Ranchi Municipal Corporation

REQUEST FOR PROPOSAL

FOR

DEVELOPMENT OF INTEGRATED SOLID WASTE MANAGEMENT SYSTEM

FOR

RANCHI MUNICIPAL CORPORATION

ON

PUBLIC PRIVATE PARTNERSHIP (PPP)

UNDER JnNURM SCHEME

Chief Executive Officer
Ranchi Municipal Corporation
Kutchury Road,
Ranchi – 834001
(Jharkhand)
Phone: 0651-2211215, 2203469
Fax: 0651-2211777
Email: jnnurm@ranchimunicipal.com, support@ranchimunicipal.com
Website: www.ranchimunicipal.com

THIS DOCUMENT IS ONLY MEANT FOR THE BIDDERS SHORTLISTED AT THE REQUEST FOR QUALIFICATION STAGE.

THE SHORTLISTED BIDDERS WERE:

1. A2Z Infrastructure Limited requisite
2. Hanjer Bio-Tech Energies Pvt. Ltd.
3. IL&FS Waste Management & Urban Services Ltd.
4. Jamshedpur Utilities & Services Company Limited
5. Jindal Urban Infrastructure Limited
6. Ramky Enviro Engineers Ltd.
7. SMS Infrastructure Limited
8. SPML-ISI-GWMCPL Consortium

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Disclaimer

1. The information contained in this Request for Proposal document (the "**RFP**") or subsequently provided to Eligible Bidder(s), whether verbally or in documentary or any other form, by or on behalf of the Ranchi Municipal Corporation (RMC) or any of its employees or advisors, is provided to Eligible Bidder(s) on the terms and conditions set out in this RFP and such other terms and conditions subject to which such information is provided.

2. This RFP is not an agreement and is neither an offer nor invitation by the RMC to the prospective Applicants or any other person. The purpose of this RFP is to provide interested parties with information that may be useful to them in the formulation of their application for qualification pursuant to this RFP. This RFP includes statements, which reflect various assumptions and assessments arrived at by the RMC in relation to the Project.

3. Such assumptions, assessments and statements do not purport to contain all the information that each Applicant may require. This RFP may not be appropriate for all persons, and it is not possible for the RMC, its employees or advisors to consider the investment objectives, financial situation and particular needs of each party who reads or uses this RFP. The assumptions, assessments, statements and information contained in this RFP may not be complete, accurate, adequate or correct. Each Applicant should therefore, conduct its own investigations and analysis and should check the accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments, statements and information contained in this RFP and obtain independent advice from appropriate sources.

4. Information provided in this RFP to the Eligible Bidder(s) is on a wide range of matters, some of which may depend upon interpretation of law. The information given is not intended to be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The RMC accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.

5. The RMC, its employees and advisors, Tetra Tech India Limited make no representation or warranty and shall have no liability to any person, including any Applicant or Bidder, under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this RFP or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFP and any assessment, assumption, statement or information contained therein or deemed to form part of this RFP or arising in any way with pre-qualification of Applicants for participation in the Bidding Process.

6. The RMC also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Applicant upon the statements contained in this RFP.

7. The RMC may, in its absolute discretion but without being under any obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this RFP.

8. The issue of this RFP does not imply that the RMC is bound to select and short-list pre qualified Applications for Bid Stage or to appoint the selected Bidder or Concessionaire, as

the case may be, for the Project and the RMC reserves the right to reject all or any of the Applications or Bids without assigning any reasons whatsoever.

9. The Applicant shall bear all its costs associated with or relating to the preparation and submission of its Application including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by the RMC or any other costs incurred in connection with or relating to its Application. All such costs and expenses will remain with the Applicant and the RMC shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by an Applicant in preparation or submission of the Application, regardless of the conduct or outcome of the Bidding Process.

Part 1 Instruction to Eligible Bidders

A. Background Information

1.0 Introduction

1.1. Background

1.1.1. Ranchi Municipal Corporation ("RMC") has been in the forefront in implementing reforms aiming at improved service delivery that is qualitative, reliable, and sustainable. Solid Waste Management (SWM) is the priority area of service delivery and RMC has been making continued efforts in improving MSW management in Ranchi for the past few years.

1.1.2. Jawaharlal Nehru National Urban Renewal Mission ("JnNURM") program was launched under the Ministry of Urban Development, Government of India to undertake reforms and facilitate investments in the urban sector of identified cities. Ranchi has been selected as one of the cities eligible for availing financial assistance under the JnNURM program.

1.1.3. In February 2009, RMC appointed M/s MSV International to prepare Detailed Project Report (DPR) for establishing Integrated Solid Waste Management System (ISWM) in Ranchi by availing grant under JnNURM (www.jnnurm.nic.in).

1.1.4. To ensure that the ISWM Project is developed in accordance with the applicable laws including Municipal Solid Waste (Management & Handling) Rules, 2000 and meets construction and O&M requirements set out by RMC; Tetra Tech India Limited, has been appointed as Transaction Advisor cum Project Management Consultant (TA Cum PMC) to assist RMC in implementation of integrated MSW management system through selection of developer and construction supervision during construction and implementation phase.

1.1.5. With the objective of developing the project under a Public Private Partnership (PPP) framework, RMC will select a Private Developer who shall be responsible for enabling collection, transportation, processing and disposal of MSW and reclamation/ alternative use of existing dump sites and for that purpose to design, develop, part-finance, construct, operate and maintain the ISWM facilities.

1.1.6. RMC initiated competitive two stage bid process for identification of the private developer ("the Concessionaire") who in accordance with the provisions of the Concession Agreement to be executed between RMC and the Concessionaire, shall be responsible for enabling collection, transportation, processing and disposal of MSW and for that purpose to design, develop, finance, construct, operate and maintain the facilities (the "Project") as explained in the **Request For Qualification** (RFQ) published earlier and **Request For Proposal** (RFP).

1.1.7. In accordance with the Clause 2.2.5 of the RFQ document, the Concession agreement will be signed between Ranchi Municipal Corporation and the Special Purpose Vehicle (SPV) formed by the Selected Bidder.

1.1.8. RMC has shortlisted Eligible Bidders during the RFQ Stage (Stage 1). Through this stage i.e. RFP Stage (Stage 2), the Proposals would be invited on the basis of criteria set out in the RFP and evaluated as per evaluation criteria ("Evaluation Methodology") in order to identify the successful Bidder for the Project ("Successful Bidder"). The Successful Bidder would then have to enter into a Concession Agreement with RMC and perform the obligations as stipulated therein, in respect of the Project.

1.1.9. Terms used in this RFP Document which have not been defined herein shall have the meaning ascribed there to in the RFQ and Draft Concession Agreement. RFQ issued earlier would be part of the Bid documents.

1.1.10 An overview of the Project is as follows:

Aspects	Description
Key Objective	RMC's key objective for setting up the Project on PPP basis is to improve municipal solid waste management services.RMC is desirous of selecting a Concessionaire to establish a viable & environmentally sustainable

	integrated municipal solid waste management system in compliance with the Municipal Solid Waste (Management & Handling) Rules, 2000, CPHEEO Manual and other relevant guidelines/ notifications issued by the competent authorities.
DPR	The DPR for municipal solid waste management has been already prepared by the RMC and approved by Central Sanctioning & Monitoring Committee, GOI. The Concessionaire may however note that the DPR may not cover adequately the equipment/resources/technology to undertake efficiently and comprehensively the activities as defined in the Scope of Work covering the entire area within the municipal limits. Therefore the Concessionaire may as he deem fit, include such activities/equipment/manpower at its own cost to make good any shortcomings or enhance the techno-economic viability of the project.
Estimated MSW Generation	As per the DPR, the estimated municipal solid waste generation for the Year 2011 within the RMC area is 491TPD (approximately).
Scope of Work	The scope of work for the Project would broadly include: a. Door-to-door collection of MSW b. Primary storage of collected door-to-door MSW c. Secondary collection and transportation of waste, street sweeping waste and de-silting of drains, Spraying bleaching powder in drains d. Collection of the user charges, on behalf of RMC as determined by the RMC from time to time. e. Construction and operation & maintenance of the waste processing facility with composting as one of the main processes. The concessionaire shall have to restrict the quantity of rejects going to SLF to 20% or less. f. Construction and operation and maintenance of the sanitary engineered landfill g. Collection, transportation, processing and disposal of the MSW littered within the jurisdiction of the RMC at the time of commencement of the collection and transportation services. h. Assist RMC in public education / awareness related to MSW. i. In consultation with RMC, develop and implement a public complaint system operational for at least 8 (eight) hours a day. Note: i. The service area to be entrusted to the Concessionaire for carrying out the collection and transportation of MSW shall be the entire area within the municipal limits or as defined by the RMC in the Concession Agreement. ii. Applicants are encouraged to submit their respective RFPs after visiting the Project site and ascertaining for themselves the site conditions, location, surroundings, climate, access to the site(s), applicable laws and regulations or any other matter considered relevant by them
Capital Grant and Concession	a. Capital Grant under the Jawaharlal Nehru National Urban Renewal Mission would be provided to the Concessionaire in accordance with the terms and conditions of the Concession Agreement. b. No Capital Grant shall be provided towards the capital expenditure incurred by the Concessionaire on equipments and machinery for setting up the processing plant for composting and brick making RMC shall provide land for transfer stations, landfill site and processing plant. c. RMC will provide the existing equipment/ vehicles (for collection and

	transportation activities) on "as is where is basis", to the Concessionaire solely for the purpose of the Project. d. The concession period for the Project shall be 30 (thirty) years including construction period. e. The Concessionaire shall collect the user charges from households, industry, shops and others on behalf of the RMC. The revenue collected from User Charges to go to RMC. The basis of the notification of such charges by the RMC from time to time. f. The Concessionaire would have the right to retain the revenue generated from: i. Sale of compost, bricks, recyclables or any other products of the processing plant ii. Sale of recyclables iii. Carbon credits. iv. Advertisement revenue, if any generated from leasing advertising rights of Transfer Stations, landfill site, bins, workers' uniform etc. g. RMC may pay Tipping Fee per MT of the MSW collected and transported, to the Selected Bidder depending upon of final outcome of the Bid negotiation.
Bidding Parameter	The bidding criteria shall be based on technical as well as financial bid.
Concession Agreement	Agreement would be entered into between the RMC and the Concessionaire for the Project. .
Clearances/ Approvals	Concessionaire shall be responsible for maintaining clearances/approvals/permissions required for the entire Concession Period.
Exclusion	The Concessionaire shall not be responsible for lifting/handling: (i) Bio-medical waste (ii) Hazardous waste (iii) Radioactive waste In case bio-medical / hazardous waste is found to be mixed with the MSW, the concessionaire shall segregate the same and transport it to the location as decided by the RMC for its further disposal by the RMC Concessionaire shall not use bio-methanation for MSW processing.

1.2. Eligible Bidders

1.2.1. The eligible bidders were shortlisted in the RFQ stage, are now requested to submit Financial Proposals in response to this RFP document. Eligible Bidder(s) shall purchase RFP Document or download the RFP and notify in writing their intention to participate in the bid for the Project as per format provided in Appendix 1.

1.2.2. Submissions made at the time of submitting RFQ would be considered as part of the Proposal. Eligible Bidders shall be bound by the submissions made at the time of submitting RFQ. Eligible Bidder(s) shall provide such evidence of their continued eligibility to the satisfaction of RMC, as RMC may reasonably request. No change in the composition of a Consortium will be permitted by the RMC.

1.3. Schedule of Bidding Process

RMC would endeavour to adhere to the following schedule:

Sr. No.	Activity Description	Date
1.	Issue of RFP	16.11.2010
3.	Last date of receiving queries	22.11.2010
4.	Pre-bid meeting at RMC Office	25.11.2010 at 3 PM
5.	Proposal Due Date	6.12.2010 at 3PM
6.	Opening of Technical Bids	6.12.2010 at 3:30PM
7.	Technical Presentations	8.12.2010 from 10 AM onwards.
8.	Opening of Financial Bids	8.12.2010 at 3:30PM

1.4. Cost of RFP document

1.4.1. The RFP document can be downloaded from www.ranchimunicipal.com. The cost of RFP document is Rs 25, 000 (twenty five thousand) . The Proposals must accompany with cost of RFP document in the form of a bank draft in favor of Chief Executive Officer, Ranchi Municipal Corporation, payable at Ranchi in case RFP is downloaded from website: (www.ranchi municipal.com). The Eligible Bidder(s) may also obtain a hard copy of the RFP from the office of Chief Executive Officer, Ranchi Municipal Corporation, Ranchi. The Eligible Bidder(s) purchasing the hard copy of the RFP must attach the copy of Receipt along with the Proposal. This fee is non-refundable.

1.5. Number of Proposals

1.5.1. Each Bidder shall submit only one (1) Proposal for the Project in response to this RFP Document. Any entity, which submits or participates in more than one Proposal for the Project will be disqualified and will also cause the disqualification of Consortium in which it is a member.

1.6. Proposal Preparation Cost

1.6.1. The Eligible Bidder shall be responsible for all the costs associated with the preparation of its Proposal and its participation in the bidding process. RMC will not be responsible or in any way liable for such costs, regardless of the conduct or outcome of bidding.

1.7. Contents of RFP Document

1.7.1. The RFP Document consists of Parts as listed below and would include any addenda issued in accordance with Clause 1.9.

Part 1	Instruction to Eligible Bidder(s)
Part 2	Project Information Memorandum
Part 3	Draft Concession Agreement

1.8. Clarifications

1.8.1. Eligible Bidder(s) requiring any clarification on the RFP Document may notify RMC in writing or by facsimile within such date as specified in the Schedule of Bidding Process. Based on its sole discretion, RMC may forward to all Eligible Bidder(s), copies of RMC'S response, including a description of the enquiry but without identifying its source.

1.9. Amendment of RFP Document

1.9.1. At any time prior to the Proposal Due Date, RMC may, for any reason, whether at its own initiative or in response to clarifications requested by a Bidder, modify the RFP Document by the issuance of Addenda.

1.9.2. Any Addendum thus issued will be uploaded on the website (www.ranchimunicipal.com) or will be sent in writing to all the Eligible Bidder(s) who have purchased or acknowledged downloading of the RFP Document and will be binding upon them. Eligible Bidder(s) shall promptly acknowledge receipt thereof to RMC.

1.9.3. In order to afford Eligible Bidder(s) reasonable time in which to take an Addendum into account, or for any other reason, RMC may, at its own discretion, extend the Proposal Due Date.

B. Preparation and Submission of Proposal

1.10. Language and Currency

1.10.1. The Proposal and all related correspondence and documents shall be written in the English language. Supporting documents and printed literature furnished by the Eligible Bidder with the Proposal may be in any other language provided that they are accompanied by an appropriate translation into English. Supporting materials that are not translated into English shall not be considered. For the purpose of interpretation and evaluation of the Proposal, the English language translation shall prevail.

1.10.2. The currency for the purpose of the Proposal shall be the Indian Rupee, (INR).

1.11. Validity of Proposal

1.11.1. The Proposal shall indicate that it would remain valid for a period not less than six (6) months from the Proposal Due Date (Proposal Validity Period). RMC reserves the right to reject any Proposal that does not meet this requirement.

1.11.2. Prior to expiry of the original Proposal Validity Period, RMC may request the Eligible Bidder(s) to extend the period of validity for a specified additional period. A Bidder may refuse the request without forfeiting its Bid Security. A Bidder agreeing to the request will not be allowed to modify its Proposal, but would be required to extend the validity of its Bid Security for the period of extension and comply with Clause 1.11 of this document in all respects.

1.12. Bid Security

1.12.1. In terms of the RFP, a Eligible Bidder will be required to deposit, along with its Bid, a bid security of Rs.50,00,000/- (Rupees fifty lacs only) (refer clause 3.12) in the form of a demand draft or a bank guarantee from a Scheduled Bank. The Bid shall be summarily rejected if it is not accompanied by the Bid Security.

1.12.2. The Bid Security would be required to be extended if so required by RMC.

1.12.3. The Bid Security shall be returned to unsuccessful Eligible Bidder(s) within a period of thirty (30) days from the date of announcement of the Successful Bidder. The Bid Security

submitted by the Successful Bidder shall be released upon furnishing of the Performance Security in the form and manner stipulated in the Draft Concession Agreement.

1.12.4. The Bid Security shall be forfeited in the following cases:

a. If the Bidder withdraws its Proposal during the interval between the Proposal Due Date and expiration of the Proposal Validity Period; and

b. If the Successful Bidder fails to provide the Performance Security within the stipulated time or any extension thereof provided by RMC.

1.12.5. Eligible Bidder(s) may note that RMC will not entertain any deviations to the RFP Document at the time of submission of the Proposal or thereafter. The Proposal to be submitted by the Eligible Bidder(s) will be unconditional and unqualified and the Eligible Bidder(s) would be deemed to have accepted the terms and conditions of the RFP Document with all its contents including the Draft Concession Agreement. Any conditional Proposal shall be regarded as non-responsive and would be liable for rejection.

1.12.6. RMC will endeavour to hold the pre- RFP meeting on 25.11.2010 at 3 PM

1.13. Correspondence

1.13.1. All correspondence / enquiries should be submitted to the following in writing by fax /post / courier:

ATTN. OF:	Chief Executive Officer Ranchi Municipal Corporation
ADDRESS:	Kutchury Road, Ranchi – 834001 (Jharkhand)

1.13.2. No interpretation, revision, or other communication from RMC regarding this solicitation is valid unless in writing and is signed by Authorised signatory, RMC or its authorised representative. RMC may choose to send to all Eligible Bidder(s) or will upload on the website (www.ranchimunicipal.com) written copies of RMC's responses, including a description of the enquiry but without identifying its source to all the Eligible Bidder(s).

1.14. Format and Signing of Proposal

1.14.1. Eligible Bidder(s) would provide all the information as per this RFP Document and in the specified formats. RMC reserves the right to reject any Proposal that is not in the specified formats.

1.14.2. The Proposal should be submitted in three parts in three separate envelops:

Part 1: **Key Submissions**, which would include:

I. Acknowledgement of RFP Document and Notification of Intent to Submit Proposal Appendix as per **Appendix 1**
II. Covering Letter cum Project Undertaking as per **Appendix- 2**
III. Anti-Collusion Certificate as per **Appendix- 3**
IV. Bid Security in the form of Bank Guarantee as per **Appendix- 4** or demand draft
V. Historical contract Non-performance **Appendix- 5**
VI. Pending Litigation **Appendix- 6**

Part 2: Technical Proposal Description of Approach, Methodology and Project Plan as per **Appendix 7**

Part 3: **Financial Proposal** as per the format set out in **Appendix- 8**

1.14.3. The Eligible Bidder shall prepare one set of original documents comprising the Proposal as described above, clearly marked "ORIGINAL". In addition, the Eligible Bidder shall make one copy of the Proposal, clearly marked "COPY". The Applicant shall also provide 2 (two) soft copies on Compact Disc (CD). In the event of any discrepancy between the original and the copy, the original shall prevail.

1.14.4. If the Proposal consists of more than one volume, Eligible Bidder must clearly number the volumes. Eligible Bidder must provide an indexed table of contents.

1.14.5. The Proposal and the copy shall be typed or printed in indelible ink and the Eligible Bidder shall initial each page. All the alterations, omissions, additions, or any other amendments made to the Proposal shall be initialed by the person/s signing the Proposal.

1.15. Sealing and Marking of Proposals

1.15.1. The Eligible Bidder shall seal the submissions duly marking the envelopes as "KEY SUBMISSIONS", "TECHNICAL PROPOSAL" and "FINANCIAL PROPOSAL". This envelope shall then be sealed in an outer envelope.

1.15.2. The original and the copy of the Proposal shall be provided in separate envelopes, duly marking the outer envelopes as "ORIGINAL" and "COPY".

1.15.3. Each envelope shall indicate the name and address of the Eligible Bidder

1.15.4. The envelopes shall clearly bear the following identification:

"**Proposal for Development of Integrated Solid Waste Management System for Ranchi Municipal Corporation on Public private partnership (PPP) under JNNURM scheme"**

"To be opened by Tender Committee only"
and "Submitted by
Name, Address and Contact Phone No. of the Applicant"

1.15.5. The envelope shall be addressed to:

Chief Executive Officer
Ranchi Municipal Corporation
Kutchury Road,
Ranchi – 834001
(Jharkhand)
Phone: 0651-2211215, 2203469
Fax: 0651-2211777
Email: jnnurm@ranchimunicipal.com, support@ranchimunicipal.com
Website: www.ranchimunicipal.com

1.15.6. If the envelope is not sealed and marked as instructed above, the Proposal may be deemed to non-responsive and would be liable for rejection. Ranchi Municipal Corporation

assumes no responsibility for the misplacement or premature opening of such Proposal submitted.

1.16. Proposal Due Date

1.16.1. Proposals should be submitted before 1500 hours IST on the Proposal Due Date mentioned in the Schedule of Bidding Process, to the address provided in Clause 1.3 in the manner and form as detailed in this RFP Document. Applications submitted by either facsimile transmission or telex will not be acceptable.

1.16.2. RMC, at its sole discretion, may extend the Proposal Due Date by issuing an Addendum in accordance with Clause 1.8.

1.17. Late Proposals

1.17.1. Any Proposal received by RMC after 1500 hours IST on the Proposal Due Date will be returned unopened to the Eligible Bidder.

1.18. Modification and Withdrawal of Proposals

1.18.1. The Eligible Bidder are not allowed to modify or withdraw the proposals; once they are submitted.

1.19. Tests of responsiveness

1.19.1. Prior to evaluation of Proposals, RMC will determine whether each Proposal is responsive to the requirements of the RFP Document. A Proposal shall be considered responsive if:

a. It is received by the Proposal Due Date.

b. It is signed, sealed, and marked as stipulated in Clause 1.14.3

c. It contains the information and documents as requested in the RFP Document.

d. It contains information in formats specified in the RFP Document.

e. It mentions the proposal validity period as set out in the RFP Document

f. It provides the information in reasonable detail. ("Reasonable Detail" means that, but for minor deviations, the information can be reviewed and evaluated by RMC without communication with the Eligible Bidder). RMC reserves the right to determine whether the information has been provided in reasonable detail.

g. There are no inconsistencies between the Proposal and the supporting documents.

1.19.2. A Proposal that is substantially responsive is one that conforms to the preceding requirements without material deviation or reservation. A material deviation or reservation is one

a. Which affects in any substantial way, the scope, quality, or performance of the Project, or

b. Which limits in any substantial way, inconsistent with the RFP Document, RMC's rights or the Eligible Bidder's obligations under the Draft Concession Agreement, or

c. Which would affect unfairly the competitive position of other Eligible Bidder(s) presenting substantially responsive bids.

1.19.3. RMC reserves the right to reject any Proposal which in its opinion is non-responsive and no request for modification or withdrawal shall be entertained by RMC in respect of such Proposals.

1.19.4. Conditional proposal shall not be considered. Any bid found to contain conditions attached, will be rejected.

1.20. Confidentiality

1.20.1. Information relating to the examination, clarification, evaluation and recommendation for the short listed Eligible Bidder(s) shall not be disclosed to any person not officially concerned with the process. RMC will treat all information submitted as part of Proposal in confidence and will ensure that all who have access to such material treat it in confidence. RMC will not divulge any such information unless it is ordered to do so by any Government authority that has the power under law to require its disclosure.

1.21. Clarifications

1.21.1. To assist in the process of evaluation of Proposals, Ranchi Municipal Corporation may, at its sole discretion, ask any Eligible Bidder for clarification on its Proposal. The request for clarification and the response shall be in writing or by facsimile. No change in the substance of the Proposal would be permitted by way of such clarifications.

1.22. Proposal Evaluation

1.22.1. To assist in the examination, evaluation, and comparison of Proposals, RMC is utilizing the services of M/s Tetra Tech India Limited who are appointed as Transaction Advisor Cum Project Management Consultants (TA CUM PMC) for this project.

1.23. Evaluation of the Financial Proposal

1.23.1. The Eligible Bidder(s) has to provide

I. The capital support sought – one time and

II. Year wise Tipping Fee per MT for 30 year period if sought from RMC

1.23.2. The maximum Capital Support to be provided by RMC shall in any case not exceed grant sanctioned for the project under JnNURM. The capital grant will not be provided for the Compost Plant and the Brick Making Plant

1.23.3. The value of Tipping Fees per MT quoted in the Financial Proposal shall be inclusive of all direct and indirect costs and taxes incurred to carry out work as defined under Scope of Work, In addition to the above

1.23.4. The Tipping Fees quoted by the Eligible Bidder shall be net of revenue i.e. the Eligible Bidder shall take into revenue earned from sale of compost, advertisement etc. User Charges collected from the household and other commercial establishments shall not be considered revenue of the Concessionaire.

1.23.5. RMC shall provide Capital Support only for the activities listed out in Table 2 of Appendix 8. In case the Eligible Bidder proposes to develop any facility other than that mentioned in Appendix 8, RMC shall not provide any capital support for the same. The activity proposed to be developed by the Eligible Bidder shall be in accordance with MSW Rules.

1.23.6. In the event that two or more Eligible Bidder(s) secure the same overall score, RMC may:

a. Give preference to the Eligible Bidder who has experience of working in Bihar and Jharkhand

OR

b. Invite fresh Proposals from the Eligible Bidder(s);

OR

c. Declaring the bidder securing highest technical marks amongst the Eligible Bidder(s) securing same overall score, as preferred bidder

OR

d. take any such measure as may be deemed fit in its sole discretion or annulment of the bidding process.

1.23.7. RMC may either choose to accept the Proposal of the Preferred Bidder or invite him for negotiations.

1.23.8. Upon acceptance of the Financial Proposal of the Preferred Eligible Bidder(s) with or without negotiations, RMC shall declare the Preferred Bidder as Successful Bidder.

1.24. Notifications

1.24.1. RMC will notify the Successful Bidder by facsimile and by a letter that its Proposal has been accepted.

1.25. RMC's Right to Accept or Reject Proposal

1.25.1. RMC reserves the right to accept or reject any or all of the Proposals without assigning any reason and to take any measure as it may deem fit, including annulment of the bidding process, at any time prior to award of Project, without liability or any obligation for such acceptance, rejection or annulment.

1.25.2. RMC reserves the right to invite revised Financial Proposals from Eligible Bidder(s) with or without amendment of the RFP Document at any stage, without liability or any obligation for such invitation and without assigning any reason.

1.25.3. RMC reserves the right to reject any Proposal if:

a. (a) at any time, a material misrepresentation is made or uncovered;

OR

b. (b) The Bidder does not respond promptly and thoroughly to requests for supplemental information required for the evaluation of the Proposal.

This shall lead to the disqualification of the Bidder. If the Bidder is a Consortium, then the entire Consortium shall be disqualified / rejected. If such disqualification / rejection occur after the Financial Proposals have been opened and the lowest Bidder gets disqualified / rejected, then RMC reserves the right to:

a. Invite the next lowest Bidder

OR

b. Take any such measure as may be deemed fit in the sole discretion of RMC, including annulment of the bidding process.

1.26. Letter of Award (LOA)

1.26.1. RMC will award the LOA to the successful bidder.

1.27. Execution of Concession Agreement

1.27.1. The Successful Bidder shall execute the Concession Agreement within 15 (fifteen) days of the issue of LOA or such time as indicated by RMC.

1.27.2. RMC will promptly notify other Eligible Bidder(s) that their Proposals have been unsuccessful and their Bid Security will be returned as promptly as possible in any case not later than 30 (thirty) days from the date of announcement of the Successful Bidder.

1.28. Performance Security

1.28.1. In terms of the RFP, a Successful Bidder will be required to deposit Performance Security equivalent to 5% (five per cent) of the Total Project Cost, shall mean the total cost of the project as estimated by the successful bidder on the basis of Project Information Memorandum while submitting the proposal and approved by RMC. (the "Performance Security") in the form of a demand draft or an irrevocable Bank Guarantee in favour of RMC, as per the format set out in the Draft Concession Agreement.

1.28.2. The Performance security shall be forfeited and en-cashed in any of the following cases:

a. If the Successful Bidder fails to meet the service levels as agreed.
b. If the Successful Bidder withdraws from the project midway during the project term.
c. Any other act or acts of the successful bidder which renders the project un-operational and RMC establishes sufficient reasons to forfeit the Performance Security
d. If during the project term, there Successful Bidder is found to charge user fees which were not agreed.
e. If during the project term, Successful Bidder indulges in activities that are in contravention to the spirit of the Concession Agreement.

2.0 Scope of the Project

2.1. Project Coverage Area

The proposed project will be for the entire area under RMC which is approximately 175 Sq Km. The projected population of RMC city for the year 2011 is 13.63 lac approximately.

2.2. Project Components

The various components of proposed project of Integrated Solid Waste Management system is based on the assessment of the existing deficiencies and mandatory requirement as per MSW Rules 2000.

i. Street sweeping and de-silting of drains, Spraying drains with bleaching powder

ii. Door-to-door collection of solid waste from household, industrial units and institutions.

iii. Providing separate bins, at point of collection for biodegradable/non degradable waste

iv. Procurement and operation of equipments, vehicles and tools for door-to-door collection.

v. Secondary storage of wastes

vi. Waste transfer from primary collection equipments to light motor vehicles.

vii. Collection of waste from daily sweeping of streets.

viii. Transportation of wastes to treatment facilities.

ix. Build, Operate & Maintain workshop for maintenance of vehicle/ equipments

x. Procure project vehicles, equipments and other assets required for the execution of the Project in accordance with the specifications provided in Draft Concession Agreement and Project Information Memorandum.

xi. Construction, Operations and Management of treatment facilities and land fill sites.

2.3. Project Funding

The proposed project is approved under JNNURM and is entitled to get 80% of the capital cost as grant from Government of India, 10% from the Jharkhand State and RMC has to finance the remaining 10%. The Grants would be released as per the norms laid down under JnNURM. Operations &Maintenance cost is expected to be met from the project such as sale of recyclables, sale of compost, sale of bricks, or revenue from sale/disposal of any other product produced as per terms of concession agreement, revenue from Carbon Credits, if any, advertisement rights if any granted by RMC . RMC may grant Tipping Fee as per terms of Concession agreement to part finance operation and maintenance as per terms of Concession Agreement.

2.4. Concession Period

The concession period of the project is thirty (30) years from the date of signing of the Concession Agreement. Time duration of 30 years includes the construction period as well.

2.5. User Charges

The RMC may at its own discretion impose suitable user charges on the beneficiaries towards waste collection.

RMC may impose user charges on following categories:

- Households
- Markets – Vegetable markets/shops/malls
- Hotels and Restaurants/banquet halls
- Industries
- Institutions/offices
- Etc.

The rate of user charges may be escalated in accordance with the notifications issued by RMC from time to time.

The responsibility for collection of user charges would be that of Private Partner.

The revenue collected from the users would go to RMC and would not be a part of the income of the Concessionaire. Successful Bidder shall not consider user charges as its revenue while quoting grant and/or tipping fee at the time of Bid.

The treatment facilities of the proposed DBFOT integrated solid waste treatment project with all necessary tools and equipments as under:

S No	Description	Unit	Capacity
1	Composting Plant	MT/day	300*
2	Brick making Plant	No. of bricks/day	10000*
3	Engineered Land Fill	For the Concession Period	

*the capacity to be augmented with time as per the increase in the waste quantity in the Concession Agreement

Note: The capacities and specifications mentioned in this RFP document are minimum and mandatory.

2.6. Components of the proposed project

a. Storage at primary point of waste generation

The Concessionaire would procure and provide required infrastructure for segregated storage of MSW at source.

- It is proposed that each household shall be provided with two (2) containers of 10.0 litres capacity each for storage of biodegradable and non-biodegradable waste separately.
- A set of covered 120 litre bins with wheels for each hotel/guest house/restaurant.

- Litter bin of 100 litre twin-bin set (separate bins for collection of biodegradable and non-biodegradable waste) shall be placed near all public and tourist places including schools, colleges, offices, post office, and market areas and parks. The litter bins may have the advertisement potential which can be used by the concessionaire for generating revenue.

b. Door-to-door collection of waste

The Concessionaire would procure and deploy adequate numbers of primary collection vehicles.

- It is proposed to deploy containerised tricycles each having 6 containers of 35 litres capacity each for primary collection of waste from RMC areas. Out of 6 containers in a tricycle, 4 containers shall be used for collecting biodegradable waste and 2 containers for collecting non-biodegradable waste.
- It is proposed to deploy 1.5 cum capacity mini tippers for door-to-door collection of waste from areas having wide road network.
- Workers shall be provided with uniform, necessary equipments (such as broom, dustpan, etc.) and safety equipments (like gloves, boots, etc.) required for undertaking door-to-door collection. Adequate provision of manpower shall be done to provide door-to-door collection service 365 days in a year.

c. Collection of waste from street sweeping

The Concessionaire would deploy suitable equipments to collect waste from street sweeping.

- Approximate length of roads in RMC area is 558.95 km.
- Street sweeping shall take place daily in all the areas of habitation and on alternate days in other areas as per the defined schedule. At least one wheelbarrow shall be assigned between two sweepers. Street sweeping machine shall be provided for sweeping of main road.
- Street sweeping workers shall be provided with uniforms, necessary equipments like shovel, broom, etc. and safety equipments like gloves, boots, safety masks, etc.
- RMC will undertake street sweeping in selected wards through its existing staff and remaining wards will be handed over to the concessionaire. Wards can be distributed as per mutual agreement between RMC and the Concessionaire. In case, later, if RMC wants to handover his wards also to the concessionaire, concessionaire is bound to extend his services to such areas as well.
- Procured wheelbarrows shall be distributed between RMC and the concessionaire on mutual agreement based on areas covered by each of them.

d. Secondary storage of waste

The Concessionaire would procure and deploy suitable equipments for secondary storage of waste.

- MSW at secondary collection locations shall be stored in closed containers.
- Distance between two secondary waste collection locations shall not be more than 500m. No primary waste collector shall travel more than 250m for dumping of waste.
- Total area of RMC is approximately 175 Sq. km. It is estimated that secondary collection infrastructure shall be available at minimum 455 number of locations in RMC areas.
- At each location separate closed container (refuse collector bin/dumper placer container) shall be provided for collection of biodegradable (in green bin) and non-biodegradable waste (in black bin). Adequate number of containers for storage of

biodegradable and non-biodegradable waste shall be placed at each location to ensure there is no spillage of waste.

- It is estimated that 1110 refuse collector bins (984 bins of 1.1 cum. capacity and 126 bins of 0.6 cum. capacity) and 230 dumper placer containers (of 2.5 cum. capacity) are required for waste storage at secondary collection points.
- All containers shall be placed on concrete or asphalted flooring to maintain appropriate hygienic conditions around the bins.
- RMC though has metal dumper placer containers but most of them are not in good condition and need replacement. Therefore, required number of green and black refuse collector bins and dumper placer containers shall be procured to meet the requirement of the city.

e. Transportation of waste

The Concessionaire would procure adequate number and types of vehicles for transporting different categories of waste to treatment plants and land fill sites via transfer station, if required.

- MSW from all the secondary collection points shall be first brought to the transfer station and then transported to integrated solid waste management site.
- At transfer station, MSW will be unloaded from collection vehicles and briefly held while it is reloaded onto larger vehicles for transportation to integrated solid waste treatment and disposal facility.
- Hydraulically operated equipment shall be used for transportation of waste. The waste, under any circumstances, shall not be handled manually.
- Four transfer stations are proposed at Madhukam, Old Jail, Bus Stand and Jagannathpur (backside of Jagannath temple). At these transfer stations, waste from 8.0 m^3 Refuge Collector trucks and Dumper Placers will be transferred to the bigger compactor trucks .
- It is proposed to use 8m^3 capacity Refuse Collectors for lifting waste from RC bins and twin container dumper placer for lifting of 2.5 m^3 capacity DP containers. It is estimated that 22 refuse collector trucks and 23 dumper placers are required for transportation of waste from secondary storage points to the transfer stations.
- For collection of waste from hotels/restaurants/banquet halls, 6 cum. capacity refuse collector trucks are proposed. It is estimated that 4 such trucks are required.
- For collection of waste from litter bins, 4 tipper trucks of 6 cum. capacity each are proposed.
- For transportation of waste from transfer stations to the integrated solid waste management facility site, 23 large haulage trucks of 10 cum. are proposed.
- At every stage, biodegradable and non-biodegradable waste shall be transported in separate vehicles.
- Cattle lifting vehicle and dead animal lifting van shall be used for lifting of stray animals and dead animals respectively. It is proposed to procure 2 cattle lifting vehicle and 2 dead animal lifting van.

f. f) Work shop for maintenance

- It is proposed to construct a proper and fully equipped workshop at Bakri Bazaar for maintenance of vehicles and equipments used in MSW management in RMC area.

g. g) Processing of waste

- Along with a sanitary landfill, it is proposed to develop a compost plant of 300 MT/day capacity for processing of biodegradable waste and a brick making plant for processing of construction and demolition waste at integrated solid waste management (ISWM) facility.
- It is proposed that existing dumpsite at Jhiri shall be cleared of waste and shall be utilized for development of ISWM facility after taking due measures.
- Not more than 20% of the rejects of the total MSW transported to the ISWM facility shall be landfilled. If required other appropriate technologies shall be used for processing of waste at this facility to reduce quantity of landfillable waste.

2.7. Estimates of waste and category

- The estimated waste generation from RMC areas is as under:

Year	**2011**	**2016**
Projected Population	1363242	1602795
Total waste generation per day in MT	491	577

- The average physical composition of MSW is as under:

Items/Year		**Percentages**
Total Compostable		51.49
Recyclables		9.86
Break up of Recyclable	Paper	3.45%
	Glass	1.45%
	Paper	3.45%
	Glass	1.45%
Inerts and others		38.65
Total		100%

Source: Approved DPR of SWM

2.8. Site

The following sites have been identified for setting up transfer stations, workshop and ISWM facility.

S. No	Description	Location
1	Transfer Station	Madhukam
		Old Jail
		Bus Stand
		Jagannathpur (backside of Jagannath temple)
2	Workshop	Bakri Bazaar
3	ISWM Facility	Jhiri

2.9. Project Vehicles / Equipments

The Concessionaire shall procure the Project Vehicles and Project Equipments in accordance with the specification provided in the draft Concession Agreement and as per the procedure laid down in Jharkhand Procurement Rules 2008.

3.0 Bid Evaluation

3.1. Financial Proposals

3.1.1. The offers of the Eligible Bidder on the Government financial support required as per the format prescribed in Appendix 10 shall be used for financial evaluation.

3.1.2. The maximum Capital Support to be provided by RMC shall in any case not exceed the approved cost of the project under JnNURM.

3.1.3. The Tipping Fees quoted by the Eligible Bidder shall be net of revenue i.e. the Eligible Bidder shall take into account all costs and revenue earned from sale of compost, bricks, recyclables, advertisement, etc. The method for ascertaining waste for payment of Tipping Fee will be based on actual weight assessed at the ISWM Facility.

3.1.4. The Financial Proposal of all the Eligible Bidder(s) shall be evaluated based on the following formula :

Financial Support required from Ranchi Nagar Nigam = Capital Grant plus overall Tipping Fees

i) For the purpose of evaluation, Tipping Fees (Rs per MT) shall mean present value of the amount (Rs per MT) quoted by the Eligible Bidder for the respective financial years multiplied by MT multiplied by 365 days.

Eligible Bidder

ii) In case the Eligible Bidder does not quote amount of Tipping Fees for any financial year the same will be taken as zero.

