. It is proposed that the field visits shall be carried out 'totally randomly' without advance information to contractors. TPQA would recommend any remedial measures to the Engineer-In- Charge for his information and further action under intimation to the SPIU. Issue site instructions through the Engineer In-Charge only.
26. Upon field inspection and tests the Consultants, where required and in critical cases through the Engineer in Charge shall arrange to issue, stop work" notice to the contractors and assist in remedying the defects. This shall be done only in exceptional cases where continuance of works may jeopardize the ultimate quality and safety of structure, safety of workers and of third parties etc.
27. The Consultant shall establish a mobile laboratory exclusively for Saline Embankments.
28. The Contract Documents are the basis of all works to be undertaken under the Project. These are standard documents which will be made available to the Consultant.

29. The Consultant shall be having appropriate and sufficient number of requisite tools & equipment's required for Works related to Component – A (EWDS)
30. **Annexure A** contains a list of indicative quality checks on materials, equipment and appurtenances that should not be considered as limiting. In consultation with the other consultants, SPIU and line Departments; based on **Annexure A** of the ToR; the specifications in the bid documents and relevant standards; prepare standard Quality Assurance Plan (tests, stage, frequency, standards to be complied, guidance on judging from test results, critical workmanship requirements, critical stages of work that require Engineer's presence "as a must" etc.) for various types of works to be audited and formats for documenting the quality test results and reporting of such tests.

vi. Reporting

31. State PIU of the State will be the nodal agency for the execution of this assignment. The TPQA will submit all the reports to SPIU with one copy each to the Engineer of the Contract and head of the concerned line department. as per the specified timelines also copies of the reports may be forwarded to other stakeholders with prior permission of PM.
32. The field visits which shall be an ongoing activity shall be undertaken as per the audit strategy finalized. Audit reports will be submitted within 3 days of inspection of the work. The reports shall highlight for each contract package, status and progress of work, audit opinion, status of compliance to earlier observations, critical issues, and follow-up actions. The Consultants will submit all the work audit inspection reports to SPIU with one copy each to the Engineer of the Contract and head of the concerned line department. Any critical issues needing stoppage of work need to be reported immediately both to the Engineer and the SPIU, through different means (telephone, SMS, e-mail, fax etc.).
33. At the end of every week the Consultant shall submit a report containing the details of field visits undertaken during the week indicating the date of visit. In addition to the site level reports and weekly report, consolidated reports would be submitted every month and quarter, compiling the findings in the site reports, summary audit opinion, corrective actions, progress of works and issues etc. The Consultant may be also required to make presentations on audit findings at the designated forums as and when required by the client.
34. Annual review report would be submitted at the end of financial year and a final review report (Five hardcopies & one Softcopy) would be submitted at the end of the project / this consultancy assignment. The monthly, quarterly annual and final review reports should also include good practices and lessons learnt with regard to quality systems and ESMF implementation.
35. In addition, the consultant will comply with any other reporting requirements as agreed in the project inception stage. Reports on non-compliances are to be transmitted immediately (on real time basis through email/ other means) and the communication shall be simultaneous to the concerned engineer, line department and the SPIU.

vii. Conducting Orientation Workshops of contractors and implementation agencies

36. **Orientation Workshops** will be organized by firm consultant in consultation with SPIU every quarter. The consultant will conduct **Orientation Workshops** for the staff of the implementing agency and

the contractor teams to highlight the key audit findings, guide on the corrective action required and train them on the required construction techniques, environment and social management aspects etc. The proceedings of each such individual **Orientation Workshops** shall be properly documented by the Consultant and shared with the SPIU of State. The Cost (INR-in actual) of such **Orientation Workshops** is reimbursable as per agreed conditions.

viii. Update the Project monitoring system

37. All site visit reports, audit findings, Non-compliance Reports (NCR's), progress reports, suggested corrective action, status of completion of corrective action etc. along with photographs should be uploaded to the website as specified by SPIU. SPIU will provide separate access to the Consultant for uploading all reports. In case of any difficulty in uploading in website, the Consultant shall make its own arrangements for creation of separate website and uploading all its audit reports-on approval by the Project Director, NCRMP II, Maharashtra.

