Thane Municipal Corporation

Vol-3 :Detailed Technical Specifications

BIDDING DOCUMENT

for the

Supply, Installation, Commissioning, Operation & Maintenance for Smart Water Meter & Related Infrastructure Work for Water Supply System of Thane City

TECHNICAL SPECIFICATIONS

1. OVERVIEW

The purpose of this assignment is to Supply, Install, Configure, Test, Commission and Operation & Maintenance of various sizes of battery operated Ultrasonic / Electromagnetic/ Woltman type AMR/AMI Smart Water Meters with remote wireless reading capability and manual reading capability. The assignment will also include training of TMC staff in installing, configuring, testing and meter reading of the smart meter system. The project is initiated to enhance TMC's efficiency and effectiveness in managing its consumer metering system.

The assignment will include but not limited to the following;

- Consumer Survey and Consumer Awareness program
- Change of Existing House Service Connections
- Providing, Supplying and Replacing the existing consumer meters, if any with battery operated Ultrasonic / Electromagnetic/ Woltman type AMR/AMI Water Meters
- Configure, Test, Installation and Commission the various sized Ultrasonic/ Electromagnetic/ Woltman type AMR/AMI Water Meters, with necessary accessories, reading and data processing softwares, communication infrastructure etc.
- Support the data transmission from the meters to selected sites via RF/ GSM/GPRS networks as per the rules & regulations of Department of Telecommunication, Govt. of India (DOT).
- Train TMC employees in all aspects of managing this new smart metering system.
- Operation & Maintenance of the smart meters for active operation, data transmission & receiving of data at control room for 7years.
- Generation & Distribution of Bills.
- The bidder will attend & solve the complaint about water meter in 48 hours. This will include calibration of meters. In case, the bidder is unable to solve the complaint, he will replace the meter with new meter and inform the concern officials in 2 hours.

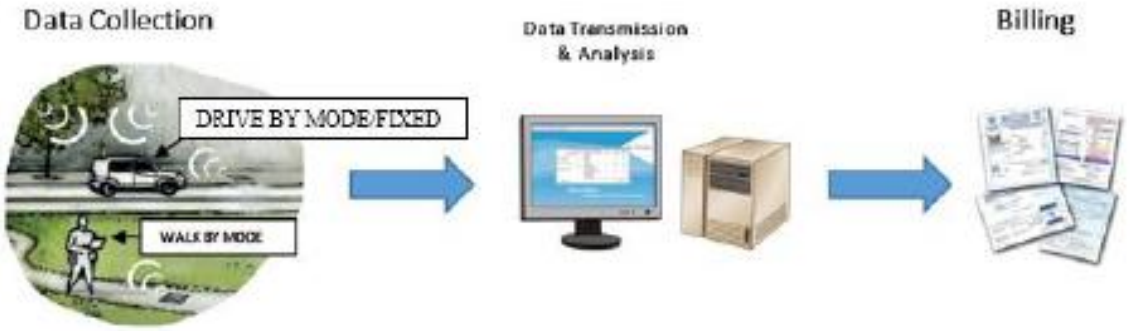
It is envisaged that the selected Solution Provider can sub-contract a civil/mechanical Contractor for the actual and timely installation of the meters while preventing unnecessary water supply interruptions to the consumers. There may also arise need to construct shallow meter chambers in some areas. The smart meter should be able to have a local data display unit while transmitting the same to selected TMC offices. It should also integrate with the TMC billing system. The billing software will make the water meter bill available to the consumers vide internet, mobile with secured payment gateway for online payment.

This assignment shall take approximately FIVE years that will include installation of 3,15,000 battery operated Ultrasonic / Electromagnetic/ Woltman type AMR/AMI water meters for domestic & non-domestic consumers followed by 7 years of Operation and Maintenance.

The bidder will transfer the complete ownership, license of software's to Thane Municipal Corporation. The software's will not be limited by time period. The tenderer should confirm that the solutions/software is able to work with at least 5,00,000 meters. During implementation the supplier shall work hand in hand with TMC employees, for hands-on training in installation, configuration, testing and commissioning of 100% of the supplied smart meters.

1.1. Vendor's Scope for data transmission.

It is envisaged that the data will be collected through walk by / drive by / fixed (AMI system) in the meter reading instrument & will be transmitted to the strategically located control room. The collected data will be analyzed & a report will be prepared on the same with the final output of generating the Bills to the individual consumers.



1.2. On Job Training requirements

The bidder will be responsible for training initially to the project team and groups of TMC personnel in both Operations & Maintenance of the system. For the project team, the training will include all aspects related to installation, configuration, testing, commissioning and operations and maintenance of the smart meter and the necessary accessories. The training of the project team will also include factory visit to the manufacturer's premises at his cost. The personnel will be trained to the extent that they will be able to demonstrate the ability to operate the system on their own

The personnel will be taken through installation, handling, operation principles, possible malfunctions (hardware & software), their causes, troubleshooting and repair. They will be trained on both practical and theory of preventive and reactive maintenance.

Training manuals will be provided for operations and maintenance. The manuals must be fully self-explanatory. The maintenance manual must include a full uncut diagram showing all components of the smart meter (not block diagram). During the contract, TMC will attach suitable personnel to acquaint themselves with the system at every stage of installation, configuration and testing. Their role will initially be observatory and culminating to hands-on. This will not in any way absolve the supplier from any liability including proper workmanship, safety, security etc.

1.3. Personnel, facilities and other requirements to be provided by the bidder.

For the purposes of effective management of this contract a project team will be constituted by TMC, which will work hand in hand with the Solution Provider in all phases of the tender, to ensure timely and smooth delivery of the entire exercise. The project team will operate from the project office or as determined by the client. The client shall provide all relevant documents as needed.

The Ultrasonic / Electromagnetic/Woltman type AMR water meters will be installed at consumers' premises to replace their existing meters if any. Ideally most of the existing meters are located next to the consumer's boundary however a couple of cases will require relocation to preferred sites within the consumer's premises.

CONSUMER SURVEY & DIGITIZATION

Scope

This specification covers consumer survey, Engineering surveys, investigations, inventory and condition assessment and digitization on GIS platform to visualize and model the entire water supply network in the Command area from source to household. This includes preparation and maintenance of comprehensive data regarding complete water supply system with the help of latest soft wares for optimization of maintenance works and future documentation

Item No.1 CONSUMER SURVEY

SCOPE OF WORK:

This specification covers the work of carrying out a consumer survey in the Service Area to record all potential and existing consumers. The survey should capture, inter alia, the number of existing and potential domestic, commercial, bulk and industrial consumers. The data to be collected during the survey will be finalized in consultation with TMC.

OBEJECTIVES:-

The objectives of the survey are:

Details of consumption of water by different beneficiaries, i.e. Domestic, Industrial Commercial, non domestic etc.

- Determine the perception of water services received.
- Provide facts for formulation of policy for Water billing and revenue collection
- Provide information and measures to be taken to improve the efficiency and financial performance of the Water distribution system.
- Evaluate the quality of service when reporting problems or making enquiries.
- Determine the level of awareness of promotional water conservation initiatives.
- Identify issues relating to payment and billing for services.

COMPONENT INCLUDES

Survey of the Utility

1. Survey of Consumers in all households in water Distribution area (Residential consumption).
2. Survey has to be conducted in all non-domestic consumers like hotels, Lodge, shops (Commercial consumption).
3. Survey has to be conducted in all institutions like Schools, hostels, Bus stands, Government offices, hospitals, etc (Institutional consumption).
4. Survey has to be conducted in industrial area. (Industrial consumption)
5. Survey has to be conducted at all public stand posts (public stand post consumption)

6. No of properties dependent on stand post should be found out Also No. of stand post working / non-working should be noted during surveys.

DATA COLLECTION

Survey form has main five categories as below

1. Identification –

Under this category basic information has to collect his house number, complete address, telephone number, etc.

2. Economic status -

Under this category data has to be collected like name of respondent, sex, education, occupation, family income and size of family etc.

3. Details of House / Building –

Data to capture in this section are type of building, where they live, and construction of building. Also information about number of water closet, number of total taps use in house, uses of water like whether they use water for gardening.

4. Connection Details

In this data collect information of the customer / owner on whose name the connection is Register. Bill connection no. of connection name must be fill accurately.

5. Quantity and use –

Use of water for daily activities in liters from various sources.

6. Health Information:

Information of main diseases occurred in last one year.

TRAINING

Two days training course has to be conducted for surveyor by staff of the company. The aim of the training will be to build their capacities to conduct survey successfully. All surveyors will be given two days training on how to conduct survey, how to interact with respondent, how to facilitate to respondent, how to fill information in the survey form. How to read facial expression of respondent, so that surveyor can get correct information.

METHODOLOGY

Survey has to be conducted house to house

The survey has to simply design to collect information about customer perceptions, their billing habits, their water consumption and usage, their misunderstanding about the water tariff and system, their satisfaction area.

Methodology is an operational framework within which facts are placed so that their meaning may be seen more clearly. The scientific method is further a systematic and

organised series of steps that ensures maximum consistency and objectivity in researching a problem.

This survey has to be conducted in which data collectors have to participate as facilitator to the respondents. Data has to be collected by utilising structured interviews conducted for a total number Household recorded in Municipals Corporation.

A disadvantage of employing interviews to gather data is that the responses given may not be accurate and may not reflect real behavior. Respondents may also provide wrong information and may forget or lack the information required. These disadvantages of the selected data gathering method may well influence the findings of this survey. The surveyor should take care such matters.

The interview schedules questionnaires for the structured interviews have to supply by the Water supply and Sanitation Department. These schedules and survey approach had to be kept consistent for all areas and wards.

Properties shall be taken as per the property register of TMC.

If a single property / Building contains no. of flats, then nomenclature of flat in the building shall be represented as 300/1, 300/2 and so on.

For Chawls and or tenants within a property extra numbers to be considered.

Illegal properties or M.C. water connections shall be identified during consumer survey and shall be shown on G.I.S. Map. By checking day today Register or unregistered consumer & take note in consumer form also.

The contractor has to find out total No. of properties having connection and total no. of properties without connection. Also he has to find out from where the properties without connection gets the water. This should clear by be mentioned in the consumer survey report.

Mode of Measurement and Payment :

Breakup of Payment of rate stipulated in schedule B shall be based on completion of activities at stages below:

1. After completion of consumer survey 50 %
2. After computerization & submission 20 % of computerised data in excel worksheet for checking.
3. After submission of analysis of data and report of computerization data. 10 %
4. After validation approval for the data and report 10 %
5. Submission of G.I.S. layer 10 %

Item No.2 Survey of Existing water supply System and digitization on GIS Platform

Scope of the Work

This specification covers the survey, investigation, digitization work and also preparation and maintenance of comprehensive data regarding complete water supply system with the help of latest softwares for optimization of maintenance works and future documentation and digitization of the same on GIS platform.

General

Carry out preliminary activities of surveying all the components of existing water supply system with their details by GPS mapping.

Confirm all ground and underground assets such as pipeline, pumping station, service reservoirs and other important appurtenances by using GPS & pipe locator or GPR technique.

Confirmation of location and other important information of all existing components related to water supply project and correcting same on the base map.

Inserting all the collected information on GIS platform (satellite image & existing Base map will be provided) and preparation of the detailed base map of existing water supply system.
While updating the base map the alignment of existing pipeline (whether left or right side of the road) and interconnections of the existing pipeline network should be corrected according to the road along which the pipelines are laid.

Survey form for surveying existing water supply system should be approved from the authority and bellow is the list of existing Water Supply System Components to be surveyed as per approved survey form & the collected information to be updated on the base map and GIS platform.

List of the Water Supply Components:

Pipe network and appurtenances

1. Pipe details
    a. Diameter
    b. Length
    c. Material
    d. Pressure class of the pipe
    e. Installation year
    f. Lining details
    g. Depth from Ground Level
2. Control Valves/ Gate Valves/ Sluice Valves
    a. Diameter
    b. Material
    c. Valve type
    d. Zone / DMA name
    e. Installation year
    f. Make
    g. Operation time

3. Isolation Valves
    a. Diameter
    b. Material
    c. Valve type
    d. Installation year
    e. Make
4. Air Valve
    a. Diameter
    b. Material
    c. Valve type
    d. Installation year
    e. Make
5. Scour Valve
    a. Diameter
    b. Material
    c. Valve type
    d. Installation year
    e. Make
6. PRV
    a. Diameter
    b. Material
    c. Valve type
    d. Installation year
    e. Pressure Setting
    f. Make
7. Bulk flow meter
    a. Diameter
    b. Material
    c. Flowmeter type
    d. Installation year
    e. Make
8. Pressure Transmitter
    a. Material
    b. Type
    c. Installation year
    d. Make
9. Consumer connection/meter
    a. Diameter
    b. Connection Type
    c. Material
    d. Installation year
    e. Make
10. Flow Control Valve
    a. Diameter
    b. Material

c. Valve type
d. Installation year
e. Make

11. Hydrant
    a. Diameter
    b. Material
    c. Hydrant type
    d. Installation year
    e. Make
12. End plug or end stop
    a. Diameter
    b. Material
    c. Installation year
    d. Make

Structural, Mechanical & Electrical Component

1. Water Treatment Plant
    a. Name
    b. Capacity
    c. Eleven
2. Service Reservoir
    a. Name
    b. Capacity
    c. Staging height
    d. LDL
    e. FSL
3. Pumping Station
    a. Name
    b. Elevation
    c. Number of Pumps
4. Pump
    a. Type
    b. Discharge
    c. Head
    d. Make
5. Sump
    a. Size
    b. Capacity
    c. Level
6. Intake structure
    a. Location
    b. Level
    c. Size
7. Valve Chamber
    a. Location

b. Size
c. Zone

8. Manhole
    a. Location
    b. Size
    c. Zone

For carrying out the work, following data will be made available,
Latest database ward / zone wise in soft copy format on GIS platform the same to be verified and to be updated by the contractor for greatest accuracy.

List of Attributes for every water supply components to be collected/ documented.

Existing base map and satellite image for updating of existing water supply system components

The objectives of preliminary survey and digitization work,
Main objective is to prepare Geo-referenced database of existing water supply system .i.e. updating of base map as per the instructions from authority.

To provide information required for execution of the project.

To provide information to improve the efficiency and financial performance of the water distribution system.

To provide details of operations of existing water supply system.

To improve efficiency, decision-making and communication by integrating various multiple and complex sets of information

To provide all the technical and other details of existing water supply system.

Geo-Spatial Data Integration
After survey & field data collection work, data integration on GIS platform and preparation of base map will be performed. This will include the following

Updating of base map for the infrastructure details collected. This has to be done in for all infrastructure details such as roads, footpath, medians, traffic signals, trees etc.

Updating & Drawing all the details collected in different layers as per the dimensions and locations on GIS and on the base map. For this the location attribute collected in survey for each feature will be used.

The scale of the base map is recommended to be at 1: 2000, 1:5000 and 1: 10000 scale based on the availability.

Finalization of GIS Data for Water Supply Scheme

The finalized data after getting all the approvals integrated into the GIS system developed for client. The outputs should be submitted in following formats

Spatial data in the form of shape and geo-database.

Non-spatial data in form of tables in Oracle or Access and Excel.

Base Map with all existing water supply components

Ward/Zone wise report including hardcopy output.

SUB WOK: CONSUMER AWARENESS

Consumer awareness is an ongoing activity. The bidder shall prepare a detailed program for the 5 years of operation and get it approved from the TMC before starting the implementation. The consumer awareness program shall include the following activities (quantities are given in the BOQ): preparation and installation of Banners, Newspaper inserts, Sending bulk SMS to the consumers (1SMS per connection per month), organizing seminars in schools/colleges, organizing activities in public places, such as road shows / street plays etc., preparing high-quality videos to be used for promoting awareness, implementing a program with the help of NGOs.

Consumer awareness shall include but not limited to the following activities

Item No.3 Hoardings for 5 Years

- Size 30 x 20 Feet for every 10,000 connections for one month quarterly. (I.e. 20 months in period of five years)

Item No.4 Regional TV advertises

- Minimum 30 seconds Advertise for every week in Five years period.

Item No.5 Banners

- 1 per 25 connections for each year for five years period.1 Banners every 25 house connections of size 6'x4' shall be prepared, printed and posted up in the implementation area within 5 years from the award of the contract, evenly distributed throughout the entire time of operation and maintenance. The item includes labour and materials.

Item No.6 News Papers advertise

- Minimum 300 sq. cm advt. is in daily NEWS paper every week for 5 years. (I.e. 240 times in period of five years.)

Newspapers inserts shall be prepared, printed and inserted in the newspapers delivered in the implementation area within 5 years from the award of the contract, evenly distributed throughout the entire time of operation and maintenance. The total number of inserts is indicated in the BOQ. The item includes labour and materials.

Item No.7 Activities in Schools, Colleges & Public Places

- Considered one activity quarterly for first year and their onwards half yearly for the period of five years for each WTP Zone.

At least 12 consumer awareness activities per each in the implementation area shall be carried out in schools, colleges & public places located in the in the implementation area, within 5 years from the award of the contract, and evenly distributed throughout the entire time of operation and maintenance.

Item No.8 Ward Sabha, Road Shows & Street Plays

- Minimum all three activities quarterly for first year and their onwards half yearly for the period of five years at sixty different places in each WTP Zone.

At least 12 consumer awareness activities such as Ward Sabha, Road shows & street plays per each in the implementation area shall be carried out in the in the implementation area, within 5 years from the award of the contract, and evenly distributed throughout the entire time of operation and maintenance.

Item No.9 Video's

- Minimum100 number of videos of 3 minute each for every WTP Zone.

Three videos of 3 minute each shall be prepared at the beginning of the project. The videos shall be used for improving the awareness of the consumers and promoting the activities to be carried out in the in the implementation area. The videos shall be submitted to TMC also.

SUB WORK: FLOW METERS

EXCAVATION IN SOFT SOIL & MURUM INCLUDING ALL TYPES OF SOIL

Item No. 10 & Item No. 11

The item refers to general Excavation in Soft Soil & Murum, including Guarding & Lighting whenever required, including transportation of excess material at a distance of 30 m & refilling without disturbing the existing services, like distribution lines, drainage lines, cables, etc. Watering, compaction, and backfilling are also included.

1. During excavation of pipe trenches, strata met may be types of earthy of sandy materials, soils-of-all types, clay mud, soft, average of hard murum i.e. all kinds of disintegrated rock shingles, Excavation required on WBM roads is included under this item.

2. The excavation may be done manually using tools, such as pick axe, phavra, crow bars etc. In short the excavation is required to be done for pipe line work, which shall also include the excavation required for pipe supporting structures; pipe line protection, measures such as pipe encasing, thrust block, fixing blocks, welding pits or similar excavation work required in connection with laying and securing the pipe line of any pipe materials. Excavation on Asphalt Road & concrete road will be paid under separate item.

3. The excavation shall be taken down to such depths as described in Schedule- B / shown in L-Section of pipe lines / specifications / drawings and/or as directed and shall be done in extra sections shown in drawings and stipulated in specifications elsewhere herein. Extra excavation done over and above specified for whatever reasons shall not be paid for. The bottom of the pits shall be perfectly leveled before laying of pipe line/ concrete / masonry and shall be watered and thoroughly rammed.

4. The section of excavation however may be increased, if necessary, as directed by the Consultant / Engineer-In-Charge. Such extra depths and such increased section as directed

by Consultant / Engineer-In-Charge shall be admissible for payment at respective tendered rates.

5. All foundation pits shall be filled on the sides of masonry and concrete by the excavated stuff to the original surface of ground as required, watered and rammed in 20 cm thick layers and the tendered rate includes this operation.

6. Excavated material from pipe trenches / foundations shall not be placed nearer than 1.2 m from the edges of excavation. If the tender item specifies any specific distance limits for placing of excavated material, then the material shall not be stored within that specified limit or 1.2 m from the edge of the trenches whichever is higher. In case of excavation in town and inhabited places, the excavation area shall be strongly fenced and lighted during night by warning red lights, with security watchman at Bidder's cost. Material shall not be dumped on road. If the pipe line work is through a busy traffic area then necessary arrangements for regulating the traffic by engaging required guards, at both the ends of blocked road, with red and green flags shall be engaged to avoid traffic congestion. Unless otherwise specific lifts are mentioned in the tendered item, the tendered rate shall be for all lifts and leads involved in the work. The Bidder shall provide shoring and strutting of approved size and type wherever necessary for excavation in soft materials without extra cost.

7. Excavation carried out in excess of the width specified shall be at Bidder's own risk and shall not be measured, so also the excavation carried out in excess of the required depth shall be made good to the required level by selected excavated material, concrete or masonry in proportion as directed by the Consultant / Engineer-In-Charge without extra cost. The tendered rate for excavation items shall include lifting and removing the excavated material for proper disposal in the vicinity of 30 m from Centre of the trench as directed by the Consultant / Engineer-In-Charge.

8. The work of refilling of the trenches is included under this item. At the time of refilling of trenches, the top of refilled surface shall be adequately above the original ground level to accommodate settlements of the refilled material. The refilling shall be done in Layers of 25 to 30 cm, duly watered and properly rammed.

9. If there is no separate item of dewatering in the tender, the Bidder's tendered rate shall include all costs required for dewatering (either manually or through Diesel / Electric/ Petrol, Kerosene driven pump sets). No separate payment will be admissible even for dewatering in nallah and/or river portion.

10. In case of pipe trenches, the Consultant / Engineer-In-Charge may reduce the width of trench wherever a hard strata is met with, if he feels that adequate width to lay the pipe line is available in order to reduce the quantity. In such cases, the Bidder will be paid on the actual measurement basis. Any damage arising out of excavation to cable, pipe lines or private public institutions shall be made good by the Bidder at his cost, and if he fails to make good such losses, then the Consultant / Engineer-In-Charge may recover the same

from the Bidder from any payment due to him. The excavation for foundation of chairs and or pedestal etc. shall be as per drawing and details specified or as per instructions of Consultant / Engineer-In-Charge and the refilling of sides of foundation shall be treated as included in the item.

Dewatering

During the excavation, if subsoil water is met with, the Bidder shall provide necessary equipment and laborers for dewatering the trenches / pits by bailing out water or water mixed with clay. If pumping out subsoil water is found to be necessary, The Bidder shall provide sufficient number of pumps for the same. In both the above cases the excavation shall be done to the required level. The Bidder shall also make necessary arrangement for the disposal of drained water to nearby storm water drain or in a pit if allowed by Consultant / Engineer-In-Charge. In no case the water shall be allowed to spread over the adjoining area. Before discharging this water into public sewer / drain, the Bidder shall take necessary permission from the local authorities.

The Bidder shall be responsible for the adequate pumping, drainage and bailing out of water from the excavation. Failure to make such provisions which results in unsuitable subgrade conditions and which will require any special foundations as directed by the Consultant / Engineer-In- Charge, such foundations shall be placed at the entire cost of the Bidder and will not be measured or paid for as separate pay items. If the Bidder selects to undercut the trench and use gravel or tile bailing, drainage of well pointing, the additional work will be considered as incidental work and additional compensation will not be allowed.

Mode of Measurement and Payment

Excavation for trenches shall be measured correct to nearest centimeter. The quantity shall be worked out in cubic meter for payment purposes. Measurement for payment shall be made as per dimensions shown in the following table or as directed by Consultant / Engineer-In-Charge or as per actual whichever is minimum.

Dia.(mm)	Width(m)	Depth(m)	Remarks
<110	0.7	0.5	For Sub work 'Volumetric measurement'
<110	0.7	1	For Sub work 'Change of house service connection connections'
<140	0.75	1.25	
<160	0.75	1.25	
<180	0.8	1.25	
<200	0.8	1.25	
<225	0.8	1.35	
<250	0.85	1.35	
<280	0.9	1.35	
<315	0.9	1.35	

Excavation to dimensions in excess of the above will not be measured or paid for. If as per instructions of Consultant / Engineer-In-Charge excavation depth has to carry below the level shown in drawing, the additional depth will be paid at the same rate only. Dimensions shall be measured

correct to nearest centimeter and individual quantity shall be calculated corrected to two places of decimals of cubic meter.

No extra cost will be paid for putting the pipe all along the trenches before laying in the trenches.

Item No.12 PROVIDING AND FIXING FULLY AMR DOMESTIC WATER

SPECIFICATIONS

Meter shall be manufactured as per ISO 4064 standards & have International Organization of Legal Metrology (OIML)/MID pattern approvals & shall bear marking on dial of water meter for each size.

1. The water meters of domestic sizes shall be equipped with RF based AMR technology, directly fitted on the water meter & wireless, , multi-jet, inferential type, dry dial, MID approved water meters .

2. Water meters of each size should have been duly tested and passed as per the relevant standards and specifications from Fluid Control Research Institute (FCRI) Kerala for performance test supported with test certificate.

Applicable Standards:

Water meter straight reading means – 15mm size domestic water meters, inferential type, multi jet, magnetically coupled, having dry dial, Class 'B' standard with OIML/MID certification mark shall be with protection class of IP-68.

The meters shall be supplied complete with GI fittings, brass nuts and brass nipples. Strainer & sealing shall be provided as per relevant IS provision.

Material of construction:

a) The manufacturer shall provide specific details of materials used for various parts of the meter which must meet the specifications for the material of construction of the individual parts of the meters as per IS 779:1994 (latest amendments) or ISO 4064: 1993.

b) The body of the meter shall be of either Brass or Bronze. The firm shall specifically mention in the offer, the metal used in manufacturing. Material that come in contact with the water supply shall withstand 2 ppm (parts per million) of chlorine residual in the water supply and shall be resistant to corrosion.

c) The water meter and accessories shall be manufactured from materials of adequate strength and durability. The materials, which come in contact with the potable water, shall not create a toxic hazard, shall not support microbial growth, and shall not give rise to unpleasant taste or discoloration in the water supply. However, the spindle and bearings inside the hydraulic chamber shall be made of polished stainless steel with hard metal tip/ sapphire.

d) The internal pressure cup shall be made of low-ferrous brass not exceeding 0.02% Fe contents / Engineering plastic. Furthermore the internal pressure cup should

overlap the meter body. The lower case of the meter shall be painted with thermal painting externally. The painting materials should be safe for human uses and not affect human health (Health certificates should be included in the bidding documents). The painting colour shall be decided in consultation with the department after order of award.

i) Variation in weight of the meter will be permissible to ± 5% of the weight indicated by the bidder in his technical bid.

f) Each meter should be supplied in separate individual box with its accessories and test Certificates and guarantee card for free repair/ replacement for duration of 5 years. The no. of individual boxes of meters shall not exceed 30 nos in each cartoon.

g) Supply shall be made strictly as per the sample meters including the weight as approved by the Board after testing at National Physical Laboratory or at Fluid Control Research Institute, Kerala.

h) Minimum three meters shall be sent for testing at FCRI from each batch of supplied meters before installation at site.

i) Markings On The Body Of The Meter:

(a) Marking on dial/ cap.

i. Class "B"

ii. Multijet/ Model

iii. Magnetic Type

vi. ISO: 4064-1993.

v. MID/OIML Code No.

vi. Make/Brand

vii. Sl.No. / Year of Manufacture.

viii. TMC

(b) Embossing/ engraved on meter body.

i. 15 mm

ii. Direction of flow of water on both sides of the body of meter.

The Totalizer and Totalizer Shield:-

The totalizer shall be designed in such a way that if the totalizer protective glass is broken for a reason or another the totalizer cannot be removed from its place. The totalizer protective cover shall be made of sturdy glass and shall have a thickness of not less than 5mm and shall pass specified tests. Sturdy glass is defined as the ability of the counter protection glass to withstand, without damage, a free fall of a metal ball weighing 27.2 grams from a vertical distance of not less than 70 cm or sturdy Engineering plastic window subject to clear visibility till end of contract period guaranteed by bidder may be allowed.

