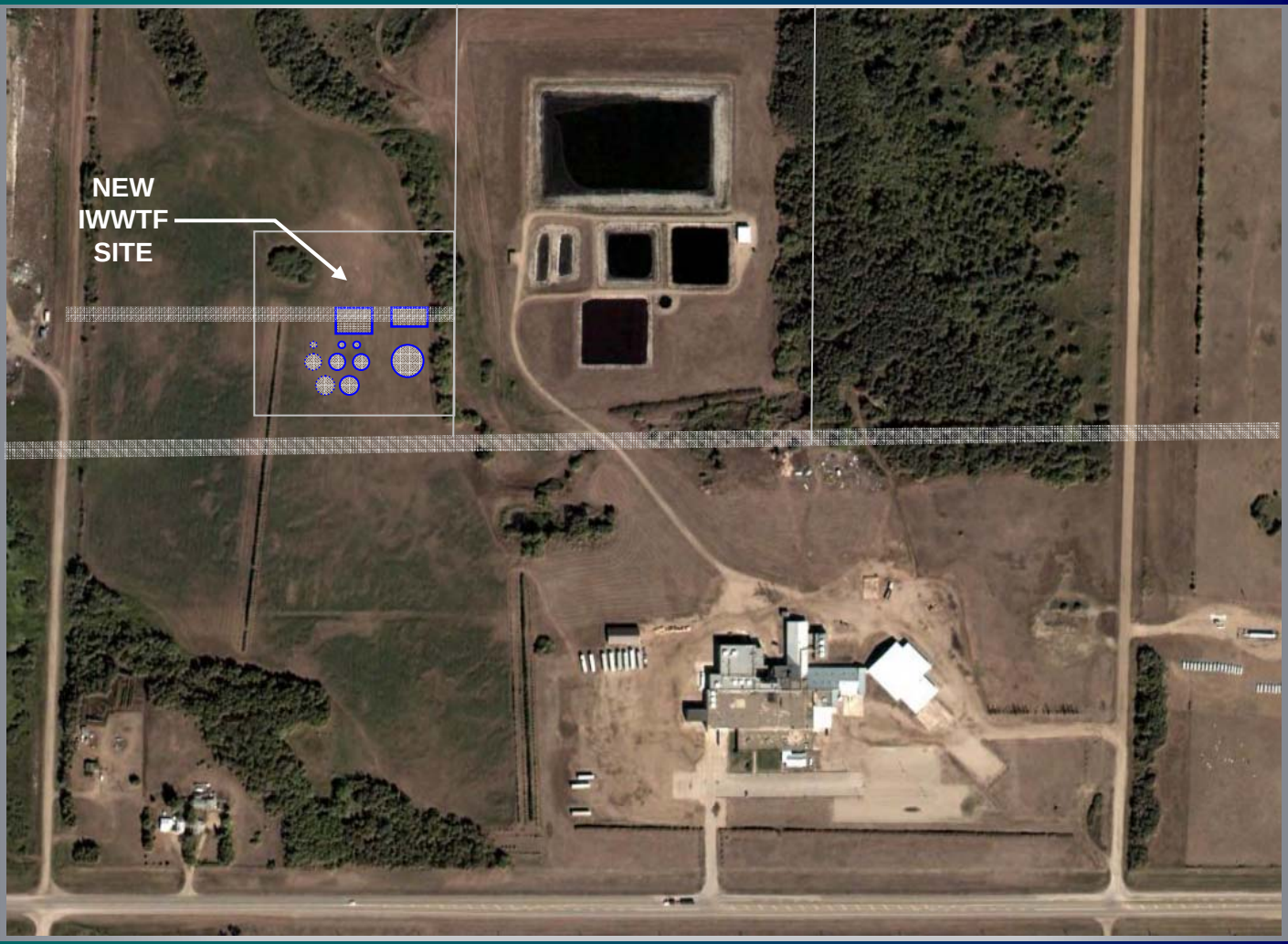
Appendix I
Functional Design Report

Industrial Wastewater Treatment Facility

Springhill Farms, LP and
Town of Neepawa, MB

FUNCTIONAL DESIGN REPORT



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Industrial Wastewater Treatment Facility

Springhill Farms, LP
and
Town of Neepawa, Manitoba

Functional Design Report

June 2008

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Section 1
Introduction

The Springhill Farms pork processing facility located in Neepawa, Manitoba has been operating with an industrial wastewater treatment facility (IWWTF) that has not be able to meet the provincial discharge requirements. As a result the Town of Neepawa municipal wastewater treatment facility has been accepting industrial wastewater treatment plant effluent where the water is further stabilized and discharged on a seasonal basis.

Hytek Ltd, recently purchased the Springhill Farms processing facility and plans on expanding the plant to its licensed capacity. As part of the acquisition and expansion, a new industrial wastewater treatment facility will be constructed to meet the Provincial regulatory requirements.

New provincial discharge requirements were put in-place to provide additional protection for surface water quality. New limits on nitrogen and phosphorus, chemicals that function as fertilizers in surface waters, will effectively reduce in-stream algae growth and provide subsequent higher dissolved oxygen, thereby improving conditions for aquatic life. The new IWWTF at Neepawa will be one of the first industrial facilities to comply with the new provincial requirements, producing some of the cleanest wastewater effluent possible.

This report develops the IWWTF with innovative treatment processes in order to meet the new provincial requirements. The design basis relies on wastewater treatment technology knowledge of the project team along with industry experience with other processing facilities. The process has been developed to meet a 15 mg/L total nitrogen and 1 mg/L total phosphorus discharge requirement. Functional design level drawings are developed to define the project in preparation for detailed design and construction.

Section 2
Design Basis

The new IWWTF will treat wastewater flows from the Springhill Farms LP pork processing facility at Neepawa, Manitoba. Process wastewater will be combined with truck wash and holding area wastes prior to initial screening and pumping.

Influent Criteria

Operation at Springhill Farms had included 18,250 head per week killed and 8,250 head per week cut. Future operation is planned to include 27,550 head killed and cut on a weekly basis. Future water use is expected to increase on a per hog basis. Table 2-1 lists the unit wastewater production on a per hog basis for the 5-day production week.

Table 2-1
Estimated Unit Wastewater Production
Weekly Production Basis
Springhill Farms LP Pork Processing Facility

Description	Units	Criteria
		Raw Influent
UNIT PRODUCTION		
Head Killed	Week	27,550
Flow per head	L/h	386
BOD_5 per head	kg/head	0.55
COD per head	kg/head	1.21
TKN per head	kg/head	0.13
TP per head	kg/head	0.012
5-DAY WASTEWATER PRODUCTION		
Flow	m3/d	2,128
BOD_5	mg/L	1,440
	kg/d	3,057
COD	mg/L	3,135
	kg/d	6,655
TSS	mg/L	820
	kg/d	1,741
TKN	mg/L	338
	kg/d	718
TP	mg/L	30
	kg/d	64

The treatment facility will be designed to treat the weekly production flow, with typically five or six days of operation, in a 7-day period. Raw influent will be screened and then pumped to a flow-attenuation tank. The attenuation tank will fill during the week and will drain over the course of the weekend. Table 2-2 lists the 7-day average treatment criteria which will serve as the basis for the main treatment facility.

Table 2-2
Estimated Wastewater Treatment Facility Influent
7-Day Wastewater Treatment Basis - Post Attenuation
Springhill Farms LP Pork Processing Facility

Description	Units	Criteria		
		Raw	Pretreat Removal	Pretreat Effluent
7-DAY WASTEWATER PRODUCTION				
Flow[A]	m3/d	1,520		1,520
BOD_5	mg/L	1,440	55%	648
	kg/d	2,184		983
COD	mg/L	3,135	55%	1,411
	kg/d	4,754		2,139
TSS	mg/L	820	77%	190
	kg/d	1,243		288
TKN	mg/L	338	56%	150
	kg/d	513		227
TP	mg/L	30	25%	23
	kg/d	45		34

A. Pre-attenuation flows (raw pumping and screening) estimated at max of 4,540 lps which translates to a peaking factor of 3.0 during the 5-day production period

Effluent Discharge Criteria

The Springhill Farms LP IWWTP is going through the permitting process and this functional design is part of that licensing process. Manitoba Conservation will require nitrogen and phosphorus removal for new wastewater treatment facilities in Manitoba. Table 2-3 lists the permit limits.

A minimum of 90% total nitrogen removal efficiency will be accomplished by sufficient recycle rates, proper operation, and the modern day equipment included in this design package.

Table 2-3
Effluent Discharge Criteria
Springhill Farms LP IWWTF

Parameter	Value
Carbonaceous 5-day Biological Oxygen Demand	<30 mg/L (based on 30 day rolling avg.)
Total Suspended Solids	<30 mg/L (based on 30 day rolling avg.)
Total Nitrogen	<15 mg/L (based on 30 day rolling avg.)
Total Phosphorus	<1 mg/L (based on 30 day rolling avg.)
Fecal Coliform	<200/100 mL based on 30 day geometric mean
Escherichia coli	<200/100 mL based on 30 day geometric mean

Section 3
Process Functional Design

This section presents the treatment processes in the industrial wastewater treatment facility serving the Springhill Farms wastewater. The narratives below discuss the proposed treatment system and refer to the drawings that appear at the end of this report.

Current Operation

Currently, raw influent from the facility drains to a sump in the dissolved air flotation (DAF) treatment room. There it is pumped to the DAF. DAF effluent flows to a manhole that also receives sanitary sewer, hog receiving facility water, and truck wash water. From the manhole, the combined flows are delivered to the existing treatment facility.

Proposed Facility Process Description

The discussion below follows sheet N0.0, the Process Flow Diagram, in the drawing set. Process mechanical and civil drawings are also noted. Drawings can be found at the back of the report, after the cost opinion section

Raw Influent and Screening. Future raw influent will be modified from the current operation. Process flows, sanitary sewer, barn waste and truck was flows will be combined just outside the processing facility. A new pump station will lift water into a forcemain and convey flows to the primary treatment building at the new treatment site.

The raw influent pumping and screening facilities need to be sized to process all flows that occur during the production schedule. Flows vary widely during a production day. Most of the wastewater flows occur during the 8-hour work day with additional wastewater coming as a result of cleaning flows after the production day. The raw influent pumping and screening facilities are sized for 4,540 lpm. On a seven day period, this equates to a peaking factor of 4.3 on a seven day week. Production may occur, however, in a five day week and so the raw influent side of the IWWTF needs to be sized to accommodate those flows. If 4,540 lpm is applied to a five day production schedule, the associated daily peaking factor is 3.0. As each hog processing facility is unique, pumping capabilities will be sized with flexible capacities to be able to provide for a certain level of uncertainty.

Influent screen size will be 0.76 mm to 1.0mm. Vendor data on the screen (IPEC 5496) is provided in the appendices.

Instrumentation schematics N1.0 and N2.0 show the raw pumping/screening and pumping to the flow attenuation tank. Mechanical sheet M2.0 and M2.1 show the facility layout and a section.

Primary Treatment – First Stage DAF. Out of the screen, water will drain to the new first stage DAF unit, sized to treat flows form the raw influent pump station. The purpose of the primary DAF unit is to remove fats/oils and gritty material that would present operational issues in the flow attenuation tank. It will remove 70% to 80% of the fat. Float sludge will drain to a dedicated hopper and them be treated

with a tricanter centrifuge that will separate the fat from the water and from the solids. The tricanter technology includes a heat treatment step with steam addition prior to addition to the centrifuge. The fat fat stream will be pumped to a fat storage tank and then used for boiler heating. The sludge and centrate are recombined to the main sludge hopper that is pumped to the sludge stabilization and storage pond.

Effluent from the first stage DAF unit drains to a sump. That water is subsequently pumped to the flow attenuation tank.

Flow Attenuation. The tank will be covered and insulated to reduce heat loss during winter time conditions. It will be equipped with a mixing system to ensure no solid settling occurs. The attenuation tank will provide 2.5 days of storage. It will fill throughout the work week and will drain throughout the two day weekend. The remaining 0.5 days of storage will be used as a minimum water level to ensure the tank can be mixed and the wastewater quality out of the tank remains consistent. This will allow the main treatment process to be designed for average flows, reducing the overall capital cost as well as the variability in wastewater quality.

The attenuation tank will be sized for 2.5 days of storage, translating to 3,800 M^3. It will be a epoxy coated bolted steel structure with a cover and spray on insulation that is protected with a spray on membrane.

Primary Treatment - Second Stage DAF. The second stage DAF unit includes a flocculantion and coagulation step with metal salt (likely ferric chloride) and polymer. Flows from the attenuation tank are regulated to the DAF unit. Metal salt and polymer is introduced upstream of a plug flow reactor prior to entering the DAF unit. The metal salt and polymer will be key in achieving sufficient nitrogen removal so that the activated sludge system can meet permit limits.

Effluent from the second stage DAF unit drains to a large standpipe/wetwell and is subsequently pumped to the anoxic basin in the activated sludge process.

Sludge from the second stage DAF will flow to the main sludge hopper where it is combined with tricanter sludge and thickened waste activated sludge prior and then is pumped to the sludge stabilization and storage ponds.

Activated Sludge / MBR. The membrane bioreactor (MBR) is an activated sludge process that uses membranes in lieu of clarifiers as the solids/liquids separation step. The activated sludge system relies on suspended bacteria in solution that consume organic material. They convert the organic material, expressed as chemical oxygen demand (COD) or biological oxygen demand (BOD_5), and produce more bacterial biomass. In doing so, nitrogen and phosphorus are taken up to support growth of the bacteria. Metal salts will be added to the treatment process to further reduce soluble phosphorus in the liquid stream. The system uses an aerated reactor to oxidize ammonia to nitrate (nitrification) and a primary non-aerated biological reactor to transform nitrate to nitrogen gas (denitrification). A secondary non-aerated reactor is provided that will be dosed with an external carbon sources (sugar) to polish additional nitrate out of solution. System sizing is listed on Table 3-1.

The general process configuration is illustrated on instrumentation sheet N0.0. The liquid process component is further illustrated in sheets N4.0 and N5.0. The aeration systems are illustrated in sheets N7.0 and N8.0.

Civil drawing sheet C2.0 and C3.0 show the layout of the anoxic and aeration tanks. Mechanical drawing sheets M1.0 and M1.1 show the layout of the MBR equipment within the treatment building.

There are a number of MBR manufacturers in the market today, but one in particular stands out in the industrial treatment market. Zenon/GE Environmental was the first large scale manufacturer of MBRs and today remains the leader related to design and build work. Vendor data for the Zenon equipment and other ancillary equipment is provided in the appendices. The Zenon proposal has equipment that has a firm capacity of 1,520 M^3/day. One membrane tank can process the design flow during periods of maintenance, providing the necessary level of redundancy. The system has an expandability of approximately 10% for future growth or additional flows.

Table 3-1
Activated Sludge / MBR Process Sizing
Springhill Farms LP Pork Processing Facility

Parameter	Value
Anoxic Tank	
Volume	950 M^3
HRT for forward flow	15.0 hrs
MLSS	10,000 mg/L
Anoxic Recycle	14 times Q
Aeration Tanks	
Number and Volume	2 @ 760 M^3
Total Volume	1520 M^3
HRT	24 hrs
MLSS	10,000 mg/L
Membrane Separation (ZeeWeed®)	
Number of Units	2
Cassettes per Unit	2
No. Modules per Cassette	48
Type:	Zenon ZW500D
Size of Each Unit	12.2 m x 2.4 m x 3.4 m high
Effluent TSS	< 2 mg/L
SRT	25 days
WAS (with metal salt addition)	816 kg/day

Disinfection. The MBR effluent has low effluent suspended solids and turbidity and as such is relatively easy to disinfect. A closed conduit ultraviolet disinfection system is proposed for use and will be located inside the treatment building. The units will be a low pressure high intensity system by Wedeco or equal.

Two units are proposed, each that can disinfect 100% of the design flow. The units have been sized for a disinfection of 120% of the design flow (1,825 M^3/day) in each of two units, thereby providing 100%

backup capacity. The 100 mJ/cm^2 dose will produce effluent easily meeting the coliform values listed in Table 2-3.

Vendor data on the UV equipment is provided in the appendices.

The UV system is illustrated in instrumentation drawing N8.0 and shown on mechanical sheet M1.0 and M1.1.

Effluent Cooling. A cooling tower process will be installed to provide effluent at winter ambient (4oC) conditions. The process will have the ability for recirculation and automatic bypass to regulate the effluent temperature.

Biosolids Handling. Several sludge streams will be produced between primary treatment and the activated sludge system. The sludge flow from the first DAF will be high in fat that must be separated from the sludge flow. Sludge will be pumped to a tricanter process that heats the sludge and then processes through a special centrifuge that fractionates the fat from the solids and water. The fat is then pumped to a heated storage vessel and then used in the boiler system as fuel. The primary DAF is expected to produce approximately 300 lbs of fat per day. The fat from the DAF unit is expected to fully fuel the steam boiler on an average basis. The boiler will be installed with dual burners, however, as a backup system. l. The sludge and water will be recombined in a common hopper with sludge from the second stage DAF. That combined sludge stream will be pumped to the sludge storage ponds.

Sludge flow from the MBR/activated sludge process is be thickened in a dedicated dissolved air flotation thickener (DAFT) unit. The DAFT is sized sufficiently large so that polymer is not necessary. Float sludge from this unit is combined in a common hopper with the sludge from the pretreatment DAFs The two DAF units are expected to produce approximately 1,200 kg/d total solids, including metal salt complexes, with the second stage DAF producing the most sludge. The activated sludge system is expected to produce 840 kg/d total solids, including metal salt complexes. .

The 12 million gallon polishing cell in the existing treatment process will be retrofitted and to store and stabilize sludge. The existing cell will be drained, cleaned out and a new divider berm will be installed in the middle of the pond. The inside slopes will be graded to 3:1. A new double HDPE liner system will be installed to provide primary and secondary containment. The new sludge ponds will have aeration, mixing, and sludge loadout. Each compartment will be approximately 18,500 cubic meters and will be sufficient to provide 400 days of hold time so that each will be fed on alternate years to provide 'batch' treatment

The liner system will consist of the following: HDPE geocomposite media with single sided non-woven geotextile on the soil side for gas venting, 80 mil HDPE conductive containment liner plumbed to a monitoring sump, HDPE geocomposite media to convey leakage flow between the liners, and a final primary layer of 80 mil HDPE conductive liner. The primary liner leakage will be monitored for leakage by using the secondary containment liner system.

Equipment List

Table 3.2 lists the major equipment identified for this project. The list generally follows the discussion above.

Operational Requirements

The wastewater treatment facility will run 24 hours per day seven days per week. It will be staffed during one shift per day, seven days per week. Three full time staff have been assumed for operations.

Control System

Because the plant will run unattended much of the time, automatic control of the unit processes is critical. A central programmable logic controller (PLC) will provide the automatic control and data acquisition for the various unit processes. Some of the unit processes will be supported by vendor PLCs, such as with the MBR, centrifuges, and UV disinfection equipment. In those instances, the vendor PLCs will provide data to the central PLC. In the event of a critical alarm, the central PLC will produce an alarm call to plant staff telephones.

Odors

Wastewater treatment facilities generate odors. Some are minor and some are major, but all treatment facilities produce some type of off-gas with an aroma. Such odors can be managed or minimized by containment, ventilation, facility citing, and odor control equipment when necessary. The existing industrial wastewater treatment facility generates odors due to the DAF pretreatment facility and treatment ponds. The plant location, on the downwind side of the Town of Neepawa, assists in keeping wastewater and hog processing odors out of town.

The new IWWTF will contain considerably less open water surface than the existing facilities. The unit processes contain a higher level of control than the existing facilities. Therefore, the new IWWTF will produce less odors than the existing facilities.

Traffic

The wastewater treatment facility will be staffed one shift per day. Chemical deliveries of polymer, metal salt (ferric chloride or alum), magnesium hydroxide, and carbon source (sugar) will be brought in on a monthly basis. Truck traffic to the IWWTF will average about two trucks per day during normal conditions. Under non-biosolids application periods, the traffic to and from the IWWTF will be minimal.

Once per year, there will be a liquid biosolids handling campaign where stored biosolids will be pumped out and applied to land. During those campaigns, there will be approximately 800 (5,000 gallon) truck loads over a two week period. Trucks will be routed through the a new plant access road in the existing plant access right of way.

Table 3-2
Equipment List

ITEM AND FUNCTION	NO.	TYPE	CAPACITY	HP	LOCATION	SPECIFICATIONS / COMMENTS
HEADWORKS FACILITY						
RAW LIFT PUMP	1+(1)	SELF PRIMING TRASH PUMP	3024 LPM @ 12.2 m (800 gpm @ 40 feet)	15 kW (20 HP)	HW BLDG	T-SERIES GORMAN RUPP, BACKUP SHARED WITH RAW LIFT PUMP, Z-BELT CONFIGURATION
FINE SCREEN	1	INTERNALLY FED DRUM	4530 LPM (1,200 GPM)	1.1 kW (1.5 HP)	HW BLDG	IPEC 5496 WITH 0.02" WEDGEWIRE
SCREENED LIFT PUMP	1+(1)	SELF PRIMING TRASH PUMP	3024 LPM @ 12.2 m (800 gpm @ 40 feet)	15 kW (20 HP)	HW BLDG	T-SERIES GORMAN RUPP, BACKUP SHARED WITH RAW LIFT PUMP, Z-BELT CONFIGURATION
FLOW ATTENUATION TANK						
FLOW ATTENUATION TANK	1	PAINTED BOLTED STEEL	3787M3 (1.0 MG), 24.4 M (80FT) DIA. X 9.1 M (30 FT) SWD	NA	OUTSIDE	WITH COVER, WITH 3" FOAM INSULATION AND SPRAY ON MEMBRANE
TANK MIX PUMP	1	SELF PRIMING TRASH PUMP	4540 LPM @ 17 m (1200 gpm @ 45 feet)	25 kW (40 HP)	HW BLDG	T-SERIES GORMAN RUPP, Z-BELT CONFIGURATION
DAF FEED PUMP	1	SELF PRIMING TRASH PUMP	1500 LPM @ 3 m (400 gpm @ 10 feet)	1.9 kW (2.5 HP)	HW BLDG	T-SERIES GORMAN RUPP, Z-BELT CONFIGURATION
ACTIVATED SLUDGE TANKAGE						
ANOXIC TANK	1	PAINTED BOLTED STEEL	950M3 (0.25 MG), 14.3 M (47FT) DIA. X 6.4 M (21 FT) SWD	NA	OUTSIDE	NO COVER, WITH 3" FOAM INSULATION AND SPRAY ON MEMBRANE
ANOXIC TANK MIXER	1	FLOATING MIXER	NA	30 kW (40 HP)	ANOXIC TANK	AQUA AEROBICS DDM
AERATION TANK	2	PAINTED BOLTED STEEL	760M3 (0.20 MG), 12.5 M (41FT) DIA. X 6.4 M (21 FT) SWD	NA	OUTSIDE	NO COVER, WITH 3" FOAM INSULATION AND SPRAY ON MEMBRANE
AERATION SYSTEMS	2	9" MEMBRANE DIFFUSER	450 DIFFUSERS, 650 SCFM EACH SYSTEM	NA	AERATION TANKS	ITT / SANITAIRE SILVER SERIES
POST ANOXIC TANKS	2	PAINTED BOLTED STEEL	169M3 (0.05 MG), 6 M (20FT) DIA. X 6 M (20 FT) SWD	NA	OUTSIDE	COVERED, WITH 3" FOAM INSULATION AND SPRAY ON MEMBRANE
POST ANOXIC MIX PUMPS	2	END SUCTION HORIZONTAL, FRAME MOUNTED	750 LPM @ 15.2 m (200 gpm @ 50 feet)	4.7 kW (6.5 HP)	PROCESS BUILDING	BELL AND GOSSETT OR EQUAL
MBR AND ANCILLARIES						
MEMBRANE UNITS, PREASSEMBLED	2	PRE-ASSEMBLED	1,520 M3/D (0.4 MGD) FIRM	NA	PROCESS BUILDING	EPOXY COATED RECTANGULAR TANK WITH 96 ZW500D MEMBRANE ELEMENTS IN TWO CASSETTES, PART OF MBR SUPPLIER PACKAGE
MBR RECIRCULATION PUMP RACK		PRE-ASSEMBLED	2625 LPM @ 7.6 m (700 gpm @ 25 feet)	TBD	PROCESS BUILDING	PART OF MBR SUPPLIER PACKAGE
PERMEATE PUMP RACK		PRE-ASSEMBLED	525 LPM @ X m (280 gpm @ X feet)	TBD	PROCESS BUILDING	PART OF MBR SUPPLIER PACKAGE
MEMBRANE SCOUR BLOWERS	2	POSITIVE DISPLACEMENT WITH SOUND ENCLOSURES	TBD	30 kW (40 HP)	PROCESS BUILDING	KAESER MODEL XXX, SOUND ENCLOSURE TO MEET 75 DbA at 1m, PART OF MBR SUPPLIER PACKAGE
AERATION / AIR LIFT PUMP BLOWERS	3	POSITIVE DISPLACEMENT WITH SOUND ENCLOSURES	1,200 SCFM AT MAX 12PSIG BLOWOFF	75KW (100 HP)	PROCESS BUILDING	KAESER FB 620C, SOUND ENCLOSURE TO MEET 75 DbA at 1m.
FERRIC TANK	1	POLYETHLENE	23 M3 (6,000 GAL)	NA		
FERRIC FEEDER	1	HOSE PUMP	MAX 3.5 LPM (56 GPH)	<0.3 KW (<0.5 HP)	PROCESS BUILDING	WATSON MARLOW DU520REL HOSE PUMP, WILL KEEP ONE ON-SHELF SPARE INSTEAD OF REDUNDANT UNITS
MAGNESIUM HYDROXIDE TANK	1	PAINTED STEEL	23 M3 (6,000 GAL)	1 KW (1.5 HP)	PROCESS BUILDING	TOP MOUNTED MIXER 7.5 HP MIXER
MAGNESIUM HYDROXIDE FEEDER	1	HOSE PUMP	MAX 3.5 LPM (56 GPH)	<0.3 KW (<0.5 HP)	PROCESS BUILDING	WATSON MARLOW DU520REL HOSE PUMP, WILL KEEP ONE ON-SHELF SPARE INSTEAD OF REDUNDANT UNITS
SUGAR BULK SYSTEM	1					
SUGAR STOCK TANK	1	POLYETHLENE	23 M3 (6,000 GAL)	NA		
MAGNESIUM HYDROXIDE FEEDER	1	HOSE PUMP	MAX 3.5 LPM (56 GPH)	<0.3 KW (<0.5 HP)	PROCESS BUILDING	WATSON MARLOW DU520REL HOSE PUMP, WILL KEEP ONE ON-SHELF SPARE INSTEAD OF REDUNDANT UNITS
DAF Units						
PRIMARY DAF	1		4,540 LPM (1,200 GPM-US)			IPL090E BY NIJHUIS
SECONDARY DAF	1		1,320 LPM (350 GPM-US)			IFP090E BY NIJHUIS WITH PFR
THICKENING DAF	1		62 LPM (16.5 GPM-US)			GDS BY NIJHUIS
SLUDGE PUMPS	1					
LAGOON SYSTEM						
SLUDGE AERATION BLOWER	1			100		KAESER
MIXING LOADOUT	1					TBD

Contingency Planning

The Neepawa IWWTF, as layed out, has redundancy in-place in each unit process and has multiple barriers. The combined redundancy with multiple barriers leaves the facility far less susceptible to catastrophic failure as a result of process and process equipment. The following are provisions available:

- **Influent Pumping.** One duty and one standby pumps
- **Screen.** One screen provided that is highly reliable from a mechanical standpoint. If for some reason, the screen could no longer function, the system can run without screening.
- **Flow attenuation lift pumps.** One duty lift pump with a standby pump.
- **Two Stage DAF System.** The first DAF is fed by gravity from the flow attenuation tank and does not rely on chemical dosing. The second stage DAF does have chemical dosing. The system can be run with one unit down for a period for servicing. The DAF equipment is highly reliable, however, and not subject to break downs with proper maintenance.
- **Process Feed Pumps.** DAF effluent will be fed to the anoxic tank using process feed pumps. One duty and one standby pump are provided.
- **Anoxic Recycle Pumping** is accomplished with air lift pumps that are not subject to failure. One blower is dedicated to air lift pumping and is same size as the aeration blowers. A standby blower is provided for backup.
- **MBR Recycle Pumping** is accomplished with end suction pumps in the treatment building. A spare pump is provided for backup.
- **Two MBR** tanks with associated membrane cassettes are provided. The system is sized such that all the flow can be processed through one membrane tank when necessary.
- **Post Anoxic Treatment.** The pretreatment and activated sludge system is designed to meet the required effluent conditions related to total nitrogen removal assuming a certain set of assumptions related to wastewater composition. Because there is an ever small chance the wastewater could be organically limited, a post anoxic system is provided that includes post anoxic tanks ahead of the MBR tanks. A supplementary carbon source feed system is provided to 'trim' nitrate out of the system to meet required permit levels.
- **Chemical Feed Systems** are provided that include ferric chloride, alkalinity, polymer, and sugar (carbon source) dosing. There is a single model of delivery pumps (variable speed peristaltics) that are highly reliable and unlikely subject to failure. Because of this, an on the shelf spare pump is provided in the even that one does malfunction.
- **Chemical Containment.** Each chemical feed system has its own associated containment volume, equal to 1.5 times the maximum storage volume.
- **Ultraviolet Disinfection.** Two UV disinfection units in a one (duty) and one (standby) arrangement.
- **Effluent Cooling.** The cooling system relies on a cooling system that is mechanically simple and relies on recirculation pumps and an automatic diversion valve linked to a temperature transmitter. Spare recycle pumps are provided. The system is designed so that as freezing occurs, water is bypassed to avoid freezing in the effluent pipeline

- **Backup Power.** Backup power will be provided to ensure the system will continue to convey flow. A small engine generator will be installed at the treatment facility and will power all necessary elements to convey flow. If a large scale power outage occurred, the processing facility will also lose power which will subsequently stop wastewater production.