4.0 Schedule for completion of tasks

38. The consultancy will be initially for a period of 18 months. This duration is the maximum period required to complete Work Packages under consideration. However this period and respective deliverables are directly related to Project/ Work Packages completion period. The Consultancy period shall be applicable for entire period required for completion of entire work packages involved in the project as per approved procurement plan. The consultants shall start audit within 10 days of finalization of audit plan and thereafter ends within 10 Days after the end of each quarter. The SPIU will facilitate for the Consultant to conduct audit as per the strategy.

39. The key deliverables for the assignment along with respective timelines are as follows:

Deliverable	Timeline
Inception report containing the Quality Audit methodology, field procedures and quality control plan	Within 30 days of signing the contract.
Audit Plan/Audit Strategy, QAP and reporting format	Within 1 month of signing the contract as part of inception report and within 7 days from end of earlier quarter
Site Visit Report	Within 7 days
Non-compliance event report	Immediate (to be simultaneously reported to the engineer over phone and email)
Monthly progress report	Within 7 days from end of reporting Month
Quarterly Summary Report	Within 15 days from end of quarter

Annual Review Report	Within 15 days from end of financial year
Final Review Report	Three months prior to winding up of the Project or completion of the Consultant's contract, whichever is earlier
Presentation to the PIU on the findings of the audit and suggestions	Every quarter

5.0 Team composition and estimated man month inputs

- i. Profile agency** -The Agency will have 10 years of experience in Quality Audit (Technical and performance audit) especially in infrastructure projects in India. Familiar with M&E systems and MIS Proficient in English, Marathi, both written and spoken. Priority will be given to candidates with experience in post-disaster reconstruction projects, and having undertaken projects in cyclone prone areas.
- ii. Team Composition** - Estimated input for the consultancy services is around - 18 months. However, depending on the number of works getting completed subsequently, the number of man-month requirement may vary.

1	Project Management Team	<ul style="list-style-type: none"> • Team Leader • Environment Management Expert • Social Management Expert • MIS specialist • Senior Engineer (E&TC) • Senior Engineer (Electrical) • Senior Engineer (Civil.) 	Position as mentioned in Resource Qualification and Requirement as given below
2	Site Teams	<ul style="list-style-type: none"> • Field Staff(Engineering): <ul style="list-style-type: none"> i) Cyclone Shelters, Roads, bridges and culverts ii) Embankments iii) Underground Cabling Works iv) Early Warning & Dissemination System (EWDS) 	To be engaged as per requirement. They will be provided with field staff (Engineering). The number of engineers in team may vary depending upon the construction activity in progress under the Team leader.

The list of sites proposed to be audited in has been provided as **Annexure B**.
The desired qualifications for various team members are as follows:

Resource Qualification and Requirement

Sr. No	Key Position	Minimum Qualifications	Minimum desired Experience	Age as on March 31, 2018	Estimated Requirement
1	Project Management Team				
1.1	Team Leader	Graduate in Civil or Electrical Engineering And PG in Management is preferable	<p>At least 18 years' experience in construction management of multi-location civil and electrical engineering projects including 07 years' experience in senior supervisory position in capacity of Team Leader in the multidisciplinary engineering project/organization the person served.</p> <p>Experience of managing multi-disciplinary teams is essential.</p> <p>Experience of working in the coastal regions will be an added advantage.</p> <p>Past experience of having conducting technical audit for WB projects is desirable.</p>	Not more than 60 years	One for Contract Period
1.2	Environment Management Expert	Master's degree in Environment Science/Engineering or related field	<p>At least 10 years of experience of working in the field of environment management.</p> <p>Good knowledge of Government of India/State Government and World Bank procedures/policies for environment safeguards is a prerequisite.</p> <p>The person should have hands on experience in projects funded by the WB and/or other multilateral agencies in India</p>	Not more than 60 years	One for Contract Period

