VOLUME III

EMPLOYER'S REQUIREMENTS

&

SPECIFICATIONS

A. SCOPE OF WORKS

The works under Contract comprises the supply and installation of modern underground waste collection system by using smart bins for collection of municipal solid waste at designated locations in surat city other related miscellaneous works along with operation and maintenance of tendered works for period of five years on procurement and construction basis inculding prepartion of working drawings.

Details and drawings given in Tender document is for information purpose only and successful bidder shall undertake confirmatory survey for accuracy and completeness of data. It is in scope of successful Bidder to undertake all Site surveys, Geotechnical investigations, Underground Utility Survey and Scanning of the roads for utility shifting, obtaining all required approvals from the relevant authorities,Carry out Design and Drawings for all the components of the work as per Employers requirement and submit the same to client for review and approval, Prepare Good for Construction Drawings, submit maintenance manual to client for approval before start of Maintenance period.

The successful bidder shall have to prepare and submit 'As Built Drawings' depicting the exact construction carried out on site, in soft and hard copy format.

Statutory and other charges for getting various required approvals shall be in scope of Successful bidder

The scope of work also includes :

1.1 Proejct Components

Component 1: 3 cubic meter capacity underground bin

BIS / International standard underground vertical waste bins made of precast reinforced concrete bunker having water proof, good quality closed construction. The top cover lid to be hydraulically fixable in water tight condition with necessary provision to lock the filling lid having inter-genius design, secured garbage storage, longer empty intervals, improved hygiene and space saving above ground profiles with suitable lifting light weight MDPE/HDPE close bottom Container container with 2mm galvanised metallic internal casing to prevent fire suitable for collecting municipal solid waste including paper glass and organic waste with a provision of 2 separate opening to receive the

mixed solid waste by the user/municipal workers at street-level and door-to-door collection from households and commercial establishments collected by hand/tri-cycle cart and with provision suitable to lift the container through a 1 hook crane fitted on the compactor truck for emptying through standard compactor din lifting device. The entire bin should be free from fire risk, vandalism and safety.

The space on the external part above the groundof underground bin may be so designed that it'll be used for running awareness among the users/citizen for safe garbage disposal. The desired colour stickers/logo's and the awareness messageshall be provided by Surat Municipal Corporation.

Specification for 3 Cubic meter undergrund bin model as per the Tender Drawing:

1) One high quality stainless steel intake column with appropriate lids to accept the waste by the user and also directly from hand/tri-cycle cart.

2) One Steel lid with a lock for locking the raise including hinges, gas cylinders which are necessary to help the operator to raise and lower the lid of underground container to support a minimum load of 450 kg/m² not occupying more space than 2 x 2 meters that ensures tightness of the underground container when closed with top layer of anti-skid material or equivalently matching to the pavement.

3) One 3m³ with close bottom MDPE container empty weight not exceeding 150kgwith with 2mm galvanized metallic internal casing to prevent fire and with 1-hook lifting system assembled on the outside part of the container. The thickness of MDPE container must be of 7mm and 10mm on flat and reinforced side respectively.

4) One reinforced concrete bunker to be installed underground that provide space to store 3m³ waste bin/container must be prefabricated to be completely waterproof to surface and underground water.

5) The entire system must be in accordance to the standard EN13071-1 EN 13071-2 and the test reports and results by an accredited domestic or foreign laboratory must be provided.

Sealing and Stickering: The space on the external part above the ground of underground bin may be so designed that it'll be used for running awareness among the users/citizen for safe garbage disposal. The desired colour stickers/logo's and the awareness messageshall be provided by Surat Municipal Corporation.The bins shall be distinctively marked for easy identification. The marking and pictograms writings on the underground bins must be designed to help people clearly identify the bins for its use of depositing general waste in the bins.

Component 2: Bin Levelling System and its automated software

The operator shall install bin levelling system on each bin and shall provide a software solution for tracking the levelling of waste filled in underground bins at various locations on real time basis. The software solution must be mobile compatible and must also to provide the optimal route management solution with a provision for alerting the operator for emptying a specific bin by keying in the codes. Software should have the capabilities to generate data log as and when required. The software should be modular to be able to add or remove additional components as required and provide administrator users to the Surat Municipal Corporation. The Monitoring Software must be be accessed by designated officer by SMC over internet & also all to be integrated at SMC Centre.

Bin Levelling System and its automated software	**Specification**
Sensor Type	Ultrasonic
Signal distribution technology	GPRS over GSM (Quad band – 850/900/1800 MHz) with internal SIM Card. No user accounts required.
Accuracy of volume indication	+/-5%
Operating Parameter Range	-30°C to +70°C
Housing	Plastic – IP66 Weather proof, non-corrosive PA66

Power Management	3.6V C Cell Lithium Thionly Chloride 6.5Ahr capacity Replacable Battery
Technology for route optimisation	Google API
GIS integration	Google Maps
Driver management module	Mobile App
Bin Management	Configured fill-level, temperature and geo-positioning reports, map view of bin locations, filling graph of each monitored bin, app feature to symbolise authorised collection. Configured Alerts: Batter power, fill-level drop, cell tower locations, full/empty, days to full.
Incident Management	Over-full alert, temperature alert, proximity to cell tower change alert, unauthorised emptying alert

Component 3: Crane

Knuckle boom truck mounted Crane with remote control operation to lift the Underground Bins. The CRANE must have minimum Lifting Capacity of 1.5 Tons from approx. 6 Meter horizontal & vertical outreach along with manual outriggers hydraulic stabilizers, including sub-frame fabrication, mounting & installation and commissioning on compactor Truck.