The redundancy at each unit process is the main approach to contingency planning. Structural elements will be designed to withstand design winds, earthquakes, and snow loads.

Groundwater Protection

New facilities are designed with little or no leakage. Process tanks will have concrete foundations. The liner system on the retrofitted lagoon will meet lagoon seepage requirements. The double liner system will provide continuous seepage monitoring.

Section 4
Facility Design Criteria

The following elements will be used for detailed design of the industrial wastewater treatment facility.

Structural

A geotechnical engineering report was prepared for the site that will be available during detailed design. That report found groundwater at 2 to 2.5 meters in depth and native sand soils that were considered acceptable for typical foundations not requiring piles. Soil bearing for structures was recommended not to exceed 110 kPa which will be met by all new facilities. Slab work will include a layer of clean crushed gravel. Native soil was considered appropriate for sub-grade structure backfill.

The site is classified as Seismic Site Response - Site Class D.

The treatment building and screening building are currently planned as pre-engineered steel buildings. Outdoor tanks will be constructed as epoxy coated bolted steel, either with bolted steel floors or cast in place concrete floors.

Facilities will be designed in accordance with the following codes:

- Manitoba Building Code
- National Building Code of Canada (NBC) 1995
- NBC Structural Commentaries (Part 4)
- ACI 350M-01 Code Requirements for Environmental Engineering Concrete Structures
- Any other provincial or municipal codes or ordinances

Fire Protection

Where appropriate NFPA 820 will be used as a guideline for design associated with ventilation and electrical requirements. Currently, there is a fire hydrant system at the facility on a 150 mm diameter pipe.

HVAC

Screening Building. The screening building will be somewhat humid and odorous. It will be designed with a two rate ventilation system; 6 air changes per hour when not occupied and 12 air changes per hour when occupied.

Treatment Building. There are three rooms in the treatment building and each will have different characteristics.

1. Pretreatment Building. This room will contain a raw influent screen, a first stage DAF unit, a second stage DAF unit with a steam injected sludge treatment tricanter technology, and a waste activated sludge DAFT. This will be a moist and odorous atmosphere and is assumed to be a 12 air

change per hour system. Heating equipment will be designed to maintain 10°C conditions with the maximum 6 air changes per hour.

2. MBR Process Area. This area contains the MBR equipment (mixed liquor suspended solids with 1% solids content), non-classified chemicals (magnesium hydroxide, ferric chloride, sugar, and weak acids for membrane cleaning), and electric motors. MBR tankage will be covered and vented to outside in an effort to reduce moisture. A maximum ventilation rate of 2 air changes per hour is suggested for this space in order to control moisture. Heating equipment will be designed to maintain 10°C conditions with the maximum 6 air changes per hour.

3. Breakroom/Lab/Electrical Room Space. This area is furred in from the MBR process area. Air will be handled separately in this space, maintained with a positive pressure, and vented to the MBR process area. This space will be designed with a minimum air exchange for an occupied space and heated to 22°C in winter conditions.

Electrical

The site currently runs on a 3-phase, 600 volt power system and has a 1,000 amp capacity. This system will be continued. Initial work at the site suggests that the existing power transformer is large enough to power the new site. This will be confirmed during detailed design.

The screening facility will be treated as a classified space with regards to electrical. Motors will all be 3-phase TEFC, lights will meet Class I Division II requirements. HVAC equipment will meet non-sparking requirements.

The treatment building is not considered classified. All equipment motors, however, will be 3-phase TEFC. Control panels that are subject to any water will be Nema 4 or Nema 4x.

Civil

The site for the new treatment facilities are on the north side of the hog processing buildings and south of the existing wastewater treatment facilities. An effort is being made to keep the new IWWTF site as compact as possible while still serving functional requirements. Sheet C1.0, C2.0, and C3.0 provide a preliminary civil perspective on the site.

Currently, there is no asphalt on the north side of the facility. In an effort to reduce dirt traffic into buildings, the current strategy is to have 10 meters of asphalt approach on all garage doors, sidewalks and personal doors.

Section 5
Schedule

Implementation of the new IWWTF includes the functional design step, a permitting or environmental review step, detailed design, design review, equipment procurement and finally construction. Table 5-1 lists the schedule. It assumes two design packages. In Phase 1, the process mechanical and electrical will be suitably developed so that piping, electrical, and instrumentation stubs can be located in the building slab. This will also be the point where the MBR equipment vendor negotiation is finalized. Then the treatment building and associated foundation will be designed. When environmental licensing is complete, the site will be cleared and the building construction will proceed with the goal of completing the slab work prior to winter. The steel erection will then be completed over the winter.

Phase 2 will include the full civil, process mechanical, structural, electrical and instrumentation design. It will proceed after licensing and continue in the fall/winter with a final design review step in January 2009. Equipment procurement will be started in the late fall 2008 and continue through winter, completing in February 2009. Civil work will begin on April 1, 2009 with simultaneous work inside the treatment building with mechanical and electrical disciplines. Table 5-1 shows treatment process startup beginning in mid-August and continuing through mid-September 2009.

Table 5-1
Springhill Farms IWWTF
Project Development Schedule

Element	Calendar Days Duration	Start	Finish	
Permitting / Licensing	150	Apr 2, 2008	Aug 30, 2008	
Detailed Design	150	May 1, 2008	Dec 18, 2008	
Construction				
Treatment building subgrade with stubs for process piping, water, electrical	35	Sep 13, 2008	Oct 18, 2008	
Treatment building foundation	28	Oct 19, 2008	Nov 16, 2008	
Metal building erection	90	Dec 16, 2008	Mar 16, 2009	
Fur in electrical/lab/break room	21	Mar 17, 2009	Apr 7, 2009	
Site grading and civil piping	35	Apr 1, 2009	May 6, 2009	
Tank foundations	35	May 7, 2009	Jun 11, 2009	
Tank erection	42	Jun 12, 2009	Jul 24, 2009	
Tank Testing	14	Jul 25, 2009	Aug 8, 2009	
Process mechanical in buildings	63	Apr 14, 2009	Jun 16, 2009	
Electrical	60	May 14, 2009	Jul 13, 2009	
Instrumentation - integration	35	Jul 14, 2009	Aug 18, 2009	
Seeding / landscaping	21	Sep 1, 2009	Sep 22, 2009	
Asphalt	14	Aug 24, 2009	Sep 7, 2009	
Startup	21	Aug 19, 2009	Sep 9, 2009	
Tuning	60	Sep 10, 2009	Nov 9, 2009	
Performance Testing	30	Jan 15, 2010	Feb 14, 2010	

Section 6
Cost Opinion

A cost opinion was developed for this project. The development of the cost opinion relied on vendor pricing for major equipment, collaboration with a local contractor on unit pricing for standard construction elements, and recent experience with similar projects. The cost opinion breakdown shows detailed costs and allocations where appropriate. Table 6-1 provides the entire capital cost opinion. Table 6-2 provides the operation and maintenance cost opinion. The final project costs may vary from the numbers presented and will depend on final project scope, implementation schedule, continuity in project team, conditions required of the general contractor, actual site conditions, competitive market conditions, and actual material costs and labor rates.

Table 6-1
Project Capital Cost Opinion[A]
Town of Neepawa and Springhill Farms, LP
New IWWTF - Functional Design
(June, 2008)

DESCRIPTION	Area Total
Mobilization/Demobilization	$70,000
Decommissioning Existing Facilities	$50,000
Site Prep	$160,000
Lagoon Improvements	$1,110,000
Primary Electrical	$110,000
Roads / Driveways	$270,000
Yard Piping	$300,000
Fine Screen	$460,000
Raw and Post Screening Lift Station	$310,000
Flow Attenuation	$1,570,000
Chemical Feed Facilities	$560,000
Activated Sludge System	$2,890,000
Disinfection	$350,000
Effluent Cooling	$300,000
Install of MBR and Centrifuge	$560,000
Ancillary Dewatering Room Equipment	$380,000
Laboratory area and Break Room	$110,000
Mechanical, Design Details	$630,000
Electrical, Instrumentation and Control	$1,570,000
Process Building	$1,310,000
Screening Bldg	$210,000
MBR Equipment	$1,820,000
DAF Equipment	$1,290,000
SUBTOTAL CONSTRUCTION COST	**$16,390,000**
Base Project Contingency	$3,280,000
Engineering and Admin	$1,970,000
Environmental Permitting	$320,000
General Conditions	$1,640,000
OVERALL PROJECT COST OPINION	**$23,600,000**

A. Functional design level cost development. Costs may vary from those shown due to labor rates, materials pricing, fuel pricing, and project continuity as well as other factors.

B. Design Criteria: 1,520 m3/day; Primary Influent: 2,180 kg/d BOD, 1,240 kg/d TKN; Primary DAF removes 40% TKN

C. Provincial sales taxes included and GST is excluded in all numbers shown

Table 6-2
Project Operation and Maintenance Cost Opinion
Town of Neepawa and Springhill Farms, LP
New IWWTF - Functional Design
(May 22, 2008)

DESCRIPTION	Item Total	Comments
Plant Labor	$210,000	Full time staff, fully burdened, (DAF and MBR can be run with one full time person)
Polymer for DAF	$9,132	5 mg/L total polymer dose
Electricity	$197,100	
Denit. Carbon Source	$56,657	Per Univar; 15 mg/L N
Membranes	$26,400	Full membrane replacement every 8 years
Building Heat	$61,600	150 day heating season at 0F average, see heating calcs spreadsheet, assumed 55F in building and $0.90/therm
Magnesium Hydroxide	$273,750	Per Univar
Ferric Chloride	$136,875	In DAF and AS
Liquid Sludge Hauling/Disposal	$108,500	@ $0.03 / imperial gallon
Maintenance	$225,000	overall estimate
Lab Analyses	$45,500	for regulatory compliance
SUBTOTAL[A]	$1,360,000	
Additional allowances @ 10%	$140,000	
TOTAL O&M COST OPINION	$1,500,000	

A. Rounded up to nearest $1,000

DRAWINGS

Spring Hill Farms Pork Processing Plant, L.P. & Town of Neepawa, Manitoba

Industrial Wastewater Treatment Facility

Neepawa, Manitoba

Functional Design Drawings
May, 2008

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

DRAWINGS INDEX

VICINITY MAP

LOCATION MAP

Perpared for:

Neepawa

SPRINGHILL FARMS

For Additional Information Regarding This Project, Contact:

PHARMER ENGINEERING

1998 W. Judith Lane
Boise, ID 837065
208.433.1900

PRELIMINARY - NOT FOR CONSTRUCTION

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION: 0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSR
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility
Neepawa, Manitoba
HYDRAULIC PROFILE

DRAWING NUMBER
G1.0
REV A

PRELIMINARY - NOT FOR CONSTRUCTION

N:\10211 Hytek - Spring Hill\dwg\G1.0-10211RA.dwg, 5/22/2008 11:58:36 AM

PLAN

1 – 150

0 150'

PRELIMINARY

DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHKD BY	DATE

ATTENTION: 0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DMS
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	AS NOTED

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

FACILITY LOCATION PLAN

DRAWING NUMBER: C1.0

REV: D

PRELIMINARY - NOT FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	AS NOTED

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

SITE PLAN

DRAWING NUMBER
C2.0
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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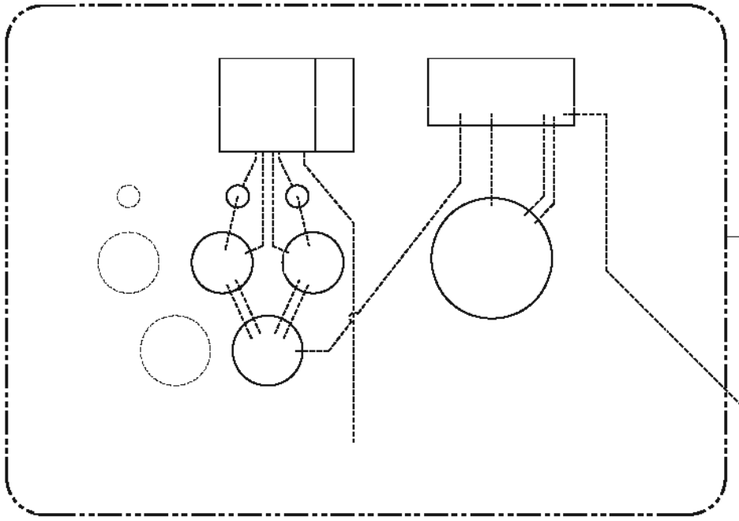

SEE C3.1 FOR ENLARGED PLAN

250mm(10")

PICK-UP TRUCK WASH AND SANITARY SEWER

DAF ROOM

EXISTING COLLECTION SUMP

EXISTING BLDG.

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

PLAN
1=50
0 50'

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	AS NOTED

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

YARD PIPING PLAN

DRAWING NUMBER
C3.0
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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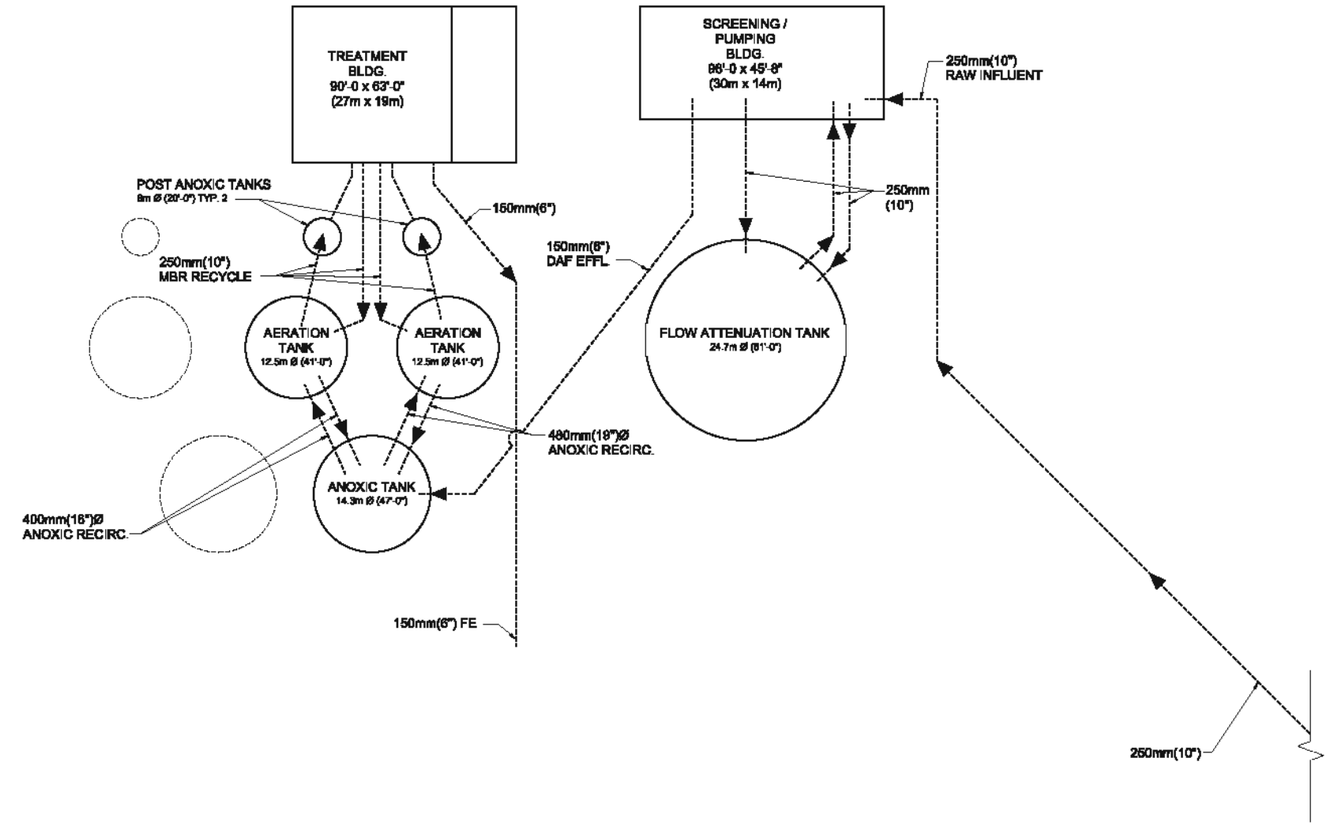

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

PLAN
1=30
0 30'

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	AS NOTED

Spring Hill Farms
Industrial Wastewater Treatment Facility
Neepawa, Manitoba
YARD PIPING ENLARGED PLAN

DRAWING NUMBER
C3.1
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

N:\10211 Hytek - Spring Hill\dwg\C3.1-10211RC.dwg, 5/22/2008 12:04:28 PM

90'-0"
[27432.00mm]

20'-0"
[6096.00mm]

B
M1.1

12'-0" [3657mm]
O.H. DOOR
(TYP. 2)

PALLET STORAGE

LAYDOWN AREA

MONORAIL

MONORAIL

SUGAR STOCK
7'-0"Ø TANK
[2130mm]

SUGAR FEED AREA

FD

14'-6"
[4419.60mm]

63'-0"
[19202.40mm]

9'-6"
[2895.60mm]

A
M1.1

CIP AREA

MBR TANK

MBR TANK

COMPRESSOR
(INSTRUMENT AIR)

MBR
BLOWERS

AERATION /
AIRLIFT
BLOWERS

RECIRC P.S.

PERMEATE P.S.

EYEWASH

BACK PULSE TANK

HW

UTILITY
WATER
PUMPS

SODIUM
HYPOCHLORITE
DRUMS

UV UNITS

UV SERVICE
AREA

UV
CONTROL
PANEL

PROCESS BUILDING
PRE-ENGINEERED STEEL
W/ 8.5m(28'-0") CLEAR
HEIGHT

68'-6"
[20878.80mm]

BREAK
AREA

CONTROL AREA

LAB AREA

EYEWASH

REST
RM.

MECHANICAL

ELECTRICAL

20'-6"
[6248.40mm]

20'-6"
[6248.40mm]

20'-6"
[6248.40mm]

AREA OF DROP CEILING

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

PLAN

3/16"=1'-0"

0 3' 16'

PRELIMINARY - NOT FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

TREATMENT BUILDING PLAN

DRAWING NUMBER
M1.0
REV C

FILENAME: X1-0000000.DWG

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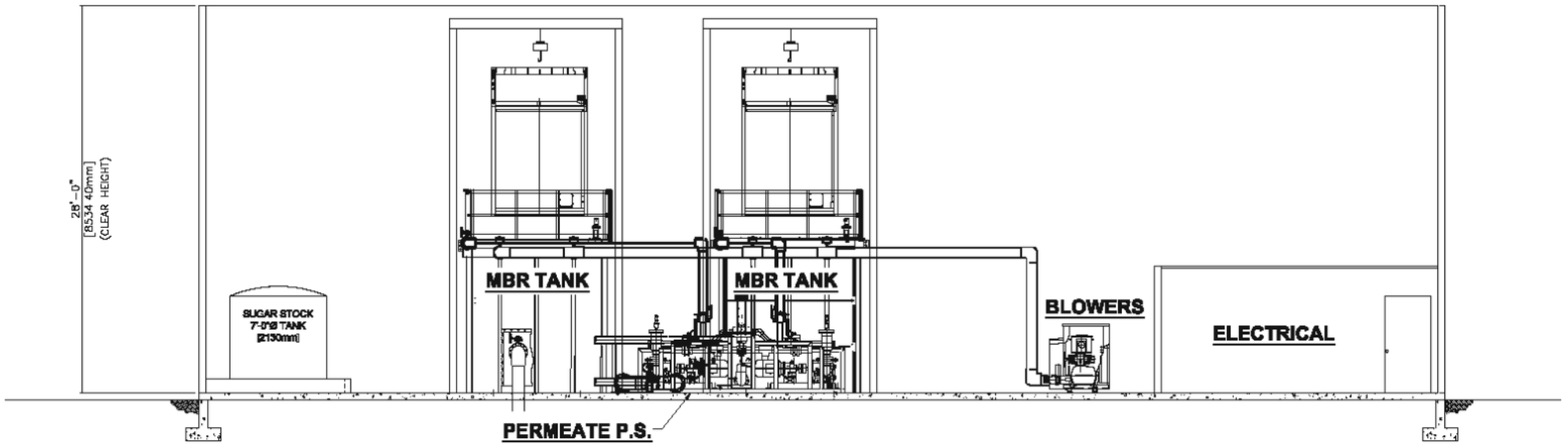
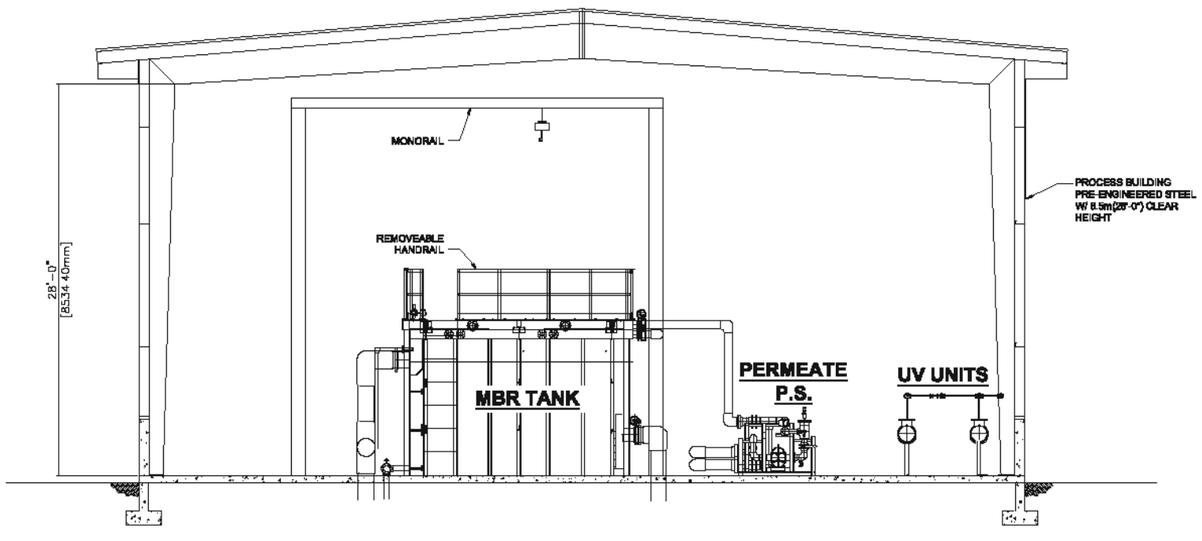


SECTION A

3/16"=1'-0"

0 3' 16'



SECTION B

3/16"=1'-0"

0 3' 16'

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

TREATMENT BUILDING SECTION

DRAWING NUMBER
M1.1
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

N:\10211 Hytek - Spring Hill\dwg\M1.1-10211RC.dwg, 5/22/2008 12:14:56 PM

98'-0"
[29870.22mm]

B
M2.1

12'-0" [3657mm]
O.H. DOOR

PRE-ENGINEERED
METAL BUILDING

9'-0"
[2743.20mm]

ELECTRICAL

FERRIC CHLORIDE
STORAGE TANK

MAGNESIUM
HYDROXIDE
STORAGE TANK

POLYMER AREA

MAGNESIUM
HYDROXIDE
PUMPS

FINE
SCREEN
(IPEC 5486 ENCLOSED, SS
0.02" WEDGE WIRE OPENING.
FEET AT 3m ABOVE F.F.)

