UW Campus Utilities and Operations (CUO) Standards – Metering and Monitoring Summary Table – See specification sections for complete requirements – Print on legal 8.5x14 **10/30/20**

Utility Metering

System	Units	CUO Standards Spec	Primary Metering Unit	Measurement Devices and Notes - Meters/Sensors/Transmitters	Communication Method(s)	Maintenance Responsibility
Main Electrical Meter	kW, kWh, kVAR, kVARh, PF	26 27 13	1. Electro Industries – Nexus 1262 2. Electro Industries – Shark 270 with V3 Switch Pack 3. No Substitutions	Install in socket based electrical metering cabinet Electro Industries 9S4 Meter Enclosure or approved equal	Modbus TCP to Facnet via Dedicated Ethernet (CAT6)	Shop 51 High Voltage
Building Steam	N/A	N/A	No Vortex Steam Meters Allowed	Directly measuring steam flow is not acceptable as the metering does not accurately measure during low consumptions periods. **Refer to Total Building Steam Condensate** to measure steam usage.	N/A	N/A
Main/Total Building Steam Condensate (Total Building Steam Use – Includes Direct Steam Heating, Heating and/or Domestic Hot Water produced from Steam)	Pounds of Steam, Gallons, Degrees F	23 05 19.11	UW Campus Utilities Data Collection Controller	**Flow Meter:** 1. Central Station Steam Co. Cadillac CMAG[3] Magnetic Flow Meter installed loop seal/inverted trap assembly. 2. Central Station Steam Co. Cadillac CG Condensate Mass Meter (Bucket Meter) Building Mech. Engineer to choose which style of meter above **Conductivity Sensor:** Condensate up to 3": Sensorex – CS675HTTC – K=1/P1K Condensate 4" and 6": Sensorex – CS676HTTC – K=1/P1K **Conductivity Transmitter:** Sensorex – CX-105 **Temperature Transmitter RTD:** Pyromation R1T185L483-004-SL-8HN31,T-440 385U-S (0-400^{0}F) **Thermowell with Sensor:** Pyromation – S4D0408T2S Install per manufacturer's instructions and wire back to Data Collection Controller.	Data Collection Controller: Modbus TCP to Facnet via Dedicated Ethernet (CAT6) to panel Measurement Devices: Analog Temp and Cond. 4-20mA (via TSP) and Flow Accumulation Pulse Out to Data via specialized cable to Collection Controller	Shop 50 Meter Management
Central <u>Cooling</u> Water BTU (CCW)	BTU, Gallons, GPM, Degrees F	23 05 19.21	Onicon Incorporated System-10 BTU Meter	**New Construction – Flow Tube Meter Required:** 1. Onicon Incorporated – F-3100 Series **Retrofit – Insertion Meter Acceptable (with prior Campus Util. approval)** 1. Onicon Incorporated – F-3500 Series Supply and return temperature transmitters included with units. Install per manufacturers instructions and wire back to BTU meter.	Bacnet/IP to Facnet via Dedicated Ethernet (CAT6)	Shop 69 HVAC Controls
