

## UV INFLUENT PUMPING DESIGN AND OPERATING DESCRIPTION

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### 1. INTRODUCTION

- .1 Pumps and related electrical systems are City supplied. The Contractor shall be responsible for supplying, installing, and Commissioning of the pump control systems.
- .2 Secondary Effluent (SE) leaves the clarifiers via a pair of rectangular conduits. Up to 400 ML/d of the flow is diverted to one conduit only at the Primary Effluent Bypass Junction structure. The flow is conveyed in this single conduit for approximately 150 m to the existing Effluent Gate Chamber (EGC).
- .3 SE enters a new channel connected to the future outfall connection of the EGC. The new channel terminates in a deep section which serves as a pump intake sump. Five (5) laterals convey flow to five (5) vertically mounted axial flow propeller pumps mounted in individual "cans". The pumps discharge into individual boxes set higher than the receiving channel water level, providing a passive backflow protection, with no need for valves or flapgates.
- .4 The SE flows down a channel and is distributed into the three (3) UV Reactor Channels.

### 2. DESIGN

#### 2.1 Description

- .1 SE flows through a channel to a structure where five (5) submersible axial flow propeller pumps are installed in vertical draft tubes. The pumps are removable with an overhead crane for repair, maintenance, and replacement.
- .2 Because flows vary throughout the day, the pumps are equipped with variable frequency drives (VFDs). The pump(s) speed modulates to maintain a relatively constant level in the intake sump between the minimum submergence and overflow levels.
- .3 There are five (5) pumps, each sized to pump approximately one-fifth (1/5) of the maximum flow. No standby pump is installed; a sixth unit will be available on the shelf. Because the pumps are relatively easy to remove and install, this reduces the size of the pump intake and discharge structure by approximately 20%.
- .4 Each pump will pump between 42 ML/d and 86 ML/d at a static head of 6 to 6.5 m
- .5 The pumps will be restricted to a maximum combined flow of approximately 410 ML/d. Flow in excess of this amount will be allowed to back up into the Primary Effluent (PE) Channel and spill over the PE bypass weirs directly into the outfall conduit.

#### 2.2 Design Criteria

- .1 Five (5) pumps will be installed at this stage, each sized to accommodate 100% of the minimum flow to 20% of the maximum flow (approximately). Each pump will be variable speed. The level in the wetwell (SE channel) will control the speed of the pumps between their minimum and maximum pumping rates. Signals from level sensor(s) in the intake control the pump speed to maintain the set level.

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- .2 The water depth will be maintained at between 226.12 m ASL (above sea level) (4.3 m above plant datum) to provide at least 1,800 mm above the centre line of the pump intake lateral, and a maximum water level of 226.62 m ASL (4.8 m above plant datum).
- .1 Main Inlet Channel Invert: 225.478 m ASL / 3.658 m APD (above plant datum)
  - .2 Pump Intake Channel and Pipe Invert: 223.72 m ASL / 1.900 m APD
  - .3 Pump Intake Pipe Centre Line: 224.32 m ASL / 2.5 m APD
  - .4 Normal LWL (low water level): 226.12 m ASL / 4.3 m APD
  - .5 Normal Operating Water Level: 226.37 / 4.55 m APD
  - .6 Normal HWL (high water level): 226.62 ASL / 4.8 m APD
  - .7 Pump Shut-off Level: 225.82 / 4.0 m APD
  - .8 Overflow Level: 227.12 m ASL / 5.3 m APD
- .3 As the influent flow increases and the water level in the channel rises, the pumps' speeds will increase to prevent SE from rising above HWL (26.62 m), and spilling over the UV bypass weir (227.12 m). At flows less than or equal to 430 ML/d, the pumps turn on and off or speed up and slow down to maintain the water level between the minimum submergence level and the maximum water level.
- .4 Flow into the secondary treatment system will be restricted to 380 ML/d at the inlet to the existing High Purity Oxygen (HPO) reactors. Excess flow will overflow at the PE bypass structure. The influent control at the HPO reactors is not precise, and allowance is made for the pumps and UV structure to hydraulically accommodate up to 430 ML/d. Under normal circumstances, the flow into the pump intake will not exceed 380 ML/d.
- .5 Each pump is mounted in a 1,000 mm diameter vertical tube, which discharges vertically into individual discharge boxes set approximately 500 mm above HWL in the receiving channel, preventing backflow when a pump is not operating.

**2.3 Design Data**

Description	Units	Design Value
Duty		5
Standby		1 (on shelf)
Capacity (maximum, each)	L/s	995
Capacity (minimum, each)	L/s	486
Discharge tube diameter	mm	1,000 maximum
TDH	m	6-0 - 6.5
Power, each	kW	127 maximum
Firm capacity total	ML/d	410 – 430 (APPROX)
Minimum Submergence	m	1.800
Wetwell (SE channel) floor invert	m	223.42

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<b>Description</b>	<b>Units</b>	<b>Design Value</b>
Pump Intake Pipe Centre Line	m	224.32
Minimum water level at pump intake	m	226.12
Bypass weir elevation	m	227.12
Maximum water level	m	226.62
High High alarm level (bypass occurring)	m	227.12
High alarm (bypass imminent)	m	226.82
Minimum water level (pump stop)	m	225.82

**2.4 Arrangement**

- .1 The pump inlet channel abuts the eastern side of the EGC structure. The PE enters a deeper section of channel, and is withdrawn to the pumps by five (5) 1,200 mm diameter laterals [one (1) per pump].
- .2 The five (5) pumps are mounted in individual "cans" and discharge tubes which discharge to a channel upstream of the UV reactors.
- .3 The UV system is sized for a peak flow of 380 ML/d (disinfection capacity) and approximately 430 ML/d (hydraulic capacity). The pumps installed at this stage will be sized to convey approximately 410 - 430 ML/d.

**2.5 Other Disciplines**

- .1 Structural/Building Services
  - .1 The floor of the pump intake area is at an elevation to provide an overall minimum submergences.
  - .2 The length and width of the pump intake area meets the minimum requirements to optimize flow conditions through each pump.
  - .3 The enclosure over the pump structure provides adequate access to allow the pumps to be removed by crane or hoist.
  - .4 Each pump weighs approximately 1,700 kg; the can and discharge tube assembly is estimated to weigh 11,000 kg.
- .2 Mechanical
  - .1 The pump structure is an enclosed underground structure and does not require general ventilation.

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.3 Electrical

- .1 The electrical room and electrical service is sized for the major items of equipment installed summarized in the following table.

Description	Tag	Full Load (kW)*
UV Influent Pump 1	U010-P1	100 – 130
UV Influent Pump 2	U020-P1	100 – 130
UV Influent Pump 3	U030-P1	100 – 130
UV Influent Pump 4	U040-P1	100 – 130
UV Influent Pump 5	U050-P1	100 – 130
TOTAL PUMP LOAD		
* Load dependent on manufacturer/pump model		

**3. OPERATING DESCRIPTIONS**

**3.1 Control Devices**

Description	Location	Number	Function
U010-VFD1	Central	1	Match pump 1 output to inflow, up to 995 L/s
U020-VFD2	Central	1	Match pump 2 output to inflow, up to 995 L/s
U030-VFD3	Central	1	Match pump 3 output to inflow, up to 995 L/s
U040-VFD4	Central	1	Match pump 4 output to inflow, up to 995 L/s
U050-VFD5	Central	1	Match pump 5 output to inflow, up to 995 L/s
U005-LE U005-LIT UA005-LT	Local  DCS	1	Controls pump VFDs to maintain wetwell water level
U060-FT U060-FIT U060-FT	Local  PLC	1	Measure flow by depth over inlet weirs
U170-LE U170-LIT U170-LT	Local  PLC	1	Water Depth at UV Channel 1 outlet
U270-LE U270-LIT U270-LT	Local  PLC	1	Water Depth at UV Channel 2 outlet
U370-LE U370-LIT U370-LT	Local  PLC	1	Water Depth at UV Channel 3 outlet
U102-ZSB	Local		UV outlet weir gate closed
U102-ZSD	Local		UV outlet weir gate open
U102-ZIT	Local		UV outlet weir gate position
U102-HS1/HS2/HS3	Local		UV outlet weir gate Local/Remote Open/Close
U202-ZSB	Local		UV outlet weir gate closed
U202-ZSD	Local		UV outlet weir gate open
U202-ZIT	Local		UV outlet weir gate position
U202-HS1/HS2/HS3	Local		UV outlet weir gate Local/Remote Open/Close
U302-ZSB	Local		UV outlet weir gate closed
U302-ZSD	Local		UV outlet weir gate open

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<b>Description</b>	<b>Location</b>	<b>Number</b>	<b>Function</b>
U302-ZIT	Local		UV outlet weir gate position
U302-HS1/HS2/HS3	Local		UV outlet weir gate Local/Remote Open/Close
Off/On Switch	Central	5	Turn pumps on and off from central control
HOA Switch	Local	5	Turn pumps control from central (AUTO) to OFF to local (HAND)
Start/Stop	Local	5	Start and stop pumps in local control mode

**3.2 Normal**

.1 Automatic (local HOA selector switch in AUTO)

- .1 The pumps maintain a relatively constant liquid level in the wetwell and generally pump the SE at the same rate as it arrives from the secondary clarifiers.
- .2 During normal operation all five (5) pumps will be available for operation, and will run, depending on the flow. The lead and lag pump roles will alternate.
- .3 All five (5) pumps are placed in AUTO mode at the local panel and ON at the central control system.
- .4 The speed of the pumps and the number of pumps in operation is controlled by the level in the inlet. One (1) to five (5) pumps normally run continuously, unless the water level falls below the minimum operating level and approaches the level corresponding to the minimum submergence requirement. If this occurs while the pump(s) is/are running at minimum speed, it/they will shut down.

.1 Water levels used for pump control are as follows:

- .1 225.82 m (4.0 m): Minimum Pump Submergence Level; operating pumps begin to shut off as this level is reached
- .2 226.12 m (4.3 m): Minimum Recommended Intake Water Level, or Normal Low Water Level (NLWL): approximate normal operating level with operating pump(s) running at minimum speed (operating pumps will adjust speed to maintain this level)
- .3 226.37 m (4.5 m): Average Water Level: Pumps will operate to maintain this water level.
- .4 226.62 m (4.8 m): Normal High Water Level (NHWL): Operating pump(s) will speed up if they are running at less than maximum speed if this level cannot be maintained
- .5 226.82 m (5.0 m): High Level Alarm: Information alarm which indicates operating pumps are running at full capacity with net positive inflow into the inlet channel. Next pump, if available will start. If all pumps are running at

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maximum speed (> 380 ML/d combined) the water level will be allowed to rise to overflow 227.12 m (5.3 m).

- .6 227.02 m (5.2 m): Overflow Imminent Alarm. If all pumps are operating at maximum speed (> 380 ML/d combined) the water level will be allowed to rise to overflow 227.12 m (5.3 m).
- .7 227.12 m (5.3 m): Overflow weir level
- .2 At effluent flows between 85 and 170 ML/d, two (2) pumps will run; water level should be maintained at or below 226.37 m (4.55). If influent flow drops below the minimum pumping rate of 42 ML/d per pump while the two (2) pumps are at minimum speed, the water level will drop. One (1) pump will shut off in this event. If the inflow is less than 42 ML/d, the last operating pump will shut off when the water level drops to the shutoff level.
- .3 As flows increase, the increase in water level will cause additional pumps to start. All operating pumps will be controlled to run at the same speed.
- .5 High Level Alarm is 226.82 m. There are three (3) possible responses to this condition:
  - .1 If five (5) pumps are running at maximum speed: Normally, as it is permissible to bypass the UV process when flows exceed 380 ML/d, this high level alarm is an “information alarm” only, indicating that bypass of the UV influent pumps is about to occur; the pumps will not speed up past their combined imposed limit of 410 to 430 ML/d. The flow into the pump intakes should not exceed this under normal conditions as the flow is restricted to 380 ML/d at a remote point upstream.
  - .2 All running pumps should be running at maximum speed if the water rises to this level. If, however, the pumps are not running at maximum speed, the pumps will speed up, and the next duty pump (if four (4) or fewer pumps are operating) will start to prevent overflow into the bypass, up to their combined imposed limit of 410 ML/d.
  - .3 If High Level Alarm occurs in conjunction with another alarm that indicates failure or malfunction of a pump, another pump will be started if available.
- .6 High High alarm 227.02 m (bypass to outfall is imminent). There are three (3) possible responses to this condition:
  - .1 If five (5) pumps are running at maximum speed: Normally, as it is permissible to bypass the UV process when flows exceed 380 ML/d, this alarm is an “information alarm” only, indicating that bypass of the UV is occurring; the pumps will not speed up past their combined imposed limit of 410 ML/d.
  - .2 All running pumps should be running at maximum speed if the water rises to this level. If, however, the pumps are not running at maximum speed, the pumps will speed up, and the next duty pump (if four (4) or fewer pumps are operating) will start in an attempt to prevent overflow into the bypass, up to their combined imposed limit of 410 – 430 ML/d.

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- .3 If High level alarm occurs in conjunction with another alarm that indicates failure or malfunction of a pump (at flows less than 330 ML/d), another pump will be started if available.
- .7 Low level alarm is 225.82 m (approximately minimum required pump submergence, indicating pump shutdown is imminent). The pumps will continue to run, but will slow down to try to maintain the water level at this elevation. If the water level drops with all running pumps at minimum speed, they will shut down one by one, until no pumps are in operation.
- .8 The lead pump will restart first when the influent level rises above 226.12 m after all pumps have been shut down. The lead pump duty will be cycled among all five pumps.
- .9 The number of pumps running, and the speed at which they are running, is controlled to maintain a relatively constant level in the wetwell (SE channel) at about 226.37 m.
- .10 The level transmitter (U-005) measures the water level in the wetwell. The signal is sent to the control system, which uses the setpoints for start, stop, speed control, and alarms for the pumps.
- .11 Motor status and HOA status of each pump are output to the Computer Control System.
- .2 Manual (Local HOA selector switch in HAND, and start/stop button on START)
  - .1 Each pump that is in MANUAL will run continuously, regardless of the level in the wetwell (PE channel) or signal from the flow meter, until it is shut off (start/stop button on STOP or HOA placed in OFF or AUTO).
  - .2 The pump will run at the speed set manually at the VFD keypad.
- .3 Automatic Startup
  - .1 To start the pumps, place the HOA on AUTO. The DCS will confirm that all control inputs (wetwell levels, flow signals, speed controllers etc) are functional. Ensure the suction and discharge structures are unobstructed. The pumps will start and vary their speed automatically in response to the level in the wetwell.
  - .2 Normally, two (2) pumps will operate in tandem until flow exceeds 170 ML/d. When this occurs, levels in the influent well increase, causing a third pump to start. The lead pumps will slow down, and all operating pumps will run at the same speed. Above 250 ML/d, water level increases again, and a fourth pump starts. All running pumps ramp down and match speed to pump the incoming wastewater. If the inflow exceeds 330 ML/d, the water level increases again and the fifth pump starts. Again, all operating pumps ramp down to match each other's speed. All pumps then ramp up to match inflow if it increases beyond this point. At 410 ML/d, all five (5) pumps should be running at maximum speed. Higher flows should not occur as the flow into the upstream process is limited to 380 ML/d. In the event higher flows do enter the influent channel, overflow to the bypass will occur
  - .3 The pumps alternate lead/lag/standby roles.

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- .4 Automatic Shutdown
  - .1 From the central control system, any pump can be stopped by the operator by placing it in an OFF status.
  - .2 From the local panel, placing any pump local HOA selector switch in OFF stops the pump from operating regardless of other conditions.
  - .3 In AUTO, the pumps automatically shut down in sequence; the LEAD pump continues to run while the LAG pumps shut down in sequence. When inflow falls below 100 ML/d, only the lead pump should remain in operation.

### 3.3 Adverse Conditions

- .1 Low Flows: When the minimum capacity of a single pump exceeds the SE flow, water level in the intake structure will fall. The pump will stop if the interval of low flow is sufficient to decrease the water level to the shut off level of 225.82 m (4.0 m). The pump will restart when the water level rises to 226.37 m (4.55 m).
- .2 High flows: When flow exceeds the capacity of each individual pump, water level in the intake structure will rise, and the pumps will start/stop or speed up/slow down in response, as described above in 3.2.3.2.
- .3 Extreme flows: When the influent to the Works exceeds the design capacity of the five (5) duty pumps (410 – 430 ML/d), the five (5) pumps will run continuously at the speed required to convey their maximum capacity, and excess flows will be allowed to spill over the PE bypass weir (approximately 150 m upstream of the EGC) directly to the outfall.
- .4 One (1) unit out of service: The facility is not designed to allow a pump to be taken out of service at any one time under maximum anticipated flow conditions. However, under most conditions, only four duty pumps will be required. In the event a pump needs to be serviced, it should be removed and replaced and the shelf spare installed in its place.

### 3.4 Complete Pump System Failure

- .1 Two power supplies to the pumps minimizes the risk of the concurrent failure of all five pumps. However, the loss of one power supply will necessitate a manual changeover to the standby supply. All pumps will be off in the interim period until the switchover can be performed, and a short period of bypassing will occur.
- .2 In the event of a *localized* catastrophic event that compromises both the normal and back-up power supplies which causes the pump station to shut down, *independently of the entire plant*, it will no longer be possible to disinfect. However, flow will still be entering the plant and the pump station and UV system will need to be bypassed.
- .3 Due to hydraulic constraints, it is not possible to passively overflow the peak flow through the existing system. Without pumping, the capacity of the single Secondary Conduit falls from 400 ML/d to approximately 275 ML/d.



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- .4 If the flow is less than 250 ML/d, and the pumps fail, the condition will trigger a signal to restrict plant inflow at the Influent Pumps to 250 ML/d. The overflow weir at the pump intake will allow approximately 250 ML/d to overflow. The hydraulic gradeline in the SE conduit will increase approximately 500 mm, but at this flow and below, the secondary clarifier discharges should remain free.
- .5 If the plant flow is greater than 250 ML/d, the Influent Pumps will also be slowed, but the effect on SE flows will not be immediate. The south secondary effluent conduit (SSECon) needs to be opened, and relatively quickly as there is minimal storage available in the SE Conduit system (approx 275,000 L under best conditions). An actuator (independent power source from the UV Pumps) will open the gate automatically (at lower flows the gate will not open automatically, but will open on active intervention of a human operator).
- .6 In the event of a plant-wide power failure, the need to bypass is eliminated as no flow is entering the plant due to shut down of the influent pumps.

