Process Operation & Maintenance Manual

for the Iqaluit Water Treatment Plant

Iqaluit, Nunavut

Year of Completion: 2004

Original Scope: Design and upgrade existing Water Treatment Plant to meet current and future demands.

This manual has been updated to include:

Date	Description of Change

Iqaluit Water Treatment Plant

Project History

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For The Iqaluit Water Treatment Plant

Iqaluit, Nunavut

Chapter 2

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Chapter 3
BACKGROUND AND DESIGN DATA

3.1 Background

3.1.1 Old Water Treatment Plant

The City of Iqualuit uses Geraldine Lake as its raw water source. Geraldine Lake water quality is characterized as good quality raw water, apart from algal blooms in the summer months.

The old treatment plant had a maximum design output of 1,296 m^3/day and a useful output of 1,050 m^3/day. The 2002 average day demands on the plant exceeded the useful output by approximately 20%. The capacity of the filters was the main limitation of the treatment process.

The old treatment plant comprised the following major components:

Lake Geraldine dam structure and valve chamber,

raw water intake pipeline and tempering system (upgraded in 1999);

treatment plant inlet flow control valve,

prechlorination and pH control (through lime contact) system,

settling tanks,

sand/gravel filtration system,

flouridation system,

backwash system,

On-site Clearwell of 575m^3, and

Treated water storage reservoir 2,280m^3.

3.1.2 New Process Description

The upgraded plant has incorporated the following process changes:

Increased capacity by constructing four new filters,

flocculation units.

Provided additional backwash waste storage.

Updated chemical dosing systems.

Updated PLC-based control.

3.2 Design Data

3.1.1 Design Capacity

The design life of the new WTP is 20 years to 2022. In 2022 the average day demand will be 4,520 m^3/day with a peak day demand of 9,040 m^3/day. The gross design capacity for the WTP is set at 9,500 m^3/day. These figures are based upon a projected population in 2021 of 11,300.

3.2.2 Raw Water Supply

Raw water enters the plant through an existing 250 mm main and a flow control valve. The flow control valve will be capable of accurately controlling flows from present minimum demands of about 1,000 m^3/day up to about 10,000 m^3/day, slightly above the plant design raw water flow.

3.2.3 UV Disinfection

As the raw water enters the WTP it is disinfected with UV light to inactivate pathogens. UV light is the primary disinfectant with chlorination as a secondary disinfectant to provide a residual through the distribution system. The design parameters of the UV system are as follows;

Number of UV Reactors	1 Duty and 1 Standby
Maximum flow per reactor	9 ML/Day
UV Transmittance	90% (1cm Length)
Maximum dose	40 mJ/cm^2

3.2.4 Flocculation Tanks

Flocculation tanks are provided downstream of the UV. These tanks will only be required to operate as flocculation tanks in the event that future coagulation is required to meet the final water quality targets. At this time mixers will be required in the tanks to maintain the flocc particles in suspension. Two trains each with three stages of flocculation are provided. The total volume of the flocculation stage is 300m^3 resulting in a hydraulic retention time of 45 minutes at design capacity.

3.2.5 Filtration

The filtration process consists of dual media rapid gravity filters for the removal of particulate matter from the water. The design parameters of the filters are as follows;

Number of filters	4
Total Filter Area	47m2
Individual filter area	11.75 m2
Max Filtration Rate	8.5 m3/m2/hr
Media Type	Anthracite/ sand dual media
Expected Filter Run Time	48 hours
Air Scour Rate	25 m3/m2/hr
Backwash Rate	50 m3/m2/hr
Backwash Duration	12 mins
Expected Daily wash volume	232 m3
Filter to waste flow	100 m3/h
Expected filter to waste volume	23.5m3

3.2.6 Backwash and Filter to Waste Storage

Backwashing produces large amounts of waste water for a relatively short time, and because the capacity of the sanitary sewage system is limited, a Backwash Waste Holding Tank of 130 m^3 is provided. This tank will only be sufficient for the volume of one filter wash and therefore need to be drained at a controlled rate to the sewer prior to a second filter washing.

A second waste tank of 55m^3 is provided to balance the “filter to waste” flow. This tank will also drain at a controlled rate to the sewer system.

A 60mm diameter orifice plate has been included in the drain to sewer in order to restrict the flow to a maximum of 70m^3/hour to prevent surcharging in the sewer. This orifice can be changed in the future should a different flow rate be required.

3.2.7 Chlorination

The chlorine system uses gas cylinders with an automatic switchover system. The chlorine is injected into the water system through a gas chlorinator and injector. The design parameters are as follows;

Maximum dose rate	90 kg/Day
Average dose rate	1.6 to 16 kg/Day

3.2.8 pH Adjustment

Caustic Soda will replace the lime system of the old plant as the chemical for pH adjustment. The system will be capable of dosing both at the plant inlet, if required for coagulation and at the final water for stabilisation. The design criteria are as follows;

Maximum dose rate	17 L/h
Minimum dose rate	0.017 L/h

3.2.9 Zinc Orthophosphate

Zinc orthophosphate is provided to reduce the corrosivity of the water. It is dosed into the water prior to the Treated Water Reservoir.

Maximum Dose Rate	30 L/h
Minimum Dose Rate	0.030 L/h

3.2.10 Hydrofluorosilicic Acid

Hydrofluorosilicic Acid is metered into the clearwell inlet chamber to provide a dose of 1mg/L as Fluoride Design Critera

Maximum Dose Rate	2.2 L/h
Minimum Dose Rate	0.004 L/h

3.2.11 Plant Capacity and Storage

Treated water storage is important for providing sufficient disinfection and to balance the needs of the community with respect to fire storage, equalization storage and emergency storage.

The recommended minimum treated water storage for the present and future system demands are 2,385 m^3 and 4,811 m^3, respectively. The recommended treated water storage amounts above assume no increase in the recommended fire storage component of the storage equation. The storage available at the plant is 575m^3, which exceeds the present and future recommended storage requirements for in-plant needs. The total system storage, 2,875 m^3, just meets present requirements. However, the existing storage will likely no longer meet the storage requirements within a couple of years if the treated water demand increases as projected. The total storage volume should be increased within a couple of years. **Table 3.4** summarizes the system storage requirements.

Table 3.4 – Reservoir Storage Requirements

Storage Requirements	Present (m^3)	Future (m^3)
A – Fire	720	720
B – Equalization 25% of Max Day Demand	1,200	2,260
C – Emergency 30% of Average day demand	360	1,356
In-Plant Needs	105	475
Total Storage Required	2,385	4,811
Total Storage Available (Clearwell and Reservoir)	*2,875*	*2,875*

The existing storage meets disinfection storage requirements for both existing plant capacity. The existing storage can also meet disinfection storage requirements at plant design capacity of 9,500 m^3/day if the chlorine residual is increased to approximately 1.0 mg/L.

3.2.12 Tempered Water System

(Refer to Drawing M-2, Section 4)

Tempering of the Raw Water is required during the winter to prevent the raw water from freezing in route from the Dam to the Plant.

The Raw Water is tempered via shell and tube heat exchanger by the hydronic heating system to maintain the raw water temperature above 5^oC.

A raw water pump circulates the Raw Water from a point at the raw water intake to the Plant back to the Dam Reservoir to the heat exchanger for tempering.

END OF CHAPTER 3

Chapter 4
SCHEMATICS AND FUNCTIONAL DATA

4.1 General

The following tables describe where the components to the various systems are located and the function that each performs. For each table there are drawings that can be referenced to better understand the flow of that part of the Water Treatment Plant.

4.2 Raw Water Flow

(Refer to Drawing P-1 and P-2 at the end of this section)

The following table identifies the components related to the flow of water from the plant intake to the filters.

