

Additional ETS Room Design NOC Requirements (Sub-Metering System)

1.0 SUMMARY

The purpose of this document is to be used as overview and guidelines for the Customer for the installation of Sub-Metering system and to define the scope of work of Empower and the Customer.

Sub-meters shall only be installed for apartments, offices and retails.

2.0 DEFINITIONS

- A. "Sub-Metering System" Energy meters, set of instruments and its network to measure the consumption of chilled water of each tenant.
- B. "Energy Meter" means set of instruments to measure rate of enthalpy change in the chilled water by measuring flow rate and temperature different which indicates rate of consumption of cooling.
- C. "Empower" means Emirates Central Cooling System Corporation and its authorized representative or assignee.
- D. "Customer" means a Master Developer/Building Owner or Individual Customer of district cooling service provided by Empower, as the context applies.
- E. "Sub-meter Cabinet" means dedicated place where sub-meters for the floor apartments will be installed containing the Btu Calculator, Flow sensor, Isolation valves, Smart, Valve Tee Junctions with Temperature sensors and unions. Refer Appendix 3.3 – typical installation details. Sub-meter cabinet size can vary. Empower will give approval for the design as long as clear access to meter installation is attained.

3.0 SCOPE & RESPONSIBILITIES

This document is applicable to Empower Customers and unit owners wherever there is provision for Empower to directly charge the tenants as further detailed in this document.

Sub-metering cabinet is one of the mandatory requirements in order to approve NOC request. Customer can approach Empower Sales and Marketing department (S&M) to request for all necessary requirements and can ask for technical meeting for the details on how to follow installation requirement.

All the new projects should comply with sub-meter cabinet in order to get final approval of the compliance statement. Project Management Office (PMO) is responsible for ensuring its compliance to sub-meter cabinet prior approval of NOC request.

Responsibility matrix is presented in Appendix 1 of this compliance statement.

Sub-meters shall be supplied by Empower under customer's cost. However, remaining requirements such as smart valve, gate valves, tee-junctions, pipe fittings and Mbus cables are under the scope of the customer (supply and install) subject to Empower review and approval.

All sub-meter accessories such as gate valve, union and reducer fittings shall be under responsibility of building side for future maintenance and replacement of the part as needed. Any issues relevant to meter accessories hindering the performance to do meter maintenance will be escalated to building owner for them to do rectification such as valve passing, valve stuck-up, cracked fittings and any other source of water leakage from meter accessories.

4.0 SUBMITTALS

- A. Customer to submit data on the chilled water flow rate, pipe diameter for each unit i.e. each flat, office, common area, corridor etc. for installed cooling capacity.
- B. Customer to submit the installation program for the sub meters based on the following duration,

Number of meters	Tentative installation Duration (calendar days)
< 300	60 Days
300 – 600	90 Days
600 – 900	120 Days
900 – 1200	150 Days
1200 – 1500	180 Days

- C. Customer to submit the following documents,
 - a. Compliance Statement to this specification document – TECH-ST-001 along with all the appendices. The customer shall comply with each points by hand writing stating "COMPLY" only. Below are the acceptance criteria:
 - i. COMPLY – acceptable (without any comments)
 - ii. COMPLY WITH COMMENTS – not acceptable
 - iii. NOTED – not acceptable
 - b. Typical floor layout which includes piping layout from BTU Meter Room up to sub-meter cabinet.
 - c. Secondary chilled water piping layouts, clearly indicating details of riser / shaft availability for carrying Empower chilled water services.
 - d. Typical Sub meter installation information indicating the sub-meter cabinet, Flow sensor, Temperature sensors, Tee junctions, Isolation valves, etc. for one Btu meter. Sub-meter cabinet size can vary. Empower

will give approval for the design as long as clear access to meter installation is attained.

- e. System architecture indicating all the meters in the M-Bus network up to gateway with tenant information, prepared in co-ordination with Empower's Btu meter supplier.
- f. System architecture for smart valve architecture up to gateway/concentrator located inside the 2m x 2m room.
- g. Cable routing lay out drawing, indicating the M-Bus cable path from the sub meter room to the top most floor.
- h. Material Submittal shall be made for Empower approval for the Isolation Gate valves, Insulation materials, Tee junctions, gateway for sub-meter connectivity and Smart Valve prior to installation.
- i. The entire compliance statement shall be submitted to Empower having below information:
 - i. Project details, customer details and sign / stamp with from the consultant and contractor involved in the project should be made available at first page of the compliance statement.
 - ii. Remaining pages should have stamp and signature with date from consultant and contractor.

5.0 SUPPLY & INSTALLATION

- A. The Customer shall design conduit based on schematic drawings provided in appendix 2 and as follows"
 - i. Two number 1" PVC conduit shall be used for the riser with junction box in each floor.
 - ii. 1" PVC conduit from the floor junction box to the meters.
- B. Sub-meters for each floor shall be installed in a common location inside the cabinet. All the meters will be grouped in that particular cabinet, covering full meter installation as per appendix 3, including smart valve, and Mbus wire termination. Sub-meter cabinet shall be secured to avoid unauthorized access by having a door lock for each cabinet. One key will be handed-over to Empower while spare key will be under building security's possession. Only authorized Empower personnel are allowed to access sub-meter cabinet.
- C. Sub-meter cabinet shall be provided as per the drawing submitted by the customer. Drawing is subject to further review and approval by Empower. Sub-meter cabinet size can vary. Empower will give approval for the design as long as clear access to meter installation is attained. More than one vertical riser (if needed) is allowed to be reviewed and approved by Empower.
- D. Customer shall carry out conduit work & wiring required for M-Bus network through building contractor from the 2m x 2m Metering room (to be located inside the ETS room) to all the energy meters. Conduit shall be heavy grade PVC material.