Total Building Domestic Water Consumption[6]	Cubic Feet	23 05 19.41	UW Campus Utilities Data Collection Controller	**Flow Meter:** Central Station Steam Co. Cadillac CMAG Magnetic Flow Meter w/ Integral Converter	Pulse Out to Data Collection Controller	Shop 10 Grounds & Shop 50 Meter Management
Total Building Domestic Water Consumption – Standalone (See note 6)	Cubic Feet	N/A	Onicon Incorporated D-100 Series Flow Meter Display	**New Construction – Flow Tube Meter Required:** Onicon Incorporated – F-3100 Series **Retrofit – Insertion Meter Acceptable (with prior Campus Util. approval)** Onicon Incorporated – F-3500 Series	Bacnet/IP to Facnet via Dedicated Ethernet (CAT6)	Shop 10 Grounds & Shop 50 Meter Management
Cooling Tower Make-Up (SPU Sewer Deduct)	Cubic Feet	23 05 19.31	**Up to 2"** - Badger Meter – E-Series Ultrasonic **2" and Larger** - Master Meter – Octave Ultrasonic	100W Itron ERT. The ERT must be programmed in "hard-to-read" mode. AMR signal must be read by Seattle Public Utilities along meter reading route. Provide meter to be configured with two (2) outputs – Itron ERT and 4-20ma for connection to building DDC to alarm on excess makeup.	RF via Itron ERT	Maint. Zone & Shop 50 Meter Management
Cooling Tower Blowdown/Drain (SPU Sewer Charge)	Cubic Feet	23 05 19.31	**Up to 2"** - Badger Meter – E-Series Ultrasonic **2" and Larger** - Master Meter – Octave Ultrasonic	100W Itron ERT. The ERT must be programmed in "hard-to-read" mode. AMR signal must be read by Seattle Public Utilities along meter reading route.	RF via Itron ERT	Maint. Zone & Shop 50 Meter Management
Irrigation Water (SPU Sewer Deduct)	Cubic Feet	23 05 19.31	Sensus AccuMag	100W Itron ERT. The ERT must be programmed in "hard-to-read" mode. AMR signal must be read by Seattle Public Utilities along meter reading route.	RF via Itron ERT	Shop 10 Grounds
Water submetering to chargeable accounts (domestic hot and cold)	Cubic Feet	23 05 19.41	UW Campus Utilities Data Collection Controller	**Flow Meter:** Central Station Steam Co Cadillac CMAG[3] Magnetic Flow Meter w/ Integral Converter Needs to be installed to not be incorrectly influenced by the DHW recirculation.	Pulse Out to Data Collection Controller	Maint. Zone & Shop 50 Meter Management
UW Natural Gas Service	Cubic Feet	33 51 33	UW Campus Utilities Data Collection Controller	**Up to 1.5"** - American Meter – AL-1000 or approved equal **2" and Larger**: 1. American Meter 2. Dresser Measurement	Pulse Out to Data Collection Controller	Shop 50 Meter Management
PSE Natural Gas Service	Cubic Feet	33 51 33 and PSE	Per PSE Requirements	Per PSE Requirements	Per PSE	PSE