18'-8"
[5689.55mm]

47'-8"
[14528.80mm]

8'-0" [2438mm]
O.H. DOOR

WASTE ACTIVATED SLUDGE DAFT

SECONDARY DAF
(NIJHUIS IPF 080E)

SCREENED
EFFLUENT LIFT
PUMPS

SCREEN
PLATFORM
COLUMN

20 cu. yd.
LOAD-OFF BIN

SLUDGE
PUMP
AREA

A
M2.1

FLOOR
HATCH

COMPRESSOR

TRICANTER

SLUDGE
HOPPER

RECEIVING
TANK

PRIMARY DAF
(NIJHUIS PL060E)

ATTENUATION
TANK MIX
PUMP

PRIMARY DAFT
FEED PUMPS

STEAM
BOILER

FAT STORAGE
(HEATED)

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

PLAN
1/4"=1'-0"
0 1' 4'

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE. SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	AS NOTED

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

SCREENING / PUMPING BUILDING PLAN

DRAWING NUMBER
M2.0
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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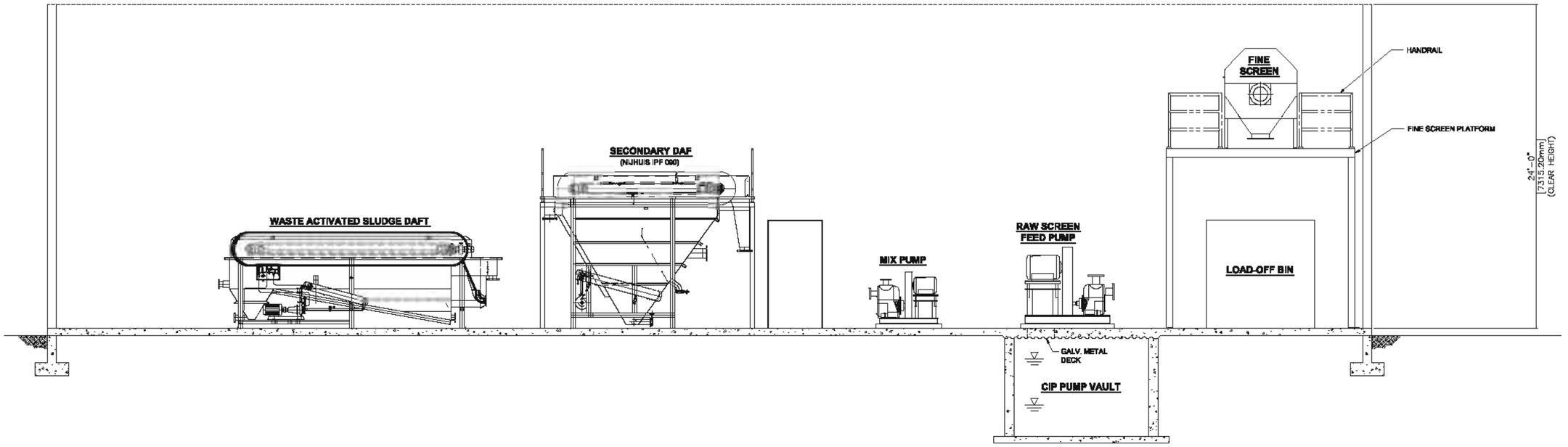
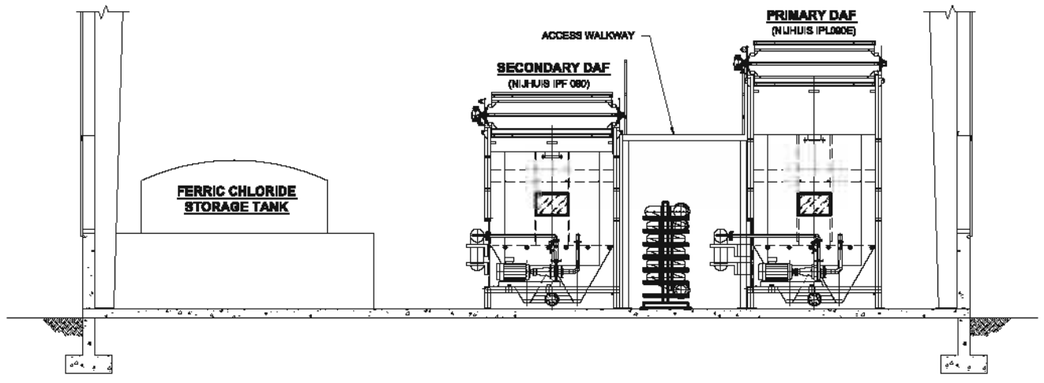


SECTION A
1/4"=1'-0"
M2.0



SECTION B
1/4"=1'-0"
M2.0

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION: 0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility
Neepawa, Manitoba
SCREENING / PUMPING BUILDING SECTIONS

DRAWING NUMBER
M2.1
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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PROCESS WW

EXISTING RAW PUMP STATION

SANITARY SEWER

RECEIVING AREA AND TRUCK WASH

(MANHOLE IN DRIVEWAY)

FINE SCREEN

PRIMARY DAF

TO BLOWDOWN SUMP

FLOW ATTENUATION

FeCL & POLYMER

M

SECONDARY DAF

TO BLOWDOWN SUMP

STEAM

FAT STORAGE

SLUDGE

CENTRATE

TO LAGOONS

HoCl

M

NON-POTABLE UTILITY WATER

UV DISINFECTION

UV DISINFECTION

EFFLUENT COOLING

PERMEATE PUMPING

MBR

MBR RECYCLE PUMPING 5X

SUGAR FEED

POST ANOXIC

AIR

AEROBIC TANK

PERMEATE PUMPING

MBR

MBR RECYCLE PUMPING 5X

SUGAR FEED

POST ANOXIC

POST ANOXIC

AIR

AEROBIC TANK

ANOXIC RECYCLE PUMPING ~12X TO ~14X

$Mg(OH)_2$

$FeCl_3$

ANOXIC TANK

TO LAGOONS

PRELIMINARY

DO NOT USE FOR CONSTRUCTION

PRELIMINARY - NOT FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION: 0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	JRH
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

PROCESS FLOW DIAGRAM

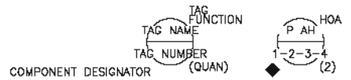
DRAWING NUMBER

N0.0

REV C

N:\10211 Hytek - Spring Hill\dwg\W0.0-10211RC.dwg, 5/22/2008 12:18:32 PM

INSTRUMENT TAG IDENTIFICATION



TAG NAME
- P: FIRST LETTER, SEE ISA TABLE BELOW
- AH: SUCCEEDING LETTERS, SEE ISA TABLE BELOW
- HOA: TAG FUNCTION ABBREVIATION, SEE LISTING AT RIGHT

TAG NUMBER
- 1: UNIT NUMBER. UNIT (UNIT PROCESS) NUMBER IS A MAJOR PORTION OF THE ENTIRE TREATMENT PROCESS. SEE DRAWING NO. 09-N-1 FOR INTERFACE SUMMARY DIAGRAM.
- 2: LOOP NUMBER
- 3: DEVICE NUMBER
- 4: SECONDARY DEVICE NUMBER. USED WHEN MORE THAN ONE COMPONENT HAS THE SAME UNIT, LOOP AND DEVICE DESIGNATIONS.

(QUANTITY) (2): TOTAL NUMBER OF DEVICES WHERE MORE THAN ONE DEVICE IS REQUIRED. DEVICE NUMBERS ARE SEQUENTIAL BEGINNING WITH THE TAG NUMBER SHOWN. IF QUANTITY IS NOT SHOWN THEN ONE DEVICE ONLY IS REQUIRED.

COMPONENT DESIGNATOR ◆: SEE LISTING AT RIGHT

TAG FUNCTION ABBREVIATIONS

ALT	ALTERNATE
C	CLOSE(D)
CM	COMPUTER–MANUAL
DIFF	DIFFERENCE OR DIFFERENTIAL
DO	DISSOLVED OXYGEN
F	FAIL
F(X)	CHARACTERIZED
FOR	FORWARD–STOP(OFF)–REVERSE (MAINTAINED CONTACT)
FSR	FORWARD–STOP–REVERSE (MOMENTARY CONTACT)
HOA	HAND–OFF–AUTOMATIC (MAINTAINED CONTACT)
HOR	HAND–OFF–REMOTE (MAINTAINED CONTACT)
II	CURRENT–TO–CURRENT
IP	CURRENT–TO–PNEUMATIC
LL	LEAD–LAG (MAINTAINED CONTACT)
LOE	LOSS OF ECHO (ULTRASONIC SENSOR FAILURE)
LOR	LOCAL–OFF–REMOTE (MAINTAINED CONTACT)
LOS	LOCKOUT STOP (LOCKABLE IN "STOP" POSITION. MOMENTARY CONTACT)
LR	LOCAL–REMOTE (MAINTAINED CONTACT)
MA	MANUAL–AUTOMATIC (MAINTAINED CONTACT)
MOA	MANUAL–OFF–AUTOMATIC (MAINTAINED CONTACT)
O	OPEN
OA	OFF–AUTOMATIC
OCA	OPEN–CLOSE–AUTOMATIC (MAINTAINED CONTACT)
OC	OPEN–CLOSE(D) (MAINTAINED CONTACT)
OSC	OPEN–STOP–CLOSE (MOMENTARY CONTACT SPRING RETURN TO CENTER POSITION)
OO	ON–OFF (MAINTAINED CONTACT)
OOA	ON–OFF–AUTOMATIC (MAINTAINED CONTACT)
OOR	ON–OFF–REMOTE (MAINTAINED CONTACT)
R	RUN
SBL	SLUDGE BLANKET INTERFACE LEVEL
SP	SPEED POT
SQRT	SQUARE ROOT
SS	START–STOP (MOMENTARY CONTACT)
SSA	START–STOP–AUTOMATIC (MOMENTARY CONTACT)
SSL	START–STOP–LOCK (LOCKABLE IN "STOP" POSITION. MOMENTARY CONTACT)
SUM	SUMMATION
VIB	VIBRATION
X	MULTIPLY

TAG SYMBOLS

	FIELD MOUNTED	PANEL MOUNTED ACCESSIBLE TO OPERATOR	PANEL MOUNTED NONACCESSIBLE TO OPERATOR	MOTOR STARTER MOUNTED ACCESSIBLE TO OPERATOR	MOTOR STARTER MOUNTED NONACCESSIBLE TO OPERATOR
DISCRETE INSTRUMENTS	( )	⟷	⟷	⟷	⟷
PROGRAMMABLE CONTROLLER–BASED FUNCTIONS			⟷		⟷
MULTIFUNCTION KEYPAD/DISPLAY FUNCTIONS	( )	⟷		⟷	
HMI/SCADA SOFTWARE–BASED FUNCTIONS		⟷	⟷		

INSTRUMENT SOCIETY OF AMERICA TABLE

LETTER	FIRST LETTER (S): PROCESS OR INITIATING VARIABLE	FIRST LETTER (S): MODIFIER	SUCCEEDING LETTERS: READOUT OR PASSIVE FUNCTION	SUCCEEDING LETTERS: OUTPUT FUNCTION	SUCCEEDING LETTERS: MODIFIER
A	ANALYSIS (*)		ALARM (W LOGGING)	ANNUNCIATE	
B	BURNER COMBUSTION		USERS CHOICE (*)	USERS CHOICE (*)	USERS CHOICE (*)
C	USERS CHOICE (*)			CONTROL	
D	USERS CHOICE (*)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE				FEEDBACK
G	USERS CHOICE (*)		GLASS		
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE	TIME RATE OF CHANGE	KEYPAD (DATA ENTRY)	CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTOR	MOMENTARY			MONITORING
N	USERS CHOICE (*)		USERS CHOICE (*)	USERS CHOICE (*)	USERS CHOICE (*)
O	USERS CHOICE (*)		ORIFICE		
P	PRESSURE OR VACUUM		POINT (TEST CONNECTION)		
Q	QUANTITY	INTEGRATE			
R	RADIOACTIVITY		RECORD OR TREND		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	UNIVERSAL/MULTIVARIABLE (*)		MULTIFUNCTION (*)	MULTIFUNCTION (*)	MULTIFUNCTION (*)
V	VIBRATION			VALVE	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED (*)	X AXIS	UNCLASSIFIED (*)	UNCLASSIFIED (*)	CONTROL
Y	EVENT, STATE (W. LOGGING)	Y AXIS		RELAY OR COMPUTE (*)	
Z	[illegible] DIMENSION	Z AXIS		DRIVE, ACTUATE OR UNCLASSIFIED FINAL CONTROL ELEMENT	

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

(*) WHEN USED, EXPLANATION IS SHOWN ADJACENT TO INSTRUMENT SYMBOL.

SPECIAL CASES:
ETM – ELAPSED TIME METER
MS – MOTOR STARTER
MOR – MOTOR OVERLOAD RELAY
MPR – MOTOR PROTECTION RELAY

EQUIPMENT AND VALVE TAG IDENTIFICATION

TAG NUMBER

W–X–Y–Z
**

- W: EQUIPMENT OR SELF CONTAINED VALVE ABBREVIATION
- X: UNIT PROCESS NUMBER
- Y: LOOP NUMBER
- Z: UNIT NUMBER
- ** COMPONENT DESIGNATOR

EQUIPMENT ABBREVIATIONS

E	EJECTOR
G	GATE
M	MECHANICAL EQUIPMENT
P	PUMP
T	TANK

SELF CONTAINED VALVE ABBREVIATIONS

ARV	AIR RELEASE VALVE
AVRV	AIR AND VACUUM RELIEF VALVE
LCV	LEVEL CONTROL VALVE
PCV	PRESSURE CONTROL VALVE
TCV	TEMPERATURE CONTROL VALVE
PSV	PRESSURE SAFETY (RELIEF) VALVE

LOCAL CONTROL PANEL TAG IDENTIFICATION

TAG NUMBER

W–X–Y–Z
◆

- W SITE IDENTIFIER (BUILDING NUMBER)
- X SEE EQUIPMENT LIST BELOW
- Y UNIT PROCESS NUMBER
- Z PANEL NUMBER
- ◆ COMPONENT DESIGNATOR

EQUIPMENT LIST

- LCP – LOCAL CONTROL PANEL
- CS – CONTROL STATION
- ITC – INTERCONNECTING TERMINATION CABINET
- AFD – ADJUSTABLE FREQUENCY DRIVE
- AP – ALARM PANEL

POWER OPERATED VALVE TAG IDENTIFICATION

- HKU — MULTIFUNCTION DISPLAY/KEYPAD
- ——S—— SERIAL LINK
- ——F—— PLC DATA HWY (FIBER OPTIC)
- ——DH—— PLC DATA HWY (COPPER)
- FOC — FIBER OPTIC CONVERTER
- PIC — PROCESSOR INTERFACE CARD
- D — DATA OUTLET

LINE IDENTIFICATION

PROCESS FLOW

FLOW STREAM IDENTIFIERS

- PI — NEW MAJOR PROCESS FLOW STREAM (CLOSED CONDUIT)
- RAS — NEW INTERMEDIATE PROCESS FLOW STREAM (CLOSED CONDUIT)
- ALP — NEW MINOR PROCESS FLOW STREAM (CLOSED CONDUIT)
- PI — EXISTING MAJOR PROCESS FLOW STREAM (CLOSED CONDUIT)
- RAS — EXISTING INTERMEDIATE PROCESS FLOW STREAM (CLOSED CONDUIT)
- ALP — EXISTING MINOR PROCESS FLOW STREAM (CLOSED CONDUIT)
- – – PI – – FUTURE PROCESS FLOW STREAM

SIGNALS

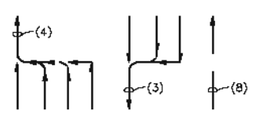
- DISCRETE (ON/OFF ETC.)
- A — MODULATED (4 TO 20 mADC ETC.)
- DATA HIGHWAY
- S — SERIAL LINK (RS–232, RS–485)
- INSTRUMENT SUPPLY OR CONNECTION TO EQUIPMENT
- FILLED SYSTEM (CAPILLARY TUBING ETC.)
- PNUEMATIC
- HYDRAULIC
- ELECTROMAGNETIC OR SONIC (GUIDED)
- ELECTROMAGNETIC OR SONIC (UNGUIDED)
- MECHANICAL LINK

STRUCTURES AND EQUIPMENT

- NEW OR RELOCATED ITEM
- EXISTING ITEM
- NEW OR RELOCATED STRUCTURE
- EXISTING STRUCTURE

NON–CONNNECTING LINES

CONNECTING LINES



PARALLELING LINES (PARENTHETICAL NUMBER INDICATES THE NUMBER OF SIGNALS REPRESENTED)

COMPONENT DESIGNATORS

- ● CRITICAL ALARM
- ◆ PROVIDE IN ACCORDANCE WITH SECTION 13400
- ◆◆ EXISTING COMPONENT TO BE RELOCATED IN ACCORDANCE WITH SECTION 13400
- ◆◆◆ OWNER FURNISHED COMPONENT TO BE INSTALLED IN ACCORDANCE WITH SECTION 13400
- * OWNER FURNISHED COMPONENT TO BE INSTALLED IN ACCORDANCE WITH DIVISION 11 AND DIVISION 15
- ** PROVIDE AS PART OF A MANUFACTURER'S OR VENDOR'S PACKAGED SYSTEM IN ACCORDANCE WITH DIVISION 11, DIVISION 13 AND DIVISION 15
- *** EXISTING COMPONENT TO BE RELOCATED IN ACCORDANCE WITH DIVISION 11 AND DIVISION 15

PROVIDE COMPONENT WITHOUT A DESIGNATOR IN ACCORDANCE WITH DIVISION 11, DIVISION 13 AND DIVISION 15

GENERAL NOTES

1. HALF–TONED PORTIONS OF P&ID'S INDICATE EXISTING FACILITIES WHICH ARE NOT A PART OF THIS CONTRACT.
2. HALF–TONED RECTANGULAR SHAPES ON P&ID'S REPRESENT EXISTING CONTROL PANELS WHICH ARE NOT A PART OF THIS CONTRACT.
3. THERE IS NO INTENT TO SHOW ALL EXISTING FACILITIES ON THE P&ID'S.

NOTICE:

THIS IS A STANDARD LEGEND.
NOT ALL OF THE INFORMATION SHOWN ON THIS LEGEND IS USED IN THESE CONTRACT DRAWINGS.

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION: 0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	D.B.
DRAWN:	T.B.
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	NTS

Spring Hill Farms
Industrial Wastewater Treatment Facility
Neepawa, Manitoba

PROCESS AND INSTRUMENTATION LEGEND

DRAWING NUMBER
N0.1
REV C

FILENAME: N-1-10088RA.DWG

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PRELIMINARY - NOT FOR CONSTRUCTION

VALVE SYMBOLS

- ECCENTRIC PLUG (SEAT/PORT)
- BUTTERFLY
- BALL
- GLOBE
- GATE
- KNIFE GATE
- PINCH
- NEEDLE
- SOLENOID
- THREE-WAY
- TELESCOPING
- BALL CHECK
- SWING CHECK
- SPLIT DISC CHECK
- DIAPHRAM CHECK
- CALIBRATED BALANCE
- PRESSURE CONTROL (REGULATED SIDE)
- PRESSURE RELIEF
- AIR RELEASE AND VACUUM RELIEF
- MUD

GATE SYMBOLS

- SLUICE
- SLIDE
- FLAP GATE
- WIER GATE
- STOP PLANK

VALVE AND GATE POWER ACTUATOR SYMBOLS

- ELECTRIC MOTOR
- ELECTRIC MOTOR WITH POSITIONER
- PNEUMATIC WITH SOLENOID
- PNEUMATIC WITH POSITIONER
- HYDRAULIC WITH SOLENOID
- HYDRAULIC WITH POSITIONER

NOTE ON 'XX':

ON LOSS OF PRIMARY POWER (PNEUMATIC OR ELECTRICAL)

XX:
- FC = FAIL CLOSED POSITION
- FIP = FAIL INTERMEDIATE POSITION
- FLP = FAIL LAST POSITION
- FO = FAIL OPEN POSITION

FLOW ELEMENT SYMBOLS

- PARSHALL FLUME
- ROTAMETER
- PROPELLER OR TURBINE METER
- SUSPENDED ULTRASONIC LEVEL ELEMENT
- SUSPENDED SUBMERSIBLE LEVEL ELEMENT
- SUBMERSIBLE PROBE
- CLAMP ON ULTRASONIC FLOWMETER
- MAGNETIC FLOWMETER
- PITOT–STATIC
- TARGET TYPE SENSOR
- VENTURI OR FLOW TUBE
- VORTEX SHEDDING
- ORIFICE METER
- VERTICAL FLOAT

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

MISCELLANEOUS SYMBOLS

- HARDWIRED INTERLOCK SEE SPECIFICATION
- OR
- MICROPROCESSOR BASED INTERLOCK SEE SPECIFICATION
- OR
- BLIND FLANGE OR CLEAN OUT
- AIR GAP
- STRAINER
- FLUSHING WATER CONNECTION
- SEAL WATER CONNECTION
- EJECTOR
- AUTOMATIC SAMPLER
- DIFFUSER
- BUBBLER LEVEL ELEMENT
- VENT
- PURGE SET X W = WATER A = AIR
- 120V — 120 VOLT, 60 HZ POWER SUPPLY POINT
- MIXER WITH ELECTRIC MOTOR
- ELECTRIC MOTOR
- MANUAL SAMPLE PORT
- AUTOMATIC DRAIN
- MANUAL DRIP TRAP
- DIAPHRAGM SEAL
- ANNULAR SEAL
- FLOW STRAIGHTENING VANE
- CALIBRATION CHAMBER
- DENSITY METER X: N – NUCLEAR D – OPTICAL U – ULTRASONIC
- RUPTURE DISK
- PULSATION DAMPENER

LEGEND:

ALUM	ALUMINUM SULFATE
ALP	AIR LOW PRESSURE
CL	CHLORINE
DE	DECANT
FE	FINAL EFFLUENT
RAS	RETURN ACTIVATED SLUDGE
RW	RAW
THIO	CALCIUM THIOSULFATE
W3	NON POTABLE (RECLAIM)

PUMP & COMPRESSOR SYMBOLS

- SUBMERSIBLE PUMP
- CENTRIFUGAL PUMP (DRY PIT)
- VERTICAL TURBINE PUMP
- PROGRESSING CAVITY PUMP
- CENTRIFUGAL BLOWER
- ROTARY LOBE PUMP, BLOWER OR COMPRESSOR (POSITIVE DISPLACEMENT)
- COMPRESSOR (PISTON)
- CHEMICAL FEED PUMP
- PLUNGER PUMP
- DIAPHRAGM PUMP
- AIR LIFT PUMP

INTERFACE SYMBOLS

PROCESS FLOW

XXX = SOURCE SHEET XO.
YYY = DESTINATION SHEET NO.

INTER–UNIT PROCESS:
A = SOURCE UNIT PROCESS NO.
B = INTERFACE NO.

NEW OR CONCURRENT — EXISTING

TO INTERFACE NOT IN CONTRACT

INPUTS & OUTPUTS (I/O) TO PLC OR DISTRIBUTED CONTROL SYSTEMS

- (X) ANALOG INPUT
- (X) ANALOG OUTPUT
- (X) PULSE INPUT
- (X) PULSE (MODULATING) OUTPUT
- (X) DIGITAL INPUT
- (X) DIGITAL OUTPUT

NOTE ON 'X':

X = TOTAL NUMBER OF I/O WHERE MORE THAN ONE I/O IS REQUIRED. IF QUANTITY IS NOT SHOWN THEN ONE I/O IS REQUIRED.

NOTICE:

THIS IS A STANDARD LEGEND.
NOT ALL OF THE INFORMATION SHOWN ON THIS LEGEND IS USED IN THESE CONTRACT DRAWINGS.