- E. Junction Boxes (JB) in the main riser for each floor are required for 2 numbers of 6 cores cable as indicated in the schematics. Junction Boxes shall be of size 150 x 150 x 100 mm or standard available.
- F. Junction Boxes in the floor for each tapping in the flat are smaller size and are required to accommodate 2 c x 1.5 Sq.mm twisted pair cable with size 50 x 50 x 40 mm or standard available.
- G. Customer shall supply and install 2 numbers of 6C x 1.5 Sq.mm twisted pair unshielded, PVC Jacket cable for the raiser cable. The Customer shall supply and install one number of 2C x 1.5 Sq.mm twisted pair unshielded, PVC jacket cable for each floor. The cable shall be BELDEN CABLE or approved equal. (Connection details as per schematic drawings provided in appendix 2). The Customer shall carry out the termination of the cables on all ends.
- H. Empower's Sub-Metering solution provider shall check continuity of wiring along with building contractor before and after the installation of meters.
- I. The cables shall be routed away by at least 50cm from other power cables.
- J. Customer to provide 500 mm spool piece or a spool piece of length equal to 16 times the diameter of the pipe (whichever is greater). The Spool piece shall be replaced with Flow sensor, two isolation gate valves across the flow sensor and one Tee in return line. Unions on both sides shall be installed across the flow sensor. Customer to provide one isolation gate valve, one Smart Valve, one union and one Tee in the supply line. Thermo wells will be provided by the Empower's Sub-Metering solution provider. Refer Appendix 6 – Isolation Gate Valve, Appendix 7 – Smart Valve.
- K. The Tee junctions (reducing tee with 1/2' thread) shall be installed by the customer, with the tip pointing sideward facing the door cabinet. Tee-Junction shall be mounted without any extension to minimize linkage that might be source of water leak in the future if the part will break. Individual BTU Calculator should be mounted away from the chilled water pipeline.
- L. Empower's supplier shall deliver and hand over all the meters and accessories to customer at site. Customer / Customer's representative shall be responsible for inspection of delivered material and shall notify to Empower for any missing parts, defects, damages, wire cuts etc. Customer shall be responsible for proper storage of meters and accessories at site in accordance with the guidelines provided by the Empower's supplier. Customer / Customer representative shall be responsible for the damages / defects or loss occurred during the storage or handling of the meters.
- M. Customer / Customer's representative shall be responsible for the damages during the installation of the meter and its accessories. It is primary responsibility of Customer / Customer representative to notify Empower if any defects found during the stage of installation and should be in position to demonstrate that identified defect was not caused due to improper installation practice.
- N. Sub-meters shall be installed by the building contractor under the supervision of supplier.

- O. Customer to notify Empower if any defects found during the installation stage and shall be in a position to demonstrate the identified defect was not caused due to the proper installation practice.
- P. Customer shall carry out all the flushing work while the spool piece is in place and prior to the installation of flow and temperature sensor. No flushing shall be done after the installation of the Sub-Meters.
- Q. The Flow sensor part of the Sub-Meter is installed on the Return line unless otherwise instructed by Empower or Empower's Sub-Metering solution provider.
- R. Individual tagging attached to each sub-meter is mandatory to be provided for all installed sub-meters to clearly identify proper allocated sub-meter for each apartment. Tagging should include Empower BTU Meter with Apartment Reference No. Tagging shall be attached also to smart valves. Please find below pattern:

- For Sub-meter to be attached in BTU Calculator

EMPOWER BTU – APT 101

- For Smart Valve to be attached in valve enclosure

SMART VALVE – APT 101

- S. Empower require a room of 2 meter x 2 meters inside the ETS room, air conditioned, where active equipments and controls will be installed. This room will be in Empowers possession and owner to provide access to this room at all times.
- T. The room shall be cooled by a dedicated Fan coil unit with separate controls mounted inside the room.
- U. Empower require provision for Complete Mbus Master and It's Remote Connectivity Equipment (Gateway, Concentrator... etc) Enclosure. Enclosure shall be wall-mounted and lockable type. Panel size should be at least 600mm x 800mm x 300mm.
- V. UPS with 4 hours back-up shall be provided for the equipment connected inside the panel (Mbus master and its gateway for remote connectivity, and Smart Valve Gateway.
- W. The room should contain 2 numbers power sockets with 230 V power supply and normal room lighting. TCP / IP / Internet connection provision shall be made available.
- X. Each flat should be supplied with the chilled water from a single standalone branch.
- Y. Insulation Material and the work shall be carried out as detailed in Appendix 4 – Insulation Material and Appendix 5 – Insulation work.

- Z. Smart Valve shall be supplied and installed by the customer. Device specification is attached in appendix 7 for the customer to comply with. Material submittal shall be reviewed for further approval by Empower.
- AA. Gateway for sub-meter reading shall be supplied and installed by the customer. Attached device specification to be submitted to Empower for further review and approval. Please refer to appendix 2.3 for reference.

6.0 LOCATION

- A. Sub-meters shall only be installed for apartments, offices and retails.
- B. Sub-meters shall be installed in a dedicated sub-metering cabinet near the chilled water vertical riser of each floor. Sub-meter cabinet size can vary. Empower will give approval for the design as long as clear access to meter installation is attained. More than one vertical riser (if needed) is allowed to be reviewed and approved by Empower.

7.0 MOCKUP & SITE ACCEPTANCE TEST

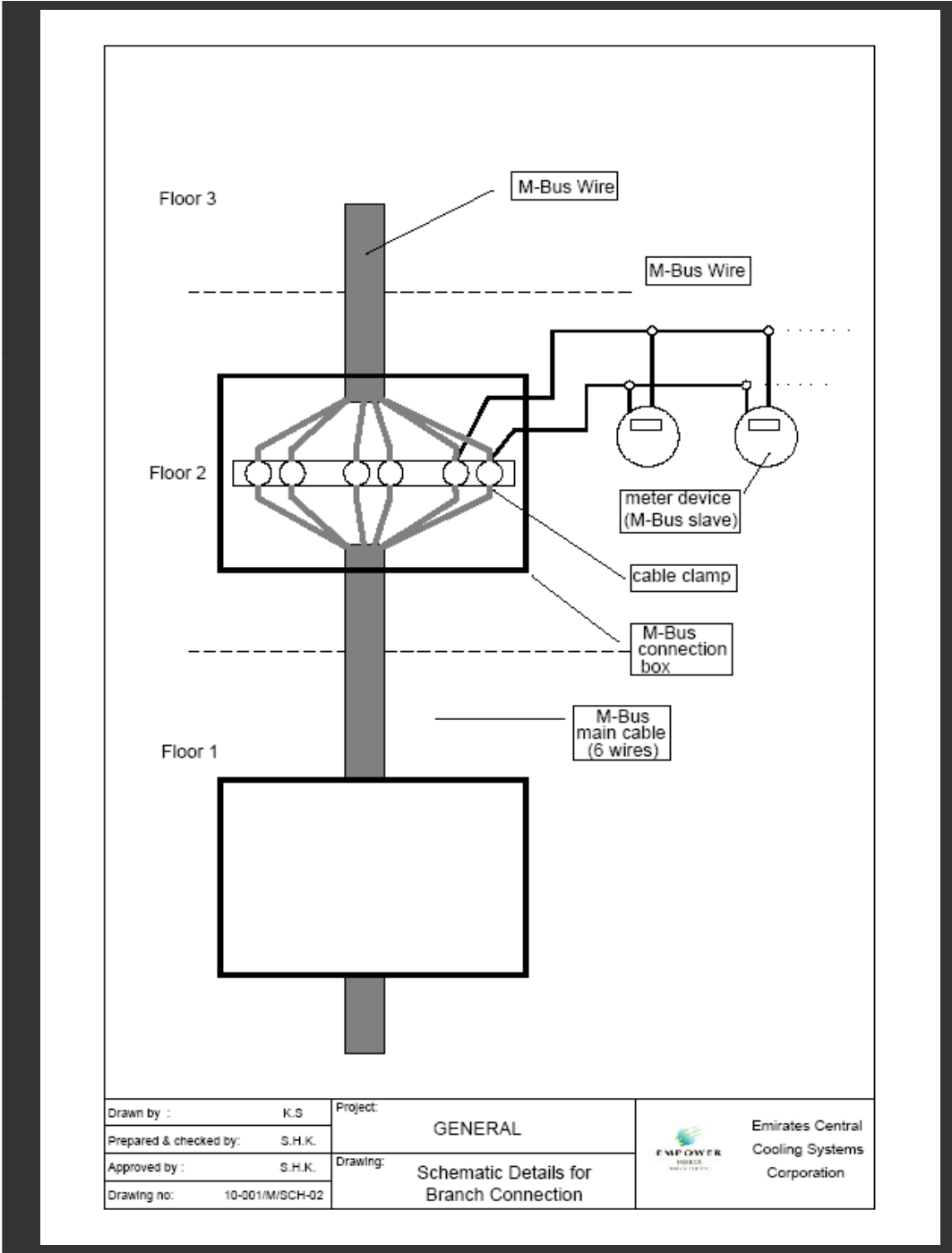
- A. Customer to perform the sub-meter cabinet mock-up to the satisfaction of Empower. Installation of meters and its components to follow after the successful mock up inspection. Customer is not allowed to install meters for remaining floors if sub-meter cabinet mock-up is not yet approved.
- B. Customer to perform the Site Acceptance Test jointly with Empower's Btu meter supplier and Empower. The handing over of the individual units shall be jointly signed by Customer or Customer's representative, Empower's Meter supplier and Empower representative using the form in Appendix 8 – Sub metering Installation Acceptance and handing-over checklist.
- C. Customer to demonstrate hindrance free removal of the Btu meter and its components when demanded by Empower during Site Acceptance Test.
- D. Customer to demonstrate that sub-meters for specific apartments is properly installed. Empower has the right to ask individual apartment testing (switching on/off) FCU and verify if the sub-meter status will follow.

