

Pyramid Water Treatment Plant Sodium Hypochlorite On-Site Generation Project Manual

PREPARED FOR:



City of Unalaska

PREPARED BY:

 taku
ENGINEERING

907.433.1125



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1.0 Executive Summary

The City of Unalaska is replacing the existing gaseous chlorine dosing system with a new hypochlorite generation system for potable water disinfection at the Pyramid Water Treatment Plant. The City is providing the hypochlorite generation equipment. The contractor is to install the hypochlorite generation equipment provide all the interconnecting piping, valves, wires, and miscellaneous fittings necessary to the function of the system. Also included in the contractor's scope is a water pressure booster system to bring the sodium hypochlorite system inlet pressure above 50 psig. This work is to follow construction taking place at the Pyramid Water Treatment Plant to install electrical generation turbines.

2.0 Scope of Work

2.1 General

The work is to be phased in two steps to maintain constant chlorine dosing capabilities within the plant. Coordination with the operators is required during construction and for all demolition and startup work. All work shall be completed in accordance with the drawings in *Appendix A* and the applicable project specifications in *Appendix B*. Contractor to provide startup support, equipment, and additional work as necessary to provide a complete and fully functioning system.

- Owner provided equipment to include:
 - Two on-site sodium hypochlorite generation units, with integrated PLCs, transforming rectifiers, and pumps
 - Two dilution air blowers with airflow switches
 - Two water softener systems
 - Two 360-gallon HDPE brine tanks
 - Two 1,100-gallon sodium hypochlorite tanks
 - Two dosing pump systems
 - One manual hypochlorite dilution panel
 - One hydrogen detector
 - Instrumentation for generation system
 - Filters
- Contractor to provide materials to include, but not limited to:
 - Two water pressure boosting pumps
 - One pressure switch
 - One hydro-pneumatic tank
 - All piping, valves, and fittings
 - All electrical equipment and interconnections
 - Anchor bolts and seismic restraints
 - Concrete, rebar, and sealant for containment wall

Contractor to provide startup support and other work and

2.2 Mechanical

- The contractor is to demolish all the existing gaseous chlorine equipment and associated piping, pumps, and instrumentation.
- The demolition is to be staged. The two smaller gaseous chlorine units (25 pounds per day and 50 pounds per day) are to be demolished first, leaving the two larger units online. The final two units and remaining equipment is to be demolished following the startup of one of the two sodium hypochlorite generator trains.
- The contractor is to demolish the existing exhaust ventilation ducting on the south wall of the room to make space for the new equipment. If necessary, the contractor is to patch the hole in the painted plywood wall that previously was for the ventilation ducting.
- The contractor is to install two booster pumps, pressure switch, hydropneumatic tank, valves, and piping to provide the required inlet pressure to the two sodium hypochlorite generation trains. All piping to be field routed. A line list is included for reference in Appendix C.
- The contractor is to install the two sodium hypochlorite generation trains per the design drawings. The two trains will be put in one at a time as a phased construction sequence as required to maintain constant chlorine dosing of the Pyramid Water Treatment Plant. All piping to be field routed. A line list is included for reference in Appendix C.
- The contractor is to install the two hydrogen dilution blowers and vent piping and exhaust outside the building as shown on the drawings to prevent hydrogen build up in the system and in the chlorine room. All piping to be field routed. A line list is included for reference in Appendix C.
- The contractor is to install the dilution panel on the provided stand per the design drawings. The dilution panel is for manual feeding of sodium hypochlorite into the dilution tanks at a required concentration.
- The contractor is to install two dosing pumps and pulsation dampener as shown on the drawings. The pumps are to be mounted on a fabricated pedestal style stand per the drawings.

2.3 Civil

- The contractor is to build an 18" concrete containment wall around the dilution tanks and brine tanks as shown on the drawings.
- The contractor is to anchor the dilution tanks to the existing slab with fabricated anchors and cable per the manufacturer's instructions and design drawings.
- Stands and other supports are to be anchored to the existing concrete floor with grouted concrete anchors.

2.4 Electrical

- The contractor is to demolish the existing gaseous chlorine system equipment including: instruments, pumps, switches, and other associated equipment. The demolition is to be phased to maintain chlorine dosing capabilities within the Pyramid Water Treatment Plant.

Project Manual

- The contractor is to provide power and instrumentation wiring to all the new equipment installed during this project, including interconnection wiring between the sodium hypochlorite generator units and remotely located instruments.
- The contractor is to provide one new 120/240V electrical panel to provide UPS-backed power to critical system components. The contractor is to remove the existing 120/208V UPS backed panel and integrated transformer and relocate existing 120V UPS-backed circuits to the new panel.
- A new 50KVA, 1-phase, 480-120/240V, pad mount Square D EE50S3H or approved equal transformer will be installed on the mezzanine level of the building. This transformer is required to provide 120V UPS backed power to critical components.
- Non-critical components are to be landed on the existing panel 'H'.
- The contractor is to run CAT5e cable between the existing plant PLC and the two onboard PLCs each located on the respective sodium hypochlorite generator.

3.0 Specifications

The project shall be completed in accordance with the applicable specifications issued with the City of Unalaska Pyramid WTP Microturbine Project. In addition, the following additional specifications are included as part of this design package.

Mechanical

221113 – Facility Water Distribution Piping
220523.12 – Ball Valves for Process Piping
220523.14 – Check Valves for Process Piping
221223.11 – Potable Water Storage Tanks

Electrical

262416 – Panelboards
26221 – Low-Voltage Distribution Transformers

Appendix A: Project Drawings

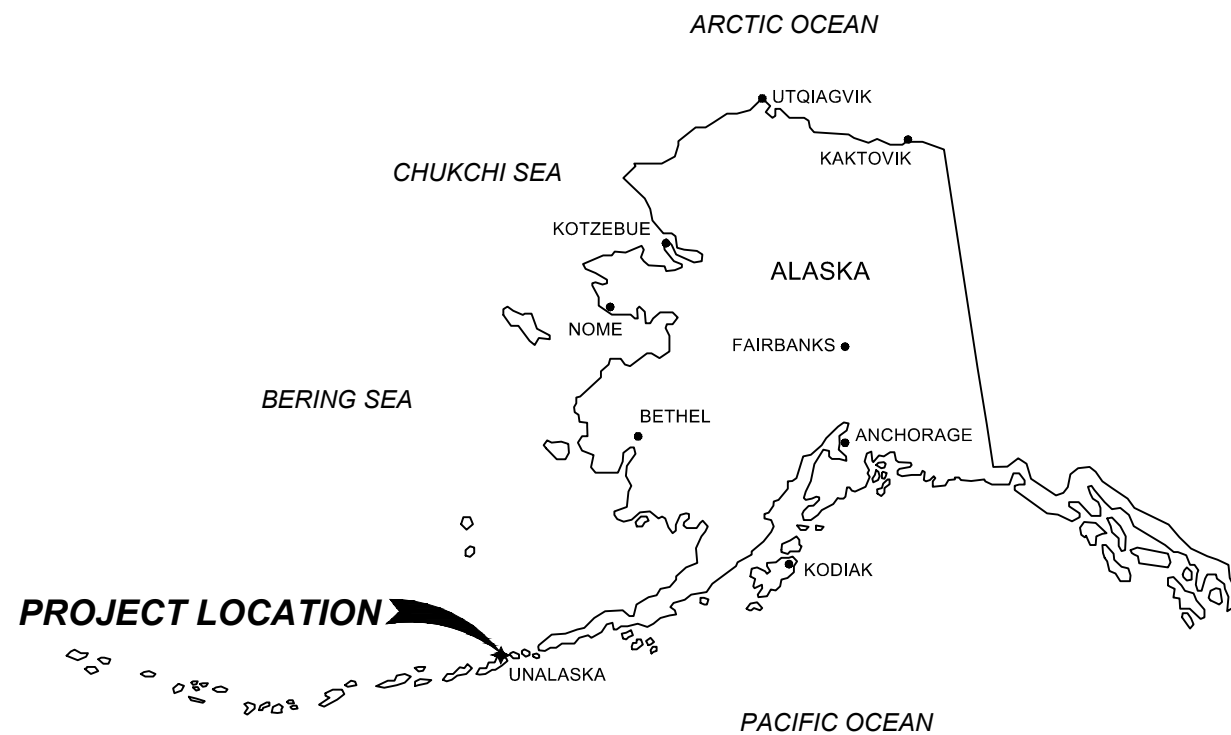


CITY OF UNALASKA

PYRAMID WATER TREATMENT PLANT



SODIUM HYPOCHLORITE ON-SITE GENERATION

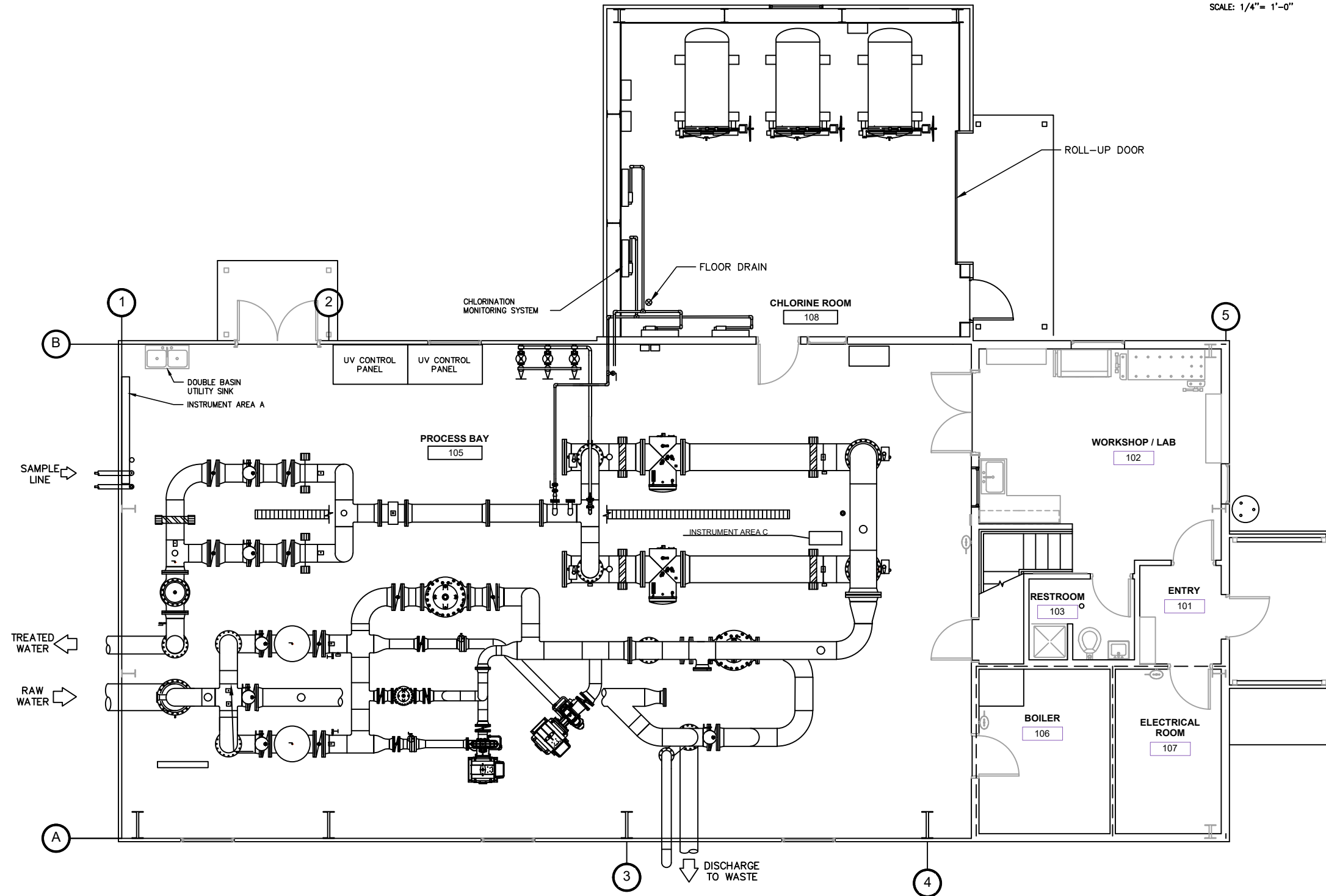
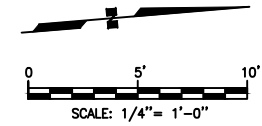
LOCATION MAP



DRAWING INDEX

DRAWING #	DRAWING TITLE	DRAWING #	DRAWING TITLE
G1.0	COVER PAGE	E6.0D	ONE-LINE DIAGRAM – DEMO
G2.0	WTP FLOORPLAN	E6.0	ONE-LINE DIAGRAM
G3.0	P&ID LEGEND SHEET	E6.1D	PANEL SCHEDULES – DEMO
P1.4D	CHLORINATION ELEVATION – PHASE 1 DEMO	E6.1	PANEL SCHEDULES
P1.4	CHLORINATION ELEVATION – PHASE 1 CONST.	E6.2	CIRCUIT SCHEDULE
P1.4D	CHLORINATION ELEVATION – PHASE 2 DEMO	E7.0	NETWORK DIAGRAM
P1.4	CHLORINATION ELEVATION – PHASE 2 CONST.	E7.6D	MCP ANALOG INPUT – DEMO
P1.5D	CHLORINATION P&ID – PHASE 1 DEMO	E7.6	MCP ANALOG INPUT
P1.5A	CHLORINATION P&ID – PHASE 1 CONST. SH1	E7.8D	MCP ANALOG OUTPUT – DEMO
P1.5A	CHLORINATION P&ID – PHASE 1 CONST. SH2	E7.8	MCP ANALOG OUTPUT
P1.5A	CHLORINATION P&ID – PHASE 1 CONST. SH3	C4.0	CIVIL DETAILS
P1.5D	CHLORINATION P&ID – PHASE 2 DEMO		
P1.5	CHLORINATION P&ID – PHASE 2 CONST. SH1		
P1.5	CHLORINATION P&ID – PHASE 2 CONST. SH2		
P1.5	CHLORINATION P&ID – PHASE 2 CONST. SH3		
P1.7D	EQUIPMENT PLAN DEMO – PHASE 1		
P1.7	EQUIPMENT PLAN – PHASE 1		
P1.7D	EQUIPMENT PLAN DEMO – PHASE 2		
P1.7	EQUIPMENT PLAN – PHASE 2		
P3.0D	VALVE SCHEDULE DEMO		
P3.1D	VALVE SCHEDULE DEMO		
P3.2D	VALVE SCHEDULE DEMO		
P3.0	VALVE SCHEDULE		
P3.1	VALVE SCHEDULE		
P3.2	VALVE SCHEDULE		
P3.3	VALVE SCHEDULE		
M5.3	MECHANICAL DETAILS		
E1.6D	ELECTRICAL PLAN – DEMO		
E1.6	ELECTRICAL PLAN		

			 406 W Fireweed Ln, Anchorage, AK 99503 PHONE: 907-433-1125 LIC.# AECL890	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>REV</th> <th>DATE</th> <th>DESCRIPTION</th> <th>DWN</th> <th>CKD</th> <th>APP</th> <th>REV</th> <th>DATE</th> <th>DESCRIPTION</th> <th>DWN</th> <th>CKD</th> <th>APP</th> </tr> <tr> <td>A</td> <td>6/21</td> <td>35% SCHEMATIC DESIGN</td> <td>RFK</td> <td>ZBB</td> <td>ZBB</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>B</td> <td>9/21</td> <td>65% DETAILED DESIGN</td> <td>RFK</td> <td>ZBB</td> <td>ZBB</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C</td> <td>10/21</td> <td>95% CONSTRUCTION DESIGN</td> <td>RFK</td> <td>AB</td> <td>AB</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>D</td> <td>3/22</td> <td>100% IFC</td> <td>RFK</td> <td>RAN</td> <td>WMC</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>E</td> <td>6/22</td> <td>100% IFC RE-ISSUE</td> <td>RFK</td> <td>RAN</td> <td>WMC</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP	A	6/21	35% SCHEMATIC DESIGN	RFK	ZBB	ZBB							B	9/21	65% DETAILED DESIGN	RFK	ZBB	ZBB							C	10/21	95% CONSTRUCTION DESIGN	RFK	AB	AB							D	3/22	100% IFC	RFK	RAN	WMC							E	6/22	100% IFC RE-ISSUE	RFK	RAN	WMC							DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG COVER PAGE
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1 EXISTING WATER TREATMENT PLANT FLOOR PLAN
1/4" = 1'-0"



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NUMBER	TITLE
	REFERENCE DRAWINGS

LINE TYPES

	ELECTRICAL (AC, SINGLE PHASE)
	ELECTRICAL (AC, THREE PHASE)
	ELECTRICAL (DC)
	LIMITS
	LIQUID & GAS FLOW
	SIGNAL WIRING

TAGS

	LINE CONTINUATION TAG (EXTERNAL)
	LINE CONTINUATION TAG (INTERNAL)
	LINE IDENTIFICATION TAG
	LOCAL INSTRUMENTATION TAG
	PLC INSTRUMENTATION TAG
	POWER SOURCE TAG
	VFD TAG

VALVES

	BALL VALVE
	BALL VALVE (3-WAY)
	BUTTERFLY VALVE
	CHECK VALVE
	CONTROL VALVE
	GLOBE VALVE
	PRESSURE REGULATING VALVE
	PRESSURE RELIEF VALVE (2-WAY)
	PRESSURE RELIEF VALVE (3-WAY)

EQUIPMENT

	BLOWER		PULSATION DAMPENERS
	CALIBRATION COLUMN		PUMP (CENTRIFUGAL)
	ELECTROLYTIC CELL		PUMP (POSITIVE DISPL., SIMPLEX)
	FILTER		PUMP (POSITIVE DISPL., DUPLEX)
	FLOWMETER (MAGNETIC)		TRANSFORMER/RECTIFIER
	FLOWMETER (PADDLE-WHEEL)		WATER SOFTENER
	FLOWMETER (ROTAMETER)		

ISA INSTRUMENT LETTER ID

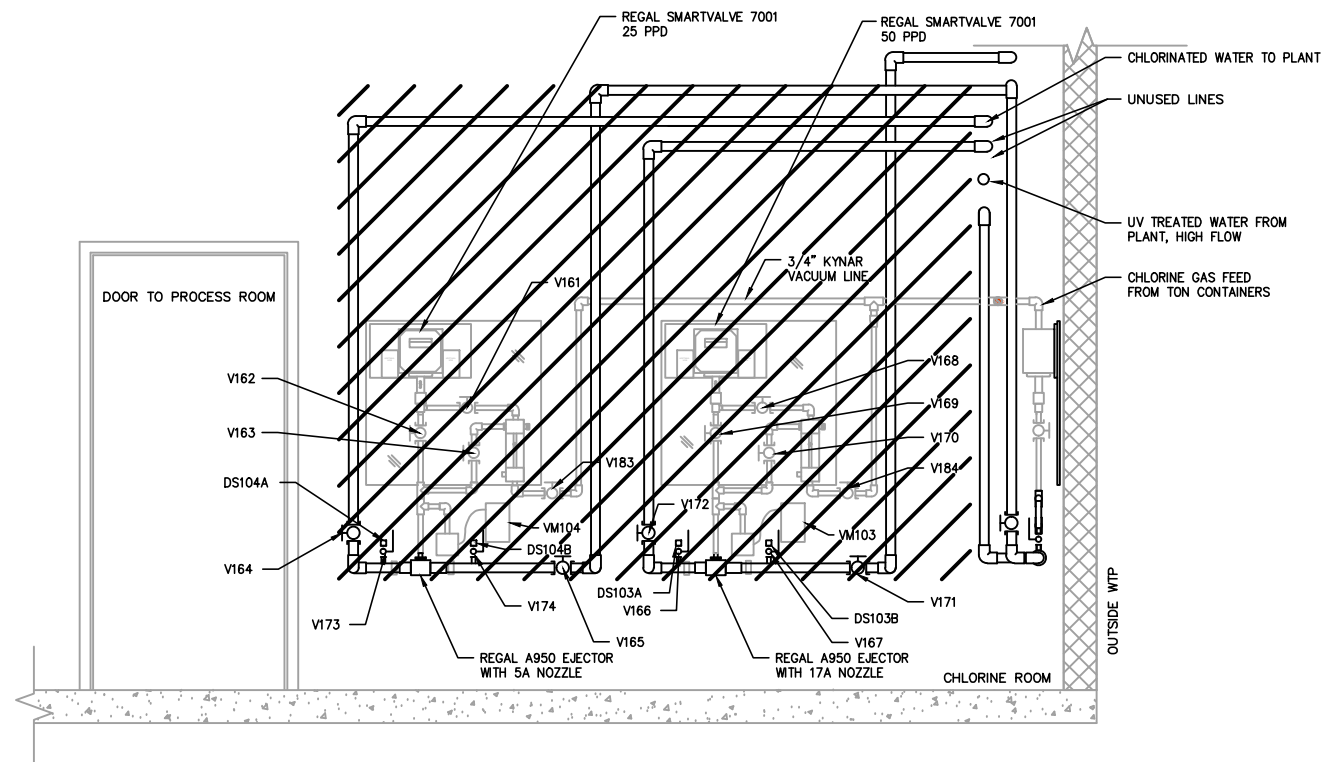
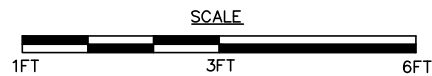
LETTER	PROCESS VARIABLE	MODIFIER	READOUT/OUTPUT FUNCTION	MODIFIER
A	ANALYZER		ALARM	
B	BURNER		USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE	CONTROL	CONTROL	CLOSE
D	USER'S CHOICE	DIFFERENTIAL		
E	VOLTAGE		PRIMARY ELEMENT	
F	FLOW	RATIO		
G	USER'S CHOICE		GLASS	
H	HAND			HIGH
I	CURRENT		INDICATE	
J	POWER	SCAN		
K	TIME		CONTROL SITUATION	
L	LEVEL		LIGHT	LOW
M	USER'S CHOICE	MOMENTARY		INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE	OPEN
P	PRESSURE		POINT (TEST CONNECTION)	
Q	QUANTITY	INTEGRATE, TOTALIZE		
R	RADIATION	RELIEF	RECORD	
S	SPEED	SAFETY	SWITCH	
T	TEMPERATURE		TRANSMIT	
U	MULTI-VARIABLE		MULTI-FUNCTION	MULTI-FUNCTION
V	VIBRATION		VALVE, DAMPER	
W	WEIGHT, FORCE		WELL	
X	UNCLASSIFIED	X-AXIS	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE	Y-AXIS	RELAY, COMPUTE	
Z	POSITION	Z-AXIS	DRIVER, ACTUATOR, UNCL. F.C.E.	

FITTINGS

	AIR GAP
	BULKHEAD CONNECTION
	CAP
	DRAIN CONNECTION
	FLANGE CONNECTION
	FLEX CONNECTION
	GAUGE ISOLATOR
	REDUCER
	UNION CONNECTION
	Y-STRAINER

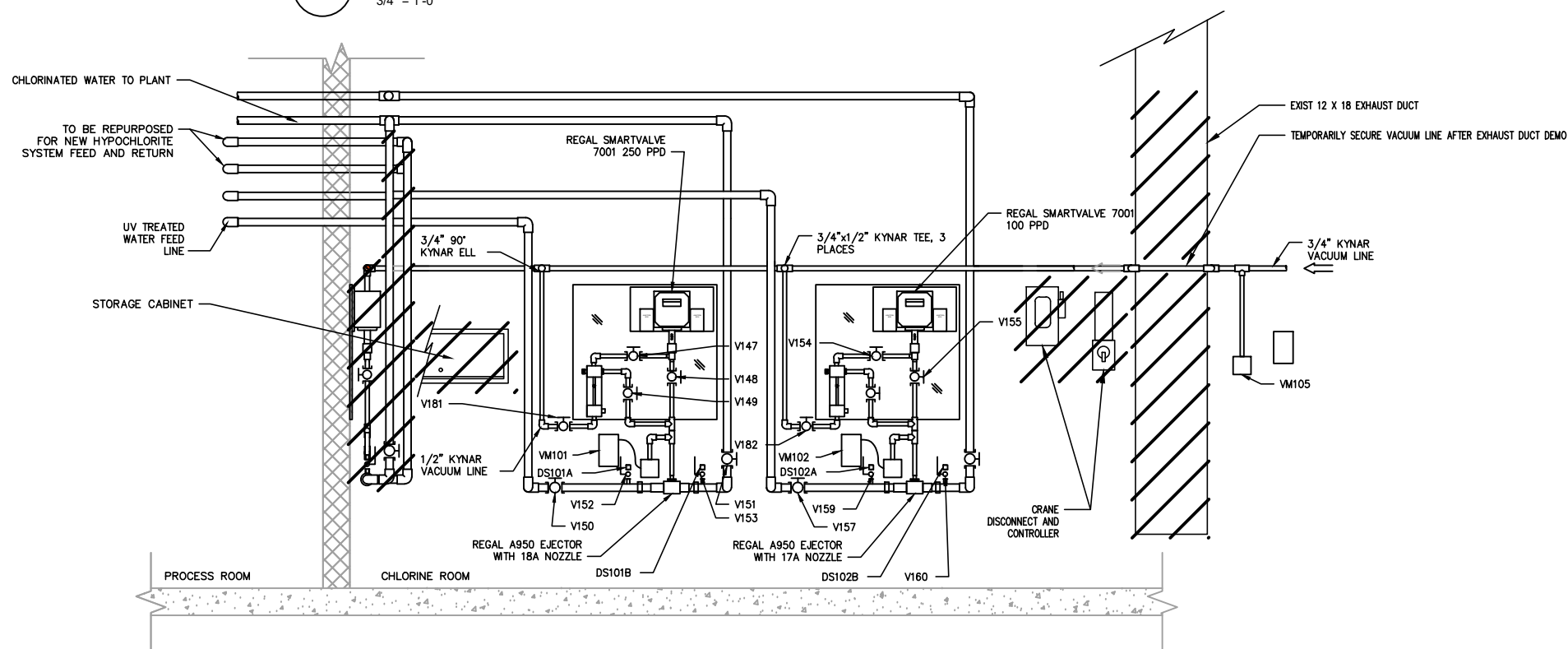
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	<p>taku engineering 406 W Fireweed Ln, Anchorage, AK 99503 PHONE: 907-433-1125 LIC.# AECL890</p>	<table border="1"> <tr> <td>A</td> <td>03/22</td> <td>100% IFC</td> <td>BWL</td> <td>RFK</td> <td>WMC</td> </tr> <tr> <td>B</td> <td>6/22</td> <td>100% IFC RE-ISSUE</td> <td>BWL</td> <td>RFK</td> <td>WMC</td> </tr> </table>	A	03/22	100% IFC	BWL	RFK	WMC	B	6/22	100% IFC RE-ISSUE	BWL	RFK	WMC	DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG P&ID LEGEND SHEET		
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- DEMOLITION NOTES:**
1. DEMOLISH 25 PPD AND 50 PPD CHLORINE INJECTION UNITS.
 2. CAP ALL OPEN CHLORINE GAS PIPING ENDS WITH KYNAR THREADED PLUG.
 3. DEMOLISH EXHAUST DUCT TO 8' AFF.
 4. RELOCATE CRANE DISCONNECT SWITCH AND CONTROLLER
 5. RELOCATE STORAGE CABINET FOR REUSE.

