

## CONTROL SEQUENCE FOR DOSING SYSTEM

CLIENT :	
CONSULTANT	
PROJECT :	PW GENERATION SYSTEM (DOSING SYSTEM)
DOC.NO :	
REF.DWG :	

Tag	Instrument/Equipment/Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (Of HMI)	Unit	Resolutions	101.2DP-01	101.4DP-01	102.1AV-01	102.1AV-02	-	101.3DP-01	Fault lamp	Hooter	Alarm and Message	DISCRIPTION
							Anti-scalent Dosing Pump	SMBS Dosing Pump	ORP Dump Valve	MPT Tank Inlet Valve	Water Demand Signal	NaOH Dosing Pump				

Dosing system will have Two operating modes. These are Manual Mode and Auto Mode. These modes are selectable from HMI and at a time only one mode can be executed. To select the Manual mode, user has to select the Manual mode button from the HMI. To select the Auto mode, user has to select the Auto mode button from the HMI. If user has selected the Manual mode, then Auto mode selection button will become disable and will become enable only when Manual mode button is de-selected. If user has selected the Auto mode, then Manual mode selection button will become disable and will become enable only when Auto mode button is de-selected.

Special Conditions:

1) During Manual mode, logic of ORP shall remain enable

### MANUAL MODE

AFR-PS-L	At Air Line	Low	NA	NA	NA	NA	X	X	X	X	X	X	/	/	"Air Pressure Low"	In case if the Air pressure switch installed at Air Filter Regulator unit becomes low, then system will stop or turn Off all the field devices and will initiate an alarm (Fault Lamp & Hooter) . Thenafter when the Air Pressure switch becomes healthy, then the system will not switch On the field devices. User has to again press the particular field devices icons in order to start or turn it On
Emergency Switch	On Control Panel	Emergency Switch Pressed	NA	NA	NA	NA	X	X	X	X	X	X	/	/	"Emergency Switch Pressed"	In case if the user presses the Emergency switch button from the panel, then system will stop or turn Off all the field devices and will initiate an alarm (Fault Lamp & Hooter). Thenafter when the user releases the Emergency switch button from the panel, then the system will not switch On the field devices. User has to again press the particular field devices icons in order to start or turn it On
Power	Of Control Panel	Power Fails	NA	NA	NA	NA	X	X	X	X	X	X	X	X	NA	In case if there is a power failure then the system will stop or turn Off all the field devices. When the Power resumes back, system will not switch On the field devices. User has to again press the particular field device icon in order to start or turn it On

### AUTO MODE

AFR-PS-L	At Air Line	Low	NA	NA	NA	NA	X	X	X	X	X	X	/	/	"Air Pressure Low"	In case if the Air pressure switch installed at Air Filter regulator unit becomes low, then system will stop or turn Off all the field devices and will initiate an alarm (Fault Lamp & Hooter). Thenafter when the Air Pressure switch becomes healthy, system after a delay of 30 secs will restart automatically.
Emergency Switch	On Control Panel	Emergency Switch Pressed	NA	NA	NA	NA	X	X	X	X	X	X	/	/	"Emergency Switch Pressed"	In case if the user has pressed the Emergency switch button from the panel, then system will stop or turn Off all the field devices and will initiate an alarm (Fault Lamp & Hooter). Thenafter when user has released the Emergency switch button from panel, system after a delay of 30 secs will restart automatically
Power	Of Control Panel	Power Fails	NA	NA	NA	NA	X	X	X	X	X	X	X	X	NA	In case if there is a power failure then the system will stop or turn Off all the field devices. When the Power resumes back, then the system after a delay of 30 secs will restart automatically.
101.2LS-01	Antiscalent Dosing Tank Level Switch	Low	NA	NA	NA	NA	/	/	X	/	/	/	/	X	"101.2LS-01 Low"	Low level at Antiscalent dosing tank will initiate an alarm (Fault Lamp). Operator has to fill the Dosing tank manually. Once Dosing tank level becomes healthy, system will acknowledged the alarm of Low level at Dosing tank
101.4LS-01	SMBS Dosing Tank Level Switch	Low	NA	NA	NA	NA	/	/	X	/	/	/	/	X	"101.4LS-01 Low"	Low level at SMBS dosing tank will initiate an alarm (Fault Lamp). Operator has to fill the Dosing tank manually. Once Dosing tank level becomes healthy, system will acknowledged the alarm of Low level at Dosing tank
102.1ORP-01	ORP at MPT Tank Inlet	High	0 to 500	0 to 999	mV	###.#	/	/	X	/	/	/	/	X	"102.1ORP-01 High"	After delay of 30 secs, if in case ORP becomes High, system will initiate an alarm (Fault Lamp).

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Tag	Instrument/Equipment/Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (Of HMI)	Unit	Resolutions	101.2DP-01	101.4DP-01	102.1AV-01	102.1AV-02	-	101.3DP-01	Fault lamp	Hooter	Alarm and Message	DISCRIPTION
							Anti-scalent Dosing Pump	SMBS Dosing Pump	ORP Dump Valve	MPT Tank Inlet Valve	Water Demand Signal	NaOH Dosing Pump				
102.1ORP-01	ORP at MPT Tank Inlet	High-High	0 to 500	0 to 999	mV	###.#	/	/	/	X	X	X	/	/	"102.1ORP-01 High-High"	After delay of 30 secs, if in case ORP becomes High-High, system will open the ORP dump valve, Close MPT Tank inlet Valve, trip NaOH Dosing Pump and will initiate an alarm (Fault Lamp & Hooter). system will start the ORP Validation timer which shall be setttable from the HMI having range from 0 secs to 999 secs.
102.1ORP-01	ORP at MPT Tank Inlet	Within ORP Validation timer ORP falls below high set point	NA	0 to 999	Secs	###.#	/	/	X	/	/	/	X	X	NA	Within ORP validation timer if in case ORP falls below high set point system will reset the ORP Validation timer, close ORP dump valve, open MPT Tank inlet valve, start NaOH Dosing Pump (Provided MPT tank level is not high-high) and will acknowledged the alarm of High and High-High ORP.
102.1ORP-01	ORP at MPT Tank Inlet	ORP Validation timer is Completed and ORP remains High	NA	0 to 999	Secs	###.#	X	X	X	X	X	X	/	/	"102.1ORP-01 Validation Timer Over"	If ORP Validation timer is Completed and if in case ORP value remains above high set point, then system will trip Antiscalent dosing pump, trip SMBS dosing pump and will initiate an alarm (Fault Lamp & Hooter). User has to press System reset button from HMI. Once System reset button is pressed it will resartt automatically.
101.3LS-01	NaOH Dosing Tank Level Switch	Low	NA	NA	NA	NA	/	/	X	/	/	/	X	X	"101.3LS-01 Low"	Low level at NaOH dosing tank will initiate an alarm (Fault Lamp). Operator has to fill the Dosing tank manually. Once Dosing tank level becomes healthy, system will acknowldged the alarm of Low level at Dosing tank
101.3PH-01	pH sensor Cum Transmitter	High	0 to 14	0 to 99.99	pH	##.##	/	/	X	/	/	/	/	X	"101.3PH-01 High"	If in case pH becomes High, system will give Fault Lamp.
101.3PH-01	pH sensor Cum Transmitter	High-High	0 to 14	0 to 99.99	pH	##.##	/	/	X	/	/	X	/	/	"101.3PH-01 High High"	If in case pH becomes High-High, system will give Alarm (Fault Lamp & Hooter) and trip NaOH Dosing Pump. Thenafter when pH falls below high minus hysteresis set point system will Start NaOH Dosing Pump and will acknowldge the alarm of High and High-High pH.
101.3PH-01	pH sensor Cum Transmitter	Low	0 to 14	0 to 99.99	pH	##.##	/	/	X	/	/	/	/	X	"101.3PH-01 Low"	If in case pH becomes Low, system will give Fault Lamp.
101.3PH-01	pH sensor Cum Transmitter	Low-Low	0 to 14	0 to 99.99	pH	##.##	/	/	X	/	/	/	/	/	"101.3PH-01 Low Low"	If in case pH becomes Low-Low system will give Alarm (Fault Lamp & Hooter). Thenafter when pH rises above low plus hysteresis low set point system will acknowldge the alarm of Low and Low- Low pH.
117.1LS-01	Level Switch (MPT Tank)	High-High	NA	NA	NA	NA	X	X	X	X	X	X	X	X	"117.1LS-01 High-High"	High-high level at Multipurpose storage tank will trip Antiscalent dosing pump, trip SMBS dosing pump,trip NaOH dosing pump, Close MPT Tank Inlet Valve, Trip Water Demand Signal and will initiate an alarm (Only Text)
117.1LS-01	Level Switch (MPT Tank)	High	NA	NA	NA	NA	/	/	X	/	/	/	X	X	NA	High level at Multipurpose storage tank will Start Water Demand Signal, start Antiscalant dosing pump, start SMBS dosing pump and will open ORP dump valve for a delay of 30 secs. After a delay of 30 secs, system will check for ORP. If ORP is unhealthy, then the system will execute the logic for ORP and If in case the ORP becomes healthy, only then the system will close ORP dump valve and will open MPT Tank Inlet valve, Start NaOH Dosing Pump and will acknowldge the alarm of High-high level at Multipurpose storage tank.