Knuckle Boom truck mounted Crane with the following specification	**Palfinger/Hyva/Hiab make or similar 9.5tm crane**
Max. lifting moment	9.5 mt/93.5 kNm
Max. lifting capacity	5700 kg/55.9 kN
Max. Hydraulic outreach	12.4 meters
Slewing angle	400°
Stabilizer spread	3.3 m standard and 5.6 m max.
Width folded	2.5 m

Max. Operating pressure	315 bar

Crane should have remote control and manual overdrive so the operator can operate the crane safely. Crane shall be securely fitted between the truck cabin and compactor body with required reinforcements so that the truck chassis or the sub frame is not damaged or cracked in due course of operations.

Component 4: Civil Work

Civil/Earth work excavation in all type of soil including removing the same to the nearest low-lying area and after refilling the surrounding gap between the concrete bunker for filling, strutting, barricading, shuttering, safety measures, balling out of water wherever necessary as per standard specifications.

Component 5: Compactor Truck for Collection of Municipal Solid Waste

Commissioning of Compactor Truck with company fitted PTO gear box on 16 Ton GVW Chassis (TATA/Eicher/Mahindra or similar) with cabin and hydraulically controlled compactor body for easy collection and disposal of municipal solid waste collection along with an in-built bin washing system for regular cleaning of underground bins. The compactor body must be so fabricated that it should be intended to fit a crane between the driver cabin and compactor body suitable for emptying the underground bins through standard compactor din lifting device. The truck used for collection of waste from smart bins to disgnated loation must be new and it has been approved by SMC/ SSDL and Consultant.

1.2 Construction and completion of the following

a. Site clearance, demolition works, earthworks, temporary works, traffic diversion, barricading the construction site, and all ancillary works deemed necessary for the carrying out of temporary & permanent construction works.
b. Tree cutting (if any) .
c. Construction of reinforced concrete bunker as per approved drawing.

d. All other works and services ancillary or related to the full completion of the Works in accordance with the Employer‘s requirements

1.3 The Contractor shall support and protect services that need not be diverted.

1.4 The Contractor‘s responsibility for the design and build works includes the submissions to relevant government authorities / technical departments for obtaining all necessary clearances/approvals.

1.5 The Contractor shall co-ordinate and interfaces his works with that of all other contractors,subcontractors, utility services, statutory authorities, etc. and achieve the completion of the Works to the satisfaction of the Engineer

1.6 The Contractor shall verify the proposed road reserve, cadastral boundary and contract boundary and all dimensions on Site prior to submission of Tender. The Contractor is responsible for clarifying any discrepancy between the Drawings and actual condition on Site.

1.7 The Contractor shall make good all works including road surfaces, drains, concrete slabs, gratings, kerbs, pavements, turfing, railing, fence, boundary wall, etc. affected or damaged during the course of construction, to the satisfaction of the Engineer. The costs of making good all these defects shall be borne solely by the Contractor and deemed included in his Contract Sum

1.8 All works specified shall include the provision of all labour, tools, equipment, material,traffic control, transport and everything else necessary for the satisfactory completion of the Work by the Contractor to the satisfaction of the Engineer.

1.9 Description of the Works involved in this Contract is given in the Specifications for the guidance of the Contractor. The Contractor shall be solely and fully responsible for investigating and ensuring the actual extent and nature of the Works comprised in this Contract prior to submission of his Tender.

1.10 Construction, management and quality of the Works shall comply with the Drawings, Specifications and Employers requirement

B. CONTRACTOR'S OBLIGATION

1. SITE RESPONSIBILITY CHART

The Contractor shall submit, within 15 days after the Date of Commencement of the Contract, a site responsibility chart to show the functions and responsibilities of various personnel from the Project Manager to the workmen responsible for executing the Works, as well as the functions and responsibilities of the sub-contractors involved.

2. SETTING OUT AND EXISTING LEVELS

The Contractor shall take levels and set out for the whole of the Works. The information on existing levels as shown on the Drawings is provided in good faith for the general guidance of the Contractor. The Contractor is to note that accuracy of information shown on the Drawings is not guaranteed. The Contractor shall visit the site and carry out field surveys if he considers it necessary to ascertain the full extent of the Works. Within one week after the commencement of the Works, the Contractor shall submit to the Engineer for his verification and endorsement, records of levels of the existing site condition. Similarly, the Contractor shall submit the as-constructed levels of the site to the Engineer upon completion of the Works. Such records shall be certified and endorsed by a Registered Surveyor engaged by the Contractor at his own cost.

3. DESIGN OF WORKS :

The Contractor shall carry out, and be responsible for the design of the Works, including any site surveys, subsoil investigations, materials testing, and all other things necessary for proper planning and design.

With 10 days from Award of work, the Contractor shall start submiting drawings, construction documents, etc., for review and approval by the Employer's Representative. The Contractor will be fully responsible for ensuring that its designs, drawings, and construction documents satisfy all requirements for constructing Works that are complete and fully functional in all respects.