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION: 0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	D.B.
DRAWN:	T.B.
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	NTS

Spring Hill Farms
Industrial Wastewater Treatment Facility
Neepawa, Manitoba

PROCESS AND INSTRUMENTATION DIAGRAM LEGEND

DRAWING NUMBER: N0.2
REV: C

PRELIMINARY - NOT FOR CONSTRUCTION

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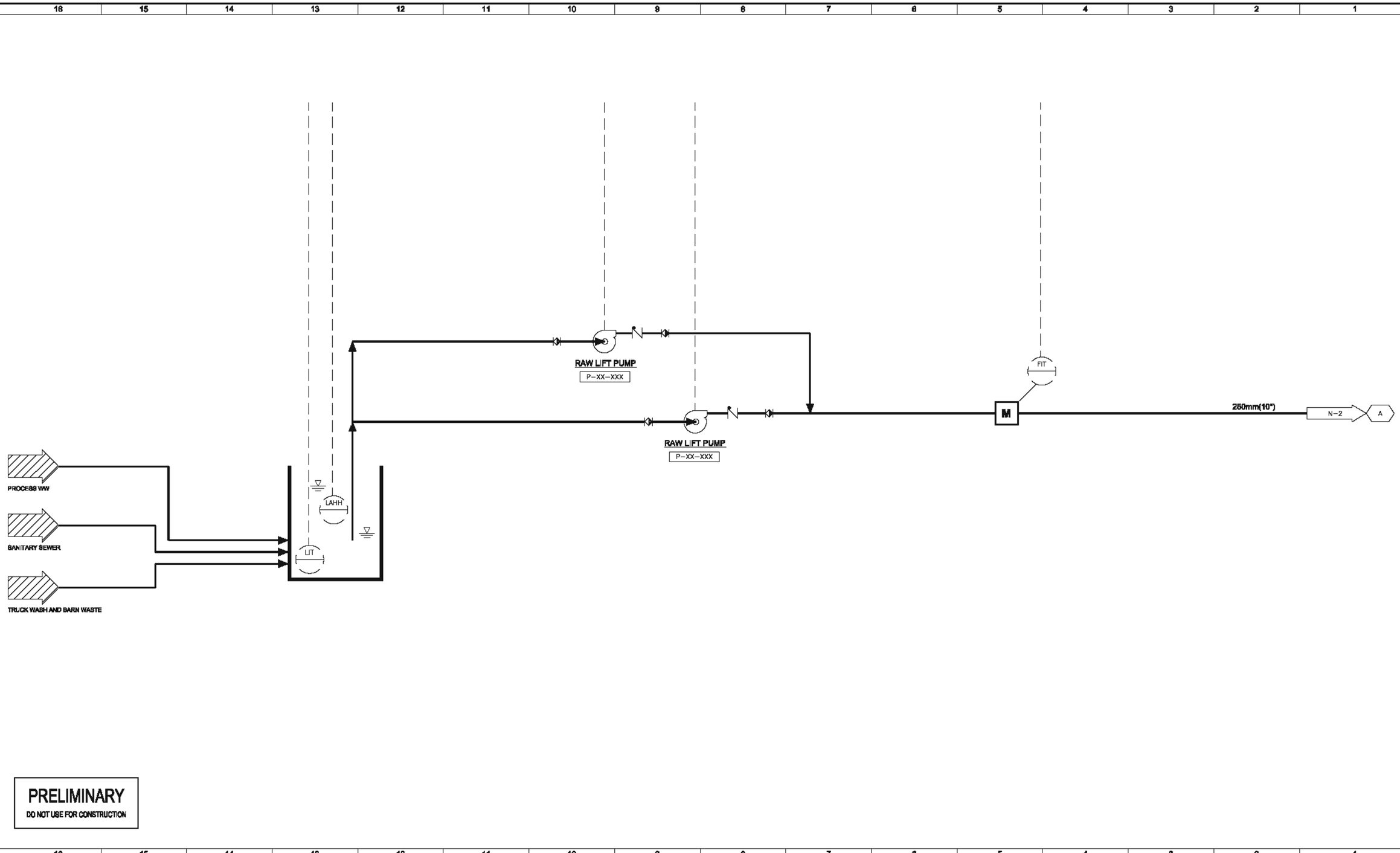

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

NEW RAW INFLUENT LIFT STATION
P&ID

DRAWING NUMBER
N1.0
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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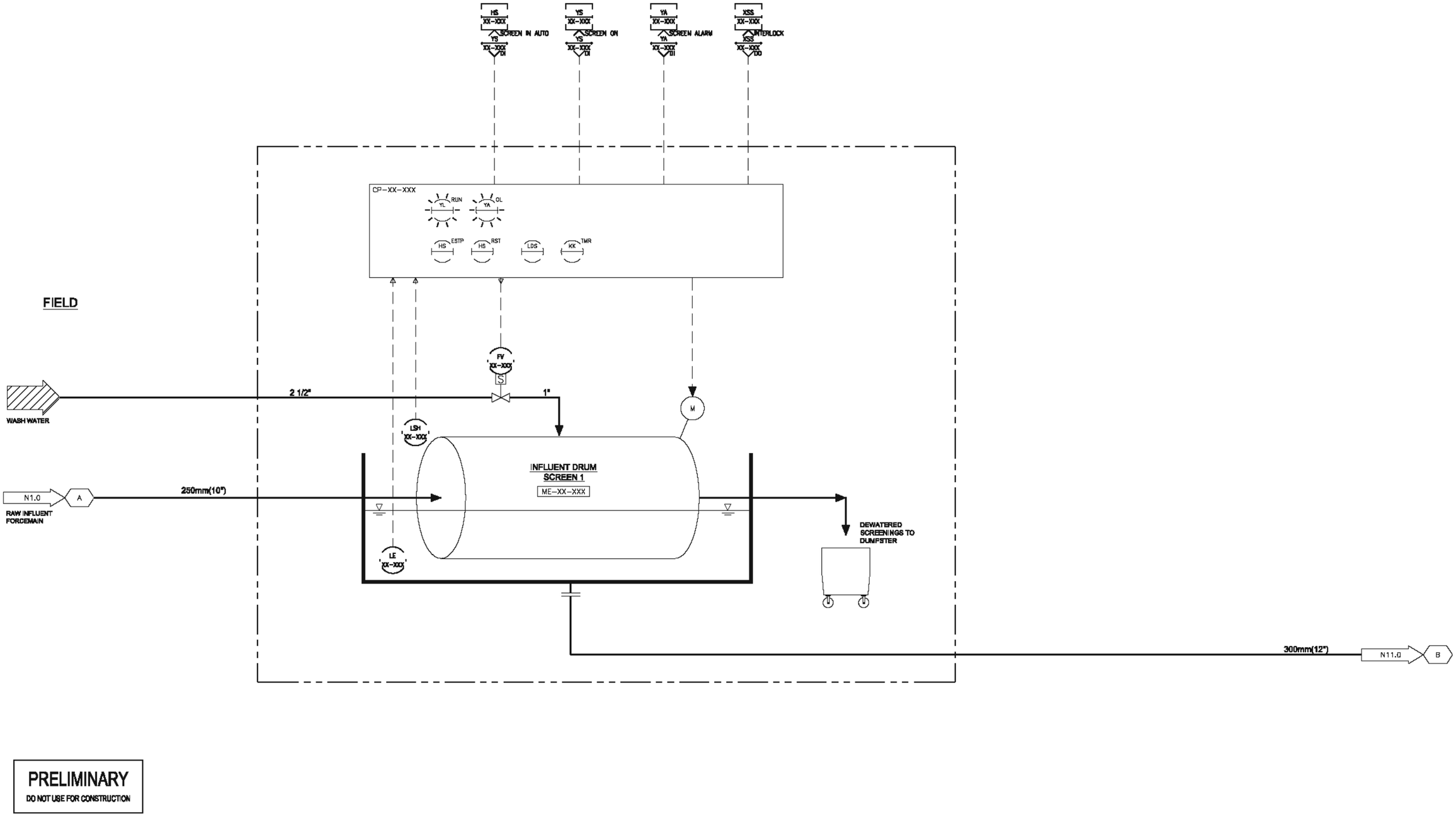

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION: 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility
Neepawa, Manitoba
INFLUENT SCREEN P&ID

DRAWING NUMBER: N2.0 REV B

PRELIMINARY - NOT FOR CONSTRUCTION

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CONTROL PANEL

24m Ø x 9.1m SWD
(80 ft. x 30 ft. SWD)

LE

SCREENED LIFT PUMP
P–XX–XXX

SCREENED LIFT PUMP
P–XX–XXX

SCREENED LIFT PUMP
P–XX–XXX

EA. @
3137 lpm @ 15.2m
(830gpm @ 22 psig)

TANK MIX PUMP
P–XX–XXX

DAF FEED PUMP
P–XX–XXX

1690 lpm @ 3.6m
(420gpm @ 5 psig)

FIT

150mm (6")

N11.0

D

N11.0

C

300mm (12")

LE

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

FLOW ATTENUATION
P&ID

DRAWING NUMBER
N3.0
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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CONTROL PANEL

N11.0 E 150mm (6")

N9.0 M 25mm (1")

M

ANOXIC TANK
T-XX-XXX

350mm (14")

400mm (16")

350mm (14")

400mm (16")

FIT

AIR LIFT PUMP
P-XX-XXX

AIR

AIT

TT

TE

AEROBIC TANK #1
T-XX-XXX

400mm (16")

400mm (16")

POST ANOXIC TANK #1
T-XX-XXX

M

PUMP
P-XX-XXX

25mm (1") N9.0 K

N5.0 F

400mm (16")

N5.0 H

N10.0 N

FIT

AIR LIFT PUMP
P-XX-XXX

AIR

AIT

TT

TE

AEROBIC TANK #2
T-XX-XXX

400mm (16")

400mm (16")

POST ANOXIC TANK #2
T-XX-XXX

M

PUMP
P-XX-XXX

25mm (1") N9.0 K

N5.0 G

400mm (16")

N5.0 J

N10.0 P

400mm (16")

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

PRELIMINARY - NOT FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

BASIN P&ID

DRAWING NUMBER
N4.0
REV C

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CONTROL PANEL

FROM POST ANOXIC
N4.0 F
300mm (12")

TO AERATION
N4.0 H
300mm (12")

FIT

M

PUMP
P-XX-XXX

MEMBRANE TANK #1
M-XX-XXX

PIT

AIR
N5.0

M

PUMP
P-XX-XXX

M

PUMP
P-XX-XXX

M

PUMP
P-XX-XXX

FIT

150mm (6")
N8.0 L

FROM POST ANOXIC
N4.0 G
300mm (12")

TO AERATION
N4.0 J
300mm (12")

FIT

M

PUMP
P-XX-XXX

MEMBRANE TANK #2
M-XX-XXX

PIT

AIR
N5.0

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

EQUIPMENT IN VENDOR SUPPLIED PACKAGE

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

MEMBRANE SYSTEM
P&ID

DRAWING NUMBER
N5.0
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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AIR LIFT PUMP
P-XX-XXX

TRAIN 1
AERATION BASIN

AIR LIFT PUMP
P-XX-XXX

TRAIN 2
AERATION BASIN

AIRLIFT PUMPS

250mm(10")

250mm(10")

150mm(6")

100mm(4") x150mm(6")

AERATION BLOWER
B-XX-XXX

150mm(6") x100mm(4")

150mm(6")

100mm(4") x150mm(6")

BACKUP BLOWER
B-XX-XXX

150mm(6") x100mm(4")

150mm(6")

100mm(4") x150mm(6")

AERATION / AIRLIFT BLOWER
B-XX-XXX

150mm(6") x100mm(4")

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

AERATION BASIN BLOWER / AERATION P&ID

DRAWING NUMBER
N6.0
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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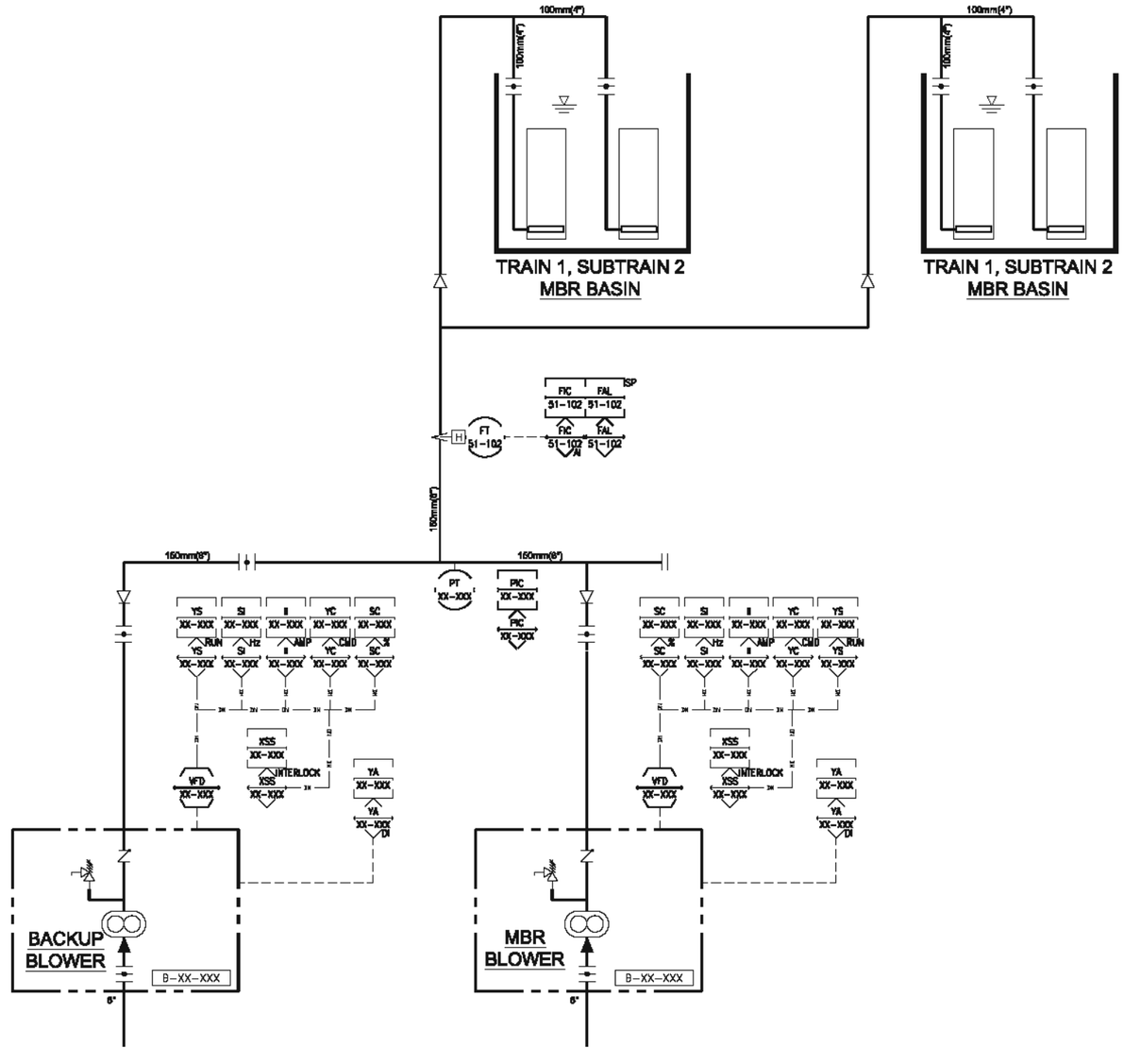

PRELIMINARY

DO NOT USE FOR CONSTRUCTION

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ATTENTION:
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IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

MBR / BLOWER
P&ID

DRAWING NUMBER
N7.0
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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CONTROL PANEL

CONTROL PANEL

VENDOR SUPPLIED EQUIPMENT

FIT

N5.0

L

TO EFFLUENT COOLING OR EFFLUENT DISCHARGE

UV UNIT #1

UV-XX-XXX

M

UV UNIT #2

UV-XX-XXX

M

PRELIMINARY

DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION: 0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

UV DISINFECTION
P&ID

DRAWING NUMBER

N8.0

REV C

PRELIMINARY - NOT FOR CONSTRUCTION

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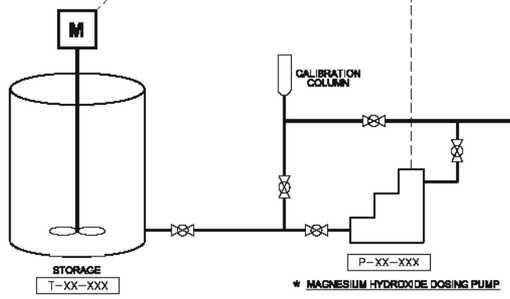
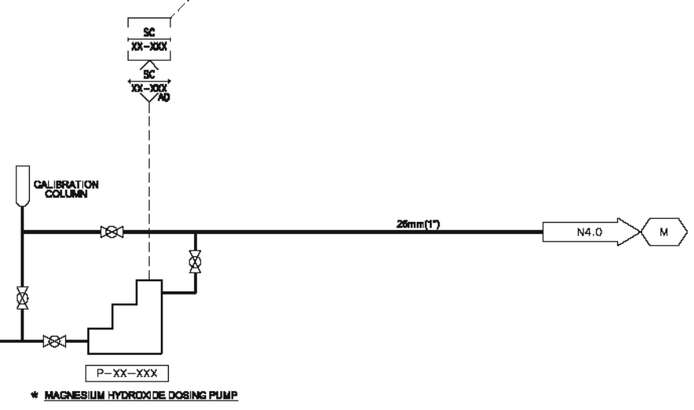
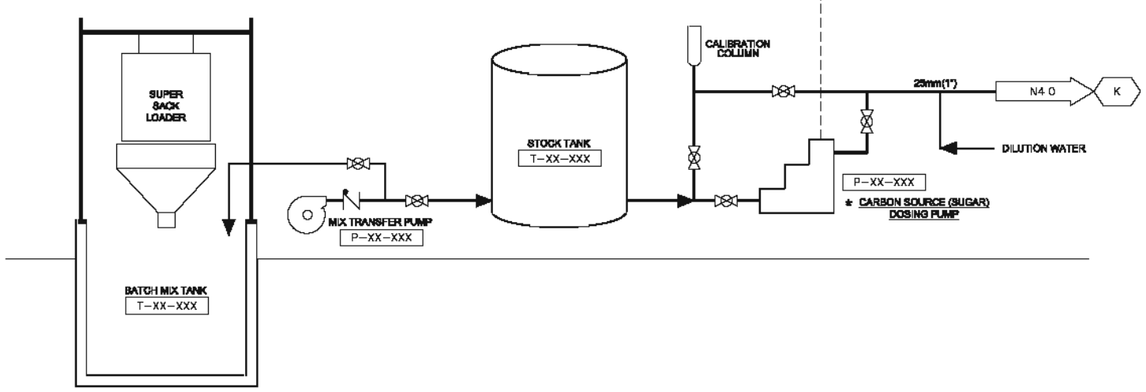
CONTROL PANEL





* MAGNESIUM HYDROXIDE DOSING PUMP



* NOTE:
ONE DOSING PUMP SHOWN. ONE COMMON ON SHELF SPARE FOR ALL DOSING PUMPS

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

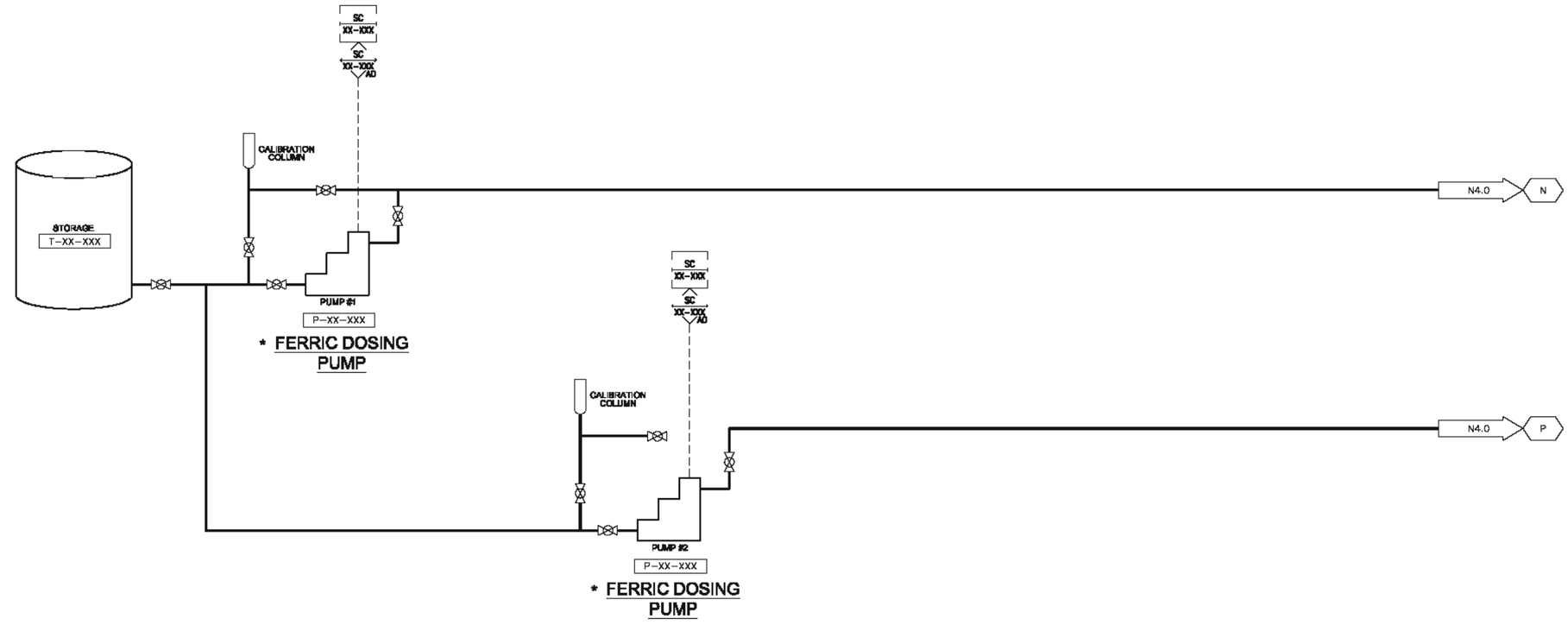
Spring Hill Farms
Industrial Wastewater Treatment Facility
Neepawa, Manitoba
CHEMICAL FEED P&ID

DRAWING NUMBER
N9.0
REV C

FILENAME: X1-XXXXXX.DWG

N:\10211 Hytek - Spring Hill\dwg\N9.0-10211RC.dwg, 5/22/2008 1:02:25 PM

PRELIMINARY - NOT FOR CONSTRUCTION



PRELIMINARY
DO NOT USE FOR CONSTRUCTION

* NOTE:
ONE DOSING PUMP SHOWN. ONE COMMON ON SHELF SPARE FOR ALL DOSING PUMPS

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

FERRIC SYSTEMS P&ID

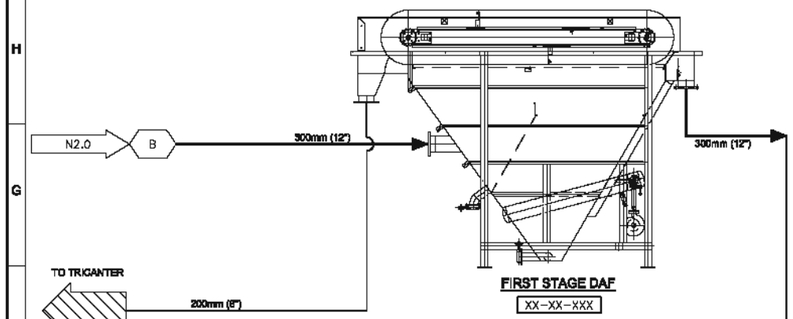
DRAWING NUMBER
N10.0
REV C

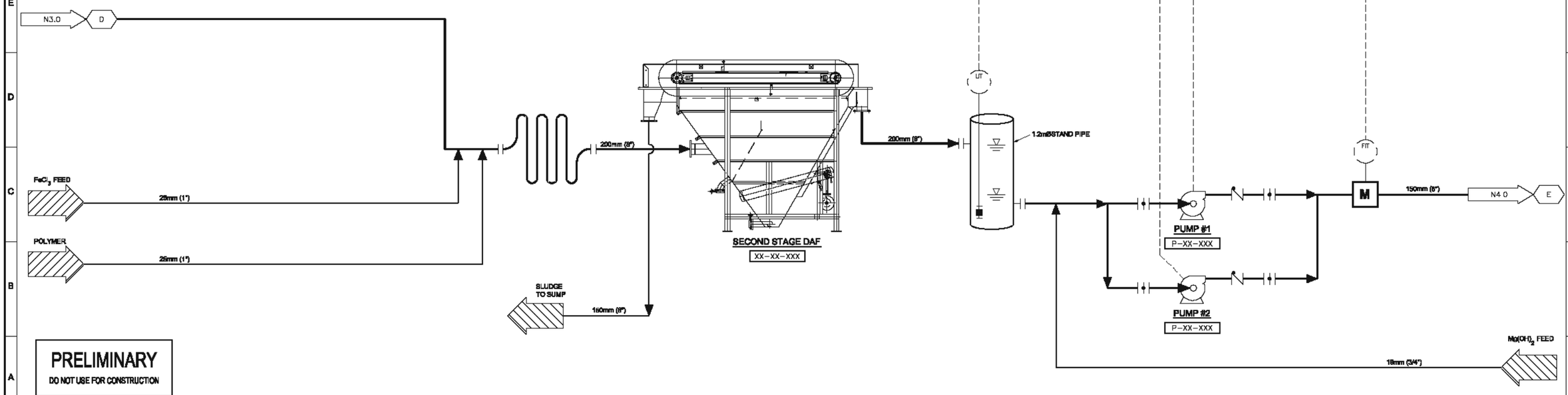
PRELIMINARY - NOT FOR CONSTRUCTION

N:\10211 Hytek - Spring Hill\dwg\N10.0-10211RC.dwg, 5/22/2008 1:02:58 PM

FILENAME: X1-XXXXXX.DWG

CONTROL PANEL





PRELIMINARY
DO NOT USE FOR CONSTRUCTION

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE

ATTENTION:
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

PHARMER ENGINEERING

DESIGNED:	DSB
DRAWN:	TMB
CHECKED:	XXX
APPROVED:	XXX
PROJECT DATE:	May 2008
PROJECT NO.:	10211
SCALE:	N/A

Spring Hill Farms
Industrial Wastewater Treatment Facility

Neepawa, Manitoba

DAF PRE-TREATMENT P&ID

DRAWING NUMBER
N11.0
REV C

PRELIMINARY - NOT FOR CONSTRUCTION

N:\10211 Hytek - Spring Hill\dwg\N11.0-10211PA.dwg, 5/22/2008 1:03:26 PM

PLOTNAME: N1-XXXXXX.DWG

APPENDIX A

EQUIPMENT DATA

IPEC DRUM SCREEN

Proposal No. 2080264

To: Dan Barbeau
Pharmer Engineering
1998 West Judith Lane
Boise, ID 83705

Voice: 208.433.1900
Fax: 208.433.1901
Email: dbarbeau@pharmereng.com
Project: Hog Farm
Date: February 19, 2008

WE ARE PLEASED TO QUOTE AS FOLLOWS:

One (1) only **IPEC Model IFU 5496 Medium Duty Internally Fed Uni-frame Rotary Screen**, in all stainless steel construction, complete with:

- uni-frame screen housing, supports the trunnions, drive and headbox;
- 54" diameter by 96" long, wedgewire screen drum with slot openings of 1mm mesh;
- internal headbox, extending 2/3 the length of the drum, in 10 gauge plate;
- integral splash guards, drainage pan and solids chute in 11 gauge plate;
- enclosure panels in 14 gauge plate;
- connections are 304 stainless steel stub ends c/w galvanized back up flanges;
- shaft mounted, 10" diameter by 3" wide, UHMW polyurethane, roll wheels c/w two internal bearings;
- external spray bar, 1-1/4" Sch.40, 304 stainless steel c/w 31 fan jet, spray nozzles;
- #80 corrosion resistant roller chain, stainless steel driven sprocket and hardened carbon steel drive sprocket;
- helical parallel gear drive c/w 1-1/2 hp, TEFC, motor.

Manual: Two copies of the Installation, Operation and Maintenance Manual.

Service: To screen 1,200 USGPM of hog kill effluent prior to membrane plant.

IFU 5496 Price, FOB Factory: **USD $57,100**

Freight Estimate: (Freight will be prepaid and billed at cost plus handling charge) **USD $ 1,800**

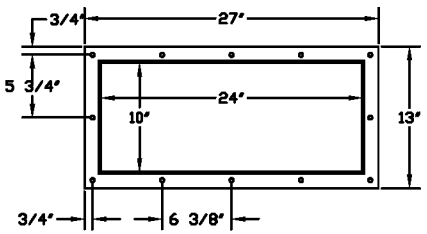
Taxes: Extra, as applicable

Terms: 40% deposit with order, 60% net 30 days of delivery of equipment, OAC

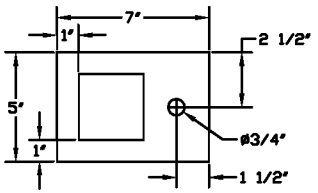
Shipment: 8 - 10 weeks from receipt of signed purchase order and deposit. If submittal of drawings is required, shipment will be from date of approval of submittals.