1 CHLORINATION ELEVATION EAST WALL - PHASE 1 DEMO
3/4" = 1'-0"



2 CHLORINATION ELEVATION SOUTH WALL - PHASE 1 DEMO
3/4" = 1'-0"

DEMOLITION

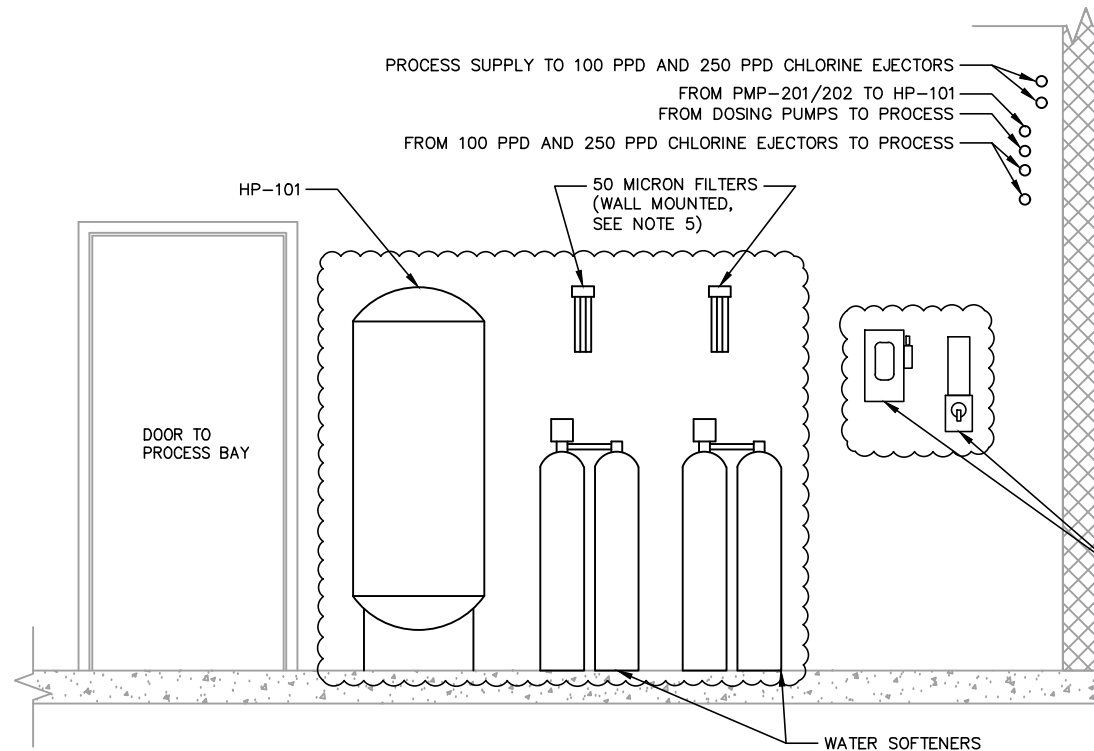
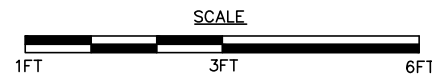


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E	6/22	100% IFC RE-ISSUE	RFK	RAN	WMC						

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CKD: RAN	APP:	P1.4D	E
DATE: 6/8/22	SCALE: AS SHOWN	SHEET 1 OF 1	

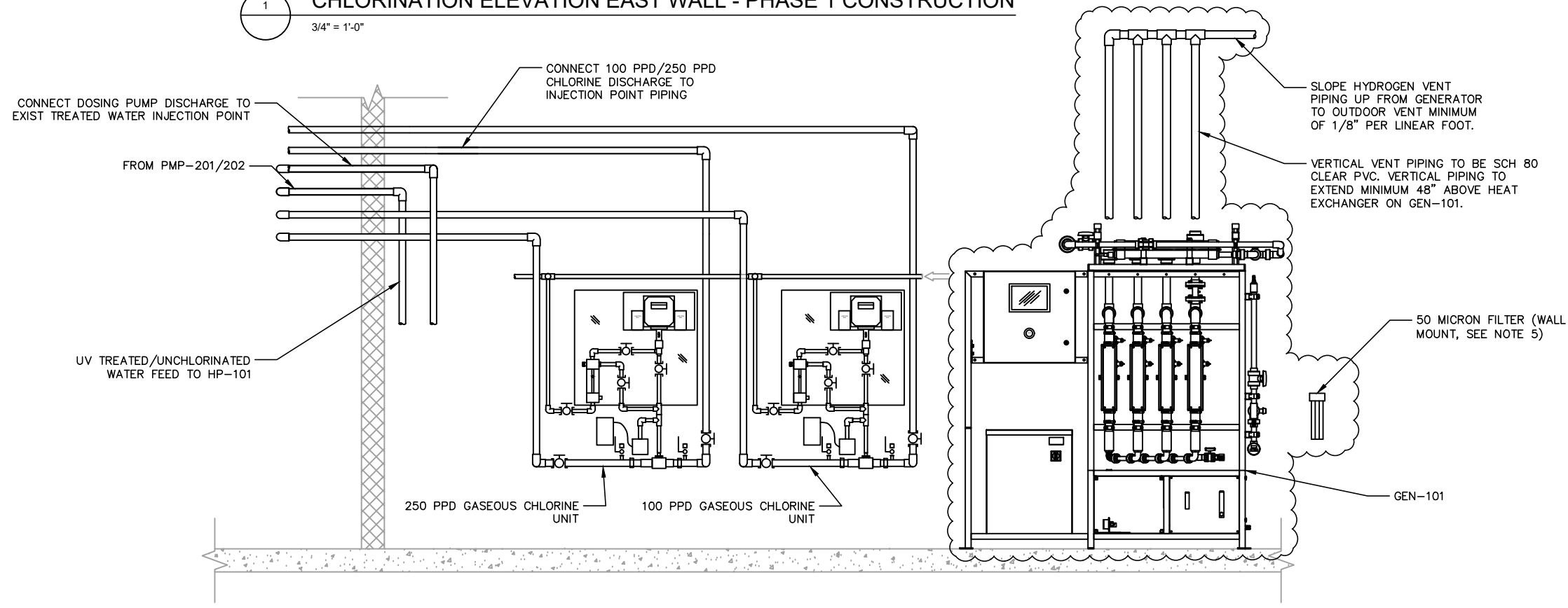
NUMBER	TITLE
	REFERENCE DRAWINGS



- CONSTRUCTION NOTES:**
1. CONNECT 100 PPD/250 PPD INJECTOR DISCHARGE CONNECTION TO EXISTING TREATED WATER INJECTION POINT. USE THE LINE FOR TEMPORARY GASEOUS CHLORINE OPERATION DURING CONSTRUCTION.
 2. REPURPOSE 50 PPD/100 PPD INJECTION LINE FOR SODIUM HYPOCHLORITE GENERATION INJECTION POINT.
 3. REPURPOSE PMP-103 AND PMP-104 SUCTION LINES FOR SODIUM HYPOCHLORITE GENERATION INLET.
 4. THIS DRAWING IS FOR PHASING PURPOSES. SEE P1.4 PHASE 2 CONSTRUCTION FOR FINAL INSTALLATION DETAILS.
 5. MOUNT 50 MICRON FILTERS WITH TOP OF FILTER AT 30" A.F.F.
 6. HP-101 TO BE ASME-CERTIFIED PRESSURE VESSEL.

RELOCATE CRANE DISCONNECT AND CONTROLLER TO SOUTHEAST CORNER AS SPACE ALLOWS

1 CHLORINATION ELEVATION EAST WALL - PHASE 1 CONSTRUCTION
3/4" = 1'-0"



2 CHLORINATION ELEVATION SOUTH WALL - PHASE 1 CONSTRUCTION
3/4" = 1'-0"

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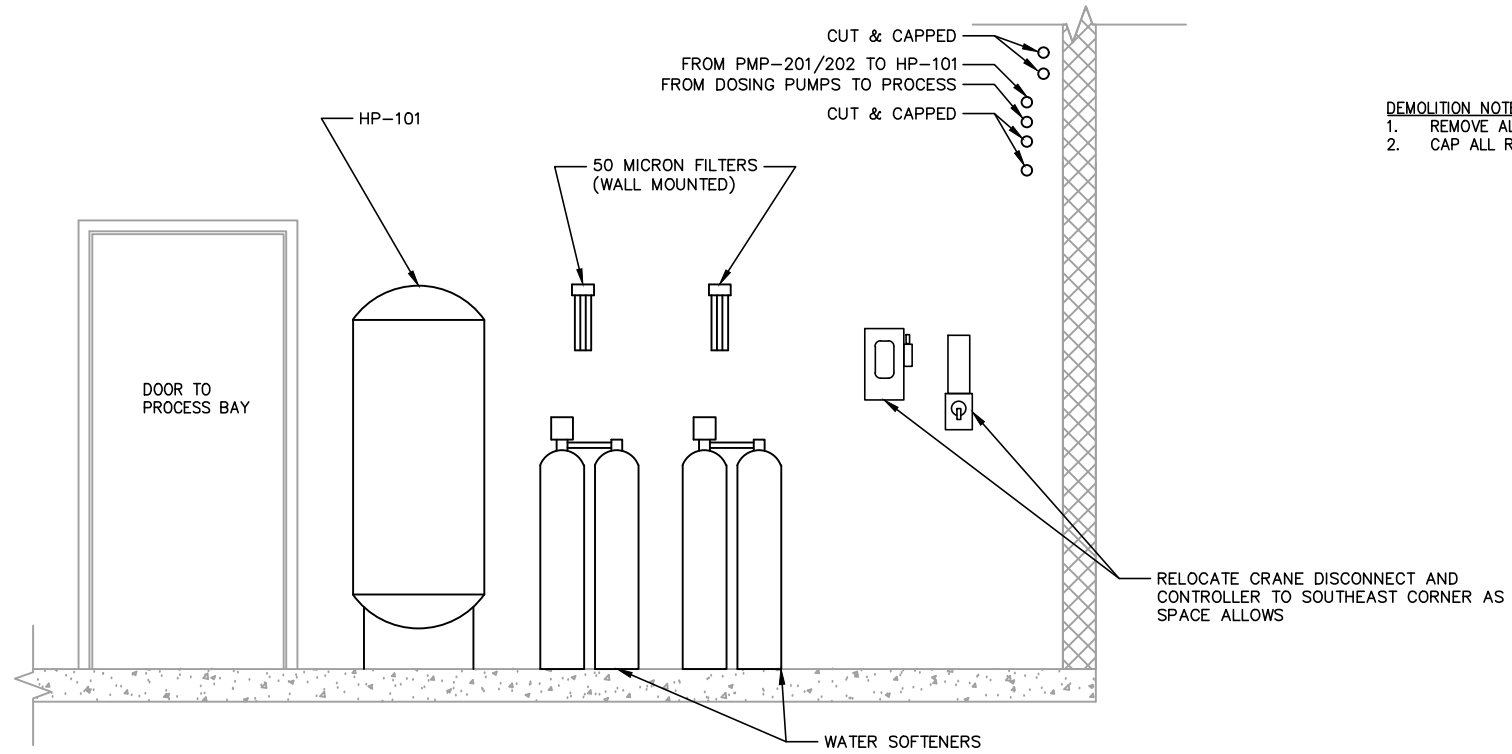
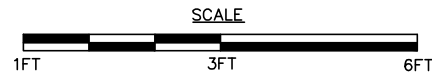


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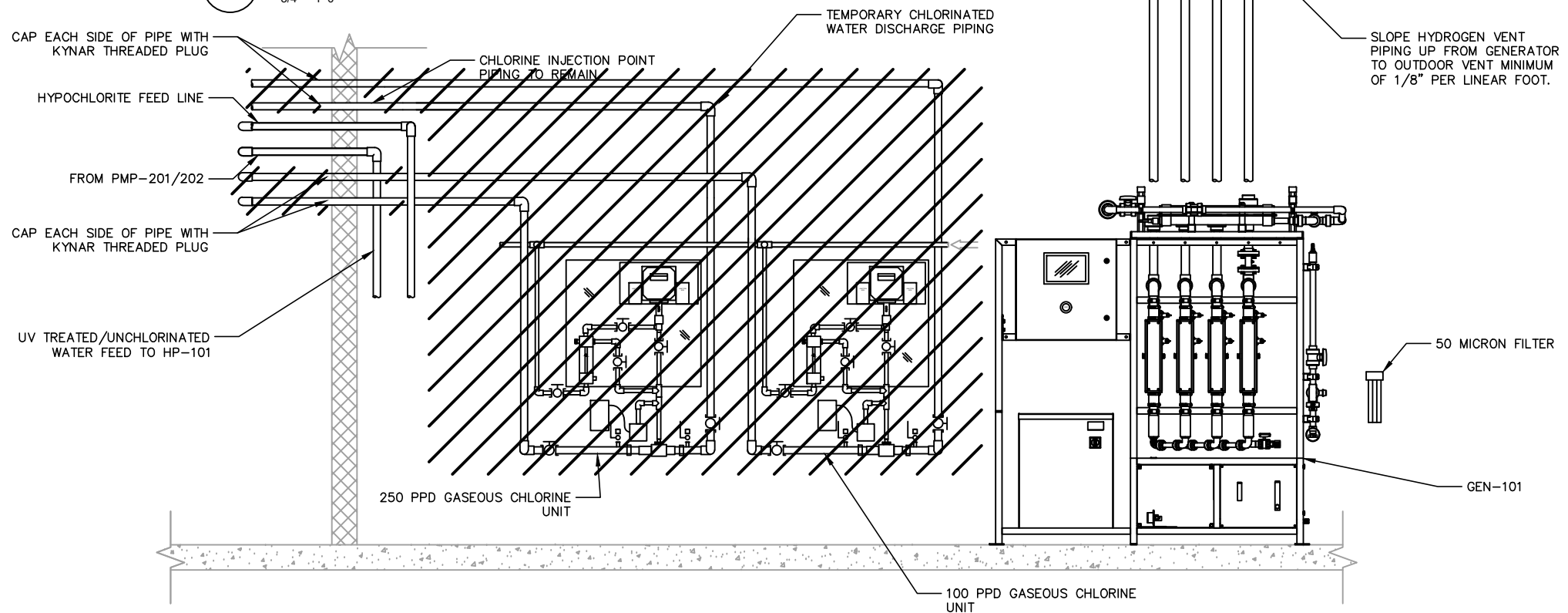
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CKD: RAN	APP:	P1.4	E
DATE: 6/8/22	SCALE: AS SHOWN	SHEET 1 OF --	

NUMBER	TITLE
	REFERENCE DRAWINGS



- DEMOLITION NOTES:**
1. REMOVE ALL REMAINING GASEOUS CHLORINE EQUIPMENT
 2. CAP ALL REMAINING OPEN PIPES WITH KYNAR THREADED PLUG.

1 CHLORINATION ELEVATION EAST WALL - DEMO PHASE 2
3/4" = 1'-0"



2 CHLORINATION ELEVATION SOUTH WALL - DEMO PHASE 2
3/4" = 1'-0"

DEMOLITION

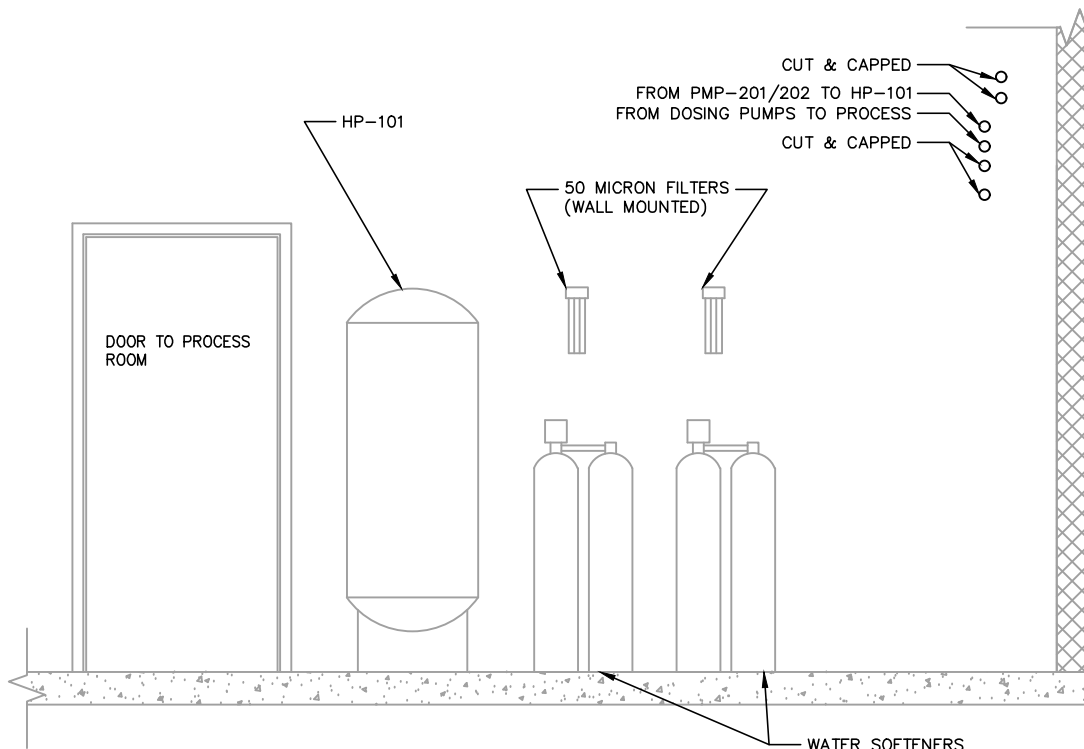
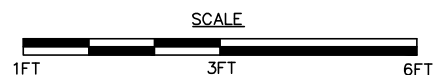


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D	3/22	100% IFC	RFK	RAN	WMC						
E	6/22	100% IFC RE-ISSUE	RFK	RAN	WMC						

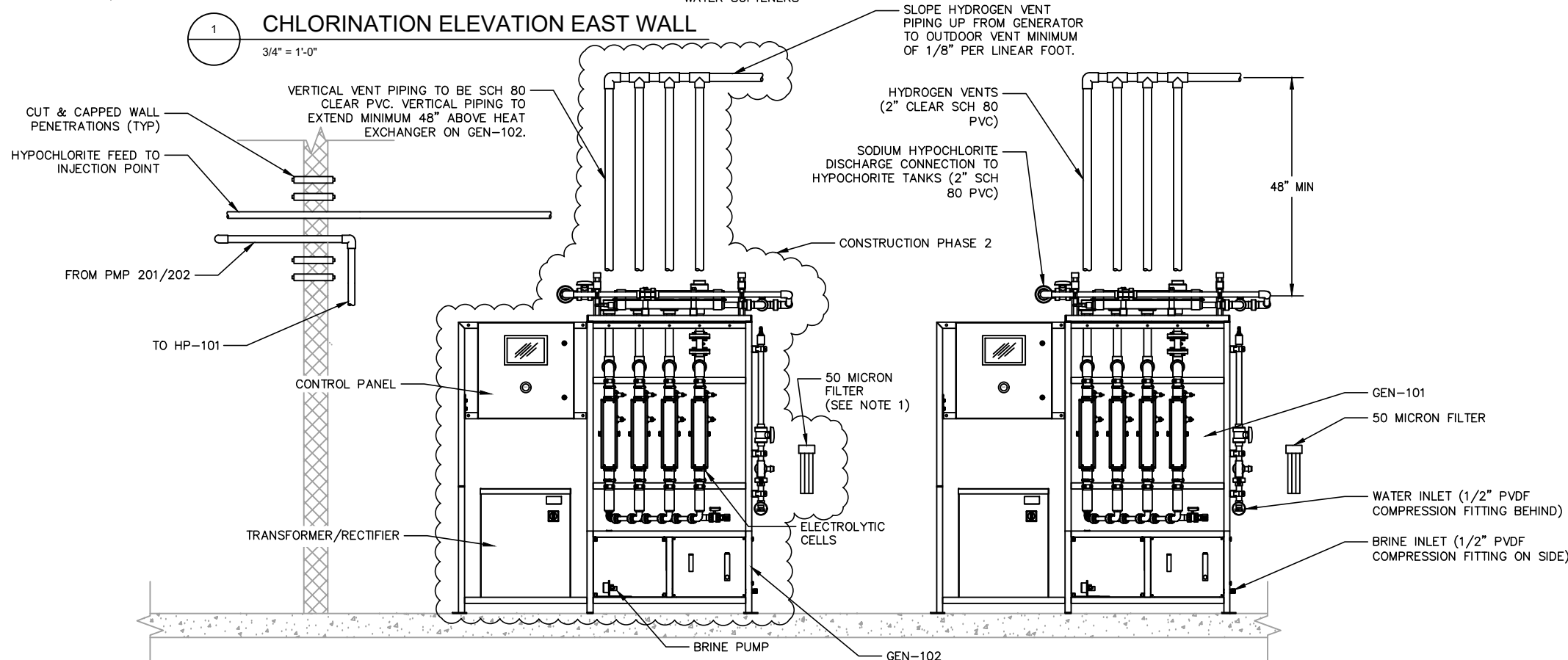
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CKD: RAN	APP:	P1.4D		E							
DATE: 6/8/22	SCALE: AS SHOWN	SHEET 1 OF									

NUMBER	TITLE
	REFERENCE DRAWINGS



CONSTRUCTION NOTES:
1. MOUNT 50 MICRON FILTERS WITH TOP OF FILTER AT 30" A.F.F.

1 CHLORINATION ELEVATION EAST WALL



2 CHLORINATION ELEVATION SOUTH WALL - CONSTRUCTION PHASE 2

DSGN/CNST

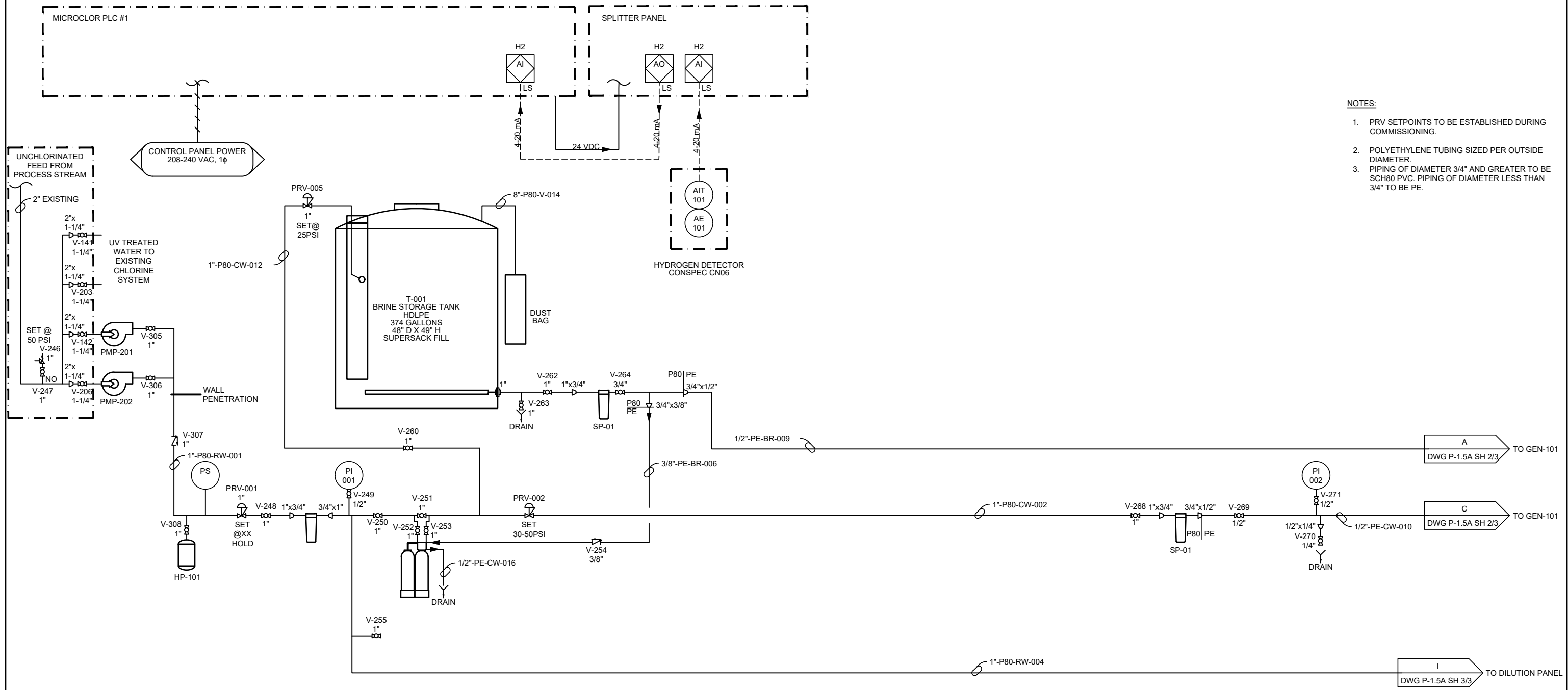


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PHONE: 907-433-1125
LIC.# AECL890

A	6/21	35% SCHEMATIC DESIGN	RFK	ZBB	ZBB						
B	9/21	65% DETAILED DESIGN	RFK	ZBB	ZBB						
C	10/21	95% CONSTRUCTION DESIGN	RFK	AB	AB						
D	3/22	100% IFC	RFK	RAN	WMC						
E	6/22	100% IFC RE-ISSUE	RFK	RAN	WMC						
REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP

DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG CHLORINATION ELEV.- PHASE 2 CONST.											
DWN:	RFK	APP:	WMC	DRAWING NUMBER:	P1.4	REV:	E				
CKD:	RAN	APP:		DATE:	6/8/22	SCALE:	AS SHOWN	SHEET	1	OF	--

REFERENCE DRAWINGS											
NUMBER	TITLE										



- NOTES:**
1. PRV SETPOINTS TO BE ESTABLISHED DURING COMMISSIONING.
 2. POLYETHYLENE TUBING SIZED PER OUTSIDE DIAMETER.
 3. PIPING OF DIAMETER 3/4" AND GREATER TO BE SCH80 PVC. PIPING OF DIAMETER LESS THAN 3/4" TO BE PE.