3.1.5. The present value of Tipping Fees quoted by the Eligible Bidder shall be discounted at 10% would be used for final evaluation.

3.1.6. 3.1.6 The present value (PV) of Tipping Fees would be computed as PV = T1/(1.10)^1 + T2/(1.10)^2 + T3/(1.10)^3 + T4/(1.10)^4 + ... +Tn/(1.10)^n T1, T2, T3, T4 and Tn are the Tipping Fees Rs per MT required during year1, year 2, and up to year 30.

3.1.7. For the purpose of financial evaluation the overall financial support in Rs Crores would be computed as under where the Eligible Bidder quotes Tipping Fees :

Capital Grant (Rs Crores) + (Tipping Fee/1,00,00,000)

Eligible Bidder

3.1.8. For the purpose of financial evaluation the overall financial support in Rs Crores would be computed as under where the Eligible Bidder quotes Tipping Fees

Capital Grant (Rs Crores) + (Tipping Fee/1,00,00,000)

3.2. Technical Proposal

The Eligible Bidder would be given marks on the basis of their understanding of the project plan. The Eligible Bidder shall be invited to make a presentation on approach, methodology and project plan to judge their understanding of the Project.

NOTE:

- The weightage for Financial Proposal and Technical Proposal has been given 80% and 20% respectively.

- The Financial Proposals shall be given scores as follows:
  Pf = 100 X Fm/F

Where:

- Pf is Financial Score
- Fm is the Lowest Bid Price
- F is the price of the proposal under consideration

The Composite Score from Technical Proposal and Financial Proposal shall be computed as follows:

Composite Score = (Pf X 0.8) + (Pt X 0.2),

Where:

- Pt is the Technical Score of the proposal under consideration

- The Eligible Bidder getting highest marks would be declared Successful.

- In the event that two or more Eligible Bidder(s) secure the same overall score, RMC may:

  i. Declaring the Eligible Bidder securing highest technical marks amongst the Eligible Bidder(s) securing same overall score, as preferred bidder

     Or

  ii. Give preference to the Eligible Bidder who has experience of working in Bihar and Jharkhand

     Or

  iii. Take any such measure as may be deemed fit in its sole discretion or annulment of the bidding process.

- RMC may either choose to accept the Proposal of the Preferred Bidder or invite him for negotiations. In case negotiation fails, RMC has the right to invite the next preferred bidder for negotiation.

- Upon acceptance of the Financial Proposal of the Preferred Eligible Bidder with or without negotiations, RMC shall declare the Preferred Bidder as Successful Bidder.

- RMC will notify the Successful Bidder by facsimile and by a letter that its Proposal has been accepted.

Appendix 1
Format for Acknowledgement of RFP Document and Notification of Intent to Submit Proposal

Date:

To
Chief Executive Officer
Ranchi Municipal Corporation
Kutchury Road,
Ranchi – 834001
(Jharkhand)

Dear Sir,

Re: Request For Proposal for Development of Integrated Solid Waste Management System for Ranchi Municipal Corporation on Public private partnership (PPP) under JNNURM scheme.

The undersigned hereby acknowledges and confirms receipt of all the Parts (Part I, Part II and Part III) of the Request for Proposal (RFP) Document for the captioned project from Ranchi Municipal Corporation and conveys its intention to submit a Proposal for the Project on Public Private Partnership mode , under DBFOT (**Design, Build, Finance, Operation and Transfer**) structure.

……..
Name of the Bidder

……..
Signature of the Authorised Person

……..
Name of the Authorised Person

Note:

- *On the Letterhead of the Bidder or Lead Member of Consortium.*
- *To be signed by the Lead Member in case of a Consortium.*
- *The acknowledgement should be sent within 2 days of purchase/ downloading of the RFP Document*

Appendix 2
Format for Covering Letter Cum Project Undertaking

Date:

To
Chief Executive Officer
Ranchi Municipal Corporation
Kutchury Road,
Ranchi – 834001
(Jharkhand)

Dear Sir,

Re: Request For Proposal for Development of Integrated Solid Waste Management System for Ranchi Municipal Corporation under JNNURM scheme on Public Private Partnership (PPP) under DBFOT (**Design, Build, Finance, Operation and Transfer**) structure.

We have read and understood the Request for Proposal (RFP) Document in respect of the Project provided to us by Ranchi Municipal Corporation. We hereby submit our Proposal for the captioned project.

We are enclosing our Proposal in one (1) original plus one (1) copy and two (2) soft copies in a compact disc (CD), with the details as per the requirements of the RFP Document, for your evaluation.

We confirm that our Proposal is valid for a period of six (6) months from ……. (Proposal Due Date)

We hereby agree and undertake as under:
Notwithstanding any qualifications or conditions, whether implied or otherwise, contained in our Proposal we hereby represent and confirm that our Proposal is unqualified and unconditional in all respects and we agree to the terms of the Draft Concession Agreement, a draft of which also forms a part of the RFP Document provided to us.

Dated this ……..Day of ……., 2010.

Name of the Bidder
…….

Signature of the Authorised Person
…….

Name of the Authorised Person

Note:
• *On the Letterhead of the Bidder.*

Appendix 3
Format for Anti-Collusion Certificate

Anti-Collusion Certificate We hereby certify and confirm that in the preparation and submission of this Proposal, we have not acted in concert or in collusion with any other Bidder or other person/s and also not done any act, deed or thing which is or could be regarded as anti-competitive.

We further confirm that we have not offered nor will offer any illegal gratification in cash or kind to any person or agency in connection with the instant Proposal.

Dated this ……..Day of ……., 2010

Name of the Bidder
…….
Signature of the Authorised Person
…….
Name of the Authorised Person

Appendix 4

(Proforma of Bank Guarantee for Bid Security Scheduled Bank)

B.G. No. Dated:

1. In consideration of you, Ranchi Municipal Corporation having its office at Kutchury Road, Ranchi -834001,Jharkhand (hereinafter referred to as the "Ranchi Municipal Corporation" or "RMC", which expression shall unless it be repugnant to the subject or context thereof include its, successors and assigns) having agreed to receive the Bid of _____ [a Company registered under provision of the Companies Act, 1956] and having its registered office at _____ [and acting on behalf of its Consortium] (hereinafter referred to as the "Bidder" which expression shall unless it be repugnant to the subject or context thereof include its/their executors administrators, successors and assigns), for the Integrated Solid Waste Management Project at Ranchi on [DBFOT] basis (hereinafter referred to as "the Project"). Pursuant to the RFP Document dated ***** issued in respect of the Project and other related documents (hereinafter collectively referred to as "Bidding Documents"), we [Name of the Bank] having our registered office at _____ and one of its branches at _____ (hereinafter referred to as the "Bank"), at the request of the Bidder, do hereby in terms of Clause 1.11 of the RFP Document, irrevocably, unconditionally and without reservation guarantee the due and faithful fulfilment and compliance of the terms and conditions of the Bidding Documents (including the RFP Document) by the said Bidder and unconditionally and irrevocably undertake to pay forthwith to the RMC an amount of Rs. 50,00,000/- (Rupees fifty lacs only)as bid security (hereinafter referred to as the "Bid Security") as our primary obligation without any demur, reservation, recourse, contest or protest and without reference to the Bidder if the Bidder shall fail to fulfil or comply with all or any of the terms and conditions contained in the said Bidding Documents.

2. Any such written demand made by the RMC stating that the Bidder is in default of the due and faithful fulfilment and compliance with the terms and conditions contained in the Bidding Documents shall be final, conclusive and binding on the Bank.

3. We, the Bank, do hereby unconditionally undertake to pay the amounts due and payable under this Guarantee without any demur, reservation, recourse, contest or protest and without any reference to the Bidder or any other person and irrespective of whether the claim of the RMC is disputed by the Bidder or not merely on the first demand from the RMC stating that the amount claimed is due to the RMC by reason of failure of the Bidder to fulfil and comply with the terms and conditions contained in the Bidding Documents including failure of the said Bidder to keep its Bid open during the Bid validity period as set forth in the said Bidding Documents for any reason whatsoever. Any such demand made on the Bank shall be conclusive as regards amount due and payable by the Bank under this Guarantee. However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs. **********/- (Rupees **********only).

4. This Guarantee shall be irrevocable and remain in full force for a period of 270 (two hundred and seventy) days from the Bid Due Date inclusive of a claim period of 60 (sixty) days or for such extended period as may be mutually agreed between the RMC and the Bidder, and agreed to by the Bank, and shall continue to be enforceable till all amounts under this Guarantee have been paid.

5. We, the Bank, further agree that the RMC shall be the sole judge to decide as to whether the Bidder is in default of due and faithful fulfilment and compliance with the terms and conditions contained in the Bidding Documents including, inter alia, the failure of the Bidder to keep its Bid open during the Bid validity period set forth in the said Bidding Documents, and the decision of the RMC that the Bidder is in default as aforesaid shall be final and binding on us, notwithstanding any

differences between the RMC and the Bidder or any dispute pending before any Court, Tribunal, Arbitrator or any other Authority.

6. The Guarantee shall not be affected by any change in the constitution or winding up of the Bidder or the Bank or any absorption, merger or amalgamation of the Bidder or the Bank with any other person.

7. In order to give full effect to this Guarantee, the RMC shall be entitled to treat the Bank as the principal debtor. The RMC shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee from time to time to vary any of the terms and conditions contained in the said Bidding Documents or to extend time for submission of the Bids or the Bid validity period or the period for conveying acceptance of Letter of Award by the Bidder or the period for fulfilment and compliance with all or any of the terms and conditions contained in the said Bidding Documents by the said Bidder or to postpone for any time and from time to time any of the powers exercisable by it against the said Bidder and either to enforce or forbear from enforcing any of the terms and conditions contained in the said Bidding Documents or the securities available to the RMC, and the Bank shall not be released from its liability under these presents by any exercise by the RMC of the liberty with reference to the matters aforesaid or by reason of time being given to the said Bidder or any other forbearance, act or omission on the part of the RMC or any indulgence by the RMC to the said Bidder or by any change in the constitution of the RMC or its absorption, merger or amalgamation with any other person or any other matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of releasing the Bank from its such liability.

8. Any notice by way of request, demand or otherwise hereunder shall be sufficiently given or made if addressed to the Bank and sent by courier or by registered mail to the Bank at the address set forth herein.

9. We undertake to make the payment on receipt of your notice of claim on us addressed to [name of Bank along with branch address] and delivered at our above branch who shall be deemed to have been duly authorised to receive the said notice of claim.

10. It shall not be necessary for the RMC to proceed against the said Bidder before proceeding against the Bank and the guarantee herein contained shall be enforceable against the Bank, notwithstanding any other security which the RMC may have obtained from the said Bidder or any other person and which shall, at the time when proceedings are taken against the Bank hereunder, be outstanding or unrealised.

11. We, the Bank, further undertake not to revoke this Guarantee during its currency except with the previous express consent of the RMC in writing.

12. The Bank declares that it has power to issue this Guarantee and discharge the obligations contemplated herein, the undersigned is duly authorised and has full power to execute this Guarantee for and on behalf of the Bank.

Signed and Delivered by _____ Bank

By the hand of Mr./Ms _____, its _____ and authorised official.

(Signature of the Authorised Signatory)

(Official Seal)

APPENDIX 5

Historical Contract Non-Performance

[The following table shall be filled in for the bidder and for each member of the Consortium]

Please tick either (A) or furnish details is case of (B)

Bidder's Name:
Consortium Members' Name:
Date:

Non-Performing Contracts in accordance with section 1.24.2 (Sl.No 5)- Pre Qualification Criteria			
A. Contract non-performance did not occur during last five(5) years specified in section 1.24.2 - Pre Qualification Criteria B. Contract(s) not performed during last five(5) years specified in section 1.24.2 - Pre Qualification Criteria			
Year	**Non performed portion of contract**	Name/address of the Project	*Reason(s) for non performance* **and total contract amount**
[insert year]	*[insert amount and percentage of total project cost]*	*Address of project sponsor : [insert street/ city/country]* *: [indicate main reason(s)]*	

APPENDIX 6

Pending Litigation

[The following table shall be filled in for the bidder and for each member of the Consortium]

Bidder's Name: [insert full name]
Consortium Members' Name:[insert full name]
Date: [insert day, month, year]

Year	**Outcome Value and as Percentage of Total Assets**	Name/address of the Project	*Reason(s) for non performance* **and total contract amount**
[insert year]	*[insert Value and percentage of total assets]*	*Address of project sponsor : [insert street/ city/country]* *: [indicate main reason(s)]*	*Reason(s) for non performance* **and total contract amount**

APPENDIX 7

Description of Approach, Methodology and Project Plan

Technical approach, methodology, project plan and past experience are key components of the Technical Proposal. Based on the details/requirements given in the RFP, Eligible Bidder(s) shall submit their Technical Approach, Methodology and Project Plan. In case, bidder has another option for treatment, processing and disposal of MSW other than the one specified in this RFP, the bidder shall submit this option as an 'Alternative Plan'. A parallel technical proposal of this 'Alternative Plan' shall also be presented along with the Technical Proposal based on the RFP design.

You are suggested to present in your technical proposal the followings:

a) Technical Approach and Methodology,
b) Project Plan
c) Organization and Staffing,
d) Assessment of Risk and mitigation plan
e) Change Management plan
f) Benefits of the proposed 'Alternative Plan' (only in case of Eligible Bidder(s) who have submitted an 'Alternative Plan')

a) Technical Approach and Methodology. In this chapter you should explain your understanding of the objectives of the project, approach to the services, methodology for carrying out the activities obtaining the expected output and the degree of detail of such output. You should highlight the problems being addressed and their importance and explain the technical approach you would adopt to address them.

b) Project Plan. In this chapter you should propose the main activities of the project, their content and duration, phasing and interrelations, milestones and completion dates of the key project deliverables. The proposed project plan should be consistent with the technical approach and methodology, showing understanding of the TOR and ability to translate them into a feasible project plan. The project plan should be consistent with the project activity schedule attached.

c) Organization and Staffing. In this chapter you should propose the structure and composition of your project and operational team. You should list the main disciplines of the project, the key expert responsible and proposed technical and support staff.

d) Assessment of Risk and mitigation plan. In this chapter you should explain the various categories of risks, you envisage in the project implementation and operation phase. You should highlight the method to evaluate the overall chances of potential loss and the consequences. You should propose a plan to control & monitor the risks and plan for contingencies to risks, which occur.

e) Change Management Plan. In this chapter you should propose the information resource management strategies and technology framework to support project change.

f) Benefits of the proposed 'Alternative Plan'- For 'Alternative Plan' bidder shall also submit a comparative chart illustrating benefits and drawbacks of this plan vis-à-vis the plan given in this RFP.

Note: The bidder shall be invited to make a presentation on approach, methodology and project plan to judge their understanding of the project.

EVALUATION CRITERIA FOR TECHNICAL BIDS OF INTEGRATED MSW MANAGEMENT PROJECT OF RANCHI

Technical Proposal would be evaluated based on the following criteria:

TECHNICAL DOCUMENT	DESCRIPTION
Technical Approach & Methodology	Primary Collection
	Secondary Storage and Transportation
	Treatment and Processing
	Disposal
Project Plan Till COD	Clarity & Continuity
	Coverage of all aspects of project / detailing
Organization & Staffing	Staff Adequacy
	Organization structure with defined roles & responsibilities
Assessment of Risks, Risk Mitigation Plan & Change Management Plan	Identification of risks
	Risk mitigation and change management plan
Presentation	Understanding of the Project, Work Plan, Experience of undertaking similar projects

The Bidders shall provide a Technical Proposal setting out the proposed plan for implementation of the Project. The Proposal shall comprise the technical approach and methodology for collection and transportation, treatment, processing and disposal of MSW & construction debris; construction works to be undertaken, schedules and timelines; manpower deployment etc. The Technical proposal shall be in adherence to the MSW Rules and the Project Information Memorandum and requirements set out in the draft Concession Agreement. The illustrative format for the Technical proposal is set out below:

1. **PROJECT APPROACH AND METHODOLOGY**

   Methodology shall be provided for all stages of MSW management. The vehicle/equipment/tools deployment plan along with O&M plan shall be provided for each stage. Each stage shall be supported by project experiences of the bidder.

   a. **Primary collection**
   b. **Secondary storage and transportation**
   c. **Treatment and Processing**
   d. **Sanitary Landfilling**

The project experience provided under each stage shall have following details:

S.No.	Project Name	Client	Date of award	Start date of commercial operations	Present Status
	Primary Collection				

	Secondary storage and transportation				
	Treatment and Disposal				
	Sanitary Landfilling				

2. PROJECT PLAN

Activity chart detailing all the activities of the scope of work and the respective completion dates during the implementation period till Commercial Operations Date.

i. Indicate all main activities of the assignment, including project delivery other benchmarks such as government approvals.
ii. Duration of activities shall be indicated in the form of a bar chart.

S. No	**Activity**	**Months**										
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**N**
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
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3. ORGANISATION AND STAFFING

a. Staff deployment plan
b. Roles and Responsibilities of management staff
c. Number of shifts per day of operations
d. Training & education plans for personnel

e. Uniforms & safety gear provisions for staff

4. ASSESSMENT OF RISK AND MITIGATION PLAN

a. Identification of risks
b. Risk mitigation plan
c. Provision for implementing mitigation plan

5. CHANGE MANAGEMENT PLAN

a. Plan during transition from Corporation run system to private run system
b. Plan during changes in the transition period

APPENDIX 8

Format for Financial Proposal

Date:

To
Chief Executive Officer
Ranchi Municipal Corporation
Kutchury Road,
Ranchi- 834001

Dear Sir,

Re: Request For Proposal for Development of Integrated

	Anti Corrosive Primer.
• Finish	Inside 1 coat Epoxy Black. Outside 2 coats synthetic enamel.
• Colour	As per choice.

DESCRIPTION	**SPECIFICATIONS**
Engine	
Type	Four Stroke, Single Cylinder, IDI, Compression Ignition
Cooling Type	Forced Air Cooled & Oil cooled
Displacement	416cc
Max Power	8.5 bhp (6.25kW) @ 3600rpm
Max Torque	20 Nm @ 2400 rpm
Ignition Type	Electric start
Transmission Type	4 forward & 1 reverse gear
Clutch Type	Single plate, dry friction type, foot operated Suspended type
Electrical system	
System	System 12V DC
CHASSIS	
Chassis Type	Semi Monocoque
Suspension	
Front Suspension	Antidive leading link with helical compression spring & shock absorber
Rear Suspension	Independent suspension with spring and shock absorber
Tyres	
Front Tyre Size	4.5x10, 8PR
Rear Tyre Size	4.5x10, 8PR
Brakes	
Front Brakes	Hydraulic brakes with auto adjuster
Rear Brakes	Hydraulic brakes with auto adjuster
Fuel tank	
Fuel Tank Capacity	12 litres
Dimensions	
Overall length	2960mm
Overall width	1375mm

Overall height	1810mm
Wheel Base	2025mm
Ground Clearance	170mm
Minimum Turning Radius	2.75m
GVW	990 kg

16.0 Road Sweeping Machine

Basic Specifications:

The Road Sweeping Machine shall be rugged, durable, efficient and shall incorporate the latest technological features offered by the manufacturer / supplier and shall be suitable to carry out road sweeping in the city. The components are to be mounted on all steel welded sub-frames. Unit shall conform to the best practice known to the body fabrication trade in design, quality of material and workmanship. Assemblies, sub-assemblies, components and accessories shall be standard and interchangeable.

The vehicle and equipment should confirm to the following specifications:

General Description

Dimensions	
Overall Sweeping Width	Not Less than 2000 mm
With One Broom	Not Less than 2700 mm
With Dual Brooms	Not Less than 3300 mm
Auxiliary Engine	
Combustion System	Diesel
Number of Cylinders	6
Power Rating	93 Kw @ 230 RPM
Cooling System	Liquid Cooled
Electrical	12 volts
Oil Filter	Full Flow / Spin – on
Air Cleaner	Dry type / HD
Safety Shutdown	Automatic
Electrical System	
Starter	12 volts 4.5 Kw
Alternator	12 Volts, 85 Amp
Battery	1x 600CCA 12 Volts
Controls	12 Volts
Circuit Breakers	Resettable Type
Cab Chassis	
Cab Type	Cab over Engine
Engine Accoss	45^0 Full Tilt
Brakes	

Service	Dual Circuit Full Air S-Cum Brake System
Parking	Spring Actuated
Propulsion Engine	
Number of Cylinders	6 in Line
Power	108 Kw (147 Hp) @ 3200 rpm
Torque	405 Nm @ 1440 rpm
Oil Filter	Full Flow / Spin-on
Air Cleaner	Dry Type remote mounted
Transmission	
No. of Gears	5 Forward and 1 Reverse
Steering	
Type	Integral Power
Debris Hopper	
Capacity	6500 Liters
Construction	Heavy Gauge Stainless Steel
Dumping	Electro / Hydraulic
Inspection Doors	One Each Side of Hopper
Dumping Controls	In Cab
Exterior Finish	Powder Coat Enamel
Suction Fan	
Type	Centrifugal Fan
Construction	Welded Bisalloy Steel Blades
Suction Fan Casing	
Construction	Welded Mild Steel
Liner	Replaceable Rubber
Vacuum Enhancer	For Light / Heavy Material
Hydraulic System	
Type	Gear Pump
Fluid Capacity	70 Liters
Drive	Direct Drive
Filter	10 Micron Spin – on
Strainer	80 mesh
Sweeping Head	
Type	Dual Chamber Full Width Blast Orifice
Operating Direction	Forward
Suspension	Adjustable Spring Balance
Full Width	Not Less than 2000mm
Suction Hose Diameter	350mm
Blast Hose Diameter	350mm
Hose Construction	Reinforced Moulded Rubber
Skids	Mild Steel with tungsten Carbide Inserts
Controls	Hydraulic Raise & Lower
Dust Control	

Type	Low Pressure / Low Volume
Water	1000 Liters
Control	Electric In – Cab
Gutter Broom	
Type	4 Segment Steel Tined
Diameter	100mm
Drive	Hydraulic Motor
Speed	Variable Non-Reversing
Tilt Adjustment	Electric In-Cab
Tyres & Wheels	
Tyres	10.00 x 20 – 16PR Diagonal Ply
No. of Wheels	Front: 2, Rear: 4, Spare: 1
STANDARD EQUIPMENT	
Spare Wheel & Tyre, Hour Meter to both Engines, Auxillary Engine Safety Shutdown	
Work Lights to each side, ear and Aux Engine Bay, Tool Boxes	
Dual Control & Dual Sweep, Additional High Mounted Stop & Indicator Lights	
Towing Eyes, Hopper Screen Vibrator, Hopper Floor Vibrator, Rotating Beacons.	

Manufacturer shall provide following with each vehicle;

- Two sets of certified net torque, horsepower and fuel consumption curves.
- Two copies of technical details, drawings, operator's manual standard tools/part's book
- Two copies of workshop and service manual
- Two copies of spare parts catalogue
- Warranty card for one year
- Battery warranty card

Drawings: The drawings of vehicle should be submitted by the bidder which shall be approved at the time of award of work.

B. GENERAL TECHNICAL SPECIFICATIONS

1.0 Preparation of Area/Clearance of Site

Clearing Site

Clearing and grubbing operations shall be performed in the entire work area. The sites should be cleared of all vegetation, rubbish and all other objectionable or organic matter such as dismantling of RCC, PCC, Brick work, RR masonry and structural steel of abandoned above ground and underground structures along with abandoned cables pipes etc. Trees of specified girth and/or any other cleared material shall be stockpiled and handed over to the Engineer-in-Charge or disposed as per direction of the Engineer-in-Charge.

2.0 Excavation and Filling Work

This section of specification covers the technical requirements for excavation and filling in and around structures, pipes trenches, wall foundations, pits, drains and similar works. This also covers filling areas and plinth with selected materials, conveyance and disposal of surplus soils and/or stacking them properly as directed by Engineer-in-Charge

Existing trees, shrubs, any other plants, pole, lines, signs, monuments, buildings, pipelines, drains, sewers, facilities within or adjacent to the works being carried out which are not to be disturbed shall be protected from damage by the Implementing Agency. The implementing agency shall provide and install suitable safeguards approved by the Engineer-in-Charge for this purpose.

During excavation, the implementing agency shall take all necessary precautions against soil erosion, water and environmental pollution and where ever required undertake additional works to achieve this objective. Before start of operations, the implementing agency shall submit to the Engineer-in-Charge for approval, its work plan and procedure it intends to follow for disposal of waste material etc. and the schedule for carrying out temporary and permanent works. However, the approval of the Engineer-in-Charge shall not absolve the implementing agency of its responsibility for safe and sound work.

All excavation and filling works shall conform to relevant BIS specifications.

2.1. Excavation in Soil

Sides and bottoms of excavation shall be sharp and true to line and level. Undercutting shall not be permitted. When machines are used for excavation, the last 300 mm before reaching the required level shall be excavated manually or by such equipment, such that soil at the required final level will be left in its natural condition. Suitability of strata (at the bottom of excavations) for laying the foundation there on shall be determined by the Engineer-in-Charge.

The bottom of all excavations shall be trimmed to required levels. Necessary arrangements i.e. Cofferdams, sheeting, shoring, bracing, maintaining, suitable slopes, draining etc. shall be provided and installed to the satisfaction of the Engineer-in-Charge

Any water collected in excavated pits and other areas due to rain water/ground water, sludge's, springs etc shall have to be constantly pumped out and maintain dry working conditions at all times until the excavation, placement of foundation/liner arrangement, backfilling etc. is completed. All slush/ muck from the excavated areas shall be removed to keep the work area dry.

All materials shall be removed arising from excavations from the vicinity to the work either for direct filling, stacking and subsequent filling or for ultimate disposal as directed by the Engineer-in-Charge. In no case shall the excavated soil be stacked within a distance of 1.5 m from the edge of excavation or one-third the depth the excavation whichever is more. Material to be used for filling shall be kept separately.

2.2. **Rock Excavation**

Rock, when encountered, shall be removed up to the formation/bed level or as otherwise indicated on the Drawings. Where, however, unstable shale's or other unsuitable materials are encountered at the formation/bed level, these shall be excavated to the extent of 500 mm below the formation/bed level or otherwise specified. In all cases; the excavation operations shall be so carried out that at no point on cut formation/bed the rock protrudes above the specified levels.

Where excavation is done to levels lower than those specified, the excess excavation shall be made good to the satisfaction of the Engineer-in-Charge

Slopes in rock cutting shall be finished to uniform lines corresponding to slope lines shown on the Drawings or as directed by the Engineer. Notwithstanding the foregoing, all loose pieces of rock on excavated slope surface which move when pierced by the crowbar shall be removed.

2.3. **Carriage of excavated materials beyond the initial lead of 50 M**

The disposal/stacking areas for excavated materials shall be indicated by the Engineer-in-Charge. The carriage of excavated materials shall be done by the methods mentioned below:

2.3.1. The excavated materials shall be carried beyond the initial lead of 50 m but up to 500 m by manual/animal labor or by mechanical means. If directed by the Engineer-in-Charge, this material shall be used directly for filling purposes.

2.3.2. For leads exceeding 500 m, the implementing agency shall transport the excavated materials by mechanical means or as directed by the Engineer-in-Charge. The Implementing agency shall allow for movements on Kuchha road etc. Providing and maintaining Kuchha road shall be responsibility of the implementing agency.

2.3.3. The transported material shall be neatly stacked and dressed as directed by Engineer-in-Charge.

3.0 Filling

Materials

Materials to be used for filling purpose shall be selected excavated material free from shingle, salts, organic materials, large roots and excessive amount of sod, lumps, concrete or any other foreign substances, which could harm or impair the strength of the substructure in any manner. In any case, the materials to be used for filling purpose shall have the prior written approval of the Engineer-in-Charge

3.1. **Filling Procedure**

3.1.1. After completion of foundation, footings, walls and other construction below the elevation of the final grades, and prior to filling, all temporary shoring, timber etc. shall be sequentially removed and excavation cleaned of all trash, debris, and perishable materials. Filling shall begin with the approval of the Engineer-in-Charge. Also areas identified for filling shall be cleared of all soft pockets, vegetation, bushes, slush etc. In case of plinth and similar filling, the ground shall be dressed and consolidated by ramming and light rolling.

3.1.2. Filling materials shall not be dropped directly upon or against any structure or facility where there is danger of displacement or damage. Filling shall be started after the concrete masonry has fully set and shall be carried in such a manner so as not to cause any undue lateral thrust on any part of the structure.

3.1.3. All space between foundation (concrete or masonry) and the sides of excavation shall be filled to the original surface after making allowance for settlement. Fill shall be placed in horizontal layers not exceeding 200 mm loose thickness. Each layer shall be watered and compacted with proper moisture content and with such equipment as may be required to obtain a compaction/density as specified.

3.1.4. Fill adjacent to pipes shall be free of stones, concrete etc. and shall be hand placed and compacted uniformly on both sides of the pipe and where practicable up to a minimum depth of 300 mm over the top of pipes. While tamping around the pipes, care should be taken to avoid unequal pressure.

3.1.5. Filling shall be accurately finished to line, slope, cross section and grade as shown on the drawings. Finished surface shall be free of irregularities and depressions and shall be within 20 mm of the specified level.

4.0 Compaction

4.1. Compaction to 95% Standard Proctor Density shall be done by mechanical means only. Where access is possible, compaction shall be by 8 to 10 tonnes rollers smooth wheeled, sheep foot or wobbly wheeled as directed by the Engineer-in-Charge smaller weight roller may be permitted by the Engineer-in-Charge. In special cases, but in any case not less than 6 passes of the roller will be accepted for each layer. Each layer shall be wetted or the material dried by aeration to moisture content of 3-5% above the optimum moisture content to be determined by the Implementing agency. Each layer shall be watered, rammed and compacted to the density as required.

4.2. For compacting each sand layer, water shall be sprayed over it to flood it and it shall be kept flooded for 24 hours to ensure maximum compaction. Vibro-compactors shall also be used if necessary to obtain the required degree of compaction. Any temporary works required to contain sand under flooded condition shall also be undertaken. The surface of the consolidated sand shall be dressed to required levels or slope.

4.3. The degree of compaction of compacted fill in place will be subjected to tests by the Engineer-in-Charge as the work progresses, and the Implementing agency shall provide the necessary facilities to make such tests. If any test indicates that the compaction achieved is less than the specified degree of compaction, the Engineer-in-Charge, may require all fill placed subsequent to the last successful test to be removed and re-compacted by the Implementing agency. Compaction procedure shall be amended as necessary to obtain satisfactory results. Compaction shall conform to relevant BIS specifications.

5.0 Sampling, Testing and Quality Control

5.1. General

5.1.1. The Implementing agency shall carry out all sampling and testing in accordance with the relevant Indian Standards and/or International Standards and shall conduct such tests as are called for by the Engineer-in-Charge. Where no specific testing procedure is mentioned, the tests shall be carried out as per the prevalent accepted engineering practice to the directions of the Engineer-in-Charge. Tests shall be done in the field and at a laboratory approved by the Engineer-in-Charge and the implementing agency shall submit to the Engineer-in-Charge, the test results in triplicate within three days after completion of a test. The Engineer-in-Charge may, at his discretion, waive some of the stipulations given below, for small and unimportant operations.

5.1.2. In case, work found unsuitable for acceptance shall be removed and replaced by the Implementing agency. Such work shall be redone as per specification requirements and to the satisfaction of the Engineer-in-Charge.

6.0 Excavation of Trenches

6.1. Scope

This section of the specification covers excavation of trenches for laying HDPE pipes underneath the embankment and other cross drainage works.

6.2. General

The Implementing agency shall furnish all labour, equipment and materials required for complete performance of the work in accordance with the drawings, schedule of items and as described herein.

6.3. Excavation for trench

Drawings for trenches shall be prepared by the bidder and approved by the Engineer-in-Charge. Trenches as shown in the drawing shall be excavated below the foundation grade and the slopes of the excavation shall be as indicated in the drawings or as directed by the Engineer-in-Charge. The alignment and cross-section shown in the drawings will be subject to such changes as may be found necessary by conditions disclosed during the excavation. Excavation of trench shall be carried out in a manner as specified under the clause for the item of "Excavation & Filling work".

Material excavated from the trenches shall, if suitable, be used in the embankment after stock piling as directed. The suitability or otherwise of the material shall be determined by laboratory tests. Material excavated from trench shall not be placed in the embankment till the foundation for the embankment has been cleared, stripped and prepared as specified and adequate arrangements made for watering and rolling the layers of earth fill in the embankment.

7.0 Borrow Areas

7.1. Scope

All materials required for the embankments which are not available from trench excavation or from other excavations shall be obtained from approved designated borrow areas. The impervious material required for foundation shall be brought from any approved borrow areas.

The depths of cut in all parts of the borrow areas will be determined by the Engineer-in-Charge depending on the level of water table at the time of excavation and the cuts shall be made to such depths only. The excavation in borrow areas shall not be done below the water table. The type of equipment used and the operation in the excavation of materials in borrow areas shall be of such type that will produce the required uniformity of mixture of materials for the embankment.

Borrow area shall be opened so as not to impair the usefulness or mar the appearance of any part of the work or any other property. The excavation surfaces and surface of waste materials shall be left in a reasonably smooth and even condition. When the borrow area is located

contiguous to the embankment alignment then it must be ensured that the borrow area shall not be opened within a distance of five times the height of embankment contiguous to the heel or the toe of the embankment or 25 meter whichever is more.

The material required for embankment construction and general foundations shall be free of admixture of stiff clay, refuse, stumps, roots, rock, brush, weeds or other material which would be detrimental to the proper compaction of materials in the embankment and foundations

7.2. **Preparation of Borrow Areas**

Site clearance

All areas required for borrowing earth for embankment shall be cleared of all rank vegetation and stumps, roots, bush, rubbish, and other objectionable material. Particular care shall be taken to exclude all organic matter from the material to be placed in the embankment. All unsuitable materials including rank vegetation, stumps shall be disposed off as specified elsewhere in this specification. The cleared areas shall be maintained free of vegetation growth during the progress of the work. The unsuitable materials will be filled back, after borrowing earth for earthen embankment construction, as directed by the Engineer-in-Charge

7.1 Stripping of Borrow Areas

Borrow areas shall be stripped of topsoil, sod and any other matter which is unsuitable for the embankment construction. Materials from stripping shall be disposed off up to a lead of 500 m at a place and in manner at the discretion of the Engineer-in-Charge and as directed by him. The depth of stripping shall be decided by the Engineer-in-Charge depending upon the nature of topsoil and the vegetation present.

7.2 Borrow Area Watering / Dewatering

The natural moisture content of material in the borrow areas as well as the optimum moisture content corresponding to the Proctor's maximum dry density for the material in the particular borrow area shall be obtained from laboratory tests. Additional moisture if required shall be introduced into the borrow area by watering well in advance of excavation, to ensure uniformity of moisture content. If in any borrow area before or during excavation there is excess moisture, steps shall be taken to reduce the moisture by the selective excavation to secure the materials of required moisture by excavating drainage ditches, by allowing adequate time for drying or by other means. To avoid formation of pools in the borrow areas during excavation operations, drainage ditches from borrow areas to the nearest outlets shall be excavated.

8.0 Cast- In- Situ Cement Concrete

Scope

This section of the specification deals with cast-in-situ cement concrete plain or reinforced as shown in the drawings and covers the requirements for concrete materials, their properties, storage, handing, grading, concrete mix design, strength and quality, pouring at all levels, testing, protection, curing, finishing, admixtures, and other associated works.

General Requirements

The provision of latest IS: 456 shall be complied with unless permitted otherwise and any other Indian Standards Codes shall form the part of the specification to the extent it has been referred to or applicable within this specification. The Implementing agency shall furnish all labor, materials and equipment to form, place, and compact and finish all structural concrete, plain concrete works for general and architectural works and miscellaneous items complete as indicated on the drawings and as described herein.

The cement concrete and works shall conform to relevant BIS specifications

8.1 Materials

Materials Properties

1. Aggregates

For reinforced concrete work, aggregate conforming to IS: 383 & 2386 having a maximum size of 20 mm shall be used. However for lean concrete maximum size up to 40mm shall be used.

Aggregates (coarse or fine) with a specific gravity below 2.6 shall not be used without special permission of the Engineer-in-Charge. Machine-made sand will be acceptable provided the constituent is sound, hard, and dense and is acceptable to the Engineer-in-Charge. Sand, natural gravel and crushed rock shall be prepared for use by such screening or washing or both, as necessary to remove all objectionable foreign matter.

2. Water

Water used for mixing and curing concrete shall be clean and free from injurious amounts of oils, acids, alkalis, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally considered satisfactory for mixing concrete.

8.2 Storage & Handling of Materials

IS: 4082 shall be followed as a general guidance for storage and handling of construction materials at site and IS: 7969 shall be followed for safety measures.

1. Cement

   The cement shall be stored in leak proof, weatherproof enclosed sheds. Different consignments of different types of cement shall be stacked separately with clear identifiable stack numbers. Cement consignments shall be stored as received and shall be consumed in the order of their delivery. The implementing agency shall make their own arrangement for the storage of adequate quantity of cement.

2. Aggregates

   Coarse and fine aggregates shall be stored separately on brick soling or on an equivalent platform. The stack height of coarse aggregates shall not exceed 120 cm to avoid coning and segregation.

8.3 Grades of Concrete

All concrete used for RCC work shall be of minimum M 25 grade design mix and in grades designated as specified in Drawing.

8.4 Nominal Mix Concrete

Nominal mix concrete shall be used only for plain cement concrete works and where shown on drawings or specifically allowed by the Engineer-in-Charge. Such concrete shall not require preparation of trial mixes and all such concrete shall be mixed in a mechanical mixer. A proportion for nominal mix concrete shall be according to Table-9 of IS: 456-2000. In addition, standard proportion by volume shall be used wherever specified.

8.5 Design Mix Concrete

Design mix concrete shall only be used for all reinforced concrete works, except where specified otherwise or specially permitted by the Engineer-in-Charge. The mix proportion for all grades of concrete shall be designed to obtain, the required workability and the characteristic strength not less than the appropriate values given in the table below, using standard deviation specified in IS: 10262. The minimum value of target strength of design mix of various grades of concrete shall be as per Table below considering the quality control as 'good' as specified in IS: 10262. However, the Engineer-in-Charge may allow changing the target strength values based on adequate numbers of works test results.

GRADE OF CONCRETE

Grade Designation of concrete	Compressive strength of a 15 cm cube at 28 days (in N/Sq.mm)	
	Preliminary Test Strength or (Target strength of trial mix) (N/mm^2)	Characteristic strength on works cubes (N/mm^2)
M-15	20.8	15
M-20	27.6	20
M-25	33.7	25
M-30	39.9	30
M-35	45.4	35

In designing the mix proportions of concrete, the quantity of both cement and aggregate shall be determined by mass. The Engineer-in-Charge may allow the quantity of aggregates to be determined by equivalent volume basis after the relationship between the weight and volume is well established by trial and the same shall be verified frequently.

Water shall be either measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean and serviceable condition, and their accuracy periodically checked.

To keep the water cement ratio to the designed value, allowance shall be made for moisture contents in both fine and coarse aggregates and determination of the same shall be made in accordance with IS: 2386 (Part-III) as frequently as directed by the Engineer-in-Charge

8.6 Mix Design

Preliminary tests/trial mix as specified or as directed by the Engineer-in-Charge shall be carried out sufficiently ahead of the actual commencement of the work, to arrive at the grading of aggregates, water cement ratio, workability and the quantity of cement required to give Preliminary (target) compressive strength as specified in above table.