No.	Component	Location	Function Performed	Remarks
1	Intake Valve (V1000)	RW Intake Pipe, Main Floor	Shuts off water from Geraldine Lake	Normally Open
2	Isolation Valve (V1036)	On 300 Dia. RW Piping, Main Floor	Used to isolate solenoid valve that controls flow to the turbidity sensor	Normally Open
3	Solenoid Valve (SV1001)	On 300 Dia. RW Piping, Main Floor	Controls the flow to the turbidity sensor	PLC controlled
4	Turbidity Sensor (AE1001)	On the RW Intake Piping just inside the Plant, Main Floor	Provides a reading to the PLC on the clarity of the water.	Sends info. to PLC
5	Drain Valve (V1034)	On 300 Dia. RW Piping, Main Floor	Used to Drain the Main Raw Water line from Geraldine Lake	Normally Closed
6	Isolation Valve (V1035)	Tempered Water Piping, Main Floor	Used to isolate the Tempered water system from the raw water	Normally Open
7	Isolation Valve (V1037)	On 300 Dia. RW Piping, Main Floor	Used to isolate solenoid valve that controls flow to the pH sensor	Normally Open
8	Solenoid Valve (SV1002)	On 300 Dia. RW Piping, Main Floor	Controls the flow to the pH sensor	PLC controlled
9	pH Sensor (AE1002)	On the RW Intake Piping just inside the Plant, Main Floor	Provides a reading to the PLC on the acidity of the water.	Sends info. To PLC
10	Isolation Valve (V1029)	RW Intake Piping, Main Floor	Used to Isolate the Flow Meter and the Flow Control Valve.	Normally Open
11	Flow Meter (FE1001)	RW Intake Piping, Main Floor	Indicates the flow of Raw Water into the Plant	Sends info to PLC
12	Flow Control Valve (FCV1001)	RW Intake Piping, Main Floor	Controls the amount of flow into the Plant.	PLC controlled
13	Isolation Valve (V1003)	RW Intake Piping, Main Floor	Used to Isolate the Flow Meter and the Flow Control Valve.	Normally Open

No.	Component	Location	Function Performed	Remarks
14	Bypass Valve (V1004)	Bypass RW Intake Piping, Main Floor	Allows the Raw Water to be bypassed around the Flow Control Valve and Flow Meter	Normally Closed
15	Drain Valve (V1005)	RW Intake Piping, Main Floor	Allows the water to be drained from this section of piping.	Normally Closed
16	Isolation Valve (V1006)	On 350 Dia. RW Piping, Main Floor	Used to isolate the air release valve	Normally Open
17	Air Release Valve (ARV1001)	RW Intake Piping, Main Floor	Allows air to be released from the intake line.	Normally Open
18	Isolation Valve (V1007)	RW Intake Piping, Main Floor	Allows for isolation of the UV unit (X120).	Normally Open
19	Isolation Valve (V1038)	On 350 Dia. RW Piping, Main Floor	Used to isolate the air release valve	Normally Open
20	Air Release Valve (ARV1002)	RW Intake Piping, Main Floor	Allows air to be released from the intake line	Normally Open
21	Isolation Valve (V1039)	Off the UV unit (X120), Main Floor	Used to isolate UV (X120) cooling solenoid	Normally Open
22	Solenoid Valve (SV201)	Off the UV unit (X120), Main Floor	Controls the flow of cooling water on the UV unit start-up.	UV panel Controlled
23	Isolation Valve (V1008)	RW Intake Piping, Main Floor	Allows for isolation of the UV unit (X121).	Normally Open
24	Isolation Valve (V1040)	Off the UV unit (X121), Main Floor	Used to isolate UV (X121) cooling solenoid	Normally Open
25	Solenoid Valve (SV211)	RW Intake Piping, Main Floor	Controls the flow of cooling water on the UV unit start-up.	UV panel Controlled
26	UV unit (X120)	RW Intake Piping, Main Floor	Partial disinfection of the Raw water	UV panel controlled
27	UV unit (X121)	RW Intake Piping, Main Floor	Partial disinfection of the Raw water	UV panel controlled
28	Drain Valve (V1041)	FLW Piping after UV units, Main Floor	Drains water from the UV unit (X120)	Normally Closed
29	Drain Valve (V1042)	FLW Piping after UV units, Main Floor	Drains water from the UV unit (X121)	Normally Closed
30	Isolation Valve (V1043)	On 350 Dia. RW Piping, Main Floor	Used to isolate the air release valve	Normally Open
31	Air Release Valve (ARV1003)	FLW Piping after UV units, Main Floor	Releases air from the piping just after the UV unit (X120)	Normally Open
32	Motorized Valve (V1009)	FLW Piping after UV units, Main Floor	After UV unit (X120) warms up the valve opens to let the plant make water, this valve also operates as an isolation valve	Normally Closed

No.	Component	Location	Function Performed	Remarks
33	Motorized Valve (V1012)	FLW Piping after UV units, Main Floor	After UV unit (X121) warms up the valve opens to let the plant make water, this valve also operates as an isolation valve	Normally Closed
34	Drain Valve (V1013)	FLW Piping, Main Floor		Normally Closed
35	Isolation Valve (V1016)	FLW Piping, Main Floor	Isolation valve for mixing tank #1	Normally Open
36	Isolation Valve (V1017)	In Mixing Tank #1	Used to isolate Mixing Tank #1 from Mixing Tank #2	Normally Open
37	Isolation Valve (V1018)	FLW Piping, Main Floor	Isolation valve for mixing tank #2	Normally Open
38	Isolation Valve (V1019)	In Mixing Tank #2	Used to isolate Mixing Tank #2 from Mixing Tank #3	Normally Open
39	Isolation Valve (V1020)	FLW Piping, Main Floor	Isolation valve for mixing tank #3	Normally Open
40	Isolation Valve (V1021)	FLW Piping, Main Floor	Isolation valve for Flocculation Train #1	Normally Open
41	Isolation Valve (V1022)	FLW Piping, Main Floor	Isolation valve for mixing tank #4	Normally Open
42	Isolation Valve (V1023)	In Mixing Tank #4	Used to isolate Mixing Tank #4from Mixing Tank #5	Normally Open
43	Isolation Valve (V1024)	FLW Piping, Main Floor	Isolation valve for mixing tank #5	Normally Open
44	Isolation Valve (V1025)	In Mixing Tank #5	Used to isolate Mixing Tank #5from Mixing Tank #6	Normally Open
45	Isolation Valve (V1026)	FLW Piping, Main Floor	Isolation valve for mixing tank #6	Normally Open
46	Isolation Valve (V1027)	FLW Piping, Main Floor	Isolation valve for Flocculation Train #2	Normally Open
47	Isolation Valve (V1028)	FLW Piping, Main Floor	By-pass Isolation valve, used to by-pass the Flocculation Train's #1 & #2	Normally Open
48	Motorized Valve (FCV2101)	Filter Inlet Piping on Filter #1, Filters Room	Controls the flow of water into Filter #1	PLC Controlled
49	Motorized Valve (FCV2111)	Filter Inlet Piping on Filter #2, Filters Room	Controls the flow of water into Filter #2	PLC Controlled
50	Motorized Valve (FCV2121)	Filter Inlet Piping on Filter #3, Filters Room	Controls the flow of water into Filter #3	PLC Controlled
51	Motorized Valve (FCV2131)	Filter Inlet Piping on Filter #4, Filters Room	Controls the flow of water into Filter #4	PLC Controlled

4.3 Filtered/Treated Water Flow

(Refer to Drawing P-3 and P-4 at the end of this section)

The following table identifies the components related to the flow of water from the plant filters to the off-site reservoir.

No.	Component	Location	Function Performed	Remarks
1	Filter #1	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
2	Level Indicating Transmitter (LIT2101)	Mounted on Filter #1 Tank wall, Filters Room	Indicates the water level in the filter	Signals the PLC
3	Isolation Valve (V2003)	On 300mm FW piping, Pumps Floor	Used to isolate the Pressure Indicating Transmitter	Normally Open
4	Isolation Valve (V2004)	Pumps Floor	Used to isolate the Pressure Indicating Transmitter	Normally Open
5	Pressure Indicating Transmitter (PIT2101)	Pumps Floor	Provides a reading to the PLC on the water pressure after the filters	Sends info. to PLC
6	Solenoid Valve (SV2102)	On 300mm FW piping, Pumps Floor	Controls the flow to the turbidity sensor	PLC Controlled
7	Turbidity Sensor (AE2102)	On 300mm FW piping, Pumps Floor	Provides a reading to the PLC on the clarity of the water.	Sends info. to PLC
8	Drain Valve (V2002)	On 300mm FW piping, Pumps Floor	Used to drain the Filtered Water / Backwash Supply pipe	Normally Closed
9	Level Control Valve (LCV2104)	On 300mm FW piping, Pumps Floor	Controls the flow of water to the Clearwell	PLC Controlled
10	Filter #2	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
11	Level Indicating Transmitter (LIT2111)	Mounted on Filter #2 Tank wall, Filters Room	Indicates the water level in the filter	Signals the PLC
12	Isolation Valve (V2055)	On 300mm FW piping, Pumps Floor	Used to isolate the Pressure Indicating Transmitter	Normally Open
13	Isolation Valve (V2056)	Pumps Floor	Used to isolate the Pressure Indicating Transmitter	Normally Open
14	Pressure Indicating Transmitter (PIT2111)	Pumps Floor	Provides a reading to the PLC on the water pressure after the filters	Sends info. to PLC
15	Solenoid Valve (SV2112)	On 300mm FW piping, Pumps Floor	Controls the flow to the turbidity sensor	PLC Controlled