SERVICE CODES:

RW - RAW WATER
 CW - CONDITIONED WATER
 HC - HYPOCHLORITE
 V - VENT
 H - HYDROGEN
 BR - BRINE

PIPE MATERIAL CODES:

P40 - SCH 40 PVC
 P80 - SCH 80 PVC
 PE - POLYETHYLENE - 0.040" WALL (NOTE 2)

PMP-201, 202
 RAW WATER PUMP
 CAPACITY: 5 GPM
 TDH: 225 FT
 POWER: 3/4 HP
 GOULDS ISV8GB3J20

HP-101
 SURGE SUPPRESSOR
 CAPACITY: 112 GAL
 MAWP: 150 PSI
 DIMENSIONS: 30" DIA. x 52" H
 AMERICAN WHEATLY BDT-112

PHASE 1 DSGN/CNST

NUMBER	TITLE

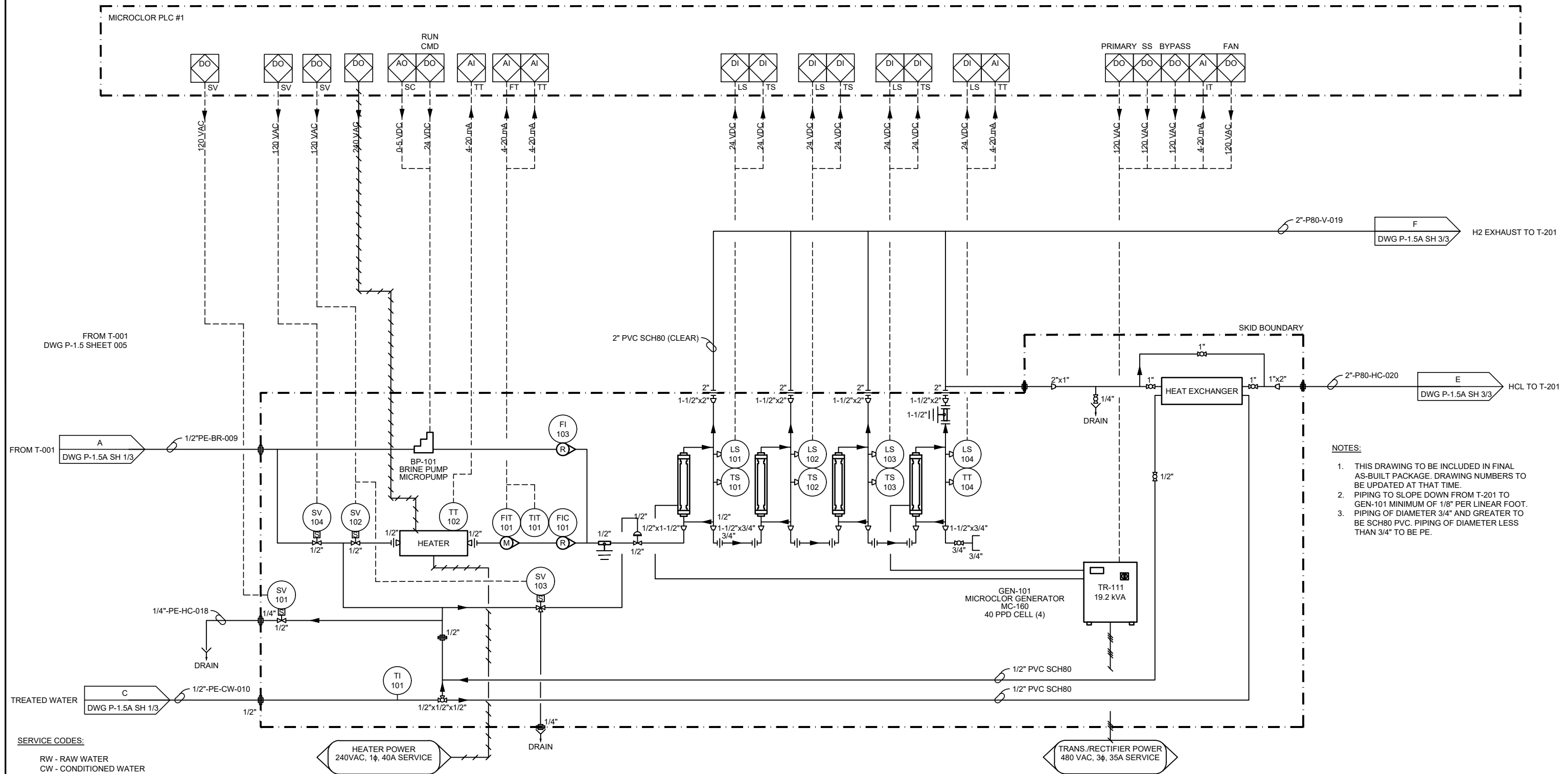
taku engineering

406 W Fireweed Ln, Anchorage, AK 99503
 PHONE: 907-433-1125
 LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	3/22	100% IFC	BWL	RFK	WMC						
B	6/22	100% IFC RE-ISSUE	BWL	RFK	WMC						

DRAWING TITLE:
 CITY OF UNALASKA
 PWTP-SODIUM HYPOCHLORITE OSG
 CHLORINATION P&ID - PHASE 1 CNST

DWN: BWL	APP: WMC	DRAWING NUMBER: P1.5A	REV: B
CKD: RFK	APP:		
DATE: 6/8/22	SCALE: NTS	SHEET 1 OF 3	



- NOTES:**
1. THIS DRAWING TO BE INCLUDED IN FINAL AS-BUILT PACKAGE. DRAWING NUMBERS TO BE UPDATED AT THAT TIME.
 2. PIPING TO SLOPE DOWN FROM T-201 TO GEN-101 MINIMUM OF 1/8" PER LINEAR FOOT.
 3. PIPING OF DIAMETER 3/4" AND GREATER TO BE SCH80 PVC. PIPING OF DIAMETER LESS THAN 3/4" TO BE PE.

SERVICE CODES:
 RW - RAW WATER
 CW - CONDITIONED WATER
 HC - HYPOCHLORITE
 V - VENT
 H - HYDROGEN
 BR - BRINE

PIPE MATERIAL CODES:
 P40 - SCH 40 PVC
 P80 - SCH 80 PVC
 PE - POLYETHYLENE - 0.040" WALL

PHASE 1 DSGN/CNST



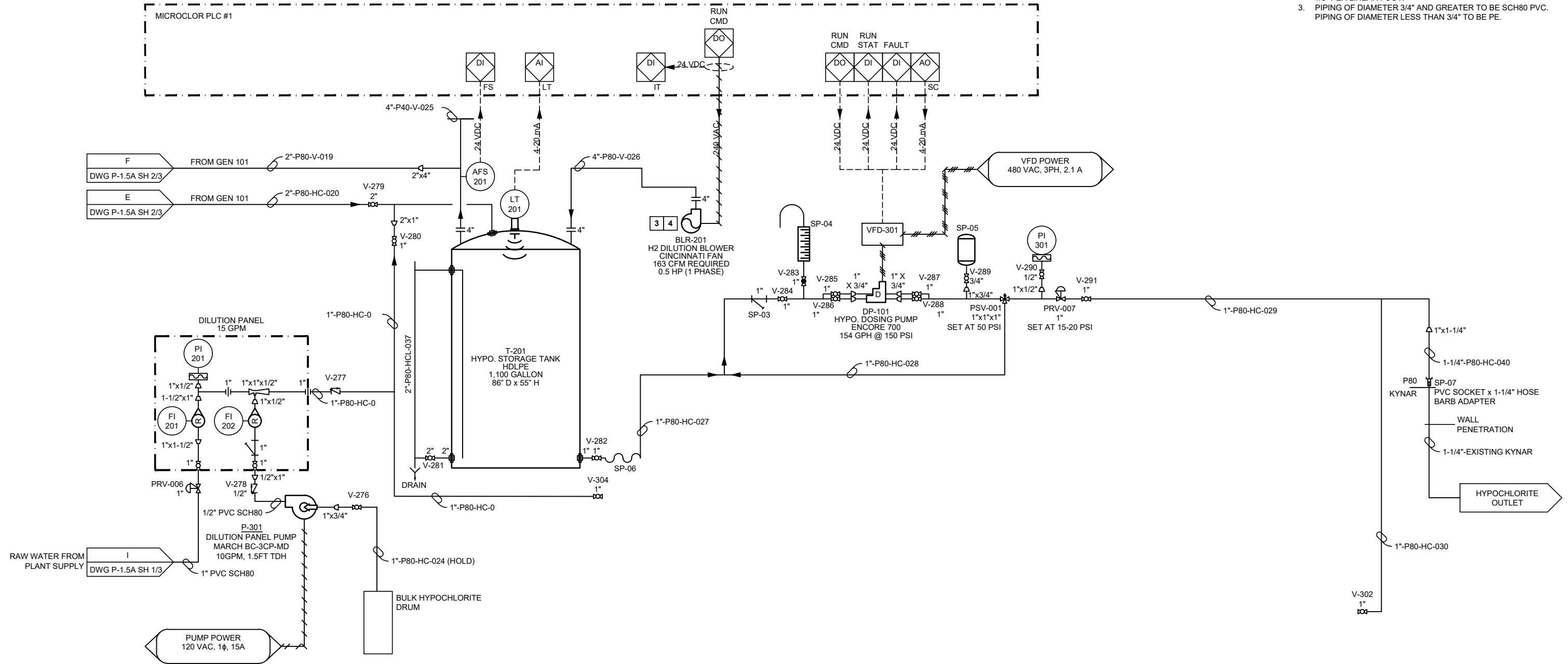
taku engineering
 406 W Fireweed Ln, Anchorage, AK 99503
 PHONE: 907-433-1125
 LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	3/22	100% IFC				BWL	RFK	WMC			
B	6/22	100% IFC RE-ISSUE				BWL	RFK	WMC			

DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG CHLORINATION P&ID - PHASE 1 CONST.											
DWN: BWL	APP: WMC	DRAWING NUMBER: P1.5A		REV: B							
CKD: RFK	APP:										
DATE: 6/8/22	SCALE: NTS	SHEET 2 OF 3									

NUMBER	TITLE
	REFERENCE DRAWINGS

- NOTES:
1. PRV SET POINTS TO BE FINALIZED DURING COMMISSIONING.
 2. PIPING TO SLOPE DOWN FROM T-201 TO GEN-101 MINIMUM 1/8" PER LINEAR FOOT.
 3. PIPING OF DIAMETER 3/4" AND GREATER TO BE SCH80 PVC. PIPING OF DIAMETER LESS THAN 3/4" TO BE PE.



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 V - VENT
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PIPE MATERIAL CODES:

P40 - SCH 40 PVC
 P80 - SCH 80 PVC
 PE - POLYETHYLENE - 0.040" WALL

PHASE 1 DSGN/CNST

NUMBER	TITLE

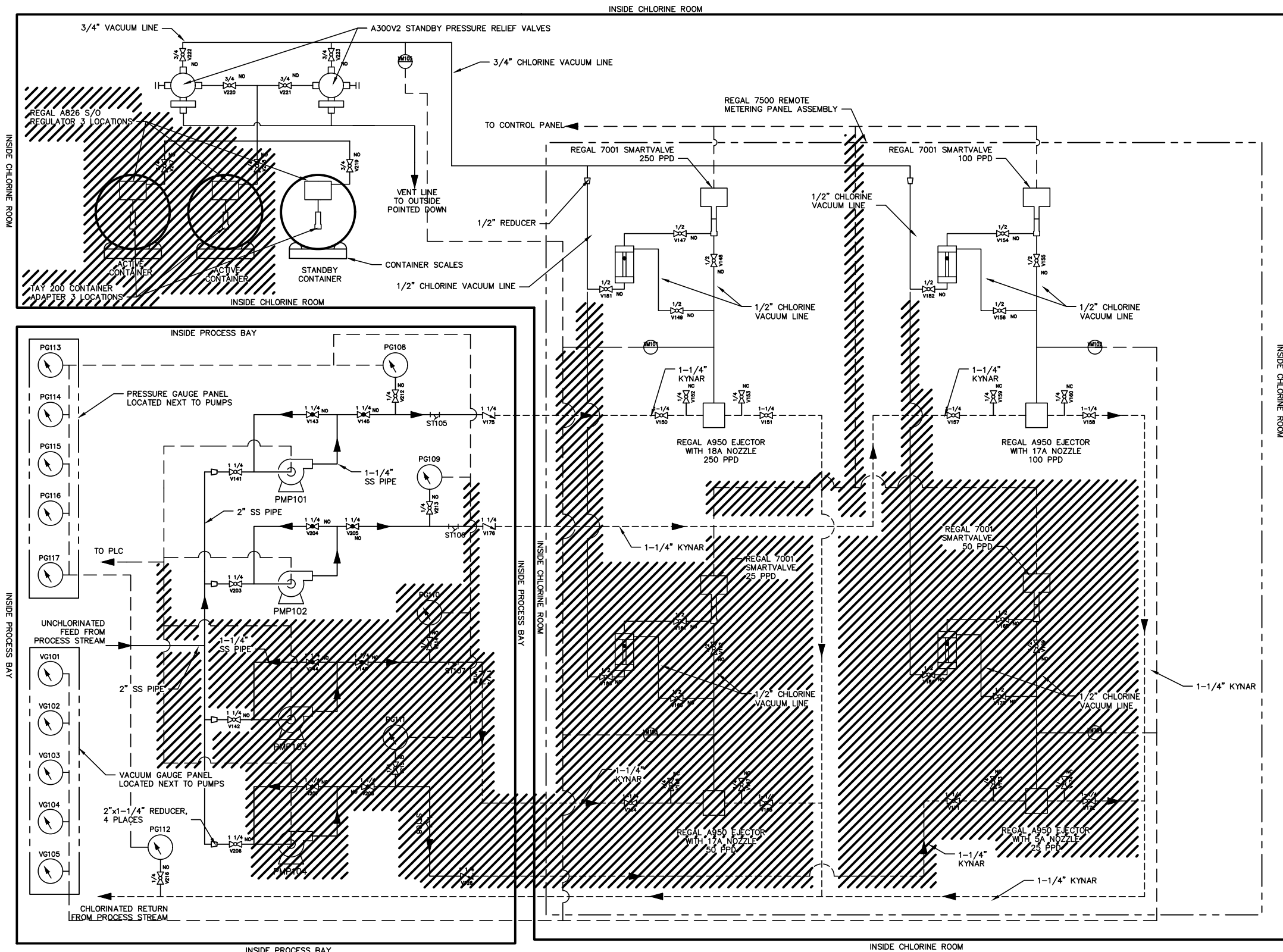


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406 W Fireweed Ln, Anchorage, AK 99503
 PHONE: 907-433-1125
 LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	3/22	100% IFC	BWL	RFK	WMC						
B	6/22	100% IFC RE-ISSUE	BWL	RFK	WMC						

DRAWING TITLE:												
CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG CHLORINATION PHASE 1 CONST.												
DWN:	BWL	APP:	WMC	DRAWING NUMBER				REV				
CKD:	RFK	APP:		P1.5A				B				
DATE:	6/8/22	SCALE:	NTS	SHEET 3 OF 3								



LEGEND	
SYMBOL	DESCRIPTION
	REGAL SMARTVALVE
	FLOWMETER
	BALL VALVE
	GLOBE VALVE
	CHLORINE EJECTOR
	STANDBY PRESSURE RELIEF VALVE
	TAY 200 ADAPTER
	PUMP
	Y-STRAINER
	CHECK VALVE
	KYNAR PIPING
	KYNAR VACUUM LINE
	REMOTE METERING PANEL ASSEMBLY
	SS PIPING
	CONTROL SIGNAL LINE
	PRESSURE GAUGE
	CHLORINE REGULATOR

PHASE 1 DEMOLITION

CHLORINATION PROCESS & INSTRUMENTATION DIAGRAM
SCALE: NOT TO SCALE

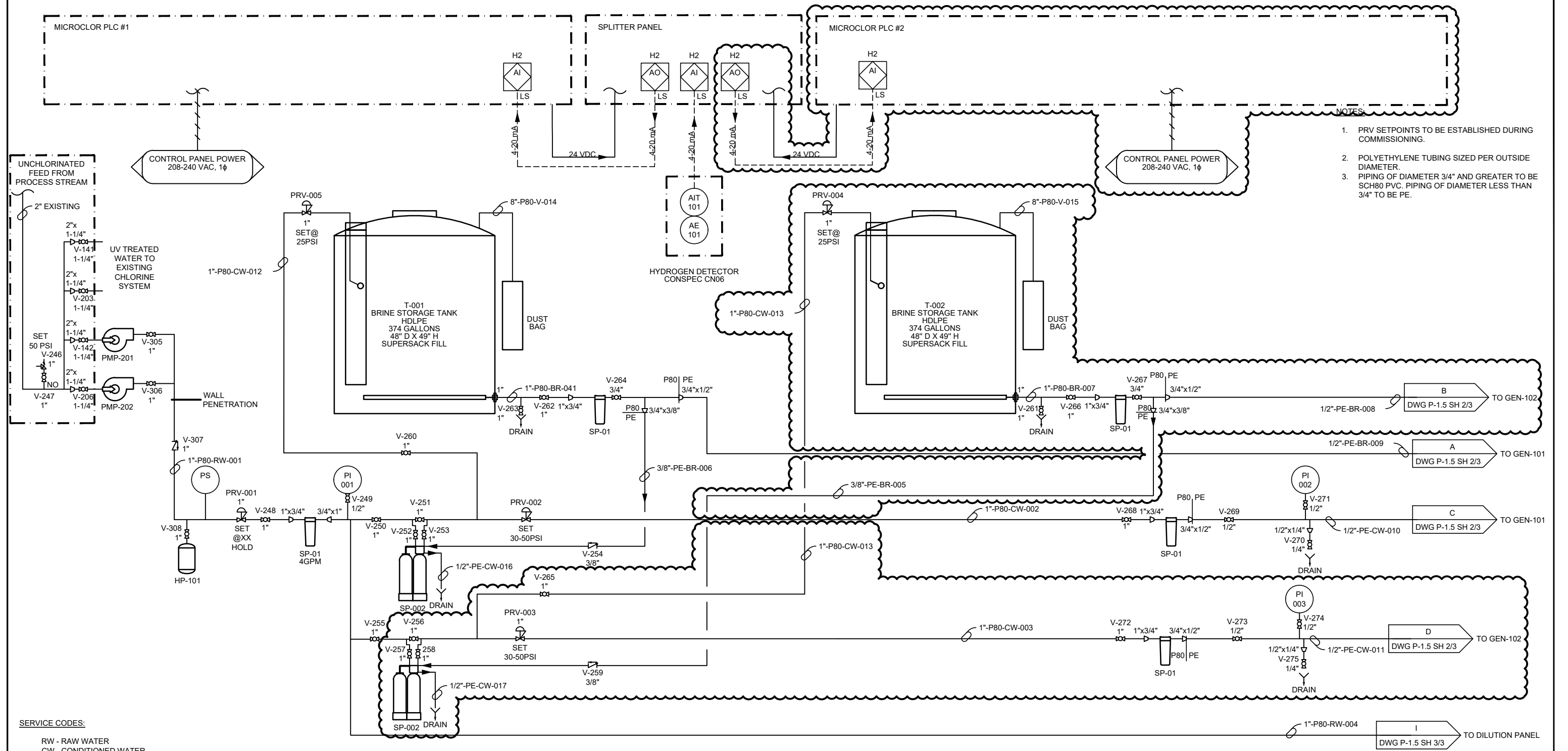
NUMBER	TITLE



taku engineering
406 W Fireweed Ln, Anchorage, AK 99503
PHONE: 907-433-1125
LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
0	4/20	ISSUED FOR CONSTRUCTION	RFK	ZBB	ZBB						
1	3/22	100% IFC	RFK	RAN	WMC						
2	6/22	100% IFC RE-ISSUE	RFK	RAN	WMC						

DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG CHLORINATION P&ID - PHASE 1 DEMO											
DWN: RFK	APP: WMC	DRAWING NUMBER		REV							
CKD: RAN	APP:	P1.5D		2							
DATE: 6/8/22	SCALE: NTS	SHEET 1 OF									



- NOTES:
1. PRV SETPOINTS TO BE ESTABLISHED DURING COMMISSIONING.
 2. POLYETHYLENE TUBING SIZED PER OUTSIDE DIAMETER.
 3. PIPING OF DIAMETER 3/4" AND GREATER TO BE SCH80 PVC. PIPING OF DIAMETER LESS THAN 3/4" TO BE PE.

SERVICE CODES:
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 HC - HYPOCHLORITE
 V - VENT
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PIPE MATERIAL CODES:
 P40 - SCH 40 PVC
 P80 - SCH 80 PVC
 PE - POLYETHYLENE - 0.040" WALL

PMP-201, -202
 RAW WATER PUMP
 CAPACITY: 5 GPM
 TDH: 225 FT
 POWER: 3/4 HP
 GOULDS ISV8GB3J20

HP-101
 SURGE SUPPRESSOR
 CAPACITY: 112 GAL
 MAWP: 150 PSI
 DIMENSIONS: 30" DIA. x 52" H
 AMERICAN WHEATLY BDT-112

PHASE 2 DSGN/CNST

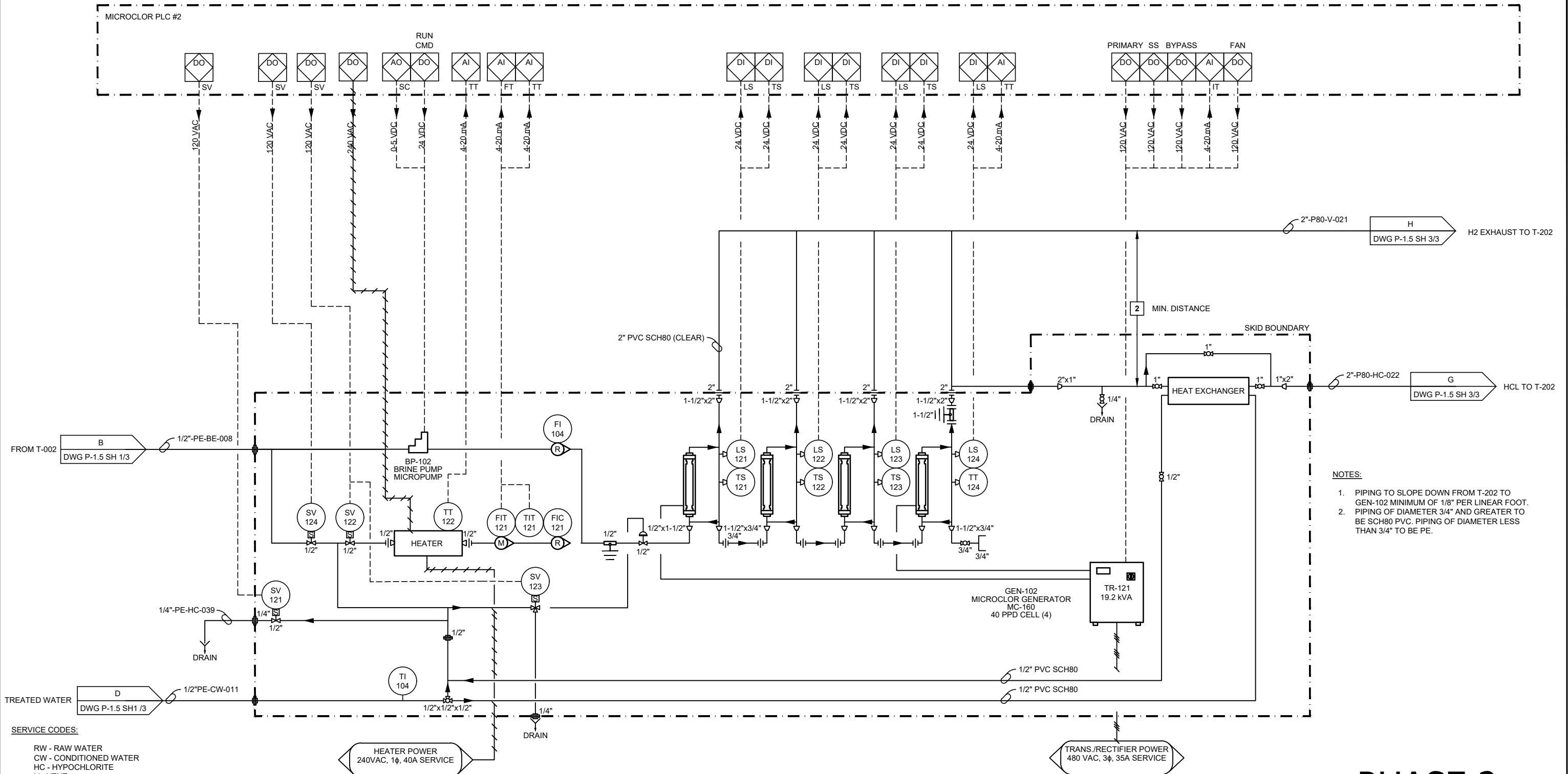
NUMBER	TITLE



taku engineering
 406 W Fireweed Ln, Anchorage, AK 99503
 PHONE: 907-433-1125
 LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	3/22	100% IFC	BWL	RFK	WMC						
B	6/22	100% IFC RE-ISSUE	BWL	RFK	WMC						

DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG CHLORINATION P&ID PHASE 2 CONST.			
DWN: BWL	APP: WMC	DRAWING NUMBER: P1.5	REV: B
CKD: RFK	APP:	DATE: 6/8/22	SCALE: NTS
SHEET 1 OF 3			



- NOTES:**
1. PIPING TO SLOPE DOWN FROM T-202 TO GEN-102 MINIMUM OF 1/8" PER LINEAR FOOT.
 2. PIPING OF DIAMETER 3/4" AND GREATER TO BE SCH80 PVC. PIPING OF DIAMETER LESS THAN 3/4" TO BE PE.