8.0 APPENDIXES

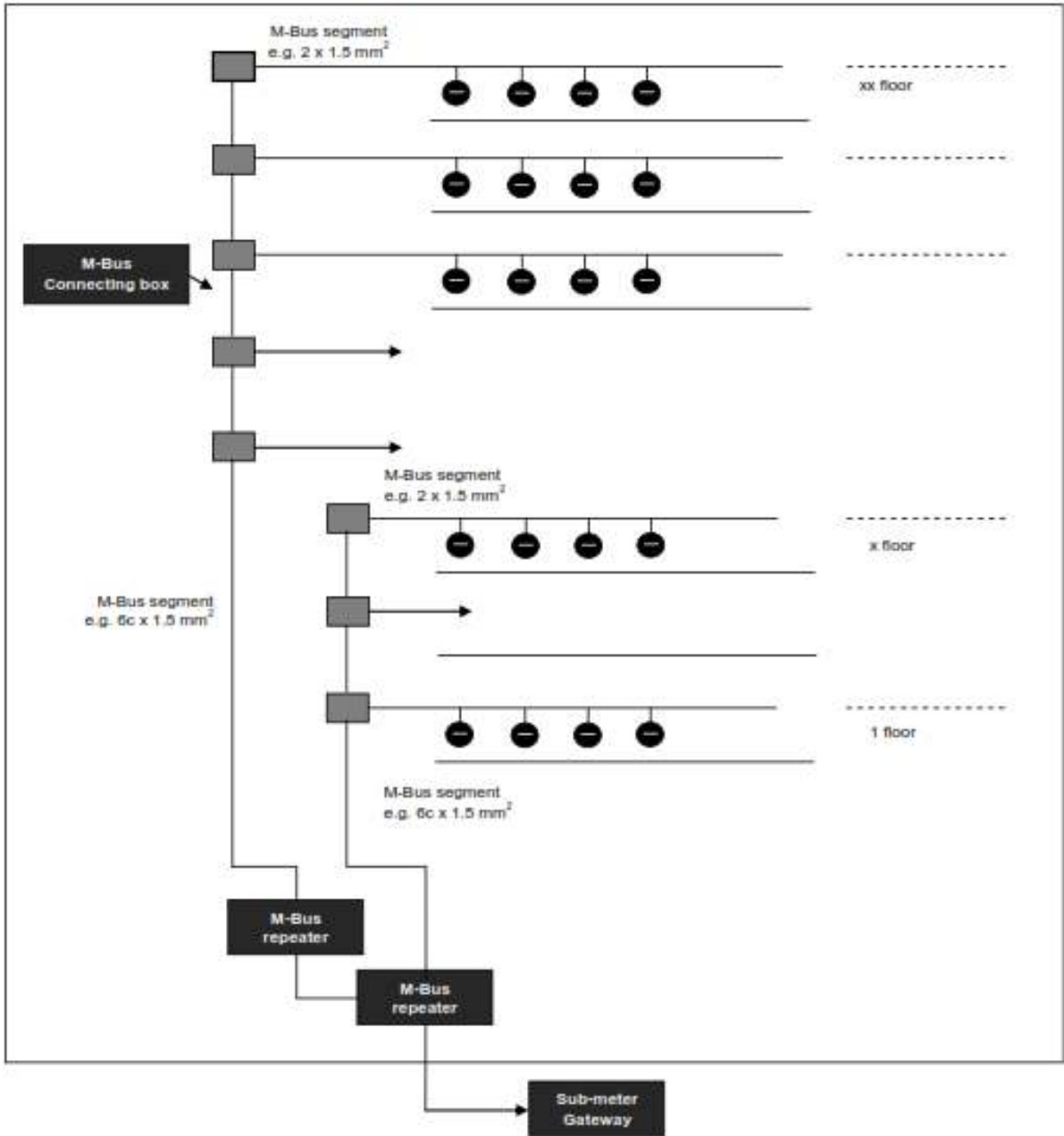
Appendix 1 - SUB-METERING RESPONSIBILITY MATRIX