Minimum cement contents, from durability consideration, for different exposures and sulphate attack shall be as per IS: 456. In case higher value is obtained from trial mixes from strength consideration, same shall be provided.

At least four trial mixes shall be made and minimum six test cubes shall be taken from each trial mix noting the slump for each type of mix. The cubes shall then be properly cured and three cubes for each mix shall be tested in a laboratory (approved by Engineer-in-Charge) at 7 days and remaining three at 28 days for compressive strength.

The implementing agency shall submit the test reports for mix design to the Engineer-in-Charge, indicating design criteria analysis and proportions of materials etc. The mix proportion by mass and water cement ratio determined on the basis of above reports shall yield the concrete with desired characteristic strength & suitable workability. The mix design to be adopted on the works shall be approved by the Engineer-in-Charge.

8.7 Workability

The workability of concrete shall be checked at frequent intervals. Workability of concrete measured in accordance with IS: 1199 shall be recorded with corresponding compressive strength results.

The degree of workability necessary to allow the concrete to be well compacted and to be worked into the corners of form work and around the reinforcement to give the required surface finish shall depend upon the type and nature of the structure and shall be based on experience and tests. The limits of consistency for various types of structures, shall be in accordance with IS: 1199.

8.8 Batching and mixing plant

A modern dependable batching and mixing plant with two mixers each of 20 cum. /hr. capacity preferable tilting type capable of producing concrete of specified quality and output required to meet the schedule shall be installed at a centralized location with the approval of the Engineer-in-Charge. Transporting, handling, and placing equipment shall be provided at a location in a manner approved by Engineer-in-Charge. The concrete batching and mixing plant shall be

completely installed and operated for sufficient length of time prior to scheduled date of placement of first concrete, to enable the Engineer in Charge to assess the performance for its satisfaction.

8.9 Conveying and Placing Concrete by pumping

Conveying Concrete

The suitably designed concrete will be conveyed by pressure applied by the pump through either rigid pipe or flexible hose and discharged directly in to the desired area. Requisite number(s) of modern dependable concrete pump(s) capable of pumping concrete of specified quality/density at a rate required meeting the schedule, together with a balanced complement of pipe lines, accessories, sparing parts, power controlled placers, experienced pump operators and maintenance staff shall also be provided.

The pump shall be of piston type pump with net concrete pumping capacity of not less than 20 m^3/hr. at a horizontal distance of 400 m and vertical distance of 30 m. The pumps shall be designed with adequate protection against adverse usage, shall be insensitive to rough treatment and operation on construction sites, have sturdy construction and easy to maintain.

Implementing agency shall make necessary standby (by providing additional spare/standby pumps) or alternate concreting arrangement in the event of failure of pumps.

8.10 Placing Concrete

Formwork and reinforcement steel shall be approved in writing by the Engineer-in-Charge before concrete is placed. The formwork in contact with the concrete shall be cleaned and thoroughly wetted and treated with an approved composition before placing the concrete. Care shall be taken that such approved composition is kept out of contact with the reinforcement. Concrete shall be deposited in its final position without segregation, re-handling or flowing. Care should be taken to avoid displacement of reinforcement or movement of formwork while placing concrete. Any drop over 180 cm shall have to be approved by the Engineer-in-Charge. Concrete when deposited shall have a temperature of not less than 4.5 degrees C and not more than 38 degrees C; it shall be compacted in its final position within 30 minutes of its discharge from the mixer. Once the concrete is deposited in its final position, it shall not be disturbed. IS: 7861 (Part-I) shall be followed for concreting in extreme hot weather.

The placing of concrete shall be a continuous operation with no interruption in excess of 30 minutes between the placing of continuous portion of concrete. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless proper construction joint is formed as per direction of the Engineer-in-Charge. Concrete shall be placed in continuous horizontal layers of 150 mm or higher thickness as directed before placing the next layer.

All excavated areas for concreting shall be kept under dry working conditions until such concrete work is completed. The implementing agency shall make provisions and furnish

equipment as required for such dewatering, subject to the approval of the Engineer-in-Charge.

Concrete shall not ordinarily be placed under water. In unavoidable cases, such concreting shall be done only with the specific approval of the Engineer-in-Charge for the methods, equipment, materials and proportions of the mix to be used and relevant clauses of IS: 456 adhered to. No concrete shall be placed in open while it rains. If there has been any sign of washing of cement and sand, the concrete shall be entirely removed immediately. Suitable precautions shall be taken in advance to guard against rains before leaving the fresh concrete unattended.

Slabs, beams and similar members shall be poured in one operation normally. Except where otherwise agreed to by the Engineer-in-Charge concrete shall be deposited in horizontal layers, but it must be ensured that under layer is not already hardened. Bleeding of under layer, if any, shall be effectively removed. Holes shall be provided and bolts, sleeves, anchors, fastenings or other fixtures shall be embedded in concrete as shown on the drawings or as directed by the Engineer-in-Charge.

After the concrete has been placed, it shall be thoroughly compacted by approved mechanical vibrators to a maximum subsidence without segregation and shall be thoroughly worked around reinforcement or other embedded fixtures into the correct form and a shape. Care must be taken to ensure that the inserts, fixtures, reinforcement and formwork are not displaced or disturbed during compaction of concrete.

Immersion vibrators shall be a 'no load' frequency amplitude and acceleration as per IS: 2505 depending upon the size of the vibrator. Immersion vibrators shall be operated by experienced men for their use. IS: 3558 shall be followed. Immersion vibrators shall penetrate both the layer poured and the under layer and shall not be allowed to come in contact with steel reinforcement, forms and finished surfaces after start of initial set.

These vibrators shall be immersed not more than 450 mm apart and withdrawn when air bubbles cease to come to the surface. Such vibrators shall in no case be used to push concrete inside the forms and vibrators shall be withdrawn slowly.

8.11 Construction Joints

When the concreting work is to be interrupted, the concrete shall be rebated at joint so such shape and size as may be required by the Engineer-in-Charge or as shown on the drawings. All vertical construction joints shall be made with stop boards, which are suitably fixed, for sufficient lateral rigidity and slotted to allow for the passage of the reinforcement steel. In the case of water and/or underground structures, water stop of approved material shall be provided if so specified on the drawings or as desired by the Engineer-in-Charge. Construction joints shall be provided in positions as shown or described on the drawings. Where it is not described, the joints shall be in accordance with the following:

1. In a column, the joint shall be formed about 75 mm below the lowest offset of the beams framing into it.

2. Concrete in a beam shall be placed throughout without a joint, but if the provision of a joint is unavoidable, the joint shall be vertical and within middle third of the span.
3. A joint in a suspended floor slab shall be vertical, at one quarter point of the span and at right angle to the principal reinforcement.
4. In forming a joint, concrete shall not be allowed to slope away to a thin edge. The location of construction joints shall be planned by the Implementing agency well in advance of pouring and have to be approved by the Engineer-in-Charge.

Before fresh concrete is placed, the cement skin of the partially hardened concrete which was poured earlier shall be thoroughly removed and aggregates shall be exposed by wire brushing, backing, water jetting or any other approved method, as directed with Engineer-in-Charge The rough surface shall be thoroughly wetted and surface water shall be removed and shall be coated with 10-15 mm thick layer of 1:1 freshly mixed cement sand slurry. Care shall be taken to ensure that the first layer of concrete placed after a construction joint is thoroughly rammed against the existing layer.

8.12 Cleaning and Finishing

All concrete surfaces shall have an even finish, free from honey combs, air bubbles, fins or other blemishes.

The formwork joints marks and other projections on concrete work exposed to view shall be rubbed out with carborundum stone and made smooth and air holes, cavities and similar imperfections shall be first saturated with water and filled with cement sand mortar (1:2) and cured. Except where a separate finish is to be applied, or where a trowel finish is called for, horizontal concrete surface shall be floated and steel troweled after achieving initial set to prevent excess fine materials from working to the surface.

Concrete surfaces to be subsequently plastered or where brickwork shall be built against it shall be adequately hacked as soon as the form is stripped off so that proper bond can develop.

8.13 Curing and Protection of Concrete

Newly placed concrete shall be protected by approved means from rain, sun, and wind. Concrete placed below the ground level be protected from falling earth during and after placing. Concrete placed in ground containing deleterious substances shall be kept free from contact with such ground or with water draining from such ground during placing of concrete and for a period of at least three days or as otherwise instructed by the Engineer-in-Charge. The ground water around newly poured concrete shall be kept to an approved level by pumping or other approved means of drainage. Adequate steps shall be taken to protect immature concrete from damage by debris, excessive loading, shocks, vibration, abrasion, traffic, rapid temperature changes, mixing with earth or other deleterious material, etc. that may impair the strength and durability of concrete.

As soon as the concrete has hardened sufficiently for the surface to be marked, it shall be

covered either with wet sacking, canvas or similar materials and kept continuously wet for at the discretion of the Engineer-in-Charge, up to fourteen (14) days. Concrete slabs and floors shall be cured by flooding with water of minimum 25 mm depth for the periods mentioned above.

Masonry work over the foundations concrete may be started after 48 hours of its laying but the curing of concrete shall be continued for a minimum period of 7 days.

8.14 Sampling and Testing Criteria

General

1. Facilities required for sampling & testing materials and concrete in the field and in the laboratory shall be provided by the Implementing agency. All sampling and testing shall be done in accordance with relevant Indian Standard and this specification. Tests shall be done in the field in the presence of the Engineer-in-Charge and the Implementing agency shall submit the test result in triplicate within 3 days after completion of any test.
2. Concrete samples shall be cured under laboratory conditions, except when in the opinion of the Engineer-in-Charge extreme weather conditions may prevail at which time the Engineer-in-Charge may require curing under job conditions.
3. If the "test strength" of the laboratory controlled cubes for any portion of the concrete work falls below the compressive strength specified, the Engineer-in-Charge shall have the right to order a change in the proportions or the water content for the remaining portion of the structure, and shall have the right to require provisions for temperature and moisture control, during the period of curing, as necessary to secure the required strength, and may require re-tests on the basis of core test as given in IS: 456.
4. Concrete found unsuitable for acceptance shall be removed and replaced by the implementing agency. The work shall be redone as per specification and to the satisfaction of the Engineer-in-Charge and at no extra cost to the owner.
5. Rebound hammer test shall be carried out for ascertaining the quality of concrete work, as directed by the Engineer-in-Charge.
6. Core test shall be done as described in IS: 516. The number of cores required shall be as decided by the Engineer-in-Charge and shall be represented of whole of the concrete concerned. In no case, however, shall fewer than three cores be tested.

Concrete in the member represented by a core test shall be considered acceptable if the average equivalent cube strength of the cores is equal to at least 85 percent of the cube strength of the grade of concrete specified for the corresponding age and no individual core has strength less than 75 percent.

8.15 Sampling of Concrete

Sampling from fresh concrete shall be taken according to IS: 1199 tested as per IS: 516. Normally only compressive test shall be performed but the Engineer-in-Charge may require other tests to be performed in accordance with IS: 516.

1. Trial Mixes

At least four trial mixes shall be made with, minimum 6 test cubes for each.

2. Works Tests

a. The minimum frequency of sampling of concrete of each grade shall be according to clause 15.2.2 of IS: 456-2000. However, after getting continuous satisfactory results and in the case of voluminous concrete works, the Engineer-in-Charge may at his discretion reduce the frequency of sampling.

b. For each grade of concrete, and for each 8 hours (shift) of work or part thereof, at least one sample consisting of six specimens shall be taken from each 50 cum. of concrete or part there of, 3 specimens shall be tested at 7 days and remaining 3 shall be tested at 28 days. However, in all cases, the 28 days compressive strength shall alone be the criterion for acceptance or rejection.

To control the consistency of concrete from every mixing plant, slump tests and/or compaction factor tests in accordance with IS: 1199 shall be carried out by the implementing agency every two hours or as directed by the Engineer-in-Charge. Slumps corresponding to the test specimens shall be recorded for reference.

The strength of sample shall be the average of the strength of three specimens. Individual variation should not be more than ± 15% of the average.

8.16 Acceptance criteria for concrete

The acceptance criteria of concrete shall be in accordance with Clause No. 16 of IS: 456.However, in exceptional circumstances, the Engineer-in-Charge may at his discretion accept concrete of lower strength than that specified at reduced rates pro-rata to the strength obtained. The concrete shall be deemed to comply with the strength requirements, if:

1. Every sample has test strength not less than the characteristic value

Or

2. The strength of one or more samples, though less than the characteristic value, in each case is not less than the greater of:
   a. The characteristic strength minus 1.35 times the standard deviation and
   b. 0.80 times the characteristic strength: and the average strength of all the samples is not less than the characteristic strength + [1.65 – 1.65/square root of (No. of Samples)] times the standard deviation.

8.17 Tolerance Limits

Unless otherwise specified, the tolerance in construction shall be as follows:

Description of item/structural element	Permissible Deviation in mm

Description of item/structural element	Permissible Deviation in mm
The dimensions of concrete as cast when compared with those on the drawings shall be within the tolerance given below:	
Faces of concrete in foundation and structural members against which backfill is placed	+ 25 - 10
Location of footing (for RCC framed structures only)	+ 25 - 25
Eccentricity of footing	2% of footing width of direction of misplacement but limited to 50 mm + 5
Cross sectional dimensions of walls, slabs and similar structural elements	+ 5 - 5
Deviation from specified dimensions of cross section of columns and beams	+ 12 - 6
Embedded parts (in any direction)	+ 5 - 5
Centers of pockets of grooves with greatest lateral dimension not exceeding 150 mm	+ 10 - 10
Plumb	3 mm for every meter subject to a maximum of 10 mm.

9.0 Formwork and Staging

Scope

This section of the specification deals with the requirements for the supply, erection, dismantling of formwork and staging required for cast-in-situ concrete works including for making pockets.

General Requirements

The implementing agency shall supply, fabricate erect and dismantle (after use) all temporary and permanent formwork and staging that is required for all activities covered under the specifications.

Materials

Formwork shall compose of steel, plywood or best quality wood. Timber shall be free from significant knots and shall be of medium grain as far as possible and hard woods shall be used as caps. Timber shall be well seasoned, free from sap, worm holes, wraps or other surface defects and shall smooth finish.

Staging unless specified otherwise shall generally be of mild steel tubes, steel beams and channels etc. or strong sowbellies 150 mm in diameter or above.

The form work materials shall conform to relevant BIS specifications

9.1 Quality of Formwork and Staging

The forms and staging shall be sufficiently strong to carry without undue deformation, the dead weight of the concrete and the effects of vibration. The joints in the formwork shall be sufficiently tight to prevent any leakage of mortar. The formwork shall be such as to ensure a smooth uniform surface free from honeycombs, air bubbles, bulges, fins and other blemishes.

Beveled strips 25 x 25 mm shall be provided to form angles and in corners of columns and beam boxes for chamfering of corners if shown in drawings or directed by the Engineer-in-Charge.

The implementing agency shall maintain necessary camber in centering for all floor slabs and beams in all spanning directions, so as to offset the deflection and assume correct shape.

9.2 Construction Operation

All form shall be thoroughly cleaned of old concrete, wood shavings, saw dust, dirt and dust sticking to them before these are fixed in position. Before formwork is placed in position, the form surface that will be in contact with concrete shall be treated with approved non-staining oil or composition which is insoluble in water and not injurious to concrete. Care shall be taken that the oil or composition does not come in contact with reinforcing steel or stain the concrete surfaces.

9.3 Removal of Formwork

The Implementing agency shall begin the removal of formwork only after approval of the Engineer-in-Charge. He shall place on record the dates on which the concrete is placed in different parts of the work and the dates of the removal of formwork there from. This record shall be checked and countersigned by the Engineer-in-Charge.

Forms of various types of structural components shall, under normal circumstances, not be removed before the minimum periods specified in clause 11.3 of IS: 456-2000, which shall also be subject to the approval of the Engineer-in-Charge.

In normal circumstances and where ordinary Portland cement is used, forms may generally be removed after the expiry of the following periods, according to clause no. 11.3 of IS:456-2000.

a)	Walls, columns and vertical faces of all structural members as directed by the Engineer-in-Charge	1 to 2 days
b)	Slabs (Props left under)	3 days

c)	Beams off its (props left under)	7 days
d)	Removal of props under slabs	
	Spanning up to 4.5 M	7 days
	Spanning over 4.5 M	14 days
e)	Removal of props under Beams	
	Spanning up to 6 M	14 days
	Spanning over 6 M	21 days
f)	Cantilever Slabs	14 days

In case PPC/PSC is used instead of OPC, the removal of shuttering/support shall be after 50% more time from that being applied for OPC unless otherwise permitted by the Engineer-in-Charge. For concrete temperature above 40 Degree C. Stripping time shall be increased.

9.4 Reuse of Forms

Before reuse, all forms shall be thoroughly scraped, cleaned, holes and leaks satisfactorily plugged, joints examined and inside surfaces treated as specified herein before. Formwork shall not be used/reused, if declared unfit or unserviceable by the Engineer-in-Charge.

9.5 Dimensional Tolerance for Formwork

Levels and heights	± 6 mm
Plumb	3 mm for every meter subject to maximum of 10 mm
Unevenness of any surfaces	± 3 mm
Length or breadth	± 12 mm
Diagonals	± 15 mm

10.0 Reinforcement

Scope

This section of the specification covers the technical requirements for fabricating and placing in position of mild steel or High strength deformed steel reinforcement bars for all RCC works as indicated in the drawings and as directed by the Engineer-in-Charge.

10.1 General Requirements

The implementing agency shall arrange for transport, fabricate and place reinforcement to shapes and dimensions as indicated in the approved drawings and specifications and/or as directed by the Engineer-in-Charge. The reinforcement shall be either mild steel or cold deformed twisted steel bars conforming to relevant IS specifications as specified in Schedule of Items and Drawings.

The implementing agency shall prepare bar bending schedules on the basis of information furnished in the drawings, approved for construction, and submit the same for approval by the Engineer-in-Charge. No work shall be commenced without the prior approval of the schedule by the Engineer-in-Charge.

Any adjustments in reinforcement to suit field conditions, construction joint etc., other than those shown on the drawings shall be subject to the approval of the Engineer-in-Charge, before placing.

10.2 Storage and Handling

Reinforcement and structural steel (including steel required for embedment) shall be stored consignment wise and size wise off the ground by at least 150 mm and protected from rusting, oil, grease and distortion by providing suitable cover. The storage area shall be such that water does not accumulate and steel does not get corroded.

10.3 Bending and Placing

10.3.1 Bending

Reinforcing bars supplied bent or in coils shall be straightened in cold without damaging the bars, before these are cut to size.

Reinforcing steel shall be bent in accordance with procedure specified in IS: 2502 and/or as approved by the Engineer-in-Charge. Bends and shapes shall comply strictly with the dimensions shown on the approved bar bending schedule and they shall be rechecked by the implementing agency before bending and he shall be entirely responsible for their correctness. The details of reinforcement shall be in accordance with IS: 5525 and SP: 34. Welding of bars to obtain continuity shall not be allowed particularly for cold twisted bars unless specifically approved by the Engineer-in-Charge. If welding is unavoidable, the work shall be carried out as per IS: 2751 and IS: 9417 and as directed by the Engineer-in-Charge.

10.3.2 Placing in Position

All reinforcement shall be accurately fixed and maintained in position as shown on the drawings by means of steel chairs and or concrete spacer blocks as per IS:2502. Bars intended to be in contact and crossing points, shall be securely bound together at all such points by two numbers annealed steel wire of 1.2 mm size conforming to IS:280.
The vertical distance between successive layers of bars shall be maintained by provision of spacer bars, and shall be so spaced that the main bars do not sag perceptively between adjacent spacers.

Laps and anchorage length of reinforcing bars shall be as shown on the drawings and shall be in accordance with IS: 456.

10.4 Cover to Reinforcement

Unless shown otherwise on the drawings, minimum clear concrete cover for reinforcement (exclusive of plaster or other finishes) shall be as per provisions of IS: 456, subject to minimum of the following:

For bottom reinforcement in footings, 75 mm, if concrete is laid against the ground or 50 mm if laid on a layer of lean concrete.

For retaining walls, grade beams, top and sides of footings and similar surfaces exposed to weather or ground, 50 mm for bars larger than 16 mm and 40 mm for bars up to 16 mm.

For concrete members exposed to the action of harmful chemicals, acids, alkalies, atmosphere, sulphurous smoke, sea water etc., the cover shall be as shown on the drawings.

For liquid retaining structures 40 mm or diameter of main bar whichever is larger.
Clear distance between reinforcing bars shall be in accordance with IS: 456 or as shown on approved drawings.

11.0 Structural Steel Work

Scope

This section of specification covers the technical requirement for supply, fabrication & erection of structural steel and associated works.
The specification covers structural steel works involving rolled sections, pipes, plates, chequered plates, beams, fixing of embedded parts.

11.1 General Requirement

The implementing agency shall furnish all labour, plant, equipment's, consumables, scaffolding, tools, tackles, materials etc., required for the completion of work on schedule in accordance with drawings and as described herein and/or as directed by the Engineer-in-Charge

The structural steel work shall conform to relevant BIS specifications

11.2 Safe working

The implementing agency shall strictly follow, at all stages of fabrication, transportation and erection of steel structures, the stipulation contained in the Indian Standard Safety Code for erection of structural steel work IS: 7205.

11.3 Detailed Working/Fabrication Drawings

Fabrication drawings shall be prepared by the implementing agency based on the scope of drawings supplied by the owner. The detailed working drawings shall indicate complete details of fabrication and erection weld size, lengths etc.

11.4 Materials

Structural steel rolled sections and plates shall confom1 to IS: 2062. Pipes shall conform to IS: 1161. Chequered plates shall conform to IS: 3502. All other materials shall be as per the relevant Indian Standards and as specified in IS: 800.

11.5 Fabrication

Fabrication work shall be carried out in accordance with IS: 800 as well as stipulations contained in these specifications.

All steel materials shall be straightened and/or flattened, wherever required by straightening machine, though minor kinks or bends may be corrected by limited heating under careful supervision.

11.6 Cutting Plan

The implementing agency shall prepare cutting plan according to detailed working drawings, taking into consideration the availability of material, the cut pieces generated during work with the objective of minimizing waste.

11.7 Straightening and Cutting

All steel materials shall be straightened and/ or flattened, wherever required by straightening machine, though minor kinks or bends may be corrected by limited heating under careful supervision.

11.8 Cutting

Cutting may be effected by shearing, cropping sawing or by gas cutting by mechanically controlled torch. Gas cutting by hand may only be used when specifically authorized in writing by the Engineer-in-Charge.

11.9 Grinding

All the edges cut by flame shall be ground before they are welded.

11.10 Assembly

The components parts shall be assembled in such a manner that they are neither twisted nor otherwise damaged.

11.11 Welding

Welding shall be carried as per IS: 816 and IS: 9595 and the welding procedure duly approved by the Engineer-in-Charge.

All structural welding shall be done by welders who qualify the appropriate tests laid down in IS: 817 and IS: 1181. The entire weld of any structure joint shall be made by one welder.

11.12 Electrodes

The electrodes used shall be of suitable type and size depending upon specifications of the parent materials, the method of welding and quality of weld desired.

Where coated electrodes are used they shall meet the requirements of IS: 814. All electrodes shall be stored properly as per manufacturer's recommendations.

Specific approval of the Engineer-in-Charge shall be taken by the implementing agency for the various electrodes proposed to be used on the work before any welding is started.

11.13 Preheating

Preheating shall, be done wherever required as per IS: 9595

1. When base metal not otherwise required to be preheated is at a temperature below 0^{o} C it shall be preheated to at least 20°C.
2. Thermo-chalk or other approved methods shall be used for measuring the plate temperature.

All welding shall be done in a proper sequence.

11.14 Inspection of Welds

11.15 Visual Inspection

100 percent of the welds shall be inspected visually after cleaning the weld surface with steel wire brushes/chisels to remove slag, scales, and the spatter metal. The weld shall be correct in size, length and shall be of regular height and width and shall be free from defects like craters on the surface under cuts, and visible cracks. Weld gauges shall be used to measure the weld sizes.

Wherever above mentioned defects are noticed, the welds, in such locations shall be removed by gouging process. The joints shall be prepared again by cleaning the burrs and residual matters with wire brushes and grinded and rewelded.

11.16 Erection Procedure

Before any steel work leaves the implementing agency's fabrication site it shall be suitably marked in accordance with the approved fabrication drawings.

11.17 Erection Scheme

The implementing agency shall submit for approval of the Engineer-in-Charge is erection scheme giving full details of the method of handling, transport, hoisting and erection including staging, temporary bracing, guying etc.

Erection shall commence only after approval of the implementing agency's proposed erection scheme.

11.18 Dismantling of Steel Work

The new structure shall be dismantled wherever called for. Such dismantling shall be done carefully without causing damage to other structures and further modifications shall be done in the fabrication yard.

11.19 Modification

The work of modification may involve cutting of certain portions or gouging of welds, cuttings, grinding, fabrication, welding drilling holes, straightening, removal of bends, painting and touch up painting, transporting the cut and removed parts/items and new steel to be added.

11.20 Re-erection

The work of re-erection includes transportation of structures from field fabrication yard to erection site, lifting of same to the required portion aligning, erection in position, inclusive of erection bolts, tack welding, final welding and touch up painting etc., complete to the satisfaction of the Engineer-in-Charge.

11.21 Painting

After inspection and issue of test acceptance certificate, all steel surfaces shall be painted, as per the specifications given in the tender document and to the satisfaction of the Engineer-in-Charge.

The paint shall conform to relevant BIS specifications

11.22 Surface Preparation

The surface preparation shall be done as per IS: 1477 (Part-I). The surface shall be cleaned, de greased and descaled manually.

11.23 Application of Priming Coat

The primers shall consist of red oxide zinc chromate conforming to IS: 2074. Two coats of primer paint shall be applied first at the shop and the second after the erection is completed.

Application of primer shall be done by brush or by any other method specified in IS: 1477 (Part-II) Touch up painting shall be done after erection.

11.24 Application of Finishing Coats

Before application of finishing coats the second coat of primer paint shall be completed.

Finishing coat shall be synthetic enamel paint conforming to IS: 2932 & IS: 2933. Total coating thickness (DFT) of the painting shall not be less than 100 micron.

11.25 Embedded Parts

The embedded steel parts shall be properly placed in position with lugs. Temporary supports shall be provided to ensure proper installation of the embedded parts and these shall be in plumb and level. Concrete around the embedded parts shall be properly compacted so as to avoid voids or honeycombing. The structure shall be hoisted and placed in position carefully without any damage to itself or to the structure in which it is to be fixed and injury to workmen. If necessary, appliance such as lifting shall be used.

11.26 Hand Railings

Pipe hand rails shall be of standard weight galvanized steel pipes of flush welded construction, ground smooth, using 32 mm nominal bore medium class pipes with double rail, 1.2 meter above platform level and pipe posts spread not more than 1.5 meters apart as per the drawings or instructions of Engineer-in-Charge.

11.27 Covers

Chequered plates shall be fixed to supporting members by tack welding or by counter sunk bolts. Care shall be taken to avoid distortion of the plate while welding of stiffening angles/vertical stiffening ribs.

11.28 Bolts

Stainless steel Bolt with a 38 x 6 mm stainless steel flat bar shall be used to bind the HDPE liner with the concrete in leachate collection sump, leachate detection sump etc as shown in the drawings. Bolts shall generally conform to IS: 5624.

All bolts shall be embedded in concrete in plumb and in level at true location. The threads shall be protected by using PVC tape.

Hexagonal nuts and locknuts shall conform to IS: 4218.

11.29 Permanent Bolts

Permanents bolts used for connection of structural steel members shall conform to 1S:1363, 1S:13643 and 1S:1367. These shall be provided with washers, nuts and locknuts.

12.0 Stone work- random rubble masonry

Scope

This section covers the furnishing of all labor, materials and equipment and the performing of all operations required for the stone masonry work and incidental items pertinent thereto all in accordance with the drawings, specifications, schedule of items and as directed by the Engineer-in-Charge.

12.1 General Requirements

The stone shall be of the type specified, shall be hard, sound and free from decay and weathering. This shall be obtained from an approved quarry. Stones with round surface shall not be used. Stones shall be properly hammered dressed on the face, the sides and the beds to enable it to come in close proximity with the neighboring stone. IS: 1597 shall be followed as general guidance for construction of stone masonry.

12.2 Mortar

Mortar used for joining shall be as specified and the ingredients shall conform to relevant IS codes or as specified.

12.3 Laying

All stones shall be wetted before use. The vertical faces shall be carried up truly plumb, or to the specified batter. Face stones shall extend well into backing. These shall be arranged to break joints as much as possible and to avoid vertical lines of joints. Their height shall not be greater than the breadth at the face of the depth inwards. The hearting or interior filling of the wall face shall consist of rubble stones which may be of any shape but do not pass through a circular ring of 15 cm. Inner diameter, thickness of these stones in any direction shall not be less than 10 cm. These shall be carefully laid, hammered down with a wooden mallet into position and solidly bedded in mortar, chips and spells of stone being used wherever necessary to avoid thick mortar beds or joints and at the same time ensuring that no hollow spaces are left anywhere in the masonry. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and these shall not exceed 20% of the quantity of stone masonry.

12.4 Bond Stones

Bond or through stones running right through the thickness of walls shall be provided in walls up to 60 cm thick. If the walls are more than 60 cm thick, two or more bond stones over lapping each other by at least 15 cm shall be provided in a line from face to back. At least one bond stone or a set of bond stones shall be provided for every 0.5 sq. meter of wall surface.

12.5 Quoins

The quoins shall be selected stones neatly dressed with the hammer or chisel to from the required angle, and laid header and stretcher alternately. No quoin stone shall be less than 25 x 25 x 25 cm.

12.6 Joints

Stones shall be so laid that joints are full of mortar. Face joints shall not be more than 2.5 cm thick.

12.7 Curing

Green work shall be protected from the effects of sun, rain etc. by suitable covering. All the masonry work shall be kept constantly moist on the faces for a period of seven days.

12.8 Embedding of Fixtures

All fixtures to be embedded in mortar and masonry units shall be properly fixed as indicated in the drawings.

12.9 Encasing of Structural Steel and Pipes

This shall be done by building masonry work round fringes, webs etc. and filling the gap between steel and masonry by minimum 12 mm thick mortar. Encased members shall be wrapped with chicken wire mesh of 18 gauge when shown on drawings or instructed by the Engineer-in-Charge. The minimum lap in chicken wire mesh shall be 50mm.

13.0 Weighbridge

Scope

The Implementing agency shall procure electronic type weigh-bridge (road) as per this specification from an approved vendor (approved vendor list attached with the tender). Erection / installation, commissioning, performance testing and calibration of the weigh bridge at site shall be under the scope of supply of implementing agency

13.1 General requirements

a) Supply one no. Electronic Weigh- Bridge (road) of 20 T capacity along with other accessories as per the technical requirements of this specification.

The weigh-bridge shall basically comprise of:

- Steel platform for the required size with approaches on both sides.
- Load cells with integral cables and mountings.
- All electrical parts:
  - junction boxes
  - Cable between junction box and weigh cabin (The weigh cabin shall be located at approx. 3m from, nearest edge of the weigh-bridge.)
  - Weighing console with a digital indicator.
  - 2 no. RS -232C/422/485 serial communication ports in weighing console.
- All necessary software required for the unit (It shall be customised to generate the reports desired by the operating personnel of the Owner).
- Necessary furniture for the operators and the console.
- Window type air conditioners required for the weigh cabin.
- Any other item required for the Smooth & trouble free operation of the weigh bridge.

b) All commissioning spares (as per the Manufacturer's recommendation)
c) All consumables required for start-up & commissioning and for first 6 months operation.
d) All test weights (10 % of rated weight)
e) Spare parts for 2 years trouble free operation (as per the manufacturer's recommendation)

13.2 Technical requirements

Weigh-bridge type	:	Electronic type with load cells
Material handled	:	Sulphur trucks, in general
Weigh-bridge capacity	:	20T
Weigh-bridge construction	:	Pit less with approach ramps on both sides and non-skid type steel plates
Platform size	:	6.1mx3-m
No. of load .cells for weighing	:	4-nos. Min.
Weighing console	:	Microprocessor based with suitable memory device for storing data of 90days with 100

		trucks/day transactions.
Area classification	:	Safe
Corrosion Allowance for fabricated items	:	3mm
Material of Construction	:	IS 2062, for fabricated structure / component
Control Console Room	:	The console shall be provided on suitable table with the operator chair at a convenient location in the control room. The control room shall also be provided with window air- conditioner(s). UPS for 2 hr. rating, required for the system shall be supplied.

13.3 Vendor data requirements

i) GA drawing of the platform with details of MOC
ii) Foundation drawing with load details
iii) All electrical drawing with the specification/ rating of the items as per the tender specification.
iv) Installation, operation and maintenance manuals

14.0 Piezometers

Scope
This section of the specifications covers supply and installation of piezometers as indicated in the basic design and engineering report and the drawings to be released for the construction or as directed by the Engineer-in-Charge.

14.1 General requirements
The implementing agency shall furnish all labour, equipment and material required for the complete performance of the work in accordance with the drawings and as described herein.

The piezometer shall conform to relevant BIS specifications.

14.2 Specifications
Piezometer shall be constructed to monitor the quality of groundwater. Four piezometers shall be constructed on the downstream side of the landfill i.e. on the eastern side. Two piezometers shall be constructed on the upstream side i.e. on the western side of the landfill. The piezometer consists of a stand pipe made up of stainless steel which shall be screened along the entire aquifer depth. The screened interval shall be encased in a filter zone made up of gravel and sand layer. The function of the filter zone is to allow free flow of groundwater into and out of standpipe and prevent fines from entering the standpipe. Immediately above the screened interval, a clay and bentonite seal shall be placed. The thickness of clay seal shall be 0.5 m. above the clay and bentonite seal, a grout seal consisting of cement and bentonite shall be constructed which provides a barrier for preventing surface water and ground water from elsewhere from migrating into the screened interval. At the ground level, a steel casing embedded in concrete pad shall be employed. A cap shall be placed on the top of steel casing to prevent rainwater and surface water from entering into the standpipe. The piezometer shall be constructed at a distance of 7 m from outside edge of the embankment.

15.0 Electrical Works

15.1 Scope

The scope of electrical works shall cover Design, Engineering, Supply, Erection, Electrical Inspectorate Clearance, Testing & Commissioning of the complete equipment /system within the Battery Limits.

The electrical system selected shall confirm up to date statutory rules and regulations and due consideration has been given to general safety requirements for personnel and plant & machinery.

Any item or any provision/requirement if not included in this section, but is necessary to be provided for the completion of the project and for its functional necessity, the same shall be provided by the implementing agency.

All electrical works shall conform to relevant BIS specifications.

15.1.1 The Electrical scope of work start from the supply of LT Panel (MCC) and further power distribution to Motors including incoming feeding cables to this proposed LT panel from the Purchaser's existing panel.

The power at 415 V, 3 phases, 50Hz, 3-wire shall be brought to proposed LT panel from existing LT panel located at the nearest distance from Proposed LT panel placed in MCC room

The cable sizing shall be done as per the following Criteria:

1. Load of 20% higher of Full load of the proposed plant
2. Voltage Drop within 6% of the rated voltage
3. Voltage Drop within 15% of the rated voltage due to starting current effect.
4. Derating factors effect of Ambient temperature.
5. Derating factors effect of grouping of cables
6. Derating factors effect of depth of laying of cables

Incoming cables termination at both ends will be in scope of this work.

15.1.2 This LT Panel will have one number incoming feeder and will have required outgoing feeders for motors of the plant and also for lighting and control supply feeder with control transformers. Separate Lighting transformer shall be provided.

There will be two nos. control transformers of required capacity. One of two control transformers will be in operation and second will be standby. The standby should come into circuit automatically when operating transformer is stopped.

LT Panel will be located inside the MCC room. The motor feeder for motor up to 7.5HP will be with DOL feeder and above 7.5HP star-delta starter will be used.

20% spare feeders will be provided in LT panel.

There will be one number control panel placed near LT panel for the operation of plant. Only stop push button with mushroom headed and turn to release will be provided on LT panel for

emergency stop only. In addition to above, local push button station will be place near all the main drives of plant for testing/maintenance and emergency stop purpose.

So all the motors will be started either from Control Panel or from local Push button stations.

The capacitor bank for improvement of power factor is not considered, as load of the plant is low.

15.1.3 One number Main LT Panel for complete Plant, which will feed power to individual drive/equipment
Short circuit current level for LT panel shall be 30 KA for one second for bus bar selection. For ease of maintenance, Local Push Button Stations are placed near the drives.
The drives shall be started either from Control Panel or from local push button station.

All the drives will be started in sequence as per system requirement. Local / remote selector switch are also provided on Control Panel for selection of control either from Control Panel or from local push button station. In case of remoter selection, drives will be controlled from Control Panel and in case of local selection; drives will be controlled from local push button station.

15.2 AC Motors

All the motors in this scope of supply shall be energy efficient squirrel cage Induction type, TEFC having degree of protection IP 55. Motor shall be suitable for 415V+/-10%, 50HZ+/-5% and suitable for DOL/star-delta starting. The motors shall generally conform to IS: 325. All motor shall be with class F insulation. Motor rating shall be at least 20% higher than the driven equipment.

15.3 LT Panel

This will be floor mounted fully drawn out type, single front type and shall be fabricated out of 2mm CRCA sheet with multi-tier compartmentalised design with enclosure protection IP-54. The doors and covers will be fabricated out of 1.6mm CRCA sheet. Panel shall be manufactured as per standard manufacturing practice.

Incoming feeder (1 no.) shall be equipped with MCCB, CT/Ammeter with SS. Voltmeter with SS, RYB Lights and Circuit Breaker ON/OFF lamps.

The outgoing feeders are with MPCB/DOL/Star Delta Starter as per motor rating.

The incoming feeder for LT Panel will comprise of the following:

1no.	:	415V, TP, MCCB
1set	:	Phase indicating lamps
1no.	:	Ammeter with selector switch
1no.	:	Voltmeter with selector switch
1set	:	Control fuses
1set	:	CTs of suitable ratio for metering

The outgoing feeders for motor shall be equipped with MPCB, Power contactor.

Each DOL starter feeder will comprise of the following:

1no.	:	MPCB
1no.	:	Power Contactor
1no.	:	Ammeter
1set	:	Control DP MCB
1set	:	ON/OFF/TRIP Lamps
1set	:	Stop Button
1set	:	Test Button

Each RDOL starter feeder will comprise of the following: (for Motorised valves)

1no.	:	MPCB
1no.	:	Power Contactor
1no.	:	Ammeter
1set	:	Control DP MCB
1set	:	ON/OFF/TRIP Lamp
1set	:	Stop Button
1set	:	Test Button

Each Star-Delta starter feeder will comprise of the following:

1no.	:	MPCB
3nos.	:	Power Contactor
1no.	:	Timer
1no.	:	Ammeter with CT
1set	:	Control DP MCB
1set	:	ON/OFF/TRIP Lamps
1set	:	Stop Button
1set	:	Test Button

Each Control Transformer will be provided with primary and secondary MCB and required interlocking and sector switch.

The feeders will be provided with one number CT and one number ammeter along with other items for above 11KW motor rating on Y-phase.

Stop Push Button on LT Panel or Control panel or on Local Push Button Station will be with mushroom headed and turn to release type.

15.4 Control Panel

This will be floor mounted, single front type and shall be fabricated out of 2mm CRCA sheet with vertical type design. This will be with enclosure protection IP-54. Panel shall be manufactured as per standard manufacturing practice.

