

**Standard Specification & Guidelines For Sub Metering Of Chilled Water
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Standard Specifications & Guidelines for Chilled Water Sub-Metering

Introduction:

This document includes the standard specifications, guidelines & recommendations for typical chilled water sub-metering (BTU metering) system.*

Pre-qualifications:

The metering specialist needs to demonstrate the following aspects in order to meet the general expectations and standard best practices of metering projects:

Supply of BTU metering system:

- Supplier of BTU metering system must have the in house qualified technical resources in order to provide testing & commissioning services upon completion of installation of metering system. In addition the supplier must also provide periodic supervision during installation and cabling of metering system.
- The brand of BTU meters are to be suitable to UAE environment and proven with several installation references in UAE and GCC.
- Supplier of BTU metering system must have the dedicated maintenance team in order to provide maintenance services on monthly/yearly basis as required by client.
- In case of meter failure and to avoid loss of reading/revenue the supplier must maintain minimum local and easily available stock of 10% of total meters supplied to the project.
- Supplier of BTU metering system must have the in house qualified technical resources in order to provide reading and billing services.

Section 1: Standard specification for BTU meters

This section contains the standard specification for the chilled water BTU meters (hardware) & various components of energy metering system including M Bus Master & billing software. Generally this specification is implemented during procurement of BTU meters for under construction project.

➤ General:

The energy meter shall consist of the flow sensor, the integrator with integral hardware and software for measuring flow rate, temperature and energy consumption as well as 2 wired temperature sensors to measure the Return and Supply temperatures. The system shall measure with exceptional accuracy especially for the sizes of qp 1.5 - 6.0 where a dynamic range of 1:100 (qi : qp) must be available. Also there shall be full memory backup board within each meter for a minimum of the last 12 months as well as the last two billing dates. Each BTU meter shall be equipped with the facility for communication with a unique address/ID. These BTU meters are to looped and connected to an integrator hardware which will convert the energy meter data into BACnet/IP protocol to be connected to the billing system/BMS system.

The BTU meter hardware shall be integrated with a user-friendly LCD display for easy handling and monitoring of the consumption values in the measuring and metering devices. The display shall automatically switch off 60 seconds after the last press of a button, to save battery power. The technology shall guarantee unique reliability with battery-operated measuring and recording devices. Batteries shall have a life span of up to 10 years.

To minimize error sources, the read-out data from BTU meters shall be imported into the billing system without any other intermediate interface. BTU meters must be looped together

& connected to PC / laptop via appropriate controller/integrator. The metering system supplier must be capable of supplying metering billing software. BTU metering system should be standalone independent system. This is to ensure reliability, performance & billing accuracy.

The metering system supplier must also conduct end user training of billing software to client representative.

➤ **Particular Specifications:**

● **Chilled Water BTU Meter:**

- Temperature range: 5-105°C
- Temperature difference: 3-80 K
- Operating margin: 0.2 K
- Temperature measuring pattern: 30s (with battery), 4s (with power pack unit)
- Power supply: Battery for 10 years
- Metrological class: 1:100
- Nominal throughput: 0.6-60 m³/h
- Maximum overload: 2 x Q_p

● **Microprocessor Counter/Calculator:**

- Connection technology temperature sensor: 2 conductor/ 4 conductor
- Limit values of temperature range TB: 5-105°C
- Limit values of the temperature difference Δt : 3-80K
- Temperature difference suppression: <0.2 K
- Measuring sensitivity: <0.01 °C
- Heat coefficient k: independent of the temperature, floating
- Ambient temperature: 5-55°C
- Ambient conditions: corresponding to EN 1434 Class 2
- Display of the heat consumption: kWh or MWh, 7-digit, 1 decimal point
- Voltage supply: integrated battery (10 years life)
- Saved values:
 - current measuring value, 12 end of month values, 2 target date values
 - Error code
 - Protection class: IP 54

● **Temperature sensor:**

- Length of cable: 1.5 meter
- Connection technology: 2 or 4 conductor
- Platinum resistance thermometer: Pt 500
- Limit values of temperature range TB: 5-105°C
- Installation temperature sensor: Φ 5mm, direct installation or immersion tube installation

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● **LED Display:**

- Power Supply (Green)
- Transmit (Yellow)
- Overload (Red)
- Receive (Yellow)

● **Power Consumption:**

- Max 40W

● **Connections:**

- Power Supply
- M-Bus
- RS232

➤ **Project deliverables by supplier:**

- Submittal during approval stage
- Mock up installation report after MEP contractor has installed first meter
- Testing & commissioning report
- Work completion certificate
- O&M manual along with the warranty certificate.