SERVICE CODES:

RW - RAW WATER
 CW - CONDITIONED WATER
 HC - HYPOCHLORITE
 V - VENT
 H - HYDROGEN
 BR - BRINE

PIPE MATERIAL CODES:

P40 - SCH 40 PVC
 P80 - SCH 80 PVC
 PE - POLYETHYLENE - 0.040" WALL

PHASE 2 DSGN/CNST

NUMBER	TITLE



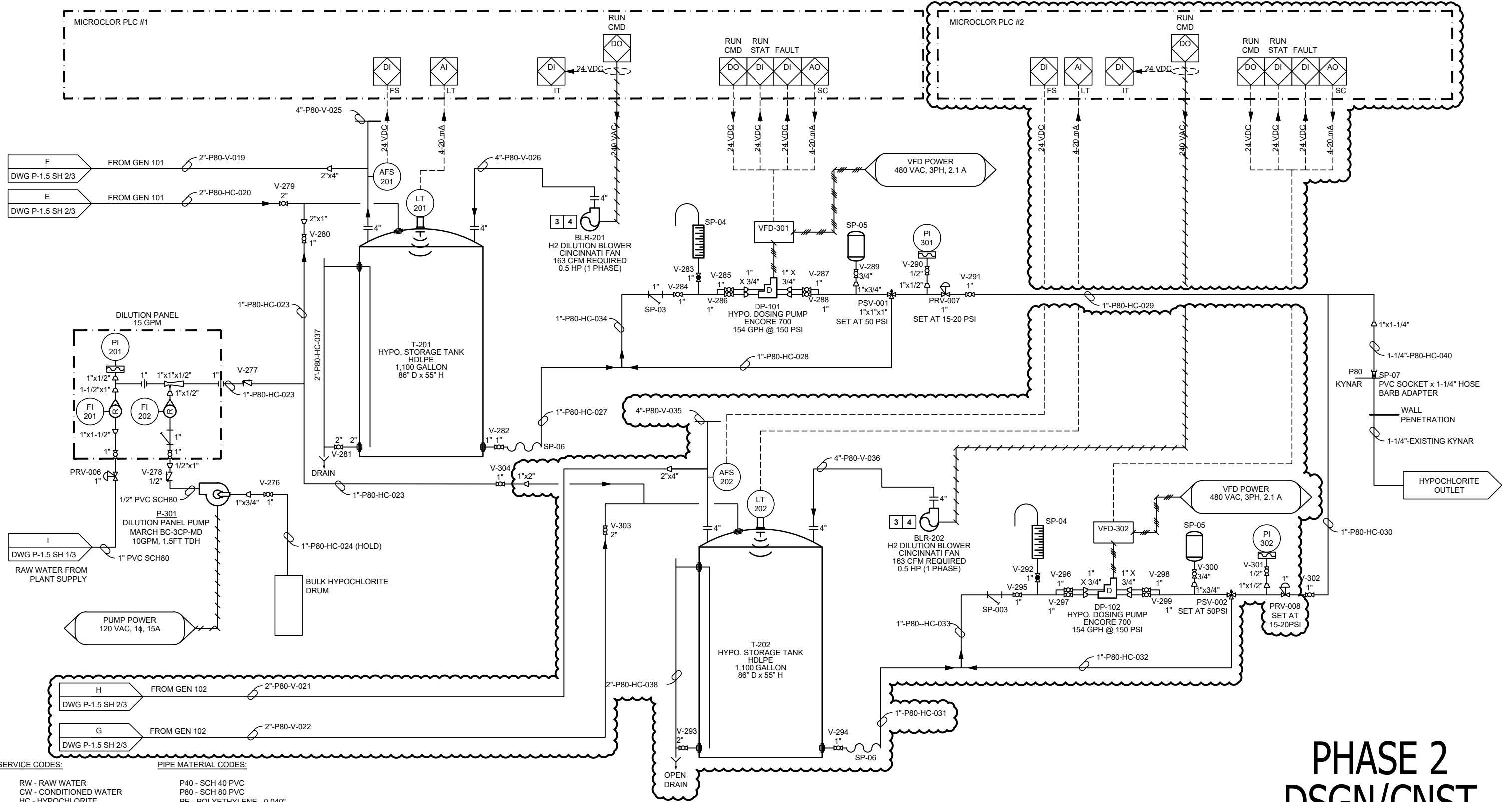
taku engineering

406 W Fireweed Ln, Anchorage, AK 99503
 PHONE: 907-433-1125
 LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	3/22	100% IFC	BWL	RFK	WMC						
B	6/22	100% IFC RE-ISSUE	BWL	RFK	WMC						

DRAWING TITLE:												
CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG CHLORINATION P&ID PHASE 2 CONST.												
DWN:	BWL	APP:	WMC	DRAWING NUMBER				REV				
CKD:	RFK	APP:		P1.5				B				
DATE:	6/8/22	SCALE:	NTS	SHEET 2 OF 3								

- NOTES:
1. PRV SET POINTS TO BE FINALIZED DURING COMMISSIONING.
 2. PIPING TO SLOPE DOWN FROM T-202 TO GEN-102 MINIMUM OF 1/8" PER LINEAR FOOT.
 3. PIPING OF DIAMETER 3/4" AND GREATER TO BE SCH80 PVC. PIPING OF DIAMETER LESS THAN 3/4" TO BE PE.



SERVICE CODES:
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PIPE MATERIAL CODES:
 P40 - SCH 40 PVC
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 PE - POLYETHYLENE - 0.040" WALL

PHASE 2 DSGN/CNST

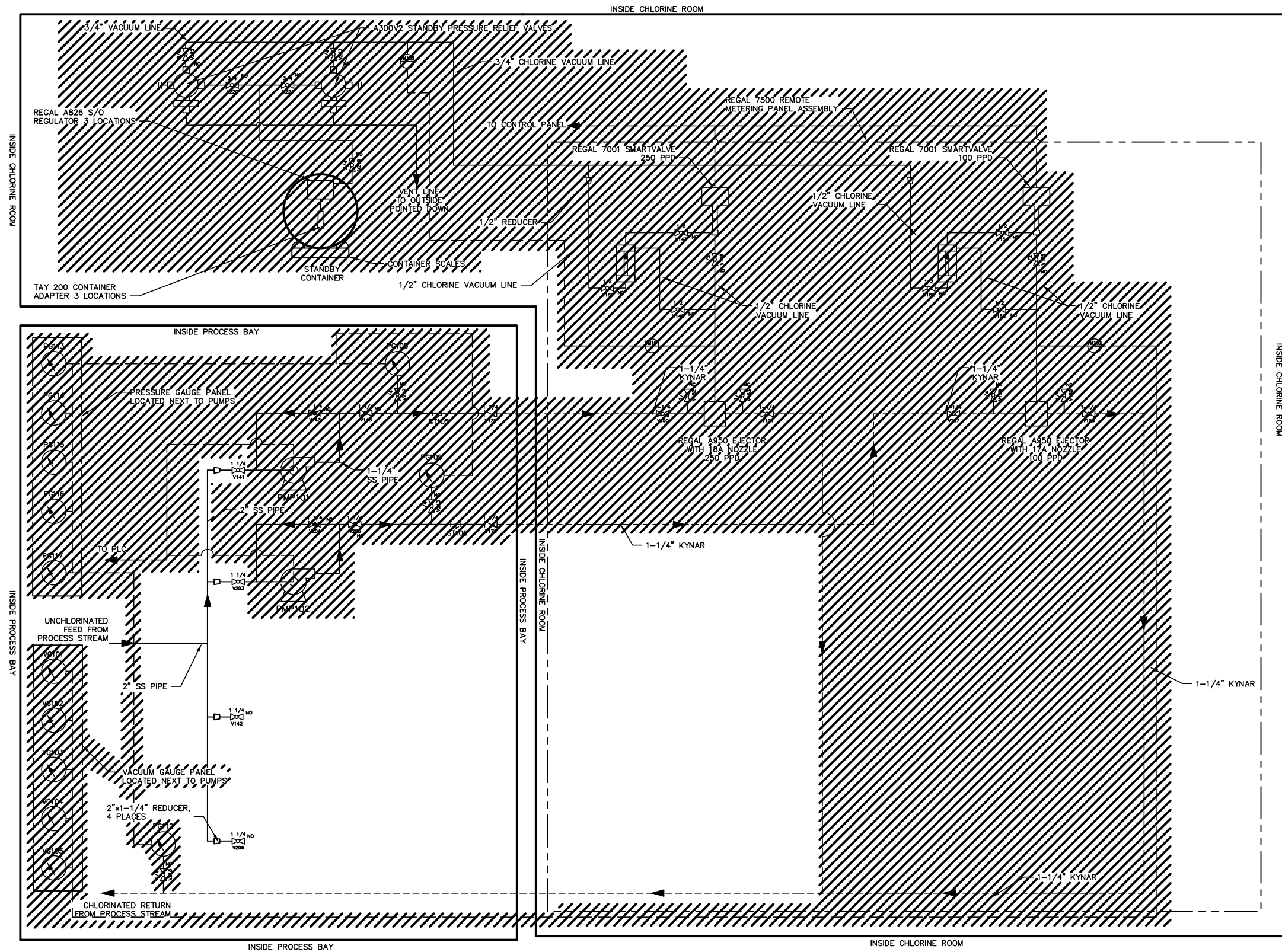
NUMBER	TITLE
	REFERENCE DRAWINGS



taku engineering
 406 W Fireweed Ln, Anchorage, AK 99503
 PHONE: 907-433-1125
 LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	3/22	100% IFC				BWL	RFK	WMC			
B	6/22	100% IFC RE-ISSUE				BWL	RFK	WMC			

DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG CHLORINATION P&ID PHASE 2 CONST.					
DWN: BWL	APP: WMC	DRAWING NUMBER P1.5		REV B	
CKD: RFK	APP:	DATE: 6/8/22	SCALE: NTS	SHEET 3 OF 3	



LEGEND	
SYMBOL	DESCRIPTION
	REGAL SMARTVALVE
	FLOWMETER
	BALL VALVE
	GLOBE VALVE
	CHLORINE EJECTOR
	STANDBY PRESSURE RELIEF VALVE
	TAY 200 ADAPTER
	PUMP
	Y-STRAINER
	CHECK VALVE
	KYNAR PIPING
	KYNAR VACUUM LINE
	REMOTE METERING PANEL ASSEMBLY
	SS PIPING
	CONTROL SIGNAL LINE
	PRESSURE GAUGE
	CHLORINE REGULATOR

PHASE 2 DEMOLITION

CHLORINATION PROCESS & INSTRUMENTATION DIAGRAM

SCALE: NOT TO SCALE



taku engineering
 406 W Fireweed Ln, Anchorage, AK 99503
 PHONE: 907-433-1125
 LIC.# AECL890

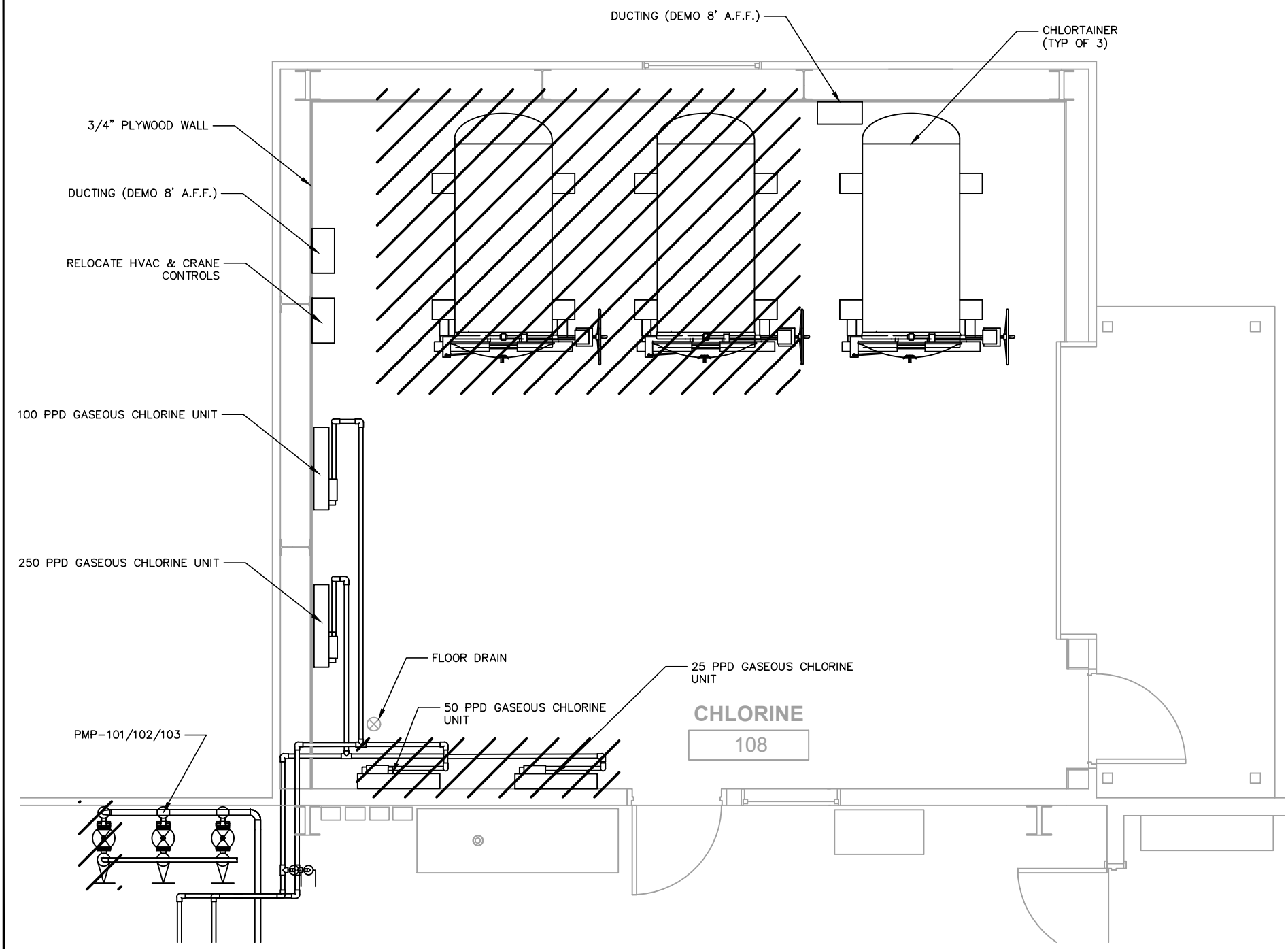
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0	4/20	ISSUED FOR CONSTRUCTION	RFK	ZBB	ZBB						
1	3/22	100% IFC	RFK	RAN	WMC						
2	6/22	100% IFC RE-ISSUE	RFK	RAN	WMC						

DRAWING TITLE:			
CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG CHLORINATION P&ID - PHASE 2 DEMO			
DWN: RFK	APP: WMC	DRAWING NUMBER	REV
CKD: RAN	APP:	P1.5D	2
DATE: 6/8/22	SCALE: NTS	SHEET 1 OF --	

NUMBER	TITLE
	REFERENCE DRAWINGS



- DEMOLITION NOTES:**
1. CAP ALL OPEN PIPING
 2. DEMOLISH 25 PPD AND 50 PPD CHLORINE SYSTEMS.
 3. 100 PPD AND 250 PPD CHLORINE SYSTEMS TO REMAIN.
 4. ONE CHLORINE TANK TO REMAIN. COORDINATE WITH OPERATORS PRIOR TO DEMOLITION.



1 WATER TREATMENT PLANT FLOOR PLAN - DEMO PHASE 1
1/2" = 1'-0"

DEMOLITION

NUMBER	TITLE
P1.2	PROCESS FLOOR PLAN
REFERENCE DRAWINGS	



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406 W Fireweed Ln, Anchorage, AK 99503
PHONE: 907-433-1125
LIC.# AECL890

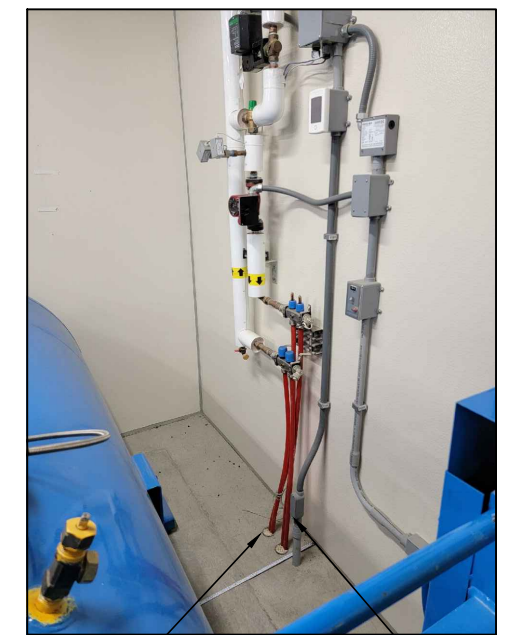
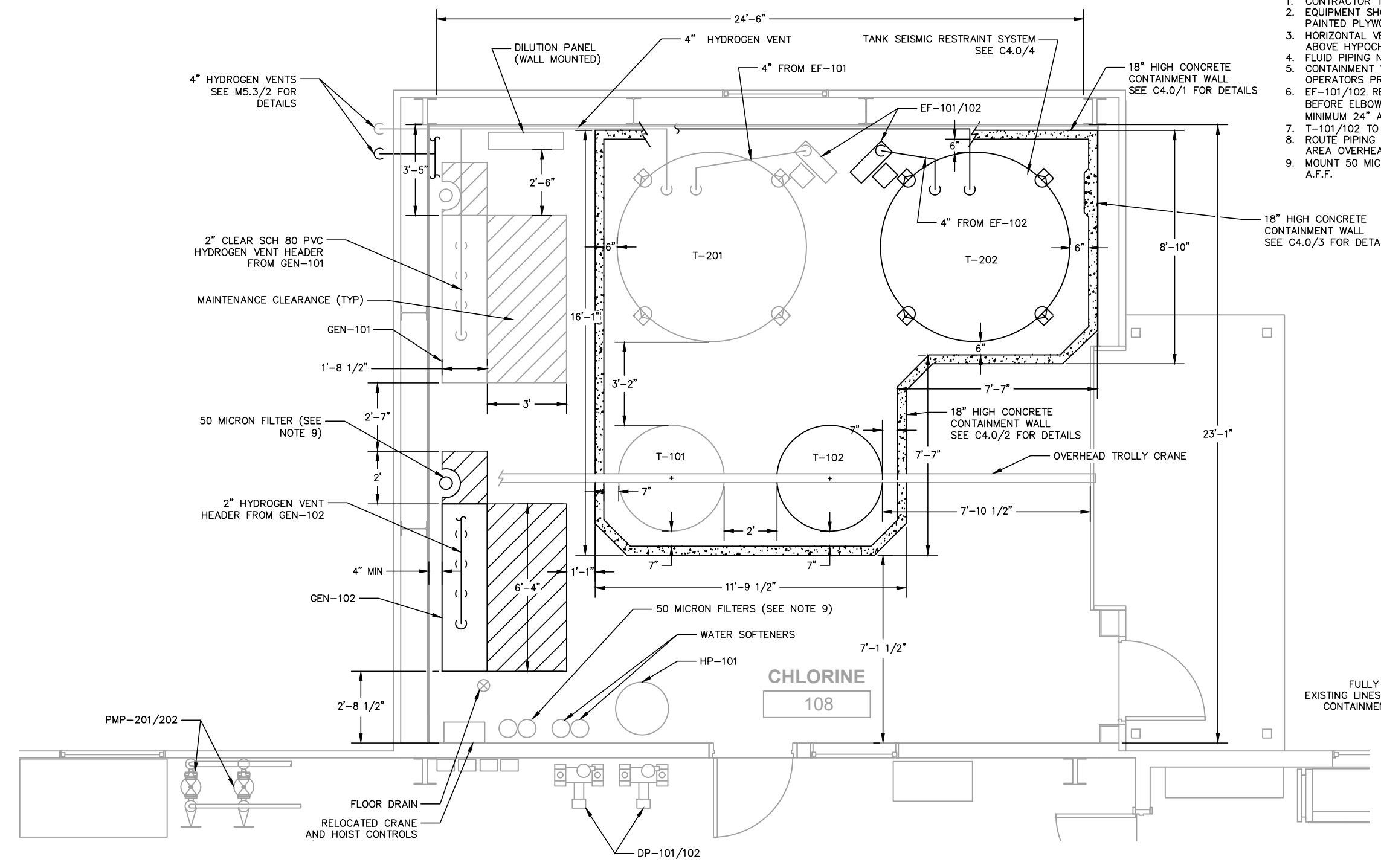
REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	6/21	35% SCHEMATIC DESIGN	RFK	ZBB	ZBB						
B	9/21	65% DETAILED DESIGN	RFK	ZBB	ZBB						
C	10/21	95% CONSTRUCTION DESIGN	RFK	AB	AB						
D	3/22	100% IFC	RFK	RAN	WMC						
E	6/22	100% IFC RE-ISSUE	RFK	RAN	WMC						

DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG EQUIPMENT PLAN DEMO - PHASE 1											
DWN: RFK	APP: WMC	DRAWING NUMBER		REV							
CKD: RAN	APP:	P1.7D		E							
DATE: 6/8/22	SCALE: AS SHOWN	SHEET 1 OF									

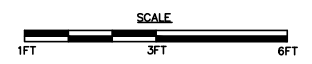


CONSTRUCTION NOTES:

1. CONTRACTOR TO VERIFY DIMENSIONS IN THE FIELD.
2. EQUIPMENT SHOWN IN APPROXIMATE LOCATION AGAINST PAINTED PLYWOOD FALSE WALL.
3. HORIZONTAL VENT HEADERS INSTALLED MIN OF 48" ABOVE HYPOCHLORITE DISCHARGE CONNECTION LEVEL.
4. FLUID PIPING NOT SHOWN FOR CLARITY
5. CONTAINMENT WALL LAYOUT REQUIRES APPROVAL FROM OPERATORS PRIOR TO CONSTRUCTION.
6. EF-101/102 REQUIRE MIN 32" OF STRAIGHT PIPE BEFORE ELBOWS OR VALVES. MOUNT EF-101/102 MINIMUM 24" A.F.F.
7. T-101/102 TO BE CENTERED UNDER HOIST
8. ROUTE PIPING IN AND OUT OF CONTAINMENT WALL AREA OVERHEAD.
9. MOUNT 50 MICRON FILTER WITH TOP OF FILTER AT 30" A.F.F.



FULLY ENCASE EXISTING LINES IN NEW CONTAINMENT WALL
RELOCATE PULLBOX TO ABOVE NEW CONTAINMENT WALL



1 CHLORINATION EQUIPMENT PLAN - PHASE 2 CONSTRUCTION
1/2" = 10"

DSGN/CNST

NUMBER	TITLE



taku engineering
406 W Fireweed Ln, Anchorage, AK 99503
PHONE: 907-433-1125
LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	6/21	35% SCHEMATIC DESIGN	RFK	ZBB	ZBB						
B	9/21	65% DETAILED DESIGN	RFK	ZBB	ZBB						
C	10/21	95% CONSTRUCTION DESIGN	RFK	AB	AB						
D	3/22	100% IFC	RFK	RAN	WMC						
E	6/22	100% IFC RE-ISSUE	RFK	RAN	WMC						

DRAWING TITLE:											
CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG EQUIPMENT PLAN - PHASE 2											
DWN: RFK	APP: WMC	DRAWING NUMBER		REV							
CKD: RAN	APP:	P1.7		E							
DATE: 6/8/22	SCALE: AS SHOWN	SHEET 1 OF 1									



Table with columns: TAG NO., ITEM, OPERATI ON, FUNCTION, SIZE, MANUFACTUR ER/SUPPLIER, MODEL NO, TYPE, ACTUATOR, NOTES. Contains equipment specifications for various sensors and gauges.