1.3	Social Management Expert	Master's degree in relevant field	At least 10 years of experience in working in the field of social management. Good knowledge of Government of India/State Government and World Bank procedures/policies for environment and social safeguards is a prerequisite. Experience in Resettlement issues of External Funded Projects The person should have hands on experience in projects funded by the WB and/or other multilateral agencies in India	Not more than 60 years	One for Contract Period
1.4	MIS specialist	Graduate in any discipline of Engineering	At least 8 years of experience in MIS development, and management specific to engineering construction projects. Hand on experience of using project Management tools is desirable.	Not more than 60 years	One for Contract Period
1.5	Senior Engineer Electrical	Graduate in Electrical Engineering	At least 12 years of experience in the field of Electrical Power Distribution Infrastructure Projects and should have managed technical audits in the past. Demonstrate expertise of working in the coastal areas, Past experience of conducting technical audits for WB projects is desirable Demonstrate expertise in one or more of the following areas <ul style="list-style-type: none"> • construction of Underground Cable and Indoor Substation works is desirable 	Not more than 60 years	Two for contract period. One for Ratnagiri and One for Alibag and Satpati UGC Package

1.6	Senior Engineer Buildings, Roads and Saline Embankments	Graduate in Civil Engineering	At least 12 years of experience in the field of civil engineering and should have managed technical audits in the past. Demonstrate expertise of working in the coastal areas, Past experience of conducting technical audits for WB projects is desirable Demonstrate expertise in one or more of the following areas <ul style="list-style-type: none"> • construction of disaster resistant buildings in coastal zones • construction of building works in coastal area (P.H. & S.I. work) 	Not more than 60 years	02 for Contract Period
1.7	Senior Engineer Electronics and Tele-Communication	Graduate in Electronics & Tele-Communication Engineering	At least 12 years of experience in the field of Electronics & Tele-Communication engineering and should have managed technical audits in the past. Demonstrate expertise of working in the coastal areas, Past experience of conducting technical audits for WB projects is desirable Demonstrate expertise in disaster resistant communication System building and Operations in coastal zones	Not more than 60 years	02 for Contract Period

2	Site Teams				
2.4	Field Engineer–Embankments	Civil Engineer (Degree/Diploma)	At least 5 year experience after Graduation or 10 Yrs experience after Diploma in the field of civil engineering and should have worked in technical audit teams in the past. Should have experience in construction of embankments. Should have relevant experience in construction of earthen dam / dyke / embankment & hydraulic structure. Experience of working in the coastal regions will be an added advantage. Should have relevant experience in construction of earthen dam / dyke / embankment & hydraulic structure. Familiarization with disaster resistance construction technique is essential. Experience of working in coastal regions added advantages.	Not more than 60 years	03 for Contract Period (One Full time for Each Working Site)
			At least 5 year experience after Graduation or 10 Yrs experience after Diploma in the field of civil engineering and should have worked in technical audit teams in the past. Should have experience in construction of Building and Road Works	Not more than 60 years	03 for Contract Period (One Full time for Each Working Site)
2.5	Field Engineer–Electrical	Electrical Engineer (Degree/Diploma)	At least 5 year experience after Graduation or 10 Yrs experience after Diploma in the field of Electrical engineering Demonstrate expertise of working in the coastal areas, Past experience of conducting technical audits for WB projects is desirable Demonstrate expertise in one or more of the following areas • construction of Underground Cable and Indoor Substation works is desirable	Not more than 60 years	03 for Contract Period (One Full time for Each Working Site)

2.6	Field Engineer Electronics and Tele-Communication	Graduate in Electronics & Tele-Communication Engineering	At least 5 years of experience in the field of Electronics & Tele-Communication engineering and should have managed technical audits in the past. Demonstrate expertise of working in the coastal areas, Past experience of conducting technical audits for WB projects is desirable Demonstrate expertise in disaster resistant communication System building and Operations in coastal zones	Not more than 60 years	03 for Contract Period
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6.0 Data and Services to be provided by the Client

The TPQA will be provided access to all such information as is necessary to plan and execute the assignment. It shall include:-

1. List of sites
2. Contracts/tenders for selected sites, including special specifications
3. Project documents available in public domain such as ESMF, Procurement Plan, DPRs & Manuals etc.
4. Access to sites, and support of the respective nodal line department

7.0 Review and Monitoring of Consultants Work

TPQA performance and quality of work will be continuously reviewed by a Committee set up as below at SPIU. There would be formal review, monthly/annually by the Committee set up at SPIU at the inception stage. Unsatisfactory performance will invite action including pre closure of contract in accordance with the contract provisions.