No.	Component	Location	Function Performed	Remarks
16	Turbidity Sensor (AE2111)	On 300mm FW piping, Pumps Floor	Provides a reading to the PLC on the clarity of the water.	Sends info. to PLC
17	Drain Valve (V2054)	On 300mm FW piping, Pumps Floor	Used to drain the Filtered Water / Backwash Supply pipe	Normally Closed
18	Level Control Valve (LCV2114)	On 300mm FW piping, Pumps Floor	Controls the flow of water to the Clearwell	PLC Controlled
19	Filter #3	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
20	Level Indicating Transmitter (LIT2121)	Mounted on Filter #3 Tank wall, Filters Room	Indicates the water level in the filter	Signals the PLC
21	Isolation Valve (V2066)	On 300mm FW piping, Pumps Floor	Used to isolate the Pressure Indicating Transmitter	Normally Open
22	Isolation Valve (V2067)	Pumps Floor	Used to isolate the Pressure Indicating Transmitter	Normally Open
23	Pressure Indicating Transmitter (PIT2121)	Pumps Floor	Provides a reading to the PLC on the water pressure after the filters	Sends info. to PLC
24	Solenoid Valve (SV2122)	On 300mm FW piping, Pumps Floor	Controls the flow to the turbidity sensor	PLC Controlled
25	Turbidity Sensor (AE2121)	On 300mm FW piping, Pumps Floor	Provides a reading to the PLC on the clarity of the water.	Sends info. to PLC
26	Drain Valve (V2065)	On 300mm FW piping, Pumps Floor	Used to drain the Filtered Water / Backwash Supply pipe	Normally Closed
27	Level Control Valve (LCV2124)	On 300mm FW piping, Pumps Floor	Controls the flow of water to the Clearwell	PLC Controlled
28	Filter #4	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
29	Level Indicating Transmitter (LIT2131)	Mounted on Filter #4 Tank wall, Filters Room	Indicates the water level in the filter	Signals the PLC
30	Isolation Valve (V2077)	On 300mm FW piping, Pumps Floor	Used to isolate the Pressure Indicating Transmitter	Normally Open
31	Isolation Valve (V2078)	Pumps Floor	Used to isolate the Pressure Indicating Transmitter	Normally Open
32	Pressure Indicating Transmitter (PIT2131)	Pumps Floor	Provides a reading to the PLC on the water pressure after the filters	Sends info. to PLC

No.	Component	Location	Function Performed	Remarks
33	Solenoid Valve (SV2132)	On 300mm FW piping, Pumps Floor	Controls the flow to the turbidity sensor	PLC Controlled
34	Turbidity Sensor (AE2131)	On 300mm FW piping, Pumps Floor	Provides a reading to the PLC on the clarity of the water.	Sends info. to PLC
35	Drain Valve (V2076)	On 300mm FW piping, Pumps Floor	Used to drain the Filtered Water / Backwash Supply pipe	Normally Closed
36	Level Control Valve (LCV2134)	On 300mm FW piping, Pumps Floor	Controls the flow of water to the Clearwell	PLC Controlled
37	Chlorine Injection point	On 200mm FW piping, Pumps Floor	Point of chlorine injection for disinfection	
38	Caustic Soda Injection point	On 200mm FW piping, Pumps Floor	Point of caustic soda injection for pH adjustment	
39	Hydrofluorosilic Acid Injection point	On 200mm FW piping, Pumps Floor	Point of fluoride injection	
40	Contact Chamber	Clearwell Level	Where the chemicals come in contact and are mixed with the Filtered Water	
41	Isolation Valve (V2038)	North Clearwell	Used to isolate the North Clearwell	Normally Open
42	North Clearwell	Clearwell Level	Forms part of the overall treated water reservoir	
43	Isolation Valve (V2039)	South Clearwell 300mm piping	Used to isolate the North Clearwell from the South Clearwell and the Backwash Chamber	Normally Open
44	South Clearwell	Clearwell Level	Forms part of the overall treated water reservoir	
45	Isolation Valve (V2037)	Contact Chamber	Used to isolate the South Clearwell from the Contact Chamber and the Backwash Chamber	Normally Closed
46	Backwash Chamber	Clearwell Level	The chamber containing the Backwash Pumps and Plant Service Pumps	
47	Isolation Valve (V2035)	South Clearwell 300mm piping	Used to isolate the North Clearwell from the South Clearwell	Normally Open
48	Isolation Valve (V2034)	Backwash Chamber	Used to isolate the North & South Clearwells from the from the Backwash Chamber	Normally Closed
49	Isolation Valve (V2033)	Backwash Chamber	Used to isolate the South Clearwell from the Backwash Chamber	Normally Open
50	Level Indicating Transmitter (LIT2501)	Mounted on Filter Tank wall	Indicates the water level in the backwash tank (reservoir & clearwells)	Signals the PLC

No.	Component	Location	Function Performed	Remarks
51	Flow Control Valve (FCV2501)	300mm PVC piping in the Utilidor	Controls the amount of flow to the main treated water reservoir	PLC Controlled
52	Orthophosphate injection point	300mm PVC piping in the Utilidor	Point of Orthophosphate injection for pH adjustment	
53	Isolation Valve (V2040)	300mm PVC piping in the Utilidor	Used to isolate the flow to the pH/Cl_2 sensor	PLC controlled
54	pH Sensor (AE2501)	300mm PVC piping in the Utilidor	Provides a reading to the PLC on the acidity of the water.	Sends info. to PLC

4.4 Hydro Fluorosilicic Acid Chemical

(Refer to Drawing P-5 at the end of this section)

The following table identifies the components related to the flow of Hydro-Fluorosilicic Acid. The referenced drawing shows the components but not their locations.

No.	Component	Location	Function Performed	Remarks
1	Fluorosilicic Acid Drum	Filters Floor	Stores & provides Fluorosilicic Acid for Chemical Addition into filtered water	
2	Pumps Package	Filters Floor	Refer to supplier O&M for more detail	
3	Check Valve (V3052)	Chemical Addition supply piping to Contact Chamber	Prevents backflow of Filtered Water into Chemical Addition system	
4	Isolation Valve (V3053)	Chemical Addition supply piping to Contact Chamber	Used to isolate the Hydro Fluorosilicic Acid system from other systems	Normally Open

4.5 Chlorine Chemical

(Refer to Drawing P-6 at the end of this section)

The following table identifies the components related to the flow of Chlorine. The referenced drawing shows the components but not their locations.

.No.	Component	Location	Function Performed	Remarks
1	Chlorine Gas Cylinders	Filters Floor Chlorine room	Stores & provides Chlorine for Chemical Addition into filtered water	
2	Chlorinator & Injector Package	Main Floor Chlorine room	Refer to supplier O&M for more detail	
3	Check Valve (V3050)	Chemical Addition supply piping to Contact Chamber	Prevents backflow of Filtered Water into Chemical Addition system	
4	Isolation Valve (V3051)	Chemical Addition supply piping to Contact Chamber	Used to isolate the Chlorine system from other systems	Normally Open

4.6 Zinc Orthophosphate Chemical

(Refer to Drawing P-5 at the end of this section)

The following table identifies the components related to the flow of Zinc Orthophosphate. The referenced drawing shows the components but not their locations.

No.	Component	Location	Function Performed	Remarks
1	Zinc Orthophosphate Drums	Filters Floor	Stores & provides Chlorine for Chemical Addition into filtered water	
2	Pumps Package	Filters Floor	Refer to supplier O&M for more detail	
3	Check Valve (V2031)	Chemical Addition supply piping to TW piping in the Utilidor	Prevents backflow of Filtered Water into Chemical Addition system	
4	Isolation Valve (V2032)	Chemical Addition supply piping to TW piping in the Utilidor	Used to isolate the Zinc Orthophosphate system from other systems	Normally Open

4.7 Caustic Soda Chemical

(Refer to Drawing P-7 at the end of this section)

The following table identifies the components related to the flow of Caustic Soda. The referenced drawing shows the components but not their locations.