The Contractor shall prepare, and keep up-to-date, a complete set of "as-built" records

of the execution of the Works, showing the exact as-built locations, sizes and details of the work as executed. These records shall be kept on the Site and Two sets of such records shall be Submited to Employer.

In addition, the Contractor shall supply to the Employer's Representative as-built drawings of the Works, showing all Works as executed.

Contractor shall be responsible for Preparing Baseline Programme, upon acceptance of the Baseline Programme by the SMC, the Contractor shall adhere to it strictly. The Contractor shall ensure that preparation, updating and revision of programme of works are carried out by experienced and qualified personnel.

4. PROGRAMMING & PLANNING

1.4.1 BASELINE PROGRAMME :

Within 15 days after the award of the Contract, the Contractor shall submit six (6) hardcopies and one (1) softcopy of a Baseline Programme to the Engineer for his acceptance. The Contractor‘s project manager shall make a presentation of his proposed programme to the Engineer to demonstrate his understanding of the contract requirements, planning, control, monitoring of works programme and resources of the Works. Upon acceptance of the Baseline Programme by the Engineer, the Contractor shall adhere to it strictly. The Contractor shall ensure that preparation, updating and revision of programme of works are carried out by experienced and qualified personnel. The Baseline Programme shall be developed by the computerised Critical Path Method (CPM) using the Precedence Diagramming Method (PDM). The programming software shall be Primavera Project Planner or Microsoft Project or Open Plan, subject to the Engineer‘s approval.

1.4.2 Programme Details

The level of programme development, information and detail shall be sufficient to accurately define the Contractor‘s intentions and sequence of works. The programme shall show every significant activity required for the completion of the Contract that include but not limited to the following:

a) key dates, milestones, interface and handover dates, phased completion and completion of Whole of the Works

b) Contractor‘s design including dates for submission to and acceptance by the Engineer

c) submission and acceptance of road diversion plan, utilities diversion plan, Temporary Works and other works requiring approvals from authorities

d) procurement of major equipment and material, in particular long lead items and the delivery to site

e) all on-site works, including preliminary and Temporary Works by the Contractor, his sub contractors and suppliers

f) any off-site work such as the production and/or fabrication of any components ormaterials

g) the different stages of traffic diversion and specific requirements with regard to traffic aspects as given in this Specification

h) interface with Utility Agencies and work done by Utility Agencies or the Contractor for diversion

i) interface with other contracts/contractors; and

j) any outside influence which will or may affect the progress of Works

5. SITE MEETINGS

The Contractor shall provide all facilities at the site for the purpose of conducting joint site meetings between the Contractor and the Engineer.The Contractor‘s key representatives (Project Manager, Construction Managers, Safety and Health Officer, Environmental Control Officer and site engineers, etc.) are required to attend daily pre-work meeting punctually prior to commencement of site activities and submit daily and weekly works programme to the Engineer (or his representatives).

6. NOISE CONTROL

The Contractor shall maintain noise levels for construction premises as stipulated under the Environmental Pollution Control (Control of Noise at Construction Site Regulations) (Amended) Regulations latest and subsidiary legislation and any amendments and/or reenactment thereto. All vehicles and mechanical construction plants used for the purpose of the Works shall be fitted with effective exhaust silencers

and shall be maintained in good and efficient working order. All compressors shall be sound reduced models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturer.All construction plants shall, where appropriate, be muffled and the Engineer shall have the authority to instruct the Contractor to shut down any which is not adequately muffled and to remove it from the Site. All machines in intermittent use shall be shut down or throttled down to a minimum in the intervening periods between works. Noise emitting equipment running continuously shall be housed in a suitable acoustic enclosure. Constructional plant shall be maintained in good and workmanlike condition so that extraneous noises from mechanical vibration, creaking and squeaking are reduced to an acceptable minimum. Percussive methods will not be permitted for breaking concrete. Equipment which breaks concrete or used for bending or such other equipment as is approved by the Engineer shall be used. All pile driving, demolition works etc shall be carried out by a recognised noise reducing system. Rotary drills and busters actuated by hydraulic or electrical power shall, where practicable, be used for excavating hard material. Noisy constructional plant shall be sited as far away as possible from occupied buildings. The use of barriers (noise barriers, site huts, acoustic sheds, screens or partitions) to absorb and or deflect noise away from occupied buildings shall be employed wherever possible. Care shall be taken when loading or unloading vehicles, dismantling scaffolding or moving materials to reduce impact noise. Access to the working areas shall be such as to ensure minimum disturbance to persons in occupied buildings. The Contractor shall not execute any of the works or carry out maintenance of construction plants in such a manner as to cause nuisance unless the work is absolutely necessary to save life or property or for the safety of the works in which case the Contractor shall immediately advise the Engineer. The Contractor shall provide all that is necessary, including competent and qualified personnel and suitable equipment for all the measurements and recordings of the noise levels as and when requested by the Engineer during the Contract duration and submit a detailed report including analysis within two days after the day of measurements to the Engineer.The Contractor shall provide and use construction plant and equipment, which have been specifically designed or modified to reduce the noise of normal operation.All night work after 6pm shall be subject to the approval of the Engineer.