This will have mimic and fault enunciator on top portion. The mimic will depict the Equipment flow diagram. On each equipment of Mimic, ON lamp will be provided.

The following shall be provided for each motor:

1. Local/Remote Selector sw.

2. Start Push Button
3. Stop Push Button with mush room and turn to release type.
4. ON lamp
5. OFF lamp
6. Annunciation window for trip indication.

Lamp will be provided for each level and pressure switches. In addition to this very high level will be also annunciated on enunciator window of Control panel.

15.5 Power and Control Cable:

Incoming LT cables shall be with 3.5 cores or higher, up to LT Panel based on load shall be provided.

15.6 L.T. Power Cable:

The power cable shall be PVC insulated, PVC sheathed, armoured type with 3.5 core for motors, with Aluminium conductor. For motors up to 5.5 KW, the power cable shall be 4Cx4. sq. mm Aluminium.

15.7 Control Cable:

The control cable shall be PVC insulated, PVC sheathed, armoured type with copper solid conductor suitable for 1100 V grade and of sizes mentioned below:

7C x 1.5 sq. mm

4C x 1.5 sq. mm

2C x 1.5 sq. mm for instruments

15.8 Earthing System

The earthing system will be limited to the earthing of equipment which are in this scope of supply.

Required number of GI Plate Electrode for earth pits will be provided for making over all earth resistance less than 1.0 Ohms. GI strips/wires of required size shall be provided. Earthing system shall be as per IS: 3043.

50x6 mm GI strip shall be laid from existing earthing grid and linked to proposed plate electrode. The existing point is 500 metre away from this proposed LT Panel.

Each electrical equipment shall be earthed at two distinct points.

The inter connection of earth pits, LT PANEL shall be done with 50x6 mm G.I Strips. 25x6mm, 25x3 mm G. I. Strip / 38 sq. mm GI Wire for motors and boards etc. shall be used. 10 SWG wire for auxiliary or miscellaneous items like Push Button Station etc.

15.9 Local Push Button Station

The local push button Station shall be placed near the main drive. This will comprise of two nos. push buttons (one for Start and other for stop). Stop push button will be with mushroom headed and turn to release type. This will be fabricated with 1.6 mm steel sheet along with canopy.

16.0 Lighting System

This lighting system shall be provided for the complete plant including office. The internal lighting will be done with the help of 2x40W Fluorescent Lamps for the room height upto 5 M and beyond above 5M, 250W HPSV lamp will be used.

The outdoor lighting will be with weather proof Street Lighting 70/125 W HPSV Lamps. For lighting the landfill area, 10M mast type flood light of 400W HPSV lamps shall be used.

Internal lighting will be done with industrial type lighting fitting with 2x40W Fluorescent Lamps. Office will have decorative type light fitting.

The illumination level for Indoor lighting for MCC room and office will be 250 Lux. Outdoor lighting illumination level will be 25-30 lux.

There will be one number Main Lighting Board and required sub lighting boards. Main Lighting Board will be fed from lighting transformer by 4core cable of required size and sub-lighting board will be fed from Main Lighting board by 4-core cable of required size.

17.0 MCC Room

One MCC room shall be provided to accommodate the LT panel, Main Lighting Board and control panel. There will be one office adjacent to MCC room.

18.0 Instrumentation System

18.1 Level Switches

Separate level switches shall be provided along with each pump for indication/annunciation. The level switches shall be float type.

18.2 Pressure Switches

This will be diaphragm sealed type and will be used on each Delivery Pipe of pumps.

18.3 Pressure Gauge

This will be diaphragm sealed type and will be used in each Delivery Pipe of pumps.

18.4 Safety Items

Rubber mat (2 M x 1Mx12 mm) : 1 no.

Shock treatment chart : 1no.

Caution board : As per requirement

18.5 Cable Tray & Cable Accessories

All cables shall be directly buried underground as per standard, outside the building and cable marker shall be provided. Cable shall be laid overhead cable try inside the building. All cables shall be neatly dressed and clamped on the trays. Cable shall be provided with the necessary cable gland, lugs Tags etc.

The cable tray will be ladder type hot dip galvanised to 80 micron and made by 2mm thick CRCA sheet steel.

The cable tray sizes will be of following sizes:

1. 40x150x40x2mm
2. 40x300x40x2mm
3. 40x450x40x2mm
4. 40x600x40x2mm

Note: Any item or any provision / requirement if not included in this section, but is necessary to be provided for the completion of the project and for its functional necessity, the same shall be provided by the Implementing agency. The decision of Engineer-in-Charge in this regard shall be final and binding on the implementing agency.

19.0 Quality Assurance Checklist

This checklist is intended to be an aid to the Implementing agency and the Engineer-in-Charge in identifying aspects of testing materials and workmanship.

Results of all tests to be carried out by the Implementing agency shall be submitted to the Engineer-in-Charge promptly.

The following minimum checks/tests shall be carried out for soil, rock material, concrete, RCC works and other works. The implementing agency shall add the cost of all the tests and facilities to be provided by him to the Owner for his testing in the quoted rates for various rates for various items under the Schedule of Items.

Item No.	Type of Test of Check	Frequency/Quantum Norms	Ref. Document for testing	Accept
a	b	c	d	e
1.	**EARTH FILLING AND COMPACTION**			
	I) Suitability of fill Material			
	a) Grain size analysis	Once in every 2000 cum. for each type and each source subject to a min. sample of two samples	IS: 2720 (part IV)	IS: 2720 (part IV)
	b) Liquid and Plastic limit	-ditto-	IS: 2720 (part V)	IS: 2720 (part V)
	c) Shrinkage limit	Once in every 5000 cum. for each type and each source subject to a min. sample of two samples	IS: 2720 (part VI)	IS: 2720 (part VI)
	d) Free swell Index	-ditto-	IS: 2720 (part XL)	IS: 2720 (part XL)
	e) Chemical Analysis	Once in every 5000	IS: 2720	IS: 2720

Item No.	Type of Test of Check	Frequency/Quantum Norms	Ref. Document for testing	Accept
	i) organic matter ii) Calcium carbonate iii) pH iv) Total soluble sulphate	cum. for each type and each source subject to a min. sample of two samples	Part XXII Part XXIII Part XXVI Part XXVII	Part XXII Part XXIII Part XXVI Part XXVII
	II) Standard Proctor Test	Once in every 2000 cum. for each type and each source subject to a min. sample of two samples	IS: 2720 (part VII)	IS: 2720 (part VII)
	III) Moisture content of fill before compaction	-ditto-	IS: 2720 (part II)	IS: 2720 (part II)
	IV) Degree of compaction of fill	-ditto-		
	a) Dry density by core method Or Dry density in place by sand displacement method	i) For foundation filling, one for every ten foundations for each layer. However, each layer for location of important and heavily loaded foundations resting on fill shall be tested. ii) For Area filling, one of every 1000 sqm area for each compacted layer.	IS : 2720 (Part XXIX , Part XXVIII)	IS : 2720 (Part XXIX , Part XXVIII)
	b) Relative density (density Index)	-ditto-	IS: 2720 (Part XIV)	IS: 2720 (Part XIV)
	c) Dry density by proctor needle penetration	Random check to be carried out for each compacted layer in addition to test mentioned under IV(a) above	Standard practice	Standard practice
2.	**COARSE AGGREGATE FOR CONCRETE** a) Check for Gradation	Once per 100 cum. or part thereof or each change of source.	IS:2386 & IS:383	As per IS: 383 for concrete
	b) Specific Gravity	-ditto-	IS: 386 & IS:1122	Minimum Sp. Gravity 2.60 for concrete

Item No.	Type of Test of Check	Frequency/Quantum Norms	Ref. Document for testing	Accept
	c) Crushing Value (for concrete only)	Once for each source	IS:2386 Part IV	As per IS:383
	d) Sulphate Soundness	-ditto-	IS:2386 Part V & IS:1126	(i) As per IS: 383 for concrete. (ii) Max. 10% weight loss after five cycles for filter materials.
	e) Acid & Alkali Reactivity (for concrete only)	-ditto-	IS:2386 Part-VII & IS:383	As per IS:2386 Part-VII
	f) Flakiness & Petrographic Examination (for concrete only)	-ditto-	IS:2386 Part-VIII & IS:383	Flakiness Index Max. 15% Aggregate constituents which are known to cause deleterious chemical reaction with cement/lime should be avoided.
	g) Impact Value	Once for every source	IS:2386	Maximum 30%
	h) Water Absorption	-ditto-	IS:2386	Maximum 2%
	I) Slake Durability	-ditto-	IS:10050	Percentage retained after two 10 minutes cycles shall be more than 85%.
3.	**FINE AGGREGATE FOR CONCRETE & SAND FOR MORTAR** a) Bulkage (for concrete only)	Once per week	IS:2386 & IS:383	As per IS:383
	b) Moisture Content (for concrete and mortar only)	-ditto-	-ditto-	-ditto-
	c) Gradation	Once for every source	IS:2386 Part-I,	

Item No.	Type of Test of Check	Frequency/Quantum Norms	Ref. Document for testing	Accept
			IS:9429 & IS:383	
	d) Specific Gravity	-ditto-	IS:2386 Part-I	Minimum 2.40
	e) Water Absorption & Density (for concrete and mortar only)	Once for every source	IS:2386	Maximum 2.5%
	f) Soundness (for concrete only)	-ditto-	IS:2386 Part-V As per IS:383	-ditto-
	g) Visual Examination	100%	IS:2386 & IS:383	-ditto-
4.	**WATER FOR MORTAR AND CONCRETE MIXING & CURING** a) pH Value	Once for every source	IS:3025 & IS:456	As per IS:456
	b) Turbidity	-ditto-	-ditto-	-ditto-
	c) Sulphate Content	-ditto-	-ditto-	-ditto-
5.	**CEMENT** a) Fineness	Once for every source	IS:269 & IS:4031	
	b) Setting time	-ditto-	-ditto-	
	c) Soundness	-ditto-	-ditto-	
	d) Specific Gravity	-ditto-	-ditto-	
	e) Compressive Strength	-ditto-	-ditto-	As per IS code
6.	**CONCRETE**			
	a) Workability	Minimum 3 samples per batch.	IS:1199 & IS:456	
	b) Crushing Strength	One sample of 6 cubes per 150 cum. or part thereof.	IS:1199, IS:456, IS 516 & spec.	As per IS code
	c) Compacting Factor	Once per mix	-ditto-	-ditto-
	d) Water Tightness	Each tank and reservoir	IS:3370	IS:3370

Item No.	Type of Test of Check	Frequency/Quantum Norms	Ref. Document for testing	Accept
	e) Finished Dimension	All Structures including embankment slopes		As per drgs.
7.	**BRICK** a) Visual Examination	At Random	IS:3495 & IS:1077	
	b) Compressive Strength	One set of samples per 10,000 bricks or part thereof.	IS:3495 & IS:1077	
	c) Efflorescence	-ditto-	-ditto-	
	d) Water absorption	-ditto-	-ditto-	
	e) Colour and Dimensional Conformity	One from each stack	-ditto-	
	f) Soundness	-ditto-	-ditto-	
8.	**FORM WORK** a) Staging	Each member	IS: 456 & approved drawing & specification.	
	b) Dimensions & Plumb line	-ditto-	-ditto-	
	c) Shape & Alignment	-ditto-	-ditto-	
	d) Ground Support (drawings & specifications)	Each member	IS: 456 & appd.	
	e) Cleaning & Oiling	100%	-ditto-	
	f) Tightness for mortar	100%	-ditto-	
9.	**REINFORCEMENT** a) Bending	At random	Approved drgs.	
	b) Joints with right gauge of bending wire.	-ditto-	-ditto-	
	c) Placement as per levels and covers	-ditto-	-ditto-	
	d) Rust/loose scales	-ditto-	IS:456	

20.0 LIST OF MANDATORY SPARES

a.	For each Vertical Centrifugal pump	
	i. Impellers	1 set
	ii. Shaft and Shaft sleeve	1 set
	iii. Set of bearings	1 set
	iv. V-Belt	1 set
	v. Strainer	1 set
b.	Butterfly valves motorized (for each size)	1 no.
c.	Butterfly valves manual (for each size)	1 no.
d.	Non Return valve (for each size)	1 no.
e.	Pressure indicator (for each type)	1 no.
f.	Pressure switch (for each type)	3 no.
g.	Level switches (for each type)	2 no.
h.	Voltmeter (for each type)	1 no.
i.	Ammeter (for each type)	1 no.
j.	Power contactor (for each rating)	1 no.
k.	Switches (for each type)	1 no.
l.	HRC fuses (for each type)	3 no.
m.	Push button (green)	5 no.
n.	Push button (red)	5 no.
o.	Indicating Lamp (green)	5 no.
p.	Indicating Lamp (red)	5 no.
q.	Indicating Lamp (amber)	5 no.
r.	Enunciator Channel PCB	50% of total channel
s.	Power supply PCB	1 no.

C. TECHNICAL SPECIFICATIONS OF COMPOST PLANT

1.0	FEEDER	
	Particulars	**Technical Specification**
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc.
	Covers	MS Sheet 12& 14 SWG
	Gear Box	Worn Reduction Gear Box
	Motor	Hydraulic
	Chain	Specially made, heavy duty, roller type 3'' pitch
	Belt	900 mm wide, 3 ply, 10 mm thick, rubberized
	Sprockets	3'' pitch
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	8.2m
	Width	1.2m
	Height	3m
2.0	**CAGE DRUM**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc.
	Covers	MS Sheet 12& 14 SWG
	Motor	Hydraulic
	Tyres	Specially made, heavy duty, rubber type
	Screen	MS-7 SWG with punched hole of 50 mm
	Ring	Fabricated Heavy Duty Blasting & Pickling
	Surface	Epoxy primer
	Primer	Epoxy paint
	Paint	20mm, High pressure

	Hyd. Line	7m
	Length	2.2m
	Width	4m
	Height	
3.0	**CONVEYOR PROCESS- 50**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc.
	Covers	MS Sheet 12& 14 SWG
	Gear Box	Worn Reduction Gear Box
	Motor	Hydraulic (G-Rotor Type)
	Chain	Specially made, heavy duty, roller type 3'' pitch
	Belt	750 mm wide, 3 ply, 10 mm thick, rubberized
	Sprockets	3'' pitch
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	12.5m
	Width	1.1m
	Height	3m
4.0	**CONVEYOR REJECT- 50**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc.
	Covers	MS Sheet 12& 14 SWG
	Gear Box	Shaft Mounted
	Motor	Hydraulic (G-Rotor Type)
	Chain	Specially made, heavy duty, roller type 3'' pitch
	Belt	650 mm wide, 2 ply, 10 mm thick, rubberized
	Sprockets	3'' pitch

	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	7m
	Width	1m
	Height	3m
5.0	**TROMMEL-35**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc
	Covers	MS Sheet 10, 12& 14 SWG
	Drive	Friction Drive
	Motor	Hydraulic
	Tyres	Specially made, heavy duty, rubber type
	Screen	MS-7 SWG with punched hole of 35mm
	Ring	Fabricated Heavy Duty
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	7m
	Width	1.8m
	Height	4.5m
6.0	**CONVEYOR PROCESS- 35**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc.
	Covers	MS Sheet 14 SWG
	Gear Box	Worn Reduction Gear Box
	Motor	Hydraulic (G-Rotor Type)

	Chain	Specially made, heavy duty, roller type 3'' pitch
	Belt	650 mm wide, 3 ply, 10 mm thick, rubberized
	Sprockets	3'' pitch, hardened
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	13m
	Width	1m
	Height	3m
7.0	**TROMMEL 14**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc
	Covers	MS Sheet 10, 12& 14 SWG
	Drive Motor	Friction Drive Hydraulic
	Tyres	Specially made, heavy duty, rubber type
	Screen	MS-10 SWG with punched hole of 14 mm
	Ring	Fabricated Heavy Duty
	Surface Primer	Blasting & Pickling Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	7m
	Width	1.8m
	Height	4.5m
8.0	**CONVEYOR REJECT- 35**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc.
	Covers	MS Sheet 14 SWG

	Gear Box	Worn Reduction Gear Box
	Motor	Hydraulic (G-Rotor Type)
	Chain	Specially made, heavy duty, roller type 3'' pitch
	Belt	650 mm wide, 3 ply, 10 mm thick, rubberized
	Sprockets	3'' pitch, hardened
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	6.6m
	Width	1m
	Height	2.9 m
9.0	**TRANSFER CONVEYOR**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc.
	Covers	MS Sheet 14 SWG
	Gear Box	Worn Reduction Gear Box
	Motor	Hydraulic (G-Rotor Type)
	Chain	Specially made, heavy duty, roller type 3'' pitch
	Belt	650 mm wide, 3 ply, 10 mm thick, rubberized
	Sprockets	3'' pitch, hardened
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	27m
	Width	1m
	Height	8 m

10.0	**CONVEYOR REJECT=14**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 etc.
	Covers	MS Sheet 14 SWG
	Gear Box	Worn Reduction Gear Box
	Motor	Hydraulic (G-Rotor Type)
	Chain	Specially made, heavy duty, roller type 3'' pitch
	Belt	650 mm wide, 3 ply, 10 mm thick, rubberized
	Sprockets	3'' pitch, hardened
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	27m
	Width	1m
	Height	8 m
11.0	**CONVEYOR CURING STRAIGHT**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100, ISMC75, ISA50 etc.
	Covers	MS Sheet 12 &14 SWG
	Gear Box	Shaft Mounted (SGR)
	Motor	Electrical
	Chain	Specially made, heavy duty, roller type with 3'' pitch
	Belt	650 mm wide, 2 ply, 10 mm thick, rubberized
	Sprockets	3'' pitch
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure

	Length Width Height	33m 0.6m 0.8 m
12.0	**CONVEYOR CURING INCLINED**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100, ISMC75, ISA50 etc.
	Covers	MS Sheet 12 &14 SWG
	Gear Box	Shaft Mounted (SGR)
	Motor	Electrical
	Chain	Specially made, heavy duty, roller type with 3'' pitch
	Belt	650 mm wide, 2 ply, 10 mm thick, rubberized
	Sprockets	3'' pitch
	Surface Primer	Blasting & Pickling Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	33m
	Width	0.6m
	Height	0.8 m
13.0	**DRAG FEEDER**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100, ISMC75, ISA50 etc.
	Covers	MS Sheet 12 &14 SWG
	Gear Box	Worm Reduction Gear Box
	Motor	Hydraulic (Radial piston Type)
	Chain	Specially made, heavy duty, roller type with 142 pitch
	Liner	UHMW Liner
	Sprockets	142 mm pitch
	Surface	Blasting & Pickling
	Primer	Epoxy primer

	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	3m
	Width	0.5m
	Height	3 m
14.0	**ELEVATOR E-380**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100, ISMC75, ISA50 etc.
	Covers	MS Sheet 12 &14 SWG
	Gear Box	Worm Reduction Gear Box
	Motor	Electrical
	Chain	Specially made, heavy duty, with 4” pitch
	Sprockets	4” pitch Head = E_n-8 Tail= MS (Heat Treated)
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Length	0.4m
	Width	1.1m
	Height	9.5m
15.0	**ROTARY SCREEN**	
	Structure	Various rolled steel sections viz. ISMC 125, ISMC 100 , ISMC 75, ISA 50 etc
	Covers	MS Sheet 10, 12& 14 SWG
	Drive	Friction Drive (Tyre Type)
	Motor	Hydraulic (Radial Piston Type)
	Tyres	Specially made, heavy duty, solid rubber type

	Screen	Spring steel, 10 SWG with hole of 6 mm
	Ring	Fabricated Heavy Duty
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Hyd. Line	20mm, High pressure
	Length	4.5m
	Width	1.8m
	Height	2.7m
16.0	**GRAVITY SEPARATOR**	
	Structure	Casted base plate & links, various rolled steel sections viz. ISMC 75, ISA 50 etc
	Covers	MS Sheet 12& 14 SWG
	Screen	Spring steel, Woven Wire
	Motor	Electrical
	Fan	MS fabricated
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Length	1.25m
	Width	0.85m
	Height	1.6m
17.0	**FINISHING REJECT CONVEYOR**	
	Structure	Various rolled steel sections viz ISMC 125, ISMC 100, ISMC75, ISA50 etc.
	Covers	MS Sheet 12 &14 SWG
	Gear Box	Worm Reduction Gear Box
	Motor	Electrical

	Chain	Specially made, heavy duty roller type with 3” pitch
	Sprockets	3” pitch
	Surface	Blasting & Pickling
	Primer	Epoxy primer
	Paint	Epoxy paint
	Length	8m
	Width	0.8m
	Height	2.3m
18.0	**HYDRAULIC SYSTEM**	
	Power Packs	4 a) PP I-45 HP b) PP II- 25 HP c) PP III-20 HP d) PP IV-10 HP
	Drive	Electrical
	Manifold	Specially Designed, MS
	Pump	Twin Stage, Heavy Duty (3090/3070)
	Motors	Radial Piston & Orbit
	Line	Heavy Duty 20mm
	Cooling	Forced Waster Circulation in cooling tank through radiator
	Controls	Local push button type control panel for each 20 HP unit
	Reservoir	MS fabricated, 400 l Oil capacity
	Working Fluid	Servo System 68

D. TECHNICAL SPECIFICATIONS OF SANITARY LANDFILL

A. FACILITY

1. Filling for Clay Liner and Foundation

Scope

This section of specification covers the item of filling for clay liner and foundation. This section also covers borrowing approved quality of impervious clay from approved designated borrow areas,

1.1. General Requirements

a. The Implementing agency shall furnish all labour, equipment and material required for complete performance of the work in accordance with the drawings, schedule of items and as described herein.

b. The foundation and clay liner shall be constructed in layers not exceeding 200 mm in compacted thickness and in the manner described under placing the Earth fill in Clause 8.5.0 using impervious clayey soil obtained from approved designated borrow areas having hydraulic conductivity in the range of 10-7cm/ see and plasticity index between 10 to 30%. The soil layers shall not contain soil particles or chunks of rocks larger than 25 mm in size, the suitability or otherwise of the material shall be determined by laboratory tests. Each layer of earth deposited shall the be compacted to have a dry density not less than 95% of the maximum dry density (standard proctor) for the soil with suitable tractor drawn heavy sheep foot tamping rollers or by any other method approved by the Engineer-in-Charge. The compaction will have to be uniform throughout the length and breadth of the layers. The roller should be made to travel over the entire section of each layer so that the earth is fully compacted and the roller leaves no visible marks on the surface, Where smooth rollers are used with the approval of the Engineer-in-Charge, the surface of each layer of compacted material shall be roughened with a harrow and thoroughly furrowed or raked before depositing the succeeding layer of material. Care shall be exercised to avoid occurrence of horizontal seams. Earthwork should be continuous from day-to-day. In case of break in compaction exceeding four days, the dried surface shall be well watered and harrowed before a fresh layer of earth is laid on it.

c. Before placing the HDPE pipes within the embankment, construction of embankment up to 600 mm above the RCC lining for pipes shall be carried out without actually placing the pipes. Later on, trenches shall be excavated for pipes and lining work and pits for cutoff collars. These trenches shall then be filled using CL-ML type soil (plasticity index 720). Earth layer deposited in these trenches shall be compacted with plate compactors to have a dry density not less than 95% of the maximum dry density (standard proctor).

d. The spreading of the next layer shall be carried out only after the underlying layer has been approved by the Engineer-in-Charge or his authorised representative.

e. The clay liner will conform to all relevant BIS specifications.

1.2. Water for Clay filling works

The Implementing agency has to make his own arrangements for the supply of water for earth filling works. It shall be the responsibility of the Implementing agency to identify and develop water source or sources, running a pipe line/pipe lines laid at a distance not less than 10 meters away from the toe/heel of the embankment for conveying the water required for the work from the supply sources, tapping water from manifolds provided at suitable intervals along the pipe line with the aid of water hoses and sprinkling jets for sprinkling water uniformly over the entire area (and not poured in patches) for bringing up the layers to the required moisture content. Alternately he may employ sufficient number of water tankers also. No separate payment for the above will be made and entire cost on account of the same shall be included in the rates for relevant items of schedule.

2. Foundation for Embankment

Scope

This section covers the preparation/compaction of foundation of the embankment described herein.

2.1. General Requirements

a. Foundation preparation shall be performed as described herein subsequent to stripping of foundation and excavation, if any. No material shall be placed in any section of the fill portion until the foundation for that section of the fill has been dewatered, suitably prepared and has been approved by the Engineer-in-Charge. All portions of excavations made for test pits or other sub-surface investigation and all other existing cavities, found within the area are to be filled with earth and properly compacted and which extend below the established lines of excavation for foundation shall be filled with earth of the corresponding zone and properly compacted. The foundation should be free from all organic materials, vegetable sods. The topsoil of foundation should be stripped properly such that vegetable sods and top layers are removed to ensure proper bond between embankment and foundation.

b. Masonry surfaces of the back of retaining walls, wing walls and box culverts etc. against which the fill is to be placed, shall be cleaned and moistened prior to placing the earth. The foundation immediately adjacent to the masonry/concrete structures shall be thoroughly cleaned of loose materials and moistened. Pools of water shall not be permitted in the foundation and shall be drained and cleaned prior to placing the first layer of embankment material.

3. Earthen Embankment

Scope

This section of specification covers the earthwork involved in the embankment formation as per the drawings and as mentioned herein.

3.1. General Requirements

The Implementing agency shall furnish all labour, equipment and materials required for complete performance of the work in accordance with drawings, schedule of items and as described herein.

3.2. Earthen Embankment

The embankment shall be constructed to the lines and grades shown on the drawings. Placement of fill shall be performed in an orderly way and in an efficient and workman like manner, so as to produce fills having such quantities of density, strength and permeability as will ensure the highest practicable degree of stability and performance of the embankment.

No bushes, roots, sods or other perishable or unsuitable materials shall be placed in the embankment. The suitability of each part of the foundation for placing embankment materials thereon and of all materials for use in embankment construction shall be determined by the Engineer-in-Charge. The embankment may be constructed in separate portions, provided that:

a. The slopes of the bonding surfaces between the previously completed portions of the embankment and materials to be placed in each zone shall not be steeper than 2.5 horizontal to 1 vertical along the centerline of the embankment.
b. The embankment is constructed right across the whole section in each portion.

3.3. Fill Materials

The materials for embankment shall be obtained from the designated borrow areas and available excavated material. In general, all materials from the particular borrow area shall be a mixture of materials obtained for the full depth of the cut. Some earth material available from the excavation in the landfill area if found suitable will also be used for the embankment construction.

The Fill material shall conform to relevant BIS specifications

3.4. Placing the fill material

a. Before placing the fill the foundation shall be prepared and compacted. Prior to placing the first layer of embankment on the foundation moistening and compacting the surface by rolling to achieve dry density not less than 95% of maximum dry density. (Standard

Proctor) shall be done. The distribution and gradation of materials throughout the fill shall be as shown in the drawings or as directed. The fills shall be free from lenses, pockets, streaks, or layers of material differing suitably in texture or gradation from the surrounding material. The combined excavation and placing operations shall be such that the materials when compacted in the fill will be blended sufficiently to produce the specified degree of compaction and stability. The earth obtained from a particular borrow area as far as possible shall be used in forming the complete cross-section of the fill for a particular stretch. Sequencing of the placing of fill material shall be such that it shall be possible to identify at all stages of construction which borrow area material is used in which stretch of the fill/embankment.

b. No stones cobbles or rock fragments, having maximum dimensions of more than 5 cm shall be placed in the fill. Such stones and cobbles shall be removed either at the borrow pit or after being transported to the site but before the materials in the fill are rolled and compacted. Such stones or cobbles shall be placed in other portions of embankment if found suitable or rejected as directed. The materials shall be placed in the fill in continuous horizontal layers, stretching right across the whole section, not more than 20 cm in compacted thickness and rolled as herein specified. During construction a small transverse slope from center towards the edges should be given to avoid pools or water forming due to rains. The surface of materials to be placed thereon shall be moistened and/or worked with harrow, or other suitable equipment, in an approved manner to a sufficient depth to provide a satisfactory bonding surface before the next layer of fill material is placed. If the rolled surface of any fill is found to be too wet for proper compaction, it shall be raked up, allowed to dry, or shall be worked with a harrow or any other approved equipment to reduce the moisture content to the required amount and then it shall be re compacted before the next layer of earth is placed.

c. When compacting the soils against steep rock abutment or walls or masonry or concrete structure the construction surface of embankment shall be sloped away from rock or masonry or concrete structures for a distance of 3 m to 4 m at an inclination not steeper than 6 horizontal to 1 vertical. If the foundation surface is too irregular to allow the use of a large roller directly against a structure or rock out crop, the roller shall be used to compact the soil as close to the structure or the out crop as possible and the portion of the embankment directly against the rock or the structure shall be compacted with pneumatic hand tampers in thin layers. The moisture content of the earth placed against the rock or the structure shall be high enough to allow it to be compacted into all irregularities of the rock. Care shall be taken in placing the first layer of the fill so that no damage is caused by the hauling machinery to the base grade as this may get concealed by the spread layer or fill. Sheep foot roller shall not be employed for compacting till the thickness of the layers already compacted by other means is greater by 30 cm than the depth of the feet on the roller drum. The soil for the first layer shall be at moisture content sufficient to enable bonding of the fill with the rock surface.

3.5. Weather Conditions

Embankment materials shall be placed only when the weather conditions are satisfactory to permit accurate control of the moisture content in the embankment materials.

3.6. Moisture Control

Prior to and during compacting operations, the materials in each layer of earth shall have moisture content about 2% less than the optimum moisture content. Laboratory investigations may impose some restrictions on the lower limits of the practicable moisture contents on the basis of studies of compaction in embankment. As far as practicable the materials shall be brought to the proper moisture content in the borrow area before excavation. If additional moisture content is required, it shall be added by sprinkling water before rolling. The Implementing agency shall make his own arrangements for supply of water in a manner described under water for earth fill work. If the moisture content is greater than required, the material shall be spread and allowed to dry before starting rolling. The moisture content shall be uniform throughout the layer of material and ploughing, dicing, harrowing or other methods of mixing may be required to obtain uniform distribution. If the moisture content is more or less than the range of the required particle, moisture content, or if it is not uniformly distributed throughout the layer, rolling shall be stopped and shall be started again only when the above conditions are satisfied.

3.7. Compaction Equipment

While the specifications provide that equipment of a particular type and size is to be furnished and used, it is to be understood that the use of improved equipment is to be encouraged. Tamping (sheep foot) rollers or pneumatic rollers and vibratory rollers shall be used for compacting cohesive materials and pneumatic rollers and vibratory rollers shall be used for compacting cohesion less materials.

a. Tamping (Sheep foot) Rollers
   Tamping rollers shall conform to the following requirements

b. Roller drums
   Each drum of a roller shall have an outside diameter of not less than 1.5 m and shall not be more than 1.8 m in length. The space between two adjacent drums when on level surface shall neither be less than 30 cm nor more than 40 cm. Each drum shall be free to pivot about an axis parallel to the direction of travel.

c. Tamping Feet
   At least one tamping foot shall be provided for each 600 sq.cm of drum surface. The shape measured on the surface of the drum between the centers of any two adjacent tamping feet shall not less than 25 cm.

   The length of each tamping foot from the outside surface of the drum..-'3hall be maintained at not less than 25 cm. The cross sectional area of each tamping foot shall" not be more than 60 sq .cm at a plane normal to the axis of the shank 15 cm from the drum surface and shall be maintained at not less than 45 sq. cm and not more than 60 sq. cm at a place normal to the axis of the shank 20 cm from the drum surface.

d. Roller Weight
   The weight of a roller when fully loaded shall not be less than 7000 kgs per drum. The loading used in the roller drums and operating of rollers shall be as required to obtain the desired breakdown and compaction of materials. If more than one roller is used on anyone layer of fill, all rollers so used shall be of the same type and essentially of the same dimensions. Tractors used for pulling rollers shall have sufficient power to pull them at a speed of about 4 km per hour with drums fully loaded. During the operation of rolling the spaces between the tamping feet shall be kept clear of materials which could impair the

effectiveness of the tamping rollers. If the rollers used are at tandem, the tamper spacing shall be set so that the circumferential rows of the rear drums are in line with the midpoint between the circumferential rows on the forward drums.

e. Pneumatic rollers
Pneumatic rollers shall have four wheels equipped with pneumatic tyres and a body suitable for ballast loading so that the load per wheel may be varied as necessary from 7000 kgs to 11000 kgs. Tyre pressure shall not exceed 2.5 kgs/ sq. cm. The tyres shall be of such size and ply as can be maintained during rolling operations with tire pressure not greater than 2.5 kgs/ sq. cm for a 11000 kgs wheel load. The roller wheels shall be located abreast and each wheel and tire shall be mounted in such a way that all wheels exert approximately equal loads when traversing uneven grounds. The spacing of the wheels shall be such that the distances between the nearest edges of adjacent tyres at the imprint will not be greater than 50 per cent of the width of single tire. When one pneumatic roller is attached to a tractor, the entire tractor and roller unit shall be capable of executing a 180 deg turn on a 5 m radius.

f. Vibratory Rollers
Vibratory rollers shall have dead weight 5 to 15 tonnes and the vibrators shall have frequency between 1100 and 1800 pulses per minute and amplitude of vibration shall between 0.5 mm and 1.5 mm

3.8. Rolling and Tamping

a. Rolling

When each layer of material has been conditioned, so as to have the proper moisture content uniformly distributed throughout the material, it shall be compacted by passing the roller. The exact number of passes shall be decided after necessary field tests. The layers shall be compacted in strips overlapping not less than 0.6 m. The rollers or loaded vehicles shall travel in a direction parallel to the axis of the embankment. Turns shall be made carefully to ensure uniform compaction. Rollers shall always be pulled Density tests shall be made after rolling and the dry density attained shall be not less than 95% of maximum dry density (Standard Proctor) obtained in the Laboratory for the type of material used.

b. Tamping

Rollers will not be permitted to operate within 1.0 m of concrete and masonry structures. In locations where compaction of the earth fill material by means of the roller is impracticable or undesirable, which would be designated at the sole discretion of the Engineer-in-Charge the earth shall be specially compacted

Fill shall be spread in layers not more than 20 cm in compacted thickness and shall be moistened to have the required moisture content. When each layer of material has been conditioned to have the required moisture content it shall be compacted to achieve the dry density of 'not less than 95% of Maximum Dry Density (Standard Proctor) by special rollers mechanical tampers hand held vibratory tampers or by other approved methods and all equipment and methods used shall be subject to approval based on evidence of actual performance. The moisture control and compaction shall be equivalent to that obtained in the earth actually placed in the embankment in accordance with specifications explained here in.

3.9. Inspection Test

Control tests shall be carried out in laboratory from time to time to determine whether the earth produced by methods employed satisfies the requirements of the specifications. Routine field tests shall also be carried out by the Engineer-in-Charge and the work shall be inspected regularly. Field density test should be particularly and specially made in the following areas.

a. Where the degree of compaction is doubtful.
b. Where embankment operations are concentrated i.e. where 2 or more layers are placed one over the other on the same day.
c. To represent every 1000 cu. meters of embankment placed.
d. Atleast one test for every full or part shift of compaction operations and
e. Atleast one test for every 250 m length of embankment in each layer.

The Engineer-in-Charge shall determine whether the desired results are being obtained.

The Implementing agency shall provide all facilities such as labour conveyance equipment etc. required for collection of samples and to conduct test in situ or at laboratory. Relevant test to be conducted by the Engineer-in-Charge at his discretion at the borrow area.

3.10. Dressing and Trimming of the slopes

The outer slopes of the embankment shall be neatly dressed to line. Compaction shall extend over the full width of the embankment and the material in the slopes shall be compacted as for the rest of structure. To ensure proper compaction at the outer edge, the fill shall be constructed for a minimum of 0.5 m extra width on either edges or the outer edge dressed to true width and slope after compaction. No earth slope shall be left without trimming to design slope. Slopes shall be maintained until final completion and acceptance. Any material that is lost by weathering or due to any other cause shall be replaced. The trimmed material is permitted for reuse in the embankment. No separate payment will, however be made for forming extra width offsets or trimming the slopes and the unit rates for the embankment work shall therefore provide for the same.

3.11. Provision for Settlement

While forming the embankment due allowance shall be made to allow for settlement so as to maintain the top of embankment at designed elevation.

4. TURFING

Scope

This section of specifications covers turfing on the slope of the embankment as Indicated in the following drawing and mentioned herein with turf sods.

4.1. General Requirement

The implementing agency shall furnish all labour, equipment and materials required for the complete performance of the work in accordance with the drawings, schedule of items and as described herein.

Grass turf sods of approved variety shall be used in this work. No directing planting of grass on the embankment slope shall be permitted. The turfing will conform to relevant BIS specifications.

4.2. Placing

The slope of the embankment including berms if any shall be turf sodded. After the slope has been dressed to line, it shall be slightly roughened and scarified. The entire slope surface shall then be covered with a layer of turf sod consisting of blocks of thin lining grass growth of approved species. The sods shall include a mat of roots and earth. Thick Sod containing an excessive amount of obnoxious weed growth shall be excluded Sod shall be carefully handled in transportation and placing so that a minimum amount of earth will be lost from the root mass. The blocks of sod shall be laid on the slope in close contact and then tamped firmly in place so as to fill and close the joints between blocks. The interval of time between cutting and laying shall be kept to a minimum and sod shall not be permitted to dry out. Immediately after placing the sods, slope shall be thoroughly wetted and then kept moist for 3 months or till such time the grass establishes itself uniformly on the surface whichever is later. The watering shall be done. The growth of weeds on the turfing shall be prevented by removing them and disposing off. The finished work shall be to the satisfaction of the Engineer-in-Charge and his decision shall be final in the matter.

5. HDPE Liner

Scope

This section covers the specifications for the supply, laying, jointing and testing of HDPE geomembrane liner as per the drawings and specifications mentioned herein to the satisfaction of the Engineer-in-charge

5.1. Sheet Material

The HDPE sheet shall conform to the minimum average roll value requirements listed below in Table-2. The minimum width of the roll shall be 8 m and the minimum length shall be 150 m.

Specification of HDPE as Liner Material

Parameter	Test Method	Minimum values
Thickness, mm	ASTM D 5199	1.5 mm (-5% to +10%)
Color	-	Black
Permeability	ASTM E 96	2.3×10^{-14} cm/sec.
Density	ASTM D 1505	>0.935 gm/cc
Coefficient of Linear Thermal Expansion	ASTM E 831	1.5×10^{-4} °C^{-1}
Tensile Strength at Yield	ASTM D 638, Type IV Dumbbell at 2 inch/min	245 N /cm width
Tensile Strength at Break	ASTM D 638, Type IV Dumbbell at 2 inch/min	420 N/cm width
Elongation at Yield	ASTM D 638, Type IV Dumbbell at 2 inch/min	12-13 %
Elongation at Break	ASTM D 638, Type IV	700 %

Parameter	Test Method	Minimum values
	Dumbbell at 2 inch/min	
Carbon Black	ASTM D 4218	2 to 2.5%
Ozone resistance	ASTM D 1149, 168 hrs	No crack
Water absorption	ASTM D 570, 23 °C	0.1%
Environmental Stress Cracking	ASTM D 1693	> 2000 hrs
Volatile Losses	ASTM D 1203	0.1%
Tear Resistance	ASTM D 1004, A	131 N/mm
Water Vapor Transmission	*ASTM E 96*	0.024 g/day.m^2
Puncture Resistance	ASTM D 4833	3500 N/cm
Seam Properties (a) Shear Strength (b) Peel Strength (hot wedge fusion) (c) Peel Strength (filled extrusion)	ASTM D 4437 mod.	 13.8 MPa 10.3 MPa 9.0 MPa
Change in weight (%)	EPA 9090A, Chemical Compatibility Test	≤10
Change in volume (%)	EPA 9090A, Chemical Compatibility Test	≤10
Change in tensile strength (%)	EPA 9090A, Chemical Compatibility Test	<20
Change in elongation at break (%)	EPA 9090A, Chemical Compatibility Test	<30
Change in modulus (%)	EPA 9090A, Chemical Compatibility Test	<30
Change in hardness (%)	EPA 9090A, Chemical Compatibility Test	<10

HDPE liner material should conform to relevant BIS specifications.

