THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

Engineer's Seal

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CONTROL NARRATIVE

CHLORINE UPGRADES
MCPHILLIPS PUMPING STATION

City Document Number: 694715-0000-48ER-0002

Project: Chlorine Ventilation Upgrades at Regional Pumping Stations

Rev.	Description	Date	Created By	Checked By	Approved By
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1.0 OVERVIEW

This document is intended to provide a description of the Chlorine System upgrades for City of Winnipeg at McPhillips Pumping Station. It is written from a technical perspective and is intended to be read along with the associated Process & Instrument Diagram (P&ID) drawings and Automation Loop Drawings. The Contractor shall use this as a guide along with the Spec 23 09 33- Electric and Electronic Control System for HVAC to program the PLC. Any deviations from the information specified in the documents are permitted but shall be forwarded to the Contract Administrator for approval. This documents provides the major chlorine upgrades to be implemented in the PLC, but it should be understood by the Contractor additional programming and/or modifications may be required to provide a functioning system. The Contractor is responsible to provide a fully functioning PLC and HMI system and any programming and HMI updates discovered during design and commissioning that are required is the responsibility of the Contractor as part of the original scope.

1.1 Associated Documents

The associated Automation drawings and Process and Instrumentation diagram drawings are listed below.

Drawing Number	Rev	Description
1-0640C-P0002-0001	03	Chlorine Cylinder Shutoff Valves
1-0640C-P0003-0001	00	HVAC System, Process and Instrumentation Diagram

1.2 Definitions

Abbreviation	Description
AI	Analog Input
AO	Analog Output
DI	Discrete Input
DO	Discrete Output
HMI	Human Machine Interface
I/O	Input / Output
MODBUS	Modbus Communication Protocol
P&IDs	Process & Instrumentation Diagrams
PLC	Programmable Logic Controller
RTU	Remote Terminal Unit
SCADA	Supervisory Control And Data Acquisition

2.0 GENERAL

2.1 Human Machine Interface

The SCADA HMI screen will be completed by the City of Winnipeg. The existing local HMI screen updates on the front door of existing HVAC Control Panel CP-M826 will be completed by the Contractor.

2.2 Program Language

Functional Blocks is to be used for all programming. Ladder logic will not be permitted.

2.3 Tagname Convention

Internal PLC/SCADA to utilize the tagging convention outlined in the City of Winnipeg – Water & Waste Department –Identification Standard for the tag naming convention.

2.4 Equipment and System General Requirements

2.4.1 I/O Signal Addresses

Refer to the McPhillips I/O List RIO-C806 for I/O signal addresses.

2.4.2 HMI Interface Points

Not all points between the Local HMI and SCADA are necessarily specified or listed under the HMI interface lists.

2.4.3 HMI Interface Type Codes

Code	Description
R	HMI Read
RA	HMI Read, Alarmed
R/W	HMI Read/Write
W	HMI Write
W1	HMI Write, PLC will immediately reset to 0

2.4.4 HMI Display Codes

HMI Display Code	Description
-	Do not show on the HMI screen
A	Alarm Banner
DD-T	Show as text on the data display.
GD-A	Show as an animation on the graphic display.
GD-G	Show as a graphic on the graphic display.
GD-L	Show as an indicator light on the graphic display.

GD-T	Show as text on the graphic display.
SW-T	Show as text on a settings window.
T	Trend

Example:

HMI Equipment Code and HMI Display Code

Tag	Type	Description	0 State	1 State	Display
YL-U010	DI	Pump Ready	Not Ready	Ready	GD-T GD-T
HS-U010-2A	DI	Pump Automatic Mode	Not Auto	Auto	GD-T
YLR-U010	DI	Pump is Running	Stopped	Running	GD-L GD-L

2.4.5 HMI Control Code

HMI Control Code	Description
-	Not Applicable
EF-PB	Show as a button on the equipment faceplate
EF-TE	Show as a text entry on the equipment faceplate
SW-CB	Show as a checkbox on the equipment settings window.
SW-TE	Show as a text entry on the equipment settings window.