**END OF SECTION**

**LIST OF SCHEDULES**

**1.1 Air Handling Unit Schedule**

<b>Tag</b>	<b>U-410-AHU-1</b>		<b>U-420-AHU-1</b>
Location	Mechanical Mezzanine		UV Room 105
Area Served	Electrical Room 103		UV Room 105
Type	Draw Through		Draw Through
Manufacturer	Haakon		McQuay
Model	CUSTOM		CAH012FDAC
<b>Supply Fan</b>			
Tag	U-416-SF	U-417-SF	U-424-SF
Volume – l/s (cfm)	4720 (10,000)	6,135 (13,000)	2,600 (5,500)
ESP – Pa (in.wg.)	300 (1.2)	300 (1.2)	275 (1.1)
Fan Type	20" DWDI-AF	24" DWDI-AF	<b>15" FC</b>
Fan Speed rpm	1931	1499	<b>1034</b>
Motor Power – kW (hp)	11.2 (15)	14.9 (20)	3.7 (5)
Power Supply	575/3/60	575/3/60	575/3/60
<b>Return Fan</b>			
Tag	U-411-RF	U-412-RF	U-421-RF
Volume – l/s (cfm)	4,720 (10,000)	6,135 (13,000)	2600 (5500)
ESP – Pa (in.wg.)	200 (0.8)	200 (0.8)	175 (0.7)
Fan Type	22" DWDI-AF	24" DWDI-AF	<b>15" FC</b>
Fan Speed (rpm)	1276	1199	<b>743</b>
Motor Power – kW (hp)	7.5	10	<b>2.2 (3)</b>
Power Supply	575/3/60	575/3/60	575/3/60
Minimum Outdoor Air (cfm)	100	100	250
<b>Air Blender</b>			
Performance			<b>70%</b>
Air Pressure Drop – Pa (in wg)			<b>62 (0.25)</b>
<b>Heating Coil</b>			
Tag			U-420-HC
Heating Cap. – kW (MBH)			56.2 (192)
Fluid			30% E.G.
Flow Rate – l/s (usgpm)			2.60 (41.2)
Water ΔP – kPa (ft Hd)			15.8 (5.3)
EWT - °C (°F)			29.4 (85)
LWT - °C (°F)			23.7 (74.9)
Entering Air Temp. – °F (°C)			30 (-1.1)
Leaving Air Temp – °F (°C)			62.9 (17)
<b>Cooling Coil</b>			
Tag	U-416-CC	U-417-CC	U-420-CC
Size, H x L in(mm)	2 @ 36x40	2 @ 36x52	33x53
Face Area ft <sup>2</sup> (m <sup>2</sup> )	2 @ 10 (2 @ 0.93)	2 @ 13 (2 @ 1.21)	12.15 (1.13)
Rows / FPI	6/11	6/11	3/8
Face Velocity fpm	500	500	453
Water side P.D. ft Hd(kPa)	4.3 (12.8)	5.4 (16.1)	1.8 (5.4)
Flow rate l/s (gpm)	2.76 l/s x2 (34.6x2)	2.91x2 (46.1x2)	0.98 (15.6)
EAT DB/WB °F(°C)	80/67 (26.7/19.4)	80/67 (26.7/19.4)	80/67 (26.7/19.4)
LAT DB/WB °F(°C)	55.4/55.2 (13.0/12.9)	56/55.7 (13.3/13.2)	67.5/63.0 (19.7/17.2)
EWT °F (°C)	44	44	46.5 (8.1)
LWT °F (°C)	55.4	54.7	56.6 (13.7)
Fluid	30% E.G.	30% E.G.	
<b>Physical Data</b>			
Overall Length mm(in)	7170 (282)	<b>6000 (236)</b>	
Overall Width mm(in)	3130 (123)	1680 (66)	
Overall Height mm(in)	3010 (118)	1070 (42)	
Overall Weight kg (lb)	7730 (17050)	1590 (3500)	

Power Cable List

CABLE SCHEDULE							Rev
CABLE NUMBER	CABLE TYPE	CABLE ROUTING	ORIGIN	DESTINATION	DESCRIPTION	REMARKS	
<b>POWER CABLES</b>							
P001	66kV	Overhead/under ground	Hydro Fused Disconnect	Transformer PDT-1	<b>Contractor to confirm cable type and sized with Manitoba Hydro</b>		1
P002A,B & C	3-3/C 350MCM external 4/0 Ground	Underground Concrete Duct	Transformer PDT-1	Breaker 52-L1 UV Bldg.	8kV TRXLPE Power	Pirelli Cable 375A per cable	0
P003A & B	2-3/C 500MCM Plus External 4/0 Ground	Existing Duct Git Building Tray in Exting pipe Gallery Tray in Admin. Bldg. Underground PVC Duct Via Manhole 1 and 2	Grit Bldg. Distribution New 5kV Breaker	Breaker 52-L2 UV Bldg.	8kV TRXLPE Armortek	Pirelli Cable 535A per cable	0
P004	2-3/C 350MCM Plus Ground	Cable Tray T001	5kV Breaker 52-UVT2	Transformer UVT-2	8kV TRLPE Armortek	Pirelli Cable 435A per cable	0
P005	2-3/C 350MCM Plus Ground	Cable Tray T001	5kV Breaker 52-UVT3	Transformer UVT-3	8kV TRLPE Armortek	Pirelli Cable 435A per cable	0
P006	3/C #2/0 Plus Ground	Cable Tray T002, T004	5kV Breaker 52-LST4	Transfomer LST-4	8kV TRLPE Armortek	Pirelli Cable 245A per cable	0
P007	3/C #2/0 Plus Ground	Cable Tray T002, T003	5kV Breaker 52-LST5	Transformer LST-5	8kV TRLPE Armortek	Pirelli Cable 245A per cable	0
P008	5000 Amp Bus Duct, 100% GRD, 200% Neutral		Transformer UVT-2	Breaker 480-B1	600V/3Ø/4 Wire		0
P009	5000 Amp Bus Duct, 100% GRD, 200% Neutral		Transformer UVT-3	Breaker 480-B2	600V/3Ø/4 Wire		0
P010	1600 Amp Bus Duct, 100% GRD		Transformer LST-4	Breaker 600-B1	600V/3Ø/3 Wire		0
P011	1600 Amp Bus Duct, 100% GRD		Transformer LST-5	Breaker 600-B2	600V/3Ø/3 Wire		0
P012	3-4/C 350MCM, 100% GRD, 200% Neutral	Cable Tray T009	Breaker 480-B8 UV Distribution	Trojan PDC-3B	1kV R90 Teck		0
P013	3-4/C 350MCM, 100% GRD, 200% Neutral	Cable Tray T009	Breaker 480-B7 UV Distribution	Trojan PDC-2B	1kV R90 Teck		0
P014	3-4/C 350MCM, 100% GRD, 200% Neutral	Cable Tray T009	Breaker 480-B6 UV Distribution	Trojan PDC-1B	1kV R90 Teck		0
P015	3-4/C 350MCM, 100% GRD, 200% Neutral	Cable Tray T008	Breaker 480-B5 UV Distribution	Trojan PDC-3A	1kV R90 Teck		0
P016	3-4/C 350MCM, 100% GRD, 200% Neutral	Cable Tray T008	Breaker 480-B4 UV Distribution	Trojan PDC-2A	1kV R90 Teck		0
P017	3-4/C 350MCM, 100% GRD, 200% Neutral	Cable Tray T008	Breaker 480-B3 UV Distribution	Trojan PDC-1A	1kV R90 Teck		0
P018	1-3/C 4/0 plus GRD	Cable Tray T010, T011	Breaker 600-B3	Harmonic Filter U-050-HF-P5	1kV R90 Teck		0
P019	1-3/C 4/0 plus GRD	Cable Tray T010, T012	Breaker 600-B4	Harmonic Filter U-040-HF-P4	1kV R90 Teck		0
P020	1-3/C 4/0 plus GRD	Cable Tray T010, T012	Breaker 600-B5	Harmonic Filter U-030-HF-P3	1kV R90 Teck		0
P021	1-3/C 4/0 plus GRD	Cable Tray T013	Breaker 600-B6	Harmonic Filter U-020-HF-P2	1kV R90 Teck		0
P022	1-3/C 4/0 plus GRD	Cable Tray T013	Breaker 600-B7	Harmonic Filter U-010-HF-P1	1kV R90 Teck		0
P023	1-3/C 4/0 plus GRD		Harmonic Filter U-050-HF-P5	U-050-VFD-P5	1kV R90 Teck		0
P024	1-3/C 4/0 plus GRD		Harmonic Filter U-040-HF-P4	U-040-VFD-P4	1kV R90 Teck		0
P025	1-3/C 4/0 plus GRD		Harmonic Filter U-030-HF-P3	U-030-VFD-P3	1kV R90 Teck		0
P026	1-3/C 4/0 plus GRD		Harmonic Filter U-020-HF-P2	U-020-VFD-P2	1kV R90 Teck		0
P027	1-3/C 4/0 plus GRD		Harmonic Filter U-010-HF-P1	U-010-VFD-P1	1kV R90 Teck		0
P028	1-3/C 4/0 plus GRD	Cable Tray T005, T007	U-050-VFD-P5	Disconnect Cabinet P-5	1kV R90 Teck		0
P029	1-3/C 4/0 plus GRD	Cable Tray T005, T007	U-040-VFD-P4	Disconnect Cabinet P-4	1kV R90 Teck		0
P030	1-3/C 4/0 plus GRD	Cable Tray T005, T007	U-030-VFD-P3	Disconnect Cabinet P-3	1kV R90 Teck		0
P031	1-3/C 4/0 plus GRD	Cable Tray T006,T007	U-020-VFD-P2	Disconnect Cabinet P-2	1kV R90 Teck		0
P032	1-3/C 4/0 plus GRD	Cable Tray T006,T007	U-010-VFD-P1	Disconnect Cabinet P-1	1kV R90 Teck		0
P033	Pump Supplier Cable		Disconnect Cabinet P-5	Pump U-050-P5		Cable supplied with pumps. Connect to associated disconnect cabinet.	0
P034	Pump Supplier Cable		Disconnect Cabinet P-4	Pump U-040-P4			0
P035	Pump Supplier Cable		Disconnect Cabinet P-3	Pump U-030-P3			0
P036	Pump Supplier Cable		Disconnect Cabinet P-2	Pump U-020-P2			0
P037	Pump Supplier Cable		Disconnect Cabinet P-1	Pump U-010-P1			0
P038	1-3/C 350MCM	Cable Tray T008	Breaker 600-B8	CDP 100	1kV R90 Teck		0
P039	1-3/C #2		CDP 100	Transformer DT-6	1kV R90 Teck		0
P040	1-4/C 250MCM		Transfomer DT-6	Panel A	1kV R90 Teck	0	
P041	4#2 R90	Conduit	Panel A	Panel B	600V R90	0	
P042	3#4 R90 Plus Ground	Direct Buried	Panel A	Panel C	600V R90 Teck	0	
P043	3/C #12 Teck Cable	Existing tray/Direct Buried	ExistingMCC1G Grit Bldg	U-002 SG-1	600V R90 Teck		1
P044	3/C #12 Teck Cable	Cable Tray T009	Panel 100	U-102-WG-1	600V R90 Teck		1
P045	3/C #12 Teck Cable	Cable Tray T009	Panel 100	U-202-WG-1	600V R90 Teck		1
P046	3/C #12 Teck Cable	Cable Tray T009	Panel 100	U-303-WG-1	600V R90 Teck		1

CONTROL CABLE LIST

CABLE SCHEDULE							
CABLE NUMBER	CABLE TYPE	CABLE ROUTING	ORIGIN	DESTINATION	DESCRIPTION	REMARKS	Rev
<b>Note: Teck cables may be used instead of complete installation in conduit if the equipment is located close to cable trays.</b>							
CCTV-001	RG-59 Coaxial	Conduit as required	CCTV Camera 001	UV Control Panel UV CP1	Camera Video	Refer to CI1.01	0
UV CP1-001	Fibre Multimode	C013,C025,C037	UV Control Panel UV CP1 Trans	PCWC Receiver	Camera Video	Refer to CI1.01	1
CCTV-002	RG-59 Coaxial	Conduit as required	CCTV Camera 002	UV Control Panel UV CP1	Camera Video	Refer to CI1.01	0
UV CP1-001	Fibre Multimode	C013,C025,C037	UV Control Panel UV CP1 Trans	PCWC Receiver	Camera Video	Refer to CI1.01	1
CCTV-003	RG-59 Coaxial	Conduit as required	CCTV Camera 003	UV Control Panel UV CP1	Camera Video	Refer to CI1.01	0
UV CP1-001	Fibre Multimode	C013,C025,C037	UV Control Panel UV CP1 Trans	PCWC Receiver	Camera Video	Refer to CI1.01	1
CCTV-004	RG-59 Coaxial	Conduit as required	CCTV Camera 004	UV Control Panel UV CP1	Camera Video	Refer to CI1.01	0
UV CP1-001	Fibre Multimode	C013,C025,C037	UV Control Panel UV CP1 Trans	PCWC Receiver	Camera Video	Refer to CI1.01	1
PCV-001	Category 5	Conduit as required	UV PCV Operator Workstation	UV Control Panel UV CP1	PCV Ethernet network cable	Refer to CI1.01	0
SCC-001	Category 5	Conduit as required	UV SCC	UV Control Panel UV CP1	PLC Communication to DCS	Refer to CI1.01	0
U002-1	15/C #14 Teck Cable	UG to Grit Bldg, cable tray in Bldg	U002-HS1,HS2,HS3,ZSD,ZSB	Grit Building Control Center	U-002 SG-1	Refer to CP1.04, ILD-01	0
U002-2	7/C#14		Grit Building Control Center	DCS Panel	U-002 SG-1	Refer to CP1.04, ILD-01	1
U002-3	7/C#14		U002-HS1,HS2,HS3,ZSD,ZSB	U-002 SG-1	U-002 SG-1	Refer to CP1.04, ILD-01	1
U005-1	1/PR/TW/SH Belden 8760	UG to UV Bdg, cable tray to UVCP1	U005-LIT	UV Control Panel UV CP1	Level Control	Refer to CP1.04, ILD-02	0
U005-2	4/C#14		U005-LIT	UV Control Panel UV CP2	Instrument power, fault signal	Refer to CP1.04, ILD-02	1
U005-3	Supplied with Transducer		U005-LIT	U005-LE	Transducer cable	Refer to CP1.04, ILD-02	1
U010-1	4/PR/TW/SH	Conduit as required	U010-SC, SIT	UV Control Panel UV CP1	Speed	Refer to CP1.06,ILD-03	0
U010-2	10/C #14	Conduit as required	U010-IIT,MM,UF,MN,YS	UV Control Panel UV CP1	Control	Refer to CP1.06,ILD-03	0
U020-1	4/PR/TW/SH	Conduit as required	U020-SC, SIT	UV Control Panel UV CP1	Speed	Refer to CP1.06,ILD-03	0
U020-2	10/C #14	Conduit as required	U020-IIT,MM,UF,MN,YS	UV Control Panel UV CP1	Control	Refer to CP1.06,ILD-03	0
U030-1	4/PR/TW/SH	Conduit as required	U030-SC,SIT	UV Control Panel UV CP1	Speed	Refer to CP1.06,ILD-03	0
U030-2	10/C #14	Conduit as required	U030-IIT,MM,UF,MN, YS	UV Control Panel UV CP1	Control	Refer to CP1.06,ILD-03	0
U040-1	4/PR/TW/SH	Conduit as required	U040-SC,SIT	UV Control Panel UV CP1	Speed	Refer to CP1.06,ILD-03	0
U040-2	10/C #14	Conduit as required	U040-IIT,MM,UF,MN,YS	UV Control Panel UV CP1	Control	Refer to CP1.06,ILD-03	0
U050-1	4/PR/TW/SH	Conduit as required	U050-SC,SIT	UV Control Panel UV CP1	Speed	Refer to CP1.06,ILD-03	0
U050-2	10/C #14	Conduit as required	U050-IIT,MM,UF,MN,YS	UV Control Panel UV CP1	Control	Refer to CP1.06,ILD-03	0
U060-1	1/PR/TW/SH Belden 8760	UG to UV Bdg, cable tray to UVCP1	U060-FIT	System Control Centre (SCC)	Flow Control	Refer to CP1.07, ILD-06	0
U060-2	4/C#14 Teck		U060-FIT	System Control Centre (SCC)	Instrument power, fault signal	Refer to CP1.07, ILD-06	1
U060-3	Supplied with Transducer		U060-FIT	U005-LE	Transducer cable	Refer to CP1.07, ILD-06	1
U070-1	20/C#14	Conduit as required	System Control Centre (SCC)	UV Control Panel UV CP1	Control	Refer to CP1.07,08,09,ILD-04	0
U100-1	1/PR/TW/SH Belden 8760		U100-TT-1	UV Control Panel UV CP1	Outside temperature	Refer to CP1.11, ILD-11	0
U100-2	1/PR/TW/SH Belden 8760		U100-TT-2	UV Control Panel UV CP1	Outside temperature	Refer to CP1.11, ILD-11	0
U102-1	7/C#14	Conduit as required	U102-WG-1	System Control Centre (SCC)	Control	Refer to CP1.10, ILD-05	1
U102-2	3/PR/TW/SH Belden 8760	Conduit as required	U102-WG-1	System Control Centre (SCC)	Open, Close	Refer to CP1.10, ILD-05	1
U102-3	7/C#14		U102-WG-1 Local Control	U102-WG-1	Open, Close	Refer to CP1.10, ILD-05	1
U170-1	1/PR/TW/SH Belden 8760		U170-LIT	System Control Centre (SCC)	Effluent Channel	Refer to CP1.07, ILD-02	0
U170-2	4/C#14		U170-LIT	System Control Centre (SCC)	Effluent Channel	Refer to CP1.07, ILD-02	1
U170-3	Supplied with Transducer		U170-LIT	U170-LE	Effluent Channel	Refer to CP1.07, ILD-02	1
U202-1	7/C#14	Conduit as required	U202-WG-2	System Control Centre (SCC)	Control	Refer to CP1.10, ILD-05	0
U202-2	3/PR/TW/SH Belden 8760	Conduit as required	U202-WG-2	System Control Centre (SCC)	Open, Close	Refer to CP1.10, ILD-05	0
U202-3	7/C#14		U202-WG-2 Local Control	U202-WG-2	Open, Close	Refer to CP1.10, ILD-05	1
U270-1	1/PR/TW/SH Belden 8760		U270-LIT	System Control Centre (SCC)	Effluent Channel	Refer to CP1.08, ILD-02	0
U270-2	4/C#14		U270-LIT	System Control Centre (SCC)	Effluent Channel	Refer to CP1.08, ILD-02	1
U270-3	Supplied with Transducer		U270-LIT	U270-LE	Effluent Channel	Refer to CP1.08, ILD-02	1
U303-1	7/C#14	Conduit as required	U302-WG-3	System Control Centre (SCC)	Control	Refer to CP1.10, ILD-05	0
U303-2	3/PR/TW/SH Belden 8760	Conduit as required	U302-WG-3	System Control Centre (SCC)	Open, Close	Refer to CP1.10, ILD-05	0
U303-3	7/C#14		U302-WG-2 Local Control	U303-WG-2	Open, Close	Refer to CP1.10, ILD-05	1
U370-1	1/PR/TW/SH Belden 8760		U370-LIT	System Control Centre (SCC)	Effluent Channel	Refer to CP1.09, ILD--02	0