Table with columns: TAG NO., ITEM, OPERATI ON, FUNCTION, SIZE, MANUFACTUR ER/SUPPLIER, MODEL NO, TYPE, ACTUATOR, NOTES. Contains equipment specifications for various gauges, mixers, and reactors.

DEMOLITION



taku engineering logo and address: 406 W Fireweed Ln, Anchorage, AK 99503

Revision table with columns: REV, DATE, DESCRIPTION, DWN, CKD, APP, REV, DATE, DESCRIPTION, DWN, CKD, APP. Includes revision history and drawing title information.

Table for drawing information with columns: NUMBER, TITLE, REFERENCE DRAWINGS.

DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSC VALVE SCHEDULE - DEMO. Includes drawing number P3.0D and sheet 1 of 1.



Table with columns: TAG NO., ITEM, OPERATI ON, FUNCTION, SIZE, MANUFACTUR ER/SUPPLIER, MODEL NO, TYPE, ACTUATOR, NOTES. Includes rows for items V107A through V176.

Table with columns: TAG NO., ITEM, OPERATI ON, FUNCTION, SIZE, MANUFACTUR ER/SUPPLIER, MODEL NO, TYPE, ACTUATOR, NOTES. Includes rows for items V144 through V201.

DEMOLITION



taku engineering logo and contact information: 406 W Fireweed Ln, Anchorage, AK 99503. Phone: 907-433-1125. Lic.# AECL890

Revisions table with columns: REV, DATE, DESCRIPTION, DWN, CKD, APP, REV, DATE, DESCRIPTION, DWN, CKD, APP. Lists design stages from 6/21 to 6/22.

Revisions table with columns: REV, DATE, DESCRIPTION, DWN, CKD, APP, REV, DATE, DESCRIPTION, DWN, CKD, APP. Lists design stages from 6/21 to 6/22.

Drawing title and metadata table including: CITY OF UNALASKA, PWTP-SODIUM HYPOCHLORITE OSC VALVE SCHEDULE - DEMO, DWN: RFK, APP: WMC, DRAWING NUMBER: P3.1D, REV: E, DATE: 6/8/22, SCALE: NTS, SHEET 1 OF --

Table with columns: NUMBER, TITLE, REFERENCE DRAWINGS.



TAG NO.	ITEM	OPERATION	FUNCTION	SIZE	MANUFACTURER/SUPPLIER	MODEL NO	TYPE	ACTUATOR	NOTES
V202	BALL VALVE	MANUAL	ISOLATION VALVE FOR CARBON FILTER	3/4	-	-	MANUAL	N/A	
V203	BALL VALVE 150 LB	MANUAL	UNUSED	1 1/4	-	-	MANUAL	N/A	
V206	BALL VALVE 150 LB	MANUAL	INLET TO PUMP PMP202	1 1/4	-	-	MANUAL	N/A	
V209	BALL VALVE	MANUAL	ISOLATION VALVE FOR TURB-3	1/4	-	-	OP/CL	N/A	
V210	BALL VALVE	MANUAL	ISOLATION VALVE FOR INSTRUMENT FLOW	1/2	-	-	OP/CL	N/A	
V211	BALL VALVE	MANUAL	ISOLATION VALVE FOR INSTRUMENT FLOW	1/2	-	-	OP/CL	N/A	
V224	BALL VALVE	MANUAL	ISOLATION VALVE FOR TURB-4	1/4	-	-	OP/CL	N/A	
V225	ISOLATION VALVE	MANUAL	ISOLATION OF PRESSURE GAUGE TO PH/TEMP INSTRUMENT	3/8	-	-	MANUAL		
V229	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	TEMPORARY PROCESS BYPASS	10	PRATT	HP250II	OP/CL	N/A	
V230A	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	UPSTREAM ISOLATION FOR TG-A	8	PRATT	HP250II	OP/CL	N/A	
V230B	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	UPSTREAM ISOLATION FOR TG-B	8	PRATT	HP250II	OP/CL	N/A	
V231A	ELECTRICALLY OPERATED BUTTERFLY VALVE	AUTOMATED	INLET TO TG-A	8	PRATT	HP250II	MODULATING	AUMA FQMR12.1/AC01.2	
V231B	ELECTRICALLY OPERATED BUTTERFLY VALVE	AUTOMATED	INLET TO TG-B	8	PRATT	HP250II	MODULATING	AUMA FQMR12.1/AC01.2	
V232A	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	DOWNSTREAM ISOLATION TG-A	10	PRATT	HP250II	OP/CL	N/A	
V232B	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	DOWNSTREAM ISOLATION FOR TG-B	8	PRATT	HP250II	OP/CL	N/A	
V233A	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	UPSTREAM ISOLATION FOR V234A	16	PRATT	HP250II	OP/CL	N/A	
V233B	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	UPSTREAM ISOLATION FOR V234B	8	PRATT	HP250II	OP/CL	N/A	
V234A	PRESSURE REDUCING CONTROL VALVE	AUTOMATED	FLOW CONTROL	16	CLA-VAL	631G-36BCSY	MODULATING	N/A	
V234B	PRESSURE REDUCING CONTROL VALVE	AUTOMATED	SURGE RELIEF/FLOW CONTROL	8	CLA-VAL	690G-018CP1P2SYKCO W/CRD-34	MODULATING	N/A	
V235A	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	DOWNSTREAM ISOLATION FOR V234A	16	PRATT	HP250II	OP/CL	N/A	
V235B	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	DOWNSTREAM ISOLATION FOR V234B	8	PRATT	HP250II	OP/CL	N/A	
V236	BALL VALVE	MANUAL	ISOLATION VALVE FOR PRESSURE TRANSDUCER PT115	1/2	-	-	OP/CL	N/A	
V237	MANUALLY OPERATED BUTTERFLY VALVE	MANUAL	DISCHARGE PRV ISOLATION	16	PRATT	HP250II	OP/CL	N/A	
V238	PRESSURE REDUCING CONTROL VALVE	AUTOMATED	FLOW CONTROL	16	CLA-VAL	50-90 PRESS SUSTAINING TRIM	MODULATING	N/A	
V239	BALL VALVE	MANUAL	ISOLATION VALVE FOR PRESSURE TRANSDUCER PT114	1/2	-	-	OP/CL	N/A	
V240A	BALL VALVE	MANUAL	LOW POINT DRAIN BEFORE TG-A	1/2	-	-	OP/CL	N/A	
V240B	BALL VALVE	MANUAL	LOW POINT DRAIN BEFORE TG-B	1/2	-	-	OP/CL	N/A	

TAG NO.	ITEM	OPERATION	FUNCTION	SIZE	MANUFACTURER/SUPPLIER	MODEL NO	TYPE	ACTUATOR	NOTES
V241	BALL VALVE	MANUAL	LOW POINT DRAIN ON DISCHARGE PIPE	1/2	-	-	OP/CL	N/A	
V242	AIR/VACUUM RELEASE VALVE	AUTOMATIC	RELEASE AIR FROM ELEVATED INCOMING RAW WATER LINE	1	VALMATIC	VMC-100S	AUTOMATIC	-	
V243	BALL VALVE	MANUAL	ISOLATION VALVE FOR V242 AIR RELEASE	1	-	-	MANUAL	N/A	
V244	AIR/VACUUM RELEASE VALVE	AUTOMATIC	RELEASE AIR AFTER ALL TURBINES	1	VALMATIC	VMC-100S	AUTOMATIC	-	
V245	BALL VALVE	MANUAL	ISOLATION VALVE FOR V244 AIR RELEASE	1	-	-	MANUAL	N/A	
V246	AIR/VACUUM RELEASE VALVE	AUTOMATIC	RELEASE AIR FROM UNCHLORINATED FEED FROM PROCESS STREAM	1	VALMATIC	VMC-100S	AUTOMATIC	-	
V247	BALL VALVE	MANUAL	ISOLATION VALVE FOR V246 AIR RELEASE	1	-	-	MANUAL	N/A	

TAG NO.	ITEM	OPERATION	FUNCTION	SIZE	MANUFACTURER/SUPPLIER	MODEL NO	NOTES
TG-A	TURBINE	AUTOMATED	POWER GENERATION	8	CORNELL	8TR3	
TG-B	TURBINE	AUTOMATED	POWER GENERATION	6	CORNELL	6TR3	

PUMP NO.	DESIGN FLOW	DESIGN HEAD	MAUFACTURER/SUPPLIER	PRODUCT LINE	RPM	NO. OF STAGES	CONFIG OPTIONS	HP RATING	POLE/HZ/PHASE	VOLTAGE	ENCLOSURE TYPE	MODEL NO.	NOTES
PMP 201	5 GPM	97 PSI / 225 FT	GOULDS	SV	1750	8	ROUND 304	3/4	2/60/1	120V	TEFC	15V8GB3J20	OWNER PROVIDED
PMP 202	5 GPM	97 PSI / 225 FT	GOULDS	SV	1750	8	ROUND 304	3/4	2/60/1	120V	TEFC	15V8GB3J20	OWNER PROVIDED

TAG NO.	ITEM	MODEL	FUNCTION	TANK VOLUME (GAL)	ACCEPTANCE FACTOR	ACCEPTANCE VOLUME (GAL)	NOTES
HP-101	HYDROPNUEMATIC TANK	AMERICAN WHEATLEY BDT-112	SURGE SUPPRESSION	112	1.0	112	OWNER PROVIDED

TAG NO.	ITEM	MANUFACTURER	MODEL	VOLTAGE	MAX FLOW RATE	DISINFECTION GEN RATE	NOTES
GEN 101/102	ON-SITE HYPOCHLORITE GENERATOR	MICROCLOR	MC-160	480V	3 GPM	160 POUNDS PER DAY	OWNER PROVIDED

TAG NO.	ITEM	MANUFACTURER	MODEL	VOLTAGE	HP	MAX FLOW RATE	MAX PRESSURE	NOTES
DP-101/102	DOSING PUMPS	ENCORE	700	480V	3/4	1.6 GPM	150 PSIG	OWNER PROVIDED

TAG NO.	ITEM	MANUFACTURER	MODEL	VOLUME	DIAMETER	MATERIAL	NOTES
T-101/102	BRINE TANKS	BRINE MAKER	53X56FBDT	360 GAL	48"	HDPE	OWNER PROVIDED
T-201/202	SODIUM HYPOCHLORITE TANKS	SNYDER INDUSTRIES	1710000 N	1100 GAL	86"	HDPE	OWNER PROVIDED

TAG NO.	ITEM	MANUFACTURER	MODEL	FLOW RATE	STATIC PRESSURE	VOLTAGE	RPM	HP	NOTES
EF-101/102	HYDROGEN EXHAUST BLOWERS	CINCINNATI FAN	PB-8	163 CFM	3.10 IN. WG	240V	3600	1/2	OWNER PROVIDED

PUMP NO.	DESIGN FLOW	DESIGN HEAD	MAUFACTURER/SUPPLIER	RPM	HP RATING	HZ/PHASE	VOLTAGE	MODEL NO.	NOTES
P-301	10 GPM	0.65 PSI / 1.5 FT	MARCH	3450	1/14	60/1	120V	BC-3CP-MD	OWNER PROVIDED

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REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	6/21	35% SCHEMATIC DESIGN	RFK	ZBB	ZBB						
B	9/21	65% DETAILED DESIGN	RFK	ZBB	ZBB						
C	10/21	95% CONSTRUCTION DESIGN	RFK	AB	AB						
D	3/22	100% IFC	RFK	RAN	WMC						
E	6/22	100% IFC RE-ISSUE	RFK	RAN	WMC						

DRAWING TITLE: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG VALVE SCHEDULE											
DWN: RFK			APP: WMC			DRAWING NUMBER			REV		
CKD: RAN			APP:			P3.2			E		
DATE: 6/8/22		SCALE: NTS		SHEET 1 OF --							

NUMBER	TITLE
	REFERENCE DRAWINGS



HYPOCHLORITE SYSTEM VALVES

Table with 6 columns: Number, Valve Type, Size, Connection, Material, Comments. Lists valves V248 through V302.

HYPOCHLORITE SYSTEM VALVES

Table with 6 columns: Number, Valve Type, Size, Connection, Material, Provided By. Lists valves V303 through V308.

HYPOCHLORITE SYSTEM PRVS

Table with 7 columns: Number, Size, Connection, Setpoint, BRAND/MODEL, Comments, Provided By. Lists PRV-001 through PRV-008.

HYPOCHLORITE SYSTEM PSVS

Table with 6 columns: Number, Size, Connection, Setpoint, BRAND/MODEL, Provided By. Lists PSV-001 and PSV-002.

HYPOCHLORITE SYSTEM SPECIALTY ITEMS

Table with 9 columns: Number, QTY, Description, Brand, Model, Capacity, MAWP, Dimensions, Connections. Lists specialty items SP-01 through SP-07.

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Revisions table with columns: REV, DATE, DESCRIPTION, DWN, CKD, APP, REV, DATE, DESCRIPTION, DWN, CKD, APP.

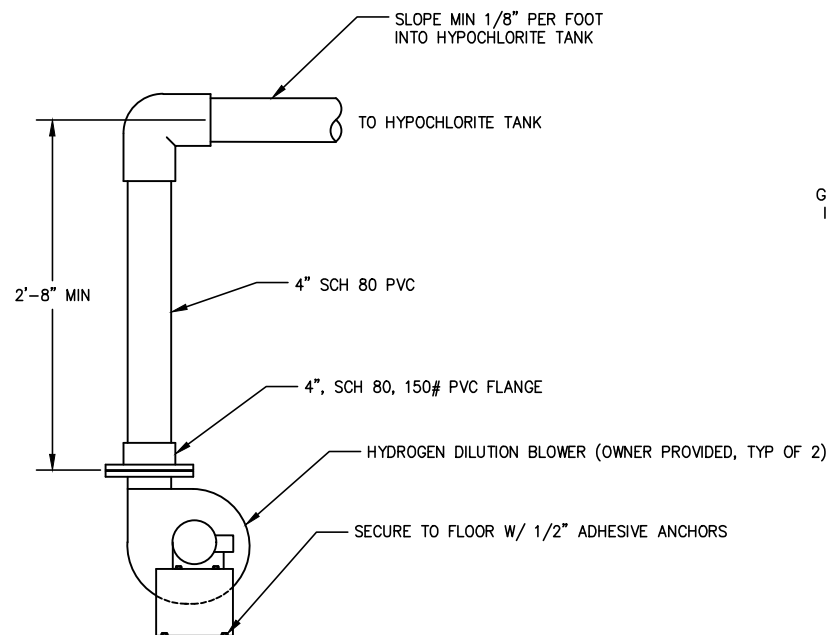
Drawing title and metadata table: CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG VALVE SCHEDULE, DWN: RFK, APP: WMC, DRAWING NUMBER: P3.3, REV: B, DATE: 6/8/22, SCALE: NTS, SHEET 1 OF 1.

Reference drawings table with columns: NUMBER, TITLE.

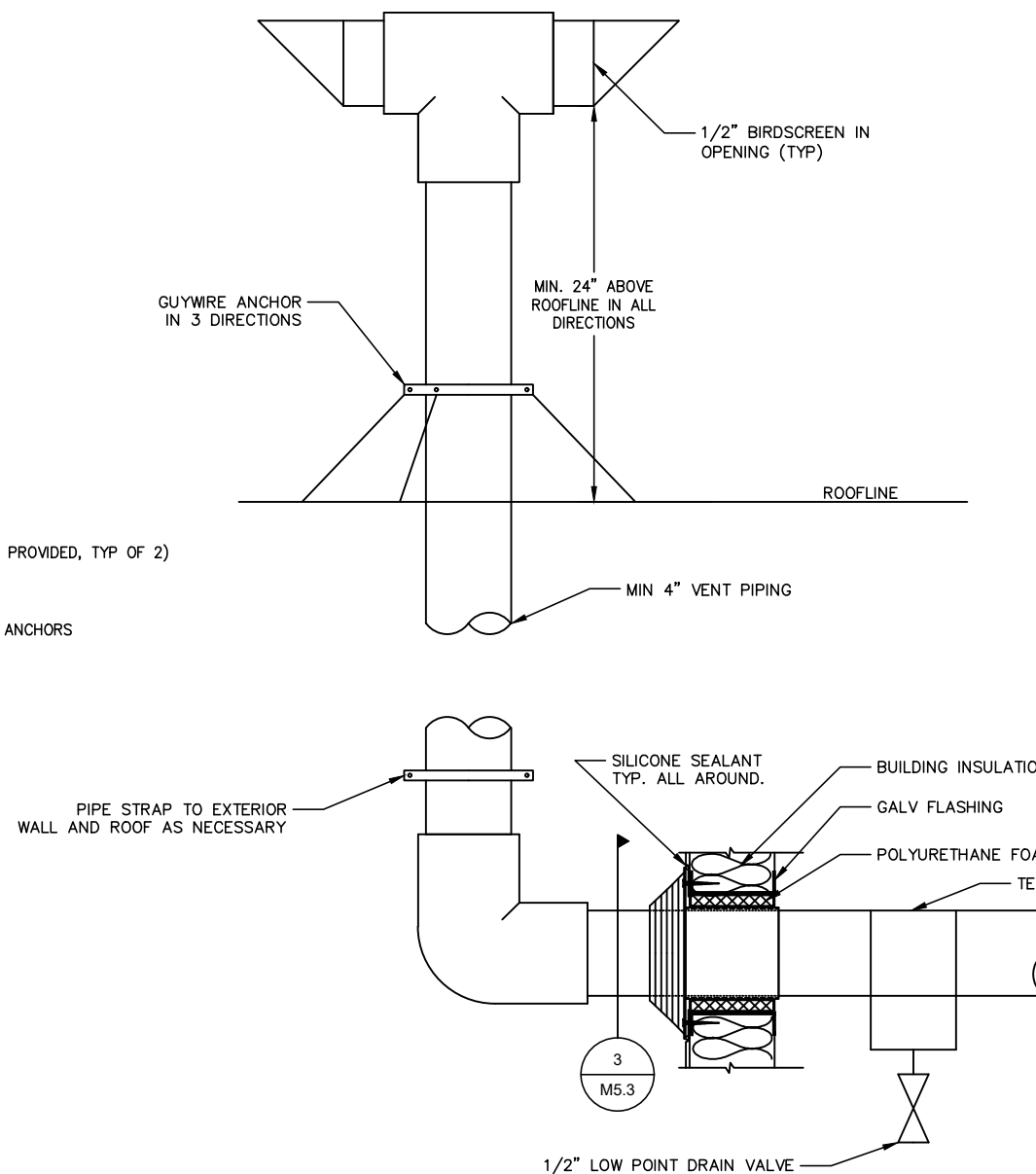


CONSTRUCTION NOTES:

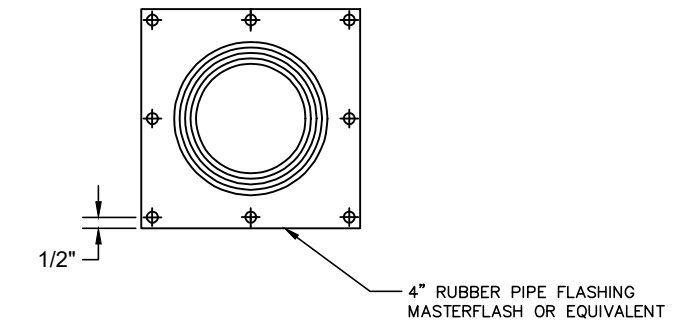
1. EXPANSION ANCHORS SHALL BE HILTI KWIK BOLT TZ SS 304 (OR APPROVED EQUAL) INSTALLED PER MANUFACTURE'S INSTRUCTIONS.
2. SUBMIT DATA SHEETS FOR ALL EMBEDDED ANCHORS FOR APPROVAL.
3. LOCATE EXISTING REBAR BY GPR, XRAY, OR OTHER MEANS PRIOR TO DRILLING TO AVOID HITTING REINFORCING REBAR.
4. CONTRACTOR SHALL ENSURE INSTALLATION PERSONNEL ARE ADEQUATELY QUALIFIED AND FAMILIAR WITH THE MANUFACTURER'S INSTALLATION PROCEDURES.



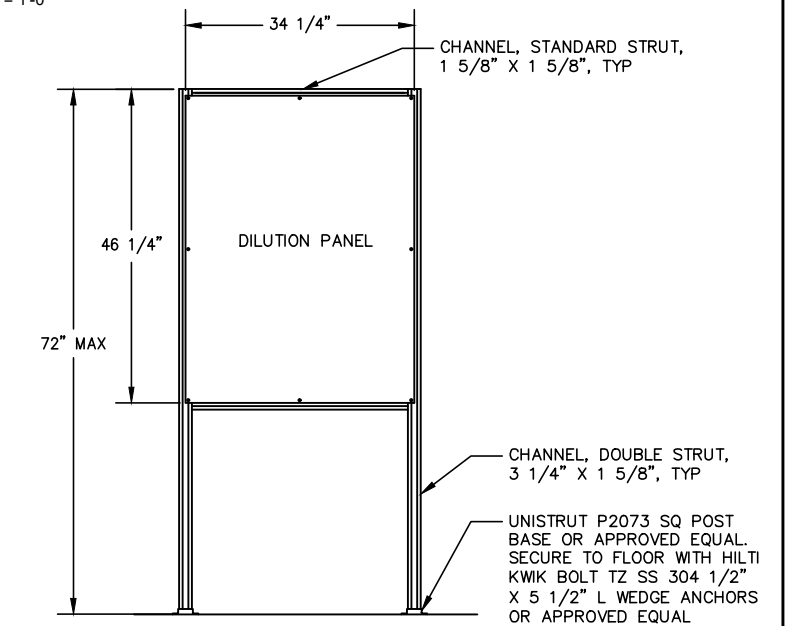
1 DILUTION BLOWER DETAIL
M5.3 1/2" = 1'-0"



2 HYDROGEN VENT SYSTEM (TYP OF 2)
M5.3 NTS



3 HYDROGEN VENT WALL PENETRATION (TYP OF 2)
M5.3 1 1/2" = 1'-0"



4 DILUTION PANEL MOUNTING
M5.3 1" = 1'-0"

DSGN/CNST

NUMBER	TITLE



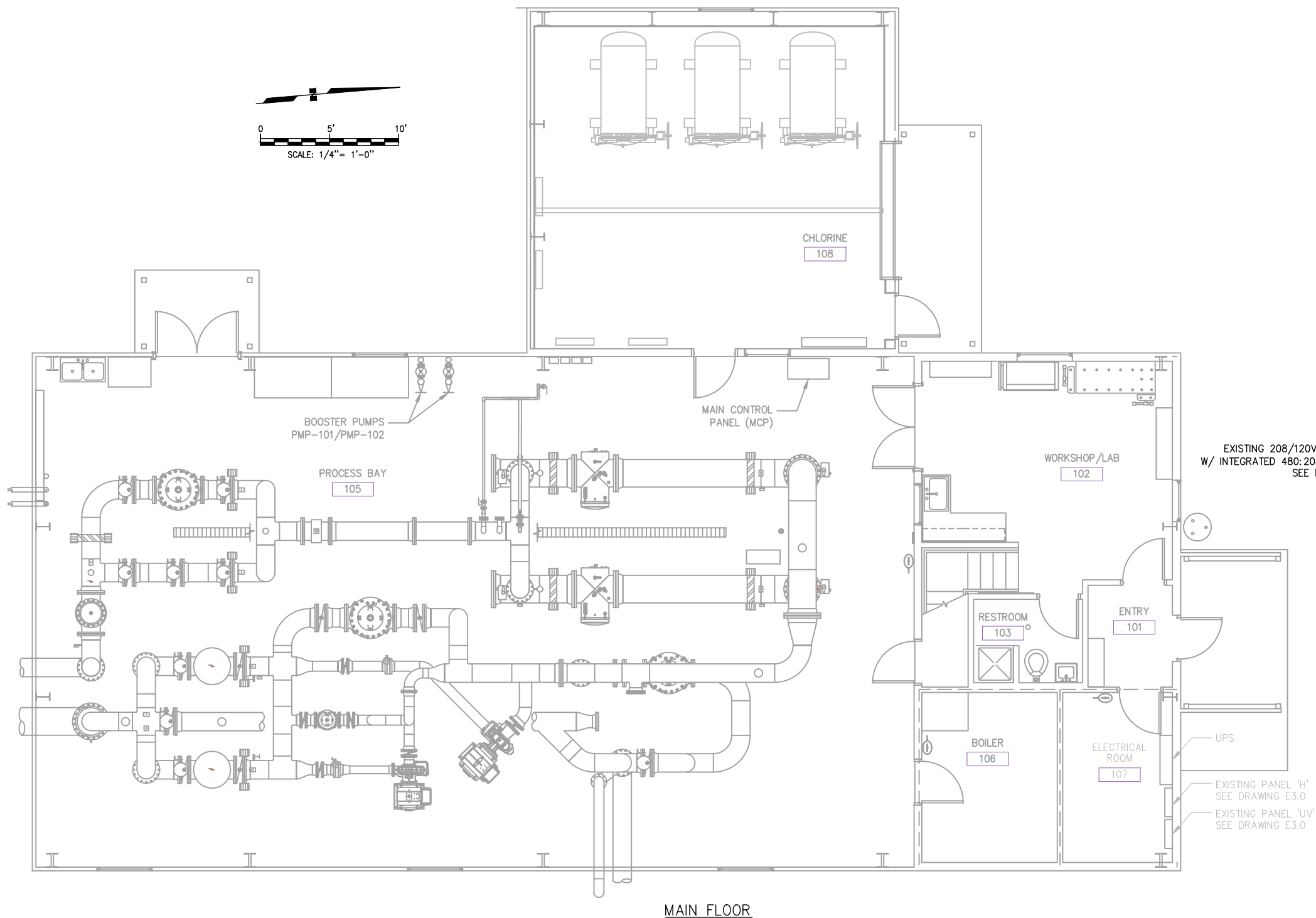
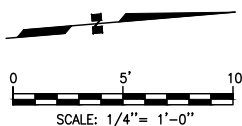
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 PHONE: 907-433-1125
 LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	6/21	35% SCHEMATIC DESIGN	RFK	ZBB	ZBB						
B	9/21	65% DETAILED DESIGN	RFK	ZBB	ZBB						
C	10/21	95% CONSTRUCTION DESIGN	RFK	AB	AB						
D	3/22	100% IFC	RFK	RAN	WMC						