2.5 Networked Signals

The field I/O signal are connected to PLC-M806 in the HVAC panel CP-M826 at each station. The I/O interfaces with the local HMI and SCADA via a modbus connection from the HVAC panel to a network switch in the main control panel. Modbus addresses will be configured for all internal PLC tags so that they can be read by the HMI.

2.6 Alarm Action

Alarm Action	Description
1	Immediate Callout
2	Callout during Normal Business Hours.
3	No Callout

3.0 EQUIPMENT AND SYSTEM REQUIREMENTS

3.1 Chlorine Ventilation State

The new HVAC equipment installed in the tonner storage and scale room will operate according to the ventilation state of the tonner room (storage and scale rooms). There are different states:

States: 0 – Unoccupied, No tonner storage or scale room chlorine leak
1 – Occupied , No tonner storage or scale room chlorine leak
2 – Tonner storage and scale room chlorine leak (Emergency)

3.1.1 PLC-I/O

None

3.1.2 HMI – PLC Interface

Discrete Status Bits:

Tagname	Description	Type	Display
C6001_CtrlMan	Control Mode Manual	R	GD-T
TonnerRoom_Unoccupied	Tonner Room Unoccupied	R	GD-T
TonnerRoom_Occupied	Tonner Room Occupied	R	GD-T
TonnerRoom_Chlorine_Leak	Tonner Room Chlorine Leak	R	GD-T

Discrete Control Bits:

Tagname	Description	Type	Display
C6001_CtrlAutoCmd	Set to Auto Control Mode	W1	GD -PB
C6001_CtrlManCmd	Set to Manual Control Mode	W1	GD -PB
C6001_CtrlManUnOcpd	Set to Manual Unoccupied State	W1	GD -PB
C6001_CtrlManlOocpd	Set to Manual Occupied State	W1	GD -PB
C6001_CtrlManEmerg	Set to Manual Emergency State	W1	GD -PB

3.1.3 Control Narrative

The supply, exhaust fans, and scrubber will follow the ventilation state to determine the operating requirements. In Auto mode, the state transitions will occur as indicated:

State 0 = TonnerRoom_Unoccupied = Occupied switch is turned OFF and no tonner storage room and scale room chlorine leak (NOT (HS-C6001 or HS-C6002) and NOT AAH_C6903-2 AND NOT AAH-C6903-3)

State 1= TonnerRoom_Occupied = Occupied Switch is turned ON and no tonner storage room and scale room chlorine leak ((HS-C6001 or HS-C6002) and NOT AAH_C6903-2 AND NOT AAH-C6903-3)

State 2= TonnerRoom_Chlorine_Leak = Tonner storage room and scale room chlorine detection (AAH_C6903-2 OR AAH_C6903-3) is activated.

3.2 Tonner Room Chlorine Scrubber SCBR-C670

Chlorine scrubber SCRB-C670 is utilized to remove chlorine vapour from the tonner room and scale room of the Chlorine Building during a chlorine leak. Implement all I/O as listed in the I/O list and on the P&IDs.

3.2.1 PLC-I/O

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Display
			Rack	Slot	Point				
SCBR-C670.Run	SCBR_C670_Run	Scrubber Running	0	2	1	DI	0 = Off 1 = Running	R	GD-T
SCBR-C670.Auto	SCBR_C670_Auto	Scrubber in Auto Mode	0	2	3	DI	0 = Hand 1 = Auto	R	GD-T
SCBR-C670.Rdy	SCBR_C670_Rdy	Scrubber Ready	0	2	2	DI	0 = Not Ready 1 = Ready	R	GD-T
SCBR-C670.Flt	SCBR_C670_Flt	Scrubber Fault	0	2	0	DI	0 = Ok 1 = Normal	R	GD-T
SCBR-C670.RunCmd	SCBR_C670_RunCmd	Scrubber Run Cmd	0	4	0	DO	0 = Stop 1 = Run	W	GD-PB
XV-C6701.ZSO	XV-C6701_ZSO	Scrubber Damper Fully Open	0	2	5	DI	0 = Not Fully Open 1 = Fully Open	R	GD-T
XV-C6701.ZSC	XV-C6701_ZSC	Scrubber Damper Closed	0	2	4	DI	0 = Not Closed 1 = Closed	R	GD-T

3.2.2 HMI - PLC Interface

The full HMI – PLC interface will include PLC I/O designated above.