CONTROL CABLE LIST

U370-2	4/C#14		U370-LIT	System Control Centre (SCC)	Effluent Channel	Refer to CP1.09, ILD--02	1
U370-3	Supplied with Transducer		U370-LIT	U370-LE	Effluent Channel	Refer to CP1.09, ILD--02	1
U410-1	1/PR/TW/SH Belden 8760		U410-TT-1	UV Control Panel UV CP1	Supply Air Temperature	Refer to CP1.11, ILD-11	1
U410-2	1/PR/TW/SH Belden 8760		U410-TT-2	UV Control Panel UV CP1	Return Air Temperature	Refer to CP1.11, ILD-11	1
U410-3	1/PR/TW/SH Belden 8760		U410-TT-3	UV Control Panel UV CP1	Return Air Temperature	Refer to CP1.11, ILD-11	1
U410-4	1/PR/TW/SH Belden 8760		U410-PDT	UV Control Panel UV CP1	Room Differential Pressure	Refer to CP1.11, ILD-11	1
U410-5	2/PR/TW/SH Belden 8760		U410-ZC-2	UV Control Panel UV CP1	Heating Coil Control Valve	Refer to CP1.22, ILD-12	1
U410-6	2/PR/TW/SH Belden 8760		U-410-MD	UV Control Panel UV CP1	Return Air Damper Position	Refer to CP1.11, ILD-14	1
U410-7	4/C#14		U-410-MD	UV Control Panel UV CP1	Return Air Damper Control	Refer to CP1.11, ILD-14	1
U411-1	10/C #14		U-411-MD	UV Control Panel UV CP1	Return Air Damper	Refer to CP1.11, ILD-13	1
U411-2	4/PR/TW/SH Belden 8760		U-411-VFD	UV Control Panel UV CP1	Ventilation Fan Status/ Control	Refer to CP1.11, ILD-15	1
U411-3	1/PR/TW/SH Belden 8760		U-411-VFD	UV Control Panel UV CP1	Ventilation Fan Speed Control	Refer to CP1.11, ILD-15	1
U412-1	10/C #14		U-412-MD	UV Control Panel UV CP1	Return Air Damper	Refer to CP1.11, ILD-13	1
U412-2	4/PR/TW/SH Belden 8760		U-412-VFD	UV Control Panel UV CP1	Ventilation Fan Status/ Control	Refer to CP1.11, ILD-15	1
U412-3	1/PR/TW/SH Belden 8760		U-412-VFD	UV Control Panel UV CP1	Ventilation Fan Speed Control	Refer to CP1.11, ILD-15	1
U413-1	2/PR/TW/SH Belden 8760		U-413-MD	UV Control Panel UV CP1	Waste Heat Damper Position	Refer to CP1.11, ILD-14	1
U413-2	4/C#14		U-413-MD	UV Control Panel UV CP1	Waste Heat Damper Control	Refer to CP1.11, ILD-14	1
U414-1	2/PR/TW/SH Belden 8760		U-414-MD	UV Control Panel UV CP1	Air Exhaust Damper Position	Refer to CP1.11, ILD-14	1
U414-2	4/C#14		U-414-MD	UV Control Panel UV CP1	Air Exhaust Damper Control	Refer to CP1.11, ILD-14	1
U415-1	2/PR/TW/SH Belden 8760		U-415-MD	UV Control Panel UV CP1	Outside Air Damper Position	Refer to CP1.11, ILD-14	1
U415-2	4/C#14		U-415-MD	UV Control Panel UV CP1	Outside Air Damper Control	Refer to CP1.11, ILD-14	1
U416-1	1/PR/TW/SH Belden 8760		U416-TT	UV Control Panel UV CP1	Return Air Temperature	Refer to CP1.12, ILD-11	1
U416-2	2/PR/TW/SH Belden 8760		U416-ZC-1	UV Control Panel UV CP1	Cooling Coil Control Valve	Refer to CP1.21, ILD-12	1
U416-3	4/C#14		U416-PDSH, U416-TSL	UV Control Panel UV CP1	HVAC temp & Diff Press Sw	Refer to CP1.12, ILD-16	1
U416-4	2/PR/TW/SH Belden 8760		U416-ZC-2	UV Control Panel UV CP1	Cooling Coil Control Valve	Refer to CP1.21, ILD-12	1
U416-5	10/C #14		U-416-MD-1	UV Control Panel UV CP1	Return Air Damper	Refer to CP1.12, ILD-13	1
U416-6	10/C #14		U-416-MD-2	UV Control Panel UV CP1	Supply Air Damper	Refer to CP1.12, ILD-13	1
U416-7	4/PR/TW/SH Belden 8760		U-416-VFD	UV Control Panel UV CP1	Ventilation Fan Status/ Control	Refer to CP1.12, ILD-15	1
U416-8	1/PR/TW/SH Belden 8760		U-416-VFD	UV Control Panel UV CP1	Ventilation Fan Speed Control	Refer to CP1.12, ILD-15	1
U417-1	1/PR/TW/SH Belden 8760		U417-TT	UV Control Panel UV CP1	Return Air Temperature	Refer to CP1.12, ILD-11	1
U417-2	2/PR/TW/SH Belden 8760		U417-ZC-1	UV Control Panel UV CP1	Cooling Coil Control Valve	Refer to CP1.21, ILD-12	1
U417-3	4/C#14		U417-PDSH, U417-TSL	UV Control Panel UV CP1	HVAC temp & Diff Press Sw	Refer to CP1.12, ILD-16	1
U417-4	2/PR/TW/SH Belden 8760		U417-ZC-2	UV Control Panel UV CP1	Cooling Coil Control Valve	Refer to CP1.21, ILD-12	1
U417-5	10/C #14		U-417-MD-1	UV Control Panel UV CP1	Return Air Damper	Refer to CP1.12, ILD-13	1
U417-6	10/C #14		U-417-MD-2	UV Control Panel UV CP1	Supply Air Damper	Refer to CP1.12, ILD-13	1
U417-7	4/PR/TW/SH Belden 8760		U-417-VFD	UV Control Panel UV CP1	Ventilation Fan Status/ Control	Refer to CP1.12, ILD-15	1
U417-8	1/PR/TW/SH Belden 8760		U-417-VFD	UV Control Panel UV CP1	Ventilation Fan Speed Control	Refer to CP1.12, ILD-15	1
U418-1			U418-TSH	UV Control Panel UV CP1	Electrical Room Temp High	Refer to CP1.13, ILD-17	1
U418-2			U418-ZSB-1	UV Control Panel UV CP1	Outside Air Damper Position	Refer to CP1.13, ILD-17	1
U418-3			U418-ZSB-2	UV Control Panel UV CP1	Outside Air Damper Position	Refer to CP1.13, ILD-17	1
U418-4			U418-ZSB-3	UV Control Panel UV CP1	Outside Air Damper Position	Refer to CP1.13, ILD-17	1
U419-1			U419-ZSB	UV Control Panel UV CP1	Electrical Room Damper Psn	Refer to CP1.13, ILD-17	1
U419-2	10/C #14		U-491-EF	UV Control Panel UV CP1	Elec Room Exhaust Fan Control	Refer to CP1.13, ILD-18	1
U420-1	1/PR/TW/SH Belden 8760		U420-TT-1	UV Control Panel UV CP1	Supply Air Temperature	Refer to CP1.14, ILD-11	1
U420-10	2/PR/TW/SH Belden 8760		U-420-MD	UV Control Panel UV CP1	Return Air Damper Position	Refer to CP1.14, ILD-14	1
U420-11	4/C#14		U-420-MD	UV Control Panel UV CP1	Return Air Damper Control	Refer to CP1.14, ILD-14	1
U420-2	1/PR/TW/SH Belden 8760		U420-TT-2	UV Control Panel UV CP1	Return Air Temperature	Refer to CP1.14, ILD-11	1
U420-3	1/PR/TW/SH Belden 8760		U420-TT-3	UV Control Panel UV CP1	Return Air Temperature	Refer to CP1.14, ILD-11	1
U420-4	1/PR/TW/SH Belden 8760		U420-TT-4	UV Control Panel UV CP1	Room Temperature	Refer to CP1.14, ILD-11	1
U420-5	1/PR/TW/SH Belden 8760		U420-AT	UV Control Panel UV CP1	Room Humidity	Refer to CP1.14, ILD-11	1
U420-6	1/PR/TW/SH Belden 8760		U420-PDT	UV Control Panel UV CP1	Room Differential Pressure	Refer to CP1.14, ILD-11	1
U420-7	4/C#14		U420-PDSH, U420-TSL	UV Control Panel UV CP1	HVAC temp & Diff Press Sw	Refer to CP1.14, ILD-16	1
U420-8	2/PR/TW/SH Belden 8760		U420-ZC-1	UV Control Panel UV CP1	Cooling Coil Control Valve	Refer to CP1.21, ILD-12	1

CONTROL CABLE LIST

U420-9	2/PR/TW/SH Belden 8760		U420-ZC-2	UV Control Panel UV CP1	Heating Coil Control Valve	Refer to CP1.22, ILD-12	1
U421-1	4/PR/TW/SH Belden 8760		U-421-VFD	UV Control Panel UV CP1	Ventilation Fan Status/ Control	Refer to CP1.14, ILD-15	1
U421-2	1/PR/TW/SH Belden 8760		U-421-VFD	UV Control Panel UV CP1	Ventilation Fan Speed Control	Refer to CP1.14, ILD-15	1
U422-1	2/PR/TW/SH Belden 8760		U-422-MD	UV Control Panel UV CP1	Air Exhaust Damper Position	Refer to CP1.14, ILD-14	1
U422-2	4/C#14		U-422-MD	UV Control Panel UV CP1	Air Exhaust Damper Control	Refer to CP1.14, ILD-14	1
U423-1	2/PR/TW/SH Belden 8760		U-423-MD	UV Control Panel UV CP1	Outside Air Damper Position	Refer to CP1.14, ILD-14	1
U423-2	4/C#14 Teck		U-423-MD	UV Control Panel UV CP1	Outside Air Damper Control	Refer to CP1.14, ILD-14	1
U424-1	4/PR/TW/SH Belden 8760		U-424-VFD	UV Control Panel UV CP1	Ventilation Fan Status/ Control	Refer to CP1.14, ILD-15	1
U424-2	1/PR/TW/SH Belden 8760		U-424-VFD	UV Control Panel UV CP1	Ventilation Fan Speed Control	Refer to CP1.14, ILD-15	1
U425-1	2/PR/TW/SH Belden 8760		U-425-MD	UV Control Panel UV CP1	UV Room Ex Damper Position	Refer to CP1.14, ILD-14	1
U425-2	4/C#14		U-425-MD	UV Control Panel UV CP1	UV Room Ex Damper Control	Refer to CP1.14, ILD-14	1
U426-1	4/PR/TW/SH Belden 8760		U-426-VFD	UV Control Panel UV CP1	Ventilation Fan Status/ Control	Refer to CP1.14, ILD-15	1
U426-2	1/PR/TW/SH Belden 8760		U-426-VFD	UV Control Panel UV CP1	Ventilation Fan Speed Control	Refer to CP1.14, ILD-15	1
U430-1	1/PR/TW/SH Belden 8760		U430-TT-1	UV Control Panel UV CP1	Supply Air Temperature	Refer to CP1.15, ILD-11	1
U430-2	1/PR/TW/SH Belden 8760		U430-TT-2	UV Control Panel UV CP1	Return Air Temperature	Refer to CP1.15, ILD-11	1
U430-3	1/PR/TW/SH Belden 8760		U430-TT-3	UV Control Panel UV CP1	Room Temperature	Refer to CP1.15, ILD-11	1
U430-4	4/C#14		U430-PDSH, U430-TSL	UV Control Panel UV CP1	HVAC temp & Diff Press Sw	Refer to CP1.15, ILD-16	1
U430-5	2/PR/TW/SH Belden 8760		U430-ZC-1	UV Control Panel UV CP1	Cooling Coil Control Valve	Refer to CP1.21, ILD-12	1
U430-6	2/PR/TW/SH Belden 8760		U430-ZC-2	UV Control Panel UV CP1	Heating Coil Control Valve	Refer to CP1.22, ILD-12	1
U430-7	2/PR/TW/SH Belden 8760		U-430-MD	UV Control Panel UV CP1	Return Air Damper Position	Refer to CP1.15, ILD-14	1
U430-8	4/C#14		U-430-MD	UV Control Panel UV CP1	Return Air Damper Control	Refer to CP1.15, ILD-14	1
U431-1	2/PR/TW/SH Belden 8760		U-431-MD	UV Control Panel UV CP1	Outside Air Damper Position	Refer to CP1.15, ILD-14	1
U431-2	4/C#14		U-431-MD	UV Control Panel UV CP1	Outside Air Damper Control	Refer to CP1.15, ILD-14	1
U432-1	10/C #14		U-432-SF	UV Control Panel UV CP1	Vent Fan Control/ Status	Refer to CP1.15, ILD-19	1
U433-1	4/C#14		U433-PDSH	UV Control Panel UV CP1	Filter Diff Pressure Switch	Refer to CP1.16, ILD-16	1
U433-2	2/PR/TW/SH Belden 8760		U433-ZC-1	UV Control Panel UV CP1	Heating Coil Control Valve	Refer to CP1.22, ILD-12	1
U434-1	10/C #14		U-434-SF	UV Control Panel UV CP1	Vent Fan Control/ Status	Refer to CP1.16, ILD-19	1
U435-1	1/PR/TW/SH Belden 8760		U435-TT	UV Control Panel UV CP1	Room Temperature	Refer to CP1.16, ILD-11	1
U451-1	10/C #14		U-451	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.17, ILD-19	1
U452-1	10/C #14		U-452	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.17, ILD-19	1
U455-1	1/PR/TW/SH Belden 8760		UV-455-TT	UV Control Panel UV CP1	Effluent Temperature	Refer to CP1.17, ILD-11	1
U456-1	1/PR/TW/SH Belden 8760		UV-456-TT	UV Control Panel UV CP1	Heat Exchanger U454 Temp	Refer to CP1.17, ILD-11	1
U457-1	1/PR/TW/SH Belden 8760		UV-457-TT	UV Control Panel UV CP1	Heat Exchanger U453 Temp	Refer to CP1.17, ILD-11	1
U460-1	1/PR/TW/SH Belden 8760		U460-TT-1	UV Control Panel UV CP1	Chiller Coil Supply Temp	Refer to CP1.21, ILD-11	1
U460-2	1/PR/TW/SH Belden 8760		U460-TT-2	UV Control Panel UV CP1	Chiller Coil Return Temp	Refer to CP1.21, ILD-11	1
U461-1	10/C #14		U-461	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.19, ILD-19	1
U462-1	10/C #14		U-462	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.19, ILD-19	1
U463-1	10/C #14		U-463	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.19, ILD-19	1
U464-1	10/C #14		U-464	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.19, ILD-19	1
U465-1	10/C #14		U-465	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.18, ILD-19	1
U466-1	10/C #14		U-466	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.18, ILD-19	1
U467-1	10/C #14		U-467	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.18, ILD-19	1
U468-1	10/C #14		U-468	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.18, ILD-19	1
U469-1	10/C #14		U469	UV Control Panel UV CP1	Heat Pump Control/ Status	Refer to CP1.19, ILD-20	1
U470-1	10/C #14		U470	UV Control Panel UV CP1	Heat Pump Control/ Status	Refer to CP1.19, ILD-20	1
U471-1	10/C #14		U471	UV Control Panel UV CP1	Heat Pump Control/ Status	Refer to CP1.18, ILD-20	1
U472-1	10/C #14		U472	UV Control Panel UV CP1	Heat Pump Control/ Status	Refer to CP1.18, ILD-20	1
U473-1	10/C #14		U473	UV Control Panel UV CP1	Heat Pump Control/ Status	Refer to CP1.18, ILD-20	1
U474-1	10/C #14		U-474-LSL	UV Control Panel UV CP1	Pressurisation Unit Low Level	Refer to CP1.20	1
U480-1	1/PR/TW/SH Belden 8760		U480-TT-1	UV Control Panel UV CP1	Heating Coil Supply Temp	Refer to CP1.22, ILD-11	1
U480-2	1/PR/TW/SH Belden 8760		U480-TT-2	UV Control Panel UV CP1	Heating Coil Supply Temp	Refer to CP1.21, ILD-11	1
U481-1	10/C #14		U-481	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.20, ILD-19	1
U482-1	10/C #14		U-482	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.20, ILD-19	1

CONTROL CABLE LIST

U483-1	10/C #14		U-483	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.20, ILD-19	1
U484-1	10/C #14		U-484	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.20, ILD-19	1
U485-1	10/C #14		U-485	UV Control Panel UV CP1	Pump Control/ Status	Refer to CP1.20, ILD-19	1
U486-1	10/C #14		U486	UV Control Panel UV CP1	Heat Pump Control/ Status	Refer to CP1.20, ILD-20	1
U487-1	10/C #14		U487	UV Control Panel UV CP1	Heat Pump Control/ Status	Refer to CP1.20, ILD-20	1
U488-1	10/C #14		U488	UV Control Panel UV CP1	Heat Pump Control/ Status	Refer to CP1.20, ILD-20	1
U489-1	10/C #14		U489	UV Control Panel UV CP1	Heat Pump Control/ Status	Refer to CP1.20, ILD-20	1
U900	4/C #14		Fire Alarm Panel	UV Control Panel UV CP1	Fire and Trouble Alarm	Refer to ILD-10	0
U910-1	2/C #16		Motion Detector	UV Control Panel UV CP1	Alarm	Refer to ILD-09	0
U911-1	2/C #16		Motion Detector	UV Control Panel UV CP1	Alarm	Refer to ILD-09	0
U912-1	2/C #16		Motion Detector	UV Control Panel UV CP1	Alarm	Refer to ILD-09	0
U913-1	2/C #16		Door Switch	UV Control Panel UV CP1	Alarm	Refer to ILD-09	0
U914-1	2/C #16		Door Switch	UV Control Panel UV CP1	Alarm	Refer to ILD-09	0
U915-1	2/C #16		Motion Detector	UV Control Panel UV CP1	Alarm	Refer to ILD-09	0
U916-1	2/C #16		Motion Detector	UV Control Panel UV CP1	Alarm	Refer to ILD-09	0
U930-1	10/C #14		Transformer PDT-1	UV Control Panel UV CP1	Transformer Alarms	Refer to ILD-07	0
U935-1	6/C #14		Transformer UVT-2	UV Control Panel UV CP1	Transformer Alarms	Refer to ILD-08	0
U940-1	6/C #14		Transformer UVT-3	UV Control Panel UV CP1	Transformer Alarms	Refer to ILD-08	0
U945-1	6/C #14		Transformer LST-4	UV Control Panel UV CP1	Transformer Alarms	Refer to ILD-08	0
U950-1	6/C #14		Transformer LST-5	UV Control Panel UV CP1	Transformer Alarms	Refer to ILD-08	0
UV CP1-001	12 Fiber 62.5/125 µM Glass Multimode	C017,C029,C041	UV Control Panel UV CP1	Process Control Wiring Closet	Communication to Admin Building	Refer to CI1.01	0
UV CP1-002	12 Fiber 62.5/125 µM Glass Multimode	C017,C029,C041	UV Control Panel UV CP1	Process Control Wiring Closet	Communication to Admin Building	Refer to CI1.01	0
Bank1A-CAB	Alpha 6412 1/PR/TW/SH		System Control Centre (SCC)	UV Bank 1A CCB	SCC to UV Bank Comms	Trojan dwg 929329	1
Bank1B-CAB	Alpha 6412 1/PR/TW/SH		UV Bank 1A CCB	UV Bank 1B CCB	SCC to UV Bank Comms	Trojan dwg 929329	1
Bank2A-CAB	Alpha 6412 1/PR/TW/SH		UV Bank 1B CCB	UV Bank 2A CCB	SCC to UV Bank Comms	Trojan dwg 929329	1
Bank2B-CAB	Alpha 6412 1/PR/TW/SH		UV Bank 2A CCB	UV Bank 2B CCB	SCC to UV Bank Comms	Trojan dwg 929329	1
Bank3A-CAB	Alpha 6412 1/PR/TW/SH		UV Bank 2B CCB	UV Bank 3A CCB	SCC to UV Bank Comms	Trojan dwg 929329	1
Bank3B-CAB	Alpha 6412 1/PR/TW/SH		UV Bank 3A CCB	UV Bank 3B CCB	SCC to UV Bank Comms	Trojan dwg 929329	1

**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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**1. DESCRIPTION**

**1.1 Description**

- .1 Provide transformers to transform primary 5000 volt, 3 phase, 3 wire supply to main secondary distribution voltage of 347/600 volt, 3 phase, 3 wire. (Total of 2 units)
- .2 Provide transformers to transform primary 5000 volt, 3 phase, 3 wire supply to main secondary distribution voltage of 277/480 volt, 3 phase, 4 wire. (Total of 2 units)

**1.2 Codes and Standards**

- .1 The transformers are to be built to CSA Specifications CAN/CSA-C2.

**1.3 Related Work**

- .1 General Electrical Requirements: Section 16010
- .2 HV Power Cables & 15 kV Shielded Cable Terminations: Section 16120
- .3 Busway: Section 16115
- .4 Cast-In-Place Concrete: Division 3

**1.4 Source Quality Control**

- .1 Submit production test certificates to Contracy Administrator.

**1.5 Tests**

- .1 Tests shall be done in accordance with Sections 16010 – Electrical General Requirements and 16980 – Testing, Adjusting, and Balancing of Electrical Equipment and System.
- .2 Each transformer shall be completely factory tested and the results certified, proving the performance of the units to provide capacities as listed in these Specifications.
- .3 Factory tests for each transformer to include:
  - .1 Resistance measurements of all windings
  - .2 Ratio test at rated connection and on all taps
  - .3 Polarity and phase relation tests
  - .4 Audible sound level tests
  - .5 No-load loss at rated voltage and losses at 25%, 50%, 75%, and 100% load



**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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- .6 Exciting current at rated voltage
- .7 Laboratory test of insulating liquid
- .8 Impedance
- .9 Applied potential test
- .10 Induced potential test
- .11 95 kV B.I.L. test
- .12 Hi-pot test
- .13 Heat run, temperature rise tests on each transformer

The above heat run tests and impulse tests to be witnessed by the City.