- **BTU Metering System Preventive Maintenance: (Building owner scope)**

This is a qualitative process allowing periodic monitoring and preventive maintenance to enhance the performance and lifetime of the BTU metering system. This is essential to ensure fault early detection, quick responses to disputes and accurate bills since will be directly linked to meter readings.

- Physically checking all meters at building/s at least once a year
- Continues random checking of BTU meters with individual checking reports presented on a monthly report
- Conducting maintenance checks as per manufacturer recommendations.
- Checking meters based on read-outs errors as highlighted by read-outs report if available
- Identifying the faulty meters / items and manage replacements as per the agreed scope
- Checking BTU meter errors based on system read-outs and physically checking all BTU meters at the building/s before issuing first billing.

Section 2: Installation of BTU meters

Section 2A: Recommendations / best practices for installation & cabling of sub-meters

Sub meter hardwired integration system: Generally, the submeter hardwired integration system is installed & commissioned in the construction stage of the project. This is usually the most reliable system.

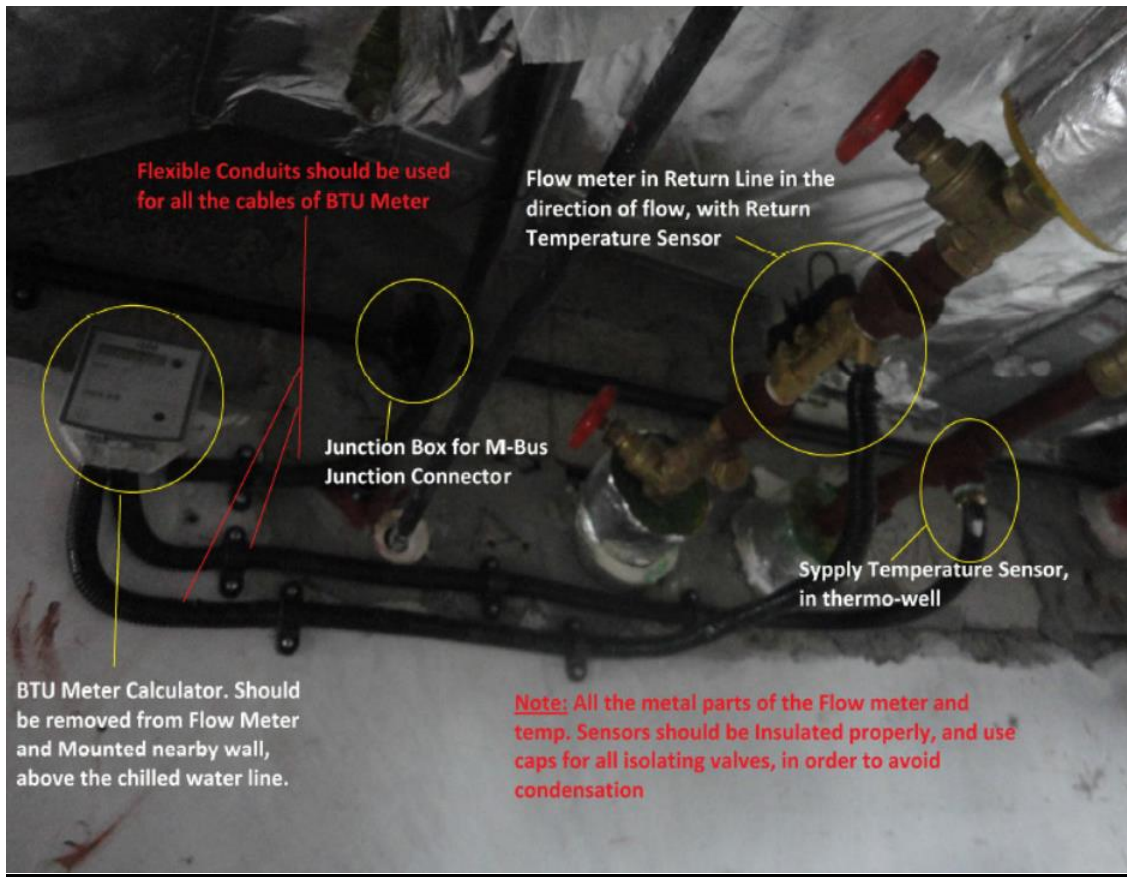
- Energy meters (BTU meters) should be installed only after chemical treatment & flushing are done. If BTU meters are exposed to chemical treatment & flushing then this will damage the meters permanently.
- It is strongly recommended to install the meters as well as valves in the common areas (in corridors). The meters & valves should never be installed inside the units (apartments, offices, shops, etc.). This is to enable proper maintenance for BTU meters & possibility of disconnection of chilled water in cases where the end user does not pay for cooling service.
- Distance between 2 isolation valves must be considered as per the requirement of the BTU Manufacturer & should be maintained to accommodate flow meter, union fittings & reducers. The flow measuring part along with union fittings & reducers must be installed between these 2 isolation valves. This is for easy maintenance & replacement reasons.
- Installation & cabling contractor should first do a mock-up & approval must be taken for this mock up from the supplier.
- Cabling contractor should use the appropriate model of Belden cable (shielded) for cabling (looping all BTU meters). Cable should be at least 3 feet away from high voltage cables; otherwise there may be interference & problems in communication. The cable should be routed through the GI/PVC conduits.
- Temperature sensors must be installed from bottom or sideways. Do not install from top of CHW pipe as this may cause condensate water to enter the thermo well causing permanent damage to temperature sensors.
- The length of sensor cables of BTU meter is fixed. Please do not make any local cuts, extensions, modification to these sensor cables. This will damage the meter permanently.

Standard specification & guidelines for sub metering of chilled water

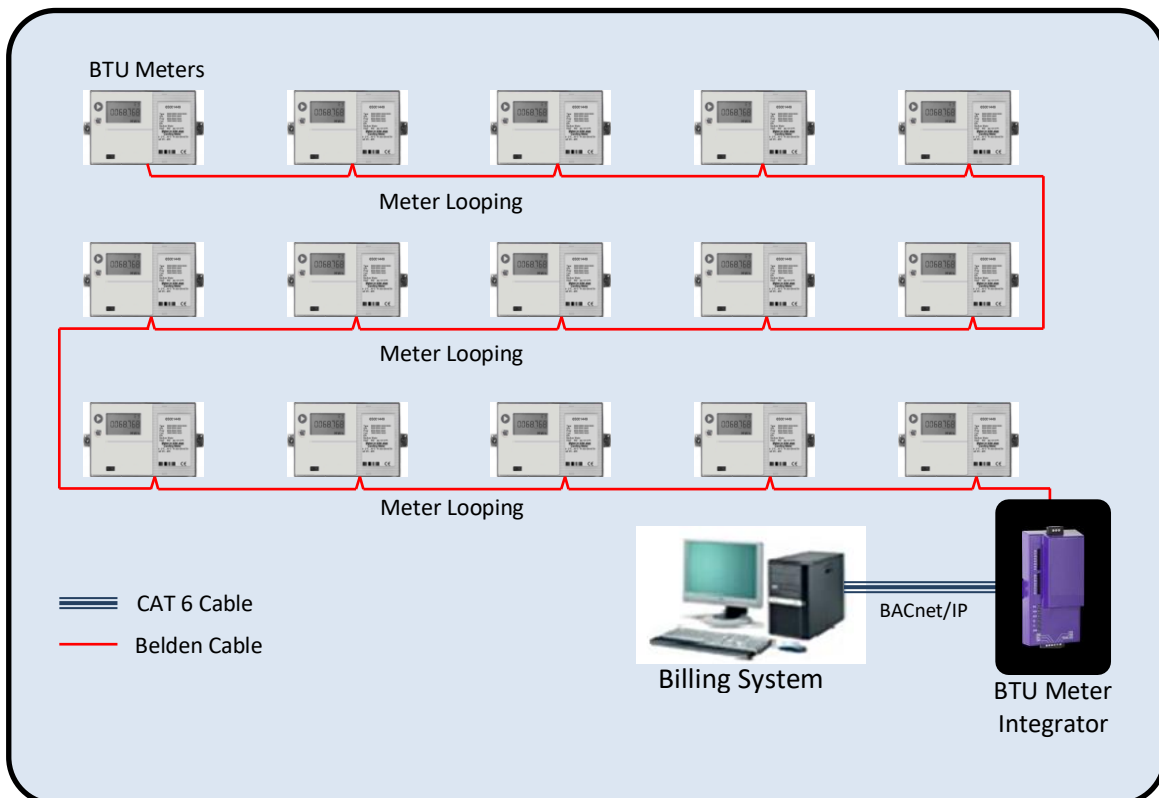


- The flow measuring tube should be installed in the chilled water return line & between two isolating valves. The direction of flow measuring tube (arrow mark) should be in the direction of the chilled water flow.
- One isolating valve should be provided in the supply line before the temperature sensor.
- Calculator should be removed from the flow meter and mounted on the nearby wall or ceiling. If calculator is installed on CHW pipe then condensate water may cause permanent damage.
- Flow measuring tube & thermo wells (Tee joints) should be insulated properly in order to avoid the damage from condensate water.
- The cables from the calculator to the flow measuring tube & to the temperature sensors should be routed through the flexible PVC conduit in order to avoid any damage
- All parts like flow measuring tube, calculator, temperature sensors and valves should be accessible for testing, commissioning, future maintenance & replacements. Accordingly the installation contractor must provide sufficiently large permanent access panels near BTU meter & valves.

Image for typical energy metering arrangement for chilled water:

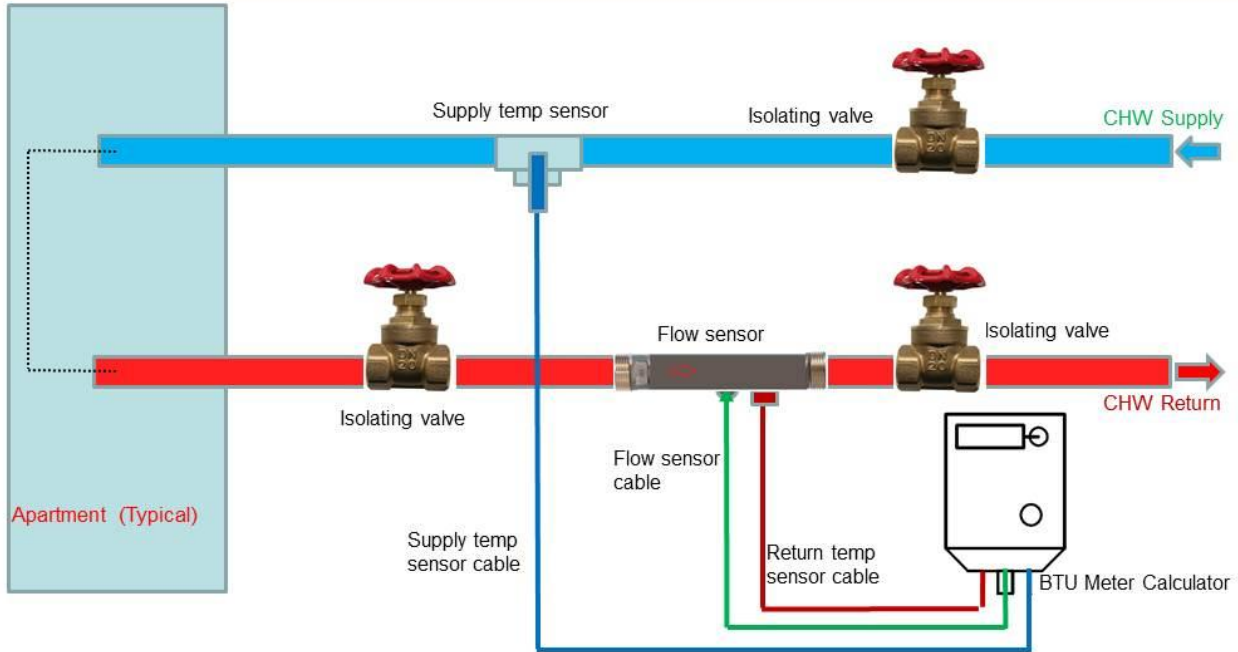


Schematic diagram of a typical system architecture of a BTU meter system



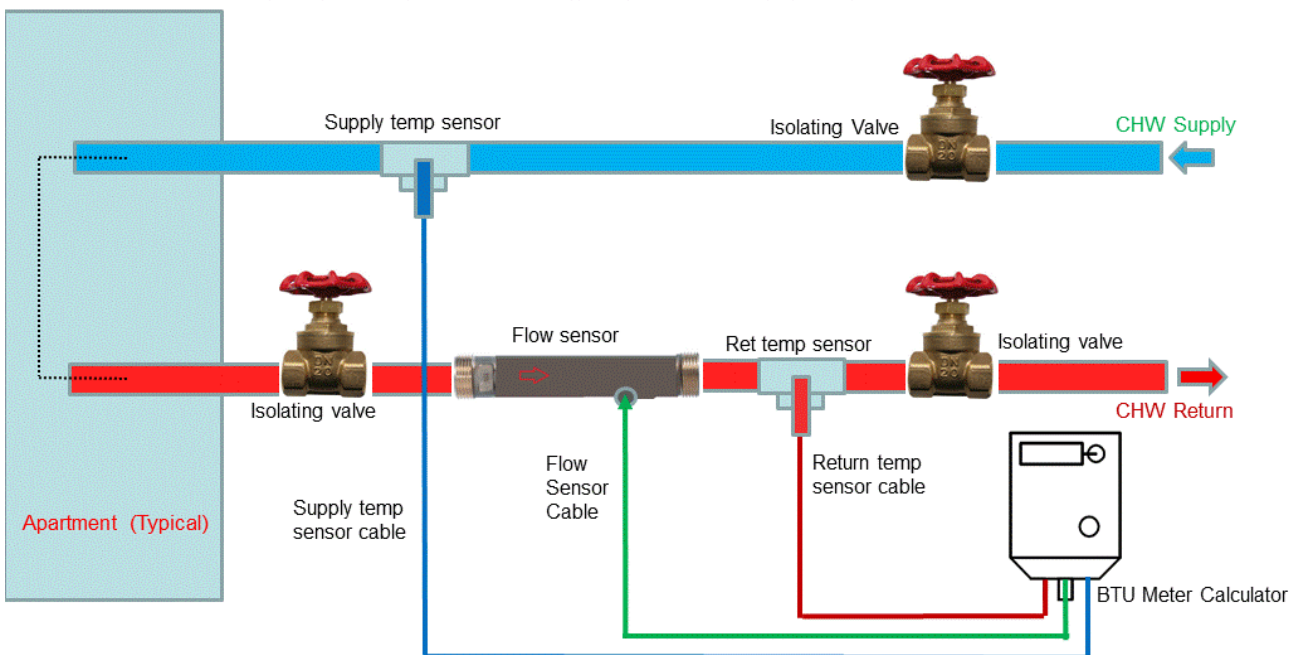
Typical connection diagram - BTU Meter - Type 1

Typical connection diagram - Type 1



Typical connection diagram - BTU Meter - Type 2

Typical connection diagram - Type 2



Section 2B: Retrofitting energy sub-meters for chilled water (where applicable)

Retrofitting refers to installation of sub-meters in existing & occupied buildings. Considering access problems & complexity of working in live (occupied) building, it is recommended that the turnkey solution should be provided by from a single source supplier. Certain activities may be outsourced but it is recommended for the nominated metering specialist to take overall responsibility by providing the full scope including supply, installation, engineering, testing & commissioning.

Inspection and design:

- Conduct complete survey of the building(s) associated with project and identify suitable locations for the installation of BTU meters.
- Conduct complete survey of all the floors in the building to identify the riser isolation valves. Thorough check should be done to identify the location of the valves, condition and the available drain points.
- Arrange to check if any spool piece is provided in the CHW lines with necessary union joints & isolation valves.
- Prepare a detailed survey report identifying the floors, flat/ office no's, meter location, obstruction from other services like PPR, duct, cable tray etc. additional access cutting required (if any).
- Identify and notify if any modifications required on the CHW lines to accommodate BTU meters.
- As far as possible the BTU meters shall be installed in the corridor area with maximum access for the meters and the valves. However this depends case by case since retrofit projects will always have some space / access constraints.
- Existing damages in the building with photographs should be immediately reported prior to commencement of work. Reports shall be maintained for future reference.
- Client must provide central stores, work space near each building & 230 V AC permanent power supply for daily work.
- During the work if found that any third party has caused any damage to the nearby equipment/ property then the same shall be highlighted immediately.
- The chilled water shutdown schedule will be mutually agreed with the client. The contractor should make sure that the schedule of work is maintained accordingly.
- Working hours to be discussed and agreed with the client.

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