Discrete Status Bits:

Tagname	Description	Type	Display
SCBR_C670_CtrlHand	Manual Control Mode	R	GD-T

Discrete Control Bits:

Tagname	Description	Type	Display
SCBR_C670_ReqHand	Set to Manual Control Mode	W	GD-PB
SCBR_C670_ManualStart	Manual Start Command in HMI	W	GD-PB
SCBR_C670_ManualStop	Manual Stop Command in HMI	W	GD-PB
SCBR_C670_ReqAuto	Set to Auto Control Mode	W	GD-PB

3.2.3 Alarms

Tagname	Description	Logic	Mask	Alarm Action	Reset	Display
SCBR_C670_Flt	Scrubber Fault	SCBR_C670_Flt =1	N/A	2	Manual	GD-T, A

3.2.4 Control Narrative

- State 0 (TonnerRoom_Unoccupied) = Scrubber OFF
- State 1 (TonnerRoom_Occupied) = Scrubber OFF
- State 2 (TonnerRoom_Chlorine_Leak)= Scrubber ON

A chlorine leak in the chlorinator equipment room will not activate the scrubber.

3.3 Tonner Room Air Handling Unit AHU-C601

Chlorine make-up air unit AHU-C601 is utilized to provide outdoor air to the tonner storage and scale area of the Chlorine Building during Emergency (chlorine leak). Implement all I/O as listed in the I/O list and on the P&IDs.

3.3.1 PLC-I/O

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Display
			Rack	Slot	Point				
AHU-C601.Run	AHU_C601_Run	AHU Running	0	2	30	DI	0 = Off 1 = Running	R	GD-T
AHU-C601.Auto	AHU_C601_Auto	AHU Auto	0	2	31	DI	0 = Hand 1 = Auto	R	GD-T
AHU-C601.Rdy	AHU_C601_Ready	AHU Ready	0	3	9	DI	0 = Not Ready **1 = Ready**	R	GD-T
AHU-C601.Flt	AHU_C601_Faulty	AHU Faulted	0	3	10	DI	0 = Normal **1 = Alarm**	R	GD-T
AHU-C601.RunCmd	AHU_C601_RunCmd	AHU RunCmd	0	4	1	DO	0 = Stop 1 = Run	W	GD-PB

3.3.2 HMI – PLC Interface

The full HMI – PLC interface will include PLC I/O designated above.

Discrete Status Bits:

Tagname	Description	Type	Display
AHU_C601_CtrlHand	Manual Control Mode	R	GD-T

Discrete Control Bits:

Tagname	Description	Type	Display
AHU_C601_ReqHand	Set to Manual Control Mode	W	GD-PB
AHU_C601_ManualStart	Manual Start Command in HMI	W	GD-PB
AHU_C601_ManualStop	Manual Stop Command in HMI	W	GD-PB
AHU_C601_ReqAuto	Set to Auto Control Mode	W	GD-PB

3.3.3 Control Narrative

- State 0 (TonnerRoom_Unoccupied) = AHU-C601 OFF
- State 1 (TonnerRoom_Occupied) = AHU-C601 OFF
- State 2 (TonnerRoom_Chlorine_Leak)= AHU-C601 ON. Speed controlled by PDT-G6012 to maintain negative pressure in Tonner Room. See Section 3.13

Operation of make-up air unit AHU-C601 and AHU-C602 should not run at the same time due to potential overloading on the distribution. Add delay on start to ensure no simultaneous running.

3.4 Tonner Room Air Handling Unit AHU-C602

Chlorine make-up air unit AHU-C602 is utilized to provide outdoor air to the tonner storage and scale area of the Chlorine Building during occupied state. Implement all I/O as listed in the I/O list and on the P&IDs.