- .4 Carry out following insulation tests using megger with 20,000 megohm scale and resulting insulation resistance corrected to base of 20 degree C:
  - .1 High voltage to ground with secondary grounded for duration of test
  - .2 Low voltage to ground with primary grounded for duration of test
  - .3 High to low voltage.
- .5 Inspect primary and secondary connections for tightness and for signs of overheating.
- .6 Inspect and clean bushings and insulators.
- .7 Check oil level and temperature indicators.
- .8 Set transformer taps to rated voltage as specified.
- .9 Inspect for oil leaks and excessive rusting.
- .10 Inspect for oil level.
- .11 Check fuses for correctness of type and size.
- .12 Check for grounding and neutral continuity between primary and secondary circuits of transformer.
- .13 Notify the City three weeks in advance, in writing, of the time, date, and place of the tests. This test will be attended first by the City at the City's expense. Any subsequent witness tests due to test failure shall be at the expense of the equipment manufacturer, but at the direction of the City.

**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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- .14 Witness tests may be waived by the City at his discretion; such waiver shall be in writing and shall not imply any acceptance by the City nor limit the liability of the manufacturer. A copy of the test results is to accompany the transformer when shipped.

**1.6 Shop Drawings**

- .1 Submit shop drawings in accordance with Section 16010 – Electrical General Requirements.
- .2 Indicate:
  - .1 Dimensioned positions of mounting devices.
  - .2 Dimensioned positions of terminations.
  - .3 Identified internal and external component layout on assembly drawing.
  - .4 Insulating liquid capacity.
- .3 At completion of Work and prior to final acceptance, provide maintenance manuals for all items specified in this section, in accordance with “Operations and Maintenance Manuals”, including all test results.

**1.7 Maintenance Data**

- .1 Provide maintenance data for liquid cooled transformers for incorporation into manual specified in Section 16010 – Electrical General Requirements.
- .2 Include insulating liquid maintenance data.

**1.8 Maintenance Materials**

- .1 Provide maintenance materials in accordance with Division 1.
- .2 Provide spare parts as recommended by the Manufacturer.

**1.9 Delivery and Storage**

- .1 Ship the transformers completely assembled and oil filled suitably protected from damage during transportation.

**2. PRODUCTS**

**2.1 Manufacturer**

- .1 Partner Technologies Incorporated.
- .2 Carte International Inc.

**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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**2.2 Ratings**

.1 Type: Silicone liquid insulated, self-coded:

.2 Transformers UVT-2 and UVT-3

.3 K13 rated

Phase	three
Cycles	60 Hz
Capacity	4000 kVA
Cooling	natural cooled (ONAN)
Temperature Rise	55°/65° F
Insulation	Class H
Primary Voltage	4160 volts delta
Secondary Voltage	277/480 volts wye
Primary Impulse Level	95 kV BIL
Secondary Impulse Level	30 kV BIL
Sound Level	55 dB
No Load Watts Loss	4000 watts maximum
Impedance	6.5 %
Taps Above Normal	2 – 2.5 % full capacity
Taps Below Normal	2 – 2.5 % full capacity

Off circuit tap selection shall be by manual operator with position indicator and suitable for padlocking in all tap positions.

.4 Type: Silicone liquid insulated, self-coded:

.5 Transformers LST-4 and LST-5

Phase	three
Cycles	60 Hz
Capacity	1250 kVA
Cooling	natural cooled (ONAN)
Temperature Rise	55°/65° F
Insulation	Class H
Primary Voltage	4160 volts delta
Secondary Voltage	600 volts delta
Primary Impulse Level	95 kV BIL
Secondary Impulse Level	30 kV BIL
Sound Level	55 dB
No Load Watts Loss	3000 watts maximum
Impedance	6.5 %
Taps Above Normal	2 – 2.5 % full capacity
Taps Below Normal	2 – 2.5 % full capacity

Off circuit tap selection shall be by manual operator with position indicator and suitable for padlocking in all tap positions.

**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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**2.3 Transformer Characteristics**

- .1 Transformers: To CSA C2.
- .2 Liquid cooled, outdoor, distribution transformers type ONAN with provision for fan cooling if required.
- .3 Primary Voltage: As indicated in Clause 2.2
- .4 Secondary Voltage: As indicated in Clause 2.2
- .5 Capacity: As indicated in Clause 2.2
- .6 Basic Impulse Level: As indicated in Clause 2.2
- .7 Polarity: Additive.
- .8 Impedance: Not less than 6.5 %; not more than 8 %.
- .9 No load losses not to exceed CSA C802.3-01 recommended kW rating.
- .10 Full load losses not to exceed CSA C802.3-01 recommended kW rating.
- .11 Primary cable to enter transformers from top
- .12 Secondary bus duct exiting transformer from top.

**2.4 Vibration Dampers**

- .1 Anti-vibration mountings to isolate not less than 90 % of disturbing vibrations.

**2.5 Voltage Taps**

- .1 Four - 2.5 % taps, two-FCAN, two-FCBN.

**2.6 Tap Changer**

- .1 Off-load type with external operating handle located for operation from ground level, with locking facilities and nameplate with markings to show tap voltages as actual voltages.

**2.7 Cooling**

- .1 Provide top oil temperature controller element.

**2.8 Sealed Tank**

- .1 Provide adequate capacity for the maximum increase in oil volume due to thermal expansion between extreme operating temperatures.

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**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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- .2 Equip tank with magnetic oil level gauge easily readable from the ground.

**2.9 Transformer Insulating Liquid**

- .1 To be fire retardant, non-corrosive, chemically degradable, thermally stable silicone, designed to operate with a 55/65°F rise insulation system.

**2.10 Primary Bushings**

- .1 Terminate high voltage windings in three tank wall-mounted, porcelain bushings.
- .2 Surround primary bushings with a termination box to permit connection of top incoming primary cables. Provide compression type connectors.

**2.11 Secondary Bushings**

- .1 Terminate low voltage windings in four tank wall-mounted porcelain bushings, three phase and neutral.
- .2 Surround secondary terminals with a terminal box for a flanged throat connection to match connection on main secondary bus duct.
- .3 The secondary neutral is grounded in the 480 V switchgear.

**2.12 Throat Connections**

- .1 Extend primary terminals through a throat connection to cable connection box. Extend the secondary terminals through a throat connection to bus duct connection box.

**2.13 Control Junction Box**

- .1 Provide control wiring junction box with terminal strip. Wire temperature and sudden pressure alarms to terminal strip using rigid conduit and wire. Provide four spare terminals on terminal strip. The control junction box is to be easily accessible from the floor level.
- .2 Terminals and wire markers are to be as specified.

**2.14 Exterior Finish**

- .1 Bonderize and thoroughly clean all exterior surfaces. Apply a zinc chromate primer and two coats of finish enamel, special colour is to be as specified in Section 16010 – Electrical General Requirements.
- .2 Provide four (4) cans of spray paint for touch-up after installation.

**2.15 Identification**

- .1 Provide lamacoid nameplates with 12 mm letters per Section 16010 – Electrical General Requirements.

**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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- .2 City's Equipment Reference Label: Size 7.

**2.16 Accessories**

- .1 Equip transformers with all standard accessories as required by CSA Standard CAN3-C88. Items required are:
  - .2 Hanger irons and adapter plates.
  - .3 Top filter press connection.
  - .4 Liquid Celsius temperature measuring devices, maximum indicating type, dial size 100 mm with one set of contacts.
  - .5 Liquid level gauge with two (2) sets contacts.
  - .6 Gas detector relay with two (2) sets contacts.
  - .7 Wiring and terminal box for protective devices.
  - .8 Top non-flammable insulating liquid sampling device.
  - .9 Anchor devices, setting templates means for securing transformer.
  - .10 Bi-directional skid base.
  - .11 Wildlife-proof shroud for each high voltage bushing.
  - .12 Vacuum Pressure Gauge: Dial size 100 mm.
  - .13 Factory install accessories.
  - .14 [25] mm drain valve with plug and sampling valve.
  - .15 Sudden pressure relay with alarm contacts.
  - .16 Primary bushings in termination box for cable connection.
  - .17 Secondary bushings in terminations box for bus duct connection.
  - .18 Control junction box.
  - .19 EEMAC2 Enclosure c/w drip hood and lifting eyes.
  - .20 Pressure relief vent.
  - .21 115 mm (4.5 inch) switchboard-type thermostat, 120 degree C (250 degree F) scale, with alarm contacts (hi and hi-hi).

**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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- .22 Stainless steel nameplate and connection diagram.
- .23 Provision for lifting, jacking, and skidding.
- .24 Ground studs and lugs.

**3. EXECUTION**

**3.1 Installation**

- .1 Install transformers only after other Work in area is completed and in accordance with manufacturer's instructions.
- .2 Install transformers as indicated on the Drawings and in accordance with the manufacturer's recommendations.
- .3 Use spreader bars on slings when lifting transformers into place.
- .4 Set and secure transformers in place rigid, plumb, square.
- .5 Ensure internal connections are mechanically tight.
- .6 Make connections.
- .7 Connect transformer ground terminal to system ground.
- .8 Fill transformers when required with metal hose and ensure care is taken to prevent contamination of liquid and components.
- .9 Set taps to produce rated secondary voltage at no-load.
- .10 Wire one set contacts on liquid temperature measuring device, liquid level gauge, gas detector relay, winding temperature detector relay, to terminal box and DCS System.
- .11 Mount the transformers on pad; ensure that the pad are true and level. Mount the transformer assembly on the isolators as recommended by the manufacturer. Ensure concrete pad is fully cured for 28 days before installation of transformer.
- .12 Connect the thigh temperature contact to alarm circuit as indicated and to trip the main secondary air circuit breaker.
- .13 Before energization, keep transformers or storage room enclosure above 10 degrees C, ambient.

**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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**3.2 Testing (Coordinate with Section 16980)**

- .1 After the transformers have been set in place, prior the energizing, verify in writing that the transformers have been installed and tested in accordance with recommended practice and are suitable for energizing and use.
- .2 Without limiting the foregoing, the Work shall, as a minimum, include the following:
  - .1 Prior to connecting, the Contractor is to inspect visually and conduct the following tests:
    - .1 Megger insulation and correct reading to 20 degree C base. Megger high voltage to ground with the secondary grounded for the duration of the test. Megger low voltage to ground with the primary grounded for the duration of the test.
    - .2 Perform electrical centres test on high voltage off-load tap changer switch.
    - .3 Sample transformer insulating liquid laboratory analysis to be carried out as follows:
      - .1 Dielectric breakdown
      - .2 Neutralization number
      - .3 Colour
      - .4 Interfacial tension
      - .5 Specific gravity
    - .4 Leak test piping.
    - .5 Perform ratio test for all transformer gap positions.
    - .6 Verify that shipping braces and shipping shims have been removed.
  - .2 After connection of line, load, control, and alarm wiring, but prior to energizing, the calibration and verification firm is to inspect the installation and confirm the following:
    - .1 That the transformer has been properly cleaned, is dry and free of foreign materials and contaminants, and otherwise is suited for energizing.
    - .2 That all bus and connector bolts have been installed, tightened, torqued properly, and uninsulated surfaces of connectors and buses have been taped.
    - .3 That transformer taps have been set to provide secondary voltage required.
    - .4 That all insulators are in perfect condition, without cracks, chips, or surface contaminants.
    - .5 That core, coil, terminal boards, tap changers, bushings and all insulated surfaces have not been damaged.



**DISTRIBUTION TRANSFORMERS, LIQUID COOLED**

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- .6 That the forced cooling fans are functioning and that the power supply circuits to the fans have been properly connected and protected.
- .7 That all alarm and indicating devices are operating correctly, and are properly connected either internally or externally from the terminal of the instrument to the external system, including the following:
  - .1 Liquid level and pressure
  - .2 Liquid temperature, with hi and hi-hi contacts connected to the building control computer
  - .3 Sudden pressure is unblocked and wired to trip the primary circuit breaker.
- .3 Any other tests or inspections deemed necessary or appropriate by the manufacturer.

**END OF SECTION**

**Panel 100**

PANEL SCHEDULE											
PANEL ' 100 '											
DESCRIPTION	LOAD	BKR	CCT	A	B	C	CCT	BKR	LOAD	DESCRIPTION	
Gate Actuator U-100-SG-1	2HP	15A	1	*			2	15A	2HP	Gate Actuator U-200-SG-1	
3#12 - 21mm conduit		3P	3		*		4	3P		3# 12 - 21mm conduit	
			5			*	6				
Gate Actuator U-300-SG-1	2HP	15A	7	*			8	60A	2	Welding Receptacle	
3#12 -21mm conduit		3P	9		*		10	3P	Rec.	3#6 - 35mm conduit	
			11			*	12				
<b>Motor Control Centre MCC UV</b>		<b>100A</b>	13	*			14	40A	15HP	U-416-SF - VFD	
<b>3#3 - 35mm conduit</b>		<b>3P</b>	15		*		16	3P		Electrical Room Supply Fan	
			17			*	18			3/C #10 Teck Cable	
U-424-SF - VFD	5HP	15A	19	*			20	20A	7.5HP	U-411-RF - VFD	
UV Process Room		3P	21		*		22	3P		Electrical Room Return Fan	
3/C #12 Teck Cable			23			*	24			3/C #12 Teck Cable	
U-421-RF - VFD	5HP	15A	25	*			26	50A	20HP	U-417-SF - VFD	
UV Process Room		3P	27		*		28	3P		Electrical Room Supply Fan	
3/C #12 Teck Cable			29			*	30			3/C #10 Teck Cable	
U-426-EF - VFD	1.5HP	15A	31	*			32	30A	10HP	U-412-RF - VFD	
UV Process Room		3P	33		*		34	3P		Electrical Room Return Fan	
3/C #12 Teck Cable			35			*	36			3/C #10 Teck Cable	
U-469-HP	14A	40A	37	*			38	40A	14A	U-470-HP	
Cooling Loop Heat Pump		3P	39		*		40	3P		Cooling Loop Heat Pump	
3/C # 10 Teck Cable			41			*	42			3/C #10 Teck Cable	
U-471-HP	14A	40A	43	*			44	40A	14A	U-472-HP	
Cooling Loop Heat Pump		3P	45		*		46	3P		Cooling Loop Heat Pump	
3/C #10 Teck Cable			47			*	48			3/C #10 Teck Cable	
U-486-HP	14A	40A	49	*			50	40A	14A	U-487-HP	
Heating Loop Heat Pump		3P	51		*		52	3P		Heating Loop Heat Pump	
3/C #10 Teck Cable			53			*	54			3/C #10 Teck Cable	
U-489-EB-1	18kW	30A	55	*			56	15A	5A	U-473-HP	
Electric Boiler		3P	57		*		58	3P		Heating Loop Heat Pump	
3/C #10 Teck Cable			59			*	60			3/C #12 Teck Cable	
U-488-HP	5A	15A	61	*			62			Space	
Heating Loop Heat Pump		3P	63		*		64			Space	
3/C #12 Teck Cable			65			*	66			Space	
Space			67	*			68			Space	
Space			69		*		70			Space	
Space			71			*	72			Space	
Space			73	*			74			Space	
Space			75		*		76			Space	
Space			77			*	78			Space	
Space			79	*			80	100A	75kVA	Transformer DT-6	
Space			81		*		82	3P		75kVA	
Space			83			*	84			Cable P040	

Voltage: 600V/3Ø/3 wire

Feeder: 3/C 350MCM R90 Teck

Mains: 400A

Main Breaker: N/A

Location: Electrical Room

Power Source: 600V Distribution - Breaker 600-B7

Mounting: Surface

**Panel A**

PANEL SCHEDULE											
Panel 'A'											
DESCRIPTION	LOAD	BKR	CCT	A	B	C	CCT	BKR	LOAD	DESCRIPTION	
Hydraulic System Centre 1A	50A	70A	1	*			2	70A	50A	Hydraulic System Centre 1B	
Hydraulic System Centre 2A	50A	70A	3		*		4	70A	50A	Hydraulic System Centre 2B	
Hydraulic System Centre 3A	50A	70A	5			*	6	70A	50A	Hydraulic System Centre 3B	
System Control Centre (SCC)	16.7A	30A	7	*			8	30A	1/2HP	U-430-AHU-1 Control Rm AHU	
U-440-EF-1 WR Exhaust Fan	100W	15A	9		*		10	30A	1/2HP	U-430-AHU-2 Corridor AHU	
U-480-HWT	7.4kW	50A	11			*	12	15A	1HP	U-475-P-1 Boiler Circ. Pump	
2/C #6 Teck Cable		2P	13	*			14	3P		3/C #12 Teck Cable	
Control Panel CP-1	200W	15A	15		*		16				
Control Panel CP-1	200W	15A	17			*	18	15A		Level Transmitter U005 LIT	
Control Panel CP-1	200W	15A	19	*			20	15A		Level Transmitter U060 LIT	
Spare		15A	21		*		22	15A		<b>Level Transmitter U170</b>	
Spare		15A	23			*	24	15A		<b>Level Transmitter U270</b>	
Spare		15A	25	*			26	15A		<b>Level Transmitter U370</b>	
Spare		15A	27		*		28	15A		<b>Pressure switch U474 PT</b>	
Spare		15A	29			*	30			Space	
Motion Detectors		15A	31	*			32	50A	5kW	Panel C	
Motorized Damper (Mech)		15A	33		*		34	2P		3/C #4 Teck Cable	
Motorized Damper (Mech)		15A	35			*	36			Space	
Motorized Damper (Mech)		15A	37	*			38	100A	25kW	Panel B	
Motorized Damper (Mech)		15A	39		*		40	3P		4#2 -41mm conduit	
Fire Alarm Panel	200W	15A	41			*	42			Plus Ground	