Validity: 30 days from quotation date.

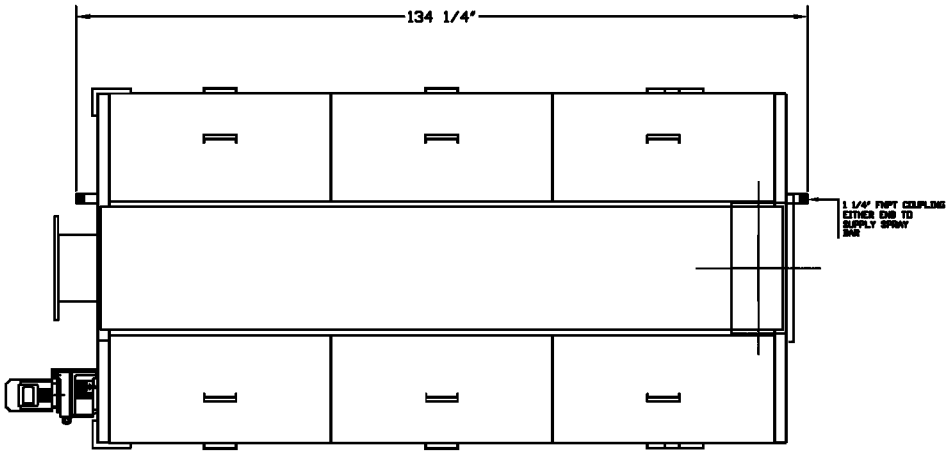
Mike Malec
IPEC Consultants Ltd.

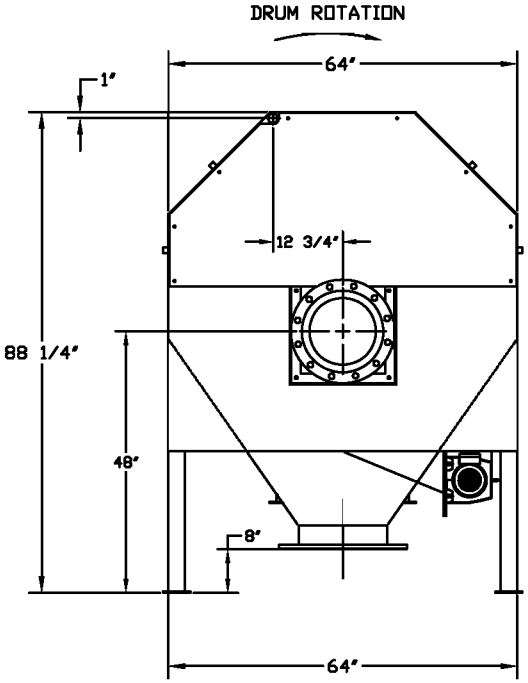


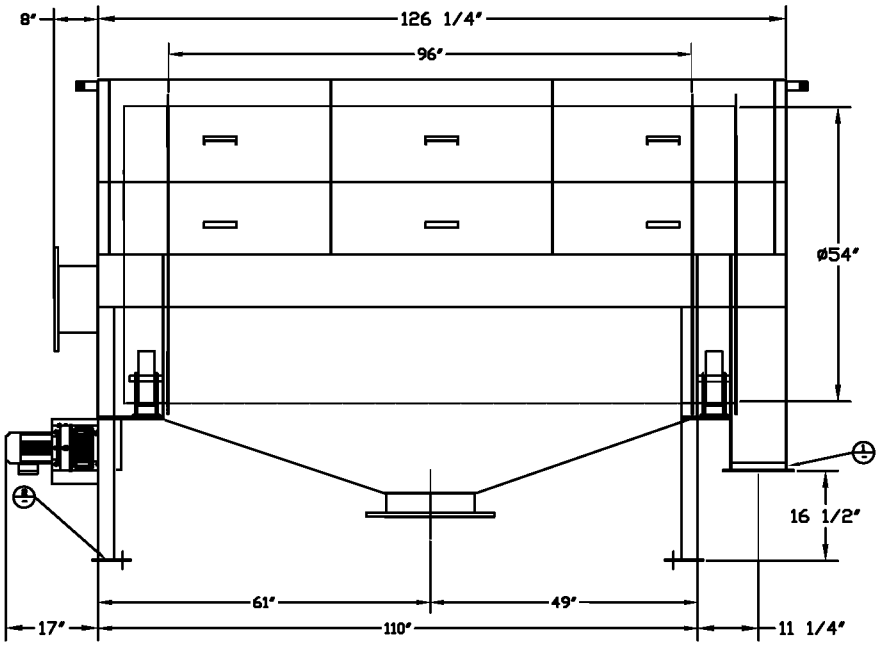
DET. 1 - DISCHARGE FLANGE



DET. 2 - BASE PAD







COMPONENTS

ITEM	P/N	DESCRIPTION
1	2548-020	SCREEN DRUM DIM: 54" X 96" CONST: 92/.156 MATERIAL: 304 SS SLOT: 0.020" FITTINGS: 25471 & 25472 ROLL CYLINDER
2	18541	ENCLOSURE CONST: 3" X 3" X 1/8" TUBE 10 GA. MATERIAL: 304 SS FITTINGS: FILTRATE: 16" SCH PIPE C/W ANSI FLANGE SOLIDS: 10" X 24" FLANGED
3	18552 18545 10555 10557	COVERS TOP (1): 10 GA. TOP/SIDES (6): 14 GA. ENDS (2): 10 GA. MATERIAL: 304 SS
4	48540	HEAD BOX CONST: 10 GA , SCH.10 PIPE MATERIAL: 304 SS FITTINGS: 12" SCH 10 PIPE C/W ANSI FLANGE
5		DRIVE SYSTEM MFG.: EURODRIVE MODEL: R67AM145 ACCESSORIES: INTERGRAL MOTOR: 1 1/2hp 575/3/60 TEFC SPROCKETS: 80A160, 80SA19 CHAIN: RS80WP
6	5123430S	SPRAY BAR 1 1/4" SCH 40 PIPE WITH 31 FAN JET NOZZLES @ 3" C/C 1 GPM @ 40 PSI

WEIGHTS

OPERATING: 5000 LBS
FLOODED: 6200 LBS

NOTES

1) DRUM ROTATES AT 4 RPM
2) OPTIONAL EFFLUENT TO EITHER SIDE
3) UNIT TO BE MOUNTED IN A LEVEL POSITION
4) 2' ACCESS REQUIRED ALONG ALL SIDES AND ABOVE
5) GEARBOX RATING : TORQUE - 2830 lbs-in
S.F. - 1.9

SYM.	DESCRIPTION	DATE	BY

REVISIONS

CUSTOMER: ***	TITLE: IFU 5496 GENERAL ARRANGEMENT	IPEC IPEC CONSULTANTS 2889 NORLAND AVE BURNABY BC CANADA V5B 3A9 1 800 663 8409
QUOTE NO: ***	PROJECT: ***	SCALE: ***
DRAWN: A.R.G.	CHK'D: A.R.L.	DWG. NO: U5496301 REV. 0
DATE: JUNE 19, 2006	DATE: JUNE 19, 2006	

IFU Series of Internally-fed Rotary Screens have cylindrical drums mounted horizontally on four shaft-mounted wheels. The drum rotates at 4 rpm and is driven by a TEFC motor, geardrive, stainless steel roller chain and sprocket. The IFU/W series screening element is slotted, wedgewire screen, with openings ranging from 0.010 to 0.100 inches, and the IFU/M series screen has a mesh lining, with openings from 100 to 500 microns. The IFU is a compact uni-frame screen that typically is applied to effluents containing moderate to low solid loadings.

IFU 4272 (Enclosure Panel Removed)

METHOD OF OPERATION

The influent enters a headbox, which extends 2/3 the length of the drum, where the flow is evenly distributed onto the sidewalls of the drum. Solids are retained on the screen surface as the liquid flows radially through the openings. Splash guards direct the liquid filtrate to a central drainage area, and the solids are transported axially, by flights, to the open end of the drum. The rotation of the drum allows the entire screening surface to be continuously or intermittently washed by a fixed external spray bar fitted with a bank of fan jet, spray nozzles.

Features

- All 304 stainless steel construction
- Unitary body
- TEFC motor and geardrive
- Stainless steel roller chain
- UHMW polyethylene trunnions shaft mounted on pillow block bearings
- Internal flights
- External spray bar
- Vapour enclosure
- Drainage pan
- Solids chute

Options

- 316 stainless steel construction
- Mesh lined drum
- Chain oiler
- Internal spray bar
- Wash down motor
- Control panel c/w starter, spray bar timer and/or frequency drive

General flow rates of the IFU screen.

Note that to properly size this screen to your application, please contact our sales staff to discuss the specifics of your particular situation.

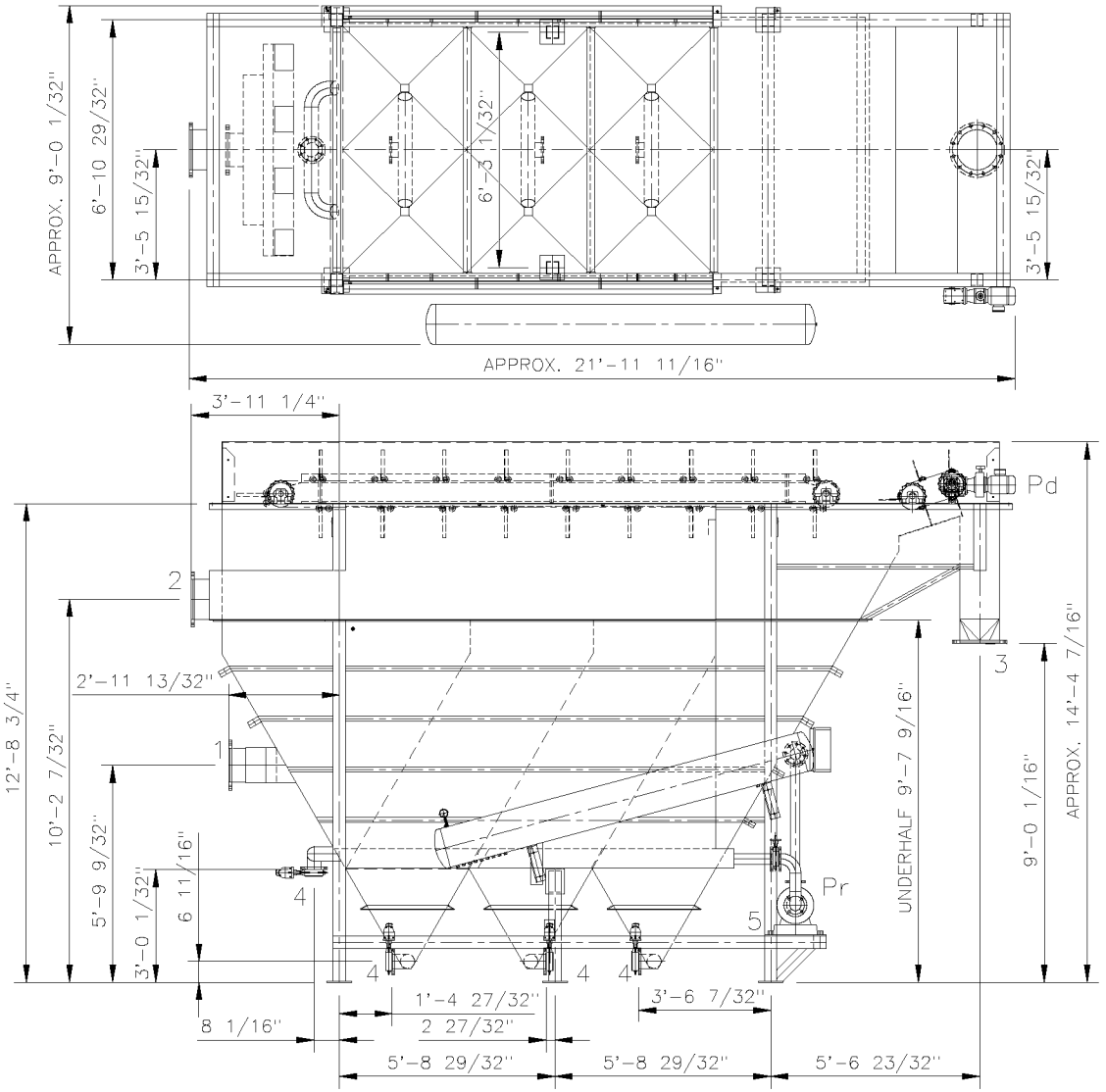
	APPLICATIONS										
	Municipal	Pulp & Paper			Fruit & Vegetable		Seafood		Meat		Poultry
	Primary	White Water	Total Effluent	Debarking	Process Water		Plant Effluent		Plant Effluent		Plant Effluent
	SCREEN OPENINGS										
	0.100"	100 mesh	0.030"	0.040"	0.020"	0.030"	0.020"	0.030"	0.020"	0.030"	0.020"
	FLOW CAPACITIES (US gpm)										
IFU 3036	600	130	260	320	300	320	240	260	240	260	240
IFU 3048	800	180	350	455	400	420	320	350	320	350	320
IFU 3060	1,000	230	420	560	500	520	420	450	420	450	420
IFU 4248	1,400	300	550	700	650	790	550	600	550	600	575
IFU 4272	2,000	450	850	1,000	950	1,000	850	900	850	900	850
IFU 5472	2,800	640	1,200	1,700	1,400	2,000	1,300	1,400	1,300	1,400	1,300
IFU 5496	3,600	850	1,600	2,200	1,500	2,100	1,700	1,850	1,700	1,850	1,700

2889 NORLAND AVENUE, BURNABY, BRITISH COLUMBIA, CANADA, V5B 3A9 PHONE: 800-663-8409 or 604-291-7150, FAX: 604-291-7190

NIJHUIS DAF EQUIPMENT

CHANGES RESERVED

1 INFLUENT
2 EFFLUENT
3 FLOTATION SLUDGE
4 SEDIMENT
5 AIR



TYPE	1	2	3	4	5			
IPL090E	10"	12"	12"	4"	1/4"NPT	3858 lb	7165 lb	70548 lb

TYPE	Pd	Pr
IPL090E	0,50 hp	15 hp or 20 hp

Rev.	Description	Drawn	Date	Checked Mech.Eng.	Approved Eng.
0	FIRST ISSUE	RG	22-11-2002	BJ	RG

REVISION

NIJHUIS WATER TECHNOLOGY

Nijhuis Water Technology b.v.
Anholtseweg 32
P.O. Box 89
7090 AB DINXPERLO
Phone (31)315 655466
Fax (31)315 655494
E-mail · info@nijhuis-water.nl

Projection

Scale N.T.S.
Do not scale
Unit : inch

TITLE : IPL090E

PROJECT :

PROJECT N°

Size	Document number	Sheet	Number of sheets
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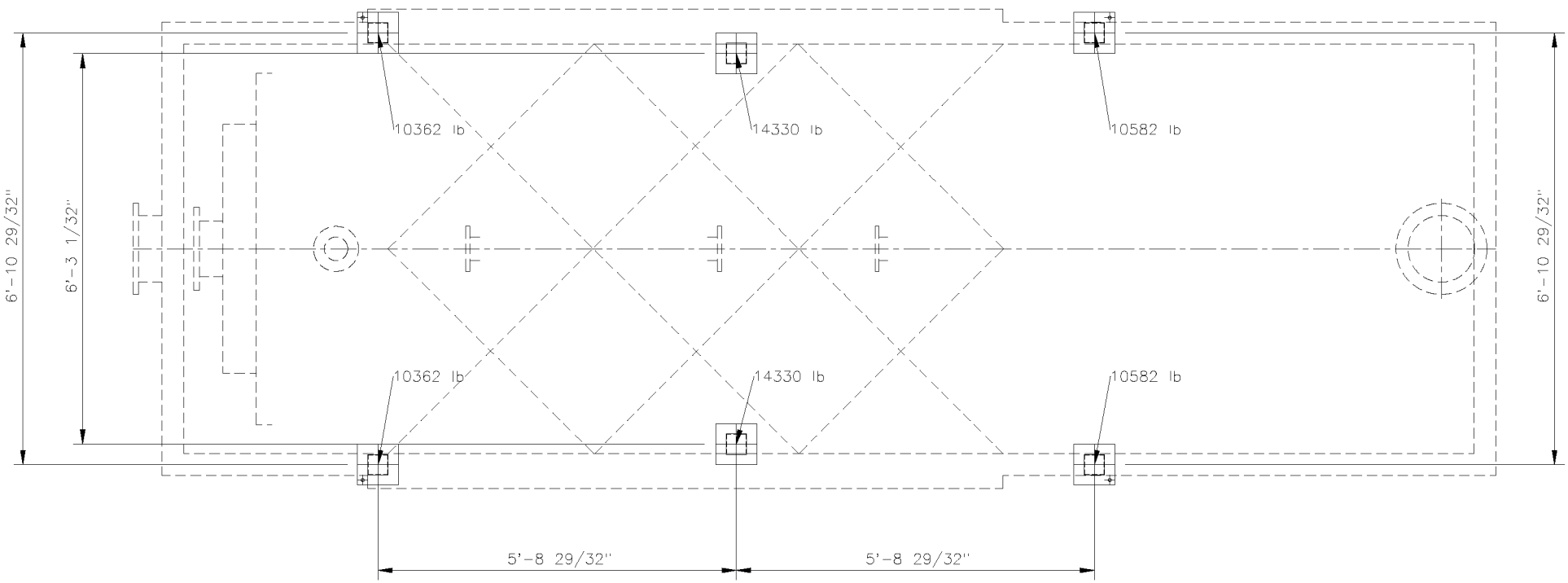

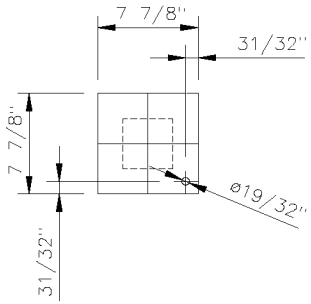

THE OUTSIDE PLATES
WITH A HOLE (4x)
THE INSIDE PLATES
WITHOUT A HOLE (2x)

FOUNDATION LOADING PLAN
WEIGHT : EMPTY 11023 lb
: FULL 70548 lb

CHANGES RESERVED

Rev.	Description	Drawn	Date	Checked Mech.Eng.	Approved Eng.
0	FIRST ISSUE	RG	22-11-2002	BJ	RG

REVISION

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7090 AB DINXPERLO
Phone (31)315 655466
Fax (31)315 655494
E-mail · info@nijhuis-water.nl

Projection

Scale N.T.S.
Do not scale
Unit : inch

TITLE : IPL090E

PROJECT : FOUNDATION PLAN

PROJECT N°

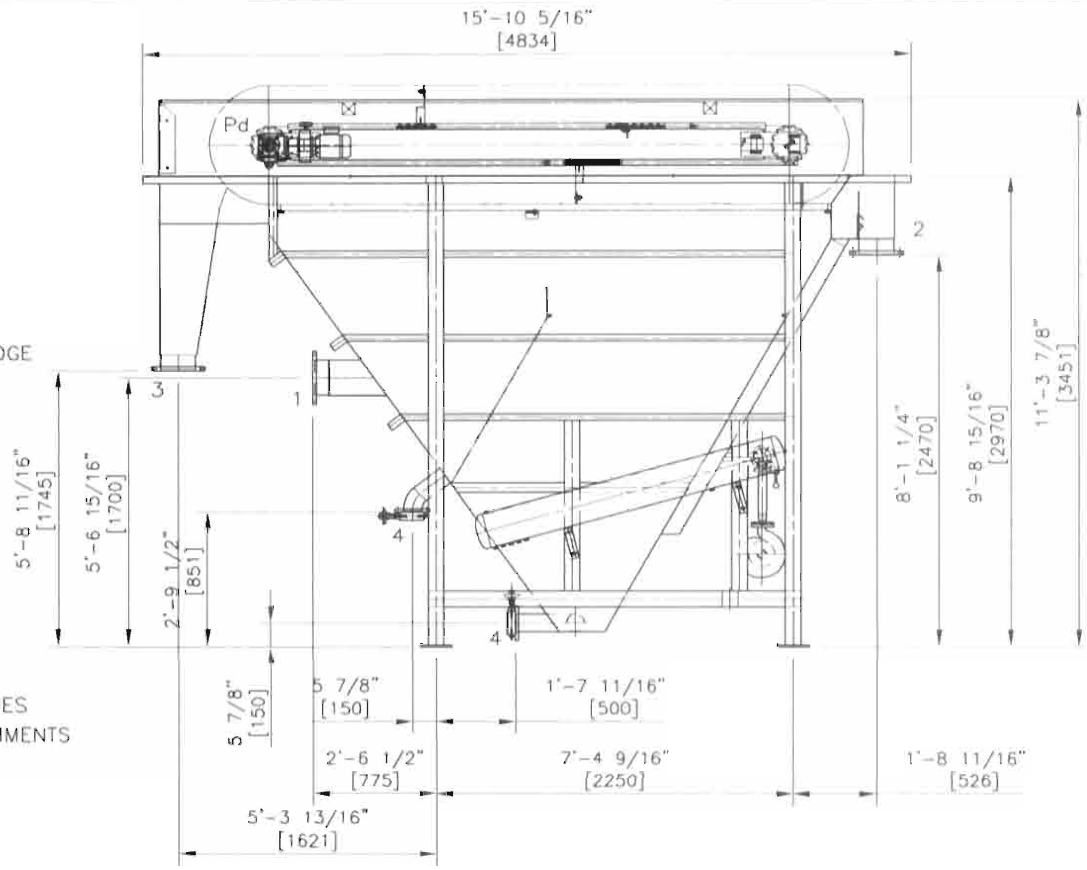
Size	Document number	Sheet	Number of sheets
A3	800334	2	2

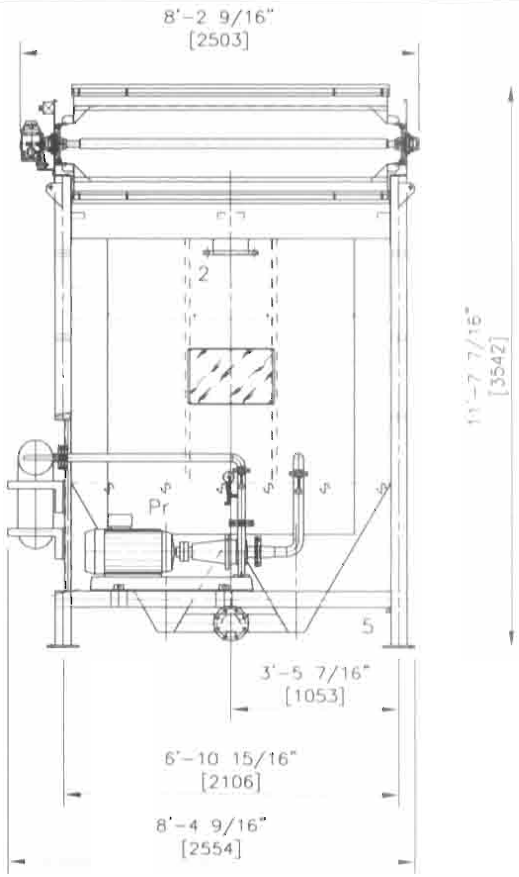
1 INVOER
2 AFVOER
3 FLOTAAT
4 SEDIMENT
5 LUCHT

1 INFLUENT
2 EFFLUENT
3 FLOTATION SLUDGE
4 SEDIMENT
5 AIR

1 EINLAUF
2 ABLAUF
3 FLOTAT ABLAUF
4 SEDIMENT
5 LUFT

1 ENTREE
2 SORTIE D'EAUX
3 SORTIE DE BOUES
4 SORTIE DE SEDIMENTS
5 AIR





DIN	TYPE	1	2	3	OPTION	4	5			Pd	Pr
	IPF 090 E	DN 200	DN 200	DN 200	DN 80	DN 100	1/4" G	1820 kg	13200 kg	0,37 kW	7,5 kW
ASA	TYPE	1	2	3	OPTION	4	5			Pd	Pr
	IPF 090 E	8"	8"	8"	3"	4"	1/4"NPT	4010 lb	29100 lb	0.503hp	10.5hp

WIJZIGINGEN VOORBEHOUDEN
CHANGES RESERVED
ÄNDERUNGEN VORENTHALTEN
SOUS RESERVE DE MODIFICATIONS
SUCCEPTIBLE DE MODIFICATIONES

Rev.	Description	Drawn	Date	Checked Mech.Eng.	Approved Eng.
B	REV.DIM.STYLE/SCRAPER/INFLUENT	AWE	14-10-2003	RG	AWE
A	CONVERSION	JATD	07-06-1999	RG	JATD
0	FIRST ISSUE	RH	30-03-1995		

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Fax (31)315 655494
E-mail : info@nijhuis-water.nl

Projection

Scale: NTS
Do not scale
UNITS: mm/INCH

TITLE : DIMENSIONED SKETCH

PROJECT : IPF 090 E

PROJECT N°. :