Committee shall be as follows:

Sr.No	Committee	Designation
1	Chairman	Project Director
2	Member	Technical Director/ Chief Engineer PWD
3	Member	Additional Technical Director/ Chief Engineer MSEDCL
4	Member	Deputy Secretary, Relief & Rehabilitation Department(DMU)
5	Member	Head Project Steering Committee
6	Member Convener	Project Manager NCRMP-II

ANNEXURE A: INDICATIVE TEST REQUIREMENTS:

An indicative list of tests on material and workmanship is listed here, which is to provide guidance to the Consultant. This list is not exhaustive and all the necessary tests on materials in accordance with contract documents, relevant specifications and good engineering practices need to be carried out to meet the objective of quality inspection which is to ensure that the works are carried out in conformity with required standards and specifications. Necessary field tests to be carried out for Underground Cable Works, MPCS and Saline Embankments as mentioned in package wise tender document. Indicative tests requirements for components but not limited to following:

A. Civil Works -The main materials to be inspected are as follows:

1. Reinforced concrete
2. Building works
3. Road materials
4. Building service appurtenances and associated works
5. Soil tests for saline embankments
6. Embankment works

1. **Reinforced concrete** - The relevant tests are included in the standard specifications; they shall include but not be limited to the following:

Tests for cement and aggregates

Cement	1. Consistency test
	2. Initial and final setting time test
	3. Compressive strength test
	4. Soundness test
	5. Fineness test
Coarse Aggregate	1. Sieve analysis test and grading.
	2. Bulk density test
	3. Flakiness index test
	4. Elongation index test
	5. Water absorption test
	6. Aggregate impact value test
	7. Abrasion resistance test
	8. Crushing value test
	9. specific gravity
	10. Aggregate crushing value
Fine Aggregate	1. Sieve analysis test
	2. Silt content test
	3. Specific gravity
	4. Uniformity co-efficient
	5. Effective size Percentage of impurities
	6. Loss on ignition
	7. Acid Solubility
	8. Bulkage of sand
Test for water	1. Suitability for use in concrete e.g. PH etc
	2. Suitability for drinking water
Concrete	1. Cube Test
	2. Slump test

Tests for reinforcement

Reinforcing Steel	1. Tensile test- 0.2% proof stress,
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2. Bend test ultimate strength and % of elongation.
3. Re-bend test

Tests for Reinforced Concrete Members

- 1 Rebound hammer test
- 2 In Some cases extraction of cores shall be carried out for further test on concrete

2. Building Works

Structural steel	1	Tensile test
	2	Bend test
	3	Thickness of galvanizing
Bricks	1.	Compressive strength test
	2.	Water absorption test
	3.	Efflorescence test
	4.	Dimensional tolerance
Blocks	1.	Compressive strength test
	2.	Water absorption test
	3.	Density test
Bricks	1.	Compressive strength test
	2.	Water absorption test
	3.	Efflorescence test
	4.	Dimensional tolerance
Blocks	1.	Compressive strength test
	2.	Water absorption test
	3.	Density test
Tiles	1.	Water absorption test
	2.	Wet transverse strength test
	3.	Abrasion/wear resistance test
Ceramic tiles	1.	Water absorption test
	2.	Wet Transverse strength test
	3.	Abrasion / wear resistance test
	4.	Crazing test
Galvanized sheeting	1.	Thickness of sheets
	2.	Thickness of galvanizing
Water proofing compounds	1.	Tests for permeability and compatibility
Paints	1.	Performance tests
	2.	Thickness
Plumbing and sanitary fixtures	1.	Dimensional verification, physical examination and relevant tests.