Voltage: 120/208V/3Ø/4 wire

Feeder: 3/C 250MCM R90 Teck

Mains: 225A

Main Breaker: N/A

Location: Electrical Room

Power Source: Transfromer DT-6

Mounting: Surface

Motor Schedule

MOTOR		MOTOR SCHEDULE																	POWER	DISC.	INTERLOCK	REMARKS
EQUIP. NO.	DESCRIPTION	EQUIP. LOAD	V/PH	MCC	SIZE	TYPE	MAN.	MAG.	S/S	PL	H.O.A	OVERCURRENT DEVICE	LOCATION	PANEL	CCT.	FEEDER	CAP. SIZE	TYPE	INTERLOCK	REMARKS		
U-410-AHU-1	U-416-SF Elec. Rm.	15HP	600/3									40A-3P	Mezzanine	100	14,16,18	3/C#10		Div. 16	DCC Cont.	VFD by Div. 15 installed by Div. 16 Note 2		
	U-411-RF Elec. Rm.	7.5HP	600/3									20A-3P	Mezzanine	100	20,22,24	3/C#12		Div. 16	DCC Cont.	VFD by Div. 15 installed by Div. 16 Note 2		
	U-417-SF Elec. Rm.	20HP	600/3									50A-3P	Mezzanine	100	26,28,30	3/C#10		Div. 16	DCC Cont.	VFD by Div. 15 installed by Div. 16 Note 2		
	U-412-RF Elec. Rm.	10HP	600/3									30A-3P	Mezzanine	100	32,34,36	3/C#10		Div. 16	DCC Cont.	VFD by Div. 15 installed by Div. 16 Note 2		
U-420-AHU-1	U-424-SF UV Rm.	5HP	600/3									15A-3P	UV Room	100	19,21,23	3/C#12		Div. 16	DCC Cont.	VFD by Div. 15 installed by Div. 16 Note 2		
	U-421-RF UV Rm.	3HP	600/3									15A-3P	UV Room	100	25,27,29	3/C#12		Div. 16	DCC Cont.	VFD by Div. 15 installed by Div. 16 Note 2		
U-419-EF	Electrical Room Exhaust Fan	15HP	600/3	1A	2			*	*	*		30MCP	Roof	MCC		3/C#10		Div. 16	DCC Cont.			
U-426-EF	UV Room Exhaust Fan	1-1/2HP	600/3					*	*	*		15A-3P	Roof	100	31,33,35	3/C#12		Div. 16	DCC Cont.	VFD by Div. 15 installed by Div. 16 Note 2		
U-432-SF	Control Room Fan Coil Unit	1/2 HP	120/1					*	*	*		15A-1P	Corridor	A	8	2#12		Div. 16	DCC Cont.			
U-434-SF	Corridor & Washroom Fan Coil	1/2 HP	120/1					*	*	*		15A-1P	Corridor	A	10	2#12		Div. 16	DCC Cont.			
U-440-EF	Wash Room Exhaust Fan	87W	120/1					*	*	*		15A-1P	Washroom	A	9	2#12		Div. 15				
U-445-EF	Sampling Building Exhaust Fan	87W	120/1					*	*	*		15A-1P	Sampling Bldg	C	6	2#12		Div. 15				
U-451-P	HX Loop Pump	2HP	600/3	1B	1			*	*	*		7MCP	UV Room	MCC		3/C#12 Teck		Div. 16	Temp Sensor			
U-452-P	HX Loop Pump	2HP	600/3	1C	1			*	*	*		7MCP	UV Room	MCC		3/C#12 Teck		Div. 16	Temp Sensor			
U-461-P	Cond Loop Pump	1.5HP	600/3	1D	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	460-HP-1			
U-462-P	Evap Loop Pump	2HP	600/3	1E	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	460-HP-1			
U-463-P	Cond Loop Pump	1-1/2HP	600/3	1F	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	460-HP-2			
U-464-P	Evap Loop Pump	2HP	600/3	2A	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	460-HP-2			
U-465-P	Cond Loop Pump	2HP	600/3	2B	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	460-HP-3			
U-466-P	Evap Loop Pump	3HP	600/3	2C	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	460-HP-3			
U-467-P	Cond Loop Pump	1-1/2HP	600/3	2D	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	460-HP-4			
U-468-P	Evap Loop Pump	2HP	600/3	2E	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	460-HP-4			
U-481-P	Cond Loop Pump ITT	1-1/2HP	600/3	2F	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	470-HP-1			
U-482-P	Evap Loop Pump ITT	2HP	600/3	3A	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	470-HP-1			
U-483-P	Cond Loop Pump ITT	1-1/2HP	600/3	3B	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	470-HP-2			
U-484-P	Evap Loop Pump ITT	2HP	600/3	3C	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	470-HP-2			
U-490-P-1	Flushing Water	2.5HP	600/3	3D	1			*	*	*		7MCP	UV Room	MCC		3/C#12 Teck		Div. 16	U-490-PT	Interlock with expansion tank pressure sw		
U-469-HP	Cooling Loop Heat Pump	14A	600/3									40A-3P	Mezzanine	100	37,39,41	3/C#10 Teck		Div. 15	Temp Sensor	Package Unit. Starter By Div. 15		
U-470-HP	Cooling Loop Heat Pump	14A	600/3									40A-3P	Mezzanine	100	38,40,42	3/C#10 Teck		Div. 15	Temp Sensor	Package Unit. Starter By Div. 15		
U-471-HP	Cooling Loop Heat Pump	14A	600/3									40A-3P	Mezzanine	100	43,45,47	3/C#10 Teck		Div. 15	Temp Sensor	Package Unit. Starter By Div. 15		
U-472-HP	Cooling Loop Heat Pump	14A	600/3									40A-3P	Mezzanine	100	44,46,48	3/C#10 Teck		Div. 15	Temp Sensor	Package Unit. Starter By Div. 15		
U-473-HP	Cooling Loop Heat Pump	5A	600/3									20A-3P	Mezzanine	100	56,58,60	3/c#12 Teck		Div. 15	Temp Sensor	Package Unit. Starter By Div. 15		
U-486-HP	Heating Loop Heat Pump	14A	600/3									40A-3P	Mezzanine	100	49,51,53	3/C#10 Teck		Div. 15	Temp Sensor	Package Unit. Starter By Div. 15		
U-487-HP	Heating Loop Heat Pump	14A	600/3									40A-3P	Mezzanine	100	50,52,54	3/C#10 Teck		Div. 15	Temp Sensor	Package Unit. Starter By Div. 15		
U-488-HP	Heating Loop Heat Pump	5A	600/3									20A-3P	Mezzanine	100	61,63,65	3/c#12 Teck		Div. 15	Temp Sensor	Package Unit. Starter By Div. 15		
U-480-HWT-1	Hot Water Heater	7.6kW	208/1									50A-2P	Washroom	A	11,13	2/C#6 Teck		Div. 16				
U-485-DHWP	DHW Recirc Pump	23 w	115/1									15A-1P	Washroom	B		2#12						
U-489-EB	Electric Boiler	18kW	600/3									30A-3P	Mezzanine	100	55,57,59	3/C #10 Teck		Div. 16	Temp Sensor			
U-455-AC-1	Air Compressor	3HP	600/3	3E	1			*	*	*		7MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	Press. Sw.			
U-455-AC-2	Air Compressor	5HP	600/3	3F	1			*	*	*		15MCP	Mezzanine	MCC		3/C#12 Teck		Div. 16	Press. Sw.			
U-010-P-1	Lift Pump No.-1	170HP	600/3									800AF/300AT	Lift Station	Dis. 600	B-7	3/C #4/0 Teck		Div. 16	Level Sensor	Harmonic Filter and VFD Note 1		
U-020-P-2	Lift Pump No.-2	170HP	600/3									800AF/300AT	Lift Station	Dis. 600	B-6	3/C #4/0 Teck		Div. 16	Level Sensor	Harmonic Filter and VFD Note 1		
U-030-P-3	Lift Pump No.-3	170HP	600/3									800AF/300AT	Lift Station	Dis. 600	B-5	3/C #4/0 Teck		Div. 16	Level Sensor	Harmonic Filter and VFD Note 1		
U-040-P-4	Lift Pump No.-4	170HP	600/3									800AF/300AT	Lift Station	Dis. 600	B-4	3/C #4/0 Teck		Div. 16	Level Sensor	Harmonic Filter and VFD Note 1		
U-050-P-5	Lift Pump No.-5	170HP	600/3									800AF/300AT	Lift Station	Dis. 600	B-3	3/C #4/0 Teck		Div. 16	Level Sensor	Harmonic Filter and VFD Note 1		
U-485-P	Boiler Circulation Pump	1HP	208/3									15A-3P	Mezzanine	A	12,14,16	3/C #12 Teck		Div. 16				
U-102-SG-1	Valve Actuator #1	2HP	600/3									15A-3P	UV Room	100	1, 3, 5	3/C #12 Teck			UV SCC	Starter complete with operator		
U-202-SG-1	Valve Actuator #2	2HP	600/3									15A-3P	UV Room	100	2, 4, 6	3/C #12 Teck			UV SCC	Starter complete with operator		
U-302-SG-1	Valve Actuator #3	2HP	600/3									15A-3P	UV Room	100	7, 9, 11	3/C #12 Teck			UV SCC	Starter complete with operator		
U-002-SG-1	Valve Actuator	5HP	600/3									15A-3P	Grit Building	MCC-1G	Sect. 1	3/C #12 Teck				MCC located in Grit Building Electrical Rm.		

Note

- VFD's and harmonic filters to be supplied by the City to the contractor for installation of pumps P-1 to P-5.
- VFD's Associated with HVAC equipment to be supplied under Div. 15 and installed under Div.16

**ELECTRICAL EQUIPMENT AND SYSTEMS  
DEMONSTRATION AND INSTRUCTION**

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**SYSTEM COMPLETION AND COMMISSIONING**

**SYSTEM:** \_\_\_\_\_

The above system is installed as per the Drawings and Specifications, is complete and has been commissioned.

**Electrical Contractor**

Signed by: \_\_\_\_\_ Dated: \_\_\_\_\_

**General Contractor**

Signed by: \_\_\_\_\_ Dated: \_\_\_\_\_

Deficiencies Attached

This system has been reviewed by:

**The Contract Administrator**

Signed by: \_\_\_\_\_ Dated \_\_\_\_\_

The City's personnel have been instructed in the operation and maintenance of the above system:

**The City**

Signed by: \_\_\_\_\_ Dated \_\_\_\_\_

The above does not constitute a waiver of any of the requirements of the Contract Documents.

ELECTRICAL  
CONTRACTOR

GENERAL  
CONTRACTOR

Address:

_____	_____
_____	_____
_____	_____
_____	_____

Phone:

_____	_____
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**ULTRAVIOLET SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME	DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION					
			FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.
								LOW	HIGH		
1	0	U060-FIT	Ultrasonic Open Channel Flow Trans	UV Influent Pump Discharge Channel	PI-07					AI	
2	1	U060-QF	Instrument Fault	Channel Flow Sensor	PI-07					DI	
3	0	U070-UA-1	Minor Alarm	UV System	PI-07					DO	
4	0	U070-UA-2	Major Alarm	UV System	PI-07					DO	
5	0	U070-UA-3	Critical Alarm	UV System	PI-07					DO	
6	0	U110-YM	Bank On	UV System Bank 1A	PI-07					DO	
7	0	U111-AT	Ultraviolet Light Intensity	UV System Bank 1A	PI-07					AI	
8	0	U120-YM	Bank On	UV System Bank 1B	PI-07					DO	
9	0	U121-AT	Ultraviolet Light Intensity	UV System Bank 1B	PI-07					AI	
10	0	U170-LT	Liquid Level Transmitter	UV Channel 1	PI-07					AI	
11	1	U170-QF	Instrument Fault	UV Channel 1	PI-07					DI	
12	0	U210-YM	Bank On	UV System Bank 2A	PI-08					DO	
13	0	U211-AT	Ultraviolet Light Intensity	UV System Bank 2A	PI-08					AI	
14	0	U220-YM	Bank On	UV System Bank 2B	PI-08					DO	
15	0	U221-AT	Ultraviolet Light Intensity	UV System Bank 2B	PI-08					AI	
16	0	U270-LT	Liquid Level Transmitter	UV Channel 2	PI-08					AI	
17	1	U270-QF	Instrument Fault	UV Channel 2	PI-08					DI	
18	0	U310-YM	Bank On	UV System Bank 3A	PI-09					DO	
19	0	U311-AT	Ultraviolet Light Intensity	UV System Bank 3A	PI-09					AI	
20	0	U320-YM	Bank On	UV System Bank 3B	PI-09					DO	
21	0	U321-AT	Ultraviolet Light Intensity	UV System Bank 3B	PI-09					AI	
22	0	U370-LT	Liquid Level Transmitter	UV Channel 3	PI-09					AI	
23	1	U370-QF	Instrument Fault	UV Channel 3	PI-09					DI	
24	0	U102-YS	Remote Control Selected	UV Channel 1 Weir Gate	PI-10					DI	
25	0	U102-ZC	Position Control Output	UV Channel 1 Weir Gate	PI-10					AO	
26	0	U102-ZSB	Closed Status	UV Channel 1 Weir Gate	PI-10					DI	
27	0	U102-ZSD	Open Status	UV Channel 1 Weir Gate	PI-10					DI	
28	0	U102-ZT	Position Transmitter	UV Channel 1 Weir Gate	PI-10					AI	
29	0	U202-YS	Remote Control Selected	UV Channel 2 Weir Gate	PI-10					DI	
30	0	U202-ZC	Position Control Output	UV Channel 2 Weir Gate	PI-10					AO	
31	0	U202-ZSB	Closed Status	UV Channel 2 Weir Gate	PI-10					DI	
32	0	U202-ZSD	Open Status	UV Channel 2 Weir Gate	PI-10					DI	
33	0	U202-ZT	Position Transmitter	UV Channel 2 Weir Gate	PI-10					AI	

I/O POINT TYPES: AI = Analog Input, AO = Analog Output, DI = Discrete Input, DO = Discrete Output, MB = Modbus

**ULTRAVIOLET SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME	DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION					
			FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.
								LOW	HIGH		
34	0	U302-YS	Remote Control Selected	UV Channel 3 Weir Gate	PI-10					DI	
35	0	U302-ZC	Position Control Output	UV Channel 3 Weir Gate	PI-10					AO	
36	0	U302-ZSB	Closed Status	UV Channel 3 Weir Gate	PI-10					DI	
37	0	U302-ZSD	Open Status	UV Channel 3 Weir Gate	PI-10					DI	
38	0	U302-ZT	Position Transmitter	UV Channel 3 Weir Gate	PI-10					AI	

I/O POINT TYPES: AI = Analog Input, AO = Analog Output, DI = Discrete Input, DO = Discrete Output, MB = Modbus

**DISTRIBUTED CONTROL SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME			DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION					
		PCU		DEVICE TAG	FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.
		AREA	PNL							LOW	HIGH		
1	0	U	A	U005-LT	Liquid level transmitter	UV Influent Pump Well Level	PI-04	mm				AI	
2	0	U	A	U005-LF	Liquid level transmitter fault	UV Influent Pump Well Level	PI-04					DI	
3	0	U	A	U010-IIT	Current Transmitter	UV Influent Pump U-010-P-1	PI-06	Amps				AI	
4	0	U	A	U010-MM	Motor Running	UV Influent Pump U-010-P-1	PI-06					DI	
5	0	U	A	U010-MN	Start Command	UV Influent Pump U-010-P-1	PI-06					DO	
6	0	U	A	U010-SC	Speed Control Output	UV Influent Pump U-010-P-1	PI-06	%				AO	
7	0	U	A	U010-SIT	Speed Transmitter	UV Influent Pump U-010-P-1	PI-06	%				AI	
8	0	U	A	U010-UF	Pump or Drive Fault	UV Influent Pump U-010-P-1	PI-06					DI	
9	0	U	A	U010-YS	Remote Control Selected	UV Influent Pump U-010-P-1	PI-06					DI	
10	0	U	A	U020-IIT	Current Transmitter	UV Influent Pump U-020-P-1	PI-06	Amps				AI	
11	0	U	A	U020-MM	Motor Running	UV Influent Pump U-020-P-1	PI-06					DI	
12	0	U	A	U020-MN	Start Command	UV Influent Pump U-020-P-1	PI-06					DO	
13	0	U	A	U020-SC	Speed Control Output	UV Influent Pump U-020-P-1	PI-06	%				AO	
14	0	U	A	U020-SIT	Speed Transmitter	UV Influent Pump U-020-P-1	PI-06	%				AI	
15	0	U	A	U020-UF	Pump or Drive Fault	UV Influent Pump U-020-P-1	PI-06					DI	
16	0	U	A	U020-YS	Remote Control Selected	UV Influent Pump U-020-P-1	PI-06					DI	
17	0	U	A	U030-IIT	Current Transmitter	UV Influent Pump U-030-P-1	PI-06	Amps				AI	
18	0	U	A	U030-MM	Motor Running	UV Influent Pump U-030-P-1	PI-06					DI	
19	0	U	A	U030-MN	Start Command	UV Influent Pump U-030-P-1	PI-06					DO	
20	0	U	A	U030-SC	Speed Control Output	UV Influent Pump U-030-P-1	PI-06	%				AO	
21	0	U	A	U030-SIT	Speed Transmitter	UV Influent Pump U-030-P-1	PI-06	%				AI	
22	0	U	A	U030-UF	Pump or Drive Fault	UV Influent Pump U-030-P-1	PI-06					DI	
23	0	U	A	U030-YS	Remote Control Selected	UV Influent Pump U-030-P-1	PI-06					DI	
24	0	U	A	U040-IIT	Current Transmitter	UV Influent Pump U-040-P-1	PI-06	Amps				AI	
25	0	U	A	U040-MM	Motor Running	UV Influent Pump U-040-P-1	PI-06					DI	
26	0	U	A	U040-MN	Start Command	UV Influent Pump U-040-P-1	PI-06					DO	
27	0	U	A	U040-SC	Speed Control Output	UV Influent Pump U-040-P-1	PI-06	%				AO	
28	0	U	A	U040-SIT	Speed Transmitter	UV Influent Pump U-040-P-1	PI-06	%				AI	
29	0	U	A	U040-UF	Pump or Drive Fault	UV Influent Pump U-040-P-1	PI-06					DI	
30	0	U	A	U040-YS	Remote Control Selected	UV Influent Pump U-040-P-1	PI-06					DI	
31	0	U	A	U050-IIT	Current Transmitter	UV Influent Pump U-050-P-1	PI-06	Amps				AI	
32	0	U	A	U050-MM	Motor Running	UV Influent Pump U-050-P-1	PI-06					DI	
33	0	U	A	U050-MN	Start Command	UV Influent Pump U-050-P-1	PI-06					DO	
34	0	U	A	U050-SC	Speed Control Output	UV Influent Pump U-050-P-1	PI-06	%				AO	
35	0	U	A	U050-SIT	Speed Transmitter	UV Influent Pump U-050-P-1	PI-06	%				AI	
36	0	U	A	U050-UF	Pump or Drive Fault	UV Influent Pump U-050-P-1	PI-06					DI	



**DISTRIBUTED CONTROL SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME			DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION						
		PCU		DEVICE TAG	FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.	
		AREA	PNL							LOW	HIGH			
37	0	U	A	U050-YS	Remote Control Selected	UV Influent Pump U-050-P-1	PI-06						DI	
38	0	U	A	U070-UA-1	Minor Alarm	UV System	PI-07						DI	
39	0	U	A	U070-UA-2	Major Alarm	UV System	PI-07						DI	
40	0	U	A	U070-UA-3	Critical Alarm	UV System	PI-07						DI	
41	0	U	A	U110-YM	Bank On	UV System Bank 1A	PI-07						DI	
42	0	U	A	U120-YM	Bank On	UV System Bank 1B	PI-07						DI	
43	0	U	A	U210-YM	Bank On	UV System Bank 2A	PI-08						DI	
44	0	U	A	U220-YM	Bank On	UV System Bank 2B	PI-08						DI	
45	0	U	A	U310-YM	Bank On	UV System Bank 3A	PI-09						DI	
46	0	U	A	U320-YM	Bank On	UV System Bank 3B	PI-09						DI	
47	0	U	A	U900-UA-1	Fire Alarm	UV Facility Fire Alarm Panel							DI	
48	0	U	A	U900-UA-2	Trouble Alarm	UV Facility Fire Alarm Panel							DI	
49	0	U	A	U910-ZS-1	Infra-Red Motion Sensor	UV Facility Process Room							DI	
50	0	U	A	U910-ZS-2	Infra-Red Motion Sensor	UV Facility Process Room							DI	
51	0	U	A	U910-ZS-3	Infra-Red Motion Sensor	UV Facility Process Room							DI	
52	0	U	A	U910-ZS-4	Infra-Red Motion Sensor	UV Facility Process Room							DI	
53	0	U	A	U911-ZS	Infra-Red Motion Sensor	UV Facility Entrance Hall							DI	
54	0	U	A	U912-ZS-1	Infra-Red Motion Sensor	UV Facility Electrical Room							DI	
55	0	U	A	U912-ZS-2	Infra-Red Motion Sensor	UV Facility Electrical Room							DI	
56	0	U	A	U913-ZS	Door Switch	UV Facility Entrance							DI	
57	0	U	A	U914-ZS	Door Switch	UV Facility Process Room							DI	
58	0	X	X	U920-ET	Voltage	UV Facility 4160 Volt Bus A		Volts					TCP/IP	
59	0	X	X	U920-IT	Current	UV Facility 4160 Volt Bus A		Amps					TCP/IP	
60	0	X	X	U920-JT	Power	UV Facility 4160 Volt Bus A		kW					TCP/IP	
61	0	U	A	U980-ZS	Infra-Red Motion Sensor	Final Effluent Sampling Building							DI	
62	0	U	A	U981-TAL	Wet Side Heat Fault	Final Effluent Sampling Building							DI	
63	0	U	A	U982-TAL	Dry Side Heat Fault	Final Effluent Sampling Building							DI	
64	1	G	A	U002-VB	Gate close command	Sluice Gate YG-12B Actuator	PI-04						DO	
65	1	G	A	U002-VD	Gate open command	Sluice Gate YG-12B Actuator	PI-04						DO	
66	1	G	A	U002-YS	Computer selected	Sluice Gate YG-12B Actuator	PI-04						DI	
67	1	G	A	U002-ZSB	Gate closed status	Sluice Gate YG-12B Actuator	PI-04						DI	
68	1	G	A	U002-ZSD	Gate open status	Sluice Gate YG-12B Actuator	PI-04						DI	
69	0	X	X	U921-ET	Voltage	UV Facility 4160 Volt Bus B		Volts					TCP/IP	
70	0	X	X	U921-IT	Current	UV Facility 4160 Volt Bus B		Amps					TCP/IP	
71	0	X	X	U921-JT	Power	UV Facility 4160 Volt Bus B		kW					TCP/IP	
72	0	U	A	U930-TSH1	Winding Temperature Not at Trip Level	Transformer PDT-1							DI	