No.	Component	Location	Function Performed	Remarks
1	Caustic Soda Drum	Pumps Floor	Stores & provides Caustic Soda for Chemical Addition into filtered water	
2	Pumps Package	Pumps Floor	Refer to supplier O&M for more detail	
3	Check Valve (V1015)	Chemical Addition supply piping to Contact Chamber	Prevents backflow of Filtered Water into Chemical Addition system	
4	Isolation Valve (V1031)	Chemical Addition supply piping to Contact Chamber	Used to isolate the Caustic Soda system from other systems	Normally Open

4.8 Backwash Flow

(Refer to Drawings P-8 and P-9 at the end of this section)

The following table identifies the components related to the flow of water from the backwash pumps to the City sanitary sewer system.

No.	Component	Location	Function Performed	Remarks
1	Backwash Pump (P206)	Pumps Floor/Pumping Chamber	Provides Backwash supply from Treated Water	PLC Controlled
2	Isolation Valve (V2028)	300mm Backwash piping, Pumps Floor	Provides isolation for the Pressure Indicator	Normally Open
3	Isolation Valve (V2028)	300mm Backwash piping, Pumps Floor	Used to remove any debris that might block the Pressure Indicator	Normally Closed
4	Pressure Indicator (PI2061)	300mm Backwash piping, Pumps Floor	Indicates the output pressure of Pump P206	
5	Check Valve (V2023)	300mm Backwash piping, Pumps Floor	Prevents the backflow of water into the Pumping Chamber	
6	Isolation Valve (V2022)	300mm Backwash piping, Pumps Floor	Provides isolation for the check valve V2023 and Pump P206	Normally Open
7	Backwash Pump (P205)	Pumps Floor/Pumping Chamber	Provides Backwash supply from Treated Water	PLC Controlled
8	Isolation Valve (V2026)	300mm Backwash piping, Pumps Floor	Provides isolation for the Pressure Indicator	Normally Open
9	Isolation Valve (V2027)	300mm Backwash piping, Pumps Floor	Used to remove any debris that might block the Pressure Indicator	Normally Closed
10	Pressure Indicator (PI2051)	300mm Backwash piping, Pumps Floor	Indicates the output pressure of Pump P205	
11	Check Valve (V2024)	300mm Backwash piping, Pumps Floor	Prevents the backflow of water into the Pumping Chamber	
12	Isolation Valve (V2025)	300mm Backwash piping, Pumps Floor	Provides isolation for the check valve V2024 and Pump P205	Normally Open
13	Pump Relief Valve (PRV2501)	300mm Backwash piping, Pumps Floor	Provides relief for the Backwash supply pumps on start-up of a backwash sequence	PLC Controlled

No.	Component	Location	Function Performed	Remarks
14	Flow Control Valve (FCV2105)	300mm Backwash piping, Pumps Floor	Controls the flow of backwash water to Filter #1	PLC Controlled
15	Filter #1	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
16	Flow Control Valve (FCV2106)	400mm Backwash Waste piping, Pumps Floor	Controls the flow of backwash waste water from Filter #1 to Backwash Waste Chamber	PLC Controlled
17	Flow Control Valve (FCV2115)	300mm Backwash piping, Pumps Floor	Controls the flow of backwash water to Filter #2	PLC Controlled
18	Filter #2	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
19	Flow Control Valve (FCV2116)	400mm Backwash Waste piping, Pumps Floor	Controls the flow of backwash waste water from Filter #2 to Backwash Waste Chamber	PLC Controlled
20	Flow Control Valve (FCV2125)	300mm Backwash piping, Pumps Floor	Controls the flow of backwash water to Filter #3	PLC Controlled
21	Filter #3	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
22	Flow Control Valve (FCV2126)	400mm Backwash Waste piping, Pumps Floor	Controls the flow of backwash waste water from Filter #3 to Backwash Waste Chamber	PLC Controlled
23	Flow Control Valve (FCV2135)	300mm Backwash piping, Pumps Floor	Controls the flow of backwash water to Filter #4	PLC Controlled
24	Filter #4	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
25	Flow Control Valve (FCV2136)	400mm Backwash Waste piping, Pumps Floor	Controls the flow of backwash waste water from Filter #4 to Backwash Waste Chamber	PLC Controlled
26	Backwash Waste Tank	Clearwell Floor level	Contains the waste water from the backwash process	
27	Level Indicating Transmitter (LIT4001)	Mounted on Backwash Waste Tank wall	Indicates the water level in the backwash waste tank	Signals the PLC
28	Flow Meter (FE4001)	Waste Piping in the Utilidor	Indicates the flow of Backwash Waste Water leaving the Plant	Sends info to PLC
29	Flow Control Valve (FCV4001)	Waste Piping in the Utilidor	Controls the flow rate of Backwash Waste Water leaving the Plant	PLC Controlled
30	Orifice Plate	Waste Piping in the Utilidor	Back-up waste water flow rate control for all process waste leaving the Plant	

4.9 Filter to Waste Flow

(Refer to Drawing P-10 – P-11 at the end of this section)

The following table identifies the components related to the flow of water from the plant filters to the City sanitary sewer system.

No.	Component	Location	Function Performed	Remarks
1	Filter #1	Filters Room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
2	Flow Control Valve (FCV2103)	200mm Backwash piping, Pumps Floor	Controls the flow of Filter to waste water from Filter #1 to the Surge Tank	PLC Controlled
3	Filter #2	Filters Room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
4	Flow Control Valve (FCV2113)	200mm Backwash piping, Pumps Floor	Controls the flow of Filter to waste water from Filter #2 to the Surge Tank	PLC Controlled
5	Filter #3	Filters Room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
6	Flow Control Valve (FCV2123)	200mm Backwash piping, Pumps Floor	Controls the flow of Filter to waste water from Filter #3 to the Surge Tank	PLC Controlled
7	Filter #4	Filters Room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
8	Flow Control Valve (FCV2133)	200mm Backwash piping, Pumps Floor	Controls the flow of Filter to waste water from Filter #4 to the Surge Tank	PLC Controlled
9	Surge Tank	Under Mixing Tanks, Access from the exterior of the Plant	Used for the storage of the filter to waste water enabling the waste water to be released gradually into the City sanitary system	
10	Level Indicating Transmitter (LIT4011)	Mounted on Surge Tank access wall	Indicates the water level in the Surge Tank	Signals the PLC
11	Flow Meter (FE4011)	Waste Piping in the Utilidor	Indicates the flow rate of Filter Waste Water leaving the Plant	Sends info to PLC
12	Flow Control Valve (FCV4011)	Waste Piping in the Utilidor	Controls the flow rate of Backwash Waste Water leaving the Plant	PLC Controlled
13	Orifice Plate	Waste Piping in the Utilidor	Back-up waste water flow rate control for all process waste leaving the Plant	

4.10 Air Scour Flow

(Refer to Drawing P-12 at the end of this section)

The following table identifies the components related to the flow of water from the air blowers to the filters.

No.	Component	Location	Function Performed	Remarks
1	Air Scour Blower #1 (C200)	Pumps Floor	Provides the air for the air scour operation during the backwash sequence	PLC Controlled
2	Isolation valve (V2001)	100mm Air Scour piping, Pumps Floor	Used to isolate Blower #1 from the rest of the system	Normally Open
3	Air Scour Blower #2 (C201)	Pumps Floor	Provides the air for the air scour operation during the backwash sequence	PLC Controlled
4	Isolation valve (V2041)	100mm Air Scour piping, Pumps Floor	Used to isolate Blower #2 from the rest of the system	Normally Open
5	Flow Control Valve (FCV2107)	100mm Air Scour piping, Pumps Floor	Controls the flow of air into Filter #1	PLC Controlled
6	Filter #1	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
7	Flow Control Valve (FCV2117)	100mm Air Scour piping, Pumps Floor	Controls the flow of air into Filter #2	PLC Controlled
8	Filter #2	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
9	Flow Control Valve (FCV2127)	100mm Air Scour piping, Pumps Floor	Controls the flow of air into Filter #3	PLC Controlled
10	Filter #3	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	
11	Flow Control Valve (FCV2137)	100mm Air Scour piping, Pumps Floor	Controls the flow of air into Filter #4	PLC Controlled
12	Filter #4	Filters room	Filters raw water with a 300mm sand layer and a 700mm anthracite layer	

Note: All drain valves are Normally Closed

END OF CHAPTER 4

Chapter 5
COMPONENT DETAILS

5.1 General Overview

The following tables describe the components of the various systems and provide some basic details and settings. For each table there are drawings that can be referenced to better understand in what part of the Water Treatment Plant the components are located.