5.2. QA/QC Requirements for Membrane Raw Materials

All raw material supplied to the manufacturer shall be delivered in rail car batches and must be supplied with test certification from the raw material supplier. The certification must state the results of tests, which confirm the quality of the resin. The raw material supplier must also confirm that each batch of resin is all of the same type and is 100% Virgin. Each batch of resin shall be given an identification (batch) number which shall be used and remain on file to keep track of all rolls manufactured from each batch.

The use of any off spec, recycled or blends of resins will not be considered. Prior to the production of the membrane, the membrane manufacturer shall test the raw material batches

to certify the raw material suppliers test results and entity of the singular resin. The membrane manufacturer shall provide certification and all available test result for raw materials prior to the delivery of materials to site.

5.3. QA/QC Requirements for Membrane Manufacturing

The manufacturing process shall be a fully automated Flat-Cast extrusion process controlled by a fully computerized system. The control system shall provide for the continuous monitoring of the parameters like; Temperature, Pressure and Speed. The manufacturing process must also provide for the automated continuous monitoring of thickness and sheet quality.

5.4. Thickness: - Each roll shall be tested automatically and evenly over its entire surface area, the minimum parameters acceptable for testing each roll shall be 6,000 thickness point checks. The acceptable thickness for each roll shall not be greater than -5% to +10% of the specified material thickness.

5.5. Sheet Quality: - Each roll shall be tested automatically for High Voltage Test over its entire surface area for any point of Electrical Continuity through (across) the thickness of the sheet. The high voltage scanner shall be capable of detecting any pinhole, void or significant reduction of electrical resistance. Any roll detected to have holes or electrically conductive inclusions shall be rejected and not sent to the site.

Each roll delivered to site shall be provided with a roll test data report, these reports must provide the following information and test results as per the specified ASTM standards, reports must also carry the manufactures laboratory QA/QC approval seal.
The liner material shall be supplied with a 125mm-film sheet along the roll longitudinal edges in order to keep this zone clean and to stop oxidization. This film shall be removed immediately before welding.

The overlapping and welding area shall be marked to assure an optimum welding. The HDPE liner shall have a glossy smooth surface.

5.6. Roll Identification

1. Roll Number and dimensions
2. Production Date
3. Area of Sheet on Roll
4. Roll Length
5. Roll Width
6. Roll Weight

5.7. Resin Lot Information

1. Batch Number
2. Resin Type
3. Resin Test Results as per following ASTM Test methods.
   a. Density D792
   b. Moisture D570
   c. Brittleness D746
   d. Melt Index D1238
   e. O.I.T. D3895

5.8. Membrane Property

The implementing agency will arrange to carry out the following tests, at their cost, at a reputed and approved laboratory at the time of execution of work to ascertain and assure the quality of material received at project site. The tests shall be witnessed by client / consultant at their discretion. The frequency of tests for physical and mechanical properties and their conformity norms are indicated in following Table.

Frequency	Property	Norms (ASTM)
1/5000 m2	Thickness	D-5199
1/5000 m2	Density	D-792
1/5000 m2	Carbon black content	D-1603
1/5000 m2	Carbon black dispersion	D-5596-94
1/1500 m2	Mechanical Properties Tensile resistance	D-638 Mod.NSF 43
1/2000 m2	Shear test (on seam)	D-4437, 6.3 NSF mod.
1/2000 m2	Peel test (on seam) Rupture test (on seam)	D-4437, 6.2 NSF mod. US-EPA.
Every lot	ESCR	ASTM D 1693 –B
1/5000 m2	Puncture Resistance	ASTM D 4833
1/5000 m2	Tear Resistance	ASTM D 1004
Note	Sample size for conformity test a meter of the entire width for the roll and must not be taken in the first thickness.	

5.9. QA/QC at site

The material shall be inspected after it is delivered at site as follows:

1. Rolls or portions of rolls that appear damaged shall be marked.
2. Verification shall be done to ensure that materials are stored in secure place and are protected against dirt, theft, vandalism, and passage of vehicles.
3. Rolls shall be properly labeled with date and roll size.

Any material rejected on site by the Engineer-in-charge shall be jointly inspected by the Engineer-in-Charge and the Manufacturer/Installer. If required, the material shall be tested and if the material is unable to meet the specification, it shall be replaced by the Manufacturer / Installer at his cost.

5.10. Preparation for HDPE Liner Deployment:

Prior to commencement of HDPE liner deployment, layout drawings shall be prepared to indicate the panel configuration and general location of field seams for the project. The actual panel layout may vary, but shall have to be approved by the Engineer-in-charge, in order to accommodate field conditions. Each panel used for the installation will be given a number that will be correlated with a batch or roll number.

Overlap the panels of geo-membrane approximately six (6”) inches prior to welding. Clean the seal area prior to seaming to assure the area is clean and free of moisture, dirt or debris of any kind. No grinding is required for fusion welding.

Adjust the panels so that the seams are aligned with the fewest possible number of wrinkles and “fish mouth”.

Grind seams overlap prior to welding within one (1) hour of the welding operation in a manner that does not damage the geo-membrane. Grind marks should be covered with extrude whenever possible. In all cases, grinding should not extend more than one quarter inch (1/4”) past the edge of the area covered by the extrude welding.

5.11. Special Instructions for Installation

Implementing agency shall protect the sub soil desiccation, flooding protection, if required may consist of a thin plastic protective cover (or other material as approved by Engineer-in-Charge installed over the completed sub-soil until such times as the placement of geo-membrane liner begins. Sub soil found to have desiccation cracks greater than half inch (1/2”) in width or depth or which exhibit swelling, heaving or other similar conditions shall be replaced or reworked by the implementing agency to remove these defects.

5.12. Sub-base Preparation

The sub-base must be properly prepared and compacted for installation of HDPE liner. The sub-base must not contain any particles. The sub-base must be checked for footprints or similar depressions before laying the liner. The seaming equipment tends to get caught in such small depressions, causing burnout and subsequent repair. A small piece of the synthetic membrane placed below the membranes that are being seamed (this piece is moved forward along with the seaming equipment) may reduce burnout due to small depressions.

5.13. Field Panel Placement

HDPE deployment will generally be not done during any precipitation, in the presence of excessive moisture, in an area of standing water, or during high winds.

Installation of field panels shall be done as indicated on the approved layout drawing keeping the provision for settlement of the soil. If the panels are deployed in a location other than that indicated on the layout drawings, the revised location will be noted in the field. Information relating to HDPE panel placement including date, panel number, and panel dimensions may be maintained on a site-specific basis. If a portion of a roll is set aside to be used at another time, the roll number will be written on the reminder of the roll at several places.

The method and equipment used to deploy the panels must not damage the HDPE or the supporting sub grade surface. No personnel working on the HDPE engage in actions that could result in damage to the HDPE. Adequate temporary loading and/or anchoring, (i.e. sandbags, tires) which will not damage the HDPE, will be placed to prevent uplift of the HDPE by wind.

The HDPE will be deployed with adequate allowance for typical thermal expansion.

Any area of a panel seriously damaged (torn, twisted, or crimped) will be marked and repaired.

5.14. HDPE Field Seaming

In general, seams shall be oriented parallel to the slope, i.e. oriented along, not across the slope. Whenever possible, horizontal seams should be located on the base of the cell, not less than five (5') feet from the toe of the slope. Each seam made in the field shall be numbered. Seaming information shall include seam number, welder ID, machine number, temperature setting and weather conditions.

All personnel performing seaming operations shall be trained in the operation of the specific seaming equipment being used and will qualify by successfully welding a test seam.

5.15. Equipment

5.15.1. Fusion Welding

Fusion Welding consists of placing a heated wedge, mounted on a self propelled vehicular unit, between two (2) over-lapped sheets such that the surface of both sheets are heated above the polyethylene's melting point. After being heated by the wedge, the overlapped panels pass through a set of pre-set pressure wheels, which compress the two (2) panels together to form the weld. The fusion welder is equipped with a device, which continuously monitors the temperature of the wedge.

5.15.2. Extrusion Fillet Welding

Extrusion fillet welding consists of introducing a ribbon of molten resin along the edge of the overlap of the two (2) HDPE sheets to be welded. A hot air pre heat and the addition of molten polymer causes some of the material of each sheet to be liquefied resulting in a homogeneous bond between the molten weld bead and the surfaces of the overlapped sheets. The extrusion welder is equipped with gauges giving the temperature in the apparatus and a numerical setting for the pre-heating unit.

Factors such as the HDPE temperature, humidity, wind, precipitation, etc., can affect the integrity of field seams and must be taken into account when deciding whether or not seaming should proceed.

5.15.3. Seam Testing of HDPE

All field seams shall be non-destructively tested over their full length using test equipment and procedures described herein. Seam testing shall be performed as the seaming work progresses, not at the completion of the field seaming.

5.15.4. Air Pressure Testing

The welded seam is composed of a primary seam and a secondary track that creates an unwelded channel. The presence of an unwelded channel permits fusion seams to be tested by inflating the sealed channel with air to a predetermined pressure and observing the stability of the pressurized channel over time.

5.15.5. Equipment for Air Testing

The equipment required for air testing consists of following components:

1) An air pump (manual or motor driven) capable of generating and sustaining a pressure between 20 to 60 psi.
2) A rubber hose with fittings and connections.
3) A sharp hollow needle or other approved pressure feed device with a pressure gauge capable of reading and sustaining a pressure between 0 to 60 psi.

5.15.6. Procedure for Air Testing

Both the ends of the seam to be tested should be sealed. Needle or other approved pressure feed device should be inserted into the sealed channel created by the fusion weld.
Test channel should be inflated to a pressure of approximately 30 psi, and the pressure should be maintained within the range listed in Initial Pressure Schedule given below. Valve should be closed and the initial pressure should be observed and recorded.

INITIAL PRESSURE SCHEDULE *		
MATERIAL (MIL)	MIN.PSI	MAX. PSI
40	24	30
60	27	35
80	30	35
100	30	35

** Initial Pressure settings shall be recorded after an optional two (2) minute stabilization period. The purpose of this 'relaxing period" is to permit the air temperature and pressure to stabilize. The initial pressure reading may be recorded once stabilization has taken place.*

The air pressure should be observed and recorded five (5) minutes after the initial pressure setting is recorded. If loss of pressure exceeds the following or if the pressure does not stabilize, the suspect area should be located and repaired in accordance with specifications here in.

MAXIMUM PERMISSIBLE PRESSURE DIFFERENTIAL AFTER 5 MINUTES	
MATERIAL (MIL)	PRESSURE DIFF.
40	4 PSI
60	3 PSI
80	2 PSI

At the conclusion of all pressure tests, the end of the air-channel opposite the pressure gauge shall be cut. A decrease in gauge pressure must be observed or the air channel will be considered "blocked" and the test will have to be repeated from the point of blockage. If the point of blockage cannot be found, air channel shall be cut in the middle of the seam shall be cut and each half shall be treated as a separate test.

Pressure feed needle shall be removed and the resulting hole shall be sealed by extrusion welding.

5.15.7. Procedure for Non-Complying Test

In the event of a Non-complying Air Pressure Test, the following procedure shall be followed:

1. Seam end seals should be checked and seams should be retested.
2. If a seam does not maintain the specified pressure, the seam should be visually inspected to localize the flaw.
3. If no flaw is found, area to be vacuum tested should be marked. Entire length of the seam should be vacuum tested as explained in this chapter.
   a. If leak is located by the vacuum test, it should be repaired by extrusion fillet welding. Repair should be tested by vacuum testing.
   b. If no leak is discovered by vacuum testing, the seam will be considered to have passed non-destructive testing.

5.15.8. General Air Testing Procedures

1. The opposite end of the air channel will in all cases be pierced to assure that no blockages of the air channel have occurred.
2. Whenever possible, seams should be air-tested prior to completing butt seams to avoid having to cut into liner. All cuts through the liner as a result of testing will be repaired by extrusion welding.
3. All needle holes in air channels, within the boundaries of the active cell, will be repaired with an extrusion bead or repaired by patching at the discretion of the Engineer-in-Charge.

5.15.9. Air Pressure Testing Documentation

All information regarding air-pressure testing (date, initial time and pressure, final time and pressure, pass/fail designation, and Technicians number) will be written on one end of the seam, or portion of seam tested.

5.15.10. Vacuum Testing

This test is used on extrusion welds, or when the geometry of a fusion well makes air pressure testing impossible or impractical, or when attempting to locate the precise location of a defect believed to exist after air pressure testing.

5.15.11. Equipment for Vacuum Testing

The equipment required for vacuum testing shall consist of following components:

1. Vacuum box assembly consisting of rigid housing with a soft neoprene gasket attached to the open bottom, a transparent viewing window, port hole or valve assembly, and a vacuum gauge.
2. Vacuum pump or Ventura assembly equipped with a pressure controller and pipe connection.
3. A rubber pressure/vacuum hose with fittings and connections.
4. A bucket and means to apply a soapy solution.
5. A soapy solution.

5.15.12. Procedure for Vacuum Testing

1. Excess overlap from the seam should be trimmed, if any.

2. Vacuum pump/compressor should be turned on to reduce the vacuum Box to approximately 10 inches of mercury, i.e., 5-psi gauge.
3. A strong solution of liquid detergent and water should be applied to the area to be tested.
4. Vacuum box should be placed over the area to be tested and sufficient downward pressure should be applied to "seat" the seal strip against the liner.
5. Bleed valve should be closed and vacuum valve should be opened.
6. A minimum of 5-psi vacuum should be applied to the area as indicated by the gauge on the vacuum box.
7. It should be ensured that a leak tight seal is created.
8. The suction should be held for an adequate time to thoroughly examine the HDPE through the viewing window for the presence of soap bubbles.
9. After this period vacuum valve should be closed and bleed valve should be opened, the box should be moved over the next adjoining area with a minimum three inch (3") overlap, and the process should be repeated.

5.15.13. Procedure for Non-Complying Test

1) All the areas where soap bubbles appear should be marked and repaired
2) The repaired areas should be retested.

5.15.14. General Vacuum Testing Procedures

1. Vacuum box testing will be performed by qualified construction personnel.
2. Overlap must be trimmed prior to vacuum boxing all seams.
3. Special attention shall be exercised when vacuum testing "T" seams or patch intersections with seams.

Vacuum testing crew will use Mean Streak permanent markers to write online indicating tester's ID number, date, and pass/fail designation on all areas tested. Records of vacuum testing shall be maintained on non-destructive testing form.

5.15.15. Destructive Testing

The purpose of destructive testing is to determine and evaluate seam strength. These tests require direct sampling and thus subsequent patching. Therefore, destructive testing should be held to a minimum to reduce the amount of repairs to the HDPE.

5.15.16. Procedure for Destructive Testing

1. Destructive test samples shall be marked and cut out randomly at a minimum average frequency of one (1) test location every 500 feet of seam length, unless otherwise specified or agreed.
2. Destructive samples should be taken and tested as soon as possible after the means are welded (the same day), in order to receive test results in a timely manner.
3. Qualified personnel will observe all field destructive testing and record date, time, seam number, location, and test results on Destructive Testing Form.
4. Sample Size
   (a) The sample should be twelve inches (12") wide with a seam sixteen inches (16") long centered length-wise in the sample. The sample may be increased in size to accommodate independent laboratory testing by the Owner at the Owner's request or by specific project specifications.

(b) A one-inch (1") specimen shall be cut from each end of the test seam for field-testing.
(c) The two (2) one inch (1") wide specimens shall be tested on a field tensiometer for peel strength. If either field specimen does not pass, it will be assumed the sample would also not pass laboratory destructive testing.

5.15.17. Procedure for Non-Complying Destructive Test

1. Additional field samples should be cut for peel testing. In the case of a field production seam, the samples must lie a minimum of ten (10) feet in each direction from the location of the initial non-complying sample. A field test should be performed for peel strength. If these field samples pass, then laboratory samples can be cut and forwarded to the laboratory for full testing.
   (a) If the laboratory samples pass, the seam between the two (2) passing sample locations should be repaired according to procedures detailed in para 11.0.0 of this chapter.
   (b) If either of the samples is still in non-compliance, then additional samples should be taken in accordance with the above procedure until two (2) passing samples are found to establish the zone in which the seam/seams should be reconstructed.
2. All passing seams must be bounded by two (2) locations from which samples passing laboratory destructive tests have been taken.
3. In cases of repaired seams exceeding 150 consecutive feet, a sample must be taken and pass destructive testing from within the zone in which the seam has been reconstructed.
4. All destructive seam samples shall be numbered and recorded on Destructive Test Form.

5.15.18. Laboratory Testing of Destructive Seam Samples

1. Seam destructive samples may be sent to laboratory or tested on site when permitted by a site-specific quality control plan or in the event that third party laboratory destructive testing is not being performed.

2. Destructive samples will be tested for "Shear Strength" and "Peel Adhesion". Five (5) specimens shall be tested for each test method. Four (4) out of the five (5) specimens must exhibit for each round of peel and shear testing. In addition, four (4) of the five (5) individual specimens must meet or exceed the strength requirements as listed in Material specification sheet in order for the seam to pass the destructive test.

5.15.19. Testing for Pinholes, Cuts

Laid HDPE sheet on liner shall be tested for cuts, pinholes, seam leakage's etc. by using modern Geo-electrical leak detection/vacuum box on complete lining profiles before putting the next layer. The implementing agency shall give the detailed methodology for testing. Any defect remediation / repair modification as required by this test shall be carried out by the implementing agency.

5.16. Defects and Repairs

5.16.1. Repair Procedures

Any portion of the HDPE or HDPE seam shown a flaw, or having a destructive or non-destructive test in non-compliance shall be repaired. Procedures for repair include the following

5.16.2. Patching

Patching shall be used to repair large holes, tears and destructive sample locations. All patches shall extend at least three inches (3") beyond the edges of the defects and all corners of patches shall be rounded. The total area of patches in no case shall exceed 1.0% of the panel area.

5.16.3. Grinding and Welding

Grinding and welding shall be used to repair sections of extruded fillet seams.

5.16.4. Spot Welding or Seaming

Spot welding or seaming shall be used to repair small tears, pinholes or other minor localized flaws

5.16.5. Capping

Capping shall be used to repair lengths of extrusion or fusion welded seams.

5.16.6. Verification of Repairs

Every repair shall be non-destructively tested. Repairs, which pass the non-destructive test, shall be deemed acceptable. Repairs in excess of 150 consecutive feet of seem shall require a destructive test.

5.16.7. Control and Verification Tests on Geo-membrane Installation

These tests will verify the welds' mechanical resistance to peel and shear. No assembling equipment will be used on site without a previous calibration test.
The Installer must prepare samples of a minimal length of one (1) metre by a width of 300mm, with the weld centered on the sample's width. Two (2) specimens will be taken from each end of the samples of peel and shear. For each sample, two paired peel and shear results will thus be obtained.

Calibration of all welding equipment must be performed and documented by the installer for each instrument used, at the start of each work shift, following abrupt changes in weather conditions and as requested by the Engineer-in-Charge.
Calibration of equipment will be performed by tests on geo membrane samples under the same weather conditions as those expected on site during panel assembling.
Once removed, samples will be tested on site with a calibrated portable tensionmeter and must meet with the requirements of welds resistance to peel and shear as described in the Technical specification.

The Installer shall provide the Engineer-in-Charge with recent certificates of standardization for all control instruments (tensionmeter; speed, tensile level etc.). The Engineer-in-Charge reserves the right to demand any additional calibration test at any time.

All documentation on the calibration tests performed by the Installer shall be submitted to the Engineer-in-Charge. The installer will identify each calibration test with the following information;

- Date and time
- Identification of destructive test
- Identification of weld
- Welded panel's identification number
- Quantified results of peel and shear test
- Identification of type of rupture
- Quality control technician's identification
- Localization on "As-built" plan

The Quality Assurance technician shall perform small perforations in the lining in order to assess the efficiency of the Installer's non-destructive testing program. The Quality Assurance technician shall perform those perforations with an approximate frequency of one (1) each 1000 meters of weld at least three (3) instances of the project.

The Quality Assurance technician shall document those punching or perforations by including at least the following information:

- Date and time of operation
- Identification of weld
- Exact location of perforation
- Quality Assurance technician's identification
- Results of Installer's non-destructive tests
- Date and time of repair.

If the Installer's non-destructive testing program fails to find the punching or perforations made, the Installer will repeat non-destructive testing on the faulty weld, as well as on the welds before and after it.

The Quality Assurance technicians shall perform verification destructive tests at an approximate frequency of one (1) for each 1000 meter of weld.
A special testing frequency will be used at the Engineer-in-Charge discretion when visual observations indicate a potential occurrence of problems. Verification tests may be performed in the following cases:

- Variation on the thickness of the weld
- Doubtful cleanliness of overlapping
- Dirty equipment or in poor condition
- Different personnel than the one authorized
- Adverse weather conditions
- Welding equipment failure
- Visible variation in material's quality
- Close confined or complex working space
- Beginning and end of panels
- On the Engineer-in-Charge request

5.17. Warranty

Written warranties addressing HDPE material and installation workmanship shall be submitted to and approved by Engineer-in-Charge. The manufacturer's warranty shall state that the installed material meets all requirements of the contract drawings and specifications and that

under typical local atmospheric conditions and weather aging, the sheet material is warranted for at least 20 years. The installer's warranty shall state that the HDPE field and factory seams will not fail within at least 20 years of the installation under similar conditions.

6. CLAY LINER

Scope

This section covers the specifications for the supply, laying and testing of clay liner as per the drawings and specifications mentioned herein to the satisfaction of the Engineer-in-charge
Composite Clay Liner serves as a hydraulic barrier to flow of leachate the properties required for compacted clay liner as per specs is as follows:

- Minimum thickness of each composite clay liner/layer (primary & Secondary) shall be 0.60 m (Total $\geq$ 0.9 m).
- Maximum hydraulic conductivity of 1 x 10-7 cm/ sec. ($k \leq 1 \times 10\text{-}9$ m/s).

The minimum requirements recommended to achieve above specified hydraulic conductivity:

6.1. General Requirements

The soil used in the liner shall meet the following minimum criteria:

1. Be classified under the Unified Soil Classification System CL, CH, SC and OH (IS 2720 Part IV/ASTM Standard D248769)
2. Allow greater than 20 - 30 percent (dry weight) passage through no. 200 sieve (75 μm) (grain size analysis as per IS:2720 Part IV/ ASTM Test D1140)
3. Plasticity index greater than or equal to 7 to 10% (IS 2720 Part V)/ Plasticity greater than or equal to 15 units (ASTM Test D424)
4. Gravel content shall not be exceeding more than 30 %
5. Maximum particle size shall be between 20 to 50 mm
6. Have a pH of 7.0 or higher
7. Have a liquid limit equal to or great than 30 units (IS 2720 Part V/ ASTM Test D423)
8. Moisture Density relationship as per IS: 2720 Part VIII
9. Permeability test as per IS: 2720 Part XXXVI.

The clay liner should conform to relevant BIS specifications.

6.2. Quality control aspects

General quality control aspects which shall be adhered to are as follows:

1. The material (soil) used for filling shall be free from boulders, lumps, tree roots, rubbish or any organic deleterious matter.
2. Pre-processing may be carried out for water content' adjustment, removal of oversized, materials, pulverization of any clumps, homogenization of the soils, and., introduction of additives such as bentonite.
3. Ensure that a sub-grade on which a compacted clay liner will be constructed is properly prepared by compacting and obtaining required firmness.
4. Proper compaction of liner materials is to be carried out to ensure compacted clay liner meets hydraulic conductivity specified above.
5. Determine the appropriate thickness (as measured before compaction) of each of the several lifts that will make up the clay liner. Also proper bonding between lifts is to be ensuring to avoid formation of preferential pathways.

6. Preventive measures to protect compacted layers from desiccation are to be provided during construction.

6.3. Laying of clay liner

This specification and the method of measurements described herein are applicable for construction of compact clay liner at the base and on the sides of the landfill.

1. The implementing agency has to identify the borrow soil (if required) area having the requisite properties as mentioned above and make his own approach and access roads (as required) from the borrow area to the demarcated landfill area. No ,claim shall also be admissible to the Implementing agency on account of his having to take longer leads or routes for earth movement, than envisaged by him, either due to any road cuttings, non-availability of routes, or any other grounds whatsoever.

2. In case total filling required in any area consists of earth both from borrow areas and available approved excavated material from within site area or use of any amended soil to achieve the stipulated permeability. The necessary laboratory tests/demonstrations/calculations are to be furnished to Engineer-in-Charge for approval.

3. In the event of filling of soil material as mentioned above, joint levels shall be taken - before commencing the filling with earth from borrows areas.

4. Prior to the placement of the clay in the desired location, the sub grade under the clay - liner shall be checked. This shall be usually performed by proof-rolling the sub grade. Any weak zones shall be removed and appropriately backfilled, and all debris should be removed. The clay may then be placed above the sub grade in loose lift.

5. Compacted clay liners shall be constructed in a series of thin lifts for proper compaction and homogeneous bonding between lifts. The lift thickness of clay liner shall be 20 to 22.5 cm before compaction and 15 cm after compaction. The soil placed in a loose lift shall be no thicker than about 230 mm. After the soil is placed, a small amount of water may be added to offset evaporative losses, and the soil may be tilled one last time prior to compaction. Each lift of clay liner shall be bonded to the underlying and overlying lifts. The surface of a previously compacted lift must be rough so that the new and old lifts blend into one another.

6. Sheep foot rollers shall be used for compacting the clay liner. The roller with fully penetrating feet (of 22.5 cm shaft length) shall be used for compact the liner. The minimum weight of the roller shall be 10000 kg (10 Tonnes). The minimum foot length shall be between 180 to 200 mm and Minimum number of passes shall be 5. A pass shall be reckoned as one pass of the compactor, not just an axle, over a given area, and the recommended minimum of five passes is for a vehicle with front and rear drums. The compaction shall be continued till the specified hydraulic conductivity is obtained and verified by Engineer-in-Charge.

7. Each layer shall be tested in field for Moisture Content and Hydraulic Conductivity (Undisturbed Sample) before laying the next layer the next layer. A minimum of 1 test for 500 sq. m for each layer shall be conducted.

8. Successive layers of clay shall not be placed until the layer below has been thoroughly compacted to satisfy the requirements laid down in specifications.

9. Prior to compaction, the moisture content of material shall be brought to within plus or minus 2 % of the Optimum Moisture Content as described in IS: 2720 Part VII. The moisture content shall preferably be on the wet side for potentially expansive soil.

10. After compaction of a lift, the soil must be protected from desiccation, which causes the cracking of the Clay liner. Desiccation shall be minimized by smooth rolling the surface to form a relative impermeable layer at the surface or the soil can be periodically moistened. The protective measures stipulated above shall apply to each lift as well as the completed liner or cover barrier.

11. The lifts shall be placed in horizontal layers. For liners to be constructed slopes, the lifts shall be placed parallel to the slope.

7. Leachate Collection System

Scope

The primary function of the leachate collection and removal system (LCRS) is to collect and convey leachate out of the landfill unit to control the depth of leachate above the liner. The leachate collection system is placed over the unit's liner system. The bottom liner should have a minimum slope of 2 percent to allow the leachate collection system to gravity flow to a collection sump or alternate arrangements for pumping shall be made.

The implementing agency shall Design a leachate collection and removal system using adequate water balance equations or appropriate modes to estimate leachate generation for the landfill and to maintain less than 30 cm depth of leachate, or 'head', above the liner.
Leachate Collection and detection system should include a high-permeability drainage layer, perforated leachate collection pipes, a protective filter layer, and a leachate removal system. Design considerations for each of these elements are given below:

1. High permeability drainage layer:

   (a) Drainage materials are to be placed on the liner system at the same minimum 2 percent grade.
   (b) The drainage materials (sand and gravel) shall be provided as per specifications given in chapter 21 and chapter 22 of this document.
   (c) It should be demonstrated that the layer will have sufficient bearing capacity to withstand the weight load of full unit.
   (d) Geo-synthetic drainage materials may be used in addition to or in place of, soil materials.
   (e) The flow rate of geo-net can be evaluated by ASTM D-4716.
   (f) The drainage layer shall conform to relevant BIS specifications.

2. Perforated Leachate Collection Pipes.
   The leachate collection pipes shall conform to relevant BIS specifications.

3. Perforated piping system should be located in the drainage layer to rapidly transmit the leachate to the sump and removal system.

(a) The design of perforated leachate collection pipes should consider necessary flow rates, pipe sizing and pipe structural strength.

4. Protective filter Layer

(a) To protect the drainage layer and perforated leachate piping from clogging, a filter layer is to be placed over the high permeability drainage layer. As per the specifications given in chapter 18
(b) The filter layer should consist of a material with smaller pore space than the drainage material or the perforation openings in the collection pipes.
(c) Leachate Removal system
(d) A leachate collection sump shall be designed and constructed of materials compatible with and impermeable to leachate formed in landfill. The final leachate collection sump shall be common for the total secure landfill area and shall be located and sized accordingly.
(e) The sump should be accessible for removal of leachate if the pump becomes inoperative and the stand pipe becomes damaged.
(f) Pumps are to be provided to remove leachate that has collected.
(g) The pump should be placed at adequate depth to allow enough leachate collection to prevent the pump from running dry.
(h) A level control, standby pump and warming system is to be provided to ensure proper sump operation.
(i) Standpipes should also be provided to remove leachate from the sump.
(j) The leachate shall be pumped for treatment in the leachate treatment plant
(k) The filter layer shall conform to relevant BIS specifications.

The primary leachate collection system shall be placed over the primary liner in this project is a composite liner (geo-membrane with compacted clay beneath). The secondary leachate collection system also called leak detection system shall be placed over the secondary liner i.e. between two composite liners. The leachate, if any, shall be collected at low point (provision shall be made sufficiently) and periodically sampled so as to assess the adequacy of primary liner against leakage of leachate.

Material for Filter shall meet the following requirements:

The drainage and filter material shall be placed dry and may be lightly compacted with a vibratory roller. Care must be taken, to ensure that vehicles are up to driven over the naked HDPE liner.

Laying of Perforated Leachate Collection Pipes

The upper half of the pipe above the spring line shall be perforated, whereas the lower half of the pipe shall remain un-perforated. The bidder shall provide details of supplier of the HDPE pipes along with the three pipe parameters i.e. Compressive yield strength, wall crushing, wall buckling.
The perforated pipes shall be laid out in 'v' trenches and the trenches shall be backfilled. All care shall be taken to avoid digging the trench below the levels indicated in the drawing. All the perforated-pipes shall be connected to a solid HDPE header pipe, through a Standard "T' - joint".

8. HDPE Pipes

Scope

This section covers the specifications for the supply, laying, jointing and testing of HDPE pipes as per the drawings and specifications mentioned herein to the satisfaction of the Engineer-in-charge.

8.1. Specifications

The pipe shall conform to the material grade PE-80 of latest edition of IS: 4984.The pressure rating shall be PN-6.

The pipe and fittings shall be chemically resistant and shall be suitable for all pH ranges i.e. 0 to 14.

These shall have smooth internal bore enhancing the hydraulic flow properties with low frictional losses. The pipes and fittings shall be strong and resilient enough to withstand static and hydrodynamic both with regard to internal as well as external pressures.

The pipe shall have excellent elastic properties and can take sufficient curvature. The pipes and fittings shall have the property that it can be joined conveniently with no leakage. The pipe and fittings shall be UV rays resistant and shall also be resistant to wear and abrasion. The pipes flange should be provided wherever required with joints having HDPE long stub ends. The flange shall conform to DIN-PN-10 and drilling shall be to match with the counter flange of valves/pipes/pumps etc.

HDPE pipes should conform to relevant BIS specifications

8.2. Piping System

All piping systems shall be capable of withstanding the maximum pressure in the corresponding lines at the relevant temperatures. The minimum thickness for pipes and fittings shall be adhered to higher thickness in equivalent material is acceptable. However, no credit will be given for higher thickness.

All the piping systems, fittings and accessories supplied under this package shall be designed to operate with normal maintenance for a plant service life of 20 years and shall withstand the operating parameter fluctuations and cycling which can be normally expected during this period.

All piping system shall be properly laid to take care of hydraulic shocks and pressure surges, which may arise in the system during operation. Bidder should provide necessary protective arrangements like anchor blocks / anchor bolts, etc. for the safeguard of the piping system under above-mentioned conditions. External and internal attachments to piping shall be designed so as not to cause flattering of pipes, excessive bending stresses or harmful thermal gradients of pipe walls.

Pipes and fittings shall be manufactured by an approved firm of repute. A list of approved manufacturers is given in the tender document. They should be truly cylindrical of clear internal diameter as specified in the IS code, of uniform thickness, smooth, and strong, free from dents,

cracks and holes and other defects. They shall allow ready cutting, chipping or drilling, welding etc.

9. Sand Layer

Scope
This section of the specification covers supplying and laying sand layer in the leachate collection and removal system and leak detection system as shown in the drawings and as mentioned herein.

9.1. General Requirements

The implementing agency shall furnish all labour and material required for the complete performance of the work in accordance with the drawings, schedule of item and as described herein.

Graded sand filter of 100 mm thickness shall be laid as indicated in the drawing in the landfill area in the leachate collection and removal system and leak detection system

The sand layer should conform to relevant BIS specifications

9.2. Material

The material for sand layer shall consist of clean, sound and well graded coarse sand. The material shall be free from debris.

Above the gravel bed, clean sand (425 micron to 4.75 mm) shall be placed. The thickness of the sand layer shall be 100 mm. The effective size (d10) of the sand recommended is 0.4 mm with uniformity co-efficient of 1.5. The sand shall be laid on the top of the gravel layer manually and spread to the specified thickness. The minimum thickness of 100 mm shall be ensured after spreading water.

The sand layers shall be well watered and rammed. Care shall be taken that materials of different layers do not get mixed, both at the time of placing and during compaction. The sand material shall be clean, sound, durable and well graded. No debris, wood, deleterious material etc., shall be permitted.

10. Gravel Layer

Scope
This section of the specifications covers supply and placement of the gravel in the leachate collection and removal system and leak detection system as indicated in the drawings released for the construction or as directed by the Engineer- in -Charge.

10.1. General requirements

The implementing agency shall furnish all labour, equipment and material required for the complete performance of the work in accordance with the drawings and as described herein.

The gravel layer should conform to relevant BIS specifications

10.2. Materials

1. Gravel layer in the leak detection system

   The gravel shall be rounded, cleaned and free from disintegrated and foreign material. The size of the gravel shall decrease upwards. The size of the gravel recommended is 4.75 -65 mm. The gravel shall be stockpiled at site separately and shall be mixed as per the specifications and then laid on the ground. Average density of the gravel recommended is 1600 kg/m3. The gravels shall be well graded as directed by the Engineer-in-Charge.

2. Gravel layer in the leachate Collection and Removal System

   The gravel shall be rounded, cleaned and free from disintegrated and foreign material. The size of the gravel shall be 4.75 - 80 mm. The gravel shall be stockpiled at site separately and shall be mixed as per the specifications and then laid to the ground. The gravel's shall be well graded as directed by the Engineer-in-Charge.

10.3. Placing

Graded gravel's shall be constructed as indicated in the drawings. The gravels shall be placed in layers of uniform thickness as shown in the drawings and care shall be taken to avoid segregation of coarse and fine materials and formation of pockets.

11. Vertical Centrifugal Pump

Scope

This specification covers the works of the design, manufacture, construction features, testing, delivery to site, erection, commissioning, performance of vertical centrifugal pumps. (Non-clog type)

11.1. Code and Standards

The design, manufacture and performance of the pump shall comply with all currently applicable statutes, regulation and safety codes in the locality where the equipment will be installed. The equipment shall also confirm to the latest applicable Indian or equivalent international standard.

11.2. Design Requirements

1. The pumps shall be capable of handling Liquid of pH 0 to 10. These pumps shall be designed for parameters specified in tender drawing and shall be suitable for continuous (normal) operation and intermittent operation.

2. The total head capacity curve shall be continuously rising towards the shut off with the highest at shut off. The pump speed shall not exceed 1500 rpm.

3. Pumps of particular category shall be identical pumps and shall be suitable for parallel operation with equal load division. Impellers shall preferably be of non-over loading type.

4. Pumps shall run smooth without undue noise and vibrations. The magnitude of peak-to-peak vibration at shop will be limited to 75 decibel at the bearing housing. After installation at site the magnitude of vibration shall be limited to 50 db.

5. The KW rating of the pump motor shall be:

   Sufficient to drive the pump through the entire range of head – capacity curve, and KW / HP rating of the drive shall be calculated for additional 20% reserve power to take care of over loading on entire operating range.

6. The pump shall be capable of developing the specified total head at the specified rated capacity while operating in parallel and be capable of operating continuously at run-out capacity condition.

7. Pump shall be supplied with level control as per manufactures standard.

11.3. Features of Construction

Pumps shall be of vertical centrifugal non-clog type with required number of stages suitable for the service conditions. Materials of construction offered by the Bidder for pumps, drives and accessories shall be as per relevant BIS specifications. All wetted parts shall be inside and outside rubber lined and shall be suitable to handle liquid of pH 0 to 10.
Written guarantee addressing pump material shall be submitted to and approved by Engineer-in-Charge. The manufacturer's guarantee shall state that the installed material meets all requirements of the contract and specifications and that under typical local atmospheric/operating conditions and weather aging, the pump material is suitable.

11.4. Accessories

1. All accessories required for proper and safe operation shall be furnished with the pumps.
2. Each stage of pump, unless self-venting, shall be provided with a suitable vent connection, complete with valves.
3. Tapping suitably plugged for pressure gauges shall be provided on delivery flanges.

11.5. Drives

Drive motor shall be connected to the line shaft of the pump with the help of a V-belt and shall have maximum rpm of 1500. The pulley shall match the rpm of pump.

11.6. Testing at Manufacturers Works

Materials and performance of the pumps and its components shall be tested in accordance with the relevant standards. Test certificates for these shall be furnished for the Owner's approval.

11.7. Noise and Vibration Measurements

Noise and vibration shall be measured during the performance testing at shop as well as during the site test. The Noise and vibration levels measured at shop test shall be furnished to the Owner for its acceptance. The noise and vibration test at site shall be done in presence of Engineer-in-Charge or his representative. Noise and vibration level measured and accepted as per applicable standards.

11.8. Visual Inspection

Pumps shall be offered for visual inspection to the Owner before dispatch. The components of the pumps shall not be painted before inspection.

11.9. No weld repair on cast iron shall be allowed

11.10. Field Testing

After installation, the pumps offered shall be subjected to mechanical run testing and trial operation at field. If the performance at field is found not to meet the requirements, then the equipment shall be rectified or replaced by the implementing agency, at no extra cost to the Owner. The procedure of the above testing will be mutually agreed between Owner and Implementing agency.
Based on observations of the trial operation, if modifications and repair are necessary the same shall be carried out by the Implementing agency to the full satisfaction of the Engineer-in-Charge.