**DISTRIBUTED CONTROL SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME			DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION					
		PCU		DEVICE TAG	FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.
		AREA	PNL							LOW	HIGH		
73	0	U	A	U930-TSH2	Winding Temperature Normal (Not High)	Transformer PDT-1						DI	
74	0	U	A	U930-TSH3	Oil Temperature Normal (Not High)	Transformer PDT-1						DI	
75	0	U	A	U930-LSL	Oil Level Normal (Not Low)	Transformer PDT-1						DI	
76	0	U	A	U930-PSH	Vacuum Pressure Normal (Not High)	Transformer PDT-1						DI	
77	0	U	A	U930-ISL	Circuit not Open	Transformer PDT-1 Grounding Resistor						DI	
78	0	U	A	U935-TSH1	Winding Temperature Not at Trip Level	Transformer UVT-2						DI	
79	0	U	A	U935-TSH2	Winding Temperature Normal (Not High)	Transformer UVT-2						DI	
80	0	U	A	U940-TSH1	Winding Temperature Not at Trip Level	Transformer UVT-3						DI	
81	0	U	A	U940-TSH2	Winding Temperature Normal (Not High)	Transformer UVT-3						DI	
82	0	U	A	U945-TSH3	Winding Temperature Not at Trip Level	Transformer LST-4						DI	
83	0	U	A	U945-TSH4	Winding Temperature Normal (Not High)	Transformer LST-4						DI	
84	0	U	A	U950-TSH3	Winding Temperature Not at Trip Level	Transformer LST-5						DI	
85	0	U	A	U950-TSH4	Winding Temperature Normal (Not High)	Transformer LST-5						DI	
86	0	U	A	U100-TT-1	Outside air temperature	HVAC	PI-11	°C				AI	
87	0	U	A	U100-TT-2	Outside air temperature	HVAC	PI-11	°C				AI	
88	1	U	A	U410-PDT-1	Differential air pressure	Elect Rm Air Handling Unit U-410-AHU-1	PI-11	PA				AI	
89	1	U	A	U410-PDT-2	Differential air pressure	Elect Rm Air Handling Unit U-410-AHU-2	PI-12	PA				AI	
90	0	U	A	U410-TT-1	Supply air temperature	Elect Rm Air Handling Unit U-410-AHU-1	PI-12	°C				AI	
91	0	U	A	U410-TT-2	Return air temperature	Elect Rm Air Handling Unit U-410-AHU-1	PI-11	°C				AI	
92	0	U	A	U410-TT-3	Room temperature	Elect Rm Air Handling Unit U-410-AHU-1	PI-11	°C				AI	
93	0	U	A	U410-2-ZC	HC Valve Actuator Position Control	Heating coil U-410-2-HC	PI-22	%				AO	
94	0	U	A	U410-ZC-1	Damper position control	Econ air damper U-410-MD (U-410-AHU-1)	PI-11	%				AO	
95	0	U	A	U410-ZSB	Damper closed status	Econ air damper U-410-MD (U-410-AHU-1)	PI-11					DI	
96	0	U	A	U410-ZSD	Damper open status	Econ air damper U-410-MD (U-410-AHU-1)	PI-11					DI	
97	1	U	A	U410-TSL	Freeze stat	Cooling coil U-417-CC (U-410-AHU-1)	PI-12					DI	
98	0	U	A	U411-MM	Motor running	Return Fan U-411-RF (U-410-AHU-1)	PI-11					DI	
99	0	U	A	U411-MN	Start Command	Return Fan U-411-RF (U-410-AHU-1)	PI-11					DO	
100	0	U	A	U411-SC	Speed control output	Return Fan U-411-RF (U-410-AHU-1)	PI-11	%				AO	
101	0	U	A	U411-UF	Fan or drive trouble	Return Fan U-411-RF (U-410-AHU-1)	PI-11					DI	
102	0	U	A	U411-YS	Computer Control Selected	Return Fan U-411-RF (U-410-AHU-1)	PI-11					DI	
103	0	U	A	U411-ZB	Damper close command	Return air damper U-411-MD (U-410-AHU-1)	PI-11					DO	
104	0	U	A	U411-ZD	Damper open command	Return air damper U-411-MD (U-410-AHU-1)	PI-11					DO	
105	0	U	A	U411-ZSB	Damper closed status	Return air damper U-411-MD (U-410-AHU-1)	PI-11					DI	
106	0	U	A	U411-ZSD	Damper open status	Return air damper U-411-MD (U-410-AHU-1)	PI-11					DI	
107	0	U	A	U412-MM	Motor running	Return Fan U-412-RF (U-410-AHU-1)	PI-11					DI	
108	0	U	A	U412-MN	Start Command	Return Fan U-412-RF (U-410-AHU-1)	PI-11					DO	

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**DISTRIBUTED CONTROL SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME			DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION						
		PCU		DEVICE TAG	FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.	
		AREA	PNL							LOW	HIGH			
109	0	U	A	U412-SC	Speed control output	Return Fan U-412-RF (U-410-AHU-1)	PI-11	%					AO	
110	0	U	A	U412-UF	Fan or drive trouble	Return Fan U-412-RF (U-410-AHU-1)	PI-11						DI	
111	0	U	A	U412-YS	Computer Control Selected	Return Fan U-412-RF (U-410-AHU-1)	PI-11						DI	
112	0	U	A	U412-ZB	Damper close command	Return air damper U-412-MD (U-410-AHU-1)	PI-11						DO	
113	0	U	A	U412-ZD	Damper open command	Return air damper U-412-MD (U-410-AHU-1)	PI-11						DO	
114	0	U	A	U412-ZSB	Damper closed status	Return air damper U-412-MD (U-410-AHU-1)	PI-11						DI	
115	0	U	A	U412-ZSD	Damper open status	Return air damper U-412-MD (U-410-AHU-1)	PI-11						DI	
116	0	U	A	U413-ZC	Damper position control	Waste heat damper U-413-MD (U-410-AHU-1)	PI-11	%					AO	
117	0	U	A	U413-ZSB	Damper closed status	Waste heat damper U-413-MD (U-410-AHU-1)	PI-11						DI	
118	0	U	A	U413-ZSD	Damper open status	Waste heat damper U-413-MD (U-410-AHU-1)	PI-11						DI	
119	0	U	A	U414-ZC	Damper position control	Exhaust air damper U-414-MD (U-410-AHU-1)	PI-11	%					AO	
120	0	U	A	U414-ZSB	Damper closed status	Exhaust air damper U-414-MD (U-410-AHU-1)	PI-11						DI	
121	0	U	A	U414-ZSD	Damper open status	Exhaust air damper U-414-MD (U-410-AHU-1)	PI-11						DI	
122	0	U	A	U415-ZC	Damper position control	Outside air damper U-415-MD (U-410-AHU-1)	PI-11	%					AO	
123	0	U	A	U415-ZSB	Damper closed status	Outside air damper U-415-MD (U-410-AHU-1)	PI-11						DI	
124	0	U	A	U415-ZSD	Damper open status	Outside air damper U-415-MD (U-410-AHU-1)	PI-11						DI	
125	0	U	A	U416-MM	Motor running	Supply Fan U-416-SF (U-410-AHU-1)	PI-12						DI	
126	0	U	A	U416-MN	Start Command	Supply Fan U-416-SF (U-410-AHU-1)	PI-12						DO	
127	0	U	A	U416-SC	Speed control output	Supply Fan U-416-SF (U-410-AHU-1)	PI-12	%					AO	
128	0	U	A	U416-UF	Fan or drive trouble	Supply Fan U-416-SF (U-410-AHU-1)	PI-12						DI	
129	0	U	A	U416-YS	Computer Control Selected	Supply Fan U-416-SF (U-410-AHU-1)	PI-12						DI	
130	0	U	A	U416-ZB-1	Damper close command	Isolation damper U-416-MD-1 (U-410-AHU-1)	PI-12						DO	
131	0	U	A	U416-ZD-1	Damper open command	Isolation damper U-416-MD-1 (U-410-AHU-1)	PI-12						DO	
132	0	U	A	U416-ZSB-1	Damper closed status	Isolation damper U-416-MD-1 (U-410-AHU-1)	PI-12						DI	
133	0	U	A	U416-ZSD-1	Damper open status	Isolation damper U-416-MD-1 (U-410-AHU-1)	PI-12						DI	
134	0	U	A	U416-ZB-2	Damper close command	Air damper U-416-MD-2 (U-410-AHU-1)	PI-12						DO	
135	0	U	A	U416-ZD-2	Damper open command	Air damper U-416-MD-2 (U-410-AHU-1)	PI-12						DO	
136	0	U	A	U416-ZSB-2	Damper closed status	Air damper U-416-MD-2 (U-410-AHU-1)	PI-12						DI	
137	0	U	A	U416-ZSD-2	Damper open status	Air damper U-416-MD-2 (U-410-AHU-1)	PI-12						DI	
138	0	U	A	U416-PDSH	Filter status	U-416-SF - Filter section (U-410-AHU-1)	PI-12						DI	
139	0	U	A	U416-ZC-1	CC Valve Actuator Position Control	Cooling coil U-416-CC-1 (U-410-AHU-1)	PI-21	%					AO	
140	0	U	A	U416-ZC-2	CC Valve Actuator Position Control	Cooling coil U-416-CC-2 (U-410-AHU-1)	PI-21	%					AO	
141	0	U	A	U416-TSL	Freeze stat	Cooling coil U-416-CC (U-410-AHU-1)	PI-12						DI	
142	0	U	A	U416-TT	Mixed air temperature	Supply Fan U-416-SF (U-410-AHU-1)	PI-12						AI	
143	0	U	A	U417-MM	Motor running	Supply Fan U-417-SF (U-410-AHU-1)	PI-12						DI	
144	0	U	A	U417-MN	Start Command	Supply Fan U-417-SF (U-410-AHU-1)	PI-12						DO	

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**DISTRIBUTED CONTROL SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME			DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION						
		PCU		DEVICE TAG	FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.	
		AREA	PNL							LOW	HIGH			
145	0	U	A	U417-SC	Speed control output	Supply Fan U-417-SF (U-410-AHU-1)	PI-12	%					AO	
146	0	U	A	U417-UF	Fan or drive trouble	Supply Fan U-417-SF (U-410-AHU-1)	PI-12						DI	
147	0	U	A	U417-YS	Computer Control Selected	Supply Fan U-417-SF (U-410-AHU-1)	PI-12						DI	
148	0	U	A	U417-ZB-1	Damper close command	Isolation damper U-417-MD-1 (U-410-AHU-1)	PI-12						DO	
149	0	U	A	U417-ZD-1	Damper open command	Isolation damper U-417-MD-1 (U-410-AHU-1)	PI-12						DO	
150	0	U	A	U417-ZSB-1	Damper closed status	Isolation damper U-417-MD-1 (U-410-AHU-1)	PI-12						DI	
151	0	U	A	U417-ZSD-1	Damper open status	Isolation damper U-417-MD-1 (U-410-AHU-1)	PI-12						DI	
152	0	U	A	U417-ZB-2	Damper close command	Air damper U-417-MD-2 (U-410-AHU-1)	PI-12						DO	
153	0	U	A	U417-ZD-2	Damper open command	Air damper U-417-MD-2 (U-410-AHU-1)	PI-12						DO	
154	0	U	A	U417-ZSB-2	Damper closed status	Air damper U-417-MD-2 (U-410-AHU-1)	PI-12						DI	
155	0	U	A	U417-ZSD-2	Damper open status	Air damper U-417-MD-2 (U-410-AHU-1)	PI-12						DI	
156	0	U	A	U417-PSH	Filter status	U-417-SF - Filter section (U-410-AHU-1)	PI-12						DI	
157	0	U	A	U417-ZC-1	CC Valve Actuator Position Control	Cooling coil U-417-CC-1 (U-410-AHU-1)	PI-21	%					AO	
158	0	U	A	U417-ZC-2	CC Valve Actuator Position Control	Cooling coil U-417-CC-2 (U-410-AHU-1)	PI-21	%					AO	
159	0	U	A	U417-TT	Mixed air temperature	Supply Fan U-417-SF (U-410-AHU-1)	PI-12	4-20 ma					AI	
160	0	U	A	U418-ZSB-1	Damper closed status	Emergency Cooling System U-418-MD-1	PI-13						DI	
161	0	U	A	U418-ZSB-2	Damper closed status	Emergency Cooling System U-418-MD-2	PI-13						DI	
162	0	U	A	U418-ZSB-3	Damper closed status	Emergency Cooling System U-418-MD-3	PI-13						DI	
163	0	U	A	U418-TSH	Room high temperature	Emergency Cooling System	PI-13						DI	
164	0	U	A	U419-ZSB	Damper closed status	Emergency Cooling System U-419-MD	PI-13						DI	
165	0	U	A	U419-MM	Motor running	Exhaust Fan U-419-SF	PI-13						DI	
166	0	U	A	U419-YS	Auto control selected	Exhaust Fan U-419-SF	PI-13						DI	
167	0	U	A	U420-TT-1	Supply air temperature	UV Rm Air Handling Unit U-420-AHU-1	PI-14	°C					AI	
168	0	U	A	U420-TT-2	Mixed air temperature	UV Rm Air Handling Unit U-420-AHU-1	PI-14	°C					AI	
169	0	U	A	U420-TT-3	Return air temperature	UV Rm Air Handling Unit U-420-AHU-1	PI-14	°C					AI	
170	0	U	A	U420-TT-4	Room air temperature	UV Rm Air Handling Unit U-420-AHU-1	PI-14	°C					AI	
171	0	U	A	U420-AT	Room air humidity transmitter	UV Rm Air Handling Unit U-420-AHU-1	PI-14	%					AI	
172	0	U	A	U420-PDT	Differential air pressure transmitter	UV Rm Air Handling Unit U-420-AHU-1	PI-14	PA					AI	
173	0	U	A	U420-ZC-1	Damper position control	Econ air damper U-420-MD (U-420-AHU-1)	PI-14	%					AO	
174	0	U	A	U420-ZC-2	CC Valve Actuator position control	Cooling coil U-420-CC (U-420-AHU-1)	PI-21	%					AO	
175	0	U	A	U420-ZC-3	HC Valve Actuator position control	Heating coil U-420-HC (U-420-AHU-1)	PI-22	%					AO	
176	0	U	A	U420-TSL	Freeze stat	Heating coil U-420-HC (U-420-AHU-1)	PI-14						DI	
177	0	U	A	U420-PDSH	Filter status	UV Rm Air Handling Unit U-420-AHU-1	PI-14						DI	
178	0	U	A	U420-ZSB	Damper closed status	Econ air damper U-420-MD (U-420-AHU-1)	PI-14						DI	
179	0	U	A	U420-ZSD	Damper open status	Econ air damper U-420-MD (U-420-AHU-1)	PI-14						DI	
180	0	U	A	U421-MM	Motor running	Return Fan U-421-RF (U-420-AHU-1)	PI-14						DI	

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**DISTRIBUTED CONTROL SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME			DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION					
		PCU		DEVICE TAG	FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.
		AREA	PNL							LOW	HIGH		
181	0	U	A	U421-MN	Start command	Return Fan U-421-RF (U-420-AHU-1)	PI-14					DO	
182	0	U	A	U421-SC	Speed control output	Return Fan U-421-RF (U-420-AHU-1)	PI-14	%				AO	
183	0	U	A	U421-UF	Fan or drive trouble	Return Fan U-421-RF (U-420-AHU-1)	PI-14					DI	
184	0	U	A	U421-YS	Computer Control Selected	Return Fan U-421-RF (U-420-AHU-1)	PI-14					DI	
185	0	U	A	U422-ZC	Damper position control	Exhaust air damper U-422-MD (U-420-AHU-1)	PI-14	%				AO	
186	0	U	A	U422-ZSB	Damper closed status	Exhaust air damper U-422-MD (U-420-AHU-1)	PI-14					DI	
187	0	U	A	U422-ZSD	Damper open status	Exhaust air damper U-422-MD (U-420-AHU-1)	PI-14					DI	
188	0	U	A	U423-ZC	Damper position control	Outside air damper U-423-MD (U-420-AHU-1)	PI-14	%				AO	
189	0	U	A	U423-ZSB	Damper closed status	Outside air damper U-423-MD (U-420-AHU-1)	PI-14					DI	
190	0	U	A	U423-ZSD	Damper open status	Outside air damper U-423-MD (U-420-AHU-1)	PI-14					DI	
191	0	U	A	U424-MM	Motor running	Supply Fan U-424-SF (U-420-AHU-1)	PI-14					DI	
192	0	U	A	U424-MN	Start command	Supply Fan U-424-SF (U-420-AHU-1)	PI-14					DO	
193	0	U	A	U424-SC	Speed control output	Supply Fan U-424-SF (U-420-AHU-1)	PI-14	%				AO	
194	0	U	A	U424-UF	Fan or drive trouble	Supply Fan U-424-SF (U-420-AHU-1)	PI-14					DI	
195	0	U	A	U424-YS	Computer Control Selected	Supply Fan U-424-SF (U-420-AHU-1)	PI-14					DI	
196	0	U	A	U425-ZC	Damper position control	UV Rm Exhaust air damper U-425-MD	PI-14	%				AO	
197	0	U	A	U425-ZSB	Damper closed status	UV Rm Exhaust air damper U-425-MD	PI-14					DI	
198	0	U	A	U425-ZSD	Damper open status	UV Rm Exhaust air damper U-425-MD	PI-14					DI	
199	0	U	A	U426-MM	Motor running	UV Rm Exhaust Fan U-426-EF	PI-14					DI	
200	0	U	A	U426-MN	Start command	UV Rm Exhaust Fan U-426-EF	PI-14					DO	
201	0	U	A	U426-SC	Speed control output	UV Rm Exhaust Fan U-426-EF	PI-14	%				AO	
202	0	U	A	U426-UF	Fan or drive trouble	UV Rm Exhaust Fan U-426-EF	PI-14					DI	
203	0	U	A	U426-YS	Computer Control Selected	UV Rm Exhaust Fan U-426-EF	PI-14					DI	
204	0	U	A	U430-TT-1	Supply air temperature	Control Rm Air Handling Unit U-430-AHU-1	PI-15	°C				AI	
205	0	U	A	U430-TT-2	Mixed air temperature	Control Rm Air Handling Unit U-430-AHU-1	PI-15	°C				AI	
206	0	U	A	U430-TT-3	Room temperature	Control Rm Air Handling Unit U-430-AHU-1	PI-15	°C				AI	
207	0	U	A	U430-ZC-2	CC valve actuator position control	Cooling coil U-430-CC (U-430-AHU-1)	PI-21	%				AO	
208	0	U	A	U430-ZC-3	HC valve actuator position control	Heating coil U-430-HC (U-430-AHU-1)	PI-22	%				AO	
209	0	U	A	U430-TSL	Freeze stat	Cooling coil U-430-CC (U-430-AHU-1)	PI-15					DI	
210	0	U	A	U430-ZC-1	Damper position control	Return air damper U-430-MD (U-430-AHU-1)	PI-15	%				AO	
211	0	U	A	U430-ZSB	Damper close status	Return air damper U-430-MD (U-430-AHU-1)	PI-15					DI	
212	0	U	A	U430-ZSD	Damper open status	Return air damper U-430-MD (U-430-AHU-1)	PI-15					DI	
213	0	U	A	U431-ZC	Damper position control	Outside air damper U-431-MD (U-430-AHU-1)	PI-15	%				AI	
214	0	U	A	U431-ZSB	Damper close status	Outside air damper U-431-MD (U-430-AHU-1)	PI-15					DI	
215	0	U	A	U431-ZSD	Damper open status	Outside air damper U-431-MD (U-430-AHU-1)	PI-15					DI	
216	0	U	A	U432-MM	Running Status	Supply Fan U-432-SF (U-430-AHU-1)	PI-15					DI	