UW Campus Utilities and Operations (CUO) Standards – Metering and Monitoring Summary Table – See specification sections for complete requirements – Print on legal 8.5x14 **10/30/20**

Sub Metering – Energy and Consumption

System	Units	CU Standards Spec	Primary Metering Unit	Measurement Devices and Notes - Meters/Sensors/Transmitters	Communication Method(s)	Maintenance Responsibility
Electrical Submeter	kW, kWh, kVAR, kVARh, PF	26 27 13.11	**Approved manufacturers and models:** 1. Electro Industries – Shark 200 with V3 Switch Pack 2. Electro Industries – Shark MP200 with V2 Switch Pack and optional Ethernet Modbus communications module. 3. Eaton – PXMP with Local Display and Energy Portal Module (Ethernet Communications/ ModbusTCP) 4. Eaton – PXM2260 5. GE – EPM 4600 with Basic Logging, Local Display and Ethernet Communications (ModbusTCP) options 6. Siemens SEM3 Branch Circuit Meter, Local Display and Ethernet Communications (ModbusTCP) options Submeter all loads at building switchboard per owner's requirements		Modbus TCP to Facnet via Dedicated Ethernet (CAT6)	Shop 51 High Voltage
Heating Hot Water Energy BTU	BTU, GPM, Degrees F	23 05 19.51	Onicon Incorporated System-10 BTU Meter	**New Construction – Flow Tube Meter Required:** Onicon Incorporated – F-3100 Series **Retrofit – Insertion Meter Acceptable (with prior Campus Util. approval)** Onicon Incorporated – F-3500 Series Supply and return temperature transmitters included with units. Install per manufacturers instructions and wire back to BTU meter.	Bacnet/IP to Facnet via Dedicated Ethernet (CAT6)	Maint. Zone
Building Domestic Hot Water Condensate Submeter (if produced from steam/hot water converter)	Pounds of Steam, Gallons, Degrees F	23 05 19.11	UW Campus Utilities Data Collection Controller	**Flow Meter:** 1. Central Station Steam Co. Cadillac CMAG^3 Magnetic Flow Tube Meter installed in loop seal/inverted trap assembly. 2. Central Station Steam Co. Cadillac CG Condensate Mass Meter (Bucket Meter) Building Mech. Engineer to choose which style of meter above **Conductivity Sensor:** Condensate up to 3": Sensorex – CS675HTTC – K=1/P1K Condensate 4" and 6": Sensorex – CS676HTTC – K=1/P1K **Conductivity Transmitter:** Sensorex – CX-105 **Temperature Transmitter & RTD:** Pyromation R1T185L483-004-SL-8HN31,T-440 385U-S (0-400^{0}F) **Thermowell with Sensor:** Pyromation – S4D0408T2S Install per manufacturer's instructions and wire back to Data Collection Controller.	Data Collection Controller: Modbus TCP to Facnet via Dedicated Ethernet (CAT6) to panel Measurement Devices: Analog Temp and Cond. 4-20mA (via TSP) and Flow Accumulation Pulse Out to Data via specialized cable to Collection Controller.	Shop 50 Meter Management
Building Domestic Hot Water Energy BTU	BTU, GPM, Degrees F	23 05 19.51	Onicon Incorporated System-10 BTU Meter	**New Construction – Flow Tube Meter Required:** Onicon Incorporated – F-3100 Series **Retrofit – Insertion Meter Acceptable (with prior Campus Util. approval)** Onicon Incorporated – F-3500 Series • Supply and return temperature transmitters included with units. Install per manufacturers instructions and wire back to BTU meter. • Needs to be installed to not be incorrectly influenced by the DHW recirculation. • May require additional BTU sub-metering if heat recovery pre-heat equipment is used (i.e. heat recovery chiller for pre-heat)	Bacnet/IP to Facnet via Dedicated Ethernet (CAT6)	Maint. Zone
Reclaimed Water – Purple Pipe (SPU Sewer Deduct)	Cubic Feet	23 05 19.31	**Up to 2"** - Badger Meter – E-Series Ultrasonic **2" and Larger** - Master Meter – Octave Ultrasonic	100W Itron ERT. The ERT must be programmed in "hard-to-read" mode. AMR signal must be read by Seattle Public Utilities along meter reading route. Provide meter to be configured with two (2) outputs – Itron ERT and 4-20ma for connection to building DDC to alarm on excess makeup.	RF via Itron ERT	Maint. Zone
Hydronic Closed Loop Makeup (Water submeter closed heating or cooling loop makeup in building)	Cubic Feet	23 05 19.41	Dual output flow meter	**Flow Meter:** Central Station Steam Co Cadillac CMAG^3 Magnetic Flow Meter w/ Integral Converter or Badger ADE Meter	RF via Itron ERT 4-20ma signal to DDC/BMS for alarming	Maint. Zone
Rainwater Collection/Harvest	Cubic Feet	23 05 19.41	UW Campus Utilities Data Collection Controller	**Flow Meter:** Central Station Steam Co Cadillac CMAG^3 Magnetic Flow Meter w/ Integral Converter	Pulse Out to Data Collection Controller	Maint. Zone
Natural Gas Submetering (UW or PSE)	Cubic Feet	33 51 33	UW Campus Utilities Data Collection Controller	Must be reviewed based on proposed application. Contact Campus Utilities to determine specific meter.	Pulse Out to Data Collection Controller	Maint. Zone

General Notes:

1. SPU deduct meter requirement subject to change. Obtain SPU meter-deduction acceptance prior to purchase of meter(s) listed above
2. All meters must be installed with a full-size bypass to allow for routine maintenance
3. Central Station Steam Co. EMAG may be substituted for CMAG provided that upstream/downstream straight pipe requirements are met. Submittal must include piping shop drawing in order for Campus Utilities to approve.
4. All cabling to be Belden 88760 or equal, unless otherwise noted
5. Perform all integration and commissioning per 23 08 00.11 – Mechanical Meter Integration and Commissioning
6. For buildings that do not have central steam service or natural gas services (and thus no Data Collection Controller), contact Campus Utilities and Operations for alternative metering options for limited utility services