3.4.1 PLC-I/O

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Display
			Rack	Slot	Point				
AHU-C602.Run*	AHU_C602_Run	AHU Running	0	3	0	DI	0 = Off 1 = Running	R	GD-T
AHU-C602.Auto	AHU_C602_Auto	AHU Auto	0	3	1	DI	0 = Hand 1 = Auto	R	GD-T
AHU-C601.Rdy	AHU_C602_Ready	AHU Ready	0	3	10	DI	0 = Not Ready **1 = Ready**	R	GD-T
AHU-C601.Flt	AHU_C602_Faulty	AHU Faulted	0	3	11	DI	0 = Normal **1 = Alarm**	R	GD-T
AHU-C602.RunCmd	AHU_C602_RunCmd	AHU RunCmd	0	4	5	DO	0 = Stop 1 = Run	W	GD-PB

3.4.2 HMI - PLC Interface

The full HMI – PLC interface will include PLC I/O designated above.

Discrete Status Bits:

Tagname	Description	Type	Display
AHU_C602_CtrlHand	Manual Control Mode	R	GD-T

Discrete Control Bits:

Tagname	Description	Type	Display
AHU_C602_ReqHand	Set to Manual Control Mode	W	GD-PB
AHU_C602_ManualStart	Manual Start Command in HMI	W	GD-PB
AHU_C602_ManualStop	Manual Stop Command in HMI	W	GD-PB
AHU_C602_ReqAuto	Set to Auto Control Mode	W	GD-PB

3.4.3 Control Narrative

- State 0 (TonnerRoom_Unoccupied) = AHU-C602 OFF
- State 1 (TonnerRoom_Occupied) = AHU-C602 ON, Speed set to 100%
- State 2 (TonnerRoom_Chlorine_Leak)= AHU-C602 OFF.

Operation of make-up air unit AHU-C601 and AHU-C602 should not run at the same time due to potential overloading on the distribution. Add delay on start to ensure no simultaneous running.

3.5 Flow Outdoor Air Flow Modulating Damper – FV-C6111

Damper FV-C6111 is utilized to control the amount of air flow into the Tonner Storage Room by either air handling units AHU-C601 or AHU-C602.

3.5.1 PLC I/O

Discrete:

None

Analog:

Tag	Tag	Type	Description	I/O Point	Range	Display
FV-C6011.CmdZ	FV_C6111_CmdZ	AO	Tonner Storage Room Outdoor Air Damper Position Command	Rack 0 Slot 7 Point 2	0-100 % Open	GD-TE
FV-C6011-.ZT	FV_C6111_1_ZT	AI	Outdoor Air Damper Position Feedback	Rack 0 Slot 5 Point 5	0-100 % Open	GD-T

3.5.2 HMI - PLC Interface

Discrete Status Bits:

Tagname	Description	Type	Display
FV_C6111_CtrlMan	Control Mode Manual	RW	GD-T

Discrete Control Bits:

Tagname	Description	Type	Control
FV_C6111_CtrlAutoCmd	Set to Auto Control Mode	W1	GD -PB
FV_C6111_CtrlManCmd	Set to Manual Control Mode	W1	GD -PB

Analog Set Points:

Tagname	Description	Range	Type	Control
FV_C6111_Manual	Manual Mode Output	0 – 100 %	RW	GD-TE

3.5.3 Internal Constants

Tagname	Description	Analog Range	Initial Setpoint	HMI Code	Display
FV_C6111_SP	Tonner Storage Room Outdoor Air Damper Setpoint Occupied State	0 – 100%	0% (fully closed)	RW	EF-TE

3.5.4 Control Narrative

- State 0 (TonnerRoom_Unoccupied) = FV-C6111.CmdZ = 0%(Fully Closed)
- State 1 (TonnerRoom_Occupied) = FV-C6111.CmdZ = 0%(Fully Closed)
- State 2 (TonnerRoom_Chlorine_Leak)= FV-C6111.CmdZ = FV_C6111_SP

Setpoint to be determined during comssioning.

3.6 Tonner Room Exhaust Fan EF-C640

Exhaust Fan EF-C640 is located in the tonner storage room. Implement all I/O as listed in the I/O list and on the P&IDs.