5.2 Raw Water Flow

(Refer to Drawing P-1 and P-2, Section 4)

The following table identifies the components related to the flow of water from the plant intake to the filters.

No.	Component	Details	Setting	Remarks
1	Intake Valve (V1000)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
2	Isolation Valve (V1036)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
3	Solenoid Valve (SV1001)	ASCO Red Hat II		Supplier: Emco Ltd. Edmonton, AB
4	Turbidity Sensor (AE1001)	Hatch 1720D Aqua Trend Interface/SOM	0 – 100.0 NTU	Supplier: Hach Company Loveland, Colorado
5	Drain Valve (V1034)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
6	Isolation Valve (V1035)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
7	Isolation Valve (V1037)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
8	Solenoid Valve (SV1002)	ASCO Red Hat II		Supplier: Emco Ltd. Edmonton, AB
9	pH Sensor (AE1002)	Depolox 3 Plus pH sensor	4.0 – 10.0	Supplier: Wallace & Tiernan Products Markham, ON
10	Isolation Valve (V1029)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
11	Flow Meter (FE1001)	Promag 50W	0-120 l/sec	Supplier: Endress + Hauser Canada Ltd. Edmonton, AB

No.	Component	Details	Setting	Remarks
12	Flow Control Valve (FCV1001)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0121 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
13	Isolation Valve (V1003)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
14	Bypass Valve (V1004)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
15	Drain Valve (V1005)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
16	Isolation Valve (V1006)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
17	Air Release Valve (ARV1001)	APCO Air Vent Valve		Supplier: Summit Valve & Controls Edmonton, AB
18	Isolation Valve (V1007)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
19	Isolation Valve (V1038)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
20	Air Release Valve (V1036)	APCO Air Vent Valve		Supplier: Summit Valve & Controls Edmonton, AB
21	Isolation Valve (V1039)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
22	Solenoid Valve (SV201)	ASCO Red Hat II		Supplier: Emco Ltd. Edmonton, AB
23	Isolation Valve (V1008)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
24	Isolation Valve (V1040)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
25	Solenoid Valve (SV211)	ASCO Red Hat II		Supplier: Emco Ltd. Edmonton, AB
26	UV unit (X120)	UV Disinfection System	Max. dosage: 40 mJ/cm^2	Supplier: Trojan Technologies Inc. London, ON
27	UV unit (X121)	UV Disinfection System	Max. dosage: 40 mJ/cm^2	Supplier: Trojan Technologies Inc. London, ON
28	Drain Valve (V1041)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB

No.	Component	Details	Setting	Remarks
29	Drain Valve (V1042)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
30	Isolation Valve (V1043)	MAS G2 Ball Valve		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
31	Air Release Valve (V1039)	APCO Air Vent Valve		Supplier: Summit Valve & Controls Edmonton, AB
32	Motorized Valve (V1009)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0301 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
33	Motorized Valve (V1012)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0301 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
34	Drain Valve (V1013)	Kitz Ball Valve #58cc		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
35	Isolation Valve (V1016)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
36	Isolation Valve (V1017)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
37	Isolation Valve (V1018)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
38	Isolation Valve (V1019)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
39	Isolation Valve (V1020)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
40	Isolation Valve (V1021)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
41	Isolation Valve (V1022)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
42	Isolation Valve (V1023)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
43	Isolation Valve (V1024)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
44	Isolation Valve (V1025)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB

No.	Component	Details	Setting	Remarks
45	Isolation Valve (V1026)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
46	Isolation Valve (V1027)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
47	Isolation Valve (V1028)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
48	Motorized Valve (FCV2101)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0501 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
49	Flow Control Valve (FCV2111)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0501 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
50	Motorized Valve (FCV2121)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0501 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
51	Motorized Valve (FCV2131)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0501 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB

5.3 Filtered/Treated Water Flow

(Refer to Drawing P-3 and P-4)

The following table identifies the components related to the flow of water from the plant filters to the off-site reservoir.

No.	Component	Details	Setting	Remarks
1	Filter #1	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
2	Level Indicating Transmitter (LIT2101)	MultiRanger, Echomax XPS-10	0.3 – 10m	Supplier: Siemens Milltronics Edmonton, AB
3	Isolation Valve (V2003)	Kitz Ball Valve #58		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
4	Isolation Valve (V2004)	Kitz Ball Valve #58		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
5	Pressure Indicating Transmitter (PIT2101)	Deltabar S PMD235	0 – 4.00 m H_2O	Supplier: Endress + Hauser Canada Ltd. Edmonton, AB
6	Solenoid Valve (SV2102)	ASCO Red Hat II		Supplier: Emco Ltd. Edmonton, AB

No.	Component	Details	Setting	Remarks
7	Turbidity Sensor (AE2102)	Hatch 1720D Aqua Trend Interface/SOM	0 – 2.0 NTU	Supplier: Hach Company Loveland, Colorado
8	Drain Valve (V2002)	Kitz Ball Valve #58cc		Supplier: Bartel & Gibson Co Ltd. Edmonton, AB
9	Level Control Valve (LCV2104)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0121 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
10	Filter #2	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
11	Level Indicating Transmitter (LIT2111)	MultiRanger, Echomax XPS-10	0.3 – 10m	Supplier: Siemens Milltronics Edmonton, AB
12	Isolation Valve (V2055)	Kitz Ball Valve		Supplier: Emco Ltd. Edmonton, AB
13	Isolation Valve (V2056)	Kitz Ball Valve		Supplier: Emco Ltd. Edmonton, AB
14	Pressure Indicating Transmitter (PIT2111)	Deltabar S PMD235	0 – 4.00 m H_2O	Supplier: Endress + Hauser Canada Ltd. Edmonton, AB
15	Solenoid Valve (SV2112)	ASCO Red Hat II		Supplier: Emco Ltd. Edmonton, AB
16	Turbidity Sensor (AE2111)	Hatch 1720D Aqua Trend Interface/SOM	0 – 2.0 NTU	Supplier: Hach Company Loveland, Colorado
17	Drain Valve (V2054)	Ball Valve		Supplier: Emco Ltd. Edmonton, AB
18	Level Control Valve (LCV2114)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0121 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
19	Filter #3	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
20	Level Indicating Transmitter (LIT2121)	MultiRanger, Echomax XPS-10	0.3 – 10m	Supplier: Siemens Milltronics Edmonton, AB
21	Isolation Valve (V2066)	Ball Valve		Supplier: Emco Ltd. Edmonton, AB
22	Isolation Valve (V2067)	Ball valve		Supplier: Emco Ltd. Edmonton, AB
23	Pressure Indicating Transmitter (PIT2121)	Deltabar S PMD235	0 – 4.00 m H_2O	Supplier: Endress + Hauser Canada Ltd. Edmonton, AB
24	Solenoid Valve (SV2122)	ASCO Red Hat II		Supplier: Emco Ltd. Edmonton, AB

No.	Component	Details	Setting	Remarks
25	Turbidity Sensor (AE2121)	Hatch 1720D Aqua Trend Interface/SOM	0 – 2.0 NTU	Supplier: Hach Company Loveland, Colorado
26	Drain Valve (V2065)	Ball Valve		Supplier: Emco Ltd. Edmonton, AB
27	Level Control Valve (LCV2124)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0121 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
28	Filter #4	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
29	Level Indicating Transmitter (LIT2131)	MultiRanger, Echomax XPS-10	0.3 – 10m	Supplier: Siemens Milltronics Edmonton, AB
30	Isolation Valve (V2077)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
31	Isolation Valve (V2078)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
32	Pressure Indicating Transmitter (PIT2131)	Deltabar S PMD235	0 – 4.00 m H_2O	Supplier: Endress + Hauser Canada Ltd. Edmonton, AB
33	Solenoid Valve (SV2132)	ASCO Red Hat II		Supplier: Emco Ltd. Edmonton, AB
34	Turbidity Sensor (AE2131)	Hatch 1720D Aqua Trend Interface/SOM	0 – 2.0 NTU	Supplier: Hach Company Loveland, Colorado
35	Drain Valve (V2076)	Ball Valve		Supplier: Emco Ltd. Edmonton, AB
36	Level Control Valve (LCV2134)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0121 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
37	Chlorine Injection point			
38	Caustic Soda Injection point			
39	Hydroflourosilic Acid Injection point			
40	Contact Chamber			
41	Isolation Valve (V2038)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
42	North Clearwell			