1.7 Interface with Government Authorities / Consultants / Contractors / Vendors

Contractor shall Coordinate with Various Government Authorities / Agencies , State

Electricity Board, Torrent Power, Gas Authority, ICT Consultant, ICT Contractor, various other Contractors / Vendors engaged by Employer for this Project for finalizing the Drawings, Implementation Schedule, for Proper Execution of works. All the Statutory Charges/ Fees. etc required for the same shall be borne by the Contractor.

1.8 Operation & maintenance Requirement

During Operation & Maintenance period, it shall be the responsibility of the contractor to collect the waste from Smart bin and deposite it to nearest Waste transfer station as suggesed by SMC. The Contractor has to provide detail process writeup of Waste collection process from smartbins including loading and unloading procedure and deposite it to nearest transferstation.

Before Commencement of Operation & maintenance Period, the Contractor shall submit Operation & Maintenance manual to SMC for approval. SMC shall review and finalize Operation and Maintenance requirements to be carried out by the Contractor. Operation & maintenance period will commence only after getting approval to Operation & Maintenance manual from SMC.

During the operation and maintenance period contractor shall provide a supervisor level staff for attending to all the O& M activities during the O&M Period. All the Operation and Maintenance obligations as approved by SMC shall be carried out by the Contractor.

The monthly report on the Operation and Maintenance shall be submitted to the Enginer and Quarterly payment for O& M as per the BOQ shall be released to the contractor based on the work carried out by him and assesement by the Engineer in charge. **SMC reserves the right for reduction in such payments, for any delay in attending the Maintenance obligation within the stipulated time as approved by SMC.**

1.9 Design and Drawings to be submitted for review and Approval

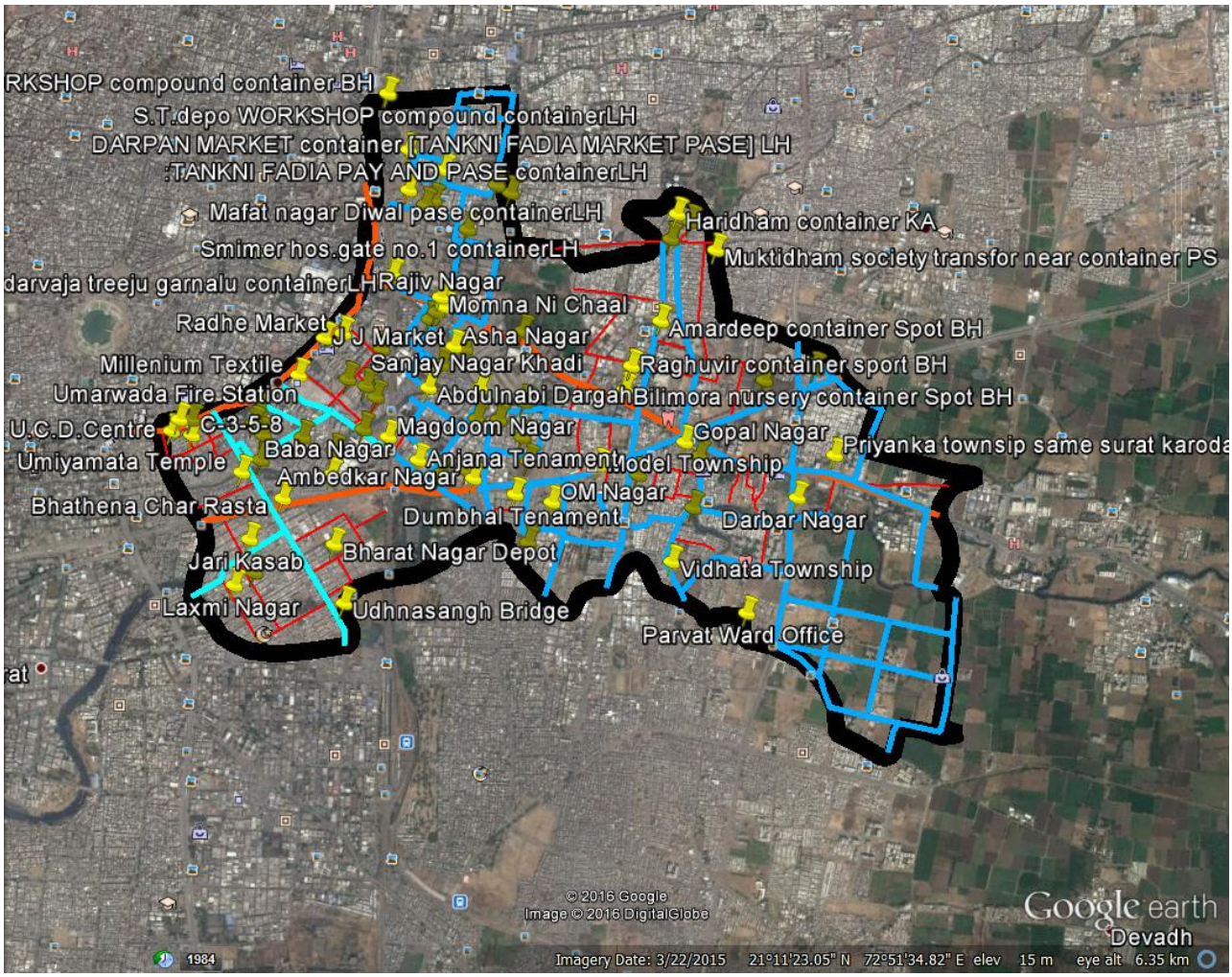
On Award of work the Contractor shall submit the design and Drawing for review and

approval. Drawings mentioned in the list are indicative and for Information. Contractor shall not limit himself to the same but it is in scope of Contractor to submit all required design and drawings for review and approval as per Instruction from Engineer-In-Charge