3. Road Materials

The relevant tests are included in the standard specifications; they shall include but not be limited to the following:-

Tests for Road Materials

Earthwork (in Soil & sand admixture)	1	Dry density/ proctor compaction
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	2	CBR Value
	3	MDD & FDD value
Granular Sub-base	1	Grain size analysis
	2	Percentage of sand murum admixture
	3	LPL and Plasticity Index
	4	MDD & FDD values
	5	CBR
WBM	1	Camber
	2	Thickness of layer and grading
	3	Width of metal layer
	4	P.I. value of screening
Concrete	1	Sump Test
	2	Grading of Aggregate
	3	Temperature Measurement
	4	Unit Weight & Yield
	5	Air Content
	6	Strength Test
	7	Water/ Cement Ratio
	8	Time of Setting
	9	Accelerated Curing
	10	Chloride Content and
	11	Bleeding of Concrete

4. Building service appurtenances and associated works –

Test requirements shall include but not be limited to the following:-

Test for valves and other pipe appurtenances

Valves	1	Visual and dimensional checks
	2	Review of material test certificate for valve body and internals
	3	Operational smoothness
	4	Witnessing Hydraulic test/leakage test as per applicable codes
Manhole covers and other covers	1.	Witnessing Load test as per relevant IS Codes

5. Soil Tests for Saline Embankment

Soil	1	Gradation (Grain Size Analysis)
	2	Procters Compaction
	3	Atterbergs Limit
	4	Permeability
	5	Porosity and Void ration
	6	Shear Test
	7	Specific Gravity

6. Embankment Works – Depending on the nature and stage of works involved respective tests as mentioned above can be applied for Embankment works.

B. Mechanical & Electrical Works - List of mechanical and electrical items required to be inspected by third parties

1. Mechanical

- i. Pumps by type

2. Electrical

- i. Motors by type
- ii. Electrical starters
- iii. Electrical panels
- iv. Switchboards
- v. Motor control panels
- vi. DC distribution panels
- vii. Induction-cum-enunciation panels
- viii. Bus ducts
- ix. Battery chargers
- x. Transformers
- xi. HV/MV/LV
- xii. Power
- xiii. Voltage
- xiv. Current
- xv. Capacitors
- xvi. Level switches
- xvii. Electrical cables

3. Miscellaneous

- i. Earthing equipment
- ii. Lightening arrestors and essential fittings
- iii. Cable trays
- iv. Gabion box/Gabion mattress
- v. Geotextile filter
- vi. "Z" type sheet pile
- vii. Sluice gate
- viii. Any other items as specified in the contract documents

4. Inspections - The main headings for these works are as follows:

- Pumps
- Motors
- Gear Boxes
- Transformers
- Capacitors
- Cables
- Pipe and special
- Valves
- Diesel generator sets

1. Pumps

1. Review of material test certificate for pump casing, bowls, shaft, impeller bearings, column pipe etc.
2. Review of heat treatment certificate if any
3. Review of dynamic balancing or rotating parts / impeller
4. Examination of the shaft
5. Witnessing Hydro test of casing
6. Witnessing performance test at 49 Hz and 50 Hz frequency including vibration measurement covering following tests:
 - i. Capacity in LPM/LPS

- ii. Delivery head in metres
- iii. Efficiency at the specified duty
- iv. Power absorbed by the pump at the specified duty
- v. NPSH required
- vi. Maximum power required by the pump
- vii. Shut off head of the pump
- viii. Discharge of the pump when only one pump is operated in the system
- ix. Delivery pressure when only one pump is operated in the system
- x. Power absorbed by the pump when only one pump is operated in the system
- xi. Efficiency of the pump when only one pump is operated in the system
- xii. Visual and dimensional check
- xiii. Strip test
- xiv. Speed test at 49 Hz and 50 Hz frequency
- xv. Witnessing performance test at 49 Hz and 50 Hz frequency including vibration measurement covering following tests:
 - xvi. Capacity in LPM/LPS
 - xvii. Delivery head in metres
 - xviii. Efficiency at the specified duty
 - xix. Power absorbed by the pump at the specified duty
 - xx. NPSH required
 - xxi. Maximum power required by the pump
 - xxii. Shut off head of the pump
 - xxiii. Discharge of the pump when only one pump is operated in the system
 - xxiv. Delivery pressure when only one pump is operated in the system
 - xxv. Power absorbed by the pump when only one pump is operated in the system
 - xxvi. Efficiency of the pump when only one pump is operated in the system
 - xxvii. Visual and dimensional check
 - xxviii. Strip test
 - xxix. Speed test at 49 Hz and 50 Hz frequency