No.	Component	Details	Setting	Remarks
43	Isolation Valve (V2039)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
44	South Clearwell			
45	Isolation Valve (V2037)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
46	Backwash Chamber			
47	Isolation Valve (V2035)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
48	Isolation Valve (V2034)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
49	Isolation Valve (V2033)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
50	Level Indicating Transmitter (LIT2501)	MultiRanger, Echomax XPS-10	0.3 – 10m	Supplier: Siemens Milltronics Edmonton, AB
51	Flow Control Valve (FCV2501)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0301 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
52	Orthophosphate injection point			
53	Isolation Valve (V2056)	Kitz Ball Valve		Supplier: Emco Ltd. Edmonton, AB
54	pH Sensor (AE2501)	Depolox 3 Plus pH sensor	4.0 – 10.0 (pH) 0 – 5.0 mg/l (Free Cl_2)	Supplier: Wallace & Tiernan Products Markham, ON

5.4 Hydro Fluorosilicic Acid Chemical

(Refer to Drawing P-5, Section 4)

The following table identifies the components related to the flow of Hydro-Fluorosilicic Acid. The referenced drawing shows the components but not their locations.

No.	Component	Details	Setting	Remarks
1	Fluorosilicic Acid Drum			
2	Pumps Package (P305 / P306)	LMI series A Electronic Metering Pumps, etc.	0.004 – 2.2 l/h	Supplier: Peacock Inc. Edmonton, AB
3	Check Valve (V3052)	Stainless Steel Swing Check Kitz class 200		Supplier: Emco Ltd. Edmonton, AB
4	Isolation Valve (V3053)	MA Stewart Stainless Steel G5 full port Ball Valve		Supplier: Emco Ltd. Edmonton, AB

5.5 Chlorine Chemical

(Refer to Drawing P-6, Section 4)

The following table identifies the components related to the flow of Chlorine. The referenced drawing shows the components but not their locations.

No.	Component	Details	Setting	Remarks
1	Chlorine Cylinders			
2	Chlorination Package	200 PPD Vacuum Regulator, Series V10K Chlorinator, etc.		Supplier: Alberta Mequipco Ltd. Calgary, AB
3	Check Valve (V3052)	Stainless Steel Swing Check Kitz class 200		Supplier: Emco Ltd. Edmonton, AB
4	Isolation Valve (V3053)	MA Stewart Stainless Steel G5 full port Ball Valve		Supplier: Emco Ltd. Edmonton, AB

5.6 Zinc Orthophosphate Chemical

(Refer to Drawing P-5, Section 4)

The following table identifies the components related to the flow of Zinc Orthophosphate. The referenced drawing shows the components but not their locations.

No.	Component	Details	Setting	Remarks
1	Zinc Orthophosphate Drum			
2	Pumps Package (P303 / P304)	LMI series C Electronic Metering Pumps, etc.	0.030 – 30 l/h	Supplier: Peacock Inc. Edmonton, AB
3	Check Valve (V3052)	Stainless Steel Swing Check Kitz class 200		Supplier: Emco Ltd. Edmonton, AB
4	Isolation Valve (V3053)	MA Stewart Stainless Steel G5 full port Ball Valve		Supplier: Emco Ltd. Edmonton, AB

5.7 Caustic Soda Chemical

(Refer to Drawing P-7, Section 4)

The following table identifies the components related to the flow of Caustic Soda. The referenced drawing shows the components but not their locations.

No.	Component	Details	Setting	Remarks
1	Caustic Soda Drum			
2	Pumps Package	LMI series B Electronic Metering Pumps	0.017 – 17 l/h	Supplier: Peacock Inc. Edmonton, AB
3	Check Valve (V3052)	Stainless Steel Swing Check Kitz class 200, etc.		Supplier: Emco Ltd. Edmonton, AB
4	Isolation Valve (V3053)	MA Stewart Stainless Steel G5 full port Ball Valve		Supplier: Emco Ltd. Edmonton, AB

5.8 Backwash Flow

(Refer to Drawing P-8 and P-9, Section 4)

The following table identifies the components related to the flow of water from the backwash pumps to the City sanitary sewer system.

No.	Component	Details	Setting	Remarks
1	Backwash Pump (P206)	Verti-line –1200 14FHH (1 stage)		Supplier: National Process Equipment Edmonton, AB
2	Isolation Valve (V2028)	Ball Valve		Supplier: Ener-Tech Mechanical sales Ltd. Edmonton, AB
3	Isolation Valve (V2029)	Kitz Ball Valve		Supplier: Emco Ltd. Edmonton, AB
4	Pressure Indicator (PI2061)	Trerice #620B		Supplier: Ener-Tech Mechanical sales Ltd. Edmonton, AB
5	Check Valve (V2023)	Check Rite model 15-XMZ A351-CF8M body A351-CF8 hinge		Supplier: Summit Valve & Controls Edmonton, AB
6	Isolation Valve (V2022)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
7	Backwash Pump (P205)	Verti-line –1200 14FHH (1 stage)		Supplier: National Process Equipment Edmonton, AB
8	Isolation Valve (V2026)	Ball Valve		Supplier: Ener-Tech Mechanical sales Ltd. Edmonton, AB
9	Isolation Valve (V2027)	Kitz Ball Valve		Supplier: Emco Ltd. Edmonton, AB
10	Pressure Indicator (PI2051)	Trerice #620B		Supplier: Ener-Tech Mechanical sales Ltd. Edmonton, AB
11	Check Valve (V2024)	Check Rite model 15-XMZ A351-CF8M body A351-CF8 hinge		Supplier: Summit Valve & Controls Edmonton, AB
12	Isolation Valve (V2025)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB

No.	Component	Details	Setting	Remarks
13	Pump Relief Valve (PRV2501)	Singer model 106-DWX-RPS c/w model 81-RP pilot, 120VAC solenoid, X129 SPDT limit switch, and 82-B booster pilot		Supplier: Summit Valve & Controls Edmonton, AB
14	Flow Control Valve (FCV2105)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0301 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
15	Filter #1	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
16	Flow Control Valve (FCV2106)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0501 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
17	Flow Control Valve (FCV2115)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0301 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
18	Filter #2	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
19	Flow Control Valve (FCV2116)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0501 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
20	Flow Control Valve (FCV2125)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0301 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
21	Filter #3	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
22	Flow Control Valve (FCV2126)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0501 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
23	Flow Control Valve (FCV2135)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0301 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
24	Filter #4	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
25	Flow Control Valve (FCV2136)	Motorized Bray series 30-111, wafer style Butterfly Valve, c/w Bray S70-0501 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
26	Backwash Waste Tank			
27	Level Indicating Transmitter (LIT4001)	MultiRanger, Echomax XPS-10	0.3 – 10m	Supplier: Siemens Milltronics Edmonton, AB
28	Flow Meter (FE4001)	Promag 50W	0-12 l/sec	Supplier: Endress + Hauser Canada Ltd. Edmonton, AB
29	Flow Control Valve (FCV4001)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0031 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB

No.	Component	Details	Setting	Remarks
30	Orifice Plate		60 mm hole for a regulated flow of 70 L/min	

5.9 Filter to Waste Flow

(Refer to Drawing P-10 and P-11, Section 4)

The following table identifies the components related to the flow of water from the plant filters to the City sanitary sewer system.

No.	Component	Details	Setting	Remarks
1	Filter #1	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
2	Flow Control Valve (FCV2103)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0121 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
3	Filter #2	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
4	Flow Control Valve (FCV2113)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0121 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
5	Filter #3	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
6	Flow Control Valve (FCV2123)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0121 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
7	Filter #4	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
8	Flow Control Valve (FCV2133)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0121 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
9	Surge Tank			
10	Level Indicating Transmitter (LIT4011)	Waterpilot FMX167	0 – 4.00m	Supplier: Endress + Hauser Canada Ltd. Edmonton, AB
11	Flow Meter (FE4011)	Promag 50W	0-5 l/sec	Supplier: Endress + Hauser Canada Ltd. Edmonton, AB
12	Flow Control Valve (FCV4011)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0031 actuator	Modulating	Supplier: Summit Valve & Controls Edmonton, AB
13	Orifice Plate		60 mm hole for a regulated flow of 70 L/min	

5.10 Air Scour Flow

(Refer to Drawing P-12, Section 4)

The following table identifies the components related to the flow of water from the air blowers to the filters.