Sr.No	Documents
1	Geotechnical investigation report
2	Topography Survey Layout
3	Civil / structural design basis report
4	Structural design (calculations) report
5	Design,Drawings, Sections for all Waste Collection bins

C. Salient Features of Project :

1. Location of bins



Note: Location of bins are marked as Yellow darts.

At present, looking to the waste quantity generation pattern, waste collection bins will be establish all 75 locations. The Location for installation of waste bin should be installed within 100 meters radius of identified locations as shown above. Further location can be shifted or added or removed depend on following factors which decided on execution stage.

- Waste generation of that area

- Availability of space for loading and unloading of waste
- Soil strata of location
- Flood plain and ground water level near area of location
- Traffic density of road near to location

The waste collected from the underground bin will be transfer to nearest transfer-station. SMC is currently operating two transfer-stations within the vicinity of the defined project boundary. Both the transfer-station are within 5 km vicinity of smart bin locations. The Contractor has to identified smart bin on 75 location mutually agreed by SMC and Consusltant and Installed smart bins as per the technical specification provided in Tender.

Following are the tententive location identify by SMC which must be visited and identified by the contractor with all feasibilty.

ID	Name	Zone
311	DARPAN MARKET container [TANKNI FADIA MARKET PASE] LH	EZ
312	Mafat nagar Diwal pase containerLH	EZ
313	:TANKNI FADIA PAY AND PASE containerLH	EZ
314	Navjivan GARAGE pase containerLH	EZ
315	Sahara darvaja treeju garnalu containerLH	EZ
316	CR "bombay market L container.H	EZ
317	S.T.depo WORKSHOP compound containerLH	EZ
318	Smimer hos.gate no.1 containerLH	EZ
319	Smimer hos.-2 containerLH	EZ
320	javahar nagar container KA	EZ
321	khadi PUL juni pad container KA	EZ
322	Haridham container KA	EZ
323	Resham bhavan container BH	EZ
324	EWS awas container QUARTER BH	EZ
325	Samarth park container Spit BH	EZ
326	Samarth park container Spit BH	EZ
327	sita ram nagar container Spot BH	EZ
328	WORKSHOP compound container BH	EZ
329	Suman awas container BH	EZ
330	Raghuvir container sport BH	EZ
331	Amardeep container Spot BH	EZ
332	Parsi panchayat container spot BH	EZ
333	Bilimora nursery container Spot BH	EZ
334	Transport godown container spot BH	EZ
335	Akshaypatra container spot BH	EZ
336	Magob PS naher near container PS	EZ
337	Muktidham society transfor near container PS	EZ
338	Priyanka townsip same surat karodara road container PS	EZ

339	Momna Ni Chaal	LZ
340	Vidhata Township	LZ
341	Jalaram Nagar	LZ
342	Model Township	LZ
343	OM Nagar	LZ
344	Dumbhal Tenament	LZ
345	S K Nagar	LZ
346	Fulwala Compound	LZ
347	Jay Industries-3	LZ
348	Momin Industries	LZ
349	Swimming Pool	LZ
350	Darbar Nagar	LZ
351	Gopal Nagar	LZ
352	Halpativas	LZ
353	Ranchhod Nagar	LZ
354	Parvat Ward Office	LZ
355	Rajiv Nagar	LZ
356	Shramjivi Road	LZ
357	Silver Dying	LZ
358	Asha Nagar	LZ
359	Anand Nagar	LZ
360	Sanjay Nagar	LZ
361	Mahavir Market	LZ
362	Silkcity Market	LZ
363	Saidarshan Market	LZ
364	Abhishek Market	LZ
365	Radhe Market	LZ
366	J J Market	LZ
367	Millenium Textile	LZ
368	Bhathena Pumping Sation	LZ
369	Halpativas	LZ
370	Patch Depot	LZ
371	Chimni Tekra	LZ
372	C-3-5-8	LZ
373	U.C.D.Centre	LZ
374	Umarwada Fire Station	LZ
375	Umarwada Tenament-B	LZ
376	Abdulnabi Dargah	LZ
377	Narayan Nagar	LZ
378	Sanjay Nagar Khadi	LZ
379	Magdoom Nagar	LZ
380	Raghukul Market	LZ
381	Anwar Nagar	LZ
382	Salim Nagar	LZ
383	Umiyamata Temple	LZ
384	Umarwada Vegetable Market	LZ

385	Baba Nagar	LZ
386	Anjana Tenament	LZ
387	Anjana Pay & Use	LZ
388	Ambedkar Nagar	LZ
389	Udhnasangh Bridge	LZ
390	Bhathena Char Rasta	LZ
391	Bharat Nagar Depot	LZ
392	Jari Kasab	LZ
393	Pushpa Nagar-2	LZ
394	Laxmi Nagar	LZ

2. Waste Collection Process

The waste collection process must composed of an innovative lifting system bilateral, automated and mono-operator devices which, able to collect waste from various types of ground level and underground containers/bins.