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NO.	REV. NO.	TAG NAME			DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION					
		PCU		DEVICE TAG	FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.
		AREA	PNL							LOW	HIGH		
217	0	U	A	U432-MN	Start Command	Supply Fan U-432-SF (U-430-AHU-1)	PI-15					DO	
218	0	U	A	U432-UF	Fan or motor trouble	Supply Fan U-432-SF (U-430-AHU-1)	PI-15					DI	
219	0	U	A	U432-YS	Computer Control Selected	Supply Fan U-432-SF (U-430-AHU-1)	PI-15					DI	
220	0	U	A	U434-MM	Running Status	Supply Fan U-434-SF (U-430-AHU-2)	PI-16					DI	
221	0	U	A	U434-MN	Start Command	Supply Fan U-434-SF (U-430-AHU-2)	PI-16					DO	
222	0	U	A	U434-UF	Fan or motor trouble	Supply Fan U-434-SF (U-430-AHU-2)	PI-16					DI	
223	0	U	A	U434-YS	Computer Control Selected	Supply Fan U-434-SF (U-430-AHU-2)	PI-16					DI	
224	0	U	A	U435-TT	Room air temperature	Corridor Air Handling Unit U-430-AHU-2	PI-16	°C				AI	
225	0	U	A	U451-MM	Run Status	Heat Exchanger Pump U-451-P	PI-17					DI	
226	0	U	A	U451-MN	Start Command	Heat Exchanger Pump U-451-P	PI-17					DO	
227	0	U	A	U451-YS	Computer Control Selected	Heat Exchanger Pump U-451-P	PI-17					DI	
228	0	U	A	U452-MM	Run Status	Heat Exchanger Pump U-452-P	PI-17					DI	
229	0	U	A	U452-MN	Start Command	Heat Exchanger Pump U-452-P	PI-17					DO	
230	0	U	A	U452-YS	Computer Control Selected	Heat Exchanger Pump U-452-P	PI-17					DI	
231	0	U	A	U455-TT	Effluent supply temperature	Effluent/Condenser Heat Exchanger	PI-17	°C				AI	
232	0	U	A	U456-TT	Glycol return temperature	Effluent/Condenser Heat Exchanger	PI-17	°C				AI	
233	0	U	A	U457-TT	Glycol supply temperature	Effluent/Condenser Heat Exchanger	PI-17	°C				AI	
234	0	U	A	U460-TT-1	Glycol supply temperature	Cooling Loop	PI-21	°C				AI	
235	0	U	A	U460-TT-2	Glycol return temperature	Cooling Loop	PI-21	°C				AI	
236	1	U	A	U460-PDSH-1	Glycol Pressure	Cooling Loop Pressure	PI-21	PA				AI	
237	1	U	A	U460-PDSH-2	Glycol Pressure	Cooling Loop Pressure	PI-22	PA				AI	
238	1	U	U	U-460-PBV-1	Glycol Pressure Sustaining Valve	Valve Position Control	P1-21	PA				AO	
239	1	U	U	U-460-PBV-2	Glycol Pressure Sustaining Valve	Valve Position Control	P1-22	PA				AO	
240	0	U	A	U461-MM	Run Status	Condenser loop pump U-461-P	PI-19					DI	
241	0	U	A	U461-MN	Start Command	Condenser loop pump U-461-P	PI-19					DO	
242	0	U	A	U461-YS	Computer Control Selected	Condenser loop pump U-461-P	PI-19					DI	
243	0	U	A	U462-MM	Run Status	Condenser loop pump U-462-P	PI-19					DI	
244	0	U	A	U462-MN	Start Command	Condenser loop pump U-462-P	PI-19					DO	
245	0	U	A	U462-YS	Computer Control Selected	Condenser loop pump U-462-P	PI-19					DI	
246	0	U	A	U463-MM	Run Status	Condenser loop pump U-463-P	PI-19					DI	
247	0	U	A	U463-MN	Start Command	Condenser loop pump U-463-P	PI-19					DO	
248	0	U	A	U463-YS	Computer Control Selected	Condenser loop pump U-463-P	PI-19					DI	
249	0	U	A	U464-MM	Run Status	Condenser loop pump U-464-P	PI-19					DI	
250	0	U	A	U464-MN	Start Command	Condenser loop pump U-464-P	PI-19					DO	
251	0	U	A	U464-YS	Computer Control Selected	Condenser loop pump U-464-P	PI-19					DI	
252	0	U	A	U465-MM	Run Status	Condenser loop pump U-465-P	PI-18					DI	

I/O POINT TYPES: AI = Analog Input, AO = Analog Output, DI = Discrete Input, DO = Discrete Output, MB = Modbus, TCP/IP = Ethernet

**DISTRIBUTED CONTROL SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME			DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION					
		PCU		DEVICE TAG	FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.
		AREA	PNL							LOW	HIGH		
253	0	U	A	U465-MN	Start Command	Condenser loop pump U-465-P	PI-18					DO	
254	0	U	A	U465-YS	Computer Control Selected	Condenser loop pump U-465-P	PI-18					DI	
255	0	U	A	U466-MM	Run Status	Condenser loop pump U-466-P	PI-18					DI	
256	0	U	A	U466-MN	Start Command	Condenser loop pump U-466-P	PI-18					DO	
257	0	U	A	U466-YS	Computer Control Selected	Condenser loop pump U-466-P	PI-18					DI	
258	0	U	A	U467-MM	Run Status	Condenser loop pump U-467-P	PI-18					DI	
259	0	U	A	U467-MN	Start Command	Condenser loop pump U-467-P	PI-18					DO	
260	0	U	A	U467-YS	Computer Control Selected	Condenser loop pump U-467-P	PI-18					DI	
261	0	U	A	U468-MM	Run Status	Condenser loop pump U-468-P	PI-18					DI	
262	0	U	A	U468-MN	Start Command	Condenser loop pump U-468-P	PI-18					DO	
263	0	U	A	U468-YS	Computer Control Selected	Condenser loop pump U-468-P	PI-18					DI	
264	0	U	A	U469-MM	Run Status	Heat pump U-469-HP	PI-19					DI	
265	0	U	A	U469-MN	Start Command	Heat pump U-469-HP	PI-19					DO	
266	0	U	A	U469-MF	Motor trouble	Heat pump U-469-HP	PI-19					DI	
267	0	U	A	U469-YS	Computer Control Selected	Heat pump U-469-HP	PI-19					DI	
268	0	U	A	U470-MM	Run Status	Heat pump U-470-HP	PI-19					DI	
269	0	U	A	U470-MN	Start Command	Heat pump U-470-HP	PI-19					DO	
270	0	U	A	U470-MF	Motor trouble	Heat pump U-470-HP	PI-19					DI	
271	0	U	A	U470-YS	Computer Control Selected	Heat pump U-470-HP	PI-19					DI	
272	0	U	A	U471-MM	Run Status	Heat pump U-471-HP	PI-18					DI	
273	0	U	A	U471-MN	Start Command	Heat pump U-471-HP	PI-18					DO	
274	0	U	A	U471-MF	Motor trouble	Heat pump U-471-HP	PI-18					DI	
275	0	U	A	U471-YS	Computer Control Selected	Heat pump U-471-HP	PI-18					DI	
276	0	U	A	U472-MM	Run Status	Heat pump U-472-HP	PI-18					DI	
277	0	U	A	U472-MN	Start Command	Heat pump U-472-HP	PI-18					DO	
278	0	U	A	U472-MF	Motor trouble	Heat pump U-472-HP	PI-18					DI	
279	0	U	A	U472-YS	Computer Control Selected	Heat pump U-472-HP	PI-18					DI	
280	0	U	A	U473-MM	Run Status	Heat pump U-473-HP	PI-18					DI	
281	0	U	A	U473-MN	Start Command	Heat pump U-473-HP	PI-18					DO	
282	0	U	A	U473-MF	Motor trouble	Heat pump U-473-HP	PI-18					DI	
283	0	U	A	U473-YS	Computer Control Selected	Heat pump U-473-HP	PI-18					DI	
284	0	U	A	U480-TT-1	Glycol supply temperature	Heating Loop	PI-22	°C				AI	
285	0	U	A	U480-TT-2	Glycol return temperature	Heating Loop	PI-22	°C				AI	
286	0	U	A	U481-MM	Run Status	Condenser loop pump U-481-P	PI-20					DI	
287	0	U	A	U481-MN	Start Command	Condenser loop pump U-481-P	PI-20					DO	
288	0	U	A	U481-YS	Computer Control Selected	Condenser loop pump U-481-P	PI-20					DI	

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**DISTRIBUTED CONTROL SYSTEM  
 INPUT/OUTPUT LIST**

NO.	REV. NO.	TAG NAME			DESCRIPTION		P&ID DRAWING	I/O SPECIFICATION					
		PCU		DEVICE TAG	FUNCTION	SERVICE		ENG. UNITS	SCALE LOW-HIGH	ALARMS		I/O POINT TYPE	I/O POINT NO.
		AREA	PNL							LOW	HIGH		
289	0	U	A	U482-MM	Run Status	Heating loop pump U-482-P	PI-20					DI	
290	0	U	A	U482-MN	Start Command	Heating loop pump U-482-P	PI-20					DO	
291	0	U	A	U482-YS	Computer Control Selected	Heating loop pump U-482-P	PI-20					DI	
292	0	U	A	U483-MM	Run Status	Condenser loop pump U-483-P	PI-20					DI	
293	0	U	A	U483-MN	Start Command	Condenser loop pump U-483-P	PI-20					DO	
294	0	U	A	U483-YS	Computer Control Selected	Condenser loop pump U-483-P	PI-20					DI	
295	0	U	A	U484-MM	Run Status	Heating loop pump U-484-P	PI-20					DI	
296	0	U	A	U484-MN	Start Command	Heating loop pump U-484-P	PI-20					DO	
297	0	U	A	U484-YS	Computer Control Selected	Heating loop pump U-484-P	PI-20					DI	
298	0	U	A	U485-MM	Run Status	Heating loop pump U-485-P	PI-20					DI	
299	0	U	A	U485-MN	Start Command	Heating loop pump U-485-P	PI-20					DO	
300	0	U	A	U485-YS	Computer Control Selected	Heating loop pump U-485-P	PI-20					DI	
301	0	U	A	U486-MM	Run Status	Heat pump U-486-HP	PI-20					DI	
302	0	U	A	U486-MN	Start Command	Heat pump U-486-HP	PI-20					DO	
303	0	U	A	U486-MF	Motor trouble	Heat pump U-486-HP	PI-20					DI	
304	0	U	A	U486-YS	Computer Control Selected	Heat pump U-486-HP	PI-20					DI	
305	0	U	A	U487-MM	Run Status	Heat pump U-487-HP	PI-20					DI	
306	0	U	A	U487-MN	Start Command	Heat pump U-487-HP	PI-20					DO	
307	0	U	A	U487-MF	Motor trouble	Heat pump U-487-HP	PI-20					DI	
308	0	U	A	U487-YS	Computer Control Selected	Heat pump U-487-HP	PI-20					DI	
309	0	U	A	U488-MM	Run Status	Heat pump U-488-HP	PI-20					DI	
310	0	U	A	U488-MN	Start Command	Heat pump U-488-HP	PI-20					DO	
311	0	U	A	U488-MF	Motor trouble	Heat pump U-488-HP	PI-20					DI	
312	0	U	A	U488-YS	Computer Control Selected	Heat pump U-488-HP	PI-20					DI	
313	0	U	A	U489-MM	On Status	Electric boiler U-489-EB	PI-20					DI	
314	0	U	A	U489-MN	On Command	Electric boiler U-489-EB	PI-20					DO	
315	0	U	A	U489-UF	Trouble	Electric boiler U-489-EB	PI-20					DI	



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RECORD NO.	REV. NO.	TAG NAME	DESCRIPTION		REFERENCES				
			INSTRUMENT TYPE	SERVICE	SPEC. SHEET or SECTION	P&ID DRAWING	WIRING REF.	LOCATION DWG-	SUPPLY CODE
1	1	U002-HS-1	COH Selector Switch	Sluice Gate YG-12B Actuator	17216	PI-04			CON
2	1	U002-HS-2	Close Pushbutton	Sluice Gate YG-12B Actuator	17216	PI-04			CON
3	1	U002-HS-3	Open Pushbutton	Sluice Gate YG-12B Actuator	17216	PI-04			CON
4	1	U002-ZSB	Closed Limit Switch	Sluice Gate YG-12B Actuator		PI-04			CON
5	1	U002-ZSD	Open Limit Switch	Sluice Gate YG-12B Actuator		PI-04			CON
6	0	U005-LE	Ultrasonic Liquid Level Transducer	UV Influent Pump Well		PI-04		I2-01	CON
7	0	U005-LIT	Ultrasonic Liquid Level Transmitter	UV Influent Pump Well		PI-04		I2-01	CON
8	0	U010-AE	Pump Motor Moisture/Temperature Element	UV Influent Pump U-010-P-1		PI-06		I2-02	CITY
9	0	U010-AY	Pump Motor Moisture/Temperature Switch	UV Influent Pump U-010-P-1		PI-06		I2-01	CITY
10	0	U010-HS-1	Lock-off-stop Pushbutton	UV Influent Pump U-010-P-1	17216	PI-06		I2-01	CITY
11	0	U010-HS-2	COH Selector Switch	UV Influent Pump U-010-P-1 VFD	17216	PI-06		I2-01	CITY
12	0	U010-NLF	Pump Motor Moisture Alarm Pilot Light	UV Influent Pump U-010-P-1	17216	PI-06		I2-01	CITY
13	0	U010-TLF	Pump Motor Temperature Alarm Pilot Light	UV Influent Pump U-010-P-1	17216	PI-06		I2-01	CITY
14	0	U020-AE	Pump Motor Moisture/Temperature Element	UV Influent Pump U-020-P-1		PI-06		I2-02	CITY
15	0	U020-AY	Pump Motor Moisture/Temperature Switch	UV Influent Pump U-020-P-1		PI-06		I2-01	CITY
16	0	U020-HS-1	Lock-off-stop Pushbutton	UV Influent Pump U-020-P-1	17216	PI-06		I2-01	CITY
17	0	U020-HS-2	COH Selector Switch	UV Influent Pump U-020-P-1 VFD	17216	PI-06		I2-01	CITY
18	0	U020-NLF	Pump Motor Moisture Alarm Pilot Light	UV Influent Pump U-020-P-1	17216	PI-06		I2-01	CITY
19	0	U020-TLF	Pump Motor Temperature Alarm Pilot Light	UV Influent Pump U-020-P-1	17216	PI-06		I2-01	CITY
20	0	U030-AE	Pump Motor Moisture/Temperature Element	UV Influent Pump U-030-P-1		PI-06		I2-02	CITY
21	0	U030-AY	Pump Motor Moisture/Temperature Switch	UV Influent Pump U-030-P-1		PI-06		I2-01	CITY
22	0	U030-HS-1	Lock-off-stop Pushbutton	UV Influent Pump U-030-P-1	17216	PI-06		I2-01	CITY
23	0	U030-HS-2	COH Selector Switch	UV Influent Pump U-030-P-1 VFD	17216	PI-06		I2-01	CITY
24	0	U030-NLF	Pump Motor Moisture Alarm Pilot Light	UV Influent Pump U-030-P-1	17216	PI-06		I2-01	CITY
25	0	U030-TLF	Pump Motor Temperature Alarm Pilot Light	UV Influent Pump U-030-P-1	17216	PI-06		I2-01	CITY
26	0	U040-AE	Pump Motor Moisture/Temperature Element	UV Influent Pump U-040-P-1		PI-06		I2-02	CITY
27	0	U040-AY	Pump Motor Moisture/Temperature Switch	UV Influent Pump U-040-P-1		PI-06		I2-01	CITY
28	0	U040-HS-1	Lock-off-stop Pushbutton	UV Influent Pump U-040-P-1	17216	PI-06		I2-01	CITY
29	0	U040-HS-2	COH Selector Switch	UV Influent Pump U-040-P-1 VFD	17216	PI-06		I2-01	CITY
30	0	U040-NLF	Pump Motor Moisture Alarm Pilot Light	UV Influent Pump U-040-P-1	17216	PI-06		I2-01	CITY
31	0	U040-TLF	Pump Motor Temperature Alarm Pilot Light	UV Influent Pump U-040-P-1	17216	PI-06		I2-01	CITY
32	0	U050-AE	Pump Motor Moisture/Temperature Element	UV Influent Pump U-050-P-1		PI-06		I2-02	CITY
33	0	U050-AY	Pump Motor Moisture/Temperature Switch	UV Influent Pump U-050-P-1		PI-06		I2-01	CITY
34	0	U050-HS-1	Lock-off-stop Pushbutton	UV Influent Pump U-050-P-1	17216	PI-06		I2-01	CITY
35	0	U050-HS-2	COH Selector Switch	UV Influent Pump U-050-P-1 VFD	17216	PI-06		I2-01	CITY
36	0	U050-NLF	Pump Motor Moisture Alarm Pilot Light	UV Influent Pump U-050-P-1	17216	PI-06		I2-01	CITY

**SUPPLY CODES:** CON = Contractor Supply, CITY = City Supply, PKG = Part of Equipment Package, Trojan = UV Vendor Supply

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			INSTRUMENT TYPE	SERVICE	SPEC. SHEET or SECTION	P&ID DRAWING	WIRING REF.	LOCATION DWG-	SUPPLY CODE
37	0	U050-TLF	Pump Motor Temperature Alarm Pilot Light	UV Influent Pump U-050-P-1	17216	PI-06		I2-01	CITY
38	0	U060-FE	Ultrasonic Open Channel Flow Transducer	UV Influent Pump Discharge Channel Level		PI-07			CON
39	0	U060-FIT	Ultrasonic Open Channel Flow Transmitter	UV Influent Pump Discharge Channel Level		PI-07			CON
40	0	U102-HS-1	Local/Remote Selector Switch	Weir Gate U-100-SG-1	17216	PI-10		I2-01	CON
41	0	U102-HS-2	Open Pushbutton	Weir Gate U-100-SG-1	17216	PI-10		I2-01	CON
42	0	U102-HS-3	Close Pushbutton	Weir Gate U-100-SG-1	17216	PI-10		I2-01	CON
43	0	U102-ZSB	Closed Limit Switch	Weir Gate U-100-SG-1		PI-10		I2-01	CON
44	0	U102-ZSD	Open Limit Switch	Weir Gate U-100-SG-1		PI-10		I2-01	CON
45	0	U102-ZT	Position Transmitter	Weir Gate U-100-SG-1		PI-10		I2-01	CON
46	0	U111-AT	UV Light Intensity Sensor/Transmitter	UV Reactor Bank 1A		PI-07		I2-02	Trojan
47	0	U121-AT	UV Light Intensity Sensor/Transmitter	UV Reactor Bank 1B		PI-07		I2-02	Trojan
48	0	U170-LE	Ultrasonic Liquid Level Transducer	UV Reactor Channel #1		PI-07		I2-02	Trojan
49	0	U170-LIT	Ultrasonic Liquid Level Transmitter	UV Reactor Channel #1		PI-07		I2-02	Trojan
50	0	U202-HS-1	COH Selector Switch	Weir Gate U-200-SG-1	17216	PI-10		I2-01	CON
51	0	U202-HS-2	Open Pushbutton	Weir Gate U-200-SG-1	17216	PI-10		I2-01	CON
52	0	U202-HS-3	Close Pushbutton	Weir Gate U-200-SG-1	17216	PI-10		I2-01	CON
53	0	U202-ZSB	Closed Limit Switch	Weir Gate U-200-SG-1		PI-10		I2-01	CON
54	0	U202-ZSD	Open Limit Switch	Weir Gate U-200-SG-1		PI-10		I2-01	CON
55	0	U202-ZT	Position Transmitter	Weir Gate U-200-SG-1		PI-10		I2-01	CON
56	0	U211-AT	UV Light Intensity Sensor/Transmitter	UV Reactor Bank 2A		PI-08		I2-02	Trojan
57	0	U221-AT	UV Light Intensity Sensor/Transmitter	UV Reactor Bank 2B		PI-08		I2-02	Trojan
58	0	U270-LE	Ultrasonic Liquid Level Transducer	UV Reactor Channel #2		PI-08		I2-02	Trojan
59	0	U270-LIT	Ultrasonic Liquid Level Transmitter	UV Reactor Channel #2		PI-08		I2-02	Trojan
60	0	U302-HS-1	COH Selector Switch	Weir Gate U-300-SG-1	17216	PI-10		I2-01	CON
61	0	U302-HS-2	Open Pushbutton	Weir Gate U-300-SG-1	17216	PI-10		I2-01	CON
62	0	U302-HS-3	Close Pushbutton	Weir Gate U-300-SG-1	17216	PI-10		I2-01	CON
63	0	U302-ZSB	Closed Limit Switch	Weir Gate U-300-SG-1	17216	PI-10		I2-01	CON
64	0	U302-ZSD	Open Limit Switch	Weir Gate U-300-SG-1	17216	PI-10		I2-01	CON
65	0	U302-ZT	Position Transmitter	Weir Gate U-300-SG-1	17216	PI-10		I2-01	CON
66	0	U311-AT	UV Light Intensity Sensor/Transmitter	UV Reactor Bank 3A		PI-09		I2-02	Trojan
67	0	U321-AT	UV Light Intensity Sensor/Transmitter	UV Reactor Bank 3B		PI-09		I2-02	Trojan
68	0	U370-LE	Ultrasonic Liquid Level Transducer	UV Reactor Channel #3		PI-09		I2-02	Trojan
69	0	U370-LIT	Ultrasonic Liquid Level Transmitter	UV Reactor Channel #3		PI-09		I2-02	Trojan
70	0	U910-ZS-1	Infra-Red Motion Sensor	UV Facility Process Room				E1-06	CON
71	0	U910-ZS-2	Infra-Red Motion Sensor	UV Facility Process Room				E1-06	CON
72	0	U910-ZS-3	Infra-Red Motion Sensor	UV Facility Process Room				E1-06	CON