Size	Document number	Sheet	Number of sheets
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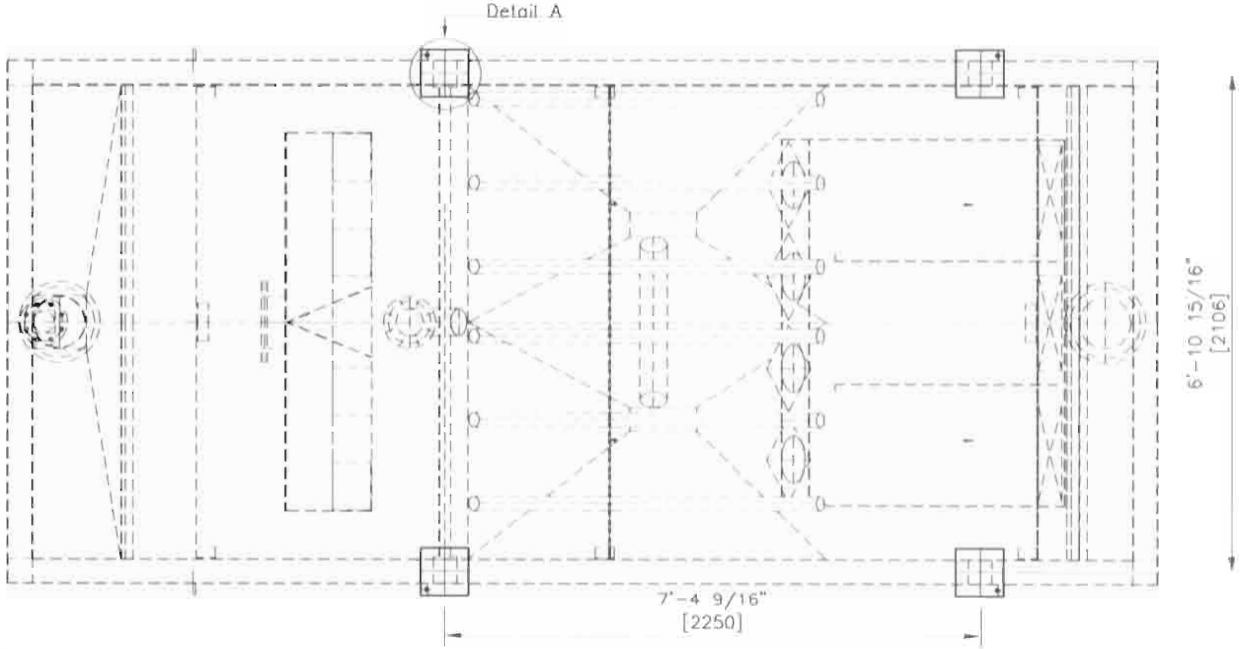
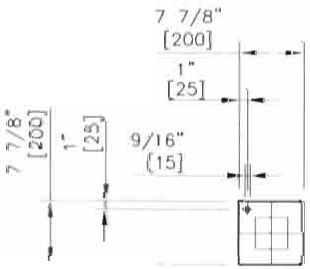


DETAIL A



WIJZIGINGEN VOORBEHOUDEN
ÄNDERUNGEN VORENTHALTEN
CHANGES RESERVED
SOUS RESERVE DE MODIFICATIONS
SUCCEPTIBLE DE MODIFICATIONES

FOUNDATION LOADING PLAN
WEIGHT EMPTY 1820 kg
FULL 13200 kg

EACH FOUNDATION PLATE: 3300 kg

FOUNDATION LOADING PLAN
WEIGHT EMPTY 4010 lb
FULL 29100 lb

EACH FOUNDATION PLATE: 7275 lb

Rev.	Description	Drawn	Date	Checked Mech Eng	Approved Eng
C	REV.DIM STYLE	AWE	15-10-2003	RG	AWE
B	INCHES/MM	ETH	26-06-2001	RG	JATD
A	AutoCAD R14	RH	21-02-2000	RG	RH
0	FIRST ISSUE	RG	05-02-1997		

REVISION

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7090 AB DINXPERLO
Phone (31)315 655466
Fax (31)315 655494
E-mail : info@nijhuis-water.nl

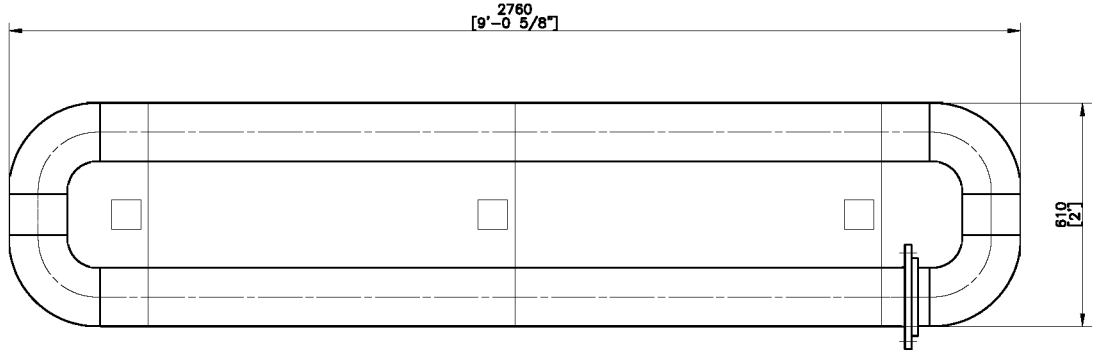
Projection	Scale NTS Do not scale Units: mm/INCH	Size	Document number	Sheet	Number of sheets
		A3	800113	2	2

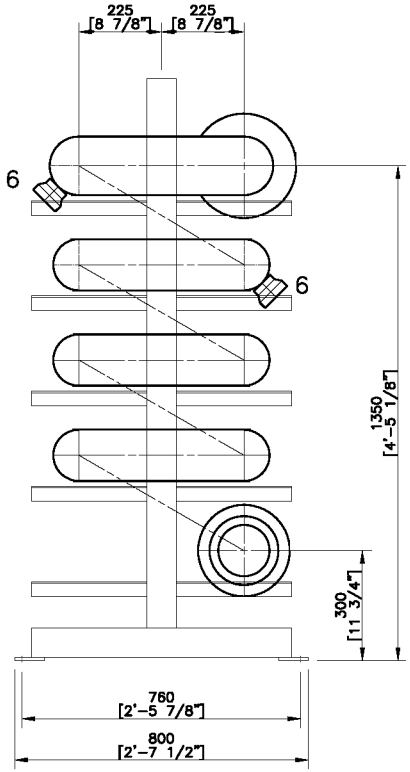
TITLE : FOUNDATION LOADING PLAN IPF090E

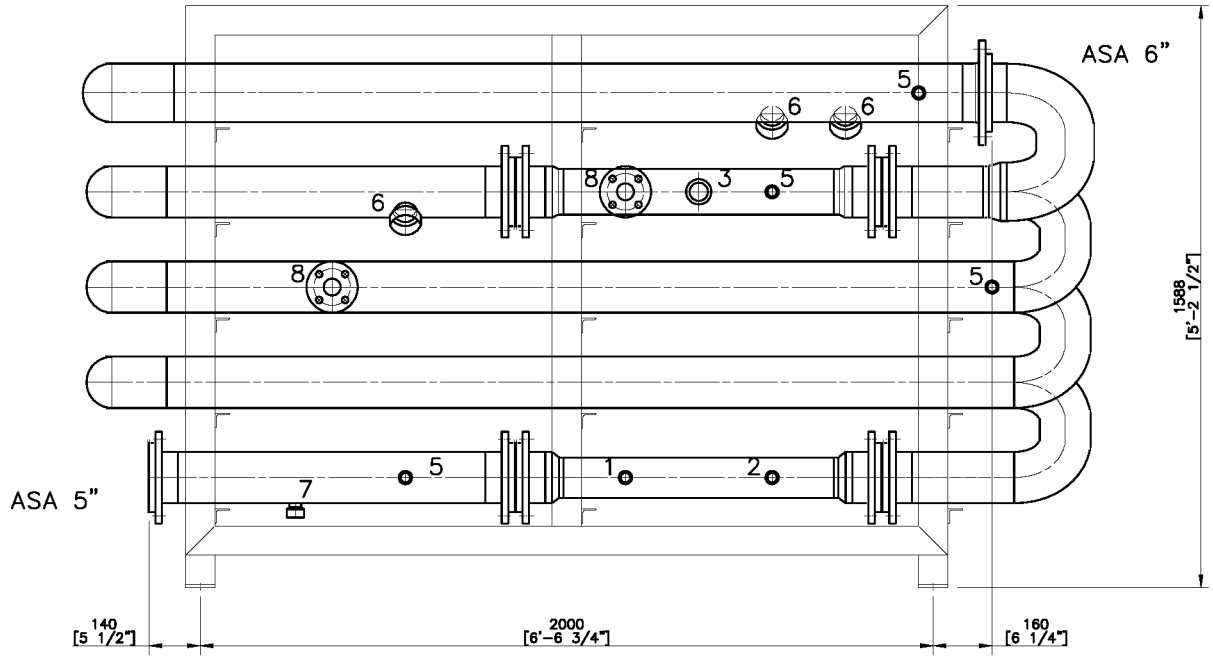
PROJECT :

PROJECT N°:

1	1/2"	COAGULANT INJ.	1 X	
2	1/2"	NEUTRALIZER INJ.	1 X	
3	1 1/2"	POLY INJ.	1 X	
4		---		
5	1/2"	SAMPLING	4 X	
6	2"	AERATION	3 X	
7	1"	DRAIN	1 X	BLINDED
8	1 1/4"	PH MEASURE	2 X	FLANGE ASA







Rev.	Description	Drawn	Date	Checked Mech.Eng.	Approved Eng.
0	FIRST ISSUE	STS	15-03-2005	JATD	STS

REVISION

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Phone (31)315 655466
Fax (31)315 655494
E-mail : info@nijhuis-water.nl

TITLE :	FLOCCULATOR PFR060
PROJECT :	
PROJECT N°. :	

Projection	Scale 1 : 10	Size	Document number	Sheet	Number of sheets
	Do not scale	A2	800498	1	1
	Unit : inch/mm				

ZENON MBR EQUIPMENT

Dan Barbeau

From: Sparkes, Andrew (GE Infra, Water) [Andrew.Sparkes@ge.com]
Sent: Monday, January 14, 2008 1:57 PM
To: Dan Barbeau
Cc: Robert Pharmer
Subject: RE: Springhill Farms
Attachments: ZeeWeed Typical GA.pdf

Dan,

As discussed.
A 400,000 gpd MBR system with the scope below would cost approximately $975,000 USD.
The design includes 2 process trains each of which can process the design flow for short periods (ie during a membrane cleaning).

- Two Membrane Tanks (epoxy coated carbon steel) with covers or grating, access ladder and handrails
- Membranes (192 ZW500d elements in 4 cassettes)
- One Process Pump Skid (2 pumps)
- One Recirculation Pump Skid (2 pumps)
- Two Membrane Scour Blowers
- NaOCl CIP Chem Skid
- Citric CIP Chem Skid
- Backpulse Tank
- Control Panel with PLC and HMI
- Instrumentation and valves
- PVC piping on the skids and SS piping for the membrane headers

A typical GA is provided (please consider that the configuration shown is for an in ground concrete tank)
The skid sizes, blower sizes should be relatively accurate. A recirculation skid is not shown.

If you need additional details or a formal quote, please let me know.

Regards,

Andrew Sparkes
GE
Water & Process Technologies
Regional Sales Manager
ZENON Membrane Solutions

T (905) 465-3030 Ext. 3409
F (905) 465-3050
www.zenon.com

3239 Dundas Street West
Oakville, Ontario, Canada L6M 4B2

From: Dan Barbeau [mailto:dbarbeau@pharmereng.com]
Sent: Wednesday, January 09, 2008 1:50 PM
To: Sparkes, Andrew (GE Infra, Water)
Subject: Springhill Farms

Hi Andrew,

I just left you a quick voicemail on the Springshill Farms facility at Neepawa. Hytek Ltd is in the process of purchasing. We've been in the loop just a couple weeks, but need to move quickly on the predesign level.

Please call when you get a moment.

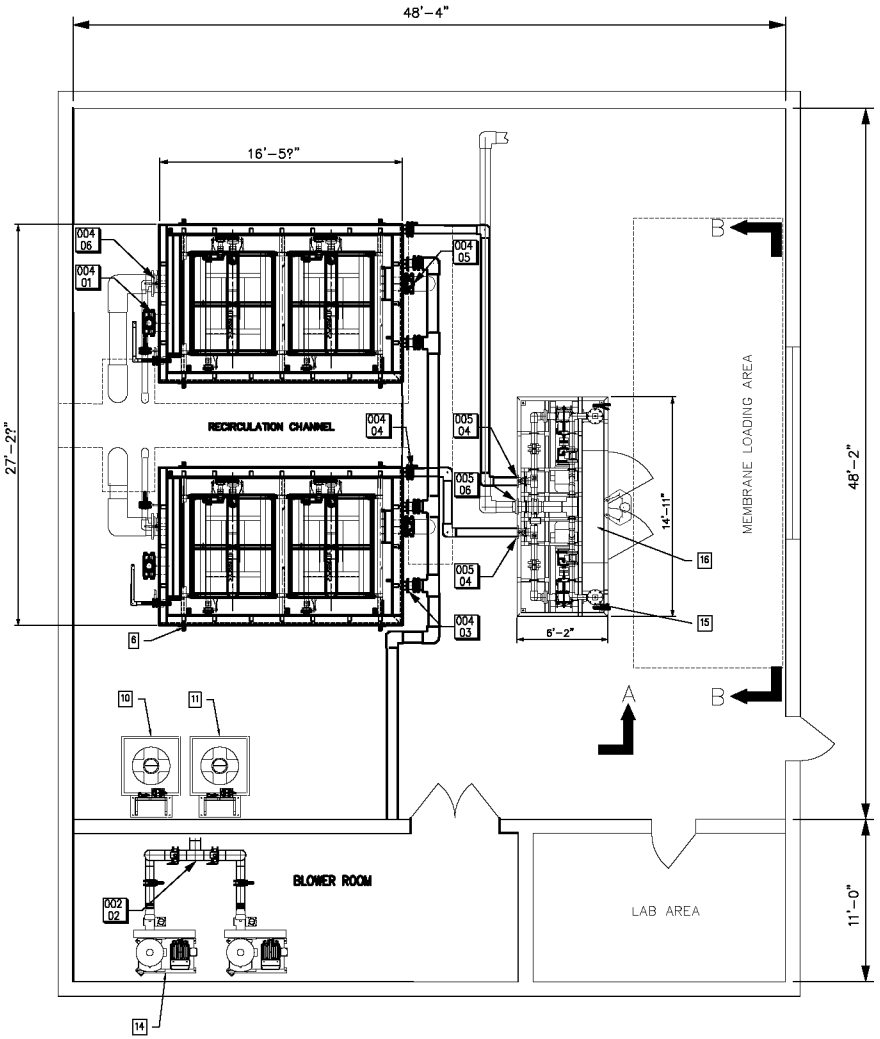
Thanks,

Dan

==========

Dan Barbeau, P.E.
Pharmer Engineering, LLC
1998 West Judith Lane
Boise, ID 83706

(208) 433 - 1900 [ph]
(208) 433 - 1901 [fax]
(208) 866 - 9095 [mobile]



SYSTEM CONFIGURATION	
A # OF CASSETTES	LENGTH
1	
2	17'5"
3	
B # OF SYSTEMS	LENGTH
1	27'2"

GE Water & Process Technologies
ZENON Membrane Solutions

REFERENCE ONLY
DO NOT USE FOR CONSTRUCTION

EQUIPMENT REFERENCE DRAWINGS

ITEM	DESCRIPTION	GA DWGS	P&ID REF.
1			
2			
3			
4			
5			
6	MEMBRANE TANK	N/A	L963-3-001
7			
8			
9			
10	CITRIC ACID SYSTEM	3001472	L963-3-005
11	HYPOCHLORITE SYSTEM	3001470	L963-3-005
12			
13			
14	MEMBRANE BLOWERS	N/A	L963-3-002
15	PERMEATE SKID	3003494	L963-3-005
16	ELECTRICAL CONTROL PANEL	N/A	N/A

TERMINATION POINTS

TP #	SIZE	CONNECTION	FUNCTION
004-6	14"	150# SS FLG	OVERFLOW TO ANOXIC ZONE
004-6	4"	150# SS FLG	DRAIN TO ANOXIC ZONE
004-1	14"	150# SS FLG	FEED TO MEMBRANE TANK
004-5	12"	150# SS FLG	RECIRCULATION BACK TO ANOXIC ZONE
007-1	8"	150# PVC FLG	TREATED WATER TO BACKPULSE TANK
007-2	14"	150# PVC FLG	BACKPULSE TANK DRAIN
007-2	14"	150# PVC FLG	BACKPULSE TANK OVERFLOW
005-4	6"	150# PVC FLG	TREATED WATER FROM MEMBRANES
005-6	6"	150# PVC FLG	TREATED WATER TO CUSTOMER/BACKPULSE
005-4	6"	150# PVC FLG	TREATED WATER TO MEMBRANES
004-3	6"	150# SS FLG	AIR SPLIT TO MEMBRANE TANKS
004-4	6"	150# SS FLG	TREATED WATER FROM MEMBRANES
002-2	8"	150# SS FLG	AIR TO MEMBRANE TANKS
002-1	6"	150# SS FLG	PROCESS AIR TO BIOREACTOR

NOTES

1. SINGLE ELECTRIC HOIST (BY OTHERS)ON MONORAIL TO BE LOCATED ABOVE ZeeWeed TANK FOR ZeeWeed MEMBRANE REMOVAL.
2. ALL TIE POINTS TERMINATE WITH FLANGED CONNECTIONS.
3. ALL MAJOR EQUIPMENT SHOULD BE SUPPORTED ON 4" CONCRETE HOUSEKEEPING PADS.
4. ROLL UP DOORS C/W ELECTRIC OPENER(BY OTHERS).
5. ALL LINES RUN OVERHEAD (APPROX. 10'-0" ELEVATION UNLESS OTHERWISE NOTED), SHALL BE SUITABLY SUPPORTED (IN ACCORDANCE WITH ANSI B31.1) FROM FLOOR OR FROM SKID MEMBERS.
6. ANY CONCRETE CHEMICAL CONTAINMENT AREAS SHOULD HAVE CONCRETE GRADED (i.e. SLOPED) TO LOW POINT (CORNER), AND BE LINED WITH SUITABLE EPOXY LINING.
7. INSTRUMENT AIR HEADER (i.e. 2") TO BE RUN AROUND PERIMETER WITH ½" DROP-OFFS TO EACH SKID.
8. VENTILATION SYSTEM MUST ACCOMMODATE 6 COMPLETE AIR CHANGES PER HOUR.
9. BUILDING LAYOUT MUST HAVE FLOOR SPACE ALLOCATED FOR MEMBRANE LAYDOWN.

REV.	DATE	DESCRIPTION	ZONE	DSGN	APPD
B	07/11/30			W.H	

UNLESS OTHERWISE SPECIFIED.
1. DIMENSIONS ARE IN INCHES
2. TOLERANCES
FRACTIONS ±1"
DECIMALS .X ±030
.XX ±015
ANGLES ±5 DEG
HOLE SIZES ±1"
HOLE CENTRES ± 1"
DRAWING INTERPRETATION: ANSI Y14.5 M

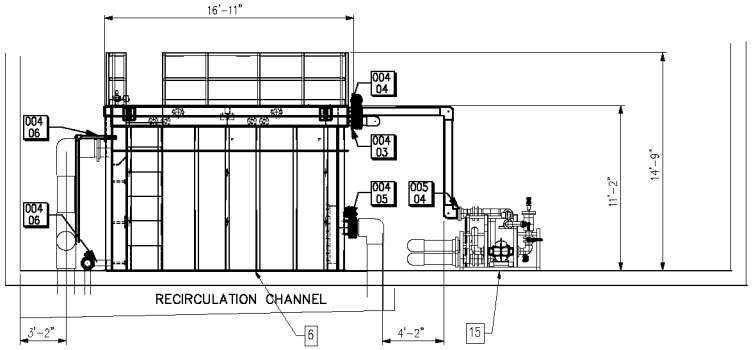
APPROVAL		DATE (YY/MM/DD)
DRWN:	W.H.	07/11/27
DSGN:	S.N.	07/11/27
CHKD:		
APPD:		
CADD FILE:	4085A1P1 1.DGN	
SCALE:	1:48	

GE Water & Process Technologies
ZENON Membrane Solutions

CUSTOMER: DELTA AIRLINES MBR WATER REUSE SYSTEM

TITLE: PLOT PLAN
WASTE WATER TREATMENT PLANT

SIZE: D | DRAWING NO. 4085A1-P-001 | SHEET 1 OF 3 | REV. B



SECTION A–A

GE Water & Process Technologies
ZENON Membrane Solutions

REFERENCE ONLY
DO NOT USE FOR CONSTRUCTION

REV.	DATE	DESCRIPTION	ZONE	DSGN	APPD
A	07/11/27			W.H.	

UNLESS OTHERWISE SPECIFIED.
1. DIMENSIONS ARE IN INCHES
2. TOLERANCES
FRACTIONS ±1"
DECIMALS .X ±.030
.XX ±.015
ANGLES ±.5 DEG
HOLE SIZES ±1"
HOLE CENTRES ± 1"
DRAWING INTERPRETATION: ANSI Y14.5 M

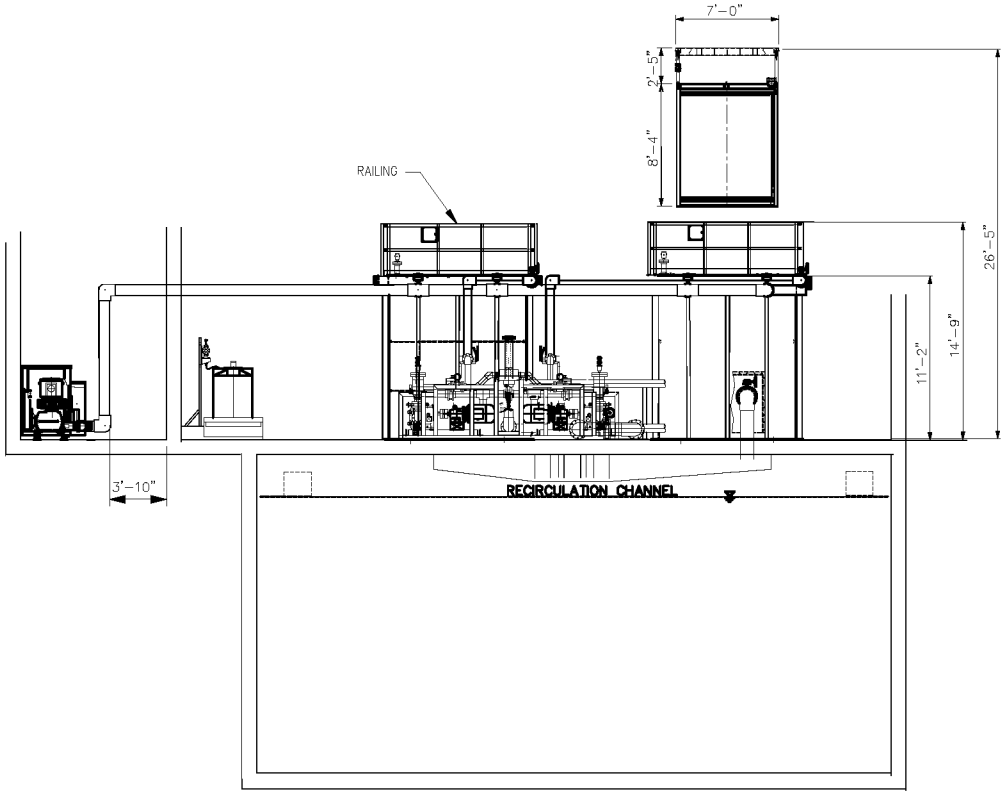
APPROVAL		DATE (Y/M/D)
DRWN:	W.H.	07/11/27
DSGN:	S.N.	07/11/27
CHKD:		
APPD:		
CADD FILE:	4085A1P1 2.DGN	
SCALE:	1:48	

GE Water & Process Technologies
ZENON Membrane Solutions

CUSTOMER: DELTA AIRLINES MBR WATER REUSE SYSTEM

TITLE: PLOT PLAN
WASTEWATER TREATMENT PLANT

SIZE: D | DRAWING NO. 4085A1–P–001 | SHEET 2 OF 3 | REV. A



SECTION B-B

GE Water & Process Technologies
ZENON Membrane Solutions

REFERENCE ONLY
DO NOT USE FOR CONSTRUCTION

REV.	DATE	DESCRIPTION	ZONE	DSGN	APPD
A	07/11/27			W.H.	