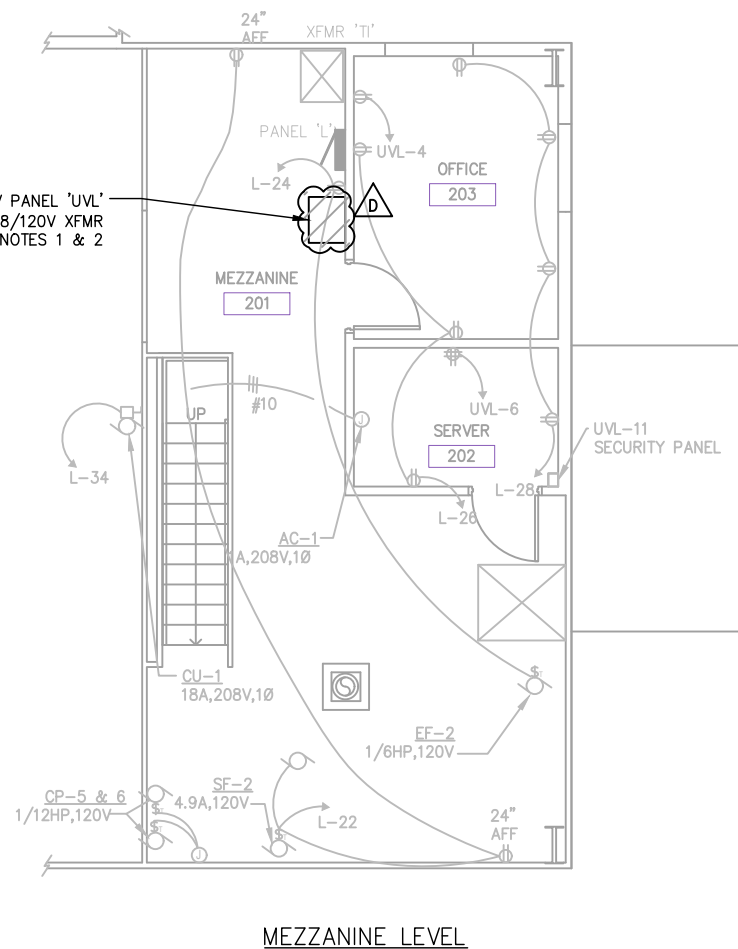
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CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG MECHANICAL DETAILS											
DWN: RFK	APP: WMC	DRAWING NUMBER		REV							
CKD: RAN	APP:	M5.3		D							
DATE: 3/25/22	SCALE: AS SHOWN	SHEET 1 OF 1									

**DEMOLITION NOTES:**

- DEMOLISH EXISTING PANEL 'UVL' AFTER INSTALLING NEW TRANSFORMER PER DRAWING E2.1. DE-TERMINATE ALL LOAD CONDUCTORS AND RETAIN IN PLACE FOR REUSE.
- DEMOLISH RACEWAY AND CONDUCTORS FROM PANEL 'UV' TO EXISTING INTEGRATED TRANSFORMER BACK TO THE FIRST ACTIVE DEVICE OR JUNCTION BOX.



EXISTING 208/120V PANEL 'UVL'
W/ INTEGRATED 480:208/120V XFMR
SEE NOTES 1 & 2



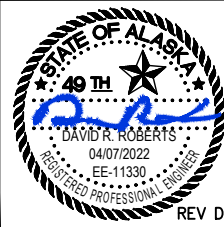
1

ELECTRICAL EQUIPMENT PLAN - DEMO

1/4" = 1'-0"

DEMOLITION

PI.2	PROCESS FLOOR PLAN
NUMBER	TITLE
REFERENCE DRAWINGS	



406 W Fireweed Ln, Anchorage, AK 99503
PHONE: 907-433-1125
LIC.# AECL890

REV D

A	6/21	35% SCHEMATIC DESIGN	BPC	JDS	JDS						
B	9/21	65% SCHEMATIC DESIGN	BPC	JDS	JDS						
C	10/21	95% SCHEMATIC DESIGN	BPC	JDS	JDS						
D	3/22	100% SCHEMATIC DESIGN	BPC	DRR	DRR						
REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP

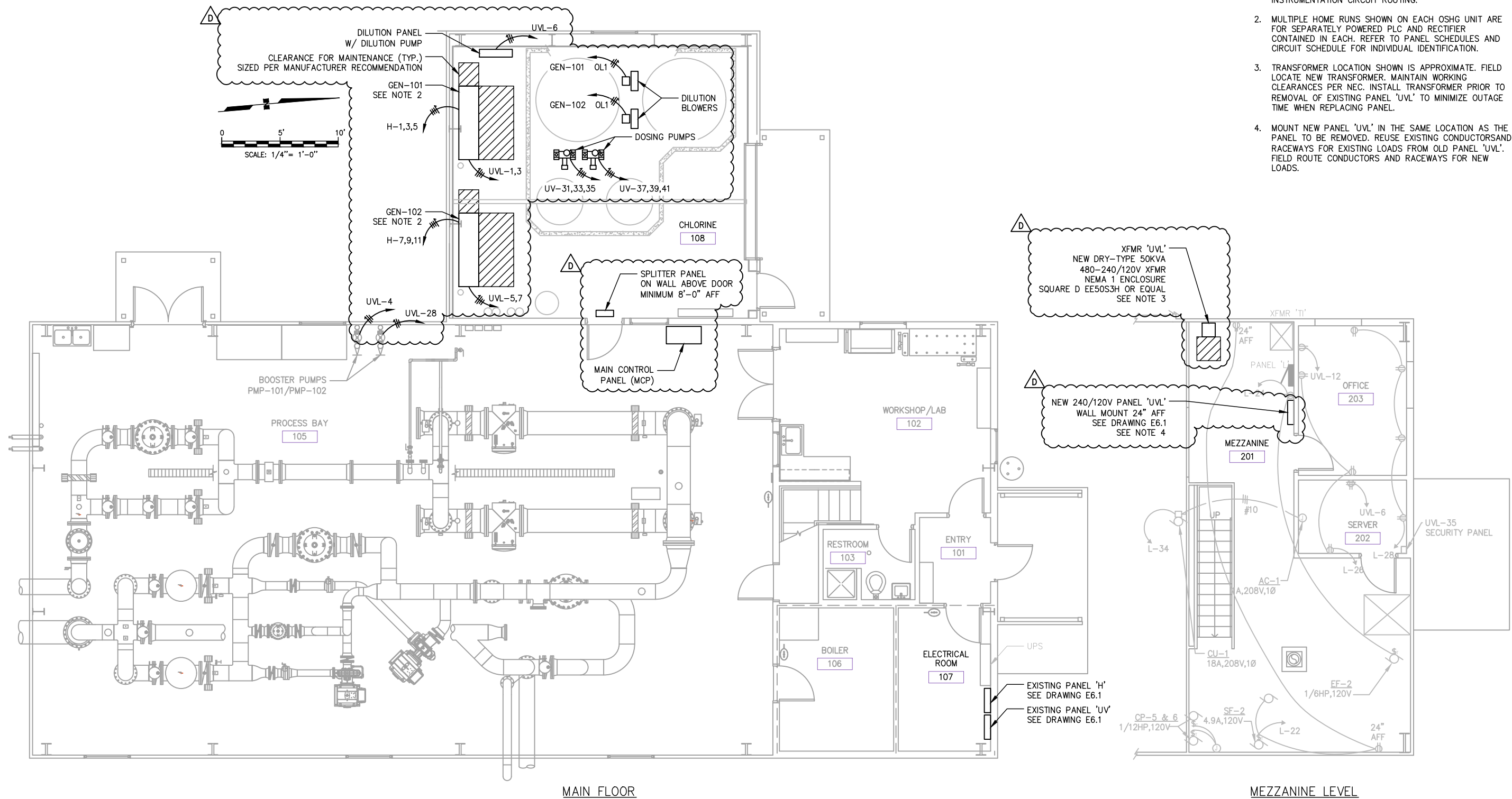
REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP

DRAWING TITLE:				
CITY OF UNALASKA				
PWTP-SODIUM HYPOCHLORITE OSG				
CHLORINATION SYSTEM ELECTRICAL PLAN				
DWN: BPC	APP: JDS	DRAWING NUMBER		REV
CKD: JDS	APP: JDS	E1.6D		D
DATE: 6/18/21	SCALE: AS SHOWN	SHEET 1 OF 1		



NOTES:

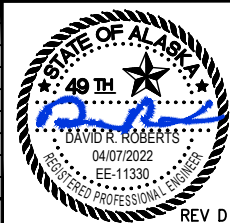
1. REFER TO DRAWING E6.2 FOR POWER AND INSTRUMENTATION CIRCUIT ROUTING.
2. MULTIPLE HOME RUNS SHOWN ON EACH OSHG UNIT ARE FOR SEPARATELY POWERED PLC AND RECTIFIER CONTAINED IN EACH. REFER TO PANEL SCHEDULES AND CIRCUIT SCHEDULE FOR INDIVIDUAL IDENTIFICATION.
3. TRANSFORMER LOCATION SHOWN IS APPROXIMATE. FIELD LOCATE NEW TRANSFORMER. MAINTAIN WORKING CLEARANCES PER NEC. INSTALL TRANSFORMER PRIOR TO REMOVAL OF EXISTING PANEL 'UVL' TO MINIMIZE OUTAGE TIME WHEN REPLACING PANEL.
4. MOUNT NEW PANEL 'UVL' IN THE SAME LOCATION AS THE PANEL TO BE REMOVED. REUSE EXISTING CONDUCTORS AND RACEWAYS FOR EXISTING LOADS FROM OLD PANEL 'UVL'. FIELD ROUTE CONDUCTORS AND RACEWAYS FOR NEW LOADS.



1 **ELECTRICAL EQUIPMENT PLAN**
1/4" = 1'-0"

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P1.2	PROCESS FLOOR PLAN
NUMBER	TITLE



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REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	6/21	35% SCHEMATIC DESIGN	BPC	JDS	JDS						
B	9/21	65% SCHEMATIC DESIGN	BPC	JDS	JDS						
C	10/21	95% SCHEMATIC DESIGN	BPC	JDS	JDS						
D	3/22	100% SCHEMATIC DESIGN	BPC	DRR	DRR						

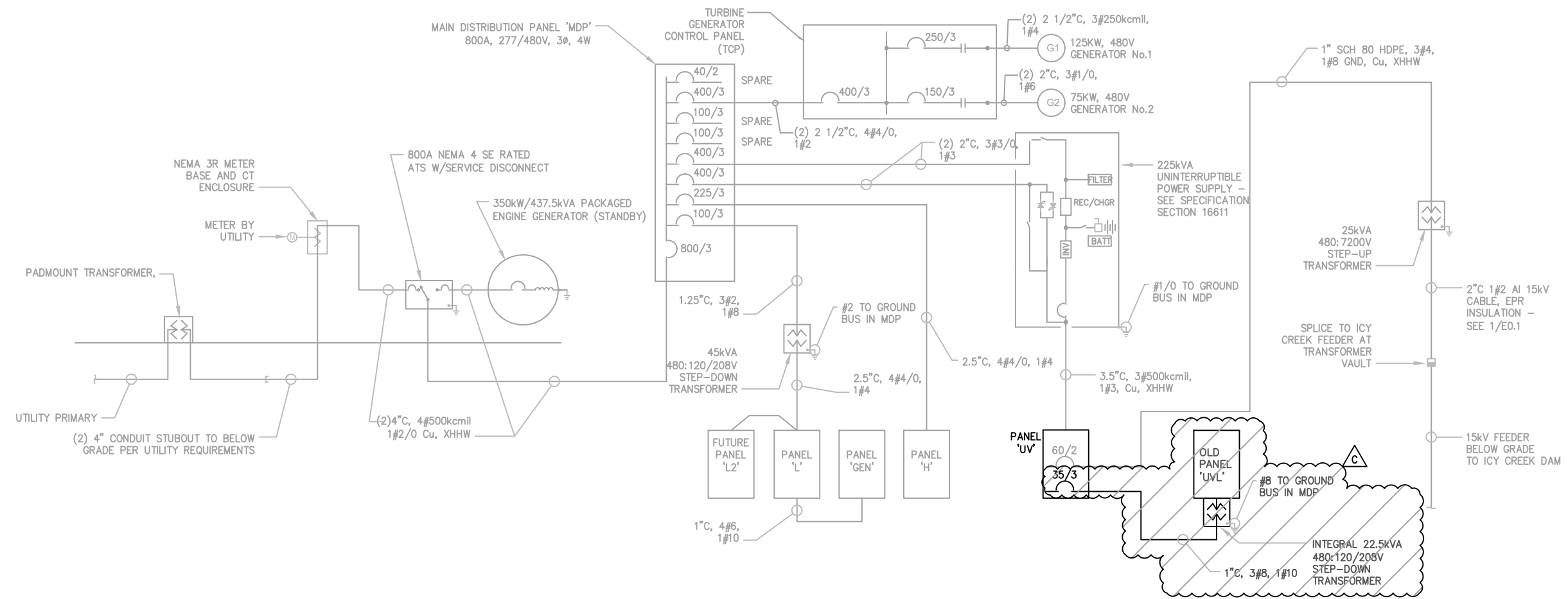
DRAWING TITLE:	DRAWING NUMBER	REV
CITY OF UNALASKA PWTW-SODIUM HYPOCHLORITE OSG CHLORINATION SYSTEM ELECTRICAL PLAN	E1.6	D

DWN: BPC	APP: JDS	DATE: 6/18/21	SCALE: AS SHOWN	SHEET 1 OF 1
CKD: JDS	APP:			



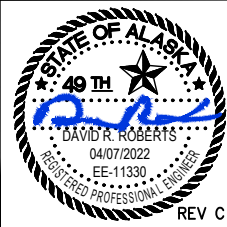
DEMOLITION NOTES:

1. EXISTING PANEL "UVL" AND INTEGRATED TRANSFORMER TO BE REMOVED. RETAIN CONDUCTORS AND RACEWAY FOR EXISTING LOADS FOR REUSE. TO MINIMIZE OUTAGE DURATION, INSTALL NEW TRANSFORMER XFMR-UVL (SHOWN ON E1.1 & E2.1) PRIOR TO DEMOLITION OF EXISTING PANEL "UVL".



DEMOLITION

NUMBER	TITLE



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REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	8/21	65% DESIGN	BPC	JDS	JDS						
B	10/21	95% DESIGN	BPC	JDS	JDS						
C	3/22	100% DESIGN	BPC	DRR	DRR						

DRAWING TITLE:				
CITY OF UNALASKA PWTP - SODIUM HYPOCHLORITE OSG ONE-LINE DIAGRAM				
DWN:	BPC	APP:	JDS	REV
CKD:	JDS	APP:		
DRAWING NUMBER		REV		
E6.0D		C		
DATE:	8/31/21	SCALE:	NTS	SHEET 1 OF 1



LEGEND:

RACEWAY USE:

- P - POWER
C - CONTROL
J - ETHERNET
M - METERING

CONDUCTOR TYPE:

- A - SINGLE CONDUCTORS
E - ETHERNET
TSP - TWISTED SHIELDED PAIR
TRIAD - TWISTED SHIELDED TRIAD

EQUIPMENT:

- MCP - MAIN CONTROL PANEL
AI - ANALOG INPUT
AO - ANALOG OUTPUT
DI - DISCRETE INPUT
DO - DISCRETE OUTPUT

Main wiring schedule table with columns: USE, SIZE, FROM, TO, TYPE, NO., SIZE, GND, NOTES. Includes entries for transformer, booster pumps, PLCs, dosing pumps, dilution panel, blowers, heaters, and various control signals.

SEE NOTE 6

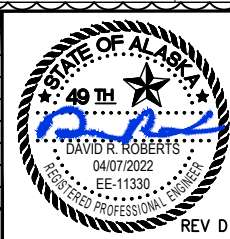
CONSTRUCTION NOTES:

- 1. MINIMUM CONDUIT SIZE IS 3/4". MAXIMUM CONDUIT FILL PER NEC
2. SINGLE CONDUCTORS SHALL BE THHN.
3. CONTRACTOR MAY COMBINE SEVERAL RACEWAYS INTO A RACEWAY OF THE SAME USE. CONTROL, POWER, AND SIGNAL WIRES MAY NOT BE COMBINED IN THE SAME CONDUIT. NEC FILL REQUIREMENT MUST BE MAINTAINED.
4. ALL RACEWAYS SHALL BE LABELED. LETTERING SHALL BE BLACK ON WHITE AND 3/4" IN SIZE.
5. 304 OR 316 STAINLESS STEEL SHALL BE USED FOR ALL FASTENERS, HANGERS, RODS, CHANNEL, STRUTS, AND OTHER MOUNTING HARDWARE UNLESS SPECIFICALLY NOTED OTHERWISE.
6. REFER TO VENDOR DRAWINGS 3555_PLC1_500, 3555_PLC2_500, AND 3555_SCP_500 FOR CONTROL WIRING TO PLCS GEN-101 AND GEN-102 AND ASSOCIATED CHLORINATION EQUIPMENT. UNLESS OTHERWISE NOTED, DISCRETE I/O FIELD WIRING SHALL BE #14 AWG AND ANALOG I/O FIELD WIRING SHALL BE #18 AWG. WIRING FROM PANELS TO BLOWER MOTORS AND HEATERS SHALL BE #12 AWG.

Secondary wiring schedule table with columns: USE, SIZE, FROM, TO, TYPE, NO., SIZE, GND, NOTES. Includes entries for control wiring, power wiring, and connections to various equipment like pumps and heaters.

DSGN/CNST

Reference drawings table with columns: NUMBER, TITLE. Includes a row for REFERENCE DRAWINGS.

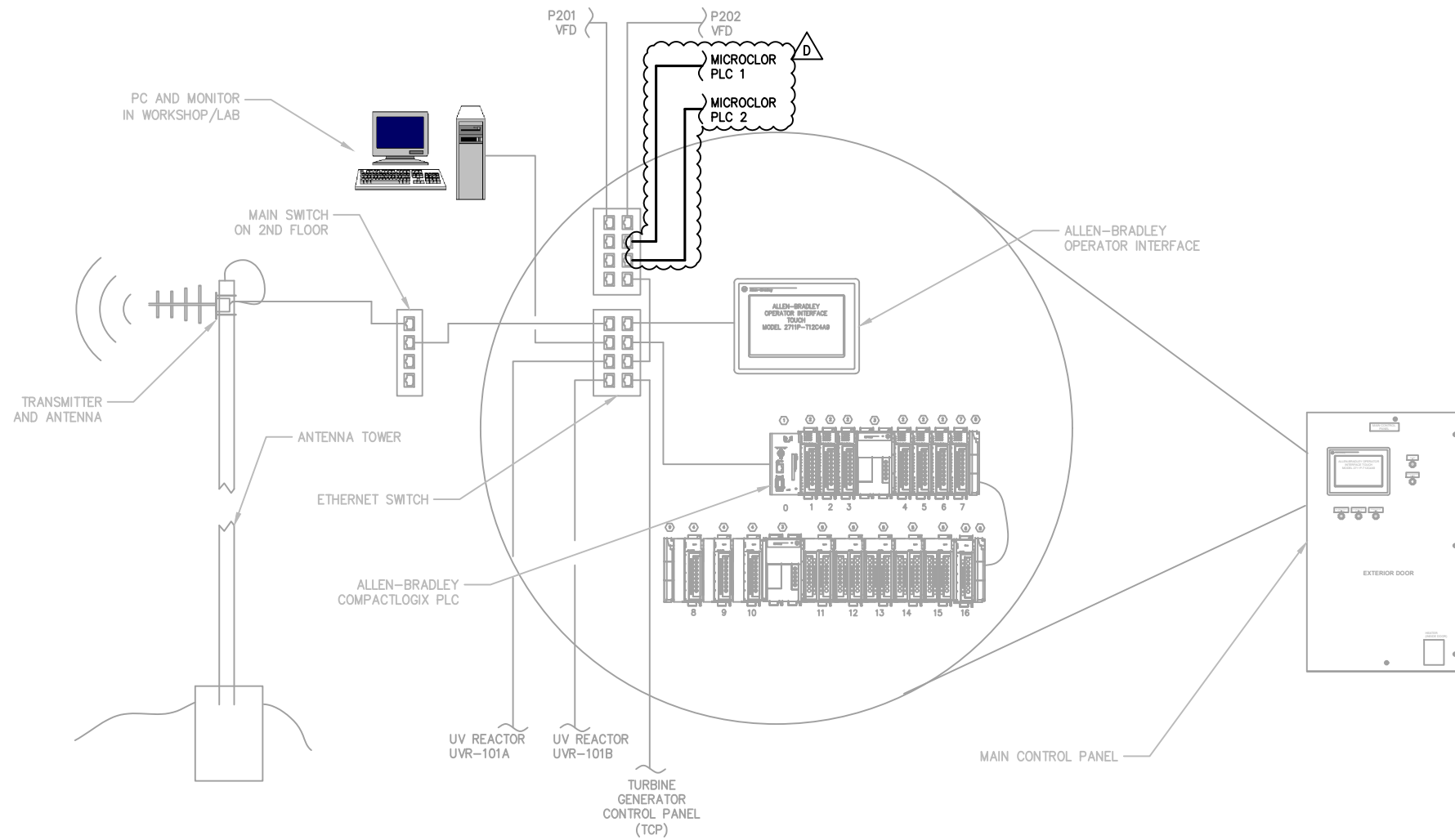


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Revisions table with columns: REV, DATE, DESCRIPTION. Lists design stages from 35% to 100% design.

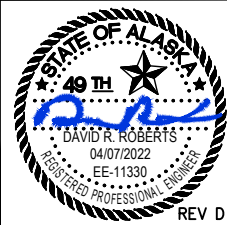
Revisions table with columns: DWN, CKD, APP, REV, DATE, DESCRIPTION. Lists drawing actions and dates.

Drawing title block: CITY OF UNALASKA, PWPT - SODIUM HYPOCHLORITE OSC CIRCUIT SCHEDULE, DRAWING NUMBER E6.2, SHEET 1 OF 1, DATE 6/18/21, SCALE NTS.