Totalizer :-

A] It shall be of straight reading type

B] The totalizer shall register in cubic meter units

C] The totalizer reading should be less than 1KL

D] The totalizer shall consist of a row of minimum five on-line consecutive digits to read at least 99,999 m3.

E] Another three digits or pointers shall register flows in litres and be of a Different colour.

F] The totalizer should be of closed type.

G] The totalizer must be suitable for test on an electronic test bench.

H] Totalizer shall be made of copper CAN having 5mm thickness mineral glass or any other Suitable material required to maintain IP 68 protection class.

I] Meter will be provided with monolithic seal with copper wire.

AMR SYSTEM

1. The water meters shall have the anti – magnetic properties / immunity, as specified in ISO: 4064 – 2005, when tested with 400 gauss magnet is mandatory. For AMR system resistivity against application of magnate is not required

2. The remote reading of AMR water meter needs two way communications without affecting battery life and reading perforations throughout O&M period.

3. The remote readings of AMR water meter should be obtainable by either 'Walk by' or 'Drive by' methods.

4. The AMR trans-receivers shall be wireless and have IP 68 protection class i.e. no ingress of water after submerging AMR water meter for 48 hours under 3 meters of water column.

5. The AMR trans-receivers shall be used (RF End units/ Wireless RF transmitter/Receiver) for communication and remote reading. If the water meter & AMR trans-receivers are independent units then they must be from the same manufacturer

6. AMR shall be obtainable even under submerged conditions.

7. Remote readings of different water meters shall be obtained with single command. The remote readings shall have instant reading facility. The remote readings and dial readings of water meters shall match at all the times.

8. All A. M. R. readings shall show the date and time of the reading recorded.

9. The AMR system shall have facility to detect the reverse flow in water meters readings on the Hand Held Device (HHU) i.e. AMR reading device and on computer

screen.

10. The AMR system shall have the facility to record the abnormalities like application of very high consumptions, water leakages etc. along with necessary alarms in HHU and in software

11. The battery life of AMR water meter shall not be less than 7 (seven) years from successful installation of said AMR water meter along with its AMR system, the battery life shall be calculated by considering the monthly remote reading. During remote reading the battery life of AMR water meter shall be displayed / indicated on HHU.

10. If the AMR communication frequency is using / operating on paid frequency band, then the AMR water meter manufacturer has to produce the valid copy of license issued by Govt. of India / Deptt. of Telecom (DOT), for using the said operating frequency band. The cost of the same will be presumed as included in the quoted rates.

12. The technically qualified bidders shall obtain license for using frequency band to conduct the demo in the area of demonstration. The bidder will have to start the demonstration within 10 days of submission of bids and hence they would be allowed to produce the certificate till such time.

13. The AMR water meter shall not get affected for its AMR functioning due to High Tension or High Voltage line concentration.

14. All the time electronic index of the water meter shall match with mechanical index.

15. All water meter shall be fitted with RF based wireless remote trans receivers for AMR reading. It shall be either inbuilt or directly fitted on the water meter without wires.

16. The water meters fitted with A.M.R. shall have the facility to transmit reading in maximum submerged condition (as specified for IP-68 compliance)& the remote readings should be obtained outside the meter chamber, with water meter in submerged condition & lid of the chamber closed.

17. The manufacturer shall specify the frequency of the AMR operating system & shall possess the necessary license of said operating frequency, as per norms of Department of telecommunication, Govt. Of India issued by Government of India (GOI) / Department of Telecom (DOT). In case, if he claims frequency of the operation in the free band, necessary documents / clearance from GOI / DOT shall be submitted, along with the offer. However, the Utility reserves the right for acceptance of offered frequency & Power subjected to the guidelines issued by DOT / WPC.

18. AMR system should be compatible for up gradation to fixed net work if required in future.

Lab Testing:

The lab testing shall include following tests as per ISO:4064:2005 standards . The same will be conducted at FCRI, Palghat.

i. Accuracy testing of water meters at Qn.

ii. Accuracy testing of water meter at Qn after clamping the magnet on the water meter.

iii. IP 68 testing of water meter& AMR system.

iv. Remote reading of water meter in dry i.e. open air condition.

v. Remote reading of water meter in submerged condition i.e. under water, with under variable water depth conditions.

vi. Remote reading with different tamper alarms for back flows, magnet and physical damage, etc.

vii. Response time of AMR reading on HHU.

viii. Visual inspection of AMR water meter and its AMR system along with its software.

ix. Real Index test i.e. all the time electronic index of the water meter shall match with mechanical index.

x. Demonstration of uploading of readings from hand held unit to PC and vice versa.

xi. Life cycle and endurance test.

These tests should be performed in the in-house laboratory of the meter manufacturer. The Employer will depute Third Party Inspection Agency to the meter manufacturing facility of the manufacturer to inspect the meter as per QAP approved by Engineer In charge. Inspection charges and all other charges shall be borne by the contractor.

OR

Item No. 12 PROVIDING ULTRASONIC OR ELECTROMAGNETIC AMR WATER METERS

The items refer to design, manufacture, test, supply, give technical support, and submit a full-fledged detailed scheme including technology & methodology for taking remote water Meter readings of the Consumer AMR water meters from 15 mm to 300 mm to be installed on TMC connections. Water meters of size 15 to 40 mm can be Ultrasonic or Electromagnetic type, whereas mechanical Woltmann type will be required for larger sizes.

ITEM	SPECIFICATIONS
a) Measuring Principle	A battery operated inline non- Intrusive ultrasonic/ Electromagnetic water meter with no moving parts.
b) Power Supply	Battery operated for the sensor and calculator with a battery life of minimum 10 years to ensure recording at all times.
c) Meter Lifetime	Minimum10 years
d) Protection Class	Must comply to IP68 Standard for indoor and outdoor operation, including fully submerged installations
e) Approvals and certifications	The meter should be type approved and verified according to international water meter Standard OIML R 49 and or ISO 4064. The meter should be EEC/ MID approved. The bidder should provide a signed type approval certificate from FCRI.

ITEM	SPECIFICATIONS
f) Accuracy	+/-2% or better over typical operating range and temperatures. The ultrasonic / electromagnetic water meter should maintain its accuracy over its lifetime.
g) Calibration	3-Point calibration with calibration certificate available for each unit.
h) Dynamic Ratio (Q3/Q1)	Minimum of 100:1. See table 1 of ultrasonic/ Electromagnetic water meter sizes and measuring range.
i) Material	The water meter body shall be made of corrosion resistant material like brass, bronze, stainless steel, carbon steel or Engineered plastic.
j) Pressure Rating	Working pressure of >16 bars.
k) Environmental Temperature	0 degree C to 50 degree C
l) Lockable Cabinet	For Woltman type meters Weather proof mountable cabinet for the electronics that should not cause obstruction to the RF/GSM/GPRS signal.
m) Connectors	The meter body-casing nipple shall have an external straight BSP threads and should include2 No. coupling nuts with internal BSP threads of the same nominal pitch and diameter
	as those on the meter body and2 No. rubber gaskets of equal diameter with the meter connectors. These should be included in the cost
n) Data Protection and tamper proof	The meter should be tamper proof with suitable data protection of calibration and revenue parameters.
o) Self-diagnostics for error detection.	The smart meter should have advanced diagnostics with active alarm(s) indicated on display
p) Access to information	Display with ≥8 digits for main information. Index, menu and status symbols for dedicated information
q) Measuring Units	The measuring units should be m3 for volume and m3/h or l/h for flow rate.
r) Facility for Remote Communication interface	The ultrasonic/ Electromagnetic water meter should be configured with battery operated remote reading capability using point-to-point RF.
t) Indicators / Alarms	Tampering, Burst, Reverse Flow, Leakage etc.

Warranty

All the supplied smart water meters, their peripherals and equipment, etc., must have a written warranty from the manufacturer covering not less than 10 years from the date of commissioning.

Maintenance liability

All the installed smart water meters, their peripherals and equipment etc. will be subject to a defect liability period of 10 year beginning from the successful commissioning date. This means that if there

is a malfunction or breakdown within the period the supplier will be responsible for making good the same by repair/ replacement at his cost.

When there is a malfunction the bidder, it is expected that the problem will be resolved within 48 hours of the supplier receiving the information. In case a spare part has to be imported then the repair should similarly take not more than 21 days.

The supplier should do a classification of what malfunction/breakdown to be given 48 hours or 21 days. This should be in his tender. The list must be exhaustive and include all elements and how they can be detected.

Spare parts

The supplier must show prove that spares for all the supplied/installed items are available and that they will continue to be produced for the next 10 years at the least. It will be preferable for the spares to be within the country, and full explanation given of their availability.

In case the spares are overseas, full contacts, i.e. email, website, postal address and office telephone must be given and tested for workability. The language of communication must be ENGLISH.

Weatherproof

The equipment to be supplied will be installed and used in unfavorable weather conditions, such as in water, very humid, exposed to any external conditions etc. it is therefore required to supply equipment with all units of build standard to IP 68.

Serial Number:

Serial Number: On every meter body there shall be marked the nominal diameter of the meter *(e.g. DN 50 mm), the meter model, an arrow indicating the direction of flow in indelible marking cast in raised characters, in very easily visible position on the outer case of the meters, but NOT on the lid. The serial number of the meter must begin with the size of the meter e.g. DN50 for 2". The size shall be followed by meter number and end with the 2 last digits of the year of production The letter "TMC" followed by the serial number (e.g. TMC 5012345615) should be engraved on the top part of the meter body and laser marked on the upper part of the totalizer in Number and Barcode, near the index, in big letters (5mm minimum) and not on any transparent part of the totalizer. The set of the serial numbers to be used will be issued by TMC to the winning bidder.

Pre Tender Testing -The tenderer shall provide a sample of one meter per the given range within two days of bid submission and acknowledged by the supply chain manager; which will be used during the evaluation stage of the tender.

The sample shall form part of the specifications and thus shall be tested for compliance.

The sample of the winning bidder shall be retained for the actual delivery comparison /inspection and shall form part of the winning bidder's delivery consignment. Non conformity of the actual delivery to the awarded sample shall lead to rejection.

Testing and Commissioning

After award and delivery the bidder shall undertake the installation and configuration of the meters, then satisfy himself that the installation and configuration is okay, the supplier will in the presence of the TMC representatives, go through and test every part of the system for proper functionality. There will be pre-agreed and TMC approved sign-off forms on which to fill the test results.

The approval of the installation does not relief the Solution Provider of defects thereafter in accordance to the contract.

Commissioning will involve the official startup of the normal operations of the system. This will take place after successful testing. Commissioning should be done as soon as possible after installation of the meter. The maintenance liability period of 5 years months shall begin from the date of successful commissioning.

Brochures

The supplier must provide original manufacturer's brochures, of all the items tendered for as part of the offer. Manufacturer's brochures are documents produced by the manufacture with photographs of the equipment, general and technical specifications, installation and operational instructions etc. The brochures must be stamped with the suppliers' official stamp to be identified with. Any document returned without brochures will be rejected. Any other supplementary information will also be considered, only as additional to but not as substitute to brochures.

All the information in the brochures will be considered as part of the specifications in the suppliers offer, and will therefore be part of the contract, and deemed to be covered in the tender sum. Anything to the contrary should be clearly indicated before submission of the document.

Sub-Contracting and Partnerships

Whilst the contract is for Supply, Installation, Configuration and Testing and Commissioning of 315000 number of various sized Battery Powered Ultrasonic / Electromagnetic/Woltman type AMR / AMI Water Meters and related peripherals, the employer is cognizant of the fact that the supplier may not undertake all of the project, and will therefore require services of a sub-contractor and other partners for the smooth execution of the assignment.

The supplier should therefore include in his bid, the services for which he/she shall outsource and the cost of such outsourcing. The supplier will engage, manage and supervise these sub-contractors and partners effectively for the timely and efficient execution of the works. The engagement of the sub-contractors and partners shall not absolve the main supplier from his/her obligations on issues of quality or otherwise related to the overall contract.

Site and Factory Visit

Prior to award, the client shall conduct a site visit of the sites where the proposed solution has been implemented by the technically responsive bidders.

AMR SYSTEM

All rights, interest and ownership of all the components of automatic meter reading system (i.e. Software for reading meter, software to analyse the readings, alarms and to transfer reading to billing software of Thane Municipal Corporation) will be transferred to Thane Municipal Corporation during Hand Over of the System. Thane Municipal Corporation may ask to share necessary technical details with third party developers for customizing the application to suite future requirements of citizens, the meter manufacturer should be agree for the same.

1. The water meters shall have the anti – magnetic properties / immunity, as specified in ISO-4064:2005, when tested with 4000 gauss magnet. The AMR system shall remain unaffected with application of 4000 gauss magnet, as specified in ISO-4064:2005.
2. The remote readings of AMR water meter should be obtainable by 'Walk by/Drive by/Fixed network' methods. The Walk by mode shall be used only in case the meter is un readable by Drive by method.
3. The data Communication from the meters shall comply with the European standard on wireless M- bus Communication EN13757-4 Mode C1.
4. The AMR trans-receivers shall be wireless and have IP 68 protection category i.e. no ingress of water after submerging AMR water meter for 48 hours under 3 meters of water column.
5. The remote Meter reading device shall have instant reading facility. The remote readings and physical meter readings of water meters shall match at all the times.
6. All AMR readings shall show the date and time of the reading recorded.
7. The AMR system shall have facility to record the reverse flow in water meters readings and it shall show the **quantum of reverse flow** on the **Meter Reading device (METER READING DEVICE) i.e.** AMR reading device as well as computer system**.**
8. The AMR system shall have the facility to record the abnormalities like application of external magnetic effect, very high consumptions, water leakages, tampering, and removal of AMR unit from the meter body, etc. Along with necessary alarms in meter reading device and in software.
9. The battery of AMR water meter shall be inbuilt and its life shall not be less than 10 years from successful installation of said AMR water meter along with its AMR system, the battery life shall be calculated by considering the temperature conditions of Thane and daily remote reading. The implemented system shall be capable of carrying out hourly readings collection for 45 days, in order to derive the consumption pattern.
10. During remote reading, **meter reading device** will show remaining battery life of AMR water meter.
11. The AMR device of the water meter shall be tamper proof.
12. The AMR water meter shall not get affected for its AMR functioning due to High Tension or High Voltage line concentration.
13. All water meters shall be fitted with RF based wireless remote Tran's receiver for AMR reading. It shall be either inbuilt or directly fitted on the water meter without wires. Meter manufacturing company will assure that the frequency is FREE TO USE and necessary documentation with Department of Telecom is available at the time of bidding the tender.
14. The water meters fitted with AMR shall have the facility to transmit reading in submerged condition & the remote readings should be obtained with water meter in submerged condition & lid of the chamber closed.

15. All the time **electronic index** of the water meter shall match with the physical reading, available on water meter.
16. All following Critical Alarms should be with date and time stamp.
    A. Peak flow
    B. Reverse Flow.
    C. Meter not working.
    D. Meter Dry
    E. Leakage/Burst
    F. Meter Tampered

The AMR system should be able to customize alarms in order to make alarms relevant.

17. The AMR system should be able to be upgraded to a **Fixed Network system** which will provide hourly interval data on daily basis to control center of Thane Municipal Corporation.
18. The AMR system should date and time **synchronize** every meter.
19. The AMR system should retrieve required data from every meter without reduction in battery lifetime and/or reading speed.
20. The AMR system should be compatible to inter-operability with other brand AMR meters used in this project.
21. The AMR meters and the AMR module should be of the same brand.
22. AMR system should operate in free frequency band available in India as per notification of Department of Telecommunication Govt. of India. The necessary documents should be submitted with the proposal.
23. The Water Meter Manufacture should give undertaking on non-judicial stamp paper of Rs. 500 stating that the frequency used for AMR system is in free frequency band available in India.

AMR SOFTWARE

1. The software shall give output, at least in the CSV **(Comma Separated Value)/txt/xls format**.
2. The Route Management software must be capable of running on a standard PC compatible with minimum Pentium processor; in addition the software must run under Windows95, Windows XP Professional, Windows Vista, Windows 7 and / or latest version of windows operating system.
3. The Route Management software should be cloud base and should have web portal access so that user can view customer data through browser. In addition to above the software may have option for individual customer to view their meter consumption data through Web portal
4. The software shall allow the PC operator to review and edit any account in **Route Management/** AMR software database. Also, the PC operator shall be able to generate **routes/ groups as per zones or areas** and activity reports.
5. The software shall provide **database backup / restore functions** and must have real-time data access. The software should be **web-enabled and alerts to be provided through email/SMS to users.**
6. The software shall alert the meter reader for unread accounts in that route.
7. The software should have the facility to export CSV/txt/xls files in the pre-defined format by TMC to billing system.

8. The software shall enable the user to specify the data to be exported from the database for transferring to billing system.
9. The software shall select the routes to be read, and assignment of routes to a reading device and dynamic updating of routes and sub-routes to be enabled.
10. The software shall upload routes from the reading device through GSM/GPRS.
11. The software shall post the reading from the reading device onto appropriate accounts within the database.
12. The software shall make a backup copy of the routes within the database.
13. Software shall be able to set meter status on the fly like, meter not okay, reading not reliable, meter maintenance required etc
14. The software should be able to display reading data on screen.
15. The software should have capability to add additional customer information and create customizable data fields.
16. The software should manage GPS data of AMR Meters.
17. The software should manage customizable list of message codes for Meter Reader.– METER READING DEVICE.
18. The software should have the facility to view the photographs of meter taken my Meter reader.

Item No. 13 FIXING WATER METERS OF 15-50 mm DIA.

The item refers to all water meters from 15 mm to 50 mm size. After all meters are installed on existing house connections and the first water audit is carried out, the house connections will have to be replaced with MDPE pipes: this Item 'Fixing Water Meters of 15-50 mm Dia.' includes both fixing water meters on existing pipes and shifting of the same meters on the new MDPE house connections.

After fixing the Bidder has to check the fittings for possible leakages. All the class B G.I. fittings required for installations (apart from G.I. unions and G.I. nipples, which are considered in separate items) shall be provided and shall conform to the following specifications. All meters shall be protected and covered with the meter protecting box.

Types of Fittings

1. Dimensions of the fittings shall be as per IS: 1239 (Part-II): 1992 Table 1, to 28.
2. Manufacture: tubular conforming to this standard shall be made from tubes which comply with all the appropriate requirements of IS 1239 (Part 1): 2004
3. Socket: Socket shall be manufactured from mild steel by any of the following processes:

   a) Hot-finished seamless (HFS),
   b) Electric resistance welded (ERW),
   c) High frequency induction welded (HFIW), and d) Hot-finished welded (HFW),

Wherever tubular are supplied with sockets, the dimensions of socket shall be as under:-

Nominal Bore	Minimum Outside Diameters	Minimum length
15	27	19
20	32.5	27
25	39.5	28
32	49	37

40	56	39
50	68	46
65	84	51
80	98	51
100	124	60

Tapping of socket shall be done from one end only.

Other Fittings

Other wrought steel pipe fittings shall be manufactured from mild steel by any approved process.

1. Unless otherwise specified by the purchaser, all fittings shall be manufactured with thread connection, complying with the requirements of IS 554: 1999.
2. The steel from which the fittings are made, when tested in accordance with IS 1894: 1972 shall show on test a minimum tensile strength of 320 MPa.

Dimensions of tubular:

1. Pieces: Pieces shall conform to the dimensions given in table 1 IS: 1239 (Part 2) : 1992
2. Nipple: Close taper and running nipples shall be made only from heavy tubes. Barrel nipples shall be made either from medium or heavy tubes. The dimensions of nipples shall be as given in table 2 IS: 1239 (Part 2): 1992
3. Long screws (Connectors) Long screws (connection) shall be made only from heavy tube and shall be supplied single or double, as may be specified, and shall conform ok the appropriate dimensions given in Table No.3 of IS: 1239 (Part 2) : 1992
4. Bends and springs: Bends and springs shall conform to the appropriate dimensions given in Table 4. of IS: 1239 (Part 2): 1992 shall be fitted with sockets and back nuts conforming to the requirements given in the Standards.
5. Return bends Return bends shall be made from heavy tubes, supplied with socket at one end if so specified by the purchaser, and shall conform to the dimensions given in Table 5. IS 1239 (Part-2): 1992. The ends of the bends shall be parallel within ±1.5 °.

Test on Fittings and Sockets

1. The fittings and sockets before they leave the works shall be subjected to either of the following pressure tests.
2. The ends of fittings and sockets when subjected to the required pressure, after having been made up wrench tight with the prior application of lubricant, or sealant, or by any other appropriate method shall not show any leakage. The test shall be carried out after the fittings and sockets have been screwed and before any protecting coating other than galvanizing has been applied.
3. Drift Expanding Test
   It shall be carried out on sockets, tubes, blanks, or sockets in accordance with ARE 2335: 2005. On a conical mandrel having an included taper on diameter 1 in 16 and the minimum increase in outside diameter after expansion shall be as follows:
   Nominal Bore (mm) / Percentage of Expansion Min (%) Upto and including 25 / 2.0
   32 to 40 / 1.5
   50 to 80 / 1.0
   100 to 150 / 0.5
4. The sample size and the acceptance criteria for the pressure test shall be as follows:

Scale of Sampling and Acceptance Criteria for Pressure Test

Lot Size	Stage	Sample Size	Cumulative Sample Size	Acceptance Number	Rejection Number
Up to 1000	First	13	13	0	2
	Second	13	26	1	2
1001 to 3000	First	20	20	0	2
	Second	20	40	1	2
3001 to 5000	First	32	32	0	3
	Second	32	64	3	4
5001 to 10000	First	50	50	1	4
	Second	50	100	4	5
10001 and above	First	80	80	2	5
	Second	80	160	6	7

5. Taper Screw Plug Test: Sockets shall be capable of withstanding the expansion test as described below without showing any sign of fracture or failure.
6. The test shall consist of screwing the selected socket on a taper screw plug.
7. The threads of socket shall be thoroughly clean and free from foreign matter. Should the threads show sign of burr, this shall be removed by means of a pipe thread tap. The threads of the socket and the end of the test plug shall be lubricated with oil, and the socket shall then be screwed on to the test plug between the jaws of a vice, or other suitable fixtures, and by rotating the socket with both hands. The socket shall then be further rotated either by means of a pipe wrench of an adequate length to operative the test with gradual turning or by a power machine giving an appropriate leverage. The wrench shall not be hammered.
8. The plugs shall be manufactured from steel and shall be hardened to give a Vickers hardness between 700 and 800 HV when determined by applying a load of 30 kgf in accordance with IS 1501 2002.
9. The dimensions of plug shall conform to those given. The threads shall be ground after the plugs are case hardened, and the thread form and angle of taper shall be in accordance with the appropriate dimensions and tolerances specified in IS 554:1999.
10. For routine testing, use may be made, if so desired, of unhardened steel plugs in accordance with the dimensions given in Table 31 and having machined threads, the thread form and angle of taper being in accordance with the appropriate dimensions and tolerance specified in IS 554:1999.
11. In case of dispute, however in the test shall be carried out with the hardened plugs specified above.

ULTRASONIC / ELECTROMAGNETIC METERS

The Bidder must engage personnel possessing minimum Qualification of Graduation & experience to supervise installation of the consumer water meters. During installation, the existing G.I. line shall replace with MDPE Pipes & fittings along with ball valve/stop cock. The stop cock shall be fixed near the inlet of the water meter. The meter shall be installed exactly horizontal in the flow line in the direction shown by the arrow cast on the body of the meter. Care shall be taken that the factory seal

of the meter is not disturbed. Wherever the meter shall be fixed to a newly fitted pipe line, the pipe line shall have to be completely washed before fitting the meter. For this purpose a piece of pipe equal to the length of the meter shall be fitted in the proposed position of the meter in the new pipe line. The water shall be allowed to flow completely to wash the pipe line and then the meter installed as described above by replacing the connecting piece. No air valves will be required if Ultrasonic / electromagnetic meters are installed, or if the AMR meter is equipped with a microchip or equivalent facility that prevents air to be measured.

Testing of Joints

The pipes and fittings after they are laid and jointed shall be tested to hydraulic pressure of 6 Kg/ cm2 (60 meters). The pipes shall be slowly and carefully charged with water allowing all air to escape and avoiding all shock or water hammer. The draw off taps and stop cocks shall then be closed and specified hydraulic pressure shall be applied gradually. Pressure gauge must be accurate and preferably should have been recalibrated before the test. The test pump having been stopped, the test pressure should be maintained without loss for at least half an hour. The pipes and fittings shall be tested in sections as the work of laying proceeds, having the joints exposed for inspection during the testing. Pipes or fittings which are found leaking shall be replaced and joints found leaking shall be redone, without extra payment.

WOLTMAN TYPE METERS

The item includes supply of all additional material for assembly, cutting of pipes, and jointing wherever required. The Woltmann meters shall be installed in the water pipe in an easily accessible place so to ease its maintenance. The totalizer should be normally placed in a horizontal position. Before placing the meter in the water supply, the pipe should be well cleaned up, flushing a fair amount of water through it. It is possible to drain the water using a temporary stub. All the water supply outlets served by the meter shall sit higher than the meter itself otherwise its metering precision could be altered. Therefore the meter shall be placed upstream of an upward curve that ensures always a pipe completely filled with water. When installing, the operator must be careful with the arrow indicating the flow of water placed on the body of the meter. The pipes shall be perfectly aligned and be not off axis to avoid a mechanical stress on the meter itself. The pipe flanges must be perfectly parallel. The meters shall be installed in such a way as to ensure that the meters are always flooded. A Cast Iron stop cock and a strainer upstream are required. The flowmeter shall have a minimum 5D straight pipe length upstream and 3D straight pipe length downstream or whatever minimum distances the manufacturer is recommending for its specific meter, whichever are longer. All water meter shall be installed in boxes, as per drawings and instructions.

Item No. 14 PROVIDING & FIXING HDPE/PP MADE WATER METER BOX

The Meter Box is always recommended to encompass & protect Water meters installed on drinking water supply pipes. The Meter Box shall consist of main body and closing lid,. The body shall have inlet and outlet windows through which the pipe passes through. The lid shall have a provision to screw and fix it permanently in place. The material of construction of the lid and body of the Meter box shall be weather resistant HDPE (High Density Poly-Ethylene) or PP (Poly- Propylene). The material shall be safe to be buried in soil or exposed to sun. The Meter Box in its properly installed position shall be capable of withstanding load of human traffic typical of residential areas. The load

bearing capacity of the meter box shall be tested by applying dead load of 100 kg on the meter box top for 1 hour, without any side support. No signs of deformation of the box body shall be observed. While installing the meter box, compaction of soil around the body is required to increase its load bearing capacity. It is recommended to use Crushed gravel bed to drain out water accumulation around the valve/meter.

The box is intended to include the AMR consumer water meters up to 100 mm, the combination air valve (if present), and the ball valve/stopcock. For 15 mm and 20 mm water meters without combination air valve the box shall have the following size: lid dia. 200 mm x height 250 mm x base dia. 300 mm (round shape). For water meters equipped with combination air valve or larger water meters, the box shall be minimum 525x395x310 mm and of minimum weight 4.7 kg (rectangular shape). Since the size of the water meters of different manufacturers have also different sizes, the box size might also differ from those indicated, in any case it should not be larger than 695x520x310 mm and of maximum weight 7.5 kg. The measurement shall be on the basis of completed number of boxes.