Figure 1-1 Sketch showing the waste collection from smart bins

The technologies being used for waste collection process are Radio Frequency Identification (RFID), Global Position System (GPS), General Packet Radio Service (GPRS), and Geographic Information System (GIS). The collection trucks are embedded with RFID reader which helps in retrieving all the bin information from the RFID tags/ wireless ultrasonic and infrared sensors which also amended with SIM card and a replaceable Lithium battery placed in each bin. These sensors used advanced ultrasonic measurement and digital signal processing techniques for better accuracy to identify the waste fill level in the bin.

The sensor can be remotely configured to read the fill levels periodically at set intervals. The sensor can also be configured to store the readings frequently and sent to server whenever it breaches a threshold level. The live alerts in form of SMS and emails will be sent directly from server to centralized system. The location of the bins is identifying by GPS and centralized system will pass this message to truck drivers to initiate waste collection process. A mobile app/ web application for truck drivers shall also be provided where the routes and bins to pick up can be seen by Drivers. This app also has facility to upload real-time photograph of underground bins and exact weight cleared.

Figure 4-2 Waste Collection process

This information is regularly transferred in real time through GPRS to a database which is centrally located. A web application is designed so that the users can view the current location of the trucks individually during collection. A map server stores a digital map which displays the positions of the trucks as well as trash bin information.By using this technique, the system can come to know whether the truck has arrived to the bin location or not. The waste filling rate can be determined by the Intelligent Remote Monitoring sensor. Accordingly, waste will be collected from the bins.

D. SPECIFICATIONS

This section contains the specifications for proposed work and shall be read in conjunction with the various other sections forming the Contract namely, Instructions to Tenderers, General Conditions, Special Conditions, Bill of Quantities, Drawings and other related documents mentioned in this Tender Document together with any Addendum issued thereto.

1. Technical Specification of underground smart bins

- One high quality stainless steel intake column with approporate lids to accept the waste by user and also directly from hand/tri-cycle cart. The colored stickers are provided on the bins marking mixed municipal waste including pictograms writings to help people clearly identify the bins for the use of depositing general waste in the bins.
- One steel lockable lid is fitted with 2 industrial Gas cylinders to open and close the cover of the undeerground bin. The lid must be designed to to support a minimum load of 450 kg/m² not occupying more space than 2 x 2 meters that ensures tightness of the underground container when closed with top layer of anti-skid material or equivalently matching to the pavement.
- One 3m³ with MDPE close bottom container of 1350 x 1300 x 1700mm size having empty weight not exceeding 150kg with 2mm galvanized metallic interior to prevent fire and 1-hook lifting system assembled on the outside part of the container. The thickness of MDPE container must be of 7mm and 10mm on flat and reinforced side respectively.
- The entire system is in accordance to the standard EN13071-1 EN 13071-2 and the test reports and results by an accredited domestic or foreign laboratory shall be provided.

Dimensions

- Opening 1.35 x 1.30 m
- Height of 3 m³ container 1.7 m

Weights

- 3 m³ closed bottom container: 100 Kg

2. Concrete Bunker

The concrete bunker is rectangular in shape, comprising a base, two side walls and two end walls. All of the walls possess recesses to house elements of the opening and closing system and the raised parts of the polyethylene container. The base has a depression for collection of liquids or cleaning materials. The structural calculations of the bunker, actuating actions were designed in accordance with the prevailing standards.

Technical specification

One Reinforced concrete bunker of 1855x1855x1970 (D) mm having thickness of 110mm on flat side and 140mm on reinforced side walls to be installed fully underground that provide spade to store waste bin/container must be prefabricated to be completely waterproof to surface and underground water.

Dimensions

- Inner height of 3m³ bunker: 1.77 m
- Height of the external finishing: 90 cm
- Height of the deposition trapdoor: 95 cm
- Total height of the external semi underground container:1.5 m

Components

- Class C30/37 concrete
- A-500 yield strength steel
- Plated steel rim
- Various elements for transportation, and prepositioned
- Bushings for fastening of the elements of the opening system
- Watertight seal around the entirety of the bunker opening

Installation of Underground Bins

The installation procedure comprises following steps.

- Pit excavation

- Construction of 100mm x 100mm square concrete foundation followed by The concrete bunker is rectangular in shape, comprising a base, two side walls and two end walls
- Loose filling and closing of the pit surroundings and installation of the container
- Rebuilding of surroundings/pavement as per the requirement of location.

Concrete bunker cover

This item is is made of laminated steel plate and designed in order not to allow the entry of liquids into the underground bins. The lid with a lock is mend to lock the raise including hinges, gas cylinders which are necessary to help the operator to raise and lower the lid of underground container. It ensures tightness of the underground container when closed with top layer of anti-skid material or equivalently matching to the pavement. The cover, the metals, base of the cover, shock absorber supports and plates has an anti-corrosion treatment and protection. All bolts and sleeves are made of stainless steel. The hinges have brass bushings. The surface is protected against oxidation.