SN	Description	Empower	Building Owner
1	Details of each apartment AC load (RT), diameter of Chilled Water Pipe (mm) and flow rate (l/s) shall be prepared and submitted to Empower in their prescribed format.		X
2	Selection and Approval of BTU meters supplier	X	
3	Provide guidelines for QTY and location of BTU meters	X	
4	Prepare drawings showing QTY and location of BTU meters according to guidelines.		X
5	Review and approve the drawings listed in point 4 above.	X	
6	Determine location and requirement (socket outlets, data points, A/C ventilation, ...etc.) for billing system room	X	
7	Determine containment and wires specification	X	
8	BTU meters shop drawings and details preparation		X
9	BTU meters shop drawing and details approval	X	
10	Control Room Shop Drawing Preparation (2m x 2m room)		X
11	Control Room Shop Drawing Approval	X	
12	Supply and Installation of Sub-meter Cabinet, Smart Valve, Containment, Gateways, and wires for BTU meters		X
13	Inspection of Containment and Wires for BTU meters	X	
14	Supply of BTU meters	X	
15	Receive, Inspect & Store of BTU meters at site		X
16	Inspect delivery of BTU meters made to site	X	
17	Termination of wires for all BTU meters, M-Bus Masters, Repeaters, Gateway from all ends		X
18	Installation of Spool piece at the location of each BTU meter for flushing		X
19	Removal of spool pieces, installation of BTU meters and Smart Valve with proper insulation and pressure test under the supervision of sub-metering supplier		X
20	Supervision of BTU meters installation	X	
21	Inspection of BTU Meter, Smart Valve and Gateway Installation / Commissioning	X	
22	Supply, Installation, Testing and Commission of Billing system	X	
23	Testing and Commissioning of all BTU meters	X	
24	Operation and maintenance of BTU meters and Billing system	X	
25	Data Collection	X	

Appendix 2 – Typical connection from Riser cable to Floor cable



Drawing A2.1



Drawn by:	K.S.	Project:	GENERAL	
Prepared & checked by:	S.H.K.			
Approved by:	S.H.K.	Drawing:	Sub-metering Schematic	
Drawing no.	10-001/MISCH-01			

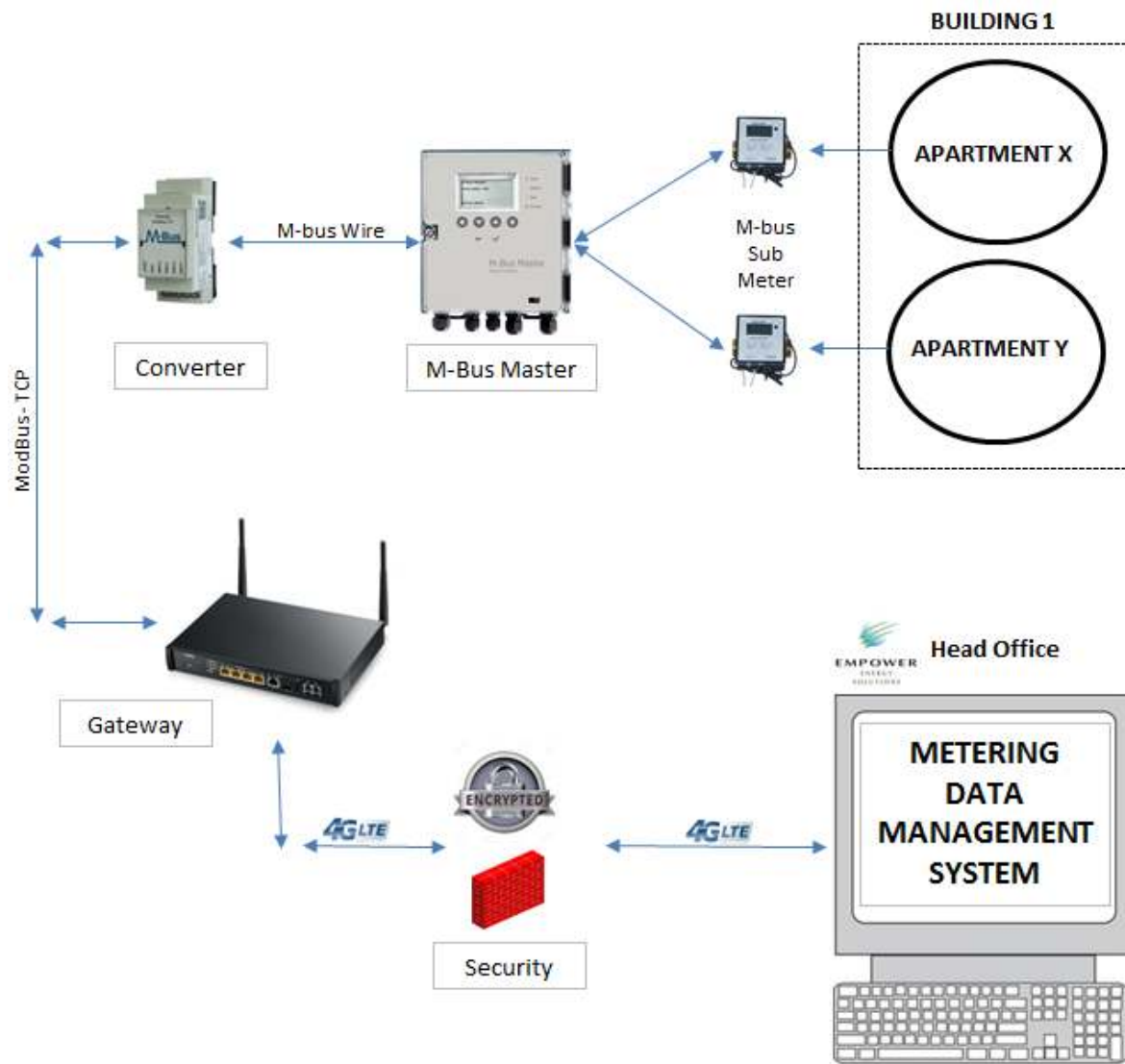
Drawing A2.2

Appendix 2.3 – Sub-meter Gateway Setup for Remote Connectivity

- A. M-bus master will be connected to converter / Gateway which will be provided by the customer. Sub-metering reading integration will be carried-out by Empower team.
- B. Compliance to product specifications and installation package shall be followed which is subject to Empower approval. Please find below details.