DSGN/CNST

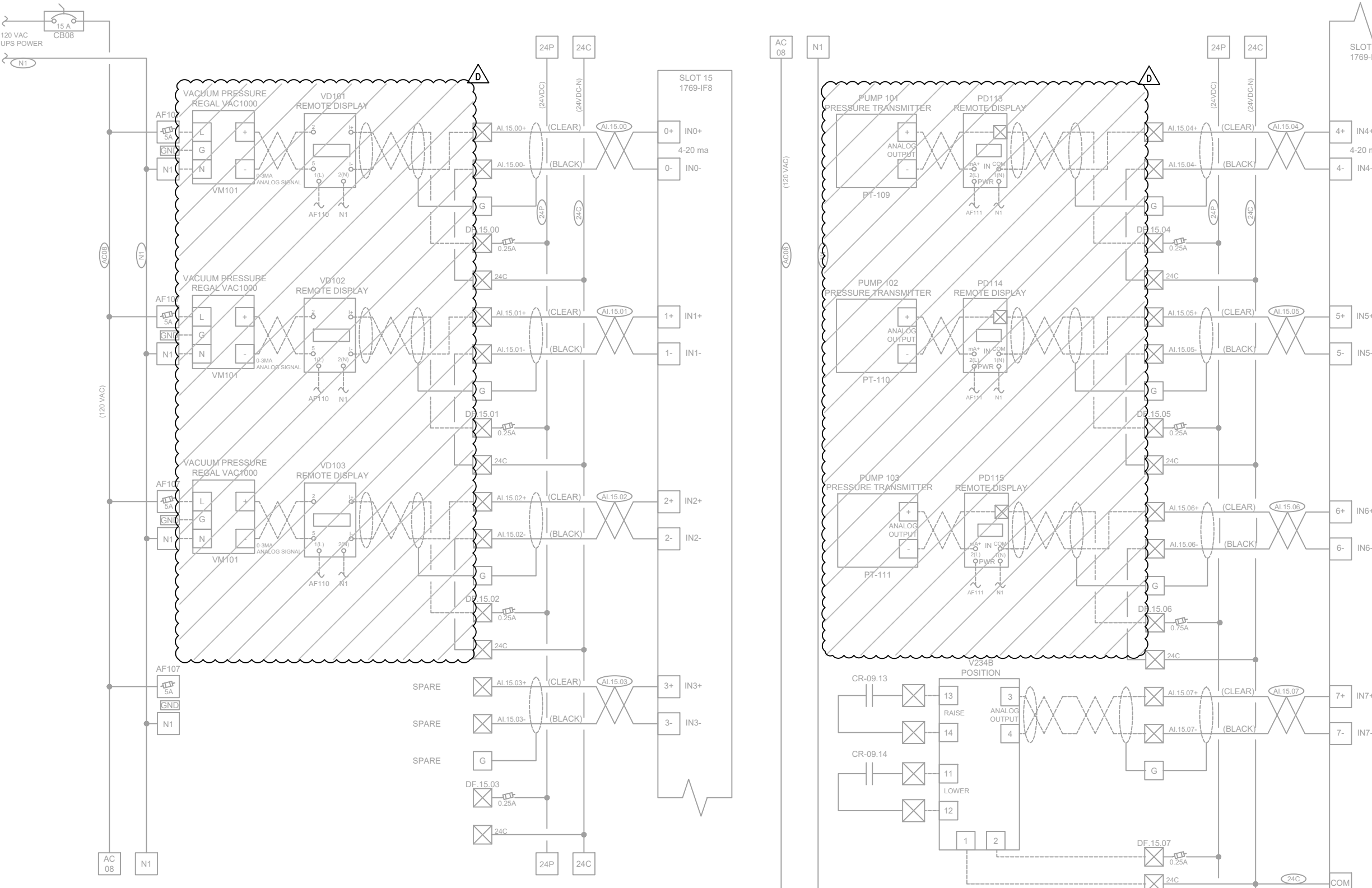
XXX	XXX
NUMBER	TITLE



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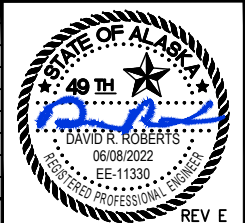
REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	6/21	35% DESIGN	BPC	JDS	JDS						
B	9/21	65% DESIGN	BPC	JDS	JDS						
C	10/21	95% DESIGN	BPC	JDS	JDS						
D	3/22	100% DESIGN	BPC	DRR	DRR						

DRAWING TITLE:					
CITY OF UNALASKA PWTP - SODIUM HYPOCHLORITE OSG NETWORK DIAGRAM					
DWN: BPC	APP: JDS	DRAWING NUMBER	REV		
CKD: JDS	APP:	E7.0	D		
DATE: 6/18/21	SCALE: NTS	SHEET 1 OF 1			



DEMOLITION

XXX	XXX
NUMBER	TITLE

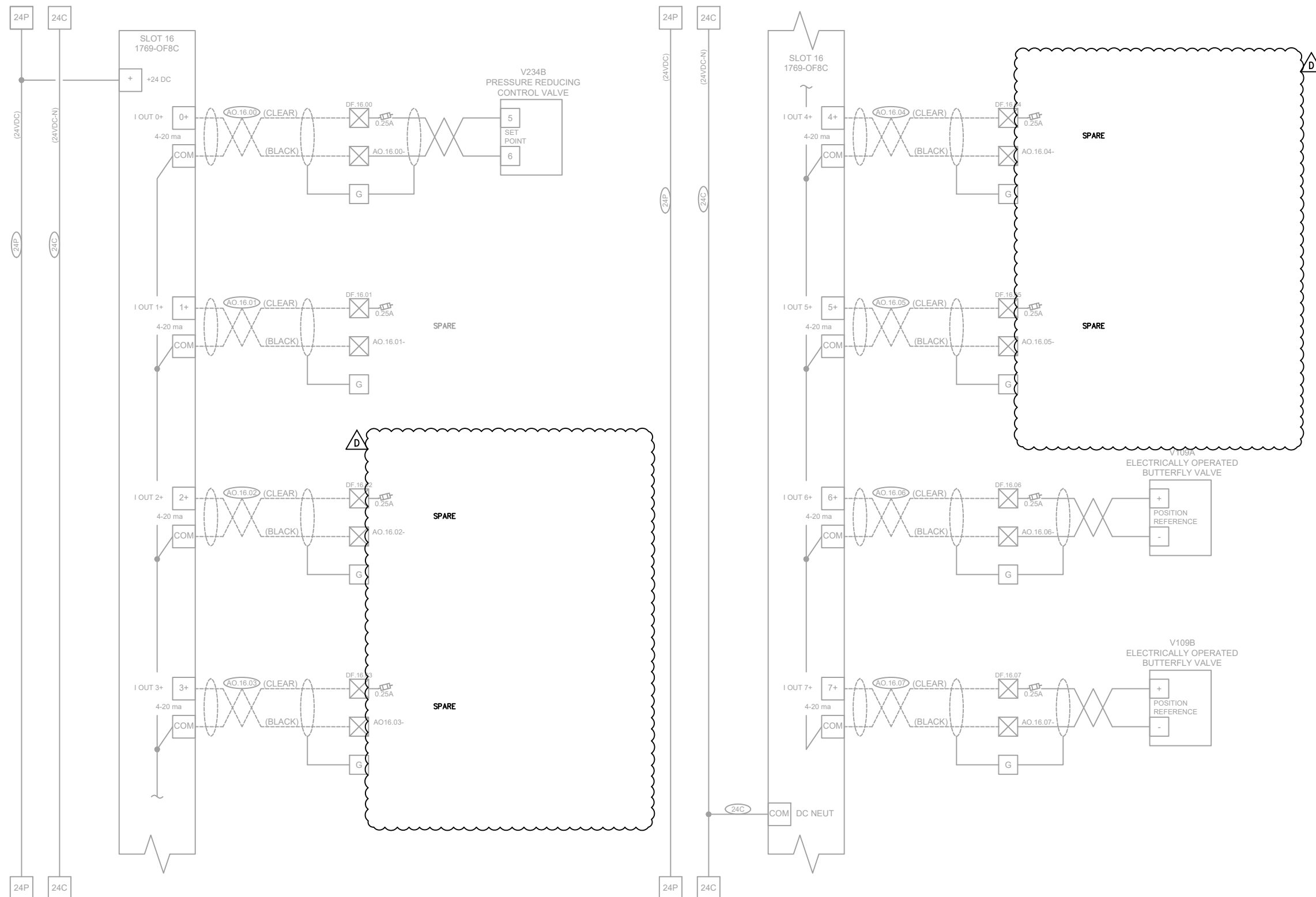


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A	6/21	35% DESIGN
B	9/21	65% DESIGN
C	9/21	95% DESIGN
D	3/22	100% DESIGN
E	6/22	100% DESIGN RE-ISSUE

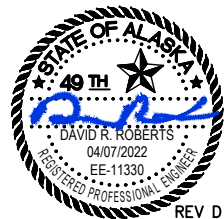
REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP

DRAWING TITLE: CITY OF UNALASKA PWPT – SODIUM HYPOCHLORITE OSB MCP ANALOG INPUT	
DWN: BPC	APP: JDS
DWN: JDS	APP: JDS
DRAWING NUMBER	REV
E7.6D	E
DATE: 6/8/22	SCALE: NTS
SHEET 1 OF 1	



DSGN/CNST

XXX	XXX
NUMBER	TITLE
REFERENCE DRAWINGS	



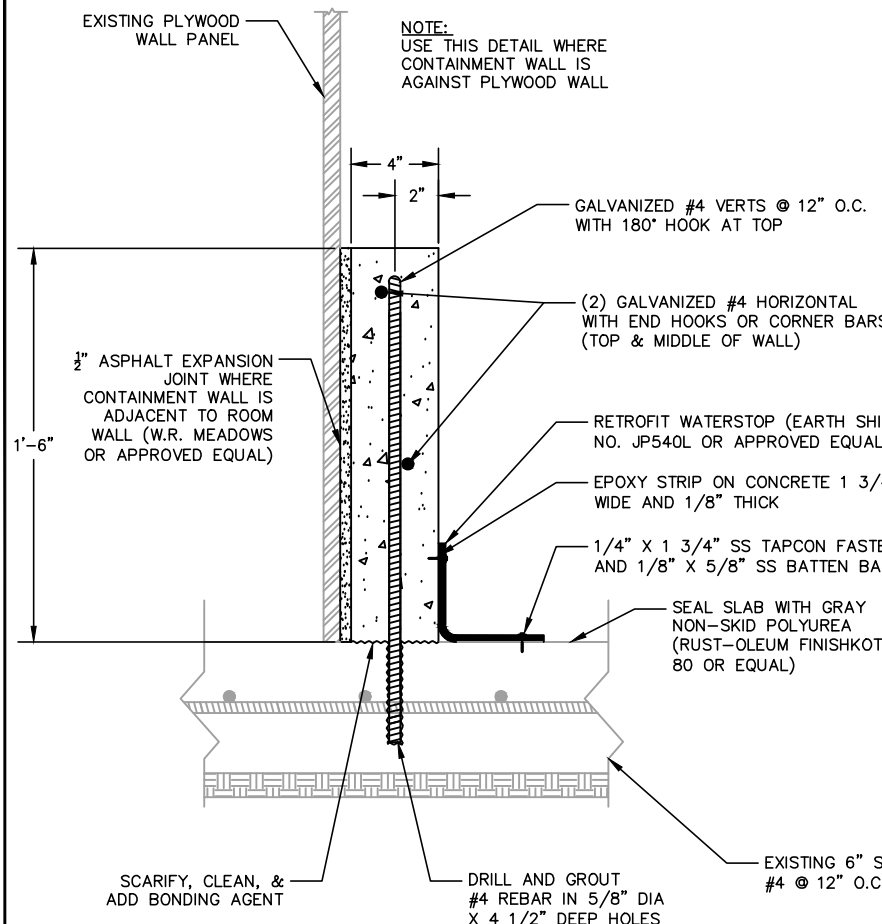
taku Engineering
 406 W Fireweed Ln, Anchorage, AK 99503
 PHONE: 907-433-1125
 LIC.# AECL890

A	6/21	35% DESIGN	BPC	JDS	JDS
B	9/21	65% DESIGN	BPC	JDS	JDS
C	9/21	95% DESIGN	BPC	JDS	JDS
D	3/22	100% DESIGN	BPC	DRR	DRR

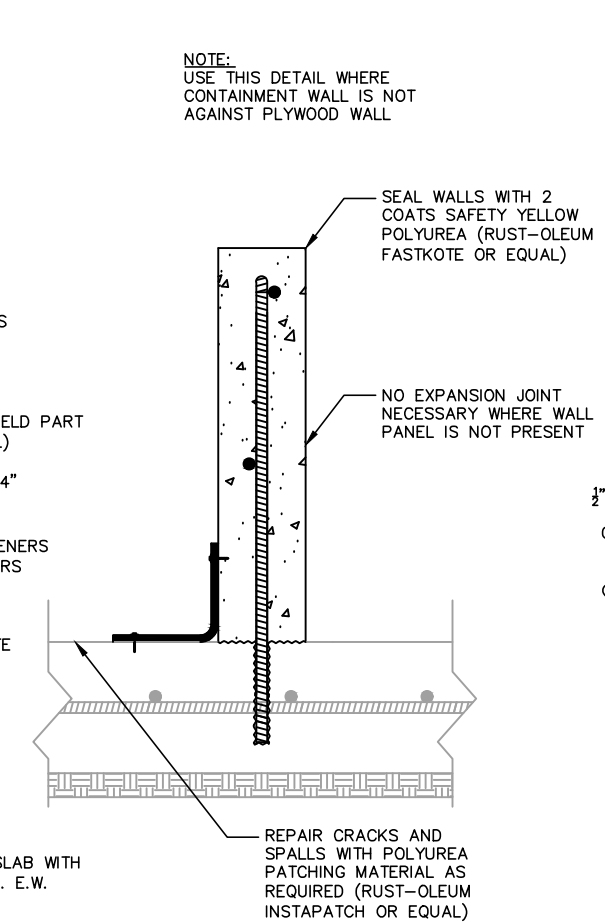
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DRAWING TITLE:
 CITY OF UNALASKA
 PWPT - SODIUM HYPOCHLORITE OSG
 MCP ANALOG OUTPUT

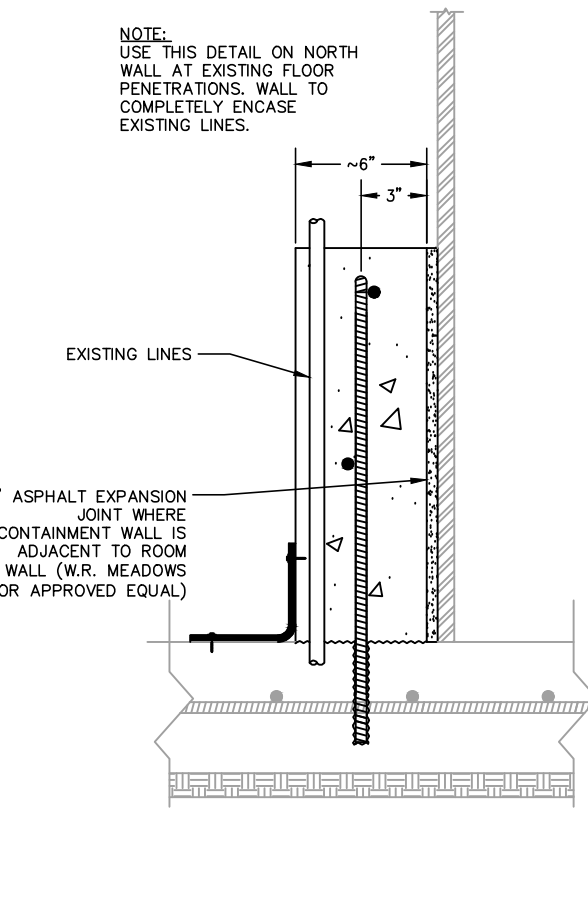
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CKD: JDS	APP:	E7.8	D
DATE: 6/18/21		SCALE: NTS	SHEET 1 OF 1



1 CONTAINMENT WALL - DETAIL 1
C4.0 3" = 1'-0"

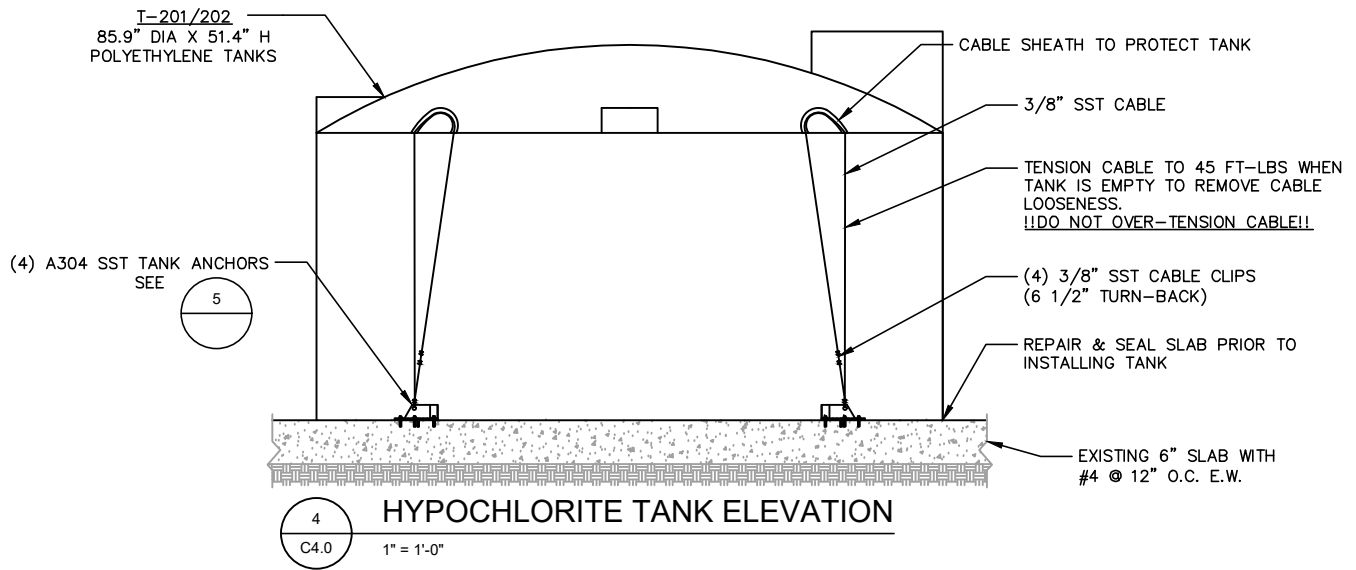
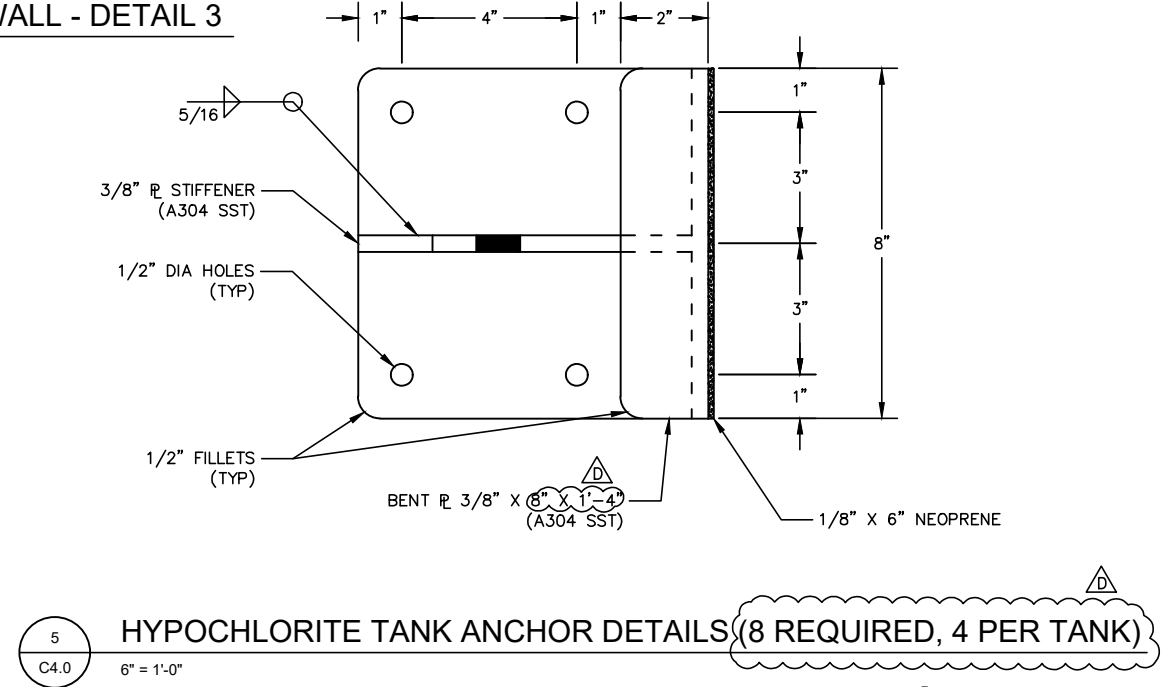
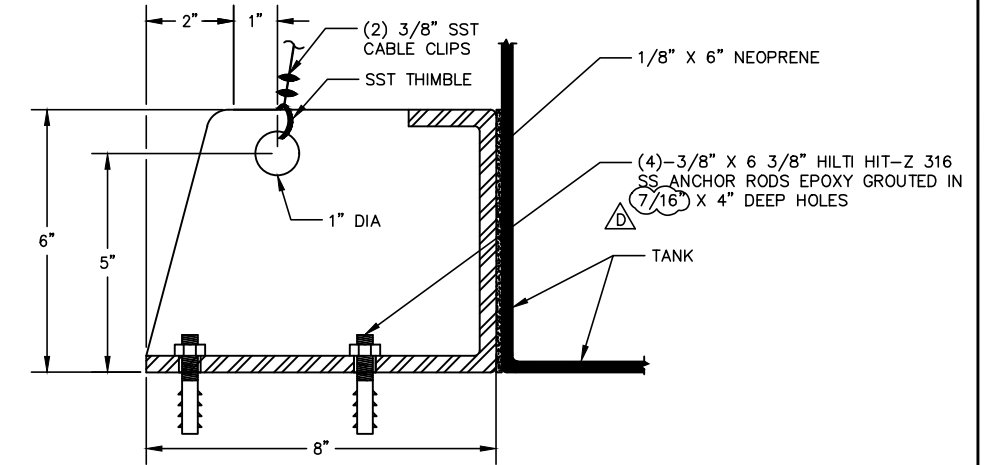


2 CONTAINMENT WALL - DETAIL 2
C4.0 3" = 1'-0"



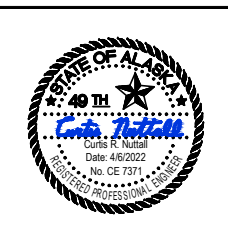
3 CONTAINMENT WALL - DETAIL 3
C4.0 3" = 1'-0"

- INSTALLATION NOTES:**
- 1) INSTALL TANK, ADHESIVE ANCHORS, AND SEALANTS PER MANUFACTURERS' INSTRUCTIONS
 - 2) LAY OUT ALL ANCHORS REQUIRED EQUALLY SPACED, (4 ANCHORS MUST BE DIRECTLY BELOW THE TANK TIE DOWN LOCATIONS). MAKE SURE ALL ANCHORS ARE LOCATED NEXT TO THE TANK WITH THE FRONT FACE OF THE ANCHOR WELDMENT LOCATED NEXT TO THE TANK. MARK ALL THE ANCHOR BOLT LOCATIONS, REMOVE THE ANCHORS AND INSTALL THE ANCHOR BOLTS AS SPECIFIED IN THE ASSEMBLY DRAWING.
 - 3) REPLACE THE ANCHORS AND SECURE THE ANCHORS TO THE CONCRETE. FASTEN THE TANK TO THE CONCRETE PAD WITH THE REQUIRED CABLE (MAKE SURE THE CABLE SHEATH IS ON THE CABLE AND LOCATED AROUND THE LUG LOCATIONS) AS SHOWN BY THE ASSEMBLY DRAWING UTILIZING THE CABLE THIMBLES AND CLAMPS PROVIDED. TENSION THE CABLE BEFORE FILLING THE TANK TO REMOVE CABLE LOOSENESS. DO NOT OVER-TENSION THE CABLES AS THIS MAY CAUSE TANK DAMAGE. THE CABLE TENSION WILL CHANGE WITH TANK LOADING AND TEMPERATURE CHANGES - DO NOT RE-TENSION THE CABLES.



DSGN/CNST

NUMBER	TITLE



taku engineering

406 W Fireweed Ln, Anchorage, AK 99503
PHONE: 907-433-1125
LIC.# AECL890

REV	DATE	DESCRIPTION	DWN	CKD	APP	REV	DATE	DESCRIPTION	DWN	CKD	APP
A	6/21	35% SCHEMATIC DESIGN	RFK	CRN	CRN						
B	9/21	65% DETAILED DESIGN	RFK	CRN	CRN						
C	10/21	95% CONSTRUCTION DESIGN	RFK	CRN	CRN						
D	3/22	100% IFC	RFK	CRN	CRN						

DRAWING TITLE:			
CITY OF UNALASKA PWTP-SODIUM HYPOCHLORITE OSG CIVIL DETAILS			
DWN: RFK	APP: CRN	DRAWING NUMBER	REV
CKD: CRN	APP:	C4.0	D
DATE: 3/25/22	SCALE: AS SHOWN	SHEET 1 OF --	

Appendix B: Project Specifications

MECHANICAL SPECIFICATIONS

- 221113 – FACILITY WATER DISTRIBUTION PIPING
- 220523.12 – BALL VALVES FOR PROCESS PIPING
- 220523.14 – CHECK VALVES FOR PROCESS PIPING
- 221223.11 – POTABLE WATER STORAGE TANKS



These documents were prepared under the supervision of a registered Professional Engineer.

SECTION 221113 - FACILITY PIPING

1.1 SUMMARY

This specification covers the material selection and testing requirements for the following piping:

- A. Process Piping in Water Service, non-potable and potable
- B. Chlorine Treatment Piping, to include interconnecting piping for the hypochlorite skids
- C. Vent Piping
- D. Fire Water Piping

1.2 SUBMITTALS

- A. Shop Drawings/Weld Map Drawings identifying welders
- B. Welding Documentation
 - 1. PQR – Procedure Qualification Records of the weld procedure complying with ASME Section IX shall be submitted and approved by the owner for each weld type performed for this project.
 - 2. WPQ – Welder Performance Qualifications shall be submitted for each welder, performed to the PQR, and approved by the owner prior to the commencement of welding activities.
 - 3. NDE Records – Visual Examination (VT) and Radiographic Examination (RT) results
 - 4. Hydrostatic Test Results.
 - 5. Welding Inspector Qualifications – AWS CWI certification.
- C. Material Documentation
 - 1. MTR – For all stainless steel piping and fittings, material test reports shall be provided showing the materials comply with ASTM A312/A312M.

1.3 QUALITY ASSURANCE

- A. Quality Standard for Electrical Components, Devices, and Accessories: NFPA 70.
- B. Quality Standard for Water-Service Piping and Specialties for Domestic Water: NSF 61 Annex G.
- C. Inspectors/NDE personnel shall be certified per AWS QC1 and ASNT TC-1A. Radiographic (RT) film interpreters shall be level II at a minimum.

1.4 MATERIALS

- A. General

1. Piping shall be schedule 40 unless otherwise noted. Piping should be reused where possible.
2. Studs shall be A320 Gr B8M, nuts shall be A194 Gr 8M. Flange stud bolts and nuts shall not be reused.
3. All miscellaneous fasteners shall be 316 stainless steel in the treatment room.
4. Gaskets shall be SBR or EPDM, NSF 61 Certified. Gaskets shall not be reused.
5. When dissimilar metals are joined with flanges, isolation gasket kits shall be used: Pikotek VCS or equivalent.

A. Water Service

1. PIPE - Stainless steel, 304L, schedule 40, welded or seamless, ASTM A312/A312M
 - a. All pipe and fittings shall be joined by full penetration, butt welding with ends beveled prior to weld up.
2. FITTINGS - Stainless steel, 150# Raise Face Weld Neck Flanges, Schedule 40, ASTM A182 and ASME B16.5.