No.	Component	Details	Setting	Remarks
1	Air Scour Blower #1 (C200)	Delta Blower Package Aerzen model #GM 15L Blower		Supplier: National Process Equipment Edmonton, AB
2	Isolation valve (V2001)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
3	Air Scour Blower #2 (C201)	Delta Blower Package Aerzen model #GM 15L Blower		Supplier: National Process Equipment Edmonton, AB
4	Isolation valve (V2041)	Bray series 31 trim 109, lug style Butterfly Valve		Supplier: Summit Valve & Controls Edmonton, AB
5	Flow Control Valve (FCV2107)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0031 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
6	Filter #1	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
7	Flow Control Valve (FCV2117)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0031 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
8	Filter #2	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
9	Flow Control Valve (FCV2127)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0031 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
10	Filter #3	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA
11	Flow Control Valve (FCV2137)	Motorized Bray series 30-109, wafer style Butterfly Valve, c/w Bray S70-0031 actuator	Open or Closed	Supplier: Summit Valve & Controls Edmonton, AB
12	Filter #4	Underdrains & Media	300mm sand layer & 700mm anthracite	Supplier: Leopold Zelienpole, PA

END OF CHAPTER 5

Chapter 6
OPERATING PROCEDURES

6.1 General

Raw water enters the Water Treatment Plant through a 250 mm from the dam on Geraldine Lake above the Plant. Upon entering the Plant the raw water is metered and controlled. The raw water is then disinfected with UV light to inactivate any pathogens. Downstream of the UV equipment the water flows through a set of flocculation tanks, or through a flocculation tank bypass line on to the filters. From the filters the now filtered water flows into the contact chamber where the necessary chemicals are added. The treated water then flows into the clearwells, through the backwash pumping chamber, then to a separate reservoir and finally into the City distribution system.

This process will be automatically controlled using a Plant Control System (PCS) and will require minimal intervention unless there is an alarm indicated. Monitoring, fine-tuning and scheduled maintenance of the Plant operating systems will ensure reliability and dependability with reduced system malfunctions and breakdowns.

6.2 Raw Water to Filter Flow

(Refer to drawing P-1 and P-2, Section 4)

Operation of the Treated Water System is initiated by the Reservoir water level indicator located in the off-site Reservoir (Level Indicating Transmitter-5001) or the back-up located in the backwash pumping chamber (Level Indicating Transmitter-2501). Either water level indicators will initiate the Treated Water Operation. On initiation of the treated water system operation the flow control valve (FCV-1001) is opened. This allows the gravity feed raw water to flow through either of the UV reactors (X-120 or X-121). The water then flows on to flocculation tanks or through the flocculation by-pass line on to the filters. Flocculation time can be varied by utilizing various configurations (series or parallel) of flocculation tanks, however this will only be required if flash mixing and coagulant dosing systems are installed in the future.

Presently the flocculation by-pass line will be utilized to divert the water to the filters. Each filter has a motorized control valve in its' influent channel which is either open or closed.

6.3 Filtered/Treated Water Flow

(Refer to drawing P-3 and P-4, Section 4)

The UV treated water flows through the filter media (sand & anthracite) and through the filter effluent channel of each filter. The motorized flow control valve on the 200 mm filtered water line is opened to allow the water to flow to the contact chamber. In the contact chamber chlorine is add to the water along with hydrofluorosilic acid (for fluoride) and caustic soda (for pH adjustment). The flow from the contact chamber can be diverted to either of the two clearwells or into the backwash pumping chamber, normally the now treated and filtered water flows into the east clearwell then to the west clearwell and then to the backwash pumping chamber. The treated water continues on from the backwash pumping chamber through the last motorized valve, at this point there is an injection point for the orthophosphate and testing of the pH and chlorine, and finally on to the off-site reservoir.

6.4 Chemical Flows

(Refer to drawing P-5, P-6 and P-7, Section 4)

All of the chemicals start at a small pumping skid consisting of two injection pumps with associated equipment and valving. The chlorine system uses gas cylinders and the other chemicals (hydroflourosilic acid, caustic soda, zinc orthophosphate) use 205 L drums.

6.5 Backwash Flow

(Refer to drawing P-8 and P-9, Section 4)

The backwash is initiated when: the filtered water valve is fully open, the filtered water turbidity > 0.3 NTU, the pressure indicating transmitter on the filtered water line senses the drop in pressure across the filter media, the operator enables the backwash sequence on the PCS or the elapsed time has passed (variable set in the PCS) . On backwash start-up the pump relief valve (PRV-2501) is in the open position so that when the backwash pump starts the backwash water flow initially goes back to the backwash pumping chamber. The backwash waste valve and backwash supply valves will now be opened. After a delay of about 3 minutes the PRV-2501 pilot solenoid will be energized allowing this valve to close slowly, thereby closing the pump bypass allowing backwash water to be introduced into the filter. The backwash water will flow from the filters into the backwash waste tank. The backwash waste water will then be metered out into the City sanitary sewer system. The backwash pump will deliver water to the filter for approximately 10 minutes at which time the PRV-2501 pilot solenoid will be de-energized allowing PRV-2501 to return to

bypass mode. Backwash supply and backwash waste valves will be closed. The backwash pump will be shut down following 2 minutes after PRV-2501 is fully open and once the valve status is confirmed for all backwash related valves, the filter is then ready to enter the filter to waste mode at which time the filter will be ripened.

6.6 Filter to Waste Flow

(Refer to drawing P-10 and P-11, Section 4)

The filter to waste flow allows the filter to ripen following the backwash sequence and pass filtered water with excess turbidity to storage. The filter influent valve will open allowing UV treated water to begin flowing through the filter. The filter to waste valve will be modulated to maintain the filter water level. The filtered waste water flows to the filtered water waste tank and then is metered out into the City sanitary sewer system. Filter to waste will continue for a pre-set time (~ 10-15 minutes) or until the turbidity of the filtered water is < 0.3 NTU. At this time the filtered water valve will open and the filter to waste valve will close, thereby placing the filter into filtration mode.

6.7 Air Scour Flow

(Refer to drawing P-12, Section 4)

At the start of the backwash cycle the air scour valve will open, followed by the starting of one of the air scour blowers. Air will be delivered to the filter for approximately 5 minutes followed by the blower shutting down, then the air scour valve closing.

END OF CHAPTER 6

Chapter 7
TROUBLESHOOTING PROCEDURES

7.1 Alarms in General

The Water Treatment Plant process, mechanical and electrical operating systems and equipment is continuously monitored with the appropriate alarms indicated if there is a system or equipment failure.

7.2 Pre-Treatment Alarms

Alarm No.	Tripped By	Set Point	Consequence
FAL-1001	Low flow in raw water supply header *Alarm held out or 5minutes on plant start sequence*	2 L/s	Plant Shut Down
X-120 Minor Alarm	X-120 Control Panel	Various Conditions	None
X-120 Major Alarm	X-120 Control Panel	Various Conditions	Duty/Standby reactor change over
X-120 Critical Alarm	X-120 Control Panel	Various Conditions	Duty/Standby reactor change over
X-121 Minor Alarm	X-120 Control Panel	Various Conditions	None
X-121 Major Alarm	X-120 Control Panel	Various Conditions	Duty/Standby reactor change over
X-121 Critical Alarm	X-120 Control Panel	Various Conditions	Duty/Standby reactor change over
LAL-5001	Low level in the existing reservoir	3.5 m	WTP Start
LAH-5001	High level in the existing reservoir	4.46 m	WTP Stop
LAL-2501	Low level in the backwash pumping chamber	x.x m	WTP Start
LAH-2501	High level in the backwash pumping chamber	x.x m	WTP Stop

7.3 Filtration Alarms

Alarm No.	Tripped By	Set Point	Consequence
AAH-2101	Filtration Mode – High filtered water turbidity	>0.3 NTU	Backwash sequence initiated
	Filter to Waste Mode – High filtered water turbidity	<0.3 NTU	Change to filtration mode
ZOA-2101	Failure of filter influent valve to open		Filter will not enter filtration or filter to waste mode
ZCA-2101	Failure of filter influent valve to close		Filter will not enter backwash mode
ZOA-2103	Filter to waste valve is fully open		Filter shutdown. Backwash was not effective.
ZCA-2103	Filter to waste valve has failed to open		Filter shutdown. Filter to waste can't occur
ZOA-2104	Filtered water valve is fully open		Backwash required.
ZCA-2104	Filtered water valve has failed to open		Filtration can't proceed
ZOA-2105	Failure of backwash water supply valve to open		Backwash pumps (P-205/206) can't start, backwash can't proceed
ZCA-2105	Failure of backwash water supply valve to close		Filter to waste can't proceed
ZOA-2106	Failure of backwash waste valve to open		Backwash pumps (P-205/206) can't start, backwash can't proceed
ZCA-2106	Failure of backwash waste valve to close		Filter to waste can't proceed, filter influent valve remains closed
ZOA-2107	Failure of air scour valve to open		Air scour blowers (C-200/201) can't start, backwash can't proceed
ZCA-2107	Failure of air scour valve to close		Backwash can't proceed.
UA-2001*	Fault in C-200		If duty blower, set C-201 as duty pump.If UA-201 active, plant Shut down.