Item No. 15 PROVIDING WOLTMANN TYPE AMR WATER METER (METERS SIZE 50 mm and above)

1. For some specific consumer connections having diameter of 50 mm or higher, Woltmann flowmeters are to be supplied and installed. Such meters shall be integrated in the same AMR system encompassing meters of size lower than 50 mm - see technical specifications of AMR System in the item 'providing Ultrasonic / electromagnetic AMR Water Meters'. The Woltmann meters shall be of axial helix type with only one moving part. The helix shall be made of non- hygroscopic, antimagnetic, un-deformable and wear resistant material. The meters are to be capable of measuring low flows & high flows, must be manufactured as per ISO 4064:2005 / OIML R49:2006 standards, and must be IP 68 waterproof.
2. The permanent flow rate to be measured Q3 shall be 25 m3/h for 50 mm meter, and 100 m3/h for 100 mm meter.
3. The dial of the meter shall be of dry type with magnetic transmission.
4. The body of the meter shall be in cast iron with epoxy paint finish or polyester coating, flanged to UNI PN 1 pressure rating.
5. The meter shall have European Economic Council (EEC) or International Organization of Legal Metrology (OIML)/MID pattern approvals & shall bear EEC marking on dial of water meter, as well as all other markings and engravings already specified for Ultrasonic / electromagnetic water meters i.e.
   I. Woltmann type
   II. ISO: 4064:2005 & EEC Code No. / MID approval No
   III. Make/Brand
   IV. Sr. No. /year of manufacturing
   V. TMC
   VI. Size (i.e.50 mm or 100 mm)
   VII. Direction of flow of water on both sides of the body of meter
6. The meter shall have no sensitivity to vibration conditions, humidity conditions. The meter shall be tamper proof against electromagnetic fields (Class E1 as per ISO 4064). The severity conditions shall comply with Class C as per ISO - 4064.
7. The meter shall record the reverse flow with time of such occurrence.

8. The totalizer protective cover and the totalizer itself shall have equivalent technical specifications in terms of sturdiness as those already specified for Ultrasonic / Electromagnetic water meters.
9. The meter shall be able to withstand a maximum temperature of 50 °C.
10. The water meters shall be equipped with RF based AMR technology, must have register having bidirectional wireless Radio frequency module (RF END unit/Wireless RF transmitter/Receiver) for communication and remote reading.
11. Water meters of each size should have been duly tested and passed as per the relevant standards and specifications from Fluid Control Research Institute (FCRI) Kerala for performance test supported with test certificate.
12. The Woltmann meters shall undergo the same type of Lab testing already specified for Ultrasonic/Electromagnetic type water meters.
13. If not already integrated in it, the meter shall be supplied and installed with a strainer upstream. The permissible loss of head through the meter with the strainer shall not exceed 0.63 bar at Q3.
14. The meter shall be supplied with all material required for fixing & giving satisfactory leak proof test. The Bidder shall install the meters in suitable locations for AMR-based drive-by reading system.

FIXING WOLTMAN TYPE WATER METER

The item includes supply of all additional material for assembly, cutting of pipes, and jointing wherever required. Labor for fixing the Woltmann meters is also included. The Woltmann meters shall be installed in the water pipe in an easily accessible place so to ease its maintenance. The totalizer should be normally placed in a horizontal position. Before placing the meter in the water supply, the pipe should be well cleaned up, flushing a fair amount of water through it. It is possible to drain the water using a temporary stub. All the water supply outlets served by the meter shall sit higher than the meter itself otherwise its metering precision could be altered. Therefore the meter shall be placed upstream of an upward curve that ensures always a pipe completely filled with water. When installing, the operator must be careful with the arrow indicating the flow of water placed on the body of the meter. The pipes shall be perfectly aligned and be not off axis to avoid a mechanical stress on the meter itself. The pipe flanges must be perfectly parallel. The meters shall be installed in such a way as to ensure that the meters are always flooded. A gate valve and a strainer upstream are required. The flowmeter shall have a minimum 5D straight pipe length upstream and 3D straight pipe length downstream or whatever minimum distances the manufacturer is recommending for its specific meter. All water meter shall be installed in boxes, as per drawings and instructions.

Item No. 16 CUTTING & CHAMFERING CI/DI PIPES

Cutting of pipes maybe necessary, when pipes are to be laid in lengths shorter than the lengths supplied such as while salvaging the pipes with damaged ends or while replacing cast iron accessories like tees, bends, etc., at fixed positions in the pipeline. Aline shall be marked around the pipe with a chalk piece at the point where the cut is to be made. The line shall be so marked that the cutis truly at right angle to the longitudinal axis of the pipe. The pipe shall be rigidly held on two parallel rafters nailed to cross beams, taking care that

the portion to be cut does not over hang and the cut mark is between the two rafters. The pipe shall be neatly cut at the chalk mark with carpenter's saw or hacksaw having along blade, by slowly rotating the pipe around its longitudinal axis so as to have the uncut portion on top for cutting. Cutting of the pipe at the overhang should as far as possible be avoided, it is dangerous as an overhanging end is liable to tear off due to its weight before the cut is completed. The ends of pipes should be suitably chamfered or rounded off to facilitate smoothen try of socket/fitting/specials.

Item No. 17 PROVIDING AND LAYING D.I. SPECIALS

Item includes:-

1. Providing DI I Mechanical Specials.
2. Providing DI Conventional, Specials
3. Providing DI Flanged Specials.
4. Carting the specials to site of work.

Specifications:-

The DI specials shall be manufactured and tested in accordance with IS 9523 or BS 4772. The mechanical test and hydrostatic test shall confirm to clause 9 and clause 10 respectively of IS 9523. The tolerances on dimensions shall be as per IS 9523.

The manufacturer of the pipes shall supply the fittings. D.I. Specials shall confirm to relevant IS codes of latest edition. Material should be procured from approved manufacturer with manufacturers test certificate. At least 50% of the D.I. specials should be inspected by S.G.S., RITES or any other agency approved by the TMC. Inspection charges shall be borne by the contractor.

All the DI fittings shall be supplied with rubber rings for each socket. The rubber ring shall conform to IS 12820 and IS 5382. Flanged fittings shall be supplied with one rubber gasket per flange and the required number of nuts and bolts. Rubber Gaskets shall be as per IS specifications mentioned in the schedule.

Synthetic rubber ring dimension should be as per IS 12820 / 89 and quality should be as per I.S. 5382/1985 and suitable for jointing of D.I. pipes as per I.S. 8329-2000 or C.I. pipes as per I.S. 1536-2001. Mechanical joint Bends, Tees, Reducer, Adopter etc. shall be of exact size, dia degree and as per standard specifications.

The special shall be coated or protected from rusting and shall be suitable for D.I. pipes (as per IS 8329/2000) or C.I. pipes (as per IS 1536-2001).

Mechanical compression sealing flanged socket tail piece (Jiffy flange adopter) shall be of exact size

and dia. to match D.I. pipes (IS 8329-2000). Mechanical Joint double socket reducer shall be as per IS 13382-1992 and suitable to D.I. pipes (IS 8329-2000) sealing gaskets of S.B.R. shall be as per IS 12820-1989.

This item includes providing of special, transporting the special to site and testing. It also includes cost of entire jointing material, cost of specials, and nut-bolts etc. Only labour charges required for jointing shall be paid separately under relevant items of this tender.

The contractor shall supply the required dia of special at his cost. **The Special shall be accepted after the third party inspection by SGS, RITES or any other agency authorized by TMC,** the charges for the same shall be **borne** by the contractor

Item No. 18 PROVIDING JIFFY / MECHANICAL JOINT I.S. 1538-1993

The item includes the supply of Cast Iron / Ductile Iron Mechanical compression (jiffy collar coupling) confirming to I.S.1538-1993, on quality of casting & IS 5382/1985 for sealing rubber gasket, including all taxes and duties & Octroi/LBT), transporting, loading, unloading and stacking at work site as directed. The necessary test certificate also shall be provided along with the supply.

General:

The item provides to supply the Cast Iron jiffy collar coupling with rings etc. complete as per the specified diameter of pipe / pipes. (Dia. between 80 mm & 750 mm). The joints shall conform the provisions of IS: 1538-1993 and IS 5382-1985. All Cast iron / Ductile iron specials such as C.I. mechanical compression collar coupling shall confirm to I.S. 1538-1993 (Part 1 to 24) The Supply shall be of various diameters as specified in supply order. The specials shall be free from any defects. It should be possible to cut or it drills the special to suit the site condition and fit in position etc. The hardness of the external surface shall not exceed 210 HBS. Sealing Rings shall confirm to IS 5382-1985. Ring shall be homogeneous and free from porosity, grit and surface defects, such as pitting, irregularities. Dimension of rings shall be as per IS.

The dimensions of jiffy collar coupling shall be as per Table 9 IS 1538-1993. The fittings shall be tested for:

1. Tensile Test: Minimum Tensile strength of 150 MPa.
2. Brinell Hardness Test: shall not exceed 210 HBS.
3. Hydrostatic Test: As per IS: 1538-1993/ (13382-2004),

which shall be:

For Dia. up to and including 300 mm - 2.5 MPa.

Dia over 300 mm & up to & include 600 mm - 2.0 MPa. over 600 mm - 1.5 MPa.

Markings:

Each fitting shall have cast stamped or indelibly painted on it the following markings:

1. Manufacturer's Name or trademark or identification mark.
2. The nominal diameter,
3. Mass of fitting,
4. Last 2 digits of year of manufacture,
5. Any other mark required by the purchaser.

Mode of Measurement and Payment:

The item shall be measured as numbers of collar couplings for the specified diameter of pipe. The measurement and payment shall be per number.

Item No. 19 FIXING JIFFY / MECHANICAL JOINTS

The Item includes jointing of C.I./D.I./M.S./PSC pipelines, fixing the mechanical fittings & easylink fittings for repairs of specials, for fixing air valves, for ferrule connection, for jointing broken pipes, for jointing new pipes with suitable rubber ring to make the joint water tight, including cost of zinc plated nut bolts, and giving satisfactory hydraulic testing of joints.

Item No. 20 PROVIDING DOUBLE FLANGED D.I. GLANDLESS SLUICE VALVE PN-1

The item includes providing, transporting to work site, and unloading of DI sluice valves. D.I. glandless (resilient seated) manually operated sluice valve PN1 with internal & external epoxy coating with testing as per IS14846 and flange ends on both sides confirming to IS1538 are required. The sluice valve shall be designed to guarantee low operating torque seven after many years of use in water-distribution applications. The glandless bonnet shall have a pressure supported sealing system; the valve shall be equipped with O-ring sealing. Stem sealing shall ensure maximum corrosion resistance. The valve's body, bonnet and wedge shall be of Ductile Iron (GGG-40).The stem shall be of Stainless Steel SS410 and the stem nut of brass.

The valve shall be marked with an arrow to show the direction of turn for closing of the valve. Prior permission of Consultant /Engineer-In-Charge should be taken before actual purchasing.

Item No. 21 FIXING C.I./ D.I. SLUICE VALVE

CI/DI sluice valve shall be provided with necessary jointing material, rubber gaskets and nut bolts etc. as per grade, alignment as directed by Consultant/ Engineer-In-Charge. The item includes cost of labour. The flanges of the pipe shall be perfectly aligned. The sluice valves shall be fixed by means of mechanical joints and particular care is to be taken in order not to move the rubber gasket from its position. The sluice valve shall be checked for leaks. The location for installation of the valve shall be approved by the Consultant /Engineer-In-Charge.

Item No. 22 PROVIDING AND CONSTRUCTING B.B. MASONRY VALVE CHAMBER

The work which shall be carried out as per Construction Specification contained in this section, involves construction of masonry Chamber at site as instruction of site in charge.

Manholes:

Masonry Chambers will be provided at where it necessary. However if required the same has to be provided in the road. The walls will be built up of solid masonry blocks. The top will be covered with heavy duty removable RCC slabs. This type of Chamber will be used when manholes are provided in footpath. The roof will also be heavy duty RCC slab with two openings.

Specification for masonry chamber:

a) chambers, due to constraints of the location, may have to be constructed on the road. The wall, roof and floor thickness will be 20 cm. The Manhole chamber with above said measurement should be constructed with solid masonry structure. The top of the manhole should be covered with SFRC covers slabs. The RCC slabs so covered should be flush with the level of the adjacent ground; footpath etc., the drawing for manhole may be referred.

b) All chambers / manholes shall be made water proof using water proofing compound. Necessary care shall be taken at construction joints to make the jointing chamber water proof. Whenever required, special water proofing treatment like gunting chemical water proofing treatment, cement based water proofing treatment, polythene sheet water proofing treatment etc., may be resorted as per direction of Engineer-in-charge.

c) The Manhole chamber with the said measurement should be constructed using with 75 class designation brick work in cement mortar 1:4 (1 cement : 4 coarse sand). The top of the manhole should be covered with RCC slabs of size 15cm (thick) × 40 cm (width).

d) Curing of concrete: After the concrete hardens, it shall be protected from quick drying with moist gunny bags, sand or any other materials approved by Site Engineer. The curing shall be done for a minimum period of 5 days or as determined by the Site Engineer.

e) Finishing chambers / pedestal: The internal faces of roof, walls and neck of chamber and exposed areas of pedestals shall be finished smooth with cement mortar 1:3 (1 cement: 3 coarse sand), finished smooth with a floating coat of neat cement.

f) Finishing of outer surface of chambers: Finishing of outer face of the chamber shall be done with 12 mm thick cement plaster 1:3 (1 Cement: 3 fine sand).

g) Finishing of floor of chambers: The floor of manhole shall be finished with 40 mm thick (av) cement concrete flooring by providing adequate slope.

h) Vertical Racking: Regarding Vertical Racking arrangement:-Vertical Racking arrangement has been changed. Ladder in minimum three steps may be provided for going inside & coming outside from the manhole using 12mm dia M.S. rod on shorter walls and on opposite side and fixing it in masonary (as per drawing given).

The arrangement for pipe openings shall be done

Frame and cover assembly: The frame for the cover shall be fixed as per standard drawings. The top level of frame shall be flush with road level or footpath level as the case may be.

Cover Lifting arrangement:

Cover lifting arrangement may be as per drawing given. dia is to be provided so that the cover may be lifted easily.

i) Loading : The manhole cover and frame shall be able to withstand heavy duty grade of loading conforming to relevant IS Code, square type and shall be galvanized according to ISO : 1460 R & R 1461 or IS 4736.

j) Marking: Each manhole cover and frame shall have a permanent marking sunk cast on them providing following information. Year of manufacture. Figure of TMC emblem.

Stores to be procured by the Contractor

All materials for use shall be new and duly tested as per approved standards and shall comply the material specifications. Where no spec. is specified, it shall conform to BIS/ISI/PWD standards.

Construction of chambers (manhole) should be done as per the specification at places as instructed by the Site Engineer. The cost shall be paid at, with count on basic unit. In case dimensional variation is required due to site condition, the payment will be proportional to the volume of chamber.

Specification for stone aggregates, coarse sand, fine sand

Stone aggregate : Stone aggregate to be used in the work shall be hard broken stone and shall be conform to PWD specification.

Coarse Sand: Coarse sand to be used shall conform to PWD specifications.

Fine Sand: Fine sand for finishing to be used in the work shall conform to PWD specifications Note : Where only one variety of sand is available, the sand will be sieved for use in finishing work as directed by the Engineer-in-charge in order to obtain smooth surface and nothing extra will be paid on this account.

Testing of Material : To have the quality control on the material used for construction OF manhole; Contractor will prepare Cubes of a size as desired by site in charge using the same material which is used for construction of manhole. These cubes will be sent for testing by an authorized testing laboratory for verifying the quality of material.

Final Inspection :- No work shall be treated as complete until acceptance testing and quality control checks are completed and found satisfactory.

All the defects pointed out by Engineer-in-charge shall be rectified and got re-tested by the contractor at his own cost before the work is treated as completed. The responsibility of non-clearing the defects and thus non-completion of work shall always rest with the contractor.

The rejection of the work shall be intimated to all concerned to ensure prompt action.

Engineering Instruction:

A. Safety Precaution while constructing Chamber

General :

Where a road or footpath is to be kept opened up in the course of work, special care shall be taken to see that proper protection is provided to prevent any accidents from occurring. Work shall be done in such a manner that it will not unduly inconvenience pedestrians or occupants of buildings or obstruct road traffic.

Danger from falling Material:

Care shall be taken to see that apparatus, tools or other excavating implements are not left in a dangerous or insecure position as to fall or be knocked into the trench thereby injuring any workmen who may be working inside the trench.

Danger of Cave in :

When working in deep trenches in loose soil, timbering up the side will prevent soil subsidence. The excavated material shall be kept far enough from the edge of the trench or pit. Vehicles or heavy equipment must not be permitted to approach too close to the construction site.

Precaution while working on Road:

The flags and the lamps shall be placed in conspicuous position so as to indicate the pedestrians and drivers of vehicles the full extent, i.e. both width and length of the obstruction. The distance between lamps or between floors shall not generally exceed 1.25 meters along the width and 6 meters along length of the obstruction in non-congested areas, but 4 meters along the length in congested areas. If the excavation is extensive, sufficient notices to give adequate warning of the danger shall be displayed conspicuously not less than 1.25 meters above the ground and close to the excavation.

Where any excavation is not clearly visible for a distance of 25 meters to traffic approaching from any direction or any part of the carriage way of the road in which the excavation is not clearly visible for a distance of 25 mtrs. to traffic approaching from any direction or any part of the carriage way of the road in which the excavation exists, a warning notice shall be placed on the kerb or edge of all such roads from which the excavation is not visible. Such warning shall be placed at a distance of 25 meters from the excavation or as near the distance as is practicable but not less than 10 meters from the junction of an entering or intersecting road with in the road in which the excavation exists.

All warnings, in these cases shall have a red background and shall be clearly visible and legible. All warning lamps shall exhibit a red light, but white lights may be used in addition to facilitate working at night. Wherever required a passage for pedestrians with foot bridge shall be provided. At excavations tools and all materials likely to offer obstruction shall be properly folded round and protected.

While permission for manhole work will be taken by TMC but the manhole should be properly covered while no work is going on to avoid any accident. Contractor shall be solely responsible in case of laxity on his part.

Contractor shall provide the caution board of appropriate size at his own cost on all the sides of the manhole stating “Caution, TMC manhole work is progress.”

Damage to Utilities:

The damage to the exposed utilities shall be contractor’s responsibility. Round the clock safety of utilities shall be sole responsibility of the contractor and the damage cost shall be deducted from the contractor. While constructing manholes the utilities should be properly accommodated in manholes.

The work is to be done in workman like manner as per type designs of the TMC and as directed. The Cost of extra excavation in all strata which in addition to the pipe trench excavation is included in this item, Size of chamber mentioned in tender item are the internal dimensions of the chamber. The size of chamber shall be selected to accommodate sluice valve or air valve and facilitate replacement / repairs any time without breaking the chamber.

The brickwork & other items required to be executed for construction shall confirm to the standard specifications detailed in the RED book of Govt. PWD dept. and cover slab 20 cm thick in M-200 mix. The finished top of the chamber shall be flush with road surface and shall not cause any inconvenience to the traffic.

Item No. 23 FERRULES

Item includes providing and fixing GM or brass ferrules confirming to IS-2692/1984 (reaffirmed 2005) tested to 21.09 Kg/sq.cm i/c boring & tapping the main, the contractor shall supply the required dia of ferrule at his cost. **The ferrule shall be accepted after the third party inspection by SGS, RITES or any other agency authorized by TMC,** the charges for the same shall be **borne** by the contractor.

Item No. 24 ELECTRO FUSION FITTINGS FOR HDPE PIPES

All the electrofusion fittings included in this document should be designed for use in water distribution systems and be manufactured/supplied by manufacturers having ISO 9001: 2000 certification for their quality systems. The products should comply with the following specific requirements.

1. The products shall comply with the requirements of BS EN 12201-3: 2003, BS EN 1555-3 or ISO 8085-3.
2. All the fittings shall be of SDR 11 rating.
   The product group used for drinking water applications should have undergone type test by WRc-NSF, U.K according to BS 6920 in any of their Certified Laboratories like WRc – NSF/DVGW/KIWA/SPGN and certificate of Compliance to be produced for the following parameters:
   a. Odour & Flavour of Water
   b. Appearance of Water
   c. Growth of Micro Organism
   d. Extraction of substances that may be of concern to Public Health (Cyto Toxicity)
   e. Extraction of Metals

3. All the products shall be manufactured by injection moulding using virgin compounded PE 80 (MDPE) polymer having a melt flow rate between 0.5 – 1.1 grams/10 minutes and shall be compatible for fusing on either PE 80 or PE 100 distribution mains manufactured according to the relevant national or international standards. The polymer used should comply with the requirements of BS 3412 and/or BS EN12201-1.

4. The fittings intended for water distribution applications shall be coloured blue for the clear identification of the services.

5. All the electrofusion products should be individually packed so that they can be used instantaneously at site without additional cleaning process. The protective packing should be transparent to allow easy identification of the fittings without opening the bags.

6. The electro fusion products should be with only a single heating coil to fully electrofuse the fitting to the adjoining pipe or pipe component as applicable. The heating coils shall be terminated at terminal pins of 4.0 or 4.7 millimetre diameter, protected with terminal shrouds. Each terminal shroud should be additionally protected with polyethylene shroud caps.

7. No heating element shall be exposed and all coils are to be integral part of the body of the fitting. The insertion of the heating element in the fitting should be part of the injection moulding process and coils inserted after the injection moulding process or attached to the body of the fitting as a separate embedded pad etc. are strictly not acceptable.

8. The pipe fixation shall be achieved by external clamping devices and integral fixation devices are not acceptable.

9. The brand name, size, raw material grade, SDR rating and batch identification are to be embedded as part of the injection moulding process. Each fitting should also be supplied with a barcode sticker for fusion parameters attached to the body for setting the fusion parameters on an automatic fusion control box. The barcode sticker should also include the fusion and cooling time applicable for the fitting for the manual setting of a manual fusion control box.

10. The fittings should be V-regulated type designed to fuse at a fusion voltage of 40 volts AC.

11. The heating elements should be designed for fusion at any ambient temperatures between -5 to +40 degree centigrade at a constant fusion time i.e. without any compensation of fusion time for different ambient temperatures.

12. A limited path style fusion indicator acting for each fusion zone as visual recognition of completed fusion cycle should be incorporated into the body of each fitting near the terminals. The fusion indicators should not allow the escape of the molten polymer through them during or after the fusion process.

13. All the sockets in the electrofusion fittings should include a method of tapping controlling the pipe penetration (pipe positioner/stopper).

The contractor shall supply the required dia of special at his cost. **The Electrofusion fittings special shall be accepted after the third party inspection by SGS, RITES or any other agency authorized by TMC,** the charges for the same shall be **borne** by the contractor.

Item No.25 & 26 SUPPLY OF COMPRESSION FITTINGS AND UPVC BALL VALVES COMPRESSION FITTINGS

Compression fittings used for House service connection shall comply with ISO 14236.

Material of Construction

Compression fittings material shall confirm to ISO 14236 Clause -5.

a) Body-Polypropylene
b) Nut / Cap –Polypropylene.
c) Clip Ring-POM (Acetylic resin)
d) Packing bush- Polypropylene
e) “O” ring – NBR
f) Threaded metal inserts –SS 304 with BSP Threads

Pressure testing:

The pressure rating of compression fittings as per clause 8 of ISO 14236 which shall be PN1.6

Dimensions:

The Dimension of compression fittings shall be as per clause 7.1 of ISO 14236

Performance requirements:

The compression fittings shall be tested as per ISO 14236. Following Test methods shall be performed.

Clause 8.2.1 -Leak tightness under internal pressure.

Clause 8.2.2 -Resistance to Pull out.

Clause 8.2.3 -Leak tightness under Internal Vacuum.

Clause 8.2.4 -Long term Pressure Test for Leak tightness for assembled joint

Clause 8.3.2.1 -MRS Value as per ISO 9080

Clause 8.3.3.1 -Resistance to Internal pressure.

Effects on Quality of Water:

The Compression fittings for intended for conveyance of Potable water for Human consumption to be tested to comply with BS 6920 specifications in any of the laboratories like DVGW / KIWA / SPGN / WRc –NSF and certificate of compliance to be produced for the following parameters :

a) Odor & Flavour of Water. b. Appearance of Water.
b) Growth of Micro Organism
c) Extraction of substances that may be of concern to Public Health (Cyto Toxicity)
d) Extraction of Metals.

For clear identification of the water services, the nuts of the fittings should be coloured blue while the body to be black. All fittings with threaded ends should be with BSP threads.

SUPPLY OF U PVC BALL VALVE

Ball Valves used for HOUSE Service Connections comply with ISO 4422, Part 4.

Material of Construction:

Ball Valve material shall confirm to as per clause 4 of ISO 4422.

a) Body and Handle - UPVC
b) Seals - PTFE
c) O-rings – NBR/EPDM
d) Material of Construction for compression end will as per specifications for compression fittings.

Pressure Rating

The Pressure of the Ball Valve shall be as per ISO 4422 shall be PN 1.6.

Dimensions:

The Dimensions of the Ball Valve shall be as per Table 3 of ISO 4422.

Performance Requirements:

The Ball valves shall be tested as per ISO 4422. Following test methods will be performed.

Clause 7.1 - Resistance of Valve Bodies to internal pressure

Clause 7.2 - Crushing Test

Clause 7.3 - Endurance Test

Clause 7.4.2 - Seat and Packing Test

Clause 7.4.1 - Operating torque Test

The Ball Valves intended for conveyance of Potable water for Human consumption to be tested to comply with BS 6920 specifications in any of the laboratories like DVGW / KIWA / SPGN / WRc–NSF and certificate of compliance to be produced for the following parameters:

a) Odor & Flavor of Water. b. Appearance of Water.
b) Growth of Micro Organism
c) Extraction of substances that may be of concern to Public Health (Cyto Toxicity)
   Extraction of Metals.

Item No. 27 PROVIDING STRAP / CLAMP SADDLE FOR SERVICE CONNECTION ON C.I. /D.I. PIPES
General Specifications:

Clamp saddles for service connection from water distribution mains shall be of wrap around type, wide skirt and wide straps support, which shall reinforce the pipe while providing excellent stability to the saddle. Clamp Saddles for service connections shall be of fastened strap type with threaded outlet for service connection.

The service connection threading sizes shall be conforming to IS: 554.Clamp saddles shall be suitable for DI pipes of nominal size 3" (NB 80) to 12" (NB 300) with nominal service connection size from ½" (NB 15), ¾" (NB 20), 1" (NB 25), 1 ¼" (NB 32), 1 ½" (NB40) and 2"(NB 50).

The wrap around straps shall be plastic type for firm grip on pipe as well as to protect the coating on the pipe. The strap design shall be such that metallic part of the saddle, if any, shall not come in direct contact with pipe and must insulate the un-identical metals. The saddles shall be single strap type up to pipe sizes of NB 600 and service outlet of ½", ¾" and 1".

The saddles shall be double strap type for pipe sizes above NB 600 or when the service outlet is 1¼", 1 ½" or 2".

Fasteners shall be threaded type. Fasteners of size ½" (M12) shall be used for saddles of size up to 4" (NB 100) and Fasteners of size 5/8" (M16) shall be used for saddles of size 6" (NB 150) and above.

The sealing between the saddle and mains shall be obtained by using a profiled elastomer seal matching to the curvature of the pipe and suitable for all potable water applications. The Material of construction of the body, fasteners etc. shall be of a non-corrosive material such as engineering plastic (PE/PP) or stainless steel or a combination of both.

The design of the saddle body should be such that, the service connection outlet metal insert shall project out towards pipe side and align with the hole drilled on the pipe to ensure positive locking against rocking or creeping on the pipe, as might be caused by vibration, pressure or excessive external loading.

The clamp saddles shall be suitable for maximum working pressures up to 10 bars.

Material and Design Specifications:

Saddle Body:
Non corrosive Engineering Plastic body moulded with Stainless steel threaded metal insert for tapping outlet. Also, the stirrup metal plate shall be duly embedded in the plastic body, except at the place of fastener lugs. All metal parts shall be made of SS 304 or higher grades. Threading size and dimensions shall conform to IS: 554. The body shall have retaining cavity housing for internal and external retention of the elastomeric seal. Sealing shall be achieved by pressure exerted by the body while fastening the saddle straps & body on the pipe.

Saddle Strap:
Saddle straps shall be made of plastic with or without metal reinforcement depending on size and injection moulded to prevent galvanic corrosion over the long service life. In case of metal reinforcement, the metal should not come in direct contact with pipe

Saddle Seal:
It shall be virgin rubber SBR Grade 30 / NBR (NSF 61 approved). It shall be of type pressure activated hydro-mechanical design. It shall be contoured gasket to provide a positive initial seal which increases with increase in the line pressure. Gasket shall be gridded mat, with tapered ends, with the outlet section having O- ring contacting the saddle body multiple O-rings contacting the pipe, preferably with a Stainless steel reinforcing ring insert moulded to prevent expansion under pressure.

Fasteners:
Stainless Steel Type 304, NC rolled thread,
Tightening torque: for ½" (M12) Fastener: 14-15 kg.m and for 5/8" (M 16)
Fastener: 21-23 kg.m

Item No. 28 PROVIDING MDPE PIPES

These specifications are for MDPE Blue PE 80 Pipes for connections used for installing the pressure transmitters (20 mm OD), as well as for House Service Connections of Dia 20 mm to 63 mm OD.

Raw Material
Raw material used to Manufacture MDPE Blue Pipes shall be Virgin Natural Resin PE 80 containing those anti – oxidants, UV Stabilisers & Pigments necessary for Manufacturing of pipes. The Density of Pipes shall be in the Range 0.930 to 0.940 g/cm3 confirming to ISO 4427-1 Standard. The PE 80 Resin shall have MRS of 8 Mpa.

Effects on Water Quality:
The MDPE PE 80 Blue Pipes shall confirm to clause 5.3 of ISO 4427-2 for conveyance of Water for Human Consumption. Also the pipes intended for conveyance of Potable water for Human consumption to be tested to comply with BS 6920 specifications in any of the laboratories like DVGW/KIWA/SPGN/WRc-NSF and certificate of compliance to be produced for the following parameters

1. Odor & Flavor of Water
2. Appearance of Water

3. Growth of Micro Organism
4. Extraction of substances that may be of concern to Public Health (Cyto Toxicity)
5. Extraction of Metals

Pressure Rating:
The Pressure rating of MDPE Blue PE 80 Pipes shall be confirming to Clause 4.1 of ISO 4427: 1996.

Colour of Pipes:
The Colour of MDPE PE 80 Pipes shall be BLUE confirming to Clause 5.2 of ISO 4427-2 : 2007.

Dimensions:
The pipe dimensions shall be as per latest revisions of Clause 6 of ISO 4427-2:2007 and pipes up to diameters 32 mm shall be supplied in Coils of 300 mtrs. The internal diameter, wall thickness, length and other dimensions of pipes shall be as per relevant tables of ISO 4427:1996. Each pipe shall be of uniform thickness throughout its length.

The wall thickness of the PE 80 Pipes shall be as per the table given below:

Nominal Dia of MDPE Pipe (mm)	PR rating	Wall thickness	
		Maximum	Maximum
20	PN 1.6	2.3	2.7
25	PN 1.25	2.3	2.7
32	PN 1.25	3.0	3.4
40	PN 1.25	3.7	4.2
50	PN 1.25	4.6	5.2
63	PN 1.0	4.7	5.3

The dimension tolerances shall be as per table 2 of ISO 4427-2:2007 clause 6.3

Performance requirements
The Pipe supplied should have passed the acceptance test as per ISO 4427. The manufacturer should provide the test certificates for the following tests.

1. Melt Flow Rate
2. Density,
3. Oxidation and Induction test,
4. Hydrostatic Test ,
5. Longitudinal Reversion Test.

These tests should be performed in the in-house laboratory of the pipe manufacturer. The Employer will depute Third Party Inspection Agency to the pipe manufacturing facility of the manufacturer to inspect the pipes as per QAP approved by Engineer In charge/ Project Management Consultant.

Item No. 29 LOWERING, LAYING & JOINTING OF MDPE PIPES
The item refers to connections used for installing the pressure transmitters, as well as to change of house connection to MDPE pipes.

1. Existing House connections are to be replaced from Ferrule point to 1 meter inside the

2. Consumer property, by using MDPE pipes. The new meters are to be fixed on these new service connections preferably near the entrance of property of consumer or at the location earmarked in the dwelling unit. The Bidder has to submit the program of fixing of house connection meters before actually starting the work.
3. The Bidder shall suggest the preventive measures required to be taken by the consumers to avoid damage to the installed new meter.
4. Any leakage observed in joints of special & pipe fixed by the Bidder while installing the meter during the contract period shall be repaired by the Bidder at its own cost. If the ball valve needs replacement the same shall be provided by the consumer but fixed by the Bidder while installing the meter.
5. After changing the house connection the Bidder has to uninstall the meter from the old house connection and then install it on the new MDPE house connection as per the requirement.

Handling, Transportation storage and Lowering of pipes

1. If transportation of MDPE pipes from a distance greater than 300km than pipes shall be received only when bare coils of pipe have been wrapped with hessian cloth.
2. The truck use for transportation of the PE pipes shall be exclusively used of PE pipes only with no other material loaded-especially no metallic, glass and wooden items. The truck shall not have sharp edges that can damage the pipe.
3. At the time of opening coils it must be remembered that the coils are under tension and must be opened in a controlled manner. Straight length should be stored on horizontal racks giving continuous support. Loss/damages during transit.
4. During handling, transportation, storage and lowering, all sections shall be handled by such means and in such a manner that no distortion or damage is done to the section or to the pipes as a whole.
5. Pipes must not be stored or transported where they are exposed to heat sources likely to exceed 60º C.
6. Pipes shall be stored such that they are not in contact with direct sunlight, lubricating or hydraulic oils, petrol, solvents and other aggressive materials.
7. Scores or scratches to a depth of greater than 10 % or more of wall thickness are not permissible; any pipes having such defects should be strictly rejected.
8. PE pipes should not be subjected to rough handling during loading and unloading operations. Rollers shall be used to move, drag the pipes across any surface.
9. Only polyester webbing slings should be used to lift heavy PE (>315mm) pipes by crane. Under no circumstances, chains, wire ropes and hooks shall be used on PE surface.
10. Pipes shall not be dropped to avoid impact or bump. If any time during handling or during installation, any damage, such as gouge, crack or fracture occurs, the pipe shall be repaired if so permitted by the competent authority before installation.

Lowering, laying of pipes

IS-7634:2003 shall be applicable. Before using the pipe following precautions/check shall be taken.

1. Each pipe shall be thoroughly checked for any damages before laying and only the pipes which are approved by the Consultant / Engineer-In-Charge shall be laid.
2. While installing the pipes in trenches, the bed of the trench should be level and free from sharp edged stones. In most cases, the bedding is not required, as long as the sharp and

protruding stones are removed, by sieving the dug earth, before using the same as a backfill material. While laying in rocky areas suitable bed of sand or gravel should be provided. The fill to about 10 to 15 cm above the pipe should be fine sand or screened excavated material. Where hard rock is met with, bed concrete 15 cm thick of grade M-15 or 20 cm thick sand bed as approved by the Consultant / Engineer-In-Charge may be provided.

3. As PE pipes are flexible, long lengths of fusion-jointed pipes having joints made above ground can be rolled or snaked into narrow trenches. Such trenches can be excavated by narrow buckets.
4. During the pipe laying of continuous fusion jointed systems, due care and allowance should be made for the movements likely to occur due to the thermal expansion/contraction of the material. This effect is most pronounced at end connections to fixed positions (such as valves etc.) and the branch connections. Care should be taken in fixing by finishing the connections at a time the length of the pipe is minimal (lower temperature times of the day).
5. For summer time installations with two fixed connection points, a slightly longer length of PE pipe may be required to compensate for contraction of the pipe in the cooler trench bottom.
6. The final tie-in connections should be deferred until the thermal stability of the pipeline is achieved.
7. The flexibility of polyethylene pipes allows the pipe to be cold bend. The fusion jointed PE pipe is also flexible as the plain pipe. Thus the total system enables directional changes within the trench without recourse to the provision of special bends or anchor blocks. However, the pipe should not be old bent to a radius less than 20 times the OD of the pipe.
8. The installation of flanged fittings such as connections to sluice/air/gate valves and hydrant tees etc. requires the use of stub ends (collars/flange adaptor complete with backing rings and gasket. Care should be taken when tightening these flanges to provide even and balance torque.
9. Provision should be made at all heavy fittings installation points for supports (such as anchoring of the flange in the soil) for the flange joint to avoid the transfer of valve wheel turning torque on to the PE flange joint.
10. PE pipe is lighter than water. Hence care should be taken for normal installations where there could be a possibility of flooding of the trench thus the trench shall be kept free of water till the jointing has been properly done.
11. However, weights by way of concrete blocks (anchors) are to be provided so that the PE pipe does not float when suddenly the trench is flooded and the soil surrounding the pipe is washed away. Thus site conditions study is necessary to ensure the avoidance of flotation.
12. Pipe embedment backfill shall be stone-free excavated material placed and compacted to the 95% maximum dry density.

Jointing of pipes

The pipe shall have a jointing system that shall provide for fluid tightness for the intended service conditions. Appropriate jointing for MDPE pipe as per IS 4984:1995 shall be selected considering site and working conditions, pressure and flow or liquid.

Hydraulic Test

After lying the pipe hydraulic test shall be done to conform the quality of work and material. There shall not be any signs of localized swelling, leakage or weeping. It should conform to IS: 4984 & IS 7634.

Measurement

The net length of fixed pipe shall be measured in running meters correct to a cm. The portion of the pipe inside the joints shell not be included in the length of pipe work. Specials shall be excluded and measured and paid separately under the relevant item.

Item No. 30 PROVIDING G.I. "B" CLASS PIPES

The item refers to Galvanized Iron Pipes of "B" Class (Medium), as per IS: 1239. 15 mm size is required for the pressure transmitter pipe connections; 40 mm or larger is required to route the cables of the solar powered system as well as the cables of the several instruments receiving power supply from the same system; 100 mm dia. - 90 cm long pipe sleeves are required to provide access to the ferrule installed for consumer connections.

1. The pipes (tubes) shall be galvanized mild steel hot finished seamless (HFS) or welded (ERW) HRIW or HFW screwed and socketed conforming to the requirements of IS 1239 Part-1 for medium grade. They shall be of the diameter (nominal bore) specified in the BOQ, the sockets shall be designated by the respective nominal bores of the pipes for which they are intended.
2. Galvanizing shall conform to IS 4736: the zinc coating shall be uniform adherent, reasonably smooth and free from such imperfections as flux, ash and dross inclusions, bare batches, black spots, pimples, lumping runs, rust stains bulky white deposits and blisters. The pipes and sockets shall be cleanly finished, well galvanized in and out and free from cracks, surfaces flaws, laminations and other defects. All screw threads shall be clean and well cut. The ends shall be cut cleanly and square with the axis of the tube.
3. Specifications of medium pipes shall be as per Table No.-4 IS 1239 (Part-1) -2004 "Dimensions and Nominal Mass of steel Tubes- Medium"
4. The following manufacturing tolerances shall be permitted on the tubes and sockets.
   (A) Thickness:
   (1) Welded tubes - 10 Percent
   (2) Seamless tubes - 12.5 Percent
   B) Mass**:**
   (1) Single tube + 10 Percent
   (2) Single tube ± 10 Percent

Joints

1. All screwed tubes shall be supplied with pipe threads conforming to IS 554. Gauging in accordance with IS 8999 shall be considered as an adequate test for conformity of threads of IS 554.
2. Unless specified otherwise, tubes shall be supplied screwed with taper threads and fitted with one socket having parallel thread. The socket shall conform to all requirements (except 6.4) of IS 1239 (part 2).
3. The plain end pipes shall be supplied with square cut. However, bevel end may also be supplied on mutual agreement between the purchaser and the manufacturer

Sampling of pipes:

Lot for the purpose of drawing samples all tubes bearing same designation and manufactured under a single process shall be grouped together to constitute a lot. Each lot shall be sampled separately and assessed for conformity to this specification. Sampling of tubes shall conform to IS 4711.

Testing of Pipes:

Following tests shall be conducted by the manufacturer on tubes.

1. The tensile strength shall be at least 320 MPa (320 N/mm²). The test shall be carried out on full section or strip cut from the selected tubes in accordance with IS 1608 and IS 12278.

Notes:

a) For welded tubes, the strip tensile test specimen shall not contain the weld.
b) For galvanized tubes, zinc coating may be removed by stripping prior to tensile test.

2. The elongation Percent on a gauge length of 5.66 SO, where SO is the original cross-sectional area of the test specimen, shall be as follows:
3. Nominal Bore / Elongation Percent, Min (a) For steam services for all sizes / 20 (b) For other services:

- Up to and including 25 mm / 12
- Over 25 mm up to and including 150 mm / 20

4. Bend Test on Tubes Up to and including 50 mm Nominal Bore. When tested in accordance with IS 2329 the tubes shall be capable of withstanding the bend test without showing any signs of fracture or failure. Welded tubes shall be bent with the weld at 90° to the place of bending. The tubes shall not be filled for this test.
5. The maximum permissible pressure and temperature for tubes with screwed and socketed joints shall be as given under.
6. For tubes fitted with appropriate flanges or suitably butt welded together, the maximum permissible pressure shall be 2.06 MPa and the maximum permissible temperature 260°C. For Maximum Permissible Pressure and Temperature for Tubes with Steel Couplings or Screwed and Socketed Joints Refer to Table No. 6 IS 1239 (Part-1) - 2004.

Marking

1. Each tube shall be marked with manufacturer's name or trade-mark, IS NO. That is, IS 1239 (Part 1) and class of tubes, that is, L, M, and H, for light, medium and heavy class.
2. The different classes of tubes shall be distinguished by colour bands, which shall be applied as follows before the tubes leave the works:
   (a) Light tubes - Yellow
   (b) Medium tubes - Blue
   (c) Heavy tubes - Red

Jointing

1. The pipes shall be cleaned and cleared of all foreign matter before being laid. While jointing the pipes, the inside of the socket and the screwed end of the pipes shall be oiled and rubbed over with white lead and a few turns of spun yarn wrapped round the screwed end of the pipe.

2. The end shall then be screwed in the socket, tee, end cap, etc. with the pipe wrench. Care shall be taken that all pipes and fittings are properly jointed so as to make the joints completely water tight and pipes are kept at all times free from dust and dirt during fixing. Burr from the joint shall be removed after screwing. After laying, the open ends of the pipe shall be temporarily plugged to prevent access of water, soil or any other foreign matter.

Measurement

1. The length shall be measured in running meter correct to a cm for the finished work. It shall include G.I. pipe and G.I. fittings such as bends, tees, elbows, reducers, crosses, plugs, sockets, nipples and nuts, but exclude stopcocks, valves.
2. All pipes and fittings shall be classified according to their diameters, method of jointing and fixing substance, quality and finish. In case of fittings of an equal bore the pipe shall be described as including all cuttings and waste. In case of fittings of unequal bore, the largest bore shall be measured.
3. G.I. union shall be measured and paid for separately.

Rates

The rate shall include the cost of the material and labour involved in all the operation described in the item. The rate shall not include excavation in trenches, painting of pipes and sand filling all around the pipes unless otherwise specified.

The 100 mm GI sleeves used to provide access to the ferrules of each new house connection shall have a slit at the bottom end to allow the passage of the MDPE pipe connected to the ferrule.

Item No. 31 SUPPLY & INSTALLATION OF SOFTWARE REQUIRED FOR AMR METER

SOFTWARE

1. The software shall give output, at least in the CSV (Comma Separated Value) format.

2. The Route Management software must be capable of running on a standard PC compatible with minimum Pentium processor; in addition the software must run under Windows95, Windows XP Professional, Windows Vista, Windows 7 and / or latest version of windows operating system.

3. The software shall allow the PC operator to review and edit any account in Route Manager database. Also, the PC operator shall be able to generate route and activity reports.

4. The software shall alert the meter reader for unread accounts in that route.

6. The software shall enable the user to specify the data to be exported from the database for transferring to billing system.

7. The software shall take routes from an existing database for loading into a reading device.

8. The software shall select the routes to be read, and assignment of routes to a reading device and dynamic updating of routes and sub-routes to be enabled.

9. The software shall upload routes from the reading device.

10. The software shall post the reading from the reading device onto appropriate accounts within the database.

11. Software shall be able to set meter status on the fly like, meter not okay, reading not reliable, meter maintenance required etc

12. Software should have a radio configuration tool which can enable/disable meter,

set / read meter status

Item No. 32 BILLING SOFTWARE :-

Item includes supply, providing, installing and successfully running of billing software as per the requirement of EGINEER IN CHAREGE.

The billing software should have flowing features as given below:-

- Fast COTS based implementation to provide rapid ROI.
- Reduces cost of total ownership
- Reduce loss & improve revenues with proper real time data captured
- Efficient Management dashboard with real time information & consolidated accounts
- Improve overall operational synergy & efficient Business Intelligence Management
- Efficient inventory management, improve asset management & better maintenance management
- Efficient & integrated back office support.
- Solution should be scalable, flexible, end-to-end solution for the business processes in **TMC** that have the highest value in terms of customers, assets, services, regulations, and financials. It supports the gradual expansion and adaptation of transaction volume as well as new processes
- Optimized meter-to-cash processes and days sales outstanding through end-to-end management of service, billing, and financials processes
- Increased customer satisfaction and call Center efficiency using an integrated customer service collaboration solution that automates standard services and provides fast access and a single view into all data and work history related to your customers
- Improved efficiencies in supply operations by providing a utility wide supply operations solution
- integrated with core back-office functions and information on customers, meters, hydrants, financials**,** and the workforce
- Integrated financial information using standardized processes; providing visibility on capital, operational, and third-party expenditures; monitoring project costs and regulatory risks; and integrating business performance
- information with management processes helps Better managed investment, opportunities and risks through the establishment of strategic enterprise management techniques
- Optimized procurement processes and material inventory by enabling collaboration and contracting of operational management services with suppliers, contractors, and partners, as well as streamlining corporate-wide buying processes
- Streamlined and simplified workforce-related processes through integrated employee transaction management, workforce deployment based on skills and availability, and innovative employee life-cycle management that aligns employee talents with corporate goals

Connection Management	Consumer Management	Reporting & Analysis
Submission of Application Form	Citizen Meter management	MIS reports
Approval of connections	Rate Management	Dashboards
New connection charges	Citizen Category Management	
Physical connection, creation of CCN & Meter Reading route	Citizen Grievances management	
Meter Reading	Consumer Usage Pattern	
Disconnection of water connection	Billing System	
Connection restoration	Bill Collection and Deposit	
Unauthorized water connection	Bill Cancelation	
Misuse of water connection	Dispute Registration and Settlements	
Meter testing	File Tracking	
Meter testing for new connection	Financial and Accounting	
Meter testing –suspected low consumption		
Meter Replacement with TMC Meter		
Customer compliant registration	Compliant Tracking	Reporting & Analysis
Asset management		Reporting & Analysis

Detailed technical requirements for Billing software are as follows:-

1.0 Customer Information System : Rates and Fees Management

SN	**Description**
1.1	**Rates**
	The system should have the ability to create the following rate types:
RM-1	o Raw water Rates
RM-2	o Chlorinated Rates
RM-3	o Treated Rates
RM-4	o Baseline Rates
RM-5	o Tiered Rates
RM-6	o Flat Rates (Compounded Rates per day and per month)
RM-7	o Area rates (Construction)
RM-8	o Seasonal Rates
1.2	**Rate & Fee Setup**
	Rates

RM-9	The system should allow on-line user creation of rates without requiring programming
RM-10	The system should allow existing rates to be copied to new rates
RM-11	The system should be capable of maintaining rates that utilize effective dates. i.e. validity date of the rates
RM-12	The system should have rates that are specific per service. (e.g. water, sewer, waste removal, etc…)
RM-13	The system should be capable of generating rates that are specific per billing class. (e.g. service pipeline; Residential, Commercial, Industrial, and tanker; residential, commercial, etc)
RM-14	The system should be capable of generating single rates that can accumulate all related rates, charges, taxes and fees for proper billing of the service including:
RM-15	o Consumption based rate
RM-16	o Service charge Flat Rate
RM-17	o Service charge based on meter size
RM-18	o Service charge based on EDU (equivalent dwelling unit) factor
RM-19	o Multiple surcharges
RM-20	o Multiple Taxes
RM-21	o Multiple usage steps (Telescopic rates)
RM-22	o Estimation Routine
RM-23	o Proration Routine
RM-24	o Late Charge Routine
RM-25	o Winter, Summer, etc Consumption Rate
RM-26	o Number of billing periods per year
RM-27	o Estimated Usage
RM-28	o Hi and Low usage thresholds
RM-29	The system should be able to assign each discrete rate component its own unique revenue code or G/L number
RM-30	The system should be able to create custom user-definable rate structures. The system should have logic functions or scripts that can create and apply rates, charges, taxes and credits to consumption ranges and date ranges.
	Surcharges
RM-31	The system should allow for multiple surcharges per rate
RM-32	The system should be capable of surcharges with effective dates.
RM-33	The system should be capable of surcharges based on the following:
RM-34	o Total Usage
RM-35	o Treated/Untreated water
RM-36	o Meter Size
RM-37	o Service Size
RM-38	o Usage Steps
RM-39	o Premise Location
RM-40	o Over baseline usage
RM-41	o Equivalent Dwelling Units (EDUs) (Condos, apartments, etc…)
RM-42	The system should have surcharges with billing frequencies different from rate billing frequency (e.g. an annual surcharge can be billed each January)
RM-43	The system should be able to assign each surcharge its own revenue code or G/L number
RM-44	The system should be able to prorate fixed surcharges based on rate proration

	Exemptions
RM-45	The system should provide for surcharge exemptions
RM-46	The system should provide for late charge exemptions
RM-47	The system should provide reports of exempt Consumers
	Fees
RM-48	The system should be able to create an unlimited number of fee types.
RM-49	The system should be able to assign fees the following attributes:
RM-50	o Unique code
RM-51	o Amount
RM-52	o Type
RM-53	o Revenue Code or G/L number
RM-54	The system should be able to assign fees to service orders
RM-55	The system should be able to individually bill fees to a single account
1.3	**Developer Project Fees and Deposits**
RM-56	The system should be able to generate a fee quote/estimate and bill accounts for the following fees and deposits:
RM-57	Plan Check Fee for multiple types:
RM-58	o Fees (domestic) based on buildings, layouts, etc.
RM-59	o Sewer fees (residential or commercial) based on unit costs (e.g. number of seats, etc.)
RM-60	Fire Flow Test Fee (flat fee per test)
RM-61	Planning Deposit
RM-62	Plan Check Fee Calculation Worksheet
RM-63	Maps and Records Fee
RM-64	Construction Water Deposit (flat amount)
RM-65	Labour Water Fee (metered - consumption based)
RM-66	Extra water charges
RM-67	Extra sewerage charges
RM-68	Extra additional water charges
RM-69	Extra additional sewerage charges
RM-70	Prorata charges
RM-71	Water mains diversion charges
RM-72	Pipeline damage charges
RM-73	Wastage of water
RM-74	Pipeline repair charges
RM-75	Other utility damages and repair charges
RM-76	The system should be able to generate Plan Check Fee Calculation Worksheets to assist in fees calculation.
RM-77	New Connection Fees
RM-78	The system should generate cross connection fees (construction and maintenance department) as part of initial fee quote and will serve letter.
RM-79	Connection File scrutiny fees
RM-80	Road Re-instatement charges
RM-81	Meter fixing charges
RM-82	Meter charges
RM-83	Connection making charges
RM-84	Security deposits
RM-85	Legal charges

RM-86	Non assessment charges
RM-87	Meter rent
RM-88	Meter deposit
RM-89	Meter testing charges
RM-90	Connection Cutting Charges
RM-91	Meter Removal Charges
RM-92	Service Charges
RM-93	Other charges
RM-94	The system should provide the ability to recalculate the current connection fees for each will serve account.
1.4	**Rate Management**
	Rate Application
RM-95	The system should only assign rates to services they are authorized for.
RM-96	The system should verify the rate assignment against the Consumer/account type. (eg. Residential, Commercial, Industrial, etc…)
	Rate History
RM-97	The system should not delete rates as long as a billing history is available for that rate
	Rate Development
RM-98	The system should allow for sample bill calculations that will test billing amounts and revenue code or G/L accounts without affecting actual revenue.
RM-99	The system should provide the ability to model rates based on Consumer types (Residential, Commercial, etc.), revenue types (Usage charges, base charges, etc.), or location
RM-100	The system should provide the ability to forecast revenue by rate based on system usage history.
RM-101	The system should provide statistics on usage by rate
RM-102	The system should provide "What-If" capabilities (rate modelling) to forecast revenue by rate.

2.0 Billing Management

SN	**Description**
2.1	**Billing Types**
	The system should be flexible to handle a variety of billing situations including the following basic billing types:
BI-1	o Bill-in-arrears
BI-2	o Bill-in-advance
BI-3	o Consumption based billing
BI-4	o Connection Size based billing (Unmetered)

BI-5	o Flat rate tenement based billing
BI-6	o Variable Tiered rate billing
BI-7	o Contractual billing (Temporary and Unmetered)
BI-8	o Group Billing
BI-9	o Miscellaneous or one-time or penalty for damages billings
BI-10	o Additional security deposit billing
BI-11	o Service install or meter install billings
BI-12	o Meter removing and re-fixing billing
BI-13	o Meter Testing billing
BI-14	o Multiple Services (water, sewer)
BI-15	o Misuse charges billing
BI-16	o Meter damage /loss billing
2.2	**Billing Determinants**
	Cycle Based Billing
BI-17	The system should have the ability to assign accounts to a billing cycle. All accounts with a billing cycle will be billed when cycle is selected for billing.
BI-18	The system should provide the ability to develop billing cycles from meter reading routes or Meter Reading Book.
BI-19	The system should provide the ability to generate bill in a cycle even if all reads are not captured. Accounts without reads should be estimated by system for accounts complying billing rule.
BI-20	The system should not generate bills for accounts in the cycle or the reading routes not complying billing rule.
BI-21	The system should provide the ability for billing cycles to be billed for not billed Consumers in that particular cycle.
BI-22	The system should generate bills automatically after the exceptions are approved.
BI-23	The system should be able generate bills on estimation of all accounts in a cycle or Meter Reading Book in case Meter reads of all accounts are not available.
	Date Based Billing
BI-24	The system should assign accounts a billing date. All accounts should be selected on the same day of the month for each billing period.

BI-25	The system should allow generation of bills other than those scheduled bill date. Accordingly the period and date shall be mentioned on bill.
	Event Based Billing
BI-26	The system should be able to bill accounts based on events such as closing bills, etc.
	Zone Based Billing
BI-27	The system should have the ability to assign accounts to a supply zone and / or pressure zone
BI-28	The system should provide the ability for billing when supply zone or pressure zone is selected.
2.3	**Batch Billing Selection**
BI-29	The system should be able to use cycles to select accounts for billing
BI-30	The system should be able to assign billing cycles a billing date
BI-31	The system should be able to assign billing cycles a billing period
BI-32	The system should be able to assign billing cycles an accounting date
2.4	**Billing Periods**
	Billing Frequencies
BI-33	The system should support flexible billing periods, including the following periods:
BI-34	o Monthly
BI-35	o Quarterly
BI-36	o Semi-annual
BI-37	o Annual
	Proration
BI-38	The system should support proration of charges during any billing period for single or multiple rate changes.
BI-39	The system should allow for proration of fixed charges and fees for opening bills. (e.g. based on days active in billing cycle to days in standard billing period)
BI-40	The system should allow for proration of fixed charges and fees for closing bills. (e.g. based on days since last bill to days in standard billing period)
BI-41	The system should allow for proration of fixed charges and fees for recurring billings based on standard billing cycle days (e.g. based on days active to standard billing period)
BI-42	The system should accommodate proration by rate type
BI-43	The system should accommodate proration by rate component
2.5	**Billing Methods**
	Consumption Based
BI-44	The system should bill consumption based i.e on previous and current meter readings
BI-45	The system should correctly bill for multiple meter changes during a single billing period.
BI-46	The system should be able to combine consumption from multiple meters and use for billing on a single rate or tiered rate.
BI-47	The system should be able to subtract consumption from meters and use net consumption to bill with a single rate or tiered rate.

BI-48	The system should be able to bill one service based on consumption from another service. (eg. Sewer billing based on water consumption)
BI-49	The system should support multiple rates with variable tiered billing.
BI-50	The system should accommodate billing for a service multiplied by a multiplier VALUE each billing period.
BI-51	The system should support multiple billing for a single account with proportionate consumption.
	Estimating
BI-52	The system should bill consumption based on a system calculated (estimated) consumption value.
BI-53	The system should support an estimation calculation that is user defined.
BI-54	The system should limit the number of consecutive estimated consumption billings an account can have. (Number of consecutive billing cycles is user definable).
BI-55	The system should allow services that are not estimated for billing.
BI-56	The system should treat the estimated read separate from actual read billings and track the same. When an actual read is obtained the estimated bill amount should be reversed (credited) and the actual read used to calculate the final actual bill amount.
	Flat Rate/Fixed Charge
BI-57	The system should accommodate flat or fixed charge billing for a service for each billing period.
BI-58	The system should accommodate flat or fixed charge billing for a service multiplied by a fixed quantity figure each billing period.
BI-59	The system should accommodate flat or fixed charge billing for a service multiplied by a variable quantity (or Factor) figure each billing period.
BI-60	The system should accommodate fixed charge billing based on meter size.
BI-61	The system should accommodate fixed charge billing based on water connection size (un-metered).
BI-62	**Bill-In-Arrears**
	The system should accommodate billing services in arrears
	One-Time Billings
BI-63	The system should perform non-Consumer billings. A user can create a one-time bill and print an invoice for the charges.
BI-64	The system should provide charge codes (fees) for individual line item (invoice) billings.
	Budget Billing
BI-65	The system should accommodate annual billing based on previous year consumption history at premise
BI-66	The system should accommodate annual billing based on user defined consumption value.

BI-67	The system should automatically re-establish Consumer in budget billing process and adjust next year billing based on actual consumption for current year.
BI-68	The system should auto-generate notices to budget billing Consumers informing them of next budget billing period and the expected new monthly amount.
BI-69	The system should apply a variance or "true-up" amount to the next billing.
BI-70	The system should perform automatic recalculation of budget billing amount on demand for current year.
BI-71	The system should accommodate removing Consumers from budget billing based on credit events or credit score.
BI-72	The system should provide budget billing that can be applied to one or more services per account.
2.6	**Billing Charges and Fees**
	Automatic Charges
BI-73	The system should accommodate billing the following charges automatically:
BI-74	o Percent based late charge with fixed minimum
BI-75	o Not Sufficient Fund (NSF) charge
BI-76	o Disconnection charges
BI-77	o Additional Deposits
BI-78	o Service order based charges(i.e. meter shifting, etc)
	Manual Charges
BI-79	The system should accommodate billing the following miscellaneous type charges:
BI-80	o One-time misc. charges
BI-81	o Deposits
BI-82	o Reconnection charges
BI-83	o Service charges
BI-84	o Tanker water charges (i.e. water charges, sewerage charges, labour charges, electricity charges, etc)
	New Service Connection
BI-86	The system should provide for tracking and billing new service installations.
BI-85	The system can bill non-utility charges (new service connection orders, facilities charges, etc…) to a separate invoice for utility Consumers.
2.7	**Billing Adjustments**
BI-87	The system should accommodate miscellaneous adjustments to an account.
BI-88	The system should accommodate usage adjustments to an account and automatically calculate the amount based on all billing components including rates, etc.

BI-89	The system should keep usage adjustments in usage history.
BI-90	The system should bill adjustments on a one time bill or during next scheduled account billing.
2.8	**Disputed Bill**
BI-91	The system should not charge late fees on disputed bill if 50% of the disputed bills are paid.
BI-92	The system should not charge late fees on disputed bill if percentage of the disputed bills or fixed amount and dates beyond due dates decided by user is paid.
BI-93	The system should consider all other bills as disputed until the first registered disputed bill is resolved. The additional charges for all such bills shall not be charged.
2.9	**Group Billing**
BI-94	The system should allow combining accounts into a single summary or group bill.
BI-95	The system should apply cash receipts to each account in the group bill.
BI-96	The system should allow preference to be assigned to each account in group for cash receipts application if partial payment is received.
BI-97	The system should provide for a group bill that includes detail by account in addition to the summary bill.
BI-98	The system should provide for a group bill with one remittance.
BI-99	The system should bill accounts based on the Master accounts billing cycle. All individual accounts should not be billed until the master account is billed. Individual accounts should be included in their respective bill cycles and marked as unbilled or group bill for control purposes.
2.10	**Billing Calculations**
BI-100	The system provides a rule based billing engine where simple user created functions or scripts can be created to bill special rates or contracts. Logic can be placed on consumption ranges and date ranges for calculating charges or credits.
2.11	**Conservation Billing**
BI-101	The system should store baseline consumption per service per location and track cumulative over/under baseline usage for a user defined period of time.
BI-102	The system can bill a surcharge for usage over the baseline quantity per billing period.
2.12	**Bill Messages**
	The system can print the following bill message types:
BI-103	o Per individual account
BI-104	o Per Billing Job
BI-105	o Consumer categories
BI-106	o Per Service

BI-107	o Per Area or DMZ or Company
BI-108	o Global Message on all bills
BI-109	o Consumer feedback messages including check boxes, signature line, input lines, etc…
2.13	**Bill Production**
	Bill Formatting
BI-110	The system provides the ability to customize the bill print appearance.
BI-111	The system supports "two-up" or multiple formats
BI-112	The system supports graphic images, shading, bolding and other format features for bill formatting
	The system supports a bill that presents the following discrete data:
BI-113	o Bill Date
BI-114	o Bill period for each service
BI-115	o Previous and Current Meter readings by meter
BI-116	o Rate per meter/service
BI-117	o Group code
BI-118	o Consumption billed by service
BI-119	o Meter size per service
BI-120	o Meter number(s) per service
BI-121	o Account Name
BI-122	o Account Address/Premise address
BI-123	o Account Number (CCN)
BI-124	o Postal Address
BI-125	o Surcharges, fees, penalties and taxes with descriptions
BI-126	o Past Due Balance (Over due amount)
BI-127	o Current Balance

BI-128	o Current Amount Due
BI-129	o Bill Due Date
BI-130	o Meter Status and Billing (GAP) Code
BI-131	o Next meter reading date
BI-132	o Consumption History Graph by service
BI-133	o Subtotal by service
BI-134	o Bill Messages
BI-135	o Barcode
BI-136	o Handling code. (e.g. opening bill, closing bill, group bill, etc.)
BI-137	The system supports different bill formats that can be defined for different companies and areas.
BI-138	The system supports different bill formats that can be defined for different kinds of bills, regular bills, reminder notices, etc…
	Bill Sorting
	The system has the ability to sort bills by the following criteria:
BI-139	o Special Handling code
BI-140	o Administrative ward, Pin Code
BI-141	o Carrier, Meter Read Route
BI-142	o Group Billing
BI-143	o User defined Multiple sort options
	Bill Print
BI-144	The system can print to a system or network connected printer.
BI-145	The system can create a print file in PDF format for print and download to media.
BI-146	The system can create a print file in HP PCL format and print or download to media.
BI-147	The system should show the total number of bills to be printed
BI-148	The system should show the total number of bills printed

BI-149	The system should show the total number of bills remaining to be printed
BI-150	The system should allow restarting of bill print from anywhere in the bill print job.
BI-151	The system should allow a bill print job to be paused and restarted at any time.
BI-152	The system can print multiple copies of a bill with or without charges.
BI-153	The system can re-print any previous bill created in the system.
2.14	**Billing Controls and Statistics**
	Billing Control and Edit
BI-154	The system provides system and user defined bill error codes. Billing error codes can be created by the user and include the following :
BI-155	o High Bill threshold per service
BI-156	o High and low Consumption Threshold per service
BI-157	o Recent Meter Change
BI-158	o Opening Bill
BI-159	o Closing Bill
BI-160	o Low Bill threshold per service
BI-161	o Negative Bill
BI-162	o Zero Consumption per service
BI-163	o Estimated Read
BI-164	o Low supply DMZ
BI-165	o High supply DMZ
BI-166	o Fag end
BI-167	The system has the ability to define errors as hard or soft. Hard errors have to be resolved to complete billing, soft errors will not stop billing.
BI-168	The system should provide the ability to barcode account number and billing amount on bills to use with automated cash register and mail receipt validation equipment. The scan line must be printed in OCR-A format.
BI-169	The system provides for on-line review and correction of bills.
	Billing Reports
BI-170	The system should produce a detailed billing register detailing all charges by account.

BI-171	The system should produce a summary billing register detailing charges by service, rate, company and area.
BI-172	The system should produce a summary billing register detailing charges by general ledger number.
BI-173	The system should create a billing edit report.
BI-174	The system should track the delivery of bills and generate undelivered bills with reason of non-delivery.
BI-175	The system should track the number of bills issued from handheld unit with details of handheld unit and the user i.e. Meter Reader generating the bills.
BI-176	The system provides for user definable billing reports
BI-177	The system calculates control totals for the billing job including cycle counts, route counts, closing bills, opening bills, special bills etc.
2.15	**Reconciliation and Audit**
BI-178	The system should generate report of an end to end of the entire billing output process.
BI-179	The system should have capability for end to end reconciliation of counts of bills generated / processed and sent through various delivery channels.
BI-180	The system should have support for connecting for multiple data sources (databases and flat files).
BI-181	The system should have support for capturing specific metadata information and indexing for subsequent generation of reconciliation and process audit reports.
BI-182	The system should have support for a configurable GUI based business rule engine that helps perform data integrity and validation check between the input source and the data provided for reconciliation.
BI-183	The system should have support for designing simple and nested rules within the business rule engine through an easy to configure GUI.
BI-184	The system should have the support to generate output in the form of a CSV, XML, HTML, PDF for generating error and audit reports.

3.0 Customer Information System: Payment Processing and Cash Receipt

SN	**Description**
3.1	**Introduction**
PP-1	The system must be able to accept one time Payments using Web API / Web Service, and IVR.
PP-2	The system must be able to establish recurring payments for credit cards and debit cards
PP-3	The system must also allow Consumers to make quick payment without creating a user-id/login.

PP-4	The system must be able to authorize credit/debit card transactions real-time.
PP-5	The system must be able to provide payment data files (Remittance) that includes user defined data.
PP-6	The proposed solution must be able to transmit payments details to the bank.
PP-7	The Bidder must be able to provide an independent test report stating the application is free from known security defects.
3.2	**Cash Receipts**
PP-8	The system should be able to maintain multiple cash accounts (G/L Accounts) for different cash receipt sources. (e.g. Cashiering, Remittance Processing, Drop Box, NEFT / RTGS, ECS, Credit Card, Debit Card, Third Party collection agency, Mobile Payment, HHU, KIOSK, Online, etc.)
3.3	**Cashiering**
PP-9	The system provides an integrated on-line cashiering function to receive payments from utility Consumers on an individual basis.
PP-10	The system collects information on form of payment (Cash, Cheque, DD, credit card, Debit Card, etc.)
PP-11	The system should print a cash receipt to a standard printer
PP-12	The system should process master account payments where a single check covers multiple accounts and payments can be allocated to each account properly.
PP-13	The system supports cash drawer reconciliation procedures. (batch controls, drawer balancing, etc.)
PP-14	The system should print cash receipts reports by cashier and payment type.
PP-15	Cash receipts should be reflected in Consumer account balance immediately after the transaction is entered into the system. Cash receipt will be pending and not finalized until posted.
3.4	**Remittance Processing**
PP-16	The system should process direct mail receipts and flat file upload from a remittance processor.
PP-17	The system should record the date of the payment.
PP-18	The system should record the batch ID of the payment.
PP-19	The system can process master account payments. Single cheque covering multiple accounts and allocate payment to each account properly.
3.5	**Consolidated Electronic Payments**
PP-20	The system provides an interface for receiving file upload.
PP-21	The system has a predefined interface to receive payments from Bank
3.6	**EFT (i.e. ECS, NEFT / RTGS, etc.)**
	The system should be integrated with bank for receiving payment details.

PP-22	The system should accept payments via file upload from EFT sources.
PP-23	The system should provide a process to manage the setup, documentation, pre-note, processing and termination of the EFT.
PP-24	The system should track bank ID information in a table for validation
PP-25	The system should encrypt bank account information
PP-26	The system should process denied funds transfers and bill required late and NSF fees.
PP-27	The system should display EFT receipts on the bill remittance and be identified as EFT.
3.7	**Credit/Debit Card**
PP-28	The system supports an automated credit/Debit card interface and will receive payments and print receipts
PP-29	System should interface with third party credit card processor to process credit/debit card payments in CIS that includes the payment amount, authorization number, transaction date, and receipt number, etc.
PP-30	The system should store the authorization result for each credit card payment request.
PP-31	The system should automatically process reoccurring credit/debit card payments for monthly utility bills where the Consumer has enrolled and authorized such a payment method.
PP-32	The system should be PCI (Payment Card Industry) compliant.
3.8	**IVR**
PP-33	The system should accept payment over the phone for credit cards.
PP-34	The system should accept payments over the phone for direct bank debits
PP-35	The system should have ability for Consumer to respond via telephone keypad.
PP-36	The system should have ability for Consumer to respond by voice
PP-37	The system should have ability to identify Consumer by phone number
PP-38	The system should have ability to state the Consumer's account balance before asking for payment information.
PP-39	The system should have ability to transfer Consumer to Corporation's call center representative when Consumer is not able to complete the transaction.
PP-40	The system should have ability for Consumers to type ahead/cut through and enter data while the voice command is being spoken.
PP-41	The system should have ability for Consumer to transfer back to Corporation IVR after making payment.
3.9	**Internet/IWR**
PP-42	The system should accept payment over the Internet for credit cards.
PP-43	The system should accept payment over the Internet for direct bank debits
3.10	**Legacy Accounts**
PP-44	The system should store and process cash receipts based on previous or legacy system account numbers
3.11	**Mobile Platform**
PP-45	Mobile payment application available for

PP-46	o I-phone
PP-47	o Android
PP-48	o Blackberry
PP-49	o Windows
PP-50	o Others if any, please describe.
PP-51	The system should have ability to Accept Credit/Debit Card Payments using Mobile application
PP-52	For hosted solution, ability to update Consumer's billing or payment information (billing address, payment method, etc.) via a mobile application
PP-53	The system should have ability to text (SMS) payment confirmation immediately after making payment.
PP-54	The system should have ability to text (SMS) notification that payment was not successful
PP-55	The system should have ability to text (SMS) when change is made to Consumer's billing or payment information (billing address, payment method, etc.) via a mobile application.
3.12	**Cyber CFC**
PP-56	The system should integrate with 3rd party payment portal for bill payment.
PP-57	The system should provide reconciliation of payment received in Escrow account with 3rd party by integrating the bank with the system.
PP-58	The system should check the bank guarantee validity and the amount before enabling bill payment collection by 3rd party through the system.
3.13	**Convenience Fees**
PP-59	The system should have ability to include a convenience fee for all payment integration methods (Web API, Mobile, etc)
PP-60	The system should have ability to present a single transaction to the Consumer that includes the payment and convenience fee
PP-61	The system should have ability to present a payment and convenience fee to the Consumer as separate transactions when paying but combine to a single credit/debit card.
PP-62	The system should have ability to report on convenience fees and payments separately.
3.14	**Payment Confirmation, Notifications and Error Handling**
PP-63	The system should have ability to create unique confirmation number after processing any payment attempt (successful or not successful).
PP-64	The system should have ability for Consumer to specify HTML or text preference for email.
PP-65	The system should have ability to format email in both HTML or text format (so Consumer is not required to indicate a preference).
PP-66	The system should have ability for Corporation to modify notification text.
3.15	**Returned Cheque**

PP-67	The system should provide the ability to upload electronic NSF transactions, process the payment reversal and apply any NSF charges to the account
PP-68	The system should provide an on-line or batch method to input NSF Cheque that will debit the account and bill the required late charges and NSF fees.
PP-69	NSF transactions should place an account back into the DCO process where it would normally be if payment had not been received.
PP-70	NSF transactions should create a user defined credit score event.
PP-71	The system should provide an on-line review or report of NSF account activities.
3.15	**History**
PP-72	The system should maintain all receipts history per account.
3.17	**Administrative Tools and Reports**
PP-73	The system should provide web-based portal/dashboard for research and reports.
PP-74	The system should provide ability to track/audit activity including all adds, changes, and deletions.
PP-75	The system should provide ability to secure permissions based on role.
PP-76	The system should provide ability to view real time transaction detail (e.g. today's payments).
PP-77	The system should provide ability to view errors received by the Consumer (e.g invalid account, credit card decline details) real time.
PP-78	The system should provide ability to view transactions details by batch settlement.
PP-79	The system should provide ability to query payment details by
PP-80	Batch Settlement Date
PP-81	Consumer/Account Number
PP-82	Confirmation Number
PP-83	Payment Date
PP-84	Payment Amount
PP-85	Payment method (Mobile payment, 3rd party payment, ECS, NEFT/RTGS, Visa, MasterCard, HHU, CFC, Drop Box, Cheque, DD, Online, Remittance, KIOSK, Etc)
PP-86	Address(s)
PP-87	Name
PP-88	Email
PP-89	Phone Number
PP-90	Last 4 digits of credit card or bank account number
PP-91	User defined fields
PP-92	The system should provide ability for Corporation to initiate a refund back to the Consumer's original payment method.
PP-93	The system should provide ability for Corporation to initiate an action to release held funds, when Consumer's bank has authorized payment attempt, but payment has not been completed on the Corporation side. (i.e. Soft Decline).
PP-94	The system should provide ability to download reports in CSV, Excel and PDF format.

PP-95	The system should create Daily Receipts reports by payment source. (e.g. Cashiering(CFC), Remittance Processing, EFT(ECS, NEFT/RTGS), Credit Card, Debit Card, Mobile payment, 3rd party, HHU, etc.).
PP-96	The system should produce error reports for misapplied payments (closed or inactive accounts, bad account number, etc…) by source. Eg. Cashiering, Remittance Processing, EFT (ECS, NEFT/RTGS), Credit Card, mobile payment, 3rd party, HHU, etc.
4.0	**Customer Information System : Credit and Collection Management**
4.1	Consumer Credit
	Credit Profile
CC-1	The system should capture basic Consumer credit information in order to provide a credit profile, credit score and credit status of the Consumer.
CC-2	The system should provide credit information fields that are user-defined and unlimited.
	Credit Scoring Process
CC-3	The system should provide a flexible credit scoring capability; the user can vary weights associated with various credit offenses. Collection points for credit scoring purposes are applicable to all types of accounts.
CC-4	The system should track a credit score takes into consideration the number of years connected and the past credit events, applying a weighted value to the Consumer's good/bad credit points.
CC-5	The system should provide the ability to manually adjust or override a Consumer's credit score.
CC-6	The system should transfer the credit score from the old account to the new account. (From old account number and also within new system. All Consumer history follows Consumer)
CC-7	The system should be able to determine credit worthiness and assess deposits.
	· Cash Only for defaulters excluding GPR account
CC-8	The system should provide automatic identification of a "cash only" account based on a specific credit rating or a user defined criteria.
4.2	Account Balance
	· Outstanding Account Balance
CC-9	The system should provide capability to isolate an account from DCO or disconnect.
CC-10	The system should provide an on-line summary or report of all amounts owed by an entity having multiple service locations, active, closed and pending.
CC-11	The system should provide the ability to correct incorrect posted payments.
1.1.1.3	Collections
	· Notification and Disconnection for Non-Payment
CC-12	System will automatically generate the payment due date information to Consumer through SMS, email or auto generated call as per the user defined setting.
CC-13	The system should support an automated intimation for disconnection against non-payment as per user defined setting.
CC-14	The system should support automatic generation of list of Consumer whose advance exceeds the x months bill amount for DCO action.
CC-15	The system should provide the ability to integrate with an automatic dialer for assistance with outgoing calls for collections efforts.
CC-16	The system should provide a report of delinquent payment arrangements; System will automatically generate the disconnection order the day after the payment is not received within the due date.

CC-17	The system should provide the ability to select the number of orders to be worked each day by geographic area or route or Meter Book Binder.
CC-18	The system should allow disconnection orders to be automatically removed if payment is received and SMS sent to field staff handed over the disconnection work order.
CC-19	The system should allow for preventing disconnection of service due to DCO for various reasons including:
CC-20	o A day before and including Holidays/ Sunday
CC-21	o Weather (heavy rains)
CC-22	o Payment Arrangements (automatic)
CC-23	o High Bill Investigation/Bill Disputes
CC-24	o User defined
CC-25	The system should provide for identification and reporting of non-pay disconnected Consumers for subsequent follow-up.
CC-26	The system should be able to inform directly to Consumers with registered mobile number and email id except for those identified as special handling.
CC-27	The system should be able to suppress or issue DCO information either individually, in groups, or by area or for specific time period
CC-28	The system should provide for the printing of DCO orders by due amount in descending order or high value only or route (Binder) wise.
CC-29	The system should allow time duration editable by user for DCO activity after generation of DCO service order.
CC-30	The system should generate DCO work order status report with list of pending DCO work order to be executed with revised time period for execution. The same must be available online for view.
CC-31	DCO work order of the Consumer can be edited or extended thrice only. The DCO list not executed after the limited nos of extension should be generated under exception list of DCO.
CC-32	The system should allow user to define DCO information content.
CC-33	The system should provide on-line identification or reporting of accounts that have been disconnected for non-pay.
CC-34	The system should auto generate intimation to Consumer with registered mobile and email-id on completion of DCO. Cheque
1.1.1.4	Collections
	· General
CC-35	The system should provide for on-line view of payments collected by receivable type for a specified period of time.
CC-36	The system should provide for on-line view or report of contacts/notices made to accounts in the collection process. System will provide a mechanism to input external collection contacts into the CIS.
CC-37	The system should maintain the Consumer history and the type of letter or legal transaction from corporation along with the date of production on the account.
CC-38	The system should have multiple standard format of letter or notices to be issued to Consumer against various non-compliance by the Consumer. The content and the format of the letter and notices may be edited by the user.
CC-39	The system should provide a list of accounts with payments received; include the amount paid, the number of days since inactivation, the last type collection letter sent and the date on which the account was referred to the collection process.
	· Active Account Collections Process
CC-40	The system should provide the following against temporary cut-off account.

CC-41	o Previous credit and collection actions taken on the account.
CC-42	o Outbound predictive dialling to notify or warn the Consumer of pending collection activity.
CC-43	o Outbound mailing to notify or warn the Consumer of pending collection activity.
CC-44	o Initiation of deferred payment arrangements.
CC-45	o Initiate collection order sequence.
CC-46	o Request additional deposits.
CC-47	o Bypass any credit activities.
	· Inactive (Permanently Closed) Account Collection Process
CC-48	The system should provide the following against permanent cut-off account.
CC-49	o Previous credit and collection actions taken on the account
CC-50	o Consumer
CC-51	o Conduct a skip trace of the Consumer / account
CC-52	o Resend returned collection letters
	· Temporarily Disconnected Account Collection Process
CC-53	The Meter Inspector should be able to notify the Meter Supervisor and flag the responsible party account when unauthorized usage of service is detected.
CC-54	The system should generate a demand note for the period from the date of disconnection to date of re-disconnection at the prevailing applicable water charges. In case of detection of unauthorized usage for 2nd time, the water charges shall be recovered at the double rate till the date of re-disconnection and so on.
CC-55	The system shall generate the above demand note in addition to the water tax and/or sewerage tax applicable on the account on disconnection. This additional payment shall not be base for claiming exemption from water tax and/or sewerage tax.
CC-56	The demand note should explicitly mention; “This payment shall not be base for claiming exemption from water tax and/or sewerage tax.”
CC-57	The system should provide for the identification of un-authorised usage on a temporarily disconnected account.
CC-58	The system should be able to send notification to address to prompt for reconnection application or payment of dues pending for used service.
CC-59	The system should generate a monthly statement on unauthorized usage, demand generated and payment received.
	· Write-off
CC-60	The system should provide the ability to view all charges by accounts which are past due "x" months from their bill date by service. Used to identify potential write-off for an active account.
CC-61	The system should provide a view of all accounts with unpaid amounts greater than "x" months from their final bill date. Used to identify potential write-off for an inactive account.
CC-62	The system should provide for viewing of accounts which are scheduled for write-off. The system shall also provide any other active connection against the account scheduled for write-off.
CC-63	The system should provide for moving accounts to write-off status once user defined criteria for inability to collect from Consumer has been reached, maintaining on-line access to inactive accounts.
CC-64	The system should not allow automated process of write off. The write off must be approved by The Standing Committee. Consumer
CC-65	The system should process a write-off report at specified intervals to indicate the following items:

CC-66	o The starting balance and number of accounts (total receivables)
CC-67	o The addition of accounts referred (value and number)
CC-68	o Additions and reductions due to adjustments
CC-69	o The number of payments received and the total value of those payments
CC-70	o The totals for the end of the report period (total receivables)
CC-71	o User defined reports
	· Bad Debt Archive
CC-72	The system should provide a method for automatically archiving and purging bad debt history information (time to be user defined).
1.1.1.5	Penalty
	· Late Payment Penalty
CC-73	The system should allow for a late payment penalty based on a percentage.
CC-74	The system should apply a late payment penalty based on a user defined criteria (e.g. flat amount or a percentage of the balance due). The user can also define by other parameters such as Consumer segmentation, rates, service type geographic location.
CC-75	The system should, upon receipt of a partial late payment, automatically indicate the payment amount on the DCO list and reduce the balance due.
	· Returned Cheque (a credit perspective)
CC-76	The system should debit returned cheque amount back to the Consumer's account and create appropriate returned cheque charge.
CC-77	The system should automatically place Consumers with returned cheque into the DCO process if the charge is past due.
CC-78	The system should automatically call, mail or deliver to the Consumer, notice of the returned cheque. Severity of the notice will reflect the recent credit score for the Consumer.
CC-79	The system should automatically apply a returned cheque fee upon entry of the reversal of the payment.
CC-80	The system should provide the ability to override the fee without an adjustment to the account.
CC-81	The system should provide an on-line view or report of cheque that have been returned based upon user defined criteria such as date, amount, and Consumer class.
1.1.1.6	Payment Arrangements/Instalments
CC-82	The system should track the number of payment arrangements granted to an account in a running twelve month period. Payment arrangements are made for Consumer accounts with user defined criteria.
CC-83	The system should track the number of payment arrangements not met. For each arrangement that is made provide the ability to track default.
CC-84	The system should establish and maintain Consumer payment arrangements based upon an instalment arrangement. Total balance owing can be divided into multiple user-defined instalments.
CC-85	The system should establish payment arrangements on the final bill of an inactive account. Providing Consumers the ability to pay total balance with an instalment arrangement after they have moved from the Utility service area.
CC-86	The system should track payment arrangements on both active and inactive accounts and render notices based on the terms of the payment arrangement in lieu of the criteria established for regular notices. The notices may have additional terminology reflecting default.
CC-87	The system should be capable of generating on-line view the payment schedules and amounts.

CC-88	The system should allow the user to adjust the instalment amount for each payment.
CC-89	The system should provide for payment instalment dates that are user defined.
CC-90	The system should automatically generate instalment payment letters. System should provide the ability to send "reminder" notices via SMS, email or letter to Consumers with payment instalments.
CC-91	The system should provide the ability to make deferred payment arrangements for Consumers. Consumer can pay current bill and avoid collection on past due amounts until a future date. Arrangements are made to pay over "x" months in the future.
CC-92	The system should provide an on-line view of payment arrangements made with a Consumer for an account.

5.0 Consumer / Customer Management

SN	Description
5.1	**Consumer Types**
	The system should have the ability to manage the following types of Consumers:
CM-1	o Normal billed utility Consumers
CM-2	o Prospective Consumers (Consumers applied for supply of water)
CM-3	o Consumer
CM-4	o Corresponding Consumer
CM-5	o Premises Owner Consumers (Linked to accounts)
CM-6	o Construction Consumer
CM-7	o Consumer
CM-8	o Master Consumers (linked to multiple accounts)
CM-9	o User defined
CM-10	The system should support further unlimited numbers of grouping of Consumer within each Consumer types
CM-11	The system should support grouping Consumer based on Consumer class (i.e. residential, commercial and industrial), rates and Consumer types.
5.2	**Consumer Setup**
CM-12	The system should have a Consumer data level used for grouping accounts, prospecting, landlord responsibility, property owner, etc.
CM-13	The system should manage Consumer records with the following data elements:
CM-14	o Consumer Code Number(CCN)
CM-15	o Consumer Name
CM-16	o Consumer Bank Account Number
CM-17	o Co-Applicant Name
CM-18	o Aadhaar Number (In case of slum, all members of slum account)
CM-19	o Photo Pass Number (In case of slum, all members of slum account)
CM-20	o Election Role Number (In case of slum, all members of slum account)
CM-21	o Ward / Zone
CM-22	o Election ward / Assembly constituency Number
CM-23	o Ration Card ID number

CM-24	o Home Phone Number
CM-25	o FAX Number
CM-26	o Mobile Number
CM-27	o Business Number
CM-28	o Email Address
CM-29	o Premise Address line (locality)
CM-30	o Billing Address line (locality)
CM-31	o City
CM-32	o State
CM-33	o Country
CM-34	o Pin Code
CM-35	o System and User Defined Consumer Type (Group Code)
CM-36	o Consumer Category
CM-37	o SAC code (Property Number)
CM-38	o User Defined Fields (please provide how many)
CM-39	o Accounts can be created from Consumer record to facilitate linking to Consumer.
CM-40	o Consumers can be linked to several Accounts
5.3	**Consumer Management**
CM-41	The system should maintain information specifically related to the Consumer, their accounts and activities, including the following:
CM-42	o Consumer Credit Score (combined credit score of all related accounts)
CM-43	o Consumer Balance(combined balance of all accounts)
CM-44	o Accounts (listing of related accounts with drill down)
CM-45	o Consumption History (combined consumption of all related accounts)
CM-46	o Contacts (for all related accounts)
CM-47	o Service Orders (for all related accounts)
CM-48	o Billing History (for all related accounts)
CM-49	o Payment History (for all related accounts)
CM-50	o Deposits (for all related accounts)
CM-51	The system should readily display the Consumer status; active, inactive, pending, prospect, etc.
CM-52	The system should accommodate multiple addresses for each Consumer such as Premise and billing.
5.4	**Consumer Inquiry**
	The system should provide the ability to access Consumer information on-line using the following key fields:
CM-53	o Consumer Code Number (CCN)
CM-54	o Consumer Name
CM-55	o Aadhar Number
CM-56	o Any Phone Number
CM-57	o Any Address
CM-58	o Election Role Number
CM-59	o Photo Pass Number

CM-60	The system should provide the ability to drill down to all related Accounts of Consumer
CM-61	The system should identify and flag DCO accounts on the Consumer screen.
CM-62	The system should identify and flag accounts that are in bad debt on the Consumer screen.
CM-63	The system should provide the ability to export Consumer data into spreadsheet format for analysis.
5.5	**Consumer Self Service**
	IVR
CM-64	The system should provide account inquiry capability via the phone.
CM-65	The system should provide service request capability via the phone.
CM-66	The system should log IVR calls as a contact in the contact system.
CM-67	The system should provide IVR callers with special status information like past due, disconnect dates, etc.
CM-68	The system should provide statistical data on IVR usage such as calls per day, services utilized, etc.
CM-69	The system should require a security PIN or other access control method for access to data.
	WEB
CM-70	The system should provide account inquiry capability via the web
CM-71	The system should provide service request capability via the web
CM-72	The system should provide for Disconnection/Reconnection or transfer of service orders via the web
CM-73	The system should provide a contact log of web contacts
CM-74	The system should provide the ability to check status of service orders.
CM-75	The system should provide web users with special status information like past due, disconnect date, etc…
CM-76	The system should provide ability to email utility and receive email in contact system linked to Consumer or account
CM-77	The system should require security PIN or other access control method for access to data
CM-78	The system should provide for payment of bill via web using direct debit of bank account.
CM-79	The system should provide for payment of bill via web using credit card.
CM-80	The system should provide for EFT setup via the web.
CM-81	The system should provide for presentment of bill via web.
	Web Chat
CM-82	The system should support a web chat feature that allows multiple Consumers to be corresponding with a single CSR (Consumer Service Representative).
CM-83	The system should maintain a log of the event and the detail of the two-way correspondence.
CM-84	The system should allow a CSR to view the exact same data as the Consumer.
CM-85	The system should allow a CSR to be activated and deactivated as available for chat sessions.

CM-86	The system should allow chat sessions as a whole to be activated and deactivated if not available 24x7.
	Technical Features
CM-87	The integration of the Consumer self-service Web application and your CIS Solution should be accomplished without third party software.
CM-88	The CIS Solution desktop support should be compliant with the following browsers (describe any known version or other limitations or any browsers not supported):
CM-89	o Microsoft Internet Explorer
CM-90	o Firefox
CM-91	o Google Chrome
CM-92	o Safari
CM-93	The system should support a Secure Socket Layer with 128-bit encryption.
CM-94	The system should support mobile access via native applications (e.g., Blackberry, iPhone, tablet computers, etc.).
CM-95	The system should support mobile website optimized display and access (e.g., Blackberry, iPhone, tablet computers, etc.).
CM-96	The system should ensure that credit card numbers and bank account numbers are not stored on the web server.
CM-97	The system should meet current PCI standards.
CM-98	The system should provide the utility Consumer the ability to make real-time updates to their account information.
CM-99	The CIS system should provide the ability to include hyperlinks on a page to direct Consumers to other related sites.
5.6	**Consumer Status Management**
CM-100	The system should have the ability to use Consumer Information to create an account
CM-101	The system should support Consumers that are independent of accounts and premises. (prospective Consumers, contacts, non-utility Consumers)
CM-102	The system should have the ability to link a Consumer to an account as third party, landlord, responsible party
CM-103	The system should maintain Consumers with unique number separate from account or property number
CM-104	The system should support Consumers with multiple mailing addresses and indication of active mailing address (please list how many)
CM-105	The system should provide the ability to drill-down to related accounts and premises
CM-106	The system should be capable of an unlimited number of accounts linked to a Consumer

6.0 Customer Information System : Account Management

SN	Description
6.1	**Account/ Connection Types**
	The system should have the ability to manage the following account types:
AC-1	o Utility Billed Account (normal utility billed account)

AC-2	o Mobile Accounts (accounts without a permanent premises attached. Hydrant Meters, etc..)
AC-3	o Responsible Party Accounts: Landlords, Owners, tenants, etc..
AC-4	o Temporary Connection Account (short period)
AC-5	o Permanent Connection Account
AC-6	o Meterless Connection / Compounded Connection Account
AC-7	o Meterless Construction (WC Rule 6.2, Appendix-B) Account
6.2	**Account Setup**
	The system should collect account information that is used to identify unique billing entities for billing services, and includes the following data elements:
AC-8	o Account Number (CCN)
AC-9	o Account Holder Name
AC-10	o Co-Applicant Name
AC-11	o Consumer Bank Account Number
AC-12	o Aadhaar Number (In case of slum, all members of slum account)
AC-13	o Photo Pass Number (In case of slum, all members of slum account)
AC-14	o Election Role Number (In case of slum, all members of slum account)
AC-15	o Ward / Zone
AC-16	o Election ward / Assembly constituency Number
AC-17	o Ration Card Number
AC-18	o Home Phone Number
AC-19	o FAX Number
AC-20	o Mobile Number
AC-21	o Business Number
AC-22	o Email Address
AC-23	o Billing Address Line 1
AC-24	o Billing Address Line 2
AC-25	o City
AC-26	o State
AC-27	o Country
AC-28	o Zip Code
AC-29	o Legacy Account Number
AC-30	o Account Status
AC-31	o Account Type
AC-32	o Establish Date
AC-33	o Disconnect Date
AC-34	o Last Bill Date
AC-35	The system should be able to create accounts by copying other accounts
AC-36	The system should be able to create accounts by copying Consumer
AC-37	The system should be able to link accounts to Consumers
AC-38	The system should be able to link accounts to landlords
AC-39	The system should be capable of accounts with more than one responsible party on the account
AC-40	The system should be capable of accounts with multiple billing addresses (Primary and Secondary) that will be used based on date ranges
AC-41	The system should provide the following account statuses:
AC-42	o Active
AC-43	o Inactive (Temporary cutoff on Meter –main connection or sub-meter connection.

AC-44	o Main connection cutoff – submeter entry closed
AC-45	o Main connection cutoff – Prorata account closed
AC-46	Permanent cutoff at Ferule
AC-47	o Cutoff for non-payment
AC-48	o Cutoff for for violation
AC-49	o Meter Removed (Active Supply without meter / with standby meter)
AC-50	Testing
AC-51	Short supply
AC-52	Replacement
AC-53	o Write-off
AC-54	The system should provide for user defined statuses
AC-55	The systems should provide the ability to initiate specific services without initiating others
AC-56	The system should provide a mechanism to allow accounts to bill consumption based services without a premise. (hydrant and portable meters)
AC-57	The system should maintain a flag for EBP accounts (no paper bill)
6.3	**Account Maintenance**
AC-58	The system should track and maintain all billing, consumption, credit, DCO, deposit, contact, service order, and receipts history for the account until deleted or purged.
AC-59	The system should have the ability to establish third-party and landlord relationships at will.
AC-60	The system should provide forwarding billing address for closed accounts
AC-61	The system should automatically update account statuses by system events including:
AC-62	o Connection, Disconnection and reconnection service orders
AC-63	o Cut-off service orders
AC-64	o Notices and service orders
AC-65	o Write-off and bad debt processing
AC-66	o Meter maintenance processing
AC-67	The system should provide a mechanism to easily move an account from one premise to another retaining all billing, consumption, credit, DCO, deposit, contact, service order, and receipts history
AC-68	The system should provide a mechanism to conduct mass changes across accounts: Address, Name, Phone Number, etc.
AC-69	The system should provide the ability to create value based adjustments to accounts
AC-70	The system should provide the ability to create consumption based adjustments to accounts
AC-71	The system should require appropriate user level security to apply an adjustment
AC-72	The system should create all adjustments utilizing general ledger codes defined in system
AC-73	The system should provide the ability to reverse adjustments
AC-74	The system should provide for predefined adjustment types including:
AC-75	o Courtesy
AC-76	o Re-Read
AC-77	o User Defined
AC-78	o wrong billing
AC-79	The system should provide a mechanism to exempt accounts from late charges.
AC-80	The system should provide a mechanism to exempt accounts from disconnect.
AC-81	The system should display DCO status on account screens.

AC-82	The system should display Credit Score on account screens.
AC-83	The system should not allow accounts to be deleted while active.
AC-84	The system should not allow accounts to be deleted while premises are linked.
AC-85	The system should only allow accounts to be deleted if there is no history and with special user permissions.
6.4	**Account Inquiry**
	The system should provide on-line access to account information. The following access paths have been identified:
AC-86	o Account Number
AC-87	o Account Name
AC-88	o Co-Applicant Name
AC-89	o Third-Party Names
AC-90	o Consumer Name
AC-91	o Consumer Number
AC-92	o Account Address
AC-93	o Premise Address
AC-94	o Meter Number
AC-95	o Premise Number
AC-96	o Premise Parcel Number
AC-97	o GIS X,Y Coordinate
AC-98	o Aadhaar Number
AC-99	o Telephone Number
AC-100	o Drivers License Number
AC-101	o Legacy Account Number
AC-102	o Contact Number
AC-103	o Service Order Number
	The system should provide the following account views:
AC-104	o Billing and financial history
AC-105	o Deposits
AC-106	o Consumption and usage history (in total)
AC-107	o Consumption and usage history (by meter)
AC-108	o DCO history
AC-109	o Service Orders
AC-110	o Contacts
AC-111	o Premise or location history
AC-112	o Actual bill image history
AC-113	o Services view (Water, Wastewater)
AC-114	o Service Point view (Water Meter 1, Water Meter 2, etc…)
AC-115	o Consolidated account view of all related accounts
	Deposits
AC-116	The system should be able to assess a deposit by service type
AC-117	The system should be able to maintain default deposit amounts based on service type (Water, Wastewater, etc.), Account Class (Residential, Commercial, Industrial, etc.) and Meter Size.
AC-118	The system should be able to assess a deposit to an account and allow collection of deposit over multiple billing periods

AC-119	The system should be able to adjust deposit against an outstanding bill amount
AC-120	The system should automatically adjust the deposit to the amount due when closing an account
	Refunds Payable
AC-121	The system should accumulate and display on-line or via report all credit balances as of a user defined date.
AC-122	The system should be able to track user-defined type of refunds (overpayment, close account, deposit refund, etc.)
AC-123	The system should provide the ability to process credit balance refunds in batch.
AC-124	The system should allow the user to assign a G/L account to the payable refund.
AC-125	The system should update G/L accounts when credit balance refunds are posted.
AC-126	The system should print a journal for all credit balance refunds processed.
AC-127	The system should automate the processing of refunds through accounts payable integration.

7.0 Customer Information System : Premise Management

SN	Description
7.1	**Premise Types**
	The system should be able to handle several types of premises including:
PM-1	o Permanent Premises (land parcels with addresses)
PM-2	o Temporary Premises (Construction sites,,, Events sites, etc)
PM-3	**o Non-identifiable Premises (medians, right-of-ways, bare land, etc.)**
7.2	**Premise Setup**
PM-4	The system should limit the setup of premises to Consumer.
	The system should manage premise data records with the following discrete data elements:
PM-5	o Premise Number (SAC Number)
PM-6	o Key Word or Phrase
PM-7	o House Number /Shop Number
PM-8	o Building Name
PM-9	o Building Floor
PM-10	o Name of Building Wings
PM-11	o Plot Number / CS Number
PM-12	o Extension
PM-13	o Street Number
PM-14	o Street Name
PM-15	o Road Junction
PM-16	o Area
PM-17	o Landmark
PM-18	o City
PM-19	o State
PM-20	o Pin code
PM-21	o Reading Route Number for specific services (Control Table Verified)
PM-22	o Create Date

PM-23	o Premise Inactive Date
PM-24	o Last Bill Date
PM-25	o Legacy Premise Number
PM-26	o Link to GIS
PM-27	o GIS X,Y Coordinates
PM-28	o Administrative Ward(Control Table Verified)
PM-29	o Zonal Area (E/W/C) (Control Table Verified)
PM-30	o Pressure Zone/Point (Control Table Verified)
PM-31	o Supply Zone (DMZ) (Control Table Verified)
PM-32	o Premise Type (Control Table Verified) (e.g. residential, commercial, industrial, institutional, etc.)
PM-33	o Premise Sub-Type (Control Table Verified) (e.g. single family, multi-family, industrial types, etc.)
PM-34	o Premise Status (Control Table Verified)
PM-35	o Number of Units (for multi dwelling)
PM-36	o User Defined Fields (please provide number of fields)
PM-37	The system should allow the user to define required fields
PM-38	The system should allow incomplete premise information to be entered while status is pending. Active status should only be selected when required data elements are entered.
PM-39	The system should be able to create temporary premises such as construction sites, etc where permanent premise install is not practical
PM-40	The system should be able to create premises by copying another premise
PM-41	The system should allow all defined services to be available at a premise
PM-42	The System should allow multiple accounts at a premise.
PM-43	The system should allow a premise to have multiple services of the same type
7.3	**Premise Maintenance**
PM-44	The system should track and maintain all billing history for the premise until deleted or purged.
PM-45	The system should track and maintain all consumption history for the premise until deleted or purged.
PM-46	The system should track and maintain all service order history for the premise until deleted or purged.
PM-47	The system should track and maintain all account history for the premise until deleted or purged.
PM-48	The system should track and maintain all meter history for the premise until deleted or purged.
PM-49	The system should track and maintain all service history for the premise until deleted or purged.
PM-50	The system should not allow an inactive status while a Consumer is linked to premise.
PM-51	The system should be capable of automatically updating premise statuses by system events including:
PM-52	o Disconnection and Restoration service orders on Consumer request
PM-53	o Cut-off and Restoration service orders by Corporation.

PM-54	o Health violation notices and service orders
PM-55	o Meter maintenance processing
PM-56	The system should provide a mechanism to conduct mass changes across Premises I.e. Address components
PM-57	The system should be able to link the responsible party (Owner, landlord, etc.) to a premise that stays linked while other accounts open and close at premise
PM-58	The system should not allow premises to be deleted with an active account
PM-59	The system should not allow a premise to be deleted while services are active.
PM-60	The system should only allow premises to be deleted with special user authority.
7.4	**Premise Inquiry**
	The system should provide on-line access to premise information. The following access paths have been identified:
PM-61	o Account Number
PM-62	o Account Name
PM-63	o Premise Number (SAC Number)
PM-64	o Premise Address Components
PM-65	o Reading Route
PM-66	o Division or Area (User Defined Field)
PM-67	o Service Order Number
PM-68	o Meter Number
PM-69	o Legacy Premise Number
PM-70	o GIS X,Y Coordinate
PM-71	The system should be capable of partial word searches.
	The system should support multiple premise views including the following:
PM-72	o Billing and financial history
PM-73	o Consumption and usage history (in total)
PM-74	o Consumption and usage history (by meter)
PM-75	o Service Orders
PM-76	o Account history
PM-77	o Services view (Water, Sewerage)
PM-78	o Service Point view (Water Meter 1, Water Meter 2, etc…)
PM-79	o Meter history

8. Customer Information System : Customer Contact Management

Description
Contact Types
The system should be able to create, receive, track, and manage the contact types listed below:
o Inbound Telephone Calls through PBX
o Inbound Telephone Calls through IVR (system provides IVR capabilities)
o Inbound Contact via email (your system provides email capabilities)
o Inbound Contact via FAX (your system provides FAX capabilities)
o Inbound Access via IWR (your system provides a IWR interface)
o Outbound Letters auto-generated by system

o Outbound Letters manually generated by user
o Outbound FAXing auto-generated by system
o Outbound FAXing manually generated by user
o Outbound email auto-generated by system
o Outbound email manually generated by user
o Outbound IVR auto-generated by system
The system should be capable of linking all contacts/communication to a Consumer or Account.
Contact Setup
The system should include a full featured contact system that captures and tracks all contacts from a Consumer or Account including the following fields
o User Defined Contact types
o Contact Status
o Contact Create Date
o Contact Create Time
o Contact Create User
o Contact Description (State how large field is)
o Contact Closed Date
o Contact Closed Time
o Contact Closed User
o User Defined Fields (how many)
The system should support unlimited user defined contact types
The system should allow contacts to be configured to auto-create predefined service orders
The system should be able to link contacts to the Service Orders they create
The system should allow contacts can be created from anywhere in the system
Contact Management
The system should prompt users about long standing open contacts
The system should not allow a linked service order to be closed when closing a contact.
The system should allow the user to view service order status from contact screen
The system should allow the user to view on-line all open contacts
The system should allow contacts to be configured to create and send outbound predefined letters when closed
The system should allow contacts to be configured to create and send outbound predefined FAXs when closed
The system should allow contacts to be configured to create and send outbound predefined emails when closed
The system should maintain a hierarchy for preferred outbound contact method for each Consumer or account (e.g. email, fax, letter)
The system should be able to select a preferred contact method based on fields populated and available (e.g. email address, fax number, etc.)
Contact Inquiry

The system should allow the user to view on-line contacts by Consumer
The system should allow the user to view on-line contacts by account
The system should allow the user to view on-line contacts by user
The system should allow the user to view on-line contacts by status
The system should allow the user to view on-line contacts by type
Outbound Contacts
The system should be able to contact Consumers via outbound Letters created by system from templates.
The system should be able to contact Consumers via outbound email created by system from templates.
The system should be able to contact Consumers via outbound FAXs created by system from templates.
The system should be able to contact Consumers via outbound IVR created by system from templates.

9.0 Customer Information System : Customer Grievance Redressal

SN	Description
9.1	**Customer Grievance Redressal (non voice based)**
CG-1	The system should support Configuration of letters/email/SMS/fax Groups on the basis of different zones, Wards etc.
CG-2	The system should allow to route the scanned letters to respective email-Ids (based on queries/requests/complaints). These emails should get routed to different groups/work queues.
CG-3	The system should be capable of displaying the previous interaction histories with the customer on email / SMS/FAX, and the same should be available to voice based users.
CG-4	The system should have capability to notify and make available the complaints to the respective users either at the Zones or Wards based on the nature of the complaint.
CG-5	The system should be able to automatically set a deadline and priority for the resolution of complaints based on the type of grievance as per Corporation policy and provide option for setting deadlines and priority for exceptional cases.
CG-6	The system should have capability to delegate responsibilities to an alternate user in the absence of the assigned user.
CG-7	The system should allow the user who reviews the complaint to assign the task of redressing the grievance to another defined user from a list, and optionally also assign a criticality level.
CG-8	The system should have capability to allow the user to assign selected grievances to Field staff from a list.
CG-9	The system should have capability to present a monitoring dashboard with customized alerts to the user.
CG-10	The system should be able to generate and print task sheets for complaints to be resolved by field officers with such details as:
CG-11	o Type of complaint
CG-12	o Name of Field staff
CG-13	o Name of Customer
CG-14	o Connection Number

CG-15	o Contact details of customer
CG-16	o Grievance Reference Number
CG-17	o Deadline for redressal
CG-18	o Status of grievance redressal
CG-19	o Date on which closed
CG-20	o Remarks from Field staff
CG-21	The system should have capability to record/update/close the status of grievance redressed against each complaint from the task sheet submitted by field officers to the user.
CG-22	The system should have capability to reopen a complaint which was inappropriately addressed and closed.
CG-23	The system should have capability to alert Corporation officials through email, dashboard alerts, automated SMS messages with reminders on deadlines for grievance redressal before the due date.
CG-24	The system should have capability to inform the customer by SMS/Email/Voice calls that the grievance has been redressed.
CG-25	The system should provide facilities through IVR based system, SMS and Web for customers to check the status of grievances as per the grievance reference number provided to them.
CG-26	The system should have capability to automatically escalate the complaint to higher authorities on passing of the deadline for the grievance redressal
CG-27	The system should be able to allow higher authorities to monitor and follow up for the prompt redressal of the escalated grievances.
CG-28	The system should have capability to allow users to seek a show cause notice electronically from defaulted Users for each grievance that has been escalated.
CG-29	The system should have capability to set an extended deadline for pending grievances based on inputs received from higher authorities.
CG-30	The system should have capability to generate and print fresh task sheets for delayed grievances with the same grievance reference number, to be issued to the assigned field officer with the extended deadline.
CG-31	The system should have capability to provide authority to close grievances which are not practical to be redressed in exceptional cases with notifications to the Customer and all users concerned.
	Customer Grievance Redressal (voice based)
CG-32	System must allow customer calls to be entered directly into the application.
CG-33	The system should be capable of displaying the previous interaction histories with the customer on call
CG-34	The call entry should support the ability to display and enter customer information such as:
CG-35	o CCN / Account Number
CG-36	o Name
CG-37	o Phone Number
CG-38	Once the customer information is entered, the system should automatically display fields such as:
CG-39	o Customer type
CG-40	o Account Number / CCN
CG-41	o Date and time of call
CG-42	o Meter ID

CG-43	o Status information
CG-44	o Any previous complaints
CG-45	o Estimated restoration time, if available
CG-45	Call entry should support a configurable set of trouble indicators on drop down menus such as over billed, meter stopped, bill not received etc
CG-47	The call entry should provide a unique identifier for each call taken so that a complaint number can be given to the caller.
CG-48	The system should automatically generate call back lists when complaint has been resolved
CM-49	System should provide details of resolved complaint to the call back personnel.

10.0 Customer Information System : Services

SN	**Description**
10.1	**Service Types**
	The system should support all utility related services including:
SM-1	o Metered Treated Water
SM-2	o Un-Metered Treated Water
SM-3	o Metered Raw Water
SM-4	o Un-Metered Raw Water
SM-5	o Potable tanker water
SM-6	o Waste Water
SM-7	o Metered Recycle Water
SM-8	o User Defined
10.2	**Service Setup**
	The system should allow authorized users to establish one or more individual services available at a premise including the following data elements:
SM-9	o Service Type (control table validated)
SM-10	o Service Size (control table validated)
SM-11	o Service Status (control table validated)
SM-12	o Service Activated Date
SM-13	o Service Deactivated Date
SM-14	o Last Reading Date
SM-15	o Last Bill Date
SM-16	o Service Location
SM-17	o Link to GIS service connection points
SM-18	o GIS X,Y Coordinate
SM-19	o Service Instruction
SM-20	o Reading Route
SM-21	o Reading Route Stop
SM-22	o Service Installation Work Order Number
SM-23	The system should allow multiple services at a premise
SM-24	The system should allow metered and non metered services at a premise
SM-25	The system should allow multiple metered services at a premise

SM-26	The system should allow multiple non metered services at a premise
SM-27	The system should allow other inventory items at a service point (e.g. backflow device, detector check valves, etc.)
SM-28	The system should associate unique rates to each service point
SM-29	The system should associate unique rates to each meter
SM-30	The system should allow master meters at a service
SM-31	The system should allow additive meters at a service
SM-32	The system should allow deductive meters at a service
SM-33	The system should allow compound or multi-register meters at a service
SM-34	The system should allow multiple meters to accumulate consumption and bill under one rate
SM-35	The system should assign read route by service point
SM-36	The system should assign read route stops by service point
10.3	**Service Maintenance**
SM-37	The system should track all usage by service regardless of associated meter
SM-38	The system should track service orders by service
SM-39	The system should automatically update service status by service order activities (e.g. meter change out orders, meter removal orders, etc.)
SM-40	The system should allow any combination of services to be active or inactive without affecting the other services billing
SM-41	The system should accept reading route stop re-sequencing from meter reading interface
SM-42	The system should maintain all service records until deleted or removed by administrator.
10.4	**Service Inquiry**
SM-43	The system should allow consumption history to be viewed on-line for each service
SM-44	The system should allow meter history to be viewed on-line for each service
SM-45	The system should allow service orders to be viewed on-line for each service
SM-46	The system should allow service orders history to be viewed on-line by location, Consumer, meter, account, etc.
SM-47	The system should allow meter reading history to be viewed on-line for each service
10.5	**Meter Reading**
SM-48	The system should provide the ability for users to create reading routes per service
SM-49	The system should have a interface file for downloading to an external meter reading system
SM-50	The system should have an interface for uploading from an external meter reading system
SM-51	The system should be able to display current and previous meter reading date
SM-52	The system should be able to display current and previous meter reading values
SM-53	The system should be able to assign predefined trouble/ status codes of the meter (i.e. non-functional, broken, etc)
SM-54	The system should be able to capture all the field inputs (i.e. unauthorised meter, misuse of connection, change in connection category, etc)
SM-55	The system should be able to create service orders from meter reading trouble codes and field inputs.

10.0	**Customer Information System : Services**
10.1	Service Types
	The system should support all utility related services including:

SM-1	o Metered Treated Water
SM-2	o Un-Metered Treated Water
SM-3	o Metered Raw Water
SM-4	o Un-Metered Raw Water
SM-5	o Potable tanker water
SM-6	o Waste Water
SM-7	o Metered Recycle Water
SM-8	o User Defined
10.2	Service Setup
	The system should allow authorized users to establish one or more individual services available at a premise including the following data elements:
SM-9	o Service Type (control table validated)
SM-10	o Service Size (control table validated)
SM-11	o Service Status (control table validated)
SM-12	o Service Activated Date
SM-13	o Service Deactivated Date
SM-14	o Last Reading Date
SM-15	o Last Bill Date
SM-16	o Service Location
SM-17	o Link to GIS service connection points
SM-18	o GIS X,Y Coordinate
SM-19	o Service Instruction
SM-20	o Reading Route
SM-21	o Reading Route Stop
SM-22	o Service Installation Work Order Number
SM-23	The system should allow multiple services at a premise
SM-24	The system should allow metered and non metered services at a premise
SM-25	The system should allow multiple metered services at a premise
SM-26	The system should allow multiple non metered services at a premise
SM-27	The system should allow other inventory items at a service point (e.g. backflow device, detector check valves, etc.)
SM-28	The system should associate unique rates to each service point
SM-29	The system should associate unique rates to each meter
SM-30	The system should allow master meters at a service
SM-31	The system should allow additive meters at a service
SM-32	The system should allow deductive meters at a service
SM-33	The system should allow compound or multi-register meters at a service

SM-34	The system should allow multiple meters to accumulate consumption and bill under one rate
SM-35	The system should assign read route by service point
SM-36	The system should assign read route stops by service point
10.3	Service Maintenance
SM-37	The system should track all usage by service regardless of associated meter
SM-38	The system should track service orders by service
SM-39	The system should automatically update service status by service order activities (e.g. meter change out orders, meter removal orders, etc.)
SM-40	The system should allow any combination of services to be active or inactive without affecting the other services billing
SM-41	The system should accept reading route stop re-sequencing from meter reading interface
SM-42	The system should maintain all service records until deleted or removed by administrator.
10.4	Service Inquiry
SM-43	The system should allow consumption history to be viewed on-line for each service
SM-44	The system should allow meter history to be viewed on-line for each service
SM-45	The system should allow service orders to be viewed on-line for each service
SM-46	The system should allow service orders history to be viewed on-line by location, Consumer, meter, account, etc.
SM-47	The system should allow meter reading history to be viewed on-line for each service
10.5	Meter Reading
SM-48	The system should provide the ability for users to create reading routes per service
SM-49	The system should have a interface file for downloading to an external meter reading system
SM-50	The system should have an interface for uploading from an external meter reading system
SM-51	The system should be able to display current and previous meter reading date
SM-52	The system should be able to display current and previous meter reading values
SM-53	The system should be able to assign predefined trouble/ status codes of the meter (i.e. non-functional, broken, etc)
SM-54	The system should be able to capture all the field inputs (i.e. unauthorised meter, misuse of connection, change in connection category, etc)
SM-55	The system should be able to create service orders from meter reading trouble codes and field inputs.
11.0	**Meter Data Management**
SN	**Description**
11.1	**MDMS Functional Requirements**
	MDMS System should support the following Corporation existing / required facilities:
MD-1	TMC is divided into 24 administrative wards. Each ward is divided into water supply zones. The supply zone receives water from one or more supply sources i.e. service reservoir or reroute water mains supply.

MD-2	Balancing Reservoir at Water Treatment Plant feeds the Service Reservoir located at different parts of the city. Flow meters are installed at outlets and inlets of the Reservoir and pre-identified specific locations in the water supply system.
	TMC shall read Consumer meters monthly or quarterly as per the following:
MD-3	o Non-AMR : Manually using handheld data collection devices for residential Consumer meters (as proposed). At present the data is collected on Meter reading physical book and entered into the system through user interface to the system.
MD-4	o AMR (RFID) : Walkby meter data collection with RFID handheld devices for residential Consumer meters.
MD-5	o AMR (GSM/GPRS): Automated meter data collection through GSM/GPRS network for commercial and industrial Consumer meters.
	Tanker fill station metering
MD-13	o AMR Application: AMR meter based on GPRS is proposed to monitor the reading of tanker fill station.
11.2	**MDMS Interface**
MD-14	TMC meter information should be transferred to the new MDMS system. The MDMS must be interfaced with new water utility applications, such as Billing, CIS, GIS(Optional) and AMI, etc.
MD-15	MDMS shall be interfaced with Billing System proposed by Successful Bidder
MD-16	MDMS shall be interfaced with CIS System proposed by Successful Bidder
MD-17	MDMS shall be interfaced with Document Management System(DMS) proposed by Successful Bidder
MD-19	Bidder shall describe the solution for interface to AMI system to be deployed later by TMC.
11.3	**Asset Management**
MD-20	TMC does not have databases for more detailed water meter asset management, such as historical device location and testing results. TMC has a long term vision of consolidating all meter asset management into a single application and wants the MDMS to be that future asset repository.
MD-21	Meters shall be categorised broadly on billing basis as Consumer and Management Meters. Other instruments in the network shall be water Quality(turbidity and chlorine) measuring instruments etc.
MD-22	The Bidder shall create the data relationships among water modules and meters to associate water modules with water meters. Water Modules i.e. water treatment plant, balancing reservoir, service reservoir, and supply zone, etc.
MD-23	The movement of meter assets shall be recorded and monitored by MDMS. The new mechanical meters are expected to have serial number bar coded for easy maintenance of records. Others meters in the network is expected to be bar coded.
MD-24	TMC is expecting to have Meter Testing system. The same must be integrated with the MDMS. The Meter test records (manual or automated) are also to be maintained in the MDMS.
MD-25	Various Meter asset along with status of the meter must be available in MDMS based on location of the meter i.e. stock, lab, water network, etc.
MD-26	Where ever alarms are generated from the meter (AMR consumer meter installed in the water network) must be properly captured and reflected against the meter status in the MDMS. Status (physical conditions) of mechanical meter collected by HHU.
MD-27	Describe how proposed system associates meters and Premise Location/Service Point Locations when there are multiple meters at the same location.

MD-28	Bidder shall explain the solution for operation and maintenance of the meters. The meter maintenance is expected to be handled by MDMS.
11.4	**AMI System Interface**
MD-29	At presents nearly One lakhs Thirty Five Thousands AMR meters are installed in the field and also expected to add another One Lakhs for the high end consumers.
MD-30	The MDMS shall have the ability to receive input from multiple metering systems including the fixed network AMI system and specify which system manages each endpoint device.
MD-31	The MDMS shall automatically facilitate the provisioning (ensuring successful communication) of the installed meter or module with the AMI head end.
MD-32	The MDMS shall generate exceptions for meter or modules that failed to be provisioned with the AMI head end.
MD-33	The MDMS shall generate exceptions for meter or modules not delivering the correct meter data based on the installed meter program.
MD-34	The MDMS shall provide a reconciliation report that identifies the meters that have been identified to the MDMS as having been deployed but have not been successfully provisioned for meter read and billing cycle.
MD-35	The MDMS shall generate reports on the number of meters installed in comparison to the number of meters successfully provisioned.
11.5	**Meter Data Collection**
	This section provides a description of the core information that is anticipated. Bidder shall identify the ability to meet these requirements and identify any areas where the proposed system is unable to comply, along with proposed efforts to resolve the lack of compliance.
MD-36	The MDMS solution must be able to process and manage the information that is collected from the planned AMR and Handheld Device.
MD-37	The MDMS shall support water metering. Identify the meter installed and owned by TMC or AMR and SCADA vendor who have installed Non-AMR, AMR Meter and Management Meter.
MD-38	The wireless Handheld devices shall be used by vendor and TMC for collection of Non-AMR Meter data. Data from Handheld devices already deployed without wireless interface shall be imported through USB interface transfer. MDMS shall provide appropriate interface to transfer the meter data from Handheld device to MDMS.
MD-41	The MDMS shall input, process, store, and analyze interval data and register reads from Meters.
MD-44	The MDMS shall collect and report on the performance and availability of data being delivered and trend performance over time. Report on meters not being read or data not entered manually where ever required.
MD-45	MDMS shall provide user interface for manual entry of meter data for consumer meter.
11.6	**Time Management.**
MD-46	The MDMS shall accurately track and provide time stamps as appropriate to data and information receipt, management and process activities.
MD-47	The Bidder shall identify the start and end of day date/time stamps for its solution.
MD-48	The Bidder shall indicate if its solution manages all time stamps in local time.
MD-49	The Bidder shall identify system functionality to normalize date/time stamps to a common start/end of day if different metering systems have different start/end of day time stamps.
11.7	**Data Integrity**
MD-50	The Bidder shall explain how its solution performs programmatic data integrity checks.

MD-51	The Bidder shall explain how its solution identifies and flags any missing or corrupt data and generate reports. Validation rules shall be configurable by data type, meter and AMI technology, and consumer class, etc.
11.8	**Exception Management**
	An important aspect of any information system is how that system manages exceptions. This includes how exceptions are categorized, identified, managed and reported. As the MDMS will provide a crucial link in TMC Utilities' meter to bill process, as well as support other future advanced services, the Bidder shall describe how the proposed MDMS performs exception management. For each of the following requirements, the Bidder shall indicate its solutions ability to meet the requirement.
	Exception Generation.
MD-52	The MDMS shall generate exceptions based on configurable business rules. The exceptions may be in regards to:
MD-53	o Meter, register, communication module health
MD-54	o Combined analysis based on the consumption of two or more meters at the same premise/account
MD-55	o Consumer Consumption less than requirement or more than the calculated discharge capacity for that connection.
	Exception Generation Criteria.
MD-58	Exceptions may be generated based on the combinations of the following configurable parameters.
MD-59	Meter tamper alerts received from the meter via the AMI and AMR Application application.
MD-60	Meter, communication module health/diagnostic alerts received from the meter via the AMI and AMR Application
MD-61	o Zero Consumption; Water Meters with zero consumption in a 24 hour period or a 30 days period as the case may be. Additionally, the system shall be capable of using other Billing & CIS supplied factors, such as a seasonal use designation code, or an "disconnection" code, etc. in order to validate zero consumption field activities.
MD-62	o Negative Consumption; Meters with reverse flow.
MD-63	o Daily/weekly/monthly Consumption Verification; Meter daily/weekly/monthly usage above or below a programmable threshold for a configurable number of days. The threshold shall be different as per usage for the Consumer on that meter on similar days (weekday, weekend, holiday) or as per usage for the Consumer on that meter as compared to other 'like' Consumers (as identified by a common demographic attributes).
MD-64	o Over or below usage Verification; System shall perform the comparison of consumption in a bill cycle with requirement and discharge capacity of that connection.
MD-65	o Attributes of the meter or the account associated with meter, such as the account being inactive, service being cut at the ferrule, or disconnection from meter.
11.9	**Service Orders**
MD-66	TMC shall utilize proposed CIS for generation, handling and reporting of service orders. CIS will remain the primary System of Record for service order management. For each of the following requirements, the Bidder shall indicate its solutions ability to meet the requirement.
MD-67	MDMS shall monitor and identify specific meter diagnostic flags provided by the AMI fixed network system or AMR application (such as stop-meters, reverse rotation, etc) and uses configurable rules to automatically generate service order requests for CIS. The system shall also identify combinations of flags over a specified period of time.

MD-68	The system shall receive and identify trouble codes provided by Handheld system and uses configurable rules to automatically generate service order requests for CIS i.e . Meter replacement for meter not working, etc.
MD-69	The system shall support configurable parameters for generating service orders and may be defined separately for different groups of meters, based on common attributes of the meter, premise, and consumer.
11.10	**Commissioning**
MD-70	TMC expects that MDMS assist in cutting over from manually read data to AMI collected data for billing. The Bidder should provide detailed explanations of how the proposed product meets the requirements below.
MD-71	The Bidder shall explain how its solution compares AMI data to manual reads and/or historical consumption to determine if the AMI data is accurate and can be used for billing.
MD-72	The Bidder shall explain any exception processes if the AMI data is not accurate.
MD-73	The Bidder shall explain how its solution notifies CIS (Billing system) that a meter is ready for AMI billing.
MD-74	The Bidder shall explain how its solution holds individual meters that are “ready for AMI billing” and release them as a group to CIS. Identify the meter relationships that can be used to group meters for this purpose.
MD-75	The Bidder shall explain if its solution generates reports on the number of meters successfully provisioned in comparison to the number of meters commissioned to AMI collected data for billing
MD-76	The Bidder shall explain if its solution generates reports on the number of meters successfully commissioned in relationship to total meters within the route.
MD-77	The water network shall also have Non AMR meter. The installation details of the meter and the billing details of the meter must be verified and service order generated for non compliance.
MD-78	Bidder must explain how the system responds to the meter installed in the network with no data captured for the specified period.
11.11	**Billing**
MD-79	TMC intends to use the MDMS as the central data management application for all TMC metering information. The information collected from the AMR application and Hand Held devices will be funneled through the proposed MDMS into the CIS i.e. Billing (as billing determinants) and CRM system
	The requirements in this section are key items for TMC and the Bidder should provide detailed explanations of how the proposed product meets the requirements.
	Data Validation, Estimation, and Editing (VEE).
MD-80	The Bidder shall follow the Corporation water charges rule for estimation of billing determinants for billing..
MD-81	The MDMS shall maintain both the original received raw data in a non-manipulated state, in addition to VEE’d data.
MD-82	The Bidder shall explain how its solution provides a GUI for configuring estimation parameters and support configuring estimation for specific meters/accounts or groups of meters/accounts. Additionally the system shall support the ability to establish specific thresholds or boundaries for estimation on specific accounts by meter/Consumer, group, or tariff/rate. Exceeding such a threshold would flag the need to manually edit the data.
MD-83	The MDMS shall allow some meters to be identified as meters that cannot be estimated.
MD-84	The MDMS shall generate alerts/notifications for manual data editing and flag all estimated or manually edited data, identify data gaps (where automatic estimation cannot be accurately performed).

MD-85	The MDMS must clearly distinguish visually within the GUI between metered, estimated, and manually edited data.
MD-86	The MDMS shall have a manual interface for VEE, and retain appropriate user controls and audit to investigate actual raw data collected and the manual edited data.
MD-87	The MDMS shall allow for a configurable number of missing intervals to make a determination if a billing determinant is flagged as an estimate (i.e. How many intervals in a bill cycle are estimated for the billing determinant to be an estimate).
MD-88	Notwithstanding the latency of data collection via the AMI system, once the MDMS receives meter read data, the VEE process occurs in real-time and the post-VEE data is then immediately available to user or external systems / spot billing from HHU
MD-89	The MDMS shall be able to import standard requirement and discharge pattern per Consumer or account type for use in the VEE processes.
MD-90	The MDMS shall be able to import network data i.e. pressure, flow, etc or similar information to provide for normalization to be used in the VEE processes.
	Billing Determinants Calculations
MD-91	The Bidder shall confirm the ability to deliver water billing determinants, to include: MLD and thousands of Litre (KL).
MD-92	The Bidder shall detail the MDMS's capability to support seasonal consumption patterns in estimation of bill determinants as per the TMC water charges rule.
MD-93	The Bidder shall explain how its solution allows TMC to configure multiple seasons structures by Consumer type, tariffs, day type (weekend, weekdays, and holidays) and by season.
MD-94	The Bidder shall explain how its solution allows TMC to configure multiple rate structures by Consumer type, etc.
MD-95	The Bidder shall explain how its solution supports totalized billing where consumption data is totalized across multiple sub-meters into one master meter prior to aggregating the consumption and demand. The system shall be able to identify meters that are part of a totalized relationship.
MD-96	The Bidder shall explain the information required from the proposed billing system to create totalization relationships. This explanation must include an explanation of how the solution responds to totalized meters with different interval length and one meter in the relationship having estimated data.
MD-97	The Bidder shall explain when its solution calculates billing determinants For example, billing determinants are calculated each day so that cumulative billing determinants to date are available or, billing determinants are calculated at the time billing determinants are requested.
	Delivering Billing Information
MD-98	The billing determinants the MDMS creates must be provided to proposed CIS' Billing system in an organized, timely manner to support the effective creation of Consumer bills. The maintenance of the integrity of the billing process is of paramount concern to TMC. The Bidder shall describe how the proposed MDMS solution meets the requirements below.
MD-99	The Bidder shall provide a comprehensive list of the data validations that the system provides at the time data is framed for billing.
MD-100	These validations shall use the individual consumer' historic usage patterns.
MD-101	These validation rules shall be configurable by consumer type and water charges.
MD-102	These validation rules shall use demand and calculated discharge for the connection.

MD-103	The MDMS shall receive a billing request from CIS' Billing System and respond with the configured billing determinants.
MD-104	The MDMS shall provide the capability to receive and respond to ad-hoc requests for offcycle billing determinants via both the user interface and an API, for events such as new connection, disconnection, reconnection or a cancel, re-bill, etc.
MD-105	The Bidder shall explain how the delivery of billing determinants to proposed Billing system will be impacted by events that occurred during the billing period, such as, meter change, consumer class change, season changes, price adjustment events, etc.
MD-106	The MDMS shall provide configurable business rules around the billing window regarding VEE behaviour when billing determinants are missing (i.e. estimate and deliver to billing, schedule an on-demand read as necessary, create a service order to collect read data).
MD-107	The MDMS shall provide the ability to pass to the Billing system a flag identifying an estimated value, along with the reason for the estimate.
MD-108	The MDMS should issue notifications when it receives actual reads from the AMI or other application or devices that were previously estimated in calculating the billing determinants sent to CIS' Billing system.
MD-109	The Bidder shall explain how its solution supports the cancel/rebill process. The Bidder shall explain the suggested process and interaction with Billing system to complete this bill correction process.
11.12	**Usage Analysis**
MD-110	TMC intends to use the MDMS to analyze the data provided by the AMI system to perform various billing data tests, to flag conditions to TMC which require additional investigation, or highlight a potential problem. For each of the following requirements, the Bidder shall indicate its solutions ability to meet the requirement.
MD-111	The MDMS shall identify any meter daily/monthly usage above or below a programmable threshold and generate reports and flags accordingly. The programmable threshold shall be configurable by Consumer attributes and meter characteristics.
MD-112	The MDMS shall identify any meter with cumulative usage since the last bill greater than a programmable threshold as derived from the individual Consumer's historical standard deviation and generate reports and flags accordingly.
MD-113	TMC uses tiered rates for Domestic Consumer. The Bidder shall explain how its solution can be configured to notify Consumers prior to hitting the next tier in the rate and when they enter the next tier.
MD-114	The Bidder shall explain how its solution can be configured to notify Consumers prior to reaching the demand/discharge and when the demand/discharge is exceeded.
MD-115	The system must monitor consumption of all the meters in a society wrt to numbers of flats/family served and overall consumption for the society for total number of flats in the society.
11.13	**Consumer Service Support**
MD-116	TMC must have access to the essential information and capabilities that are contained in the MDMS in order to make effective use of the valuable information in transforming the Consumer support process. The requirements below must be supported between the MDMS and the CIS system to enable the users to perform their activities.
MD-117	The Bidder shall explain how its solution provides users with access to Meter details, Meter Test certificate, and Meter reading.
MD-118	The Bidder shall explain how its solution provides users with access to current and historical consumption. The data shall be displayed in graphical and tabular form depending on user choice. Provide samples of the user interface.

MD-119	The Bidder shall explain the recommended approach for integrating GUI into the CIS user experience.
11.14	**Real-Time Applications Support**
MD-120	The MDMS shall support real-time support for other applications in their use of MDMS information or MDMS managed AMI services. For each of the following requirements, the Bidder shall indicate its solutions ability to meet the requirement.
MD-121	The MDMS shall supports requests for an on-demand read from external applications, such as proposed Billing System, and CIS.
MD-122	The MDMS shall provide a means for users to request an on-demand read and view results via a GUI. Any information that is available through the AMI system should be available via this capability.
MD-123	If the AMI system or required application supports the capability, the MDMS shall be able to request and receive on-demand water quality information.
MD-124	The MDMS must determine if an on-demand read is possible and inform the user if the device does not support the request.
MD-125	The MDMS shall provide, on request, any available meter registers (consumption, demand, meter/system status, etc.) of an individual meter, or batch of meters. The MDMS shall timestamp requests and responses.
MD-126	The MDMS shall provide, on request, the ability for a disconnect/re-connect request to be executed by the AMI system on a mains valve operation meter.
11.15	**Metering water tankers**
MD-127	The filling stations shall use metering system for filling water tankers. The system shall monitor the quantity and the destination for use of tanker water.

12.0 System Interface

SN	Description
12.1	**System Interface**
SI-1	The system should provide the ability to interface with the Post Office/Planning Department for service and mailing address verification when adding new connection or making service changes to insure correct street spelling and street types and provide the proper Pin code information.
SI-2	The system should provide the ability to interface with third party hand held meter reading device processing. Bidder should provide the named sources and specifications of the handheld unit that meets the functional requirement of the Corporation.
SI-3	The system should provide the ability to integrate with document management system.
SI-4	The system should provide the ability to archive electronic documents of any or all reports in a user defined sequence.
SI-5	The system should provide the ability, with proper authorization, to interface with remote sites (i.e. Sanitation, Water Distribution, etc.) for data entry of miscellaneous charges.
SI-6	The system should provide the ability to generate bank drafts in ACH format.
SI-7	The system should provide the ability for all financial transactions to interface with the General Ledger System.
SI-8	The system should provide the ability to reconcile cash processed to bank deposits.
SI-9	The system should provide the ability to link to the Corporation GIS System for current owner information.
SI-10	The system should provide the ability to interface service orders between Meter and Data Management System.

SI-11	The system should provide the ability to interface with KIOSKs and third party payment centres.
SI-12	The system should provide the ability to create refund information to be interfaced with the Finance System to generate refund cheque.
SI-13	The system should provide the ability to store and update the Corporation map coordinates.
SI-14	The system should provide all necessary interfaces to the General Ledger
SI-15	The system should provide the ability to handle charges, payments, deposits, additional deposits, payments adjustments, write-offs, and refunds of credit balances, etc. Also, for refunds and identify the reason for the refund.
SI-16	The system should provide the ability to write refund cheque for deposits according to user defined rules.
SI-17	The system should provide the ability to transfer deposits, payments from one account to another.
SI-18	The system should provide the ability to post to appropriate accounts in the General Ledger for all transactions related to deposit.
SI-19	The system should provide the ability to produce an audit trail of all transactions processed.
SI-20	The system should provide the ability to automatically generate refund transactions for closed accounts with credit balances to interface with Accounts Payable System.
SI-21	The system should provide the ability to initiate refund transactions upon request to a Consumer with a credit balance and interface with the Accounts Payable System.
SI-22	The system should Provide the ability to automatically reverse all transactions generated as a result of posting a cheque which is returned for insufficient funds or other reasons.
SI-23	The system should provide the ability to correctly age an account which has been adjusted as a result of posting a cheque which is returned for insufficient funds.
SI-24	The system should provide the ability to generate budget transactions to debit departmental expense accounts for services billed.
SI-25	The system should provide the ability to access Code Enforcement/Building Permits to know of areas under construction, demolition, street repairs, etc.
SI-26	The system should provide the ability to print bills and/or notices on postcard size forms. The form must also comply with postal regulations for size, weight and barcoding specifications and accommodate OCR/barcoding on the bills and other mailing documents.
SI-27	The system should provide the ability to electronically send the regular, as well as final and transfer billing files as they are completed on a daily basis to the printing and postal handling agency requirement and produce supporting documentation and reports.

13. Integration with SCADA/GIS Software

The billing software shall be integrated with SCADA /GIS software

14 . Hardware requirement

Hardware requirement attached with this cost of billing software:-

Servers	No. of Servers	RAM GB	DISK GB
OEM Software Server	10	64	800

Item No-33 Supplying 15 to 23 cm. Trap / Granite / quartzite / gneiss / laterite

Item includes Supplying 15 to 23 cm. Trap/Granite/quartzite/gneiss/laterite stone rubble at the road side including conveying & stacking etc. complete. as directed by engineer -in-charge.
And all other activity shall be carried out as per the detailed PWD specification for Road

Item No-34 Water bound Macadam

Wet mix macadam:

Wet mix macadam construction is an improvement over the conventional water bound macadam providing speedy and more durable construction. It differs from the water bound macadam in that graded aggregates (conforming to requirements indicated in Table 3.11) and granular materials are mixed with predetermined quantity of water in accordance with the specifications to form dense mass which is spread and wiled to approved lines, grades and cross-section to serve as pavement course(s).

Table 3.11. Physical requirements of coarse aggregates for wet mix macadam for sub-base/base courses

S.No.	Test	Test Method	Requirements
1.	* Los Angeles Abrasion Value	IS:2386 (part IV)	40 per cent (Max)
2.	* Aggregate Impact Value	IS:2386 (part IV) or IS:5640	30 per cent (Max)
3.	Combined Flakiness and Elongation Indices (Total)	IS:2386 (part I)	30 per cent (Max)

* Aggregate may satisfy requirements of either of the two tests

The specified grading for the aggregates as per Table 3.12 and granular materials should be used for mixing. Quantity of water should not vary from OMC determined as per IS: 2720 (Pt. VIII), by more than agreed limit.

Table 3.12. Grading requirements to aggregates for wet mix macadam

S.No.	IS sieve designation	Per cent by weight passing the IS sieve
1.	53 mm	100
2.	45 mm	95 - 100
3.	26.5 mm	-
4.	22.4 mm	60 - 80
5.	11.2 mm	40 - 60
6.	4.75 mm	25 - 40
7.	2.36 mm	15 - 30
8.	600 micron	8 - 22
9.	75 micron	0 - 8

General guideline and Procedure for Wet mix macadam

1) P.I. value of Materials finer than the 425 micron sieve should be less than 6.

2) The mix should be prepared in approved mixing plant at site in project area of suitable capacity having provision for controlled addition of water and forced/positive mixing arrangement, like, pug mill or pan type mixes of concrete batch/plant
3) The mixed material should be uniformly wet and no segregation should be permitted.
4) The mix should be spread uniformly and evenly in required quantities on the prepared sub grade/sub-base either by a ~elf-propelled paver finisher or a motor grader fitted with blades having hydraulic control suitable for initial adjustment and maintaining the same. In no case should the mix be dumped in heaps on the area.
5) The thickness of single compacted wet mix macadam layer should not be less than 75 mm nor more than 100 mm. However, the compacted thickness of single layer of the sub-base may be increased up to 200 mm provided vibratory roller of approved type is used for compaction. The roller speed should not exceed 5 Km / hour.
6) Rolling should continue till density achieved is at least 98 per cent maximum dry density as per IS: 2720 (Part VIII).
7) When surface irregularity of wet mix macadam exceeds permissible tolerance or where the course is otherwise defective (like, sub grade soil getting mixed with the aggregates), the full thickness of the layer should be scarified over the affected area, reshaped with added premixed material as applicable and re-compacted. The area treated in this manner should not be less than 5 m long and 2 m wide.
8) It is not advisable to lay the wet mix macadam during rains and the tempo of work suffers during rains.
9) After construction of the top WMM layer will need immediate sealing with bituminous surfacing.
10) Provision of adequate drainage for the foundation area for the construction courses assumes greater importance in this method of construction.