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							Anti-scalent Dosing Pump	SMBS Dosing Pump	ORP Dump Valve	MPT Tank Inlet Valve	Water Demand Signal	NaOH Dosing Pump				

Rev. no.	Date	Released for	Prepared By	Checked By	Approved By
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**CONTROL PHILOSOPHY FOR GLACIER SKID**

CLIENT :	
CONSULTANT	
PROJECT :	PW GENERATION SYSTEM (GLACIER SKID)
DOC.NO :	
REF.DWG :	

Tag	Instrument/Equipment /Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (Of HMI)	Unit	Resolution	117.1EH-01	117.1P-01	117.1AV-01	117.1AV-02	117.1AV-03	119.1P-01	119.1AV-03	119.1AV-02	119.1AV-01	119.1EDI-01	119.1AV-06	119.1AV-04	119.1AV-05	Fault lamp	Hooter	Alarm and Message	DESCRIPTION
							Electrcal Heater	RO-I High Pressure Pump	RO-I Reject Valve	RO-I Conductivity Dump Valve	RO-I Conductivity Process Valve	RO-II High Pressure Pump	RO-II Conductivity Dump Valve	RO-II Conductivity Process Valve	RO-II Reject Valve	EDI Unit	EDI Reject Valve	PW tank Inlet Valve	Recirculation Valve				

Glacier system will have Three operating modes. These are Manual Mode, Auto Mode and Sanitization Mode. These modes are selectable from HMI and at a time only one mode can be executed. To select the Manual mode, user has to select the Manual mode button from the HMI. To select the Auto mode, user has to select the Auto mode button from the HMI and To select the Sanitization mode, user has to select the Sanitization mode button from the HMI. If user has selected the Manual mode, then Auto mode selection button and Sanitization mode selection button will become disable and will become enable only when Manual mode button is de-selected. If user has selected the Auto mode, then Manual mode selection button and Sanitization mode selection button will become disable and will become enable only when Auto mode button is de-selected. If user has selected the Sanitization mode, then Auto mode selection button and Manual mode selection button will become disable and will become enable only when Sanitization mode button is de-selected.

**Special Conditions:**  
 1) During Manual mode, logic of EDI inlet flow switch will remain enable for EDI safety.  
 2) During Manual mode, logic of Concentrate Flushing cycle for Conductivity high will remain enable for system safety.  
 3) During Sanitization in Manual mode, logic of Heater will remain enable.  
 4) During Manual mode, if MPT tank level becomes low-low, system will not start RO-1 High Pressure Pump, RO-2 High pressure pump, Heater and EDI manually.

MANUAL MODE																							
AFR-PSL	At Air Line	Low	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	" Air Pressure Low"	In case if the Air pressure switch installed at Air Filter Regulator unit becomes low, then system will stop or turn Off all the field devices and will give an alarm. Thenafter when the Air Pressure switch becomes healthy, then the system will not switch On the field devices. User has to again press the particular field devices icons in order to start or turn it On
Emergency Switch	On Control Panel	Emergency Switch Pressed	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	" Emergency Switch Pressed"	In case if the user presses the Emergency switch button from the panel, then system will stop or turn Off all the field devices and will give an alarm. Thenafter when the user releases the Emergency switch button from the panel, then the system will not switch On the field devices. User has to again press the particular field devices icons in order to start or turn it On
Power	Of Control Panel	Power Fails	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NA	In case if there is a power failure then the system will stop or turn Off all the field devices. User has to again press the particular field device icon in order to start or turn it On

AUTO MODE																							
AFR-PSL	At Air Line	Low	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	" Air Pressure Low"	In case if the Air pressure switch installed at Air Filter regulator unit becomes low, then system will stop or turn Off all the field devices and will give an alarm. Thenafter when the Air Pressure switch becomes healthy, then the system after a delay of 30 secs will restart automatically.
Emergency Switch	On Control Panel	Emergency Switch Pressed	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	" Emergency Switch Pressed"	In case if the user presses the Emergency switch button from the panel, then system will stop or turn Off all the field devices and will give an alarm. Thenafter when the user releases the Emergency switch button from the panel, then the system after a delay of 30 secs will restart automatically
Power	Of Control Panel	Power Fails	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NA	In case if there is a power failure then the system will stop or turn Off all the field devices. When the Power resumes back, then the system after a delay of 30 secs will restart automatically.
117.1LS-01	Level Switch (MPT Tank)	Low-Low	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"117.1LS-01 Low-Low"	Low-Low Level at MPT tank will trip the RO-1, RO2-EDI System (i.e. trip RO-1 High Pressure Pump, RO-2 High pressure pump, trip EDI) and will initiate an alarm.
117.1LS-01	Level Switch (MPT Tank)	Low	NA	NA	NA	NA	X	/	/	X	/	/	X	/	/	/	/	/	X	X	X	NA	Low level at MPT tank will start RO-I high pressure pump and will Check the conductivity at outlet of RO-I, If Conductivity is above High High set point system will excute the logic of High high Conductivity and if the conductivity is below High set point then system will Close RO- I Conductivity Dump Valve, Open RO-I conductivity process valve, start RO-II High Pressure pump and will perform the Concentrate Flushing cycle by opening RO Permeate conductivity Dump Valve for settable time period. This timer shall be settable from the HMI having the range from 0 secs to 9999 secs. During this period, system will give an indication on the HMI stating "Concentrate Flushing Cycle". As soon as the concentrate Flushing cycle timer is completed, system will check for RO Permeate conductivity. If the conductivity is above the high-high set-point, then the system will execute the logic for conductivity and if the conductivity is below the high set-point then system will Close RO-II Permeate conductivity Dump Valve and Open RO-II Permeate conductivity Process Valve, start EDI, Open the PW Inlet Valve (Provided if EDI Permeate conductivity is below high set point and PW Tank Level is below High High Level) and System will acknowledge the alarm of Low-low level at Multipurpose storage tank.
117.1TT-02	Temperature Transmitter at supply line	High	0 to 150	0 to 999.9	degreeC	###.#	X	/	/	X	/	/	X	/	/	/	/	/	X	/	X	" 117.1TT-02 High"	When high pressure pump is running and In case if the Supply Line Temperature becomes High (Remains High for 3 secs), then the system will initiate an alarm.
117.1TT-02	Temperature Transmitter at supply line	High-High	0 to 150	0 to 999.9	degreeC	###.#	X	/	/	X	/	/	X	/	/	/	/	/	X	/	/	"117.1TT-02 High-High"	When high pressure pump is running and In case if the Supply Line Temperature is High-High, then the system will give an alarm (Fault Lamp & Hooter) and will start Temp. Validation Timer.
117.1TT-02	Temperature Validation Timer	During Temperature validation timer, supply line temperature falls below high set point	NA	0 to 999.9	secs	###.#	X	/	/	X	/	/	X	/	/	/	/	/	X	X	X	NA	Temperature validation timer shall be settable from the HMI having the range from 0 secs to 999 secs. During temperature validation timer in case if the supply line temperature falls below the high set point, will reset the timer and will acknowledge the alarm of High and High-High temperature of supply Line.
117.1TT-02	Temperature Validation Timer	Temperature Validation Timer is completed and supply line temperature remains High- High set point	NA	0 to 999.9	secs	###.#	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"117.1TT-02 Validation Timer Over"	In case if the Temp. validation timer is completed and still if supply line temperature remains above High set point, then the system will trip RO-1 High Pressure Pump, RO-2 High pressure pump, trip the EDI and will initiate an alarm. User has to press system reset button. Once system reset button is pressed from HMI, system will restart from concentrate flushing cycle
117.1CT-01	RO-I Permeate Conductivity	High	0 to 100	0 to 999.99	µ S/cm	###.##	X	/	/	X	/	/	X	/	/	/	/	/	X	/	X	"117.1CT-01 High"	When RO-1 HPP is running, after delay of 30 secs, if in case Conductivity at RO-1 Permeate becomes High, system will initiate an alarm (Fault Lamp).