UNLESS OTHERWISE SPECIFIED.
1. DIMENSIONS ARE IN INCHES
2. TOLERANCES
FRACTIONS ±1"
DECIMALS .X ±030
.XX ±015
ANGLES ±5 DEG
HOLE SIZES ±1"
HOLE CENTRES ± 1"
DRAWING INTERPRETATION: ANSI Y14.5 M

APPROVAL		DATE (Y/M/D)
DRWN:	W.H.	07/11/27
DSGN:	S.N.	07/11/27
CHKD:		
APPD:		
CADD FILE:	4085A1P1 3.DGN	
SCALE:	1:48	

GE Water & Process Technologies
ZENON Membrane Solutions

CUSTOMER: DELTA AIRLINES MBR WATER REUSE SYSTEM

TITLE: PLOT PLAN
WASTEWATER TREATMENT PLANT

SIZE: D | DRAWING NO. 4085A1-P-001 | SHEET 3 OF 3 | REV. A

CHEMICAL FEED PUMPING

520SN/REL, 520UN/REL, 520DuN/REL 0-30 psi NEMA 4X pumps fitted with LoadSure® element pumpheads

500 series

Watson-Marlow Bredel

FEATURES

- Flow rates up to 55.5 gph (3500 ml/min) at 30psi (2 bar) peak pressure with 520 LoadSure® elements
- 520REL pumphead features large swept volume with sprung rollers for high accuracy, gentle pumping of shear-sensitive fluids
- Robust pumphead construction with PPS (polyphenylene sulphide) track and rotor and stainless steel rollers and bearings
- Precise 2200:1 speed control range from 0.1 to 220rpm in 0.1rpm increments
- Maintenance free brushless DC motor
- NEMA 4X washdown protection for corrosive and heavy duty industrial environments
- Manual control with additional flow calibration and MemoDose for accurate single shot dispensing
- Dual voltage, 115V/230V 50/60Hz

3 warranty

24 hour duty

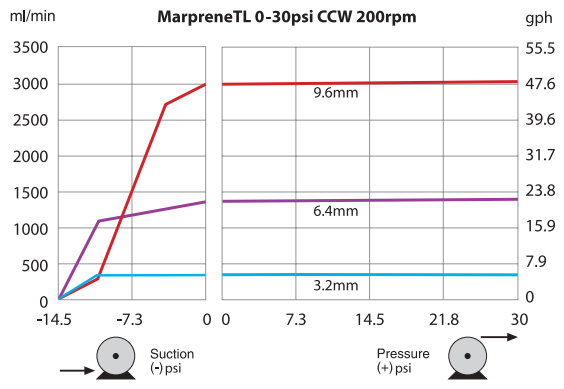
One minute maintenance

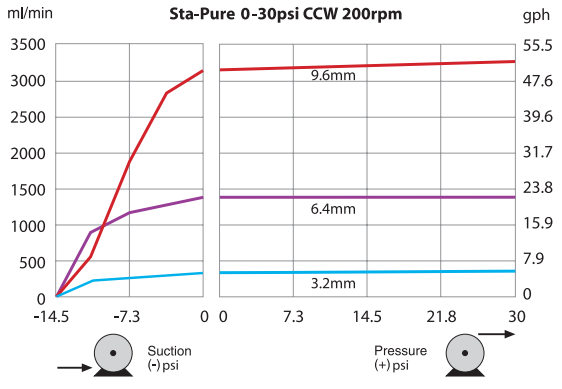
FUNCTIONALITY

Pump drives	520SN	520UN	520DuN
Manual control			
Full calibration with choice of flow units			•
Simple calibration to display flow in ml/min	•	•	
Choice of flowrate or speed display	•	•	•
Remote control			
Run/Stop, direction change, Auto/manual toggle, Leak detector input (via contact closure or 5V TTL or 24V industrial logic)		•	•
Remote operation of MemoDose (foot/hand-switch or logic input)		•	•
Analog speed control			
Software programmable inputs; 0-10V, 1-5V or 4-20mA		•	•
Analog outputs; 0-10V (8 bit resolution)		•	
Analog outputs; 0-10V, 4-20mA (8 bit resolution)			•
Keypad/analog input scaling (replacement of diaphragm pumps)			•
Tacho frequency output; 0-1258Hz		•	•
Digital communication			
RS232 network control			•
Security			
Basic security code to protect set-up		•	•

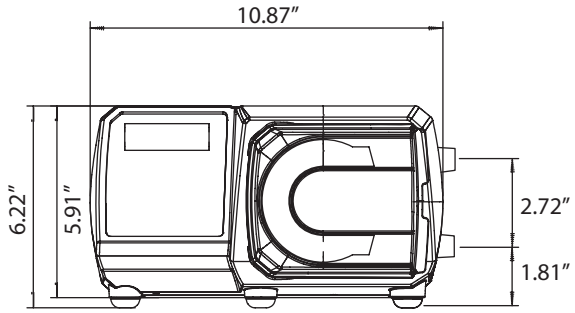
PERFORMANCE

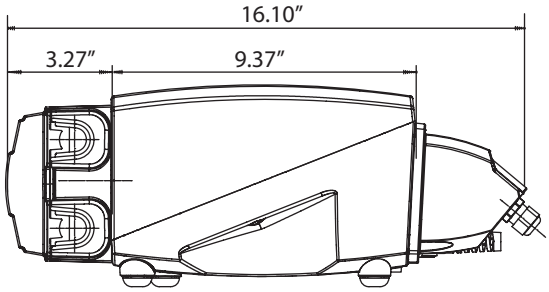
LoadSure® Element tubing flow rates, ml/min(gph)				
Tube Material	Speed	3.2mm	6.4mm	9.6mm
Pumpsil, Sta-Pure, Chem-Sure, Neoprene	0.1 to 220rpm	0.18-390(0.003-6.2)	0.70-1500(0.01-23.8)	1.6-3500(0.03-55.5)
Marprene TL, Bioprene TL	0.1 to 220rpm	0.17-370(0.003-5.9)	0.67-1500(0.01-23.8)	1.5-3300(0.02-52.3)





DRAWINGS





SPECIFICATIONS

	520SN, 520UN, 520DuN
Ingress rating	NEMA 4X
Enclosure	Washdown / watertight / dustproof
Suitability	Corrosion resistant for heavy industrial environments
Humidity	(Condensing) 10-100% RH
Temperature	40F to 104F
Pump weight	23lb 9oz
Control ratio	2200:1
Noise	< 70dB(A) at 1m
Standard	CE, cETLus
Power supply	115/230V 1ph 50/60Hz

MATERIALS OF CONSTRUCTION

Component	Material
Keypad	Polyester
Switch-plate	Glass filled ABS plastic
Rear blanking plate	Stainless steel 304
Drive casework	Pressure die-cast aluminum LM24
Case work coating	Alocrom pre-treatment, exterior grade polyester powder coat
Drive shaft	Electroless nickel plated carbon steel
Pumphead track	PPS (polyphenelene sulphide)
Guard - inner/outer	Polycarbonate
Guard seal	Neoprene
Rotor hub	Stainless steel 316
Roller arms, rotor cover	PPS (polyphenylene sulphide)
Rollers – main/guide	Stainless steel 316
Main roller bearings	Stainless steel with PTFE seals
Drain port and nut	PP (polypropylene)
Drain plug	Hytrel

ORDER INFORMATION

Pump and pumphead product codes

Description	Partcode	Description	Partcode
520REL element pumphead only	053.1011.EL0	520SN drive only	056.713N.00A
520SN/REL pump	050.713N.ELA	520UN drive only	056.714N.00A
520UN/REL pump	050.714N.ELA	520DuN drive only	056.715N.00A
520DuN/REL pump	050.715N.ELA	Leak Detector	059.8121.000

Element product codes

	Industrial LoadSure® elements Quick-release PVDF connectors			Sanitary LoadSure® elements 3/4 in Sanitary PVDF connectors		
	3.2mm	6.4mm	9.6mm	3.2mm	6.4mm	9.6mm
Marprene TL	902.0032.PFQ	902.0064.PFQ	902.0096.PFQ			
Pumpsil	913.A032.PFQ	913.A064.PFQ	913.A096.PFQ	913.A032.PFT	913.A064.PFT	913.A096.PFT
Neoprene	920.0032.PFQ	920.0064.PFQ	920.0096.PFQ			
Chem-Sure	965.0032.PFQ	965.0064.PFQ	965.0096.PFQ	965.0032.PFT	965.0064.PFT	965.0096.PFT
Bioprene TL				903.0032.PFT	903.0064.PFT	903.0096.PFT
Sta-Pure				960.0032.PFT	960.0064.PFT	960.0096.PFT

All flow rates shown were obtained pumping water at 68F with zero suction and delivery heads. Watson-Marlow, Bioprene and Marprene are trademarks of Watson-Marlow Limited. Disclaimer: The information contained in this document is believed to be correct but Watson-Marlow Limited accepts no liability for any errors it contains, and reserves the right to alter specifications without notice. LoadSure is a trademark of Watson-Marlow Limited.
® Chem-Sure and ® STA-PURE are registered trademarks of W.L Gore & Associates Inc.
Pumpsil is a trademark of Watson-Marlow Limited. Please state the product code when ordering pumps and tubing.

Watson-Marlow-Bredel Pumps
37 Upton Technology Park
Wilmington, MA 01887
Tel: 800 282 8823 Fax: 978 658 0041
www.watson-marlow.com support@watson-marlow.com

520rel66 - us -01

FormPak

FormPak, Inc.7209 St. Charles Rock Road, St. Louis, MO 63133

February 1, 2008

Jordi Figueras
Pharmer Engineering
1998 W. Judith Lane
Boise, Idaho, 83705
208.433.1900
jfigueras@pharmereng.com

QUOTE 080125-01-R1

SITUATION OVERVIEW

Customer requires a system to dispense carbon black from bulk bags via Hoist & Trolley loaded frame. Material will gravity feed into a mix tank below grade.

DESIGN PARAMETERS

Rate:	*Unknown*
Bulk density:	*Unknown*
Bag Weight:	*TBD*
Bag Sizes:	*TBD*
Bulk bags will be loaded via:	Hoist & Motorized Trolley
Contact surfaces:	Mild steel coated in enamel paint
Non contact surfaces:	Mild steel coated in enamel paint

RECOMMENDATIONS

- **FormPak BagFlo-500-HT** (Hoist & Trolley loaded) bulk bag unloader

OPERATION

Bulk bag will be positioned onto hooks of crane adapter. Using pendent control, adapter and bag can now be lifted and placed onto bag receiver hopper. By opening access door operator can feed bag spout into access box, untie spout, (material can now flow into downstream equipment) then close access door. Once “Start” button has been hit, bag unloader gyrator will start and material will flow.

If optional iris valve is used on any of the designs the bag spout will be pulled through the open iris valve prior to untying bag discharge spout. Iris valve can then be closed prior to dispensing, or set at one of many intermittent positions for metering material. This will allow operator to dispense a given amount by watching a scale indicator. Iris valve can be closed and bag spout retied and removed from unloader if desired.

FormPak

FormPak, Inc.7209 St. Charles Rock Road, St. Louis, MO 63133

EQUIPMENT DESCRIPTIONS

Item	Qty	Description

1 **1** **FormPak BagFlo 500-HT (Hoist and Trolley)**

- Heavy-duty tubular steel frame (3" x 3" x .25 wall) and cross supports, with integral I-Beam for hoist mounting, ¾" plate steel mounting feet pre-drilled, constructed of mild steel coated in enamel paint
- 48" X 48" bag receiver hopper, gyrator mounting plate, and outlet flange, mild steel coated in enamel paint
- Gasketed access door/surge hopper, 12" flanged top with clamp to attach to unloader discharge, stainless steel – welds ground smooth, bead blast finish
- 12" RCN (Rubber Coated Nylon) flex sleeve, (2) stainless steel clamps (for mounting between access box and screener or conveyor below)
- Harrington Electric Chain Hoist Model ERM010-L-15: 2200# capacity, 15' lift, 16' per minute lift speed, motor driven trolley – 42' per minute traverse speed, chain container, 230-460/3/60
- Crane adapter (one point pick up) for hoist hook to lift bag by straps, mild steel coated in enamel paint
- **Bag ShakR** system: live fluidization vibration pan on the bag hopper - 1500# force - .62hp heavy-duty Powtek gyrator 230/3/60
- (4) Flex bolt sandwich isolators
- Operator control panel, "System Start" button and all motor controls, fuses, and relays pre-wired and mounted in NEMA 12 enclosure

$ **17,385**

OPTIONS

1) **12" Aluminum Body Iris Valve** for metering flow of material from bag or removing partially empty bag from system **$ 925**

2) **Upgrade to Stainless Steel Contacts –** Bag receiver hopper and access box to be fabricated from 304 stainless steel – mill finish **$ 1,380**

3) **Upgrade to Epoxy Paint –** All structural steel to be sand-blasted, primed, and coated in two part epoxy coating **$ 370**

4) **Upgrade to 4" square tube uprights** **$ 445**

FormPak

FormPak, Inc.7209 St. Charles Rock Road, St. Louis, MO 63133

GAURANTEE

A full one year, unlimited guarantee of parts and labor.

CONDITIONS

System is unconditionally guaranteed to work only if a sample of material to be handled is delivered for testing. Quote does not include on site mechanical or electrical installation, field service, or start-up. Also does not include any applicable state and local taxes, or permitting costs. Credit references must be provided prior to acceptance of order. LTL shipments will be charged an additional crating charge not to exceed $250. Additional terms and conditions apply, please request full disclosure prior to order.

TERMS

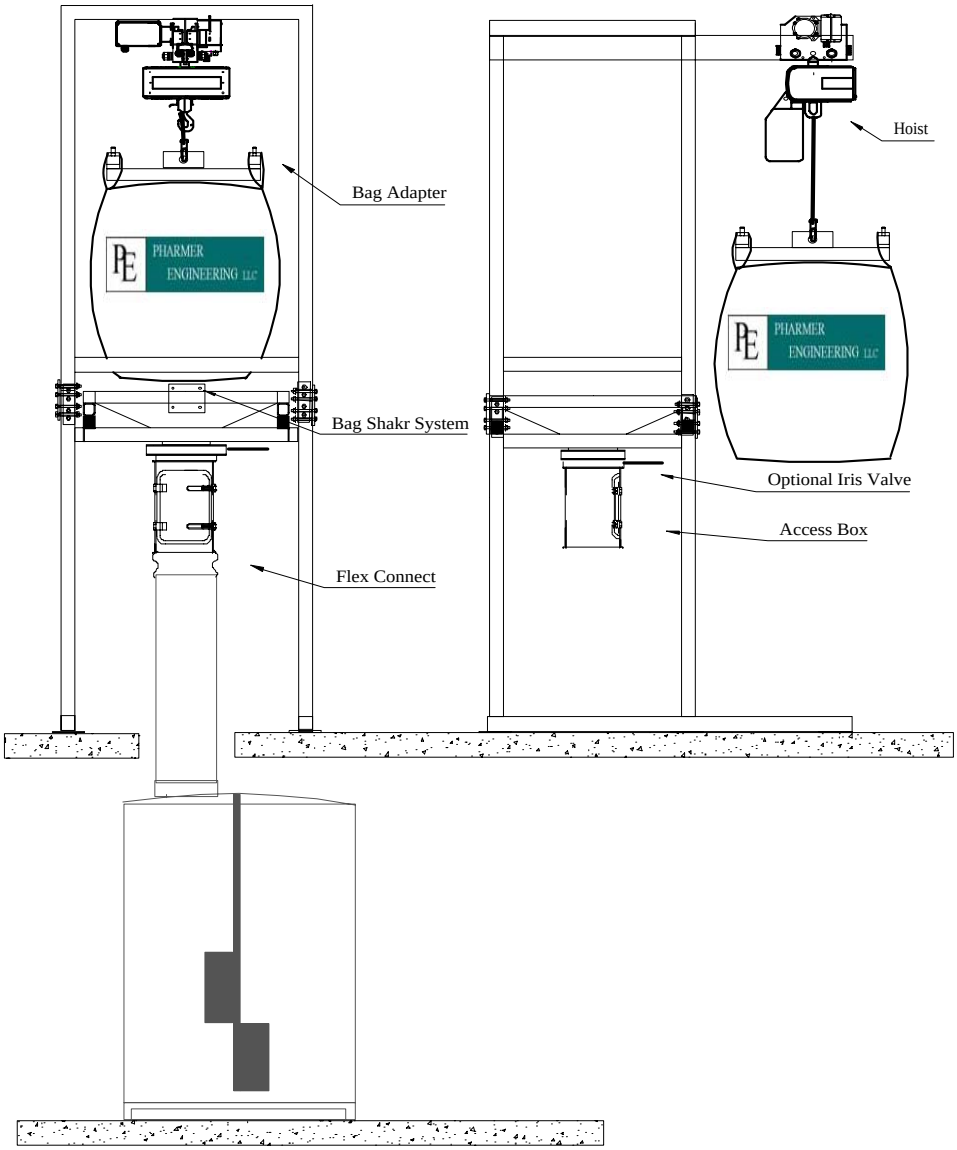
Quote:	Good for 30 days from date of issue.
Leadtime:	4-8 weeks from drawing approval depending on options and shop load
Payment:	30% down with order, 40% upon completion (prior to shipment), balance net 30 from receipt of equipment. Overdue balances will be charged a 2% penalty.
FOB:	St. Louis, MO

Phone: 417.753.5640 Fax : 417.753.5641 Email: FormPak@aol.com

FormPak

FormPak, Inc.7209 St. Charles Rock Road, St. Louis, MO 63133

FormPak BagFlo-500-HT



Phone: 417.753.5640 Fax : 417.753.5641 Email: FormPak@aol.com

Meeting Your Dry Material Handling & Packaging Needs Since 1968

COLUMBIA TECH TANKS

QUOTE FOR: Pharmer Engineering
Dan Barbeau
Email: dbarbeau@pharmereng.com

1712 19th Street, Suite 109
Bakersfield, CA 93301
Phone: 661-636-1357
Fax: 661-636-1329

Quote Number: 0712-2544 **Date:** 12/20/2007

Reference: Neepawa, Wastewater Tanks

Thank you for your inquiry. We are pleased to offer the following quotation for your consideration.

- **DESCRIPTION - 47x24 Anoxic Basin**

  1 - 47.534' Diameter x 24.18' nominal sidewall height factory coated bolted carbon steel Water storage tank, specific gravity of 1.00, nominal capacity 320,986 gallons, usable capacity 294,436 gallons based on 2.000' of freeboard, designed in accordance with AWWA D103-97 Specifications, Seismic Zone 3, I = 1.25, Rw = 4.50, S = 1.50 per AWWA, 100 MPH wind load per AWWA, ***Flat steel bottom,*** Anchoring stirrups with anchor bolts (cast in place type), Open top with wind girder

  NOTE: It is the customer's responsibility to notify CTT if design conditions are other than noted.

- **COATINGS**

  Interior and both sides of bottom painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy (7 mils average, DFT). Exterior painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy with finish coat of Standard Tan performance urethane (4.5 mils average, DFT). Coatings are electrostatically applied over a minimum SSPC-SP 10 near-white blast and thermally cured. CTT coatings are applied within a controlled environment and blast is achieved using a steel grit and shot mix.

- **HARDWARE**

  Galvanized bolts, nuts, washers and EPDM gasketing. Plastic encapsulated head bolts for interior vertical seams. Encapsulated nuts for all floor seams.

- **ACCESSORIES**

  1- Columbian TecTank decal installed on top ring
  1- 24" X 46" Flush cleanout with 2-piece cover
  1- Name Plate, Liquid Tank
  1- 24" Diameter shell manway with bolt-on hinged cover
  1- Outside ladder with safety cage and lockable entry hoop - OSHA - hot dip galvanized (CTT standard construction)
  1- 4' Square platform (HDG)

1- 10" 150# Pipe penetration
1- 10" 150# Pipe penetration
1- 12" Internal overflow weir cone with external Sch. 10 downcomer pipe and flap gate
1- Design of simple ringwall or slab foundation in accordance with AWWA D103. Design to be based upon complete geotechnical report provided by others. Should special foundations be required, such as spread footings, pilings, or other complex foundation types, such foundation designs are to be provided by others.
1- Calculations to be sent with final drawings

● **DESCRIPTION - 47x24 Anoxic Basin w/ BSR**

1 - 47.534' Diameter x 24.76' nominal sidewall height factory coated bolted carbon steel Water storage tank, specific gravity of 1.00, nominal capacity 328,725 gallons, usable capacity 302,176 gallons based on 2.000' of freeboard, designed in accordance with AWWA D103-97 Specifications, Seismic Zone 3, I = 1.25, Rw = 3.50, S = 1.50 per AWWA, 100 MPH wind load per AWWA, ***Embedded base setting ring (installation and caulking by others***), Open top with wind girder

NOTE: It is the customer's responsibility to notify CTT if design conditions are other than noted.

● **COATINGS**

Interior painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy (7 mils average, DFT). Exterior painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy with finish coat of Standard Tan performance urethane (4.5 mils average, DFT). Coatings are electrostatically applied over a minimum SSPC-SP 10 near-white blast and thermally cured. CTT coatings are applied within a controlled environment and blast is achieved using a steel grit and shot mix.

● **HARDWARE**

Galvanized bolts, nuts, washers and EPDM gasketing. Plastic encapsulated head bolts for interior vertical seams.

● **ACCESSORIES**

1- Columbian TecTank decal installed on top ring
1- 24" X 46" Flush cleanout with 2-piece cover
1- Name Plate, Liquid Tank
1- 24" Diameter shell manway with bolt-on hinged cover
1- Outside ladder with safety cage and lockable entry hoop - OSHA - hot dip galvanized (CTT standard construction)
1- 4' Square platform (HDG)
1- 10" 150# Pipe penetration
1- 10" 150# Pipe penetration

1- 12" Internal overflow weir cone with external Sch. 10 downcomer pipe and flap gate
1- Design of simple ringwall or slab foundation in accordance with AWWA D103. Design to be based upon complete geotechnical report provided by others. Should special foundations be required, such as spread footings, pilings, or other complex foundation types, such foundation designs are to be provided by others.
1- Calculations to be sent with final drawings

- **DESCRIPTION - 41x22 Aeration Basin**

1 - 41.592' Diameter x 22.18' nominal sidewall height factory coated bolted carbon steel Water storage tank, specific gravity of 1.00, nominal capacity 225,425 gallons, usable capacity 205,098 gallons based on 2.000' of freeboard, designed in accordance with AWWA D103-97 Specifications, Seismic Zone 3, I = 1.25, Rw = 4.50, S = 1.50 per AWWA, 100 MPH wind load per AWWA, ***Flat steel bottom,*** Anchoring stirrups with anchor bolts (cast in place type), Open top with wind girder

NOTE: It is the customer's responsibility to notify CTT if design conditions are other than noted.

- **COATINGS**

Interior and both sides of bottom painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy (7 mils average, DFT). Exterior painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy with finish coat of Standard Tan performance urethane (4.5 mils average, DFT). Coatings are electrostatically applied over a minimum SSPC-SP 10 near-white blast and thermally cured. CTT coatings are applied within a controlled environment and blast is achieved using a steel grit and shot mix.

- **HARDWARE**

Galvanized bolts, nuts, washers and EPDM gasketing. Plastic encapsulated head bolts for interior vertical seams. Encapsulated nuts for all floor seams.

- **ACCESSORIES**

1- Columbian TecTank decal installed on top ring
1- 24" X 46" Flush cleanout with 2-piece cover
1- Name Plate, Liquid Tank
1- 24" Diameter shell manway with bolt-on hinged cover
1- Outside ladder with safety cage and lockable entry hoop - OSHA - hot dip galvanized (CTT standard construction)
1- 4' Square platform (HDG)
1- 10" 150# Pipe penetration
1- 10" 150# Pipe penetration

1- 12" Internal overflow weir cone with external Sch. 10 downcomer pipe and flap gate
1- Design of simple ringwall or slab foundation in accordance with AWWA D103. Design to be based upon complete geotechnical report provided by others. Should special foundations be required, such as spread footings, pilings, or other complex foundation types, such foundation designs are to be provided by others.
1- Calculations to be sent with final drawings

- **DESCRIPTION - 41x22 Aeration Basin w/ BSR**

1 - 41.592' Diameter x 22.76' nominal sidewall height factory coated bolted carbon steel Water storage tank, specific gravity of 1.00, nominal capacity 231,350 gallons, usable capacity 226,269 gallons based on 0.500' of freeboard, designed in accordance with AWWA D103-97 Specifications, Seismic Zone 3, I = 1.25, Rw = 3.50, S = 1.50 per AWWA, 100 MPH wind load per AWWA, ***Embedded base setting ring (installation and caulking by others)***, Open top with wind girder

NOTE: It is the customer's responsibility to notify CTT if design conditions are other than noted.

- **COATINGS**

Interior painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy (7 mils average, DFT). Exterior painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy with finish coat of Standard Tan performance urethane (4.5 mils average, DFT). Coatings are electrostatically applied over a minimum SSPC-SP 10 near-white blast and thermally cured. CTT coatings are applied within a controlled environment and blast is achieved using a steel grit and shot mix.

- **HARDWARE**

Galvanized bolts, nuts, washers and EPDM gasketing. Plastic encapsulated head bolts for interior vertical seams.

- **ACCESSORIES**

1- Columbian TecTank decal installed on top ring
1- 24" X 46" Flush cleanout with 2-piece cover
1- Name Plate, Liquid Tank
1- 24" Diameter shell manway with bolt-on hinged cover
1- Outside ladder with safety cage and lockable entry hoop - OSHA - hot dip galvanized (CTT standard construction)
1- 4' Square platform (HDG)
1- 10" 150# Pipe penetration
1- 10" 150# Pipe penetration

1- 12" Internal overflow weir cone with external Sch. 10 downcomer pipe and flap gate
1- Design of simple ringwall or slab foundation in accordance with AWWA D103. Design to be based upon complete geotechnical report provided by others. Should special foundations be required, such as spread footings, pilings, or other complex foundation types, such foundation designs are to be provided by others.
1- Calculations to be sent with final drawings

- **DESCRIPTION - 81x30 Equalization Basin**

1 - 80.214' Diameter x 30.00' nominal sidewall height factory coated bolted carbon steel Water storage tank, specific gravity of 1.00, nominal capacity 1,134,078 gallons, usable capacity 1,058,473 gallons based on 2.000' of freeboard, designed in accordance with AWWA D103-97 Specifications, Seismic Zone 3, I = 1.25, Rw = 4.50, S = 1.50 per AWWA, 100 MPH wind load per AWWA, ***Flat steel bottom,*** Anchoring stirrups with anchor bolts (cast in place type), Open top with wind girder

NOTE: It is the customer's responsibility to notify CTT if design conditions are other than noted.

- **COATINGS**

Interior and both sides of bottom painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy (7 mils average, DFT). Exterior painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy with finish coat of Standard Tan performance urethane (4.5 mils average, DFT). Coatings are electrostatically applied over a minimum SSPC-SP 10 near-white blast and thermally cured. CTT coatings are applied within a controlled environment and blast is achieved using a steel grit and shot mix.

- **HARDWARE**

Galvanized bolts, nuts, washers and EPDM gasketing. Plastic encapsulated head bolts for interior vertical seams. Encapsulated nuts for all floor seams.

- **ACCESSORIES**

1- Columbian TecTank decal installed on top ring
1- 24" X 46" Flush cleanout with 2-piece cover
1- Name Plate, Liquid Tank
1- 24" Diameter shell manway with bolt-on hinged cover
1- Outside ladder with safety cage and lockable entry hoop - OSHA - hot dip galvanized (CTT standard construction)
1- 4' Square platform (HDG)
1- 10" 150# Pipe penetration
1- 10" 150# Pipe penetration

1- 12" Internal overflow weir cone with external Sch. 10 downcomer pipe and flap gate
1- Design of simple ringwall or slab foundation in accordance with AWWA D103. Design to be based upon complete geotechnical report provided by others. Should special foundations be required, such as spread footings, pilings, or other complex foundation types, such foundation designs are to be provided by others.
1- Calculations to be sent with final drawings

- **DESCRIPTION - 81x30 Equalization Basin w/ BSR**

1 - 80.214' Diameter x 30.58' nominal sidewall height factory coated bolted carbon steel Water storage tank, specific gravity of 1.00, nominal capacity 1,156,117 gallons, usable capacity 1,080,512 gallons based on 2.000' of freeboard, designed in accordance with AWWA D103-97 Specifications, Seismic Zone 3, I = 1.25, Rw = 3.50, S = 1.50 per AWWA, 100 MPH wind load per AWWA, ***Embedded base setting ring (installation and caulking by others),*** Open top with wind girder

NOTE: It is the customer's responsibility to notify CTT if design conditions are other than noted.

- **COATINGS**

Interior painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy (7 mils average, DFT). Exterior painted one coat of Trico Bond EP® thermoset corrosion resistant powder epoxy with finish coat of Standard Tan performance urethane (4.5 mils average, DFT). Coatings are electrostatically applied over a minimum SSPC-SP 10 near-white blast and thermally cured. CTT coatings are applied within a controlled environment and blast is achieved using a steel grit and shot mix.

- **HARDWARE**

Galvanized bolts, nuts, washers and EPDM gasketing. Plastic encapsulated head bolts for interior vertical seams.