Mechanism for opening and closing the concrete bunker cover is designed to be comfortably operated by a single person. The cover is fitted with hinges which allow it to open, turning on the respective rim of the concrete bunker to an angle close to 90 degrees. The cover is opened by means of a key. Immediately after the tab which keeps the system closed is turned, the cover begins to open automatically. After several centimeters, the operator assists the opening of the cover and its retention at the end of this movement. The basic effort of opening the cover is undertaken by two cylinders connected to two supports located inside the concrete bunker, and two other identical supports located on the cover.

The cover is closed manually. The operator assists initially, facilitating the first part of the movement. The cover continues to close automatically until a semi-closed position. The stainless steel tab attached to the cover then turns, entering the recess in the rim attached to the concrete bunker.

3. Bin Levelling Sensor including automated software

The fill level management and route planning is carried out by a system that uses an ultrasonic sensor and a web portal to provide information on the state of filling in each container. Each sensor is protected against impacts and placed inside the container. In a specific time the system sends by GSM the filling level information to the web platform. Data from the various sensors allow the manager to allocate resources and program the required route with an economic and environmentally sustainable way.

Figure- 5-3 Sensors for Measuring Waste Filling

The mode “Route Planning” shows the containers to collect and the most efficient route. This information can be sent to a mobile device (Smartphone or Tablet) to help the driver. With this system it is possible to produce different reports on filling levels of the different containers: the number of collections, the historical data and other useful information to manage a more efficient collection.

Table 5-2 Technical Specification of Sensor

Sr. No	Parameter	Value
	Sensor Type	Ultrasonic
	Signal distribution Technology	GPRS over GSM (Quad band – 850/900/1800 MHz) with internal SIM Card. No user accounts required.
1	Dimensions	Width x Height 90mmx67 mm
2	StandardThread Mount	1 inchNPT
3	ContainerDepthmax.	3.0 meters
4	Min. Measurement	15 cm
5	Temperature Rating	-30 C to +70 C (operation)
6	Battery Life	Upto 10 years
7	Protectionrating	IP66
8	Shocks	100geach Axis(EN60058-2-27/F4)
9	Impact	IK10 (EN50102/F4)
10	Recycling	ROHSCompatible
11	Housing	High-density IP66 polyethylene (HDPE)
12	Communications	EGSM(850/900/1800/1900MHz)

13	CE Certification	CE0980 Articles3.1(a)(b), 3.2 (inside)
14	FCCCompliance	FCCID:UDV-0912142009007 (inside)

4. Waste Collection Vehicles and its Attachments

The waste collection vehicles are the trucks with capability to install PTO gear box on chassis for installation of fully automated crane and mobile compactor Unit.There are two types of waste collection vehicles Rear-loading vehicles and Top-loading vehicles are used for waste collection purpose.

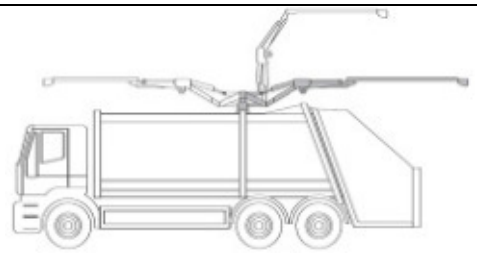
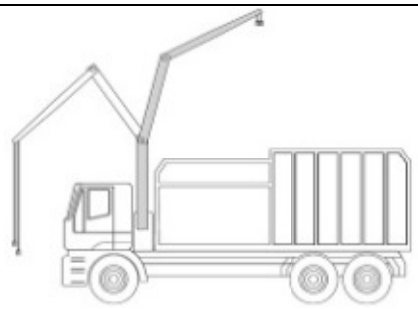
	
Rear-loading vehicles with Mobile compactor	Top-loading vehicles with Mobile compactor

Figure- 5-4 Waste Collection vehicles

Its Special purpose Vehicle Mounted Refuse Compactor Machine, Mounted on 16 Ton to 25 Ton GVW Chassis with PTO and Hydraulic Assembly. It also includes 10 ton/meter crane which can be mounted on truck which can be operated directly from driver cabin. A Crane with Lifting Hook, Radio Remote Control, Overload Protection, 3-Section Hydraulic Boom, Telescopic Outriggers medium as per the below mentioned Technical Specifications.

Crane

Knuckle boom truck mounted Crane with remote control operation to lift the Underground Bins. The CRANE must have minimum Lifting Capacity of 1.5 Tons from

approx. 6 Meter horizontal & vertical outreach along with manual outriggers hydraulic stabilizers, including sub-frame fabrication, mounting & installation and commissioning on compactor Truck.

Knuckle Boom truck mounted Crane with the following specification	**Palfinger/Hyva/Hiab make or similar 9.5tm crane**
Max. lifting moment	9.5 mt/93.5 kNm
Max. lifting capacity	5700 kg/55.9 kN
Max. Hydraulic outreach	12.4 meters
Slewing angle	400°
Stabilizer spread	3.3 m standard and 5.6 m max.
Width folded	2.5 m
Max. Operating pressure	315 bar

Crane should have remote control and manual overdrive so the operator can operate the crane safely. Crane shall be securely fitted between the truck cabin and compactor body with required reinforcements so that the truck chassis or the sub frame is not damaged or cracked in due course of operations.