Alarm No.	Tripped By	Set Point	Consequence
UA-2011*	Fault in C-201		If duty blower, set C-200 as duty pump. If UA-200 active, plant shut down
LAH 2101	High level in filter	300mm above normal operating level	FCV 2101 filter inlet valve closed

7.4 Clearwell & Backwash Supply Alarms

Alarm No.	Tripped By	Set Point	Consequence
UA-2051	Fault with P-205		If duty pump, set P-206 as duty pump. If UA-2061 active, plant shut down
UA-2061	Fault with P-206		If duty pump, set P-205 as duty pump. If UA-2051 active, plant shut down
LAL-2501	Low level in backwash pumping chamber		Backwash sequence disabled
LAH-2501	High level in backwash pumping chamber		Plant shut down

7.5 Chlorination Alarms

Alarm No.	Tripped By	Set Point	Consequence
AAH-3401 Chlorine alarms are always active	Chlorine Leak	2 ppm	Ventilation in chlorine room stops. HN-3401 starts BA-3401 starts

7.6 Fluoride, Orthophosphate & Hypochlorite Alarms

Alarm No.	Tripped By	Set Point	Consequence
UA-3031	Pump failure		P-304 starts Plant Shutdown
UA-3041	Pump failure		P-303 starts Plant Shutdown
UA-3051	Pump failure		P-306 starts Plant Shutdown
UA-3061	Pump failure		P-305 starts Plant Shutdown
UA-3621	Pump failure		P-363 starts Plant Shutdown
UA-3631	Pump failure		P-362 starts Plant Shutdown

7.7 Waste Tankage Alarms

Alarm No.	Tripped By	Set Point	Consequence
LAH-4001	High level in the backwash waste tank	3.1 m	FILTERS ARE LOCKED OUT FROM BACKWASHING AND P-205 AND P-206 SHUTDOWN
LAH-4011	High level in the filter to waste tank	3.1 m	Filters are locked out from filter to waste mode
FAH-4001	High flow out of backwash tank	10 L/s	FCV-4001 closes
FAH-4011	High flow out of filter to waste tank	5 L/s	FCV-4001 closes

7.8 Service Water Pumps Alarms

Alarm No.	Tripped By	Set Point	Consequence
UA-4101	Pump failure		P-411 starts Plant Shutdown
UA-4111	Pump failure		P-410 starts Plant Shutdown
PAL-4112	Low Pressure in service water	245 kPag	Plant Shutdown

END OF CHAPTER 7

Chapter 8
MAINTENANCE PROCEDURES AND SERVICE INFORMATION

8.1 General

To ensure uninterrupted use, equipment should be regularly inspected, tested, and proper repairs made and recorded. The objective is to minimize equipment operating problems and prevent failures by making minor or necessary repairs before major difficulties occur. The importance of record keeping cannot be over-emphasized. Good maintenance protects the owner's interest with manufacturer warranties, continuity, or maintenance despite staff turnovers and equipment reliability track record.

Environmental and operating conditions are key elements affecting proper and reliable operation of equipment. Costly repairs can be minimized if the following items are attended to:

KEEP IT CLEAN

KEEP IT TIGHT

8.1.1 Keep It Clean

Day-to day accumulation of normal atmospheric particles, lint, metallic particles form mechanical equipment cause problems with equipment over a long period of time. An accumulation affects equipment reliability and operating life. ALL equipment should be regularly cleaned.

8.1.2 Keep It Tight

All contactors and control devices operate with high speed movement. This motion creates vibration that can loosen hardware and other parts. External vibration from equipment may cause the loosening of hardware and connections in any equipment. All hardware and connections should be tightened regularly. This simple procedure takes only a small amount of time and can save hours of searching for intermittent problems. All rotating equipment such as motors are affected by vibrations. This can cause alignment problems, which can result in bearing failures.

8.2 Renewal Parts

Availability of parts can be a major problem these days as distributors are keeping very low inventories in a move to economize. This may make any part a long delivery item. For this reason local distributors should be contacted and parts availability assessed.

Any critical part affecting the reliability of the system should be ordered, recorded and stored by the maintenance department.

8.3 Parts and Equipment Ordering Procedure

During the first year of operation, the Contractor should be contacted for any replacement parts required. This will ensure that parts covered by warranty will be replaced under warranty. Failure to contact the Contractor may result in difficulties in obtaining warranty replacement.

Following the first year of operation, it is recommended that the Contractor also be contacted as many of the suppliers have a wholesale only policy. If it is necessary to purchase parts directly from the original supplier, the following information is required.

Make
Model No.
Year of Installation
Installing Contractor
Description of Part Required (ie. Fan Bearing)
Part No. if Available

When quoting a part number contained in manufacturer's catalogue, always provide the date of the catalogue you are referring to, as these numbers are often subject to change. The equipment supplier will have the latest edition of the manufacturer's catalogue.

If the original supplier is no longer in business, contact the contractor who will be able to suggest an alternate source of supply.

8.4 Scheduled Preventive Maintenance Program

Scheduled preventive maintenance is an effective means to improve services from systems and equipment. Where failure of equipment can result in shutdown, scheduled preventive maintenance is an economical alternative.

Causes of Equipment Failure

An effective maintenance program will attempt to remove or reduce causes of equipment failure. Common failure initiating causes are:

1. Loose and broken belts
2. Misaligned pulleys
3. Dirty or plugged filters
4. Dirty or plugged coils
5. Worn bearings
6. Improper lubrication and oiling or lack of
7. Persistent overloading
8. Above normal temperatures
9. Below normal temperatures
10. Obstruction of ventilation by foreign objects or material (blockage of air, dirt on components etc.)
11. Normal deterioration from age
12. Severe weather conditions

The scheduled preventive maintenance suggestions presented will be applicable to most equipment, but all of the suggestions given in any one section may not be applicable to the particular mechanical component being maintained. Most of the work may be done by the building operator but some may have to be left to the discretion of the building operator.
When equipment repair is necessary, please refer to the Manufacturer Data section provided in this manual. The frequency, which the tasks should be done as indicated.

Most maintenance can be done by average personnel, with a minimum need for specialized service.

8.4.1 Maintenance Legend

D		Daily
W		Weekly
M		Monthly
SA		Semi-Annually
A		Annually
PMI		Per Manufacturer's Instructions
AN		As Necessary

8.5 General Maintenance

Item	Maintenance Operations	Inspection Frequency	Remarks
Valves	Check for proper operation	A	
Motorized Valves	Follow maintenance schedule in the manufacturers manual	PMI	
UV Reactors	Maintenance as required by the list in the manufacturers manual	PMI	
Backwash Pumps	Follow maintenance schedule in the manufacturers manual	PMI	
Air Scour Blowers	Follow maintenance schedule in the manufacturers manual	PMI	
Item	**Maintenance Operations**	**Inspection Frequency**	**Remarks**
Service Water Pumps	Check pump operation and switch between duty and stand-by	M	
Chemical Metering Pumps	Follow maintenance schedule in the manufacturers manual	PMI	

8.6 Lubrication Schedule

Note:
For details of maintenance requirements or procedures for a specific piece of equipment, refer to the manufacturers brochures included as Chapter 9 of this manual.

Item	Part to be lubricated	Lubricant type	Frequency	Remarks

END OF CHAPTER 8

Chapter 9

TESTING AND CERTIFICATION DATA

Chapter 10

A: Valves

B: Blowers

C: Pumps

D: Chemical Equipment

E: UV Units

F: Media and Under Drains

G: Orifice Plate: