

WATER SUPPLIES DEPARTMENT
STANDARD SPECIFICATION E-89-01
AUTOMATIC METER READING (AMR) OUTSTATION

1. Scope

This standard specification stipulates the requirements of the Automatic Meter Reading (AMR) Outstation.

It shall be read in conjunction with the following Water Supplies Department (WSD) Standard Specifications:

- E-11-03 Electrical and Instrumentation Panels and Cubicles
 - E-78-04 Programmable Logic Controller
 - E-80-01 Instrumentation Equipment – General
 - E-88-05 Power Supply Equipment for Telemetry Systems
- (a) The Works shall consist of design, supply, installation, testing and commissioning and warranty of the AMR Outstation.
- (b) The Works shall include the submissions of AMR Outstation proposal, testing and commissioning (T&C) procedure, operation and maintenance (O&M) manual complete with all necessary documentation and test certificates to the WSD for approval.
- (c) The Works shall consist of design, supply and installation of all infrastructures for AMR equipment and network including concealed cable conduits and junction boxes.
- (d) The Works shall comprise site works for laying, connection and termination of associated cables for all equipment and smart water meters including power cables, signal cables, control cables and communication network cables.
- (e) The Works shall comprise site works for the programming and configuration of AMR Outstation including programmable logic controller (PLC), data concentration unit (DCU), meter interfacing unit (MIU) and communication equipment. Configuration details of MIU will be provided by the WSD.
- (f) The Works shall include the provision of electricity power supply at all necessary locations for operation of AMR Outstation before and after handing over of the system to the WSD.
- (g) The Works shall include the provision of the broadband/mobile (e.g.3G/4G/5G) network services as deemed appropriate by the WSD to enable the AMR Outstation securely data communicating with the AMR Master Station.

- (h) Upon successful commissioning of the AMR Outstation to the satisfaction of the WSD, when requested by the WSD, the whole system shall be handed over to the WSD for operation and maintenance. All approved drawings, documents, test records/certificates shall form parts of the operation and maintenance manuals to be submitted to the WSD prior to handing over of the system.
- (i) All the equipment supplied and installed shall be subject to a warranty against defects and workmanship for 24 months from the handing over date of the AMR Outstation to the WSD.
- (j) If Electromagnetic (EM) water meter is provided with pulses output for AMR application, a pulse-to-M-Bus converter for interfacing of metering data in pulses with DCU in M-Bus protocol shall be provided under the scope of works.

2. Overview of Automatic Meter Reading (AMR) System

The AMR System of the WSD shall collect metering data remotely and automatically, manage and analyze metering data, provide output for billing and water supplies management and disseminate useful information to customers.

The infrastructure of the system shall consist of AMR Outstations and AMR Master Station. The AMR Outstation shall comprise smart water meters equipped with meter interfacing units (MIU) compatible with hard-wired Meter-Bus (M-Bus) communication protocol, an M-Bus network, an AMR panel comprising a programmable logic controller (PLC), a data concentration unit (DCU), a communication router and the associated networking equipment as well as a 24V battery, a battery charger and other associated power supply equipment. The AMR Outstation shall be interfaced with the AMR Master Station at the WSD and utilize broadband/mobile (e.g. 3G/4G/5G) networks as deemed appropriate by the WSD.

The AMR Master Station shall be supplied and installed by the WSD. The AMR Master Station shall comprise necessary hardware and software, equip with the required network communication and security equipment, together with all AMR Outstations to form a complete AMR System.

The smart water meters equipped with MIUs for building up AMR Outstation will be supplied by the WSD. The Developer, or his contractor (hereinafter referred to as “the Contractor”), shall supply (except smart water meters), install and commission the AMR Outstation according to the requirements as specified by the WSD from time to time.

3. AMR Outstation

An AMR Outstation shall be designed to collect metering data from smart water meters and transmit them to the AMR Master Station at the WSD. The requirements of the components composing the AMR Outstation shall be as follows:

3.1 Smart Water Meters and Meter Interfacing Units (MIUs)

Smart water meters will be provided by the WSD for installation by the Contractor. Based on the water consumption of customers, the smart water meters shall be of mechanical, electromagnetic type or other types as deemed appropriate by the WSD.

(a) Mechanical water meters and MIUs

The mechanical water meters provided by the WSD for installation by the Contractor shall be equipped with MIUs which read the meter register and transfer the meter reading via a wired M-Bus communication protocol to a DCU. Each MIU is equipped with a connecting cable complying with the M-Bus protocol EN 13757 and EN 1434 for connection to the bus-wire of the M-Bus network. The Contractor shall be responsible for the cable connection and termination between the MIUs and the bus-wire of the M-Bus network.

The MIU shall serve as an interface between the water meter and the M-Bus network. It shall record the meter readings and store in its internal memory with date and time stamps and to transmit the stored data to the DCU via the M-Bus bus-wire once a data interrogation request is initiated by the DCU.

(b) Electromagnetic (EM) water meters

The EM water meters provided by the WSD for installation by the Contractor shall be equipped with a converter capable of generating electric pulse output for AMR application.

A pulse-to-M-Bus converter for interfacing of metering data in pulses with DCU in M-Bus protocol shall be required and provided by the Contractor. The pulse-to-M-Bus converter shall be housed in the panel with a degree of protection of IP54 and shall be properly fixed or mounted on the secured location.

3.2 M-Bus Network

The M-Bus is a European Standard EN 13757 and EN 1434 which is developed for the remote reading of utility meters. The M-Bus network shall supply the power necessary for interrogation of metering data from the MIUs installed on the smart water meters.

- (a) The M-Bus network shall be composed of a 4-core 1.5 sq.mm copper cable with two cores to serve as the bus-wire for the M-bus system, while reserving the remaining two cores as spare cores. The cable shall be laid inside at least

25mm diameter concealed G.I. conduits. The spur cables from the MIUs shall be connected to the main bus cable via terminal blocks inside the terminal box. Spare cores shall be terminated to the terminal blocks.

- (b) The M-Bus shall be reverse-polarity protected and used for both data transmission and power supply from the DCU to the MIUs. The M-Bus shall be short-circuit proof and no bus failure shall be resulted in case of faults in any MIU.
- (c) The M-Bus shall support various bus topologies, including linear, star and tree configuration with any given segment, up to 250 MIUs. For each AMR Outstation, the M-bus network shall provide 20% spare capacity for connection of additional MIUs in future expansion. Network cascading with additional DCUs shall also be acceptable for provision of the required spare capacity. The maximum cable length shall be 350 metres.
- (d) The M-Bus shall adopt a master-slave communication protocol, which shall facilitate bi-directional data transmission from DCU to MIU triggered by changing voltage in the M-Bus bus-wire. The nominal bus voltage shall be around 36V at the master's output. Communication requests shall be activated by change of voltage to the input circuits of the MIU by the DCU, while the data transmission from the MIU to DCU shall be triggered by changing current demand at the MIU. The transmission rate shall be adjustable from 300 to 2400 baud (bits per second) supporting automatic error detection by means of parity and checksum to enable repetition of data transmission in the event of an error.

3.3 Automatic Meter Reading (AMR) Panel

The AMR panel shall be designed for housing the PLC, DCU, communication router, communication networking equipment, terminal blocks for power supply, control wiring connection and associated equipment.

3.3.1 Enclosure

The panels shall be designed for indoor wall-mounted installation and fabricated with 1.5mm thick stainless steel. The size of the panels shall be not larger than 600(h) x 400(w) x 300(d) mm. The panels shall be designed to the degree of protection of IP54. The design and construction of the panels shall be in compliance with the WSD Standard Specification E-11-03. The circuit and connection diagrams shall be provided inside the panel.

3.3.2 Data Concentration Unit (DCU)

The DCU shall serve as the M-Bus master of the M-bus network, which is designed to collect metering data at a programmable interval from the MIUs of meters and store the meter readings to its non-volatile memory for transmission to the AMR Master Station via the communication network.

- (a) The DCU shall be able to exchange data with the existing application server in the AMR Master Station.
- (b) The DCU shall be able to automatically transmit the metering data via internet connection using integrated LAN interface and shall be equipped with at least one Ethernet RJ45 port for data transmission.
- (c) The DCU shall be capable of connecting all the M-Bus devices of the AMR Outstation with 20% spare capacity. Additional DCU shall be provided if necessary.
- (d) The DCU shall be programmable to initialise retrieval of meter reading data from the MIUs at an interval of 15 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, 6 hours, 12 hours or 24 hours.
- (e) The DCU shall have an internal non-volatile memory of capacity sufficient to store 500,000 meter readings.
- (f) The DCU shall be equipped with at least one USB 2.0 port and one Ethernet RJ45 port for firmware upgrading, parameter configuration and diagnosis by a notebook computer installed with the DCU configuration and diagnosis software. The software shall be provided together with the DCU.
- (g) The DCU shall be cascable for connecting more devices to build up larger M-Bus networks.
- (h) The DCU shall use FTP protocol to transmit XML metering data to the AMR Master Station while the PLC will use TCP Client to transmit AMR panel status to the AMR Master Station.
- (i) The DCU shall be suitable for operating at ambient conditions of temperature 0 to 50°C.
- (j) The DCU shall operate on 220V 50Hz a.c. power supply or a 24V d.c. power supply either from the battery charger output or from the 24V battery.

3.3.3 Programmable Logic Controller (PLC) Unit

The PLC Unit shall be provided to facilitate automatic, remote control and monitoring of equipment such as DCU, power supply, battery, communication equipment, etc.

- (a) The PLC Unit shall be of compact design housing embedded inputs, outputs, power supply and communication ports and equipped with an embedded LCD or indicating lights for showing modes of PLC operation, e.g. program mode, run mode and diagnosis mode etc.
- (b) The PLC Unit shall operate on 24V d.c. power supply and possess battery backed up internal memory for user program and data with a minimum memory size of at least 64 kbyte for data logging.

- (c) The PLC Unit shall have at least one (1) RS232/RS485 port and one (1) Ethernet port supporting serial protocols including DH-485 and TCP/IP for connection of router, programming tools for data communication, on-line programming and diagnosis.
- (d) The PLC Unit shall be equipped with at least six (6) nos. of digital input and six (6) nos. of digital output with volt-free contacts. The digital input channels shall be fast enough to catch pulse input up to 100 kHz.
- (e) The PLC shall be programmed to force a reset to the router and/or DCU upon detection of cessation of data communication for a period of time.
- (f) All input/output channels shall be adequately programmed to relay the required alarm signals such as power supply failure, battery low, battery fault, etc.
- (g) Twenty per cent (20%) of readily available spare channels for each type of digital, analogue counter input/output channels of the PLC Unit shall be provided. The Contractor shall be responsible for providing all the labour, equipment, cabling, materials, programming and engineering costs for the utilization of the spare channels when any additional site signals are considered necessary by the WSD.
- (h) The PLC Unit shall accept program downloaded locally via their communication ports from a notebook or tablet computer. The Contractor shall be responsible for providing the programming software for the PLC Unit.
- (i) The PLC Unit shall have provisions for communicating with the AMR Master Station on a report-by-exception manner in order to reduce network traffic and shall be capable of stand-alone operation in the event of communication link and the AMR Master Station failure.
- (j) The PLC shall be suitable for operating at ambient conditions of humidity 10 to 90% and temperature 0 to 50°C.

3.3.4 Router and Switch

The communication equipment shall facilitate the communication and data transmission between the AMR Outstation and the AMR Master Station. The metering data collected by the DCU shall be transmitted to the AMR Master Station at the WSD via Ethernet router through broadband, mobile (e.g. 3G/4G/5G) network or other means as deemed appropriate by the WSD.

- (a) The router shall be designed for enterprise or industrial use capable of serving a high speed, high availability and high reliability performance. The router shall support the features of firewall support, VPN security and SNMP management.

- (b) The router shall provide broadband network interface and/or mobile (e.g.3G/4G/5G) networkinterface via SIM card and/or wi-fi interface as deemed appropriate by the WSD for data transmission.
- (c) The router shall provide VPN security encryption feature with VPN tunneling protocol IPSec with AES 256.
- (d) The router shall provide the feature of Dyn DNS client which support the access to the router with a dynamic IP address.
- (e) The router shall be integrated with Ethernet switch which shall provide at least 1 number of Ethernet WAN 10/100Mbps port (RJ45) and 4 numbers of Ethernet LAN 10/100mb port (RJ45), or a separated Ethernet switch with same port numbers shall be provided.
- (f) The router shall be suitable for operating at ambient conditions of humidity 10 to 90% and temperature 0 to 50°C.
- (g) The router shall operate on 220V 50Hz a.c. power supply or a 24V d.c. power supply either from the battery charger output or from the 24V battery.

3.4 Backup Battery Unit

A battery charger and backup battery unit shall provide the backup power to the system when the input power source is interrupted.

3.4.1 Extent of Supply

This Standard covers the provision of power supply equipment for use with the AMR systems.

In general, the equipment shall include the following:

- (a) Maintenance free battery
- (b) Battery charger with both float and boost charging facilities
- (c) Panel enclosure for both (a) and (b)
- (d) Interconnecting cables between (a) and (b)

3.4.2 System Operation

The system shall operate from a 220V 50Hz a.c. power supply. Unless otherwise specified, the output voltage of the battery supply shall be 24V d.c..

The equipment supplied shall include all sub-units and components to form a complete system. The equipment shall be suitable for operation from 0°C to 50°C with a relative humidity up to 90%.

3.4.3 Battery Charger Panel

The Battery Charger Panel for housing the 24V battery charger shall comply with the following requirements:

- (a) The enclosure shall be fabricated with 1.5mm thick stainless steel to IP54.
- (b) The size of the panel shall be not larger than 400(h) x 300(w) x 210(d) mm.
- (c) It shall be designed for housing a 24V battery charger and the associated control board and terminal blocks for power supply and control wiring connection.
- (d) The 24V battery charger shall be in compliance with the WSD Standard Specification E-88-05.
- (e) The front panel shall be installed with a voltmeter and an ammeter of appropriate ranges for load output voltage and current and LED alarm indications.

3.4.4 Battery Panel

The Battery Panel for housing the 24V battery shall comply with the following requirements:

- (a) The enclosure shall be fabricated with 1.5mm thick stainless steel to IP54.
- (b) The size of the panel shall be not larger than 380(h) x 380(w) x 210(d) mm.
- (c) It shall be designed for housing the battery cells and the associated terminal blocks for power supply and control wiring connection.
- (d) The 24V battery shall be in compliance with the WSD Standard Specification E-88-05.
- (e) The battery cell capacity shall be able to support operation of the AMR Outstation for six (6) hours with 20% safety margin taking into account all various derating factor under a.c. power failure condition.

4. Cabling Facilities and Site Installation

A complete cabling system shall consist of power cables, control cables, M-Bus cables and communication network cables including associated conduits to all equipment. The Works shall comply with the following requirements and shall be completed by competent workers of the trade:

- (a) The Works specified herein shall comply with the latest edition of the Code of Practice for the Electricity (Wiring) Regulations issued by Electrical and Mechanical Services Department (EMSD), HKSAR Government and the General Specification for Electrical Installation in Government Buildings of Hong Kong Special Administrative Region issued by Architectural Services Department (ArchSD), HKSAR Government, where applicable.
- (b) The Contractor shall supply, install, connect and terminate a complete system of power cables, control cables, M-Bus cables and communication network cables to all equipment, instrument and ancillaries supplied, modified and installed. The Contractor shall also supply, install, connect and terminate all other power, control, M-Bus and communication network cables necessary for the completion of the Works and functioning of the system even not explicitly shown in the submissions but necessary for the completion of the Works.
- (c) Even not explicitly specified, all civil and building services work arising from execution of the Works shall be deemed to have included.
- (d) The Contractor shall also supply and install all necessary earthing system to form a complete, neat and safe installation as required to comply with the relevant wiring regulations.
- (e) The cabling work shall include the provision of conduits, cable trays, ladders, mounting brackets, supports, channels, cleats, ties, lugs, glands, shrouds, tapes, markers, ferrules, joints, terminations etc., as necessary and required to form a complete, neat and safe installation. All conduits and equipment boxes shall be marked for identification.
- (f) The Contractor shall prepare a complete cable list for the power, control, M-Bus and communication network cables shown on the drawings.
- (g) Terminal boxes with the size of 150mm(h) x 150mm(w) x 75mm(d) complete with the associated connectors and connection terminal blocks on the concealed junction boxes shall be supplied and installed on each floor to facilitate connection of the signal cables of the MIUs to the M-bus wires. The bus-wires shall be terminated to the DCU for data concentration and temporary storage.

5. Data Transmission Equipment and Network

The AMR Outstation communication equipment and all required network shall be provided to enable the AMR Outstation to securely communicate with the AMR Master Station for data transmission through broadband/mobile (e.g. 3G/4G/5G) communication networks as deemed appropriate by the WSD.

- (a) The data transmission from smart water meters to the AMR Master Station

shall be initiated by the DCU. The time for data transmission of the AMR Outstation shall be preset by the AMR Master Station, in which clock synchronisation of the DCU with the AMR Master Station shall be carried out.

- (b) TCP/IP communication protocol shall be adopted, in which a broadband account or a mobile data (e.g. 3G/4G/5G) services account as deemed appropriate by the WSD with dynamic IP address shall be assigned to the AMR Outstation.
- (c) The communication network shall be capable of forming a connection established by the AMR Master Station to obtain AMR data, diagnostic information or programming the DCU of the AMR Outstation on an ad hoc basis.
- (d) The metering operation shall be handled by the AMR Master Station, which shall respond to the pre-scheduled data transmission requests initiated by the AMR Outstations. The AMR Master Station can also initiate ad-hoc polling to particular AMR Outstation on the need basis.
- (e) Communication network service from ISP shall be provided to enable effective data transmission from the AMR Outstation to the AMR Master Station during testing and commissioning (T&C).

6. Electricity Power Supply and Communication Network Service

A 220V 50Hz a.c. power supply and communication network service (i.e. broadband/mobile (e.g. 3G/4G/5G) as deemed appropriate by the WSD) shall be provided by the Developer/Grantee at all necessary locations for operation of the AMR Outstation. The Developer/Grantee shall continue to provide the power supply and communication network service at his own expense after handing over of the system to the WSD.

7. Civil Requirement for Cabling Works

- (a) All water meters shall be housed in a meter rooms or meter boxes as per the requirements set out in the Technical Requirements for Plumbing Works in Buildings.
- (b) At least two cable conduits shall be provided to run through the meter room of each floor and terminate with a 150mm(h) x 150mm(w) x 75mm(d) adaptable box in each of the meter rooms for installing M-Bus cables and network communication cables.
- (c) AMR panel (for housing of PLC, DCU and communication equipment) shall be installed in the meter room (hereinafter called AMR equipment room). If one AMR panel is provided, the panel shall be housed in the meter room on the ground floor, or near the ground floor, so as to facilitate ease communication network connection and maintenance works. If more than one

AMR panel is provided, the panel shall be housed in the meter room at the middle floor level, or at an appropriate floor, to minimise the length of M-Bus cable from smart water meters to the AMR panel.

- (d) A 220V 50Hz a.c. power supply with a 13A fuse spur unit and a wall space of 1,000mm(h) x 800mm(w) x 300mm(d) for mounting an AMR panel shall be provided.
- (e) Should the requirements specified in (d) above cannot be met in the meter room(s), a covered and lockable area on the same floor level of the respective meter room shall be provided for mounting the AMR panel instead. In such case, two cable conduits running through the above-mentioned meter room to the AMR equipment room shall be provided and to be terminated with 100mm(h) x 100mm(w) x 50mm(d) adaptable boxes.
- (f) A cable conduit running through the AMR equipment room to the telecommunication room shall be provided and to be terminated with 100mm(h) x 100mm(w) x 50mm(d) adaptable boxes.
- (g) For cases with more than one AMR equipment room within a development, a cable conduit running through those of the AMR equipment rooms for network communication cables shall be provided and to be terminated with 100mm(h) x 100mm(w) x 50mm(d) adaptable boxes.
- (h) If master meter and check meter positions are provided, two cable conduits running through the master meter room and check meter room to the AMR equipment room shall be provided and to be terminated with 150mm(h) x 150mm(w) x 75mm(d) adaptable boxes, or individual AMR panel with associated electricity power supply point and telecommunication cable conduit shall be provided at each of the meter rooms.
- (i) All conduits specified above shall be of 25mm concealed galvanised steel. All provided adaptable boxes complete with covers shall be of concealed galvanised steel.
- (j) The installation location of the AMR panel, battery charger panel, battery panel and any other auxiliary equipment shall be easily accessible to facilitate the operation and maintenance works. The AMR panel and auxiliary equipment shall not be installed under any pipework.
- (k) The maximum distance between the terminal box to either of the smart water meter shall be 1.5 metres.
- (l) If the cables run across the access or without proper supports, suitable fixed cable conduits and flexible conduit shall be provided for cable protection.

8. Intellectual Property and Proprietary Rights

- (a) If the supplied equipment requires intellectual property rights, appropriate licences shall be obtained from the relevant rights owners and copies of which shall be furnished to the WSD prior to handing over of the system.
- (b) All technical information, documents and manuals furnished to the WSD shall have the license, copyright or written permission from the proper rights holder for using of these materials by the WSD.
- (c) Documentary evidence of all licences of all software for the Works shall be provided prior to handing over of the system to the WSD.

9. Inspection and Equipment Test

- (a) The Contractor shall inspect the supplied equipment for verification of the brand, model, capacity, clock speed, ratings, specifications, serial numbers of the hardware as well as the brand, version, serial number, licence keys, licence documents of all hardware, software and firmware supplied.
- (b) The Contractor shall carry out equipment test including, but not limited to, the following procedures:
 - i. Verify the correct inventory of hardware including software licences, authentication certificates, cables, etc.;
 - ii. Demonstrate that all spare memory, equipment capacity and system expansion requirements;
 - iii. Demonstrate that all input and output expansion requirements have been met, including wiring and signal isolation, and verify that power supplies are capable of supporting the increased load for this expansion;
 - iv. Demonstrate all hardware and software boot-up and diagnostics;
 - v. Verify all power supply voltages are within tolerance;
 - vi. Verify proper earth connections and isolation of instrumentation earth for all equipment;
 - vii. Demonstrate that all preloaded software and firmware have been properly installed and are operating correctly;
 - viii. Verify the connectivity and speed of the communications network equipment; and
 - ix. Demonstrate the systems to full functioning.

10. Testing and Commissioning (T&C)

- (a) After completing the installation of the AMR Outstation and prior to setting to work, individual equipment shall be tested to ensure that it performs in accordance with the specified requirements and is in satisfactory working conditions.
- (b) Before carrying out the required site test, the Contractor shall ensure the following:
 - i. The AMR Outstation is installed in accordance with all relevant drawings, circuit diagrams and the specified requirements;
 - ii. All cables and individual conductors are labeled and ferruled as per the relevant drawings;
 - iii. All items of the AMR Outstation are adequately and correctly labeled and identified;
 - iv. The insulation resistance and continuity of all conductors of cables, etc. are acceptable;
 - v. The earthing arrangements are complete and a satisfactory value of earth loop impedance has been achieved; and
- (c) The test procedures and format of test records shall be submitted to the WSD for approval prior to the scheduled commencement of testing and commissioning.
- (d) All measuring instruments, indicators, testing computers, network testing instruments and other apparatus necessary for carrying out the tests shall be provided by the Contractor and accepted by the WSD.
- (e) The Contractor shall submit a comprehensive T&C procedure including, but not limited to, the following items for approval:
 - i. Integrity of the AMR data on the DCU;
 - ii. Integrity of the AMR data on the Router/Modem;
 - iii. Integrity of the AMR data on the AMR Master Station;
 - iv. Configuration and operation check on the MIUs;
 - v. Operation check on the PLC;
 - vi. Change over test on the backup battery unit;

- vii. Operation check on the AMR Outstation upon a.c. power supply failure;
 - viii. 6-hour discharge test on the battery of the AMR Outstation;
 - ix. Demonstration of remote programming and diagnosis of the AMR Outstation.
- (f) Final acceptance test for full function of the AMR Outstation including successful data transmission to the AMR Master Station shall be conducted by the Contractor to the satisfaction of the WSD.

11. System Transfer for Operation and Maintenance and Warranty

- (a) Upon successful commissioning of the AMR Outstation by the Contractor to the satisfaction of the WSD, when requested by the WSD, the whole system shall be handed over to the WSD for operation and maintenance.
- (b) An Operation and Maintenance manual complete with all necessary documentation, catalogues, drawings, reports, test certificates and T&C records shall be submitted to the WSD for approval prior to handing over of the system. Four (4) complete sets of hardcopy of the final O&M manual with softcopy in pdf format in a CD-ROM shall be provided.
- (c) Upon requested by the WSD for handing over of the AMR Outstation, the Contractor shall arrange a joint inspection with the WSD to check and confirm the AMR Outstation for the purpose of system handing over.
- (d) All the equipment supplied and installed by the Contractor are subject to a warranty against defects and workmanship for 24 months from the handing over date of the AMR Outstation to the WSD.

12. Submissions

- (a) An AMR Outstation proposal detailed the design, layout and equipment for building up the AMR Outstation shall be submitted to the WSD for approval prior to commencement of installation work.
(refer to the "Checklist on documents for inclusion in the AMR Outstation proposal" in Appendix.)
- (b) A Testing and Commissioning procedure shall be submitted to the WSD for approval prior to commencement of testing and commissioning work.
- (c) An Operation and Maintenance manual complete with all necessary documentation, catalogues, drawings, reports, test certificates and T&C records shall be submitted to the WSD for approval prior to handing over of the system.

The submission and approval of AMR Outstation proposal shall be separated from the submission and approval of plumbing proposal for application of water supply. The information submitted for the above purposes shall be self-contained and shall not be mixed up.

Information (e.g. meter room/box layout, meter schedule, etc.) related to the application of water supply shall be approved under the plumbing proposal. Such information provided in the AMR Outstation proposal is for reference only.

13. Coordination and Responsibility

The Developer shall employ a Responsible Engineer with competence and experience in electrical installation to be responsible for building up the AMR Outstation. The Responsible Engineer shall be responsible for, but not limited to, the following works:

- (a) Coordinate and communicate with the WSD in building up the AMR Outstation;
- (b) Arrange, check and endorse all submissions including proposal, drawings, T&C procedure, O&M manual and technical information to the WSD;
- (c) Oversee all aspects for the AMR Outstation including planning, organising, coordinating, supervising and monitoring of the supply, installation, T&C and system handing over works;
- (d) Supervise, monitor and inspect the Works to be completed with quality and up to the standard in according to the requirements, proposal and drawings;
- (e) Supervise, monitor and report the work progress and ensure the Works are completed within the required time frame;
- (f) Coordinate the interfacing of the AMR Outstation with works by others.

14. Reference Documents

The Contractor shall further note “Standard Requirements for Supply and Installation of AMR Outstation”, “Introduction of the AMR System in WSD” and “Typical Drawings for the Supply and Installation of AMR Outstation” issued by the WSD, which can be obtained via the following website, in relation to the AMR Outstation(s):

<http://www.wsd.gov.hk/en/plumbing-engineering/automatic-meter-reading/index.html>

15. Terms, Definitions and Abbreviations

15.1 Terms and Definitions

"Works"	The work or services to be carried out, completed, maintained and/or supplied in accordance with the scope and requirements of this Standard Specification and includes temporary works.
"Developer"	The person, firm, company or the Purchaser (as defined in the Conditions of Sale) responsible for the execution of the Works.
"contractor"	The person, firm or company employed by the Developer for the execution of the Works.
"The Contractor"	The Developer, or his contractor.

15.2 Abbreviations

AES	Advanced Encryption Standard
AMR	Automatic Meter Reading
ArcSD	Architectural Services Department
DCU	Data Concentration Unit
Dyn DNS	Dynamic Domain Name System
EM	Electromagnetic
EMSD	Electrical and Mechanical Services Department
FTP	File Transfer Protocol
HKSAR	Hong Kong Special Administrative Region
IP	Internet Protocol
IPSec	Internet Protocol Security
ISP	Internet Service Provider
LAN	Local Area Network
M-Bus	Meter-Bus
MIU	Meter Interfacing Unit
O&M	Operation and Maintenance
PLC	Programmable Logic Controller
SIM	Subscriber Identity Module
SNMP	Simple Network Management Protocol
TCP	Transmission Control Protocol
T&C	Testing and Commissioning
VPN	Virtual Private Network
WAN	Wide Area Network
WSD	Water Supplies Department
XML	Extensible Markup Language

**Check List on Documents for Inclusion in
Automatic Meter Reading (AMR) Outstation Proposal**

Part I – General Information

Address of Premises: _____

Name of Consumer: (In English) _____

(In Chinese) _____

Contact Tel No.: _____

Email address: _____

ASN No. / CCID No. (if applicable): _____

WSD Reference No. (if applicable): _____

Part II – Documents to be included

The AMR Outstation proposal/supplementary information includes:

Please tick the appropriate boxes

		Enclosed in the proposal	Not Applicable
(1)	Site location plan - showing the location and boundary of the development	<input type="checkbox"/>	<input type="checkbox"/>
(2)	Building floor layout plan - showing the meter room(s)/box(es) for housing the AMR panel(s)	<input type="checkbox"/>	<input type="checkbox"/>
(3)	Meter room/box layout - indicating typical meter room/box - showing the detailed layout of the meter room/box with dimensions	<input type="checkbox"/>	<input type="checkbox"/>

		Enclosed in the proposal	Not Applicable
	<ul style="list-style-type: none"> - showing the meter positions including the associated fittings - showing the position of M-Bus adaptable boxes with dimensions - showing the distance between adaptable box to either of meter shall not be more than 1.5m - showing the layout and routing of cable conduits - indicating the meter room/box shall be lockable 		
(4)	<p>AMR equipment room (meter room/box for housing the AMR panel) layout</p> <ul style="list-style-type: none"> - showing the position of AMR panel with dimensions - showing the positions of adaptable boxes for M-Bus cable and telecommunication cable and 13A fuse spur unit with dimensions - showing the layout of cable conduits - showing the distance between adaptable box to either of meter shall not be more than 1.5m - indicating the length of M-Bus cable (shall not be more than 350m) 	<input type="checkbox"/>	<input type="checkbox"/>
(5)	<p>Meter schedule</p> <ul style="list-style-type: none"> - showing the address of each premises in the building that requires individually metered water supply - showing the numbers, sizes and types of meters 	<input type="checkbox"/>	<input type="checkbox"/>
(6)	<p>Design of the AMR Outstation</p> <p>Including:</p> <ul style="list-style-type: none"> - detail drawings - schematic diagram - general arrangement of AMR panel - wiring diagram of PLC - power supply circuit diagram including backup battery and battery charger - schematic diagram of communication network showing the application of broadband/mobile (e.g. 3G/4G/5G) as deemed appropriate by the WSD - indicating the numbers of meters connected to each DCU and the max. no of devices that can be connected - indicating the pulse-to-M-Bus converter for EM water meter if applicable 	<input type="checkbox"/>	<input type="checkbox"/>
(7)	<p>Equipment details</p> <ul style="list-style-type: none"> - showing the list and details of equipment for AMR Outstation including the brand and model of equipment 	<input type="checkbox"/>	<input type="checkbox"/>

		Enclosed in the proposal	Not Applicable
	<ul style="list-style-type: none">- showing the numbers of M-Bus devices supported by the DCU and the capacity of internal memory- showing by calculation the battery size is capable for supporting the backup operation in specified hours- indicating the panels' dimensions, material and the degree of protection		
(8)	<p>Installation Programme</p> <ul style="list-style-type: none">- indicating the Building Covenant date- showing the detail installation programme- indicating the installation date of the smart water meters	<input type="checkbox"/>	<input type="checkbox"/>
(9)	<p>Other information required by the Water Supplies Department (WSD). Please specify:</p> <hr/>	<input type="checkbox"/>	<input type="checkbox"/>

Remarks:

- a. The submission and approval of AMR Outstation proposal shall be separated from the submission and approval of plumbing proposal for application of water supply. The information submitted for the above purposes shall be self-contained and shall not be mixed up.
- b. Information (e.g. meter room/box layout, meter schedule, etc.) related to the application of water supply shall be approved under the plumbing proposal. Such information provided in the AMR Outstation proposal is for reference only.
- c. Catalogues of equipment are not required to be submitted at the Proposal Stage. However, such catalogues shall be submitted to the WSD for information together with the submission of operation and maintenance manual.