2. **Motors**

- 1. Visual inspection and testing of stator assembly
- 2. Review of test certificate for conductor, stator coils, shaft bearings etc.
- 3. Witnessing routine test no load and load test vibration measurement as per IS
- 4. Verification of type test report.
- 5. Visual and dimensional check

3. **Distribution Transformer**

- 1. Visual inspection, dimensional check and verification of bill of materials
- 2. Witnessing resistance voltage test at HV side and LV side
- 3. Routine tests as per IS:2026
- 4. Verification of type results, temperature rise test, impulse test, insulating oil test etc.

5. Other tests as per IS and tender document of respective package.
4. **Underground Cables**
 1. Visual and dimensional check
 2. Witnessing routine test as per IS:1554
 3. Witnessing insulating test, resistance test, current rating test, star reactance test, star capacitance test, short circuit current test, voltage drop test
 4. Other tests as per IS and tender document of respective package.
 5. **Pipes and Specials –**
 1. Visual and dimensional check
 2. Review of chemical and physical test certificates as per the relevant Indian Standard specifications
 3. Witnessing hydrostatic pressure test as per the relevant Indian Standard specifications
 4. Checking the integrity of epoxy lining for MS pipes at joints after laying and jointing pipes
 6. **Valves**
 1. Visual and dimensional check
 2. Review of material test certificates for valve body and internals.
 3. Operational smoothness.
 4. Witnessing hydrostatic test/leakage test as per applicable code
 7. **Diesel Generating Set**
 1. Review of tests as specified in relevant IS or Special Specifications
5. **Quality Checks On Materials, Equipment and Appurtenances** - These lists are not to be considered as prescriptive. The Consultant is to develop a more detailed approach before commencing work in the field.
- C. Embankments, overhead water tanks** - The quality monitoring / auditing of various works shall be included but not be limited to the following:-
1. Quality of materials
 2. Quality of construction of various construction works at various stages
 3. Witnessing the performance tests
 4. Performance of the various mechanical equipment in treatment plants and sluice gate
1. **Quality of materials**
 - Physical examination of materials brought to the site.
 - Perusal of test reports on materials furnished by the construction agency from time-to-time and also ensuring the frequency of such tests to be as per relevant standards
 - Randomly selecting the samples at site and conducting necessary test for confirmation
 2. **Quality monitoring during the construction stage**
 - a) **Embankment:-**
 - Examine the stripping for new / extended base and stripping of old embankment slopes to steps and scarifying bank top, water spraying to stripped surface to receive new earth.
 - Check the quality of the soil brought to site with respect to soil test reports of samples of Borrow Area.

- Check the thickness of the soil layer, spreading, watering and compaction of soil by PRR/VRR and checking of the Proctor Density to confirm the accepted percentage of compaction, frequency of field compaction test.
- Check the filling and compaction of stone inside the Gabion box/Mattress, its stitching and then its placing and installation.
- Check the laying of Geo-textile filter in proper position.
- Check the driving and fixing of “Z” type sheet pile and the inter locking of sheet pile.
- Check the installation and functioning of Sluice Gate.

b) Structure:-

Foundation stage

- Examining the soil encountered at site with respect to soil test reports furnished and also
- checking the adequacy of type of foundation system proposed to be adopted with respect to site condition
- Randomly checking grid markings
- Checking the fabrication of reinforcement and dimensions
- Witnessing concreting of foundation systems and reviewing the reports of cube testing

Superstructure

- Checking the fabrication of reinforcement, formwork, cover, etc.
- Checking the facilities available for the concreting, curing, etc.
- Dimensional verification and alignment of reinforced concrete members
- Checking the various levels to ascertain whether they are in accordance with the drawings and from hydraulic considerations
- Witnessing the concrete works of major structures and witnessing the tests on fresh concrete