3.6.1 PLC-I/O

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Display
			Rack	Slot	Point				
EF-C640.Run	EF-C640 _Run	Exhaust Fan Running	0	2	12	DI	0 = Off 1 = Running	R	GD-T
EF-C640.Auto	EF-C640 _Auto	Exhaust Fan Running Auto Mode	0	2	13	DI	0 = Hand 1 = Auto	R	GD-T
EF-C640.Flt	EF-C640 _Flt	Exhaust Fan Running Fault	0	2	14	DI	0 = Alarm 1 = Normal	R	GD-T
EF-	EF_C640_ZSC	Exhaust	0	2	15	DI	0 = Not Closed	R	GD-T

C6401.ZSC		Damper Closed					1 = Closed		
EF-C640.Rdy	EF_C640_Ready	Exhaust Fan Ready	0	3	5	DI	0 = Not Ready 1 = Ready	R	GD-T
EF-C640.RunCmd	EF_C640_RunCmd	Exhaust Fan Running Run Cmd	0	4	2	DO	0 = Stop 1 = Run	W	GD-T

3.6.2 HMI - PLC Interface

The full HMI – PLC interface will include PLC I/O designated above.

Discrete Status Bits:

Tagname	Description	Type	Display
EF-C640_CtrlHand	Manual Control Mode	R	GD-T

Discrete Control Bits:

Tagname	Description	Type	Display
EF_C640_ReqHand	Set to Manual Control Mode	W	GD-PB
EF_C640_ManualStart	Manual Start Command in HMI	W	GD-PB
EF_C640_ManualStop	Manual Stop Command in HMI	W	GD-PB
EF_C640_ReqAuto	Set to Auto Control Mode	W	GD-PB

3.6.3 Control Narrative

- State 0 (TonnerRoom_Unoccupied) = EF-C640 OFF
- State 1 (TonnerRoom_Occupied) = EF-C640 ON
- State 2 (TonnerRoom_Chlorine_Leak)= EF-C640 OFF

EF-C641 run command will open damper XV-C6401.

3.7 Tonner Room Exhaust Fan EF-C641

Exhaust Fan EF-C641 is located in the tonner storage room. Implement all I/O as listed in the I/O list and on the P&IDs.

3.7.1 PLC-I/O

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Display
			Rack	Slot	Point				
EF-C641.Run	EF-C641 _Run	Exhaust Fan Running	0	2	23	DI	0 = Off 1 = Running	R	GD-T
EF-C641.Auto	EF-C641 _Auto	Exhaust Fan Running Auto	0	2	24	DI	0 = Hand 1 = Auto	R	GD-T

		Mode							
EF-C641.Flt	EF-C641 _Flt	Exhaust Fan Running Fault	0	2	25	DI	0 = Normal 1 = Alarm	R	GD-T
EF-C6411.ZSC	EF_C641_ZSC	Exhaust Damper Closed	0	2	26	DI	0 = Not Closed 1 = Closed	R	GD-T
EF-C641.Rdy	EF_C641_Ready	Exhaust Fan Ready	0	3	6	DI	0 = Not Ready 1 = Ready	R	GD-T
EF-C641.RunCmd	EF_C641_RunCmd	Exhaust Fan Running Run Cmd	0	4	3	DO	0 = Stop 1 = Run	W	GD-T

3.7.2 HMI - PLC Interface

The full HMI – PLC interface will include PLC I/O designated above.

Discrete Status Bits:

Tagname	Description	Type	Display
EF-C641_CtrlHand	Manual Control Mode	R	GD-T

Discrete Control Bits:

Tagname	Description	Type	Display
EF_C641_ReqHand	Set to Manual Control Mode	W	GD-PB
EF_C641_ManualStart	Manual Start Command in HMI	W	GD-PB
EF_C641_ManualStop	Manual Stop Command in HMI	W	GD-PB
EF_C641_ReqAuto	Set to Auto Control Mode	W	GD-PB

3.7.3 Control Narrative

- State 0 (TonnerRoom_Unoccupied) = EF-C641 ON
- State 1 (TonnerRoom_Occupied) = EF-C641 OFF
- State 2 (TonnerRoom_Chlorine_Leak)= EF-C641 OFF

EF-C641 run command will open damper XV-C6411.