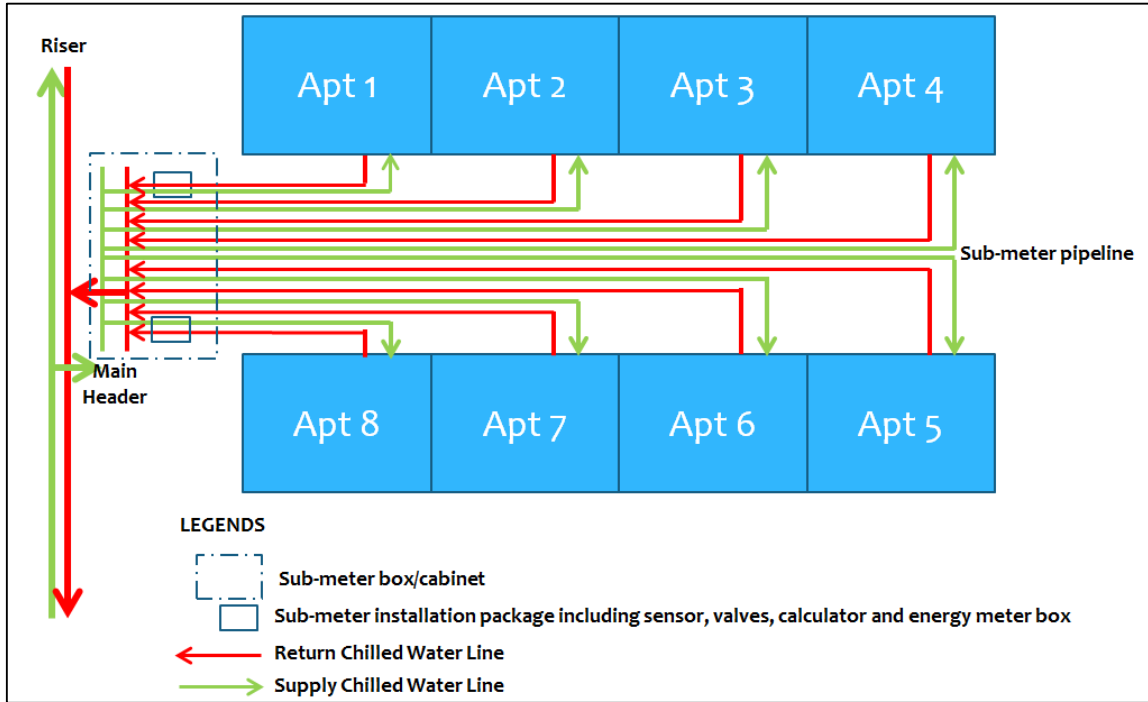
SUBMETERS CONNECTIVITY SPECIFICATION COMPLIANCE STATEMENT				
SN	CRITERIA/SOW	DESCRIPTION	CONTRACTOR'S COMPLIANCE	REMARKS
1	System's Communications	From M-Bus Sub-meter to M-Bus Master: M-Bus		
		From M-Bus Master to Collector: Modbus TCP/IP through M-Bus to Modbus Converter		
		From Collector to MDMS: High speed 4G LTE secured network		
2	Alternate device	Smart Phone/Tablet as a backup and routine/emergency use		Alternate device shall be used as secondary back-up in case remote setup from Empower office failed
3	System Security	Encrypted and Secured solution		
4	Meter Search	Individual Sub-meter Search Option by Meter Serial No. & Location		
5	Design & Operating temperature	Robust design, industrial grade +70°C		
6	Capacity	Capacity to connect 60,000+ Sub-meters on the server; With security firewall and shall have software updates regularly to prevent any communication breach		
7	Unique Identity	Read-only unique identity that can be read and transmitted thru communication module		

SN	CRITERIA/SOW	DESCRIPTION	CONTRACTOR'S COMPLIANCE	REMARKS
8	Logic Design	Log 12x Meter Reading per day, Data Analysis, plot the history of the meter reading, Generating reports and provide meters status, Alarms & Notifications.		
		Error Detection System: Design the logic where all the acceptable parameters will be considered as good readings.		
		Provide alarms for the meter faults that are outside the defined metering logic		
9	Tampering Alarm Notification	Meter will automatically notify in the event of tampering. Eg - If Valve Status is Off and flow is available Or if the device is being tampered by someone, it should sent alarm notification		
10	CONTRACTOR Scope: Method of Statement / Risk Assessment	CONTRACTOR scope shall identify full MOS with RA and to provide schematics drawings and layout for the entire setup.		
		Moreover, Supply, Installation, Testing and Commissioning shall be satisfactory completed.		
		Installation shall satisfy Empower acceptance criteria.		
11	After Sales Support	CONTRACTOR's ability to provide any technical support after successful handing-over of the project to ensure smooth remote operations of the connected Sub-meters.		
12	Training	CONTRACTOR shall conduct Operations and maintenance training for both hardware and software		
13	Origin	Shall be made in USA or Europe		
14	2 Years Warranty	CONTRACTOR to provide 2 years warranty after successful commissioning and handing-over		