11.11. Drawings to be submitted

The following drawings along with datasheet shall be submitted by the Bidders for Owners approval.

1. Outline dimensional drawings showing the details of pump and motor assembly
2. Performance curves, showing capacity Vs total head, efficiency, NPSH and power consumption ranging from maximum flow to shut-off head.
3. GA drawing of pump house showing mounting arrangements, sump details, center to center distance of pumps etc.

4. Necessary Catalogues

11.12. Name Plate

Each pump shall be provided with a name plate indicating the following details:
Design capacity, total head, speed, motor rating, model number, tag number, etc., manufacture serial number and weight of equipment.

12. Valves

Scope
This specification covers the design, performance, manufacture, and construction features, testing, packing and forwarding to site erection, commissioning of the Butterfly Valve.

12.1. Code and Standards

The design, manufacture and performance of valves and specials shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment shall also conform to the latest applicable Indian / British / USA standards / or equivalent International standards.

12.2. Specification for Butterfly Valve

Butterfly valves shall be of double flanged confirming to AWWA-C-504 class or BS: 5155 Class 150. The Butterfly Valves shall be manually operated as wells as motor operated as per the requirement of the system. The motor shall be suitable for 415 V, 3 phase, 50 Hz and outdoor service. The motorized operated valves shall also have the manual override.
The various components of butterfly valves shall be of the following material of construction. The specification mentioned below is the minimum requirement; however bidder shall confirm that these are suitable for handling the liquid having pH range of 0 to 10. If any lining etc. is required on the wetted part of the valves, the bidder has to provide.

1.	Body	2% Ni Cast Iron - ASTM A 48 Cl. 40; BS: 1452 Gr 220; SG Iron - BS: 2789, Neoprene rubber lined Cast Iron – ASTM A 216 Groundwater. WCB; BS: 1504 Eq. Gr, Neoprene rubber lined
2.	Disc	Cast Iron – ASTM A 48 Cl. 40; BS: 1452, Gr. 200, SG Iron – BS : 2789, Neoprene rubber lined Cast Steel – ASTM A 216 Gr. WCB. BS: 1504 Eq. Gr, Neoprene rubber lined
3.	Shaft	ASTM. A 296 Gr. CF 8M/AISI 316: AISI 420; BS: 970

		GR. 316S16; BS: 970 Gr. 420 S45.
4.	Seat rings	Nitrile rubber, EPDM (Ethylene propylene rubber), Hypalon
5.	Motor	Suitable for 415 V, 3 phase, 50 Hz and outdoor service

Butterfly valves shall be fitted with sleeve type bearing such as PTEF. Valves of 350 NB and above shall be provided with one or two thrust bearing to hold the disc securely in the centre of valve seat without hydraulic or external axial shaft loads. Sleeve and other bearings fitted into the valves body shall be of self-lubricated materials that do not have any effect on the fluid handled and other components of the valves.

All the manually operated butterfly valves shall be provided with Hand wheel or Hand lever as per the requirements. For larger sizes i.e. 150 NB and above. Hand wheel shall be provided. For lever/wrench operated valves, means shall be provided for positively holding the disc is not less than three intermediate positions. Manually operated valves shall be provided with reduction gear unit for valves of size 200 NB and above. All the valves shall be equipped with adjustable mechanical stop-limiting devices to prevent over travel of the valve disc in the open and closed positions. The valve operators (Hand wheel, Gear reduction unit etc) shall be designed as per relevant International Standard.
All the butterfly valves shall be provided with an indicator to show the position of the disc. Flanges shall conform to ANSI B 16.5 C150.

12.3. Tests

All the valves shall be tested hydro-statically for strength, tightness of seats and tightness of back seating at the pressures specified in relevant code.

The procedure for testing the tightness of seats of valves shall be as follows. The valves shall be subjected to water pressure of a minimum 2.812 kg/cm. The pressure shall then be increased to the specified seat test pressure. Valves shall then be cracked open at this pressure to determine the tightness of the seat ring in the body. Butterfly valves shall be tested on both sides of disc. The testing in general shall confirm to the relevant IS standard. Vendor shall furnish five sets of the following certificates for all types of valves. Certified physical and chemical analysis certificates, metallurgical test reports of all components of the valves and specialties. Certified hydrostatic test reports for all body castings.

12.4. Painting and Corrosion Protection

A shop coat of paint shall be applied to all steel and cast iron exposed surfaces as required to prevent corrosion, after release has been given for painting and before dispatch. All parts shall be adequately protected for rust prevention, grease shall not be used on mechanical surfaces.

12.5. Drawings and Manuals

Bidder shall furnish the following drawings along with datasheet for Owners approval:

- Dimensional outline drawings.

- Cross section drawing.
- Instruction manual.

12.6. Name Plate

All valves shall have permanent name plates indicating the service, type, size of the valves.

13. Leachate Treatment Plant

Scope
This specification covers the design, performance, manufacture, construction, site erection, commissioning and testing of the Leachate treatment plant.

13.1. General requirements

The capacity of leachate treatment plant shall be as per design documents. However the implementing agency shall review the site, collect rainfall and other relevant data and shall work out the capacity and design of the plant. All the drawings in this regards would be submitted to the Engineer-in-Charge for approval.

For designing the system the implementing agency shall account for

1. the anticipated flow rate which will require treatment;
2. the composition of the leachate at source;
3. the discharge composition required by the regulating authority.

From this information the technology needed to meet the discharge consent shall be selected. There are estimated to be approximately twenty principal technologies that can be employed for leachate treatment.

Each of which shall be combined in various modes with other standard chemical engineering unit processes to optimize the balance between cost and quality. Refer to following table.

Title	**Title**
Thermally driven ammonia strippers	Power generation from LFG
Sequencing batch reactors	Exhaust gas sampling equipment
Leachate heaters	Ambient air line-coolers
Eductor pump sets	Leachate evaporation

Pneumatic pumps	OdorgaardTM (Landfill gas odour control)
Borehole pumps	Pressure swing adsorption
Gas chillers	AC Range flares
Distributed monitoring systems	SC Range flares
Gas analysis packages	MC Range flares
SCADA control	RB Range flares
LinkLand™ GUI (For use with SCADA system)	SMART flares
LHC Range flares (For the combustion of low calorific value gases)	Mobile ground flares
Spray-irrigation sets	pH driven ammonia stripper
Scrubbing columns	Aeration lagoons
Stripping towers	Aeration towers
Chemical dosing equipment	SepsizerTM (Air classification system)
Cyclone water knockout pot	Activated carbon columns
VOC adsorption with activated carbon	Flare stack standard options

13.2. Specifications

The equipments, pipes, pumps, valves, filter material, civil works shall be provided in accordance with the specifications as per relevant BIS codes.

13.3. Painting and Corrosion Protection

A shop coat of paint shall be applied to all steel and cast iron exposed surfaces as required to prevent corrosion, after release has been given for painting and before dispatch. All parts shall be adequately protected for rust prevention; grease shall not be used on mechanical surfaces.

13.4. Drawings and Manuals

Bidder shall furnish the following drawings and documents for Owners approval:

- Dimensional outline drawings.
- P & ID
- Instruction manual.
- Operational Manual

13.5. Guarantee

Written guarantee addressing material shall be submitted to and approved by Engineer-in-Charge. The manufacturer's guarantee shall state that the installed material meets all requirements of the contract and specifications and that under typical local atmospheric/operating conditions and weather aging, the material is suitable.

The bidder shall also submit a guarantee for treated water quality parameters. The treated water quality parameters shall be in accordance with the relevant IS codes.

B. EQUIPMENTS

The technical specification of various equipments required by RMC is indicated as follows.

1.0 Compactor /Roller

Basic specification

The compactor / roller vehicle shall be rugged and durable and shall incorporate the latest technological feature offered by the manufacturing / supplier.

The equipment should confirm to the following specification.

General Description

DRUM DIMENSIONS	
Drum width	2130 mm
Drum Diameter	1523 mm
Drum	Standard
Max. weight	10350 kg
Operating weight	9350 kg
Thickness	25 mm
Tyres	2 nos. all weather pattern
Pneumatic Tyre	23.1/26
COMPACTION CHARACTERISTIC	
Static linear load	23.7

Nominal amplitude	
High	1.72
Low	0.80
Vibration Frequency	30-1800
ENGINE	Air cooled diesel engine developing 108 bhp at 2400 RPM meeting BSII
BRAKES	Service brake Hydrostatic
Parking / Emergency	Fail safe multi disc in rear axle
MANOEUVRABILITY	
Turning Radius Inner	3750
Turning Radius Outer	5900
Speed Range	
Stage-I	0-9
Stage-II	0-23
Fuel tank Capacity	265

Standard features:

Operation cab, cushion seat, instrument panel, light equipments, lifting eyes, tool box, break warning lights, windscreen wiper, rear view mirror compactor meter, frequency meter, natural start switch, air filter clog indicator, hydraulic filter clog indicator v belt failure warning horn.rpm cum hour meter, meter, fuel gauge, engine temperature gauge, indicator for engine oil pressure, battery charging current, hydraulic oil and air filter condition, parking breaks, neutral position control lever, switches for speed range, acoustic back up alarm, 4 working light, headlamps, turn signal and hazard warning lights.

Manufacturer shall provide following with each vehicle;

- Two sets of certified net torque, horsepower and consumption curves.
- Two copies of technical details, drawings, operator's manual standard tools/part's book
- Two copied of workshop and service manual
- Two copies of spare parts catalogue
- Warranty cart for one year
- Battery warranty card

After Sales Support:

- Free service in the first year with a warranty for machine for I year from the date of commissioning
- To demonstration capabilities of giving proper service and spare parts after the expiry of warranty period
- Shall be proposing maintenance contact for subsequent year at Indore

Drawings:

The drawing of vehicle should be submitted by the bidder which shall be approved by the RMC at the of award of work

2.0 Back hoe loader

Basic Specification

The Back Hoe Loader with 6 in one attachment vehicle shall be rugged and durable and shall incorporate the latest technological features offered by the manufacturer. The Loader excavator should provide superb drive power in all conditions. The equipment should confirm to the following specifications.

General Description

Excavator Performance

Particular	Specification requirement by purchaser
Max. dig depth	4.77 m
Reach – ground level to rear wheel center	6.72 m
Reach – ground level to slew center	5.40 m
Reach at full height to slew center	2.74 m
Reach side to center line of machine	6.02 m
Max. working height	5.97 m
Max. load over height	4.18 m
Bucket rotation – power	185^0
Bucket tear out force	5700kgf
Dipper tear out force	3010kgf

Loader Performance

Particular	Specification requirement by purchaser
Dump height	2.74 m
Load over height	3.23 m
Pin height	3.45 m
Reach at ground	1.42 m
Max. reach at full height	1.20 m
Reach at full height – Bucket dumped	0.83 m
Below ground level dig depth	0.07 m
Rollback at ground	45^0
Dump angle	43^0
Bucket break-out force	6010kgf
Loader arm break-out force	5300kgf
Pay load	1800kgf
Shovel capacity	1.1 cum

Transmission

Easy-to-use column mounted electric reversing shuttle switch that can change machine direction while allowing operator to keep hands on the steering wheel leading to fast cycle times.

Brake

- Hydraulically actuated, dual line, self-adjusting, oil immersed, multi-disc type well protected from dirt, water, requiring no maintenance. Through independent pedals linked together for normal use.
- Two independently operatable foot pedals enabling machine to maneuver in tight spaces.
- Parking: Hand operated disc brakes on rear axle input disc.

Steering

Power steering with manual capability in the event of engine or hydraulic power failure.

Tyre

Company recommended and provided

Cab

- Provide excellent all round visibility.
- Excellent operator safety. Conforms to ROPS and FOPS standards.
- Plenty of legroom.
- A fully adjustable seat combined with ergonomically positioned controls and soft touch steering wheel.
- Seat belt, large convex rear view mirror, interior light, front screen wiper, front and rear horn, hazard warning system, tool box and helper seat.
- Instrumentation panel that includes engine speed, engine hours, fuel level and water temperature
- Audible and visual fault warning system for alternator charge, coolant temperature, engine oil pressure, blocked air filter, transmission oil pressure and temperature and hand brake on.

Hydraulic

- Pump capacity : 101 lpm
- Main relief valve : 3300 p.s.i. (228 bar)
- Unloader valve : 3300 p.s.i. (207 bar)
- During excavation, the circuit should automatically adjust the pump flow to provide speed for fast cycles or power for hard digging conditions.
- Careful routing of hydraulic hoses and pipe work guards against site damage and allows easy servicing.

3.0 Water Tanker of 3000 Ltr. Capacity

Carrier Vehicle

The chassis of the carrier vehicle shall be Diesel engine driven Euro 2 and above norms of appropriate capacity suitable for carrying the water tanker of capacity 3000 litres and compatible with the water tank, proposed by the bidder. It shall be rugged, durable and shall incorporate latest technological features. The Chassis should be perfectly capable and suitable for mounting water tank of capacity 3000 litres, diesel engine operated water pump and hosepipe and hose reel etc. The chassis shall be light commercial vehicle.

Basic specifications for the vehicle
The Light Commercial vehicle chassis with factory installed Cab should meet the following specification:

- **Engine** **:** Minimum Euro 2 fuel-efficient turbo charged 4 strokes,4/6 cylinders water cooled, direct injection delivering required BHP to pull mounted load.
- **No. of gears** **:** 5 forward and 1 reverse
- **Steering** : Power Steering
- **Suspension** **:** Semi elliptical leaf spring at front and rear with auxiliary springs.
- **Shock absorber** : Hydraulic double acting telescopic type.
- **Wheel Base Maximum**: 3400 mm
- **Payload Minimum** : 5700 kg
- **No. of Wheels** : Front 2, Rear: 2 Spare: 1 (lockable)
- **Cabin** : All steel fully forward driver's cabin having minimum two numbers foam padded seats with seat belts. It should have all standard accessories like two doors, openable side windows, rear view door mirrors, laminated wind screen, three speed windshield wipers, fuel gauge, multiple warning lamps and buzzers for low oil pressure, coolant level etc. Locking arrangement from inside and outside should be provided. The cabin shall be painted with one coat of steel primer and two coats of good quality paint internally and externally, of approved colour and shade.

Electric System for the vehicle:

- Voltage: 12/24 Volts
- Battery capacity: 12/24 Volts, 100 Amps per hour
- Alternator: Minimum 35 Amps
- Head light: 2 with head light protection
- Brake light: 3 Numbers
- Light on tank side: 1 Number
- Turn signal: Front and rear
- Reverse alarm: 1 No.
- Hazard flashers: Rear and cab mounted "Flashing beacons" for use when loading.

Water Tank: Water tank shall be fabricated out of 3.0 mm thick M.S Sheet elliptical in shape of suitable dimension compatible with cabin and chassis to be supplied by the bidder over which the tank is to be mounted. The tank

shall have 3 compartments of equal capacity. Tank shall be provided with air vent pipe of size 50mm and a 450 mm size manhole with hinged coverlid and locking arrangements. Internal partitions shall be made of 3.0 mm thick M.S sheet reinforced by 35x35x5 mm thick angles. The tank shall have dished faces at both the ends. Ladders made of 16 SWG conduit pipe will be provided to have access to manhole and to get into the tank.

Hose Pipe: Hose pipe shall be of good quality rubber hose of reputed make of size equal to diameter of pump delivery and 10 meters long ISI marked suitable for connecting to the delivery of water pump.

Jetting Pump : Single cylinder, Four stroke Diesel engine, Air cooled, Rope start, 5 BHP at 3600 RPM, Model Greaves 5520 with Monoblock Pumpset, Suction /Delivery 50/50 mm. 10 m length of high pressure water hose of minimum 1" internal dia. Engine pumpset shall be properly installed on the tanker subframe at the rear.

Tool Box: Supplier will provide lockable toolbox at the veh

WL, is the quantity of MSW in excess of the cap limit of the quantum of MSW that is permitted to be land filled in accordance with this Clause 5.15.1
R is the rate of penalty
TP is the Tipping Fee Rate in Rupees applicable for the particular period

5.16 Disposal of Certain MSW

5.16.1 As provided in Clause 5.13.2, RMC shall promptly divert from the Project Site and dispose of, at no cost to the Concessionaire and at the Concessionaire's request, all of the Non Conforming Waste to the Assigned Place.

5.17 User Charges

5.17.1 The Concessionaire shall collect user charges from the beneficiaries based on the rates determined by RMC from time to time.

5.18 Maintenance and Certification of Records

5.18.1 The Concessionaire shall maintain records of the quantum (measured in metric tonnes) of MSW and other wastes collected, MSW and other waste processed at Composting Facility and deposited at Landfill, duly countersigned by the TA CUM PMC /Project Engineer and provide monthly, quarterly and annual reports of the same to RMC.

5.19 Training

5.19.1 In the event of Termination or expiry of the Agreement, the Concessionaire shall make best efforts to provide or cause to be provided such training to the employees of RMC as may be required for RMC to continue to operate and maintain the Project Facilities after the Termination /expiry.

5.19.2 The training shall be completed prior to the Hand Back of the Project Facilities and shall be for a period not exceeding 3 (three) months. The training plan shall be mutually agreed between the Parties prior to the commencement of training. The cost for training will be borne by the Concessionaire

5.20 Management Information System

The Concessionaire shall establish a Management Information System (MIS) and install appropriate software to maintain records of the Project operations. MIS shall include details of all the information as specified in Project Information Memorandum.

5.21 Shareholding

The Concessionaire shall ensure that SPV is formed in accordance with terms and conditions set out in RFQ and Applicant /Consortium members hold equity as per the shareholding pattern submitted to RMC at RFQ stage.

5.22 Indemnity by Concessionaire

The Concessionaire shall indemnify and hold harmless RMC, the TA CUM PMC / Project Engineer and their employees from and against all claims, damages, losses and expenses arising out of or resulting from Concessionaire's negligence or breach in execution of the Construction Works and any activity incidental thereto. RMC shall indemnify Concessionaire for towards expenses incurred for its inability to provide timely data and information available with RMC.

5.23 General Obligations

The Concessionaire shall at its own cost and expense:

(a) investigate, study, design, construct, operate and maintain the Project Facility in accordance with the provisions hereof;

(b) obtain all Applicable Permits as required by or under the Applicable Law and be in compliance thereof at all times during the Concession Period;

(c) comply with Applicable Law governing the operations of the Project Facility, as the case may be, at all times during the Concession Period;

(d) ensure and procure that each Project Agreement contains provisions that would entitle RMC or a nominee of RMC to step into the same at RMC's discretion, in place and substitution of the Concessionaire, pursuant to the provisions of this Agreement ;

(e) procure and maintain in full force and effect, as necessary, appropriate proprietary rights, licenses, agreements and permissions for materials, methods, processes and systems used in or incorporated into the Project ;

(f) appoint, supervise, monitor and control as necessary, the activities of Contractors under the respective Project Agreements;

(g) make efforts to maintain harmony and good industrial relations among the personnel employed in connection with the performance of its obligations under this Agreement and shall be solely responsible for compliance with all labour laws and solely liable for all possible claims and employment related liabilities of its staff employed in relation with the Project and hereby indemnifies RMC against any claims, damages, expenses or losses in this regard and that in no case and shall for no purpose shall RMC be treated as employer in this regard;

(h) make its own arrangements for construction materials and observe and fulfil the environmental and other requirements under the Applicable Law and Applicable Permits;

(i) be responsible for all the health, security, environment and safety aspects of the Project Site/ Project Facility, as the case may be, at all times during the Concession Period;

(j) ensure that the Project Site remains free from all encroachments and take all steps necessary to remove encroachments, if any;

(k) upon receipt of a request thereof, afford access to the Project Facility to the authorised representatives of RMC for the purpose of ascertaining compliance with the terms, covenants and

conditions of this Agreement and to any Government Agency having jurisdiction over the Project, including those concerned with safety, security or environmental protection to inspect the Project Facility and to investigate any matter within their authority and upon reasonable notice, the Concessionaire shall provide to such persons assistance reasonably required to carry out their respective duties and functions.

(l) pay all taxes, duties and outgoings, including utility charges relating to the Project Facility, as applicable throughout the Concession Period.

(m) make its own arrangements for the engagement of the employees and labour engaged for execution of the Construction Work.

(n) keep on the Project Site two complete sets of this Agreement, Construction Documents, approvals given by the RMC/ TA CUM PMC / Project Engineer and any other communication given or issued under provisions hereof for inspection, verification and use by the RMC/ TA CUM PMC / Project Engineer or any authority authorised by law to inspect the same or any of them.

(o) provide and maintain all necessary accommodation and welfare facilities for its staff and labour. The Concessionaire shall not permit any of its employees to maintain any temporary or permanent living quarters within the structure forming a part of the Construction Works.

(p) take precautions to ensure the health and safety of its staff and labour.

(q) employ adequate number of appropriately qualified, skilled and experienced persons in order to execute the Construction Works. The TA CUM PMC / Project Engineer may require the Concessionaire to remove any person employed on the Project Site or Construction Works, who in the opinion of the TA CUM PMC / Project Engineer :

i. persists in any misconduct,
ii. is incompetent or negligent in the performance of his duties,
iii. fails to conform with any provisions of the Agreement, or
iv. persists in any conduct which is prejudicial to safety, health, or the protection of the environment

The Concessionaire shall in such cases appoint suitable replacement/s.

(r) take reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst its staff and labour and to preserve peace and protection of persons and property in the neighbourhood of the Construction Works against such conduct.

5.24 No Breach of Obligations

The Concessionaire shall not be considered to be in breach of its obligations under this Agreement nor shall it incur or suffer any liability if and to the extent performance of any of its obligations under this Agreement is affected by or on account of any of the following:

(i) Force Majeure Event, subject to Clause 8.3;
(ii) RMC Event of Default;

(iii) Compliance with the instructions of the Transaction Advisor Cum Project Management Consultant /RMC or the directions of any Government Agency other than instructions issued as a consequence of a breach by the Concessionaire of any of its obligations hereunder;
(iv) Closure of the Project Facility or part thereof with the approval of RMC.

5.25 Access and Assured Availability of the Project Facilities

The Concessionaire shall, at all times during the Concession Period, allow access to and usage of Project Facilities to RMC / Person nominated by RMC.

5.26 Expenses Towards Statutory Deposits and Charges

The Concessionaire shall reimburse to RMC, service charges towards connection of utilities to the Project Facility in the Project Site, other taxes such as property tax, water tax and sewerage charges for the Project Site.

5.27 Erection of Sign Board

(a) The Concessionaire shall erect a signboard, of a size not less than 2 ft. by 4 ft, adjacent to the main entrance to the Project Site in an manner such that it is ordinarily visible to any person using such entrance. The signboard shall prominently display the following text in black upper case letters on a white/yellow background:

"This property belongs to the Ranchi Municipal Corporation, Government of Jharkhand and has been handed over to _____ (name of the Concessionaire) for build, operate and transfer Integrated Solid Waste Management system from _____ (Insert the in Appointed Date) to _____ (Insert the Expiry Date)".

(b) The Concessionaire shall ensure that the signboard is maintained in good condition throughout the Concession Period.

RMC's Obligations	ARTICLE 6

In addition to and not in derogation or substitution of any of its other obligations under this Agreement, RMC shall have the following obligations :

6.1 Specific Obligations

(a) RMC shall handover the possession of the Project Site to the Concessionaire in accordance with the Agreement;

(b) Prior to handover of the Project Site to the Concessionaire, RMC shall remove all encroachments from the Project Site;

(c) RMC shall pay Tipping Fee as per the provisions of the Agreement.

(d) In the event of shifting of transfer station due to urban development issues, RMC shall pay the cost of shifting operations, as certified by the Project Engineer.

(e) The Capital Support quoted by the Concessionaire as part of its Financial Proposal in the RFP Document shall be disbursed to the Concessionaire in the manner set out in Schedule 2 on achievement of respective Project Milestones following JnNURM guidelines.

Provided that the Capital Support shall be released only when the Concessionaire submits to RMC, respective bill ('Invoice') for the actual value of the Works executed and Project Assets procured. The Invoice shall be duly certified by the TA CUM PMC certifying therein that the works have been carried out as per the Construction Requirements.

(f) RMC shall pay Tipping Fees to the Concessionaire in accordance with clause 7.2.

(g) RMC shall grant in a timely manner all such approvals, permissions and authorizations which the Concessionaire may require or is obliged to seek from RMC under this Agreement, in connection with implementation of the Project and the performance of its obligations.

(h) Provided where authorization for availment of utilities such as power, water, sewerage, telecommunications or any other incidental services/ utilities is required, the same shall be provided by RMC, within 15 days from receipt of request from the Concessionaire to make available such authorization.

6.2 General Obligations
RMC shall:

(a) upon written request from the Concessionaire, assist the Concessionaire in obtaining access to all necessary infrastructure facilities and utilities, including water, electricity and telecommunication facilities at rates and on terms no less favorable to the Concessionaire than those generally available to commercial customers receiving substantially equivalent facilities/utilities;

(b) assist the Concessionaire in obtaining police assistance, upon payment of prescribed costs and charges, if any, for traffic regulation, patrolling and provision of security on the Project Site/ Project Facility and implementing this Agreement in accordance with the provisions hereof;

(c) observe and comply with all its obligations set forth in this Agreement.

6.3 Monitoring and Assessment

(a) RMC, in consultation with Government of Jharkhand, shall set up a program monitoring mechanism including an Expert Committee comprising of domain experts from government, RMC, public to periodically monitor the project deliverables.

(b) The expert committee would be chaired by Principal Secretary, Urban Development or his nominee, CEO RMC, Government of Jharkhand

(c) The other members of the expert committee would be as under:

i. Representative of RMC not below the rank of*******
ii. Municipal Health Officer
iii. Representative from public group

(d) Since the outputs in terms of overall cleanness in the city, frequency of collection and transportation of MSW, treatment of MSW and disposal of MSW in accordance with MSW Rules are the prime deliverables of the entire project, the expert committee would evaluate the efforts and outputs of these activities by the concessionaire.

(e) The expert committee shall submit its report to the government regarding the achievement of projects deliverables with specific recommendation(s) on continuance/discontinuance/restructuring of the project. The findings of the expert committee would be considered to be final and binding.

(f) If the project deliverables are found to be moderate or low, the expert committee would direct RMC to plan corrective action(s) with the concessionaire and implement the same to achieve desired output in thirty (30) days.

(g) The expert committee shall evaluate project deliverables on a three monthly basis based on visit to the facility, review of auditors' reports, reports provided by concessionaire, information received from general public including project stakeholders etc.

(h) The Expert Committee shall monitor the performance of the Concessionaire based on the requirements laid down in Project Information Memorandum and *Handbook on Service Level Benchmarking*, published by Ministry of Urban Development, Government of India (available on www.urbanindia.nic.in) or any amendments from time to time.

RMC shall facilitate the expert committee in information gathering, conducting facility visit, meetings, interviews etc.

Capital Grant and Tipping Fees	ARTICLE 7

7.1 Capital Grant

(a) Subject to the provisions of this Agreement and in consideration of the Concessionaire accepting the Concession and undertaking to perform and discharge its obligations in accordance with the terms, conditions and covenants set forth in this Agreement, RMC agrees and undertakes to pay to Concessionaire, the Capital Grant quoted by the Concessionaire in the RFP Document as part of its Financial Proposal or the negotiated amount at the time of selection, whichever is less, in accordance with the Project Milestones set out in Schedule 2.

(b) The Capital Grant would be paid to the Concessionaire after receiving the utilization certificate duly approved by the RMC and as per JNNURM process of payment.

(c) Capital grant shall not be made available for i) Compost Plant, and ii) Brick making Plant. (iii) Contingencies.

(d) The grants will be released on reimbursement basis (no mobilization advance will be provided) as per the milestones decided on mutual agreement at Concession Agreement stage.

7.2 Tipping Fees

7.2.1 Subject to the provisions of this Agreement and in consideration of the Concessionaire accepting the Concession and undertaking to perform and discharge its obligations in accordance with the terms, conditions and covenants set forth in this Agreement, RMC agrees and undertakes to pay to Concessionaire, the Tipping Fee quoted by the Concessionaire in the RFP Document and as part of its Financial Proposal in accordance with Schedule 2 and Clause 7.2.2 below.

7.2.2 Payment by RMC to Concessionaire shall be:

Tipping Fee = {TP*(WS-NCW-RW)} + (Adjustments as per Clause 5.10.4, 5.14.3 and 5.15.1)
Where,
TP is the Tipping Fee Rate per tonne as applicable for the concerned month
WS is the quantity of Waste Collected in tones in that month
NCW is the quantity of Non Conforming Waste rejected by the Concessionaire (in excess of 10 (ten) percent of total MSW supplied) in that month,
Non Conforming Waste includes: i. Industrial Waste ii. Radio Active waste iii. Bio medical waste iv Effluents requiring treatment
RW is the quantity of waste other than Non Conforming Waste rejected by Transaction Advisor Cum Project Management Consultant / Project Engineer in that month

For eg. If RMC or its nominee receives 12% of non conforming waste then Tipping fee will be estimated as Tipping fee = {TP*(WS-2% of NCW -RW)}

7.3 Mechanism of Payment

7.3.1 RMC shall, within 15 days from the date of receipt of the Tipping Fee Statement, Pay to the concessionaire, Tipping Fee quoted by the Concessionaire in the RFP Document as part of its Financial Proposal and in accordance with Schedule 2 and as stated in the Tipping Fee Statement,

7.3.2 The Tipping Fee Statement shall be verified and approved by the TA CUM PMC/ Project Engineer before it is being sent to RMC.

7.3.3 RMC shall before releasing the payment to the Concessionaire, deduct applicable taxes based on Applicable Laws.

7.3.4 Any delay in making any payment in accordance with the Tipping Fee Statement shall, without prejudice to any other consequences under this Agreement, entail payment of interest on the amount on tipping fees shall be 3% plus SBI PLR per annum calculated for the duration of delay.

7.3.5 All payments to the Concessionaire shall be made by way of cheque. All payments to RMC shall be made by way of demand draft in favour of Chief Executive Officer, Ranchi Municipal Corporation payable at Ranchi.

7.4 Advertisement / Hoarding Charges

The Concessionaire shall have the right to permit/ allow and charge for advertisement/ hoarding in the Project Facility as per Applicable Laws, provided no such activity shall affect the safe and smooth flow of Project operations or cause any physical damage to the Project Facility.

7.5 Change of Scope

RMC may, notwithstanding anything to the contrary contained in this Agreement, require provision of such addition/ deletion to the works and services in the Project Facility which are beyond the scope of the Project as contemplated by this Agreement ("Change of Scope"), provided such changes do not adversely affect the COD. All such changes shall be made by RMC by an order (the "Change of Scope Order") issued in accordance with the procedure set forth in this Clause.

7.5.1 **Procedure for Change of Scope**

(a) RMC shall whenever it desires provision of addition/ deletion of items of work and services referred to in Clause 7.7 above, issue to the Concessionaire a notice of change of scope (the "Change of Scope Notice").

(b) Upon receipt of such Change of Scope Notice, the Concessionaire shall within 15 days provide to RMC and the TA CUM PMC 0/ Project Engineer such information as is necessary and reasonable together with preliminary documentation in support of the following:

i. the impact, if any, which the Change of Scope is likely to have on the SPCD if the work is required to be carried out before COD, and

ii. the cost to the Concessionaire of complying with such Change of Scope Notice (including, without limitation, material and labor cost information furnished in accordance with the current schedule of rates applicable to the works assigned by RMC to its contractors, including the premium on such rates), the options suggested for implementing the proposed Change of Scope and the effect, if any, each such option would have on the costs and time for the implementation thereof including a detailed breakdown by work classifications.

Provided, however, that the cost of providing such information shall be reimbursed to the Concessionaire by RMC to the extent such costs are certified to be reasonable by the TA CUM PMC / Project Engineer .

(c) If RMC desires, after receipt of information set forth in sub-clause (b) to proceed with the Change of Scope, it shall convey the desired option (with or without modification) to the Concessionaire by issuing a Change of Scope Order within 30 days from the date of recommendation made by TA CUM PMC / Project Engineer and thereupon the Parties shall make good faith efforts to mutually agree upon the costs and time for implementing of the same. Upon reaching an agreement relating to such costs and time, RMC shall issue a written confirmation of the Change of Scope and thereupon the Concessionaire shall proceed with performance of such order. In the event, the Parties are unable to agree, RMC may, by issuing a confirmation in writing of such Change of Scope Order, require the Concessionaire to proceed with the performance of the Change in Scope Order pending resolution of such dispute.

7.5.2 A Change of Scope Order will be effective and binding upon issuance of a confirmation of such Change of Scope Order by RMC. Notwithstanding a dispute regarding cost and time for implementation of such Change of Scope Order, the Concessionaire shall proceed with the performance of such Change of Scope Order promptly following RMC's confirmation pursuant to Clause 7.7.1(c). Pending resolution of such dispute, RMC shall pay to the Concessionaire, if the Change of Scope Order involves increase in bill of quantities an amount equal to the costs that are certified by the Transaction Advisor Cum Project Management Consultant/ Project Engineer.

7.5.3 All claims by the Concessionaire pursuant to this Clause 7.7 shall be supported by such documentation as is reasonably sufficient for RMC/ TA CUM PMC / Project Engineer to determine the accuracy thereof, including invoices from Contractors and certification of such claims by the Statutory Auditors.

7.5.4 RMC has the right to ask for review of Tipping Fees in case of Change of Scope for the balance concession period.

Force Majeure and Change In Law	ARTICLE 8

8.1 Force Majeure Event

Any of the following events which is beyond the control of the Party claiming to be affected thereby ("Affected Party") and which the Affected Party has been unable to overcome or prevent despite exercise of due care and diligence, and prevents the Affected Party from performing or discharging its obligations under this Agreement, shall constitute Force Majeure Event

(a) earthquake, flood, inundation and landslide

(b) storm, tempest, hurricane, cyclone, lightning, thunder or other extreme atmospheric disturbances

(c) fire caused by reasons not attributable to the Concessionaire or any of the employees, Contractors or agents appointed by the Concessionaire for purposes of the Project;

(d) acts of terrorism;

(e) strikes, labour disruptions or any other industrial disturbances not arising on account of the acts or omissions of the Concessionaire or the Contractor;

(f) action of a Government Agency having Material Adverse Effect including but not limited to

(i) acts of expropriation, compulsory acquisition or takeover by any Government Agency of the Project Facility or any part thereof or of the Concessionaire's or the Contractor's rights in Contractor's rights under any of the Project Agreements.

(ii) any judgment or order of a court of competent jurisdiction or statutory authority in India made against the Concessionaire or the Contractor in any proceedings which is non-collusive and duly prosecuted by the Concessionaire, and

(iii) any unlawful, unauthorised or without jurisdiction refusal to issue or to renew or the revocation of any Applicable Permits, in each case, for reasons other than Concessionaire's or the Contractor's breach or failure in complying with the Project Requirements, Applicable Laws, Applicable Permits, any judgment or order of a Governmental Agency or of any contract by which the Concessionaire or the Contractor as the case may be is bound.

(g) early determination of this Agreement by RMC for reasons of national emergency, national security or the national interest.

(h) any failure or delay of a Contractor caused by any of the events mentioned in (f) and

(g) above, for which no offsetting compensation is payable to the Concessionaire by or on behalf of the Contractor.

(i) war, hostilities (whether declared or not), invasion, act of foreign enemy, rebellion, riots, weapon conflict or military actions, civil war, ionising radiation, contamination by radioactivity from

nuclear fuel, any nuclear waste, radioactive toxic explosion, volcanic eruptions, any failure or delay of a Contractor caused by the events mentioned in this sub-clause for which no offsetting compensation is payable to the Concessionaire by or on behalf of the Contractor.

8.2 Obligations of the Parties

(a) As soon as practicable and in any case within 10(Ten) days of the date of occurrence of a Force Majeure Event or the date of knowledge thereof, the Affected Party shall notify the Transaction Advisor Cum Project Management Consultant / Project Engineer and the other Party of the same setting out, inter alia, the following in reasonable detail:

(i) the nature and extent of the Force Majeure Event;

(ii) the estimated duration of the Force Majeure Event;

(iii) the nature of and the extent to which, performance of any of its obligations under this Agreement is affected by the Force Majeure Event;

(iv) the measures which the Affected Party has taken or proposes to take to alleviate/mitigate the impact of the Force Majeure Event and to resume performance of such of its obligations affected thereby; and

(v) any other relevant information concerning the Force Majeure Event, and /or the rights and obligations of the Parties under this Agreement.

(b) As soon as practicable and in any case within five (5) days of notification by the Affected Party in accordance with the preceding Clause 8.2 (a), the Parties along with the Transaction Advisor Cum Project Management Consultant/ Project Engineer , shall meet and hold discussions in good faith and where necessary conduct physical inspection/survey of the Project Facility in order to:

(i) assess the impact of the underlying Force Majeure Event,

(ii) to determine the likely duration of Force Majeure Event and,

(iii) to formulate damage mitigation measures and steps to be undertaken by the Parties for resumption of obligations, the performance of which shall have been affected by the underlying Force Majeure Event.

(c) The Affected Party shall during the duration of Force Majeure event provide to the other Party with regular (not less than fortnightly) reports concerning the matters set out in the preceding clause (b) as also any information, details or document, which the Parties may reasonably require.

8.3 Performance of Obligations

If the Affected Party is rendered wholly or partially unable to perform any of its obligations under this Agreement because of a Force Majeure Event, it shall be excused from performance of such obligations to the extent it is unable to perform the same on account of such Force Majeure Event provided that:

(a) due notice of the Force Majeure Event has been given as required by the preceding Clause 8.2;

(b) the excuse from performance shall be of no greater scope and of no longer duration than is necessitated by the Force Majeure Event;

(c) the Affected Party has taken all reasonable efforts to avoid, prevent, mitigate and limit damage, if any, caused or is likely to be caused to the Project Facility as a result of the Force Majeure Event and to restore the Project Facility , in accordance with the Good Industry Practice and its relative obligations under this Agreement;

(d) when the Affected Party is able to resume performance of its obligations under this Agreement, it shall give to the other Party and the TA CUM PMC written notice to that effect and shall promptly resume performance of its obligations hereunder, the non issue of such notice being no excuse for any delay for resuming such performance;

(e) the Affected Party shall continue to perform such of its obligations which are not affected by the Force Majeure Event and which are capable of being performed in accordance with this Agreement;

(f) any insurance proceeds received shall, subject to the provisions of Financing Documents, be entirely applied to repair, replace or re-instate the assets damaged on account of the Force Majeure Event, or in accordance with Good Industry Practice.

8.4 Termination due to Force Majeure Event
(a) **Termination**

(i) If a Force Majeure Event, is an event described under Clauses 8.1(a) to 8.1(e) and 8.1(i), continues or is in the reasonable judgement of the Parties likely to continue beyond a period of 120 days, the Parties may mutually decide to terminate this Agreement or continue this Agreement on mutually agreed revised terms. If the Parties are unable to reach an agreement in this regard, the Affected Party shall after the expiry of the said period of 120 days, be entitled to terminate this Agreement.

(ii) If the Force Majeure Event is an event described in 8.1 (f), 8.1 (g) or 8.1 (h) and the Concessionaire having exhausted the remedies available to him under the Applicable Laws, has been unable to secure the remedy, the Concessionaire shall be entitled to terminate this Agreement.