3.8 Chlorinator Equipment Room Supply Fan SF-C630

Supply Fan SF-C630 is located in the chlorinator equipment room. Implement all I/O as listed in the I/O list and on the P&IDs

3.8.1 PLC-I/O

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Display
			Rack	Slot	Point				
SF-C630.Run	SF-C630 _Run	Supply Fan Running	0	2	6	DI	0 = Off 1 = Running	R	GD-T
SF-C630.Flt	SF-C630 _Flt	Supply Fan Fault	0	2	7	DI	0 = Off **1 = Fault**	R	GD-T
SF-C630.NotOn	SF-C630 _NotOn	Supply Fan Not On	0	2	8	DI	0 = On **1 = Off**	R	GD-T
SF-C630.Rdy	SF_C630_Ready	Supply Fan Ready	0	3	7	DI	0 = Not Ready **1 = Ready**	**R**	**GD-T**

3.8.2 Control Narrative

Supply Fan SF-C630 is always to be ON.

3.9 Chlorinator Equipment Room Exhaust Fan EF-C642

Exhaust Fan EF-C642 is located in the chlorinator equipment room. Implement all I/O as listed in the I/O list and on the P&IDs

3.9.1 PLC-I/O

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Display
			Rack	Slot	Point				
EF-C642.Run	EF-C642 _Run	Exhaust Fan Running	0	2	9	DI	0 = Off 1 = Running	R	GD-T
EF-C642.Flt	EF-C642 _Flt	Supply Fan Fault	0	2	10	DI	0 = Off **1 = Fault**	R	GD-T
EF-C642.NotOn	EF-C642 _NotOn	Supply Fan Not On	0	2	11	DI	0 = On **1 = Off**	R	GD-T
EF-C642.Rdy	EF_C642_Ready	Exhaust Fan Ready	0	3	8	DI	0 = Not Ready **1 = Ready**	**R**	**GD-T**

3.9.2 Control Narrative

Exhaust Fan EF-C642 is always to be ON.

3.10 Chlorinator Equipment Room Duct Heater HCE-C620

Duct heater HCE-C620 provided heated outside air to the Chlorinator Equipment Room. Implement all I/O as listed in the I/O list and on the P&IDs.

3.10.1 PLC-I/O

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Display
			Rack	Slot	Point				
HCE-C620.RunEnable	HCE_C620_CmdEnb	Duct Heater Command Enable	0	4	4	DO	0 = Stop 1 = Run	W	GD-T

3.10.2 Control Narrative

Duct Heater HCE-C620 shall enabled whenever:

- Outside air temperature (TT-M6401) is less 10°C (adjustable, TT-C6403.HEAT_SP). Note, that TT-M6401 is an existing signal currently monitored in the PLC.
- AND Supply Fan SF-C630 is Running

3.11 Chlorinator Room Air Temperature TT-C6041

Temperature transmitter in the chlorinator equipment room for monitoring and alarming.

3.11.1 PLC I/O

Discrete:

None

Analog:

Tag	Tag	Type	Description	I/O Point	Range	Display
TT-C6041	TT_C6041	AI	Chlorinator Equipment Room Air Temperature	Rack = 0 Slot = 5 Point = 2	0-100 °C	GD-T

3.11.2 PLC Generated Alarms

Tagname	Description	Logic	Alarm Action	Reset
TAH_C6041	Chlorinator Equipment Room Temperature High Alarm	TT_C6041 => TT_C6041.HI_SP for > 10 sec	2	Auto
TAL_C6041	Chlorinator Equipment Room Temperature Low Alarm	TT_C6041 <= TT_C6401.Lo_SP for > 10 sec	2	Auto

3.11.3 Internal Constants

Tagname	Description	Analog Range	Initial Setpoint	HMI Code	Display
TT_C6401.HI_SP	Chlorinator Equipment Room High Temp. Alarm Setpoint	0°C - 100°C	30°C	RW	EF-TE
TT_C6401.Lo_SP	Chlorinator Equipment Room Low Temp. Alarm Setpoint	0°C - 100°C	5°C	RW	EF-TE

3.11.4 Control Narrative

N/A

3.12 Air Temperature TT-C6042

Temperature transmitter in the tonner storage room for monitoring and alarming both storage and scale room areas.