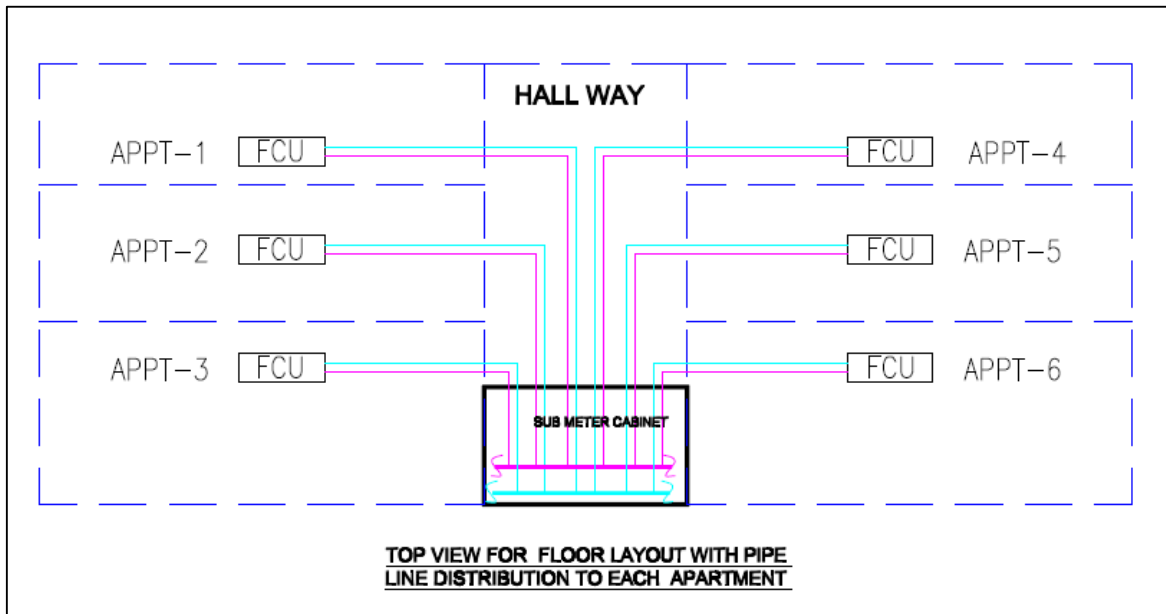


A2.4 – Typical Sub-meter Gateway Connection Details

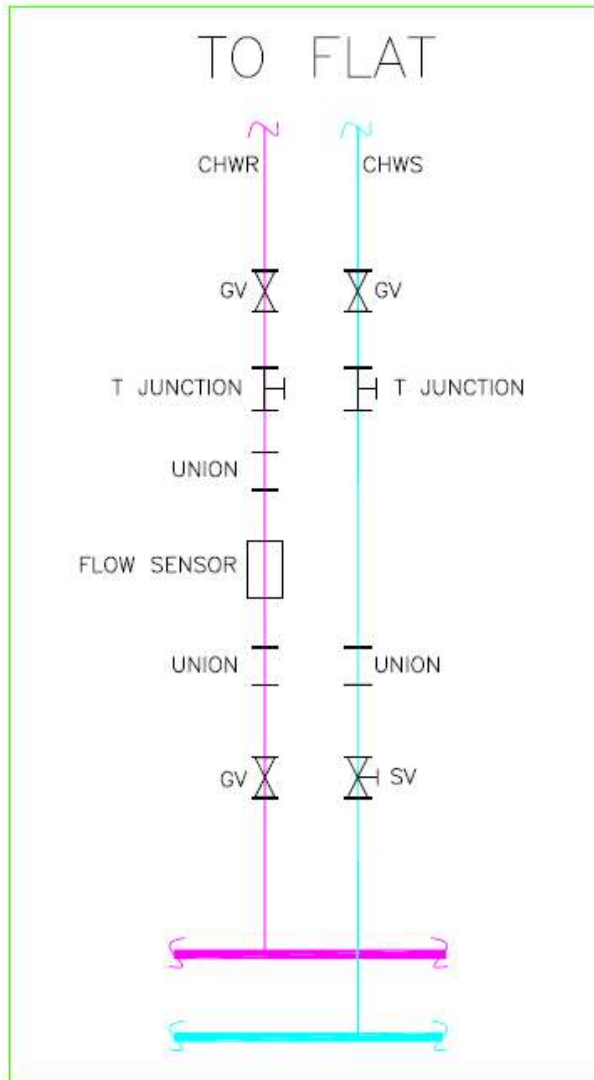
Appendix 3 – Sub-meter Cabinet Drawing Details



Drawing A3.1 Typical Sub-meter Cabinet Diagram



Drawing A3.2 Top View – pipeline distribution from Sub-meter Cabinet



**DETAIL VIEW OF SUBMETER
ACCESSORIES INSTALTATION
FOR EACH APARTMENT**

LEGENDS :

-  GV GATE VALVE
-  SV SMART VALVE
-  UN UNION
-  REDUCING TEE JUNCTION 1/2"
-  FM FLOW METER
-  CHILLED WATER SUPPLY
-  CHILLED WATER RETURN

01	UPDATE VALVE REQUIREMENT	12-02-17
00	ISSUED FOR SUBMISSION	20-11-14
REV. NO.	DESCRIPTION	DATE

OWNER :



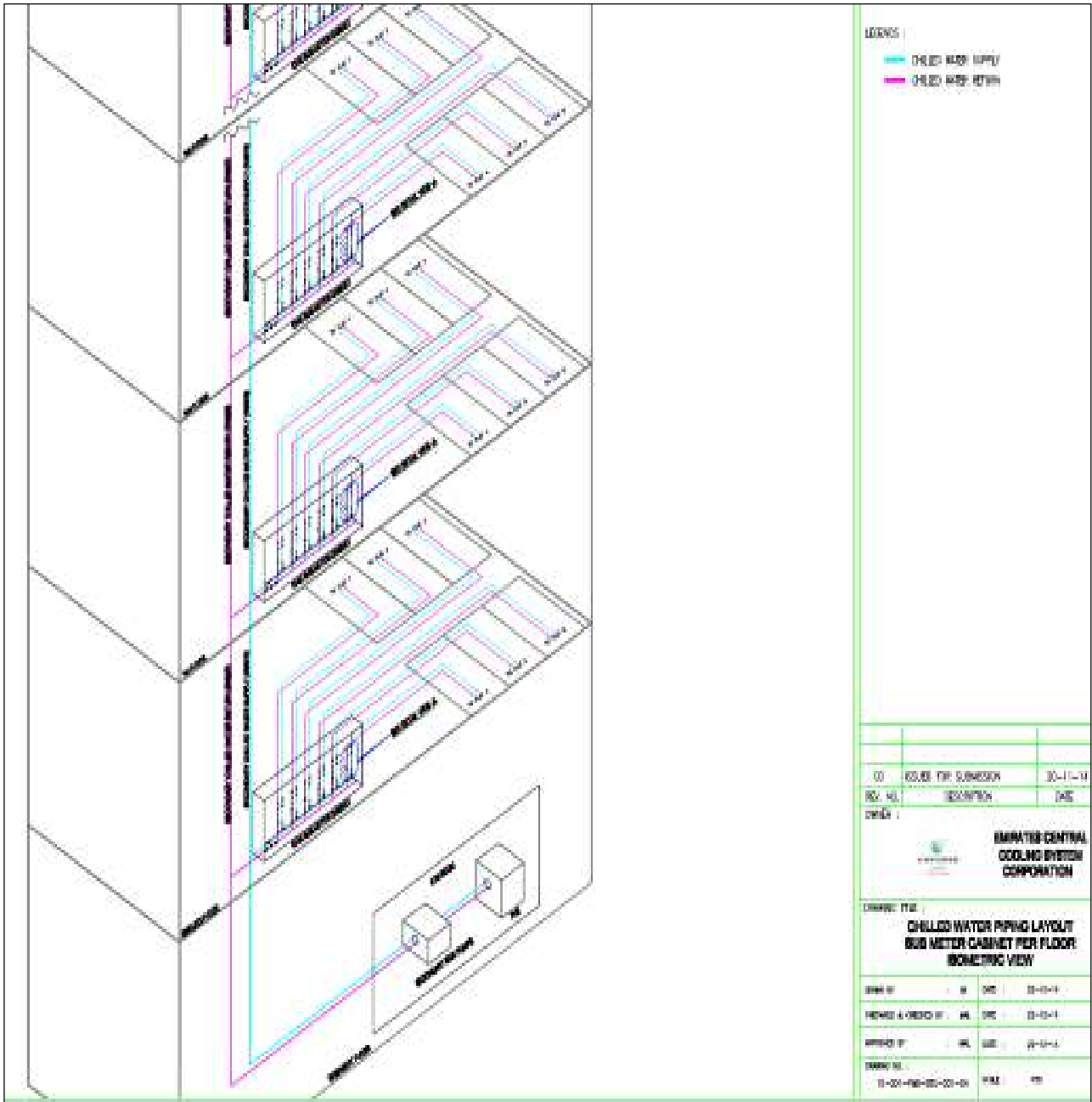
EMIRATES CENTRAL
COOLING SYSTEM
CORPORATION

DRAWING TITLE :

DETAIL VIEW OF SUBMETER
& BTU METER MAIN BRANCH

DRAWN BY :	SA	DATE :	22-12-14
PREPARED & CHECKED BY :	MAL	DATE :	22-12-14
APPROVED BY :	MAL	DATE :	22-12-14
DRAWING NO. :	10-001-PME-BTU-001-03	SCALE :	NTS

Drawing A3.3 Typical Installation Detail Including Smart Valve



Drawing A3.4 Chilled water piping layout distribution

Appendix 4 - Insulation Material

- A. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
 - 1. Adhesive: Solvent base, contact adhesive, as recommended by insulation material manufacturer.
 - 2. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
 - 3. Thermal Conductivity: ≤ 0.038 W/mK at 20 °C (68 deg. F).
 - 4. Density: 65 to 80 kg/m³.
 - 5. Water Vapor Permeability: 0.15 perm-inches.
 - 6. Thickness: 38 mm

Appendix 5 – Insulation Work

- A. PREPARATION
 - 1. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. GENERAL APPLICATION REQUIREMENTS
 - 1. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of equipment.
 - 2. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
 - 3. Keep insulation materials dry during application and finishing.
 - 4. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
 - 5. Apply insulation with the least number of joints practical.
 - 6. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - 7. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.
 - 8. Insulation Terminations: For insulation application where vapor retarders

are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

9. Apply insulation with integral jackets as follows:
 - a. Pull jacket tight and smooth.
 - b. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
10. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.
11. Install vapor-retarder mastic on equipment scheduled to receive vapor retarders. Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.

Appendix 6 – Isolation Gate Valves

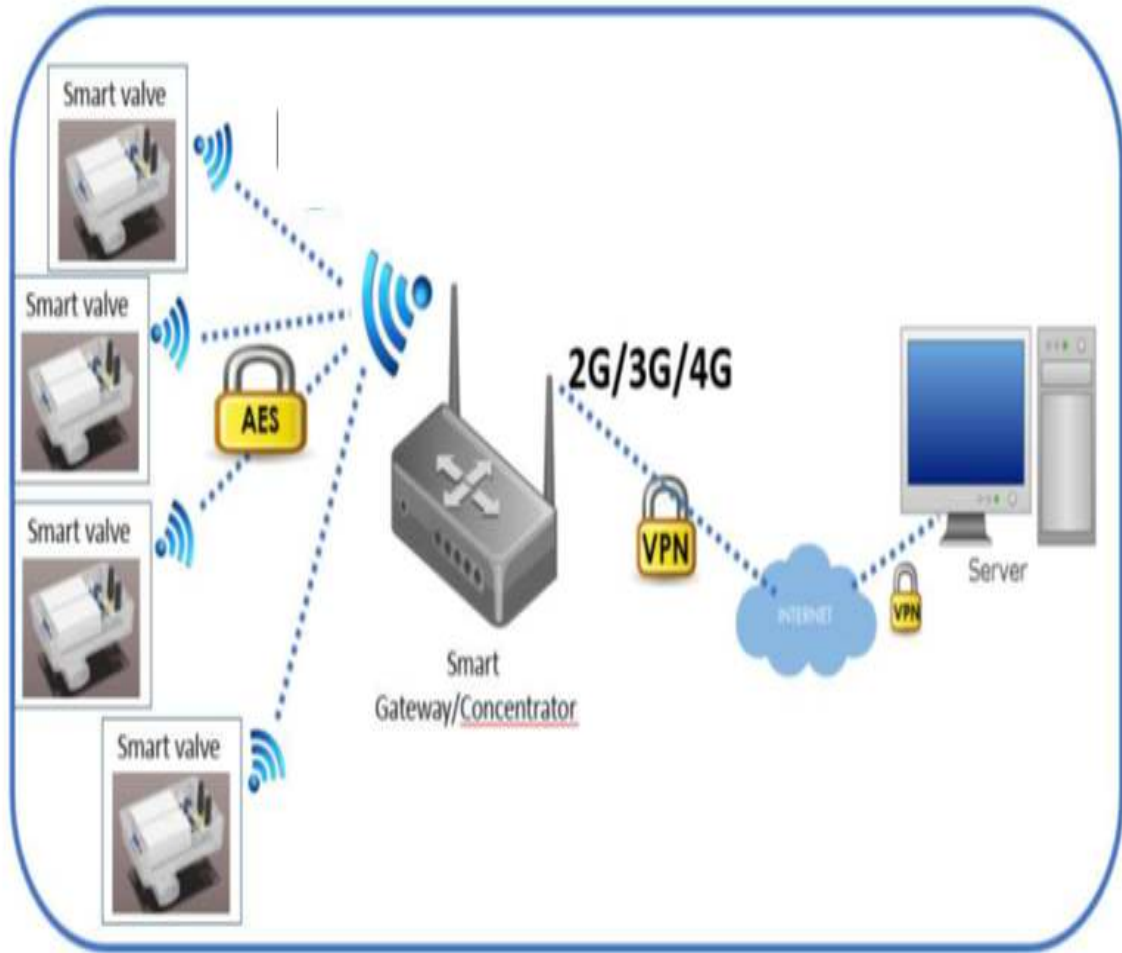
- A. Gate valves, 25 mm and Smaller: Rated for 1030 kPa saturated steam pressure, 2760 kPa WOG pressure; two piece construction; with bronze body conforming to ASTM B 62, standard (or regular) port, chrome-plated brass gate, replaceable "Teflon" or "TFE" seats and seals, blowout-proof stem, and vinyl-covered steel handle. Provide solder ends for condenser water, chilled water, and domestic hot and cold water service; threaded ends for heating hot water and low-pressure steam. Provide PN 16 valves where system pressure requires.
- B. Gate valves, 32 mm to 50 mm: Rated for 1030 kPa saturated steam pressure, 2760 kPa WOG pressure; 3 piece construction; with bronze body conforming to ASTM B 62, conventional port, chrome-plated brass gate, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for condenser water, chilled water, and domestic hot and cold water service; threaded ends for heating hot water and low-pressure steam. Provide PN 32 valves where system pressure requires.
- C. For flange type installation, butterfly valve with the same PN is applicable for DN65 and above.

Appendix 7 – Smart Valve

- A. Smart valve shall be provided for all installed meters.
- B. Compliance to product specifications and installation package shall be followed which is subject to Empower approval. Please find below details.

SMART VALVE PRODUCTS SPECIFICATION COMPLIANCE STATEMENT				
SN	CRITERIA/SOW	DESCRIPTION	CONTRACTOR COMPLIANCE	REMARKS
1	Wireless Communications	Valve's ability to communicate thru multi RF paths including GSM/GPRS, WIFI, Bluetooth and LTE		
2	Handheld device as an alternative with 200m range	Valve can be controlled from handheld and any mobile application		
3	Software Setup for Remote Connectivity of Smart Valve	Capacity to connect 60,000+ smart valves on the server; With security firewall and shall have software updates regularly to prevent any communication breach		
4	Unique Valve / Device ID	Read-only unique identity that can be read and transmitted thru communication module		
5	Battery Power Source	3.6VDC, 15 years D-Cell battery powered		
6	Tampering Alarm Notification	Valve will automatically notify in the event of tampering		
7	Valve IP68 Protection / Class NEMA Enclosure	Valve shall be IP68 while enclosure is NEMA for better protection of the device		
8	Valve Fail Safe with Alarm	Valve to retain last position. Corresponding alarm shall be sent in central control room to notify maintenance for the status and rectification		
9	Secured Manual Valve Override Access	Access for Empower maintenance in doing rectification / repair of the valve side		
10	Compact Type	Valve and enclosure are built together, while cards and batteries can be replaced during maintenance		
11	Valve Size DN 15 to DN 65	Mandatory size requirement		
12	Valve Material	Brass Ball valve, PN 16		
13	Valve Dimension	Valve shall be compatible with standard Crane or Pegler length and thread size		
		Note: In some cases, flanged valve is required for DN50 and DN65		

SN	CRITERIA/SOW	DESCRIPTION	CONTRACTOR COMPLIANCE	REMARKS
14	10 years Valve Life Span	Valve including its communication module shall have guaranteed life span of at least 10 years		
15	CONTRACTOR Scope: Method of Statement / Risk Assessment	CONTRACTOR scope shall identify full MOS with RA and to provide schematics drawings and layout for the entire setup. Moreover, Supply, Installation, Testing and Commissioning shall be satisfactory completed.		
16	After Sales Support	CONTRACTOR's ability to provide any technical support after successful handing-over of the project to ensure smooth flow of valve operations.		
17	Training	CONTRACTOR shall conduct Operations and maintenance training for both hardware and software		
18	Origin	Shall be made in USA or Europe		
19	2 Years Warranty	CONTRACTOR to provide 2 years warranty after successful commissioning and handing-over		



Drawing A7.1 Typical Smart Valve Connectivity Diagram

Appendix 8 – Sub Metering Installation Acceptance Sheet

Meter Part Number		Meter Serial Number	
Meter DN / QP		Meter Year of Make	
Smart Valve Part Number		Smart Valve Serial Number	
Smart Valve DN		Smart Valve Year of Make	
Project Name		Building Name	
Inspection Date		Apartment No.	

Meter Installed In: Supply Line Return Line

SN	DETAILS	ACCEPTABLE	NOT ACCEPTABLE	REMARKS
1	Two Unions Across Flow Sensor at return line and one union at supply line	<input type="checkbox"/>	<input type="checkbox"/>	
2	Supply Temperature Sensor	<input type="checkbox"/>	<input type="checkbox"/>	
3	Return Temperature Sensor	<input type="checkbox"/>	<input type="checkbox"/>	
4	Tee-Junction Installation for Supply and return lines (sidewards)	<input type="checkbox"/>	<input type="checkbox"/>	
5	Insulation Done Correctly	<input type="checkbox"/>	<input type="checkbox"/>	
6	Two Isolation Valves Across Flow Sensor	<input type="checkbox"/>	<input type="checkbox"/>	
7	Isolation Valve Other Line	<input type="checkbox"/>	<input type="checkbox"/>	
8	BTU Calculator Location	<input type="checkbox"/>	<input type="checkbox"/>	
9	Smart Valve in the Supply Line	<input type="checkbox"/>	<input type="checkbox"/>	
10	M-Bus Terminations	<input type="checkbox"/>	<input type="checkbox"/>	
11	Flow Sensor Installations	<input type="checkbox"/>	<input type="checkbox"/>	
12	Sub-meter Cabinet Accessibility of sub-meter installation inside the cabinet	<input type="checkbox"/>	<input type="checkbox"/>	
13	Tagging for Each BTU Meter Locations Attached on BTU Calculator (which will Include Apt Ref)	<input type="checkbox"/>	<input type="checkbox"/>	
14	Tagging for Each Smart Valves for each apartment	<input type="checkbox"/>	<input type="checkbox"/>	
15	Local readings from BTU-Meter Display Energy = Supply Temp = Flow = Return Temp = Power = Error =	<input type="checkbox"/>	<input type="checkbox"/>	

REMARKS:

|

ACCEPTED BY	NAME	SIGNATURE	DATE	REMARKS
EMPOWER				
METER SUPPLIER				
BUILDING CONTRACTOR				

A8.1 Individual Installation Acceptance Checklist

Project Name		Date Handed Over	
Building Name		M-Bus Software Used	
Total Nos. of Installed Meters		Total Nos. of M-Bus Master	
M-Bus Master Make / Part Number		Gateway Sub-meter Connectivity	
Gateway Smart Valve Connectivity		Over-all Status	

SN	DETAILS	ACCEPTABLE	NOT ACCEPTABLE	REMARKS
1	M-Bus Master installed inside the Enclosure Box Inside the BTU-Meter Room	<input type="checkbox"/>	<input type="checkbox"/>	
2	M-Bus Cable Laying from Main Riser up to Each Floors Using Specified (1 no. of 6 core of Unshielded cable, stranded, 18AWG, Belden 9740 or equivalent)	<input type="checkbox"/>	<input type="checkbox"/>	
3	Availability of Spare M-Bus Cable from The Riser (1 no. of 6 core of Unshielded cable, stranded, 18AWG, Belden 9740 or equivalent)	<input type="checkbox"/>	<input type="checkbox"/>	
4	Check the continuity of the M-bus loop	<input type="checkbox"/>	<input type="checkbox"/>	
5	Availability of UPS Panel	<input type="checkbox"/>	<input type="checkbox"/>	
6	Provide Sub-meter Database for Downloading the Readings	<input type="checkbox"/>	<input type="checkbox"/>	
6	Provide full information for each Meter schedule (Model, QP, DN, SN, Apt Ref) – soft and hard copy	<input type="checkbox"/>	<input type="checkbox"/>	
7	Provide M-Bus Cable Layout Drawing – soft and hard copy	<input type="checkbox"/>	<input type="checkbox"/>	
8	Individual Meter Read Availability in M-Bus Room	<input type="checkbox"/>	<input type="checkbox"/>	
9	Error-free captured Readings for All Meters – all errors in each meter readings must be rectified.	<input type="checkbox"/>	<input type="checkbox"/>	
10	Functionality test of all installed smart valves	<input type="checkbox"/>	<input type="checkbox"/>	
11	M-Bus Software to Hand-Over to Empower to be Used for Billing Purposes	<input type="checkbox"/>	<input type="checkbox"/>	
12	Submit Individual Calibration Certificates for Each Meters	<input type="checkbox"/>	<input type="checkbox"/>	
13	Submit Warranty Certificate for All the Meters(24 months Coverage after Handing Over)	<input type="checkbox"/>	<input type="checkbox"/>	

A8.2 SUBMETER HANDING OVER & COMMISSIONING ACCEPTANCE SHEET

*** End of Document ***