Provided that the Parties may by mutual agreement, decide to continue this Agreement on revised terms or to terminate this Agreement, if the event described in 8.1 (f), 8.1 (g) or 8.1 (h) subsists or is likely to subsist for a period exceeding 180 days, then either Party shall be entitled to terminate this Agreement.

Provided further, RMC may at its sole discretion have the option to terminate this Agreement any time after the occurrence of any event described under Clauses 8.1(f), 8.1(g) or 8.1(h).

(b) **Termination Notice**
If either Party, having become entitled to do so, decides to terminate this Agreement pursuant to the preceding clause 8.4(a) (i) or (a) (ii), it shall issue Termination Notice setting out ;

(i) in sufficient detail the underlying Force Majeure Event;

(ii) the Termination Date which shall be a date occurring not earlier than 60 days from the date of Termination Notice;

(iii) the estimated Termination Payment including the details of computation thereof and;

(iv) any other relevant information.

(c) **Obligation of Parties**

Following issue of Termination Notice by either Party, the Parties shall promptly take all such steps as may be necessary or required to ensure that;

(i) the Termination Payment, if any, payable by RMC in accordance with the following clause is paid to the Concessionaire on the Termination Date and

(ii) the Project Facility are handed back to RMC by the Concessionaire on the Termination Date free from all Encumbrance.

(d) **Termination Payment**

Upon Termination of this Agreement due to a Force Majeure Event, Termination Payment shall be made to the Concessionaire by RMC in accordance with the following:

(i) If Termination is due to a Force Majeure Event, described under Clauses 8.1(a) to 8.1(e), no Termination Payment shall be made by RMC to the Concessionaire but, the Concessionaire shall be entitled to receive and appropriate the proceeds of any amounts under insurance policies.

(ii) If Termination is due to the occurrence of any event described under Clauses 8.1(f) or 8.1(g) or 8.1(h), RMC shall not pay any amount to the Concessionaire.

Provided that the Concessionaire shall pay any amount due to and recoverable by RMC from the Concessionaire as on the Termination Date.

(iii) If Termination is due to the occurrence of any event described under Clause 8.1(i), RMC shall, RMC shall not pay any amount to the Concessionaire.

Provided that the Concessionaire shall pay any amount due to and recoverable by RMC from the Concessionaire as on the Termination Date.

8.5 Liability for other losses, damages etc.
Save and except as expressly provided in this Article, neither Party hereto shall be liable in any manner whatsoever to the other Party in respect of any loss, damage, cost, expense, claims,

demands and proceedings relating to or arising out of occurrence or existence of any Force Majeure Event.

8.6 Changes in Law

(a) Change in Law shall mean the occurrence or coming into force of any of the following, after the Appointed Date:

(i) the enactment of any new Indian law;
(ii) the repeal, modification or re-enactment of any existing Indian law;
(iii) a change in the interpretation or application of any Indian law by a court of record.

Provided that Change in Law shall not include:

(i) coming into effect, after the Appointed Date, of any provision or statute which is already in place as of the Appointed Date,

(ii) any new law or any change in the existing law under the active consideration of or in the contemplation of any government as of the Appointed Date which is a matter of public knowledge,

(iii) any change in the rates of the Central Taxes.

(b) Subject to Change in Law resulting in Material Adverse Effect and subject to the Concessionaire taking necessary measures to mitigate the impact or likely impact of Change in Law on the Project, if as a consequence of a Change in Law, the Concessionaire is obliged to incur additional costs, RMC shall subsequently reimburse to the Concessionaire 100% (hundred percent) of such Additional Costs, provided such additional cost is not less than INR 5,00,000 (Rupees Five Lakhs).

(c) Upon occurrence of a Change in Law, the Concessionaire may, notify RMC of the following:

(i) the nature and the impact of Change in Law on the Project

(ii) in sufficient detail, the estimate of the Additional Cost likely to be incurred by the Concessionaire on account of Change in Law
(iii) the measures, which the Concessionaire has taken or proposes to take to mitigate the impact of Change in Law, including in particular, minimizing the Additional Cost

Events of Default and Termination	ARTICLE 9

9.1 Events of Default

Event of Default shall mean either Concessionaire Event of Default or RMC Event of Default or both as the context may admit or require.

(a) **Concessionaire Event of Default**

Any of the following events shall constitute an Event of Default by the Concessionaire ("Concessionaire Event of Default") unless such event has occurred as a result of one or more reasons set out in Clause 5.25:

(i) The Concessionaire has failed to adhere to the Construction Requirements and such failure, in the reasonable estimation of the TA CUM PMC, is likely to delay achievement of COD beyond 90 days of the SPCD or the extended SPCD as may be applicable;

(ii) The Concessionaire has failed to achieve COD within 90 days of the SPCD or extended SPCD for only reasons attributable to concessionaire, for any reason whatsoever;

(iii) At any time during the Concession Period, the Concessionaire fails to adhere to the Construction Requirements or O&M Requirements and has failed to remedy the same within 60 days of the receipt of notice from RMC;

(iv) The Concessionaire has failed to make any payments due to RMC and more than 120 days have elapsed since such payment became due;

(v) The Concessionaire has collected user charges in excess of the rates prescribed

(vi) The Concessionaire has failed to collect the Minimum Assured Quantity of MSW in accordance with Clause 5.10 for a continuous period of 5 (five) days or an aggregate period of 7 (seven) days in any Month;

(vii) If the difference between the quantum of MSW collected by the Concessionaire as certified by the TA CUM PMC / Project Engineer and the Minimum Assured Quantity quantum of MSW waste to be collected is less than 10% for three (3) continuous months.

(viii) At any time during the Operations Period the Concessionaire has failed to carry out Processing of at least 50% (fifty percent) of the aggregate waste collected for any month in accordance with Clause 5.14.2 for a continuous period of three (3) months or an aggregate period of 8 (eight) months during the Concession Period.

(ix) The Concessionaire is in Material Breach of any of its obligations under this Agreement and the same has not been remedied for more than 60 days ;

(x) Any representation made or warranty given by the Concessionaire at the time of submission of RFQ, RFP and under this Agreement is found to be false or misleading;

(xi) A resolution has been passed by the shareholders of the Concessionaire for voluntary winding up/ dissolution of the Concessionaire;

(xii) Any petition for winding up of the Concessionaire has been admitted and liquidator or provisional liquidator has been appointed or the Concessionaire has been ordered to be wound up by Court of competent jurisdiction, except for the purpose of amalgamation or reconstruction with the prior consent of RMC, provided that, as part of such amalgamation or reconstruction and the amalgamated or reconstructed entity has unconditionally assumed all surviving obligations of the Concessionaire under this Agreement;

(xiii) A default has occurred under any of the Financing Documents and any of the Lenders has recalled its financial assistance and demanded payment of the amounts outstanding under the Financing Documents or any of them as applicable;

(xiv) The Concessionaire has abandoned the Project Facility ;

(xv) The Concessionaire has repudiated this Agreement or has otherwise expressed an intention not to be bound by this Agreement;

(xvi) The Concessionaire has suffered an attachment levied on any of its assets which has caused or is likely to cause a Material Adverse Affect on the Project and such attachment has continued for a period exceeding 90 days

(xvii) The Concessionaire has failed to perform/ discharge its obligations under Clause 5.26 of this Agreement for a continuous period of 24 hours.

(xviii) The Consortium formed for the purpose of the Project is changed by the Concessionaire without the consent of RMC.

(b) **RMC Event of Default**

Any of the following events shall constitute an event of default by RMC ("RMC Event of Default"), when not caused by a Concessionaire Event of Default or a Force Majeure Event:

(i) RMC has failed to provide land at the Site to the Concessionaire as per the provisions of Clause 3;

(ii) RMC has failed to make Capital Grant, Tipping Fees or any payments due to the Concessionaire and more than 3 (three) months have elapsed since such default;

(iii) RMC is in Material Breach of any of its obligations under this Agreement and has failed to cure such breach within 60 days of receipt of notice thereof issued by the Concessionaire;

(iv) RMC having executed the same is in breach of any of its obligations there under and such breach has not been cured within 30 days from the date of written notice thereof given by the Concessionaire

(v) RMC has repudiated this Agreement or otherwise expressed its intention not to be bound by this Agreement;

(vi) RMC has unreasonably withheld or delayed grant of any approval or permission which the Concessionaire is obliged to seek under this Agreement, and thereby caused or likely to cause Material Adverse Effect;

(vii) Any governmental action not arising out of a breach, default or lapse on the part of the Concessionaire, whereby the Concession/ this Agreement becomes inoperable or takeover by any government agency of the Project/ Project Facilities or any part thereof, thereby causing Material Adverse Effect.

(viii) Any representation made or warranties given by the RMC under this Agreement has been found to be false or misleading.

9.2 Termination due to Event of Default

(a) Termination for Concessionaire Event of Default

(i) Without prejudice to any other right or remedy which RMC may have in respect thereof under this Agreement, upon the occurrence of a Concessionaire Event of Default, RMC shall subject to the provisions of the Lenders' Step-in Rights as per Clause 9.5, be entitled to terminate this Agreement in the manner as set out under Clause 9.2(a)(ii) and Clause 9.2(a)(iii).

Provided however that upon the occurrence of a Concessionaire Event of Default as specified under Clause 9.1(a)(xiv), RMC may immediately terminate this Agreement by issue of Termination Notice in the manner set out under Clause 9.2(c).

(ii) If RMC decides to terminate this Agreement pursuant to preceding clause (i), it shall in the first instance issue Preliminary Notice to the Concessionaire. Within 30 days of receipt of the Preliminary Notice, the Concessionaire shall submit to RMC in sufficient detail, the manner in which it proposes to cure the underlying Event of Default (the "Concessionaire's Proposal to Rectify"). In case of non-submission of the Concessionaire's Proposal to Rectify within the said period of 30 days, RMC shall be entitled to terminate this Agreement by issuing Termination Notice, and to appropriate the Performance Security, if subsisting.

(iii) If the Concessionaire's Proposal to Rectify is submitted within the period stipulated therefore, the Concessionaire shall have further period of 30 days ("Cure Period") to remedy/ cure the underlying Event of Default. If, however the Concessionaire fails to remedy/ cure the underlying Event of Default within such further period allowed, RMC shall be entitled to terminate this Agreement, by issue of Termination Notice and to appropriate Performance Security, if subsisting.

(b) Termination for RMC Event of Default

(i) Without prejudice to any other right or remedy which the Concessionaire may have in respect thereof under this Agreement, upon the occurrence of RMC Event of Default, the Concessionaire shall be entitled to terminate this Agreement by issuing Termination Notice.

(ii) If the Concessionaire decides to terminate this Agreement pursuant to preceding clause (i) it shall in the first instance issue Preliminary Notice to RMC. Within 30 days of receipt of Preliminary Notice, RMC shall forward to the Concessionaire its proposal to remedy/ cure the underlying Event of Default (the "RMC Proposal to Rectify"). In case of non submission of RMC Proposal to rectify within the period stipulated therefore, Concessionaire shall be entitled to terminate this Agreement by issuing Termination Notice.

(iii) If RMC Proposal to Rectify is forwarded to the Concessionaire within the period stipulated therefore, RMC shall have further period of 30 days to remedy/ cure the underlying Event of Default. If, however RMC fails to remedy/ cure the underlying Event of Default within such further period allowed, the Concessionaire shall be entitled to terminate this Agreement by issuing Termination Notice.

(c) Termination Notice

If a Party having become entitled to do so decides to terminate this Agreement pursuant to the preceding sub clause (a) or (b), it shall issue Termination Notice setting out:

(i) in sufficient detail the underlying Event of Default;

(ii) the Termination Date which shall be a date occurring not earlier than 30 days from the date of Termination Notice;

(iii) the estimated termination payment including the details of computation thereof; and,

(iv) any other relevant information.

(d) Obligation of Parties

Following issue of Termination Notice by either Party, the Parties shall promptly take all such steps as may be necessary or required to ensure that:

(i) until Termination the Parties shall, to the fullest extent possible, discharge their respective obligations so as to maintain the continued operation of the Project Facility,

(ii) the termination payment, if any, payable by RMC in accordance with the following Clause (f) is paid to the Concessionaire on the Termination Date and

(iii) the Project Facility is handed back to RMC by the Concessionaire on the Termination Date free from any Encumbrance along with any payment that may be due by the Concessionaire to RMC.

(e) Withdrawal of Termination Notice

Notwithstanding anything inconsistent contained in this Agreement, if the Party who has been served with the Termination Notice cures the underlying Event of Default to the satisfaction of the other Party at any time before the Termination occurs, the Termination Notice shall be withdrawn by the Party which had issued the same. Provided that the Party in breach shall compensate the other Party for any direct costs/ consequences occasioned by the Event of Default which caused the issue of Termination Notice.

(f) Termination Payments on account of RMC Event of Default

Upon Termination of this Agreement on account of RMC Event of Default, the Concessionaire shall be entitled to withdraw the Performance Security, if subsisting, and receive from RMC, termination payment as per following:

i. If the Termination is prior to achievement of COD then the Termination Payment from RMC shall be equal to the amount, as estimated by the TA CUM PMC , which has already been spent by the Concessionaire for construction / up-gradation of Project Facilities and has not been paid for by RMC as per the Project Milestone based disbursement schedule.

ii. If the Termination is after achievement of COD then the Termination Payment from RMC shall be equal to Tipping Fee payable by RMC to the Concessionaire for next 3 (three) months assuming …….MT of MSW per day.

(g) Termination Payments on account of Concessionaire Event of Default
Upon Termination of this Agreement on account of Concessionaire Event of Default, Concessionaire shall not be entitled to receive any Termination Payment from RMC. Upon Termination of this Agreement on account of Concessionaire Event of Default, RMC shall be entitled to forfeit the Performance Security.

9.3 Rights of RMC on Termination

(a) Upon Termination of this Agreement for any reason whatsoever, RMC shall upon making the Termination Payment, if any, to the Concessionaire have the power and authority to:

(i) enter upon and take possession and control of the Project Site / Project Facility forthwith;

(ii) prohibit the Concessionaire and any person claiming through or under the Concessionaire from entering upon/ dealing with the Project Site /Project Facility;

(b) Notwithstanding anything contained in this Agreement, RMC shall not, as a consequence of Termination or otherwise, have any obligation whatsoever including but not limited to obligations as to compensation for loss of employment, continuance or regularization of employment, absorption or re-employment on any ground, in relation to any person in the employment of or engaged by the Concessionaire in connection with the Project, and the handback of the Project Facility by the Concessionaire to RMC shall be free from any such obligation.

9.4 Accrued Rights of Parties

Notwithstanding anything to the contrary contained in this Agreement, Termination pursuant to any of the provisions of this Agreement shall be without prejudice to accrued rights of either Party including its right to claim and recover money damages and other rights and remedies which it may have in law or contract. The rights and obligations of either Party under this Agreement, including without limitation those relating to the Termination Payment, shall survive the Termination but only to the extent such survival is necessary for giving effect to such rights and obligations.

9.5 Lenders' Step-in Rights

Notwithstanding anything to the contrary contained in this Agreement, the Parties hereby agree that lenders do not have any Step-in Rightson the Project Assets, Project Facilities, Project , Project Sites , Project Vehicles/ Equipments and other assets created under this agreement

Handback Requirements	ARTICLE 10

10.1 Ownership
Without prejudice and subject to the Concession, the ownership of the Project Site, and the Project Facility, including all improvements made therein by the Concessionaire, shall at all times remain that of RMC.

10.2 Obligations of Parties
(a) **Concessionaire's Obligations**

i. The Concessionaire shall on the date of expiry of the Concession Period, hand back vacant and peaceful possession of the Project Site and Project Facility to RMC free of cost and in good operable condition.

ii. Atleast 12 months before the expected expiry of the Concession Period a joint inspection of the Project Site and Project Facility shall be undertaken by RMC, Concessionaire and TA CUM PMC . RMC and TA CUM PMC shall, within 45 days of such inspection prepare and furnish to the Concessionaire a list of works/ jobs ("Project Facility Handback Requirements"), if any, to be carried out so as to conform to the Construction Requirements and O&M Requirements. The Concessionaire shall promptly undertake and complete such works/jobs at least 3 months prior to the expected expiry of the Concession Period and ensure that the Project Facility continues to meet such requirements until the same are handed back to RMC.

iii. RMC/ TA CUM PMC shall, within 15 days of the joint inspection undertaken under preceding clause (ii) prepare and furnish to the Concessionaire a list of items, if any, with corresponding distinctive descriptions, which are to be compulsorily handed back to RMC along with the Project Facility.

iv. The Concessionaire hereby acknowledges RMC's rights specified in Clause 9.3 enforceable against it upon Termination and its corresponding obligations arising there from. The Concessionaire undertakes to comply with and discharge promptly all such obligations.

v. At least 24 months prior to the expiry of the Concession Period, the Concessionaire shall, for due performance of its obligations relating to handback of the Project Facility, submit to RMC a bank guarantee, in the form as set forth in Schedule 9 ("Handback Guarantee"), from a bank acceptable to RMC. The Handback Guarantee shall be kept valid for a period of 30 months for an amount to be decided by RMC/Project Engineer.

10.3 RMC's Obligations
RMC shall, subject to RMC's right to deduct amounts towards :

(i) carrying out works/jobs listed under Clause 10.2(a)(ii), which have not been carried out by the Concessionaire,

(ii) purchase of items, which have not been handed back to RMC along with the Project Facility in terms of Clause 10.2(a)(iii), and

(iii) any outstanding dues, which may have accrued in respect of the Project Facility during the Concession Period duly discharge and release to the Concessionaire the Handback Guarantee within 3 months from the expiry of the Concession Period.

Dispute Resolution	ARTICLE 11

11.1 Amicable Resolution

(a) Save where expressly stated to the contrary in this Agreement, any dispute, difference or controversy of whatever nature between the Parties, howsoever arising under, out of or in relation to this Agreement (the "Dispute") shall in the first instance be attempted to be resolved amicably in accordance with the procedure set forth in sub-clause (b) below.

(b) Either Party may require such Dispute to be referred to the Chief Executive Officer, RMC and the Chief Executive Officer of the Concessionaire for the time being, for amicable settlement. Upon such reference, the two shall meet at the earliest mutual convenience and in any event within 15 days of such reference to discuss and attempt to amicably resolve the Dispute. If the Dispute is not amicably settled within 15 days of such meeting between the two, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 11.2 below.

11.2 Arbitration

(a) **Procedure**
Subject to the provisions of Clause 11.1, any dispute, which is not resolved amicably, shall be finally settled by binding arbitration under the Arbitration Act. The arbitration shall be by a panel of three arbitrators, one to be appointed by each Party and the third to be appointed by the two arbitrators appointed by the Parties. The Party requiring arbitration shall appoint an arbitrator in writing, inform the other Party about such appointment and call upon the other Party to appoint its *Draft Concession Agreement* 59 arbitrator. If within 15 days of receipt of such intimation the other Party fails to appoint its arbitrator, the Party seeking appointment of arbitrator may take further steps in accordance with Arbitration Act.

(b) **Place of Arbitration**
The place of arbitration shall ordinarily be Ranchi but by agreement of the Parties, the arbitration hearings, if required, may be held elsewhere.

(c) **English Language**

The request for arbitration, the answer to the request, the terms of reference, any written submissions, any orders and awards shall be in English and, if oral hearings take place, English shall be the language to be used in the hearings.

(d) **Enforcement of Award**

The Parties agree that the decision or award resulting from arbitration shall be final and binding upon the Parties and shall be enforceable in accordance with the provisions of the Arbitration Act subject to the rights of the aggrieved parties to secure relief from any higher forum.

(e) **Performance during Arbitration**

Pending the submission of and/or decision on a dispute and until the arbitral award is published, the Parties shall continue to perform their respective obligations under this Agreement, without prejudice to a final adjustment in accordance with such award.

Representations and Warranties, Disclaimer	ARTICLE 12

12.1 Representations and Warranties of the Concessionaire
The Concessionaire represents and warrants to RMC that :

(a) it is duly organised, validly existing and in good standing under the laws of India;

(b) it has full power and authority to execute, deliver and perform its obligations under this Agreement and to carry out the transactions contemplated hereby;

(c) it has taken all necessary corporate and other action under Applicable Laws and its constitutional documents to authorise the execution, delivery and performance of this Agreement;

(d) it has the financial standing and capacity to undertake the Project;

(e) this Agreement constitutes its legal, valid and binding obligation enforceable against it in accordance with the terms hereof;

(f) the execution, delivery and performance of this Agreement will not conflict with, result in the breach of, constitute a default under or accelerate performance required by any of the terms of the Concessionaire's Memorandum and Articles of Association or any Applicable Laws or any covenant, agreement, understanding, decree or order to which it is a party or by which it or any of its properties or assets are bound or affected;

(g) there are no actions, suits, proceedings or investigations pending or to the Concessionaire's knowledge threatened against it at law or in equity before any court or before any other judicial, quasi-judicial or other authority, the RMC f which may constitute Concessionaire Event of Default or which individually or in the aggregate may result in Material Adverse Effect;

(h) it has no knowledge of any violation or default with respect to any order, writ, injunction or any decree of any court or any legally binding order of any Government Agency which may result in Material Adverse Effect;

(i) it has complied with all Applicable Laws and has not been subject to any fines, penalties, injunctive relief or any other civil or criminal liabilities which in the aggregate have or may have Material Adverse Effect;

(j) subject to receipt by the Concessionaire from RMC of any amount due under any of the provisions of this Agreement, in the manner and to the extent provided for under the applicable provisions of this Agreement all rights and interests of the Concessionaire in and to the Project Site/Project Facility shall pass to and vest in RMC on the Termination Date free and clear of all Encumbrances without any further act or deed on the part of the Concessionaire or RMC;

(k) no representation or warranty by the Concessionaire contained herein or in any other document furnished by it to RMC or to any Government Agency in relation to Applicable Permits contains or will contain any untrue statement of material fact or omits or will omit to state a material fact necessary to make such representation or warranty not misleading;

(l) no bribe or illegal gratification has been paid or will be paid in cash or kind by or on behalf of the Concessionaire to any person to procure the Concession.

(m) Without prejudice to any express provision contained in this Agreement, the Concessionaire acknowledges that prior to the execution of this Agreement, the Concessionaire has after a complete and careful examination made an independent evaluation of the Project Site, and the information provided by RMC, and has determined to its satisfaction the nature and extent of risks and hazards as are likely to arise or may be faced by the Concessionaire in the course of performance of its obligations hereunder.

The Concessionaire also acknowledges and hereby accepts the risk of inadequacy, mistake or error in or relating to any of the matters set forth above and hereby confirms that RMC shall not be liable for the same in any manner whatsoever to the Concessionaire.

12.2 Representations and Warranties of RMC
RMC represents and warrants to the Concessionaire that:

(a) RMC has full power and authority to grant the Concession;
(b) RMC has taken all necessary action to authorize the execution, delivery and performance of this Agreement;

(c) This Agreement constitutes RMC's legal, valid and binding obligation enforceable against it in accordance with the terms hereof;

(d) There are no suits or other legal proceedings pending or threatened against in respect of the Project, Project Site or Project Facility.

12.3 Obligation to Notify Change
In the event that any of the representations or warranties made/given by a Party ceases to be true or stands changed, the Party who had made such representation or given such warranty shall promptly notify the other of the same.

Miscellaneous	ARTICLE 13

13.1 Assignment and Charges

(a) The Concessionaire shall not assign in favour of any person this Agreement or the rights, benefits and obligations hereunder, save and except with prior consent of RMC.

(b) The Concessionaire shall not create nor permit to subsist any Encumbrance over the Project Site/ Project Facility, except with prior consent in writing of RMC, which consent RMC shall be entitled to decline without assigning any reason whatsoever.

13.2 Interest and Right of Set Off

Any sum which becomes payable under any of the provisions of this Agreement by one Party to the other Party shall, if the same be not paid within the time allowed for payment thereof, shall be deemed to be a debt owed by the Party responsible for payment thereof to the Party entitled to receive the same. Such sum shall until payment thereof carry interest at 15% per annum from the due date for payment thereof until the same is paid to or otherwise realised by the Party entitled to the same. Without prejudice to any other right or remedy that may be available under this Agreement or otherwise under law, the Party entitled to receive such amount shall also have the right of set off. Provided the stipulation regarding interest for delayed payments contained in this Clause shall neither be deemed or construed to authorise any delay in payment of any amount due by a Party nor be deemed or construed to be a waiver of the underlying breach of payment obligations.

13.3 Governing Law and Jurisdiction

This Agreement shall be governed by the laws of India. The Courts at Ranchi shall have jurisdiction over all matters arising out of or relating to this Agreement.

13.4 Waiver

(a) Waiver by either Party of any default by the other Party in the observance and performance of any provision of or obligations under this Agreement:

(i) shall not operate or be construed as a waiver of any other or subsequent default hereof or of other provisions or obligations under this Agreement;

(ii) shall not be effective unless it is in writing and executed by a duly authorised representative of such Party; and

(iii) shall not affect the validity or enforceability of this Agreement in any manner.

(b) Neither the failure by either Party to insist on any occasion upon the performance of the terms, conditions and provisions of this Agreement or any obligation hereunder nor time or other indulgence granted by a Party to the other Party shall be treated or deemed as waiver/breach of any terms, conditions or provisions of this Agreement.

13.5 Survival
Termination of this Agreement:

(a) shall not relieve the Concessionaire or RMC of any obligations already incurred hereunder which expressly or by implication survives Termination hereof, and

(b) except as otherwise provided in any provision of this Agreement expressly limiting the liability of either Party, shall not relieve either Party of any obligations or liabilities for loss or damage to the other Party arising out of or caused by acts or omissions of such Party, prior to the effectiveness of such Termination or arising out of such Termination.

13.6 Amendments

This Agreement and the Schedules together constitute a complete and exclusive understanding of the terms of the Agreement between the Parties on the subject hereof and no amendment or modification hereto shall be valid and effective unless agreed to by both the Parties hereto and evidenced in writing.

13.7 Notices

Unless otherwise stated, notices to be given under this Agreement including but not limited to a notice of waiver of any term, breach of any term of this Agreement and termination of this Agreement, shall be in writing and shall be given by hand delivery, , UPC, Registered Post, mail, telex or facsimile transmission and delivered or transmitted to the Parties at their respective addresses set forth below:

Chief Executive Officer
Ranchi Municipal Corporation
Kutchary Road,
Ranchi – 834001
(Jharkhand)

If to the Concessionaire: The Managing Director, _____ ----------(*insert complete address with phone and fax details)* Or such address, telex number, or facsimile number as may be duly notified by the respective Parties from time to time, and shall be deemed to have been made or delivered

(i) in the case of any communication made by letter, when delivered by hand, by recognised international courier or by mail (registered, return receipt requested) at that address, and

(ii) in the case of any communication made by telex or facsimile, when transmitted properly addressed to such telex number or facsimile number.

13.8 Severability

If for any reason whatsoever any provision of this Agreement is or becomes invalid, illegal or unenforceable or is declared by any court of competent jurisdiction or any other instrumentality to be invalid, illegal or unenforceable, the validity, legality or enforceability of the remaining

provisions shall not be affected in any manner, and the Parties shall negotiate in good faith with a view to agreeing upon one or more provisions which may be substituted for such invalid, unenforceable or illegal provisions, as nearly as is practicable. Provided failure to agree upon any such provisions shall not be subject to dispute resolution under this Agreement or otherwise.

13.9 No Partnership

Nothing contained in this Agreement shall be construed or interpreted as constituting a partnership between the Parties. Neither Party shall have any authority to bind the other in any manner whatsoever.

13.10 Language

All notices required to be given under this Agreement and all communications, documentation and proceedings which are in any way relevant to this Agreement shall be in writing and in English language.

13.11 Exclusion of Implied Warranties etc.

This Agreement expressly excludes any warranty, condition or other undertaking implied at law or by custom or otherwise arising out of any other agreement between the Parties and any representation by any Party not contained in a binding legal agreement executed by the Parties.

13.12 Counterparts

This Agreement may be executed in two counterparts, each of which when executed and delivered shall constitute an original of this Agreement but shall together constitute one and only the Agreement. IN WITNESS WHEREOF THE, PARTIES HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DATE FIRST ABOVE WRITTEN. SIGNED SEALED AND DELIVERED

For and on behalf of RMC by: (Signature) (Name) (Designation)

For and on behalf of CONCESSIONAIRE by: (Signature)

In the presence of : 1)

2)

Project Site	SCHEDULE 1

(i) Transfer Stations
(ii) Workshop Site
(iii) Integrated Solid Waste Management (ISWM)

As per Technical Information Memorandum.

Capital Grant and Tipping Fees	SCHEDULE 2

1. Capital Grant

RMC shall pay the amount of Capital Grant to the Concessionaire on completion of milestones mutually agreed by the Parties herein referred to as the Project Milestone and as certified by the TA CUM PMC.

2. Tipping Fee

a. The agreed tipping fee payable to the Concessionaire shall be paid on a monthly basis.

b. TA CUM PMC/ Project Engineer shall inspect and monitor project deliverables on continuous basis during the entire Concession Period.

c. TA CUM PMC / Project Engineer would certify the quantity of waste transported to the sites – transfer stations and then subsequently to Composting, land filling, brick making plant etc. The quantity of recyclable products would be verified at appropriate place.

d. Each and every vehicle used for transportation of waste would be weighed at appropriate weigh bridge to determine the gross weight. The vehicle would again be weighed after emptying the content to arrive at net weight of waste transported.

e. The above activity would be carried out for each and every vehicle. No payment would be made to the Concessionaire if any quantity is not verified by TA CUM PMC / Project Engineer.

f. The TA CUM PMC / Project Engineer, RMC and the Concessionaire would reconcile the records at the end of each month before arriving at final amount payable.

G RMC may at its own discretion device any other methods for ascertaining waste for payment of tipping fee

Construction Requirements	SCHEDULE 3

A. Construction Requirements for Project Facility

1. General

1.1 The Concessionaire shall comply with the Construction Requirements set out in this Schedule. In doing so, the Concessionaire shall ensure that the Project Facilities are maintained to the standards and specifications as set out in the Technical Information Memorandum as part of RFP and other relevant standards.

1.2 The Concessionaire shall take appropriate measures to set up an integrated solid waste management system from awareness campaigning, segregation, collection, transportation, storage, treatment and sanitary land filling of municipal solid waste.

1.3 The minimum facilities to be provided in the Project Facility which is to be implemented by the Concessionaire as part of the Project shall be as set out in this Schedule.

1.4 The Concessionaire may adopt alternative designs for the Project Facility in conformity with the Project Information Memorandum, subject to review by the TA CUM PMC /RMC.

1.5 At least two weeks prior to commencement of design work, the Concessionaire shall finalise a quality assurance plan for the design work ("Quality Assurance Plan").

2. Procedure

2.1 Before Commencement of Construction

2.1.1 Prior to commencement of any construction activity, the Concessionaire shall finalise an implementation plan for the Project ("Construction Plan") in consultation with the TA CUM PMC ` . The Construction Plan shall, inter alia, include:

(i) A detailed schedule of implementation for putting up and operationalising the Project Facilities, and which shall specify major milestones

(ii) The Critical Path Method (CPM)/ Programme Evaluation and Review Technique (PERT) charts or similar activity planning technique/ method for monitoring. This would cover all stages/ aspects of the Project implementation including design and engineering, procurement of materials and equipment, installation, construction and testing

(iii) Manpower deployment plan, including the designation of key personnel for the management and supervision of all Project activities. (This would include the designation of suitably qualified personnel for areas such as contract administration and supervision, construction management, traffic and safety, environmental management, plant and equipment maintenance, procurement, materials management and quality control); and

(iv) A broad method statement for key items setting out the methodology of construction, materials and construction equipment mobilisation/ utilisation plans, broad output calculations and details of the quality assurance and quality control procedures.

(v) Format of the monthly report giving details of the physical progress in implementation of the Project and operations and maintenance activities undertaken (Monthly Progress Report).

2.1.2 Prior to commencement of any construction activity, the Concessionaire shall also finalise in consultation with the RMC/ TA CUM PMC an operations and maintenance plan for the Project during the Construction Period ("O&M Plan – Construction Period") and which shall, inter alia, include the following :

(i) Traffic Management Plan;

(ii) Safety management programme including an Emergency Response Protocol; and

(iii) Environmental Management Plan

2.1.3 The Concessionaire shall, in consultation with the TA CUM PMC workout an appropriate schedule for submission of documents set out in 2.1.1 above to the TA Cum PMC for review.

2.1.4 Prior to commencement of construction of any of the Project Facilities, the Concessionaire shall have:

(i) Obtained all such Applicable Permits as are necessary to commence construction of such Project Facilities;

(ii) Finalised Construction Drawings as are necessary and the Construction Schedule in consultation with the TA CUM PMC ;

(iii) Mobilised the requisite resources, personnel and organisation necessary for the same and designated and appointed suitable officers/ representatives as it may deem appropriate with responsibility to supervise implementation of the Project and for exchange of information with the TA CUM PMC and the Government Agency;

(iv) Finalised in consultation with the TA CUM PMC a method statement setting out details of the actual methods that would be adopted by the Concessionaire for the construction of such Project Facilities including details of equipment and machinery that would be used, their locations, and arrangements for conveying and handling materials;

(v) Finalised in consultation with the TA CUM PMC quality assurance and quality control procedures to cover all aspects of the work so as to ensure the desired quality.

2.2 During Construction

2.2.1 The Concessionaire shall:

(i) Strictly follow the guidelines on quality as set out in Technical Information Memorandum and MSW Rules/BIS/NBC/IRC or any other relevant specifications.

(ii) Ensure that the construction/rehabilitation of the Project Facilities is undertaken with minimal inconvenience to the traffic using the roads surrounding the Project Site.

(iii) Take the necessary precautions to minimise accidents and respond to Emergency as quickly as possible;

(iv) Take precautions to avoid inconvenience to, damage to, destruction of or disturbance to any third party rights and properties;

(v) Provide a safe, clear and informative system of road signs in connection with the Project, wherever required;

(vi) Ensure adequate safety of the personnel deployed at the Project Site which would include measures for the safety such as the provision and maintenance of barricades, traffic signs and illumination during night in consultation with the TA CUM PMC;

(vii) Be in compliance with the Applicable Laws and Applicable Permits obtained for the Project including the clearances obtained by the Government Agency;

(viii) Adhere to the Construction Plan and O&M Plan-Construction Period;

(ix) Deploy adequate number of qualified and competent personnel having relevant experience and skills for implementation of the Project and interaction with the TA CUM PMC / the Government Agency.

2.2.2 Positions and Levels

(i) The Concessionaire shall be responsible for :

(a) the accurate setting-out in relation to original survey control points, lines and levels of reference provided by RMC;

(b) the correctness of the positions, levels, dimensions and alignment of all parts of the works;

(c) the provision of all necessary instruments, appliances and labour in connection with the foregoing responsibilities.

(ii) If, at any time during execution of the works, any error is noticed in the position, levels, dimensions or alignment of any part of the Construction Works, with respect to those provided by RMC, the Concessionaire, on being asked to do so by the TA CUM PMC / RMC, shall at his own cost, rectify such errors to the satisfaction of the TA CUM PMC.

(iii) The checking of any setting-out or of any line or level by the TA CUM PMC shall not in any way relieve the Concessionaire of his responsibility for the accuracy thereof and the

Concessionaire shall carefully protect and preserve all benchmarks, sight rails, pegs and other materials used in setting-out the works.

2.2.3 Tests

(i) Various quality control tests would be undertaken for the Project as per the standards prescribed by Bureau of Indian Standards and MSW Rules. Where no testing methods are specified by the said standards, details of the tests to be carried out and specifications to be achieved for the respective Project Facilities/Construction Works or part thereof shall be agreed upon with the TA CUM PMC prior to construction;

(ii) Where material properties vary from or comply only marginally with the specifications contained in the Construction Requirements, the TA CUM PMC shall increase the frequency of testing as appropriate at the cost of the Concessionaire.

(iii) The tests would be carried out at a location (place of manufacture, fabrication or preparation, at site or any specialised testing laboratory) that the TA CUM PMC may reasonably require, at the cost and expense of the Concessionaire.

(iv) The Concessionaire shall provide such assistance, labour, electricity, fuels, stores, apparatus and instruments as are normally required for examining, measuring and testing any materials or plant and shall supply samples of materials, as required by the TA CUM PMC to undertake Tests.

2.2.4 No part of the Construction Works shall be covered up or put out of view before the same has been examined by the TA CUM PMC .

2.2.5 The TA CUM PMC may from time to time require:

(v) removal from the Project Site, within such time as may be specified in its instructions, any material, equipment, machinery or plant which, in its opinion, do not meet the standards specified in the Construction Requirements;

(vi) substitution/ replacement of such improper material, equipment, machinery or plant;

(vii) re-execution, of any or part of the Construction Works which in the opinion of the TA CUM PMC do not meet the standards set out in the Construction Requirements;

(viii) the Concessionaire to make boreholes or to carry out exploratory excavation for the Project.

2.2.6 The Concessionaire shall arrange for all the material requirements for the Project and disposal of all material wastes. The Applicable Permits in this regard would have to be obtained by the Concessionaire. All excess and unsuitable excavated materials shall be piled at appropriate dumping places or otherwise disposed of by the Concessionaire in consultation with the TA CUM PMC.

2.2.7 Prior to making the request for the issue of Completion Certificate, the Concessionaire shall submit to the TA CUM PMC / RMC the following, duly finalised in consultation with the TA CUM PMC:

(i) the Operation and Maintenance Manual for the Project (O&M Manual) setting out in detail the standards, schedules, procedures, type, periodicity and other details of the operation and maintenance activities to be carried out for the Project during the Operations Period so as to meet the O&M Requirements as well as details of the management information system to be incorporated, reports to be submitted and procedure for reviews.

(ii) the Operations & Maintenance Plan (O&M Plan) for the first year of operations.

2.3 After Completion of Construction

Upon completion of construction (including road marking work) but prior to issue of the Completion Certificate, the Project Site shall be cleared of all construction equipment, surplus materials, debris and temporary installations and shall be left in tidy and an aesthetically pleasing appearance to the satisfaction of the TA CUM PMC.

2.4 Reporting Requirements and Documents to be provided

2.4.1 During the Construction Period, the Concessionaire shall submit to the TA CUM PMC / RMC, Monthly Progress Report (for each calendar month or part thereof) within 5 working days of the last day of the month. The report shall review the progress made, identify slippages, if any, and project the future activities to be undertaken (including rectifications), operations and maintenance activities undertaken and would, inter alia, include the following:

(i) Listing of working drawings/sketches submitted

(ii) Comments of the Transaction Advisor Cum Project Management Consultant , if any on the Concessionaire’s Drawings submitted

(iii) Concessionaire’s response to the comments on the Concessionaire’s Drawings

(iv) Listing of the "As Built" drawings submitted

(v) Progress of pre-construction activities - mobilization of plant and equipment, personnel, site office, utility relocation etc.

(vi) Concessionaire's compliance inspection report, if any required

(vii) Constraints in construction

(viii) Progress data with "S" curves, if applicable
(ix) Project data with contract detail and sectional completion details

(x) Tests carried out, if any, and results thereof

(xi) Remedial measures taken by the Concessionaire following such tests, where required

(xii) Traffic management steps taken by the Concessionaire

(xiii) Review of milestones and reasons for delay, if any

(xiv) Suspension of construction, if any, its reasons, duration and the steps undertaken to resume construction

(xv) Change of Scope Notice issued by the Government Agency, if any, and status thereof

(xvi) All actual or potential deviations from the Construction Plan

(xvii) Disagreements/ Disputes , if any and proposed measures to be taken

(xviii) Maintenance activities carried out by the Concessionaire on the existing carriageway

(xix) Injury to any construction personnel during construction, its severity, cause and remedial measure(s) taken to avoid recurrence

(xx) Brief report of any accident/incident within the Project Site, injury/fatality, property damage, cause of accident and actions taken to avoid recurrence

(xxi) Traffic detour/diversion for construction - time and duration

(xxii) Notes of meetings between the Concessionaire, the Transaction Advisor Cum Project Management Consultant and the Government Agency highlighting critical decisions taken or agreements reached. Minutes of the meeting issued by the client shall also be included in the monthly progress reports.