3.12.1 PLC I/O

Discrete:

None

Analog:

Tag	PLC Tag	Type	Description	I/O Point	Range	Display
TT-C6042	TT_C6042	AI	Tonner Storage and Scale Room Air Temperature	Rack = 0 Slot = 5 Point = 3	0-100 °C	GD-T

3.12.2 PLC Generated Alarms

Tagname	Description	Logic	Alarm Action	Reset
TAH_C6042	Tonner Storage and Scale Room Temperature High Alarm	TT_ C6402=> TT_ C6402.HI_SP for > 10 sec	2	Auto
TAL_C6042	Tonner Storage and Scale Room Temperature Low Alarm	TT_ C6402 <= TT_ C6402.Lo_SP for > 10 sec	2	Auto

3.12.3 Internal Constants

Tagname	Description	Analog Range	Initial Setpoint	HMI Code	Display
TT_C6042.HI_SP	Tonner Storage and Scale Room High Temp. Alarm Setpoint	0°C - 100°C	30°C	RW	EF-TE
TT_ C6042.LO_SP	Tonner Storage and Scale Room Low Temp. Alarm Setpoint	0°C - 100°C	5°C	RW	EF-TE

3.12.4 Control Narrative

N/A

3.13 Tonner Storage and Scale Room Air Differential Pressure Transmitter PDT-C6012

Pressure differential transmitter, PDT-C6012, measures the difference in pressure between the chlorine tonner storage room and outside air.

3.13.1 PLC I/O

Discrete:

None

Analog:

Tag	PLC Tag	Type	Description	I/O Point	Range	Display
PDT-C6012	PDT_C6012	AI	Tonner Storage and Scale Room Air Differential Pressure	Rack = 0 Slot = 5 Point = 4	-250PA-250PA	GD-T

3.13.2 PLC Generated Alarms

Tagname	Description	Logic	Alarm Action	Reset
PAH_C6012	Differential Pressure Low Signal	PDT_ C6042=> PDT_ C6012.HI_SP for > 1 min	1	Auto
PAL_C64012	Differential Pressure High Signal	PDT_ C6402 <= PDT_ C6012.LO_SP for > 1 min	1	Auto

- Alarm associated with PDT-C6012 are only enabled during an Emergency State (Chlorine leak detection)

3.13.3 Internal Constants

Tagname	Description	Analog Range	Initial Setpoint	HMI Code	Display
PDT_C6012_SP	Pressure Differential Setpoint	-250 PA-250 PA	-2.1 PA	RW	EF-TE
PDT_C6012_SP.HI_SP	High Pressure. Alarm Setpoint	-250 PA-250 PA	0 PA	RW	EF-TE
PDT_C6012_SP.LO_SP	Low Pressure Alarm Setpoint	-250 PA-250 PA	-2.5 PA	RW	EF-TE

3.13.4 Control Narrative

When in auto control mode and there is a chlorine leak (TonnerRoom_Chlorine_Leak =1), the chlorine scrubber will run to eliminate the chlorine. The air handling unit shall run at a variable speed to maintain the pressure at the user defined negative setpoint. Utilize PID controller to control the adjustment to the speed of the fan AHU-C601, to achieve desired pressure setpoint at PDT-C6012. Setpoints to be confirmed during commissioning.

Enable PID controller during chlorine leak, (TonnerRoom_Chlorine_Leak =1),

PV: PDT_C6012

SP: PDT_C6012_SP

CV: AHU-C601.CmdS (Reverse Acting)

Disable PID Controller when there is no tonner room chlorine leak (TonnerRoom_Chlorine_Leak =0)

Tune the PID controller with low gain, and mostly integral action. Controller should be tuned to act slowly, to avoid significant speed changes upon minor pressure changes such as the temporary opening of a door.

3.14 Chlorine Gas Detector AIT-C6903-1, 2, and 3

There will be three chlorine gas detectors in the Chlorine Building. One detector is located in the chlorinator equipment room, one in the tonner storage room and one in the tonner scale room.

3.14.1 PLC-I/O

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Display
			Rack	Slot	Point				
AAH-C6903-1	AAH_C6903_1	Chlorinator Equipment Room Chlorine Gas Alarm	0	2	17	DI	0 = Alarm 1 = Normal	R	GD-T,A
YA-C6903-1	YA_C6903_1	Chlorinator Equipment Room Chlorine Gas Detector Controller Fault	0	2	16	DI	0 = Controller Fault 1 = Normal	R	GD-T,A
AAH-C6903-2	AAH_C6903_2	Tonner Scale Room Chlorine Gas Alarm	0	2	19	DI	0 = Alarm 1 = Normal	R	GD-T,A
YA-C6903-2	YA_C6903_2	Tonner Scale Room Gas	0	2	18	DI	0 = Controller Fault	R	GD-T,A

		Detector Controller Fault					1 = Normal		
AAH-C6903-3	AAH_C6903_3	Tonner Storage Room Chlorine Gas Alarm	0	2	21	DI	0 = Alarm 1 = Normal	R	GD-T,A
YA-C6903-3	YA_C6903_3	Tonner Storage Room Gas Detector Controller Fault	0	2	20	DI	0 = Controller Fault 1 = Normal	R	GD-T,A

Analog:

Tag	Type	Description	I/O Point	Range	Type	Display
AIT-C6903-1	AI	Chlorinator Equipment Room Free Chlorine Gas Level	Rack = 0 Slot = 5 Point = 0	0-50 ppm	R	GD-T
AIT-C6903-3	AI	Tonner Storage Room Chlorine Gas Level	Rack = 0 Slot = 5 Point = 1	0-50 ppm	R	GD-T

3.14.2 PLC Generated Alarms

Tagname	Description	Logic	Alarm Action	Reset
AAH_C6903_1	Chlorinator Equipment Room Chlorine Gas Alarm	AAH-C6903-1 =0	1	Auto
YA_C6903_1	Chlorinator Equipment Room Chlorine Gas Detector Controller Fault	YA-C6903-1 =0	2	Auto
AAH_C6903_2	Tonner Scale Room Chlorine Gas Alarm	AAH-C6903-2=0	1	Auto
YA_C6903_2	Tonner Scale Room Gas Detector Controller Fault	YA-C6903-1=0	2	Auto
AAH_C6903_3	Tonner Storage Room Chlorine Gas Alarm	AAH-C6903-3=0	1	Auto
YA_C6903_3	Tonner Storage Room Gas Detector Controller Fault	YA-C6903-3=0	2	Auto

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3.15 Miscellaneous

The following physical I/O is to be displayed on an HMI Alarms Table. Note that some of the I/O listed in the Sections above are also associated with the HMI Alarms Table and shall be displayed.

3.16 Physical I/O Alarms/Status

Physical Tag	PLC Tag	Description	I/O Point			I/O Type	Mapping Range States	HMI Code	Alarm Action	Display
			Rack	Slot	Point					
CP-C827.UPS01	CP_M827_UPS01	Remote I/O UPS Power Supply Alarm	0	2	27	DI	0 = Alarm 1 = Normal	R	2	GD-T, A
U-C5301.FS	U_C5301_FS	Eyewash/Shower Station U-C530 Flow alarm	0	2	28	DI	0 = Flow 1 = No Flow	R	1	GD-T,A
U-C5311.FS	U_C5311_FS	Eyewash/Shower Station U-C531 Flow alarm	0	2	29	DI	0 = Flow 1 = No Flow	R	1	GD-T,A
HS-C6001	HS_C6001	Chlorine Building Tonner Room Occupied	0	2	22	DI	0 = Not Occupied 1 = Occupied	R	3	GD-T
TSL-C6044	TSL_C6044	Tonner Storage Room Vestibule Temperature Low	0	3	2	DI	0= Normal 1= Alarm	R	2	GD-T,A
TC-C5302	TC_C5302	Tonner Storage Room Vestibule Drainage Pipe Heat Trace Alarm	0	3	3	DI	0= Normal 1= Alarm	R	2	GD-T,A
ZSC-C9001	ZSC_C9001	Tonner Storage Room Entrance door contact	0	3	3	DI	0= Door Closed 1= Door Open	R	3	GD-T,A