Compactor Truck for Collection of Municipal Solid Waste

Commissioning of Compactor Truck with company fitted PTO gear box on 16 Ton GVW Chassis (TATA/Ashoka Laylend/Eicher/Mahindra or similar) with cabin and hydraulically controlled compactor body for easy collection and disposal of municipal solid waste collection along with an in-built bin washing system for regular cleaning of underground bins. The compactor body must be so fabricated that it should be intended to fit a crane between the driver cabin and compactor body suitable for emptying the underground bins through standard compactor din lifting device. The

truck used for collection of waste from smart bins to disgnated loation must be new and it has been approved by SMC/ SSDL and Consultant.

SPECIFICATION OF COMPACTOR TRUCK CHASSIS & BODY FOR COLLECTION OF MUNICIPAL SOLID WASTE

Truck Chassis and Compactor with following Body Specification Details	**TATA/Ashok Leyland/Eicher/Mahindra or Similar**
Truck:	
Engine	6 Cylinders Inline
Loading Capacity (GVW)	16 Tonnes or above
Axles	Heavy duty, Forged 1 beam, Reverse Elliot Type
Payload	10 Tonnes or above
Wheelbase	4800mm or above
Steering	Power Steering 20.2:1
Cabin & Chassis	YES
Emissions	BSIV or as applicable at the time of supply
PTO	As recommended or supplied by the truck chassis manufacturer
Compactor Body:	
Main Container Body	St-52/Equivalent Side Sheet Thickness: 3mm Roof Sheet Thickness: 3mm

Morden Undergound Waste Collection System by using Smart Bins

	Floor Sheet Thickness: 5mm
Refuse Ejection Barrier	St-52/Equivalent of 3mm
Tailgate Floor	Hardox 400/Equivalent of 5mm
Sweeping plate	Hardox 400/Equivalent of 5mm
Body Volume	12 - 14 m3
Type of operation	Loading with hydraulic operation
Hydraulic Cylinders	9 double acting cylinders for all operation including bin lift & emptying
Hydraulic Pump	Gear/Vane pump (52 cc/rev)
Hydraulic Tank	60 to 80 litres
Operating Pressure of the System	165 – 175 bar
Operating Pressure of the Pump	165 – 175 bar
Max. peak pressure produced by pump	275 bar
Hydraulic Oil Specifications	ISO grade 68 AW
Leachate Collection	Built in sump for collection of leachate
Hydraulic fitting, rubber and other metal fittings	All complete
Hydraulic Tank with Structure	Complete
Check Valve, Central Valve and Compound Valve	As required
Channel size (Bottom)	4 x 6”
Hydraulic Oil	60 - 80 Litres

Complete Painted Body	Colour as specified by the tender inviting authority
Accessories	Bin Washing System
Pump	Jetting pump driven by auxiliary engine
Flow Rate	15 Lpm
Pressure	96 bar
Gun	Pressurewasher gun
Water Tank	1000 litre

The Tipper Truck, Body and Crane must consist of the following:

1. Truck chassis with suitable sub-frame fabrication.
2. Knuckle Boon Truck mounted Crane with remote.
3. Compactor -
   a. Main body or Container.
   b. Hopper.
   c. Packing Mechanism
   d. Refuse Ejection Barrier
   e. Hydraulic Operating System
   f. Bin Washing System
   g. Control Station

a) <u>Main Body or the Container</u>:
   i. Smooth and rounded side wall and rook design
   ii. Constructed with structural steel with solid sub frame
   iii. Compactor container body with good aesthetics look and improved features.
   iv. The body must be with combination of Ejector plate, Hopper, Sweeper, Packer and Bin Lifters.

b) <u>Hopper</u>:
   i. Optimised 1.6 or more m3 swept volume capacity to reduce wear & tear and fuel consumption
   ii. Full 1.9m uncluttered loading width.
   iii. Integral full height body/hopper seal fitted to prevent liquid leakage from bottom edge and hopper sides
   iv. High wear resistant steel for hopper plate.

c) Packing Mechanism:

i. Proven two-plate fabricated packer/sweeper design

ii. Sweeper plate manufactures using high tensile abrasion resistant steel.

iii. Packing mechanism by dual packer cylinder and dual sweeper cylinder.

d) Hydraulic operating system:

i. Rugged PTO mounted standard gear pump

ii. Body mounted tank

iii. Pneumatic throttle control system with push button provided in chassis cabin

iv. Separate 2 spool hydraulic directional control valves with manual levers control for all system function.

v. Over centre valve on each tailgate cylinder to avoid sudden fall of tailgate with in raised condition.

vi. Body side mounted hopper lift cylinders

e) Bin Washing System:

i. Jet spray system to be provided to clean bins, equipment and work place.

ii. Jetting pump driven by auxillary engine to be provided spray gun

iii. Flow rate & Pressure – 15Lpm and 96 bar pressure

iv. 1000 litres water tank to be fitted in the compactor truck

f) Control Station:

i. Compaction mechanism control station to be provided at the rear of the vehicle. Control station must be location outside the body to enable the operator to supervise the whole operation.

ii. External discharge control station to be provided at the front of the body for ejection mechanism and lifting the tailgate.