- **ACCESSORIES**

1- Columbian TecTank decal installed on top ring
1- 24" X 46" Flush cleanout with 2-piece cover
1- Name Plate, Liquid Tank
1- 24" Diameter shell manway with bolt-on hinged cover
1- Outside ladder with safety cage and lockable entry hoop - OSHA - hot dip galvanized (CTT standard construction)
1- 4' Square platform (HDG)
1- 10" 150# Pipe penetration
1- 10" 150# Pipe penetration

1- 12" Internal overflow weir cone with external Sch. 10 downcomer pipe and flap gate
1- Design of simple ringwall or slab foundation in accordance with AWWA D103. Design to be based upon complete geotechnical report provided by others. Should special foundations be required, such as spread footings, pilings, or other complex foundation types, such foundation designs are to be provided by others.
1- Calculations to be sent with final drawings

TERMS AND CONDITIONS OF SALE

The Terms and Conditions of this Offer are per the attached Terms and Conditions of Sale for Columbian TecTank Product Lines. Please review these terms carefully, particularly the sections concerning Terms of Payment, Invoice & Hold, and Taxes.

SCHEDULE

Approximately 10-12 weeks after receipt of returned approval drawings and settlement of all details. Please allow 2-4 weeks for preparation of approval drawings. If this indicated time is not satisfactory, then we will work with you on your delivery schedule.

- **EXCEPTIONS/CLARIFICATIONS**

General

1. Columbian TecTank is submitting this quotation for a bolted tank.
2. The tank is designed and fabricated per AWWA D103-97 Specifications for bolted steel tanks, except the plate & sheet material may be of a grade which exceeds the requirements of AWWA D103-97 Section 2.4.
3. This quote does not include unloading of tank or disinfection at jobsite.
4. Foundation designed by Columbian TecTank. All foundation work shall be by others (including installation of base setting ring). Material for sealing of base setting ring to be supplied by CTT and installed by others.
5. Tank nozzles will be factory cutout and bolt on in the field.
6. Unless noted, all equipment that is to be attached to the tank to be installed by the customer. This includes alarms, gauges, insulation, and heating equipment and controls.
7. Grouting is not included.
8. If required, Lightning Protection Equipment provided by the customer.
9. Unless noted, corrosion allowance has not been added to this quotation.
10. Unless noted, Columbian TecTank has quoted our standards for design, fabrication, guardrails, ladders and coatings.
11. Cathodic Protection has not been quoted nor is it required on Trico Bond EP® coated tanks.
12. Unless noted, there is no piping (interior or exterior) quoted.
13. Unless noted, external or internal piping or piping brackets have not been quoted.

14. Prices are firm for 30 days (CS only)and do not include any fees, permits, duties or applicable taxes.

FIELD CONSTRUCTION The erecting portion of the quote includes only those items outlined in the attached Erecting Contract Conditions. In particular:

1. ***This quote does not include unloading.*** An optional price can be provided if the customer requires the erectors to unload the tank on site.
2. The customer is responsible for adequate lay down area
3. Field Testing
    a. Leak testing of tanks is described in the attached Bolted Tanks Erection Contract Conditions
    b. Unless noted, the customer is responsible for filling the tank, covering openings, supply of water to fill the tank, furnish pumps, hoses, and the accessories required to fill and dispose of the test water. An optional price can be provided if the customer requires the erector to supply water and equipment for leak testing.
    c. Prices are firm for 30 days (CS only)and do not include any fees, permits, duties or applicable taxes.

NOTE: *Any items or specifications not specifically mentioned above are not a part of this quotation. This quotation represents our completeoffering. If there are any conflicts between your requirements or the plans and specifications and what we have quoted, our quotation shall govern.*

Governing Codes: Columbian TecTank Company utilizes those standards, specifications and/or interpretations and recommendations of professionally recognized agencies and groups such as AWWA, API, ACI, AISI, AWS ASTM, Factory Mutual, U.S. Government, etc. as the basis in establishing its own design, fabrication and quality criteria, standards, practices, methods and tolerances.

CTT's area representative is Rob Young with Goble Sampson Associates- phone 801-268-8790. Please call if our representative or we can be of further service.

We trust our prices and delivery will meet your approval and that we may be favored with your order.

Sincerely,

David Oveson
Area Manager
661-636-1316

PRICING SUMMARY

Item	Qty	Size	Material	Erection	Freight	Total	Weight
1	1	47.534' x 24.18'	$ 93,366	N/A	$ 6,500	$ 99,866	46,863
2	1	47.534' x 24.76'	$ 74,946	N/A	$ 6,500	$ 81,446	41,502
3	1	41.592' x 22.18'	$ 77,560	N/A	$ 4,000	$ 81,560	35,342
4	1	41.592' x 22.76'	$ 63,932	N/A	$ 4,000	$ 67,932	32,084
5	1	80.214' x 30.00'	$ 226,332	N/A	$ 14,500	$ 240,832	138,462
6	1	80.214' x 30.58'	$ 196,265	N/A	$ 14,500	$ 210,765	127,028

Prices are for quantities shown. ***Prices are firm for 30 days (CS only). Prices do not include any fees, permits, duties or applicable taxes.***

[ ] Resale Certificate - Provided to CTT by Customer

[ ] Tax Exempt Certificate - Provided to CTT by Customer

_____

Signature

CTT's offer is accepted on

Date: _____

By: _____

Title: _____

The above signed represents that they are legally authorized to purchase on behalf of the company of _____

WEDECO UV DISINFECTION

WEDECO, Inc.

14125 South Bridge Circle
South Point Business Park
Charlotte, NC 28273
USA
tel +1 704 716 7600
fax +1 704 295 9080
www.WEDECO.us

Dan Barbeau, P.E.
Pharmer Engineering, LLC
1998 West Judith Lane
Boise, ID 83705

Stephen Jeffus
tel 214-341-1639
fax 214-341-7335
Stephen.Jeffus@itt.com

February 22, 2008

Proposal No. 08KH0216

WEDECO, Inc.
Project: Neepawa, Manitoba WWTP; Design flow = 350 GPM

Dear Sir,

Based on your inquiry, we are pleased to offer the following proposal:

TABLE OF CONTENTS

ITT

1. WEDECO UV Unit Type LBX 200

Pos.	Item
1.1	**WEDECO UV Unit Type LBX 200**

Design flow	:	350 GPM
Flow capacity (each unit)	:	350 GPM
Number of units	:	2 (1 duty, 1 standby)
Suspended solids	:	max. 5 mg/l
Particle size	:	< 10 μm
UV transmittance per cm (min.)	:	65 %
UV dose (based on calculated point source method):		100 mJ/cm² @ end of lamp life
Lamp type	:	XLR 30
UV-C output	:	150 W
Number of lamps (each unit)	:	10
Max. Power consumption (each unit; lamps and ballasts only):		3.60 kW
Max. Installed Power cons. (each unit; incl. fan-cooling):		6.50 kW
Power supply	:	480 V 50/60HZ Three Phase
Operating pressure (max.)	:	150 psi
Reactor material	:	Stainless steel 316 L
Reactor connection	:	Flange 8" RFF
Water temperature	:	0 - 60 °C; 32 - 140 °F
Control	:	SEC for on/off control only
Enclosure rating	:	NEMA 12 with fan-cooling (for indoor climate-controlled installation by OTHERS)
Automatic wiping	:	included
Chemical cleaning tank (C-series)	:	included
Calibrated UV measuring device	:	included

Qty.	Item	Unit Price US$	Total Price US$
2	**WEDECO UV Unit Type LBX 200**	**$43,000**	**$86,000**

2. Terms & Conditions

2.1. Documentation

One (1) manual is included in the price of each UV system and additional documentation is available. All WEDECO UV units are fully tested in our factory prior to delivery.

2.2. Shipment Terms

Delivery time:	**approx. 6-8 weeks after approved submittals**
Terms of Delivery:	**Transportation FOB Jobsite (by truck) including packaging**
Terms of Payment:	**Net 30 days**

All payments shall be made in US$.

The prices in this quotation are valid for three (3) months from the date of this proposal. WEDECO reserves the right to alter the system in order to incorporate technical advances realized after the date of this proposal.

The equipment proposed has been quoted as a standard product offering and is subject to the attached Terms & Conditions and warranty. Anything not specifically mentioned in this proposal is excluded.

Should you have any questions about this proposal or require any additional information, please do not hesitate to contact us.

We look forward to hearing from you.

Sincerely,

District Sales Manager
Dallas

Stephen Jeffus
District Sales Manager

Katie Cook
Applications Engineer

STANDARD TERMS AND CONDITIONS OF SALE

WEDECO, Inc. (hereinafter called “Seller”), agrees to sell the equipment described (see attached quote) (hereinafter called the “Goods”), on the following terms and conditions of sale. Any alteration of these terms and conditions shall have no force or effect unless agreed to in writing by the Seller.

1. Orders

Orders are subject to acceptance at the home office of Seller.

2. Prices, Discounts and Payments

All quotations are based on FOB Point of Shipment. Quotations automatically expire Sixty (60) days from the date issued and are subject to termination by written notice within that period. Unless otherwise agreed to in writing, the terms of payment are net cash (30) days from date of invoice payable in legal tender of the United States of America.

The Seller reserves the right to restrict the terms of payment or to require payment prior to shipment if in the Seller’s opinion, the Buyer’s financial condition or other circumstances do not warrant shipment on the terms originally specified in the Agreement.

3. Design

The Company shall be obligated to furnish only the goods described in the Company submittal data (if such data is issued in connection with this order) and as described in the Company’s proposal.

4. Liability

The Buyer shall remain primarily liable for the purchase price and the Seller shall not be obliged to accept any terms or conditions of payment which will shift said liability to a third person not a party to the contract of sale, whether or not such third person is the United States Government, its agents or instrumentalities.

5. Shipping Date

Shipping dates are estimates of approximate dates of shipment, not a guarantee of a particular day of shipment.

Seller shall not be liable in any way for the default or delay in shipping due to contingencies beyond its control which prevents or interferes with the Seller making delivery on the date specified, including but not limited to war, war restrictions, rationing of fuel, strikes, lockouts, fires, bombings, accidents, floods, droughts and any other contingency affecting shipping, delivery, delivery of materials or credit, affecting the Seller, its suppliers, or subcontractors; and the Seller shall have the right to cancel a contract of sale or to extend the shipping date in the event that one more of such contingencies prevent or delay shipments. In the event of delayed or extended shipping dates due to the above causes, if the Buyer changes shipping instructions, any additional shipping charges shall be paid by the Buyer as a part of the purchase price. Delivery dates and prices are based on prompt receipt of orders by Seller and all information necessary to permit Seller to proceed with work immediately and without interruption, and satisfactory assurance of compliance with the terms of payment agreed upon.

6. Shipping and Packing

All Goods are carefully packed for shipment and Seller will not be responsible for loss, delay or breakage after having received “in good order” receipts from the carrier. All claims for breakage, loss, delay and damage should be made to carriers, but Seller will render Buyer all reasonable assistance in securing satisfactory adjustment of such claims. In the absence of directions, Goods will be shipped by the method and via carrier selected at Seller’s discretion.

7. Cancellation/Termination

Orders are not subject to Buyer’s cancellation or change in specifications, shipping schedules or other conditions originally agreed upon without Seller’s written consent and then only upon agreement to compensate Seller for loss caused by such cancellation or changes.

Seller may terminate this Agreement without liability to Buyer if (i) Buyer shall materially breach any of the terms and conditions of this Agreement and shall fail to cure such material breach within five (5) days after written notice from Seller describing the breach and requesting its cure; or (ii) Buyer shall become insolvent; or (iii) a petition under the Bankruptcy Act or any other insolvency law shall be filed by or against Buyer; or (iv) Buyer shall make assignment for the benefit of creditors; or (v) Buyer shall fail to make timely payment of any obligation owed by it to Seller; or (vi) for any reason a good faith doubt arises as to Buyer’s ability to make prompt payment.

Seller shall not by reason of its termination of this Agreement in accordance with the terms hereof, be liable to Buyer for compensation, reimbursement or of any damages on account of the loss of profits or prospective profits on anticipated sales, or on commitments in connection with the business or goodwill of Buyer or otherwise or for direct, special, indirect or consequential damages.

8. Standard Warranty

Please refer to WEDECO Statement of Warranty (separate document).

9. Compliance with Laws
Seller has complied with all applicable Federal and North Carolina laws and regulations in connection with the manufacturer and sale of the Goods. Seller assumes no responsibility or liability for import duties, laws, regulations or taxes of any foreign country or of laws or regulations of any state other than North Carolina.

10. Taxes
Any manufacturer's excise tax, use tax, sales tax, or tax or duty of any nature whatsoever arising out of or assessed by reason of this sale shall be paid by the buyer in addition to the purchase price, and in the event Seller is required to pay such taxes or duties the Buyer shall reimburse Seller therefore, unless Buyer shall provide Seller at the time an order is submitted, with exemption certificates or other documents acceptable to taxing or customs authorities.

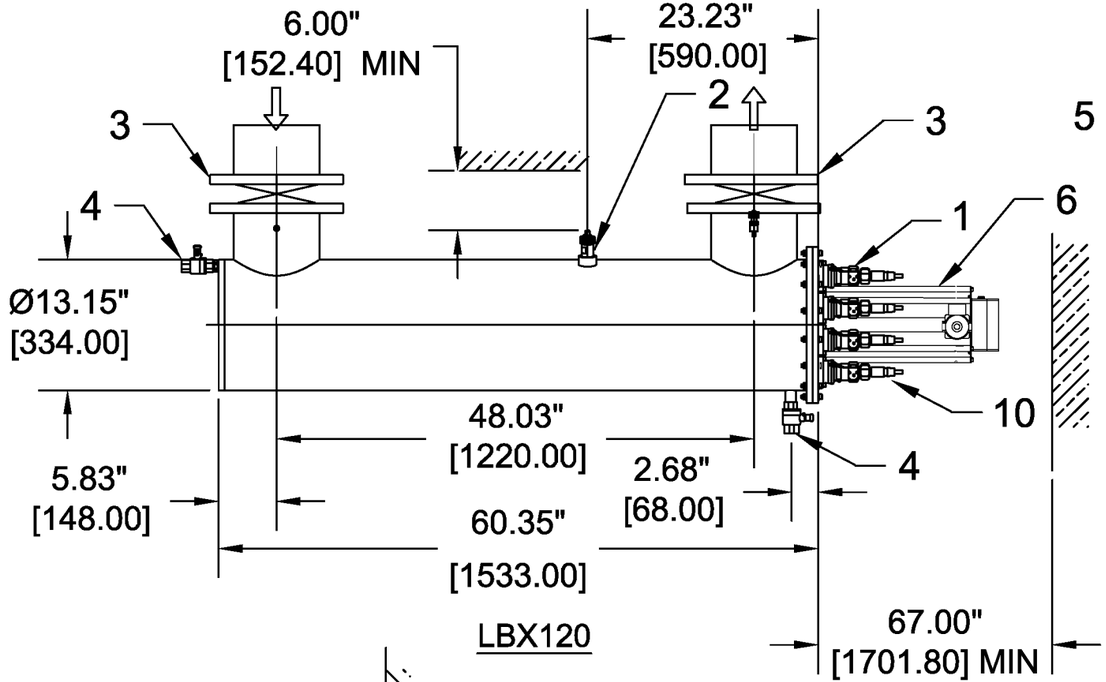
11. Errors
All clerical errors are subject to correction.

12. Applicable Laws
This Agreement and the respective rights and obligations of the Buyer and Seller with regard hereto shall be governed by and construed according to the laws of the State of North Carolina.

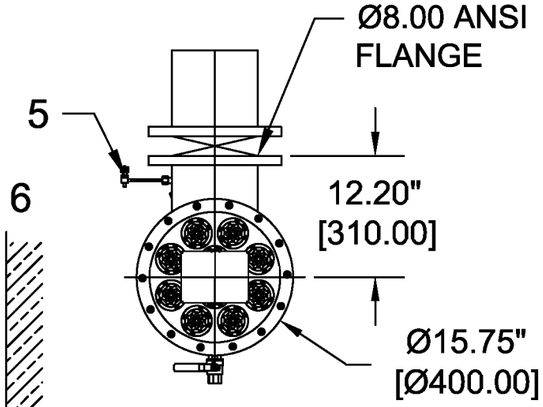
13. Notice
For the purpose of any notice required to be given by this Agreement or by an application of law, the Seller represents its principal place of business to be 14125 South Bridge Circle; Charlotte, NC 28273.

14. Assignment
Neither this Agreement nor any of the rights, interest or obligations of Buyer hereunder, may be assigned, transferred or conveyed by Buyer, by operation of law or otherwise, except upon prior written consent of seller.

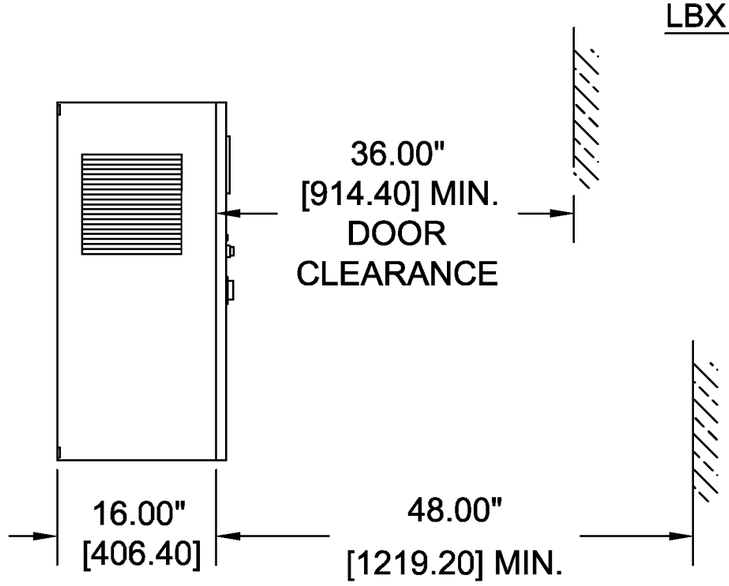
15. Entire Agreement
No promise, condition, agreement, representation or warranty with respect to this Agreement or the Goods shall bind Seller or Buyer unless expressed in this Agreement. This Agreement supersedes and cancels all other promises, conditions, agreements, representations and warranties. If this Agreement is in the form of any offer by Seller, acceptance is strictly limited to its terms. If this Agreement is in the form of an acceptance of Buyer's purchase order or other offer to buy, or in the form of an invoice covering a shipment in response to Buyer's purchase order or other offer to buy, the provisions of this Agreement shall apply to the exclusion of the provisions in Buyer's said purchase order or other offer, unless Buyer shall promptly (and in any event within 10 days after the date of this Agreement), give Seller written notice that Buyer insists upon the inclusion of any such provisions, and the Seller agrees to the same in writing. If this Agreement is in the form of any invoice, and if there has not been any such purchase order or other to buy, the provisions of this Agreement (and any quotation form issued by Seller in connection with transaction) shall constitute the entire agreement between Seller and Buyer.



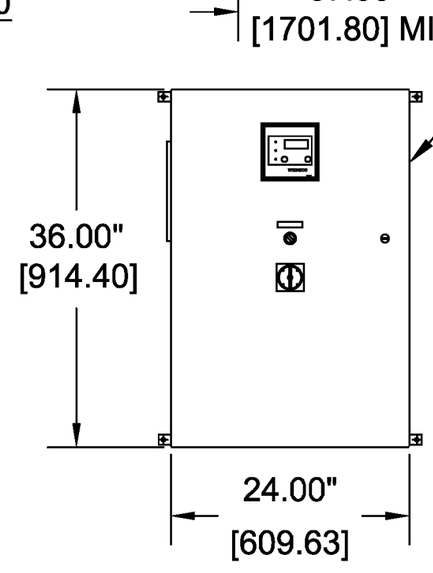
LBX120



1. LAMP CONNECTORS (QTY. 10)
2. UV-SENSOR
3. SHUT-OFF VALVE (BY CUSTOMER)
4. CLEANING/ DRAIN VALVE (¾" NPT)
5. SAMPLE VALVE (OPTION)
6. WIPING SYSTEM (OPTION)
7. UL TYPE 12 ENCLOSURE
8. 480V 3Ø POWER REQUIRED (15 AMP)
9. INDOOR AMBIENT TEMP. 40°F - 86°F
10. STANDARD LAMP/UV SENSOR CABLE LENGTH 35' (70' OPTION)
11. HP SYSTEM SHOWN

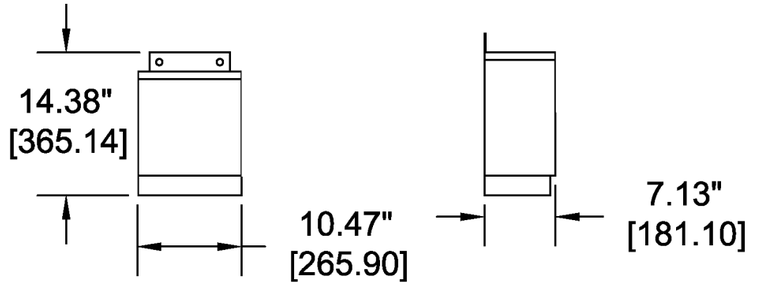


SIDE VIEW



FRONT VIEW

SYSTEM ENCLOSURE



TRANSFORMER
WALL MOUNTED
FIELD LOCATED
(BY OTHERS)

REV	REV # ECN #	SHEET (ZONE)	DESCRIPTION	DATE	APPROVAL

REVISIONS

FOR DISCUSSION ONLY

PROJECT

LOCATION

CUSTOMER

CONSULTING ENGINEER

NAVISION NUMBER | JOB NUMBER

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE
X/X = ±1/16 .X = ±.05 .XX = ± .02 .XXX = ± .005 ANG = ± 1°

THIRD ANGLE PROJECTION

DESIGNER	DATE
RQW	06/06/07
APPROVED BY	DATE
J. MENEELY	12/06/07

ITT
Engineered for life

ITT WEDECO
14125 South Bridge Circle
Charlotte, NC 28273 USA
TEL: (704) 716-7600
FAX: (704) 716-9080
www.itt.com

TITLE
UV DISINFECTION SYSTEM
GENERAL ARRANGEMENT

MODEL NO.
LBX200

SIZE	DRAWING NO.	REV
B	GA-LBX200U	

SCALE	WEIGHT	MATERIAL	FINISH	SHEET
NTS				OF 1 OF 1

EFFLUENT COOLING EQUIPMENT

Cooling Tower Systems Inc.
196 Lower Cherry Street
Macon, GA 31201
Phone: 478-755-1905
Voice: 800.752.1905
Fax: 478-755-8304
Email: info@coolingtowersystems.com
Web: www.coolingtowersystems.com

December 14, 2007
Earth Tech
Winnipeg, MB, CA

QUOTE NO. 07-1214-01

Effluent Cooling

Phone: 204-926-1147
Fax:
Email: Catharine.lin@earthtech.ca
Subject:: Cooling Tower Quotation
ATTN: Ms. Catharine Lin

Per your emailed request via Industrial Quick Search, we are pleased to quote the below cooling tower for your thermal performance design for winter use of 60.8/42.8/24.8462gpm (review carefully).

PRICE QUOTATION
Valid for Ninety (90) Days Only

ITEM NO.	DESCRIPTION	UNIT PRICE	TOTAL
Model T-2500-3	**FRP Cooling Tower with 15HP fan motor,** and v-belt speed reducer. Availability is 8 to 12 weeks		**$19,980.00/set**

Fiberglass

Notes:

1. The above net cost is FOB Macon GA. You would need to provide an exact shipping destination for freight quotation.
2. Specifications, drawings, and other submittal information to be provided with this quotation.
3. Terms to be set before accepting purchase order.

Thank you for the opportunity to quote you on your cooling tower needs. We look forward to assisting you as we continue to provide the best customer service and manufactured products available.

If I can be of any further assistance or additional information, please feel free to contact me at your convenience.

Best Regards,

Joe Coates

Cooling Tower Systems, Inc.
O.E.M Division

Just the tower
- check corrosion resistance etc
- too low a cost
but much deeper capital
option than simple lagoon
cooling
- ~~many more~~ +

"Manufacturing is Our Game
Satisfaction is Our Fame!"

Over 40 Years of Experience...

Fiberglass Cooling Tower

Tower Specifications: Model T-2500

CTS Cooling Tower Systems

The best just got better.

MEMBER

196 Lower Cherry Street
Macon, GA 31201
800-752-1905
478-755-1905
800-203-4925 FAX
478-755-8304 FAX
www.coolingtowersystems.com
info@coolingtowersystems.com

Tower Specifications: Model T-2500

CTS Cooling Tower Systems
The best just got better.

MATERIALS KEY	
FRP	Fiberglass Reinforced Plastic
HDGS	Hot Dip Galvanized Steel
AC	Aluminum Alloy Cast
SUS	Stainless Steel

NOTE:

These are **STANDARD** specifications for this cooling tower. For custom/non-standard specifications, please contact our **National Sales Office.**

Design and Operating Conditions	
Tower type:	Counter Flow Induces Draft
Water flow rates:	462 gpm
Hot water temperature:	60.8° f
Cold water temperature:	42.8° f
Ambient wet bulb temperature:	24.8° f
Total Fan BHP:	15 hp
Total pump head:	13.2
Drift loss of water flow rates:	0.002%
Evaporation loss of water flow rates:	0.93%
Design wind load:	30.7 lb/sq ft
Structural Details	
Overall diameter:	219 5/8 in
Overall height:	154.69 in
Dry weight:	5342 lbs
Operating weight:	15550 lbs
Basic Tower Construction Materials	
Tower support frame assembly:	HDGS
Casing:	FRP
Casing supporter:	HDGS
Cold water basin:	FRP
Filling:	PVC
Filling support:	HDGS
Fan guard:	HDGS
Mechanical equipment support	HDGS
Air inlet louver:	PVC
Bolts, nuts and washers:	SUS

Water Distribution System Construction Materials	
Stand pipe:	PVC
Sprinkler head:	PVC
Sprinkler pipe:	PVC
Mechanical Equipment	
Fan unit:	one unit per tower
Type:	Axial Flow
Manufacturer:	CTS
Diameter:	117 in
Blade material:	AC
Hub material:	AC
Nominal air volume:	91030 cfm
Fan Motor	
Number of motors:	one unit per tower
Type:	Induction
Manufacturer:	CTS
Insulation:	E Class
Rated HP:	15 hp
Voltage and phase:	220/440/3/60
Piping Connections	
Primary water inlet diameter:	10 in
Primary water outlet diameter:	10 in
Auto fill inlet diameter:	2 in
Quick fill inlet diameter:	2 in
Overflow outlet diameter:	4 in
Drain diameter:	2 in
Nominal water flow:	462 gpm

Specifications subject to change without notice.