Item No-35 Bitumen Bound Bases and Surfacing

Bituminous Macadam and Dense Graded Bituminous Macadam

General guideline for Bituminous macadam and dense graded bituminous Macadam

1) The work consists of construction of a single layer of compacted crushed aggregates premixed with bituminous binder. Bituminous Macadam is more open graded than the Dense Graded Bituminous Macadam.
2) Physical requirements of aggregate for BM and Dense Graded Bituminous Macadam are given in Table 3.15.
3) The filler shall be graded within the limit in table 3.16.
4) For Bituminous Macadam, the bitumen content for premix should be 3 to 3.5 per cent by weight of total mix except otherwise directed. The composition of Bituminous Macadam should conform to Table 3.17. The manufacturing and rolling temperature are given in Table 3.18. For dense graded bituminous macadam aggregate gradation and requirement of mix are indicated in Table Nos. 3.19 and Marshall Properties should be according table 3.20 .
5) The requirements for minimum per cent voids in mineral aggregate (VMA) are set out in Table 3.21.
6) Job mix formula for Dense Graded Bituminous shall comply with Clause 507.3 of the Ministry's Specifications and should be design in lab or other agency and should get approval from PMU before implementation.
7) The construction operation for Dense Graded Bituminous Macadam including lying of and stress absorbing layer should be in accordance with Clause 507.4 of the Ministry's

Specifications.

8) For more detail refer Ministry's specification clause no. 504 for Bituminous Macadam & clause no. 507 for Dense Graded Bituminous Macadam.

Table3.15. Physical requirements for coarse aggregate for Bituminous Macadam and Dense graded bituminous macadam

S.No.	Property	Test	Specification
1.	Cleanliness (dust)	Grain size analysis[1]	Max 5% passing 0.075mm sieve
2.	Particle shape	Flakiness and Elongation Index (Combined)2	Max 30%
3.	Strength*	Los Angeles Abrasion Value)	Max 35%
		Aggregate Impact Value[4]	Max 27%
		Soundness:[5] n	
4.	Durability	Soundness:[5] Sodium Sulphate Magnesium Sulphate	Max 12% Max 18%
5.	Water Absorption	Water absorption[6]	Max 2%
6.	Stripping	Coating and Stripping of Bitumen Aggregate Mixtures[7]	Minimum retained coating 95%
7.	Water Sensitivity**	Retained Tensile Strength[8]	Min 80%

Notes: 1. IS:2386 Part I 5. IS:2386 Part 5

2. IS:2386 Part I 6. IS:2386 Part 3

(the elongation test to be done only on non-flaky aggregates in the sample)

3. IS:2386 Part 4* 7. IS:6241

4. IS:2386 Part 4* 8. AASHTO *T283***

* Aggregate may satisfy requirements of either of these two tests.

** The water sensitivity test is only required if the minimum retained coating in the stripping test is less than 95%.

Table 3.16. Grading requirements for mineral filler

S.No.	IS Sieve (mm)	Cumulative per cent passing by weight of total aggregate
1.	0.6	100
2.	0.3	95 - 100
3.	0.075	85 - 100

Table 3.17. Composition of bituminous macadam

	Mix designation	Grading I	Grading 2
	Nominal aggregate size	40 mm	19 mm

S.No.	Layer thickness	80-100 mm	50-75 mm
	IS Sieve <mm	Cumulative % by weight of total aggregate passing	
1.	45 mm	100	-
2.	37.5 mm	90 - 100	-
3.	26.5 mm	75 -100	100
4.	19 mm	-	90 - 100
5.	13.3 mm	35 - 61	56 - 68
6.	4.75 mm	13 - 22	16 - 36
7.	2.36 mm	4 - 19	4 - 19
8.	0.3 mm	2 - 10	2 - 10
9.	0.075 mm	0 - 8	0 - 8
Bitumen content, % by weight of total mixture[1]		**3.1 -3.4 %**	**3.3 -3.5 %**
Bitumen grade		35 to 90	35 to 90

Note : Appropriate bitumen contents for conditions in cooler areas of India may be up to 0.5% higher subject to the approval of the Engineer.

Table 3.18. Manufacturing and Rolling Temperatures of BM / DBM

Bitumen Penetration Grade	Bitumen Mixing Temp. (°C)	Aggregate Temp. (°C)	Mixing Temp. (°C) of Mixed	Rolling (°C)	Laying (°C)
35	160-170	160-175	170 Max.	100 Min.	130 Min.
65	150-165	150-170	165 Max.	90 Min.	125 Min.
90	140-160	140-165	155 Max.	80 Min	115 Min.

Table 3.19. Composition of dense graded bituminous macadam pavement layers

S.No.	Grade of Mix	Grading I	Grading 2
	Nominal aggregate size	40 mm	19 mm
	Layer thickness	80-100 mm	50-75 mm
	IS Sieve <mm	Cumulative % by weight of total aggregate	
1.	45 mm	100	-
2.	37.5	90 - 100	100
3.	26.5	63 - 93	90 - 100
4.	19 mm	-	71 - 95
5.	13.3	55 - 75	56 - 80
6.	4.75	38 - 54	38 - 54
7.	2.36	28 - 42	28 - 42
8.	0.3 mm	7 - 21	7 - 21
9.	0.075 mm	2 - 8	2 - 8
Bitumen content, % by weight of total mixture[1]		**Min. 4.0 %**	**Min. 4.50 %**
Bitumen grade		65 or 90	65 or 90

Note : 1. The combined aggregate grading shall not vary from the low limit on one sieve to the high limit on the adjacent sieve.

2. Determined by the Marshall method.

Table 3.20. Marshall Properties Requirements for dense graded bituminous macadam layers

S.No.	Requirement of property of mix from	Standard
1.	Minimum stability (kN at 60°C)	9.0
2.	Minimum flow (mm)	2
3.	Maximum flow (mm)	4
4.	Compaction level (Number of blows)	75 blows on each of the two faces of the specimen
5.	Per cent air voids	3 -6
6.	Per cent voids in mineral aggregate (VMA)	See table 9.28 below
7.	Per cent voids filled with bitumen (VFB)	65 -75

Table 3.21. Minimum per cent voids in mineral aggregate (VMA)

S.No.	Nominal Maximum Particle	Minimum VMA, per cent Related to Design Air Voids, per		
		3.0	4.0	5.0
1.	9.5 mm	14.0	15.0	16.0
2.	12.5 mm	13.0	14.0	15..0
3.	19.0 mm	12.0	13.0	14.0
4.	25.0 mm	11.0	12.0	13.0
5.	37.5 mm	10.0	11.0	12.0

Note : 1. The nominal maximum particle size is one size large than the first sieve to retain more than10 per cent.
2. Interpolate minimum voids in the mineral aggregate (VMA) for design air voids values between those listed

Bituminous Concrete and Semi Dense Bituminous Concrete

General guideline for Semi Dense Bituminous Concrete and Bituminous Concrete

1) The work consists of construction, in a single or multiple layers of bituminous concrete prepared as per specified job mixed formula, on previously prepared bituminous base. A single layer shall be 25 mm to 100 mm in thickness.

2) The coarse aggregate for semi-dense bitumen concrete should satisfy the criteria laid in Table 3.22. Aggregate gradation is indicated in table 3.23 and SDBC should satisfy the Marshall requirement indicated in table 3.24.

3) The Job mix formula for SDBC should be in accordance with clause 511.3 of Ministry's specifications and should be design in lab or other agency and should get approval from PMU before implementation.

4) The coarse aggregate for bituminous concrete mix should satisfy the requirement mentioned in table 3.25. Composition of bituminous concrete pavement layers and Marshall Properties Requirements for bituminous pavement layers is indicated in table 3.26 and 3.27 respectively.

5) The mix design and construction operations of BC should be confirm to clause 512.3 of Ministry's specifications and should be design in lab or other agency and should get approval from PMU before implementation.

6) For more detail refer road specification clause no. 511 for Semi Dense Bituminous Concrete and clause no. 512 for Bituminous Concrete.

Fine Aggregate for Semi Dense Bituminous Concrete and Bituminous Concrete

1) The fine aggregate shall be the fraction passing the 2.36 mm and retained on the 0.075 mm sieve consisting of crusher run screening, natural sand or mixture of both. These shall be clean, hard, durable, uncoated, dry and free from soft or flaky pieces and organic or other deleterious substances.

2) The grading of the fine aggregates inclusive of filler shall be as given in table 3.12.

Table 3.22. Physical requirements for coarse aggregate for Semi-dense graded bituminous macadam

S.No.	Property	Test	Specification
1.	Cleanliness (dust)	Grain size analysis[1]	Max 5% passing 0.075mm sieve
2.	Particle shape	Flakiness and Elongation Index (Combined)2	Max 30%
3.	Strength*	Los Angeles Abrasion Value)	Max 35%
		Aggregate Impact Value[4]	Max 27%
4.	Polishing	Polish stone Value[5]	Min 55
5.	Durability	Soundness:[6] Sodium Sulphate Magnesium Sulphate	 Max 12% Max 18%
6.	Water Absorption	Water absorption[7]	Max 2%
7.	Stripping	Coating and Stripping of Bitumen Aggregate Mixtures[9]	Minimum retained coating 95%
8.	Water	Retained Tensile Strength[8]	Min 80%

Notes: 1. IS:2386 Part I 6. IS:2386 Part 5

2 IS:2386 Part I 7. IS:2386 Part 3
(the elongation test to be done only on non-flaky aggregates in the sample)
3. IS:2386 Part 4* 8. AASHTO T283**
4. IS:2386 Part 4* 9. IS:6241
5. BS:812 Part114

* Aggregate may satisfy requirements of either of these two tests.
** The water sensitivity test is only required if the minimum retained coating in the stripping test is less than 95%.

Table 3.23. Composition of Semi- dense bituminous concrete pavement layers

S.No.	Grade of Mix	Grading I	Grading 2
	Nominal aggregate size	13 mm	10 mm
	Layer thickness	35- 40 mm	25- 30 mm

	IS Sieve <mm	Cumulative % by weight of total aggregate passing	
1.	19 mm	100	
2.	13.2 mm	90 - 100	100
3.	4.75 mm	70 - 100	90 - 100
4.	2.36 mm	35 - 51	35 - 51
5.	1.18 mm	24 - 39	24 - 39
6.	0.60 mm	15 - 30	15 - 30
7.	0.3 mm	9 - 19	9 - 19
9.	0.075 mm	3 - 8	3 - 8
Bitumen content, % by weight of total mixture[1]		**Min. 4.50 %**	**Min. 5.00 %**
Bitumen grade		65*	65*

Note : 1. The combined aggregate grading shall not vary from the low limit on one sieve to the high limit on the adjacent sieve.
3. Determined by the Marshall method.

* Only exceptional circumstances, 80/100 penetration grade bitumen may be used, as approved by the engineer.

Table 3.24. Marshall Properties Requirements for Semi-dense bituminous concrete layers

S.No.	Requirement of property of mix from	Standard
1.	Minimum stability (kN at 60°C)	8.20
2.	Minimum flow (mm)	2
3.	Maximum flow (mm)	4
4.	Compaction level (Number of blows)	75 blows on each of the two faces of the specimen
5.	Per cent air voids	3 -5
6.	Per cent voids in mineral aggregate (VMA)	See table 9.28 below
7.	Per cent voids filled with bitumen (VFB)	65 -78

Marshall sample Table 3.25. Physical requirements for coarse aggregate for bituminous concrete

S.No.	Property	Test	Specification
1.	Cleanliness (dust)	Grain size analysis[1]	Max 5% passing 0.075mm sieve
2.	Particle shape	Flakiness and Elongation Index (Combined)2	Max 30%
3.	Strength*	Los Angeles Abrasion Value)	Max 30%
		Aggregate Impact Value[4]	Max 24%
4.	Polishing	Polish stone Value[5]	Min 55

5.	Durability	Soundness:[6] Sodium Sulphate Magnesium Sulphate	 Max 12% Max 18%
6.	Water Absorption	Water absorption[7]	Max 2%
7.	Stripping	Coating and Stripping of Bitumen Aggregate Mixtures[9]	Minimum retained coating 95%
8.	Water Sensitivity**	Retained Tensile Strength[8]	Min 80%

Table3.26. Composition of bituminous concrete pavement layers

S.No.	Grade of Mix	Grading I	Grading 2
	Nominal aggregate size	**19 mm**	**13 mm**
	Layer thickness	**50- 65 mm**	**30 – 45 mm**
	IS Sieve <mm	**Cumulative % by weight of total aggregate**	
1.	26.5 mm	100	
2.	19 mm	79 -100	100
3.	13.2 mm	59 - 79	79 -100
4.	9.5 mm	52 - 72	70 - 88
5.	4.75 mm	35 - 55	53 - 71
6.	2.36 mm	28 - 44	42 - 58
7.	1.18 mm	20 - 34	34 - 48
8.	0.60 mm	15 - 27	26 - 38
9.	0.3 mm	10 - 20	18 - 28
10.	0.15 mm	5 - 13	12 - 20
11.	0.075 mm	2 - 8	4 - 10
Bitumen content, % by weight of total mixture[1]		**Min. 5.0 – 6.00 %**	**Min. 5.00 – 7.00 %**
Bitumen grade		65*	65*

Note : 1. The combined aggregate grading shall not vary from the low limit on one sieve to the high limit on the adjacent sieve.
2. Determined by the Marshall method.

Table 3.27. Marshall Properties Requirements for bituminous concrete layers

S.No.	Requirement of property of mix from Marshall sample	Standard
1.	Minimum stability (kN at 60°C)	9.00
2.	Minimum flow (mm)	2
3.	Maximum flow (mm)	4
4.	Compaction level (Number of blows)	75 blows on each of the two faces of the specimen
5.	Per cent air voids	3 -6

6.	Per cent voids in mineral aggregate (VMA)	See table 9.28 below
7.	Per cent voids filled with bitumen (VFB)	65 -75
8.	Loss of stability on immersion in water at 60 C (ASTM-D-1075)	Min. 75 % retained strength

Item No. 36 PROVIDING 25MM THICK PREMIX BITUMINOUS CARPET

Item includes :- Providing 25mm thick Premix bituminous carpet of 60/70 grade of bitumen including supplying all materials, preparing and cleaning the base heating bitumen, mixing hot bitumen and chips, laying the carpet layer and compacting etc. complete. (Using Bulk Asphalt).
And all other activity shall be carried out as per the detailed PWD specification for Road

Item No. 37 Tack coat

General requirement: General requirement on materials, mixing, transporting, laying, compaction, joints and construction of bituminous pavement layers are laid down in Clause 501 of his Ministry's Specifications.

Prime Coat

General guideline for Prime Coat

1) Prime coat consists of application a single coat of low viscosity liquid bituminous material to a pours granular surface preparatory to the superimposition of bituminous treatment or mix. The choice of printer shall depend upon the porosity of the surface to be printed. Details are available in Clauses 501.2 of this Ministry's Specifications.
2) Bituminous Printer should not be applied on a wet or dusty surface. At the time of application temperature in the shade should not be less than 100C.
3) The primer distributor should be self propelled or towed bitumen pressure sprayer capable of spaying the material uniform ally at the specified rate and temperature. Hand spraying should be resorted to only in small areas and areas inaccessible to the pressure sprayer.
4) After application of cut back, the surface should be allowed to cure for at least 24 hours.
5) The quantity viscosity and temperature of lying should be as specified in table 3.13

Table 3.13. Viscosity requirement and quantity of bituminous primer

Type of surface	Kinematic Viscosity of Primer at 60^0C	Quantity per 10sq.m (kg)
Low porosity	30-60	6 to 9
Medium porosity	70-140	9 to 12
High porosity	250-500	12 to 15

Tack-Coat:

General guideline for Tack-Coat

1) The binder for tack coat should be a bituminous emulsion complying with IS: 8887 or cut-back as per IS: 217, to be used restrictively for site at sub-zero temperature or for emergency application.

2) The quantity of binder should be as per Table 3.14.

3) The binder should be applied uniformly with bitumen pressure sprayer capable of spraying bitumen at specified rate and temperature to provide a uniform unbroken spread of bitumen.

4) No more than the necessary tack coat for the day's operation should be placed.

5) The succeeding construction should be made only after curing of the tack coat

Table 3.14. Rate of application of tack coat

S.No.	Type Surface	Quantity of liquid bituminous material in kg per 10 sq.m.
i)	Normal bituminous surfaces	2.0 to 2.5
ii)	Dry and hungry bituminous surfaces	2.5 to 3.0
iii)	Granular surfaces treated with primer	2.5 to 3.0
iv)	Non bituminous surfaces	
	a) Granular base (not primed)	3.5 to 4.0
	b) Cement Concrete pavement	3.0 to 3.5

Note: Where the material to receive an overlay is a freshly laid bituminous layer that has not been subjected to traffic or contaminated by dust, a tack coat is not mandatory where the overlay is completed within two days.

Item No-38 Providing and laying in situ M-25 grade of Cement concrete

Item includes:- Providing and laying in situ, M-25 grades of C.C. of trap/granite/quartzite/gneiss metal for road surface of minimum 200 mm thickness to match the original level of road surface including dewatering, formwork, compacting and curing, finishing, etc. complete

All the defects pointed out by Engineer-in-charge shall be rectified and go re-tested by the contractor at his own cost before the work is treated as completed. The responsibility of non-clearing the defects and thus non-completion of work shall always rest with the contractor.
The rejection of the work shall be intimated to all concerned to ensure prompt action

Item No-39 60mm thick factory made cement concrete interlocking paver block

Item includes:- Providing and laying 60mm thick factory made cement concrete interlocking paver block of M-30 grade made by block making machine with strong vibratory compaction and of approved size and design / shape laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand filling the joints with coarse sand etc. all complete as per the direction on Engineer -in- charge.

All the defects pointed out by Engineer-in-charge shall be rectified and go re-tested by the contractor at his own cost before the work is treated as completed. The responsibility of non-clearing the defects and thus non-completion of work shall always rest with the contractor.
The rejection of the work shall be intimated to all concerned to ensure prompt action

SUBWORK: OPERATION & MAINTENANCE

Item No. 40 OPERATION & MAINTENANCE FOR 7 YEARS

The Bidder shall provide guarantee against all manufacturing defects for the supplied and installed equipment for 7 years from the date of completion of the works. The 7 years of period shall be reckoned from the date of issue of the certificate stating the commissioning of every lot of 5000 nos. of meters successfully commissioned including AMR system and bill generation.

The maintenance of meters installed before commencement of maintenance period will deem to be included in cost of the meter.

The Bidder will be responsible for complete Operation and Maintenance of the system for 7 years after the successful installation and commissioning of every lot of 5000 nos. of meters successfully commissioned including AMR system and bill generation.

The data collection and generation consumer bills during the O&M period shall be carried out as per the instructions given by Engineer In charge/ Project Management Consultant.

All manpower required for carrying out the activities has to be provided by the Bidder. Such activities shall include collection of AMR readings, collection of data of flow meters, observation of pressure values, and collection of printed bills from Control Room and distribution of bills.

The bidder shall appoint a full-fledged team of skilled technicians, tools & mobile van to attend and resolve the customer complaints of urgent nature viz. leakage from the body of meter & fittings, blockage of strainer of the meter, within 24 hours irrespective of any holiday. The Bidder will provide a help line number for contact and registration of complaints from the consumers. GPS mapping of installed meters will also in the scope of bidders for route management and other requirement during maintenance period.

Also as part of the Operation & maintenance of Meters, Bidder/Meter manufacturer shall establish a test bench with following technical specification.

DESCRIPTION OF WORK & TECHNICAL SPECIFICATION FOR TEST BENCH

A) Description of work: -

The Metrological Verification System (MVS) i.e. Water Meter Test Setup shall be designed and constructed for Nominal Diameter (DN) 15mm to 50mm size water meters, which will facilitate to carry out accuracy measurement, at four flow rates i. e. Maximum Flow (Q max), Nominal Flow (Q n), Transitional Flow (Qt) and Minimum Flow (Q min). These accuracy tests will be carried out in accordance with ISO: 4064 or equivalent standards. The Setup shall also facilitate the testing of pressure tightness & pressure loss for above sizes water meters.

The Metrological Verification System (MVS) shall be designed in such a way that, the meter test operation shall be semi - automatic, with pneumatically operated meter clamping system.

The scope of work includes “Design, manufacture, supply, installation, commissioning of gravimetric metrological verification system and 7 year’s comprehensive maintenance & yearly calibration of reference instruments of test setup, for measurement of accuracy, pressure tightness & pressure loss as per ISO : 4064 standard or equivalent for domestic type water meters”

B) Technical Specifications for Domestic Test Setup:-

1. The test setup shall be designed for domestic type, cold and potable water meters, which will be tested in accordance with ISO:4064 or equivalent standards.
2. The test setup shall be designed for determining the water meter accuracy with the help of "collection" method, in which the quantity of water passed through the water meter is collected in one collecting tank (i.e. reference vessel), the collected quantity will be determined by Gravimetric system (weighing scale).
3. Reference for checking accuracy: - The accuracy of the meter will be determined by comparing the indicated volume of water meter with the weight of water collected in reference vessel.
4. The test setup shall be semi - automatic, computer interfacing with gravimetric measurement, suitable for accuracy measurement of domestic type water meters for sizes 15 mm to 50 mm.
5. Separate test setup shall be designed for below mentioned sizes of water meters :
   (1) 15 mm.
   (2) 20 mm
   (3) 25 mm.
   (4) 40 & 50 mm
6. All the installed test setups shall use either the stable water source i.e. constant head tank or Variable Speed Drive pump (VSD) for measurement of accuracy:
7. In case of constant head tank, the contractor will be required to design & construct the constant head water tank at the installation site, to cater to the required quantity of water for accuracy, pressure loss & pressure tightness testing of all domestic sizes as mentioned above.
8. In case if VSD (Variable Speed Drive) system, is to be used for achieving the required head, the suitable system shall be designed & installed for accuracy, pressure loss & pressure tightness testing, according to requirements and site conditions.
9. The contractor will design the piping layout as per the available floor space. The designed pipe work layout shall be got approved from TMC & accordingly the contractor shall fabricate and install the necessary pipe work for each test setup.
10. The test setup lines of each test setup shall be generally parallel to each other.
11. The series type water meter test setup shall be used for calibrating and conducting accuracy, pressure loss & pressure tightness test on all classes of domestic water meters (screwed ends) manufactured in accordance with ISO: 4064 or equivalent standards .
12. The bidder shall offer all test setups for sizes of 15 mm to 50 mm water meters. The partial offer for test setup i.e. for one size or incomplete size range will be out rightly rejected. Moreover the bidder shall offer the test setup for all three tests i.e. Accuracy, pressure loss & pressure tightness, partial offer for any one of two tests will not be accepted & will be out rightly rejected.

13. All the equipment's & measuring instruments used in respective test setups should be duly calibrated and tested from any NABL accredited lab, or any international laboratory accredited to their respective country's national test laboratory, prior to their installation & commissioning. During the supply of test setup, the calibration certificate should be accompanied with their respective reference instruments.
14. During accuracy testing, the water meters shall be installed in series manner, the test setup shall accommodate more than one water meter at single time and minimum capacity of the test setup shall be as per the following table:

Table - X

Sr. No.	Meter Size in mm	Test Setup Quantity	(Nos) No of Test line	Min. Qty of meters on each test setup
1	15	1	Single line	10 nos.
2	20	1	Single line	10 nos.
3	25	1	Single line	8 nos.
4	40 & 50	1	Single line	8 nos.

15. During supply, the bidder shall note that the calibration & test certificates of all instruments as detailed in Sr. no. 11 above shall be exclusively in the name of test setup manufacturer. Any other certificate will not be accepted & such materials / instruments will be rejected out rightly.
16. After completion of erection of test setups at site & its trial runs, the entire system shall be got verification through 'Institute for Design of Electrical Measuring Instruments' (IDEMI) (A Govt. of India Society) for necessary calibrations & accuracy for mass & volume, pressures, etc. i.e. test results, only after this, the commissioning will be treated as valid.

The bidder shall submit along with his offer the organization chart for Operation & Maintenance staff.

BILLING AND ASSISTANCE IN COLLECTION

Billing and Collection Mechanism

The bidder shall develop and set up a computerized billing system and to work in Hindi Marathi and English with all built in monitoring systems. The bidder shall provide the TMC the access to the computerized billing system. This built in monitoring systems shall be online and directly connected to the TMC website/server, as the case may be which shall enable TMC to monitor.

For the purpose of billing the Consumers against the supply of Treated Water, the bidder shall, in accordance with the Applicable Laws and then extant rules and regulations of the TMC, carry out the following activities during the Operation & Maintenance period:

a) Operator shall continue to issue water bills as per the then prevailing Water Tariff Notification;
b) Record the water meter readings of the Consumers every month, according to the meter reading schedule and assess the water charges at the prevailing water rates and advise the Consumer and the TMC on the amounts so as to provide maximum time of 2 (two)

billing cycles to the Consumer to undertake any repairs in internal plumbing of the Consumer Property to minimize wastage of water supplied;

c) Raise Water Bill monthly on the Consumers, in the name of the TMC, based on the volume of Treated Water consumed at the Water Charges set out by TMC for the consumption from the second month onwards from the Compliance Date and assist in collecting Water Charges from the Consumers. The Operator shall raise the Water Bills in the format specified or stipulated by the TMC; Water bills shall specify due date of payment, date up to which payment is allowed with fine approved by TMC and date due for disconnection.
d) Prepare a list of the Consumers, in Service Area, who have not made the Consumer Payments and submit the same to the TMC within five (5) days from the Date Disconnection noted in the water bill and carry out disconnections of Service to such Consumers as per terms hereof;
e) The bills generated by the Operator should indicate that the Consumer Payment is collected on by TMC and if payment is not made by the Disconnection Date the Operator shall submit the information to the TMC about defaulter Consumers;
f) Collect one time connection charges from new connections at the rates as specified by the TMC and deposit the same along with Consumer Payments;
g) Submit monthly, quarterly and annual statements of billing and collection in the Service Area to the TMC.

Item No. 41 MONTHLY ANNUITY PAYMENT

Operators share (30%) shall be paid on annuity basis in 84 months equal EMI's. This items cost includes interest rate to be calculated by the operator over the period of O&M.

The EMI amount shall be adjusted taking into effect of the actual investment of contractor during the implementation period as certified by the authority

The first such EMI starts from the date of completion after implementation period (i.e. 36 months) for the respective zone in proportionate to number of connections and amount of EMI shall be calculated considering the certified amount as on date

Annuity Payment shall be Equated Monthly Installment (EMI) calculated considering the following formula:

$$EMI = P \times r \times ((1+r)^n / ((1+r)^n-1)) \; X \; \frac{\text{no. of connections in completed Zone after 36 months}}{\text{Total No. of Connections}}$$

Where,

P = Total Certified Amount invested by the Contractor (30% of Total Certified Amount of Flow Meter, HSC, Consumer Survey and awareness, IT & Billing cost)

r = Monthly Rate of Interest

n = Total No. of Months i.e. 84 Months