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Tag	Instrument/Equipment /Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (Of HMI)	Unit	Resolution	117.1EH-01	117.1P-01	117.1AV-01	117.1AV-02	117.1AV-03	119.1P-01	119.1AV-03	119.1AV-02	119.1AV-01	119.1EDI-01	119.1AV-06	119.1AV-04	119.1AV-05	Fault lamp	Hooter	Alarm and Message	DESCRIPTION
							Electrcal Heater	RO-I High Pressure Pump	RO-I Reject Valve	RO-I Conductivity Dump Valve	RO-I Conductivity Process Valve	RO-II High Pressure Pump	RO-II Conductivity Dump Valve	RO-II Conductivity Process Valve	RO-II Reject Valve	EDI Unit	EDI Reject Valve	PW tank Inlet Valve	Recirculation Valve				
117.1CT-01	RO-I Permeate Conductivity	High-High	0 to 100	0 to 999.99	μ S/cm	###.##	X	/	/	/	X	X	X	X	X	X	X	X	/	/	/	"117.1CT-01 High-High"	When RO-1 HPP is running, After delay of 30 secs, if in case Conductivity becomes High-High, system will open the RO-1 Conductivity Dump valve, close RO-1 Conductivity process valve, trip the RO2 -EDI System and will initiate an alarm (Fault Lamp & Hooter). system will start the Conductivity Validation timer which shall be settable from the HMI having range from 0 secs to 999 secs.
117.1CT-01	RO-I Permeate Conductivity	Water Quality Validation timer is completed and if the RO-1 permeate conductivity remains above high set point	0 to 100	0 to 999.99	μ S/cm	###.##	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"117.1CT-01Validation Timer Over"	Within Conductivity validation timer if in case conductivity falls below high set point system will reset the Conductivity Validation timer, close RO-1 Conductivity Dump Valve, open RO-1 Conductivity Dump valve, Start RO2 -EDI System and will acknowledged the alarm of High and High-High Conductivity.
117.1CT-01	RO-I Permeate Conductivity	Water Quality Validation timer is running & RO-1 Permeate Conductivity is below the High set point	0 to 100	0 to 999.99	μ S/cm	###.##	X	/	/	X	/	/	X	/	/	/	/	/	X	X	X	NA	If Conductivity Validation timer is Completed and if in case Conductivity at RO-1 Permeate value remains above high set point, then RO-1 system & RO2-EDI system will trip (i.e. trip RO-1HPP, RO-2 HPP, trip EDI system and will initiate an alarm (Fault Lamp & Hooter). User has to press RO-EDI system reset button. Once system reset button is pressed from HMI, system will restart from concentrate flushing cycle
117.1PS-01	Pressure Switch	Pressure at RO-1-HPP discharge becomes High	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"117.1PS-01 High"	When pressure at RO-1 High pressure pump discharge line becomes High, then system will trip RO-1 High Pressure Pump, RO-2 High pressure pump, trip EDI, close RO Permeate Conductivity Process Valve, Close RO Permeate Conductivity Dump Valve, close EDI reject valve, close PW tank inlet Valve, close EDI Permeate Recirculation Valve and system will intiate an alarm (Fault lamp & Hooter). User has to press RO-EDI system reset button. Once system reset button is pressed from HMI, system will restart from concentrate flushing cycle.
119.1PS-01	Pressure Switch	Pressure at RO-2-HPP discharge becomes High	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"119.1PS-01 High"	When pressure at RO-2 High pressure pump discharge line becomes High, then system will trip RO-1 High Pressure Pump, RO-2 High pressure pump, trip EDI, close RO Permeate Conductivity Process Valve, Close RO Permeate Conductivity Dump Valve, close EDI reject valve, close PW tank inlet Valve, close EDI Permeate Recirculation Valve and system will intiate an alarm (Fault lamp & Hooter). User has to press RO-EDI system reset button. Once system reset button is pressed from HMI, system will restart from concentrate flushing cycle.
119.1PS-02	Pressure Switch	Pressure at RO Permeate line becomes High	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"119.1PS-02 High"	In case if the pressure at RO permeate line becomes high, then system will trip RO-1 High Pressure Pump, RO-2 High pressure pump, trip EDI, close RO Permeate Conductivity Process Valve, Close RO Permeate Conductivity Dump Valve, close EDI reject valve, close PW tank inlet Valve, close EDI Permeate Recirculation Valve and system will intiate an alarm (Fault lamp & Hooter). User has to press RO-EDI system reset button. Once system reset button is pressed from HMI, system will restart from concentrate flushing cycle.
119.1CT-01	RO-II Permeate Conductivity	Concentrate Flushing Cycle Timer is completed & RO Permeate Conductivity becomes High	0 to 50	0 to 99.99	μ S/cm	###.##	X	/	/	X	/	/	X	/	/	/	/	/	X	/	X	"119.1CT-01 High"	After Concentrate Flushing cycle timer is completed and In case if the RO Permeate Conductivity is High (Remains High for 3 secs), then the system will initiate an alarm.
119.1CT-01	RO-II Permeate Conductivity	Concentrate Flushing Cycle Timer is completed & RO Permeate Conductivity becomes High-High	0 to 50	0 to 99.99	μ S/cm	###.##	X	/	/	X	/	/	X	/	X	X	X	X	/	/	/	"119.1CT-01 High-High"	After Concentrate Flushing cycle timer is completed and In case if the RO Permeate conductivity is High-High, then the system will initiate an alarm (Fault Lamp & Hooter). Open the RO-2 Permeate conductivity Dump Valve, Run the RO High Pressure pump-2 at 50 Hz, trip EDI, and will start the water Quality Validation timer which shall be settable from the HMI having the range from 0 secs to 999 secs
119.1CT-01	RO-II Permeate Conductivity	Water Quality Validation timer is completed and if the RO permeate conductivity remains above high set point	0 to 50	0 to 99.99	μ S/cm	###.##	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"119.1CT-01 Validation Timer Over"	In case if the Water Quality Validation timer is completed and still if the RO-2 Permeate conductivity remains above High set point then System will trip the RO-1 & RO2-EDI system and PW tank inlet valve shall remain tripped/off and will initiate an alarm (Fault Lamp & Hooter). User has to press RO-EDI system reset button. Once system reset button is pressed from HMI, system will restart from concentrate flushing cycle
119.1CT-01	RO-II Permeate Conductivity	Concentrate Flushing Cycle Timer is completed/Water Quality Validation timer is running & RO Permeate Conductivity is below the High set point	0 to 50	0 to 99.99	μ S/cm	###.##	X	/	/	X	/	/	X	/	/	/	/	/	X	X	X	NA	During Concentrate flushing cycle timer/ Quality validation timer is running and If RO -2 Permeate conductivity falls below its High set point, then the system will close the RO-2 Permeate conductivity Dump Valve, open the RO-2 Permeate conductivity Process Valve, start the EDI and open the PW Inlet Valve (Provided if EDI Permeate conductivity is below high set point and Level in PW tank is below High- High Level). During this period, system will give an indication on HMI stating "Production Cycle". But if in case either EDI Permeate conductivity is high-high or PW tank level becomes high-high level, then the system will close PW Inlet Valveand will open Recirculation Valve.
119.1CT-02	EDI Permeate Conductivity	High-High	0 to 10	0 to 99.99	μs/cm	###.##	X	/	/	X	/	/	X	/	/	/	/	X	/	/	/	"119.1CT-02 High High"	During RO high pressure pump-2 is running and RO-2 Permeate conductivity process valve is open and In case if the EDI Permeate Conductivity is High-High, then the system will open the Recirculation valve, Close PW Tank Inlet Valve and will initiate an alarm (Fault Lamp & Hooter).
119.1CT-02	EDI Permeate Conductivity	EDI Permeate Conductivity falls below High set point	0 to 10	0 to 99.99	μs/cm	###.##	X	/	/	X	/	/	X	/	/	/	/	/	X	X	X	NA	If EDI Permeate Conductivity falls below its High set point, then the system will close the recirculation Valve Open PW Tank Inlet valve and will give an indication on HMI stating "Production Cycle". During this period system will acknowledge the alarm of High and High-high conductivity at EDI Permeate line.

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DOC.NO :	
REF.DWG :	

Tag	Instrument/Equipment /Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (Of HMI)	Unit	Resolution	117.1EH-01	117.1P-01	117.1AV-01	117.1AV-02	117.1AV-03	119.1P-01	119.1AV-03	119.1AV-02	119.1AV-01	119.1EDI-01	119.1AV-06	119.1AV-04	119.1AV-05	Fault lamp	Hooter	Alarm and Message	DESCRIPTION
							Electrcal Heater	RO-I High Pressure Pump	RO-I Reject Valve	RO-I Conductivity Dump Valve	RO-I Conductivity Process Valve	RO-II High Pressure Pump	RO-II Conductivity Dump Valve	RO-II Conductivity Process Valve	RO-II Reject Valve	EDI Unit	EDI Reject Valve	PW tank Inlet Valve	Recirculation Valve				
305.1LT-01	Recirculation Timer	PW tank level becomes high-high will start Recirculation timer	NA	Timer: 0 to 999	Minute	###.#	X	/	/	X	/	/	X	/	/	/	/	X	/	X	X	"305.1LT-011 High-High"	When level at PW tank becomes high-high system will initiate an alarm (Only Text), system will open the Recirculation Valve, close the PW tank inlet Valve and will start the Recirculation cycle timer which shall be settable from the HMI having the range from 0 min to 999 min. During this instance, system will give an indication on the HMI stating "Recirculation cycle".
305.1LT-01	Ideal Cycle Timer	Recirculation timer is completed and still level at PW tank remains high-high, will start the Ideal Cycle	NA	Timer: 0 to 999	Minute	###.#	X	X	X	X	X	X	X	X	X	X	X	X	/	X	X	NA	In case if the Recirculation cycle timer is completed and still if level at PW tank remains high-high, then the system will trip RO-1High Pressure Pump, trip RO-2 High Pressure Pump, trip the EDI and will start the Idle cycle timer which will be settable from the HMI having the range from 0 min to 999 min. During this instance, system will give an indication on the HMI stating "Idea cycle"
305.1LT-01	Recirculation Timer	Ideal Cycle timer is completed and still level at PW tank remains high-high, will restart the system.	NA	Timer: 0 to 999	Minute	###.#	X	/	/	X	/	/	X	/	/	/	/	X	/	X	X	NA	In case if the Ideal cycle timer is completed, system will restart from concentrate flushing cycle and then Recirculation Cycle.
305.1LT-01	Recirculation/Ideal Cycle Timer	During Recirculation/ideal cycle timer in case if PW tank level is falls below high-high level (Provided EDI permeate conductivity is below high set point)	NA	Timer: 0 to 999	Minute	###.#	X	/	/	X	/	/	X	/	/	/	/	/	X	X	X	NA	If recirculation timer is running and in case if PW tank level becomes high level, system will reset Recirculation timer Open PW tank Inlet Valve, Close Recirculation Valve and will acknowledge the alarm of PW tank level high-high. If Ideal Cycle timer is running and in case if PW tank level falls below high level, system will reset the ideal cycle timer and it will restart from concentrate flushing cycle.
119.1FS-01	Flow Switch	Low Flow	NA	NA	NA	NA	X	/	/	X	/	/	X	/	/	/	/	/	X	/	/	"119.1FS-01 Low"	When the RO-2 High pressure pump is running with RO-2 Permeate conductivity Dump valve is closed and in case if the flow at EDI reject line becomes Low then the system will initiate an alarm (Fault Lamp & Hooter). System will start the EDI off delay timer which will be settable from the HMI having the range from 0 secs to 999 secs
NA	EDI Off Delay Timer	EDI Off Delay Timer is completed and flow remains low	NA	0 to 999.9	Secs	###.#	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"119.1EDI-01 Off Delay Timer Over"	In case if the EDI off delay time is completed and still if EDI reject flow remains low, then the system will trip the RO-1 high pressure pump, RO-2 high pressure pump, trip the EDI and will initiate an alarm (Fault Lamp & Hooter). User has to press RO-EDI system reset button. Once system reset button is pressed from HMI, system will restart from concentrate flushing cycle
NA	EDI Off Delay Timer	EDI Off Delay Timer is running and flow becomes healthy	NA	0 to 999.9	Secs	###.#	X	/	/	X	/	/	X	/	/	/	/	/	X	X	X	NA	Within EDI off delay timer if the flow at EDI reject flow switch becomes Healthy, then the system will reset EDI Off delay Timer, start the EDI and will acknowledge the Low flow alarm..
NA	EDI Rectifier	EDI On F/B signal from Rectifier not received	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"119.1EDI-01 Electrically Tripped"	Whenever HSEDI becomes ON, system after a delay of 30 secs will check for the EDI ON feedback signal coming from EDI Rectifier. PLC in case if does not sense this signal, then system will trip the RO-1 high pressure pump, RO-2 high pressure pump, trip the EDI, close PW Inlet Valve and will initiate an alarm (Fault Lamp & Hooter). User has to press the system reset button from the HMI. Once the button is pressed, system will restart automatically.
119.1FT-01	Flow Transmitter at EDI Permeate Line	Data Logging	0 to 6	0 to 99.9	M3/HR	###.#	X	/	/	X	/	/	X	/	/	/	/	/	X	X	X	NA	Flow Transmitter at EDI Permeate line will used for data logging only.
119.1TT-01	Temperature Transmitter at Return line	Data Logging	0 to 150	0 to 999.9	degreeC	###.#	X	/	/	X	/	/	X	/	/	/	/	/	X	X	X	NA	Temperature Transmitter at Return line will used for data logging only.

**SANITIZATION MODE**

AFR-PSL	At Air Line	Low	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	" Air Pressure Low"	In case if the Air pressure switch installed at Air Filter regulator unit becomes low, then system will stop or turn Off all the field devices and will give an alarm. Thenafter when the Air Pressure switch becomes healthy, then the system after a delay of 30 secs will restart automatically.
EMERGENCY Switch	On Control Panel	Emergency Switch Pressed	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	" Emergency Switch Pressed"	In case if the user presses the Emergency switch button from the panel, then system will stop or turn Off all the field devices and will give an alarm. Thenafter when the user releases the Emergency switch button from the panel, then the system after a delay of 30 secs will restart automatically	
Power	Of Control Panel	Power Fails	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NA	In case if there is a power failure then the system will stop or turn Off all the field devices. When the Power resumes back, then the system after a delay of 30 secs will restart automatically.	
NA	Filling Cycle	If Sanitization Level is not Achieved	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NA	As soon as the Sanitization mode is initiated from the HMI, system will first check for the High level of MPT tank. If sanitization level is not achieved, then system will start the Filling cycle by starting Water Demand Signal, start Antiscalant dosing pump, start SMBS dosing pump and will open ORP dump valve for a delay of 30 secs. after delay of 30 secs system will check for ORP value. If in case if ORP becomes unhealthy, then system will execute the control for ORP and if in case, ORP becomes healthy, only then system will close ORP dump valve and will open MPT Tank Inlet Valve, Start NaOH Dosing Pump so that will start to fill the MPT tank up to High Level. During this instance, system will give an indication on the HMI stating "Filling Cycle". As soon as Sanit level is achieved, then system will trip Water Demand Signal, trip Antiscalant dosing pump, trip SMBS dosing pump, trip NaOH Dosing Pump and Close MPT Tank inlet Valve.	

**CONTROL PHILOSOPHY FOR GLACIER SKID**

CLIENT :																								
CONSULTANT :																								
PROJECT :	PW GENERATION SYSTEM (GLACIER SKID)																							
DOC.NO :																								
REF.DWG :																								
Tag	Instrument/Equipment /Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (Of HMI)	Unit	Resolution	117.1EH-01	117.1P-01	117.1AV-01	117.1AV-02	117.1AV-03	119.1P-01	119.1AV-03	119.1AV-02	119.1AV-01	119.1EDI-01	119.1AV-06	119.1AV-04	119.1AV-05	Fault lamp	Hooter	Alarm and Message	DESCRIPTION	
							Electrcal Heater	RO-I High Pressure Pump	RO-I Reject Valve	RO-I Conductivity Dump Valve	RO-I Conductivity Process Valve	RO-II High Pressure Pump	RO-II Conductivity Dump Valve	RO-II Conductivity Process Valve	RO-II Reject Valve	EDI Unit	EDI Reject Valve	PW tank Inlet Valve	Recirculation Valve					
NA	Emptying Cycle	If level is above the Sanitization level	NA	NA	NA	NA	X	/	X	/	X	X	X	X	X	X	X	X	X	X	X	X	NA	As soon as the Sanitization mode is initiated from the HMI, system will first check for the High level of MPT tank. If MPT tank level is above sanitization level, then system will start the Emptying cycle during which system will start the RO-1 High Pressure Pump (at 12.5 Hz) and will open the RO-1 Conductivity Dump Valve, so as to drain the excess water from the tank. During this instance, system will give an indication on the HMI stating "Emptying Cycle". As soon as Sanit level is achieved, System will trip RO-1 High Pressure Pump and close the RO-1 Conductivity Dump Valve .
NA	Heating Cycle	If Sanitization Level is achieved	0 to 150	0 to 999.9	degreeC	###.#	/	/	X	X	/	/	X	/	X	X	X	X	/	X	X	NA	As soon as sanitization level (High level) is achieved by means of Filling cycle or by Emptying cycle, System will start Electrical Heater, RO-1 high pressure pump, start RO-2 high pressure pump, Open RO-1 conductivity Process valve, Open RO-2 Conductivity Process Valve and Open PW recirculation Valve. During this period EDI Unit, RO-1 Conductivity dump valve,RO-2 Conductivity Dump valve & PW Inlet valve shall remain Close / OFF. During this instance, system will give an indication on the HMI stating "Heating Cycle". During Heating cycle, Electrical Heater will controlled with respect to the heating set-point of supply line temperature transmitter. If supply line temperature is below the Heating set-point , then Electrical Heater shall become ON and if the supply line temperature is above the Heating set-point, then Electrical Heater shall become OFF. During controlling the Electrical Heater, system shall consider the temperature hysteresis set point, so as to avoid the On-Off fluctuations of the Electrical Heater . System will give an indication on the HMI stating "Heating Cycle"	
117.1TT-02	Temperature Transmitter at supply line	RO-1 High pressure pump & RO-2 High pressure pump controlled with respect to the control set-point added in the HMI in Hz at two temperature variants	0 to 150	0 to 999.9	degreeC	###.#	/	/	X	X	/	/	X	/	X	X	X	X	/	X	X	NA	RO-1 High pressure pump & RO-2 High pressure pump shall be controlled with respect to the control set-point added in the HMI in Hz at two temperature variants. A) When supply line temperature is below 45° C. B) When supply line temperature is above or equal to 45° C.	
117.1TT-02	Temperature Transmitter at supply line	High	0 to 150	0 to 999.9	degreeC	###.#	X	/	X	X	/	/	X	/	X	X	X	X	/	/	/	"117.1TT-02 High"	During Sanitization hold cycle, in case if the supply line temperature rises above its High set point, then the system will tripped the heater and will initiate an alarm. Thenafter when this supply line temperature falls below its Heating set-point, then the system will start the heater (Provided that return line temperature is below its control set-point). System will acknowledge the alarm of High temperature of supply.	
119.1TT-01	Temperature Transmitter at Return line	Control Set Point is achieved	0 to 150	0 to 999.9	degreeC	###.#	/	/	X	X	/	/	X	/	X	X	X	X	/	X	X	NA	Once the Return line temperature control set point is achieved, then heater will control with respect to the control set-point of return line temperature. If the return line temperature is below the Control set-point, then the heater will get Start and If the return line temperature is above the Control set-point, then the heater shall trip. During controlling the heater, system will consider the temperature hysteresis set point, so as to avoid the On-Off fluctuations of the heater. Since the return line temperature control set point is achieved, system will start the Sanitization Hold timer and Cumulative timer.	
NA	Sanitization Hold/Cumulative Timer from HMI	Return Line temperature achieved its control set point, start sanitization hold/cumulative Timer	NA	0 to 999	minute	###	/	/	X	X	/	/	X	/	X	X	X	X	/	X	X	Only Text "Sanit. Hold Cycle Started"	Sanitization Hold timer and Cumulative timer will be settable from the HMI having the range from 0 min to 999 min. System will give an alarm (Only text) and indication on HMI stating "Sanit. Hold Timer Started"	
NA	Sanitization Hold Timer	Sanitization hold timer is completed	NA	0 to 999	minute	###	X	/	X	X	/	/	X	/	X	X	X	X	/	X	X	"Sanit. Hold Cycle Completed"	Once the sanitization hold timer is completed, system will give an indication on the HMI and on the Alarm page (Only Text)	
NA	Cooling Cycle	Sanitization Hold Timer is completed/Sanitization is Aborted due to any reason	NA	NA	NA	NA	X	/	X	X	/	/	X	/	X	X	X	X	/	X	X	Only Indication on HMI "Cooling Cycle"	As soon as the Sanitization Hold timer is completed or if the Sanitization cycle is aborted due to any reason, system will trip the heater and will start the cooling cycle by starting Water Demand Signal, start Antiscalant dosing pump, start SMBS dosing pump and will open ORP dump valve for a delay of 30 secs. after delay of 30 secs system will check for ORP value. If in case ORP becomes unhealthy, then system will execute the control for ORP and if in case, ORP becomes healthy, only then system will close ORP dump valve and will open MPT Tank Inlet valve, Start NaOH Dosing Pump,. During this instance, system will give an indication on the HMI stating "Cooling Cycle".	
NA	Draining Cycle	RO Feedtank level becomes High-High level or if the supply line temperature achieves its cooling set-points	NA	NA	NA	NA	X	/	X	/	X	X	X	X	X	X	X	X	X	X	X	Only Indication on HMI "Draining Cycle"	As soon as level of MPT tank becomes high-high or supply line temperature achieved its cooling set point, system will trip RO-2 High Pressure Pump, Close RO-1 Conductivity Process Valve, Open RO-1 Conductivity Dump Valve, and will start the draining cycle. During this instance, system will give an indication on the HMI stating "Draining Cycle".	
NA	Sanitization Over	When the level at Level Switch of MPT tank becomes Low-low level	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"Sanitization Over"	During Draining cycle, when MPT tank level becomes low-low level system will trip RO-1 High Pressure Pump, Close RO-1 Conductivity Dump Valve and will initiate an alarm "Sanitization Over".	
NA	Sanitization Abort	Sanitization Aborted Due to Sanitization Temperature becomes Low	0 to 150	0 to 999.9	degreeC	###.#	/	/	X	X	/	/	X	/	X	X	X	X	/	/	X	"119.1TT-01 Low"	During Sanitization hold cycle, in case if return line temperature falls below the Reset set-point, then system will give an alarm (Only Fault Lamp) and will reset the Sanitization hold timer. Cumulative timer will remain ON. Sanitization hold timer then shall be started only when return line temperature control set-point is achieved again. When the control set-point is achieved, the sanitization Temperature Low alarm shall be acknowledged.	

**CONTROL PHILOSOPHY FOR GLACIER SKID**

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PROJECT :	PW GENERATION SYSTEM (GLACIER SKID)																						
DOC.NO :																							
REF.DWG :																							
Tag	Instrument/Equipment /Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (Of HMI)	Unit	Resolution	117.1EH-01	117.1P-01	117.1AV-01	117.1AV-02	117.1AV-03	119.1P-01	119.1AV-03	119.1AV-02	119.1AV-01	119.1EDI-01	119.1AV-06	119.1AV-04	119.1AV-05	Fault lamp	Hooter	Alarm and Message	DESCRIPTION
							Electrcal Heater	RO-I High Pressure Pump	RO-I Reject Valve	RO-I Conductivity Dump Valve	RO-I Conductivity Process Valve	RO-II High Pressure Pump	RO-II Conductivity Dump Valve	RO-II Conductivity Process Valve	RO-II Reject Valve	EDI Unit	EDI Reject Valve	PW tank Inlet Valve	Recirculation Valve				
NA	Sanitization Abort	During Sanitization hold cycle, In case if the Cumulative timer is completed and within Cumulative timer, sanitization hold timer is not completed	NA	0 to 999	minute	###	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"Cumulative Timer Over" "Sanitization Aborted" "Sanit. Abort Cycle Over"	In case if the Cumulative timer is completed and within Cumulative timer if sanitization hold timer is not completed, then the system will abort the sanitization cycle and will give an alarm "Cumulative Timer Over", "Sanitization Aborted". Heater shall remain off from here. System will then start the cooling cycle. After cooling cycle is completed system will perform the draining cycle and when the level of MPT tank becomes Low-low Level, system will trip the RO-1 High Pressure pump, close the RO-1 Conductivity Dump Valve and will give an alarm "Sanit. Abort Cycle Over"
119.1TT-01	Sanitization Abort	During Sanit Hold/Recirculation cycle if return line temp. becomes High	0 to 150	0 to 999.9	degreeC	###.#	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"119.1TT-01 High" "Sanitization Aborted" "Sanit. Abort Cycle Over"	During Sanitization hold cycle, High temperature at return line will abort the sanitization cycle and will give an alarm "Sanit. Temperature High", "Sanitization Aborted". Heater shall remain off from here. System will then start the cooling cycle. After cooling cycle is completed system will perform the draining cycle and when level of MPT Tank becomes Low-low Level, system will trip the RO-1 High Pressure pump, close the RO-1 Conductivity Dump Valve and will give an alarm "Sanit. Abort Cycle Over"
117.1PS-01	Sanitization Abort	During Sanit Hold/Recirculation cycle, if pressure becomes High, Sanitization Abort	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"117.1PS-01 High" " Sanitization Aborted" "Sanit. Abort Cycle Over"	During Heating cycle/Sanitization hold cycle, whenever RO-1 High pressure pump is running and in case if pump discharge pressure becomes high (Remains High for 3 secs), System will initiate an alarm "117.1PS-01 High". "Sanitization Aborted". Electrical Heater shall remain off from here. System will then start the cooling cycle. After cooling cycle system will trip Ro-2 High Pressure pump and will perform draining cycle and when the level of MPT tank becomes Low-low Level, system will trip the RO-1 High Pressure pump, Close RO-1 Conductivity drain Valve and will initiate an alarm (Fault Lamp & Hooter) "Sanit. Abort Cycle Over"
119.1PS-01	Sanitization Abort	During Sanit Hold/Recirculation cycle, if pressure becomes High, Sanitization Abort	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"119.1PS-01 High" " Sanitization Aborted" "Sanit. Abort Cycle Over"	During Heating cycle/Sanitization hold cycle, whenever RO-2 High pressure pump is running and in case if pump discharge pressure becomes high (Remains High for 3 secs), System will initiate an alarm "119.1PS-01 High". "Sanitization Aborted". Electrical Heater shall remain off from here. System will then start the cooling cycle. After cooling cycle system will trip Ro-2 High Pressure Pump and will perform draining cycle and when the level of MPT tank becomes Low-low Level, system will trip the RO-2 High Pressure Pump, Close RO-1 Conductivity drain Valve and will initiate an alarm (Fault Lamp & Hooter) "Sanit. Abort Cycle Over"
117.1LS-01	Magnetic Float Type Level Switch (of MPT Tank) / Sanitization Abort	During Sanit Hold/Recirculation cycle, level of MPT tank becomes Low-Low Level	NA	NA	NA	NA	X	X	X	X	X	X	X	X	X	X	X	X	X	/	/	"117.1LS-01 Low-Low" "Sanitization Aborted" "RO-EDI Sanit. Abort Cycle Over"	During Heating cycle / Sanitization hold cycle, When level of MPT tank becomes Low-low level, then system will trip RO-1 high pressure pump, RO-2 high pressure pump, Close Respective Valves and will initiate an alarm. Heater shall remain off from here.

RO		Client Approval			
Rev. no.	Date	Released for	Prepared By	Checked By	Approved By



## CONTROL PHILOSOPHY FOR PW DISTRIBUTION SYSTEM

CLIENT :	
CONSULTANT	
PROJECT :	PW DISTRIBUTION SYSTEM
DOC.NO :	
REF. P&ID :	

Tag	Instrument/ Equipment/ Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (In HMI)	UNIT	Resolu-tion	305.1F- 01	305.1AV -01	351.1P- 01 / 02	351.1UV -01	351.1AV- 01	PW Sanit. Signal	Fault lamp	Hooter	Alarm and Message	DISCRIPTION
							Electrica l Vent Filter	Steam Valve	Distribut ion Pump	UV System	Return Line Flow Diverter Valve	Potential Free Contact				

Purified Water Distribution system will have Three operating modes. These are Manual Mode, Auto Mode and Sanitization Mode. These modes are selectable from HMI and at a time only one mode can be executed. To select the Manual mode, user has to select the Manual mode button from the HMI. To select the Auto mode, user has to select the Auto mode button from the HMI and To select the Sanitization mode, user has to select the Sanitization mode button from the HMI. If user has selected the Manual mode, then Auto mode selection button and Sanitization mode selection button will become disable and will become enable only when Manual mode button is de- selected. If user has selected the Auto mode, then Manual mode selection button and Sanitization mode selection button will become disable and will become enable only when Auto mode button is de-selected. If user has selected the Sanitization mode, then Auto mode selection button and Manual mode selection button will become disable and will become enable only when Sanitization mode button is de-selected. During Manual mode, system will give an indication on the HMI stating "Manual Mode". During Auto mode, system will give an indication on the HMI stating "Auto Mode". During Sanitization Mode, system will give an indication on the HMI stating "Sanitization Mode".

**Special Conditions:**

- 1) During Manual Mode, Logic of Steam Valve will remain enable.
- 2) During Manual Mode, Logic of low-low level at LT will remain enable i.e. whene level at LT becomes low-low, system will not start the Distribution pump manually
- 3) During Sanitization mode, Logic of Return Line conductivity shall remain disable
- 4) Distrubition pump shall be selectable from HMI. When any one of the pump is running, pump selection button shall remain disable
- 5) System in Auto / Manual Mode, Light Source 305.1LGS-01 can be ON/ OFF from HMI.

### PW DISTIBUTION MANUAL MODE

AFR-PSL	At Air Line	Low	NA	NA	NA	NA	X	X	X	X	X	X	/	/	"Air Pressure Low"	In case if the Air pressure switch installed at Air Filter regulator unit becomes low, then system will stop or turn Off all the field devices and will give an alarm . Thenafter when the Air Pressure switch becomes healthy, then the system will not switch On the field devices. User has to again press the particular field devices icons in order to start or turn it On
Emergency Switch	Emergency Stop	Emergency Switch Pressed	NA	NA	NA	NA	X	X	X	X	X	X	/	/	"Emergency Switch Pressed"	In case if the user presses the Emergency switch button from the panel, then system will stop or turn Off all the field devices and will initiate an alarm (Fault Lamp & Hooter). Thenafter when the user releases the Emergency switch button from the panel, then the system will not switch On the field devices. User has to again press the particular field devices icons in order to start or turn it On
Power	In Control Panel	Power Fails	NA	NA	NA	NA	X	X	X	X	X	X	X	X	NA	In case if there is a power failure then the system will stop or turn Off all the field devices. When the Power resumes back, system will not switch On the field devices. User has to again press the particular field device icon in order to start or turn it On

### PW DISTIBUTION AUTO MODE

AFR-PSL	At Air Line	Low	NA	NA	NA	NA	X	X	X	X	X	X	/	/	"Air Presure Low"	In case if the Air pressure switch installed at Air Filter regulator unit becomes low, then system will stop or turn Off all the field devices and will give an alarm . Thenafter when the Air Pressure switch becomes healthy, then the system after a delay of 30 Sec.will restart automatically.
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## CONTROL PHILOSOPHY FOR PW DISTRIBUTION SYSTEM

CLIENT :																
CONSULTANT																
PROJECT : PW DISTRIBUTION SYSTEM																
DOC.NO :																
REF. P&ID :																
Tag	Instrument/ Equipment/ Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (In HMI)	UNIT	Resolu-tion	305.1F- 01	305.1AV -01	351.1P- 01 / 02	351.1UV -01	351.1AV- 01	PW Sanit. Signal	Fault lamp	Hooter	Alarm and Message	DISCRIPTION
							Electrica l Vent Filter	Steam Valve	Distribut ion Pump	UV System	Return Line Flow Diverter Valve	Potential Free Contact				
Emergency Switch	Emergency Stop	Emergency Switch Pressed	NA	NA	NA	NA	X	X	X	X	X	X	/	/	"Emergency Switch Pressed"	In case if the user has pressed the Emergency switch button from the panel, then system will stop or turn Off all the field devices and will initiate an alarm (Fault Lamp & Hooter). Thenafter when user has released the Emergency switch button from panel, system after a delay of 30 secs will restart automatically
Power	Control Panel Power	Power Fails	NA	NA	NA	NA	X	X	X	X	X	X	X	X	NA	In case if there is a power failure then the system will stop or turn Off all the field devices. When the Power resumes back, then the system after a delay of 30 secs will restart automatically.
305.1LT-01	Capacitance Level Transmitter	Low-Low	0 to 5000	0 to 9999	Ltrs	####	/	X	X	X	X	X	/	/	"305.1LT-01 Low-Low"	Low-low level at PW Tank will trip the Distribution pump and after a delay of 30 secs will trip the UV. System will initiate an alarm (Fault Lamp & Hooter).
305.1LT-01	Capacitance Level Transmitter	Low	0 to 5000	0 to 9999	Ltrs	####	/	X	/	/	X	X	X	X	NA	Low level at PW Tank will restart the Distribution pump, restart the UV and will acknowledge the alarm of low-low level.
305.1TT-01	Tank Temperature transmitter	High	0 to 150	0 to 999.9	degreeC	###.#	/	X	/	/	X	X	/	/	"305.1TT-01 High"	High Tank Temperature (Remains high for 3 secs) will initiate an alarm (Fault Lamp & Hooter). When the Tank temperature falls below the high set-point minus the hysteresis set value for temperature, system will acknowledge the alarm of high tank temperature.
351.1CT-01	Conductivity Transmitter at Return Line	High	0 to 10	0 to 99.99	µS/cm	###.##	/	X	/	/	X	X	/	X	"351.1CT-01 High"	When Distribution pump is running and in case if Return line conductivity becomes High (Remains High for 3 secs) then the system will initiate an alarm (Only Fault Lamp)
351.1CT-01	Conductivity Transmitter at Return Line	High-High	0 to 10	0 to 99.99	µS/cm	###.##	/	X	/	/	/	X	/	/	"351.1CT-01 High- High"	When Distribution pump is running and in case if Return line conductivity becomes High-High, then the system will give an alarm (Fault Lamp & Hooter). System will open Return line Dump Port and will start the Quality Validation timer which shall be settable from the HMI having the range from 0 secs to 999 secs. During this period Distribution pump shall run with respect to the control set point of flow at FT.
351.1CT-01	Quality Validation Timer from HMI	Within Quality Validation timer if CT falls below high set point	NA	0 to 999	secs	###	/	X	/	/	X	X	X	X	NA	Within this Quality Validation timer, in case if conductivity falls below High Set-point, then the system will reset the Quality Validation timer, close the Dump Port and will acknowledge the CT High and High-High alarm. Distribution pump shall run with respect to the control set point of flow at FT.

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Tag	Instrument/ Equipment/ Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (In HMI)	UNIT	Resolu-tion	305.1F-01	305.1AV-01	351.1P-01 / 02	351.1UV-01	351.1AV-01	PW Sanit. Signal	Fault lamp	Hooter	Alarm and Message	DISCRIPTION
							Electrical Vent Filter	Steam Valve	Distribution Pump	UV System	Return Line Flow Diverter Valve	Potential Free Contact				
351.1CT-01	Quality Validation Timer from HMI	Quality Validation timer is completed and CT remains above the high set point	NA	0 to 999	secs	###	/	X	X	X	X	X	/	/	"351.1CT-01 Validation Timer Over"	In case if the Quality Validation timer is completed and still if conductivity at CT is above the high set-point, then the system will trip the distribution pump, after a delay of 30 secs will trip the UV and will close the Return line Dump Port and will initiate an alarm (Fault lamp & Hooter). User has to press System reset button from HMI. Once System reset button is pressed it will resartt automatically.
351.1FT-01	Flow Transmitter	Pump speed will increase or decrease wrt to FT	0 to 15	0 to 99.99	m3/hr	###.##	/	X	/	/	X	X	X	X	NA	Distribution pump shall be controlled with respect the control set-point of the flow at FT. When the flow at FT is above the control set-point then the VFD for Distribution pump shall ramp down towards 0 Hz and when the flow at FT is below the control set-point then the VFD for Distribution pump shall ramp up towards 50 Hz.
351.1FT-01	Flow Transmitter	Low	0 to 15	0 to 99.99	m3/hr	###.##	/	X	/	/	X	X	/	/	"351.1 FT-01 Low"	When Distribution pump is running and in case if flow at FT becomes Low (Remains Low for 90 secs), system will initiate an alarm (Fault Lamp & Hooter). When flow at FT rises above the low-set-point plus the flow hysteresis set value then the alarm for FT Low shall be acknowledged
305.1RD-01	Rupture Disk	Burst	NA	NA	NA	NA	/	X	X	X	X	X	/	/	"305.1RD-01 Burst"	During Auto Mode in case PLC does not sense signal coming from Rupture Disc, then the system will trip the distribution pump, after a delay of 30 secs will trip the UV and will close respective valve and will initiate an alarm (Fault lamp & Hooter). User has to press System reset button from HMI. Once System reset button is pressed it will resartt automatically.
351.1IM-01	UV Intensity Meter	UV Intensity Low	0 to 500	0 to 999.9	W/M2	###.##	/	X	/	/	X	X	/	/	"351.1 IM-01 Low"	When UV is ON, system after a delay of 60 secs will check for the UV Intensity. In case after 60 secs if the UV intensity at UV is low then the system will initiate an alarm (Fault Lamp & Hooter). The alarm shall be acknowledged when the UV intensity becomes healthy.
351.1TT-01	Return line Temperature Transmitter	Data Logging	0 to 150	0 to 999.9	degreeC	###.##	/	X	/	/	X	X	X	X	NA	Return Line Temperature shall be used only for data logging
PW DISTIBUTION SANITIZATION MODE																
AfR-PSL	At Air Line	Low	NA	NA	NA	NA	X	X	X	X	X	/	/	/	"Air Pressure Low"	In case if the Air pressure switch installed at Air Filter regulator unit becomes low, then system will stop or turn Off all the field devices and will give an alarm . Thenafter when the Air Pressure switch becomes healthy, then the system after a delay of 30 Sec.will restart automatically.

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							Electrical Vent Filter	Steam Valve	Distribution Pump	UV System	Return Line Flow Diverter Valve	Potential Free Contact				
Emergency Switch	Emergency Stop	Emergency Switch Pressed	NA	NA	NA	NA	X	X	X	X	X	/	/	/	"Emergency Switch Pressed"	In case if the user has pressed the Emergency switch button from the panel, then system will stop or turn Off all the field devices and will initiate an alarm (Fault Lamp & Hooter). Thenafter when user has released the Emergency switch button from panel, system after a delay of 30 secs will restart automatically
Power	Control Panel Power	Power Fails	NA	NA	NA	NA	X	X	X	X	X	/	X	X	NA	In case if there is a power failure then the system will stop or turn Off all the field devices. When the Power resumes back, then the system after a delay of 30 secs will restart automatically.
NA	Filling Cycle	If Sanitization Level Not Achieved	0 to 5000	0 to 9999	Ltrs	####	/	X	X	X	X	/	X	X	Only Indication on HMI "Filling Cycle"	If level in the PW water storage tank is below the sanitization level, then the system will start the Filling cycle during which System will Open PW tank inlet Valve. Doing so level in the Purified water storage tank will increase and system will achieve the sanitization level. System will give an indication on the HMI stating "Filling Cycle".
NA	Emptying Cycle	If Level is above the Sanitization Level	0 to 5000	0 to 9999	Ltrs	####	/	X	/	X	/	/	X	X	Only Indication on HMI "Emptying Cycle"	If level in the PW water storage tank is above the sanitization level, then system will start the Emptying cycle. During this period, System will start Distribution pumps and will open Return line Dump Port so as to drain the extra water from the tank. Distribution pump shall run with respect to the control set point of flow at FT . System will give an indication on the HMI stating "Emptying Cycle".
NA	Heating Cycle	If Sanitization Level is Achieved	0 to 150	0 to 999.9	degreeC	###.#	/	/	/	X	X	/	X	X	Only Indication on HMI "Heating Cycle"	As soon as sanitization level is achieved by means of the Filling cycle or Emptying cycle, system will start the heating cycle by starting the Distribution pumps and opening the steam valve. System will give an indication on the HMI stating "Heating Cycle"
351.1 FT-01	Flow Transmitter	Pump speed will increase or decrease wrt to FT	0 to 15	0 to 99.99	m3/hr	###.##	/	/	/	X	X	/	X	X	NA	Distribution pump shall be controlled with respect the control set-point of the flow at FT. When the flow at FT is above the control set-point then the VFD for Distribution pump shall ramp down towards 0 Hz and when the flow at FT is below the control set-point then the VFD for Distribution pump shall ramp up towards 50 Hz.
305.1TT-01	Tank Temperature transmitter	High	0 to 150	0 to 999.9	degreeC	###.#	/	X	/	X	X	/	/	/	"305.1 TT-01 High"	During Heating / Sanitization Hold Cycle, High Tank Temperature will initiate an alarm (Fault Lamp & Hooter) and will close the steam valve. When the Tank temperature falls below the high set-point minus the hysteresis set value for temperature then the system will acknowledge the Tank temperature High Alarm. System will open the steam valve only in case if the return line temperature is not achieved its control set point

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Tag	Instrument/ Equipment/ Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (In HMI)	UNIT	Resolu-tion	305.1F-01	305.1AV-01	351.1P-01 / 02	351.1UV-01	351.1AV-01	PW Sanit. Signal	Fault lamp	Hooter	Alarm and Message	DISCRIPTION
							Electrical Vent Filter	Steam Valve	Distribution Pump	UV System	Return Line Flow Diverter Valve	Potential Free Contact				
351.1TT-01	Return Line Temperature transmitter	Return Line temperature of achieves its control set point	0 to 150	0 to 999.9	degreeC	###.#	/	/	/	X	X	/	X	X	NA	Steam Valve shall be controlled with respect to the control set-point of return line temperature. If return line temperature is below the control set-point then Steam Valve shall become ON and if return line temperature is above the control set-point then the Steam Valve shall become OFF. During controlling, system shall consider the temperature hysteresis so as to avoid the ON-OFF fluctuations of the steam valve. As soon as the return line temperatuer control set-point is achieved, system will close the steam valve and will start the Sanitization Hold timer and Cumulative timer.
NA	Sanitization Hold/ Cumulative Timer from HMI	Return Line temperature achieved its control set point, start sanitization hold/cumulative Timer	NA	0 to 999	minute	###	/	/	/	X	X	/	X	X	Only Text "PW Dist. Sanit. Hold Timer Started"	Sanitization Hold timer and Cumulative timers shall be settable from the HMI having range from 0 min to 999 min. System will give an indication on the HMI and on the Alarm page (Only Text). Steam Valve shall be controlled with respect to the control set-point of return line temperature.
NA	Sanitization Hold Timer from HMI	Sanitization hold timer is completed	NA	0 to 999	minute	###	/	X	/	X	X	/	X	X	Only Text "PW Dist. Sanitization Hold timer Over"	Once the sanitization hold timer is completed, system will give an indication on the HMI and on the Alarm page (Only Text)
NA	Cooling Cycle	Sanitization Hold Timer is completed/Sanitization is Aborted	NA	NA	NA	NA	/	X	/	X	X	/	X	X	Only Indication on HMI "Cooling Cycle"	As soon as the Sanitization Hold timer is completed or if the Sanitization cycle is aborted due to any reason, system will close the Steam valve, Open PW tank Inlet Valve and will start the Cooling cycle. During this instance, system will give an indication on the HMI stating "Cooling Cycle".
NA	Draining Cycle	Sanitization hold timer is completed/Sanitization aborted due to any reason	NA	NA	NA	NA	/	X	/	X	/	/	X	X	Only Indication on HMI "Draining Cycle"	As soon as Level at LT becomes High-High or Tank temperature achedived its cooling set point, system will stop the Cooling cycle & will Close the PW Tank Inlet Valve, and open the Return line Dump Port. During this instance, system will give an indication on HMI stating "Draining Cycle". During this period Distribution pump shall run with respect to the control set point of flow at FT
NA	Sanitization Over	When the level of PW tank at LT becomes Low-low level	NA	NA	NA	NA	X	X	X	X	X	X	/	/	"PW Dist. Sanitization Over"	When the level at PW Tank becomes Low-low level, system will trip Distribution Pump and will close Return line dump Port. System will initiate an alarm (Fault Lamp & Hooter).

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Tag	Instrument/ Equipment/ Type of Cycle	Condition	Full Scale Range (Of Instruments)	Full Scale Range (In HMI)	UNIT	Resolu-tion	305.1F-01	305.1AV-01	351.1P-01 / 02	351.1UV-01	351.1AV-01	PW Sanit. Signal	Fault lamp	Hooter	Alarm and Message	DISCRIPTION
							Electrical Vent Filter	Steam Valve	Distribution Pump	UV System	Return Line Flow Diverter Valve	Potential Free Contact				
351.1TT-01	Temperature Transmitter at return line	During Sanit Hold/Recirculation cycle, temp. falls below RSP - Sanitization Abort	0 to 150	0 to 999.9	degreeC	###.#	✓	✓	✓	X	X	✓	✓	✓	"351.1 TT-01 Low" "Cumulative Timer Over" "PW Dist. Sanitization Aborted" "PW Dist. Sanit. Abort Cycle Over"	During Sanitization hold cycle, in case if the Return line temperature falls below the Reset set-point , then the system will give an alarm (Only Hooter) and will reset the Sanitization hold timer. Cumulative timer will remain ON. Sanitization hold timer then shall be started only when the return line temperature control set-point is achieved again. When the control set-point is achieved, then sanitization Temperature Low alarm shall be acknowledged. In case if the Cumulative timer is completed and within Cumulative timer if sanitization hold timer is not completed, then the system will abort the sanitization cycle and will initiate an alarm (Fault Lamp & Hooter) stating "Cumulative Timer Over", "Sanitization Aborted". Steam Valve shall remain closed from here. System will then start the cooling cycle. After cooling cycle is completed system will perform the draining cycle and when the level of PW Dist. tank becomes Low-low Level, system will trip the Distribution pump, close the Return line Dump Port and will initiate an alarm (Fault Lamp & Hooter) stating "Sanit. Abort Cycle Over"
351.1TT-01	Temperature Transmitter at return line	During Sanit Hold/Recirculation cycle if temp. becomes High, Sanitization Abort	0 to 150	0 to 999.9	degreeC	###.#	X	X	X	X	X	X	✓	✓	"351.1 TT-01 High" "PW Dist. Sanitization Aborted" "PW Dist. Sanit. Abort Cycle Over"	During Sanitization hold cycle, High temperature at return line will abort the sanitization cycle and will initiate an alarm (Fault Lamp & Hooter) stating "Sanit. Temperature High", "Sanitization Aborted". Steam Valve shall remain closed from here. System will then start the cooling cycle. After cooling cycle is completed system will perform the draining cycle and when the level of PW Dist. tank becomes Low-low Level, system will trip the Distribution pump, close the Return line Dump Port and will initiate an alarm (Fault Lamp & Hooter) stating "Sanit. Abort Cycle Over"
351.1FT-01	Flow Transmitter	During Heating cycle/Sanitization hold cycle, FT becomes Low Sanitization Abort	0 to 15	0 to 99.99	m3/hr	##.##	X	X	X	X	X	X	✓	✓	"351.1 FT-01 Low" "PW Dist. Sanitization Aborted" "PW Dist. Sanit. Abort Cycle Over"	During Heating cycle / Sanitization hold cycle, Low flow at FT (Remains Low for 90 secs) will abort the sanitization cycle and will initiate an alarm "FT Low", "Sanitization Aborted. Steam Valve shall remain closed from here. System will then start the cooling cycle. After cooling cycle is completed system will perform the draining cycle and when the level of PW Dist. tank becomes Low-low Level, system will trip the Distribution pump, close Return line Dump Port and will initiate an alarm (Fault Lamp & Hooter) stating "Sanit. Abort Cycle Over"

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							Electrica l Vent Filter	Steam Valve	Distribut ion Pump	UV System	Return Line Flow Diverter Valve	Potential Free Contact					
305.1LT-01	Capacitance Level Transmitter	During Heating cycle/Sanitization hold cycle, LT level becomes Low-Low	0 to 5000	0 to 9999	Ltrs	####	X	X	X	X	X	∕	∕	∕	"305.1 LT-01 Low- Low" "PW Dist. Sanitization Aborted" "PW Dist. Sanit. Abort Cycle Over"	During Heating cycle / Sanitization hold cycle, when the level at LT becomes Low-Low level then system will trip the Distribution pump and will abort the sanitization cycle and will initiate an alarm (Fault Lamp & Hooter) stating "LT Low-Low", "Sanitization Aborted", "Sanitization Abort Cycle Over". Steam valve will remain off	

R0		Client Approval		
Rev. no.	Date	Released for	Prepared By	Checked By
				Approved By