2.4.2 Prior to making the request for the issue of Completion Certificate, the Concessionaire shall submit to RMC the following documents, free of costs:

(i) Three hardcopies and two copies in electronic form (two Compact Discs) of the "As Built" drawings of the Project - detailed, accurately scaled and sequentially numbered, covering all relevant engineering features, which in relation to structures shall also include cross sections in each drawing;

(ii) copies of all geo-technical and borehole reports obtained by the Concessionaire, if any;

(iii) Three hardcopies and two copies in electronic form (two Compact Discs) of the Operations and Maintenance Manual.

3. The concessionaire shall provide project facilities as per Project Information Memorandum which shall form part of this Agreement. Details of Construction Requirements are covered under Chapter 2 of this Memorandum.

Technical Specifications of Project Equipments and Project Vehicles	SCHEDULE 4

As per Technical Specifications laid down in Project Information Memorandum as part of RFP.

Scope of Work of Transaction Advisor Cum Project Management Consultant/ and or / Project Engineer	SCHEDULE 5

1.0 Role of the Transaction Advisor Cum Project Management Consultant / Project Engineer

1.1 The TA CUM PMC / Project Engineer is expected to play a positive and independent role in discharging its functions, thereby facilitating the smooth implementation and operation of the Project. Broadly, the role of the TA CUM PMC / Project Engineer is to:

(i) independently review, monitor and where required by the Agreement, to approve activities associated with the Design, Construction, Operation and Maintenance of the Project Facilities to ensure compliance by the Concessionaire with the Construction Requirements and Operation & Maintenance Requirements,

(ii) Certify on a daily basis, the following quantum of MSW:

a. collected by Concessionaire

b. processed at the Waste Processing facility

c. land filled at the Landfill Facility

d. returned from the Project Facility as Non-confirming Waste

(iii) report to the Parties on the various physical, technical and financial aspects of the Project based on inspections, site visits and Tests,

(iv) assist the Parties in arriving at an amicable settlement of disputes, should the need arise, and

2.0 Scope of Services

The services to be provided by the TA CUM PMC / Project Engineer are listed below. In addition, the scope of services would also include such other functions as are required to be undertaken pursuant to specific provisions of the Agreement.

2.1 Implementation Period - Design and Planning

Review of the following submitted by the Concessionaire :

(i) Quality Assurance Plan;

(ii) Implementation/ Construction Plan;

(iii) Drawings

(iv) O & M Plan – Construction Period;

2.2 Implementation Period - Construction

The TA CUM PMC / Project Engineer would monitor, in accordance with Good Industry Practice, the progress in implementation and ensure compliance with the Construction Requirements. For this purpose the TA CUM PMC / Project Engineer shall undertake, inter alia, the following activities and where appropriate make suitable suggestions:

(i) monitor the progress in implementation of the Project based on the Implementation/ Construction Plan submitted by the Concessionaire;

(ii) review and approve the material testing and mix designs results and recommend special tests, where required, for materials and/or completed works, require removal/substitution of unsuitable materials and /or works and report deficiencies in respect of the same to RMC;

(iii) review and monitor the quality assurance and quality control procedures followed by the Concessionaire;

(iv) review the manpower and equipment deployed by the Concessionaire;

(v) monitor the Construction Works for conformity with the Project Requirements;

(vi) verify the 'As-Built' drawings for each component of the works prepared by the Concessionaire and require removal of deficiencies found therein;

(vii) review the safety and traffic management measures implemented;

(viii) review and ascertain the cost variation arising as a result of Change in Law and determine the Additional Cost;

(ix) require, monitor and review the results of Tests to be carried out by the Concessionaire in accordance with the Construction Requirements and/or O&M Requirements;

(x) require suspension of whole or any part of the Construction Works if in its reasonable opinion the same does not conform to the Construction Requirements;

(xi) issue Provisional Certificate and/or Completion Certificate in accordance with the applicable provisions of the Agreement; and

(xii) issue Certificate in accordance with Clause 5.8.2 of this Agreement.

(xiii) review and assist in finalisation of the O&M Manual and first annual O&M Plan prepared by the Concessionaire.

2.3 Operations Period

2.3.1 During this period the TA CUM PMC / Project Engineer would monitor, in accordance with Good Industry Practice, the operations and maintenance activities undertaken by the Concessionaire so as to ensure compliance with the O&M Requirements. The specific activities to be undertaken would include the following:

(i) review the O&M Plans submitted by the Concessionaire from time to time and assist the Concessionaire in finalising the same;
(ii) monitor O&M activities (including maintenance of equipment, standards of service, safety and environmental issues) and the overall quality of O&M activities so as to ensure compliance by the Concessionaire with the O&M Requirements, O&M Plan and O&M Manual;

(iii) periodically review the O&M Manual for adequacy;

(iv) inspect the Project Facilities at least once a month and as and when exigencies require to ascertain conformity with Project Requirements;

(v) review and ascertain the cost variation arising as a result of Change in Law and determine the Additional Cost;

(vi) undertake a quarterly review of the various records and registers to be maintained by the Concessionaire (including the records relating to complaints and accidents) and suggest suitable remedial measures/ procedures, where necessary.

2.3.2 The TA CUM PMC / Project Engineer shall certify the quantity of MSW collected, Processed in the Processing Facility and Landfill by the Concessionaire on a daily basis.

2.3.3 In the event of Emergency, the TA CUM PMC / Project Engineer shall assist the Concessionaire in dealing with the same and if necessary require or permit, as the case may be, the Concessionaire to take such appropriate steps or measures including where necessary decommissioning of any Project Facilities.

2.4 Handback of Project Facilities to RMC

2.4.1 At the time of handing back the Project Facilities to RMC at the end of Concession Period, the TA CUM PMC / Project Engineer shall :

(i) monitor and certify compliance with Project Facility Handback Requirements and

(ii) issue a Certificate of Compliance with Project Facility Handback Requirements to the Concessionaire.

2.5 Breach of Obligations
If during the course or upon review / inspection undertaken by the TA CUM PMC / Project Engineer or otherwise, it transpires that either of the Parties is in breach/ default of any of its obligations under the Agreement, the TA CUM PMC / Project Engineer shall, under intimation to the other Party, require the defaulting Party to remedy such breach/ default within such time and in such manner as the TA CUM PMC / Project Engineer may deem fit and in each case the same shall be recorded.

2.6 Meetings, Records and Reporting

(a) The TA CUM PMC / Project Engineer would be required to participate in the Project review meetings held from time to time by the Parties, which are ordinarily expected to be held once a month during the Construction Period and once every two months during the Operations Period as also to participate in emergency or extra-ordinary meetings of the Parties held to deal with any Emergency, Force Majeure Event or other exigencies.

(b) The TA CUM PMC / Project Engineer shall, in the ordinary course, maintain record of the activities undertaken by it in discharge of its functions and responsibilities. This would include records in respect of the following:

(i) Manpower deployed and other organisational arrangements of the TA CUM PMC/ Project Engineer ;

(ii) Reviews of documents submitted to it by the Concessionaire to meet Project Requirements, such as manuals, Drawings, As-Built drawings, schedules, plans and reports;

(iii) Inspections undertaken and notices/instructions issued to the Concessionaire;

(iv) Review of compliance with Project Requirements;

(v) Records of quantities of waste certified daily with respect to door to door collection, Processing and Landfill done by the Concessionaire

(vi) Tests;

(vii) Change in Law;

(viii) Emergency (including accidents);

(ix) Force Majeure Events;

(x) Breaches and defaults by the Parties;

(xi) Project Facility Handback Requirements; and

(c) The TA CUM PMC / Project Engineer would be required to submit the following reports to the Parties during the Concession Period :

(i) Implementation / Construction Period

- Monthly Progress Report (including details of slippages and remedial measures)

- Report on Tests and report on notices Issued

- Completion Certificate (including Provisional Certificate)

- Report on Project Equipments and Vehicles purchased by the Concessionaire for implementation of the Project.

- Any supplemental or special report that may be considered necessary by the TA CUM PMC / Project Engineer (including Emergency, Force Majeure, and breach of obligations).

- Any other report as may be reasonably required by RMC or as may be necessary to give effect to the provisions of the Agreement.

(ii) Operations Period

- Monthly O&M Report (including details of waste collected, Processed and Landfill)

- Report on Tests and report on notices Issued

- Any supplemental or special report that may be considered necessary by the TA CUM PMC/ Project Engineer (including Emergency, Force Majeure, and breach of obligations)

- Annual Review of O&M Manual

- Any other report as may be reasonably required by RMC or as may be necessary to give effect to the provisions of the Agreement.

(iii) Report on Project Facility Handback Requirements.

(iv) Any other report as may be reasonably required by RMC or as may be necessary to give effect to the provisions of the Agreement.

Operation and Maintenance Requirements	SCHEDULE 6

2. General

2.1 The specifications broadly cover the design, manufacture, inspection, testing, and delivery to Project Site, storing and handling at Project Site, erection, commissioning and carrying out acceptance test of the Project Facility.

2.2 It is not the intent to specify completely herein, all the details of design and construction of the equipment/ Project Facility. However the Project Facility shall confirm, in all respects, to high standards of engineering, design and workmanship and capable of performing in continuous operations.

2.3 The Concessionaire shall comply with the O&M Requirements set out in this Schedule. In doing so, the Concessionaire shall ensure that the Project Facilities are maintained to the standards and specifications as set out in the Construction Requirements also meet the other requirements, if any, set out in the Agreement.

2.4 The Concessionaire shall take appropriate measures to minimise traffic disruption on the roads adjoining the Project Site.

2.5 In the design, planning and implementation of all works and functions associated with the operation and maintenance of the Project Facilities, the Concessionaire shall take all such actions and do all such things (including without limitation, organising itself, adopting measures and standards, executing procedures including inspection procedures, and engaging contractors, if any, agents and employees) in such manner, as will :

(i) keep the Project Facilities from undue deterioration and wear;

(ii) ensure the safety of personnel deployed for operation & maintenance of facilities like lifts, street lighting, common area lighting etc.

(iii) permit unimpaired performance of statutory duties and functions of any party in relation to the Project.

2.6 During the Concession Period, the Concessionaire shall ensure that :

(i) Project Facility is kept free from undue deterioration and undue wear;

(ii) applicable and adequate safety measures are taken;

(iii) adverse effects on the environment and to the owners and occupiers of property and/or land in the vicinity of the Project Facility, due to any of its actions, is minimised;

(iv) any situation which has arisen or likely to arise on account of any accident or other emergency is responded to as quickly as possible and its adverse effects controlled/minimised;

(v) disturbance or damage or destruction to property of third party by operations of the Project Facility is controlled/minimised;

(vi) members of the public are treated with due courtesy and consideration by its employees/ agents;

(vii) users are provided with adequate information and forewarned of any event or any other matter affecting the Project Facility to enable them to control/minimise any adverse consequences by such event or matter;

(viii) a complaint register to record grievances of any member of the public in relation to the operations and maintenance of the Project Facility is duly maintained;

(ix) all materials used in the maintenance, repair and replacement of any of the Project Facility shall meet the Construction Requirements.

(x) the personnel assigned by the Concessionaire have the requisite qualifications and experience and are given the training necessary to enable the Concessionaire meet the O & M Requirements.

(xi) It will be the responsibility of the Concessionaire to upgrade the ISWM facilities as per the changing requirements of the waste management system. All the expenses incurred in this regard will be borne by the Concessionaire

3. Operation and Maintenance Manual and O& M Plans

3.1 Prior to the commencement of any construction activity, the Concessionaire, in consultation with the TA CUM PMC, shall finalise the O&M Plan - Construction Period.

3.2 The O&M Plan for the first year of operations shall inter alia include :

a. A detailed plan of door to door collection of solid waste from within Municipal area of RMC;

b. A detailed plan of transporting the waste including the mapping of route.

c. Maintenance plan of Project Facilities;

d. Specifications of service level standards including clearance and dumping of all types of waste collected;

e. Manpower deployment plan, including the designation of key personnel for the management and supervision of all Project-related activities. (This would include the designation of suitably qualified personnel for waste collection, transportation of waste and delivery of waste, maintenance of Project Assets, Project Facility Project management and quality assurance plan);

f. Details of the IEC awareness campaign programme;

g. Establishment of suitable complaint redressal system; and

h. A detailed plan for collecting, disposing and weighing the waste;

i. A plan for segregation of waste;

j. A plan for collection of waste generated from street sweeping

k. An operating plan for Treatment Facility

l. An operating plan for Landfill Site

m. Specifications of service level standards including segregation, processing and disposal of waste;

n. Manpower deployment plan, including the designation of key personnel for the management and supervision of all Project-related activities;

o. A broad revenue generation structure of the Project including collection of Tipping fee (if quoted), sale of by products and any other source;

p. Revenue collection plan from the users of the Project Facilities

q. Format of the Monthly Project Progress Report giving details of the progress in implementation of the Project ("Monthly Project Progress
Report");

r. Environment Management plan; and

s. Quality Assurance plan.

3.3 Penalties for non compliance of services levels :
RMC shall levy following penalties on the Concessionaire for non compliance of service levels indicated in the O&M Plan:

Sr. No.	Service Level Violated	Penalty
1.	MSW not collected for more than 24 hours from any Ward	Rs. 1,00,000 per Ward for every day of default
2.	Overflowing of any secondary storage container for more than 12 hours	Rs. 5000 for every hour per bin
3.	Non collection of street sweeping waste for more than 24 hours	Rs. 5000 for every hour

3.4 The O & M Plan shall

a. Not be inconsistent with the terms and conditions of this Agreement.

b. contain an obligation on Concessionaire to provide RMC or its nominee with information relating to the delivery of MSW under this Agreement on a daily basis, including information on:

i. delivery vehicle identification;

ii. weight of loads; and

iii. times of delivery

c. contain an obligation on the Parties to keep necessary records in relation to the delivery of MSW including the information on:

i. The weight of MSW received;
ii. The numbers of vehicles and their identification;

iii. Time of delivery; and,
iv. Number of vehicles containing largely Non-Conforming Waste and hence diverted under.

d. provide that each Party shall have access to and the right to audit the other Party's records as referred to in Clause 5.12.3;

e. give each Party the right to inspect MSW loads that are declared Non-Conforming and decide on its disposal; and

f. Contains the methodology of dealing with Non Conforming Waste.

3.5 As provided in Schedule 3, prior to making application for the Completion Certificate for the Project the Concessionaire shall finalise in consultation with the RMC/ TA CUM PMC:

(i) the O&M Manual for Project Site

(ii) the O&M Plan for the first year of operations

3.6 Six weeks prior to the anniversary of COD each year, the Concessionaire shall submit an annual O&M Plan for the next year of operations.

4. Maintenance Requirements

4.1 Maintenance Standards

4.1.1 During Operations Period, the Project Facility shall be maintained in accordance with the standards (“Maintenance Standards”) set out below :

4.2 Routine Maintenance Activities

4.2.1 In order to ensure smooth and uninterrupted use of the Project Facility during normal operating conditions for all 24 hours of a day, routine maintenance of the Project Facility shall include but not be limited to:

(i) repairs to equipment, pavement, building and other civil works which are part of the Project Facilities;

(ii) replacement of Project Equipment/Vehicles, consumables,

(iii) maintenance of the Project Facilities in accordance with Good Industry Practice;

(iv) removing and disposing of in accordance with all Applicable Laws and Applicable Permits, all rubbish, debris, etc. including any and all equipment, supplies, materials and wastes brought or produced by the Concessionaire/ Contractor;

(v) taking all practical measures to prevent damage to the Project Facilities;

(vi) undertaking maintenance works in accordance with the O & M Plan and O&M Manual;

(vii) preventing, with the assistance of concerned law enforcement agencies/ RMC where necessary, any unauthorised entry to and exit from and any encroachments on the Project Facilities;

(viii) taking all reasonable measures for the safety of all the workmen, material, supplies and equipment brought to the Project Site. Explosives, if any, shall be stored, transported and disposed of by the Concessionaire in accordance with Applicable Laws/ Applicable Permits.

4.2.2 For routine maintenance works of the Project Facility, the Concessionaire shall generally follow the operational and performance criteria specified in the respective MSW Rules, IRC or any other Applicable standards. Where such criteria are not specified in the standards, the Concessionaire, for the purpose of routine maintenance shall set forth such criteria as to conform to good international standards and Good Industry Practice for sound pavement maintenance practices in consultation with the TA CUM PMC .

4.2.3 The Concessionaire shall regularly carry out the necessary preventive maintenance activities for the Project Facilities to ensure adherence to the Project Requirements throughout the Concession Period.

4.2.4 All maintenance activities shall be planned and coordinated in such a way that the maintenance works shall generally be done during nights and holidays (if unavoidable) so as to cause least disturbance.

4.3 Emergency Maintenance Activities

4.3.1 The Emergency Response Protocol (“ERP”) shall be developed by the Concessionaire in consultation with the local police, hospital/ ambulance services, fire departments and other authorities/support personnel and the TA CUM PMC . This shall be a part of the O&M Manual developed by the Concessionaire.

4.3.2 The ERP shall set out steps to be taken and measures to be adopted by the Concessionaire in responding to dealing with Emergency including those situations related to vehicle accidents involving personal injuries or fatalities, property damage and Force Majeure:

4.3.3 In case of Emergency, the Concessionaire shall

(i) carry out such emergency maintenance and repairs as may be required to repair the damages, if any, in consultation with the TA CUM PMC and where required under the supervision of the police in order to ensure that the Project Facilities are returned to normal operating standards as quickly as possible.

(ii) follow the relevant operating procedure specified in the O&M Manual including the setting up of temporary traffic cones and lights as well as the removal of obstruction and debris expeditiously.

5. Safety

5.1 The Concessionaire shall make provision for round-the-clock security of the Project Facilities.

5.2 The Concessionaire shall implement a Safety Management Programme in line with relevant guidelines and shall form a part of the O&M Manual.

6. Inspections & Frequency

The Concessionaire shall prepare an inspection programme plan for the Project Facilities for its smooth operations as follows:

6.1 Visual Inspection

Visual Inspections are broad general inspections carried out frequently by maintenance engineers having adequate knowledge of solid waste management, building and pavement structures. The purpose of visual inspection is to report fairly obvious deficiencies at the Project Site, which could lead to accidents or maintenance problems. Such inspections should be frequent. The visual inspection may be carried out by visual assessment with careful observation of the specific object/ item of the Project Facilities for identification and for quantification of the deficiencies or damages of the Project Facilities.

6.2 Close Inspection

Close inspections may be visual and/or by standard instrumental aids for assessment of defects/ deficiencies of the Project Facility with careful observation of specific element/s. The close inspection would require detailed examination of the specific element of the Project Facility and should cover all the aspects against a checklist. This inspection is to be carried out by the engineer having good knowledge of the specific element to analysis the nature, and extent of defects/ deficiencies, suggest suitable remedial measures to rectify/ remedy them and quantify repair work.

6.3 Thorough Inspection

Such an inspection is to be carried out on the basis of comprehensive checklist of items related to the materials, condition and situation of the structure etc. on the Project Site. This inspection is to be carried out by the engineer having good knowledge of the specific element to analysis the

nature, and extent of defects/ deficiencies, suggest suitable remedial measures to rectify /remedy them and quantify repair work.

6.4 Frequency of Inspections

The type of inspection and related frequency of various items of Project Facility can be decided by the Concessionaire in consultation with the TA CUM PMC if the situation so warrants.

7. Reporting Requirements

The reporting and information that generally need to be provided by the Concessionaire are given below. The Requirements given below are indicative of the type of information to be provided. The format of such reports, recording requirements, software standards and number of copies required would be finalised in consultation with the TA CUM PMC. All reports and records shall be in the English language.

7.1 Inspection Reports and Remedial Measures

The periodicity of inspections for maintenance activities by the Concessionaire shall be set out in the O&M Manual and regular reports on the same shall be sent to the TA CUM PMC. Where required, the Concessionaire shall carry out any maintenance, repair or rehabilitation works found necessary as a result of such inspections.

7.2 Monthly O & M Report

During the Operation Period, within 5 days of the end of each calendar month or part thereof, the Concessionaire shall provide to the TA CUM PMC / Project Engineer /RMC a monthly report (Monthly O&M Report) which shall contain the following minimum information:

(i) Details of major maintenance undertaken

(ii) Inspections undertaken by the Concessionaire during the month and action taken/ proposed thereafter;

(iii) Details of all reports submitted to the TA CUM PMC / Project Engineer during the month

(iv) O & M inspection compliance report

(v) Maintenance activities undertaken during the month ended,

(vi) Details of any Emergency and action taken

7.3 O & M Manual

7.3.1 The O&M Manual prepared by the Concessionaire in consultation with the TA CUM PMC shall set out the operations and maintenance standards and details of the operations and maintenance activities to be undertaken during the Operations Period; so that the Project Facilities shall at all times conform to the Project Requirements.

7.3.2 The O&M Manual shall have separate sections for operations and maintenance.

7.3.3 The O&M Manual shall include without limitation the following aspects:

(i) Organisation structure with responsibilities of key personnel;

(ii) Project Facility Management;

(iii) Safety Management Programme including the Emergency Response Protocol;

(iv) Inspection Procedures;

(v) Maintenance Standards (including Maintenance Intervention Levels);

(vi) Maintenance Programme;

(vii) Management information system;

(viii) Report Formats.

8. Miscellaneous

8.1 The Concessionaire shall maintain an inventory of all items comprised in the Project Facilities (the "Inventory"), in a format to be developed in consultation with the TA CUM PMC.

8.2 Throughout the Concession Period the Concessionaire shall keep the Inventory updated to take account of works carried out on and other changes made to the Project Facilities.

8.3 A copy of the Inventory shall be submitted by the Concessionaire to the TA CUM PMC / Project Engineer within thirty (30) days of receipt of a request for the same.

Performance Security	SCHEDULE 7

(Proforma of Bank Guarantee)

THIS DEED OF GUARANTEE executed on this the _____day of _____at _____by _____ *(Name of the Bank)* having its Head/Registered office at _____ hereinafter referred to as "the Guarantor" which expression shall unless it be repugnant to the subject or context thereof include successors and assigns;

In Favor of

Ranchi Municipal Corporation, Government of Jharkhand, represented by Chief Executive Officer and having its office at Kutchury Road, Ranchi -834001, Jharkhand hereinafter referred to as "RMC", which expression shall, unless repugnant to the context or meaning thereof include its administrators, successors or assigns.

WHEREAS

A. By the Concession Agreement entered into between RMC and_____, (name of the Successful Bidder), having its registered office/ permanent address at_____ ("the Concessionaire"), the Concessionaire has been granted the Concession to Build, Operate and Transfer Integrated Solid Waste Management system gram at Ranchi, Jharkhand for a period of 30 years (hereinafter referred to as "the Project").

B. In terms of Clause 5.1 of the Concession Agreement, the Concessionaire is required to furnish to RMC , an unconditional and irrevocable bank guarantee for an amount equal to 5% of the Project Cost as security for due and punctual performance/discharge of its obligations under the Concession Agreement, relating to Project by the Concessionaire.

C. At the request of the Concessionaire, the Guarantor has agreed to provide bank guarantee, being these presents guaranteeing the due and punctual performance/discharge by the Concessionaire of its obligations relating to the Project.

NOW THEREFORE THIS DEED WITNESSETH AS FOLLOWS :

1. Capitalised terms used herein but not defined shall have the meaning assigned to them respectively in the Concession Agreement.

2. The Guarantor hereby irrevocably guarantees the due and punctual performance by M/s._____ (hereinafter called "the Concessionaire") of all its obligations relating to the Project and in connection with achieving COD by the Concessionaire in accordance with the Concession Agreement.

3. The Guarantor shall, without demur, pay to RMC sums not exceeding in aggregate Rs. 5% of the Project Cost, within 30 calender days of receipt of a written demand therefore from RMC stating that the Concessionaire has failed to meet its obligations under the Concession

Agreement. The Guarantor shall not go into the veracity of any breach or failure on the part of the Concessionaire or validity of demand so made by RMC and shall pay the amount specified in the demand, notwithstanding any direction to the contrary given or any dispute whatsoever raised by the Concessionaire or any other Person. The Guarantor's obligations hereunder shall subsist until all such demands are duly met and discharged in accordance with the provisions hereof.

4. In order to give effect to this Guarantee, RMC shall be entitled to treat the Guarantor as the principal debtor. The obligations of the Guarantor shall not be affected by any variations in the terms and conditions of the Concession Agreement or other documents or by the extension of time for performance granted to the Concessionaire or postponement/non exercise/ delayed exercise of any of its rights by RMC or any indulgence shown by RMC to the Concessionaire and the Guarantor shall not be relieved from its obligations under this Guarantee on account of any such variation, extension, postponement, non exercise, delayed exercise of any of its rights by RMC or any indulgence shown by RMC , provided nothing contained herein shall enlarge the Guarantor's obligation hereunder.

5. This Guarantee shall be irrevocable and shall remain in full force and effect until _____[5] unless discharged/ released earlier by RMC in accordance with the provisions of the Concession Agreement. The Guarantor's liability in aggregate be limited to a sum of Rs. _____.

6. This Guarantee shall not be affected by any change in the constitution or winding up of the Concessionaire/the Guarantor or any absorption, merger or amalgamation of the Concessionaire/the Guarantor with any other Person.

7. The Guarantor has power to issue this guarantee and discharge the obligations contemplated herein, and the undersigned is duly authorised to execute this Guarantee pursuant to the power granted under _____.

IN WITNESS WHEREOF THE GUARANTOR HAS SET ITS HANDS HEREUNTO ON THE DAY, MONTH AND YEAR FIRST HEREINABOVE WRITTEN.

SIGNED AND DELIVERED

by _____Bank
by the hand of Shri _____
its _____and authorised official.

Format for Letter of Authorization	SCHEDULE 8

(To be given on RMC letterhead)

To Whomsoever It May Concern This is to confirm that to pursuant to the Concession Agreement dated _____, entered into between the RMC and _____ _____ ("the Concessionaire"), the Concessionaire has been authorised to build, operate and transfer Integrated Solid Waste Management system at Ranchi in Jharkhand and for that purpose, to apply for and obtain all approvals, licenses and permits required therein and to avail the utilities such as power, water, telecommunication and any other incidental utilities or services required in connection therewith.

Yours faithfully,

CEO
Ranchi Municipal Corporation
Kutchary Road, Ranchi-834001

Handback Guarantee	SCHEDULE 9

(Proforma of Bank Guarantee) FOOTNOTES TO BE ADDED

THIS DEED OF GUARANTEE executed on this the _____day of _____at _____ by _____ *(Name of the Bank)* having its Head/Registered office at _____ hereinafter referred to as "the Guarantor" which expression shall unless it be repugnant to the subject or context thereof include successors and assigns;

In favour of

RMC, represented by its _____, having its office at _____, hereinafter referred to as "RMC", which expression shall, unless repugnant to the context or meaning thereof include its administrators, successors or assigns.

WHEREAS

A. By the Concession Agreement entered into between RMC and _____[6], (name of the Successful Bidder), having its registered office at _____ ("the Concessionaire") the Company had been granted the Concession to implement the Project, as defined under the Concession Agreement mentioned hereinabove.

B. In terms of Clause 10.2 as the case may be, of the Concession Agreement, the Concessionaire is required to furnish to RMC, an unconditional and irrevocable bank guarantee for an amount of Rs. _____(Rupees _____only) as security for due and punctual performance/discharge of its obligations under the Concession Agreement, relating to handback of the Project Facility.

C. At the request of the Concessionaire, the Guarantor has agreed to provide guarantee, being these presents, guaranteeing the due and punctual performance/discharge by the Concessionaire of its obligations under the Concession Agreement relating to handback of the Project Facility.

[6] In case of Consortium both members would be included as Parties to the Agreement and collectively referred to as 'the Concessionaire/Consortium' as the context may require.
NOW THEREFORE THIS DEED WITNESSETH AS FOLLOWS :

1. Capitalised terms used herein but not defined shall have the meaning assigned to them respectively in the Concession Agreement.

2. The Guarantor hereby irrevocably guarantees the due and punctual performance by M/s._____ (hereinafter called "the Concessionaire") of all its obligations relating to handback of the Project Facility.

The Guarantor shall, without demur, pay to RMC sums not exceeding in aggregate Rs. _____within _____calender days of receipt of a written demand therefor from RMC stating that the Concessionaire has failed to meet its performance

obligations relating to handback of the Project Facility. The Guarantor shall not go into the veracity of any breach or failure on the part of the Concessionaire or validity of demand so made by RMC and shall pay the amount specified in the demand notwithstanding any direction to the contrary given or any dispute whatsoever raised by the Concessionaire or any other Person. The Guarantor's obligations hereunder shall subsist until all such demands are duly met and discharged in accordance with the provisions hereof.

4. In order to give effect to this Guarantee, RMC shall be entitled to treat the Guarantor as the principal debtor. The obligations of the Guarantor shall not be affected by any variations in the terms and conditions of the Concession Agreement or other documents or by the extension of time for performance granted to the Concessionaire or postponement/non exercise/ delayed exercise of any of its rights by RMC or any indulgence shown by RMC to the Concessionaire and the Guarantor shall not be relieved from its obligations under this Guarantee on account of any such variation, extension, postponement, non exercise, delayed exercise of any of its rights by RMC or any indulgence shown by RMC, provided nothing contained herein shall enlarge the Guarantor's obligation hereunder.

5. This Guarantee shall be irrevocable and shall remain in full force and effect until _____[7] unless discharged/released earlier by RMC in accordance with the provisions of the Concession Agreement. The Guarantor's liability in aggregate be limited to a sum of Rs. _____(Rupees _____only).

6. This Guarantee shall not be affected by any change in the constitution or winding up of the Concessionaire/the Guarantor or any absorption, merger or amalgamation of the Concessionaire/the Guarantor with any other Person.

7. The Guarantor has power to issue this guarantee and discharge the obligations contemplated herein, and the undersigned is duly authorised to execute this Guarantee pursuant to the power granted under

IN WITNESS WHEREOF THE GUARANTOR HAS SET ITS HANDS HEREUNTO ON THE DAY, MONTH AND YEAR FIRST HEREINABOVE WRITTEN.

SIGNED AND DELIVERED

by _____Bank
by the hand of Shri _____
its _____and authorised official.

User Charges	SCHEDULE 10

User charges may be prescribed by RMC for the following categories of beneficiaries-

- Households
- Markets – Vegetable markets/shops/malls
- Hotels and Restaurants/banquet halls
- Industries
- Institutions/offices
- Etc.

List & Locations of Hotels, Restaurants, Banquet Halls, Dhabas (Roadside Eateries)

1. Kishan Gopal Bhatia Main Road
2. Sanjay Bhatia Main Road
3. Rampyari Munjyal Main Road
4. Rampyari Munjyal Main Road
5. Ved Prakash Bhatia Punjab Sweets Main Road
6. Ashu Bhatia Main Road
7. Kathi Kabab Main Road
8. Novelty Sweets Doranda
9. Devraj Food Corner Harmu
10. Preeti Sweets Kishoreganj
11. Prakash Gupta Shivaji Hotel Kuthcery Road
12. Amrit Tirawat Big Baazar Main Road
13. Amrit Tirawat Big Baazar Main Road
14. Bum Bum Sweets Main Road
15. Marwari Kolewal Main Road
16. Mihir Kumar Ghosh Main Road
17. Devi Singh Vidya Nagar Harmu
18. Hotel Chinar Main Road
19. Hotel Jagriti Apar Baaazar
20. Kamla Hotel OCC
21. Mansarover Ratu Raod
22. Raja Hotel Kantatoli
23. Vrindavan Main Road
24. Bikaner Mishthan Bhandar ratu Raod

25. Hotel Anjali Kantatoli
26. Adam Restaurant GEL Church main road
27. Hotel Ashok Doranda
28. Hotel Green View Main Road
29. Tarun Karamkar Hindpidhi
30. Hotel Green Park Circular Road
31. Capital Hill Main Road
32. Capital Residency Station Road
33. Hotel Kaveri Main Road
34. Yuvraj Palace Kadrau
35. Yuvraj Palace Doranda
36. Eighty International Mohrabadi
37. Jupital Food Ltd Main Road
38. GeetaDevi Kanke Road
39. Point Systences Pvt. Ltd Ashok Nagar
40. Point Systences Pvt. Ltd HEC gate
41. Jodhpur Mishthan Bhandar Harmu Road
42. Jodhpur Mishthan Bhandar & Snacks Corner Harmu Road
43. Hotel Jalpan Kendra & Saffron Restaurants Harmu Road
44. Tripti Sweets Argora
45. Topin Sweets Argora
46. Sweets Mishthan Bhandhar Kadru
47. Nirmal Gorai Ashok Nagar
48. Kaveri Restaurant Circular Road
49. Deepak Kumar Kadrau
50. Vijay Ghosh Khauratoli HB road
51. Niranjan Kumar Harmu
52. Sunil Karamkar Hindpidhi
53. Mohd. Majeed Main Road
54. Pradeep Kumar Kuthery road
55. Punjabi Bagh Restaurant Station Road
56. Birsa Food Plaza Station Road
57. Dilip Ghash Doranda
58. Ravi Sharma Doranda
59. Quality in station Road

60. Hotel Amrapali Bariyatu
61. Shyam Sweet Harmu
62. Neeranjan Ghosh Harmu
63. Kamla Sweets Harmu
64. Jaika Restaurant South Office Para Doranda
65. Quality Sweets Harmu
66. New Raj Sweets Over Bridge
67. Panna Hotel Club Road
68. Hotel Anurag ACC
69. Om Bikaner Mishthan Bhandhar Bariyatu
70. Tand or-In-Restaurant Bariyatu
71. Hotel Shankar Mohrabadi
72. Omkar Hotel Itki Raod
73. Bharat Coffee House Lalpur
74. Hotel Landpark Lalpur
75. Subhash Ghosh Bariyatu
76. Akshay Kumar Layak Vardhman Compound
77. Dilip Karamkar Chutiya
78. Mira Devi Chutiya
79. Parbhuwan Kumar Sahu Chutiya
80. Min Min Restaurant PP Compound
81. India Hotel main Road
82. Seventh Heaven Tharpakna
83. Mohd. Riyaz Kailash Babu Street Main Road
84. Shamal Ghash Ratu road
85. Manpasand Hotel Ratu road
86. Uday Mishthan Bhandar Lalpur
87. Bose Hotel main Road
88. Gipi Ghsh Circular Road
89. NB Patel Kantatoli
90. Soma Ghosh Circular Road
91. Hotel Shanti Overbridge
92. Kapil Dev Rospa Tower Main Road
93. Jitendra Kumar Kantatoli
94. Vishwanath Mehto Circular Road

95. Bhojan Bhandar Apper Baazar
96. Mirch Masala Kanke Road
97. Hot Lips Kanke Road
98. Murari Shrama Lalpur
99. Kishori Sahu HB Road
100. Amul Ghosh Ratu Road
101. Madan Kumar Kesri Bahubaazar
102. Pankaj Gupta Lake Road
103. Inderdevpal Lake Road
104. Ranchi Sweets Ratu Road
105. Santosh Hotel Ratu Ratu Road
106. Rangoli Sweets Ratu Road
107. Kanchi Sweets Buti Mode
108. Budheswar Mehto Buti Mode
109. Hotel Dawat Bariyatu
110. Hotel Dawat Bariyatu Road
111. Hotel Swarn Station Road
112. Smt. Shashi Kala Kumari Husty Tasty Purulia Road
113. Hotel Enirel Hinoo
114. Prem Shankar Main Road
115. Chasmesahi Kanke Road
116. Rakesh Sharma Kokkar
117. Sudhanshu Gope Duranda
118. Subhode Gope Duranda
119. Abhay Kumar Singh Circular Road
120. Hotel Element Station road
121. Pankaj Prasoon Kadrau
122. Reliance Fresh Mohrabadi
123. Reliance Fresh Bahu Baazar
124. Reliance Fresh Hinoo
125. Reliance Fresh Mohrabadi
126. Reliance Fresh Hinoo
127. Reliance Fresh Ratu Raod
128. Reliance Fresh Circular Raod
129. Reliance Fresh Thadpakna

130. Reliance Fresh Booty Mode
131. Reliance Fresh Hehul
132. Hotel Ambe Upar Baazar
133. Eylex Hinii
134. Khalsaa Hotel over bridge
135. Mohneesh Janta Food Shop
136. BNR Hotel Station Road
137. Sunny Restaurant Station Road
138. Amrit Hotel Station Road
139. Hotel Krishna ChurchRoad
140. Vijay Kumar Verma Vishnu Gali
141. Trishna Family Restaurant Hamru
142. Deepak Kumar Sahu Hamru
143. Satpal Shukal Dhurwa
144. Manik Ghosh Dhurwa
145. Jai Lakhha Devi Dhurwa
146. Deepak Chand Soni Station Road
147. Vijay Kumar Rajgadiyan Circular Road
148. Basanti Devi Overbridge
149. Natraj Bar & Restaurant OCC
150. Natraj Bar & Restaurant Main Road
151. Gangaur Kuthcery Road
152. Sweet India Main Raod
153. Sonvit Manjhi Tharpakna
154. Hardyananad Singh Station Road
155. Jasbeer Hotel club Road
156. Hotel Plash over bridge
157. Hotel Kuber over bridge
158. Uttam Sweets ratu Raod
159. Ashok Kumar over bridge
160. Plant Masala restaurant Main Road
161. Bali Mehto Bargai
162. Virendra Mehto Bariyatu
163. Pappu Gupta Radium Road
164. Hotel Apsara Circular road

165. Santosh Bhojnalaya ratu Raod
166. Kuldeep Sahu Apar bazaar
167. Hotel Parag Apar bazaar
168. Shibhu Manjhi Mohrabadi
169. Rajmeet kaur Samlong
170. Gaurango Mishthan Bhandhaar Overbridge
171. Suman Devi harmu Baazra
172. Hotel Sartaj Main Raod
173. Gauri Yadav ratu raod
174. Rajastahn Kalevalan Kuthcery road
175. Reliance Fresh Hehul
176. Reliance Fresh Hehul
177. Reliance Fresh Hehul
178. Shyam Bhijnalaya Apar Baazar
179. Hotel Jharkhand Church Road
180. Nandlal Prasad Church Road
181. Bihari Prasad Chaurasiya Pandra
182. Bindu Sweetds Lalpur
183. Agrawal Sweets Namkum
184. Raju Kumar Gupta Dhawan Nagar Kanke Road
185. Bajrang Prajapati Karatoli Kakkar
186. Amrit Bhog Mohrabadi
187. Maju Shree South Office Para Doranda
188. Mangal Sweets Power House Chutiya
189. Milan Fast food Doranda
190. Silver Spoon Circular Road
191. Handi rice Kanke Road
192. Mahi Restaurant Argora
193. Hotel Green Chilly Bariyatu
194. Hotel Raju kanke Road
195. Sunil Bhojnalaya Apar Baazar
196. Seven Heaven Restaurant Harmu Baazar