Miscellaneous items

- Checking the quality of pipes and pipe appurtenance
- Quality of water proof plaster on the interior surface
- Galvanized items

Tests on finished structure

- Conducting non-destructive tests at random to ascertain the quality/strength
- Witnessing the hydraulic tests on water retaining structures

3. Mechanical and Electrical Works

- Effectiveness of earthing systems
- Effectiveness of lightening arrestor systems
- Evaluating the performance of various mechanical equipment installed in various units in relation to the specification requirements

D. Quality monitoring during construction of pipelines

- Checking pipe work excavation levels, randomly
- Checking effectiveness of pipe joints
- Inspection of manholes, chambers and other structures
 - Base levels and concrete thickness
 - Walls
 - Roof slabs and covers
- Checking sewers for water tightness

E. Quality monitoring of building works - The total quality monitoring of various works will be included but not be limited to the following:-

1. Quality of materials
2. Quality of construction of various works during different stages of construction.
3. Performance of mechanical and electrical equipment and systems.

1. Quality of materials - The checking of quality of materials includes:-

- Physical examination.
- Review of test reports.
- Collecting representative samples wherever possible and conducting necessary tests for confirmation.
- Informing the concerned agencies regarding the acceptance of material or otherwise.
- Witnessing the performance tests on machinery carried out by the manufacturer at his factory, before dispatching to site.

2. Quality monitoring during construction - During the course of construction, independent unannounced visits shall be made to check the quality of construction. The visits shall be made at the following stages:

Foundation stage

- Checking the foundation with respect to the soil reports and its suitability as bearing strata including shoring, shuttering and dewatering arrangements.
- If under ream pile foundation is adopted, verify the results of test piles (if done), otherwise conduct test pile for results. Check the pile work being conducted at the site.
- Dimensional verification of selected footings
- Checking the layout marking and centre lines, at random
- Checking the reinforcement fabrication, at random
- Checking the concreting arrangements and witnessing concreting of a few footing at random including use of sweet water (not saline water) for concreting

Plinth stage

- Checking the quality of stone masonry with emphasis to quality of stones, joints, joint materials, etc.
- Checking the reinforcement fabrication of plinth beams at random
- Checking the quality of concrete in plinth beams, at random
- Checking the adequacy and compaction of floor filling, at random

Lintel stage

- Checking the quality of wall masonry with emphasis to joints, joint mortar, curing, etc.
- Checking the quality of column concrete
- Checking the reinforcement fabrication of lintels, at random
- Checking the quality of concrete in lintels

Roof stage / slab stage

- Checking the quality of centering, shuttering and formwork, with emphasis on lines and levels, joints and safety considerations

- Checking the reinforcement fabrication of selected panels
- Checking the arrangements for concreting, vibration and curing
- Checking the concrete while concreting, with respect to mix proportion, w/c ration and compaction. Casting independent set of cubes for verification of strength
- Checking steel sheet fabricators for roof, roofing sheets and fencing and fixings.

Finishing stage

- Checking the quality of flooring with respect to levels and smoothness at random
 - Checking the door and window opening locations
 - Checking the quality of joinery with respect to workmanship and fixtures, at random
 - Checking the plaster in walls and ceiling with regard to proportions, line and level and curing, at random
 - Checking the finishing works at random, such as painting, dado making, fixing of ceramic tiles, fixing of sanitary fixtures, steel grill works, etc.
- 3. Mechanical and electrical works** - The standard and special specifications shall be referred, to determine the scope of the work to be undertaken. Test of earthing and lightning protection systems shall be included.