B. Chlorine Treatment Piping

1. Inside Chlorine Room
 - a. PIPE - Kynar/PVDF, schedule 40 and schedule 80
 - 1) Pipe, tees, and elbows fused by butt weld, IR fusion, or beadles welding. Socket shall not be allowed.
 - b. FITTINGS – Unions, valves, and flange adapters shall be butt weld, IR fusion, beadles welding, or socket connections, with bore to match piping.
2. Outside Chlorine Room
 - a. PIPE - Stainless steel, 304L, schedule 40, welded or seamless, ASTM A312/312M
 - 1) All pipe and fittings shall be joined by full penetration, butt welding with ends beveled prior to weld up, socket welding shall not be allowed.
 - b. FITTINGS – Stainless steel, 150# Raise Face Flanges, Schedule 40, ASTM A182 and ASME B16.5.
3. Interconnecting Piping for Hypochlorite Skids
 - a. PROCESS AND VENT PIPING – Clear Polyvinyl Chloride (PVC), schedule 80, ASTM D2467-04e1.
 - 1) Pipe and fittings to be joined by socket connections with PVC primer and cement. See Appendix A for maximum allowable working pressures.
 - 2) Fittings – PVC Schedule 80.
 - b. TUBING – Polyethylene (PE) instrument grade tubing – Parker E/EB Series. 0.040 in. wall thickness. Size specified by tube outside diameter. Color to suit. MAOP 125 psi.
 - 1) Fittings – Parker LIQUIfit or approved equal.

C. Vent Piping

1. PIPE - Stainless steel, 304L, schedule 40, welded or seamless, ASTM A312/312M
 - a. All pipe and fittings shall be joined by full penetration, butt welding with ends beveled prior to weld up.
2. FITTINGS - Stainless steel, 150# Raise Face Flanges, Schedule 40 Bore, ASTM A182 and ASME B16.5.

D. Fire Water Piping

1. PIPE – Galvanized carbon steel pipe, ASTM A-53, schedule 40, ends grooved.
2. FITTINGS – Grooved end fittings, Victualic or equal. Flange adapters shall be 150# raise face, schedule 40, ASME B16.5.

1.5 TESTING

A. Water Service Piping

1. All welds will be visually inspected (VT) by an inspector with an ASNT TC-1A level 1 certification
2. 10% or three welds, whichever is greater, shall be inspected by RT. Radiography shall be in accordance with API STD 1104.
 - a. Each welder shall have a minimum of one weld inspected by RT.
3. Hydrostatic Pressure Testing – Each spool, prior to be installed in service, shall undergo hydrostatic pressure testing with documented results. The test shall last not less than two hours at 150% of design pressure with chlorine-free water. The pressure shall be monitored and logged every 10 minutes.

B. Chlorine Treatment Piping – Kynar/PVDF, PVC, Polyethylene

1. All connections will be visually inspected by the owner or owner’s rep for approval prior to entering service.
2. Leak Testing – The piping shall be tested with water at 120% of design pressure for a minimum of two hours. Each connection will be snopped with soapy water to investigate for leaks. The pressure shall be monitored and logged every 10 minutes.

C. Chlorine Treatment Piping - Stainless Piping

1. All welds will be visually inspected (VT) by an inspector with an ASNT TC-1A level 1 certification
2. 10% or three welds, whichever is greater, shall be inspected by RT. Radiography shall be in accordance with API STD 1104.
 - a. Each welder shall have a minimum of one weld inspected by RT.
3. Hydrostatic Pressure Testing – Each spool, prior to be installed in service, shall undergo hydrostatic pressure testing with documented results. The test shall last not less than two hours at 150% of design pressure with chlorine-free water. The pressure shall be monitored and logged every 10 minutes.

D. Vent Piping

1. All welds or connections shall be visually inspected (VT) and approved by the owner prior to entering service.

E. Fire Water Piping

1. Hydrostatic Pressure Testing – Each spool, prior to be installed in service, shall undergo hydrostatic pressure testing with documented results. The test shall last not less than two hours at 150% of design pressure with chlorine-free water. The pressure shall be monitored and logged every 10 minutes.

APPENDIX A. Maximum Allowable Working Pressures for PVC Piping (from The Engineering Toolbox)

PVC				
Nominal Pipe Size (inches)	Required Minimum Burst Pressure		Maximum Operat- ing Pressure	
	<i>(psi)</i>		<i>(psi)</i>	
	Sch 40	Sch 80	Sch 40	Sch 80
1/2	1910	2720	358	509
3/4	1540	2200	289	413
1	1440	2020	270	378
1 1/4	1180	1660	221	312
1 1/2	1060	1510	198	282
2	890	1290	166	243
2 1/2	870	1360	182	255
3	840	1200	158	225
4	710	1110	133	194
5	620	1040	117	173
6	560	930	106	167
8	500	890	93	148
10	450	790	84	140
12	420	600	79	137

END OF SECTION 221113

SECTION 220523.12 - BALL VALVES FOR WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyvinyl Chloride (PVC) ball valves.

1.2 DEFINITIONS

- A. CWP: Cold working pressure
- B. RPTFE: Reinforced polytetrafluoroethylene
- C. WOG: Water, oil, gas.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion
2. Protect threads, flange faces, and soldered ends
3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of valve from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- B. Valve Sizes: Same as upstream piping unless otherwise indicated.
- C. Valve Actuator Type:
 - 1. Gear Actuator: For quarter-turn valves NPS 6 and larger
 - 2. Hand Lever: For quarter-turn valves smaller than NPS 6.

2.3 PVC BALL VALVES

- A. PE Union Ball Valves:
 - 1. Standards: MSS SP-122, ASTM D-1785, ASTM F-1970
 - 2. Pressure Rating and Temperature: 200 PSI at 75°F
 - 3. Body Material: PVC
 - 4. Body Design: Union type
 - 5. End Connections for Valves up to NPS 2-1/2: Butt-fusion or socket weld
 - 6. Ball: PE; full port
 - 7. Seals: PTFE or EPDM-rubber O-rings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

- E. Do not attempt to repair defective valves; replace with new valves. Remove defective valves from site.

3.2 INSTALLATION OF VALVES

- A. Install valves with unions or flanges at each piece of equipment arranged to allow space for service, maintenance, and equipment removal without system shutdown.
- B. Provide support to piping adjacent to valves such that no force is imposed upon valves.
- C. Locate valves for easy access.
- D. For valves in horizontal piping, install valves with stem at or above center of pipe.
- E. Install valves in position to allow full valve actuation movement.
- F. Install valve tags.
- G. Adhere to manufacturer's written installation instructions.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, provide the same types of valves with higher CWP ratings.

END OF SECTION 220523.12

SECTION 220523.14 - CHECK VALVES FOR WATER DISRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyvinyl Chloride ball check valves.

1.2 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene-diene terpolymer.
- C. NBR: Nitrile butadiene rubber (also known as Buna-N).

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, press connections, and weld ends.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use stems or other components as lifting or rigging points unless specifically indicated for this purpose in manufacturer's instructions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of valve from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Code Compliance:
 - 1. ASTM D-1784
 - 2. ASTM F-1970
 - 3. ASME B31.9 for building services piping valves.
- B. AWWA Compliance: Comply with AWWA C606 for groove-end connections.
- C. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- D. Valve Sizes: Same as upstream piping unless otherwise indicated.
- E. Valve Bypass and Drain Connections: MSS SP-45.

2.3 POLYVINYL CHLORIDE BALL CHECK VALVES

- A. Description:
 - 1. Pressure Rating and Temperature: 200 psi at 75°F.
 - 2. Body Material: PVC.
 - 3. Body Design: Union-type ball check.
 - 4. End Connections for Valves up to NPS 2-1/2: Butt-fusion or socket
 - 5. Ball: PE.
 - 6. Seals: EPDM- or FKM-rubber O-rings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.

- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Examine press fittings to verify they have been properly pressed.
- F. Do not attempt to repair defective valves; replace with new valves.

3.2 INSTALLATION OF VALVES

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Provide support of piping adjacent to valves such that no force is imposed upon valves.
- C. Locate valves for easy access and where not blocked by equipment, other piping, or building components.
- D. Install valves so that stems are horizontal or slope upward from centerline of pipe.
- E. Install valves in position that does not project into aisles or block access to other equipment.
- F. Install valves in position to allow full stem and manual operator movement.
- G. Verify that joints of each valve have been properly installed and sealed to assure there is no leakage or damage.
- H. Check Valves: Install check valves for proper direction of flow.
 - 1. With flow arrow on valve in the same direction of liquid flow.
 - 2. In horizontal or vertical position, between flanges.
- I. Install valve tags.
- J. Adhere to manufacturer's installation instructions.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

END OF SECTION 220523

SECTION 221223.11 - POTABLE-WATER STORAGE TANKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel, precharged, potable-water storage tanks.

1.3 DEFINITIONS

- A. HDPE: High-density polyethylene plastic.
- B. LDPE: Low-density polyethylene plastic.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Steel water tanks shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 .
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water storage tanks.
 - 2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.6 INFORMATIONAL SUBMITTALS

1.7 QUALITY ASSURANCE

- A. ASME Compliance for Steel Tanks: Fabricate and label steel, ASME-code, potable-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.
- B. Comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects," for potable-water storage tanks. Include appropriate NSF marking.

1.8 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 STEEL, PRECHARGED, POTABLE-WATER STORAGE TANKS

- A. Steel, Precharged, Diaphragm, Water Storage Tanks:
 - 1. Description: Steel, vertical, pressured-rated tank with cylindrical sidewalls and with air-charging valve and air precharge.
 - 2. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
 - 3. Operation: Factory-installed, butyl-rubber diaphragm.
- B. Steel, Precharged, Bladder, Water Storage Tanks:
 - 1. Description: Steel, vertical, pressured-rated tank with cylindrical sidewalls and with air-charging valve and air precharge.
 - 2. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.
 - 3. Operation: Factory-installed, butyl-rubber bladder.
- C. Construction: ASME code, steel, constructed with nontoxic welded joints, for 150-psig working pressure.
- D. Tappings: Factory-fabricated steel, welded to tank before testing and labeling.
 - 1. NPS 2 and Smaller: ASME B1.20.1, with female thread.
 - 2. NPS 2-1/2 and Larger: ASME B16.5, flanged.
- E. Specialties and Accessories: Include tappings in tank and the following:
 - 1. Pressure gage.

- F. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank before testing and labeling.
- G. Tank Interior Finish: Materials and thicknesses complying with NSF 61 Annex G barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
- H. Exterior Coating: Manufacturer's standard enamel paint.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install water storage tanks on concrete bases, level and plumb, firmly anchored. Arrange so devices needing servicing are accessible.
 - 1. Install horizontal tanks on fabricated steel supports and saddles.
- B. Anchor tank supports and tanks to substrate.
 - 1. Use steel or FRP straps over or around plastic tanks.
- C. Install tank seismic restraints.
- D. Install thermometers and pressure gages on water storage tanks and piping if indicated.
- E. Install the following devices on tanks where indicated:
 - 1. Pressure relief valves.
 - 2. Temperature and pressure relief valves.
 - 3. Vacuum relief valves.
 - 4. Connections to accessories.
- F. After installing tanks with factory finish, inspect finishes and repair damages to finishes.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to potable-water storage tanks to allow service and maintenance.
- C. Connect water piping to water storage tanks with unions or flanges and with shutoff valves. Connect tank drains with shutoff valves and discharge over closest floor drains.
 - 1. General-duty valves are specified in Section 220523.12 "Ball Valves for Plumbing Piping"
 - a. Valves NPS 2 and Smaller: Gate or ball.
 - b. Valves NPS 2-1/2 and Larger: Gate or butterfly.

- c. Drain Valves: NPS 3/4 gate or ball valve. Include outlet with, or nipple in outlet with, ASME B1.20.7, 3/4-11.5NH thread for garden-hose service, threaded cap, and chain.
2. Water Piping Connections: Make connections to dissimilar metals with dielectric fittings. Dielectric fittings are specified in Section 221116 "Domestic Water Piping."
3. Connect air piping to hydropneumatic tanks with unions or flanges and gate or ball valves. Make connections to dissimilar metals with dielectric fittings.

3.3 FIELD QUALITY CONTROL

- A. Perform the following final checks before filling:
 1. Verify that air precharge in precharged tanks is correct.
 2. Test operation of tank accessories and devices.
 3. Verify that pressure relief valves have correct setting.
 - a. Manually operate pressure relief valves.
 - b. Adjust pressure settings.
 4. Verify that vacuum relief valves are correct size.
 - a. Manually operate vacuum relief valves.
 - b. Adjust vacuum settings.
- B. Filling Procedures: Follow manufacturer's written procedures. Fill tanks with water to operating level.

3.4 CLEANING

- A. Clean and disinfect potable-water storage tanks.
- B. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, use procedure described in AWWA C652 or as described below:
 1. Purge water storage tanks with potable water.
 2. Disinfect tanks by one of the following methods:
 - a. Fill tanks with water-chlorine solution containing at least 50 ppm of chlorine. Isolate tanks and allow to stand for 24 hours.
 - b. Fill tanks with water-chlorine solution containing at least 200 ppm of chlorine. Isolate tanks and allow to stand for three hours.
 3. Flush tanks, after required standing time, with clean, potable water until chlorine is not present in water coming from tank.
 4. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination made by authorities having jurisdiction shows evidence of contamination.
- C. Prepare written reports for purging and disinfecting activities.

END OF SECTION 221223.11

ELECTRICAL SPECIFICATIONS

262416 - PANELBOARDS

262213 – LOW-VOLTAGE DISTRIBUTION TRANSFORMERS



These documents were prepared under the supervision of a registered Professional Engineer.

SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution, dry-type transformers with nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
 - b. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

1.3 INFORMATIONAL SUBMITTALS

- ##### A. Source quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

- ##### A. Inspection: On receipt, inspect for and note shipping damage to packaging and transformer.

1. If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.

- ##### B. Storage: Store in warm, dry, and temperature-stable location in original shipping packaging.

- ##### C. Temporary Heating: Apply temporary heat in accordance with manufacturer's published instructions within enclosure of ventilated-type units, throughout periods during which equipment is not energized and when transformer is not in space that is continuously under normal control of temperature and humidity.

- ##### D. Handling: Follow manufacturer's instructions for lifting and transporting transformers.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

- A. Basis for Pricing: Hammond Sentinel SG3A0045KBOR.
- B. Description: floor mount 480V-240/120V 1-phase transformer with NEMA 3R enclosure.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain each type of transformer from single source from single manufacturer.

2.3 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60 Hz service.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- C. Transformers Rated 15 kVA and Larger:
 - 1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
 - 2. Marked as compliant with DOE 2016 efficiency levels by qualified electrical testing laboratory recognized by authorities having jurisdiction.
- D. Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside transformer enclosure.

2.4 DISTRIBUTION TRANSFORMERS

- A. Comply with NFPA 70.
- B. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.
 - 1. One leg per phase.
 - 2. Core volume must allow efficient transformer operation at 10 percent above nominal tap voltage.
 - 3. Grounded to enclosure.
- C. Coils: Continuous windings without splices except for taps.
 - 1. Coil Material: Copper.
 - 2. Internal Coil Connections: Brazed or pressure type.
 - 3. Terminal Connections: Bolted.

- D. Enclosure: Totally enclosed, nonventilated.
 - 1. Core and coil must be encapsulated within resin compound to seal out moisture and air.
 - 2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
 - 3. Wiring Compartment: Sized for conduit entry and wiring installation.
 - 4. Environmental Protection:
 - a. Outdoor: UL 50E, Type 3R.
 - 5. Finish Color: ANSI 61 Grey.
- E. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with maximum of 150 deg C rise above 40 deg C ambient temperature.
- F. Grounding: Provide ground-bar kit or ground bar installed on inside of transformer enclosure.
- G. K-Factor Rating: Transformers indicated to be K-factor rated must comply with UL 1561 requirements for nonsinusoidal load current-handling capability to degree defined by designated K-factor.
 - 1. Unit may not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor, without exceeding indicated insulation class in 40 deg C maximum ambient and 24-hour average ambient of 30 deg C.
 - 2. Indicate value of K-factor on transformer nameplate.
 - 3. Unit must comply with requirements of DOE 2016 efficiency levels when tested in accordance with NEMA TP 2 with K-factor equal to one.
- H. Electrostatic Shielding: Windings must have independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
 - 1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
 - 2. Include special terminal for grounding shield.
- I. Neutral: Rated 200 percent of full load current for K-factor-rated transformers.
- J. Low-Sound-Level Requirements: Maximum sound levels when factory tested in accordance with IEEE C57.12.91, as follows:
 - 1. 30.01 to 50.00 kVA: 45 dB(A-weighted) for K-factors of 1, 4, and 9 .

2.5 IDENTIFICATION

- A. Nameplates:
 - 1. Self-adhesive label for distribution transformers. Self-adhesive labels are specified in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for transformers.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's published instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
- D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance must be 5 Ω at location of transformer.
- E. Environment: Enclosures must be rated for environment in which they are located.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install transformers level and plumb on concrete pad.
- B. Secure covers to enclosure and tighten bolts to manufacturer-recommended torques to reduce noise generation.
- C. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

- A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals in accordance with manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- D. Provide flexible connections at conduit and conductor terminations and supports to eliminate sound and vibration transmission to building structure.

3.4 ADJUSTING

- A. Record transformer secondary voltage at unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
- B. Output Settings Report: Prepare written report recording output voltages and tap settings.

3.5 MAINTENANCE

- A. Infrared Scanning: Two months after Substantial Completion, perform infrared scan of transformer connections.
 - 1. Use infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
 - 2. Perform two follow-up infrared scans of transformers, one at four months and another at 11 months after Substantial Completion.
 - 3. Prepare certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial actions taken, and scanning observations after remedial action.

END OF SECTION 262213

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Power panelboards.

1.2 DEFINITIONS

A. GFEP: Ground-fault equipment protection.

B. MCCB: Molded-case circuit breaker.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Power panelboards.
2. Disconnecting and overcurrent protective devices.
3. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
4. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

1.6 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation in accordance with NEMA PB 1.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing agency recognized by authorities having jurisdiction, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Locations: UL 50E, Type 12
 - 2. Height: 7 ft maximum.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.
 - 4. Finishes:
 - a. Panels and Trim: Steel factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.
- F. Incoming Mains:
 - 1. Location: Top.
 - 2. Main Breaker: Main lug interiors up to 400 A must be field convertible to main breaker.
- G. Phase, Neutral, and Ground Buses:
 - 1. Material: Tin-plated aluminum.
 - a. Plating must run entire length of bus.
 - b. Bus must be fully rated for entire length.
 - 2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.
 - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 - 4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure.
 - 5. Do not mount neutral bus in gutter.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Tin-plated aluminum.
 2. Terminations must allow use of 75 deg C rated conductors without derating.
 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
 4. Main and Neutral Lugs: Compression type, with lug on neutral bar for each pole in panelboard.
 5. Ground Lugs and Bus-Configured Terminators: type, with lug on bar for each pole in panelboard.
 6. Feed-Through Lugs: type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 7. Subfeed (Double) Lugs: type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 8. Gutter-Tap Lugs: type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
- I. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- J. Panelboard Short-Circuit Current Rating:
1. Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by qualified electrical testing laboratory recognized by authorities having jurisdiction. Include label or manual with size and type of allowable upstream and branch devices listed and labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series-connected short-circuit rating.
 - a. Panelboards rated 240 V or less must have short-circuit ratings as shown on Drawings, but not less than 10 000 A(rms) symmetrical.
- K. Surge Suppression: Factory installed as integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.2 POWER PANELBOARDS

- A. Listing Criteria: NEMA PB 1, distribution type.
- B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
1. For doors more than 36 inches high, provide two latches, keyed alike.
- C. Mains: Circuit breaker
- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards in accordance with NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
 - 1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA PB 1.1.
 - 2. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:
 - 1. Equipment Mounting:
 - a. Attach panelboard to vertical finished or structural surface behind panelboard.
 - 2. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
 - 3. Mount panelboard cabinet plumb and rigid without distortion of box.
 - 4. Install overcurrent protective devices and controllers not already factory installed.
 - a. Set field-adjustable, circuit-breaker trip ranges.
 - b. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.
 - 5. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
 - 6. Install filler plates in unused spaces.
 - 7. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.3 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated.

3.4 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature in accordance with manufacturer's published instructions.

END OF SECTION 262416

Appendix C: Line List

Line Number	Size (inch)	Spec	Service	Origin	Termination	Working Pressure PSI	P&ID Sheet	COMMENTS
001	1	P80	RW	INLET WATER SUPPLY	INLET WATER FILTER	50-80	P1.5A / P1.5 Sh.1	
002	1	P80	CW	WATER SOFTENER 1	010	50-80	P1.5A / P1.5 Sh.1	
003	1	P80	CW	WATER SOFTENER 2	011	50-80	P1.5A / P1.5 Sh.1	
004	1	P80	RW	INLET WATER SUPPLY	DILUTION PANEL	50-80	P1.5A / P1.5 Sh.1	
005	3/8	PE	BR	T-002	WATER SOFTENER 2	50-80	P1.5A / P1.5 Sh.1	
006	3/8	PE	BR	T-001	WATER SOFTENER 1	50-80	P1.5A / P1.5 Sh.1	
007	1	P80	BR	T-002	008	50-80	P1.5A / P1.5 Sh.1	
008	1/2	PE	BR	007	GEN-102	50-80	P1.5A / P1.5 Sh.1 and P1.5 Sh. 2	
009	1/2	PE	BR	041	GEN-101	50-80	P1.5A / P1.5 Sh.1 and P1.5A Sh. 2	
010	1/2	PE	CW	002	GEN-101	50-80	P1.5A / P1.5 Sh.1 and P1.5A Sh. 2	
011	1/2	PE	CW	003	GEN-102	50-80	P1.5A / P1.5 Sh.1 and P1.5 Sh. 2	
012	1	P80	CW	002	T-001	50-80	P1.5A / P1.5 Sh.1	
013	1	P80	CW	003	T-002	50-80	P1.5A / P1.5 Sh.1	
014	8	P80	V	T-001	DUST BAG	ATM	P1.5A / P1.5 Sh.1	
015	8	P80	V	T-002	DUST BAG	ATM	P1.5A / P1.5 Sh.1	
016	1/2	PE	CW	WATER SOFTENER 1	DRAIN	ATM	P1.5A / P1.5 Sh.1	
017	1/2	PE	CW	WATER SOFTENER 2	DRAIN	ATM	P1.5A / P1.5 Sh.1	
018	1/4	PE	HC	GEN-101	DRAIN	ATM	P1.5A Sh. 2	
019	2	P80	V	GEN-101	T-201 VENT	ATM	P1.5A Sh. 2	
020	2	P80	HC	GEN-101	T-201	50-80	P1.5A Sh. 2	
021	2	P80	V	GEN-102	T-202 VENT	ATM	P1.5A Sh. 2	HYDROGEN VENT
022	2	P80	HC	GEN-102	T-202	50-80	P1.5A Sh. 2	
023	1	P80	HC	DILUTION PANEL	T-201, T-202	50-80	P1.5A / P1.5 Sh.3	
024	1	P80	HC	BULK HCL DRUM	DILUTION PANEL	ATM	P1.5A / P1.5 Sh.3	
025	4	P80	V	T-201	TO ATMOSPHERE	ATM	P1.5A / P1.5 Sh.3	VENT ABOVE ROOFLINE
026	4	P80	V	BLR-201	T-201	ATM	P1.5A / P1.5 Sh.3	EXHAUST AIR
027	1	P80	HC	T-201	028, 034	3	P1.5A / P1.5 Sh.3	T-201 OUTLET TO TEE
028	1	P80	HC	PSV-001	027, 034	50	P1.5A / P1.5 Sh.3	PSV OUTLET
029	1	P80	HC	P-301	HYPOCHORITE OUTLET	50-80	P1.5A / P1.5 Sh.3	
030	1	P80	HC	P-302	029, HYPOCHLORITE OUTLET	50-80	P1.5A / P1.5 Sh.3	
031	1	P80	HC	T-202	HYPOCHORITE OUTLET	3	P1.5A / P1.5 Sh.3	
032	1	P80	HC	PSV-002	031, 033	50	P1.5A / P1.5 Sh.3	PSV OUTLET
033	1	P80	HC	031	P-302	3	P1.5A / P1.5 Sh.3	TO PUMP SUCTION
034	1	P80	HC	027	P-301	3	P1.5A / P1.5 Sh.3	TO PUMP SUCTION
035	4	P80	V	T-202	VENT TO ROOF	ATM	P1.5A / P1.5 Sh.3	EXHAUST AIR
036	4	P80	V	BLR-202	T-202	ATM	P1.5A / P1.5 Sh.3	
037	2	P80	HC	T-201	DRAIN	ATM	P1.5A / P1.5 Sh.3	OVERFLOW FROM T-201
038	2	P80	HC	T-202	DRAIN	ATM	P1.5A / P1.5 Sh.3	OVERFLOW FROM T-202
039	1/4	PE	HC	GEN-102	DRAIN	ATM	P1.5A Sh. 2	DRAIN FROM GEN 102
040	1-1/4	P80	HC	P-301, 302	OUTLET	15-20	P1.5A / P1.5 Sh.3	
041	1	P80	BR	T-001	009	50-80	P1.5A / P1.5 Sh.1	

Service Codes

RW - Raw Water
CW - Conditioned Water
HC - Hypochlorite

BR - Brine
V - Vent
H - Hydrogen

Specification Codes

P40 - PVC SCH 40, Clear
PE - Linear Low Density Polyethylene - Parker E/EB series - 0.040" wall. Size based on Outer Diameter. Color per Client choice.