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			INSTRUMENT TYPE	SERVICE	SPEC. SHEET or SECTION	P&ID DRAWING	WIRING REF.	LOCATION DWG-	SUPPLY CODE
73	0	U910-ZS-4	Infra-Red Motion Sensor	UV Facility Process Room				E1-06	CON
74	0	U911-ZS	Infra-Red Motion Sensor	UV Facility Entrance Hall				E1-06	CON
75	0	U912-ZS-1	Infra-Red Motion Sensor	UV Facility Electrical Room				E1-06	CON
76	0	U912-ZS-2	Infra-Red Motion Sensor	UV Facility Electrical Room				E1-06	CON
77	0	U913-ZS	Door Switch	UV Facility Entrance				E1-06	CON
78	0	U914-ZS	Door Switch	UV Facility Process Room				E1-06	CON
79	0	U100-TT-1	Outside Air Temperature Transmitter	HVAC		PI-11		M4-01	CON
80	0	U100-TT-2	Outside Air Temperature Transmitter	HCAV		PI-11		M4-01	CON
81	0	U410-TT-1	Supply Air Duct Temperature Transmitter	Elect Rm Air Handling Unit U-410-AHU-1		PI-12		M5-01	CON
82	0	U410-TT-2	Return Air Duct Temperature Transmitter	Elect Rm Air Handling Unit U-410-AHU-1		PI-11		M5-01	CON
83	0	U410-TT-3	Room Air Temperature Transmitter	Elect Rm Air Handling Unit U-410-AHU-1		PI-11		M4-01	CON
84	0	U410-PDT-1	Differential Pressure Transmitter	Elect Rm Air Handling Unit U-410-AHU-1		PI-11		M5-01	CON
85	1	U410-PDT-2	Differential Pressure Transmitter	Elect Rm Air Handling Unit U-410-AHU-2		PI-12		M5-01	CON
86	1	U410-TSL	Freeze Stat	Elect Rm Air Handling Unit U-410-AHU-1		PI-12		M5-01	CON
87	0	U410-ZSB	Closed Limit Switch	Econ air damper U-410-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
88	0	U410-ZSD	Open Limit Switch	Econ air damper U-410-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
89	0	U411-HS	COH Selector Switch	Return Fan U-411-RF (U-410-AHU-1)	17216	PI-11		M5-01	CON
90	0	U411-ZSB	Closed Limit Switch	Return air damper U-411-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
91	0	U411-ZSD	Open Limit Switch	Return air damper U-411-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
92	0	U412-HS	COH Selector Switch	Return Fan U-412-RF (U-410-AHU-1)	17216	PI-11		M5-01	CON
93	0	U412-ZSB	Closed Limit Switch	Return air damper U-412-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
94	0	U412-ZSD	Open Limit Switch	Return air damper U-412-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
95	0	U413-ZSB	Closed Limit Switch	Waste heat damper U-413-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
96	0	U413-ZSD	Open Limit Switch	Waste heat damper U-413-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
97	0	U414-ZSB	Closed Limit Switch	Exhaust air damper U-414-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
98	0	U414-ZSD	Open Limit Switch	Exhaust air damper U-414-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
99	0	U415-ZSB	Closed Limit Switch	Outside air damper U-415-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
100	0	U415-ZSD	Open Limit Switch	Outside air damper U-415-MD (U-410-AHU-1)	15835	PI-11		M5-01	CON
101	0	U416-TT	Mixed Air Duct Temperature Trasmmitter	Elect Rm Air Handling Unit U-410-AHU-1		PI-12		M5-01	CON
102	0	U416-TSL	Freeze Stat	Elect Rm Air Handling Unit U-410-AHU-1		PI-12		M5-01	CON
103	0	U416-PSH	Filter status	Elect Rm Air Handling Unit U-410-AHU-1		PI-12		M5-01	CON
104	0	U416-HS	COH Selector Switch	Supply Fan U-416-SF (U-410-AHU-1)	17216	PI-12		M5-01	CON
105	0	U416-ZSB-1	Closed Limit Switch	Isolation damper U-416-MD-1 (U-410-AHU-1)	15835	PI-12		M5-01	CON
106	0	U416-ZSD-1	Open Limit Switch	Isolation damper U-416-MD-1 (U-410-AHU-1)	15835	PI-12		M5-01	CON
107	0	U416-ZSB-2	Closed Limit Switch	Air damper U-416-MD-2 (U-410-AHU-1)	15835	PI-12		M5-01	CON
108	0	U416-ZSD-2	Open Limit Switch	Air damper U-416-MD-2 (U-410-AHU-1)	15835	PI-12		M5-01	CON

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			INSTRUMENT TYPE	SERVICE	SPEC. SHEET or SECTION	P&ID DRAWING	WIRING REF.	LOCATION DWG-	SUPPLY CODE
109	0	U417-TT	Mixed Air Duct Temperature Trasmmitter	Elect Rm Air Handling Unit U-410-AHU-1		PI-12		M5-01	CON
110	0	U417-PSH	Filter status	Elect Rm Air Handling Unit U-410-AHU-1		PI-12		M5-01	CON
111	0	U417-HS	COH Selector Switch	Supply Fan U-416-SF (U-410-AHU-1)	17216	PI-12		M5-01	CON
112	0	U417-ZSB-1	Closed Limit Switch	Isolation damper U-417-MD-1 (U-410-AHU-1)	15835	PI-12		M5-01	CON
113	0	U417-ZSD-1	Open Limit Switch	Isolation damper U-417-MD-1 (U-410-AHU-1)	15835	PI-12		M5-01	CON
114	0	U417-ZSB-2	Closed Limit Switch	Air damper U-417-MD-2 (U-410-AHU-1)	15835	PI-12		M5-01	CON
115	0	U417-ZSD-2	Open Limit Switch	Air damper U-417-MD-2 (U-410-AHU-1)	15835	PI-12		M5-01	CON
116	0	U418-ZSB-1	Closed Limit Switch	Emergency Cooling System U-418-MD-1	15835	PI-13		M6-01	CON
117	0	U418-ZSD-1	Open Limit Switch	Emergency Cooling System U-418-MD-1	15835	PI-13		M6-01	CON
118	0	U418-ZSB-2	Closed Limit Switch	Emergency Cooling System U-418-MD-2	15835	PI-13		M6-01	CON
119	0	U418-ZSD-2	Open Limit Switch	Emergency Cooling System U-418-MD-2	15835	PI-13		M6-01	CON
120	1	U418-ZSB-3	Closed Limit Switch	Emergency Cooling System U-418-MD-3	15835	PI-13		M6-01	CON
121	1	U418-ZSD-3	Open Limit Switch	Emergency Cooling System U-418-MD-3	15835	PI-13		M6-01	CON
122	0	U418-TSH	Room Air Temperature Cooling Termostat	Exhaust Fan U-419-SF		PI-13		M6-01	CON
123	0	U419-HS	COH Selector Switch	Exhaust Fan U-419-SF	17216	PI-13		M6-01	CON
124	0	U419-MM	Running Pilot Light	Exhaust Fan U-419-SF	17216	PI-13		M6-01	CON
125	0	U419-ZSB	Closed Limit Switch	Isolation damper U-417-MD-1 (U-410-AHU-1)	15835	PI-13		M6-01	CON
126	0	U419-ZSD	Open Limit Switch	Isolation damper U-417-MD-1 (U-410-AHU-1)	15835	PI-13		M6-01	CON
127	0	U420-TT-1	Supply Air Duct Temperature Transmitter	UV Rm Air Handling Unit U-420-AHU-1		PI-14		M4-01	CON
128	0	U420-TT-2	Mixed Air Duct Temperature Trasmmitter	UV Rm Air Handling Unit U-420-AHU-1		PI-14		M4-01	CON
129	0	U420-TT-3	Supply Air Temperature Transmitter	UV Rm Air Handling Unit U-420-AHU-1		PI-14		M4-01	CON
130	0	U420-TT-4	Room Air Temperature Transmitter	UV Rm Air Handling Unit U-420-AHU-1		PI-14		M4-01	CON
131	0	U420-AT	Room air humidity transmitter	UV Rm Air Handling Unit U-420-AHU-1		PI-14		M4-01	CON
132	0	U420-PDT	Differential air pressure transmitter	UV Rm Air Handling Unit U-420-AHU-1		PI-14		M4-01	CON
133	0	U420-PDSH	Filter status	UV Rm Air Handling Unit U-420-AHU-1		PI-14		M4-01	CON
134	0	U420-TSL	Freeze Stat	UV Rm Air Handling Unit U-420-AHU-1		PI-14		M4-01	CON
135	0	U420-ZSB	Closed Limit Switch	Econ air damper U-420-MD (U-420-AHU-1)	15835	PI-14		M4-01	CON
136	0	U420-ZSD	Open Limit Switch	Econ air damper U-420-MD (U-420-AHU-1)	15835	PI-14		M4-01	CON
137	0	U421-HS	COH Selector Switch	Return Fan U-421-RF (U-420-AHU-1)	17216	PI-14		M4-01	CON
138	0	U422-ZSB	Closed Limit Switch	Exhaust air damper U-422-MD (U-420-AHU-1)	15835	PI-14		M4-01	CON
139	0	U422-ZSD	Open Limit Switch	Exhaust air damper U-422-MD (U-420-AHU-1)	15835	PI-14		M4-01	CON
140	0	U423-ZSB	Closed Limit Switch	Outside air damper U-423-MD (U-420-AHU-1)	15835	PI-14		M4-01	CON
141	0	U423-ZSD	Open Limit Switch	Outside air damper U-423-MD (U-420-AHU-1)	15835	PI-14		M4-01	CON
142	0	U424-HS	COH Selector Switch	Supply Fan U-424-SF (U-420-AHU-1)	17216	PI-14		M4-01	CON
143	0	U425-ZSB	Closed Limit Switch	UV Rm Exhaust air damper U-425-MD	15835	PI-14		M4-01	CON
144	0	U425-ZSD	Open Limit Switch	UV Rm Exhaust air damper U-425-MD	15835	PI-14		M4-01	CON

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145	0	U426-HS	COH Selector Switch	UV Rm Exhaust Fan U-426-EF	17216	PI-14		M6-01	CON
146	0	U430-TT-1	Supply Air Duct Temperature Transmitter	Control Rm Air Handling Unit U-430-AHU-1		PI-15		M4-01	CON
147	0	U430-TT-2	Mixed Air Duct Temperature Trasmmitter	Control Rm Air Handling Unit U-430-AHU-1		PI-15		M4-01	CON
148	0	U430-TT-3	Room Air Temperature Transmitter	Control Rm Air Handling Unit U-430-AHU-1		PI-15		M4-01	CON
149	0	U430-TSL	Freeze Stat	Control Rm Air Handling Unit U-430-AHU-1		PI-15		M4-01	CON
150	0	U430-ZSB	Closed Limit Switch	Return air damper U-430-MD (U-430-AHU-1)	15835	PI-15		M4-01	CON
151	0	U430-ZSD	Open Limit Switch	Return air damper U-430-MD (U-430-AHU-1)	15835	PI-15		M4-01	CON
152	0	U431-ZSB	Closed Limit Switch	Outside air damper U-431-MD (U-430-AHU-1)	15835	PI-15		M4-01	CON
153	0	U431-ZSD	Open Limit Switch	Outside air damper U-431-MD (U-430-AHU-1)	15835	PI-15		M4-01	CON
154	0	U432-HS	COH Selector Switch	Supply Fan U-432-SF (U-430-AHU-1)	17216	PI-15		M4-01	CON
155	0	U432-IS	Current Switch	Supply Fan U-432-SF (U-430-AHU-1)		PI-15		M4-01	CON
156	0	U432-MM	Running Pilot Light	Supply Fan U-432-SF (U-430-AHU-1)	17216	PI-15		M4-01	CON
157	0	U434-HS	COH Selector Switch	Supply Fan U-434-SF (U-430-AHU-2)	17216	PI-16		M4-01	CON
158	0	U434-IS	Current Switch	Supply Fan U-434-SF (U-430-AHU-2)		PI-16		M4-01	CON
159	0	U434-MM	Running Pilot Light	Supply Fan U-434-SF (U-430-AHU-2)	17216	PI-16		M4-01	CON
160	0	U435-TT	Room Air Temperature Transmitter	Corridor Air Handling Unit U-430-AHU-2		PI-16		M4-01	CON
161	0	U440-HS	Start/Stop Switch	Exhaust Fan U-440-EF		PI-16		M4-01	CON
162	0	U445-HS	Room Air Temperature Cooling Thermostat	Exhaust Fan U-445-EF		PI-16		M1-02	CON
163	0	U455-TT	Effluent Supply Temperature Transmitter	Effluent/Condenser Heat Exchanger		PI-17		M6-02	CON
164	0	U456-TT	Glycol Return Temperature Transmitter	Effluent/Condenser Heat Exchanger		PI-17		M6-02	CON
165	0	U457-TT	Gycol Supply Temperature Transmitter	Effluent/Condenser Heat Exchanger		PI-17		M6-02	CON
166	0	U451-HS	COH Selector Switch	Heat Exchanger Pump U-451-P	17216	PI-17		MCC	CON
167	0	U451-MM	Pump Running Pilot Light	Heat Exchanger Pump U-451-P	17216	PI-17		MCC	CON
168	0	U452-HS	COH Selector Switch	Heat Exchanger Pump U-452-P	17216	PI-17		MCC	CON
169	0	U452-MM	Pump Running Pilot Light	Heat Exchanger Pump U-452-P	17216	PI-17		MCC	CON
170	0	U474-PS	Pressure Switch (Low)	Glycol Pressurization Unit U-474		PI-17		M3-01	CON
171	0	U460-TT-1	Gycol supply temperature	Cooling Loop		PI-21		M3-01	CON
172	0	U460-TT-2	Glycol return temperature	Cooling Loop		PI-21		M3-01	CON
173	1	U460-DPT-1	Glycol Pressure	Cooling Loop Pressure		PI-21		M3-01	CON
174	1	U460-DPT-2	Glycol Pressure	Heating Loop Pressure		P1-22		M3-01	CON
175	0	U461-HS	COH Selector Switch	Condenser loop pump U-461-P	17216	PI-19		MCC	CON
176	0	U461-MM	Pump Running Pilot Light	Condenser loop pump U-461-P	17216	PI-19		MCC	CON
177	0	U462-HS	COH Selector Switch	Condenser loop pump U-462-P	17216	PI-19		MCC	CON
178	0	U462-MM	Pump Running Pilot Light	Condenser loop pump U-462-P	17216	PI-19		MCC	CON
179	0	U463-HS	COH Selector Switch	Condenser loop pump U-463-P	17216	PI-19		MCC	CON
180	0	U463-MM	Pump Running Pilot Light	Condenser loop pump U-463-P	17216	PI-19		MCC	CON

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181	0	U464-HS	COH Selector Switch	Condenser loop pump U-464-P	17216	PI-19		MCC	CON
182	0	U464-MM	Pump Running Pilot Light	Condenser loop pump U-464-P	17216	PI-19		MCC	CON
183	0	U465-HS	COH Selector Switch	Condenser loop pump U-465-P	17216	PI-18		MCC	CON
184	0	U465-MM	Pump Running Pilot Light	Condenser loop pump U-465-P	17216	PI-18		MCC	CON
185	0	U466-HS	COH Selector Switch	Condenser loop pump U-466-P	17216	PI-18		MCC	CON
186	0	U466-MM	Pump Running Pilot Light	Condenser loop pump U-466-P	17216	PI-18		MCC	CON
187	0	U467-HS	COH Selector Switch	Condenser loop pump U-467-P	17216	PI-18		MCC	CON
188	0	U467-MM	Pump Running Pilot Light	Condenser loop pump U-467-P	17216	PI-18		MCC	CON
189	0	U468-HS	COH Selector Switch	Condenser loop pump U-468-P	17216	PI-18		MCC	CON
190	0	U468-MM	Pump Running Pilot Light	Condenser loop pump U-468-P	17216	PI-18		MCC	CON
191	0	U469-HS	COH Selector Switch	Heat pump U-469-HP	17216	PI-19		M3-01	CON
192	0	U470-HS	COH Selector Switch	Heat pump U-470-HP	17216	PI-19		M3-01	CON
193	0	U471-HS	COH Selector Switch	Heat pump U-471-HP	17216	PI-18		M3-01	CON
194	0	U472-HS	COH Selector Switch	Heat pump U-472-HP	17216	PI-18		M3-01	CON
195	0	U473-HS	COH Selector Switch	Heat pump U-473-HP	17216	PI-18		M3-01	CON
196	1	U480-TT-1	Glycol supply temperature	Heating Loop		PI-22		M3-01	CON
197	1	U480-TT-2	Glycol return temperature	Heating Loop		PI-22		M3-01	CON
198	0	U481-HS	COH Selector Switch	Condenser loop pump U-481-P	17216	PI-20		MCC	CON
199	0	U481-MM	Pump Running Pilot Light	Condenser loop pump U-481-P	17216	PI-20		MCC	CON
200	0	U482-HS	COH Selector Switch	Condenser loop pump U-482-P	17216	PI-20		MCC	CON
201	0	U482-MM	Pump Running Pilot Light	Condenser loop pump U-482-P	17216	PI-20		MCC	CON
202	0	U483-HS	COH Selector Switch	Condenser loop pump U-483-P	17216	PI-20		MCC	CON
203	0	U483-MM	Pump Running Pilot Light	Condenser loop pump U-483-P	17216	PI-20		MCC	CON
204	0	U484-HS	COH Selector Switch	Condenser loop pump U-484-P	17216	PI-20		MCC	CON
205	0	U484-MM	Pump Running Pilot Light	Condenser loop pump U-484-P	17216	PI-20		MCC	CON
206	0	U485-HS	COH Selector Switch	Condenser loop pump U-485-P	17216	PI-20		MCC	CON
207	0	U485-MM	Pump Running Pilot Light	Condenser loop pump U-485-P	17216	PI-20		MCC	CON
208	0	U486-HS	COH Selector Switch	Heat pump U-486-HP	17216	PI-20		M3-01	CON
209	0	U487-HS	COH Selector Switch	Heat pump U-487-HP	17216	PI-20		M3-01	CON
210	0	U488-HS	COH Selector Switch	Heat pump U-488-HP	17216	PI-20		M3-01	CON
211	0	U489-HS	COH Selector Switch	Electric boiler U-489-EB	17216	PI-20		M5-01	CON