F. Quality monitoring during construction of landfills –

- Checking the level of excavation, plan dimensions and side slopes
- Checking the type of soil available and its uniformity in the site
- Verifying the soil with respect to its suitability for mixing with bentonite in achieving required permeability
- Mixing of bentonite and compaction of layers through testing on compacted layers
- Checking the thickness of mixed liner through physical measurement at representative locations
- Checking the thickness of HDPE liner
- Checking the efficiency of jointing through appropriate tests
- Checking the laying of HDPE liner

G. Early Warning Dissemination Systems (EWDS) –

Appropriate testing and evaluation methodology for effective implementation of Component – A of NCRMP-II Maharashtra Project It can be devised district wise for monitoring convenience

- MPLS Connectivity
- Internet Connectivity
- Mobile connectivity
- Network Management System
- Satellite Based Communication Network
- Alert Siren System
- Civil Work related to design & construction of foundations for poles/towers,
- Inspection/audit of design & fabrication of poles & towers
- Civil works related to flooring, air-conditioning, painting, earthing, Power System for SEOC, DEOCs, TEOCs etc

**ANNEXURE B: LIST OF SITES PROPOSED TO BE AUDITED IN
MAHARASHTRA NCRMP-II**

(Sites will be added/ deleted before issuing the RFP)

Sr. No.	Name Of Work	Package No.	Status
SALINE EMBANKMENT			
1	IN-RRD-MAH-2627-CW-RFB	Renovation of saline embankment at Phansapur Kurdus	Pre-Tendering
2	IN-RRD-MAH-2630-CW-RFB	Renovation of saline embankment at Panju	Pre-Tendering
3	IN-RRD-MAH-2623-CW-RFB	Renovation of Saline embankment at Narvel Benavale	Pre-Tendering
4	IN-RRD-MAH-2626-CW-RFB	Renovation of saline embankment at Nandgaon Mazgaon-	Pre-Tendering
5	IN-RRD-MAH-2628-CW-RFB	Renovation of saline embankment at Kachali Pitkari	Pre-Tendering
6	IN-RRD-MAH-2625-CW-RFB	Renovation of saline embankment at Mora Kotha	Pre-Tendering
7	IN-RRD-MAH-2640-CW-RFB	Construction of Multi purpose Shelter at Kalethar.	Pre-Tendering
8	IN-RRD-MAH-2624-CW-RFB	Renovation of saline embankment at Kokeri	Pre-Tendering
UNDERGROUND CABLING			
9	IN-RRD-MAH-2621-CW-RFB	Underground cabling work at Ratnagiri	Pre-Tendering
10	IN-RRD-MAH-2620-CW-RFB	Underground cabling works at Alibag	Pre-Tendering
11	IN-RRD-MAH-2622-CW-RFB	Underground cabling work at Saatpati	Pre-Tendering
MULTIPURPOSE CYCLONE SHELTER			
12	IN-RRD-MAH-2635-CW-RFB	Construction of Multi purpose Shelter at Harne	Pre-Tendering
13	IN-RRD-MAH-2631-CW-RFB	Construction of Multipurpose Cyclone Shelter at Saitwade	Pre-Tendering
14	IN-RRD-MAH-2633-CW-RFB	Construction of Multi purpose Shelter at Dabhol	Pre-Tendering
15	IN-RRD-MAH-2637-CW-RFB	Construction of Multi purpose Shelter at Vijaydurg	Pre-Tendering
16	IN-RRD-MAH-2639-CW-RFB	Construction of Multi purpose Shelter at Achra	Pre-Tendering
17	IN-RRD-MAH-2636-CW-RFB	Construction of Multi purpose Shelter at Dighi	Pre-Tendering
18	IN-RRD-MAH-2638-CW-RFB	Construction of Multi purpose Shelter at Borli.	Pre-Tendering

19	IN-RRD-MAH-2634-CW-RFB	Construction of Multi purpose Shelter at Edwan	Pre-Tendering
20	IN-RRD-MAH-2642-CW-RFB	Construction of Multi purpose cyclone shelter at Jamsunday	Pre-Tendering
21	IN-RRD-MAH-2632-CW-RFB	Construction of Multi purpose Shelter at Usarni	Pre-Tendering
22	IN-RRD-MAH-2640-CW-RFB	Construction of Multi purpose Shelter at Kalethar	Pre-Tendering
EARLY WARNING DISSEMINATION SYSTEMS (EWDS)			
	IN-RRD-MAH-2653-GO-RFB / Supply & installation of EWDS system in Maharashtra.	Early Warning Dissemination Systems (EWDS) in Coastal Districts of Maharashtra	Pre-Tendering
